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**CODE OF PRACTICE SIX**

**CODE OF PRACTICE FOR THE METERING OF ENERGY  
IMPORTS VIA LOW VOLTAGE CIRCUITS FUSED AT 100 AMPS  
OR LESS PER PHASE FOR SETTLEMENT PURPOSES**

**Issue 1**

**Version 3.00**

**DATE 29 January, 1996**

## Code of Practice Six

### **CODE OF PRACTICE FOR THE METERING OF ENERGY IMPORTS VIA LOW VOLTAGE CIRCUITS FUSED AT 100 AMPS OR LESS PER PHASE FOR SETTLEMENT PURPOSES.**

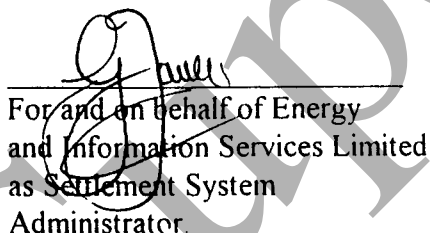
1. Reference is made to the Pooling and Settlement Agreement for the Electricity Industry in England and Wales dated 30th March 1990, and as amended and restated in 16th March 1995 and, in particular, to the definitions of "Code of Practice" and "Synopsis of Metering Codes" in clause 1.1 thereof.
2. Subject to Part 5 of Schedule 21 of the Pooling and Settlement Agreement, this Code of Practice shall apply to Metering Equipment comprising Metering Systems entered on to the Register on or after 1st October 1996.
3. This Code of Practice has been approved by the Executive Committee, the Settlement System Administrator and the Ancillary Service Provider.



For and on behalf of the  
Executive Committee.



For and on behalf of the  
Ancillary Service Provider.



For and on behalf of Energy  
and Information Services Limited  
as Settlement System  
Administrator.

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AMENDMENT RECORD

ISSUE	DATE	VERSION	CHANGES	AUTHOR	APPROVED
1	29/01/96	v 3.00	Approved by MDC	1998 MTF	MDC, 10/01/96

Superseded

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**CODE OF PRACTICE FOR THE METERING OF ENERGY IMPORTS VIA LOW VOLTAGE CIRCUITS FUSED AT 100 AMPS OR LESS PER PHASE FOR SETTLEMENT PURPOSES.**

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## 1. FOREWORD

This Code of Practice defines the minimum requirements for Direct Connected Metering Equipment at the point of connection and or supply **FOR THE METERING OF ENERGY VIA LOW VOLTAGE CIRCUITS FUSED AT 100 AMPS OR LESS PER PHASE.**

Energy Settlements and Information Services Limited, as Settlement System Administrator ("SSA") shall retain copies of, inter alia, the Code of Practice together with copies of all documents referred to in them, in accordance with the provisions of the Pooling and Settlement Agreement ("P&SA").

## 2. SCOPE

This Code of Practice states the practices that shall be employed, and the facilities that shall be provided for the measurement and recording of the quantities required for Settlement purposes.

This Code of Practice specifically applies to Direct Connected Metering Equipment to be installed **FOR THE METERING OF ENERGY IMPORTS VIA LOW VOLTAGE CIRCUITS FUSED AT 100 AMPS OR LESS PER PHASE.**

Reactive energy measurement is not specifically covered within this Code, where kVA and/or kVAr are required Code of Practice 5 equipment shall be used.

It will be noted that this Code of Practice and Code of Practice 7 apply to the same circuit consumption. For clarity the distinction is that Code of Practice 6 sets out the requirements for Settlement Metering Equipment and Code of Practice 7 specifies the settlement requirements as part of a wider metering and data collection infrastructure providing data to the Data Processing Interface. Code of Practice 7 does not require Code of Practice 6 Meters to be used. It would however be possible to construct a Code of Practice 7 system using Code of Practice 6 Metering.

The Metering Equipment shall be categorised into polyphase and single phase metering and one of the following types, dependent upon the period for which the equipment is able to record the Settlement information:

- i) Code of Practice Six (a) - minimum storage period of 20 days;
- ii) Code of Practice Six (b) - minimum storage period of 100 days;
- iii) Code of Practice Six (c) - minimum storage period of 250 days; or
- iv) Code of Practice Six (d) - minimum storage period of 450 days.

This Code of Practice derives force from the metering provisions (Part XV) of the P&SA, to which reference should be made and should also be read in conjunction with the relevant Agreed Procedures for, inter alia, operation of the data collection systems.

This Code of Practice does not contain the calibration, testing and commissioning requirements for Metering Equipment used for Settlement purposes. These requirements are detailed in Code of Practice Four - "Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Settlement Purposes".

Dispensations from the requirements of this Code of Practice may be sought in accordance with the P&SA and the relevant Agreed Procedure (AP32).

In the event of an inconsistency between the provisions of this Code of Practice and the P&SA, the provisions of the P&SA shall prevail.

### 3. REFERENCES

The following documents are referred to in the text;

BS EN 61036	AC Static Watt-hour Meters for Active Energy (Classes 1 and 2).
BS EN 60521	Specification of Class 0.5, 1 and 2 Single-Phase and polyphase, single rate and Multi rate Watt hour meters.
SI 792	The Meters (Certification) Regulations 1990.
Electricity Act 1989	Schedule 7, as amended by the schedule 1, to the Competition and Services (Utilities) Act 1992.
BS EN 61107	Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange.
Pooling and Settlement Agreement	Definitions, part XV and Agreed Procedures.
Code of Practice 4	Code of Practice for Calibration, Testing and Commissioning Requirements for Metering Equipment for Settlement Purposes.
Code of Practice 5	Code of Practice for the Metering of Energy Transfers with a Maximum Demand of up to (and Including) 1MW Covered by the Pooling and Settlement Agreement.
Code of Practice 7	Code of Practice for Metering of Energy Imports via Low Voltage Circuits Fused at 100Amps or Less per Phase for Settlement Purposes.



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## 4. DEFINITIONS AND INTERPRETATIONS

Save as otherwise expressly provided herein, words and expressions used in this Code of Practice shall have the meanings attributed to them in the P&SA.

The following definitions, which also apply, supplement or complement those in the P&SA and are included for the purpose of clarification.

### 4.1 Active Energy

Active Energy means the electrical energy produced, flowing or supplied by an electrical circuit during a time interval, and being the integral with respect to time of the instantaneous power measured in units of watt-hours or standard multiples thereof, that is;

1,000 kWh = 1 kWh

1,000 kWh = 1 MWh

1,000 MWh = 1 GWh

1,000 GWh = 1 TWh

### 4.2 Active Power

Active Power means the product of voltage and the in-phase component of alternating current measured in units of watts and standard multiples thereof, that is;

1,000 Watts = 1 kW

1,000 kW = 1 MW

1,000 MW = 1 GW

1,000 GW = 1 TW

### 4.3 Demand Period

Demand Period means the period over which Active Power is integrated to produce Demand Values. Each Demand Period shall be of 30 minutes duration, one of which shall finish at 24:00 hours.

### 4.4 Demand Values

Demand Values means, expressed in kW twice the value of kWh recorded during any Demand Period. The Demand Values are half hour demands and these are identified by the time of the end of the Demand Period.

### 4.5 Electricity

"electricity" means Active Energy and Reactive Energy.

#### 4.6 Energy Storage Device

A device to provide standby power to the Metering Equipment clock in the event of mains failure. e.g. battery or super capacitor.

#### 4.7 Full Load

Full Load means the product of the number of phases, maximum current ( $I_{max}$ ), and rated voltage of the Meter at unity power factor

#### 4.8 Import

Import means, for the purposes of this Code of Practice, an electricity flow as specified within the P&SA.

#### 4.9 Interrogation Unit

Interrogation Unit means a Hand Held Unit "HHU" (also known as Local Interrogation Unit "LIU") or portable computer which can program Metering Equipment parameters and extract information from the Metering Equipment and store this for later retrieval.

#### 4.10 Maximum Demand

Maximum Demand expressed in kW means twice the greatest number of kWh recorded during any Demand Period.

#### 4.11 Meter

Means a device for measuring electrical energy.

#### 4.12 Metering Equipment

Metering Equipment means Meters, measurement transformers (both voltage and current), metering protection equipment, including alarms, circuitry and their associated data collection Outstations and wiring which are part of the Active Energy measuring equipment at, or relating to, a Site.

#### 4.13 Meter Register

Meter Register means a device, normally associated with a Meter, from which it is possible to obtain a reading of the amount of Active Energy that has been supplied by a circuit.

#### 4.14 Outstation

Outstation means on-site equipment which receives and stores data from a Meter(s), and may perform some processing of the data before transmitting the metering data to the Settlement Instation on request. These functions may be facilitated in one or more separate units or be integral with the Meter.

#### 4.15 Password

Password means a string of characters length 6 characters, where each character is a case insensitive alpha character (A to Z) or a digit (0 to 9) or the underscore character (\_).

#### 4.16 Outstation System

Outstation System means one or more Outstations linked to a single communication line.

#### 4.17 PSTN

PSTN means the public switched telephone network.

#### 4.18 Settlement Instation

Settlement Instation means a computer based system which collects or receives data on a routine basis from selected Outstation Systems on behalf of Pool Members or by Agents of Pool Members.

#### 4.19 Universal Time Clock (UTC)

Universal Time Clock means clocks that operate to this time, as distinct from GMT.

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## 5. MEASUREMENT CRITERIA

### 5.1 Measured Quantities

For each circuit the following energy measurements are required for Settlement purposes:

- (i) Import kWh.

### 5.2 Accuracy Requirements

The overall accuracy of the energy measurements shall at all times be within the limits of error specified in SI 792 Regulation 8 pertaining to Schedule 7 of the Electricity Act 1989.

Meters, where certified, shall be certified in accordance with schedule 7 of the Electricity Act 1989.

Appropriate evidence to substantiate that these overall accuracy requirements are met shall be available for inspection to Pool Members or their agent(s).

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## 6. METERING EQUIPMENT CRITERIA

Although for clarity this Code of Practice identifies separate items of equipment, nothing in it prevents such items being combined to perform the same task provided the requirements of this Code of Practice are met. Where separate items of equipment are provided they shall be individually protected against electrical overload.

All Metering Equipment (including any Energy Storage Device) shall have a minimum design service life, without maintenance, of 10 years from date of manufacture.

### 6.1 Meters

For each circuit direct connected Active Energy Meters shall be used in accordance with Schedule 7 of the Electricity Act 1989.

New Meters shall comply with the requirements of either BS EN 61036 Class 2, for indoor meters or BS EN 60521 Class 2. The rating for single phase meters shall be 230 volts, 50Hz, 20 Amps basic or less and 100 Amps maximum and for polyphase meters 230/400 volts, 50Hz, 40 Amps basic or less and 100 Amps maximum current.

Existing meters may be used provided they were manufactured to the relevant British Standards. Ratings different to those quoted for new meters maybe utilised provided they are appropriate for the supply being metered.

Meters which provide data to separate Outstations shall provide an output for this purpose.

### 6.2 Outstation

An Outstation System shall be provided which transfers data to and receives data from a Settlement Instation(s). Outstations shall comply with all relevant requirements contained within BS EN 61036 for indoor conditions.

Separate Outstations storing data from a number of different circuits, up to a maximum consumption of 1GWh, and Meters with integral Outstation facilities may be cascaded onto one communication channel.

Metering data will normally be collected by the Settlement Instations in accordance with the following time scales, dependent upon which category of Metering Equipment that has been installed:

- a) Code Six (a) - daily interrogation;
- b) Code Six (b) - up to monthly interrogation;
- c) Code Six (c) - up to quarterly interrogation, or
- d) Code Six (d) - up to yearly interrogation.

Repeat collections of metering data shall be possible throughout the Outstation data storage period.

The Outstation shall have the ability to allow the metering data to be read by Instations other than the Settlement Instation provided the requirements of Section 8 of this Code of Practice are satisfied.

For the purpose of transferring stored metering data from the Outstation to the Settlement Instation, a unique Outstation identification code shall be provided.

Where an Outstation has a primary battery to provide back-up for the clock and calendar, this battery shall have a minimum standby service life of 3 years from the date of manufacture of the Outstation i.e. supporting the clock for 3 years without mains power.

Where Energy Storage Devices other than primary batteries are used, the clock and calendar shall be supported for a period of 7 days without an external supply connected to cater for extended supply failure.

In the event of an Outstation supply failure, the Outstation shall retain all data stored up to the time of the failure, and maintain the time accuracy in accordance with paragraph 6.2.2. These time accuracy requirements do not apply where the Outstation clock is re-synchronised from a broadcast clock when re-energised. (refer to section 6.2.3.)

Any "reading" or "reprogramming" operation shall not delete or alter any stored energy consumption data or associated alarms.

Where the Outstation is storing data for more than one circuit it shall continue to operate while any one circuit is energised.

The Outstation shall be clearly marked with the relevant part of Code of Practice 6. i.e. a, b, c or d.

### 6.2.1 Data Provision requirements

This section sets out the data to be provided by the Outstation and the duration of storage required. For the avoidance of doubt all Metering data shall be output in engineering units i.e. kWh.

Data shall be provided as follows and is specifically defined in Appendix 1.

- (i) For Each Interrogation of the Outstation the data provided shall be:
- kWh cumulative total meter advance register value for each Meter to 6 digit integer kWh value padded with leading zeroes where appropriate;
  - The date and time of interrogation [YYMMDDhhmmss];
  - The meter identifier 12 characters alphanumeric as defined in Appendix 1b. Where a separate Outstation is used the channel ID shall be the meter ID;
  - For polyphase metering Maximum Demand (MD), 6 digit (4 integer and 2 decimal places) kW value, padded with leading zeros where appropriate, for each meter for both the current and previous programmable charging period e.g. monthly, statistical review period, as required by the supplier;
  - multi-rate cumulative Active Energy registers as specified by Supplier;
  - date of Maximum Demand (MD) reset [YYMMDD]; and
  - number of days data returned from the meter.
- (ii) The Outstation shall provide the following information for each Day and for the current day up to the time of interrogation:
- kWh cumulative total register value for each Meter to 6 digit integer kWh value padded with leading zeroes where appropriate;
  - Where a battery is fitted, a battery change maintenance flag shall be provided based on standby battery service life;
  - An indication should clock failure occur e.g. When the system clock has failed due to power or battery failure;
  - The number of level 2 successful password accesses made on that day to a maximum of 7;
  - MD reset flag as appropriate;
  - Settlement day date [YYMMDD]; and
  - A flag to indicate a power outage for the whole of a Settlement Day.

(iii) For each Demand Period the Outstation will provide, for each Meter:

- A flag to indicate if net reverse energy flow has taken place over all phases;
- Truncated absolute cumulative register reading in the range 10's of kWh, kWh, 1/10 kWh and 1/100 kWh;
- A flag to indicate successful level 2 password access; and
- A flag to indicate that the power supply to the Outstation has failed.

A data capacity of 48 periods per day for the number of days specified below dependent upon the category of Metering Equipment shall be provided:

- *Code of Practice Six (a) - minimum storage period of 20 days;*
- *Code of Practice Six (b) - minimum storage period of 100 days;*
- *Code of Practice Six (c) - minimum storage period of 250 days; or*
- *Code of Practice Six (d) - minimum storage period of 450 days.*

Where the prescribed data storage period is exceeded the meter shall begin to wrap data i.e. replace the first reading with that of the latest reading.

The value of energy measured in a Demand Period but not stored in that Demand Period shall be carried forward to the next Demand Period.

Any discrepancy between the measured value of Active Energy at each individual metering point and the equivalent data presented by the Outstation for the same metering point shall not exceed +/- 0.5% at full load at that metering point.

An Outstation shall provide any portion of the data stored upon request by an Instation.

### 6.2.2 Time Keeping

- (i) The Outstation time shall be set to the Universal Time Clock (UTC). No switching between UTC and British Summer Time (BST) shall occur for settlements data storage requirements.

Routine time synchronisation may be carried out using 30 minute synchronising pulses or broadcast clocks up to a maximum limit of +/- 1 second per Demand Period without setting any password access flags.

The clock of the Outstation shall be capable of being set or adjusted using the local or remote communication ports but only once during any demand period.



- (ii) The overall limits of error for the time keeping shall be:
  - The completion of each Demand Period shall be at a time which is within  $\pm$  6 minutes of UTC; and
  - The duration of each Demand Period shall be within  $\pm$  2%, except where time synchronisation has occurred in a Demand Period.

### 6.2.3 Monitoring Facilities - Broadcast Clocks

- (i) For complete power outages up to 3 seconds in duration, the real time clock shall continue without interruption. This power outage event shall not cause the power outage flag or the successful level two password flag to be set at the time of power restoration.
- (ii) For power outages longer than three seconds and where power has now been restored, the clock shall start and continue from the time of failure until the broadcast clock is detected and successfully decoded, within the normal operating constraints of the broadcast clock system, the clock shall reset to UTC and the power failure flag and successful level two access password flag shall be set for the returning Demand Periods where the power outage existed.
- (iii) Where the broadcast clock cannot be detected by the Outstation, within the normal operating constraints and messaging protocols of the broadcast clock system, the clock failure flag shall be set for that day. The Outstation shall continue to maintain system clock accuracy as detailed in section 6.2.2. of this code of practice in the absence of the broadcast clock.

## 6.3 Displays and Facilities

The Metering Equipment shall display the following information (not necessarily simultaneously):

- total Import cumulative kWh per circuit, 6 digit integer kWh value padded with leading zeroes where appropriate for polyphase and 5 digit integer kWh value padded with leading zeroes where appropriate for single phase Meters; and
- current UTC or clock time and date as defined by the supplier.

The Metering Equipment shall be capable of enabling the display of the following information:

- (i) For polyphase meters:
  - Maximum Demand ("MD") in 6 digit (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate for the current and historic programmable charging period;
  - twice the kWh advance since the commencement of a current Demand Period, (i.e. "kW rising demand") to 6 digits (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate for the current and historic programmable charging period;
  - cumulative MD, 6 digit (4 integer and 2 decimal places) kW value padded with leading zeroes where appropriate;
  - number of MD resets up to a maximum of 99; and
  - multi-rate display sequence as specified by Supplier, with a minimum of 8 registers selectable over the calendar year. Further details are set out in Appendix 4.
- (ii) For single phase meters:
  - multi-rate display sequence as specified by Supplier, with a minimum of 4 registers selectable over the calendar year. Further details are set out in Appendix 4.

Where a multi-rate display sequence is enabled on a Meter, the default display shall be the cumulative kWh register of the active rate and the rate identifier. The initial operation of the display selector shall display the test display and the next operation shall display the total Import cumulative kWh. Subsequent operation of the display selector shall display registers in a sequence specified by the supplier.

## 6.4 Communications

The Outstation shall always provide local interrogation facilities via an accessible port.

### 6.4.1 Local Interrogation

An interrogation port shall be provided:

- Physically: shall be an optical port to BS EN 61107;
- Data Protocol: Standard as defined in Appendix 1 (a and b), Appendix 2 (a and b) and Appendix 3.

The outline Data structure for the information required in 6.2.1. is detailed in Appendix 1a.

The detailed application data structure and format for the data items specified in section 6.2.1. is detailed in Appendix 1b.

The data definitions and descriptions are detailed in Appendix 2a. The functional overlay specified in section 6.4.3. is detailed in Appendix 2b (protocol examples).

The Outstation shall have a maximum transfer time of 90 seconds per 100 days for each Meter through the local data port for the data specified above.

#### 6.4.2 Remote Interrogation

Where a remote interrogation facility is provided it shall not be possible to disconnect this link at the Outstation without the breaking of a Settlement seal.

The data shall be to the standard data structure as set out in Appendix 1b.

#### 6.4.3 Standard Protocol

The protocol shall be standard for all Outstations for the following settlement functions for the data specified in 6.2.1:

- Read complete 30 minute database;
- Last 'n' days of data, where 'n' is the number of days (n = 0 is the current day);
- Read selected Meters (if appropriate);
- Set time and date;
- Set password;
- Reset MD; and
- Change Authentication key at level 2 password access.

## 6.5 Security Requirements

To prevent unauthorised access to the data in the Metering Equipment a security scheme, as defined below, shall be incorporated for both local and remote communications access. Separate security levels shall be provided for the following activities;

- (i) Level 1 - No Password Required to access data on a read only basis as described in section 6.4.
- (ii) Level 2 - Password access for:
  - programming the Displays and Facilities as defined in Displays and Facilities;
  - programming the time by communication port access;
  - reprogramming the password for level 2;
  - reading additional information within the Metering Equipment;
  - resetting of the MD if appropriate; and
  - Changing the meter authentication key.
- (iii) Level 3 - Removal of Metering Equipment cover(s) necessitating the breaking of a seal for:
  - calibration of the Metering Equipment; and
  - programming the level 2 password.

In addition to the functions specified for each level it shall be feasible to undertake the functions at the preceding level(s). This need not apply at level 3.

## 6.6 Sealing

All Metering Equipment shall be capable of being sealed in accordance with the relevant Pool Agreed Procedures, the Meter Operator Codes of Practice, Certification Directives and other relevant standards.

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## 7. ASSOCIATED FACILITIES

### 7.1 Interrogation Unit

The Operator may interrogate the Metering Equipment using an Interrogation Unit (IU). The Interrogation Unit may be used for programming, commissioning, maintenance and fault finding and when necessary the retrieval of stored metering data. The data retrieved by the Interrogation Unit shall be compatible with the Settlement Instation.

The IU shall have a built-in security system, such as a password, so that the IU becomes inoperative and non-interrogatable if it is lost, stolen, etc.. The password can be applied at power-on of the device and/or on entry to the IU software application.

### 7.2 Additional Features

Additional features may be incorporated within or associated with the Metering Equipment provided but these must not interfere with or endanger the operation of the Settlement process.

## 8. ACCESS TO DATA

Access to metering data shall be in accordance with the provisions of the P&SA and the Agreed Procedures referred to therein. Such access must not interfere with or endanger the security of the data or the collection process for Settlement purposes.

## 9. Appendix 1: Outline Data Structure and Formats

### 9.1 Appendix 1a: Outline Data Structure

The physical definition of the local optical data port is detailed in BS EN 61107. The general protocol specification is as detailed in BS EN 61107, augmented by the specifications contained herein.

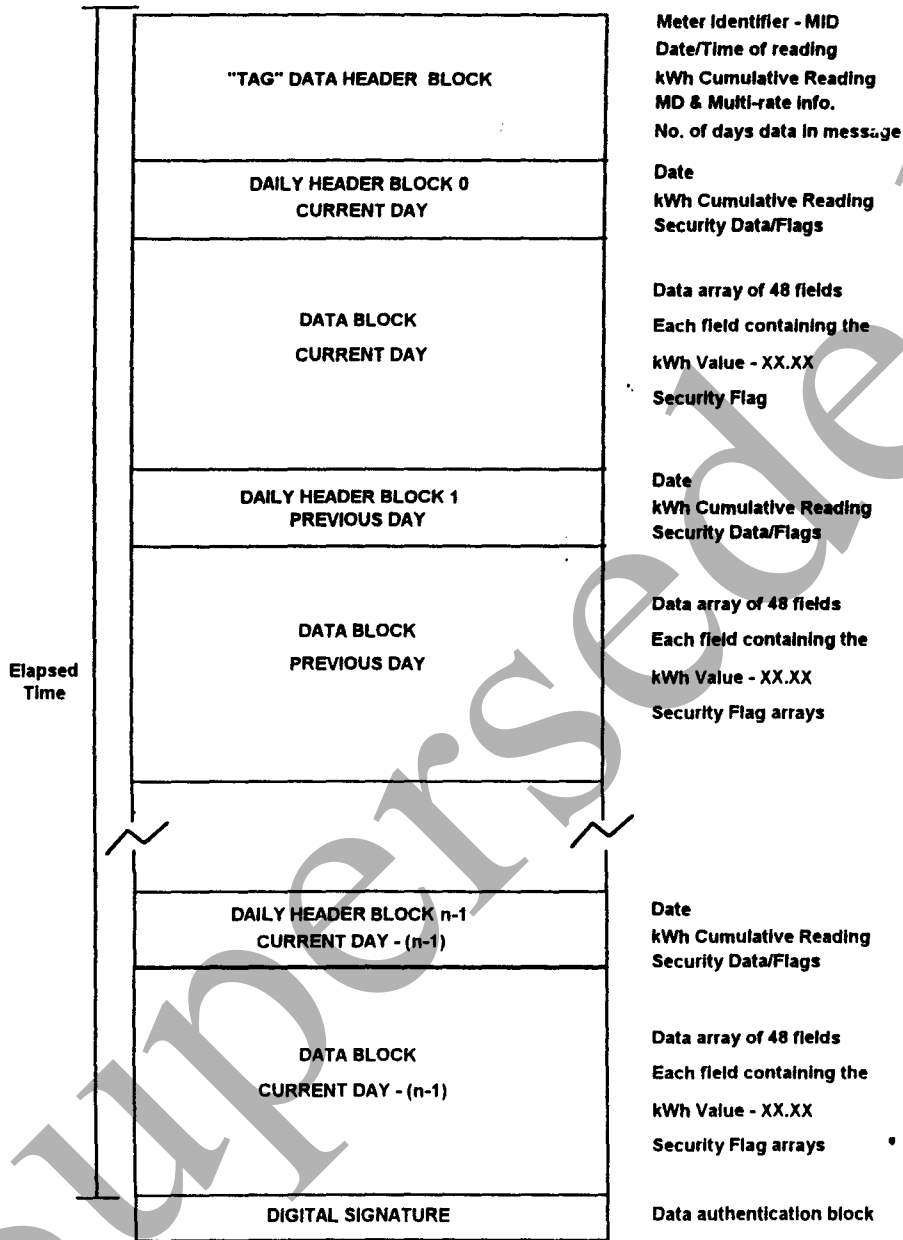
The outline data structure described in Appendix 1a is expanded in Appendix 1b to provide more detail of the precise data structures and formats. Appendix 2a contains the data definitions and descriptions. Appendix 2b details the protocol examples to meet the functional requirements of the standard protocol. The data authentication process is outlined in Appendix 3.

The following guidelines have been established for local communications :

- (i) The outstation transmits complete day information only, i.e. the current day's information is transmitted and "filled" where appropriate, if a period has not yet been completed. "Partial days" and "Missing days" must be "filled" in the data transmission from the outstation - see point (ii) below.
- (ii) Chronological inconsistencies in the data block are not allowed. i.e. all data must be contiguous. "Partial days" or "Missing days" information, (due for example to power outages), must be "filled" in the data block that is transmitted by the outstation via its local communication port. Data shall be presented as if no consumption was recorded (i.e. the repetition of the last four digits of the kWh cumulative reading for the appropriate demand periods), or Level 2 password access occurred during these periods.
- (iii) Data is transmitted in chronological order with current day's partial information transmitted first, oldest day's information transmitted last.

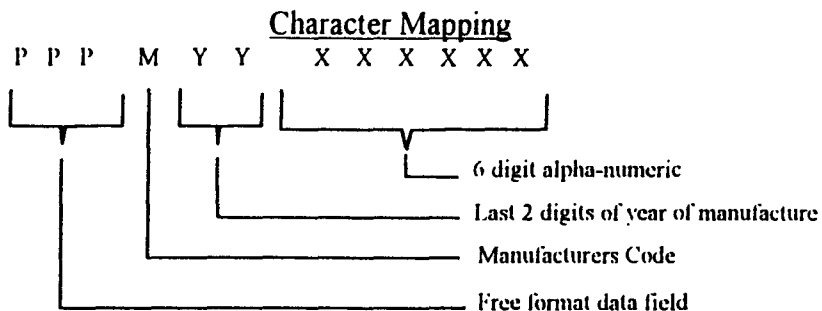
9.2 Appendix 1b: Data Structure and Formats

OUTLINE DATA STRUCTURE



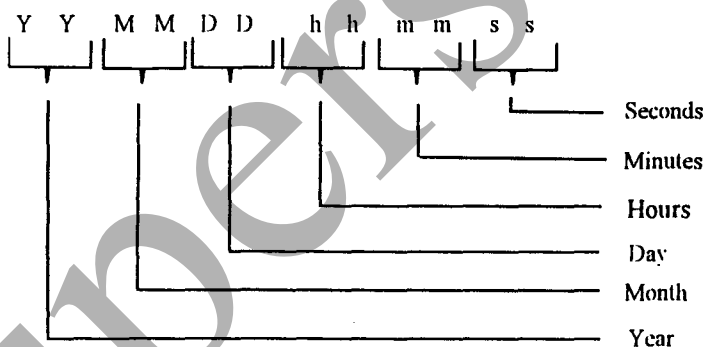
9.2.1 "TAG" Data Header Block

9.2.1.1 Meter Identifier-MID



Field	Character	Type	Range	Field Padding	Allowed Case
PPP	P	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper or Lower Case
M	M	Alpha	A-Z	-	Upper Case Only
YY	Y	Numeric	0-9	-	-
XXXXXX	X	Alpha-numeric	A-Z, 0-9	Leading Zeroes	Upper Case Only

9.2.1.2 Date and Time of Reading of Meter



9.2.1.3 kWh Cumulative Reading

The absolute value of the cumulative meter register at the time of the interrogation. Expressed as :- 6 digit integer kWh value, padded with leading zeroes where appropriate.

1	2	3	4	5	6
Hundred Thousand	Ten Thousand	Thousands	Hundreds	Tens	Units



#### 9.2.1.4 Maximum Demands - Mds

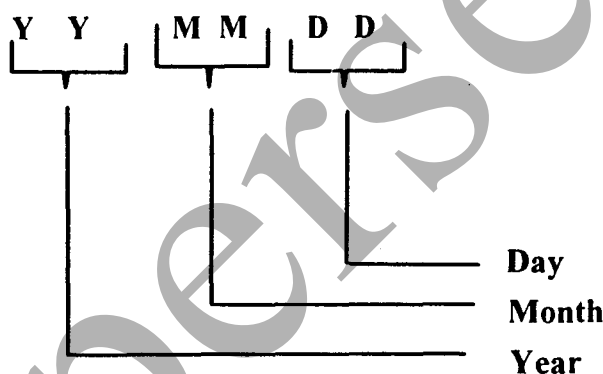
MD register data block consisting of 6 digit (4 integer and two decimal places) kW values with an implied decimal place, padded with leading zeroes where appropriate.

- i) MD in kW in current charging period
- ii) MD in kW in previous charging period
- iii) Cumulative Maximum Demand

Register ID	1000's	100's	Tens	Units	1/10ths	1/100ths
Current kW MD	1	2	3	4	5	6
Previous kW MD	1	2	3	4	5	6
Cumulative MD	1	2	3	4	5	6

#### 9.2.1.5 Date of Last MD Reset

Date of the last MD reset consisting of :-



#### 9.2.1.6 Number of Maximum Demand Resets

The numerical value representing the number of Maximum Demand Resets, maximum value NN = 99.

No. of MD Resets	N	N
------------------	---	---

9.2.1.7 *Multi-rate Energy Registers*

Multi-rate energy registers at time of data read out consisting of 6 digit integer kWh values, padded with leading zeroes where appropriate.

Register ID	100k's	10k's	1000's	100's	Tens	Units
Rate 1	1	2	3	4	5	6
Rate 2	1	2	3	4	5	6
Rate 3	1	2	3	4	5	6
Rate 4	1	2	3	4	5	6
Rate 5	1	2	3	4	5	6
Rate 6	1	2	3	4	5	6
Rate 7	1	2	3	4	5	6
Rate 8	1	2	3	4	5	6

This data block should always be of the same size. All data items should be transmitted, even if never initialised or used e.g. MD register on single phase meter, 8 rate register block even if 4 rate single phase meter, or if rate currently inactive e.g. due to tariff change.

9.2.1.8 *Number of Days Data in Message*

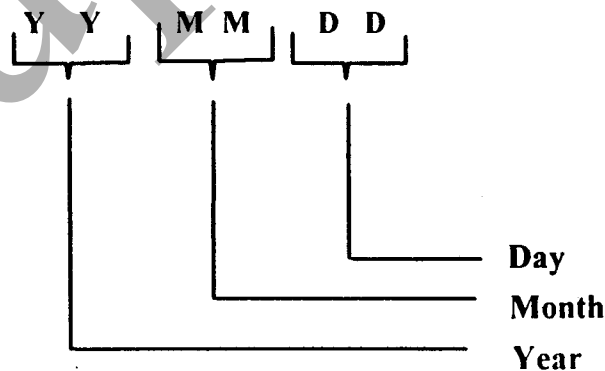
The numerical value representing the number of days of data to be transmitted by the outstation in response to a request for a data output.

No. of days of data in message	N	N	N
--------------------------------	---	---	---

9.2.2 *Daily Header Block*

9.2.2.1 *Day Identifier*

Day identifier for the 24 hour period to which the 30 minute data relates.



### 9.2.2.2 *Start of Day kWh Cumulative Reading*

The absolute value of the cumulative meter (channel) register at 00:00 hours, at the start of the 24 hour period, to which the 48 periods of information relate.

Expressed as :- 6 digit integer kWh value, padded with leading zeroes where appropriate.

1	2	3	4	5	6
Hundred Thousand	Ten Thousand	Thousands	Hundreds	Tens	Units

### 9.2.2.3 *Security Data and Flags*

The normal status of each flag is logic zero and the presence or occurrence of an identified event is signalled by setting the flag to logic 1.

- i) NNN - No. of successful level 2 accesses (maximum count = 7);
- ii) BM - Battery Maintenance Flag;
- iii) CF - Clock Failure;
- iv) MD - MD reset flag, set for the day on which the MD was reset; and
- v) PO - 24 hour continuous power outage of the outstation.

The security data and flags shall be coded into a single byte as follows:

Bit	7	6	5	4	3	2	1	0
Type	-	PO	MD	CF	BM	N	N	N

(Bit 7 is reserved for future use).

### 9.2.3 Data Block

The truncated absolute value of the cumulative meter (channel) register at the end of the 30 minute period, to which the value relates. Expressed as :- 4 digit kWh value, comprising two integers and two decimal digits, with an implied decimal place.

1	2	3	4
Tens	Units	Tenths	Hundredths

Appended for each 30 minute record are three security flags:

- i) Reverse running indication;
- ii) Successful level 2 password access; and
- iii) Power Failure.

The normal status of these flags is logic zero and the presence or occurrence of an identified event is signalled by setting the flag to logic 1.

The data block will consist of a contiguous data array of 48, 4 digit values representing the value (truncated kWh cumulative register) for each respective demand period of the day e.g.

```
2220 2221 2222 2223 2224 2225 2226 2227
2228 2229 2230 2231 2232 2233 2234 2235
2236 2237 2238 2239 2240 2241 2242 2243
2244 2245 2246 2247 2248 2249 2250 2252
2252 2253 2254 2255 2256 2257 2258 2259
2260 2262 2262 2263 2264 2265 2266 2267
```

The data flags shall be presented as individual bit arrays with a flag for each demand period of the day in the array (48 bits per day). The sequence and location of individual bits within the data flag array corresponds directly to the demand period number of the respective 30 minute data value. i.e. bit 1 associated with demand period 1 (00:00 to 00:30) bit 48 associated with demand period 48 (23:00 to 24:00).

Data that has not yet been generated for the individual 30 minute demand periods i.e. in current day block for times following the time of data readout, shall be represented by FFFF. All flags for these associated periods shall be set to logic 0.

### 9.2.4 Data Authenticator

The data authenticator is appended to each data block associated with every data read process. The data authenticator is detailed in Appendix 3

## 10. Appendix 2a: Data Definitions and Descriptions

### 10.1 Data Block

#### 10.1.1 General Definition

Complete set of data for one communications session

#### 10.1.2 Data Definition

Identifier ::= NamedVariableList

```
{
    variable list name      0
    scope of access        VAA-specific
    VAA name                7
    scope may change        FALSE
    life time               VDE
    list of named variables 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96
}
```

### 10.2 Meter Identifier - MID

#### 10.2.1 General Definition

12 characters representing the Meter Identifier - MID

#### 10.2.2 Data Definition

Identifier ::= NamedVariableObject

```
{
    variable name          8
    scope of access        VAA-specific
    VAA name                7
    scope may change        FALSE
    life time               VDE
    type description        visible-string(SIZE(12))
    read-write flag        READ-ONLY
    available               TRUE
}
```

### 10.3 Date and Time of Reading Meter

#### 10.3.1 General Definition

12 characters representing the date and time

#### 10.3.2 Data Definition

```

DateAndTime ::= NamedVariableObject
{
    variable name          16
    scope of access       VAA-specific
    VAA name               7
    scope may change      FALSE
    life time              VDE
    type description      numeric-string(SIZE(12))
    read-write flag       READ-ONLY
    available              TRUE
}

```

### 10.4 kWh Cumulative Reading

#### 10.4.1 General Definition

6 characters representing the total cumulative kWh in kWh

#### 10.4.2 Data Definition

```

CumulativekWh ::= NamedVariableObject
{
    variable name          24
    scope of access       VAA-specific
    VAA name               7                -- VAABilling
    scope may change      FALSE
    life time              VDE
    type description      numeric-string(SIZE(6))  -- Format as above
    read-write flag       READ-ONLY
    available              TRUE
}

```

## 10.5 Current kW Maximum Demand

### 10.5.1 General Definition

6 characters representing the current kW MD in 1/100s of a kW.

### 10.5.2 Data Definition

```

CurrentkWMD ::= NamedVariableObject
{
    variable name           32
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time              VDE
    type description       numeric-string(SIZE(6))  -- Format as above
    read-write flag       READ-ONLY
    available              TRUE
}

```

## 10.6 Previous kW Maximum Demand

### 10.6.1 General Definition

6 characters representing the previous kW MD in 1/100s of a kW.

### 10.6.2 Data Definition

```

PreviouskWMD ::= NamedVariableObject
{
    variable name           40
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time              VDE
    type description       numeric-string(SIZE(6))  -- Format as above
    read-write flag       READ-ONLY
    available              TRUE
}

```

## 10.7 Cumulative Maximum Demand

### 10.7.1 General Definition

6 characters representing the cumulative MD in 1/100s of a kW.

### 10.7.2 Data Definition

```
CumulativeMD ::= NamedVariableObject
{
    variable name           48
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time               VDE
    type description       numeric-string(SIZE(6))  -- Format as above
    read-write flag        READ-ONLY
    available               TRUE
}
```

## 10.8 Date Of Last MD Reset

### 10.8.1 General Definition

6 characters representing the date of the last maximum demand reset.

### 10.8.2 Data Definition

```
MDResetDate ::= NamedVariableObject
{
    variable name           56
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time               VDE
    type description       numeric-string(SIZE(6))  -- Format as above
    read-write flag        READ-ONLY
    available               TRUE
}
```



## 10.9 Number Of Maximum Demand Resets

### 10.9.1 General Definition

2 characters representing the number of maximum demand resets, 00 - 99.

### 10.9.2 Data Definition

```

NumMaxDemandResets ::= NamedVariableObject
{
    variable name           64
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time              VDE
    type description       numeric-string(SIZE(2)) -- Format as above
    read-write flag       READ-ONLY
    available              TRUE
}

```

## 10.10 Multi-rate Energy Registers

### 10.10.1 General Definition

Eight registers containing the multi-rate kWh energy in kWh.

### 10.10.2 Data Definition

```

MultiRatekWh ::= NamedVariableObject
{
    variable name           72
    scope of access        VAA-specific
    VAA name                7           -- VAABilling
    scope may change       FALSE
    life time              VDE
    type description       compact-array(SIZE(8)) OF
                          numeric-string(SIZE(6))
    read-write flag       READ-ONLY
    available              TRUE
}

```

---

## 10.11 Number of Days Data in Message

### 10.11.1 General Definition

Three characters representing the number of days of data to be transmitted.

### 10.11.2 Data Definition

NumberOfDays ::= NamedVariableObject

```
{
    variable name      80
    scope of access   VAA-specific
    VAA name          7          -- VAABilling
    scope may change  FALSE
    life time         VDE
    type description  numeric-string(SIZE(3))
    read-write flag   READ-ONLY
    available         TRUE
}
```

Superseded

## 10.12 Profile Data

### 10.12.1 General Definition

Daily data block comprising header data and profile data.

### 10.12.2 Data Definition

```

DailyData ::= NamedVariableObject
{
    variable name           88
    scope of access        VAA-specific
    VAA name                7 -- VAABilling
    scope may change       FALSE
    life time               VDE
    type description       compact-array OF DailyDataType SIZE(N+1)
    read-write flag        READ-ONLY
    available               TRUE
}

```

Where N = 20, 100, 250 or 450

```

DailyDataType ::= structure
{
    DayIdentifier           numeric-string(SIZE(6))
    StartCumulativekWh     numeric-string(size(6))
    DailyFlags              bit-string(SIZE(8))
    HalfHourData           compact-array(SIZE(48)) OF
                           numeric-string (SIZE(4))
    ReverseRunning         bit-string(SIZE(48))
    Level2                  bit-string(SIZE(48))
    PowerFail              bit-string(SIZE(48))
}

```

## 10.13 Authenticator

### 10.13.1 General Definition

Eight byte string calculated using an authentication algorithm, an internal 8 byte authentication key and the preceding data.

### 10.13.2 Data Definition

Authenticator ::= NamedVariableObject

```
{
    variable name          96
    scope of access       VAA-specific
    VAA name              7          -- VAABilling
    scope may change      FALSE
    life time             VDE
    type description      octet-string(SIZE(8))
    read-write flag       READ-ONLY
    available             TRUE
}
```

## 10.14 Authentication Key

### 10.14.1 General Definition

Eight byte string used by the authentication algorithm when calculating the authenticator.

### 10.14.2 Data Definition

AuthenticationKey ::= NamedVariableObject

```
{
    variable name          104
    scope of access       VAA-specific
    VAA name              39          -- VAAManagement
    scope may change      FALSE
    life time             VDE
    type description      octet-string(SIZE(8))
    read-write flag       WRITE-ONLY
    available             TRUE
}
```

## 10.15 Password

### 10.15.1 General Definition

Six character string consisting of case insensitive alpha characters (A to Z), digits (0 to 9) or the underscore character (\_).

### 10.15.2 Data Definition

```
Level2Password ::= NamedVariableObject
{
    variable name          112
    scope of access       VAA-specific
    VAA name              39          -- VAAManagement
    scope may change     FALSE
    life time            VDE
    type description     visible-string(SIZE(6))
    read-write flag     WRITE-ONLY
    available            TRUE
}
```

## 10.16 Date and Time Set

### 10.16.1 General Definition

12 characters representing the date and time

### 10.16.2 Data Definition

```
DateAndTimeSet ::= NamedVariableObject
{
    variable name          120
    scope of access       VAA-specific
    VAA name              39          -- VAAManagement
    scope may change     FALSE
    life time            VDE
    type description     numeric-string(SIZE(12))
    read-write flag     READ-WRITE
    available            TRUE
}
```

## 10.17 Time Adjust

### 10.17.1 General Definition

Signed integer representing the number of seconds by which to adjust the time. The maximum permissible value is  $\pm 900$  seconds.

### 10.17.2 Data Definition

DateAndTimeSet ::= NamedVariableObject

```
{
    variable name      128
    scope of access   VAA-specific
    VAA name          39           -- VAAManagement
    scope may change  FALSE
    life time         VDE
    type description  integer
    read-write flag   WRITE-ONLY
    available         TRUE
}
```

## 10.18 Maximum Demand Reset

### 10.18.1 General Definition

Boolean which when written to will initiate a maximum demand reset.

### 10.18.2 Data Definition

MDReset ::= NamedVariableObject

```
{
    variable name      136
    scope of access   VAA-specific
    VAA name          39           -- VAAManagement
    scope may change  FALSE
    life time         VDE
    type description  integer
    read-write flag   WRITE-ONLY
    available         TRUE
}
```

## 11. Appendix 2b: Protocol Examples

### 11.1 Introduction

The IEC 1107 protocol (mode C) is used to access the named variables and named variable list specified in Appendix 2a. They are accessed for read using the R4 command which specifies formatted data with partial block data transmission and for write using the W2 command which specifies formatted data.

The data is transmitted in blocks not exceeding 128 characters with each block being prefixed by an incremental block counter in the optional address field. The data is formatted according to the DLMS definitions using the A-XDR encoding rule, each byte is encoded as two ASCII characters representing the hexadecimal value of the byte with the most significant character first.

Level 2 access is obtained by sending a P1 command to the meter containing the level 2 password.

An example of each function as specified by COP6 is now described

### 11.2 Read Complete 30 Minute Database

In this example it is assumed that the meter has 20 days storage capacity. The date and time of reading is 29/08/95 at 11:35:00 a.m. and data from 09/08/95 to 29/08/95 inclusive will be read. The cumulative kWh register at the end of 28/08/95 is 012271 kWh. All status flags are set and the meter has a constant demand of 2 kW

The logical address of the data is 0000H and reading FFF will result in all available data being output.

The data sent from the meter is described in detail as follows:

Twelve variables	000C
Variable read request successful	00
Data type = visible-string	0A
Identifier	'ABCD95012345'
Variable read request successful	00
Data type = visible-string	0A
DateAndTime	950829113500
Variable read request successful	00
Data type = visible-string	0A
CumulativekWh	012294
Variable read request successful	00
Data type = visible-string	0A
CurrentkWh	000200
Variable read request successful	00
Data type = visible-string	0A
PreviouskWh	000200
Variable read request successful	00
Data type = visible-string	0A
CumulativeMD	000400
Variable read request successful	00
Data type = visible-string	0A
MDResetDate	950809
Variable read request successful	00
Data type = visible-string	0A
NumMaxDemandResets	02
Variable read request successful	00
Data type = compact-array	13
Array element type - visible-string	0C
MultiRatekWh	006147 006147 000000 000000 000000 000000 000000 000000
Variable read request successful	00
Data type = visible-string	0A
NumberOfDays	021
Variable read request successful	00
Data type = array	01
Number of elements of array (21)	0015



**Data for 29/08/95**

Structure	02
Number of items in structure	0007
Data type = visible string	0A
DayIdentifier	950829
Data type = visible string	0A
StartCumulativekWh	012271
Data type = Bit string	04
DailyFlags	7F
Data type = compact array	13
Array element type = visible string	0A
HalfHourData	2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 FFFF
Data type = bit array	04
ReverseRunning	FFFFFF7000000
Data type = bit array	04
Level2	FFFFFF7000000
Data type = bit array	04
PowerFail	FFFFFF7000000

**Data for 28/08/95**

Structure	02
Number of items in structure	0007
Data type = visible string	0A
DayIdentifier	950828
Data type = visible string	0A
StartCumulativekWh	012223
Data type = Bit string	04
DailyFlags	7F
Data type = compact array	13
Array element type = visible string	0A
HalfHourData	2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271
Data type = bit array	04
ReverseRunning	FFFFFFFFFFFF
Data type = bit array	04
Level2	FFFFFFFFFFFF
Data type = bit array	04
PowerFail	FFFFFFFFFFFF

etc.



### 11.3 Read Last 'N Days

In this example it is assumed that the date and time of reading is 29/08/95 at 11:35:00 a.m. and data from 28/08/95 to 29/08/95 inclusive will be read. The cumulative kWh register at the end of 28/08/95 is 012271 kWh. All status flags are set and the meter has a constant demand of 2 kW

The logical address of the data is 0000H and reading 002 will result in data for the last 2 days being output.

Superseded

The data sent from the meter is described in detail as follows:

Twelve variables	000C
Variable read request successful	00
Data type = visible-string	0A
Identifier	'ABCD95012345'
Variable read request successful	00
Data type = visible-string	0A
DateAndTime	950829113500
Variable read request successful	00
Data type = visible-string	0A
CumulativekWh	012294
Variable read request successful	00
Data type = visible-string	0A
CurrentkWhMD	000200
Variable read request successful	00
Data type = visible-string	0A
PreviouskWhMD	000200
Variable read request successful	00
Data type = visible-string	0A
CumulativeMD	000400
Variable read request successful	00
Data type = visible-string	0A
MDResetDate	950809
Variable read request successful	00
Data type = visible-string	0A
NumMaxDemandResets	02
Variable read request successful	00
Data type = compact-array	13
Array element type - visible-string	0C
MultiRatekWh	006147 006147 000000 000000 000000 000000 000000 000000
Variable read request successful	00
Data type = visible-string	0A
NumberOfDays	002
Variable read request successful	00
Data type = array	01
Number of elements of array (2)	0002

**Data for 29/08/95**

Structure	02
Number of items in structure	0007
Data type = visible string	0A
DayIdentifier	950829
Data type = visible string	0A
StartCumulativekWh	012271
Data type = Bit string	04
DailyFlags	7F
Data type = compact array	13
Array element type = visible string	0A
HalfHourData	2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 FFFF
Data type = bit array	04
ReverseRunning	FFFFFF7000000
Data type = bit array	04
Level2	FFFFFF7000000
Data type = bit array	04
PowerFail	FFFFFF7000000

**Data for 28/08/95**

Structure	02
Number of items in structure	0007
Data type = visible string	0A
DayIdentifier	950828
Data type = visible string	0A
StartCumulativekWh	012223
Data type = Bit string	04
DailyFlags	7F
Data type = compact array	13
Array element type = visible string	0A
HalfHourData	2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271
Data type = bit array	04
ReverseRunning	FFFFFFFFFFFF
Data type = bit array	04
Level2	FFFFFFFFFFFF
Data type = bit array	04
PowerFail	FFFFFFFFFFFF
Variable read request successful	00
Data type = octet-string	09
Authenticator	XXXXXXXXXX

To meter

```
<SOH>R4<STX>0000(002)<ETX><BCC>
```

From meter

```
<STX>0000(000C000AABCD95012345000A950829113500000A012294000A000200000
A000200000A000400000A950809000A0200130C00614700614700000000000000000000)<E
OT> <BCC>
```

```
<STX>0001(00000000000000000000000000000000A002000100020200070A9508290A012271047F130
A22722273227422752276227722782279228022812282228322842285228622872)<EOT>
<BCC>
```

```
<STX>0002(288228922902291229222932294FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0)
<EOT><BCC>
```

```
<STX>0003(4FFFFFF700000004FFFFFF700000004FFFFFF70000000200070A9508280A0122
23047F130A222422252226222722282229223022312232223322342235223622372)<EOT
> <BCC>
```

```
<STX>0004(238223922402241224222432244224522462247224822492250225122522253
22542255225622572258225922602261226222632264226522662267226822692)<EOT>
<BCC>
```

```
<STX>0005(270227104FFFFFFFFFFFFFFF04FFFFFFFFFFFFFFF04FFFFFFFFFFFFFFF0009XXXXX
XXX)<ETX><BCC>
```

Each block is confirmed by sending the <ACK> character to the meter, <NAK> will cause the block to be re-transmitted. Note that the address field contains an incremental block count, the last packet has a block count of 0005 (i.e. 6 packets of data).

#### 11.4 Read Selected Meters

This is implemented via the multi-drop option of IEC 1107. Where more than one meter is connected to the same serial port it is necessary to include a device identifier in the initial sign-on string.

```
/?<Optional device identifier>!  
<CR><LF>
```

The device identifier can be up to 16 characters.

## 11.5 Set Time And Date

Assuming level 2 access has been granted, the date and time is set by writing to variable 120 as defined in Appendix 2a.

e.g. To set the date and time to 18 December 1995 09:25:00

To meter <SOH>W2<STX>0078(951218092500)<ETX><BCC>

From meter <ACK>

Alternatively the time can be adjusted by a specified number of seconds by writing to variable 128 as defined in Appendix 2a.

e.g. To advance the clock by 12 seconds

To meter <SOH>W2<STX>0080(000C)<ETX><BCC>

From meter <ACK>

## 11.6 Set Password

Assuming level 2 access has been granted, the level 2 password is set by writing to variable 112 as defined in Appendix 2a.

e.g. To set the password to ABC123

To meter <SOH>W2<STX>0070(ABC123)<ETX><BCC>

From meter <ACK>

## 11.7 Reset MD

Assuming level 2 access has been granted, a maximum demand reset can be initiated by writing to variable 136 as defined in Appendix 2a.

e.g.

To meter <SOH>W2<STX>0088(0)<ETX><BCC>

From meter <ACK>



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### 11.8 Change Authentication Key At Level 2 Password Access

Assuming level 2 access has been granted, the level authentication key is set by writing to variable 104 as defined in Appendix 2a.

e.g. To set the authentication key to ABCD1234

To meter <SOH>W2<STX>0068(ABCD1234)<ETX><BCC>

From meter <ACK>

Superseded

## 12. Appendix 3: Authentication

### 12.1 Authentication Overview

The requirement for authentication is to ensure that the receiver of the information can be confident that the contents of the message have not been altered since it left the sender and that the identity of the sender is not misrepresented. On one hand the sender is the outstation as it generates the metering profile information and on the other hand the outstation is the receiver as it obtains requests for reprogramming data or setting of the clock.

The data authentication process utilises a system whereby Authentication Keys will be loaded into Outstations by authorised parties. These Keys, along with all the data to be communicated, will then be used to form a Digital Signature. The same Keys will be provided to the authenticating parties. This will ensure that all authorised holders of the Keys will be able to validate the authenticity of the information being transferred, provided of course that they also have knowledge of the appropriate Digital Signature algorithm.

The Authentication Keys programmed into outstations and other validation equipment can be changed should the authentication system be compromised. A Key management system is required to ensure secure creation, storage and transport of the Keys to all parties concerned.

### 12.2 Authentication Process

The data block described in Appendix 1(a) will be signed by a Digital Signature to provide authentication of the source and validation of the data. This allows the content of messages to be sent in plain text and still validated and authenticated by authorised parties only. There are two inputs to the Digital Signature function :-

- i) A Hash Function - a representation of all the data in the data block
- ii) A Private Authentication Key.

The Private Authentication Key is an 8 byte (64 bit) binary number that is kept secret. It is placed in all devices that need to either generate an authenticated Digital Signature, or check that the Digital Signature received is valid.

The Hash function is used to create a smaller representation of the transmitted data. The total data block, consisting of all data inclusive of the Tag Header Block through to the last full days data block being transmitted is included into the Hash calculation. As the data block is of variable length the Hash Function must allow for variable length messages.

These two items are then operated on by the Digital Signature function to provide an 8 byte (64 bit) Digital Signature, which is appended to the end of the data block. The details of the Hash Function and the Digital Signature are defined in a controlled document, available on request to authorised parties from the Electricity Pool of England and Wales.

### 13. Appendix 4: Multi-rate Register Switching Regime

Multi-rate registers shall be programmable to provide the following minimum seasonal time of use tariff switching regime as described below and in the following diagrams:

- A minimum of 24 stored register switching times for a single phase and 48 for polyphase Meter systems at any one time.
- A minimum of 8 day types, each of which has an individual set of register switching times.
- A sequential day of the week number to allow register switching to take place on any day of the week or combinations of days of the week. Monday shall be day 1.
- A minimum of 8 seasons. Different weekday or combinations of weekdays register switching time registers can apply to each season.
- In addition to switching times a minimum of 13 MD Reset dates, commencing at the start of the settlement day, for the start of the seasons.
- A minimum of 2 daylight clock time changes, indicated by date and month during which a time shift of 1 or 2 hours will be implemented at 02:00 (time advance) or 03:00 (time retard). This shall not effect the UTC clock.
- A minimum of 12 exclusion dates during which any day's register switching times, indicated by day type, can be implemented for each exclusion date.
- Where Maximum Demand (MD) metering is being operated the MD shall be programmable to reset automatically as defined by 13 MD reset dates.

Where load switching is provided it shall comply with the appropriate standards.

**Trigger Dates For Start of Seasons**

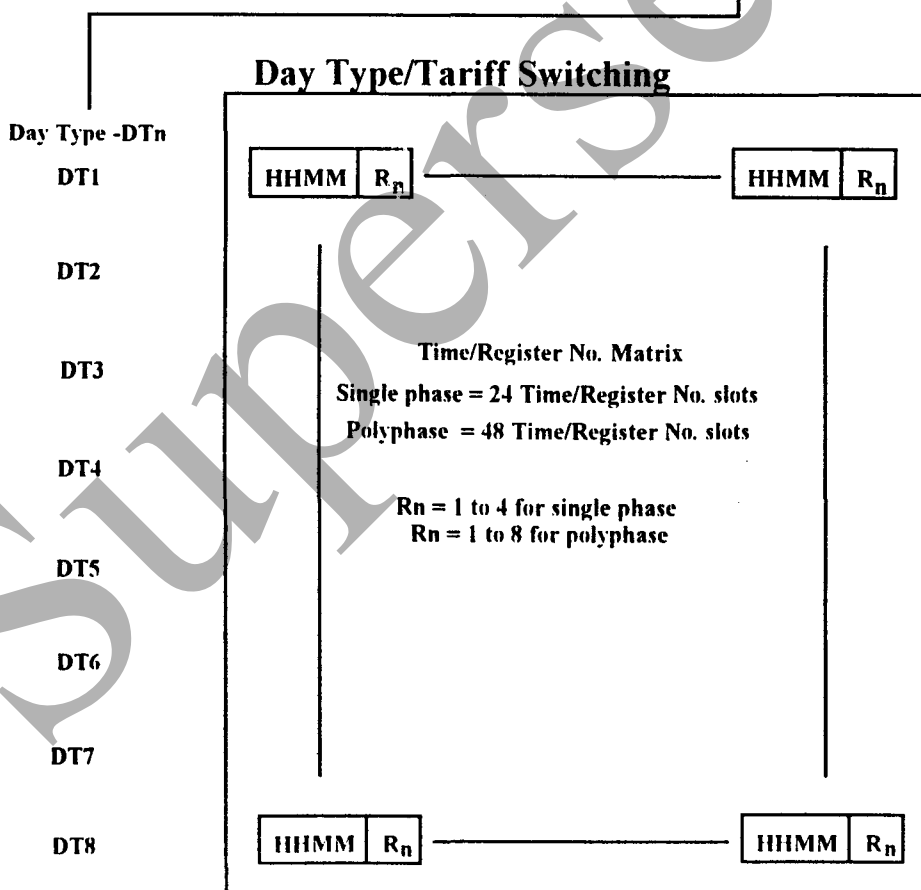
1	DDMM	Sn
2	DDMM	Sn
3	DDMM	Sn
4	DDMM	Sn
5	DDMM	Sn
6	DDMM	Sn
7	DDMM	Sn
8	DDMM	Sn
9	DDMM	Sn
10	DDMM	Sn
11	DDMM	Sn
12	DDMM	Sn
13	DDMM	Sn

Sn = 1 to 8

**Season Definitions**

Season No. Sn	Day of Week/Day Type - DT						
	M	Tu	W	Th	F	S	Su
S1	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S2	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S3	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S4	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S5	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S6	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S7	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>
S8	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>	DT <sub>n</sub>

DTn = 1 to 8



Exclusion Dates

1	DDMM	DT
2	DDMM	DT
3	DDMM	DT
4	DDMM	DT
5	DDMM	DT
6	DDMM	DT
7	DDMM	DT
8	DDMM	DT
9	DDMM	DT
10	DDMM	DT
11	DDMM	DT
12	DDMM	DT

Date of MD Reset

1	DDMM
2	DDMM
3	DDMM
4	DDMM
5	DDMM
6	DDMM
7	DDMM
8	DDMM
9	DDMM
10	DDMM
11	DDMM
12	DDMM
13	DDMM

Daylight Saving Clock Changes

DDMM	+H
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Advance Tariff Clock at 2:00am by 'H' hours on date specified

DDMM	-H
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Retard Tariff Clock at 3:00am by 'H' hours on date specified

Note - Valid range of 'H' is either 1 or 2.