OSGP Meter Customer Interface Development Guide (MEP Interface)

MEP Client Developer’s Guide

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Chapter 1: Introduction

This chapter introduces the MEP (Multipurpose Expansion Port) protocol. It includes the following sections.

- Introduction to the MEP Protocol
- MEP Clients and Servers
- About This Document
- Related Documentation

Introduction to the MEP Protocol

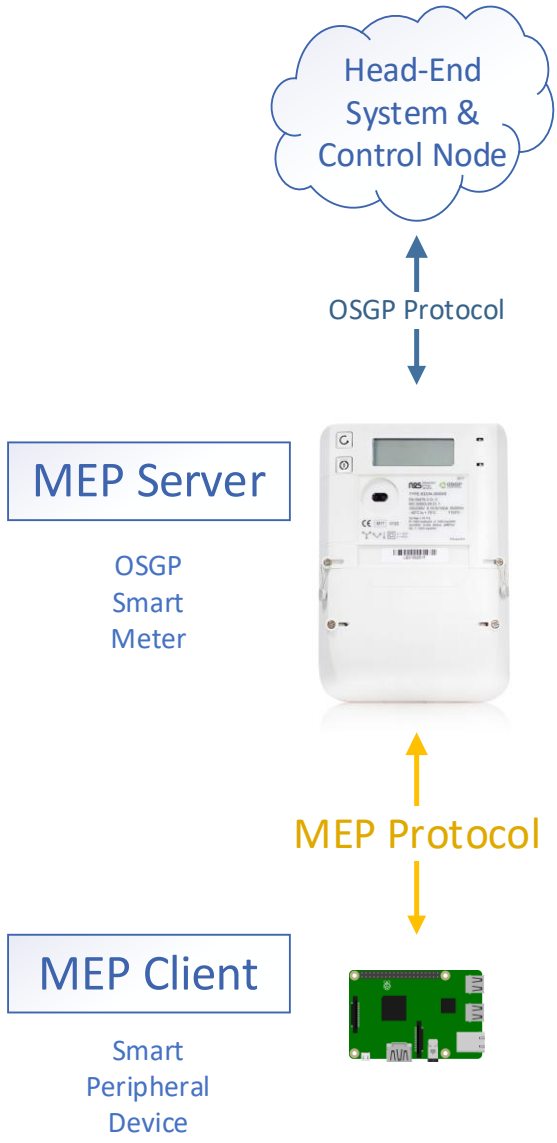
This document describes how to develop a device that implements the MEP (Multipurpose Expansion Port) protocol. The MEP protocol is a client/server protocol used to exchange OSGP Smart Meter device data, status information, and alarm data between the smart meter and an attached client device.

MEP Clients and Servers

The following diagram introduces the concepts of MEP servers and MEP clients, and demonstrates how they communicate and exchange data via the MEP protocol. A MEP server's role is to maintain smart grid device data, to respond to read and write requests from MEP client(s), and to act as an intelligent interface between an OSGP Smart Meter's Head-End System and the MEP client. A MEP client is any device or application that implements the client side of the MEP protocol. Specific examples of devices that could operate as MEP servers or MEP clients are shown in the following diagram.

The diagram also shows how a MEP server uses the Open Smart Grid Protocol (OSGP) protocol to pass on the device data, status, and alarms information it has exchanged with a connected MEP client. OSGP is an open standard for smart grid device communication and control published by the European Telecommunications Standards Institute (ETSI). For background information on OSGP, consult the OSGP Alliance Web site at www.osgp.org.

This diagram depicts an OSGP Smart Meter, which is operating as a MEP Server:



- What we have here is a **Smart Peripheral Device in conjunction with an OSGP Smart Meter**. Some OSGP Smart Meters provide an internal, factory-fitted interface card which enables a bi-directional, isolated UART serial port that is called a MEP port. The MEP port allows a connected smart peripheral device (also referred to as a *MEP device*) to use the MEP protocol to access meter data, run meter procedures, and have limited write access to the meter.
- For example, one could connect a smart RF card that communicates with an In-Home Display device that reflects the current state of the meter, as the smart peripheral (MEP) device is able to read meter data in real-time. Alternatively, the device could connect to auxiliary I/O and deliver external alarm signals to the meter using the MEP port.
- In this scenario, the OSGP Smart Meter acts as the MEP server, and the smart peripheral devices acts as the MEP client.

Throughout this document, MEP devices and Smart Grid devices and smart meters are collectively referred to as *MEP clients*. The OSGP Smart Meters are referred to as *MEP servers.*

About This Document

This document introduces the MEP protocol, including definitions of the data tables and procedures you will use when programming your MEP server with the MEP protocol. It is intended for those developing devices for use with the MEP protocol, and assumes some background knowledge of the OSGP Smart Meter you are using. The OSGP Alliance recommends that you review the appropriate user document(s) (e.g. the *OSGP Protocol specification* and any specific *Smart Meter user manual*) before developing your MEP client.

This document also assumes some knowledge of the *ANSI C12.19 (1997) Utility Industry End Device Data Tables* protocol document. Most general information regarding the rules of this protocol is not repeated here. You can find the *ANSI C12.19 Utility Industry End Device Data Tables* document online at http://www.nssn.org or http://webstore.ansi.org.

The MEP protocol is supported by all current OSGP Smart Meter firmware versions. Most of the features (and the associated tables and procedures) described in this document are available to all these device types. Exceptions to this are noted throughout the document, as this version of the *MEP Client Developer's Guide* describes some features that are only available to devices running the most recently released firmware versions.

This document includes the following additional chapters:

- *Chapter 2: MEP Protocol*. This chapter introduces the MEP protocol.
- *Chapter 3: MEP Use Cases.* This chapter describes additional tasks you can accomplish with the MEP interface, such as reading load profile data or M-Bus billing data.
- *Chapter 4: Programmer's Reference Notes.* This chapter contains supplemental information you will need when programming your MEP client, including introductory information on the tables and procedures that have been added or modified to support the operations described in Chapters 4 and 5.

- *Appendix A:* Authentication Digest. This appendix provides details on the function used to generate the 8-byte digest used to perform authentication on all transactions between a MEP server and MEP client.
- Appendix B: Encryption. This appendix provides additional details on the encryption algorithm used by the MEP protocol.
- *Appendix C: MBK/MAK Access Information.* This appendix lists the tables and procedures that are available to the MEP protocol, and indicates which of them are available to the MAK and MBK access keys.
- Appendix D: MEP Client Hardware Requirements (NES Meters Only) This chapter contains mechanical and electrical specifications and other information you will need when connecting a MEP client device to a NES-manufactured OSGP Smart Meter's terminal block.
- Appendix E: Version Changes This appendix summarizes the changes that are made to the *MEP Client Developer's Guide* for each release.

Related Documentation

The following documents may also be useful to you when developing a MEP client:

- *Pre-Shared Key Ciphersuites for Transport Layer Security (TLS)*" https://tools.ietf.org/html/rfc4279 Describes the cypher suites required for TLS encryption/authentication on the MEP port.

  .

Chapter 2: MEP Protocol

This chapter introduces the MEP protocol. It includes the following sections.

- MEP Protocol Overview
- Communication Model
- Using TLS Security to secure MEP Ports
- Using the MEP and Optical Ports (Gen 2.X and 3.X Meters Only)
- MEP Port Baud Rate
- MEP Client Health
- MEP Protocol Timing
- Multiple MEP Ports (OSGP Meter Firmware Versions 4.0 and Higher)

MEP Protocol Overview

The MEP protocol is a session-less, two-way, single layer protocol providing access to metering data. Authentication and (optional) encryption is built into all messages and exchanges, as described in this chapter. Data is represented in OSGP/ANSI C12 format. For more details on OSGP, consult the OSGP Alliance Web site at www.osgp.org.

The MEP protocol is a request-response protocol. As the MEP server is the protocol slave for the MEP protocol, all communication between the MEP server and the MEP client is initiated by the MEP client, in the form of table read and write requests and the calling of procedures.

All requests consist of a request code issued by the MEP client that is followed by arguments that are required to complete the specific request. Upon execution of the request, the MEP server will generate a response, which consists of a response code optionally followed by the requisite response data.

Each MEP port can be independently configured to require TLS or RC4 security. TLS security can be required at manufacturing time, or later over PLC/P2P, the optical port, or a MEP port. This setting is in meter table MT97. Once a TLS session is started, no RC4 messages will be accepted unless the TLS session is terminated.

Important: *The (still possible) use of RC4 security over the MEP interface is highly discouraged! We strongly suggest that you use TLS security.*

Note: *A single MEP request or response can be as large as 476 bytes (excluding the two-byte length field).*

Request and Response Message Formats for TLS security

TLS-Related Codes

Table 2.1 defines the TLS-related codes used for the MEP TLS protocol.

Table 2.1 TLS-Related Codes

Request	Code	Description
TLS_TERMINATE	0x57	This request is used to terminate the current TLS session. The message requires at least one byte of data, though it does not matter what the data is. After this message a new TLS session will need to be established, starting with the handshake, or, if TLS is not required, an RC4 session can be started.
TLS_HANDSHAKE	0x58	This request is used to initiate and execute the first step of the TLS session handshake. This request code is only used for the first TLS handshake request. If a handshake or session is already in progress, the session will be reset.
TLS_HANDSHAKE_CONT	0x59	The request is used for all subsequent messages in the TLS handshake sequence until the session is established.

Request	Code	Description
TLS_TABLE	0x80	This request is used to deliver a TLS encrypted READ or WRITE command. The data payload consists of the encrypted TLS packet. If a TLS session has not been established, this request will be rejected with failure code IS (0x0A) – Invalid Service Sequence State.If this occurs, the client should repeat the TLS Handshake sequence.

TLS Request Message Format

Table 2.2 defines the layout and supported fields of the request messages sent to the MEP server.

Table 2.2 TLS Request Message Format

Field	Number Of Bytes	Description
<length>	2 (MSB – Most Significant Byte first)	The number of bytes in the remainder of the message, not including the <length> field.
<TLS code>	1	See above table for values.
TLS encoded C12.18 request	variable	C12.18 packet. See *C12.18 Packet Structure* below. The TLS packet is either part of the TLS handshake protocol (codes 0x58 or 0x59) or an encoded C12.18 packet (code 0x80) or a TLS termination (code 0x57)

TLS Response Message Format

Table 2.3 defines the layout and supported fields of the response message sent from the MEP server.

Table 2.3 TLS Response Message Format

Field	Number of Bytes	Description
<length>	2 (MSB)	The number of bytes in the remainder of the message, not including the <length> field.
<response message>		
<response code>	1	One of the following: 0x00 – Success 0x01 = TLS error 0x03 – Invalid identity or key
TLS encoded C12.18 response message	Variable	Additional data as needed, depending on the request code. See Table 2.6 for more information.

Request and Response Message Formats for RC4 security

Important!: *The use of RC4 security over the MEP interface is highly discouraged!. We strongly suggest that you use TLS security.*

RC4 Request Message Formats

Table 2.4 defines the layout and supported fields of the request message sent to the MEP server.

Table 2.4 RC4 Request Message Format

Field	Number Of Bytes	Description
<length>	2 (MSB – Most Significant Byte first)	The number of bytes in the remainder of the message, not including the <length> field.
<request message>:	variable	C12.18 packet. See C12.18 Packet Structure below.
[sequence no.]	4 (MSB)	Subverts replay attacks. See the RC4 Authentication for more information.
[digest]	8 (MSB)	Provides data integrity and authentication features. RC4 Authentication for more information.

RC4 Response Message Format

Table 2.5 defines the layout and all supported fields of the response message sent from the MEP server.

Table 2.5 RC4 Response Message Format

Field	Number Of Bytes	Description
<length>	2 (MSB)	The number of bytes in the remainder of the message, not including the <length> field.
<response message>:	variable	C12.18 packet. See C12.18 Packet Structure below.
[digest]	8 (MSB)	Provides data integrity and authentication features. See the RC4 Authentication section for more information.

Table 2.5 describes the additional data that is included in the <response data> field for each response code.

Table 2.5 <response code> Field

<response code>	<response data>
0x00 = Successful response	For full table read or partial table read requests: <count>, <table_data> For full table write or partial table write requests there is no response data

<response code>	<response data>
0x01, 0x02, 0x03, 0x04, 0x05, 0x0B = Error states	No response data Error Meanings are 0x01 = Unrecognized request 0x02 = Unsupported request 0x03 = No permission for specified request 0x04 = Requested operation not possible 0x05 = Table operation not possible 0x0B = Authentication failure
0x0C = Invalid sequence number	[sequence no.] = Correct sequence number to be used in subsequent request messages.

RC4 Authentication

Authentication of received messages on both sides of the MEP protocol is ensured via an authentication digest that is attached to each message sent between a MEP client and a MEP server. While this digest is technically not related to the RC4 cipher, this manual refers to it as “RC4 authentication” because it is used with RC4 encryption. The 8-byte authentication digest is generated using a “digest” function that takes the MEP access key in use and the contents of the message as input. A sequence number within the message, and included in the digest, introduces variability in the authentication digest and reduces vulnerability to replay attacks.

The MEP server increments its version of the sequence number after each exchange, and your application must increment the sequence number by one after each request message it sends. This rule applies to retries sent by your application. For this reason, the MEP server will accept a sequence number that is up to 8 increments from the previous one. Your application does not need advanced knowledge of the expected sequence number. If an incorrect sequence number is used, or if the previous sequence number is used again, the MEP server returns the 0x0C response code along with the correct sequence number in the response message.

As the digest provides both authentication and confirmation that the packet was error-free, your application can check a packet digest received from the MEP server to confirm that there were no communication errors. Unless you check the received packet digest, you cannot be assured that there were no communication errors.

For more details on this function, including a reference implementation, see Appendix A: Authentication Digest. For more information on MEP access keys, see Access Levels.

RC4 Encryption

The MEP encryption algorithm uses the RC4 cipher. The portion of the MEP request packet that is encrypted is limited to the <message> fields starting with the request/response code, and includes the sequence number. The authentication digest is not encrypted, nor is the <length> field. The digest of the request and the digest for the response is still calculated based on the original un-encrypted packet. The inclusion of the sequence number adds to the variability of the encrypted data.

MEP encryption uses a constant 128-bit key plus one of two user-configurable keys. The configurable key used depends on the access level being used. For more information on access levels, see the following section, Access Levels.

Encryption is optional and requires no configuration. If the MEP client encrypts an inbound message, the MEP server will determine this condition using an additional decryption step that occurs as part of the packet validation for every inbound message, and in turn will encrypt the outbound response. If encryption is not used on the inbound message, it will not be used on the outbound response. For more information on MEP encryption and the RC4 cipher, see Appendix B: Encryption.

C12.18 Packet Structure

Both RC4 and TLS encapsulate C12.18 protocol messages, but the structures differ.

Tables 2.6, 2.7, and 2.8 describe the C12.18 protocol packet structure. Code-specific data is dependent on the code selected but consists of a subset of the following fields.

Table 2.6 C12.18 Packet Structure for Request Codes

Request Codes	Code-Specific Data
0x30 = Full Table Read	Table #, Length
0x3F = Partial Table Read	Table #,Offset, Length
0x40 = Full Table Write	Table #, Length, Data
0x4F = Partial Table Write	Table #, Offset, Length, Data

Table 2.7 Code-Specific Data

Code-Specific Data Field	Description
Table #	A 2-byte MSB table identifier
Length	A 2-byte MSB count value. For table writes, if this is set to a value that is larger than the size of the target table, then the additional data passed will be ignored. If this field is set to a value that is smaller than the size of the table being written to, then only <count> bytes will be written. If this field is missing or less than 2 bytes, then the interpreted value will be indeterminate. No error will be returned in this case.
Offset	A 3-byte MSB table offset value
Data	A multi-byte LSB (Least Significant Byte first) array of table data

Table 2.7 C12.18 Packet Structure for Response Codes

Response Codes	Code-Specific Data
0x00 = Successful response	For full table read or partial table read requests: <count>, <table_data> For full table write or partial table write requests there is no response data The <count> field is 2 bytes MSB.
0x01, 0x02, 0x03, 0x04, 0x05, 0x0B = Error states	No response data. Error Meanings are 0x01 = Unrecognized request 0x02 = Unsupported request 0x03 = No permission for specified request 0x04 = Requested operation not possible 0x05 = Table operation not possible 0x0B = Authentication failure
0x0C = Invalid sequence number	[sequence no.] = Correct sequence number to be used in subsequent request messages. This is for RC4 authentication only.

Access Levels

All communication between the MEP client and the MEP server is initiated by the MEP client in the form of table read and write requests, and the calling of procedures. (An exception to this is an alert sequence that a MEP server initiates and sends to the client to notify it that there is new information requested, or new data to be processed, as described in the Communication Model).

Chapters 3, 4, 5 and 6 provide information on which data tables you can read or write and which procedures you can call when developing a MEP application, and contain background information you will need when using tables and procedures.

The MEP protocol supports two levels of access to the data tables and procedures:

- Basic access, via the MEP Basic Key (MBK). Basic access allows read-only access to all tables, and write access to the following tables: BT07 “Procedure Initiation Table”, ET50, “MEP Inbound Data Space”, ET51 “MEP Device Configuration Table”, and ET52, “MEP Transaction Request Table”. Basic access also allows the ability to call procedures EP16 “Change System Clock By Delta” and EP39 “Post MEP Data”.
- Advanced Access, via the MEP Advanced Key (MAK). Advanced access allows read and write access to almost all tables, and the ability to call almost all procedures, with the exception of tables and procedures used for security and billing purposes.

Note: *For a complete list of tables and procedures that the MBK and MAK provide access to, see Appendix C: MBK/MAK Access and Direct Table Write Information.*

Both keys should be 16 bytes in length and must be known in advance. The access key provided may actually be up to 20 bytes in length. In that case, only the first 16 bytes should be used by your application. The keys cannot be read from the MEP server. Each access level is available to the MEP client at any time.

The MEP server determines which access level to use when it verifies the authentication digest attached to each MEP request it receives. First, the MAK is checked and if authentication passes, this access level is granted. If authentication fails with this key, it is checked again with the MBK and if this passes, basic access is granted. If neither key passes the authentication check, no access is granted to the MEP server.

Chapter 5: Programmer’s Reference Notes, lists the access levels required for each table and procedure you will use when performing communications tasks with your device.

When MEP servers are manufactured, the MBK and MAK keys used to gain MEP access can be programmed to be either unique for each individual MEP server, or common across all MEP servers for a given production run.

Given the broad access that MEP clients have to data and procedures, this is a decision that should be made carefully. If the location or usage of your MEP client presents any security risk whatsoever, you may want to consider making the keys unique per each MEP server.

If you are using unique keys, the entire population of MEP servers will not be compromised if a key is compromised. Therefore, the OSGP Alliance recommends using unique keys if the MEP client is likely to be used by different users or in locations that may present any security risk.

Hardware Lock

In addition to the keys, MEP servers employ a hardware-integrated security mechanism that supersedes the key access permissions. The hardware lock is table and procedure specific, and applies only to certain tables and procedures in the MEP server. It restricts write and read operations, as well as the execution of procedures. Attempts to access tables and procedures restricted by the hardware lock will result in the error message “Insufficient Security Clearance”. Note that the hardware lock settings for an

OSGP meter operating as a MEP server depend on the country and regulatory legislation in which the meter is installed.

TLS MEP Example Messages

This section contains examples of the messages that will be sent to and from a MEP client during a common transaction with a MEP server using TLS security. All examples are shown authenticated and unencrypted.

Note: *Charts describing each byte follow each example message. The example data is radix:hex. The < > marks indicate MEP specific component and the [] marks indicate security fields.*

TLS Example 1:

In the following example of a TLS Handshake, C (Client) is the MEP, and S (Server) is the meter.

Dir	Len (2 Bytes)	Code	Data (TLS Handshake)
C->S	00-35	58	16-03-03-00-2F-01-00-00-2B-03-03-5C-A6-57-21-AA-86-A8-DB-2D-59-91-57-AA-0C-33-81-19-42-A7-EE-92-89-F1-66-33-62-19-76-85-0D-DF-F4-00-00-04-00-A9-00-FF-01-00
S->C	00-60	00	16-03-03-00-51-02-00-00-4D-03-03-24-39-1A-AC-57-59-A0-D3-FC-9B-F4-E9-4C-93-62-B1-5C-78-C3-F7-1A-C0-D8-83-FB-70-D7-1E-A4-00-5E-60-20-4E-C1-BC-0A-54-D0-D5-4F-2F-E9-02-1B-2F-A8-64-E5-78-2C-0D-01-FE-A2-41-5B-EC-6E-38-8A-E7-87-6A-46-00-A9-00-00-05-FF-01-00-01-00-16-03-03-00-04-0E-00-00-00
C->S	00-42	59	16-03-03-00-09-10-00-00-05-00-03-64-00-01-14-03-03-00-01-01-16-03-03-00-28-00-00-00-00-00-00-00-00-57-FA-68-8F-17-1A-B5-EF-34-8E-C6-70-79-B5-87-21-1A-89-62-26-7E-68-3E-57-D1-8E-EB-85-63-07-7A-36
S->C	00-34	00	14-03-03-00-01-01-16-03-03-00-28-00-00-00-00-00-00-00-00-76-78-48-C8-F9-7D-E6-72-47-D0-38-72-E4-3D-EF-40-EB-B0-5A-3B-50-FE-84-5D-35-53-AA-16-C1-0C-7F-C1
C->S	00-42	59	16-03-03-00-09-10-00-00-05-00-03-64-00-01-14-03-03-00-01-01-16-03-03-00-28-00-00-00-00-00-00-00-00-57-FA-68-8F-17-1A-B5-EF-34-8E-C6-70-79-B5-87-21-1A-89-62-26-7E-68-3E-57-D1-8E-EB-85-63-07-7A-36
S->S	00-34	00	14-03-03-00-01-01-16-03-03-00-28-00-00-00-00-00-00-00-00-76-78-48-C8-F9-7D-E6-72-47-D0-38-72-E4-3D-EF-40-EB-B0-5A-3B-50-FE-84-5D-35-53-AA-16-C1-0C-7F-C1

TLS Example 2:

In the following example of a C12.18 Table request. C (Client) is the MEP, and S (Server) is the meter.

Dir	Len	Code	Data (TLS Encrypted C12.18 request/response)	Unencrypted Data (not part of packet)
C->S	00-26	80	17-03-03-00-20-00-00-00-00-00-00-00-01-E7-F9-86-7E-27-32-1D-43-E7-0B-F8-	3F-08-46-00-00-8E-00-01

Dir	Len	Code	Data (TLS Encrypted C12.18 request/response)	Unencrypted Data (not part of packet)
			F9-BA-30-24-43-F0-F0-72-71-B4-DE-5A-C1	(C12 request code + Data)
S->C	00-22	00	17-03-03-00-1C-00-00-00-00-00-00-00-01-68-0F-A0-53-79-BE-B3-6E-CB-96-CC-66-E2-D1-CE-A9-65-C7-28-EA	00-01-02 (C12 result code + Data)

RC4 MEP Example Messages

This section contains examples of the messages that will be sent to and from a MEP client during a common transaction with a MEP server using RC4 security. All examples are shown authenticated and unencrypted.

Note: *Charts describing each byte follow each example message. The example data is radix:hex. The < > marks indicate MEP specific component and the [] marks indicate security fields.*

RC4 Example 1:

In the following exchange, the MEP client wants to read data from BT23 “Current Register Data.” It does not know what the current sequence number is, and is using the default MAK access key of 0x01010101010101010101010101010101 (16 bytes of 1s). The request is a partial table read request (0x3F) for BT23 at offset 0 for 44 bytes. Message fields are in bold, and header and security fields are in italic:

MEP Client First Read Request:

00 14 **3f 00 17 00 00 00 00 2C** 01 02 03 04 74 86 1F 6D 76 58 DD 56

Description	Number Of Bytes	Message Data
<length>	2	00 14
<message>:		
<partial read_request code>	1	3F
<table_id>	2	00 17
<table_offset>	3	00 00 00
<count>	2	00 2C
[sequence no.]	4	01 02 03 04
[digest]	8	74 86 1F 6D 76 58 DD 56

The sequence number “01 02 03 04” is not what the MEP server expects, so the response is 0x0C followed by the current sequence number:

MEP Server Response:

Invalid Sequence Number (response code 0x0C)

New Sequence Number is 77635B90

00 0D 0C 77 63 5B 90 35 86 3C 1D F5 B9 14 82

Description	Number Of Bytes	Message Data
<length>	2	00 0D
<message>:		
<response code>	1	0C
[sequence no.]	4	77 63 5B 90
[digest]	8	35 86 3C 1D F5 B9 14 82

Using the new sequence number that has been incremented, the table read would be retried as follows:

MEP Client Second Read Request:

00 14 **3F 00 17 00 00 00 00 2C** 77 63 5B 91 13 DB 85 A1 35 A0 57 5E

Description	Number Of Bytes	Message Data
<length>	2	00 14
<message>:		
<partial read_request code>	1	3F
<table_id>	2	00 17
<table_offset>	3	00 00 00
<count>	2	00 2C
[sequence no.]	4	77 63 5B 91
[digest]	8	13 DB 85 A1 35 A0 57 5E

This time the sequence number is in range, so the response appears as the <ok>, <count> and <data>:

MEP Server Response:

00 37 00 00 2C 00 00 00 00 00 00 00 00 00 00 00

00 00 00 00 00 08 00 00 00 03 00 00 00 00 00 00

00 00 00 00 00 00 00 00 00 00 00 00 06 00 00

00 AD DC B8 2C 3D 41 7F 91

Description	Number Of Bytes	Message Data
<length>	2	00 37
<message>:		
<response code>	1	00
<count of table data>	2	00 2C
<table data>	{count}	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 08 00 00 00 03 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 06 00 00 00
[digest]	8	AD DC B8 2C 3D 41 7F 91

RC4 Example 2:

In the following example, the goal is to register the attached MEP client with a partial table write request (0x4F) to the ET50 field, “MEP Device Registered”.

MEP Client Write Request:

00 15 **4F 08 32 00 00 1E 00 01 01** 77 63 6e 2f 86 e5 0e 26 67 d1 e6 3c

Description	Number Of Bytes	Message Data
<length>	2	00 15
<message>:		
<partial write request code>	1	4F
<table_id>	2	08 32
<table_offset>	3	00 00 1E
<count>	2	00 01
<table data>	{count}	01
[sequence no.]	4	77 63 6E 2F
[digest]	8	86 E5 0E 26 67 D1 E6 3C

MEP Server Response:

00 09 **00** 86 e5 0e 26 67 d1 e6 3c

Description	Number Of Bytes	Message Data
<length>	2	00 09
<message>:		
<response code>	1	00
[digest]	8	86 E5 0E 26 67 D1 E6 3C

At this point, the MEP server will see that this flag is set and perform discovery of the MEP client device. The discovery process is described later in this document.

Communication Model

All communication between the MEP server and the MEP client is initiated by the MEP client, in the form of table read and write requests (and procedure calls). The MEP server only provides responses to MEP client requests (the “Alert Sequence” exception to this is noted below).

Alert Sequence

The exception to this model is an alert sequence that the MEP server initiates and sends to the client to notify it that there is new information requested, or new data to be processed. This removes the need for the client to poll the MEP Server for these reasons.

The alert sequence is two serial data bytes, each with a value of zero. Normally, at the start of a response, the MEP server would transmit a two-byte data length value that would not be a zero value. The alert represents a short, zero-length notification message. As long as the conditions that initiated the alert remain, the MEP server will continue to emit the alert once per second. The alert ceases

when all conditions have been serviced appropriately. (See the description of the “Alert Flags” field in ET13 in the Tables and Procedures for the MEP Protocol section for information on the conditions that may cause an alert sequence.)

To receive alerts when new M-Bus information is available for either for control valve status or load profile, you must set the “M-Bus Alerts” flag in ET50 (ET50.30.2) to 1.

Generally, the expected response to the alert sequence is for the MEP client to read the value of the “Alert Flags” field in ET13, and to take action based on these flags. Unless the expected action takes place, the alert sequence will continue to be emitted by the MEP server. The expected actions are:

Scheduled Read Request Alert – The MEP server expects the MEP client to post scheduled read data by calling EP39 with the parameter “Scheduled Read Data” or “Scheduled Read Data + Alarms.” The inclusion of alarms data in this procedure is optional. For more information, see Responding to a Scheduled Read Request (With and Without Alarms).

On-demand Request in ET15 – The MEP client must examine ET15 to determine what action to take. For more information, see Reading and Processing On-Demand Requests.

M-Bus Change – The MEP server expects the MEP client to respond to the M-Bus change and call EP39 with the “Clear M-Bus Alert” flag set to clear the condition. Consult Chapter 5: Programmer’s Reference Notes, for more information on EP39.

Tables and Procedures

Tables and procedures are used to convey data between the MEP server and the MEP client in both the uplink and downlink directions, and for the MEP client to respond to requests from the MEP server and the Head-End System. MEP clients have direct access to these tables and procedures.

Using TLS Security to secure MEP Ports

Transport Layer Security (TLS) is a frequently used internet standard to secure transport layer communication. To enable TLS, each MEP port can be configured to require either TLS or RC4. TLS security can be enabled at manufacturing time, or later over PLC/P2P or the optical port. The security cannot be changed over the MEP port.

TLS Security Suite: The TLS security protocol is *TLS v1.2* and the cipher suite is *TLS_PSK_WITH_AES_256_GCM_SHA384*. The pre-shared key will be 128 bits (NOTE: the meter key fields are 20-bytes, so only the first 16 bytes of the key values will be used). The TLS Session Cache will not be supported.

The meter TLS implementation is based on “*mbed TLS v2.16*”.

PSK Identity Hint

The first 16 bytes of the MAK and MBK keys are used to establish a TLS session for a MEP port. To connect to the meter, the MEP client must provide the TLS Client Identity Hint to the meter. The data in the hint is sent as part of the TLS handshake, and indicates to the meter which key is to be used to establish the session.

Field	Type	Offset	Description
Client ID	UInt16	0	16-bit identifier of the client (LSB). Currently, it is not validated by the meter, but will be recorded in any events generated as a result of requests from the client.
Key ID	UInt8	2	Identifier of the key to be used for the session: 0 – MEP Basic Key

Field	Type	Offset	Description
			1 – MEP Advanced Key

Using the MEP and Optical Ports concurrently (Gen 2.X and 3.X Meters Only)

Note: *This section is not applicable to Gen 4 Meters (e.g. NES meters running firmware versions 4.0 and higher), as these meters use separate serial ports for the optical port and the MEP interface.*

The MEP and optical communications interfaces in Gen 2.X and Gen 3.X meters (e.g. NES meters running firmware versions 2.X and 3.X) share a single physical UART, and thus are exclusive of each other and must operate in separate sessions. Optical sessions follow the state flow defined by ANSI C12.18. As long as the optical port is in the Session state, the MEP interface is switched out.

The MEP interface is active by default. The interface switch to the optical port is initiated by the first serial frame from the optical port. When optical activity is detected, the optical interface becomes active and remains so for the duration of the session. During the session, the MEP interface will be unresponsive. Note that the first optical packet may fail if this switchover doesn't occur quickly enough, and the meter will rely on the ANSI C12.18 retry mechanism to continue.

Once the optical session is active, the meter may time out the session and switch back to the MEP interface if the timeout is enabled. Three fields in ET51, "Enable Optical D.O.S. Timer", "Optical Session Timeout", and "Optical Session Holdoff" control this behavior. It is disabled by default. If the "Enable Optical D.O.S. Timer" field is True, and the "Optical Session Timeout" period elapses for an optical session, then that session is terminated and optical port activity is ignored for the duration of the "Optical Session Holdoff" period. Note that the "Optical Session Timeout" period is a user-configurable field, and its value may vary.

You should be aware that you may see a number of different types of communication and protocol errors when an optical port reading device is being used concurrently with the MEP interface. Even though optical port usage may be rare, you should make sure to program your device to handle the following at any time: lost responses, sequence number errors, and delayed responses.

You should also be aware that MEP server responses to the MEP client also will appear at the optical port interface because the MEP and optical ports share a single UART in the meter. Optical devices designed to work with Gen 2.X and Gen 3.X OSGP meters must be able to distinguish between optical and MEP protocol messages.

MEP Port Baud Rate

The default baud rate of the MEP port is 9600, with other baud rates of between 300 and 9600 configurable in ET13. Rates up to 115200 can be configured on Gen 4.x meters and CPM modules, though these rates are not guaranteed. The MEP client can change the baud rate setting in ET13. This rate change is carried out once the MEP response has been completely sent out by the MEP server.

MEP Client Health

The MEP server monitors the MEP traffic, both read and write requests. It will mark the "MEP Device Status" setting in ET14 as "Down" and set an alarm if a successful request message is not received within the configurable timeout period (this is configurable in ET51). A message is considered successful only if it passes all authentication and encryption tests. This behavior can be disabled in ET51.

MEP Protocol Timing

There are different timing considerations for the MEP protocol.

Response timeout

The MEP should use a response timeout of 500 ms. The timeout interval should start after the last byte of the request is sent until the first 2 bytes (non-0 packet length) of the response is received. If the response is not received, the MEP should try to deliver the packet again using the same packet contents (sequence #, digest, etc) as the original packet.

Intra-packet timing

The MEP should send at least one byte every 50 ms to the meter after it sends a packet to avoid a time-out.

Response timing

For segmented responses, there will be a 25ms delay after each 117-byte segment if the meter response is greater than 117 bytes. The meter throttles response such that there is no more than 1 MEP request every 100ms.

Alert Sequence timing

There is a timer in the MEP server that holds off the sending of the alert sequence for one second following the reception of the MEP protocol frame.

Multiple MEP Ports (OSGP Meter Firmware Versions 4.0 and Higher)

Gen4 hardware meters with firmware version 4.0+ introduce support for multiple MEP ports, where a different MEP client can connect to each port. This requires each MEP client to access different tables and use different offsets for some tables than MEP clients designed for previously released firmware versions.

This section summarizes the firmware interface changes that apply to multiple MEP support. It focuses on the additions or changes for the second MEP port and client. These changes are not applicable to earlier meter models (e.g. 83XX1-XXXX and 83XX2-XXXX model meters) running firmware versions released prior to version 4.0, as those meters support only a single MEP port.

Note: *Complete syntax details for the tables and procedures referenced in this section are provided in Chapter 5: Programmer's Reference Notes.*

MEP1 and MEP2 Naming Conventions

In this document, the MEP clients are referred to as MEP client 1 (MEP1) and MEP client 2 (MEP2). Each MEP client can be connected to either the lower MEP port or the upper MEP port on the meter's terminal block. This must be configured during manufacturing. You can consult the wiring diagram inside the meter terminal cover to determine which MEP port (i.e. the upper or the lower) each MEP client is connected to. For more details on each MEP port, including terminal assignments, see Appendix D: MEP Client Hardware Requirements (NES Meters Only)

Note: *Some meters are manufactured with a pre-installed internal MEP client, in which case the MEP client is wired to an internal communications card, as opposed to the upper or lower MEP ports on the meter terminal block. Meter tables can be read and written, and meter procedures can be called, in the same fashion for this MEP client as for MEP client devices that are wired to the upper and lower MEP ports.*

Backwards Compatibility Mode

It is possible for a single MEP client with firmware written for a previous meter release to operate on an 8XXX4-XXXXX meter running firmware versions 4.0 and higher. To do so, the meter must be commissioned by the HES and the Control Node to backwards-compatible mode. In this case, the "Multiple MEP Clients" field in ET54 (ET54.0.8) will be set to 0 (False) and the second MEP port cannot be used.

The "MEP Channel Count" field in ET11 (ET11.34) indicates how many MEP clients are physically present and usable.

Hardware Configuration

An additional option has been added to ET29 that is used to enable or disable the lower MEP port (ET29.0.23). If this bit is set to 1 (True), it indicates that this port is present and enabled. The other MEP option in ET29 (ET29.10) is used to enable or disable the upper MEP port.

Remember that MEP client 1 (MEP1) and MEP client 2 (MEP2) can be assigned to use either of the two MEP ports. This is determined by the "Comm Assignment Matrix" field in ET29 (ET29.24), which assigns the I/O board type, logical port type, and logical port sequence number for each of the MEP ports.

Note that these fields (and any other fields in ET29) must be configured during manufacturing.

Registration and Configuration

***Note:** If you only want to read data from the meter locally **(and not provide data through the meter to the HES or get data from the HES),** the registration and discovery process is not necessary. Pure read access can be done without registering the MEP device.*

The primary meter tables used for MEP client configuration are ET50 and ET51. For meters running firmware versions 4.0 and higher, each of these tables has been converted into an array with two elements: one for each MEP client. Each element contains all the fields that were included in the respective table for previous meter versions, so the configuration data provided for each MEP client is the same as in previous releases. The configuration data required to register and configure MEP client 2 is the same as the data required to register and configure MEP client 1, except it uses the fields in the second array element. When registering the MEP clients, the device handles (i.e. the unique identifier for the MEP client) assigned will be in the range 1000 to 1999 for MEP client 1 and 2000 to 2999 for MEP client 2 (typically only the first number will be used).

There are several fields in ET50 and ET51 that are not strictly related to just the associated MEP client, but have a global use. In ET50, the MEP icon display control fields (house, signal bars) can be set independently for each MEP client, but only one of the two sets will actually drive the LCD display. This is determined by the "House Icon Control" field in ET55.

ET51 has several fields that relate to the meter's optical port, which is a global function. This includes the following fields:

- Enable Optical D.O.S. Timer
- Optical Session Timeout
- Optical Session Holdoff

These have all been moved to ET55, and those fields in ET51 have been deprecated for Gen 4 meters with both MEP ports enabled. However, if a meter running firmware version 4.0 (or higher) is operating in a backward compatible mode (meaning that only a single MEP port is enabled), then the original ET51 settings for the MEP client will be used for these fields.

The “Device Config” array in ET13 (M-Bus/MEP Device Configuration) and the “M-Bus/MEP Status” array in ET14 (M-Bus/MEP Device Status) have been expanded to include an additional entry for the additional MEP port/client.

Operation

The main difference in the operation of a MEP client connected to a meter running firmware version 4.0 (or higher) is the need to determine which MEP port it is connected to, and to access the proper tables and offsets for that port.

Determining the MEP Port

When a MEP client starts operating, it must first determine which logical port it is connected to. This is done by reading the “Current Comm Channel Index” field (type: UINT8) in ET70 (ET70.142), with the value (1 or 2) indicating the MEP port being used. ET70 is a read-only table, with read access granted to both MEP keys.

If the value of the “Current Comm Channel Index” field is 1, it indicates that it is using the port for MEP client 1 (MEP1). In this case, the “Multiple MEP Clients” field in ET54 (ET54.0.8) should be read to determine if the meter is running in a backward compatible mode. If that bit is False (0), then previous release rules for MEP should be followed.

If the value of the “Current Comm Channel Index” field is 2, it indicates that it is using the port for MEP client 2.

Remember that each MEP client can be connected to either the lower or the upper MEP ports on the meter’s terminal block. This must be configured during manufacturing. You can consult the wiring diagram inside the meter terminal cover to determine which MEP port (i.e. upper or lower) each device is connected to. For more details on each MEP port, including terminal assignments, see **Appendix D: MEP Client Hardware Requirements (NES Meters Only)**

New and Modified Tables and Procedures

Assuming the meter supports multiple MEP clients, the “Current Comm Channel Index” field value must be used to determine alternate tables and table offsets for MEP client 2. In addition, there are some new meter procedures and tables that must be used. These tables and procedures are listed below. Complete syntax details for each table are provided in Chapter 5, *Programmer’s Reference Notes.*

For a summary of tables that have been modified to support other features added in firmware version 4.0, see Appendix F: Version Changes.

Table	Name	Changes
ET11	Mfg Dimension Table	The default value of the “Number of Devices” field (ET11.0) has been updated from 5 to 6. Additional fields relevant to meter firmware version 4.0 have been added to the end of the table.
ET13	MEP/M-Bus Device Configuration	The “Device Config” array includes an additional entry for the 2nd MEP client.
ET14	MEP/M-Bus Device Status	The “Device Status” array includes an additional entry for the 2nd MEP client.

Table	Name	Changes
ET29	Hardware Configuration	Added an additional bit to enable or disable the 2nd MEP port. Additional fields relevant to meter firmware version 4.0 have been added to the end of the table.
ET34	Additional M-Bus/MEP Hardware Configuration	The “Device Config” array includes an additional entry for the 2nd MEP client.
ET50	MEP Inbound Data Space	The “MEP Inbound Configuration” array includes an additional entry for the 2nd MEP client.
ET51	MEP Device Configuration	The “MEP Device Configuration” array includes an additional entry for the 2nd MEP client.
ET52	MEP Transaction Request Table	Can now be locked via EP61.
ET54	Meter Status	Includes additional fields for supporting multiple MEP clients, including the “Multiple MEP Clients” field (ET54.0.8), which indicates how many MEP clients are supported. Additional fields relevant to meter firmware version 4.0 have been added to the end of the table.
ET55	Meter Configuration	Includes additional fields for supporting multiple MEP clients, including some affecting how the MEP display icons will shared.
ET85	MEP2 Procedure Initialization Table	Procedure response table for MEP client 2.
EP61	MEP Transaction Lock Control	New procedure for MEP transaction table (ET52 and ET53) locking.

The following tables have had no physical changes but are now shared by the two MEP ports: ET15, ET16, ET20, ET32, ET45, ET52, ET53, ET57, ET58 and ET74.

Procedure Responses

For procedure responses, MEP client 1 will use ET59 if the “ET59 Response” field in ET50 (ET50.30.1) is set to True (1), or BT08 if it is set to False (0), MEP client 2 will always use ET85 for procedure responses. For more information on this, see Calling Procedures.

Device Handles

The device handle is a unique identifier for the device. In previous meter versions where only a single MEP client was supported, the device handle did not have much importance, since it would normally always be the same. However, the handle becomes more significant when there are two MEP clients. In shared tables and procedures, particularly the ones that had no physical change, the handle is used to distinguish the two devices. You must take care to manage and validate handles properly.

This is especially true with ET15 “M-Bus/MEP On-Demand Requests.” Requests to both MEP clients are posted here, and it is possible that they could even get interleaved. Only the oldest

entry can be cleared, so MEP clients should make sure their handle matches the one in that entry before processing and clearing it. If both MEP clients have entries waiting in ET15, one MEP client will effectively be stalled until the other one processes its entry. In this case, it may be necessary to increase the value of the “On-demand Timeout” field in ET51. This field sets the number of seconds before an on-demand queue entry in ET15 is considered expired and marked with “No Response.” By default, this field is set to 30 seconds.

The device handles assigned will be in the range 1000 to 1999 for MEP client 1, and 2000 to 2999 for MEP client 2 (typically only the first number will be used).

MEP Transaction Locking

The two MEP ports share the MEP transaction tables, ET52 and ET53. This means that it is possible that one MEP client could have its transaction results overwritten by the other MEP client’s transaction before the first MEP client has a chance to read them. To prevent this, access to the MEP transaction tables can be locked by a MEP client using the new procedure EP61. The tables should be locked with EP61 just before executing a transaction by writing ET52, and unlocked immediately after reading the results by reading ET53. If a MEP client does not unlock the tables, they will be automatically unlocked after a timeout of 10 seconds. For more information on transactions, see *Table Transaction Guidelines* on page 43.

Chapter 3: MEP Use Cases

This chapter describes additional tasks you can accomplish with the MEP protocol, such as displaying MEP data on the meter LCD display and reading M-Bus billing data. It includes the following sections.

- Use Cases Overview
- Reading M-Bus Scheduled Read Data
- Reading On-Demand M-Bus Data
- Reading Historical Register Data
- Load Profile Data
- Reading a Control Valve Status
- Detecting Control Valve Commands
- Delta Data Alerts
- Unbalanced Voltage Detection
- Replacing a MEP Client Device

Use Cases Overview

This chapter describes additional tasks you can accomplish with the MEP protocol, such as, reading M-Bus load profile data and reading the current status of a control valve.

The instructions provided for each task reference specific parts of tables and procedures that you will need to access when performing each task. Consult *Chapter 4:* Programmer's Reference Notes, for more extensive details on these tables and procedures. This includes descriptions of every field contained in the tables referenced in this chapter, as well as of the procedures you may need to call. Chapter 5 also contains definitions of the data types, value control identifiers, and table/procedure naming conventions found in the tables and procedures listed in each section. Chapter 5 also provides syntax details that you will require when calling the procedures.

Reading M-Bus Scheduled Read Data

For MEP clients that support M-Bus devices, the first data read from a newly commissioned M-Bus device or MEP client is stored in ET16. After that, all subsequent scheduled reads are stored in ET45 and all responses to on-demand requests are stored in ET16. ET16 is organized as a static array with one entry per device. The location of a device's entry does not change as long as the device remains commissioned on the MEP server. By contrast, ET45 is organized as a circular queue of entries for all commissioned devices with data logged in subsequent entries as they are read into the MEP server. In order to navigate ET45 to read the desired device entries, you must learn the handle assigned to each M-Bus device. This is described in this section.

When a new wired M-Bus device is commissioned to the MEP server, it is assigned a logical slot 1..4. Typically, the device is also assigned a physical address to match the slot, though some devices do not allow this. The slot designation is for all corresponding data and status that are posted to ET14 and ET16 for that device. Slot 1 (array element 0) typically corresponds to the device at physical address 1, slot 2 (array element 1) typically corresponds to the device at physical address 2, etc. Once a device is assigned a physical address/slot, this designation will not change unless the device is physically or logically removed and re-commissioned. As a result, the process for discovering a new M-Bus device that has been added to the MEP server and determining its handle in order to read subsequent data postings is as follows.

1. Poll the "Device Occupancy" bits in ET14 approximately once per minute to learn when a new M-Bus device has been added. The point at which you should stop polling for new devices may depend on the application, or outside knowledge. The "Device Occupancy" bit(s) set in ET14 corresponds to the assigned slot(s) in ET14 and ET16.
2. Read the "Device Handle" field in the ET14 slot corresponding to the newly added device. Save this information.
3. Poll the "Billing Data Collected" alarm bit in the appropriate ET14 entry approximately once every 10 seconds to see when the first read from the new device has been captured. If it's possible that the first read has already taken place, this bit may already have been cleared by the HES, so limit the polling of this bit to approximately 10 minutes. To be sure an entry has been recorded, read the "Billing Read Length" field in the appropriate ET14 entry. It will be set to a non-zero value when data has been recorded.
4. Read the ET16 entry corresponding to the device of interest for the M-Bus device identification information. The maximum size of each entry is controlled by the "Data Entry Size" field in ET11. The exact size of the latest read is captured in the "Billing Read Length" field in ET14 (referenced in step 3). Use the device identification read from ET16 to track desired M-Bus devices by their device handle.

   Subsequent scheduled reads posted to the MEP server will be stored in ET45, the MEP/M-Bus Recurring Read Log. The number and size of entries in this log are variable dimensional parameters

that are documented in ET36. ET36 is a table that consists of a set of definitions for manufacturer's log tables, which include ET45. The dimension information for ET45 is in the fifth entry of ET36. In that record there are two fields that indicate the present configuration of ET45 and must be read in order to navigate ET45. The "Entry Size" field indicates the size of each log entry in ET45, and the "Current Entries" field indicates how many total entries exist in ET45, regardless of whether they are populated with data.

Once the device handles for devices of interest and the configuration of ET45 have been acquired, the following steps should be followed to learn of and read new data postings from M-Bus devices. First, an introduction to the structure of ET45 is needed. This table is implemented as a circular queue of entries. The header fields (bytes 0...5) hold the information needed to read the queue. The "Number Of Valid Entries" field indicates how many entries in the queue contain data. The "Last Entry Element" field is the array element of the most recently recorded entry. The "Number Of Unread Entries" field stores the number of entries that have not been read through the Head-End system. This value may or may not pertain to another reader. The OSGP Alliance recommends that you read the entire list, and that you use the "Last Entry Element" field to track the starting point of the entries listed in reverse chronological order. The header fields are maintained by the HES, and they are NOT to be changed by other readers!

5. Periodically (once per minute or longer as appropriate) poll the header of ET45 (ET45.1..ET45.5) to determine if and where new entries have been posted.
6. Using the dimension information ascertained from ET36, read the "Length" and "Handle" fields of the new entry or entries. If the handle of the new entry corresponds to a device of interest, read the entire entry, using the length information to read only necessary bytes. The device may have posted fewer bytes than the size of the ET45 entry.
7. Store the index of the ET45 array element just read and use that as the starting point for future reads, keeping in mind the next read may have wrapped around to element 0.

Note: *Meters running firmware versions 3.60 also include ET74, which is used to store additional scheduled read data. If ET74 is configured to include more than 0 entries, then entries destined for ET45 are first logged in ET74, as much as the capacity permits. They are then transferred into ET45 in first-in, first-out order as soon as there are available entries in ET45.*

Reading On-Demand M-Bus Data

For MEP clients that support M-Bus devices, M-Bus billing data can also be collected via on-demand read requests, as well as via the scheduled reads described previously. You can read on-demand M-Bus read data by following the steps below:

1. Post an on-demand billing read via EP19. To do so, you will need to know the device handle of the desired M-Bus device. This can be read from the "Device Handle" field of ET14.

   When calling EP19, you should make sure that the "Transaction Number" field is set to a value that in not presently in use in ET15. There is no defined range for these fields, and so the OSGP Alliance recommends choosing a value that is far removed from the values that are currently being used. Consult the description of EP19 in Chapter 5 this document for further guidelines on the transaction number to be used with EP19.

   Generally, the "Request Type" should be set to 2 (Billing Read) when you call EP19, as this corresponds to the standard M-Bus billing read.

   Note: *When EP19 is invoked, the data read from the M-Bus device is stored in ET16, as described in the remainder of this section. Data from on-demand requests posted by a MEP client is not sent to the Control Node or to Head-End System Software.*

2. Poll ET15 every second to confirm that the on-demand read request has been posted and successfully completed. To do so, you need to poll the request queue of on-demand requests until

you find the entry assigned the transaction number used in step 1 and confirm that the “Result” field is set to “Success.”

3. Read data from the ET16 entry corresponding to the M-Bus device identified in step 1. The maximum size of each entry is controlled by the “M-Bus/MEP Data Entry Size” field in ET11. The exact size of the latest read is captured in the “Billing Read Length” field in ET14 (referenced in step 3). Use the device identification read from ET16 to track desired M-Bus devices by their device handle.

Note: *You should be aware that other applications may call EP19 to post an on-demand billing read request for an M-Bus device, in which case the previous set of on-demand data stored in ET16 for that device would be overwritten, as the MEP server supports storing one set of on-demand read data per device at a time. Therefore, you should program your application to read ET16 immediately after invoking EP19.*

Reading Historical Register Data

Historical register data can be found in BT26. This table is similar in format to BT23, but has different dimensions. BT21 and BT22 must be read to interpret the dimensions of this table. BT22 identifies which registers have been included, if any, for demand values.

This table is implemented as a circular queue of entries. The header fields (bytes 0...5) hold the information needed to read the queue. The “Number Of Valid Entries” field indicates how many entries in the queue contain data. “Last Entry Element” is the array element of the most recently recorded entry. The “Number Of Unread Entries” field stores the number of entries that have not been read through the Head End System. This value may or may not pertain to the optical reader. The OSGP Alliance recommends that you read the entire list, and that you use the “Last Entry Element” field to track the starting point of the entries listed in reverse chronological order. The header fields are maintained by the Head End System Software, and are NOT to be changed by your application!

Load Profile Data

Load profiling is the periodic storage of interval energy measurement. OSGP meters running firmware version 3.50 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher, support up to four load profile data sets. Each load profile data set can be configured to record up to 16 energy values (referred to as load profile channels) at its own logging interval.

Using these settings, you can create different data sets to log consumption and power quality measurements at varying logging intervals, For example, you could create one data set with a logging interval of 60 minutes that records hourly load curves (active energy registration) for billing purposes. You could create another data set with a shorter logging interval for measurements that require more frequent updates – this may be useful when monitoring peak load by reading maximum power values.

This feature may also be useful if you need to review data at different times as each load profile can be uploaded at different times, or even keep data on the meter only accessed when troubleshooting.

The 16 channels are selected from the measured electrical values, which are listed in the “Source IDs” section on page 203. All channels are stored as total values (no differential values).

Each load profile data set is divided into groups of data called blocks. You can specify the duration of each block, as well as the maximum number of blocks that can be stored for each load profile data set at any given time. In this way, you can limit the days of storage available to given load profile data set.

For example, consider a case where you want load profile data to be logged every 30 minutes, with no more than 30 days of data being stored at any one time (regardless of whether or not more memory is available to the data set). In this case, you would use the following settings for the data set:

- Load Profile Log Interval: 30 Minutes
- Block Size: 1 Day
- Maximum Block Count: 30

These settings would allow for 30 days of load profile data to be recorded at 30 minutes intervals. The meter also includes configuration settings you can use to easily ensure that the meter stores the maximum number of blocks possible based on the memory available to the data set where regulations describe a maximum storage time.

You can also configure the start time for the first load profile block for each data set. When doing so, you should be aware that if the total block time (i.e. the interval duration multiplied by number of intervals per block) does not divide evenly into 24 hours or is not an integer multiple of 24 hours, then the actual start time for each subsequent block will not always match the start time for the first block. For example, if you have a block start time of 00:00 and a block duration of 18 hours, then the actual block start times will rotate through these times: 00:00, 18:00, 12:00, 06:00.

Primary Load Profile Data Set Designation

If the meter or Control Point/OSGP Module is configured to contain multiple load profile data sets, one of them must be configured as the primary data set. When choosing the primary set, you should be aware of the following:

- Only log entries for the primary load profile data set can be shown on the meter display.
- The “Load Profile Overflow” diagnostic alarm that can be shown on the meter display will only be triggered for the primary data set. However, the corresponding “Load Profile Overflow” event can be triggered for any of the data sets.
- All other aspects of functionality for each data set are the same.

The “Primary Load Profile Index” field in ET55 determines which data set will be used as the primary data set.

Load Profile Configuration

The meter supports several configurations for load profiling. Load profile configuration can be found in the following tables:

- BT61 “Actual Load Profile.” Lists the current configuration and dimensions of the load profile.
- BT62 “Load Profile Control.” Lists the configuration of each of the load profile data sets, including which channels each data set is logging.
- BT63 “Load Profile Status.” Lists the current status of the load profile.

Load profile data can be found in any of the following tables: BT64 “Load Profile Data, Data Set 1,” BT65 “Load Profile Data, Data Set 2,” BT66 “Load Profile Data, Data Set 3,” and BT67 “Load Profile Data, Data Set 4.”

Note: *For meters running firmware versions prior to 3.50, all load profile data can be found in BT64, as these device types do not support the multiple load profile feature.*

All the pertinent configuration and dimension information required for interpreting load profile data also can be found in ET42 “Interface Definition Table”.

The structure of the load profile records contained in BT64 follows the ANSI C12.19 format. The records are split into logical groups called blocks. The duration of each block is configurable. Certain status information is reported only once per block, including the timestamp and status of complete intervals. Other status information is contained in tables BT61, BT62, and BT63.

Reading Load Profile Data

To read the most recently recorded load profile data in the meter, follow these steps:

1. Read and store BT61 or ET42 for the present load profile configuration, including the number of blocks (days) with available data, the number of intervals recorded in each block, the number of channels (registers) being logged, and the interval time. This information needs to be read only once per load profile reconfiguration.
2. Read and store BT62 or ET42 to note which registers (sources) have been logged. The meter can be configured to log electric meter data, M-Bus device data, and MEP data and all are stored in the same log. The source IDs listed in BT62 or ET42 define which data registers are logged in which load profile channels. This information needs to be read only once per load profile reconfiguration.

   If the interval source ID in BT62 is in the range of 112..163, this indicates it is a mapped source ID, or a key used to refer to an extended source ID in ET66 “Load Profile Source ID Mapping Table.” ET66 is described in more detail later in this document.
3. Read the “Number of Valid Blocks” and “Last Block” fields in BT63 for information on where in BT64…BT67 (depending on which data set is being read) the occupied blocks lie. Note that the “Last Block” field in BT63 is updated as soon as any single interval in the block is marked valid.
4. Read ET21 for the size of each block, the size of each interval, and the index of the most recently recorded interval. The values of parameters in ET21 change as load profile is being recorded so this table must be re-read before each read of load profile data from the meter.
5. To read the most recently recorded full block of load profile data, perform a partial read of BT64...BT67* with the following parameters. Note that these formulas are stated for reading BT64. Formulas for reading other data sets via BT65, BT66 or BT67 should be modified per data set, as described in the table descriptions in Chapter 5.
   - Offset = ((BT63.3N - 1) modulo BT61.7N) * ET21.8N
   - Count = ET21.8N
6. To read the most recently recorded one interval of load profile data, perform a partial read of BT6N with the following parameters:
   - Offset = (BT63.3N * ET21.8N) + ET21.12N + (ET21.20N * ET21.25N)
   - Count = ET21.25N

   In the formulas listed above, value N represents the array element for the data set you want to read. The data sets are ordered as follows:
   - 0: Data Set 1
   - 1: Data Set 2
   - 2: Data Set 3
   - 3: Data Set 4

   More intervals within the blocks as well as earlier recorded blocks can be read with appropriate calculations for the offset and count. Keep in mind that the load profile log is a circular buffer in the meter’s memory, so any calculations on offsets for earlier blocks should use modulo the number of total blocks in the load profile.

Parsing M-Bus Load Profile Data

Developers may choose to have the MEP application inform the MEP client how to parse load profile data to extract and interpret the relevant M-Bus data. This would include informing the MEP client

which channels are M-Bus data, what types of data those channels represent, and what units the data in those channels use. If this mechanism is chosen, the HES application would have to update the MEP client of the M-Bus load profile configuration information any time the load profile is reconfigured, or any time M-Bus devices or device types are removed or exchanged. If this mechanism is not employed and the MEP client must learn all the configuration information of M-Bus load profile on its own, the following sections apply.

To receive alerts when new M-Bus information is available in the MEP server for either control valve status or load profile, you must set the “M-Bus Alerts” field in ET50 (ET50.30.2) to 1.

M-Bus Data Types and ET57

The previous section on reading load profile data describes how to determine which source IDs correspond to all the configured load profile channels. Typically, only a subset of the channels will correspond to M-Bus device data. M-Bus source IDs will all be extended source IDs of the following format in ET42:

- Bits 15..12 = 4
- Bits 11..8 = 0..4 corresponding to the ET13 index for the device to be polled for this data type
- Bits 7..5 = Unused
- Bits 4..0 = M-Bus Data Type (MDT) value

An M-Bus Data Type (MDT) is a mapping of M-bus Data Record Header (DRH) definitions to simple 5-bit ordinals. These DRH definitions and mappings can be used to interpret the M-Bus load profile data that has been collected. One or more DRHs can be mapped to a single data type. Applying multiple DRHs to the same data type may be desirable, as it is possible that separate M-Bus devices will not always use the same DRH for a given type of reading. In that case, those DRHs (i.e. those that are all applicable to the same type of reading) can be applied to the same data type, and the MEP server will act accordingly when that data type is encountered. That way, the MEP server is able to effectively handle each type of M-Bus device. The only known case where this could occur is a MEP server that might return temperature corrected values sometimes, and non-temperature corrected other times. A flag in the MDT mapping table is used to indicate whether temperature correction is on or off.

The MDT-to-DRH mappings are contained in ET57 “M-Bus/MEP Data Type Table.” ET57 is optimized around an assumption that the typical DRH is 3 bytes or less. DRHs longer than 3 bytes are accommodated, just not as efficiently as shorter ones. Note that ET57 does not contain lengths for each DRH, because the DRH length can be deduced from the DRH itself. If a DRH is improperly formed, then either the MDT will not match (resulting in a “skipped” channel) or the MDT could match on the wrong DRH.

Each MDT entry in ET57 can be flagged as “special”. Entries flagged as special are always given precedence. If the MEP server matches on a non-special MDT but there is another entry for that MDT marked special, the MEP server continues to search for that until it exhausted all the DRHs. This allows the load profile to record certain types of entries such as temperature corrected volume preferentially.

If the M-Bus read contains no data that matches the medium or MDT criterion, then the channel is marked as “skipped” (see the “Extended Status” field in BT64). If a match is found, then if the value is less than 4 bytes, the unused bytes are stored as zero in the load profile interval. If the value is more than 4 bytes, only the first 4 bytes are stored. The assumption here is that only Mode 1 (little-endian) is used by M-Bus devices.

Using the source ID information in ET42 and the MDT information in ET57, the MEP client can learn where the M-Bus data is within the load profile and how to interpret it. Occasionally, some extra configuration and concerns arise that the MEP client may need to be aware of. These are addressed in the following sections.

Load Profile Poll Rate

The load profile poll rate is configured via the “Load Profile Poll Rate” field in ET34 (ET34.4). This determines how often M-Bus devices will be read for load profile purposes. A value of 0 means there is no limit on the polling, and the poll rate is determined by the load profile interval duration. This is an approximation, as M-Bus reads may not occur at an exact interval and retries can vary the spacing. The reason for needing a separate poll rate for M-Bus devices (instead of using the load profile interval duration) is that reading them too frequently could be a drain on their batteries. For intervals that do not require a poll, the channel is stuffed with 0 and the extended status may be marked using a value of 4 (“Skipped”) if the MEP server is configured to use this status. Otherwise, the status is 0. Polls only occur when the number of minutes in the day modulo the poll rate is 0, or if it is the last interval of the day.

Time Stamping

There are two possible behaviors of the M-Bus device. One is that the device returns instantaneous values, and the other is that it returns an hourly read. In the latter case, the hourly read should be accompanied by a time stamp. If it is, then the MEP server will check the time stamp to make sure it is current. The MEP server will determine the time stamp definition using an MDT entry and bit offset definitions in ET34.

For example, if the M-Bus device reports a time stamp in its self-read using the full date/time format, then ET57 would contain 06 6D as the DRH, the hour locator would be 17/5, and the minute locator would be 9/6. Note that if there is no time stamp in the self-read, the MEP server will not manufacture one, even if there is a load profile source ID specifying time. The day and invalid time fields in the time stamp are ignored.

If the locator bit count is 0, then a default locator is used as follows:

- 4-byte value (hour: 9/5; minute: 1/6)
- 6-byte value (hour: 17/5; minute: 9/6)

For example, if the M-Bus device is slow and an hourly read is initiated at 9:00:00, then the M-Bus device could return an hourly read with a time stamp of 8:00:00, the same as an hour before. In this case, the MEP server will repeat the read again every N (configurable) seconds until the time changes up to N (configurable) times. To reduce the chance of this occurring, the M-Bus device will not be read exactly on the hour but instead N (configurable) seconds after the hour. This should allow the M-Bus device to be ready for the read most of the time assuming time sync is configured for it.

If a “current” read cannot be made within the above parameters, then whatever value is last read is placed in the LP with an extended status of “not current”. Note that if the MEP server fails to respond on the last attempt, the value will be 0 and the status will be marked as 15.

Temperature Correction

It can be indicated whether temperature correction has occurred or not. If this information were in the data field containing the gas reading value, then this could be handled easily. However, the information is not in the data field, and is instead in the VIF (Value Information Field). Therefore, the extended status indicates that the value was “special”. If ANSI C12.19 compliance is selected, then special values get an extended status of 0. The meaning of special varies with the MDT. For gas readings, it means “temperature corrected”. As planned, a MDT can have only one special meaning. As stated earlier, ET57 will indicate whether this condition applies.

Example

The BT62 channel 2 interval source ID is 112. This maps to load profile extended source entry 0 in ET66. This entry contains extended source ID 0x4001. If you are reading ET42 for source ID

information, the value here would be 0x4001, the same as in ET66. This indicates that the M-Bus meter at index 0 with MDT 1 should be used. Consider a case where ET57 contains the following entry, where 0C 93 3A means 8-digit BCD representing non-temperature corrected cubic meters.

MDT: 1 DRH: 0C 93 3A Special: False

The load profile routine will look up 0C 93 3A in ET57, discover that it corresponds to MDT 1, and then find the load profile M-Bus source ID containing MDT 1. It would then record the 4-byte reading (8-digit BCD requires only 4 bytes) in that channel. The extended status will be 0 indicating no special condition (i.e., no temperature correction).

Note: *When load profile data is posted and the interval completes, an alert is also sent to the MEP client. The MEP client should respond to this alert by reading BT63 and BT64 to get the new information and then clear the alert using EP39.*

Reading a Control Valve Status

For MEP clients that support M-Bus, ET58 "M-Bus/MEP Status Extension" contains the latest status value for each M-Bus device connected to the MEP server. The MEP server sends an alert to the MEP client to notify it that there is new information requested or new data to be processed, as described in the *Communication Model* section on page 17. This will occur when the status values stored in ET58 are updated. When the MEP client receives the alert, you should check the value of the "Alert Flags" field in ET13. If this field is set to "M-Bus Change," it indicates that ET58 may have been updated for a control valve status change.

To receive alerts when new M-Bus information is available in the MEP server for either control valve status or load profile, you must set the "M-Bus Alerts" field in ET50 (ET50.30.2) to 1.

Detecting Control Valve Commands

For MEP clients that support M-Bus, some M-Bus requests, such as those to activate or de-activate control valves, can be detected by your application. These requests must be made by calling EP19 "Post On-Demand M-Bus Request" with the "Type" field set to either "Write User Data" or "Write User Data By Index."

To detect these requests, follow these steps:

1. Create an M-Bus Data Type in ET57 "M-Bus Data Type Table" for the desired control valve commands.
2. Specify the M-Bus Data Type created in step 1 as the "Command Monitor MDT" field in ET34 "Additional M-Bus/MEP Device Configuration."
3. Any time the command specified in steps 1 and 2 is detected, the "M-Bus/MEP Command Matched" event will be generated. Bits 13-15 of the event descriptor data returned with the event indicate the device index of the M-Bus device for which the command is intended.

Delta Data Alerts

For OSGP meters running firmware versions 3.40 and higher, you can specify data sources that will be monitored by the meter. The meter will read the value of each specified data source approximately once per second. When the value of the data source changes by a user-specified value, an alert bit will be set.

To configure the delta data alert feature, follow these steps:

1. Set the "Delta Data Alert" field in ET50 to 1 to enable delta data alerts.

2. Set the “Delta Data Alert Sources” field in ET11 to the number of data sources that you want to monitor. By default, this is set to 10.
3. Configure the “Delta Data” array in ET71 to include the data sources you want to monitor. For each data source entry, you will configure the following:
    - **Delta Data Monitor Source**. The extended source ID of the data source to be monitored. All standard source IDs, including MEP and demand data types, are available to be monitored.
    - **Configured Delta**. The delta comparison value for the data source. Any time the value of the source changes by this amount, an alert bit will be set.
    - **Comparison Value**. The current comparison value in use (i.e. the previously measured value of the data source). This value is updated any time the delta is met or exceeded by the meter, and can also be written by your application.
    - **Sampled Data Value**. The current value of the data source. This value is read and updated by the meter approximately once per second. Each time it is read, it will be compared to the Comparison Value. If the difference between the values exceeds the Configured Delta value, the “Alert State” bit for this entry will be set.
4. Monitor the “Alert State” bit for each entry “Delta Data” array in ET71 to determine when a delta data alert has been triggered. You can also read the “Delta Data Alert” bit in ET13 to determine when a data source alert has been triggered.
5. You can clear the delta data alert configuration by calling EP39 with the “Clear Delta Data Alert” type (12).

Note: *You should be aware that that the contents of this table are stored in RAM only, and will be reset to the listed default values upon each power cycle. As a result, any custom values should be re-written to this table after each power-up to ensure that the desired delta data alerts continue.*

Unbalanced Voltage Detection

OSGP meters running firmware versions 3.60 and higher monitor for the following conditions indicating unbalanced voltage:

- Broken medium voltage conductor. When all three phases are active and no phase loss has been detected, the meter will monitor the voltage RMS value for each phase. If all the following conditions are met, the Unbalanced Voltage Detected alarm will be triggered to indicate a broken medium voltage conductor:

The voltage on one of the three phases is within 85%-115% of the rated voltage,

The voltage on the remaining two phases are half (+/- 5%) of the voltage value for the phase mentioned above,

The fluctuation levels of the RMS voltage on all phases are within the value configured as the voltage fluctuation limit [-5%, 5% by default] of each other. Note that this figure (5%) can be re-configured.

Note that these conditions must last for the interval configured as the broken medium voltage conductor threshold in order for the alarm to be triggered. This interval defaults to 600 seconds, In addition, the percentage threshold used to indicate a phase loss should be set to 35% or lower in order for this feature to work properly.

- Zero fault. When all three phases are active and no phase loss has been detected, the meter will monitor the voltage RMS value for each phase. If the following conditions are met, the Unbalanced Voltage Detected alarm will be triggered to indicate the zero fault condition:

The voltage on one or two phases is 115% (or higher) of the rated voltage. This percentage is user-configurable.

The voltage for the remaining phases is within 60%-85% of the rated voltage. These percentages are user-configurable.

Note that the percentage threshold used to indicate a phase loss should be set to 35% or lower in order for this feature to work properly. In addition, the zero fault condition must last for the interval configured as the zero fault detection threshold in order for the alarm to be triggered. This interval defaults to 10 seconds.

Replacing a MEP Client Device

To replace a MEP client, you must first logically and physically remove the old device, and then install and register the new device. Logical removal of a MEP client from the meter disassociates the device with the Head-End Software as well. It may take place before or after physical removal of the device. When a MEP client is logically removed via EP17, either by System Software or by the MEP client itself the following changes occur in the MEP server:

- Clear the “MEP Device Registered” bit in ET50.
- Clear the occupancy flag in ET14.
- Reset (clear) the entire “Device Status” record in ET14, including the handle, alarms, etc.
- Eliminate (shut down) any in-process on-demand operations.
- Add an event for “MEP Status -> Device Removed.”
- All data in ET16 is left intact.

Setting the “MEP Device Registered” flag in ET50 to False has little effect other than to prevent the initiation of the alert notifications and to prevent the invocation of EP39, so this approach to logically removing a device is not recommended.

Use Cases for Replacing a MEP Client

One of the following scenarios may apply when replacing MEP clients:

1. Logical removal is initiated by System Software after determining that the device must be replaced. After this, the old device is physically removed and the replacement device is installed and it self-registers. System Software is notified of the new device via the existing MEP alarms.
2. The old device is not removed physically or logically before the new device is installed. The new MEP client must first remove the existing registered device on the MEP server, and then register itself. As a check for having to first logically remove an old device, all devices should read the identification string stored in the “Identification” field in ET50. If this field doesn’t match the new MEP client’s own serial number, then it should remove the older device and self-register for a new handle.
3. In a variation of cases 1 and 2, device removal could be initiated by System Software after determining that a MEP client must be replaced, but the device may not be physically removed for some time after logical removal. In this case, it has been previously recommended that the MEP client periodically re-register itself if it notices that the “MEP Device Registered” flag in ET50 is ever set to False. Until this device is physically removed and/or replaced, the Head-End Software will need to remove the MEP client repeatedly as long as the “old” device keeps re-registering itself in this fashion. Determining that this is the “old” device would be based on checking the unique serial number in ET50, as described in case 2.

   The OSGP Alliance recommends avoiding this removal-reregistration scenario, due to the fact that System Software retains a history of device handles for the purpose of excluding old data from deleted devices from ever entering the system. Repeating this sequence would eventually cause the device handle to wrap around and System Software would exclude data from the entire

set of device handles. To avoid this, a possible solution is to send the soon-to-be-removed MEP client a message to tell it to not re-register itself on the current meter.

Chapter 4: Programmer's Reference Notes

This chapter contains supplemental information you will need when programming your MEP client device, including introductory information on ANSI C12.19 table structures and details on the data tables and procedures that have been added or modified to support the operations described in this document. It also contains definitions for the data types, value control identifiers, and table/procedure naming conventions found in the tables and procedures described in this document. It also provides syntax details that you will require when calling the procedures. It includes the following sections.

- Table Definitions
- Table Transaction Guidelines
- Calling Procedures
- Time Synchronization
- Dynamic Sizing of Tables
- Tables and Procedures for the MEP Protocol

Table Definitions

The following sections provide definitions for the data types, value control identifiers, and table/procedure naming conventions found in the tables and procedures referenced in this document.

Data Types

This section provides definitions for the data types used in the Application Layer protocol and referenced in the table definitions included later in this chapter.

Note: *All multiple-byte fields, such as UINT16, INT32, and FLOAT (excluding arrays) are ordered least significant byte (LSB) first.*

Data Types

Type	Data Type Definition
INTx (x= 8, 16, 24, 32, 40, 48)	8, 16, 24, 32, 40 or 48 bit signed integer, binary signed two's complement
UINTx (x= 8, 16, 32)	8, 16, 32 bit unsigned integer
FILLx (x= 8, 16, 32)	8, 16 or 32 bits of zeroes used as a space holder or filler
INT(x..y)	Signed integer not bounded by an 8 bit boundary. Starting bit position = x and ending bit position = y
UINT(x..y)	Unsigned integer not bounded by an 8 bit boundary. Starting bit position = x and ending bit position = y
BOOL(x)	A single bit variable (False = 0, True = 1) where x is a bit position, numbered from 0 (LSBit) to 7 (MSBit)
SET(x)	A collection of 8x BOOL
FILL(x..y)	y-x+1 bits of zeros used as a space holder or filler
ARRAY[x] of Data Type	A contiguous block of the defined data type. Array indices are always zero-based
NI_FMAT1	Non-integer format 1, defined to be INT32 for this MEP server, as stated in Basic Table 00 (BT00).
NI_FMAT2	Non-integer format 2, defined to be INT32 for this MEP server, as stated in Basic Table 00 (BT00).
TIME	A structure of 3 – UINT8 fields where: byte 0 = hour byte 1 = minute byte 2 = second
LTIME_DATE	A structure of 6 – UINT8 fields where: byte 0 = 2-digit year (02 = 2002) byte 1 = month (01 = January, 02 = February, etc.) byte 2 = day byte 3 = hour byte 4 = minute byte 5 = second

Type	Data Type Definition
STIME_DATE	A structure of 5 – UINT8 fields where: byte 0 = 2-digit year byte 1 = month byte 2 = day byte 3 = hour byte 4 = minute
PED	Pending Event Description
RDATE	A structure defining a recurrent date that can be yearly, monthly, weekly, or daily. Bit field of UINT16, where: MONTH = UINT(0..3); IF MONTH IS: 1..13: OFFSET = UINT(4..7); WEEKDAY = UINT(8..10); DAY = UINT(11..15); 14: FILLER1 = FILL(4..7); WEEKDAY = UINT(8..10); FILLER2 = FILL(11..15); 15: PERIOD = UINT(4..9); DELTA = UINT(10..15); Identifier Value/Definition MONTH 0 = Unassigned 1..12 = Month of year 13 = Action is repeated monthly 14 = Action is repeated weekly 15 = Action is repeated each PERIOD plus DELTA OFFSET 0 = No offset 1 = Advance to WEEKDAY before MONTH, DAY entered 2 = Postpone to the first WEEKDAY on or after MONTH, DAY entered 3 = Postpone to the second WEEKDAY on or after MONTH, DAY entered 4 = Postpone to the third WEEKDAY on or after MONTH, DAY entered 5 = Postpone to the fourth WEEKDAY on or after MONTH, DAY entered 6 = Postpone to the last WEEKDAY of the MONTH on or after DAY entered 7 = Observe on MONTH, DAY entered as well as day following MONTH, DAY entered 8 = Postpone to Monday if Sunday 9 = Advance to Friday if Sunday 10= Postpone to Monday if Saturday 11 = Advance to Friday if Saturday 12 = Postpone to Monday if Sunday or Saturday

Type	Data Type Definition
	13 = Advance to Friday if Sunday or Saturday 14 = Postpone to Monday if Sunday, advance to Friday if Saturday 15 = Do not observe MONTH, DAY entered. Observe on day following MONTH, DAY entered WEEKDAY 0..6 = Sunday to Saturday 7 = Unassigned DAY 0 = Invalid 1..31 = Day of the month PERIOD 0..63 = This setting, along with DELTA, is used to schedule daily activities DELTA0..63 = This setting, along with PERIOD, is used to schedule daily activities
ANSI_DATE	A structure defining a non-recurring date that contains a year, month, and day. Bit field of UINT16, where: YEAR = UINT(0..6) (02 = 2002) MONTH = UINT(7..10) (01 = January, 02 = February, etc.) DAY = UINT(11:15)

Value Control Identifiers (VCI)

The Value Control Identifier (VCI) table column in the tables later in this chapter shows which entity has primary control over the value. The definitions for the VCI column are:

- F = Fixed value.
- M = MEP server controls value. In most cases, the host should not attempt to write this field, or does not have write access to this field (e.g. measurement registers and status fields). Extreme care should be taken when writing these fields. This value is also used to denote dimension-related parameters that could vary by device.
- H = Host or MEP server reading/configuration software controls value (e.g. configuration and customer identifiers).
- P = Program ID dependent. These fields are fixed for a given program ID (usually but not necessarily tied to the firmware version), but may change in the future due to a technology change, for example. If the alternate field values are not defined here, refer to the ANSI C12.19 specification. The OSGP Alliance recommends that you read all fields marked with this identifier on every communication with the MEP server.
- HD = Host Direct. The host or MEP server reading/configuration software can change values in this table via direct table writes.
- HI = Host Indirect. The host or MEP server reading/configuration software can change values in this table via a corresponding pending table

Value

This field specifies the hard-coded value for fields marked “F” or the non-zero value in effect when the MEP server is shipped from the factory. Fields with no value identified here are initialized to 0, but may have been changed with provisioning.

Offset

This is the byte offset of the given field, relative to the start of the table. This is 0-based.

Access Key Requirements and MEP Client Types

The description of each data table and procedure described in this chapter lists which keys are required to read or write the table, or call the procedure, as well as all other restrictions you should be aware of when using each table or procedure. Consider the following example, for ET62:

ET62, Load Profile Display Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The Access Key Requirement column indicates that either the MBK or the MAK keys is required to read ET62, and that the MAK key is required to write ET62.

The MEP Client Type columns can be interpreted as follows:

- **X:** Indicates that the client can read or write the table or procedure using the appropriate key (as defined by the access key requirements column).
- **Blank:** Indicates that the client cannot read or write the data in this table because no key provides write access, or because the data is not intended to be written or consumed by this client type, regardless of the access key privileges.

You can review the definition of each table and procedure to determine which of them are appropriate for use in your application. Not all tables and procedures will have a clear use case for your application. For example, ET62 contains configuration settings that OSGP meters use to determine how load profile data should be displayed.. Your application could read this table to determine what load profile data it should display, and how that data should be formatted.

The descriptions of the individual tables and fields in Chapter 5 of this document include references to the MEP use cases defined in Chapter 4 for which each table or procedure is applicable.

Table Transaction Guidelines

This feature provides an ability to safely execute complex interactions with the MEP server using a mechanism known as a transaction. The desire is to have semantics where a user can start a transaction, deliver multiple commands and then commit the transaction. Either all the requests occur, or none of them do. This mitigates the risk of another user performing concurrent table writes and changing content or context of data being analyzed by the MEP user. Primarily, the mechanism provides a way to perform multiple operations atomically once and only once.

Each step of a transaction is executed atomically, but the entire transaction is not. To allow for the case of a power cycle between steps of a transaction, a transaction will be re-executed on power up if it was interrupted during a power cycle. This means that a transaction must be idempotent (capable of getting the same result if executed multiple times). As a result, no step of a transaction should consist of a non-idempotent procedure (such as BP05 or EP16), nor should the entire transaction be non-idempotent. An example of the latter would be a transaction that reads BT03 and then clears BT03. If this were re-executed on a power up, the second execution would always read a cleared BT03.

The mechanism employs a transaction request table (ET52) and transaction response table (ET53). The MEP user writes a series of commands to the transaction request table. Upon finishing the write, the MEP server executes them and puts the results into the transaction response table. The OSGP Alliance recommends that you limit the use of transactions via ET52 to an average of 4 times per hour, so that the average number of transactions per day does not exceed 100. Each ET52 write is limited to 456 data bytes per partial table write. As a result, if you need to write to ET52 twice for a single transaction, then you should limit your application to two transactions of that type per hour, on average. Or if 4 ET52 table writes are need for a single transaction, then you could use only one transaction per hour, on average. This is to ensure the preservation of the memory device for the lifetime of the MEP server.

The transaction request table is 896 for meters running firmware versions 3.50 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher, or 768 bytes for all earlier firmware versions. The transaction response table is 1785 bytes. The tables contain a series of requests or responses wrapped by a duplicated transaction number. Including a transaction number at the beginning and end of the table allows the consumer of the table (the device acting as the MEP server) to ensure that the data is consistent and fully applies to the same transaction. The rule for the table readers/writers is that the data must be written consecutively from first to last byte. It is up to the transaction originator to manage the transaction space and ensure that transaction numbers are unique.

ET52 can be written to as a series of table write commands, or in a single table write command. Once the end transaction number is written into ET52 and that number matches the beginning transaction number, the MEP server will process the transactions.

Transaction Table Locking (OSGP Meter Firmware Versions 4.0 and Higher)

For OSGP meters running firmware versions 4.0 and higher, the two MEP ports share the MEP transaction tables (ET52 and ET53). This means that it is possible that one MEP client could have its transaction results overwritten by the other MEP client's transaction before the first MEP client has a chance to read them. To prevent this, access to the MEP transaction tables can be locked by either MEP client using the new procedure EP61. The tables should be locked with EP61 just before executing a transaction by writing ET52, and unlocked immediately after reading the results by reading ET53. If a MEP client does not unlock the tables, they will be automatically unlocked after a timeout of 10 seconds.

Example Transaction – Read Request

The following example shows a transaction embedded within a write to ET52. This transaction is a simple read request of BT23 at offset 0 for 44 bytes:

Description	Number Of Bytes	Message Data
<length>	2	00 25
<message>:		
<partial write request code>	1	4F
<table_id>	2	08 34
<table_offset>	3	00 00 00
<count>	2	00 11
<table data>	{count}	11 00 00 02 00 08 00 3F 00 17 00 00 00 00 2C 02 00
[sequence no.]	4	NN NN NN NN

Description	Number Of Bytes	Message Data
[digest]	8	DD DD DD DD DD DD DD DD

The <table_data> section above comprises of the data written to ET52, and in this case forms the following fields:

Description	Number Of Bytes	Message Data
<transaction size> : 17	2	11 00
<transaction type> : requests	1	00
<transaction number> : 2	2	02 00
<first command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<table_id> : BT23	2	00 17
<table_offset> : 0	3	00 00 00
<count> : 44	2	00 2C
<transaction number> : 2	2	02 00

Example Transaction – Multiple Commands

If more than one command is to be encapsulated in this transaction, then the commands are concatenated end-to-end until terminated with the end transaction number. The following example shows how this is done. In this example, the MEP client submits a transaction to the MEP server to read some of the dimension information needed to format and interpret data in subsequent messages. Message fields are displayed in bold, and header and security fields are displayed in italic.

MEP Client Write Request:

00 57 4F 08 34 00 00 00 00 43 43 00 00 01 00 08 00 3F 08 0B 00 00 00 00 0A 08 00 3F 00 14 00 00 00 00 0A 08 00 3F 00 15 00 00 00 00 0A 08 00 3F 08 04 00 00 37 00 01 08 00 3F 08 0E 00 00 00 00 0C 08 00 3F 08 0F 00 00 00 00 1F 01 00 5B 4E 42 E6 ED 6A 9C EF F4 CC 0E 39

Description	Number Of Bytes	Message Data
<length>	2	00 57
<message>:		
<partial write request code>	1	4F
<table_id>	2	08 34
<table_offset>	3	00 00 00
<count>	2	00 43

Description	Number Of Bytes	Message Data
<table_data> (LSB)	{count}	43 00 00 01 00 08 00 3F 08 0B 00 00 00 00 0A 08 00 3F 00 14 00 00 00 00 0A 08 00 3F 00 15 00 00 00 00 0A 08 00 3F 08 04 00 00 37 00 01 08 00 3F 08 0E 00 00 00 00 0C 08 00 3F 08 0F 00 00 00 00 1F 01 00
[sequence no.]	4	5B 4E 42 E6
[digest]	8	ED 6A 9C EF F4 CC 0E 39

The <table_data> section above comprises the data written to ET52, and in this case contains the following fields:

Description	Number Of Bytes	Message Data
<transaction size> : 67	2	43 00
<transaction type> : requests	1	00
<transaction number> : 1	2	01 00
<first command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<tableid> : ET11	2	08 0B
<offset> : 0	3	00 00 00
<count> : 10	2	00 0A
<second command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<tableid> : BT20	2	00 14
<offset> : 0	3	00 00 00
<count> : 10	2	00 0A
<third command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<tableid> : BT21	2	00 15
<offset> : 0	3	00 00 00
<count> : 10	2	00 0A
<fourth command>:		
<length> : 8	2	08 00

Description	Number Of Bytes	Message Data
<message>:		
<partial read request code>	1	3F
<tableid> : ET04	2	08 04
<offset> : 55	3	00 00 37
<count> : 1	2	00 01
<fifth command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<tableid> : ET14	2	08 0E
<offset> : 0	3	00 00 00
<count> : 12	2	00 0C
<sixth command>:		
<length> : 8	2	08 00
<message>:		
<partial read request code>	1	3F
<tableid> : ET15	2	08 0F
<offset> : 0	3	00 00 00
<count> : 31	2	00 1F
<transaction number> : 1	2	01 00

MEP Server Response:

00 09 00 ED 6A 9C EF F4 CC 0E 39

Description	Number Of Bytes	Message Data
<length>	2	00 09
<message>:		
<response code>	1	00
[digest]	8	ED 6A 9C EF F4 CC 0E 39

Next, the MEP client should read the start of ET53 to obtain the total size of the transaction response and to verify the transaction number.

MEP Client Read Request:

00 14 **3F 08 35 00 00 00 00 05** 5B 4E 42 E7 48 97 75 DA D8 53 E3 A3

Description	Number Of Bytes	Message Data
<length>	2	00 14
<message>:		

Description	Number Of Bytes	Message Data
<partial read request code>	1	3F
<table_id>	2	08 35
<table_offset>	3	00 00 00
<count>	2	00 05
[sequence no.]	4	5B 4E 42 E7
[digest]	8	48 97 75 DA D8 53 E3 A3

MEP Server Response:

00 10 **00 00 05 6F 00 01 01 00** 97 4B 99 CA A3 31 45 19

Description	Number Of Bytes	Message Data
<length>	2	00 10
<message>:		
<response code>	1	00
<count>	2	00 05
<table_data>	{count}	6F 00 01 01 00
[digest]	8	97 4B 99 CA A3 31 45 19

Finally, the MEP client must read the entire transaction response from ET53, using the transaction size parameter obtained previously.

MEP Client Read Request:

00 14 3F 08 35 00 00 00 00 6F 5B 4E 42 E8 1B 32 04 49 74 45 A8 7A

Description	Number Of Bytes	Message Data
<length>	2	00 14
<message>:		
<partial read request code>	1	3F
<table_id>	2	08 35
<table_offset>	3	00 00 00
<count>	2	00 6F
[sequence no.]	4	5B 4E 42 E8
[digest]	8	1B 32 04 49 74 45 A8 7A

MEP Server Response:

00 7A 00 00 6F 6F 00 01 01 00 0D 00 00 00 0A 05 42 24 05 06 05 02 01 03 F9 0D 00 00 00 0A 3F 0E FD 0F 08 10 01 04 08 1A 0D 00 00 00 0A 3F 0E 0C 0F 08 00 01 04 08 1A 04 00 00 00 01 04 0F 00 00 00 0C 00 00 00 00 00 11 01 00 01 04 2F 00 22 00 00 00 1F 00 42 00 01 00 02 01 45 00 01 00 02 01 48 00 01 00 02 01 03 00 F8 03 02 01 4B 00 01 00 02 01 01 00 BF D4 EB F2 B7 E0 1F 43

Description	Number Of Bytes	Message Data
<length>	2	00 7A
<message>:		
<response code>	1	00
<count>	2	00 6F
<table_data>	{count}	6F 00 01 01 00 0D 00 00 00 0A 05 42 24 05 06 05 02 01 03 F9 0D 00 00 00 0A 3F 0E FD 0F 08 10 01 04 08 1A 0D 00 00 00 0A 3F 0E 0C 0F 08 00 01 04 08 1A 04 00 00 00 01 04 0F 00 00 00 0C 00 00 00 00 00 11 01 00 01 04 2F 00 22 00 00 00 1F 00 42 00 01 00 02 01 45 00 01 00 02 01 48 00 01 00 02 01 03 00 F8 03 02 01 4B 00 01 00 02 01 01 00
[digest]	8	BF D4 EB F2 B7 E0 1F 43

The <table_data> section above comprises the data read from ET53, and in this case contains the following fields:

Description	Number Of Bytes	Message Data
<transaction size> : 111	2	6F 00
<transaction type> : responses	1	01
<transaction number> : 1	2	01
<first response>:		
<length> : 13	2	0D 00
<message>:		
<response code>	1	00
<count> : 10	2	00 0A
<table_data> :	{count}	05 42 24 05 06 05 02 01 03 F9
<second response>:		
<length> : 13	2	0D 00
<message>:		
<response code>	1	00
<count> : 10	2	00 0A
<table_data> :	{count}	3F 0E FD 0F 08 10 01 04 08 1A
<third response>:		
<length> : 13	2	0D 00
<message>:		
<response code>	1	00
<count> : 10	2	00 0A

Description	Number Of Bytes	Message Data
<table_data> :	{count}	3F 0E 0C 0F 08 00 01 04 08 1A
<fourth response>:		
<length> : 4	2	04 00
<message>:		
<response code>	1	00
<count> : 1	2	00 01
<table_data> :	{count}	04
<fifth response>:		
<length> : 15	2	0F 00
<message>:		
<response code>	1	00
<count> : 12	2	00 0C
<table_data> :	{count}	00 00 00 00 00 11 01 00 01 04 2F 00
<sixth response>:		
<length> : 34	2	22 00
<message>:		
<response code>	1	00
<count> : 31	2	00 1F
<table_data> :	{count}	00 42 00 01 00 02 01 45 00 01 00 02 01 48 00 01 00 02 01 03 00 F8 03 02 01 4B 00 01 00 02 01
<transaction number> : 1	2	01 00

Note that table data fields are still expressed as little-endian (LSB first) and command fields outside of the command length are expressed as big-endian (MSB first).

Once a transaction number is executed with a certain CRC over the data, it cannot be executed as the next transaction. This ensures that duplicate writes will not result in multiple executions of the transaction.

The transaction mechanism is managed within the MEP server such that a power cycle will not interrupt a transaction. However, if a transaction is somehow interrupted, it will be executed on the next power up. The operations in a transaction should have a short enough duration that they can be reasonable executed in a few hundred milliseconds.

Note that for each MEP server, there are distinct sets of transaction request/response tables for both the MEP client and the Control Node connected to the MEP server, so that they can send requests to the MEP server concurrently. The transactions are executed serially.

Note: *There is a very small window where both the PLC user and the MEP user could initiate processing of their respective transactions within the same processing loop in the MEP server. In this case the MEP transaction will not be processed, the response will not be formed, and the MEP user should retry the transaction.*

Extending the Capacity of BT07/EP39

Another application of the transaction mechanism is to virtually extend the capacity of BT07, to allow more data to be posted to the MEP server than will fit in BT07 (for a EP39 invocation). The BT07 table write can be achieved as a transaction, allowing for as much data as is the capacity of ET52, which is significantly more than BT07. The MEP server will disregard the BT07 capacity limit in this case. Note that all the data posted as a single update to the MEP server must fit within the transaction request table so that it can be written to the log, and the log header information updated atomically.

Calling Procedures

Actions performed by the MEP server are achieved through procedures. Procedures are initiated by writing into BT07 in the MEP server, and the response is read in ET59, if the “ET59 Response” field in ET50 (ET50.30.1) is set to True (1). If the “ET59 Response” field in ET50 is set to False (0), then the response will be read in BT08. MEP clients designed to work with OSGP meter firmware versions prior to 3.30 can continue to use BT08, but are strongly encouraged to upgrade their device firmware to use ET59.

Meters running firmware versions 4.0 and higher support two MEP ports. MEP client 1 will use ET59 or BT08 as the procedure response table, depending on the setting of the “ET59 Response” field. MEP client 2 will always use ET85 as the procedure response table.

By writing to BT07 with the procedure number requested and any input parameters, the meter will perform the requested action and return the result in ET59, if configured, or ET85. Reading ET59 or ET85 before writing to BT07 may have unexpected results. The contents of ET59 and ET85 are dependent on the last procedure written to BT07.

Note: *For OSGP meters running firmware versions prior to 3.40, direct table writes (including those to BT07 for executing procedures) must be limited to an average of 4 times per hour, so that the average number of table writes per day does not exceed 100. This is to ensure the preservation of the meter memory device for the lifetime of the meter. For a complete list of affected tables, see Appendix C: MBK/MAK Access Information.*

For all other MEP servers, the OSGP Alliance recommends reading tables no more than once per second (on average).

Processing new alerts should always supersede a non-alert procedure invocation.

The procedure number formats are BPxx for Standard Procedures and EPxx for Manufacturer Procedures, for example, BP01 or EP04.

The standard procedures comply with the ANSI C12.19-1997 specification. Please refer to this specification for additional information.

Procedure Timing

In general, procedures are executed synchronously. This means that the MEP server will receive the BT07 write, execute the procedure, and then send the response to the BT07 write. As a result, by the time you read the procedure response table (ET59, ET85 or BT08) for the result, the procedure will have executed. However, in some cases the procedure may set the result code in the procedure response table to “incomplete” as an indicator that the procedure did not fully execute. In this case, it might be appropriate to continue to read the procedure response table, waiting for the result code to change to something other than “incomplete”. This may not always be appropriate because some procedures return “incomplete” as a final result, and not as an intermediate result. If “incomplete” is used to indicate incomplete execution, then that fact will be explicitly stated in the procedure result code description.

Note that responses to procedures entered via BT07 may take up to 1 second to be posted.

Procedure Header Fields

Header fields occur at the beginning of each procedure request and response. These are described below and not repeated in the description of each individual procedure throughout the document. The remaining fields are different for each procedure, depending on the input and output parameters required, as shown in the specific parameters for each procedure.

Data Written From Host to Table BT07

Field Name	Type	Offset	Value	VCI	Description
Procedure Number	UINT(0..11)	0		H	Procedure to be executed in the MEP server, range 0..2065.
Response Handling	UINT(12..15)	0	0	P	Response posted in ET59, ET85 or BT08 upon procedure completion.
Procedure Sequence Number (PSN)	UINT8	2		H	Set by initiator and returned in ET59, ET85 or BT08 used for coordination. First sequence number after login must be other than 255. To differentiate the MEP client from other possible sources, the sequence number must be in the range of 5-9. Contiguous sequence numbers must be different. If a sequence number is repeated then the write to BT07 will result in a response code of 0x04.

Response From Table ET59, ET85 or BT08

Field Name	Type	Offset	Value	VCI	Description
Procedure Number	UINT(0..11)	0		M	Procedure last executed in the MEP server.
Filler	FILL(12..15)	0			
Procedure Sequence number (PSN)	UINT8	2		M	Procedure sequence number (from BT07) of procedure last executed. Use this field as a check that the result posted corresponds to the request you submitted, as opposed to a request from the optical or power-line user.

Field Name	Type	Offset	Value	VCI	Description
Result Code	UINT8	3		M	Following are ANSI-defined result codes. Certain procedures may use other codes not defined by ANSI. These are specified within the appropriate procedure as they have procedure-specific meaning. 0 = Procedure completed 1 = Procedure accepted but not fully completed 2 = Invalid parameter for known procedure, procedure ignored 3 = Procedure conflicts with current device setup, procedure ignored 4 = Timing constraint, procedure ignored 5 = No authorization for requested procedure, procedure ignored 6 =Unrecognized procedure, procedure ignored

Example

In the following example, a MEP client is logically removed (or deregistered) from an MEP server. This is accomplished by executing procedure EP17 with the handle assigned to the MEP client. The handle can be read from ET14. In this example, the handle is 0x03F8.

MEP Client Write Request:

00 17 **40 00 07 00 06 11 08 07 00 F8 03** 5B 4E 43 09 69 7A B2 01 49 7E 9C F7

Description	Number Of Bytes	Message Data
<length>	2	00 17
<message>:		
<full write request code>	1	40
<tableid>	2	00 07 = BT07
<count>	2	00 06
<table data> (LSB)	{count}	11 08 07 00 F8 03
<procedure_number>	2 (bits 0..11 only)	811 = EP17
<response_handling>	2 (bits 12..15 only)	0
<EP17 input parameters>:		
Procedure Sequence Number	1	07
Action	1	00 = Remove device
Device Handle	2	03 F8
[sequence no.]	4	5B 4E 43 09
[digest]	8	69 7A B2 01 49 7E 9C F7

MEP Server Response:

00 09 **00** 69 7A B2 01 49 7E 9C F7

Description	Number Of Bytes	Message Data
<length>	2	00 09
<message>:		
<response code>	1	00
[digest]	8	69 7A B2 01 49 7E 9C F7

Time Synchronization

Time synchronization of the MEP client to the MEP server's clock can be achieved by periodically reading the clock in BT52 (UTC) or BT55 (local). MEP servers do not manage automatic time synchronization of MEP clients.

Dynamic Sizing of Tables

Certain tables and procedures may change dimension across the various firmware versions of a MEP server. All dimensions are published in specific other data tables. This information should be read and accommodated at the start of any OSGP communication session where dimensioned table or procedure access is intended. The following chart highlights key tables and procedures used in MEP communications that are subject to dimensioning. Note that this is not an all-inclusive list. In general, any table or procedure field with a value control identifier (VCI) of "P" or "M" is a dimensionable field.

The specific location of dimension information for a given table field is in the Type column. For example, in the excerpt of ET13 below, Device Config is defined as an array with the number of elements found in ET11.0 and the size of each element found in ET11.1. ET11 should be read first in order to properly interpret ET13.

Field Name	Type	Offset	Value	VCI	Description
Device Config	ARRAY [ET11.0] of ET11.1-byte structure				Configuration information for each MEP client.

Note that certain tables containing dimension information (including BT00 and ET11) do not change for a given firmware version, as represented by the program ID stored in ET04. Therefore, it suffices to read these dimension tables only once when a new program ID is in place. Tables and fields within tables that qualify for this frequency of reading are those marked with a value control identifier (VCI) of "P".

Another category of dimension fields, marked with a VCI of "M", can change within a single firmware version or program ID of a MEP server. This could occur as a result of some reconfiguration, e.g. for adding or subtracting channels recorded in the load profile. All of the changeable parameters that impact the MEP server's interface in this fashion are reported in ET42 "Interface Definition." This table is a concatenation of information from several other data tables. It is updated whenever any of the dimension or identification parameters that it holds have been changed with a reconfiguration of the MEP server.

Whenever ET42 is updated, and whenever the MEP server's firmware is updated, the "IDT Version" field in ET04 (ET04.116) is incremented as a shorthand notification that some dimension and/or contextual parameters have changed. Your application should monitor the value of this field for changes in value (see note below). If the version has changed since your last read, you should read ET42 and any other

required dimension tables for the updated parameters pertaining to tables that your device needs to read or write. If the “Program ID” field in ET04 (ET04.14) has also changed since your last poll of ET04 you will need to re-read dimensions (in ET11 for example) that govern table fields marked with a VCI of “P”. If there are no table fields with a VCI of “M” or “P” that your device uses, you do not have to poll for updates to the value of the “IDT Version” field.

Note: *When the MEP server increments the IDT Version, it will also increment the MEP sequence number by 25. The next MEP communication with the MEP server will then result in an Invalid Sequence Number error being returned along with the new sequence number. This error indicates to the MEP client that it should check the IDT Version number should be checked for a change in value, and proceed from there. You may find it beneficial to program your application to read the IDT Version whenever it encounters the Invalid Sequence Number error as an alternative to reading the IDT Version on every communication with the MEP server.*

The following table lists the dimensionable tables that you will use with the MEP protocol, and lists which tables contain their dimension information.

Dimensionable Table	Location of Dimension information
ET07	BT30
ET13	ET11
ET14	ET11
ET15	ET11
ET16	ET11
ET34	ET11
ET50	ET11
ET53	ET52
ET57	ET11
ET66	BT60
ET67	BT30
BT22	BT21 or ET42
BT23	BT21 or ET42
BT27	BT21 or ET42
BT28	BT21 or ET42
BT33	BT30
BT62	BT61 or ET42
BT64	BT61 or ET42
EP39	BT00, ET11

Tables and Procedures for the MEP Protocol

The following sections describe the tables and procedures that you will use to perform the MEP operations described in Chapters 3 and 4 of this document.

ET03 (2051, 0x0803): Utility Information

This table is for the utility to use, to enter utility-specific information, such as a utility serial number, program information, and battery change information.

The access key requirements for ET03 are listed below.

ET03, Utility Information: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	No Key Required	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET03 is defined below.

ET03, Utility Information: Table Structure

Field Name	Type	Offset	VCI	Description
Utility Serial Number	ARRAY[30] OF CHAR	0	H	Null-terminated string containing Customer's Serial Number.
Reserved		30..136		These table fields are reserved for other uses. Do not overwrite.
Image CRC (Read Only)	UINT16	137	M	Read-only copy of the legally relevant system image CRC. Some Welmec standards stipulate that legally relevant and non-legally relevant components of the meter's firmware must be separated. All metering and measurement firmware components are considered legally relevant.
Reserved		138..142		These table fields are reserved for other uses. Do not overwrite.

ET04 (2052, 0x0804): System Information

This table holds information needed by other components of the system.

The access key requirements for ET04 are listed below.

ET04, System Information: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET04 is defined below.

ET04, System Information: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Sequence Number	UINT32	0		M	The current LonTalk message sequence number. Updated with each

Field Name	Type	Offset	Value	VCI	Description
					new MEP server read/write operation request over PLC.
Transceiver ID	ARRAY'[6] of UINT8	4		M	Unique ID of the smart transceiver within the MEP server. Updated on power-up and after resets.
Subnet ID	UINT8	10		H/M	Used in addressing the Neuron over a power line channel. The MEP server may reset this value to zero upon request. Updated every power-up. If this field is set to a non-zero value, it indicates that the MEP server has been commissioned by a Control Node and is connected to the Gateway.
Node ID	UINT8	11		H/M	Used in addressing the Neuron over a power line channel. The MEP server may reset this value to zero upon request. Updated every power-up. If this field is set to a non-zero value, it indicates that the MEP server has been commissioned by a Control Node and is connected to the Gateway.
Explicit Message Received	BOOL(0)	12		M	1 = Explicit message received. This field is updated with each new MEP server read/write operation request over PLC.
Force Neuron Cnfg	BOOL(1)	12		H/M	1 = Force Neuron MFG configuration process. This bit is cleared by the MEP server after the configuration process completes (typically 4 seconds). This also forces the encryption key back to its default value. This field will not be cleared if the config process fails (timeout = 30 seconds).
Request Neuron State	BOOL(2)	12		H/M	1 = Starts process of requesting Neuron state. This bit is cleared when state is received. The state is written to "Neuron State" field at ET04.72. This field will not be cleared if the request fails (timeout = 4 seconds).
Disable PLC Encryption	BOOL(3)	12		H	1 = Disable PLC encryption
Disable Neuron EEPROM Lock	BOOL(4)	12		H	1 = Disable Neuron EEPROM lock feature
Neuron Phase	BOOL(5.. 7)	12		M	Most recent phase information reported by the Neuron to the MEP server: 0 = No phase inversion present

Field Name	Type	Offset	Value	VCI	Description
					1 = In Phase normal 2 = Plus 120° inverted 3 = Minus 120° normal 4 = Phase 180° inverted 5 = Plus 120° normal 6 = Minus 120° inverted 7 = N/A This field is updated each time the Neuron detects a phase change.
Rated Frequency	UINT8	13		H	Value of rated frquency (in Hz) for this MEP server type. This is set during the manufacturing process.
Program ID (Firmware Version ID)	ARRAY[8] of UINT8	14		M	Program ID for the firmware the MEP server is running: This field is updated every time the MEP server powers up.
Self-Identification	ARRAY[30] of UINT8	22		M	LonTalk self-identificaton string. Updated every time the MEP server powers up.
PK Access	UINT8	52		H	0 = Access enabled 1 = Access disabled
Max Power Outages Recorded	UINT8	53	10	P	Number of power outages recorded in tables ET09 and ET10 before events are lost, queues are FIFO.
Unused	UINT8	54	4	F	Unused
Max Nbr of TE Registers	UINT8	55	4	P	Number of registers recorded for Total Energy (or Daily Consumption) in ET12.
Registration Current	UINT16	56	10 or 16	H	Value of starting current (in mA) for this MEP server type. This is set during the manufacturing process.
Max Current	UINT16	58	100	H	Value of maximum current (in A) for this MEP server type, set during mfg process, used for over-current detection.
Rated Voltage	UINT16	60	230	H	Value of rated voltage (in V) for this MEP server type. This is set during the manufacturing process.
Inactive Voltage Phases					Bit field to set active phases in the current service configuration, used to tell meter to ignore phase loss and sags on non-installed phases. 0 = Phase is present 1 = Phase is not present
Phase L1	BOOL(0)	62		H	Disable phase L1. Note that phase L1 must be enabled in all Control Point/OSGP Module

Field Name	Type	Offset	Value	VCI	Description
					configurations running firmware versions up to 1.20 in order to power on the module, and to support power line communications. When a polyphase meter is connected to a Control Point or OSGP Module, a loss of phase L1 will result in the module powering down. Status and events that occur during the module's power down can be buffered by the host device and reported to the module upon power up. For CPM 6000 Control Point and CPM 6010 OSGP Modules running firmware versions 1.21 and higher, this scenario can be avoided if the "Separate Zero Cross Signal" bit in ET76 (ET76.0.13) is set to True. This bit has been added to allow the Module to be supplied with independent Zero Cross and power fail signals, which will prevent the power down situation described previously. This is not possible with previous firmware versions. Note that if the "Separate Zero Cross Signal" bit is set to True, then the Zero Cross signals must be sent to the Module by the host meter digitally. For more information on this, consult the description of ET76 later in this chapter. Note that as of the time of the release of firmware version 1.31, this feature is not supported by the CPM 0600 OSGP Module hardware.
Phase L2	BOOL(1)	62		H	Disable phase L2. Phase L2 must be disabled in delta meters.
Phase L3	BOOL(2)	62		H	Disable phase L3
Separate Volatage and Current Inactive Phases	BOOL(3)	62		H	0: Use the inactive voltage phase values to determine inactive current phases. For example, if this bit is set and phases L2 and L3 are disabled for voltage, those phases would also be disabled for current. Use this setting for all Control Point/OSGP Modules, as the "Inactive Current Phases" field is not applicable to Control Point/OSGP Modules. 1: Use separate inactive phases for voltage and current. In this case, the "Inactive Current Phases" field determines which phases are

Field Name	Type	Offset	Value	VCI	Description
					active/inactive for current. This option is only appicable to OSGP meters.
Inactive Current Phases					Bit field to set active phases that would have current. This is used to tell a meter to ignore current related power quality event for inactive phases. 0 = Phase has current 1 = Phase does not have current This bit field is only used if the "Separate Voltage and Current Inactive Phases" bit is set to 1. Note that this bit is not applicable to Control Point and OSGP Modules.
Phase L1	BOOL(4)	62		H	Disable phase L1. Note that this bit is not applicable to Control Point and OSGP Modules.
Phase L2	BOOL(5)	62		H	Disable phase L2. Phase L2 must be disabled in delta meters. Note that this bit is not applicable to Control Point and OSGP Modules.
Phase L3	BOOL(6)	62		H	Disable phase L3. Note that this bit is not applicable to Control Point and OSGP Modules.
Reserved	BOOL(7)			H	Reserved.
DST Off Time Delta	INT16	63		H	Delta minutes of DST off time from DST on time (practical range –720 to 719 representing +/-12 hours)
Self-Read Time					Time of day to perform self-read to BT26
Hour	UINT8	65		H	Range 0..23
Minute	UINT8	66		H	Range 0..59
Stop Mode Config	UINT8	67		H	Number of days the MEP server will continue to operate in Wait mode before Stop Mode (and discontinuation of the RTC) is invoked. 0 = Never go to stop mode. 255 = Immediately go to stop mode. This field is not applicable to OSGP meters running firmware versions 4.0 and higher, as these meters do not enter stop mode after powering down.
Mfg Status	UINT8	68…70		H	Reserved for internal use only.
RK BP10 + EP16 Access	BOOL(0)	71		H	0 = Access enabled 1 = access disabled
Test Point	BOOL(1)	71		H	0 = Not a test point 1 = Is a test point

Field Name	Type	Offset	Value	VCI	Description
Test Point Confirmed	BOOL(2)	71		H	For internal use only.
LP Use Skipped	BOOL(3)	71		H	If set to 1, then the following will result in the extended status of a load profile channel being set to 4 (“skipped”) and the channel value being set to 0: 1. Stuffing an instantaneous value 2. A channel is for an M-Bus device and no such device is configured, or the interval was skipped due to the configuration of the “Load Profile Poll Rate” field in ET34. 3. A channel is for an MEP client, and no such device is registered.
Neuron State	UINT8	72		M	Last received state of the Neuron: 0,1: Invalid states 2: Has application, unconfigured 3: Applicationless, unconfigured 4: Configured, online 5: Invalid state 6: Hard offline 7: Invalid state 12: Configured, soft offline 140: Configured, in bypass mode 255: No reply from Neuron when status requested Updated on each power-up, on each re-sync request from the Control Node, and on each Neuron reset.
Phase Rotation Changed	UINT8	73		M	0: L1L2L3 1: L3L2L1 2: Phase rotation unknown Updated once a second.
PLC Comm Inactive Time Threshold	UINT16	74		H	Time threshold (in minutes). If no PLC packet addressed to this MEP server is received for more than this time threshold, the Remote Communications Inactive alarm will be set. Set to 0 to disable this threshold. In this case, no alarm will be set no matter how long PLC communications remain inactive.
Broadcast Receipt	LTIME_DATE	76		M	Time stamp (UTC) of last successful secure broadcast receipt.
Broadcast Base	UINT32	82		H	Secure broadcast base value (B)

Field Name	Type	Offset	Value	VCI	Description
Broadcast Delta	UINT16	86		H	Secure broadcast delta value (D)
Reverse Energy Alarm Current Threshould	UINT16	88	1,000	F	Current thredshold in mA. OSGP meters use this threshold and the rated voltage to calculate the active power threshold. If the measured reverse active power exceeds this threshold for the duration specified as the Reverse Energy alarm current time threshold, then the Reverse Energy alarm will be triggered. For OSGP meters running firmware versions 4.0 and higher, this time threshold is determined by the “Reverse Energy Alarm Time Threshold” fields (ET04.137 and ET04.138). For all other devices, the time threshold is set to 10 seconds. Note that for OSGP meters running firmware versions 3.71 and higher, the Reverse Energy alarm will be disabled if the Reverse Energy Alarm Current Threshold field is set to 0. For all other devices, any reverse energy conditon will trigger the alarm if this field is set to 0.
PLC Signal Qualty Status	UINT8	90		M	0: No PLC traffic detected 1: PLC traffic detected, but no packet addressed to this MEP server 2: Packet addressed to this MEP server received, the signal margin is less than or equal to 9dB 3: Packet addressed to this MEP server received, the signal margin is at 12dB or 15dB 4: Packet addressed to this MEP server received, the signal margin is greater than or equal to 18dB 5..7: These values correspond to 2..4, except they indicate that the MEP server is commissioned and hasn’t received a C12.18 message within the interval specified by the “PLC Active Timeout“ field in ET55. For example, value 5 indicates that the MEP server is commissioned with no activity, and the last activity was at the level specified by the value 2 above, and value 6 indicates that the MEP server is commissioned with no activity, and the last activity was at the level specified by the value 3 above.

Field Name	Type	Offset	Value	VCI	Description
					This field is updated once a second or once a minute if communication with a Control Node has been detected.
Auto Discovery Ta	UINT16	91		H	Extension of turn-around time, In bit-times; this value is added to the nominal value of 330; used only for address 0 during auto-discovery, once commissioned, the values in ET13 take over.
Auto Discovery To	UINT16	93		H	Extension of turn-around time, In ms; this value is added to the nominal value of 50; used only for address 0 during auto-discovery, once commissioned, the values in ET13 take over.
Auto Discovery Disable	UINT8	95		H	A non-zero value in this field disables MEP auto-discovery.
Amplifier Gain Detect Sensitivity	INT16	96		H	Adjust the sensitivity of the amplifier gain detection.
Events Outage Threshold	UINT16	98		H	The Event Outage Threshold field defaults to zero, and represents the period (seconds) that the power must be off before a Power Down event followed by a Power Up event will be logged in either BT74 or ET79. A value of 0xFFFF maps this field to the value of ET09.0 and serves as a 2.01 compatibility setting.
NVM Size	UINT16	100		F	The number of 1K blocks of non-volatile memory available.
Safe Image Locked	UINT8	102		H	1=>Safe image cannot be activated. Default: 0
MEP Seq Nbr	UINT32	103			The MEP sequence number. For OSGP meters running firmware versions 4.0 and higher, this field is unused.
Unused	UINT16	107		H	Unused
Premise Power Generation	UINT8	109		H	0 = Power generation off 1 = Power generation on
Power Outage Detection Threshold	UINT8	110	72	H	This sets the percentage of the rated voltage that indicates a power outage. A new threshold will only take effect after reset. This field is applicable to OSGP meters running firmware versions 3.X and Control Point/OSGP Modules

Field Name	Type	Offset	Value	VCI	Description
					only. It is not applicable to OSGP meters running firmware versions 4.0 and higher. For details on how power outages on OSGP meters running firmware version 4.0 and higher are recorded, consult the Power Quality section of the approprioate IEC Electric Meter User's Guide.
Phase Loss Threshold	UINT8	111	61	H	A percentage of the reference voltage. When voltage drops below this threshold, the phase is considered to be missing, and all the Energy, Power, Voltage and Current calculations will be stopped for that phase. However, if over- current condition is met on that phase, the Current RMS value will be showed in BT28. If you are using a meter running firmware versions 3.X, you should not set this property to a value lower than 61%. If you are using a Gen 4 meter running firmware versions 4.0 and higher, you can set this to lower values, as the Gen 4 meter uses a different power supply. For meters running firmware versions 4.10 and higher, values greater than 80% will be capped to 80%. Values equivalent to less than 40V will be floored to the percentage equivalent to 40V. Depending on your meter's voltage range, you should use the following values for this setting: If the voltage range is 120V-220V, the value must be between 32% and 47%. This means between 73.5V and 108V. If the voltage range is 220V-240V, the value must be between 32% and 85%. This means between 73.5V and 195.5V. The voltage range for your meter is printed on the nameplate, and is also indicated by the meter's model number. For information on decoding meter model numbers, consult the Meter Model Numbers appendix of the IEC Electric Meter User's Guide for your meter model.
Meter Form	UINT8	112		M	0 = Default. Indicates that the meter does IEC-type measurements.

Field Name	Type	Offset	Value	VCI	Description
					S: S-base A: A-base
Clock Error Tier	UINT8	113	0	H	Specify the default tariff to use when a clock error occurs. Range is 0..3.
C12.19 Compliance	UINT16	114		H	C12.19 compliance flags
Unused	BOOL(0..15)			H	
IDT Version	UINT8	116		M	This field provides a quick way of determining when any of the contents of the IDT have changed. This number is incremented by 1 (and wraps) whenever any of the following procedures are executed: EP11, EP32, EP33, EP06, EP37. It is also incremented by 1 when the MEP server's firmware version is updated.
Tilt Timer	UINT8	117	30	H	Number of seconds before a power outage that can elapse before a tilt switch input event will be ignored. If set to 255, then tilt switch eventsa will never be ignored.
Minimum Registration Current	UINT16	118	10 or 17	H	Value of starting current (in mA) for this meter type if it is larger than the value of the "Registration Current" field in ET04. For OSGP meters running firmware versions 4.10 and higher, this field defaults to 10. For all other firmware versions, it defaults to 17.
Registration Current Fraction	UINT8	120	17	H	The units for this field is 0.1mA. It will be added to "Registration Current" or "Min Registration Current" when calculting the registration current threshold.
Constant Phase Loss Alarm	BOOL(0)	121	0	H	This field determines whether or not the Phase Loss alarm should be constantly set to True when a phase loss condition exists: 0 = Only set Phase Loss alarm when phase loss condition changes. 1 = Set Phase Loss alarm whenever phase loss condition exists on any phase. This field was added for firmware version 3.60.
Power Up Wait Time	UINT8	122	0	H	This field is only applicable to Control Point/OSPG Modules. For CPM 0600 OSGP Modules, this field should be set to 20 to set the delay between

Field Name	Type	Offset	Value	VCI	Description
					power up and the start of external communications.
The following fields are only applicable to OSGP meters running firmware version 3.13, and all firmware versions 3.80 and higher.					
Maximum Key Usage Count	UINT32	123	1,000,000	F	The maximum number of usage attempts for each successful and failed attempt to use the meter's unicast and broadcast PLC keys. If the number of attempts to use either key reaches 80% of the configured maximum (one million by default), then this event will be generated. Generally, the Head-End System Software will automatically update these keys at configurable durations, preventing the need for these events to be triggered. For more information on these keys, see the Broadcast and Unicast Keys section of the IEC Electric Meter User's Guide for the applicable meter firmware version, or the Developing a Smart Meter Using the CPM 0600 and CPM 6010 OSG Modules document.
Security Mode	UINT8	127		FM	The current OSGP Security Mode for PLC communications: 0: RC4 1: Reserved 2: OSGP-AES-128-PSK Once a meter has been configured to use OSGP-AES-128-PSK as the security mode, it will only accept OSGP-AES-128-PSK messages. There are no exceptions: all RC4-based messages (configuration or otherwise) will be rejected. If desired, a meter using OSGP-AES-128-PSK as the security mode can be re-configured to use RC4. However, this can only be done using the OSGP-AES-128-PSK configuration process. It is not possible to re-configure the meter back into RC4 mode using RC4-based messages. The OSGP Alliance strongly recommends using OSGP-AES-128-PSK as the security mode. The RC4 security mode is deprecated and its use should therefore be avoided. It is only provided for backwards compatibility reasons.

Field Name	Type	Offset	Value	VCI	Description
					Note that this field must be configured during manufacturing, or when the meter is commissioned. It cannot be changed in the field with a MEP application.
FCM Message Count	UINT8	128		M	The number of FCM (challenge or commission) messages that have been received in the current 24-hour period. The maximum is 100 FCM messages per day, and this value is not incremented past 100. The count is cleared every day at 00:00:00.
The following fields are only applicable to OSGP meters running firmware versions 4.0 and higher.					
MEP Sequence Numbers	ARRAY[2] of UINT32	129		M	Sequence numbers required for communication on the MEP channels. One sequence number is assigned to the MEP client connected to each port.
Reverse Energy Alarm Time Threshold (Milliseconds)	UINT8	137			For the first field, enter a value in milliseconds. For the second field, enter a value in seconds. These values combine to establish the Reverse Energy alarm time threshold. This is the duration for which the measured reverse active power must exceed the “Reverse Energy Alarm Current Threshould” (ET04.88) before the Reverse Energy alarm will be triggered. Note that if these fields are set to 0, then any instance where the reverse active power exceeds the “Reverse Energy Alarm Current Threshould” will cause the Reverse Energy alarm to be triggered, regardless of its duration. Remember that these fields are only applicable to OSGP meters running firmware versions 4.0 and higher. For all other devices, the Reverse Energy alarm time threshold is 10 seconds.
Reverse Energy Alarm Time Threshold (Seconds)	UINT16	138	10		

ET09 (2057, 0x0809): Power Quality

This table contains settings and data for power quality measurements.

Note: *OSGP meters running firmware versions 4.10 and higher include a second set of thresholds that can be used to record voltage sag events (i.e.* ***Sag2****). Fields that you can use to configure these thresholds and to read voltage sag event data that is returned based on these thresholds have been added to ET09 starting at offset ET09.A+12.*

For these meters, events triggered by the first set of voltage sag thresholds are referred to as **sag1 events**. Events triggered by the second set of voltage sag thresholds are referred to as **sag2 events.**

All other devices only support the first set of voltage sag thresholds (i.e. **sag1**) that were present in previously released firmware versions.

The access key requirements for ET07 are listed below.

ET09, Power Quality: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET09 is defined below.

ET09, Power Quality: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Long Outage Duration Threshold	UINT16	0		H	This field sets the threshold that is used to determine whether a power outage will be recorded as a long power outage, or a short power outage. Power outages that are shorter than the Long Outage Duration Threshold, but at least 250ms (approximately), are counted as short power outages. All others will be recorded as long power outages. The range is 0 to 65,535 seconds. If set to 0 (zero), then the duration and date/time of every power outage event longer than approximately 250ms will be recorded as a long power outage, with complete records for the last 10 long outages. In this case, the short power outage count will never be incremented.

Field Name	Type	Offset	Value	VCI	Description
Sag1/Surge Time Threshold	UINT8	2		H	Threshold, in minutes, that voltage sag and voltage swell events must last before they will be recorded as events. The range is 0..255. If set to 0, then every voltage sag or voltage swell event will be recorded using instantaneous values. Note that the “Sag1/Surge Threshold Seconds” field later in ET09 defines an additional time period that can be added to this one (when set to a non-zero value). This additional value is specified in seconds. OSGP meters running firmware versions 4.10 and higher include a second set of voltage sag thresholds (i.e. sag2) that are defined later in ET09.
Sag1 Threshold	UINT8	3	10	H	Threshold, in percent under rated voltage, for recording a voltage sag event based on the first set of voltage sag thresholds (i.e. sag1). OSGP meters running firmware versions 4.10 and higher include a second set of voltage sag thresholds (i.e. sag2) that are defined later in ET09.
Surge Threshold	UINT8	4	10	H	Threshold, in percent over rated voltage, for recording a voltage surge event. For meters manufactured with firmware versions 4.10 and higher, this field defaults to 10.
Over-Current Threshold	UINT8	5		H	Threshold, in percent over reference current, for recording an over-current event.
Power Outage Record:	ARRAY[ET04.53] of 18-byte record:				Reverse-chronological list of the most recent power cycle events. Updated every meter power-up or brownout. The size of this array is determined by the value of the “Max Power Outages Recorded” field in ET04 (ET04.53).
Power-on Date/Time	LTIME_DATE	6		M	Power on date/time (UTC).

Field Name	Type	Offset	Value	VCI	Description
Reset Cause	UINT8	12		M	Reason for this reset/power on event: 3 – Power failure 8 – Brown-out
Reserved For Internal Use	UINT8	13		M	
Power-off Date/Time	LTIME_DATE	14		M	Power off date/time (UTC). This should be earlier than the Power-on Date/Time specified at ET09.4.
Power Off Duration	UINT32	20		M	Power off duration in seconds. If duration is less than 1 second, power off duration = 0. Rounds down for power-off seconds.
L1 Most Recent Sag1 Event	LTIME_DATE	ET04. 53 * 18 + 6		M	Date/time (UTC) of the most recent sag1 event on phase L1. Updated every 120 ms.
L1 Sag1 Events	UINT16	ET04. 53 * 18 + 12		M	Number of sag1 events measured by meter on phase L1 since statistics were reset. Updated every 120 ms.
L2 Most Recent Sag1 Event	LTIME_DATE	ET04. 53 * 18 + 14		M	Date/time of the most recent sag1 event on phase L2. Updated every 120 ms.
L2 Sag1 Events	UINT16	ET04. 53 * 18 + 20		M	Number of sag1 events measured by meter on phase L2 since statistics were reset. Updated every 120 ms.
L3 Most Recent Sag1 Event	LTIME_DATE	ET04. 53 * 18 + 22		M	Date/time (UTC) of the most recent sag1 event on phase L3. Updated every 120 ms.
L3 Sag1 Events	UINT16	ET04. 53 * 18 + 28		M	Number of sag1 events measured by meter on phase L3 since statistics were reset. Updated every 120 ms.
L1 Most Recent Surge Event	LTIME_DATE	ET04. 53 * 18 + 30		M	Date/time (UTC) of the most recent surge event on phase L1. Updated every 120 ms.
L1 Surge Events	UINT16	ET04. 53 * 18 + 36		M	Number of surge events measured by meter on phase L1 since statistics were reset. Updated every 120 ms.
L2 Most Recent Surge Event	LTIME_DATE	ET04. 53 * 18 + 38		M	Date/time (UTC) of the most recent surge event on phase L2. Updated every 120 ms.
L2 Surge Events	UINT16	ET04. 53 * 18 + 44		M	Number of surge events measured by meter on phase L2 since statistics were reset. Updated every 120 ms.
L3 Most Recent Surge Event	LTIME_DATE	ET04. 53 * 18 + 46		M	Date/time (UTC) of the most recent surge event on phase L3. Updated every 120 ms.

Field Name	Type	Offset	Value	VCI	Description
L3 Surge Events	UINT16	ET04. 53 * 18 + 52		M	Number of surge events measured by meter on phase L3 since statistics were reset. Updated every 120 ms.
Min Frequency	INT32	ET04. 53 * 18 + 54		M	Minimum frequency (in 1/1000 Hz) measured by the meter since statistics were reset. Updated once a second.
Min Freq Date/Time	LTIME_DATE	ET04. 53 * 18 + 58		M	Date/time (UTC) of the minimum frequency measurement. Updated once a second.
Max Frequency	INT32	ET04. 53 * 18 + 64		M	Maximum frequency (in 1/1000 Hz) measured by the meter since statistics were reset. Updated once a second.
Max Freq Date/Time	LTIME_DATE	ET04. 53 * 18 + 68		M	Date/time (UTC) of the maximum frequency measurement. Updated once a second.
L1 Over-current Events	UINT32	ET04. 53 * 18 + 74		M	Number of over-current events measured by the meter on phase L1 since statistics were reset. Over-current is defined as some precentage over the meter's maximum current rating (specified by ET09.3) for at least 10 seconds.
L2 Over-current Events	UINT32	ET04. 53 * 18 + 78		M	Number of over-current events measured by the meter on phase L2 since statistics were reset. Over-current is defined as some precentage over the meter's maximum current rating (specified by ET09.3) for at least 10 seconds.
L3 Over-current Events	UINT32	ET04. 53 * 18 + 82		M	Number of over-current events measured by the meter on phase L3 since statistics were reset. Over-current is defined as some precentage over the meter's maximum current rating (specified by ET09.3) for at least 10 seconds.

Field Name	Type	Offset	Value	VCI	Description
Phase L1 Loss	BOOL(0)	ET04. 53 * 18 + 86		M	Indication of phase loss on phase L1: 1 = Phase loss 0 = Phase present. Phase loss is defined as voltage on this phase that is less than the value of the “Phase Loss Threshold” field in ET04 for the duration established by the “Phase Loss Threshold Seconds” field in ET55. The MEP client application should not write this field, as it is always set by the MEP server.
Phase L2 Loss	BOOL(1)	ET04. 53 * 18 + 86		M	Indication of phase loss on phase L2: 1 = Phase loss 0 = Phase present. Phase loss is defined as voltage on this phase that is less than the value of the “Phase Loss Threshold” field in ET04 for the duration established by the “Phase Loss Threshold Seconds” field in ET55. For OSGP meters, the MEP client application should not write this field. This field is not applicable to Control Point/OSGP Modules.
Phase L3 Loss	BOOL(2)	ET04. 53 * 18 + 86		M	Indication of phase loss on phase L3: 1 = Phase loss 0 = Phase present. Phase loss is defined as voltage on this phase that is less than the value of the “Phase Loss Threshold” field in ET04 for the duration established by the “Phase Loss Threshold Seconds” field in ET55. For OSGP meters, the MEP client application should not write this field. This field is not applicable to Control Point/OSGP Modules.
L1 Most Recent Phase Loss Event	LTIME_DATE	ET04. 53 * 18 + 87		M	Timestamp (UTC) of the most recent phase loss event on phase L1. Updated every 10 seconds.
L1 Phase Loss Events	UINT16	ET04. 53 * 18 + 93		M	Number of phase loss events on phase L1 since statistics were reset. Updated every 10 seconds.
L2 Most Recent Phase Loss Event	LTIME_DATE	ET04. 53 * 18 + 95		M	Timestamp (UTC) of the most recent phase loss event on phase L2. Updated every 10 seconds.

Field Name	Type	Offset	Value	VCI	Description
L2 Phase Loss Events	UINT16	ET04. 53 * 18 + 101		M	Number of phase loss events on phase L2 since statistics were reset. Updated every 10 seconds.
L3 Most Recent Phase Loss Event	LTIME_DATE	ET04. 53 * 18 + 103		M	Timestamp (UTC) of the most recent phase loss event on phase L3. Updated every 10 seconds.
L3 Phase Loss Events	UINT16	ET04. 53 * 18 + 109		M	Number of phase loss events on phase L3 since statistics were reset. Updated every 10 seconds.
L1 Most Recent Sag1 Voltage	NI_FMAT1	ET04. 53 * 18 + 111		M	Lowest voltage (mV) detected during the most recent sag1 event on phase L1. Updated every 120 ms.
L2 Most Recent Sag1 Voltage	NI_FMAT1	ET04. 53 * 18 + 115		M	Lowest voltage (mV) detected during the most recent sag1 event on phase L2. Updated every 120 ms.
L3 Most Recent Sag1 Voltage	NI_FMAT1	ET04. 53 * 18 + 119		M	Lowest voltage (mV) detected during the most recent sag1 event on phase L3. Updated every 120 ms.
L1 Most Recent Surge Voltage	NI_FMAT1	ET04. 53 * 18 + 123		M	Highest voltage (mV) detected during the most recent surge event on phase L1. Updated every 120 ms.
L2 Most Recent Surge Voltage	NI_FMAT1	ET04. 53 * 18 + 127		M	Highest voltage (mV) detected during the most recent surge event on phase L2. Updated every 120 ms.
L3 Most Recent Surge Voltage	NI_FMAT1	ET04. 53 * 18 + 131		M	Highest voltage (mV) detected during the most recent surge event on phase L3. Updated every 120 ms.
Short Outage Count	UINT32	ET04. 53 * 18 + 135		M	Number of short outages experienced by the meter. Short outages are defined as outages lasting less than the Outage Time Threshold. Updated every 120 ms.
Following fields added in firmware version 2.12 and later					
PQ Configuration ID	UINT32	ET04. 53 * 18 + 139		H	Identifier representing the present power quality threshold configuration (the first 5 fields in 3.0), not controlled by the meter as being linked to any change in this table.
Sag1/Surge Threshold Seconds	UINT8	ET04.53 * 18 + 143		H	Value, in seconds, to be added to the minutes threshold defined by the “Sag1/Surge Time Threshold” field (ET09.2) to determine how long a voltage sag1 or voltage surge event must last before it will be recorded as an event.
Following fields added in firmware version 3.10					

Field Name	Type	Offset	Value	VCI	Description
Power Up Quality Hold Time	UINT8	ET04. 53 * 18 + 144	2	H	The amount of time, in seconds, that the meter will wait after powering up to begin recording power quality information. This prevents the meter from recording power quality information while the voltage is not stable.
Over Current Time Threshold	UINT16	T04. 53 * 18 + 145		H	The threshold, in seconds, for recording over current events. A value of 0 indicates that every record will be recorded. Range is 0-65,000.
THD Record	ARRAY[3] of 70-byte record				An array of records for THD events. The meter records three types of total harmonic distortion: voltage total harmonic distortion (V-THD), current total harmonic distortion (I-THD) and VA (volts-amperes) total harmonic distortion (VA-THD). THD is a ratio of the voltage or current at harmonic frequencies to the voltage or current at the fundamental frequency for the meter, expressed as a percentage. Note that for Control Point/OSGP Modules, only V-THD records are updated. I-THD and V-THD records are not updated.
THD Time Threshold	UINT16	ET04. 53 * 18 + 147		H	The time threshold for recording THD events, with a resolution of 10 seconds. A value of 0 indicates that every record will be recorded. Range is 0-65,000. The minimum value is 10 seconds. This field should not be set to a value less than 10 seconds.
THD Threshold	UINT16	ET04. 53 * 18 + 149		H	The percentage threshold for recording THD events. Range is 0-10,000, in units of 0.1%. For example, a value of 10000 means 100%. A value of 0 means that no THD events will be recorded.
THD Event Record	ARRAY[3] of 22-byte record				One record for each phase:
Event Count	UINT16	ET04. 53 * 18 + 151		M	The number of THD events.
Event Timestamp	LTIME_DATE	ET04. 53 * 18 + 153		M	Date/time (UTC) of the last THD event.

Field Name	Type	Offset	Value	VCI	Description
Max THD	UINT16	ET04. 53 * 18 + 159		M	Max THD of last event.
Max THD Timestamp	LTIME_DATE	ET04. 53 * 18 + 161		M	Date/time (UTC) of the Max THD.
Average THD	UINT16	ET04. 53 * 18 + 167		M	Average THD of last event.
Following fields added in meter firmware version 3.70. These fields are not applicable to Control Point/OSGP Modules. *In addition, value A is used to indicate the offset values for the remaining fields in this table, where A = ET04. 53 * 18 + 357.*					
DRP/DRC Event Record	ARRAY[12] of 10-byte records for DRP/DRC events. Meters running firmware version 3.70 (and higher) record the average and continuous voltage values measured for each phase. The average voltage values are calculated every 10 minutes (by default) and checked against the thresholds for DRP (Relative Duration of Transgression of Critical Voltage) and DRC (Relative Duration of Transgression of Critical Voltage). The average voltage values can be selected for inclusion on the meter display (or the load profile log). The last 12 instances of either threshold being exceeded are stored in this array.				
DRP	UINT16	A		M	DRP value in units of 0.1%. For example,123 represents a value of 12.3%.
DRC	UINT16	A + 2		M	DRC value in units of 0.1%. For example,123 represents a value of 12.3%.
Time Stamp	LTIME_DATE	A + 4		M	Timestamp indicating when the record was taken. Note that the DPC and DPC calculations are done in the background, so there may be up to a couple seconds variation in the timestamp as to the exact time interval the calculation should be done.
Following fields added in meter firmware version 4.10. These fields are not applicable to Control Point/OSGP Modules. *In addition, value A is used to indicate the offset values for the remaining fields in this table, where A = ET04. 53 * 18 + 357.*					
Sag2 Time Threshold	UINT16	A+10* 12		H	Threshold, in seconds, for recording voltage sags based on the second set of voltage sag thresholds (i.e. sag2). The range is 0..65,535. If you set this field to 0, then every voltage sag event will be recorded using instantaneous values.

Field Name	Type	Offset	Value	VCI	Description
Sag2 Threshold	UINT8	A+10*12 +2	255	H	Threshold, in percent under rated voltage, for recording a voltage sag event based on the second set of voltage sag thresholds (i.e. sag2).
L1 Most Recent Sag2 Event	LTIME_DATE	A+ 10*12+3		M	Date/time (UTC) of the most recent sag2 event on phase L1. Updated every 120 ms.
L1 Sag2 Events	UINT16	A+10*12 +9		M	Number of sag2 events measured by meter on phase L1 since statistics were reset. Updated every 120 ms.
L2 Most Recent Sag2 Event	LTIME_DATE	A+10*12 +11		M	Date/time of the most recent sag2 event on phase L2. Updated every 120 ms.
L2 Sag2 Events	UINT16	A+10*12 +17		M	Number of sag2 events measured by meter on phase L2 since statistics were reset. Updated every 120 ms.
L3 Most Recent Sag2 Event	LTIME_DATE	A+10*12 +19		M	Date/time (UTC) of the most recent sa2g event on phase L3. Updated every 120 ms.
L3 Sag2 Events	UINT16	A+10*12 +25		M	Number of sag2 events measured by meter on phase L3 since statistics were reset. Updated every 120 ms.
L1 Most Recent Sag2 Voltage	NI_FMAT1	A+10*12 +27		M	Lowest voltage (mV) detected during the most recent sag2 event on phase L1. Updated every 120 ms.
L2 Most Recent Sag2 Voltage	NI_FMAT1	A+10*12 +31		M	Lowest voltage (mV) detected during the most recent sag2 event on phase L2. Updated every 120 ms.
L3 Most Recent Sag2 Voltage	NI_FMAT1	A+10*12 +35		M	Lowest voltage (mV) detected during the most recent sag2 event on phase L3. Updated every 120 ms.
Average Current Calculation Interval	UINT16	A+10*12 +39	600	F	The interval that the meter will use to calculate the average current for each phase, in seconds. The range of this field is 0-43,1999. The intervel for averge current calculations is synced to the hour. Therefore, there are some restrictions on what values can be entered. If a value less than 60 seconds is desired, then the value must be a divisor of 60 (e.g. 2, 3, 4, 5, 6, 10, etc). If a value greater than 60 seconds is entered, it must be a full minute. Values that create partial minutes such as 1.5 minutes are not

Field Name	Type	Offset	Value	VCI	Description
					supported.The minunte also has to be a divisor 60. If a value greater than 1 hour is entered, it must be a full hour. Values that create partial hours are not supported. The hour value must be a divisor of 24 (e.g. 2, 4, 6, etc).
Following fields added in meter firmware version 4.21. These fields are not applicable to Control Point/OSGP Modules. In addition, value A is used to indicate the offset values for the remaining fields in this table, where A = ET04. 53 * 18 + 357.					
Options:	UINT8	A+10*12 +41			
Early Sag/Surge Event	BOOL(0)	A+10*12 +41	0	H	Enable this bit to log all Voltage Sag and Voltage Swell events at the beginning of each qualified sag or surge period (i.e. each instance of a voltage sag or swell that meets the detection thresholds defined for the event). When this bit is enabled, an event will be triggerred when the qualified sag or surge condition is first detected, and when it ends.

ET11 (2059, 0x080B): MFG Dimension Table

This table contains the dimensions of some MEP-related tables.

The access key requirements for ET11 are listed below.

ET11, MFG Dimension Table: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET11 is defined below.

ET11, MFG Dimension Table: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Number of Devices	UINT8	0	5 or 6	P	Maximum number of MEP clients and M-Bus device supported. For Control Point/OSGP Modules and for Gen 3.X meters (e.g. MTR 1000 and MTR 3000), up to 5 devices are supported (one MEP client and 4 M-Bus devices). For Gen 4

Field Name	Type	Offset	Value	VCI	Description
					meters, up to 6 devices are supported (two MEP clients and 4 M-Bus devices).
Config Entry Size	UINT8	1	66	P	Size in bytes of a MEP configuration table entry for M-Bus ET13.
Status Entry Size	UINT8	2	36	P	Size in bytes of a MEP status table entry for M-Bus ET14.
On-demand Request Queue Size	UINT8	3	5	P	Maximum number of entries in the MEP on-demand request queue.
On-demand Request Entry Size	UINT8	4	6	P	Size in bytes of a MEP on-demand request table entry for ET15.
Data Entry Size	UINT16	5	517	P	Size in bytes of a MEP devce data table entry for ET16.
Transaction Request Length	UINT16	7	768 or 896	P	Transaction Request Table length, in bytes. This is 896 for meters running firmware versions 3.50 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher, and 768 for all earlier fiemware versions.
Transaction Response Length	UINT16	9	1785	P	Transaction Response Table length, in bytes.
On-demand Write Entry Size	UINT8	11	25	P	Maximum length of the MEP on-demand write entry (length + msg), per device. The 25-byte limit is not adjustable, and includes a length byte (the first byte specifying the length of the entry).
Phase Measurement Data Size	UINT8	12	16	P	Size in bytes of per phase measurement data for measurement.
Config Entry 2 Size	UINT8	13	22	P	Size in bytes of a MEP configuration table 2 entry for M-Bus ET34.
Reserved		14…17			These fields are reserved for internal use.
Number of Group IDs	UINT8	18	10	P	Maximum number of group IDs that can be assigned to the MEP server.
Number of Harmonics	UINT8	19	10	P	Number of the harmonics are calculated. By default, the 1st to 10th harmonic are calculated. Refelcts the demensions of the harmoincs magnitude and phase arrays.

Field Name	Type	Offset	Value	VCI	Description
M-Bus Multicast Message Length	UINT8	20	65	P	Maximum length in bytes of an M-Bus multicast message (length + C field + CI field + User Data).
ET22 Alarm Size	UINT8	21	120	P	The number of bytes in first ET22 array.
MEP Data Sources	UINT8	22	See Notes	P	The number of MEP data sources in ET50. The default value for this field is 20 for Control Point/OSGP Modules running firmware version 1.11 (and higher). The default value for this is 6 for all other devices.
ET48 Entry Count	UINT8	23	10	P	The maximum number of entries in ET48.
Maximum Critical Event Bitmaps	UINT8	24	10	P	The maximum number of bitmasks available for critical events.
ET57 Entry Count	UINT8	25	16	P	The maximum number of M-Bus Data Types that can be created.
Time-based Relay Switches	UINT8	26	80	P	Total number of relay switches in the time-based relay calendar for each control relay (OSGP meters running firmware versions 4.30 and higher optionally include a 2nd control relay), The time-based relay control calendar is stored in ET61.
MEP Data Alert Sources	UINT8	27	10	P	The number of delta data alert sources in ET71. This field is applicable to firmware versions 3.40 and higher. For more information on delta data sources, see *Delta Data Alerts* on page 34.
RAM-only Transaction Request Length	UINT16	28	261	P	RAM-only Transaction Request Table length ,in bytes. This field was for firmware version 3.50.
RAM-only Transaction Response Length	UINT16	30	769	P	RAM-only Transaction Response Table length, in bytes. This field was for firmware version 3.50.
The following fields are only applicable to OSGP meters running firmware versions 4.0 and higher.					
Reserved	UINT8	32	6	P	Reserved
Reserved	UINT8	33	7	P	Reserved

Field Name	Type	Offset	Value	VCI	Description
MEP Channel Count	UINT8	34	2	P	Maximum number of MEP clients.
Reserved	UINT8	35	10	P	Reserved
Reserved	UINT16	36	1250	P	Reserved.
The following fields are only applicable to OSGP meters running firmware versions 4.30 and higher.					
Error/Caution Screen Count	UINT8	38	3	P	The number of error/caution screens shown on the meter display LCD.

ET13 (2061, 0x080D): MEP/M-Bus Device Configuration

This table contains the programmable configuration information for each of the MEP connected devices. The first four entries are for M-Bus devices, and the 5th entry is used to convey non-urgent downlink data and the MEP Alert flags for the MEP client connected to the MEP server.

The access key requirements for ET13 are listed below.

ET13, M-Bus/MEP Device Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET13 is defined below.

ET13, M-Bus/MEP Device Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Device Config	ARRAY [ET11.0] of ET11.1-byte structure				Configuration information for each M-Bus device, or MEP client.
Scheduled Billing Read Time	ARRAY[3] of UINT8				Date/time for the regularly scheduled billing read for this device, referenced to local time. A value of all 0's represents the first day of the month at midnight
Day		0		H	1..28 = day of the month, 0 equals the first day of the month (Hour & Minute fields still apply) For weekly scheduled reads:

Field Name	Type	Offset	Value	VCI	Description
					32 = Sunday 33 = Monday 34 = Tuesday 35 = Wednesday 36 = Thursday 37 = Friday 38 = Saturday Note that the values 29, 30, and 31 must not be used, or some months will be skipped. Note: To disable scheduled billing reads, set this field to 39, and set the “Scheduled Billing Read Frequency” field to 2.
Hour		1		H	0..23
Minute		2		H	0..59
Scheduled Billing Read Frequency	UINT8	3		H	0 = Hourly: day, hour fields of timestamp ignored 1 = Daily: day fields of timestamp ignored 2 = Weekly 3 = Monthly 4 = Never Note: To disable scheduled billing reads, set this field to 2 and set the “Day” field to 39. For CPM 0600 and CPM 6010 OSGP Modules, this field must be set to 4 (never) prior to registration.
Scheduled Status Read Frequency (M-Bus only)	UINT16	4		H	Frequency of status read in minutes, synchronized to the last status read. A value of 0 means only read status with billing reads, separate status reads are not performed.
Baud Rate	UINT8	6		H	Desired baud rate for each device: 0 = 9600 (MEP default) 1 = 300 2 = 600 3 = 1200 4 = 2400 (M-Bus default) 5 = 4800 6 = 9600 7 = 14400 (not guaranteed) 8 = 19200 (not guaranteed)

Field Name	Type	Offset	Value	VCI	Description
					9 = 28800 (not guaranteed) 10 = 38400 (not guaranteed) 11 = 57600 (not guaranteed) 12 = 115200 (not guaranteed) 13..255 = Reserved for future use
Device Alarm Bitmask	UINT8	7		H	Controls which device alarms are deemed urgent and trigger a MEP client alarm to be set
M-Bus device entries have the following format for the remainder of the table:					
Customer ID	ARRAY[20] of CHAR	8		H	Customer identification of M-Bus device.
App Reset Parameter	UINT8	28		H	Parameter to be used with the application reset command, specficies which data telegrams are to be output in billing read requests.
Security Key Length	UINT8	29		H	Number of bytes in the security key (7 or smaller => no key)
Security Key	ARRAY[32] of UINT8	30		H	The security key. For key protection the first 8 bytes are write-only and will be read back as zeros.
Ta	UINT16	62		H	Extension of turn-around time. In bit-times; this value is added to the nominal value of 330.
To	UINT16	64		H	Extension of turn-around time, In ms. This value is added to the nominal value of 50.
MEP client entries have the following format for the remainder of the table:					
Alert Flags:	UINT8:	8		M	Flags modified by the MEP server for notification to the MEP client.
Scheduled Read Request Alert	BOOL(0)	8	0	M	Set by the MEP server when a scheduled billing read period has elapsed. Cleared by the MEP server when a scheduled read data write completes. For more information on this, see Reading Non-Urgent Downlink Data and Responding to a Scheduled Read Request (With and Without Alarms).
On-demand Request in ET15	BOOL(1)	8	0	M	Set by the MEP server when an on-demand request is pending in ET15. Cleared

Field Name	Type	Offset	Value	VCI	Description
					when the request is completed. For more information on this procedure, see Reading and Processing On-Demand Requests.
Reserved	BOOL(2)	8	0	M	Reserved for internal use.
M-Bus Change	BOOL(3)	8	0	M	Set by the MEP server when an M-Bus control value has changed, or when new M-Bus load profile data is available.
Delta Data Alert	BOOL(4)	8	0	M	A change occurred to one or more of the monitored delta data sources monitored in ET71. This field is applicable to OSGP firmware versions 3.40 and higher. For more information on delta data sources, see Delta Data Alerts.
Unused	BOOL(5..7)	8			Reserved.
MEP Non-urgent Downlink Data	Array[ET11.1 - 9] of UINT8	9		H	Opaque data to be read by MEP client. This area of the table is used to store non-urgent downlink data.

ET14 (2062, 0x080E): MEP/M-Bus Device Status

This table contains the status information and alarms for each of the M-Bus and MEP clients connected to the MEP server. When a MEP client is discovered by the MEP an entry in ET14 will be dedicated to the newly discovered device. The “Device Status” field for the newly discovered MEP client will be set to “MEP Device Active.”

The access key requirements for ET14 are listed below.

ET14, M-Bus/MEP Device Status: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET14 is defined below.

ET14, M-Bus/MEP Device Status: Table Structure

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
Mode	UINT8	0	M	Bit 0 : 0 = Normal polling mode 1 = Auto-discovery mode This field is only applicable to M-Bus devices.		
Reserved	UINT32	1	M	Reserved		
Device Occupancy	UINT8	5	M	Bitmask of occupied device slots. Value 0 indicates an empty slot, and value 1 indicates an occupied slot: Bit 0 – device 1 (M-Bus) Bit 1 – device 2 (M-Bus) Bit 2 – device 3 (M-Bus) Bit 3 – device 4 (M-Bus) Bit 4 – device 5 (MEP) Bit 5 – device 6 (MEP)		
M-Bus/MEP Status:	ARRAY[ET11.0] of ET11.2-byte structure	Array of M-Bus/MEP status entries. The remaining fields in this table are included as part of each device status entry.				
Device Handle	UINT16	6	M	Unique OSGP Alliance identifier for this device. The handle ranges are		

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
				divided by device type as follows: 1..999 : M-Bus devices 1000..1999 : MEP client 1 2000..2099: MEP client 2 Multiple MEP clients are only supported by OSGP meters running firmware versions 4.0 and higher.		
Device Status	UINT8	8	M	0 = Empty slot 1 = M-Bus device active (“Up”) 2 = M-Bus device down (lost communications) 3 = MEP client active (“Up”) 4 = MEP client down (lost communications) Note that this field is only applicable when the “Monitor MEP Health” field in ET51 is set to True, and the device handle is set to a non-zero value.	OSU	MB, EP Post ABO
Baud Rate	UINT8	9	M	Current operating baud rate for this device: 0 = 9600		

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
				1 = 300 2 = 600 3 = 1200 4 = 2400 5 = 4800 6 = 9600 7 = 14400 8 = 19200 9 = 28800 10 = 38400 11 = 57600 12 = 115200 13..255 = Reserved for future use		
Billing Read Length	UINT16	10	M	Length in bytes of the latest billing read in ET16 (includes timestamp, header fields, and 0 terminator byte).	OU	MB, EP Post B
Read Attempts	UINT32	12	M	Number of attempted communications to the device for any type of request.	OS	MB, EP Pre BO
Read Answers	UINT32	16	M	Number of successful answers to a demand or scheduled billing or status read. This does not indicate alarm responses versus data response, only that communications were successful.	OSU	MB, EP Post BO

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
MEP Alarms	UINT16	20	M	MEP alarms detected by the MEP server. Bits in this field are latched until cleared via EP18. A new bit latched here triggers the MEP alarm in BT03 to be set.		
Billing Data Collected	BOOL(0)		M	Scheduled billing read completed for this device – billing data collected in ET16. NOTE – this alarm pertains to ET16 only. If ET45 is configured and the compatibility setting indicates the Control Node can read ET45, this alarm will not be posted for reads going to ET45 only (another alarm bit for mfg log entries available covers this)	SU	MB, EP Post B
App Error Response Rcvd	BOOL(1)		M	Not supported.		
New Device Alarm	BOOL(2)		M	Status read (scheduled or on-demand) completed for this device and at least one new device alarm exists.	N/A	MB, EP Post A

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
Billing Read Overflow	BOOL(3)		M	Billing read overflow occurred, all device data could not be stored in the table.	OSU	MB, EP Post B
Failed Comms On Read	BOOL(4)		M	Failed communications on read.		MB – on request timeout; EP – on health monitor timeout
Serial Number Mismatch	BOOL(5)		M	Serial number mismatch on billing read (billing data stored with new serial number).	OS	MB only Post B N/A for EP
MEP Firmware Switchover Success	BOOL(6)	20	M	MEP firmware switchover succeeded.	N/A	N/A
MEP Firmware Switchover Failure	BOOL(7)	20	M	MEP firmware switchover fialed.	N/A	N/A
Reserved	BOOL(8 …15)			Reserved for future use.		
M-Bus Application Primary Address	UINT8	22	M	For OSGP meters running firmware versiosn 4.30 and higher, this field stores the primary address assigned to te M-Bus device. This field is unused for Control Point/OSGP Modules, and for all other meter firmware versions.		

Field Name	Type	Offset	VCI	Description	Updated on On-Demand (O), Scheduled Reads (S) or Unsolicited (U)	Type of Read That Updates This Field: MB= M-Bus EP = MEP A = Alarm Read B = Blg Read O = OTR Pre = Updated At Request Time Post = Updated On Response Completion or Timeout
Reserved	LTIME_DATE	23	M	Reserved for future use.		
MEP Device Alarms	UINT8	29	M	Device alarms (in header of billing data response) received from scheduled or on-demand status read. Individual bits are latched until cleared via EP18.		MB, EP Post A
Status Read Timestamp	LTIME_DATE	30	M	Timestamp (local time) of last successful status read (demand or scheduled).		MB, EP Post A
Last Read Attempt	LTIME_DATE	36	M	Timestamp (local time) of the last attempted billing read (demand or scheduled).	OS	MB, EP Pre BO

ET15 (2063, 0x080F): MEP/M-Bus On-demand Requests

This table contains a circular queue of on-demand requests. The MEP client will read parts of this table to process on-demand data from the MEP server. As this table is read-only, the MEP client must create these entries through procedures EP19 or EP39. The results of these requests can be read here as well. Both uplink and downlink requests are posted here. For more information about on-demand requests, see Reading and Processing On-Demand Requests or Responding to an On-Demand Read Request (With and Without Alarms).

The access key requirements for ET15 are listed below.

ET15, M-Bus/MEP On-demand Requests: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET15 is defined below.

ET15, M-Bus/MEP On-demand Requests: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Pointers	UINT8				
	UINT(0..3)	0		M	Write pointer to where the next entry will be posted in the queue.
	UINT(4..7)	0		M	Read pointer to the next entry to be processed by the MEP server.
Request Queue	ARRAY[ET11.3] of ET11.4-byte structure				Queue of on-demand requests and their results. The MEP client should query this area of ET15 when reading and processing on-demand data on the MEP server, as described in the Reading and Processing On-Demand Requests section.
Transaction Nbr	UINT16	1		M	Transaction number for each request, used to keep track of requests/results on the server
Device Handle or Group Mask	UINT16	3		M	Handle of the device to be queried. For request type 6, 0xFFFF signifies all commissioned devices, else group mask.
Request Type	UINT8	5		M	0 = No entry 1 = M-Bus application reset. Not applicable to MEP. 2 = Billing read (data requested). For information on the data response expected, see Responding to an On-Demand Read Request (With and Without Alarms). 3 = Status read (data requested). Not applicable to MEP clients. 4 = Write data (see below for type of data being written). This indicates there is data to be read and response data may or may not be required. For more information on this, see Reading and Processing On-Demand Requests.

Field Name	Type	Offset	Value	VCI	Description
					5 = Time sync (no write data required). Not applicable to MEP clients. 6 = Multicast / Broadcast to specified devices. The list of specified devices is configured in ET34 (see below for type of data being written). Not applicable to MEP clients. 7 = MEP download start (created internally as a result of EP41) (no write data required). This (and request types 8 and 9) is used in conjunction with the firmware download process for MEP clients. 8 = MEP download code packet (created internally, write data stored in multicast data area below). 9 = MEP download switchover (no write data required)
Result	UINT8	6		M	0 = Request not yet completed 1 = Success 2 = No response from device 3 = Request failed
Write Messages:	ARRAY[ET11.3] of ET11.11 byte structure				User data to be written as-is to the the MEP client.
Write Data Length	UINT8	ET11.3 * ET11.4 + 1		M	Length in bytes of user data to be written to the MEP client.
Write Data	ARRAY[ET11.11 -1] of UINT8	ET11.3 * ET11.4 + 2		M	Data to be written as-is to the MEP client. This data comprises the User Data portion of the SND_UD telegram for M-Bus requests. For MEP clients, this data is to be read as-is by the device for Request Type 4.
Multicast Data Length	UINT8	ET11.3 * (ET11.4 + ET11.11) + 1		M	The length, in bytes, to be written to the MEP client. For request type 8, this is set to 56 bytes. For M-Bus devices, this includes the control fields plus user data for M-Bus requests.
Multicast Data Message:	ARRAY[ET11.20 – 1] of UINT8	ET11.3 * (ET11.4 + ET11.11) + 2		M	Multicast data to be written as-is to the M-Bus device or MEP client. For M-Bus devices, this data comprises the ‘C’ control field, followed by the ‘CI’ control field, followed by the User Data portion of the telegram, For MEP clients, this data includes the Packet Number and Code Packet

Field Name	Type	Offset	Value	VCI	Description
					fields described below for download requests:
Packet Number	UINT16			M	Download code packet number
Code Packet	ARRAY[ET11.20 -3] of UINT8			M	Download code packet written to ET15, Multicast Data Message.

ET16 (2064, 0x0810): MEP/M-Bus Device Data

This table contains the device on-demand billing read data for each of the M-Bus and MEP clients connected to the MEP server. Information on data order and response type for M-Bus devices only is included at the top of the table to aid a user in interpreting the content and format of the rest of the table.

For backward compatibility with older installations, the MEP server will continue to store the one most recent record per device of scheduled reads to this table (ET16), if dictated by the compatibility flag. Otherwise, only on-demand reads and unsolicited uplink data are stored to this table. Note that regardless of the compatibility setting, the first read of every newly commissioned or registered device is entered into ET16. The remaining scheduled reads may go into either ET45 or ET74.

See the description of ET14 earlier in this chapter for information on which statuses are updated there corresponding to entries logged in this table. For guidelines on how to read specific device data from this table, see *Reading M-Bus Scheduled Read Data* on page 27.

The access key requirements for ET16 are listed below.

ET16, M-Bus/MEP Device Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET16 is defined below.

ET16, M-Bus/MEP Device Data: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Device Table	ARRAY[ET11.0] of MEP Billing Reads (MBR):				Scheduled read/billing data for MEP and M-Bus paired devices.
MEP Billing Read (MBR):	ET11.5 – byte structure as defined below				Billing data for one device:
Timestamp	LTIME_DATE	0		M	Timestamp (local time) of last successful read.
Response Info	UINT8	6		M	Information for interpreting the M-Bus device data (n/a for MEP client data).
Data Order	BOOL(0)	6			0 = Mode 1 (LSB of a multi-byte record first) 1 = Mode 2 (MSB first)

Field Name	Type	Offset	Value	VCI	Description
Response Type	BOOL(1)	6			0 = Variable data structure 1 = Fixed data structure
Key Availability	BOOL(2)	6			0 = No key was available 1 = Decryption occurred as necessary
Authentication	UINT(3..4)	6			0 = Passed 1 = ID failure 2 = Date failure 3 = Passed with alternate date
Security Status	BOOL(5)	6			Overall security status (used for, but not restricted to, marking LP channels) 0 = Passed 1 = Failed (for one of the reasons listed for the Authentication bit above)
The remainder of this table has one of the following formats:					
NOTE: For response type "variable data structure", this table has the following format corresponding to the 12-byte header of response message CI=0x72:					
Billing Response:					A list of 1 or more telegrams, up to the capacity of the device record. The last telegram may be incomplete.
Length (L)	UINT8	7			Length, in bytes, of this telegram, not including the length byte itself. This includes a zero terminator at the end of the telegram.
Telegram	ARRAY[L] of UINT8				Contains a header and 1 or more data records
Tel. Header:					
Serial Nbr	4-byte Packed BCD	8		M	The device's serial number.
Mfg ID	UINT16	12		M	Manufacturer ID. This field uses the following format: Mfg ID = [ASCII(1st letter) – 64] x32 x32 + [ASCII(2nd letter) – 64] x32 + [ASCII(3rd letter) – 64]
Version	UINT8	14		M	Specifies the generation or version of the counter. The meaning is manufacturer specific.

Field Name	Type	Offset	Value	VCI	Description
Medium	UINT8	15		M	Type of device represented: 3= Gas 4 = Heat 6 = Hot Water 7 = Water
Access Number	UINT8	16		M	This number is increased by one after each data response from the device.
Status	UINT8	17		M	Device alarms set by the M-Bus device.
	UINT8(0..1)				00 = No error 01 = Application busy 10 = Any Application error 11 = Reserved
	BOOL(2)				1 = Power low
	BOOL(3)				1 = Permanent error
	BOOL(4)				1 = Temporary error
	UINT8(5..7)				Manufacturer specific.
Signature	UINT16	18		M	Determines whether encryption was used and in what form.
Tel. Data Records	ARRAY [L-13] of UINT8	20		M	A data record contains exactly one device register plus the information required to interpret that register. One or more data records can comprise a single telegram.
NOTE: For response type “fixed data structure”, this table has the following format corresponding to the response message CI=0x73:					
Length (L)	UINT8	7			Length, in bytes, of this telegram, not including the length byte itself; should always be 16 for fixed data messages.
Telegram	ARRAY[L] of UINT8				Contains the fixed data message.
Serial Nbr	4-byte Packed BCD	8		M	Identificaton (serial) number of the device .
Access Number	UINT8	12		M	This number is increased by one after each data response from the device.
Status	UINT8	13		M	Device alarms set by the M-Bus device.
	BOOL(0)				0 = Counters coded BCD 1 = Counters coded signed binary
	BOOL(1)				0 = Counters are actual values 1 = Counters are stored at fixed date

Field Name	Type	Offset	Value	VCI	Description
	BOOL(2)				1 = Power low
	BOOL(3)				1 = Permanent error
	BOOL(4)				1 = Temporary error
	UINT(5..7)				Mfg specific
Medium/Unit	UINT16	14		M	Always transmitted LSB first.
Counter 1	UINT32	16		M	Consumption data 1
Counter 2	UINT32	20		M	Consumption data 2
NOTE: For the fifth and later array elements (the MEP entries) this table has the following format:					
Read Count	UINT16	7		M	Counter of the number of successful billing reads from the MEP port (includes scheduled and on-demand reads).
Length (L)	UINT16	9		M	Length in bytes of the data following this field.
Data	ARRAY[L] of UINT8	11		M	L bytes of data submitted by the MEP for either a scheduled or on-demand read.

ET21 (2069, 0x0815): Load Profile Internal Configuration

This table holds configuration and status information for the MEP server's load profile log.

The access key requirements for ET21 are listed below.

ET21, Load Profile Internal Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET21 is defined below.

ET21, Load Profile Internal Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Data Set Internal Configuration	An array of the remaining fields, with one element for each load profile data set N, where N is a value between 1..4. For meters and Control Point/OSGP Modules that do not support multiple data sets, this consists of one element.				
Current Block Address	UINT32	0		M	Physical address of the current block.
Current Interval Address	UINT32	4		M	Physical address of the current interval.

Field Name	Type	Offset	Value	VCI	Description
Block Size	UINT32	8		M	Size in bytes of the block.
Block Header Size	UINT16	12		M	Size in bytes of the block header including end time, end readings, and simple status.
Number of Valid Blocks	UINT16	14		M	Number of blocks in the data set with valid data.
Number of Valid Intervals	UINT16	16		M	Number of intervals in the current block stored to Non-Volatile memory.
Last Block Index	UINT16	18		M	Array index of the most recent block with new data.
Last Interval Number	UINT16	20		M	Array index of the most recent interval recorded in the block.
Simple Status Offset From Block	UINT8	22		M	Byte offset of the simple status from the start of the block.
Simple Status Size	UINT8	23		M	Size in bytes of simple status.
Interval 0 Offset from Block	UINT8	24		M	Byte offset of the first interval from the start of the block.
Interval Size	UINT8	25		M	Size in bytes of one log interval.
Channel 0 Offset from Interval	UINT8	26		M	Byte offset of the first channel's data from the start of the interval record.
Extended Status Common	UINT8	27		M	Current extended status to be recorded in next interval record.
Number of Channels	UINT8	28		M	Number of channels being logged in the present configuration.
Interval Time	UINT8	29		M	Logging interval in the present configuration
Sources	ARRAY[8] of UINT8	30		M	Source IDs of the channels being logged in the present configuration, up to the first 8 sources. See the Source IDs section on page 203 for the list of possible sources.
Placeholders	ARRAY[8] of INT32	38		M	Used only for M-Bus channels, holds the value of the most recently posted interval data for each channel.
Sources expansion	ARRAY[8] of UINT8	70		M	The list of sources from source 8 through 16.
Load Profile Configuration ID	UINT32	78		M	Identifier representing the present load profile configuration. This field is updated any time the load profile is reconfigured.

Field Name	Type	Offset	Value	VCI	Description
MEP Billing Start Channel	UINT8	82		M	Channel number where MEP client billing data starts (0-based)
Block Start Time	LTIME_DATE	83		M	Time (UTC) when the current block started
Block Start Hour	UINT8	89		M	The UTC hour of the requested block start time. This is not necessarily the start time of the current first block, which may be offset from the requested start time, depending on how the interval lengths and the number of intervals are configured.
Block Start Minute	UINT8	90		M	The UTC minute of the requested block start time. This is not necessarily the start time of the current first block, which may be offset from the requested start time, depending on how the interval lengths and the number of intervals are configured.
Interval In Progress	UINT16	91		M	Value 0 indicates no interval is pending. A non-zero value reflects the current interval number in process of closing (i.e. waiting for MEP data to be returned).
Load Profile Options (LPO):	UINT8	93		M	
LPO – End Readings	BOOL(0)	93		H	Must be zero.
LPO – Scalar Divisor	BOOL(1)	93		H	Must be zero.
LPO – Data Reference	BOOL(2)	93		H	Must be zero.
LPO – ANSI Compliance	BOOL(3)	93		H	A value of 1 means that the load profile is ANSI-compliant, meaning that: a. Intervals are in minutes only. b. Only standard extended status are used c. Resets don't count as power cycles in common status.
Interval End Time (UTC)	LTIME_DATE	94		M	End time of last interval in UTC.
Interval End Time (local)	LTIME_DATE	101		M	End time of last interval in local time.

Field Name	Type	Offset	Value	VCI	Description
Max Memory Length	UINT32	107		M	The maximum memory length available. This is not necessarily the memory length currently in use, since that can be configured to be less than the maximum via EP11. This field was added for firmware version 3.50.
The following fields are only applicable to OSGP meters running firmware versions 3.60 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.					
Flags	lUINT8	111		M	A collection of flags:
NVMF Occurred	BOOL(0)	111		M	Set to True if an non-volatile memory failure has occurred since the load profile data set was created,
Reserved	UINT(1..7)	111		M	
Reserved	Array[19] of UINT8	112		M	Reserved for future use.

ET23 (2071, 0x0817): Miscellaneous Information

This table contains miscellaneous information, and is generally reserved for internal use. It records the number of LonTalk messages received and validated, which may be required when reading and processing data with your application.

The access key requirements for ET23 are listed below.

ET23, Miscellaneous Information: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET23 is defined below.

ET23, Miscellaneous Information: Table Structure

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM /OSGP	Meter 4.0+			
Exception Log [0]						
LonTalk Messages Received	UINT32	0			M	The number of non-validated explicit LonTalk messages received. Updated on occurrence.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM /OSGP	Meter 4.0+			
LonTalk Messages Validated	UINT32	4			M	The number of validated (digest check) LonTalk explicit messages received. Updated on occurrence.
Reserved		8...93				These fields are reserved for internal use.
Disconnect Internal Status	UINT8	94			M	The commanded (internal) state of the meter's load disconnect contactor. The OSGP Alliance recommends reading this value once every few seconds. 0 = Closed 1 = Closing (temporary state during pulsing) 2 = Opened 3 = Opening (temporary state during pulsing) This field is only meaningful for OSGP meters.
Active Calendar ID	UINT32	95			M	The ID of the currently active TOU calendar. This is updated on every power-up, every minute, and upon every table write request that occurs via power line or the optical port. Your application should not write to this field under any circumstances.
Reserved		99…185	99…217			These fields are reserved for internal use.

ET29 (2077, 0x081D): Hardware Configuration

This table contains information pertaining to the meter's hardware configuration.

If you are developing a MEP client application for a CPM 0600 or CPM 6010 OSGP Module, consult the Developing a Smart Meter Using the CPM 0600 and CPM 6010 OSGP Modules document for more information on how ET29 affects your module's operation. The "Hardware Features" section of this document includes extensive details on each ET29 setting, and how they affect the operation of your OSGP Module.

ET29 is a read-only table, meaning that the settings defined here cannot be changed directly via the MEP protocol for most device types. However, you should be aware that Control Point and OSGP Modules running firmware version 1.11 or higher include ET76, which is a writable table that maps

directly to ET29. This allows you to write the values of some of the bits in the “Hardware Options” field via the MEP protocol. However, ET76 is not available to OSGP meters.

Note: *The pulse input bits in the Hardware Options field are informational only, meaning that they can only be used to read the state of the pulse inputs. They cannot be used to enable or disable the pulse inputs. The pulse inputs can be enabled or disabled via the Pulse Input Channel Active bit in ET06.*

The access key requirements for ET29 are listed below.

ET29, Hardware Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET29 is defined below.

ET29, Hardware Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Hardware Options	Array[3] of UINT8	0		F	A bitmask indicating which hardware features are present on the meter. A value of 1 indicates the feature is present, and a value of 0 indicates the feature is not present: Bit 0: SO / KYZ Output Bit 1: Pulse input 1. Not applicable to OSGP Generation 4 meters (i.e. meters running firmware versions 4.0 and higher). Bit 2: Pulse input 2. Not applicable to OSGP Generation 4 meters (i.e. meters running firmware versions 4.0 and higher). Bits 3-4: Reserved. Bit 5: Disconnect & Buzzer Bit 6: Control Relay 1 (Dry) present. Bit 7: Control Relay 2 (Dry) present. Applicable to OSGP meters running firmware versions 4.30 only. Bit 8: M-Bus module Bit 9: Cover tamper Bit 10: The port for MEP client 1 is enabled. For Control Point/OSPG Modules and for OSGP meters running firmware versions 3.X, this is the only MEP port. Bit 11: Disconnect sensor Bit 12: Magnetic tamper

Field Name	Type	Offset	Value	VCI	Description
					Bit 13: High frequency noise detection (disabled if set) Bit 14: Two line disconnect (separate open/close line). By default, this is set to True. Bit 15: No metering Bit 16: No LCD Bit 17: External CT Bit 18: Backup power Bits 19: External disconnect feedback. Indicates that the disconnect is present and controlled by this device, but it is outside of this device so feedback info including LSV and power info are written to the device externally via EP50. Bit 20: External voltage. Indicates that an external device (such as a smart meter connected to a CPM 0600 OSGP module) will provide voltage updates that will be recorded in BT28. Bit 21: Votlage signal ADC input value is inverted Bit 22: Non-latching relay (CPM 0600 and CPM 6010 only) Bit 23: The port for MEP client 2 is enabled. This is applicable to OSGP meters running firmware versions 4.0 and higher only.
Reserved	UINT8	2…4		H	Reserved for internal use.
Internal Configuration		5			Bit 0: Single phase. For Control Point/OSGP Modules, this bit is informational only. Bit 1: Polyphase. For Control Point/OSGP Modules, this bit is informational only. Bits 2…5: Reserved Bit 6: Pulse Relay for Disconnect. This is applicable to CT meters running firmware versions 3.70 and higher only. If this bit is set to True, then the meter's control relay will be opened or closed based on the meter's average power settings. Time-based relay control will not function while this feature is enabled. However, the control relay can still be opened or closed by remote command (e.g. EP02) while this feature is enabled.

Field Name	Type	Offset	Value	VCI	Description
					Other meter models use the average power settings to open or close the load disconnect contactor. Bit 7: Reserved for Control Point/OSGP Modules and for OSGP meters running firmware versions 3.X. For OSGP meters running firmware versions 4.0 and higher, this bit enables the power boost relay.
Reserved	UINT8	6…19		H	These fields are reserved for internal use.
The following fields are applicable only to OSGP meters running firmware versions 4.0 and higher.					
Reserved		20…23			Reserved
Comm Assignment Matrix 1	LogicPorts[3][3] of UINT8	24		F	These bytes express the communication port distribution for the 3 USARTs. It is applicable to OSGP meters running firmware versions 4.0 and higher only. For details on how these bytes are allocated, consult the section following this table.
Extended Hardware Options	UINT32	33			
Two Disconnect Sensors	BOOL(0)	33		F	0: Do not refresh status automatically when the status of the 2 disconnect sensors is different. 1: Refresh status automatically when the status of the 2 disconnect sensors is different.
Disconnect Toggle Button	BOOL(1)	33	1	F	0：Two push buttons for the load disconnect contactor: one to open, and another to close. 1：One push button for the load disconnect contactor, which toggles between open and close.
Reserved	BOOL(2)	33		F	Reserved.
Backliight LCD Present	BOOL(3)	33		F	LCD backlight present.
Buzzer	BOOL(4)	33		F	Buzzer present.
Battery Type	UINT(5..6)	33	1	F	Battery type: 0: None 1: Standard 2: Reserved 3: Supercap
Earth Fault	BOOL(7)	33		F	Earth fault protection present.

Field Name	Type	Offset	Value	VCI	Description
External Tamper Input 1	BOOL(8)	33		F	External tamper input 1 present.
External Tamper Input 2	BOOL(9)	33		F	External tamper input 2 present.
S0 Pulse Output 2	BOOL(10)	33		F	S0 pulse output 2 present.
Security Chip	BOOL(11)	33		F	Optional security chip which provides for higher security present.
Last Gasp Module	BOOL(12)	33		F	Last Gasp Module installed. This is only applicable to P2P meters. The optional Last Gasp Module can be configured to send an SMS text message when power has been lost.
Control Relay 1 Type	BOOL(13)	33		F	Control Relay 1 Type. If set, this bit indicates that Control Relay 1 is a latching control relay. Applicable to OSGP meters running firmware versions 4.30 and higher only.
Control Relay 2 Type	BOOL(14)	33		F	Control Relay 2 Type. If set, this bit indicates that Control Relay 2 is a latching control relay. Applicable to OSGP meters running firmware versions 4.30 and higher only.
Reserved	UINT8	37…46		H	Reserved.
Current Sensors	UINT8	47			
Line	UINT(0...4)	47	2 in SP 1 in PP	F	Indicates the type of sensor that is measuring line current: 0: Shunt 1: PCB Coil
Neutral	UINT(5...7)	47	2 in SP 0 in PP	F	Indicates the type of sensor that is measuring neutral current: 0: Shunt 1: PCB Coil 2: Earth Fault Transformer
Comm Assignment Matrix 2	LogicPorts[2][3] of UINT8	48		F	These bytes express the communication port distribution for the 2 UARTs on the P2P Gateway Module modem. They are applicable to OSGP P2P meters only. For details on how these bytes are allocated, consult the section following this table.

The “Com Assignment Matrix 1” field expresses the communication port distribution for the 3 USARTs. It is allocated as follows. Bytes 24…26 are for USART1. Bytes 27…29 are for USART2. Bytes 30….32 are for USART3. The first byte indicates the board type. The second byte indicates the

port type. The third byte indicates the sequence number. The sequence number is used for MEP clients to indicate whether the port is for MEP client 1 (1) or MEP client 2 (2).

The following table shows how these bytes are allocated.

LogicPorts[X][Y]	Board (Wireless Board：1, Wired Board：2, PLC Board:3)	Port (MEP Port：1, MBUS Port：2, PLC Port:3)	Sequence Number
USART1(X=0)	24	25	26
USART2(X=1)	27	28	29
USART3(X=2)	30	31	32

The “Com Assignment Matrix 2” field is only applicable to OSGP P2P meters. It expresses the communication port distribution for the 2 UARTs on the P2P Gateway Module modem. It is allocated as follows. Bytes 48…50 are for UART1. Bytes 51…53 are for UART2. The first byte indicates the board type. The second byte indicates the port type. The third byte indicates the logical port number assigned to the UART.

LogicPorts[X][Y]	Board (No Board: 0, Modem Board: 4, PLC A-Band Board: 5, PLC G3 Board: 6)	Port (PLC Port: 3, Modem Port: 4, Optical Port: 5)	Logical Port Number (1, 2, 3 or 4)
UART1(X=0)	48	49	0
UART2(X=1)	51	52	0

ET31 (2079, 0x081F): Meter One-time-read Log

This table contains a log of the meter’s One-time-reads. The access key requirements for ET31 are listed below.

ET31, Meter One-time-read Log: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

ET31: Meter One-time-read Log

Field Name	Type	Offset	Value	VCI	Description
Order	BOOL(0)	0	FALSE	F	Self read records are transported in ascending order (N is older than N+1).

Field Name	Type	Offset	Value	VCI	Description
Overflow	BOOL(1)	0		M	This flag is set when the selfread memory has overflowed, causing old data to be overwritten.
List type	BOOL(2)	0	TRUE	F	The self read list is a circular queue. Reads FALSE if max entries is 0.
Inhibit overflow	BOOL(3)	0	FALSE	F	The meter does not inhibit new entries when overflow occurs.
Filler	FILL(4..7)	0			
Number of valid entries	UINT8	1		M	Number of self read records with valid data. Range is 0..BT21.2.
Last entry element	UINT8	2		M	Array element of the most recent valid self read entry. Range is 0..BT21.2.
Last entry sequence number	UINT16	3		M	Sequence number of the most recent self read opera tion. This value is never reset.
Number of unread entries	UINT8	5		M,H	Number of self read records that have not been read. This field is incremented by the meter and decremented by the host as records are read. Range is 0..BT21.2.
One-time Read Entries: Array[BT21.2] of One-time Read Data Records					
One-time Read Data Record:					
IF BT21.4 != 0 then Blg Iface Def Nbr (BIDN)	UINT16	6		M	If the “Number of Demands” field in BT21 is set to a non-zero value, then this field holds the BIDN (Billing Interface Definition Number) for this entry. The BIDN is an identifier set by the calling device to identify billing related data in logs as pertaining to the present configuration.
Time and date	STIME_DATE	6 (+2)		M	Time and date (BT55) when this data was captured.
Season	UINT8	11 (+2)		M	Season represented in this snapshot.
RegisterDataRcd = BT23		12 (+2)			The data for this one-time read record. The data included for each one-time read record matches the format of BT23.

ET34 (2082, 0x0822): Additional M-Bus/MEP Device Configuration

This table contains M-Bus device and MEP client configuration data, including the polling intervals and the number of retry attempts to use when collecting M-Bus data with the load profile log.

The access key requirements for ET34 are listed below.

ET34, Additional M-Bus/MEP Device Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET34 is defined below.

ET34, Additional M-Bus/MEP Device Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Device Config	ARRAY [ET11.0] of [ET11.13]-byte structure				Additional configuration information for each M-Bus device:
Reserved		0…1			
Group Mask	UINT8	2		H	Set any bit to 1 to include this device in one of 8 possible groups for receiving multicast messages via EP18. This field is applicable to M-Bus devices only.
Reserved		3			
Load Profile Poll Rate	UINT16	4	60	H	Maximum poll rate of the device for load profile purposes, in minutes.
Control MDT	UINT8	6	0	H	Specify the M-Bus/MEP Data Type (MDT) that defines a control status field to be read from an M-Bus device or a MEP client. The value entered here should correspond to the value of the “MDT Index” field for the desired Data Type entry in ET57. The status data corresponding to this MDT and read from the device is recorded in ET58.
Command Monitor MDT	UINT8	7	0	H	MDT defining a command to monitor (0 means none). This field corresponds to the MDT field in ET57.

Field Name	Type	Offset	Value	VCI	Description
Time Stamp MDT	UINT8	8	0	H	Specify the M-Bus/MEP Data Type that defines the Data Record Header containing a time stamp in the Variable Data Block. The value entered here should correspond to the value of the “MDT Index” field for the desired Data Type entry in ET57
Hour Locator	UINT(0..4)	9	0	H	Starting bit number of the hours in the time stamp. This is a 1-based field.
	UINT(5..7)	9	0	H	Bit count of the hours field in the time stamp.
Minute Locator	UINT(0..4)	10	0	H	Starting bit number of the minutes in the time stamp. This is a 1-based field.
	UINT(5..7)	10	0	H	Bit count for the minutes field in the time stamp.
Load Profile Poll Wait	UINT8	11	0	H	Enter the interval to wait after the conclusion of each load profile log interval to poll the device again as a value in seconds between 0 and 255. You should set this field so that it matches the maximum expected deviation between the time used by the MEP server, and the time used by the M-Bus device.
Load Profile Poll Retry Attempts	UINT8	12	0	H	Specify how many retry attempts will be made if a poll is not successful. Enter a value between 0 and 254.
Load Profile Poll Retry Wait	UINT8	13	0	H	Specify how long the MEP server will wait after each unsuccessful poll to try again.
Reserved	ARRAY[7] of UINT8	14-21			Reserved for future use.

ET36 (2084, 0x0824): Manufacturer (Extended) Table Actual Dimensions

This table holds the actual configuration dimensions of the extended tables that are adjustable. It can only be updated only via EP06 or EP37. This table defines all extended tables with the following properties:

1. They use a standard header.
2. They post an alarm when there are unread entries.
3. Their unread entries can be decremented via EP26.

4. The posted alarm is automatically cleared after using EP26 if all logs report 0 unread entries.

Entries in this table must be read in a way that ensures they didn't change while they were being read. This could be done by using a transaction, or by reading the header after reading the entries and ensuring that the read entries weren't overwritten due to wrap-around (by using the sequence number and the last element index).

The access key requirements for ET36 are listed below.

ET36, Manufacturer Table Actual Dimensions: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET36 is defined below.

ET36, Manufacturer Table Actual Dimensions: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Count	UINT8	0	7	P	Number of tables described in this list.
Actual Dimension List:	ARRAY[Count] of 17-byte records				
Table	TABLE_IDC	1		F	Table ID
Tbl_Proc_Nbr	UINT(0..10)			F	Table number of log.
Std_vs_MfgFlag	BOOL(11)			F	0 = Basic table 1 = Extended table
Procedure Flag	BOOL(12)			F	N/A
Flags	UINT(13..15)			F	Reserved for future use.
Entry Size	UINT16	3		P for ET38. M for ET31, ET32, ET41, ET45, ET75, and ET81	Size, in bytes, of an entry in the specified table, not including the list header: ET31: The default value before demand is configured is 232 bytes. ET32: Entry size is adjustable and configured via EP37, with a default value of 525 bytes (509 bytes of actual device data). ET38: 35 bytes. ET41: Entry size is variable. The current configured value will be copied here based on EP32.

Field Name	Type	Offset	Value	VCI	Description
					ET45: Entry size is adjustable and configured via EP37. The default value is 525 bytes (509 bytes of actual device data) ET75: 143 bytes. ET81: 12 bytes.
Max Entries	UINT16	5		P for ET38, M for ET31, ET32, ET41, ET45, ET75 and ET81	Maximum number of entries for this list: ET31: 255 ET32: 255 (assuming smallest meaningful entry size) ET38: 255 ET41: 255 (assuming smallest non-zero demand configuration. ET45: 253 (assuming smallest meaningful entry size) ET75: 253 ET81: 253
Current Entries	UINT16	7		M	Number of list entries currently configured. This can be configured via EP06, EP37, or EP32. The default values are: ET31: 2 ET32: 8 ET38: 10 ET41: 0 (configured only via EP32) ET45: 0 ET75: 0 ET81: 0
Flags:	UINT8	9			
Length Included	BOOL(0)			P	True indicates a 2-byte length precedes each log entry. The length is the number of bytes of meaningful data in this read, and is less than the value of the “Entry Size” field.
Unused	UINT(1..7)			M	Reserved for future use.
Spare	ARRAY[8] of UINT8	10			Reserved for future use.
Unread Entries Bitmap	ARRAY[(Count -1 / 8) + 1] of UINT8	(Count*10) +1			The order of bits in this bitmap is the same as the order of the logs that precede it in the table, with the LSB first. If a bit is set to 1, it indicates that the corresponding log for that bit has unread entries. The “Count” value referred to in the “Type” column is defined by the “Count” field at ET36.0.

ET41 (2089, 0x0829): Historical Demand Reset Log

This table is an adjustable log of previous demand reset data, including the latest demand reset data. The latest entry recorded here is copied to BT25.

The access key requirements for ET41 are listed below.

ET41, Historical Demand Reset Log: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET41 is defined below.

ET41, Historical Demand Reset Log

Field Name	Type	Offset	Value	VCI	Description
Order	BOOL(0)	0	FALSE	F	Demand reset records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	This flag is set when the demand reset memory has over flowed, causing old data to be overwritten.
List type	BOOL(2)	0	TRUE	F	The demand reset list is a circular queue.
Inhibit overflow	BOOL(3)	0	FALSE	F	The meter does not inhibit new entries when overflow occurs.
Filler	FILL(4..7)	0			
Number of valid entries	UINT8	1		M	The number of demand reset records with valid data. The maximum value for this field is set by the “Max Entries” field in ET36.
Last entry element	UINT8	2	0	F	The array element of the most recent valid demand reset entry. The maximum value for this field is set by the “Current Entries” field in ET36.
Last entry sequence number	UINT16	3		M	Sequence number of the most recent demand reset operation. This value is never reset.
Number of unread entries	UINT8	5		M,H	Number of demand reset records that have not been read. The maximum value for this field is set by the “Current Entries” field in ET36.

Field Name	Type	Offset	Value	VCI	Description
Demand Reset Entries:	Previous demand reset data. Array[ET36.CurrentEntries] of:				
Length	UINT16	6		M	Length of the entry, in bytes
Reset reason	UINT8	8		M	The instigator for this reset record: 0 = Scheduled 1 = Procedural (MP33, MP34 executed) 2 = Push button 3 = Pending table activation
BIDN	UINT16	9		M	BIDN for this entry
Time and date	STIME_DATE	11		M	Time and date (local, BT55) when this data was captured.
Season	UINT8	16		M	Season represented in this entry.
Demand Reset Data		17		M	The data for this demand reset entry. The data included for each demand reset entry matches the format of BT23.

ET42 (2090, 0x082A): Interface Definition

This table holds the interface definition data for the MEP server. All parameters that affect the dimension and/or semantics of readable data that can be modified are reflected here.

Any time any information in this table changes, whether by an explicit reconfiguration or as the result of a firmware upgrade, the Interface Change Alarm in BT03 will be triggered and the “IDT Version” field in ET04 will be incremented.

The access key requirements for ET42 are listed below.

ET42, Interface Definition: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET42 is defined below.

ET42, Interface Definition: Table Structure

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Table Length	UINT16	0		Size of this table in bytes (including this field).

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Fixed Section Length (FSL)	UINT8	2		Size in bytes of the “fixed” part of this table, up to the Adjustable Log Info fields (including this length byte and the full Table Length field). This can be used to determine whether or not fields have been added to the “fixed” section. This field can also be used as an offset to the Adjustable Log Info section of ET42. The adjustable log list is self-defining, and new logs will be added to the end of the log list. The sources list is defined by parameters in the fixed part of this table.
Log List Size (LLS)	UINT8	3	ET36.0	Number of logs included in the Log List array below.
Interface Compatibility Setting	UINT16	4	ET54.0	
ICS – ICA NAK	BOOL(0)	0	H	1 = Turn on ICA NAK and turn off MEP recurring reads that are stored in ET16.
ICS - Blg/LP Format 2	BOOL(1)	0	H	1 = Data Concentractor can handle billing data and load profile data in all formats.
ICS - Unused	BOOL(2..15)	0	H	
C12.19 Compliance	UINT16	6	ET04.114	
Unused	BOOL(0..15)		H	
Billing Interface Info:				
Billing Interface Definition Number (BIDN)	UINT16	8		The BIDN is an identifier set by the calling device to identify billing-related data in logs as pertaining to this configuration. This number is recorded in each entry of BT26 and ET31. The unique correlation of this number to a specific configuration is not enforced or guaranteed by the MEP server.
Flags:	UINT8	10		

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Demand Reset Counter	BOOL(0)		BT21.0.2	True if the number of demand resets is included with billing data and False if not.
Cumulative Demand	BOOL(1)		BT21.0.4	True if cumulative demand is configured and False if not.
Continuous Cumulative Demand	BOOL(2)		BT21.0.5	True if continuous cumulative demand is configured and False if not.
Demand Configured	BOOL(3)		ET48	True if demand feature has been configured (i.e. EP32 has been executed) at least once in the MEP server, and False if not.
Unread Log Entries Bitmap Enabled	BOOL(4)			True if the “Unread Entries Bitmap” field in ET36 is available in the current firmware. Cannot be enabled or disabled.
Number of Self-reads	UINT8	11	BT21.2	The number of self-read entries presently configured.
Number of Summations	UINT8	12	BT21.3	The number of accumulators reported in BT23. For a description of the summations, see tables BT22 and BT23.
Number of Demands	UINT8	13	BT21.4	The number of demand registers presently configured.
Number of Coincident Values	UINT8	14	BT21.5	The total number of coincident values presently configured.
Number of Occurrences	UINT8	15	BT21.6	The number of maximum demands reported for each demand register.
Number of Tiers	UINT8	16	BT21.7	The number of TOU tiers (tariffs) presently configured (default = 4). Meters running firmware version 3.70 and higher, and Control Point/OSGP Modules running firmware version 1.20 and higher, optionally support up to 8 tiers. All other devices support 4 tiers.
Number of Present Demands	UINT8	17	BT21.8	The number of present demands reported in BT28.
Number of Present Values	UINT8	18	BT21.9	The number of instantaneous measurement values recorded in BT28. For a description of the present values, see tables BT27 and BT28.

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Demand Sub-interval	UINT8	19	BT13.4	The demand sub-interval, in minutes, as configured by EP32/33. This will always be the same value for all configured demand registers
Demand Multiplier	UINT8	20	BT13.5	The demand interval multiplier in minutes as configured by EP32/33.
Tier Size	UINT16	21		The size in bytes of all the fields in a single tier in BT23.
Load Profile Info:	Load profile information for Data Set 1. For meters running firmware versions 3.50 and higher and for Control Point/OSGP Modules running firmware versions 1.20 and higher that support multiple data sets, information for Data Sets 2, 3 and 4 is stored later in the table.			
Block Size	UINT32	23	ET21.8	The block size in bytes of the load profile data set.
Number of Blocks	UINT16	27	BT61.7	The total number of blocks available for the load profile data set.
Number of Channels	UINT8	29	BT61.11 and ET21.28	The number of channels per interval for the load profile data set.
Interval Duration	UINT8	30	BT61.12 and ET21.29	The time duration between the starts of two consecutive intervals for the load profile data set.
Interval Size	UINT8	31	ET21.25	The size in bytes of one load profile interval for the load profile data set.
Options	UINT8	32	ET21.93	Indicators of various load profile features enabled. These features affect both the dimension and semantics of the load profile data. See the “Load Profile Options” field in ET21 for more information.
Intervals Per Block	UINT16	33	BT61.9	Number of intervals per block for the data set.
Block Start Hour	UINT8	35	ET21.89	Start hour for block for the data set.
Block Start Minute	UINT8	36	ET21.90	Start minute for block for the data set.
History Log Info:				
History Log Flags:	UINT8	37	BT71.0	Flags denoting the presence or absence of optional fields.
Event Number	BOOL(0)			
Date Time	BOOL(1)			

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Sequence Nbr	BOOL(2)			
Inhibit Overflow	BOOL(3)			
Event Log Inhibit Overflow	BOOL(4)			
History Log Count	UINT16	38	BT71.5	The number of entries stored in the history log.
History Log Entry Size	UINT8	40	BT71.3	The size of the argument field in the history log, in bytes.
Adjustable Log Info:				
Log List:	ARRAY[LLS] of UINT24	ET42.FSL		
OTR Log Count	UINT8	ET42.FSL	ET36.7	The number of list entries currently configured.
OTR Entry Size	UINT16	ET42.FSL+1	ET36.3	The maximum entry size currently configured.
M-Bus OTR Log Count	UINT8	ET42.FSL+3	ET36.24	The number of list entries currently configured
M-Bus OTR Entry Size	UINT16	ET42.FSL+4	ET36.20	The maximum entry size currently configured.
Config ID Log Count	UINT8	ET42.FSL+6	ET36.41	The number of list entries currently configured.
Config ID Entry Size	UINT16	ET42.FSL+7	ET36.37	The maximum entry size currently configured.
Demand Reset Log Count	UINT8	ET42.FSL+9	ET36.58	The number of list entries currently configured.
Demand Reset Entry Size	UINT16	ET42.FSL+10	ET36.54	The maximum entry size currently configured.
M-Bus Recurring Log Count	UINT8	ET42.FSL+12	ET36.75	The number of list entries currently configured.
M-Bus Recurring Entry Size	UINT16	ET42.FSL+13	ET36.71	The maximum entry size currently configured.
LP Change Log Count	UINT8	ET42.FSL+15	ET36.90	Number of list entries currently configured in ET75.

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
LP Change Log Entry Size	UINT16	ET42.FSL+ 16	ET36.88	Maximum entry size currently configured in ET75.
Power Outage Log Count	UINT8	ET42.FSL+ 18	ET36.107	The number of entries currently in the meter's power outage log in ET81.
Power Outage Log Entry Size	UINT16	ET42.FSL+ 19	ET36.103	The maximum number of entries allowed in the meter's power outage log in ET81.
Sources:				
Demand Sources (DmdScrcs)	ARRAY[ET42. NbrDmdSrcs] of UINT8	ET42.FSL + 3* ET42.LLS	BT22.[ET42.NbrSumms]	List of source ID numbers for each configured demand source. For descriptions of the demand source IDs, Source IDs on page 203.
Coincident Sources (CoinSrcs)	ARRAY[ET42. NbrCoinSrcs] of UINT8	ET42.FSL + 3* ET42.LLS + ET42.NbrDmdSrcs	BT22.[ET42.NbrSumms + ET42.NbrDmdSrcs +1]	A list of sources that are collected with each demand measurement. Coincident sources are entered in the same order as the demand sources. For example, coincidents 1 and 2 are associated with demand 1, and coincidents 3 and 4 are associated with demand 2.
Load Profile Extended Sources (Chans)	ARRAY[ET42. NbrChans] of UINT16	ET42.FSL + 3* ET42.LLS + ET42.NbrDmdSrcs + ET42.NbrCoinSrcs	BT62 and ET21.30-37, ET21.70-77	Extended source IDs for the channels selected for logging. Note that if ET04.107.1 is set to 0, then the extended source IDs will be limited to the 8-bit values from ET21 and will not be mapped to any extended source ID values from ET66.
MDTT Current Entries	UINT8	ET42.FSL + 3* ET42.LLS + ET42.NbrDmdSrcs + ET42.NbrCoinSrcs + 2*ET42.NbrChans	ET57	Number of ET57 non-zero entries that have been added.

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
MDTT Entries	ARRAY[ET42.MDTTCurrentEntries] of MdtEntry (4 bytes each)	ET42.FSL + 3* ET42.LLS + ET42.NbrDmdSrcs + ET42.NbrCoinVals + 2*ET42.NbrChans + 1	ET57	The MDT entries from ET57 with non-zero MDT values.
Load Profile Bit Mask	UINT8	A (end of MDTT entries +1)		Bit mask of active (non-zero block count) load profile sets in the Data Set Configuration array that follows: Bit 0: Set if Data Set 2 is active Bit 1: Set if Data Set 3 is active Bit 2: Set if Data Set 4 is active Note that if the “Multiple Load Profile Data Set Support” field in ET54 (ET54.0.2) is set to 0, then ET42 will not include this field or any of the “Data Set Configuration” fields below. Data starting at the “Required Section” will be included.
Data Set Configuration	An array of the remaining fields through “Load Profile Extended Sources”, with one element for each Data Set N, where N is a value between 1..4.			
Block Size	UINT32			The block size in bytes of the load profile data set.
Number of Blocks	UINT16			The total number of blocks available for the load profile data set.
Number of Channels	UINT8			The number of channels per interval for the load profile data set.
Interval Duration	UINT8			The time duration between the starts of two consecutive intervals for the load profile data set.
Interval Size	UINT8			The size in bytes of one load profile interval for the load profile data set.
Options	UINT8			Indicators of various load profile options. These options affect both the dimension and semantics of the load profile data. See the “Load Profile Options” field in ET21 for more information.
Intervals Per Block	UINT16			Number of intervals per block for the data set.

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
Block Start Hour	UINT8			Start hour for block for the data set.
Block Start Minute	UINT8			Start minute for block for the data set.
Load Profile Extended Sources	ARRAY[BT61.11N] of UINT16			Extended source IDs for the channels selected for logging. Note that if ET54.0.1 is set to 0, then the extended source IDs will be limited to the 8-bit values from ET21 and will not be mapped to any extended source ID values from ET66. The size of this array is set by the "Number of Channels in Set N" field in BT61 (BT61.11).
The following fields were added for meter firmware versions 3.60 and higher				
Required Section				
Length	UINT8			The total number of bytes in the Required Section, including the Length byte.
ET74 Entry Count	UINT16		ET54.69	Number of list entries currently configured in ET74.
The following fields were added for meter firmware versions 3.70 and higher, and Control Point/OSGP Module firmware versions 1.20 and higher				
ET77 Entry Count	UINT8		ET54.79	The number of entries in ET77.
ET79 Entry Count	UINT16		ET54.80	The number of entries in ET79.
Energy Register Unit	UINT8		ET55.A+3	Indicates the energy register unit being used. OSGP Alliance CT meters running firmware versions 3.70 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher, can be configured during manufacturing so that cumulative energy measurements that are measured in varh and Wh can be recorded in units of 1, 10 or 100. For example, if units of 10 are selected, a load profile value of 10 would actually represent 100 varh (or Wh). Or if units of 100 are selected, a load profile value of 10 would actually represent 1000 varh (or Wh). This feature may be useful if you are using a CT meter with a high

Field Name	Type	Offset	Root Table Field (If Applicable)	Description
				ratio, to prevent accumulator rollover from occurring too soon. The energy register unit can be configured via the “Energy Register Unit’ field in ET55. Consult the description of ET55 for more detailed information.
Accumulator Rollover Digit	UINT8		ET07.BT30.4*6	Indicates the accumulator rollover digit. This is the number of decimal digits of range of energy accumulators before the registers rollover, in Wh. For example, if the value is 6, the registers will rollover at 999,999 Wh (i.e. before a 7th digit becomes necessary). The range is 5..9.

ET45 (2093, 0x082D): MEP Recurring Read Log

This table is a log of MEP billing data. This table has a log entry structure identical to ET16, plus some additional fields. Only scheduled reads are recorded to this table. Note that regardless of the compatibility setting, the first read of every newly commissioned or registered device is entered into ET16. Remaining scheduled reads may go into ET45 or ET74. See ET14 for information on which statuses are updated there corresponding to entries logged in this table.

For guidelines on how to read specific device data from this table, see *Reading M-Bus Scheduled Read Data* on page 27.

The access key requirements for ET45 are listed below.

ET45, MEP Recurring Read Log: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET45 is defined below.

ET45, MEP Recurring Read Log: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Order	BOOL(0)	0	False	F	Log records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	This flag is set when the log memory has over flowed, causing old data to be overwritten.

Field Name	Type	Offset	Value	VCI	Description
List Type	BOOL(2)	0	True	F	If set to True, the log is a circular queue. Set to False if the “Max Entries” field in ET36 is set to 0.
Inhibit Overflow	BOOL(3)	0	False	F	The MEP server does not inhibit new entries when overflow occurs.
Filler	FILL(4..7)	0			
Number of Valid Entries	UINT8	1		M	Number of records with valid data. Range is between 0 and the value of the “Current Entries” field in ET36.
Last Entry Element	UINT8	2	0	F	Array element of the most recent valid entry. Range is between 0 and the value of the “Current Entries” field in ET36 minus 1.
Last Entry Sequence Number	UINT16	3		M	Sequence number of the most recent operation. This value is never reset.
Number of Unread Entries	UINT8	5		M,H	Number of records that have not been read. This field is incremented by the MEP server, and decremented by the host as recods are read. Range is between 0 and the value of the “Current Entries” field in ET36.
Log Entries:	Array of the following:				The size of tis array is found in ET36.
Length	UINT16	6		M	Number of bytes of billing read information including the handle and 0 terminator byte (M-Bus only), but not the length field (the entire entry space is still reserved if unused).
Identifier	BOOL(0..10)	8			Namespace-specific identifier. The use of this field depends upon the “Namespace” field.
Namespace	BOOL(11..15)	8			Namespace: 0 = Manufacturer specific 1 = DLMS 2 = OSGP All other values are reserved.
Handle	UINT16	10		M	Handle of the device represented by this entry.
Execution Status	UINT8	12		M	0 = Normal 2 = Delayed (entry is a power-up backfill)
Result	UINT8	13		M	4 = Success

Field Name	Type	Offset	Value	VCI	Description
Data	MBR	14		M	MBR = MEP Read. See the description of ET16 for more details.

ET46 (2046, 0x07FE): Control Output Read-Only Data

This table contains read-only configuration data for the configuration of the load disconnect contactor.

The access key requirements for ET46 are listed below.

ET46, Control Output Read-Only Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET46 is defined below.

ET46, Control Output Read-Only Data: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Reserved		0..10			Reserved
Disconnect Control Type	UINT8	11		M/H	This field indicates whether the meter is using power measurements or current measurements to determine when excessive energy is in use the load disconnect contactor should be shut off. 0 = Power measurements 1 = Current measurements Note that the “Enable Maximum Power/Current Level Thresholds” field in ET05 (ET05.25.0) must be set to 1 for this feature to be enabled.
Reserved		12			Reserved
The following fields were added for meter firmware versions 3.70 and higher, and Control Point/OSGP Module firmware versions 1.20 and higher					
Prepay Negative Credit	INT32	13		M/H	The overflow energy credit (in Wh) allowed after prepay total credit reaches 0 when negative prepay credit is enabled. When this limit is reached, the load disconnect contactor will be turned off (opened).

Field Name	Type	Offset	Value	VCI	Description
Maximum Power/Current/ Average Power Disconnect Open Time	LTIME_DATE	17		M	A timestamp indicating the last time the load disconnect contactor was opened because of the maximum power, maximum current or average power settings.

ET47 (2095, 0x082F): Calendar Override Settings

This table is used to initiate and terminate manual overrides to the TOU calendar and active tariff.

The access key requirements for ET47 are listed below.

ET47, Calendar Override Settings: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET47 is defined below.

ET47, Calendar Override Settings: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Tariff	UINT8	0	255	HD, HI	Tariff to set. The range of this field is 0-7, with each value corresponding to one of the MEP server's supported tariffs. If this is set to 255, the operation will cancel any override presently in effect. Note that meters running firmware version 3.70 and higher, and Control Point/OSGP Modules running firmware version 1.20 and higher optionally support up to 8 tiers. All other devices support 4 tiers.

Field Name	Type	Offset	Value	VCI	Description
Cancellation	UINT8	1		HD, HI	Specifies the type of override: 0 = At next calendar-driven tier switch. If the MEP server is power-cycled while an override of this type is on hold, the hold will be released on power-up if the current tariff is not equal to the tariff in use prior to the hold invocation. 1 = Indefinite. 2 = After the duration specified by the “Override Duration” field. If a type 2 override is already in effect and another type 2 override is requested, the duration timer will be restarted for the 2nd override request. 3 = At the time specified by the “Cancellation Time” field.
Override Duration	UINT32	2		HD, HI	Duration of the override, in seconds. A value of 0 results in no switch.
Cancellation Time	LTIME_DATE	6		HD, HI	Date/time (UTC) the override is to be cancelled.
Calendar ID	UINT32	12		HD, HI	Calendar ID to be used while the override is in effect. You must make sure to use a valid calendar ID when writing to this field. As a result, the OSGP Alliance recommends ensuring that the correct calendar ID to use during the override is conveyed to your application when it is directed to perform the manual tariff override. If your application is to perform tariff overrides without instruction from another utility application, then the calendar IDs to use must be agreed upon with the utility application beforehand and provisioned into the application (or entered manually).

ET50 (2098, 0x0832): MEP Inbound Data Space

This table holds status and controls relevant to the MEP client, and is normally only modified during the discovery process. You can also use ET50 to store MEP data that could be added to the load profile log.

The access key requirements for ET50 are listed below.

ET50, MEP Inbound Data Space: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MBK, MAK	X	X	X	X

The table structure for ET50 is defined below.

ET50, MEP Inbound Data Space: Table Structure

Field Name	Type	Offset	Value	VCI	Description
MEP Inbound Configuration	ARRAY[ET 11.34]	Each element of this array represents the inbound data space configuration for a MEP client. The size of this array is determined by the value of the “MEP Channel Count” field in ET11, which indicates the maximum number of MEP clients that can be connected to the OSGP meter or Control Point/OSGP Module. For OSGP meters running firmware versions 4.0 and higher, this is usually set to 2. For all other devices types, this is set to 1.			
Identification String (MEP ID)	Array[30] of HEX	0	0	M	The client’s 30-byte MEP identification string for the MEP client. For information on the format the identification string should follow, see the following section, MEP Identification String Format.
MEP Flags	UINT8:	30		M	Flags modified by the MEP client.
MEP Device Registered	BOOL(0)	30	0	M	Set by the MEP client during the auto-discovery process to indicate its presence to the MEP server.
ET59 Response	BOOL(1)	30	0	M	For Control Point/OSGP Modules and for OSGP meters running firmware versions 3.X and higher, set this field to True (1) indicate that ET59 should be used as the procedure response table for the

Field Name	Type	Offset	Value	VCI	Description
					MEP client. If set to False (0), BT08 will be used as the procedure response table. Some OSGP meters are configured to use BT08 by default. All newly developed MEP clients should design to ET59 and configure this compatibility setting accordingly every time your device registers itself to the MEP server. For OSGP meters running firmware versions 4.0 and higher, set this field to True (1) to indicate that MEP client 1 should use ET59 as the procedure response table. If set to False (0), MEP client 1 will use BT08 as the procedure response table. MEP client 2 will always use ET85 as the procedure response table.
M-Bus Alerts	BOOL(2)	30	0	M	Set this flag if you want to receive alerts for M-Bus related events.
Delta Data Alerts	BOOL(3)	30	0	M	Set this flag to enable delta data alerts. For more information on delta data sources, see *Delta Data Alerts* on page 34.
Unused	BOOL(4..7)	30			Reserved
Data Sources Icon Display Control	Array[ET11.22] of UINT16	31		M	Bitmap controls which icons are displayed when the associated data source is displayed. Values may be ORed together: 0: None 1: Euro 2: Dollar 4: Date 8: Time 16: kvarh 32: kWh 64: kvar 128: kW

Field Name	Type	Offset	Value	VCI	Description
					256: negative (-)
Data For Display/Load Profile Sources	Array[ET11 .22] of NI_FMAT1	31 + 2 * ET11.22		M	Array of data from sources to be used for load profile and LCD display. See *Load Profile Data* on page 29 for information on reading load profile data.
MEP Icon Display Control					Controls how each MEP communication icon should be displayed: 0 = OFF 1 = ON 2 = FLASH one second on and one second off
House Icon	UINT(0..3)	31 + 6 * ET11.22	0	M	House icon. Note that for OSGP meters running firmware versions 4.0 and higher, the house icon can only be controlled by one MEP client or the other. This is determined by the “House Icon Control” field in ET55.
Short Bar	UINT(4..7)	31 + 6 * ET11.22	0	M	Reserved
Medium Bar	UINT(0..3)	32 + 6 * ET11.22	0	M	Reserved
Long Bar	UINT(4..7)	32 + 6 * ET11.22	0	M	Reserved
Reserved	UINT16	33 + 6 * ET11.22		M	Reserved

MEP Identification String Format

The MEP identification string in ET50 should use the following format:

Offset	Length (Bytes)	Description
0	3	The first three bytes must contain the manufacturer-unique ID for your device issued by OSGP Alliance. Contact the OSGP Alliance to obtain a manufacturer ID. This is ORed with highest bit setting (7th bit of 0th byte) to 1 to indicate OSGP Alliance standard for the remaining 27 bytes format of the MEP identification string.
3	1	Class (e.g. LonTalk (0), ZigBee (1), C-Band (4), OSGP (5), etc)
4	1	Program ID or device definition length (N). A value of 00 indicates that the program ID is not included.

<table>
<tr><th>Offset</th><th>Length (Bytes)</th><th>Description</th></tr>
<tr><td>5 or N/A</td><td>N</td><td>N-byte program ID or device definition. The format is class dependent. The OSGP Alliance recommends using either of the following two standard program ID formats:
4-byte OSGP Alliance standard program ID format:
<table><tr><td>Device Type (8 bits)</td><td>Device Sub Type (8 bits)</td><td>Interface Version (8 bits)</td><td>Implementation Revision (8 bits)</td></tr></table>6-byte OSGP Alliance standard program ID format
<table><tr><td>Device Type (8 bits)</td><td>Device Sub Type (8 bits)</td><td>Interface Version (8 bits)</td><td>FW Major Version (8 bits)</td><td>FW Minor Version (8 bits)</td><td>FW Revision (8 bits)</td></tr></table>The device type and sub-type are defined per class. Different classes could have different device type and sub type definition. Value 0 means unspecified for all types and classes.</td></tr>
<tr><td>5 + N</td><td>1</td><td>Unique ID length (M). A value of 00 indicates that the unique ID is not included. Note that if an MCM 0600 is installed on an MTR 0600 meter, the MTR 0600’s serial number will be overwritten with this unique ID.</td></tr>
<tr><td>6 + N or N/A</td><td>M</td><td>M-byte unique ID (format is class dependent)</td></tr>
<tr><td>6 + N + M</td><td>if (M<20) then 23 – (N+M) else this field is N/A</td><td>Spares. Must be set to 0.</td></tr>
</table>

ET51 (2099, 0x0833): MEP Device Configuration

This table holds configuration parameters for the MEP client that determine how the MEP server will manage the MEP interface. Use extreme caution when writing to this table, as it contains settings such as the “Enable Optical D.O.S. Timer” field that will impact the overall performance and operation of the MEP interface.

The access key requirements for ET51 are listed below.

ET51, MEP Device Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MBK, MAK	X	X	X	X

The table structure for ET51 is defined below.

ET51, MEP Device Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
MEP Device Configuration	ARRAY[ET11.34]	Each element of this array represents the inbound data space configuration for a MEP client. The size of this array is determined by the value of the “MEP Channel Count” field in ET11, which indicates the maximum number of MEP clients that can be connected to the OSGP meter or Control Point/OSGP Module. For OSGP meters running firmware versions 4.0 and higher, this is usually set to 2. For all other devices types, this is set to 1.			
MEP Flags	UINT8	0		H	MEP configuration flags:
Enable Optical D.O.S. Timer	BOOL(0)	0	True	H	If set to True, the MEP server will enforce Optical Denial-of-service (D.O.S.) timers. If set to False, the meter will not enforce D.O.S. timers. This field is not applicable to OSGP meters running firmware versions 4.0 and higher that have both MEP ports enabled. For these meters, use the “Enable Optical D.O.S. Timer” field in ET55 to set the D.O.S. timer setting. You can check the “Multiple MEP Clients” field in ET54 (ET54.0.8) to determine whether or not your meter has both MEP ports enabled.
Monitor MEP Health	BOOL(1)	0	False	H	If set to True, monitoring of the MEP serial port requests for device status purposes will be enabled.
Reset Device Down MEP	BOOL(2)	0	False	H	If True, the MEP client will be reset when the interval specified by the “MEP Health Timeout” field elapses. The reset will be issued when the the “Device Status” field in ET14 changes from “active” to “down.”
Reset MEP Now	BOOL(3)	0	False	H	When set to True, the MEP Reset line is toggled. It is automatically cleared to False afterward. This field is applicable to OSGP meter firmware versions 3.60 and higher, and Control Point/OSGP Module firmware versions 1.20 and higher.
Unused	BOOL(4..6)	0		H	
Disable MEP	BOOL(7)	0	False	H	If set to True, all MEP operations in the MEP server will be disabled.

Field Name	Type	Offset	Value	VCI	Description
MEP Health Timeout	UINT16	1	60	H	Number of seconds of MEP inactivity before the “Device Status” field in ET14 is set to “down.”
On-demand and One-Time Read Timeout	UINT8	3	30	H	The number of seconds before an on-demand queue entry in ET15, or an active one-time read entry in ET20, is considered expired and marked with “No Response.”
Optical Session Timeout	UINT16	4	600	H	The number of seconds before an optical session is terminated for Denial of Service protection. This field is not applicable to OSGP meters running firmware versions 4.0 and higher that have both MEP ports enabled. For these meters, use the “Optical Session Timeout” field in ET55 instead. You can read the “Multiple MEP Clients” field in ET54 (ET54.0.8) to determine whether or not your meter has both MEP ports enabled.
Optical Session Hold-Off	UINT16	6	300	H	The number of seconds that the optical session is held off (disallowed) after a session timeout. This field is not applicable to OSGP meters running firmware versions 4.0 and higher that have both MEP ports enabled. For these meters, use the “Optical Session Hold-Off” field in ET55 instead. You can read the “Multiple MEP Clients” field in ET54 (ET54.0.8) to determine whether or not your meter has both MEP ports enabled.
MEP Down Reset Duration	UINT8	8	1	H	The number of seconds to assert MEP_RESETN to reset the device when the “MEP Health Timeout” interval elapses (if enabled). A value of 0 translates to 1 second. This field is applicable to OSGP meter firmware versions 3.40 and higher.

Field Name	Type	Offset	Value	VCI	Description
Deactivate HAN	BOOL(0)	9		H	Indicates whether or not the HAN (Home Area Network) controlled by the MEP client should be activated or deactivated. This should be set by the head-end software, and the MEP client can read it to control a HAN (such as an In-Home Display). 0: HAN should be activated 1: HAN should be deactivated This field is applicable only to OSGP meters running firmware versions 3.70 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
Unused	BOOL(1..7)	9			

ET52 (2100, 0x0834): MEP Transaction Request Table

This table contains transaction requests from the MEP client. Access levels for the operations within this transaction table are controlled by the access level at which the table is written to. This table is a total of 769 bytes.

Note that for OSGP meters running firmware versions 4.0 and higher, the two MEP ports share this transaction table. This means that it is possible that one MEP client could have its transaction results overwritten by the other MEP client's transaction before the first MEP client has a chance to read them. To prevent this, access to this table can be locked by a MEP client using EP61. For more information on this, see *MEP Transaction Locking* on page 25, or *Table Transaction Guidelines* on page 43.

The access key requirements for ET52 are listed below.

ET52, MEP Transaction Request Table: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MBK, MAK	X	X	X	X

The table structure for ET52 is defined below.

ET52, MEP Transaction Request Table: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Transaction Size (B)	UINT16	0		H	Total byte count (inlcuding this field).

Field Name	Type	Offset	Value	VCI	Description
Transaction Type	UINT8	2		H	0 = Requests 1 = Responses 2 = Responses – partial (not all responses could fit or premature termination due to invalid lengths). 3 = Group broadcast request. MEP servers that do not support group ID requests will ignore this transaction. 4 = Group broadcast request denied. The MEP server does not belong to any group in the request.
Transaction Number	UINT16	3		H	Used for synchronization with responses and table content verification.
*For Transaction type 3 only, the following two fields are inserted before the Record List. The length of these two fields is represented as GL = (GIC * 2) + 1. For transaction types 0..2 and 4, GL = 0.*					
Group ID Count	UINT8	5		H	Number of group IDs in the Group ID list.
Group ID List	ARRAY[ET52.5] of UINT16	6		H	List of group IDs that should process this transaction: 0xYYFF = All sub-groups of group YY should process this transaction 0xFFYY or 0xFFFF = All groups and all sub-groups should process this transaction 0x0000 is not a valid group ID and should not be used in this message
Record List:	Array[variable length] of Records				
Record 0:					
Length (L0)	UINT16	GL + 5		H	Length in bytes of the “Message” field below. A length of 0 is considered invalid, and will result in a “transaction type” of 2 (partial responses) in ET28.
Message	Array[L1] of UINT8	GL + 7		H	Request or response message. See Request and Response Message Formats for RC4 security for information on the message formats.
Record 1:					
Length (L1)	UINT16	GL + 5 + L0 +2		H	Length in bytes of Message field.

Field Name	Type	Offset	Value	VCI	Description
Message	Array[L1] of UINT8	GL + 7 + L0+2		H	Request or response message. See Request and Response Message Formats for RC4 security for information on the message formats.
…	Data for records 2…(n-1)				
Record n:					
Length (Ln)	UINT16	GL + 5 + L0+L1+ …+Ln-1 + (n*2)		H	Length in bytes of “Message” field below.
Message	Array[Ln] of UINT8	GL + 7 + L0+L1+ …+Ln-1 + (n*2)		H	Request or response message. See Request and Response Message Formats for RC4 security for information on the message formats.
Transaction Number	UINT16	B-2		H	Repeated for table content verification.

ET53 (2101, 0x0835): MEP Transaction Response Table

This table contains transaction responses for the transactions requested in ET52. It is identical in structure to ET52, and the structure not duplicated here. This table is a total of 1785 bytes.

Note that for OSGP meters running firmware versions 4.0 and higher, the two MEP ports share this transaction table. This means that it is possible that one MEP client could have its transaction results overwritten by the other MEP client’s transaction before the first MEP client has a chance to read them. To prevent this, access to this table can be locked by either MEP client using EP61. For more information on this, see *MEP Transaction Locking* on page 25 or *Table Transaction Guidelines* on page 43.

The access key requirements for ET53 are listed below.

ET53, MEP Transaction Response Table: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

ET54 (2102, 0x0836): Meter Status

This table holds status information needed by other components of the system, including status fields for the load disconnect and control relay randomization features.

The access key requirements for ET54 are listed below.

ET54, Meter Status: Read/Write Access

Read/Write		MEP Client Type

	Access Key Requirements	OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET54 is defined below.

ET54, Meter Status: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Interface Compatibility Settings	UINT16	0			
Reserved	BOOL(0…1)	0			Reserved
Multiple Load Profile Data Set Support	BOOL(2)				1 = Multiple load profile data sets are supported in ET42. 0 = Multiple load profile data sets are not supported in ET42.
Reserved	BOOL(3…5)	0			Reserved
Energy Unit Change	BOOL(6)	0	1	H	0 = The Control Node can only support energy units of 1 Wh/varh. 1 = The Control Node supports energy units other than 1 Wh/varh. OSGPCT meters running firmware versions 3.70 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher, support energy register units of 1, 10 or 100 for cumulative energy measurements that are measured in Wh and varh. This setting is stored in the “Energy Register Unit” field in ET55. Consult the description of ET55 for more detailed information.
LCD Value ID Code 5 Digit Support	BOOL(7)	0	1	H	This field is applicable to meters running firmware versions 4.0 and higher only. The LCDs for older meter versions support only 4 digits for the value ID code. 0 = The LCD supports 4 digit value ID codes. 1 = The LCD supports 5 digit ID value ID codes. Consult the Reading the Display chapter of the IEC Electric Meter User’s Guide for more information on the value ID code and the LCD.

Field Name	Type	Offset	Value	VCI	Description
Multiple MEP Clients	BOOL(8)	0	1	H	This field is applicable to meters running firmware versions 4.0 and higher only. Older meter versions (and all Control Point/OSGP Modules) support a single MEP client. 0 = Only 1 MEP client is supported. Only MEP client 1 (MEP1) can be registered and commissioned. 1 = Multiples MEP clients are supported. The “MEP Channel Count” field in ET34 (ET11.34) indicates how many MEP clients are supported.
Reserved	BOOL(9…15)	0	0	H	Reserved
Reserved		2..18			Reserved
Flags	UNIT16	19			
Load Profile Disabled	BOOL(0)	19		M	Load profiling has been disabled via the load profile opt-out feature.
Reserved	BOOL(1…15)	19			Reserved.
Reserved		20..43			Reserved
Tier Drive	UINT8	44		M	If the “Tier Drive” field in BT55 is set to 3, then this field indicates the reason for the current tier status. If this field and the “Over Power Threshold Exceeded” field are set to 0, then a time-based override is in effect.
Over Power Threshold Exceeded	BOOL(0)	44	FALSE	M	If this flag is set to 1, then the over power threshold has been exceeded for over the power threshold time.
Step Tariff In Use	BOOL(1)	44		M	If set to 1, then the step tariff feature is in use..
Reserved		45..61			Reserved.
Control Relay 1 Random Operation Pending	UINT8	62		M	Indicates whether or not a randomized open/close operation for Control Relay 1 is pending: 0 = No randomized control relay open/close operation is pending. 1 = Randomized control relay open/close operation is pending. OSGP meters running firmware versions 4.30 and higher optionally include a 2nd control relay. For

Field Name	Type	Offset	Value	VCI	Description
					these meters, the random operation pending status for the 2nd control relay is stored in the “Control Relay 1 Random Operation Pending” field.
Control Relay 1 Random Duration	UINT16	63		M	Specifies the time remaining before the next pending open/closeoperation for Control Relay 1 is to occur, in seconds. This value decreases by 1 every second. OSGP meters running firmware versions 4.30 and higher optionally include a 2nd control relay. For these meters, the random duration for the 2nd control relay is stored in the “Control Relay 1 Random Duration” field in ET54.
Control Relay 1 Random Start Duration	UINT16	65		M	Specifies the total randomization time for the current pending operation for Control Relay 1, in seconds. This is calculated at the beginning of each pending request. If the “Control Relay 1 Random Operation Pending” field is set to 0, meaning that there is currently no pending randomized control relay open/close operation, this field indicates the randomization time used for the last such operation. OSGP meters running firmware versions 4.30 and higher optionally include a 2nd control relay. For these meters, the random start duration for the 2nd control relay is stored in the “Control Relay 1 Random Start Duration” field in ET54.
Reserved		67			Reserved.
Mis-wiring Reason	UINT8	68		M	Indicates that the meter is mis-wired: 0: No mis-wiring 1: Low voltage detected on a phase. This value is not applicable to OSGP meters running firmware versions 4.0 and higher. 2: High voltage detected on a phase 4: Two or more phases in phase This field was added for firmware version 3.60.

Field Name	Type	Offset	Value	VCI	Description
ET74 Entry Count	UINT16	69	0	M	Indicates the number of entries in ET74. Entry size is controlled by ET45. This field is applicable to OSGP meter firmware versions 3.60 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
Welmec 11.2 Compliance	BOOL(0)	71	0	M	Indicates whether or not Welmec 11.2 compliance is activated: 0 = Welmec 11.2 not activated 1 = Welmec 11.2 activated This field is applicable to OSGP meters running firmware versions 3.60 and higher, and to Control Point/OSGP Modules running firmware versions 1.30 and higher.
Delta Time Synchronization Status in Current Load Profile Interval	BOOL(1..2)	71	0	M	Flags a time synchronization status in the current load profile interval: 0= No synchronization in current interval. 1= Synchronization ongoing. 2 = Synchronization done. This field is applicable to OSGP meters running firmware versions 3.60 and higher, and to Control Point/OSGP Modules running firmware versions 1.30 and higher.
Reserved	BOOL(3, 4, 5)	71	0	M	Reserved
Disconnect Push Button Close Temporarily Locked	BOOL(6)	71	0	M	This flag is applicable to OSGP meters running firmware versions 4.0 and higher only. It indicates whether the load disconnect push button is temporarily locked from closing the disconnect after it has been opened as a result of the maximum power, average power, or maximum current settings. 0 = Push button close is not locked 1 = Push button close is temporarily locked The push button may be locked temporarily at times because because at least 10 seconds must elapse between any opening or closing of the load disconnect contactor before the next open or close operation will be allowed.

Field Name	Type	Offset	Value	VCI	Description
Time Adjustment In Current Load Profile Interval	INT32	72	0	M	The cumulative amount of time adjustment that has taken place in the current load profile interval, in seconds. This field was added for firmware version 3.60.
Date Last Step Tariff Reset	DATE	76	0	M	Date of the most recent step tariff reset.
ET77 Entry Count	UINT8	79	0	M	Indicates the number of secondary display list entries in ET77. The default value for this field is 0.
ET79 Entry Count	UINT16	80	0	M	Indicates the number of entries in ET79, which contains the alternate event log.
The following fields (Unicast Key Usage Count, Broadcast Key Usage Count, and Supported Security Modes) are only applicable to OSGP meters running firmware version 3.13 and firmware versions 3.80 and higher. Other firmware versions do not support these fields. **In addition, you should be aware that on meters running firmware version 3.13, these fields only support partial table reads and writes. For more information on partial table reads and writes, see Request and Response Message Formats for RC4 security.**					
Unicast Key Usage Count	UINT32	82	0	M	Indicates the number of time unicast key has been used, regardless of success or failure.
Broadcast Key Usage Count	UINT32	86	0	M	Indicates the number of time the broadcast key has been used, regardless of success or failure.
Supported Security Modes	UINT8	90	0x05	F	Bitmap of supported OSGP Security modes for PLC communications: 0: RC4 1: Reserved 2: OSGP-AES-128-PSK
The following fields are applicable to OSGP meters running firmware versions 4.0 and higher only. Older meter versions (and all Control Point/OSGP Modules) do not support these fields.					
Module Records	ARRAY of [ET11.32] records. This array is reserved for internal use. The size of this array is determined by the value of the fields at ET11.32 and ET11.33, which are set to 6 and 7 by default.				
Reserved	UINT8	91	0	M	Reserved.
Reserved	UINT8	92	0	M	Reserved.
Reserved	UINT8	93	0	M	Reserved.
Reserved	UINT8	94	0	M	Reserved.
Reserved	UINT32	95	0	M	Reserved.
Reserved	BOOL(0)	97	0	M	Reserved.
Reserved	UINT(1..7)	97	0	M	Reserved.

Field Name	Type	Offset	Value	VCI	Description
Reserved		91+ (ET11.32* ET11.33)			Reserved.
External Tamper Input Raw ADC	UINT16	95+ (ET11.32* ET11.33)		M	This field is updated once per second. It indicates the current ADC input value for the external tamper input.
MEP TX Locked	UINT8	97+ (ET11.32* ET11.33)	0	M	A MEP client has locked the MEP transaction tables (ET52 and ET53) via EP62.
MEP TX Lock Channel	UINT8	98+ (ET11.32* ET11.33)	0	M	The MEP channel holding the lock indicated by the “MEP TX Locked” field: 0 = None 1 = MEP client 1 (MEP1) 2 = MEP client 2 (MEP2)
The following field is applicable to OSGP meters running firmware versions 4.10 and higher only. Older meter firmware versionsdo not support this field.					
Procedure Extended Failure Code	UINT32	99+ (ET11.32* ET11.33)	0	M	Procedure-specfic failure code. The upper 16 bits represent the procedure number, and the lower 16 bits represent the failure code. The procedure definitions later in this chapter note which addiitonal error codes could be stored here for each procedure. Not all procedures use this field.
The following fields are only applicable to OSGP meters running firmware versions 4.30 and higher. These fields are used to configure the meter’s optional 2nd control relay, and are not applicable to meters that only include a single control relay.					
Control Relay 2 Random Operation Pending	UINT8	103 + (ET11.32* ET11.33)		M	Indicates whether or not a randomized open/close operation for Control Relay 2 is pending: 0 = No randomized control relay open/close operation is pending. 1 = Randomized control relay open/close operation is pending.
Control Relay 2 Random Duration	UINT16	104 + (ET11.32* ET11.33)		M	Specifies the time remaining before the next pending open/closeoperation for Control Relay 2 is to occur, in seconds. This value decreases by 1 every second.

Field Name	Type	Offset	Value	VCI	Description
Control Relay 2 Random Start Duration	UINT16	106 + (ET11.32* ET11.33)		M	Specifies the total randomization time for the current pending operation for Control Relay 2, in seconds. This is calculated at the beginning of each pending request. If the “Control Relay 2 Random Operation Pending” field is set to 0, meaning that there is currently no pending randomized control relay open/close operation, this field indicates the randomization time used for the last such operation.

ET55 (2103, 0x0837): Meter Configuration

This table holds various configuration data for the meter, including fields controlling the scheduled messages that can be displayed on the meter’s LCD display and the meter’s consumption-based tariff feature.

Note that for meter firmware versions 3.82 and all meter firmware versions 4.02 and higher, and for Control Point/OSGP Module firmware versions 1.31 and higher, some of the fields used for the scheduled message feature are also used for the Free Text message feature

For Gen 3.X meters (e.g. NES 83331-XXXXX and 83332-XXXXX model meters), the ID codes that can be shown on the meter display are 4 characters. For Gen 4 meters (e.g. 8XXX4-XXXXX model meters), the ID codes are 5 characters. This means you should make the following considerations when reviewing this description of ET55:

Some of the field offsets in ET55 will vary for each client type. As a result, two sets of offset values are shown for this table: one for Gen 4 meters, and one for all other MEP clients.

Arrays for display ID codes will be either 4 or 5 bytes long, depending on the MEP client type. This is indicated by the use of the symbol “X” in the “Type”, where “X” is equivalent to 1 for Gen 4 meters, and 0 for all other MEP client types. For example, a field with type “Array [4 + X] of UINT8” would be 5 bytes for a Gen 4 meter and 4 bytes for a Gen 3.X meter.

5 bits are used to represent the decimal point state for each ID code for Gen 4 meters, and 4 bits are used for all other device types.

The default values for some of the display codes for Gen 4 meters will have an additional trailing space to account for the extra character.

The access key requirements for ET55 are listed below.

Note: *ET55 includes several fields that are used to determine when the Cover Removed alarm will be triggered. These fields are located at offsets 103…108. You should clear the Cover Removed alarm with EP03, and set the General Cover Removed Detection Threshold (ET55.103) and Power Quality Cover Removed Detection Threshold (ET55.105) fields to 0 prior to changing the values of these fields to their new values to avoid generating unnecessary alarms.*

ET55, Meter Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client

Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET55 is defined below.

ET55, Meter Configuration: Table Structure

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Reserved		0..2	0..2			Reserved
Reserved	BOOL(0)	3	3			Reserved
Consumption Based Tariff Enabled	BOOL(1)	3	3	False	H	Use this field to enable or disable the consumption-based tariff feature: 0: Consumption-based tariff disabled 1: Consumption-based tariff enabled In addition, the “Disable Consumption Based Tarrif” field (ET55.80.1 or ET55.81.1) must be set to False (0) in order for the consumption-based tariff feature to take effect. By default, it is set to False.
Reserved	BOOL(2…4)	3	3			Reserved
Step Tariff Enabled	BOOL(5)	3	3	False	H	Use this field to enable or disable the step tariff feature: 0: Step tariff disabled 1: Step tariff enabled In addition, the “Disable Step Tarrif” field (ET55.80.3 or ET55.81.3) must be set to False (0) in order for the step tariff feature to take effect. By default, it is set to False.
Delta Time Adjustment Increment	UINT8	4	1		H	Sets the number of seconds that the meter clock will be changed per minute when a delta clock adjustment is initiated with EP16. The range is 0…16.
Reserved		5..13	4..13			Reserved

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Signal Strength Threshold	UINT8	14	14	-84dB	H	Establishes the signal strength threshold that indicates that PLC activity has been detected. A value of -84dB means that all PLC messages should be accepted. The CPM 6000 Control Point Module uses this threshold to determine when status indicator pin 7 should indicate that PLC activity has been detected.
PLC Active Timeout	UINT16	15	15	60	H	The minutes of PLC inactivity that must elapse before clearing the meter's PLC icon and stopping responses to ATM "in communication with DC" queries.
Reserved		17.. 51	17.. 51			Reserved
PLC Failed Authentication Lockout Threshold	UINT8	20	20	0	H	Sets the number of consecutive authentication failures that will be allowed before PLC communications are locked out. The OSGP Alliance recommends setting this to a minimum of 30 consecutive attempts. The duration for which PLC communications will be locked out is determined by the value of the "PLC Failed Authentication Lockout Duration" field. This setting is applicable to OSGP meters running firmware versions 4.30 and higher.
PLC Failed Authentication Lockout Duration	UINT8	21	21	0	H	Sets the duration (in minutes) for which PLC communications will be locked out after the "PLC Failed Authentication Lockout Threshold" has been exceeded. This setting is applicable to OSGP meters running firmware versions 4.30 and higher.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Optical Failed Authentication Lockout Threshold	UINT8	22	22	0	H	Sets the number of consecutive authentication failures that will be allowed before optical communications are locked out. The duration for which optical communications will be locked out is determined by the value of the “Optical Failed Authentication Lockout Duration” field. This setting is applicable to OSGP meters running firmware versions 4.30 and higher.
Optical Failed Authentication Lockout Duration	UINT8	23	23	0	H	Sets the duration (in minutes) for which optical communications will be locked out after the “Optical Failed Authentication Lockout Threshold” has been exceeded. This setting is applicable to OSGP meters running firmware versions 4.30 and higher.
Reserved		24…51	24…51			
Note that for meter firmware versions 3.82 and all meter firmware versions 4.02 and higher, and for Control Point/OSGP Module firmware versions 1.31 and higher, some of the Scheduled LCD Message fields below are also used for the Free Text message feature						
Scheduled LCD Message ID (FTa Message OBIS Code)	Array [4 + X] of UINT8	52	52		H	Specify the message that will be displayed in the left side of the meter’s LCD display at the time designated by the “Scheduled LCD Message Display Start Time” field. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on. Note that for OSGP meters or Control Point/OSGP Modules that have implemented the Free Text feature, this field will used to store the OBIS code of the most recently received FTa message.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Scheduled LCD Message ID Decimal Point State (FTa Message OBIS Code Decimal Point)	UINT8	56	57		H	4 bits that indicate state of the decimal point with the associated ID character. Bit 0 indicates the state of the decimal point for the right-most character, and bit 3 is for the left-most character. A value of 1 indicates that the decimal point for that character should be on. A value of 0 indicates it should be off. Note that for OSGP meters that have implemented the Free Text feature, this field will used to indicate where the decimal point within the OBIS code of the most recently received FTa message should be placed.
Scheduled LCD Message Text (Remaining FTa Message Characters)	Array [8] of UINT8	57	58		M	Specify an 8-character message. This text will be displayed on the right side of the meter's LCD display at the time designated by the "Scheduled LCD Message Display Start Time" field. Note that for OSGP meters that have implemented the Free Text feature, this field will used to store the fixed and remaining characters portions of the most recently received FTa message.
Scheduled LCD Message Display Start Time	LTIME_DATE	65	66	1	M	The date/time (UTC) to start and stop displaying the message ID and text.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Scheduled LCD Message Display End Time	LTIME_DATE	71	72	1	M	Note that for OSGP meters or Control Point/OSGP Modules that have implemented the Free Text feature, this indicates the start and end date/times for the most recently received FTa message. If the end date/time is earlier than the start date/time for an FTa message, this message will not be displayed, and the previously sent FTa message will be deactivated. Scheduled LCD and FTa messages can be manually overridden via the display push button before the end time is reached, depending on how the “Scheduled LCD and FTa Message Override Control" flags later in ET55 are set. There are several other factors that impact how long an FTa message will be displayed.
Scheduled LCD and FTa Message Override Control	These flags determine how the user can manage the scheduled LCD/FTa messages defined earlier in ET55 with the display push button.					

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Disable Message Override	BOOL(0)	77	78		H	Specify whether the scheduled LCD or FTa message can be overridden and removed from the display with the display push button: 0 = Enable message override 1 = Disable message override If this flag is enabled, the user can press the display push button when a scheduled LCD message or FTa message is shown on the display to acknowledge receipt of the message, and remove it from the display. The message may then be included as part of the meter's primary scrolling display list, depending on the value of the “Disable Scheduled LCD Message In Scrolling List” flag.
Message Overridden	BOOL(1)	77	78		M,H	This flag is set if the message is overridden via the meter display push button. You can also set this flag if you want to cancel the schedule, or stop displaying the message before the scheduled end time. 0 = Message still active and not overriden 1 = Message inactive and overriden Note that the host meter connected to a Control Point/OSGP Module can use this bit to determine whether the FTa message data presently stored in ET55 is from a new or previously read FTa message

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Disable Scheduled LCD Message In Scrolling List	BOOL(2)	77	78		H	This flag is applicable when the "Disable Message Override" flag is set to 0. In that case, the user can press the display push button when a scheduled LCD message or FTa message is shown on the display to acknowledge receipt of the message, and remove it from the display. The message may then be moved to the primary scrolling display list, depending on how this flag is set: 0: Include message in the scrolling display list 1: Do not include message in the scrolling display list
Phase Loss Threshold Seconds	UINT16	78	79	10	H	The interval, in seconds, that a phase loss condition must last for before a phase loss event will be generated.
Reserved	BOOL(0)	80	81	TRUE		Reserved
Disable Consumption Based Tariff	BOOL(1)	80	81	FALSE		Enable or disable the consumption-based tariff feature: 0: Enables the consumption-based tariff feature 1: Disables the consumption-based tariff feature The consumption-based tariff feature will only be enabled if this bit is set to False (0) and the "Consumption Based Tariff Enabled" field (ET55.3.1) is set to True (1).
Reserved	BOOL(2)	80	81	FALSE		Reserved
Disable Step Tariff	BOOL(3)	80	81	FALSE		Enable or disable the step tariff feature: 0: Enables step tariff control 1: Disables step tariff control The step tariff feature will only be enabled if this bit is set to False (0), and the "Step Tariff Enabled" field (ET55.3.5) is set to True (1).

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Over Power Threshold	UINT32	81	82	0	H	Enter a value in Watts. This establishes the threshold the meter will use to determine when it should switch to the consumption-based tariff. If the power being delivered to the meter exceeds this threshold for the duration specified by the "Over Power Time Threshold" field, the consumption-based tariff will take effect. You can specify which power value will be compared to this threshold by setting the "Over Power Source" field.
Over Power Time Threshold	UIN16	85	86	0	H	Enter a value in seconds to establish how long the "Over Power Threshold" must be exceeded for the meter to switch to the consumption-based tariff.
Over Power Threshold Tier	UINT8	87	88	0	H	Specify which tariff should be used as the consumption-based tariff. Note that if you are using a CT meter and the consumption based tariff is in effect, pre-ratio power values will be used.
Over Power Source	UINT8	88	89	0	H	Use this field to select which power value will be compared to the "Over Power Threshold" field to determine when the consumption-based tariff should take effect: 0 = Forward + reverse power 1 = Forward power 2 = Forward – reverse power Note that the meter uses the Ferraris method for instantaneous power calculations, so forward power is equivalent to forward – reverse power
Reserved		89…92	90..93			Reserved.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Transformer Secondary Rated Current	UINT8	93	94	1	H	The current rating on the secondary side of the external current transformer
Clock Error Calendar ID	UINT32	94	95	0	H	Specify the ID that will be displayed on the meter LCD when the default tariff for a clock error is in effect. This will be displayed in place of the TOU calendar ID for the regularly scheduled tariff as long as the clock error is in effect (assuming that item has been added to the meter's scrolling display list). You can read the ID of the TOU calendar that is currently active from the "Active Calendar ID" field in ET23 (ET23.95).
Over Power Calendar ID	UINT32	98	99	0	H	Specify the ID that is to be displayed on the meter LCD when the meter's consumption-based tariff is in effect. This will be displayed in place of the TOU calendar ID for the regularly scheduled tariff as long as the consumption-based tariff is in effect (assuming that item has been added to the meter's scrolling display list). You can read the ID of the TOU calendar that is currently active from the "Active Calendar ID" field in ET23 (ET23.95).
Reserved		102	103			Reserved

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
General Cover Removed Detection Threshold (General CRDT)	UINT16	103	104	10	H	For meters running firmware versions 3.X and firmware versions 4.10 and higher, this field establishes the duration, in seconds, for which a lower terminal cover tamper condition must exist before a Cover Removed alarm will be recorded. For meters running firmware versions 4.0X, this field establishes the duration, in seconds, for which an upper meter cover tamper condition must exist before a Cover Removed alarm will be recorded. A value of 0 disables this field for all meter firmware versions. .
Power Quality Cover Cover Removed Detection Threshold (Power Quality CRDT)	UINT16	105	106	10	H	This field is not applicable to Gen 4 OSGP meters (i.e. OSGP meters running firmware versions 4.0 and higher). For Gen 3.X OSGP meters running firmware versions 3.40 and higher, this field sets the duration, in seconds, that any of the events selected in the “Cover Tamper Quality Events Mask” field must last before they will be used to qualify the Cover Removed alarm. A value of 0 disables this field.
Cover Tamper Power Quality Events Mask:	UINT16	107	108	0	H	The “Cover Tamper Power Quality Events Mask” fields are not applicable to Gen 4 OSGP meters (i.e. OSGP meters running firmware versions 4.0 and higher. For Gen 3.X OSGP meters running firmware versions 3.40 and higher, any one or all of the following power quality events can be configured to qualify the Cover Removed event

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Phase Loss	BOOL(0)			0	H	A coincident new unqualified phase loss event.
Current on Missing Or Uniused Phase	BOOL(1)			0	H	A coincident new unqualified current on no voltage event.
Subsequent Power Outage	BOOL(2)			0	H	A subsequent power outage.
Preceding or Coincident Power Outage	BOOL(3)			0	H	A preceding or coincident power outage.
Reserved	BOOL(4..15)					Reserved.
Primary Load Profile Index	UINT8	109	110	0	H	This field establishes the primary load profile data set: 0: Data Set 1 1: Data Set 2 2: Data Set 3 3: Data Set 4 This field is applicable to OSGP meter firmware versions 3.50 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
High Frequency Noise Detection Threshold	INT16	110	111	0	H	Under the influence of high frequency noise, the direct current offset of the hight current measurement channel a meter may shift, and cause meter to be inaccurate. This is conveyed via the event log's High Frequency Noise Detection field. This field estsablishes the threshold that must be reached in order for the event to be logged. Note that the condition must also last for the duration specified by the "High Frequency Noise Detection Time Threshold" field in order for the event to be logged. This event can be disabled by setting the threshold to a value that is larger than 512. This field is applicable to OSGP meter firmware versions 3.50 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
High Frequency Noise Detection Time Threshold	UINT16	112	113	0	H	This field establishes the duration, in seconds, that a high frequency noise condition must last in order for it to be logged in the event log. This field is applicable to OSGP meter firmware versions 3.50 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
Earth Fault Detection Current Threshold	UINT16	114	115		H	For Delta meters running firmware versions 4.0 and higher, this represents the current (in mA) at which an earth fault detection condition alarm will be recorded. You can determine whether or not the meter is configured for earth fault detection by reading the value of the "Earth Fault" field in ET29 (ET29.33.7).

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						This field is reserved for other devices.
Reserved	UINT8	116	117		H	Reserved
Earth Fault Time Threshold	UINT16	117	118		H	For Delta meters running firmware versions 4.0 and higher, this field sets the duration for which an earth fault condition must last before it will be recorded as an alarm. You can determine whether or not the meter is configured for earth fault detection by reading the value of the “Earth Fault” field in ET29 (ET29.33.7). This field is reserved for other devices.
Broken MV Conductor Detection Time Threshold	UINT16	119	120	600	M	This field establishes the duration that a broken MV conductor condition must exist for before the Unbalanced Voltage Detected alarm will be triggered. For more information on this field, consult the description of the “Voltage Fluctuation Limit” field below. This field is applicable to OSGP meters running firmware versions 3.60 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
Zero Fault Detection Time Threshold	UINT16	121	122	10	M	Enter a value in seconds to set the duration that a zero fault condition must last for in order for the Unbalanced Voltage Condition alarm to be triggered. Set this field to 0 to disable zero fault detection. This field is applicable to OSGP meters running firmware versions 3.60 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Normal Voltage Upper Limit	UINT8	123	124	115	M	The fields are used to determine when a zero fault condition has occurred. When all three phases are active and no phase loss has been detected, the meter will monitor the voltage RMS value for each phase. If the following conditions are met, the Unbalanced Voltage Detected alarm will be triggered to indicate the zero fault condition: • The voltage on one or two phases is 115% or higher (by default) of the rated voltage. This percentage is established by the "Normal Voltage Upper Limit Field." • The voltage for the remaining phases is within 60%-85% (by default) of the rated voltage. The percentages for these fields are established by the Normal Voltage Lower Limit and Low Voltage Higher Limit fields.
Normal Voltage Lower Limit	UINT8	124	125	85	M	
Low Voltage Higher Limit	UINT8	125	126	60	M	
Voltage Fluctuation Limit	UINT8	126	127	5	M	Enter a value as a percentage to establish the meter's voltage fluctuation limit. When all three phases are active and no phase loss has been detected, the meter will monitor the voltage RMS value for each phase. If all the following conditions are met, the Unbalanced Voltage Detected alarm will be triggered to indicate to broken medium voltage conductor: • The voltage on one of the three phases is within 85%-115% of the rated voltage. • The voltage on the remaining two phases are half (+/- 5%) of

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						the voltage value for the phase mentioned above, • The fluctuation levels of the RMS voltage on all phases are within the value configured as the voltage fluctuation limit [-5%, 5% by default] of each other. Note that this figure (5%) can be re-configured. Note that these conditions must last for the interval configured as the broken medium voltage conductor threshold in order for the alarm to be triggered.
The following fields are only applicable to OSGP meters running firmware versions 3.70 and higher, and to Control Point/OSGP Modules running firmware versions 1.20 and higher.						
Prepay Tier 5…8 Rates	Array [4] of UINT32	128	129	0	H	The conversion rates for tiers 5 to 8 (in Wh per kWh consumed) by which prepay credit will be deducted while each tier is active. The maximum value 1,000,000. Conversion rates for tiers 1-4 are located in ET05 (ET05.8…ET05.23). Note that meters running firmware version 3.70 and higher, and Control Point/OSGP Modules running firmware version 1.20 and higher optionally support up to 8 tiers. All other devices support 4 tiers.
Reverse Energy Alarm Current Threshold	UINT16	144	145	1000	F	The current threshold (in mA) that the meter uses in conjunction with the rated voltage to calculate the meter's active power threshold. This is compared to the measured reverse active power. The reverse energy icon on the LCD will flash if the measured reverse active power is greater than the active power threshold. In addition, if any phase is determined to have reverse energy, the associated phase icon on the meter display will flash.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						Note that for meters running firmware versions 4.0 and higher, the threshold to use will be calculated based on this value and the value of the “Most Significant Byte For Reverse Energy Alarm Current Threshold” field later in ET55.
Step Tariff Thresholds	Array [BT20.7-1] of UINT32	146	147	0	H	An array of values establishing the step threshold for each step tariff configured into the meter. A maximum of 8 step tariffs can be configured. A value of 0 indicates that a tier is not being used. 0 = This tier is not used. If non-zero values are assigned to more than the configured number of tiers, then the extra tiers will be ignored. Note that these thresholds are pre-multiplied by the value specified as the “Energy Register Unit” field in ET55, so they should be scaled accordingly. For example, if you want a threshold of 100 Wh and the “Energy Register Unit” field is set to 10, enter a value of 10 here.
Step Tariff Source	UINT8	146 + 4 * (BT20.7-1) [=A]	147 + 4 * (BT20.7-1) [=A]	0	H	The energy measurement that the step tariff thresholds will be compared to: 0 = Forward Active Wh L1L2L3 1 = Rev Active Wh L1L2L3 2 = Fwd + Rev Active Wh L1L2L3 3 = Fwd - Rev Active Wh L1L2L3
For the remaining fields in ET55, the offsets are designated using value A. The value of A varies depending on the size of the “Step Tariff Thresholds array earlier in ET55. It can be calculated as follows: • Meter 3.X and Control Point/OSGP Modules: 146 + 4 * (BT20.7-1) • Meter 4.X: 147+ 4 * (BT20.7-1)						
Step Tariff TOU ID	UINT32	A + 1	A + 1	0	H	The TOU ID used when the step tariff feature is enabled.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Step Tariff Reset Day	UINT8	A + 5	A + 5	1	H	The day of the month (1-28) to reset the step tariff feature.
Step Tariff Reset Hour	UINT8	A + 6	A + 6	0	H	The hour (0-23) to reset the step tariff feature (local time).
Step Tariff Reset Minute	UINT8	A + 7	A + 7	0	H	The minute (0-59) to reset the step tariff feature (local time).
Step Tariff Reset Second	UINT8	A + 8	A + 8	0	H	The second (0-59) to reset the step tariff feature (local time).
Reserved	UINT8	A + 9	A + 9	0	H	Reserved
Number of Mains Cycles Used For Consecutive RMS Voltage Calculation	UINT16	A + 10	A + 10	15		This field sets the number of mains cycles used to calculate the consecutive RMS voltage. The range of this field is 10-800. For example, if the default setting of 15 cycles is used in a 60Hz system, the RMS voltage value will be updated every 0.25 seconds. In a 60Hz system, the RMS voltage value is updated every 0.3 seconds.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Number of Seconds For Average RMS Voltage Calculations	UINT16	A + 12	A + 12	600		Enter a value in seconds. The maximum value for this field varies depending on the number of mains cycle chosen for RMS calcultions (above). For example, if the defult setting of 15 cycle is used in a 60Hz system, the RMS voltage value is updated every 0.25 seconds. In this case, this field cannot be set to a value greater than 1,000 seconds to avoid overflow. This field cannot be set to 0. The intervel for averge voltage calculation is synced to the hour. Therefore, there are some restrictions on what values can be used. If a value less than 60 seconds is desired, then the value must be a divisor of 60 (e.g. 2, 3, 4, 5, 6, 10, etc). If a value greater than 60 seconds is entered, it must be a full minute. Values that create partial minutes such as 1.5 minutes are not supported.The minunte also has to be a divisor 60. If a value greater than 1 hour is entered, it must be a full hour. Values that create partial hours are not supported. The hour value must be a divisor of 24 (e.g. 2, 4, 6, etc).
Number of Average RMS Voltage Used for nlc and nlp calculation	UINT16	A + 14	A + 14	1008		The default value of 1008 provides for approximately 7 days worth of average voltage readings if the average voltage is calculated every 10 minutes. This field cannot be set to 0.
Delta ADSUP	UINT32	A + 16	A + 16	0		The upper limit of Proper Voltage Range, in mV. Note that if these delta values are set to 0, it means all voltage fluctuation will be recorded,

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Delta ADINF	UINT32	A + 20	A + 20	0		The lower limit of Proper Voltage Range, in mV.
Delta PRSUP	UINT32	A + 24	A + 24	0		Enter a value in mV. The sum of the values of this field and the “Delta ADSUP” field sets the upper limit of Medium Voltage Range.
Delta PRINF	UINT32	A + 28	A + 28	0		Enter a value in mV. The sum of the values of this field and the “Delta ADINF” field sets the lower limit of Medium Voltage Range
Momentary Voltage Disturbance (MVD) Detection Time Threshold Lower Limit	UINT16	A + 32	A + 32	1		The number of mains cycle required for MVD detection.
MVD Detection Time Threshold Upper Limit	UINT16	A + 34	A + 34	180		The number of mains cycle for MVD detection. The default is 180 cycles, which is 3s for 60Hz system.
MVD Interruption Sag Low Vrms Threshold	UINT8	A + 36	A + 36	10		The percentage of the rated voltage that constitutes the low threshold for an MVD sag.
MVD Sag High Vrms Threshold	UINT8	A + 37	A + 37	90		The percentage of the rated voltage that constitutes the high threshold for an MVD sag.
MVD Swell Low Vrms Threshold	UINT8	A + 38	A + 38	110		The percentage of the rated voltage that constitutes the low threshold for an MVD swell.
Energy Register Unit	UINT8	A + 39	A + 39			CT meters running firmware versions 3.70 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher can be configured so that cumulative energy measurements measured in varh and Wh can be recorded into memory in units of 1, 10 or 100. All other devices use units of 1. For example, if units of 10 are selected, a load profile value of

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						10 would actually represent 100 varh (or 100 Wh). Or if units of 100 are selected, a load profile value of 10 would actually represent 1000 varh (or 1000 Wh). This may be useful if you are using an OSGP CT meter with a high ratio, to prevent accumulator rollover from occurring. In addition, this field must be set during meter manufacturing. It cannot be changed in the field. The supported values are: 1 = 1 Wh/varh (default) 10 = 10Wh/varh 100= 100 Wh/varh Other values are not supported. Note that the LCD for an OSGP meter is not affected by this setting. Cumulative energy values shown on the LCD will always be shown in units of kWh and kVARh, as described in the Energy Measurements and Calculations section of the IEC Electric Meter User's Guide.
The following fields are applicable to OSGP meters running firmware versions 4.0 and higher only.						
Flags For MEP	UINT8	N/A	A + 40			
House Icon Control	BOOL(0..1)	N/A	A + 40	0		This field indicates which MEP client will control the house icon: 0 = Neither MEP client 1 = MEP client 1 (MEP1) 2 = MEP client 2 (MEP2)
M-Bus Discovery Auto-Confirmation	BOOL(2)	N/A	A+40	0		Indicates whether or not M-Bus discovery auto-confirmation is enabled. This bit is applicable to OSGP meters running firmware versions 4.30 and higher only.
Reserved	BOOL(3…7)	N/A	A + 40			Reserved.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Optical Configuration Settings	UINT8	N/A	A + 41			
Enable Optical D.O.S. Timer	BOOL(0)	N/A	A + 41	FALSE	H	If set to True, the MEP server will enforce Optical Denial-of-service (D.O.S.) timers. If False, the meter will not enforce D.O.S. timers.
Disable Optical Port	BOOL(1)	N/A	A + 41	FALSE	H	Disable optical communication.
Reserved	BOOL(2…7)	N/A	A + 41			Reserved.
Optical Session Timeout	UINT16	N/A	A + 42	600	H	The number of seconds before an optical session is terminated for Denial of Service protection.
Optical Session Hold-Off	UINT16	N/A	A + 44	300	H	The number of seconds that the optical session is held off (disallowed) after a session timeout.
External Tamper Status	UINT8	N/A	A+46			
External Tamper 1 In Use	BOOL(0)	N/A	A+46	1	H	0 = External tamper 1 channel inactive 1 = External tamper 1 channel active
External Tamper 2 In Use	BOOL(1)	N/A	A+46	1	H	0 = External tamper 2 channel inactive 1 = External tamper 2 channel active

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Tamper ADC	ARRAY[3] of INT16	N/A	A + 47		H	This array includes 3 detection levels for ADC channels, so that the meter can correctly detect the connection state of external tamper input devices. Element 0 = Vtamper12 ADC value Element 1 = Vtamper2 ADC value Element 2 = Vtamper1 ADC value These fields will be compared to the actual ADC value measured by the meter (VADC), and used to determine the connection states as follows: If VADC < Vtamper12, then both external tamper inputs are connected to the meter. If Vtamper12 < VADC < Vtamper2, then only external tamper input device 2 is connected to the meter. If Vtamper2 < VADC < Vtamper1, then external tamper input device 1 is connected to the meter. If Vtamper1 < VADC, then no external tamper input devices are connected.
External Tamper Duration	UINT8	N/A	A+53	5	H	The duration (in seconds) for which an external tamper condition must exist before an alarm will be recorded. If set to 0, then external tamper alarms will be disabled.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
General Cover Removed Detection Threshold (General CRDT)	UINT16	N/A	A+54	10	H	For meters running firmware version 4,0X, this field establishes the duration, in seconds, for which a lower terminal cover tamper condition must exist before a Cover Removed alarm will be recorded. For meters running firmware versions 4.10 and higher, this field establishes duration for which an upper meter cover tamper condition must exist before the alarm will be recorded.
Magnetic Tamper Duration	UINT16	N/A	A+56	10	H	The duration (in seconds) for which a magnetic tamper condition must exist before an alarm will be recorded. If set to 0, then terminal tamper alarms will be disabled.
VA Power and Engery Calculation Method	UINT8	N/A	A+58	0	H	0 = VA is calculated using Vrms*Irms 1 = VA is calculated using sqrt(w*w = var*var)
Locked Flags	UINT16	N/A	A+59			
BEV Load Profile Lock Mode	BOOL(0)	N/A	A+59	0	H	Set this field to True (1) to enable BEV load profile mode. This designates the primary load profile data set as the billing data set, and blocks any further changes to that data set. When this is set to True (1), the other load profile data sets will be prohibited from containing source IDs for any registers that are designated as billing registers by BEV. The restricted registers are as follows, for totals and all tiers: forward and reverse active energy, imported and exported reactive energy, Fwd+Rev and Fwd-Rev active energy, the four quadrants of reactive energy, the four quadrants of apparent energy, and present and previous

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						demand. The source IDs for these are as follows. Standard Source IDs: Totals: 0 – 3, 6, 7 Tier 0: 29 – 32, 35, 36 Tier 1: 40 – 43, 46, 47 Tier 2: 51 – 54, 57, 58 Tier 3: 62 – 65, 68, 69 Demand: 88 – 103 Reactive Quadrants: 108 – 111 Extended Source IDs Any Type 3 extended ID with Sub-types 0 – 4, 7, 8, and 12.
Most Significant Byte For Reverse Energy Alarm Current Threshold	UINT8	N/A	A+61	0	H	For meters running firmware versions 4.0 and higher, this field is used in conjunction with the "Reverse Energy Alarm Current Threshold" field (ET54.138) to determine the current threshold (in mA) that the meter uses in conjunction with the rated voltage to calculate the meter's active power threshold. This is compared with the measured reverse active power. The reverse energy icon on the LCD will flash if the measured reverse active power is greater than the active power threshold. In addition, if any phase is determined to have reverse energy, the associated phase icon on the meter display will flash. This field establishes the Most Significant Byte (MSB) to use when calculating the threshold. If you want to use the default value of 1,000 mA as the threshold, you should leave this field set to 0.

ET57 (2105, 0x0839): M-Bus Data Type Table

This table contains the configuration of each M-Bus/MEP Data Type defined on the MEP server.

Each Data Type entry contains a 3 byte DRH (Data Record Header) that the Data Type maps to. If 3 bytes isn't sufficient, then subsequent entries can be set as "extension" entries. In this case, the 3 bytes of DRH in the extension are concatenated onto those from the previous entry(s).

The maximum number of M-Bus/MEP Data Types that can be created is stored in the "ET57 Entry Count" field in ET11 "MFG Dimension Table."

The access key requirements for ET57 are listed below.

ET57, M-Bus Data Type Table: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET57 is defined below.

ET57, M-Bus Data Type Table: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Array[ET11.25] of MdtEntry				H	MDT Entry Array
MdtEntry:					
Entry Type	UINT(0..1)	0	0		Entry Type: 0: Empty 1: M-Bus Base entry 2: MEP Base entry 3: Extension of previous entry
MDT	UINT(2..6)	0			M-Bus Data Type (ignored for extensions)
Special	UINT(7)	0		H	Entry has "special" meaning for the load profile log to indicate something different about this MDT entry compared to others with the same DRH. For example, it may indicate whether or not the M-Bus data represented by this DRH is temperature-compensated. This field is ignored for extensions.
DRH	Array[3] of UINT8	1		H	This field contains the 3-byte DRH. Note that when the "Entry Type" field is "MEP Base Entry," the Data Record Header field will be interpreted as follows: Byte 0: Offset into message Byte 1: Length to compare Byte 2: Command byte(s) to compare (possibly continued into next block, depending on length).

ET58(2106, 0x083A): M-Bus/MEP Status Extension

This table holds an array of M-Bus/MEP status by index.

The access key requirements for ET58 are listed below.

ET58, M-Bus/MEP Status Extension: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET58 is defined below.

ET58, M-Bus/MEP Status Extension: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Device Status	ARRAY [ET11.0] of MEPStatus				Status for each M-Bus device, or MEP client.
Control Status	UINT8	0		M	The latest status value. The type of data collected here is defined by the “Control MDT” field in ET34
Reserved	ARRAY[19] of UINT8				Reserved

ET59 (2107, 0x083B): MEP Procedure Response

The MEP server can be configured so that responses to procedures are written into ET59. For meters running firmware versions 4.0 and higher, this is applicable only to MEP client 1 (MEP1). MEP client 2 (MEP2) will always use ET85 for procedure responses. For more information on these settings, see *Calling Procedures* on page 51.

The access key requirements for ET59 are listed below.

ET59, MEP Procedure Response: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET59 is defined below.

ET59, MEP Procedure Response: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Procedure Number	UINT(0..11)	0		M	Procedure last executed in the MEP server.

Field Name	Type	Offset	Value	VCI	Description
Filler	FILL(12..15)	0			
Procedure Sequence Number (PSN)	UINT8	2		M	Procedure sequence number (from BT07) of procedure last executed. Use this field to check that the result posted corresponds to the request you submitted, as opposed to a request from the optical or power-line user.
Result Code	UINT8	3		M	The following are ANSI-defined result codes. Certain procedures may use other codes not defined by ANSI. These are specified within the appropriate procedure as they have procedure-specific meaning. 0 = Procedure completed. 1 = Procedure accepted but not fully completed. 2 = Invalid parameter for known procedure, procedure ignored. 3 = Procedure conflicts with current device setup, procedure ignored. 4 = Timing constraint, procedure ignored. 5 = No authorization for requested procedure, procedure ignored. 6 =Unrecognized procedure, procedure ignored.

ET61 (2109, 0x083D): Time-Based Relay Control Calendar

This table contains the time-based relay control calendar. There are a maximum of ten switches per day, and the meaning of each block of ten depends on the current mode for the time-based relay control calendar, which is configured in ET05.

The access key requirements for ET61 are listed below.

ET61, Time-Based Relay Control: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET62 is defined below.

ET61, Time-Based Relay Control: Table Structure

Field Name	Type	Offset	Default Value	VCI	Description
Relay Control	ARRAY[2] of Relay Switches. The first entry is applicable to Control Relay 1. The second entry is applicable to Control Relay 2.				
Relay Switches	ARRAY[ET11.26] of RelayControlRcd. The size of each RelayControlRcd entry is determined by the “Time-based Relay Switches” field in ET11. This defaults to 80. Each entry defines a time that the status of the control entry should switch. For each entry, specify the hour and minute that the control relay shold switch, and the state it should switch to.				
RelayControlRcd:					
Relay State	UINT(0)	0		H	Relay state to switch to at this time: 0 = Open 1 = Closed
Filler	FILL(1..4)	0			Unused.
Minute	UINT(5..10)	0		H	Start minute of new state.
Hour	UINT(11..15)	0		H	Start hour of new state.

ET62 (2110, 0x083E): Load Profile Display Configuration

This table holds configuration parameters affecting the load profile display mode, including how the data contained in each load profile entry will be formatted for display and what ID codes will be used while the meter is in load profile display mode. Load profile display mode is only applicable to OSGP meters. Note that for OSGP meters running firmware version 3.50 and higher, only data for the load profile data set configured as the primary load profile data set will be shown on the meter display.

For meters running firmware versions 3.70 and higher (and for Control Point/OSGP Modules running firmware versions 1.20 and higher), this table also includes configuration parameters affecting the meter’s power outage log display.

For Control Point/OSGP Modules and for Gen 3.X meters (e.g. 83331-XXXXX and 83332-XXXXX model meters), the ID codes that can be shown on the meter display are 4 characters. For Gen 4 meters (e.g. 8XXX4-XXXXX model meters), the ID codes are 5 characters. This means you should make the following considerations when reviewing this description of ET62:

Some of the field offsets in ET62 will vary for each client type. As a result, two sets of offset values are shown for this table: one for Gen 4 meters, and one for all other MEP clients.

Arrays for display ID codes will be either 4 or 5 bytes long, depending on the MEP client type. This is indicated by the use of the symbol “X” in the “Type”, where “X” is equivalent to 1 for Gen 4 meters, and 0 for all other MEP client types. For example, a field with type “Array [4 + X] of UINT8” would be 5 bytes for a Gen 4 meter and 4 bytes for a Gen 3.X meter.

5 bits are used to represent the decimal point state for each ID code for Gen 4 meters, and 4 bits are used for all other device types.

The default values for some of the display codes for Gen 4 meters will have an additional trailing space to account for the extra character. For example, the default value for the “Load Profile Date ID Code” is “DATE “ for a Gen 4 meter, and “DATE” for all other devices.

The access key requirements for ET62 are listed below.

ET62, Load Profile Display Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET62 is defined below.

ET62, Load Profile Display Configuration: Table Structure

Field Name	Type	Offset		Default Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Flags	UINT8					
Display Local Time	BOOL(0)	0		FALSE	H	0: Display load profile data in UTC time. 1: Display load profile data in local time.
Use All Channel ID Characters	BOOL(1)	0		FALSE	H	This flag determines how the channel ID for each load profile entry will be displayed: 0: Use first 2 characterss of extended status ID code, followed by the channel number (1 - 16). 1: Use all 4 characters of extended status ID code (no channel number).
Disable Load Profile Display	BOOL(2)	0		FALSE	H	0: Allow load profile display. 1: Disable load profile display. Note that this flag is ignored for meters and Conrol Point/OSGP Modules with Welmec compliance enabled, as those devices must have load profile display enabled. You can check if Welmec compliance is enabled on your meter or Control Point/OSGP Module by reading the “Welmec

Field Name	Type	Offset		Default Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
						11.2 Compliance" field in ET54 (ET54.71.0).
Load Profile List ID Code	Array [4 + X] of UINT8	1		"P01"	H	The ID that will be shown on the LCD when the meter initally enters load profile display mode. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Load Profile List ID Decimal Point State	UINT8	5	6	4	H	4 (or 5) bits that indicate the state of the decimal point shown on the meter display with associated ID character of the Load Profile List ID Code: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.
Load Profile Date ID Code	Array [4 + X] of UINT8	6	7	"DATE"	H	The ID that will be shown when the date/times indicating the start of each load profile interval are displayed on the LCD. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Load Profile Date ID DP State	UINT8	10	12		H	4 (or 5) bits that indicate the state of the decimal point shown on the meter display with associated ID character of the Load Profile Date ID Code: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.

Field Name	Type	Offset		Default Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Interval Time ID Code	Array [4 + X] of UINT8	11	13	”TIME”	H	The ID that will be shown when the load profile interval time is displayed on the LCD. Note that the interval time can be included as part of the normal scrolling display mode, and is not shown while in load profile display mode. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Interval Time ID DP State	UINT8	15	18		H	4 (or 5) bits that indicate the state of the decimal point shown on the meter display with associated ID character of the Load Profile Interval Time ID Code: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.
Extended Status ID Code	Array [4 + X] of UINT8	16	19	”STAT”	H	The ID that will be shown when load profile extended status data is being shown on the LCD. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Extended Status ID DP State	UINT8	20	24		H	4 (or 5) bits that indicate the state of the decimal point shown on the meter display with associated ID character of the Load Profile Extended Status ID Code: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.

Field Name	Type	Offset		Default Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Code Word:	Array[BT 60.11] of 6-byte records:	21	25	An array containing an entry for each load profile channel. Each entry defines the ID that will be displayed for that load profile channel when data for that channel is shown on the LCD in load profile display mode. The number of entries in this array is determined by the value of the “Number of Channels Set 1” field in BT60.		
Channel ID Format:			.			
Channel ID Code	Array [4 + X] of UINT8	21	25	CH01” – “CH16”	H	Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Channel ID DP State	UINT8	25	30		H	4 (or 5) bits that indicate the state of the decimal point shown on the meter display with associated ID character of the Channel ID Code: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.
Data Format:	UINT8	26	31			
Fields After DP	UINT(0..2)	26	31		H	Number of fields after the decimal point that are to be shown on the LCD display. Range is 0..3, and the sum of this field and the “Fields Before DP” cannot be greater than 8.
Fields Before DP	UINT(3..6)	26	31		H	Number of fields before the decimal point to be shown on the display per source. Range is 1..8, and the sum of this field and the “Fields After DP” cannot be greater than 8.
Zero Suppression	BOOL(7)	26	31		H	Set to True to hide leading zeros. Set to False to show all leading zeros up to the number of digits configured in the “Fields Before DP” field.

Field Name	Type	Offset		Default Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Additional Fields						
Power Outage List ID Code	Array [4 + X] of UINT8	117	137	“ ”	H	The ID to be shown on the meter LCD when the power outage list is being displayed. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Power Outage List ID DP State	UINT8	121	142	0	H	The decimal point state used when the list of power outages is being displayed. This field is 4 (or 5) bits indicating the state of the decimal point with the associated ID character: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.
Power Outage Number ID Code	Array [4 + X] of UINT8	122	143	”NUM ”	H	The ID to be shown on the meter LCD when the number of power outages is being displayed. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
Power Outage Number ID DP State	UINT8	126	148	0	H	The decimal point state used when the number of power outages is being displayed. This field is 4 (or 5) bits indicating the state of the decimal point with the associated ID character: 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.

ET66 (2114, 0x0842): Load Profile Source ID Mapping Table

This table contains a mapping of mapped source IDs to extended source IDs for each load profile data set. The mapped source IDs are standard source ID values 112 through 163. The first entry in this table contains the extended source ID for standard source ID 112, the second for 113, etc. This table can only be changed via EP11 or EP52.

The access key requirements for ET66 are listed below.

ET66, Load Profile Source ID Mapping Table: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET66 is defined below.

ET66, Load Profile Source ID Mapping Table: Table Structure

Field Name	Type	Value	VCI	Description
Extended Source IDs	ARRAY[4][BT 60.11] of UINT16		H	An extended source ID for a mapped source ID of value N, where N is equivalent to: 112 + “table offset” / 2. For example, a mapped source of 114 would be at offset 4. The source ID numbers that can be used are listed in the description of BT22 later in this document.

ET70 (2118, 0x0846): RAM Only Status

This table contains can be used by MEP clients connected to OSGP Alliance OSGP meters running firmware versions 4.0 and higher to determine which logical MEP port they are connected to.

ET70, Ram Only Status: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X			
Write	MAK	X			

The table structure for ET70 is defined below.

ET70, RAM Only Status: Table Structure

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Reserved		0…141				Reserved for internal use.
Current Comm Channel Index	UINT8	N/A	142			If the value of this field is 1, it indicates that it is using the port for MEP client 1 (MEP1). If the value of this field is 2, it indicates that it is using the port for MEP client 2. For more information on this, see *Determining the MEP Port* on page 23.
Reserved		N/A	143…155			Reserved for internal use.

ET71 (2119, 0x0847): Delta Data Alerts

This table contains control and status information for the delta data alert feature. For background information on the delta data feature, see *Delta Data Alerts* on page 34.

Note that the contents of this table are stored in RAM only, and will be reset to the listed default values upon each power cycle. As a result, any custom values should be re-written to this table after each power-up to ensure that the desired delta data alerts continue.

The access key requirements for ET71 are listed below.

ET71, Delta Data Alerts: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MBK, MAK	X	X	X	X

The table structure for ET71 is defined below.

ET71, Delta Data Alerts: Table Structure

Field Name	Type	Offset	Default Value	VCI	Description
Array[ET11.27] of Delta Data				M,H	Array of sources used for the delta data alert feature.
Delta Data Monitor Source	UINT16	0	255	H	The extended source ID of the data source to be monitored. All standard

Field Name	Type	Offset	Default Value	VCI	Description
					source IDs, including MEP and demand data types, are available to be monitored. A value of 255 indicates that the current entry is not in use. For a list of source IDs, see *Source IDs* on page 203.
Configured Delta	UINT16	2	0	H	The delta comparison value for the data source. Any time the value of the source changes by this amount, an alert bit will be set. A value of zero implies that delta data alerts are disabled for this data source.
Comparison Value	NI_FMAT1	4	0	M, H	The current comparison value in use. This value is updated by the meter any time the delta is met or exceeded. It can also be set by your application.
Sampled Data Value	NI_FMAT1	8	0	M	Current value of the data source. This value is read and updated approximately once per second. Each time it is read, it will be compared to the “Comparison Value” setting. If the difference between the values exceeds the Configured Delta value, the “Alert State” bit for this entry will be set.
Status	UINT8:	12	0	M, H	DDM Status Flags
Source ID Invalid	BOOL(0)	12	0	M	Set by the meter when an invalid source ID has been specified.
Spares	UINT(1..7)	12	0	M	Unused

ET74 (2122, 0x084A): MEP Recurring Read Extended Log

This table is an extension of ET45, which is a log of MEP billing data. This table contains the same type of data. The table has a list header with the same structure as for ET45, except the entry counts and index values are 16-bit. The log entry structure is identical to ET16.

If this table is configured for more than 0 entries, then entries destined for ET45 are first logged in ET74, as much as the capacity permits. They are then transferred in first-in, first-out order to ET45 as soon as there are available entries in that table. Therefore, it typically won't be necessary for your application to read entries out of ET74. However, you should be aware that you will be limited to reading the number of records configured for storage in ET45 at one time when reading ET74 entries. This limit is determined by the "Current Entries" field in ET36.

The use of the extension table should not alter the setting of alarms or statuses in ET14. The number of entries that can be stored in ET74 is determined by the "ET74 Entry Count" field in ET42.

The access key requirements for ET74 are listed below.

ET74, MEP Recurring Read Extended Log: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET74 is defined below.

ET74, MEP Recurring Read Extended Log: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Order	BOOL(0)	0	FALSE	F	Log records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	This flag is set when the log memory has overflowed, causing old data to be overwritten.
List Type	BOOL(2)	0	TRUE	F	The log is a circular queue. This property will be set to False if the maximum number of entries is 0. The maximum number of entries is established by the "ET74 Entry Count" field in ET54.
Inhibit Overflow	BOOL(3)	0	FALSE	F	The meter does not inhibit new entries when overflow occurs.
Filler	FILL(4..7)	0			

Field Name	Type	Offset	Value	VCI	Description
Number of Valid Entries	UINT16	1		M	Number of records with valid data. The maximum number of entries is established by the “ET74 Entry Count” field in ET54.
Last Entry Element	UINT16	3	0	F	Array element of the most recent valid entry.
Last Entry Sequence Number	UINT16	5		M	Sequence number of the most recent operation. This value is never reset.
Number of Unread Entries	UINT16	7		M,H	Number of records that have not been moved to ET45. This field is incremented and decremented by the meter as records are added and moved, respectively.
Log Entries:	Array of the following:				The number of entries in this array is set by the “ET74 Entry Count” field in ET54.
Length	UINT16	9		M	The number of bytes of billing read information, This is includes the handle and 0 terminator byte (M-Bus entries only), but not the Length field. The entire entry space is still reserved if any fields are unused.
Filler	UINT16	11		M	Reserved for future use.
Handle	UINT16	13		M	Handle of the device represented by this entry.
Execution Status	UINT8	15		M	0 = Normal 2 = Delayed (entry is a power-up backfill)
Result	UINT8	16		M	4 = Success
Data	MBR	17		M	MBR = MEP read. See the description of ET16 for a definition.

ET75 (2123, 0x084B): Primary Load Profile Channel Change Log

This table is applicable to OSGP meters running firmware versions 3.60 and higher, and to Control Point/OSGP Modules running firmware versions 1.30 and higher. It records changes to the channel sources in the primary load profile data set. It is applicable to meters and Control Point/OSGP Modules that are configured to comply with the Welmec 11.2 interval billing guidelines. This is established by the “Welmec 11.2 Compliance” field in ET54 (ET54.71.0).

This is a standard format log, but only the entry count is modifiable. The entry count must be at least two for the utility to make any changes, since one entry is used (if available) when Welmec

compliance is turned on. The meter or Control Point/OSGP Module does not enforce any minimum, but if there are no free entries, no changes can be made to the data that would need to be logged (this includes running EP52, or writing ET62). This log is not a circular queue: if a change is attempted that would require logging and the log is full, the procedure or table write is rejected. The table cannot be reset or re-sized if Welmec compliance is on.

For Control Point/OSGP Modules and for Gen 3.X meters (e.g. 83331-XXXXX and 83332-XXXXX model meters), the ID codes that can be shown on the meter display are 4 characters. For Gen 4 meters (e.g. 8XXX4-XXXXX model meters), the ID codes are 5 characters. This means you should make the following considerations when reviewing this description of ET75:

- Some of the field offsets in ET75 will vary for each client type. As a result, two sets of offset values are shown for this table: one for Gen 4 meters, and one for all other MEP clients.
- Arrays for display ID codes will be either 4 or 5 bytes long, depending on the MEP client type. This is indicated by the use of the symbol “X” in the “Type”, where “X” is equivalent to 1 for Gen 4 meters, and 0 for all other MEP client types. For example, a field with type “Array [4 + X] of UINT8” would be 5 bytes for a Gen 4 meter and 4 bytes for a Gen 3.X meter.
- 5 bits are used to represent the decimal point state for each ID code for Gen 4 meters, and 4 bits are used for all other device types.

The access key requirements for ET75 are listed below.

ET75, Primary Load Profile Channel Change Log: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET75 is defined below.

ET75, Primary Load Profile Channel Change Log: Table Structure

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Order	BOOL(0)	0		FALSE	F	Log records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0			M	This flag is set when the log memory has overflowed, causing old data to be overwritten.
List Type	BOOL(2)	0		TRUE	F	The log is a circular queue. This property will be set to False if the maximum number of entries is 0.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
Inhibit Overflow	BOOL(3)	0		FALSE	F	The meter does not inhibit new entries when overflow occurs. The exception is when an old entry still applies to existing logged data.
Filler	FILL(4..7)	0				
Number of Valid Entries	UINT8	1	1		M	Number of records with valid data. The range is established by the “ET75 Current Entries” field in ET36.
Last Entry Element	UINT8	2		0	F	Array element of the most recent valid entry.
Last Entry Sequence Number	UINT16	3			M	Sequence number of the most recent operation. This value is never reset.
Number of Unread Entries	UINT8	5			M,H	The range is established by the “ET75 Current Entries” field in ET36.
Log Entries:	Array of the following:					The number of entries in this array is set by the “ET75 Current Entries” field in ET36.
Timestamp	STIME_DATE	6			M	Timestamp of when the changes apply, in UTC. The first entry will indicate when Welmec mode was enabled, and subsequent entries will match the time of the first load profule interval entry that contains these changes
Extended Source IDs	Array UINT16[BT60.11]	11			H	Extended source IDs used prior to the timestamp of this entry. Standard IDs use type 0.
Demand Sources	Array UINT8[BT20.4]	43			H	Source IDs used prior to the timestamp.
Demand Sub Interval	UINT8	51			H	Sub-interval used prior to the timestamp.
Demand Interval Multiplier	UINT8	52			H	Multiplier used prior to the timestamp.

Field Name	Type	Offset		Value	VCI	Description
		Meter 3.X CPM/OSGP	Meter 4.0+			
LP Display Config	Array[BT60.11] of the following:					Copy of ET62 ID Format and Data Format sections. Consult the description of ET62 for more information.
ID Format:	D code, entered here in ASCII format.					
ID Code	Array [4 + X] of UINT8	53			H	The display ID code. Array element 0 is for the left-most ID character on the LCD, array element 1 is for the next ID character to the right, and so on.
ID DP State	UINT8	57	58		H	4 (or 5) bits that indicate state of decimal point (DP) with associated ID character. 1 = ON 0 = OFF Bit 0 is for the right-most decimal point, bit 1 is for the next decimal point to the left, and so on.
Data Format:	UINT8	58	59			
Fields After DP	UINT(0..2)	58	59		H	Number of characters after the decimal point to be shown on the LCD display. The range is 0..3. This field together with the “Fields Before DP” field cannot exceed a sum of 8 digits.
Fields Before DP	UINT(3..6)	58	59		H	Number of characters before the decimal point to be shown on the display, per source. This is ordered by BT16 source number. The range is 1..8. This field together with the “Fields After DP” field cannot exceed a sum of 8 digits.
Zero Suppression	BOOL(7)	58	59		H	0: Shows all leading zeros, up to the number of characters configured in the “Fields Before DP” field. 1: Hide leading zeros

ET79 (2127, 0x0849): History Log Data (Alternate Event Log)

Meters running firmware version 3.70 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher include both a primary and an alternate event log. This table holds the event log data for the alternate event log, and the pointer information required to read it.

The alternate event log is disabled by default. Once activated, it is initialized with two events enabled: the Alternate Event Log Cleared and the Alternate Event Log Updated events. However, you can enable or disable events in the alternate event log so that it will log other events.

The alternate event log can be read and cleared independently from the primary log. For example, you may want to use one log to store power quality-related events and alarms such as Power Quality State Changed and THD State Changed, and use the other log to record other types of events and alarms. Each event can be included in either or both event logs (or not included in either event log).

The alternate event log must be enabled during manufacturing. You can read the “ET79 Entry Count” field in ET54 (ET54.80) to determine if it has been enabled or not. This field indicates how many entries are supported in the alternate event log. If it is set to a non-zero value, then the alternate event log has been enabled.

You should be aware of the following differences between the primary and alternate event logs:

The alternate event log does not employ the critical event log feature.

The alternate event log includes two new events, the Alternate Event Log Cleared and Alternate Event Log Updated events. These events indicate when the alternate event log has been updated or modified. They are not enabled in the primary event log by default.

For more information on the alternate event log, consult the Primary and Alternate Event Logs section of the IEC Electric Meter User’s Guide for firmware versions 3.70 and higher.

The access key requirements for ET79 are listed below.

ET79, History Log Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

ET79: History Log Data (Alternate Event Log)

Field Name	Type	Offset	Value	VCI	Description
Order	UINT(0..0)	0	0	F	Describes the order of log entries as listed in ET79. 0 = Ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	When True, this indicates an entry was entered such that the number of unread entries exceeded the actual number of possible entries in the log. This is cleared by BP04 and BP05.

Field Name	Type	Offset	Value	VCI	Description
List Type	UINT(2..2)	0	1	F	Describes the method of log entry generation in meter memory: 0 = FIFO (reads this if maximum entries is 0) 1 = Circular queue
Inhibit Overflow	BOOL(3)	0	FALSE	F	New History Log entries are never inhibited once a memory overflow occurs.
Filler	FILL(4..7)	0			
Number of Valid Entries	UINT16	1		M	Number of valid log entries in this table.
Last Entry Element	UINT16	3		M	Array index of the last valid log entry in this table.
Last Entry Sequence Number	UINT32	5		M	The 4-byte sequence number of the last log entry in this table. This value is never reset. You should be aware that the sequencing for each event logged in either the primary event log or the alternate event log is shared across both logs. This means that there may be gaps in the sequence numbers assigned to entries in either log. However, the sequence numbers indicate the complete sequence of all events when both logs are considered together, For example, events 1-10 may occur in the primary log (BT74), events 11-15 may occur in the alternate log (ET79), and events 16-20 may occur in the primary log (BT74). This means that events 11-15 will not appear in the primary log (BT74).
Number of Unread Entries	UINT16	9		M/H	Number of valid log entries in this table set that have not been read. This number is incremented by the meter and decremented by the host via procedure.
History Record Array	ARRAY[BT71.5] of (12+BT71.3)-byte records:				
Time	LTIME_DATE	11		M	Date and time of the History Log entry (UTC).
Sequence Number	UINT16	17		M	2-byte sequence number associated with the history log only. This number is the low 2 bytes of the field in ET79.5

Field Name	Type	Offset	Value	VCI	Description
User ID	UINT16	19		M	ID of the user that was logged in to the meter when the event occurred, per the ANSI 12.18 login command. If no user was logged in, the value of this field is 0xFFFF. If a PLC message was being processed at the time, this field will be set to 0xFFFE. If a MEP client's operation was being processed at the time, this field will be set to 0xFFFD.
Event	UINT(0..11)	21		M	Event ID logged. Consult the documentation for your meter for a list of the event IDs.
Filler	FILL(12..15)	21			
Argument	ARRAY[BT71.3] OF UINT8	23		M	Argument associated with a log. Consult the documentation for your meter for a description of the argument associated with each event code.

ET80 (2128, 0x0850): Average Power Settings

Meters running firmware versions 3.70 and higher (and Control Point/OSGP Modules running firmware versions 1.20 and higher) can be configured to measure the average power (in Watts) that has been consumed. When the average power has exceeded the Primary Maximum Power Level threshold in ET05 (ET05.0), it indicates that excessive power is in use, and the meter will automatically shut off (open) the load disconnect contactor.

Both block and rolling average calculations are available for these measurements. These calculations are based on the average power consumption's main interval and sub-interval, each of which has a range of 1-60 minutes. The length of the sub-interval length (in seconds) can be specified with the "Average Power Control Sub-Interval" field (ET80.1). The length of the main interval can be determined by multiplying the sub-interval value by the "Average Power Control Interval Multiplier" field (ET80.2).

- **Rolling demand.** Rolling demand uses the main interval and sub-interval to create interlaced measurement periods. This provides a way to calculate the average power usage for a set period of time, and the meter continues to update the value as more time elapses to generate a rolling average. The sub-interval determines how frequently the value will be updated, and the main interval determines the length of time for which average power measurements will be made. Note that the length of the sub-interval is determined by the "Average Power Control Sub-Interval" field. The length of the main interval is determined by multiplying the length of the sub-interval by the "Average Power Control Interval Multiplier" field.

  Each time a sub-interval elapses, the data for the oldest sub-interval is thrown out and replaced by the data for the most recent sub-interval, and the demand is measured again.

  For example, if you wanted to measure the average power usage for a meter for 15-minute periods, and you wanted an updated value to be reported every minute, you could use rolling demand. You would set the sub-interval to 1 minute in this case, and you would set the multiplier to 15, to create a main interval of 15 minutes.

  In this scenario, if the meter begins calculating average power at 1:00, then the first main interval would elapse at 1:15. At 1:15, average power measurements for the first interval would be recorded: the time period from 1:00-1:15. At 1:16, the end of the next sub-interval, a new set of average power measurements would be recorded, for the time period from 1:01-1:16. At 1:17, a

new set of average power measurements would be recorded, for the time period from 1:02-1:17. This would continue as long as the average power measurements are enabled.

- **Block demand.** Block demand uses the interval setting to create independent measurement periods. Block demand is intended to measure the average power usage for a specific time period, so that the values returned do not reflect rolling averages.

  To use block settings, set the sub-interval to the time period for which you want to measure the average power usage, and set the multiplier to 1. For example, if the sub-interval is set to 15 minutes, average values would be read and recorded once every 15 minutes, and would reflect average power usage for the 15 minute period since the last reading only. So if the meter begins calculating average power values at 1:00, then the average values recorded at 1:15 would reflect the average power usage from 1:00-1:15. The values recorded at 1:30 would reflect average power usage from 1:15-1:30, and so on.

The access key requirements for ET80 are listed below.

ET80, Average Power Settings

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET80 is defined below.

ET80, Average Power Settings

Field Name	Type	Offset	VCI	Value	Description
Average Power Enabled	UINT8	0	0	H	0 = Disable average power calculations 1= Enable average power calculations
Average Power Control Sub-interval	UINT16	1	1	H	The average interval, in seconds, over which the average power is calculated. The interval is subject to the following requirements: If a value less than 60 seconds is desired, then the value must be a divisor of 60 (e.g. 1, 2, 3, 4, 5, 6, 10, etc). If a value greater than 60 seconds is entered, it must be a full minute. Values that create partial minutes such as 1.5 minutes are not supported.The minute also has to be a divisor 60 (e.g. 1, 2, 4, 5, 12, etc). If a value greater than 1 hour is entered, it must be a full hour. Values that create partial hours such as 2.5 hours are not supported. The hour also has to be a divisor 24 (e.g. 1, 2, 3, 4, 6, etc).

Field Name	Type	Offset	VCI	Value	Description
Average Power Control Interval Multiplier	UINT8	3	15	H	Enter the average power interval multiplier. The range is 1 to 15.
Average power Disconnect Threshold	UINT32	4	0	H	The average power disconnect threshold, in W.

ET81 (2129, 0x0851): Power Outage Log

Meters running firmware version 3.70 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher include ET81. ET81 contains a log of power outages. The start and end time for each power outage is listed in this log (in local time). The maximum number of entries that can be stored in ET81 and the current number of entries that are stored in ET81 can be read from the “Max Entries” and “Current Entries” fields in ET36.

The access key requirements for ET81 are listed below.

ET81, Power Outage Log

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET81 is defined below.

ET81, Power Outage Log

Field Name	Type	Offset	VCI	Value	Description
Order	BOOL(0)	0	FALSE	F	Log records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	This flag is set when the log memory has overflowed, causing old data to be overwritten.
List Type	BOOL(2)	0	TRUE	F	The log is a circular queue. This value will be set to False if the maximum number of entries is 0.
Inhibit Overflow	BOOL(3)	0	FALSE	F	The meter does not inhibit new entries when overflow occurs, meaning that old entries may be overwritten.
Filler	FILL(4..7)	0			

Field Name	Type	Offset	VCI	Value	Description
Number of Valid Entries	UINT8	1		M	The number of records with valid data.
Last Entry Element	UINT8	2	0	F	The array element of the most recent valid entry.
Last Entry Sequence Number	UINT16	3		M	The sequence number of the most recent operation. This value is never reset.
Number of Unread Entries	UINT8	5		M,H	The number of unread entries.
Log Entries:	Array of the remaining fields:				The maximum number of entries that can be stored in ET81 and the current number of entries that are stored in ET81 can be read from the “Max Entries” and “Current Entries” fields in ET36,
Start Timestamp	LTIME_DATE	6		M	Timestamp indicating the start of the power outage (local time).
End Timestamp	LTIME_DATE	12		M	Timestamp indicating the end of the power outage (local time).

ET85 (2133, 0x0855): MEP Procedure Response (MEP2)

This table is applicable to OSGP meters running firmware versions 4.0 and higher only. It is used as the procedure response table for MEP client 2. It shares the same format and syntax details as ET59, which is the procedure response table used by MEP client 1. For more information on this, see *Calling Procedures* on page 51.

The access key requirements for ET85 are listed below. Consult the description of ET59 earlier in this chapter for syntax details for this table.

ET85, MEP Procedure Response (MEP2): Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	N/A	N/A	N/A
Write	None				

ET89 (2137, 0x0859): Meter LN Status

This table contains properties to report the current security status of the optical and MEP ports. The access key requirements for ET89 are listed below.

ET89, Meter LN Status: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for ET89 is defined below.

ET89, Meter LN Status: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Prior MEP 1 Handle	UINT16	0	0	M	Handle of most recently deregistered MEP1
Prior MEP 1 ID	Array[30] of UINT8	2	0	M	Identification string of most recently deregistered MEP1 device
MEP 1 re-register requests	UINT8	32	0	M	Number of times MEP device has attempted to re-register. Value rolls over after reaching 255; when it does, following value is also re-set to 0
MEP 1 re-register allowed	UINT8	33	0	M	Number of times MEP device was assigned a new handle as a result of re-register.
Prior MEP 2 Handle	UINT16	34	0	M	Handle of most recently deregistered MEP2
Prior MEP 2 ID	Array[30] of UINT8	36	0	M	Identification string of most recently deregistered MEP2 device
MEP 2 re-register requests	UINT8	66	0	M	Number of times MEP device has attempted to re-register. Value rolls over after reaching 255; when it does, following value is also re-set to 0
MEP 2 re-register allowed	UINT8	67	0	M	Number of times MEP device was assigned a new handle as a result of re-register.
The following fields are applicable to OSGP meters running firmware versions 4.50 and higher only.					
Last H1 Telegram Time	LTIME_DATE	68			Time of the last H1 telegram sent. For debug to test if H1 is enabled externally
Status Flags 0	UINT8	74			
H1 Device Present	BOOL(0)		0		0: H1 data request line is not driven 1: H1 data request line is being driven externally

Field Name	Type	Offset	Value	VCI	Description
PLC Disabled	BOOL(1)		0		0 = PLC is not disabled 1 = PLC is disabled
Filler	BOOL(1..7)				
Array[2] of fields “Current OP Mode” through “Local Reserved”					
Current Op Mode	UINT8(0..2)	75	3	M	Current operation mode: 0 – Maintenance 1 – Locked 2 – Remote 3 - Local
Maintenance Time Remaining	UINT32(0..18)	76	0	M	Seconds remaining before maint mode expires.(Max value is 262143 (72 hours))
Maintenance no expire	UINT32(19..19)	76	0	M	If set maint mode does not expire
Maintenance State	UINT32(20..21)	76	2	M	Current maintenance specified state (open(0), closed(1), unknown(2))
Maintenance reserved	UINT32(22..31)	76	0	M	Reserved
Time remaining in locked state	UINT32(0..18)	80	0	M	Seconds remaining before locked mode expires.(Max value is 262143 (72 hours))
Locked no expire	UINT32(19..19)	80	0	M	If set, locked mode does not expire
Locked State	UINT32(20.21)	80	2	M	Current locked specified state (open(0), closed(1), unknown(2))
Locked reserved	UINT32(22..31)	80	0	M	Reserved
Time remaining in remote state	UINT32(0..18)	84	0	M	Seconds remaining before remote mode expires.(Max value is 262143 (72 hours))
Remote no expire	UINT32(19..19)	84	0	M	If set, remote mode does not expire
Remote State	UINT32(20..21)	84	2	M	Current remote specified state (open(0), closed(1), unknown(2))
Remote reserved	UINT32(22..31)	84	0	M	Reserved
Time remaining in local state	UINT32(0..18)	88	0	M	Seconds remaining before local mode expires.(Max value is 262143 (72 hours))
Local no expire	UINT32(19..19)	88	1	M	Local mode does not expire

Field Name	Type	Offset	Value	VCI	Description
Local State	UINT32(20..21)	88	0	M	Current local specified state (open(0), closed(1), unknown(2))
Local reserved	UINT32(22..31)	88	0	M	Reserved
Image Validation Key IDs	UINT16[2]	109	0	M	IDs of public keys used to validate signatures of downloaded firmware images.
Key Status	UINT8	113	0	M	Status of Image Validation Keys 0 – If set, key index 0 has been invalidated 1 – If set, key index 1 has been invalidated
Last validation error	UINT8	114	0	M	Result of most recent image signature validation 0 – No error 1 – Image not signed 2 – Key ID not defined 3 – Key invalidated 16 – Invalid signature 17 - Invalid signature length 18 – Invalid signature da ta 32 – Invalid public key format 33 – Invalid Key EC point 240 – Unknown error
Last Validation Key ID	UINT16	115	0	M	ID of key used to validate most recent image
Last Image Length	UINT32	117	0	M	Length of most recent image
Signature Length	UINT8	121	0	M	Length of signature in most recent image
Signature	UINT8[8]	122	0	M	First 8 bytes of signature value from most recent image
Adj log unread entry mask	UINT8[A]	130	1	M	Bitmaks that indicates whether any of the LN adjustable log tables have unread entries.
Disconnect Flags					
Block Remote Procedure Disconnect	BOOL(0)	130+A	0	M	0 = Do not block remote procedure disconnect 1 = Block remote procedure disconnect
Block Automatic and Pushbutton Disconnect	BOOL(1)	130+A	0	M	0 = Do not block automatic and pushbutton disconnect 1 = Block automatic and pushbutton disconnect

Field Name	Type	Offset	Value	VCI	Description
Block Local Procedure Disconnect	BOOL(2)	130+A	0	M	0 = Do not block local procedure disconnect 1 = Block local procedure disconnect
Block Remote Unblock	BOOL(3)	130+A	0	M	0 = Do not block remote unblock 1 = Block remote unblock
Pending Security Event Details - Array[MT90.25] of MT90.26 byte entries (‘Alarm ID’ through ‘Minutes to report’)					
Alarm ID	UINT16	131+A	0	M	Alarm ID of pending security event.
Argument	UINT16	133+A	0	M	Security Alarm/event argument
Count	UINT16	135+A	0	M	Number of occurrences of alarm in current window
Minutes to report	UINT16	137+A	0	M	Minutes until end of current alarm window
The following fields are applicable to OSGP meters running firmware versions 4.60 and higher only.					
TLS Port Status – 3 element array of the follow 4 fields (5 bytes in each element). Index 0=Optical, index 1=MEP1, index 2=MEP2					
Session State	UINT8(0..2)	138+B	0	M	Current state of port 0 = No Session 1 = RC4 (unencrypted) 2 = RC4 Encrypted 3 = C1218 (Unencrypted) 4 = TLS
TLS State	UINT8(3..7)	138+b	0	M	State of TLS handshake
TLS Error	UINT16	139+B	0	M	Most recent embedTls error code (converted to a positive value)
TLS Error Count	UINT16	141+B	0	M	Total number of TLS session errors (never cleared)

ET90 (2138, 0x085A): Dimension LN

This table is used to store dimensions used by other meter tables, such as the number of FTz message display sources supported by the meter LCD. The access key requirements for ET90 are listed below.

ET90, Dimension LN: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X

Write	None				

The table structure for ET90 is defined below.

ET90, Dimension LN: Table Structure

Field Name	Type	Offset	Value	VCI	Description
The following fields are applicable to OSGP meters running firmware versions 4.10 and higher only.					
IP Address Length	UINT16	0	50	P	The number of bytes in fields used to store IP addresses in tables ET92-ET96.
Urgent Alarm Bitmask Length	UINT8	2	20	P	The number of bytes in the “Urgent Alarm Bitmask” field in ET92.
Connection Reason Bitmap Length	UINT8	3	2	P	The length of the “Connection Reason” bitmap in ET93.
Modem APN Length	UINT8	4	64	P	The maximum number of characters in the “APN” field in ET95.
Modem APN User Length	UINT8	5	32	P	The maximum number of characters in the “APN User” field in ET95.
Modem APN Password Length	UINT8	6	32	P	The maximum number of characters in the “APN Password” field in ET95.
Modem SIM Pin Length	UINT8	7	5	P	The maximum number of characters in the “SIM PIN” field in ET94.
Modem Manufacturer Length	UINT8	8	32	P	The maximum number of characters in the “Manufacturer” field in ET95.
Modem Model Length	UINT8	9	32	P	The maximum number of characters in the “Model” field in ET95.
Modem Revision Length	UINT8	10	32	P	The maximum number of characters in the “Revision” field in ET95.
Modem IMEI Length	UINT8	11	32	P	The maximum number of characters in the “IEMI” field in ET95.
Modem SIM Phone Number Length	UINT8	12	32	P	The maximum number of characters in the “SIM Phone Number” fields in ET93 and ET95.
Modem Current Mobile Operator Name Length	UINT8	13	40	P	The maximum number of characters in the “Current Mobile Operator Name” field in ET95.

Field Name	Type	Offset	Value	VCI	Description
Modem Socket Maximum Connections	UINT8	14	2	P	The maximum number of connections supported by the modem.
Modem Maximum Connection Services	UINT8	15	10	P	The maximum number of IP services supported by the modem.
The following field is applicable to OSGP meters running firmware versions 3.82 and all firmware versions 4.02 and higher, and to Control Point/OSGP Modules running firmware versions 1.31 and higher.					
Number of FTz Messages	UINT8	16	3	P	The number of display source codes defined for FTz messages. These source codes allows multiple FTz messages to be included in the meter display lists. The default value is 3.
The following fields are applicable to OSGP meters running firmware versions 4.20 and higher only.					
Modem AT Command Reply Length	UINT16	17	200	P	The maximum length of the extended AT command reply data stored in ET98.
Modem SIM ICCD Length	UINT8	19	23	P	The maximum number of characters in the SIM ICCID stored in ET95.

ET97 (2145, 0x0861): Meter Configuration LN

This table stores the contents of the FTz messages most recently received by the meter, as well as a variety of MEP Port settings, TLS security requirements and other LN-related configuration items. It is applicable to OSGP meters running firmware versions 3.82 and firmware versions 4.02 and higher, and to Control Point/OSGP modules running firmware versions 1.31 and higher.

The access key requirements for ET97 are listed below.

ET97, Meter Configuration LN: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for ET97 is defined below.

ET97, Meter Configuration LN: Table Structure

Field Name	Type	Offset		Value	VCI	Description
		CPM 1.31 OSGP Meter 3.82	OSGP Meter 4.02			
FTz Message Contents Array	ARRAY[ET 90.16] OF ARRAY[8] OF UINT8	0	0			Each element in this array can be used to store the contents of an FTz messages sent to the meter (i.e. the remaining energy units and unit type characters). Note that the OBIS code for the FTz message is not stored here. It is shown on the LCD, however. The size of the array is dependent on the size of the "Number of FTz Messages" field in ET90, which defaults to 3. This allows for 3 separate FTz messages to be included in the meter display lists. For more information on FTz messages, see Displaying Free Text Messages.
MEP 1 ID Comparison Mode	UINT8	A	A	0	H	Selects algorithm for determining whether MEP 1 ID has changed: 0 – Standard ID comparison (see below) 1 – Mask Comparison (see below) 2 – No comparison. Assumes any new registration is a new device. 3 – No comparison. Assumes any new registration is same device.
MEP 1 ID Mask	Array[30] of UINT8	A+1	A+1	0	H	Mask to apply to old/new MEP 1 ID strings before doing comparison
MEP 2 ID Comparison Mode	UINT8		A+31	0	H	Selects algorithm for determining whether MEP 2 ID has changed: 0 – Standard ID comparison (see below) 1 – Mask Comparison (see below)

Field Name	Type	Offset		Value	VCI	Description
		CPM 1.31 OSGP Meter 3.82	OSGP Meter 4.02			
						2 – No comparison. Assumes any new registration is a new device. 3 – No comparison. Assumes any new registration is same device.
MEP 2 ID Mask	Array[30] of UINT8		A+32	0	H	Mask to apply to old/new MEP 1 ID strings before doing comparison
Power Boost Relay LN	BOOL(0)		A+62	Factory: 0 Upgrade from <4.31 : 1 if relay1 && !relay2		Relays need Power Boost line pulsed to close. (OR'd with MT24.HwInternalConfig.PowerBoostRelay)
Mbus AD use 300 Baud	BOOL(1)	A+62		0	H	If set to 1, MBus auto-discovery will scan for devices at 300 baud, otherwise it will not
Reserved	BOOL(2..7)	A+62				
Array[2] of						
Group ID	UINT16[5]		A+63			List of Group IDs associated with this relay
Mode	UINT8(0..2)		A+73	0	H	Mode of relay 0 – Standard 1 – Load Management 2 – 7 Reserved
Require Explicit HB	BOOL(3)		A+73	0	H	If set, MP02 keep alive msg must be received as HB. If clear, any msg from DC/HE will reset.
Reserved	UINT8(4..7)		A+73	0	H	Reserved. Set to 0
Heartbeat Interval	UINT16		A+74	0	H	Heartbeat (keep-alive) interval, in minutes. Only applies to LM mode. If 0, no heartbeat is expected.
Maintenance Mode Entry	UINT8(0..1)		A+76	0	H	Condition under which relay goes into maintenance control mode.

Field Name	Type	Offset		Value	VCI	Description
		CPM 1.31 OSGP Meter 3.82	OSGP Meter 4.02			
						0 – Explicit command only 1 – Terminal cover removed 2 and 3 – Reserved:
Maintenance Mode Display	UINT8(2..3)		A+76	0	H	When relay is in maintenance mode, controls whether relay state is displayed on LCD and whether relay state can be updated using push button. 0 – No display, no update 1 – Display state, no update 2 – Display state, allow update 3 - Reserved
Maintenance Mode Open	BOOL(4)		A+76	0	H	If set, relay is opened when it enters maintenance mode.
Maintenance Mode Exit	UINT8(5..6)					0 – Explicit command 1 – Terminal cover replaced plus delay 2 – Terminal cover replaced, at specified time 3 – reserved
Reserved	UINT8(7..7)		A+76	0	H	Reserved, set to 0
Maintenance Mode Exit delay	UINT8		A+77	0	H	Seconds after cover replaced (if Maintenance Mode Exit is 1)
Maintenance Mode Exit time	UINT8[2]		A+78		H	Local time (H:M) at which maintenance mode terminates (if Maintenance Mode Exit is 2)
Security Log Interval (Minutes)	UINT16		A+97	0	H	Length of window for consolidating security events logged in MT124
Require TLS on Optical port	UINT8(0)		A+98	0	H	If set, optical port clients must use TLS
Reserved	UINT8(1..7)		A+98	0	M	Reserved
Require TLS on MEP1 port	UINT8(0)		A+99	0	H	If set, MEP1 client must use TLS
Reserved	UINT8(1..7)		A+99	0	M	Reserved
Require TLS on MEP2 port	UINT8(0)		A+100	0	H	If set, MEP2 must use TLS

Field Name	Type	Offset		Value	VCI	Description
		CPM 1.31 OSGP Meter 3.82	OSGP Meter 4.02			
Reserved	UINT8(1..7)		A+100	0	M	Reserved

BT00 (0x0000): General Configuration

This table describes the general configuration and layout of the remaining tables and procedures in the MEP server, and how to read their data. To make this table a bit more compact, the following symbols are used:

Symbol	Value
A	BT00.13
B	BT00.13 + BT00.14
C	BT00.13+BT00.14+BT00.15
D	BT00.13+BT00.14+BT00.15+BT00.16

The access key requirements for BT00 are listed below.

BT00, General Configuration: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT00 is defined below.

BT00, General Configuration: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Data Order	UINT(0..0)	0	0	P	Order of bytes in multi-byte field communication transfer: 0 = Little endian, or LSB first. 1 = Big endian, or MSB first.
Char Format	UINT(1..3)	0	1	P	Format of char data type used throughout tables: 0 = Unassigned 1 = ASCII per ISO/IEC 646:1991. 2 = ISO 8859/1 or ECMA-94 Latin 1 3..7 = Unassigned
Filler	FILL(4..7)	0			

Field Name	Type	Offset	Value	VCI	Description
Time Format	UINT(0. .2)	1	2	F	Data type used for dates and times. 2 = UINT8 with discrete fields for year, month, day, hour, minute, second.
Data Access Method	UINT(3. .4)	1	1	F	Method of partial table data transfer. 1 = Offset count method is supported.
Identification Format	UINT(5. .5)	1	1	P	Format of ID fields in tables BT01, BT05, and BT06: 0 = CHAR string 1 = BCD
Integer Format	UINT(6. .7)	1	0	F	Format of signed integer data types. 0 = Two's complement.
Non-integer Format 1	UINT(0. .3)	2	8	P	Data type used for table fields specified as NI_FMAT1. 8 = 4-byte signed integer format. Refer to the ANSI C12.19 (1997) Utility Industry End Device Data Tables for more information.
Non integer Format 2	UINT(4. .7)	2	8	P	Data type used for table fields specified as NI_FMAT2. 8 = 4-byte signed integer format. Refer to section 6.2 of the ANSI C12.19 (1997) Utility Industry End Device Data Tables for more information.
Manufacturer	ARRAY [4] Of CHAR	3	NES or ELON	P	MEP server manufacturer identification.
Nameplate Type	UINT8	7	2	F	Type of meter and nameplate information contained in these tables. 2 = Electric
Default Set Used	UINT8	8	0	F	Indicates which, if any, of the ANSI C12.10 default sets are used. 0 = No default sets are supported.
Procedure Parame ter Length	UINT8	9	255	P	Maximum length in bytes of parameters passed to procedures in BT07.
Response Data Length	UINT8	10	12	P	Maximum length (in bytes) of parameters returned by procedures in BT08, ET59 and ET85.

Field Name	Type	Offset	Value	VCI	Description
Standard Version	UINT8	11	1	F	Version of ANSI C12.19 standard in use in the MEP server. 2..255 = Reserved by Standards Committee
Standard Revision	UINT8	12	0	P	Revision number of ANSI C12.19 standard in use in the MEP server.
Dim Basic Tables Used	UINT8	13	10	P	Number of bytes required to represent the set of basic tables used in the MEP server, where each bit in the set represents a specific basic table.
Dim Extended Tables Used	UINT8	14	13 or 20	P	Number of bytes required to represent the set of extended tables used in the MEP server, where each bit in the set represents a specific extended table. For OSGP meters running firmware versions 4.0 and higher, this is set to 20. For all other device types, this is set to 13.
Dim Basic Procedures Used	UINT8	15	2	P	Number of bytes required to represent the set of basic procedures used in the MEP server, where each bit in the set represents a specific basic procedure.
Dim Extended Procedures Used	UINT8	16	12	P	Number of bytes required to represent the set of extended procedures used in the MEP server, where each bit in the set represents a specific extended procedure.
Manufacturer Status Length	UINT8	17	9	P	Number of bytes used for indicating manufacturer defined alarms and statuses.
Number of Pending Tables	UINT8	18	2, 3 or 4	P	Number of pending tables used in the MEP server. For OSGP meters running firmware versions 4.0 and higher, this is set to 4. For all other device types, this is set to 2 or 3.
The remaining fields in BT00 are reserved for internal use.					

BT01 (0x0001): General Manufacturer Information

This table contains manufacturer identification information.

The access key requirements for BT01 are listed below.

BT01, General Manufacturer Information: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT01 is defined below.

BT01, General Manufacturer Information: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Manufacturer	ARRAY [4] OF CHAR	0		H	Name of manufacturer.
Model	ARRAY [8] OF CHAR	4		H	Model identifier, left-justified.
Reserved		5…15			Reserved for other uses.
Main Firmware Version Number	UINT8	14		M	These two fields are a combined 2-byte field expressing the legally relevant application firmware version number in the format x.yy.zz, according to the following formula: Bits 15..12 = x, major version, range 0..9 Bits 11..5 = yy, minor version, range 0..99 Bits 4..0 = zz, build, range 0..31 For example: 3.00.24 = 0x3018 3.10.21 = 0x3155 Some Welmec standards stipulate that legally relevant and non-legally relevant components of the meter's firmware must be separated. All metering and measurement firmware components are considered legally relevant.
Firmware Revision Number	UINT8	15		M	
Reserved		5…16			Reserved.

BT15 (0x000F): Constants

This table lists the metering constants used and applied to data in the meter, including the current transformer (CT) and the voltage transformer (VT) ratios. The CT and VT ratios are only applicable to CT meters only.

The access key requirements for BT15 are listed below.

BT15, Constants: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for BT15 is defined below.

BT15, Constants: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Electric Constants:	NOTE: This entire table's content is dependent on the type of device represented by these tables, e.g. electric or gas meter.				
Multiplier	NI_FMAT1	0		H	Value of multiplier adjustment applied to meter data.
Offset	NI_FMAT1	4		H	Value of addition/subtraction adjustment applied to meter data.
Applied	BOOL(0)	8	False	H	Indicates whether or not the CT and VT ratios in the table are applied to meter data.
Filler	FILL(1..7)	8			
CT Ratio	NI_FMAT1	9		H	Current transformer ratio. Some measurement values listed in other tables described in this document incorporate these ratios, and others do not.
VT Ratio	NI_FMAT1	13		H	Voltage transformer ratio. Some measurement values listed in other tables described in this document incorporate these ratios, and others do not.

BT21 (0x0015): Actual Register

This table lists the actual dimensions for the tables in the B20s decade (i.e.BT20-BT29) that contain the measured values registers.

The access key requirements for BT21 are listed below.

BT21, Actual Register: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT21 is defined below.

BT21, Actual Register: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Season Information Field	BOOL(0)	0	True	F	The MEP server reports the appropriate season in tables in the B20s decade. If set to True, season fields in tables B20-B29 be used. If set to False, they will be skipped.
Date/Time Field	BOOL(1)	0	True	F	The MEP server reports date and time in tables in the B20s decade. If set to True, date/time fields in tables B20-B29 be used. If set to False, they will be skipped.
Demand Reset Counter	BOOL(2)	0		M	True if the count of the number of demand resets that have occurred since billing registers were last cleared is included in billing data, False if not. This is True any time demand is activated and configured.
Demand Reset Lock	BOOL(3)	0		M	The MEP server supports a configurable lockout period for sequential demand resets.
Cumulative Demand	BOOL(4)	0		M	True if cumulative demand is configured.
Continuous Cumulative Demand	BOOL(5)	0		M	True if continuous cumulative demand is configured.
Time Remaining	BOOL(6)	0	False	P	If True, the MEP server reports the time remaining in the present demand interval. If False, the MEP server does not report the time remaining.
Filler	FILL(7..7)	0	0		
Self-read Inhibit Overflow	BOOL(0)	1	False	F	The MEP server does not inhibit self-reads once a memory overflow occurs.
Self-read Sequence Number	BOOL(1)	1		P	A 2-byte field is maintained within BT26 when demand is configured for purposes of configuration identification.
Daily Self-read	BOOL(2)	1	True	F	Daily self-reads are supported.
Weekly Self-read	BOOL(3)	1	True	F	Weekly self-reads are supported.
Self-read Demand Reset	UINT(4..5)	1		P	MEP server does not automatically perform either a self-read with every demand reset, or a demand reset with every self-read.
Filler	FILL(6..7)	1	0	F	

Field Name	Type	Offset	Value	VCI	Description
Number of Self-reads	UINT8	2	0..BT20.2	M	The number of self-read entries currently configured in the MEP server.
Number of Summations	UINT8	3	11, 19 or BT20.03	M	The number of accumulations reported in BT23. For Control Point/OSGP Modules and for OSGP meters running firmware versions 3.X, this varies depending on the demand configuration, and may be set to either 11 or to the value of the “Number of Summations” field in BT20. For OSGP meters running firmware versions 4.0 and higher, this is set to 19. For a description of the summations, see tables BT22 and BT23.
Number of Demands	UINT8	4	0..BT20.04	M	The number of demand registers (sources) currently configured in the MEP server. There can be a maximum of 8 demand registers configured.
Number of Coincident Values	UINT8	5	0..BT20.05	M	The total number of coincident values currently configured. There are two coincident values configured for every demand source.
Number of Occurrences	UINT8	6	0..BT20.06	M	Number of maximum demands reported for each demand register. This is set to 1 if demand is enabled.
Number of Tiers	UINT8	7	4	P	Most MEP servers support up to 4 TOU tiers (rates). Meters running firmware versions 3.7x and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher support up to 8 tiers.
Number of Present Demands	UINT8	8	0..BT28.08	M	The number of present demands configured.
Number of Present Values	UINT8	9	0…BT20.9	M	The number of instantaneous measurement values recorded in the MEP server. For a description of the present values, see tables BT27 and BT28.

BT22 (0x0016): Data Selection

This table lists the measurement sources (by number) that are recorded in BT23 and other tables derived from BT23. The order of sources listed here matches the order the data is presented in these other tables.

The access key requirements for BT22 are listed below.

BT22, Data Selection: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT22 is defined below.

BT22, Data Selection: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Summation Sources	ARRAY[BT21.3] of UINT8	0		M	A list of source ID numbers for each summation. For a description of the summations, see BT23. The source ID numbers that can be used are listed after this table.
Demand Select	ARRAY[BT21.4] of UINT8	BT21.3		M	A list of source ID numbers for the demand soruces. Source assignment should be handled by the head-end utility software. The source ID numbers that can be used are listed after this table.
Min Max Flags	SET((BT21..4 +7) /8)	BT21.3 + BT21.4		M	A set of bit flags corresponding to each deamnd source that indicates whether that demand source is a minimum or maximum demand. False (0) = Minimum True (1) = Maximum
Coincident Select	ARRAY[BT21.5] of UINT8	BT21.3 + BT21.4 + ((BT21.4 +7) /8)		M	A list of sourcee that can be collected with each demand measurement. Source assignment should be handled by the head-end utility software.
Coincident Demand Associated	ARRAY[BT21.5] of UINT8	BT21.3 + BT21.4 + ((BT21.4 +7) /8) + BT21.5		M	An index into the demand select field identifying the demand with which this coincident value is associated.

Source IDs

The source ID numbers that are applicable to BT22 (and BT27, which is described later in this chapter) are listed below. If the source name includes an L1, L2, L3, or L1L2L3, it indicates a phase value. If it includes a Q1, Q2, Q3, or Q4, it is an energy quadrant indicator value. In addition, you should be aware that the source IDs for tier-specific values use 0-based indexing to indicate the tier each value is applicable to. However, the OSGP meter LCD uses 1-based indexing when display tier-specific values. For example, sources for “T0” in the table below are displayed for “Tier 1” on the OSGP meter LCD.

ID	Source Name	ID	Source Name	ID	Source Name	ID	Source Name
0	Fwd Active Wh L1L2L3	1	Rev Active Wh L1L2L3	2	Import Reactive Varh L1L2L3	3	Export Reactive Varh L1L2L3
4	Power Off Seconds	5	Power Outage Qty	6	Fwd+Rev Active Wh L1L2L3	7	Fwd-Rev Active Wh L1L2L3
8	Fwd Active W L1L2L3	9	Rev Active W L1L2L3	10	Import Reactive Var L1L2L3	11	Export Reactive Var L1L2L3
12	RMS Current L1	13	RMS Current L2	14	RMS Current L3	15	RMS Voltage L1
16	RMS Voltage L2	17	RMS Voltage L3	18	Power Factor L1	19	Frequency
20	VA Power L1L2L3	21	Power Factor L2	22	Power Factor L3	23	Sin phase angle (L1)
24	Sin phase angle (L2)	25	Sin phase angle (L3)	26	Channel 0 Pulse Input	27	Channel 1 Pulse Input
28	Error Counter	29	T0 Fwd Active Wh L1L2L3	30	T0 Rev Active Wh L1L2L3	31	T0 Import Reactive VArh L1L2L3
32	T0 Export Reactive VArh L1L2L3	33	T0 Power Off Minutes	34	T0 Power Outage Qty	35	T0 Fwd+Rev Active Wh L1L2L3
36	T0 Fwd-Rev Active Wh L1L2L3	37	T0 Channel 0 Pulse Input	38	T0 Channel 1 Pulse Input	39	T0 Error Counter
40	T1 Fwd Active Wh L1L2L3	41	T1 Rev Active Wh L1L2L3	42	T1 Import Reactive VArh L1L2L3	43	T1 Export Reactive VArh L1L2L3
44	T1 Power Off Minutes	45	T1 Power Outage Qty	46	T1 Fwd+Rev Active Wh L1L2L3	47	T1 Fwd-Rev Active Wh L1L2L3
48	T1 Channel 0 Pulse Input	49	T1 Channel 1 Pulse Input	50	T1 Error Counter	51	T2 Fwd Active Wh L1L2L3
52	T2 Rev Active Wh L1L2L3	53	T2 Import Reactive VArh L1L2L3	54	T2 Export Reactive VArh L1L2L3	55	T2 Power Off Minutes
56	T2 Power Outage Qty	57	T2 Fwd+Rev Active Wh L1L2L3	58	T2 Fwd-Rev Active Wh L1L2L3	59	T2 Channel 0 Pulse Input
60	T2 Channel 1 Pulse Input	61	T2 Error Counter	62	T3 Fwd Active Wh L1L2L3	63	T3 Rev Active Wh L1L2L3

ID	Source Name	ID	Source Name	ID	Source Name	ID	Source Name
64	T3 Import Reactive VArh L1L2L3	65	T3 Export Reactive VArh L1L2L3	66	T3 Power Off Minutes	67	T3 Power Outage Qty
68	T3 Fwd+Rev Active Wh L1L2L3	69	T3 Fwd-Rev Active Wh L1L2L3	70	T3 Channel 0 Pulse Input	71	T3 Channel 1 Pulse Input
72	T3 Error Counter	73	MEP Dev 1 Counter 1	74	MEP Dev 1 Counter 2	75	MEP Dev 2 Counter 1
76	MEP Dev 2 Counter 2	77	MEP Dev 3 Counter 1	78	MEP Dev 3 Counter 2	79	MEP Dev 4 Counter 1
80	MEP Dev 4 Counter 2	81	Fwd Active W L1L2L3 Post CT/VT Ratio	82	Rev Active W L1L2L3 Post CT/VT Ratio	83	Import VAR L1L2L3 Post CT/VT Ratio
84	Export VAR L1L2L3 Post CT/VT Ratio	85	Unused	86	Unused	87	Unused
88	Present Dmd 1	89	Present Dmd 2	90	Present Dmd 3	91	Present Dmd 4
92	Present Dmd 5	93	Present Dmd 6	94	Present Dmd 7	95	Present Dmd 8
96	Previous Dmd 1	97	Previous Dmd 2	98	Previous Dmd 3	99	Previous Dmd 4
100	Previous Dmd 5	101	Previous Dmd 6	102	Previous Dmd 7	103	Previous Dmd 8
104	Q1 Reactive VAr L1L2L3**	105	Q2 Reactive VAr L1L2L3**	106	Q3 Reactive VAr L1L2L3**	107	Q4 Reactive VAr L1L2L3**
108	Q1 Reactive VArh L1L2L3**	109	Q2 Reactive VArh L1L2L3**	110	Q3 Reactive VArh L1L2L3**	111	Q4 Reactive VArh L1L2L3**
112…..163	Mapped Sources	164	Min Voltage L1	165	Min Voltage L2	166	Min Voltage L3
167	Max Voltage L1	168	Max Voltage L2	169	Max Voltage L3	170	Max Active Fwd Power L1L2L3
171	Max Active Rev Power L1L2L3	172	Max Reactive Power Q1	173	Max Reactive Power Q2	174	Max Reactive Power Q3
175	Max Reactive Power Q4	176	Time Stamp Previous Source	177	Max forward active power L1L2L3 Post CT/VT Ratio	178	Max reverse active power L1L2L3 Post CT/VT Ratio
179	Max forward active power L1 Post CT/VT Ratio	180	Max forward active power L2 Post CT/VT Ratio	181	Max forward active power L3 Post CT/VT Ratio	182	Max reverse active power A post CT/VT ratio

ID	Source Name	ID	Source Name	ID	Source Name	ID	Source Name
183	Max reverse active power L2 Post CT/VT Ratio	184	Max reverse active power L3 Post CT/VT Ratio	185	Fwd Active W L1	186	Fwd Active W L2
187	Fwd Active W L3	188	Rev Active W L1	189	Rev Active W L2	190	Rev Active W L3
191	Fwd Active W L1 Post CT/VT Ratio	192	Fwd Active W L2 Post CT/VT Ratio	193	Fwd Active W L3Post CT/VT Ratio	194	Rev Active W L1 Post CT/VT Ratio
195	Rev Active W L2 Post CT/VT Ratio	196	Rev Active W L3 Post CT/VT Ratio	197	RMS Current L1 Post CT/VT Ratio	198	RMS Current L2 Post CT/VT Ratio
199	RMS Current L3 Post CT/VT Ratio	200	Reserved For Internal Use	201	Current Load Profile Interval Time Adjustment	202	Continuous RMS Voltage L1***
203	Continuous RMS Voltage L2***	204	Continuous RMS Voltage L3***	205	Average RMS Voltage L1***	206	Average RMS Voltage L2***
207	Average RMS Voltage L3****	208	Average Fwd Active W L1L2L3	209	Average Rev Active W L1L2L3	210	Average Fwd Active W L1
211	Average Fwd Active W L2	212	Average Fwd Active W L3	213	Average Rev Active W L1	214	Average Rev Active W L2
215	Average Rev Active W L3	216	Apparent Power Q1 VA L1L2L3*	217	Apparent Power Q2 VA L1L2L3*	218	Apparent Power Q3 VA L1L2L3*
219	Apparent Power VA Q4 L1L2L3*	220	Apparent Power Q1 VA L1*	221	Apparent Power Q2 VA L1*	222	Apparent Power Q3 VA L1*
223	Apparent Power VA Q4 L1*	224	Apparent Power Q1 V A L2*	225	Apparent Power Q2 VA L2*	226	Apparent Power Q3 VA L2*
227	Apparent Power VA Q4 L2*	228	Apparent Power Q1 VA L3*	229	Apparent Power Q2 VA L3*	230	Apparent Power Q3 VA L3*
231	Apparent Power VA Q4 L3*	232	Neutral Current mA*	233	Average RMS Current mA L1	234	Average RMS Current mA L2
235	Average RMS Current mA L3	236	Voltage Angle A to B*	237	Voltage Angle B to C*	238	Voltage Angle C to A*
239	Imp Reactive VAr A*	240	Imp Reactive VAr B*	241	Imp Reactive VAr C*	242	Exp Reactive VAr A*
243	Exp Reactive VAr B*	244	Exp Reactive VAr C*	N/A	Not used.	N/A	Not used.

*Sources 216-232 are only available to OSGP meters running firmware versions 4.0 and higher. Sources 233-235 are only available to OSGP meters running firmware versions 4.10 and higher. Sources 236-244 are only available to Control Point/OSGP Modules running firmware versions 1.32 and higher, and OSGP meters running firmware versions 4.30 and higher.

**For meters running firmware versions 3.X, sources 104-111 are only available if demand is activated and configured in the meter.

***Registers for continuous voltage values are not updated for Control Point and OSGP Modules. However, registers for average voltage values are updated based on the RMS voltage values passed into the Module via EP50.

BT23 (0x0017): Current Register Data

This table contains the present energy accumulations for the totals and all TOU tiers.

Proper interpretation of the registers and offsets in BT23 relies on first reading BT21 and BT22 to determine the presently configured dimensions of this table. Additionally, BT22 describes which sources are recorded and in what order they are presented in this table.

Note: *The values presented in this table always incorporate the CT and VT ratios configured in BT15 "Constants." This means that the adjustment of the raw data by the CT and VT ratios has already been performed on the values stored in this table.*

In addition, OSGP CT meters running firmware versions 3.70 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher include configurable energy register units. This means that cumulative energy measurements stored in BT23 that are measured in varh and Wh can be recorded in units of 1, 10 or 100. This setting can be read from the "Energy Register Unit" field in ET55.

Note: *Because the CPM 0600 and CPM 6010 OSGP Modules do not include metering circuits, they are unable to make power, energy and current measurements. Therefore, all power, energy and current measurements must be passed from the meter to the CPM 0600 or CPM 6010 OSGP Module via EP50. This includes all instantaneous measurements, as well as other values that are calculated based on instantaneous measurements, such as accumulated values.*

The CPM 0600 and CPM 6010 OSGP Modules do monitor and update their registers to record values for the following measurements in BT23, without requiring the use EP50: Power Outage Duration, Power Outage Qty, Pulse Input 1, Pulse Input 2, and Error Counter.

This chart is used to calculate field offsets in the table below.

Symbol	Value	Description
A	IF BT21.0.2 THEN 1 ELSE 0	BT21.0.2 is the Demand Reset Counter bit. This is True anytime demand is enabled.
B	A + 4*BT21.3	BT21.3 is the "Number of Summations" field, which is fixed at 15 when demand is activated and configured (or 11 when it isn't activated and configured).
C	B + BT21.4*DmdRcd	BT21.4 is the "Number of Demands" field, which indicates how many demand sources are configured. This value is in the range 1…8.
D	C + BT21.5*CoinRcd	BT21.5 is the "Number of Coincident Values" field, which indicates how many coincident values are enabled. There will be two coincident values configured for each demand source/register.

The access key requirements for BT23 are listed below.

BT23, Current Register Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for BT23 is defined below.

BT23, Current Register Data: Table Structure

Number	Field Name	Type	Offset	Value	VCI	Description
	IF BT21.0.2 THEN Nbr Demand Resets	UINT8	0		M	The number of demand resets executed by the MEP server.
Total Data Block: Summations, Demands, and Coincidents						
Summations: Array[BT21.3] of NI_FMAT1 as shown next:						Measurement accumulations for totals (these are never reset in the field).
0	Fwd Active Wh L1L2L3	NI_FMAT1	A		M	These fields contain the present forward and reverse active energy measurements, in Wh, for all phases L1L2L3. These values are updated by the MEP server every time the forward active or reverse active energy increases or decreases by 1 Wh, or at most once every 500 ms.
1	Rev Active Wh L1L2L3	NI_FMAT1	A+4		M	
2	Import Reactive VArh L1L2L3	NI_FMAT1	A+8		M	Fields 2 and 3 contain the present import and export reactive energy, in VArh, for all phases L1L2L3. These values are updated by the MEP server every time the forward active or reverse active energy increases or decreases by 1 Wh, or at most once every 500 ms.
3	Export Reactive VArh L1L2L3	NI_FMAT1	A+12		M	
4	Power Outage Duration	NI_FMAT1	A+16		M	In seconds. This field not populated in tier groups.

Number	Field Name	Type	Offset	Value	VCI	Description
5	Power Outage Qty	NI_FMA T1	A+20		M	This field not populated in tier groups
6	Fwd+Rev Active Wh L1L2L3	NI_FMA T1	A+24		M	Fields 6 and 7contain the present forward+reverse and forward-reverse active energy measurements, in Wh, for all phases L1L2L3. These values are updated by the MEP server every time the energy value increases or decreases by 1 Wh, or at most once every 500 ms. Note that the result for forward-reverse active energy is clamped at 0.
7	Fwd-Rev Active Wh L1L2L3	NI_FMA T1	A+28		M	
8	Pulse Input 1	NI_FMA T1	A+32		M	Pulse input counts for channel 1 or 2. These values are updated every time a pulse is detected, as long as pulse inputs are connected to the MEP server. These fields are not populated in tier groups.
9	Pulse Input 2	NI_FMA T1	A+36		M	
10	Error Counter	NI_FMA T1	A+40		M	Increments by 1 every instance of one the following alarms: - RAM Failure - Non-volatile Memory Failure - Clock Error (only for OSGP meter firmware versions up to 3.4X) - Measurement Error - Save-all Aborted This field is not populated in tier groups.
11	Reactive VArh Q1	NI_FMA T1	A+44		M	Reactive energy for quadrant 1
12	Reactive VArh Q2	NI_FMA T1	A+48		M	Reactive energy for quadrant 2
13	Reactive VArh Q3	NI_FMA T1	A+52		M	Reactive energy for quadrant 3

Number	Field Name	Type	Offset	Value	VCI	Description
14	Reactive VArh Q4	NI_FMA T1	A+56		M	Reactive energy for quadrant 4
15	Apparent Energy VAh Q1	NI_FMA T1	A+60		M	Apparent energy for quadrant 1
16	Apparent Energy VAh Q2	NI_FMA T1	A+64		M	Apparent energy for quadrant 2
17	Apparent Energy VAh Q3	NI_FMA T1	A+68		M	Apparent energy for quadrant 3
18	Apparent Energy VAh Q4	NI_FMA T1	A+72		M	Apparent energy for quadrant 4
Demand Measurements: ARRAY[BT21.4] of DmdRcd						
DmdRcd:						
	IF BT21.0.1 THEN Event Time	ARRAY[BT21.6] of STIME_ DATE	B		M	Timestamp of the demand measurement
	IF BT21.0.4 THEN Cumulative Demand	NI_FMA T1	B + 5*BT21. 6		M	Cumulative demand measurment
	IF BT21.0.5 THEN Contin Cum Demand	NI_FMA T1	B + 5*BT21. 6 + 4		M	Continuous cumulative demand measurement
	Demand	ARRAY[BT21.6] of NI_FMA T2	B + 5*BT21. 6 +8		M	Demand measurements
Coincidents: ARRAY[BT21.5] of CoinRcd						
CoinRcd:						
	Coincidents	ARRAY[BT21.6] of NI_FMA T2	C		M	The selected sources collected with the demand measurements
Tier Data Block: Array[BT21.7] of BT23.Total Data Block						Each element in this array represents the current register data for a specific tariff (first element for tariff 0, second for tariff 1, etc). Each element is formatted in the same manner as the Total

Number	Field Name	Type	Offset	Value	VCI	Description
						Data Block area described previously.
	Summations		D		M	This matches the format of the Summations area described for the Total Data Block (i.e. each element includes the same set of summation values, but for a specific tier).
	Demand Measurements				M	This matches the format of the Demand Measurements area described for the Total Data Block (i.e. each element includes the same set of demand measurements, but for a specific tier).
	Coincidents				M	This matches the format of the Coincidents area described for the Total Data Block (i.e. each element includes the same set of coincident values, but for a specific tariff).

BT24 (0x0018): Previous Season Data

This table is a snapshot of the current register data (BT23) taken at the time of the last season change. The access key requirements for BT24 are listed below.

BT24, Previous Season Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK*	X	X	X	X

*Read-only for OSGP meter firmware versions 3.7X and all versions 4.10 and higher, and for Control Point/OSGP Module firmware version 1.2X. Note that for OSGP meter firmware versions 4.10 and higher, this table can be reset with EP64.

The table structure for BT24 is defined below.

BT24, Previous Season Data: Table StructureField name	Type	Offset	Value	VCI	Description
Time and Date	STIME_DATE	0		M	Time and date (BT55) when this data was captured.
Season	UINT8	5		M	Season represented in this snapshot.
Register Data Received		6			Snapshot of total and tier summations, and demand measurements. This data matches the format of the “Total Data Block: Summations, Demands, and Coincidents” and “Tier Data Block” areas of BT23.

BT25 (0x0019): Previous Demand Reset Data

This table contains the previous demand data recorded at the last demand reset for the totals and all 4 TOU tiers.

The access key requirements for BT25 are listed below.

BT25, Previous Demand Reset Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT25 is defined below.

BT25, Previous Demand Reset Data: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Date/Time	STIME_DATE	0		M	Date/time that this data was captured.
Season	UINT8	5		M	Season represented in this snapshot.
Register Data Received		6			The demand reset data demand data recorded at the last demand reset for the totals and all 4 TOU tariffs. This matches the format of BT23.

BT26 (0x001A): Self-Read Data

This table is a snapshot of the current register data (BT23) taken at programmed intervals of time. Self-read intervals are programmable via the TOU Calendar (BT54). In all places where BT21 is

referenced below, if that table does not exist on the meter, the error message “Inappropriate Action Requested” will be returned. In this case, the command should be attempted again using BT20.

The access key requirements for BT26 are listed below.

BT26, Self-Read Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

BT26: Self Read Data

Field Name	Type	Offset	Value	VCI	Description
Order	BOOL(0)	0	FALSE	F	Self read records are transported in ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	This flag is set when the selfread memory has overflowed, causing old data to be overwritten.
List Type	BOOL(2)	0	TRUE	F	The self read list is a circular queue. Reads FALSE if max entries is 0.
Inhibit Overflow	BOOL(3)	0	FALSE	F	The meter does not inhibit new entries when overflow occurs.
Filler	FILL(4..7)	0			
Number of Valid Entries	UINT8	1		M	Number of self read records with valid data. Range is 0..BT21.2.
Last Entry Element	UINT8	2		M	Array element of the most recent valid self read entry. Range is 0..BT21.2.
Last Entry Sequence Number	UINT16	3		M	Sequence number of the most recent self read opera tion. This value is never reset.
Number of Unread Entries	UINT8	5		M,H	Number of self read records that have not been read. This field is incremented by the meter and decremented by the host as records are read. Range is 0..BT21.2.

Field Name	Type	Offset	Value	VCI	Description
IF BT21.4 != 0 then Blg Iface Def Nbr (BIDN)	UINT16	6		M	If the “Number of Demands” field in BT21 is set to a non-zero value, then this field holds the BIDN (Billing Interface Definition Number) for this entry. The BIDN is an identifier set by the calling device to identify billing related data in logs as pertaining to the present configuration.
Time and Date	STIME_DATE	8		M	Time and date (BT55) when this data was captured.
Season	UINT8	13		M	Season represented in this snapshot.
Register Data Received		14			The data for this self-read record. The data recorded for each self-read entry matches the format of BT23.

BT27 (0x001B): Present Register Selection

This table lists the instantaneous measurement sources (by number) that are recorded in BT28 “Present Register Data” and other tables derived from BT28. The order of sources listed here matches the order the data is presented in these other tables.

The access key requirements for BT27 are listed below.

BT27, Present Register Selection: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT27 is defined below.

BT27, Present Register Selection: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Present Demand Sources	ARRAY[BT21.8] of UINT8	0		F	List of source ID numbers included in present demand measurements. The source ID numbers that can be used are listed after the description of BT22 earlier in this chapter.
Present Value Sources	ARRAY[BT21.9] of UINT8	BT21.8		F	List of source ID numbers for each instantaneous measurement value. The source ID numbers that can be used are listed after the description of BT22 earlier in this chapter.

Field Name	Type	Offset	Value	VCI	Description
					For a description of the present values, see BT28 “Present Register Data.”

BT28 (0x001c): Present Register Data

This table contains the recorded instantaneous measurement values. Proper interpretation of the registers and offsets in this table requires reading BT21 and BT27 to determine the presently configured dimensions of this table. In addition, BT27 describes which sources are recorded and in what order they are presented in this table.

For more information on the measurement values listed in this table, consult the Energy Measurements and Calculations chapter of the IEC Electric Meter User’s Guide for the meter firmware version you are using.

Note: *Unless otherwise specified in specific fields in this table, all values reported here do not incorporate the CT and VT ratios as configured in BT15.*

Note: *Because the CPM 0600 and CPM 6010 OSGP Modules do not include metering circuits, they are unable to make power, energy and current measurements. Therefore, all power, energy and current measurements must be passed from the meter to the CPM 0600 or CPM 6010 OSGP Module via EP50. This includes all instantaneous measurements, as well as other values that are calculated based on instantaneous measurements, such as accumulated values.*

The CPM 0600 and CPM 6010 OSGP Modules do monitor and update their registers to record values for the following measurements in BT28 without requiring the use of EP50: Frequency, and RMS Voltage L1 (if the External Voltage bit in ET29 is set during manufacturing).

The access key requirements for BT28 are listed below.

BT28, Present Register Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT28 is defined below.

BT28, Present Register Data: Table Structure

Number	Field Name	Type	Offset	Value	VCI	Description
	Present Demands: ARRAY[BT21.8] of PresDmdRcd:					
	PresDmdRcd:					
	IF BT21.0.6 THEN Time Remaining	TIME	0		M	Time remaining to the end of the present demand interval.
	Demand value	NI_FMAT 2	3		M	The present demand value.

Number	Field Name	Type	Offset	Value	VCI	Description
Present Value #	**Present values: ARRAY[BT21.9] of NI_FMAT1.** The offsets for the following set of values can be calculated as follows: **(A+4)*BT21.8+Present Value Number.**					
0	Fwd Active W L1L2L3	NI_FMAT 1			M	If BT21.0.6 = True, then A = 3. Otherwise, A = 0.
1	Rev Active W L1L2L3	NI_FMAT 1			M	
2	Import Reactive VAr L1L2L3	NI_FMAT 1			M	
3	Export Reactive VAr L1L2L3	NI_FMAT 1			M	
4	RMS Current (mA) L1	NI_FMAT 1			M	
5	RMS Current (mA) L2	NI_FMAT 1			M	
6	RMS Current (mA) L3	NI_FMAT 1			M	
7	RMS Voltage (mV) L1	NI_FMAT 1			M	
8	RMS Voltage (mV) L2	NI_FMAT 1			M	
9	RMS Voltage (mV) L3	NI_FMAT 1			M	
10	Power Factor L1 (1/1000)	NI_FMAT 1			M	
11	Frequency (mHz)	NI_FMAT 1			M	
12	VA L1L2L3	NI_FMAT 1			M	
13	Power Factor L2 (1/1000)	NI_FMAT 1			M	
14	Power Factor L3 (1/1000)	NI_FMAT 1			M	
15	Sin(PA) L1 (1/1000)	NI_FMAT 1			M	
16	Sin(PA) L2 (1/1000)	NI_FMAT 1			M	
17	Sin(PA) L3 (1/1000)	NI_FMAT 1			M	
18	Fwd Active W L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT 1			M	

Number	Field Name	Type	Offset	Value	VCI	Description
19	Rev Active W L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT 1			M	
20	Import Reactive VAr L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT 1			M	
21	Export Reactive VAr L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT 1			M	
Following fields added in firmware version 3.10						
22	Q1 Reactive Var L1L2L3	NI_FMAT 1			M	Reactive power for quadrant 1
23	Q2 Reactive Var L1L2L3	NI_FMAT 1			M	Reactive power for quadrant 2
24	Q3 Reactive Var L1L2L3	NI_FMAT 1			M	Reactive power for quadrant 3
25	Q4 Reactive Var L1L2L3	NI_FMAT 1			M	Reactive power for quadrant 4
Following fields added in firmware version 3.50						
26	Fwd Active W L1	NI_FMAT 1			M	
27	Fwd Active W L2	NI_FMAT 1			M	
28	Fwd Active W L3	NI_FMAT 1			M	
29	Rev Active W L1	NI_FMAT 1			M	
30	Rev Active W L2	NI_FMAT 1			M	
31	Rev Active W L3	NI_FMAT 1			M	
32	Fwd Active W L1 Post CT/VT Ratio	NI_FMAT 1			M	
33	Fwd Active W L2 Post CT/VT Ratio	NI_FMAT 1			M	
34	Fwd Active W L3 Post CT/VT Ratio	NI_FMAT 1			M	
35	Rev Active W L1 Post CT/VT Ratio	NI_FMAT 1			M	
36	Rev Active W L2 Post CT/VT Ratio	NI_FMAT 1			M	
37	Rev Active W L3 Post CT/VT Ratio	NI_FMAT 1			M	

Number	Field Name	Type	Offset	Value	VCI	Description
38	RMS Current (mA) L1 Post CT Ratio	NI_FMAT 1			M	
39	RMS Current (mA) L2 Post CT Ratio	NI_FMAT 1			M	
40	RMS Current (mA) L3 Post CT Ratio	NI_FMAT 1			M	
Following fields added in meter firmware version 3.70/Control Point/OSGP Module firmware version 1.20						
41	RMS Voltage (mV) L1 - Continuous	NI_FMAT 1			M	
42	RMS Voltage (mV) L2 - Continuous	NI_FMAT 1			M	
43	RMS Voltage (mV) L3 - Continuous	NI_FMAT 1			M	
44	RMS Voltage (mV) L1 - Average	NI_FMAT 1			M	
45	RMS Voltage (mV) L2 - Average	NI_FMAT 1			M	
46	RMS Voltage (mV) L3 - Average	NI_FMAT 1			M	
47	Average Fwd Active W L1L2L3	NI_FMAT 1			M	
48	Average Rev Active W L1L2L3	NI_FMAT 1			M	
49	Average Fwd Active W L1	NI_FMAT 1			M	
50	Average Fwd Active W L2	NI_FMAT 1			M	
51	Average Fwd Active W L3	NI_FMAT 1			M	
52	Average Rev Active W L1	NI_FMAT 1			M	
53	Average Rev Active W L2	NI_FMAT 1			M	
54	Average Rev Active W L3	NI_FMAT 1			M	
Following fields added in meter firmware version 4.0. They are not applicable to Control Point/OSGP Modules.						
55	Apparent Power Q1 VA L1L2L3	NI_FMAT 1			M	
56	Apparent Power Q2 VA L1L2L3	NI_FMAT 1			M	
57	Apparent Power Q3 VA L1L2L3	NI_FMAT 1			M	

Number	Field Name	Type	Offset	Value	VCI	Description
58	Apparent Power Q4 VA L1L2L3	NI_FMAT 1			M	
59	Apparent Power Q1 VA L1	NI_FMAT 1			M	
60	Apparent Power Q2 VA L1	NI_FMAT 1			M	
61	Apparent Power Q3 VA L1	NI_FMAT 1			M	
62	Apparent Power Q4 VA L1	NI_FMAT 1			M	
63	Apparent Power Q1 VA L2	NI_FMAT 1			M	
64	Apparent Power Q2 VA L2	NI_FMAT 1			M	
66	Apparent Power Q3 VA L2	NI_FMAT 1			M	
66	Apparent Power Q4 VA L2	NI_FMAT 1			M	
67	Apparent Power Q1 VA L3	NI_FMAT 1			M	
68	Apparent Power Q2 VA L3	NI_FMAT 1			M	
69	Apparent Power Q3 VA L3	NI_FMAT 1			M	
70	Apparent Power Q4 VA L3	NI_FMAT 1			M	
71	Neutral Current mA	NI_FMAT 1			M	
Following fields added in meter firmware version 4.10. They are not applicable to Control Point/OSGP Modules.						
72	Average RMS Current mA L1	NI_FMAT 1			M	
73	Average RMS Current mA L2	NI_FMAT 1			M	
74	Average RMS Current mA L3	NI_FMAT 1			M	
Following fields added in Control Point/OSGP Module firmware version 1.32 and OSGP meter firmware version 4.30. Note that for Control Point/OSGP Modules, a full table read of BT28 will not include these registers. You must perform an additional partial table read to read these registers.						
75	Voltage Angle A to B	NI_FMAT 1			M	Angles between adjacent phase voltages, in 1/100
76	Voltage Angle B to C	NI_FMAT 1			M	

Number	Field Name	Type	Offset	Value	VCI	Description
77	Voltage Angle C to A	NI_FMAT 1			M	of a degree (e.g. 12340 = 123.40°)
78	Imp Reactive VAr A	NI_FMAT 1			M	Import or export reactive power, per-phase, in VAr.
79	Imp Reactive VAr B	NI_FMAT 1			M	
80	Imp Reactive VAr C	NI_FMAT 1			M	
81	Exp Reactive VAr A	NI_FMAT 1			M	
82	Exp Reactive VAr B	NI_FMAT 1			M	
83	Exp Reactive VAr C	NI_FMAT 1			M	

BT30 (0x001E): Dimension Display

This table lists the maximum dimensions of fields and tables that control the OSGP meter's LCD display.

The access key requirements for BT30 are listed below.

BT30, Dimension Display: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT30 is defined below.

BT30, Dimension Display: Table Structure

Field Name	Type	Offset	Value	VCI	Description
On time	BOOL(0)	0	True	F	Reserved for future use.
Off time	BOOL(1)	0	False	F	Reserved for future use.
Hold time	BOOL(2)	0	False	P	Reserved for future use.
Filler	FILL(3..7)	0			
Number of Display Sources	UINT16	1	962	P	The number of measurement sources that can be selected for display on the LCD.
Width Display Sources	UINT8	3	2	F	Number of display sources is described by 2 bytes.
Number of Primary List Items	UINT16	4	30	P	The primary display list can contain up to 30 sources.

Field Name	Type	Offset	Value	VCI	Description
Number of Primary Lists	UINT8	6	1	P	1 display list is supported.
Number of Secondary List Items	UINT16	7	0	P	Reserved for future use.
Number of Secondary Lists	UINT8	9	0	P	Reserved for future use.

BT33 (0x0021): Primary Display List

This table is used to configure what items show in what order and for how long on the OSGP meter display.

The access key requirements for BT33 are listed below.

BT33, Primary Display List: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

The table structure for BT33 is defined below.

BT33, Primary Display List: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Primary Display List	ARRAY[BT30.6] of DispListDescRcd				
DispListDescRcd Entry:					
On Time	UINT(0..3)	0	6	H	The number of seconds each item is displayed, with a range of 6-15. You can also set this field to zero. This disables the automatic scrolling feature and requires the push button to advance to the next display list item. Note that if the secondary display list is enabled, then this behavior (advancement via push button) is overridden, and the primary display list will always autoscroll. For more information on the secondary display list, see Secondary Display List.

Field Name	Type	Offset	Value	VCI	Description
Off Time	UINT(4..7)	0	0	F	Reserved for future use.
Hold Time	UINT(0..3)	1	0	P	Reserved for future use.
Default List	UINT(4..7)	1	1	F	First group of display sources listed below up to source BT33–2 -1 pertain to Normal mode. Value 1 = Normal display
Number List Items	UINT8	2	3	H	Number of items to display in Normal mode
Display Sources:	ARRAY[BT30.4] OF UINT16	3	0x2000 0x2001 0x0000	H	List of items to be displayed on the meter's LCD in the order entered. Items to be displayed are identified by 2-byte source IDs. The high and low byte values for each source ID are listed in Appendix D, Reading the Display Configuration (CPM 0600 and CPM 6010 OSGP Modules Only).

BT50 (0x0032): Dimension Time and TOU

This table lists the number of various TOU components included in the meter, such as the number of seasons and the number of special schedules. This affects the dimensions of tables and parameters within tables BT51 through BT55.

The access key requirements for BT50 are listed below.

BT50, Dimension Time and TOU: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT50 is defined below.

BT50: Dimension Time and TOU

Field Name	Type	Offset	Value	VCI	Description
TOU Self Read	BOOL(0)	0	TRUE	F	Meter supports scheduling of self-reads within TOU calendar.
Season Self Read	BOOL(1)	0	TRUE	F	Meter supports scheduling of self-reads with season change.
Season Demand Reset	BOOL(2)	0	FALSE	P	Meter does not support automatic demand reset with season change.

Field Name	Type	Offset	Value	VCI	Description
Season Change Armed	BOOL(3)	0	FALSE	F	Meter does not support arming season change to coincide with the next demand reset.
Sort Dates	BOOL(4)	0	FALSE	F	Meter does not require the nonrecurring dates to be pre-sorted when received.
Anchor Date	BOOL(5)	0	FALSE	F	Meter does not support the anchor date format of RDATE data type.
Filler	FILL(6..7)	0			
Daylight Saving Time Auto	BOOL(0)	1	FALSE	F	Meter does not support handling DST changes outside the scope of BT54.
Separate Week Days	BOOL(1)	1	FALSE	P	If False, the meter supports 1 weekday schedule, that will be used for each day of the week (Monday-Friday). If True, the meter supports a separate schedule for each weekday.
Separate Summation Demands	BOOL(2)	1	FALSE	F	Meter does not support switching tariff rates independently for summations and demands.
Sort Tier Switches	BOOL(3)	1	TRUE	F	Meter requires tier switches in BT54 be pre-sorted when received.
Capable Of Time Zone Offset	BOOL(4)	1	TRUE	F	Meter supports time zone offset.
Filler	FILL(5..7)	1			
Number of Seasons	UINT(0..3)	2	12	P	Maximum number of seasons supported in the meter. Meters running firmware versions 3.50 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher support 12 seasons. Devices running earlier firmware versions support 4 seasons.
Number of Special Schedules	UINT(4..7)	2	2	P	Maximum number of special (holiday) schedules per season supported in the meter.
Number of Non-Recurring Dates	UINT8	3	25	P	Maximum number of non-recurring dates supported. Support for non-recurring dates was added in OSGP meter firmware version 3.50, and Control Point/OSGP Module firmware version 1.20

Field Name	Type	Offset	Value	VCI	Description
Number of Recurring Dates	UINT8	4	23	P	Maximum number of recurring dates supported for entry in BT54. This includes: 1 for DST start date, 1 for DST end date, 4 for each of 4 season start dates, 15 holidays per year, 1 independent self-read schedule, 1 reserved for future use.
Number of Tier Switches	UINT16	5	200	P	Maximum number of tier switches per day supported for entry in BT54. First switch of every day begins at midnight.
Calendar Table Size	UINT16	7	808	P	Total size in bytes of BT54.

BT52 (0x0034): UTC Clock

This table reflects the MEP server's system date and time in UTC, non-DST adjusted, non-time-zone adjusted. This table is updated every second.

The access key requirements for BT52 are listed below.

BT52, UTC Clock: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT52 is defined below.

BT52, UTC Clock: Table Structure

Field Name	Type	Offset	VCI	Description
Clock Calendar	LTIME_DATE	0	M	The MEP server's system date and time in UTC. All functions, except those scheduled from within the TOU Calendar table, BT54, (TOU rate assignment, self-reads) are scheduled from this clock, including load profile.
Day of Week	UINT(0..2)	6	M	Present day of the week, updated every second; 0= Sunday, 1 = Monday, etc.
Daylight Saving Time	BOOL(3)	6	M	Present status of DST in effect. Even when this flag is True, the Clock calendar field in this table does not reflect daylight savings time. Read BT55 for DST clock adjust.
Greenwich Mean Time	BOOL(4)	6	F	System date and time corresponds to Greenwich Mean Time (UTC).
Time Zone Applied	BOOL(5)	6	F	Time zone offset is not applied to the system date and time in this table.

Field Name	Type	Offset	VCI	Description
DST Applied	BOOL(6)	6	F	System date and time in this table does not include daylight saving time adjustment.
Filler	FILL(7..7)	6		

BT53 (0x0035): Time Offset

This table contains programmable Daylight Saving Time (DST) options.

The access key requirements for BT52 are listed below.

BT53, Time Offset: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

BT53: Time Offset

Field Name	Type	Offset	VCI	Description
Daylight Saving Time Effective	TIME	0	H	Time of day the meter adjusts the TOU clock in BT55 to or from daylight savings, based on entries in the TOU Calendar table (BT54). Refer also to ET04.63
Daylight Saving Time Adjustment	UINT8	3	H	Daylight saving time adjustment, in minutes. When daylight saving time begins, the TOU clock in BT55 will adjust forward by this amount relative to the meter system date and time in BT52. When daylight saving time ends, the TOU clock in BT55 will adjust back to the meter system date and time.
Time Zone Offset	INT16	4	H	Time zone offset, in minutes, to be applied to the TOU clock in BT55. Range of -12 to +14 hours enforced in firmware.

BT54 (0x0036): Calendar

This table holds the TOU calendar that controls the scheduling of rate changes in the meter or Control Point/OSGP Module. In addition, self-reads are scheduled in BT54. All events scheduled in this table are triggered by the TOU clock representing local time (BT55).

BT54 consists of an array of non-recurring date records (NonRecurrDateRcd), an array of recurring date records (RecurrDateRcd), an array of tier switch records (TierSwitchRcd) and an array of season schedules (SeaSchedRcd). The offsets and total size of BT54 vary depending on the following parameters in BT50:

- The “Number of Seasons” field (BT50.2): The number of seasons (12 for firmware versions 3.50 and higher, 4 for previous firmware versions), and the number of special schedules per season (2), supported in the meter.
- The “Number of Non-Recurring Dates” field (BT50.3): The number of non-recurring dates in the calendar. Meters running firmware versions 3.50 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher support up to 25 non-recurring dates.
- The “Number of Recurring Dates” field (BT50.4): The number of recurring date records.
- The “Number of Tier Switches” field (BT50.5): The maximum number of tier switches supported per day.

The access key requirements for BT54 are listed below.

BT54, Calendar: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	MAK	X	X	X	X

BT54: Calendar

Field Name	Type	Offset	VCI	Description
Non-Recurring Date Records	ARRAY[BT50.3] of NonRecurrDateRcd (Non-recurring Date Records)			
NonRecurrDateRcd:				
Non-recurring Date	ANSI_DATE	0		Date of event.
Action	Calendar Action Bitfield			See the description of the “Action” field under “Recurring Date Records” for information on this field.
Recurring Date Records	ARRAYBT50.4] of RecurrDateRcd (Recurring Date Records)			
RecurrDateRcd:				
Recurring Date	RDATE	BT50.3 * sizeof(NonRecurrDateRcd)	H	Date of event, or start date of the season. Recurring dates are based on a perpetual calendar and can repeat on a daily, weekly, monthly, or yearly basis. The activation time is the start of the scheduled day at 00:00:00.
CalendarAction Bitfield				
Action	UINT(0..4)		H	This field determines which action should be performed on this recurring date. For meters running firmware versions 3.50

Field Name	Type	Offset	VCI	Description
				and higher and for Control Point/OSGP Modules running firmware versions 1.20 and higher, this includes the following values: 0 = No action 1 = Daylight savings time on 2 = Daylight savings time off 3..14 = Select season 0…11. For example, value 3 is for season 0, value 4 is for season 1, and so on. 4 = Select season 1 5 = Select season 2 6 = Select season 3 19 = Special schedule 0 20 = Special schedule 1 For devices running earlier firmware versions, this includes the following values: 0 = No action 1 = Daylight savings time on 2 = Daylight savings time off 3 = Select season 0 4 = Select season 1 5 = Select season 2 6 = Select season 3 19 = Special schedule 0 20 = Special schedule 1
Demand Reset	BOOL(5)		H	1 = Perform demand reset on this date 0 = No demand reset
Self read	BOOL(6)		H	1 = Perform self read on this date 0 = No self read

Field Name	Type	Offset	VCI	Description
TOU Format	FILL(7..7)			For the first RecurrDateRcd entry only, this bit indicates the TOU format being used. This field is not specified for all other entries, which use the format specified for the first entry: 1 = Implement TOU format introduced for meter firmware versions 3.50 and higher (and Control Point/OSGP Module firmware versions 1.20 and higher), with up to 12 seasons and 25 non-recurring dates. 0 = Implement TOU format used in earlier firmware versions, with only 4 seasons and 0 non-recurring dates.
Tier Switches:	ARRAY[BT50.5]] of TIerSwitchRcd (Tier Switch Records)			
TierSwitchRcd:				
Tier	UINT(0..2)	BT50.3 * sizeof(NonRecurrDateRcd) + BT50.4 * sizeof(RecurrDateRcd)	H	Rate that begins at this time.
Filler	FILL(3..4)			
Minute	UINT(5..10)		H	Start minute of new rate.
Hour	UINT(11..15)		H	Start hour of new rate.
Schedule	UINT8		H	Day schedule that this rate switch belongs to. Value: 0 for first 10 switches 1 for next 10 switches 19 for last 10 switches Note: This field is not used by the meter but may be written for ease of reading the table.
Season Schedules:	ARRAY[BT50.2] of SeaSchedRcd (Season Schedule Records): NOTE: If BT50.1.1 (the “Separate Week Days” field) is True, it means that each weekday is assigned a separate schedule. In this case, this array is expanded by 4 to cover all 7 days of the week. In this case, the schedules must be defined in the following order within the array: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Special Schedule 0, Special Schedule 1. If BT50.1.1 is False, it means that all week days (Monday through Friday) will use the schedule defined by the “Weekday” entry below, and the array must be specified as ordered below.			

Field Name	Type	Offset	VCI	Description
SeaSchedRcd:				
Saturday	UINT8	BT50.3 * sizeof(NonRecurrDateRcd) + BT50.4 * sizeof(RecurrDateRcd) + BT50.5 * sizeof(TierSwitchRcd)	H	Day schedule to use on Saturday in this season.
Sunday	UINT8		H	Day schedule to use on Sunday in this season.
Weekday	UINT8		H	Day schedule to use on all weekdays in this season.
Special Schedule 0	UINT8		H	First holiday day schedule for use in this season.
Special Schedule 1	UINT8		H	Second holiday day schedule for use in this season.
Calendar ID	UINT32	BT50.3 * sizeof(NonRecurrDateRcd) + BT50.4 * sizeof(RecurrDateRcd) + BT50.5 * sizeof(TierSwitchRcd) + BT50.2 * sizeof(SeaSchedRcd)	H	Identifier for the TOU calendar. You can read the ID of the TOU calendar that is currently active from the “Active Calendar ID” field in ET23 (ET23.95).

BT55 (0x0037): Local Clock State

This table reflects the local time for the DST-adjusted, local TOU clock. It is updated every minute. All events scheduled in the TOU calendar table (BT54) are triggered by this clock.

The access key requirements for BT55 are listed below.

BT55, Local Clock State: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X

Write	None				

The table structure for BT55 is defined below.

BT55, Local Clock State: Table Structure

Field Name	Type	Offset	VCI	Description
Clock Calendar	LTIME_DATE	0	M	DST and time-zone-adjusted MEP server date/time. This field is updated every minute and on table writes. When daylight saving time begins, this clock will adjust forward by the DST adjustment programmed in BT53, relative to the system date and time in BT52. When daylight saving time ends, this clock echoes the system date/time.
Day of Week	UINT(0..2)	6	M	DST-adjusted day of the week, updated every minute 0 = Sunday 1 = Monday 2=Tuesday, etc.
Daylight Savings Time	BOOL(3)	6	M	Present status of DST in effect, updated every minute.
Greenwich Mean Time	BOOL(4)	6	F	TOU clock in this table does not necessarily correspond to Greenwich Mean Time.
Time Zone Applied	BOOL(5)	6	F	Time zone offset has been applied to the TOU clock in this table.
DST Applied	BOOL(6)	6	F	TOU clock in this table does include daylight saving time adjustment.
Filler	FILL(7..7)	6		
Current Tier	UINT(0..2)	7	M	Current active tier. This field is 0-based. The range is 0…7 for meters running firmware versions 3.70 and higher (and for Control Point Modules running firmware versions 1.20 and higher). The range is 0...3 for earlier firmware versions. Note that Control Point/OSGP Modules running firmware versions 1.21 and higher will lock out the optical interface for 8 seconds any time a tier switch is initiated. This is intended to ensure that the module will be able to use the MEP interface to read the current tier from the module within one second of the tier switch, and begin to allocate energy usage to the correct tier. For more information, consult the Optical Port Lockout On Tier Switch Change section of the Optical Port Programmer's Guide.
Filler	FILL(3..5)	7		

Field Name	Type	Offset	VCI	Description
Tier Drive	UINT(6..7)	7	M	0 = Tier (rate) selection is programmed and managed through the TOU calendar. 1 = Tier set manually with hold off. This tier will be in effect until the next scheduled tier switch. 2 = Tier set manually with hold on. This tier will be in effect indefinitely. 3 = Time-based override in effect (either duration-based or absolute time), the over power threshold has been exceeded for the power threshold time, or the consumption-based tariff is in effect. See the “Tier Drive” field in ET54 for more information.
Special Schedule Active	UINT(8..11)	7	M	Current active special (holiday) schedule.
Season	UINT(12..15)	7	M	Current active season. The range is 0-3.

BT60 (0x003C): Dimension Load Profile

This table lists the maximum dimensions of the data tables that contain the load profile configuration and records.

Note: *The parameters in this table do not reflect a valid configuration. They reflect the maximum possible setting for each individual field given that the other fields are configured appropriately.*

The access key requirements for BT60 are listed below.

BT60, Dimension Load Profile: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT60 is defined below.

BT60, Dimension Load Profile: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Memory Length	UINT32	0	NVM(s) - 24576 – Overhead	M	Total number of bytes used for all load profile log sets. “Overhead” is equal to 2 bytes for every 128 of data. For 128K NVM size, this is 104832. For 256K NVM size, this is 233856
Set 1 Inhibit overflow	BOOL(0)	4	FALSE	F	Data Set 1 load profiling is not capable of being inhibited once a memory overflow occurs.

Field Name	Type	Offset	Value	VCI	Description
Set 2 Inhibit Overflow	BOOL(1)	4	FALSE	P	Data Set 2 load profiling is not capable of being inhibited once a memory overflow occurs.
Set 3 Inhibit Overflow	BOOL(2)	4	FALSE	F	Data Set 3 load profiling is not capable of being inhibited once a memory overflow occurs.
Set 4 Inhibit Overflow	BOOL(3)	4	FALSE	F	Data Set 4 load profiling is not capable of being inhibited once a memory overflow occurs.
End Reading Supported	BOOL(4)	4	FALSE	P	End readings are not supported.
End Pulse Supported	BOOL(5)	4	FALSE	F	End Pulses are not supported.
Set 1 Scalar Divisor Enable	BOOL(6)	4	FALSE	P	Scalars and divisors are not supported for Data Set 1.
Set 2 Scalar Divisor Enable	BOOL(7)	4	FALSE	P	Scalars and divisors are not supported for Data Set 2.
Set 3 Scalar Divisor Enable	BOOL(8)	4	FALSE	F	Scalars and divisors are not supported for Data Set 3.
Set 4 scalar Divisor Enable	BOOL(9)	4	FALSE	F	Scalars and divisors are not supported for Data Set 4.
Extended Interval Status	BOOL(10)	4	TRUE	F	Extended interval status provides information about power failures and clock changes sustained in each interval. Extended interval status is supported.
Simple Interval Status	BOOL(11)	4	TRUE	F	Simple interval status provides information about which intervals in the block have been recorded. Simple interval status is supported.
Filler	UINT(12..15)	4		F	Not Used
UINT8 Supported	BOOL(0)	6	FALSE	F	This interval data format is not supported.
UINT16 Supported	BOOL(1)	6	FALSE	F	This interval data format is not supported.
UINT32 Supported	BOOL(2)	6	FALSE	F	This interval data format is not supported.
INT8 Supported	BOOL(3)	6	FALSE	F	This interval data format is not supported.
INT16 Supported	BOOL(4)	6	FALSE	P	This interval data format is not supported.
INT32 Supported	BOOL(5)	6	TRUE	F	INT32 interval data format is supported.

Field Name	Type	Offset	Value	VCI	Description
NI FMAT1 Supported	BOOL(6)	6	FALSE	F	This interval data format is not supported.
NI FMAT2 Supported	BOOL(7)	6	FALSE	F	This interval data format is not supported.
Data Set Configuration	The remainder of BT60 is an array of the remaining fields, with one element for each Data Set N, where N is a value between 1..4. For meters that do not support multiple data sets and for Control Point modules, this consists of one element.				
Number of Blocks in Set N	UINT16	7	9530 for a Data Set with 128K, 21259 for a Data Set with 256K.	P	The maximum number of blocks that Data Set N can hold based on the current memory configuration.
Number of Intervals in Set N	UINT16	9	1440	F	The maximum number of intervals per block that Data Set N can hold. This is based on an interval time of one-minute ,
Number of Channels in Set N	UINT8	11	16	P	The maximum number of channels per interval that can be configured in Data Set N.
Maximum Interval Time in Set N	UINT8	12	255	F	The maximum time duration between two consecutive intervals that can be configured for Data Set N. Value 84 indicates a 24 hour duration when ANSI LP compliance is not enabled.

BT61 (0x003d): Actual Load Profile

This table lists the current configuration of the load profile in the MEP server.

The access key requirements for BT61 are listed below.

BT61, Actual Load Profile: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT61 is defined below.

BT61, Actual Load Profile: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Memory Length	UINT32	0	0..BT60.0	M	Total number of bytes used for all load profile data sets,
Set 1 Inhibit Overflow	BOOL(0)	4	False	F	Data Set 1 load profiling is not inhibited once a memory overflow occurs.
Set 2 Inhibit Overflow	BOOL(1)	4	False	P	Data Set 2 load profiling is not inhibited once a memory overflow occurs.
Set 3 Inhibit Overflow	BOOL(2)	4	False	F	Data Set 3 load profiling is not inhibited once a memory overflow occurs.
Set 4 Inhibit Overflow	BOOL(3)	4	False	F	Data Set 4 load profiling is not inhibited once a memory overflow occurs.
End Reading Supported	BOOL(4)	4	False	P	End Readings are not supported.
End Pulse Supported	BOOL(5)	4	False	F	End Pulses are not supported.
Set 1 Scalar Divisor Enable	BOOL(6)	4	False	P	Scalars and divisors are not supported for Data Set 1.
Set 2 Scalar Divisor Enable	BOOL(7)	4	False	P	Scalars and divisors are not supported for Data Set 2.
Set 3 Scalar Divisor Enable	BOOL(8)	4	False	F	Scalars and divisors are not supported for Data Set 3.
Set 4 Scalar Divisor Enable	BOOL(9)	4	False	F	Scalars and divisors are not supported for Data Set 4.
Extended Interval Status	BOOL(10)	4	True	F	Extended interval status provides information about power failures and clock changes sustained in each interval. Extended interval status is always enabled.
Simple Interval Status	BOOL(11)	4	True	F	Simple interval status provides information about which inter vals in the block have been recorded. Simple interval status is always enabled.
Filler	UINT(12..15)	4		F	Not Used
UINT8 Supported	BOOL(0)	6	False	F	This interval data format is not supported.
UINT16 Supported	BOOL(1)	6	False	F	This interval data format is not supported.
UINT32 Supported	BOOL(2)	6	False	F	This interval data format is not supported.

Field Name	Type	Offset	Value	VCI	Description
INT8 Supported	BOOL(3)	6	False	F	This interval data format is not supported.
INT16 Supported	BOOL(4)	6	False	P	This interval data format is not supported.
INT32 Supported	BOOL(5)	6	True	F	INT32 interval data format can be configured in set 1.
NI FMAT1 Supported	BOOL(6)	6	False	F	This interval data format is not supported.
NI FMAT2 Supported	BOOL(7)	6	False	F	This interval data format is not supported.
Data Set Configuration	The remainder of BT61 is an array of the remaining fields, with one element for each Data Set N, where N is a value between 1..4. For meters that do not support multiple data sets and for Control Point modules, this consists of one element.				
Number of Blocks in Set N	UINT16	7		M	The number of blocks that Data Set N can hold.
Number of Intervals in Set N	UINT16	9		M	The number of intervals per block for Data Set N.
Number of Channels in Set N	UINT8	11		H	The number of channels per interval for Data Set N.
Maximum Interval Time in Set N	UINT8	12		H	The time duration between the starts of two consecutive intervals for Data Set N. 1..60 = a value in minutes 84 = 24 hours

BT62 (0x003e): Load Profile Control

This table lists some of the current configuration settings.

The access key requirements for BT62 are listed below.

BT62, Load Profile Control: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT62 is defined below.

BT62, Load Profile Control: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Data Set Control	An array of the remaining fields, with one element for each Data Set N, where N is a value between 1..4. For meters that do not support multiple data sets and for Control Point modules, this consists of one element.				

Field Name	Type	Offset	Value	VCI	Description
Channel Settings:	Array[BT61.11N] of 3-byte records:				
End Reading (Channel x)	BOOL(0)	0	0	F	End readings are not supported.
Interval Source (Channel x)	UINT8	1		H	Interval data source for the present configuration for channel x. Configured via procedure.
End Reading Source (Channel x)	UINT8	2	0	P	End readings are not supported.
Format	UINT8	BT61.11 * 3	32	P	Interval data format for the present configuration. INT32 format implies interval data is in snapshot mode (the exact register value is logged in the load profile).
IF BT60.4.Y THEN:	Note that Y has the following values: 6: Data Set 1 7: Data Set 2 8: Data Set 3 9: Data Set 4				
Scalars	ARRAY[BT61.11N] of UINT16	BT61.11N * 3 + 1		H	Scalars applied to interval data before being recorded.
Divisors	ARRAY[BT61.11N] of UINT16	BT61.11N * 3 + 1 + 2*BT61.11N		H	Divisors applied to interval data before being recorded.

BT63 (0x003f): Load Profile Status

This table lists the present status of valid blocks and intervals in the load profile data set, and the arrangement of log records in BT64.

The access key requirements for BT63 are listed below).

BT63, Load Profile Status: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT63 is defined below.

BT63, Load Profile Status: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Data Set Status	An array of the remaining fields, with one element for each Data Set N, where N is a value between 1..4. For meters that do not support multiple data sets and for Control Point modules, this consists of one element.				
Block Order	UINT(0..0)	0	Ascending order (N is older than N+1)	F	Describes the order of blocks as listed in BT64 and as transported. 0 = Ascending order.
Overflow	BOOL(1)	0		M	When True, this indicates an interval was entered in a new block such that the number of unread blocks exceeded the actual number of possible blocks in the data set. This flag, once triggered, will be cleared upon execution of EP11, BP04, or BP05 with appropriate parameters. It is not cleared automatically by the MEP server. Manufacturer alarm 0 is also triggered when this overflow flag is triggered, and stays set until cleared by the host.
List Type	UINT(2..2)	0	Circular list	F	Describes the method of block generation in memory. 0 = Fifo (reads this if max entries is 0) 1 = Circular queue
Block Inhibit Overflow	BOOL(3)	0	False	F	Describes the status of inhibiting load profile when memory overflow occurs. Load profiling is never inhibited once a memory overflow occurs.
Interval Order	UINT(4..4)	0	Ascending order (N is older than N+1)	F	Describes the order of intervals within a block as listed in BT64, and as transported. 0 = Ascending order.
Active Mode	BOOL(5)	0		M	Describes the current state of the data set. True = Data set is presently collecting data. False = Data set is not presently collecting data, or is disabled.

Field Name	Type	Offset	Value	VCI	Description
Test Mode	BOOL(6)	0	False	P	Test mode is not supported.
Number of Valid Blocks	UINT16	1		M	Number of valid blocks in the data set. A block is considered valid when at least one interval is recorded. Range is 0 to BT61.7.
Last Block	UINT16	3		M	Array index of the most recent valid block in the data set. Range is 0 to BT61.7 minus 1.
Last Block Sequence Number	UINT32	5		M	The sequence number of the most recent valid block in the data set. Increments by one for each new block entered. Range is 0..4294967295.
Number of Unread Blocks	UINT16	9		H	Number of valid blocks in the data set that have not been read. This number is incremented by the MEP server, and decremented by the host via procedure. Range is 0 to BT61.7.
Number of Valid Intervals	UINT16	11		M	Number of valid intervals in the most recent valid block in the set. Range is 0 to BT61.9.

BT64-BT67 (0x0040-0x0043): Load Profile Data, Data Sets 1-4

BT64 contains the entire set of load profile records for Data Set 1. For meters running firmware versions 3.50 and higher (and for Control Point/OSGP Modules running firmware versions 1.20 and higher) that have multiple data sets enabled, the following tables contain the load profile records for the additional data sets:

BT65 (0x0041): Load Profile Data, Data Set 2

BT66 (0x0042): Load Profile Data, Data Set 3

BT67 (0x0043): Load Profile Data, Data Set 4

The access key requirements for BT64-BT67 are listed below.

BT64-BT67, Load Profile Data, Data Sets 1-4: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

The table structure for BT64-BT67 is defined below.

BT64-BT67, Load Profile Data, Data Sets 1-4: Table Structure

Field Name	Type	Offset	Value	VCI	Description
Block Data:	Array[BT61.7N] OF (End Time + End Readings + Simple Status + Intervals) records:				
End time	STIME_DATE	0		M	Timestamp of the most recently recorded interval in the block, in UTC. When the block is complete, this represents the end time of the block.
IF BT61.4.4 THEN: End Readings	ARRAY[BT61.11N] of NI_FMAT1	5			Snapshots of each channel taken at the end of the block. These snapshots are not applicable if the “End Reading Supported” property in BT61 (BT61.4.4) is set to False.
Simple Status	SET((BT61.9N +7)/8)	5 + 4*BT61.11N		M	Simple status for this block, with one bit for each interval in the block: 1: The interval has been processed. 0: The interval has not been processed. For incomplete blocks, this field can be used to determine how many and which intervals in the block to read.
Intervals:	Array[BT61.9N] of (((BT61.11N /2) +1) + 4 * BT61.11N)-byte records				This array contains the load profile interval data with extended status per interval for all intervals in the block. Intervals that are marked invalid by the “Simple Status” field may contain non-zero data. This data should be ignored.
Extended Status	Array[(BT61.11 N/2) +1] of Byte	5 + 4*BT61.11N + SET((BT61.9N +7)/8)		M	Consult the following section, Extended Status Field Description, for information on the “Extended Status” field.
Interval Channel Data:	Array[BT61.11N] of 4-byte records				
Interval Channel X Value	INT32	5 + 4*BT61.11N + SET((BT61.9N +7)/8) + (BT61.11N /2+1)		M	End of Interval (EOI) value for channel X.

Extended Status Field Description

The highest nibble (byte 0 is high nibble) is status common to all channels. The contents of this nibble are bit flags representing the following (more than one flag could be set at a time):

0 = Daylight savings time is in effect during or at start of interval. Load profiling is not affected by DST clock adjustments. Load profiling is scheduled by the MEP server's system clock, which is always in standard time.

- 1 = Power fail within interval.
- 2 = Clock reset forward during interval.
- 3= Clock reset backward during interval.

The remaining nibbles represent the status of the channels, one nibble per channel:

- Byte 0 low nibble represents channel 0.
- Byte 1 high nibble represents channel 1.
- Byte 1 low nibble represents channel 2, etc.

Each of these nibbles is a binary value. The parenthetical number indicates relative precedence (if multiple apply, the status with the higher precedence number is used). The meaning of channel status nibble is defined as:

- 0(0) = No status flag.
- 1(10) = Overflow. This status is only applicable to meters running firmware versions 3.70 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
- 2(5) = Partial interval due to common state. This may occur when the common state is 2, which indicates that the clock moved forward during the interval. This would mean that data was only collected for only part of the configured load profile interval. For example, if the interval length is set to 15 minutes and the clock was moved forward 5 minutes during the interval, only 10 minutes of data would have been collected.
- 3(4) = Long interval due to common state. This may occur when the common state is 3, which indicates that the clock was set backward during the interval. This would mean that the data for this load profile interval was collected for a longer duration than the load profile interval. For example, if the interval length is set to 60 minutes and the clock was moved back 10 minutes during the interval, 70 minutes of data would have been collected.
- 4(11*) = Indicates that the entry was skipped. The MEP server can be configured to use this status for instantaneous values and intervals that do not require polling an external device. When this is configured, the channel value(s) for the interval is zeroed.
- 5(2) = Interval contains test mode data. Test mode is a special mode of operation typically used in ANSI meters only. While in test mode, the meter will suspend standard energy accumulations, standard demand calculations, power quality analysis, tariff register calculations, automated control of the disconnect switch, and automated control of the control relay.
- 8(8) = M-Bus/MEP decryption failure. This indicates that the MEP server was not able to successfully decrypt the data collected from the device. Data collected during this interval will be returned in its encrypted form, and will not be readable until it is decrypted.
- 9(3) = Clock error. If a clock error occurs during the load profile interval, then there is no guarantee that the data returned for that interval corresponds to the expected interval length.

The data returned may represent data collected over a shorter or longer period of time than the configured interval length.

- 10(6) = M-Bus/MEP device missing. This indicates that the MEP server was not able to communication with an M-Bus device or a MEP client due to a communications failure, or due to the device not being successfully installed.
- 11(7) = Not current (MDT time stamp invalid). This indicates that the M-Bus device or MEP client hasn't refreshed its data since the previous load profile interval finished, and the data for this interval.
- 12 (0) = Interval marked as skipped (zeroed out) due to load profile opt out. This status is only applicable to meters running firmware versions 3.70 and higher, and Control Point/OSGP Modules running firmware versions 1.20 and higher.
- 15(11) = M-Bus channel placeholder in effect (M-Bus device data not yet retrieved or was never retrieved). This means that the meter failed to collect data for the interval due to a communications failure, or due to the M-Bus device not being successfully installed.

Note: *In addition, if a meter is configured for ANSI C12.19 load profile compliance, conditions 8, 11, and 15 report value 4 (skipped), and conditions 9 and 10 report value 0 (no status).*

BT74 (0x004a): History Log Data (Primary Event Log)

This table holds the event log data for the primary event log, and the pointer information required to read it. Meters running firmware version 3.70 and higher include both a primary and an alternate event log. The event log data for the alternate event log is stored in ET79.

The access key requirements for BT74 are listed below.

BT74, History Log Data: Read/Write Access

Read/Write	Access Key Requirements	MEP Client Type			
		OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
Read	MBK, MAK	X	X	X	X
Write	None				

BT74: History Log Data

Field Name	Type	Offset	Value	VCI	Description
Order	UINT(0..0)	0	0	F	Describes the order of log entries as listed in BT74. 0 = Ascending order (N is older than N+1).
Overflow	BOOL(1)	0		M	When True, this indicates an entry was entered such that the number of unread entries exceeded the actual number of possible entries in the log. This is cleared by BP04 and BP05.
List Type	UINT(2..2)	0	1	F	Describes the method of log entry generation in meter memory: 0 = FIFO (reads this if maximum entries is 0)

Field Name	Type	Offset	Value	VCI	Description
					1 = Circular queue
Inhibit Overflow	BOOL(3)	0	FALSE	F	New History Log entries are never inhibited once a memory overflow occurs.
Filler	FILL(4..7)	0			
Number of Valid Entries	UINT16	1		M	Number of valid History Log entries in this table (range is 0 to BT71.5).
Last Entry Element	UINT16	3		M	Array index of the last valid log entry in this table (range is 0 to BT71.5).
Last Entry Sequence Number	UINT32	5		M	The 4-byte sequence number of the last log entry in this table. For meters running firmware versions 3.70 and higher, and for Control Point/OSGP Modules running firmware versions 1.20 and higher, this value is never reset. For all other devices, it is reset any time the history log is reset.
Number of Unread Entries	UINT16	9		M/H	Number of valid log entries in this table set that have not been read. This number is incremented by the meter and decremented by the host via procedure. The range is 0 to BT71.5.
History Record Array	ARRAY[BT71.5] of (12+BT71.3)-byte records:				
Time	LTIME_DATE	11		M	Date and time of the History Log entry (UTC).
Sequence Number	UINT16	17		M	2-byte sequence number associated with the history log only. This number is the low 2 bytes of the field in BT74.5. You should be aware that meters running firmware versions 3.70 and higher and Control Point/OSGP Modules running firmware versions 1.20 and higher support both an alternate event log and a primary event log. Each event logged in either log is assigned a sequence number. The sequencing is shared across both logs, so there may be gaps in the sequence numbers assigned to entries in one log. However, the sequence numbers indicate the complete sequence of all events when both logs are considered together,

Field Name	Type	Offset	Value	VCI	Description
					For example, events 1-10 may occur in the primary log (BT74), events 11-15 may occur in the alternate log (ET79), and events 16-20 may occur in the primary log (BT74). This means that events 11-15 will not appear in the primary log (BT74).
User ID	UINT16	19		M	ID of the user that was logged in to the meter when the event occurred, per the ANSI 12.18 optical login command. If no user was logged in, the value of this field is 0xFFFF. If a PLC, P2P or G3 message was being processed at the time, this field will be set to 0xFFFE. If a MEP client's operation was being processed at the time, this field will be set to 0xFFFD.
Event	UINT(0..11)	21		M	Event ID logged. Consult the documentation for your meter for a list of the event IDs.
Filler	FILL(12..15)	21			
Argument	ARRAY[BT71.3] OF UINT8	23		M	Argument associated with a log. Consult the documentation for your meter for a description of the argument associated with each event code.

EP17 (2065, 0x0811): Remove MEP Device

This procedure will remove the requested MEP client from the MEP server. This means that the device will no longer be polled by the MEP server, and that the MEP client's status will be cleared from all associated tables.

Note: *When you remove a MEP client with EP17, the "MEP Device Registered" bit in the "MEP Flags" field and "MEP Icon Display Control" field in ET50 will be cleared. All other fields in ET50 will be left intact. In addition, the "Baud Rate" field in ET14 will be reset to the default value of 9600.*

Use caution when changing a removed M-Bus device's address to 250. An M-Bus device at this address cannot be rediscovered by an OSGP meter. It is recommended that a removed device be set to address 0

The access key requirements for EP17 are listed below.

EP17: Remove MEP Device

Access Key Requirements	MEP Client Type			
	OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
MAK, MBK	X	X	X	X

Note that for OSGP meter clients, MBK access can only remove the MEP client, and not any M-Bus devices.

The data written from the host to BT07 is described below. For more information and guidelines to follow when removing a MEP client, see Replacing a MEP Client Device..

Field Name	Type	Offset	Value	VCI	Description
Action	UINT8	3		H	0 = Remove device and re-assign primary address = 0 1 = Remove device and re-assign primary address = 250
Device Handle	UINT16	4		H	Handle of the device to be removed 0xFFFF means remove all devices; when this option is used, the primary addresses of the devices are not changed. This option is intended for provisioning use only.

The response from ET59, ET85 or BT08 is described below.

Field Name	Type	Offset	Value	VCI	Description
(No parameters)					

The error codes that could be returned when EP17 is called are described below.

Code Returned	Reason
1	Not complete. This value will be returned until all requested devices have been removed.
2	Invalid Action specified.
3	Requested device handle to remove does not match an installed device.
4	A remove request is already in progress.

EP19 (2067, 0x0813): Post On-demand M-Bus Request

This procedure is used to post an on-demand M-Bus request. After the request is made via this procedure, the request and its result can be tracked in ET15 “MEP/M-Bus On-demand Requests.”

Note: *When EP19 is invoked, the data read from the M-Bus device is stored in ET16, as described in the Reading On-Demand M-Bus Data section on page 28. Data from on-demand requests posted by an MEP client is not sent to the Control Node or to System Software.*

The access key requirements for EP19 are listed below.

EP19: Post On-Demand M-Bus Request

Access Key Requirements	MEP Client Type			
	OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
MAK	X	X	X	X

The data written from the host to BT07 is described below.

Field Name	Type	Offset	Value	VCI	Description
Transaction Number	UINT16	3		H	The transaction number for each request. This used to keep track of requests/results on the server. The OSGP Alliance recommends using the following ranges for transaction numbers to avoid using duplicate values of the device to be addressed: 0..0x3FF : Optical port applications 0x0400..0x4FF : MEP applications The following transaction numbers are reserved 0x0500..0x05FF : System Software BROADCAST_WRITE_DATA requests 0xFF00..0xFFFF : Control Node applications and System Software WRITE_DATA requests
Device Handle, Group Mask or Device Index BItmask	UINT16	5		H	The handle, group mask, or device index bitmask of the device to be addressed. For request type 6, a value of 0xFFFF signifies the multicast should be sent to all commissioned M-Bus devices. Otherwise, this field signifies the group mask. For request type 10, this field is a device index bitmask indicating which device(s) the request should be sent to. Example: 0x0001 -> Delivered to the 1st M-Bus device defined in ET14, if it exists. 0x0002 -> Delivered to the 2nd M-Bus device defined in ET14, if it exists. 0x0004 -> Delivered to the 3rd M-Bus device defined in ET14, if it exists. 0x0008 -> Delivered to the 4th M-Bus device defined in ET14, if it exists. 0x0010 -> Delivered to the 1st MEP client (index 5) as defined in ET14, if it exists. If more than one bit is set, then the least significant device index will receive the message. For example: 0x000E -> Delivered to the 2nd M-Bus device as defined in ET14, if it exists, and no others.

Field Name	Type	Offset	Value	VCI	Description
Request Type	UINT8	7		H	0 = Reserved for internal use 1 = M-Bus application reset 2 = Billing read 3 = Status read 4 = Write user data 5 = Time sync (no write data required) 6 = Multicast to specified devices. This request type is applicable to M-Bus devices only. You can designate an M-Bus device as part of a multicast group by wriitng the “Group Mask” field in ET34. 9 = MEP download switchover (no write user data required for OSGP meter versions up to 3.7X and Control Point/OSGP Modules up to firmware version 1.2X) 10 = Write user data by index. You can use this request type to send an on-demand request to a device without knowledge of its device handle or group mask configuration.
Write Request. Fill in these fields for all request types 4, 6 and 10:					
Write Data Length	UINT8	8		H	The length, in bytes of the user data to be written to the device. This is used for request types 4, 6 and 10. For request types 4 and 10, this length must less than or equal to (ET11.11 -1)
Write Data	ARRAY[ET11.20 -1] of UINT8	9		H	The user data/multicast data to be written (as-is) to the devices. For user data, this is data to be written as-is to the device and is omprised of the SND_UD telegram. For multicast data, this is comprised of the ‘C’ control field, followed by the ‘CI’ control field, followed by the user data portion of the telegram.
MEP Download Switchover Request (for OSGP meters running firmware versions 3.80 and higher and Control Point/OSGP Modules running firmware versions 1.30 and higher only). Fill in these fields for request type 9 (PLC requests using AES encryption). These fields are not applicable to OSGP P2P meters:					
Image Length	UINT32	8		H	The fields contain the total image length for computing the MAC, and the MAC. These fields are only applicable if the “Security Mode” field in ET04 (ET04.127) is set to 2 (OSGP-AES-128-PSK).
Image MAC	UINT8[16]	12		H	

The response from ET59, ET85 or BT08 is described below.

Field Name	Type	Offset	Value	VCI	Description
Entry index	UINT8	4		M	Index into on-demand request queue in ET15 “MEP/M-Bus On-demand Requests” for this entry.

The error codes that could be returned when EP19 is called are described below.

Code Returned	Reason
2	Invalid request type specified.
3	Device handle, group mask or device index bitmask specified does not match an installed device
7	On-demand request queue is full.

EP61 (2109, 0x083D): MEP Transaction Lock Control

This procedure is only applicable to OSGP meters running firmware versions 4.0 and higher that have both MEP ports enabled. The two MEP ports share the MEP transaction tables, ET52 and ET53. This means that it is possible that one MEP client could have its transaction results overwritten by the other MEP client’s transaction before the first MEP client has a chance to read them. To prevent this, access to the MEP transaction tables can be locked by a MEP client using this procedure. The tables should be locked just before executing a transaction by writing ET52, and unlocked immediately after reading the results by reading ET53. If a MEP client does not unlock the tables, they will be automatically unlocked after a timeout of 10 seconds. For more information, see *MEP Transaction Locking* on page 25 or *Table Transaction Guidelines* on page 43.

The access key requirements for EP61 are listed below.

EP61: MEP Transaction Lock Control

Access Key Requirement	MEP Client Type			
	OSGP Meter Client	CPM 0600 Client	CPM 6000 Client	CPM 6010 Client
MBK, MAK	X			

The data written from the host to BT07 is described below:

Field Name	Type	Offset	Value	VCI	Description
Lock	UINT8	3		H	0 = Unlock 1 = Lock

The response from ET59, ET85 or BT08 is described below:

Field Name	Type	Offset	Value	VCI	Description
N/A					

The error codes that could be returned when EP61 is called are described below:

Code Returned	Reason
T08_CONFLICT(3)	The other MEP client has already locked the channel.
T08_NO_AUTH(5)	The procedure was not executed by a MEP client.

Appendix A: Authentication Digest

This appendix provides details on the function used to generate the 8-byte digest used to perform authentication on all transactions between the MEP server and the MEP client.

Authentication

The 8-byte authentication digest referenced in the RC4 Authentication section in Chapter 2 is generated using a “digest” function that takes the MEP access key in use and the contents of the message as input.

For MEP requests, the digest is calculated across the data space that starts with the request/response code, and includes the sequence number. It does not include the length fields. For MEP server responses, the digest is calculated across the original request, and the response, again excluding the length fields. The length fields and the sequence numbers are conveyed in big-endian format.

The digest function is prototyped as:

```
void Digest(const BYTE *apduBytes, unsigned long apduSize,
      const BYTE *key, BYTE *digestValueOut, DState *pState, BYTE bEnd,
      int keyLen )
```

The different fields of the function are described below:

- <apduBytes> points to the data portion of the message.
- <apduSize> indicates the length in bytes of the data at <apduBytes>,
- <key> points to the 16-byte security key.
- <digestValueOut> points to an 8-byte variable where the digest is stored by this function.
- <pState> points to a state structure used to hold state information over multiple calls to the function.
- <bEnd> is a Boolean indicating that this is the final invocation of the digest function.

<keyLen> indicates the length in bytes of the data at <key>.

In order to create the digest for a request to the MEP server, call the digest function with <apduBytes> pointing to the message data that follows the 2-byte length field at the start of the message, and covers the 4-byte sequence number at the end of the message. The digest calculated is then appended to the end of the message.

An example of an offset partial read request is shown below. The example data is radix:hex. The < > marks indicate MEP-specific component, the { } marks indicate message fields, and the [ ] marks indicate security fields.

Table A.1 Offset Partial Read Request Example

Description	Number Of Bytes	Example Data
<length> of <message>	2	00:14
<message>:		
{request_code}	1	3F
{table_id}	2	00:34
{table_offset}	3	00:00:00
{count}	2	00:06
[sequence no.]	4	F5:2F:54:81
[digest]	8	7C:FF:9A:53:47:DB:AB:FC

In this example, the value of <apduSize> would be 12. Note that before the initial call to the digest function, you must zero-fill the array at <digestValueOut>, as it is both an input and an output, and zero-fill the structure at <pState>.

Once the message has been sent to the MEP server and has been accepted and processed, a response will be generated that also contains an authentication digest. The purpose of the response digest is to authenticate the MEP server's response at the MEP client. This response digest is the product of both the original request and the response. There are two ways to produce this digest for comparison with the response digest:

1. When forming the original request, first zero the <digestValueOut> and <pState> fields, call the digest function with <bEnd> = FALSE, save the 8-byte value at <digestValueOut> and the data at <pState>, then call the digest function with <bEnd> = TRUE and <apduSize> = 0. That final step completes the digest calculation, and the request is sent to the MEP server. When the response appears, call the digest function with <apduBytes> pointing to the data portion of the response message, and use the saved values at <digestValueOut> and <pState> as inputs, and <bEnd> = TRUE. Compare the digest calculated to the digest in the response.
2. Alternately, you can save the original request. When the response arrives, perform the above sequence, first on the original request and then on the response. The difference would be that there is no need to call the digest function with <bEnd> = TRUE on the original request since the product of that step isn't needed at this point.

Digest Function Reference Implementation

```
/*
// This iterates over the key 1.5 times. This is intended to
// make it more difficult to break the key by examining the
// before and after plain text. Macro assumes length is even!
*/
#define DIGEBT_KEY_ITERATIONS(len) (len==6 ? len : (len + len/2))
typedef unsigned char BYTE;

/*****************************************************************
Function:   Digest
Parameters:
            apduBytes -> bytes of <apduSize>
            key -> <keyLen> bytes of key value. Typically 128 bits.
            digestValueOut -> 8 bytes of key result. Zero before first
            call.
            pState -> 2 bytes of state value. Zero to start.
Returns:    None
Purpose:    To compute the digest based on the authorization key.
Comments:   This routine works segment by segment for long messages.
*****************************************************************/
/* user not aware of content of DState */
typedef struct _Dstate
{
      BYTE  i;
      BYTE  j;
} DState;

void Digest(const BYTE *apduBytes, unsigned long apduSize,
      const BYTE *key, BYTE *digestValueOut, DState *pState, BYTE
      bEnd, int keyLen)
{
      unsigned long idx = 0;
      BYTE m, n, v, keyByte, last;
      BYTE j = pState->j;
```

```
BYTE i = pState->i;
BYTE iter = DIGEBT_KEY_ITERATIONS(keyLen);
do
{
      /* for each BYTE of the key (repeating the process
      * a second time for the first half of the key) */
      do
      {
            keyByte = key[i%keyLen] >> j;
            last = digestValueOut[(8-j) & 0x7];
            v = 7-j;

            if (apduSize != 0 || bEnd == 0)
            {
                  /* for each bit of the key BYTE */
                  do
                  {
                        /* zero pad the message to use up any
                        left over key bits */
                        if (apduSize)
                        {
                              /* use bytes is address order not
                              reverse  */
                              m = apduBytes[idx++];
                              apduSize--;
                        }
                        else
                        {
                              if ( bEnd )
                              {    /* if this is the end, finish
                              the key bits */ m = 0;
                              }
                              else
                              {    /* not the end, so return
                              leaving state */j = 7-v;
                                    goto done;
                              }
                        }
                        n = ~(digestValueOut[v] + v);
                        last = digestValueOut[v] = last + m +
                        ((keyByte & 1) ? ((n << 1) + (n >> 7)) :
                        -((n >> 1) + (n << 7)));
                        keyByte >>= 1;
                  }  while ( v-- );
            }
            else
            {
                  /* Faster version. This case assumes most
                  processing is done with * bEnd == true and no
                  APDU data */
                  do
                  {
                        n = ~(digestValueOut[v] + v);
                        last = digestValueOut[v] = last +
                        ((keyByte & 1) ? ((n << 1) + (n >> 7)) :
                        -((n >> 1) + (n << 7)));
                        keyByte >>= 1;
```

```
                        } while ( v-- );
                    }
                        j = 0;
                    } while ( ++i < iter );
                i = 0;
        } while (apduSize > 0);
done:
        /* return State */
        pState->j = j;
        pState->i = i;
}
```

Appendix B: Encryption

This appendix provides additional details on the encryption algorithm used by the MEP protocol.

Encryption

The MEP encryption algorithm uses the RC4 cipher. The portion of the MEP request packet that is encrypted is limited to the <message> fields starting with the request/response code, and includes the sequence number. The authentication digest is not encrypted, nor is the <length> field. The digest of the request and the digest for the response are still calculated based on the original un-encrypted packet. The inclusion of the sequence number helps add to the variability of the encrypted data.

In the example messages below, the encrypted portion of each packet is shown in bold.

Description	Number Of Bytes	Message Data
<length> of <data>	2	00:14
<data> follows:		
{request_code}	**1**	**3F**
{table_id}	**2**	**00:34**
{table_offset}	**3**	**00:00:00**
{count}	**2**	**00:06**
[sequence no.]	**4**	**F5:2F:54:81**
[digest]	8	7C:FF:9A:53:47:DB:AB:FC

The response to this message is shown below:

Description	Number Of Bytes	Message Data
<length> of <data>	2	00:11
<data> follows:		
{read_r} (ok)	**1**	**00**
{count}	**2**	**00:06**
{table_data}	**6**	**04:02:10:0F:3B:37**
[digest]	8	30:3D:9B:BE:3D:A3:A8:B6

Of the other types of responses that may occur, 0x0B is not encrypted, but 0x0C is encrypted (which covers the 0x0Bcode plus the current sequence number).

The RC4 cipher uses two public domain functions: RC4_set_key() which is used to initialize an RC4 key workspace (shown below), and RC4() which runs the cipher.

```
void RC4(RC4_KEY* key, unsigned int len, unsigned char* indata,
unsigned char* outdata);
void RC4_set_key(RC4_KEY* key, int len, unsigned char* data);
```

The structure that contains intermediate cipher data that is initialized using a key looks like this:

```
#define RC4_INT unsigned char
typedef struct rc4_key_st
{
      RC4_INT x,y;
      RC4_INT data[256];
} RC4_KEY;
```

The “key” that is used is a product of the first 16 bytes of the MEP authentication key being used, plus a constant key. You must use the same MEP key for encryption as the one used to create the digest for the

request packet (which sets the security access level). One additional factor that affects the key used on each packet is the digest of the originating request.

The process used to create the 128-bit key <mep_EncryptKey> based on the MEP key and the constant key is shown below. For this process, the RC4 cipher is used:

```
UCHAR mep_EncryptKey[16];

{
UCHAR ConstKey[16] =
{0x38,0x8B,0x8F,0xBC,0x36,0xA8,0x55,0x85,0x87,0xAF,0xC9,0x0F,0xB2,0x3A,
0x3B,0x99};
RC4_KEY rc4Key;


RC4_set_key(&rc4Key, 16, MEP_key);              // initializes rc4Key
RC4(&rc4Key, 16, ConstKey, mep_EncryptKey);     // creates
mep_EncryptKey
}
```

After the key has been created, it is used to run the cipher on the request. The first step is to initialize the RC4_KEY data structure (defined previously) with the <mep_EncryptKey> and the digest of the packet:

```
extern UCHAR Digest[8];
{
      int ii;
      UCHAR keyTemp[16];
      for(ii=0; ii<16; ii++)
      {
            keyTemp[ii] = mep_EncryptKey[ii];
            if(ii < 8)
            keyTemp[ii] ^= Digest[ii];
      }
RC4_set_key(&rc4Key, 16, keyTemp);  // initializes rc4Key
}
```

The next step is to run the cipher on the packet data using the RC4_KEY data structure. In the following statement, <dataSpan> is the size of the portion of the packet to be encrypted, and <tx_buffer.data> is both the input and output to the RC4() function.

```
RC4(&rc4Key, dataSpan, tx_buffer.data, tx_buffer.data);
```

When the MEP server generates the response to an encrypted packet, it uses the same RC4_KEY that was generated for the original request, in the state it was in following the decryption of the request packet. The MEP client follows this same procedure to decrypt the response:

```
RC4(&rc4Key, dataSpan, rx_buffer.data, rx_buffer.data);
```

Note: *RC4 is a two way cipher. If you run the cipher once on a piece of data (by first running RC4_set_key() and then running RC4()), and then repeat the process using the same inputs to RC4_set_key(), the data will be decrypted to its original form.*

Appendix C: MBK/MAK Access Information

This appendix lists the tables and procedures that are available to the MEP protocol, and indicates which of them are available to the MAK and MBK access keys. It also indicates which tables require direct table writes (reading or writing directly to NVM).

MBK/MAK Access to Tables and Procedures

Tables C.1 and C.2 list the tables and procedures that are available to the MEP protocol, and indicates which of them can be written to or invoked with the MAK and MBK access keys. Unless otherwise noted, all tables can be read with either the MBK or the MAK access key.

The **Read - NVM** column indicates which tables require reading data directly from the NVM instead of from RAM (data read from all tables not marked **Read - NVM** is read from RAM). Similarly, the **Write – NVM** column indicates which tables require data to be written directly to NVM when they are written to. For meters running firmware versions prior to 3.40, the OSGP Alliance recommends writing to these tables no more than 4 times every hour, so that the average number of table writes per day does not exceed 100, to ensure the preservation of the meter memory device for the lifetime of the meter. Note that for all other MEP servers, the OSGP Alliance also recommends reading tables no more than once per second (on average).

Table C.1 Table Access For MBK/MAK And Direct Table Write Information

Table Name	Read-only	MAK Has Write Access	MBK Has Write Access	Write - NVM	Read - NVM Only
BT00: General Configuration	X				
BT01: General Manufacturer Information	X			X	
BT04: Pending Status	X				
BT07: Procedure Initiate		X	X		
BT08: Procedure Response	X				
BT15: Constants		X		X	
BT20: Dimension Register	X				
BT21: Actual Register	X			X	
BT22: Data Selection	X			X	X
BT23: Current Register Data		X			
BT24: Previous Season Data		X			X

Table Name	Read-only	MAK Has Write Access	MBK Has Write Access	Write - NVM	Read - NVM Only
BT25: Previous Demand Reset Data	X				X
BT26: Self-Read Data	X			X	X
BT27: Present Register Selection	X			X	X
BT28: Present Register Data	X				
BT30: Dimension Display	X				
BT33: Primary Display List		X			
BT50: Dimension Size and TOU	X				
BT52: UTC Clock	X				
BT54: Calendar		X		X	
BT55: Local Clock State	X				
BT60: Dimension Load Profile	X				
BT61: Actual Load Profile	X			X	
BT62: Load Profile Control	X			X	
BT63: Load Profile Status	X				
BT64: Load Profile Data. Data Set 1	X			X	X
BT65: Load Profile Data, Data Set 2	X			X	X
BT66: Load Profile Data, Data Set 3	X			X	X
BT67: Load Profile Data, Data Set 4	X			X	X
BT70: Dimension Log	X				
BT71: Actual Log	X			X	
BT74: History Log Data (Primary Event Log)	X			X	X
ET02: RTC Calibration		X			
ET03: Utility Information		X		X	
ET04: System Information		X			
ET05: Control Output Settings		X			
ET06: Pulse Inputs		X			
ET07: LCD Display Configuration Table		X		X	
ET09: Power Quality		X			
ET11: MFG Dimension Table	X				
ET13: M-Bus/MEP Device Configuration		X		X	
ET14: M-Bus/MEP Device Status	X				

Table Name	Read-only	MAK Has Write Access	MBK Has Write Access	Write - NVM	Read - NVM Only
ET15: M-Bus/MEP On-demand Requests	X				
ET16: M-Bus/MEP Device Data	X			X	X
ET21: Load Profile Internal Configuration	X				
ET23: Miscellaneous Meter Information		X			
ET29: Hardware Configuration	X				
ET30: Maximum Power or Current Level Control	X				
ET31: Meter One-time-read Log	X				X
ET34: Additional M-Bus/MEP Device Configuration		X		X	
ET36: Manufacturer Table Actual Dimensions	X			X	
ET41: Historical Demand Reset Log	X				X
ET40: Demand Configuration		X		X	
ET42: Interface Definition	X			X	X
ET45: MEP Recurring Read Log	X			X	
ET46: Control Output Read-Only Data	X				
ET47: Calendar Override Settings		X		X	
ET50: MEP Inbound Data Space		X	X		
ET51: MEP Device Configuration		X	X	X	
ET52: MEP Transaction Request Table		X	X	X	X
ET53: MEP Transaction Response Table	X			X	X
ET54: Meter Status	X				
ET55: Meter Configuration		X			
ET57: M-Bus/MEP Data Type Table		X			
ET58: MEA Status Extension	X				
ET59: MEP Procedure Response	X				
ET66: Load Profile Source ID Mapping Table	X				
ET67: Display Source ID Mapping Table		X			
ET70: RAM Only Status	X				

Table Name	Read-only	MAK Has Write Access	MBK Has Write Access	Write - NVM	Read - NVM Only
ET71: Delta Data Alerts	X				
ET74: MEP Recurring Read Extended Log	X				
ET75: Primary Load Profile Channel Change Log	X				X
ET76: Externally Configurable Hardware Options		X			
ET77: Secondary Display List		X		X	
ET79: History Log Data (Alternate Event Log)	X			X	X
ET80: Average Power Settings		X		X	
ET81: Power Outage Log	X				X
ET85: MEP Procedure Response (MEP2)	X				

Table C.2 Procedure Access For MBK/MAK

Procedure	MAK Required To Initiate Procedure	MBK Can Initiate Procedure
EP16: Change System Clock By Delta		X
EP17: Remove MEP Device		X

Procedure	MAK Required To Initiate Procedure	MBK Can Initiate Procedure
EP61: MEP Transaction Lock Control	X	X

Table C.4 Additional Tables

Table or Procedure Name	Description	Read-only	MAK Has Write Access	MBK Has Write Access
BT04: Pending Status	Provides status of pending tables.	X		
BT20: Dimension Register	Lists the maximum dimensions for the tables in the B20s decade that contain the measured values registers.	X		
BT53: Time Offset	Contains programmable Daylight Saving Time (DST) options.		X	
BT70: Dimension Log	Lists the maximum dimensions of the tables that contain the History and Event logs.	X		
BT71: Actual Log	Lists the currently configured dimensions of the remaining tables in the B20s decade which contain the History and Event logs.	X		
ET01: Pulse Output Options	This table holds configuration of the S0 output.		X	
ET03: Utility Information	Contains utility-specific information, such as a utility serial number, program information,		X	

Table or Procedure Name	Description	Read-only	MAK Has Write Access	MBK Has Write Access
	and battery change information.			
ET06: Pulse Inputs	Holds configuration of the pulse input channels.		X	
ET40: Demand Configuration	Contains the demand reset time of day, as well as other demand configuration information that is reserved for future use. Changing the demand reset time of day in this table at an inappropriate time could cause a reset cycle to be missed. The OSGP Alliance recommends that you use System Software to apply an expiration time to requests to change this table.		X	

Appendix D: MEP Client Hardware Requirements (NES Meters Only)

This chapter contains mechanical and electrical specifications and other information you will need when connecting a smart peripheral device to a NES meter's terminal block. It includes the following section.

- External Devices

External Devices

All OSGP meters running firmware versions 3.1 and higher (i.e. Hardware Gen 3.1, 3.2 and 4.0 meters) optionally provide a bi-directional, isolated UART serial port that is called a MEP port. Hardware Gen 4 meters) optionally support an additional UART port which functions as a 2nd MEP port.

Each MEP port allows a connected smart peripheral device (*MEP device*) to use the MEP protocol described in this document to access meter data.

For example, you could connect a smart RF card that communicates with an In Home Display device that reflects the current state of the meter, as the smart peripheral (MEP) device is able to read meter data in real-time. Alternatively, the device could connect to auxiliary I/O and deliver external alarm signals to the meter using the MEP port.

It is possible to mount the peripheral device under the meter's terminal cover, although it is recommended that applications requiring greater than 4kV isolation or with other mechanical constraints be mounted outside of the meter enclosure. NES provides MEP connections in two different meter configurations:

- Isolated M-Bus with isolated, un-powered MEP. This option allows for 4kV isolation between M-Bus and MEP clients. In this case the MEP interface must be powered from the MEP client.

  Note: Developers must refrain from powering their peripheral devices from the M-Bus terminals when used in this configuration. Doing so could potentially disable the M-Bus interface.

- Isolated M-Bus with powered MEP. This option does not provide isolation between M-Bus and MEP terminals. In this configuration, an extra MEP PWR terminal is made available. This terminal when used in conjunction with MEP GND can provide power for MEP clients. Nominal voltage and power requirements are detailed in the *Electrical Specification* section.

In both cases M-Bus and MEP terminals are 4kV isolated from line inputs.

Advantages:

- 4kV Safety isolation provided by meter for M-Bus and MEP connections (referenced together for powered MEP).
- MEP and M-Bus interface is current limited, preventing damage to meter under short circuit conditions.
- The above two features allows hot installation of MEP and M-Bus Devices.
- MEP and M-Bus devices easily connect to the meter through options terminals.
- The powered MEP version eliminates the need for costly external power supplies.
- The peripheral device can be installed or serviced in the field after meter installation.
- The device does not impact meter approvals.

Electrical Specification

The following shows the M-Bus and MEP terminal assignments for OSGP meters running firmware versions 3.X (i.e. Gen 3.1 and 3.2 meters):

Meter Terminal	Name	MEP Direction	Function	RS232 DB9 Pin	RS232 DB25 Pin	Comments
14	M-Bus(+)	O	M-Bus Power	N/A	N/A	4kV isolated M-Bus port (+)*

Meter Terminal	Name	MEP Direction	Function	RS232 DB9 Pin	RS232 DB25 Pin	Comments
						(+12Vdc/+24Vdc)
15	M-Bus(-)	I/O	M-Bus Data	N/A	N/A	4kV isolated M-Bus port (-)*
16	MEP_PWR	O	MEP POWER	NC	NC	+24Vdc or +26Vdc, -5%/+6%, over temperature and power consumption range *
16A	MEP_COM_TXD	O	MEP TXD	2	3	Meter's Transmit
17	MEP_COM_RXD	I	MEP RXD	3	2	Meter's Receive
18	MEP_COM_ENABLE	I	MEP COM ENABLE	7	4	MEP +12V/+5V Interface Enable
19	MEP_COM_GND	-	MEP GNqD	5	7	MEP GND Interface Power

*Maximum allowed current consumption by MEP client and/or M-Bus slaves is 50mA peak and 40mA average. The input voltage is +24Vdc nominal for 8XXX1-XXXX meters and 8XXX2-XXXX meters manufactured before 2013, or +26Vdc for 8XXX2-XXXX meters manufactured in 2013 and after. The year the meter was manufactured is printed on the meter faceplate.

The following shows the M-Bus and MEP terminal assignments for NES meters running firmware versions 4.0 (i.e. Gen 4 meters):

Meter Terminal	Name	MEP Direction	Function	RS232 DB9 Pin	RS232 DB25 Pin	Comments
26	M-Bus(+)	O	M-Bus Power	N/A	N/A	4kV isolated M-Bus port (+)* (+12Vdc/+24Vdc)
27	M-Bus(-)	I/O	M-Bus Data	N/A	N/A	4kV isolated M-Bus port (-)*
The following terminals are for the upper MEP port.						
29	MEP_PWR	O	MEP POWER	NC	NC	+26Vdc
31	MEP_COM_TXD	O	MEP TXD	2	3	Meter's Transmit
33	MEP_COM_RXD	I	MEP RXD	3	2	Meter's Receive

Meter Terminal	Name	MEP Direction	Function	RS232 DB9 Pin	RS232 DB25 Pin	Comments
35	MEP_COM_RTS	I	MEP COM ENABLE	7	4	MEP +12V/+5V Interface Enable
37	MEP_COM_GND	-	MEP GND	5	7	MEP GND Interface Power
The following terminals are for the lower MEP port.						
28	MEP_PWR	O	MEP POWER	NC	NC	+26Vdc
30	MEP_COM_TXD	O	MEP TXD	2	3	Meter's Transmit
32	MEP_COM_RXD	I	MEP RXD	3	2	Meter's Receive
34	MEP_COM_RTS	I	MEP COM ENABLE	7	4	MEP +12V/+5V Interface Enable
36	MEP_COM_GND	-	MEP GND	5	7	MEP GND Interface Power

*Maximum allowed current consumption by M-Bus slaves is 50mA peak and 40mA average.

Each isolated MEP communications port is designed to be connected directly to a standard RS232 or inverted TTL RS232 interface. Power (+12V or +5V) must be provided to the port from the device interface via the MEP_COM_ENABLE line. Maximum current consumption on the TXD and MEP_COM_ENABLE lines is 10mA.

For M-Bus slaves powered directly from the bus, the maximum power that can be consumed is 1W at idle and 0.5W during M-Bus communications. Peak power can exceed this rating by 20% as long as the duty cycle is <20%.

When the MEP_PWR line is shared with the M-Bus internal power supply, it is extremely important that the total power consumption of both MEP and M-Bus slaves combined does not exceed 1W for model 8XXX1-XXXX (Gen 3.1) meters, or 3W for model 8XXX2-XXXX (Gen 3.2) meters.

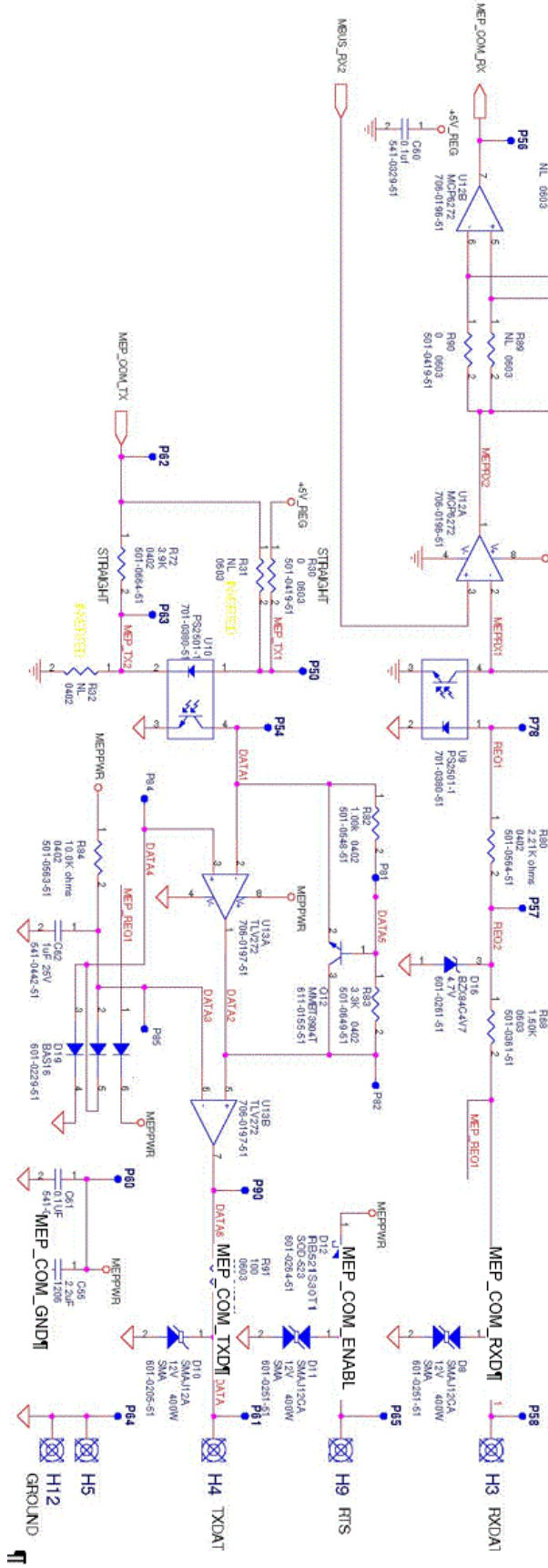
For model 8XXX4-XXXXXX (Gen 4) meters, when the upper and lower MEP_PWR lines are used to supply power to MEP devices, the combined power consumption of MEP devices and M-Bus devices must not exceed 4.5W average power, and not more than 5.5W for 1 second.

During a power failure or brown-out condition, the meter will shut down the internal bus supplies. Developers must take care to ensure that their devices can handle these power outages. In the case where a MEP client or M-Bus slave fails short circuit, the power supply will self-limit to protect the meter.

The following picture shows where each of the terminals listed in this electrical specification is located on the meter terminal block.

Isolated Signal Interface Schematic

The schematic below is a circuit diagram for the MEP interface's isolated signal interface, and is meant to help developers design the corresponding interface circuit in a MEP client. MEP_COM_TXD, MEP_COM_RXD, MEP_COM_ENABLE, MEP_COM_GND and MEP_PWR are available at the meter's auxiliary terminals.


MEP_COM_RXD
MEP_COM_ENABL
MEP_COM_TXD
MEP_COM_GND
H3 RXDAT
H9 RTS
H4 TXDAT
H5
H12 GROUND

Mechanical Specification

The developer is responsible for the mechanical design of their devices. NES allows for and supports the attachment of devices to the meter's terminal cover for ease of installation. In this case the developer would be responsible for designing, sourcing and fitting the terminal cover. Third party covers must be approved by NES before installation. It is the MEP client developer's responsibility to ensure that regulatory certifications for the meter are maintained. NES recommends that developers who are changing the cover inform the Nederlands Meetinstituut (NMi).

Third party developers are responsible for installing and testing external MEP clients. If your device is mounted outside the meter terminal cover, NES recommends that they are mounted no further away than 4 meters.

Appendix E: Version Changes

Revision A

Item Added or Changed	Reference Pages
Initial Release for OSGP Alliance	N/A