Optical Port Programmer’s Guide

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Chapter 1: Introduction

This chapter provides background information you will need when reading meter tables as described in Chapter 2 of this document.

About This Document

This document is generally intended for use with OSGP Standard compatible Meters. The OSGP Standard is accepted as open standard and described by various international standard organizations:

- ETSI TS 104 001 Open Smart Grid Protocol; (Application Layer 7)
- ETSI TS 103 908 Power Line Telecommunications (PLT) BPSK Narrow Band Power Line Channel for Smart Metering Applications. (Layer 1)
- IEC/ISO 14908 Control network layer (Layers 2-6)
- CEN/CENELEC CLC/TS 50586 Open Smart Grid Protocol
- IEC 62056-8-8, DLMS/COSEM Suite - Communication Profile for ISO/IEC 14908 series networks

The document provides information you will find useful when reading meter tables to perform the following tasks over the meter's optical port interface:

- Reading the meter's utility serial number
- Reading meter firmware version
- Reading on-demand register data
- Reading historical register data
- Reading load profile data
- Reading M-Bus data
- Reading the meter alarms
- Reading the event log
- Reading instantaneous measurement values

This document contains the following chapters:

- Chapter 1, *Introduction*. This chapter provides background information you will need when reading and writing meter tables and calling meter procedures to perform the tasks listed above.
- Chapter 2, *Reading Meter Tables*, describes how to read data from the meter tables and how to interpret the retrieved data.
- Appendix A, *Additional Meter Tables and Procedures,* lists additional meter tables and procedures that are available to the optical port interface, and that are documented in the *MEP Client Developer's Guide.* Syntax details for some meter tables referenced in this document are only provided in the *MEP Client Developer's Guide.*
- Appendix B, *Version Changes*, lists and describes updates that have been made to this document.

Audience

This document assumes knowledge of the meter version you are using. The OSGP Alliance recommends that you review the documentation for your meter model in its entirety before using the information in this manual to read and write the meter tables:

Your OSPG Standard compatible Meter's User's Guide, for the currently installed Firmware Version This document also assumes knowledge of the following protocol documents. General information regarding the rules of these protocols is not repeated here.

- ANSI C12.18 (1996) Optical Port Protocol
- ANSI C12.19 (1997) Utility Industry End Device Data Tables

For topics pertaining to M-Bus device data, knowledge of the following specifications is assumed.

- EN 13757-3, April 2002
- The M-Bus: A Documentation, version 4.8

Table Definitions

The following sections provide definitions for the data types, value control identifiers, and table/procedure naming conventions found in the Basic and Extended tables and procedures described in Chapter 2 of this document.

Data Types

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

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

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)
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 meter, as stated in Basic Table 00 (BT00).
NI_FMAT2	Non-integer format 2, defined to be INT32 for this meter, as stated in Basic Table oo (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.)

Type	Data Type Definition
	byte 2 = day byte 3 = hour byte 4 = minute byte 5 = second
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 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

Type	Data Type Definition		
	DAY	0	= Invalid
		1..31	= Day of the month
	PERIOD daily activities	0..63	= This setting, along with DELTA, is used to schedule
	DELTA daily activities	0..63	= This setting, along with PERIOD, is used to schedule
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

The VCI table column in the tables in Chapters 2 and 3 shows which entity has primary control over the value. The definitions for the VCI column are:

- F = Fixed value.
- M = Meter controls value. In most cases, the host should not attempt to write this field, or does not have write access to this field. (For example, measurement registers and statuses.) Extreme case should be taken when writing these fields. This value is also used to denote dimension-related parameters that could vary by meter.
- H = Host or meter reading/configuration software controls value. For example, 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. It is recommended that you read all fields marked with this identifier on every communication with the meter.

Value

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

Register Naming Convention

Throughout this document, the per-phase measurement registers are denoted as follows:

- L1 = Line 1 (for example ‘L1’ Sag events)
- L2 = Line 2 (for example Phase ‘L2’ Loss)
- L3 = Line 3 (for example RMS Current ‘L3’)
- L1L2L3 = All phases in a poly phase meter (for example Fwd Active Wh L1L2L3)

Table Naming Conventions

The following defines the letters preceding the table or procedure numbers in this document. This naming convention is used in titles, and in references to tables/procedures in formulas and

descriptions. To access these tables you need to specify a table ID or a procedure ID. These IDs are calculated by adding the table number to the starting index number for that table type. An index example is shown for each table/procedure type below:

- BT = Basic Table (0). For example, BT00, BT01, etc.
  - BT03 index = 0 + 3 = 3
- ET = Extended Table (2048). For example, ET01, ET03, etc.
  - ET03 index = 2048 + 3 = 2051

Note: Occasionally, references to tables in this document will contain an appended offset value to indicate that the reference is to a specific field in that table: the field located at that offset value. For example, "BT21.6" refers to the "Number of Occurrences" field in BT21, as that field is located at offset 6 of BT21. Or, "ET55.104.2" refers to the "Subsequent Power Outage" bit in ET55, as that field is at offset 104, bit 2 of ET55.

Note: In previous versions of this document, Extended Tables were referred to as Manufacturer Tables (e.g. MT06), Basic Tables were referred to as Standard Tables (e.g. ST06).

When performing a read or write for an extended table, the ID field is configured as 2048 plus the manufacturer number. For example, to write to ET03, use the number 2051 in the table ID field (2048 + 3 = 2051). This number is included in each table heading in this document. No offset is applied to the table ID field for Basic Tables (i.e. the table ID field for BT54 would be 54).

Note: When reading a pending table, there is an additional offset of 4096 applied to the table number. For example, pending table BT54 is numbered (4096 + 54 = 4150), and pending table ET47 is numbered (4096 + 2048 + 47 = 6191). For more information on pending tables, see Pending Tables on page 8.

The descriptions of the meter tables and procedures included in this document include the table ID field you should use when writing that table (or calling that particular procedure) in both decimal and hexadecimal format.

Table Offset Values

The offset for each field within each table is provided in this document. You should be aware that for some table fields, the offsets for meters running firmware version 4.0 and higher differ from those for meters running earlier firmware versions. For those table fields, two sets of offset values are provided. For table fields that use the same offset values for all device types, only a single set of offset values is provided.

You can read the "Main Firmware Version Number" and "Firmware Revision Number" fields in BT01 to determine which firmware version your meter is running.

Pending Tables

A pending table contains information that is scheduled to go into effect at some future date and time. A pending table always mirrors the contents of either a Basic Table or an Extended Table in content and format. Each pending table includes a Pending Event Descriptor (PED) that indicates the pending table's activation time. When the pending table is activated, its content will be copied into the regular table that it mirrors, and its content becomes part of the meter's active configuration.

For example, BT54 contains the configuration of the meter's active TOU calendar. The pending table for BT54 is BT4150. For details on how pending tables are numbered, see the *Table and Procedure Naming Conventions* section earlier in this chapter.

If you wanted to create a TOU calendar that the meter will use at some point in the future, you could configure BT4150 so that it contained the settings for the desired TOU calendar. You would specify the date/time that you want the TOU calendar to be activated (i.e. when the contents of BT4150 will be copied into BT54) in the PED. At the specified date/time, the contents of BT4150 would be copied into BT54, and thus the TOU calendar that had been stored in BT4150 would become the meter's active TOU calendar.

The format of the PED is described in the *Pending Event Description Format* section on page 10.

Reading Pending Tables

When reading pending tables, all <count> and <length> fields include the <PED> when present. Furthermore, the checksum is calculated over the <PED> as well as the <data>. Finally, for partial reads and writes, the offset is not affected by the presence of the <PED>. For example, to read 4 bytes from offset 3 of a pending table, the <count> would be 10 and the offset would be 3.

Full Read Service

The Full Read Request command reads the entire specified data table in the device.

Full Read Request: <command> <table ID>

Message Definition

Message Field	Data Type	Value	Comments
<command>	UINT8	0x30	
<table ID>	UINT16		Table identifier.

Full Read Response: <response> <count> <data>

Message Definition

Message Field	Data Type	Value	Comments
<response>	UINT8	<nok> | <ok>	Indicate whether or not the read was completed successfully.
<count>	UINT16		Length of <PED> and <data> returned, in bytes.
<PED>	PED		For a description of the <PED> field, see ***Pending Event Description Format*** on page 10.
<data>			Table data requested, in LSB format.

Partial Read Service

The Partial Read Request command reads the specified bytes in the specified data table in the device. If the number of bytes requested exceeds the number available in the table, then the extra bytes are returned as zeroes and no error will be returned.

Partial Read Request: <command> < table ID> <offset> <count>

Message Definition

Message Field	Data Type	Value	Comments
<command>	UINT8	0x3F	
<table ID>	UINT16		Table identifier.

<offset>	UINT24		Byte offset into data table that indicates where to begin reading.
<count>	UINT16		Length of <PED> and table data requested, in bytes.

Partial Read Response: The response is the same format as the full read response.

Pending Event Description Format

The PED must be defined as follows:

BT4150: Pending Event Description

Field Name	Type	Offset	Value	VCI	Description
Event Code	UINT(0..3)	0		H	Specify the condition upon which the pending table should be activated: 0: Based on an absolute time specified in the "Event Storage" field. 1: Based on a relative time specified in the "Event Storage" field. The time is relative to when the table write is received by the meter. 2: No meaning attached to the data, so no automatic activation will be performed. The pending table defined in BT4150 can still be activated using BP12 or BP13 when this value is chosen.
Self Read Flag	BOOL (4)	0		H	If True, the meter will perform a Self-read before pending table is activated.
Demand Reset Flag	BOOL (5)	0		H	If True, the meter will perform a demand reset before pending table is activated.
Event Storage	ARRAY[5] OF CHAR	1		H	If Event Code is 0, this is an STIME_DATE. (in UTC). If STIME_DATE is all zeroes, this indicates an empty PED. If Event Code is 1, these 5 bytes are in the order of weeks/days/hours/minutes/secs. If Event Code is 2, data is opaque.

Pending Table Status and Pending Table Procedures

The following sections provide descriptions of BT04, which you can use to read the status of pending tables, and of several procedures you can use to immediately activate (or clear the status of) a pending table.

BT04 (0x0004): Pending Status

This table provides status of pending tables. You can use this table to confirm that a pending activation has been created successfully.

Read access: MK, PK

Write access: None

Field Name	Type	Offset	Value	VCI	Description
Basic Pending	ARRAY[BT00.13] OF BOOL	0		M	A bit map of Booleans which includes one bit per basic table. The bit will be set for a table if that table has a pending table.
Extended Pending	ARRAY[BT00.14] OF BOOL	BT00.13		M	A bit map of Booleans which includes one bit per extended table. The bit will be set for a table if that table has a pending table.
Last Activation Time	STIME_DATE	BT00.13+BT00.14		M	Time of the last activation.
Number of Pending Activations	UINT8	BT00.13+BT00.14+5		M	Number of pending activations.
Pending Activations	ARRAY[BT00.18] OF 8-byte records:			M	An array of pending entry activation records
Event Code	UINT(0..3)	BT00.13+BT00.14+6		M	Specify the condition upon which the pending table should be activated: 0: Based on an absolute time specified in the "Event Storage" field. 1: Based on a relative time specified in the "Event Storage" field. 2: No meaning attached to the data, so no automatic activation will be performed. The pending table defined in BT4150 can still be activated using BP12 or BP13 when this value is chosen.
Self Read Flag	BOOL (4)			M	If True, the meter will perform a Self-read before pending table is activated.
Demand Reset Flag	BOOL (5)			M	If True, the meter will perform a demand reset before pending table is activated.
Event Storage	ARRAY[5] OF CHAR	BT00.13+BT00.14+7		M	If Event Code is 0, this is an STIME_DATE. (UTC). If STIME_DATE is all zeroes, this indicates an empty PED. If Event Code is 1, this is weeks/days/hours/minutes/secs. If Event Code is 2, data is opaque.
Table		BT00.13+BT00.14+12			
Table ID	UINT(0..11)			M	Table number 0..4095 (this does not include the 4096 offset)
Still Pending	UINT(12)			M	Flag indicating if table is still pending (1) or not (0)

This procedure clears the pending state of any pending table with a matching PED. The data in the affected pending tables is not modified. The request contains a PED (see BT04). There is no response data for this procedure.

Execution access: MK, PK

Data Written From Host To BT07

Field Name	Type	Offset	Value	VCI	Description
PED		3			See the ***Pending Event Description Format*** section on page 10 for a definition of the PED format.

Meter Response From BT08

Field Name	Type	Offset	Value	VCI	Description
(No parameters)					

Error Result Codes

Code Returned	Reason
1	No pending table was found that matched the request.
3	An internal conflict occurred when attempting to process the request.

Security and Keys

In order to prevent an unauthorized user from accessing or modifying the meter data, the meter's communication channels have added security features. The optical port communication protocol security features are documented in the ANSI C12.18 (1996) Optical Port Protocol specification.

Note: As part of the C12.18 Logon service, the "user-id" and "user" are required fields. The value of these fields is determined by the user as they are not part of the security checks performed in the meter. The C12.18 security service requires a "password" field that is used as part of the meter's security check. This field must match one of the pre-programmed meter keys, as described below.

The meter holds up to three software-programmable passwords, or keys, to be used in conjunction with the protocol's security operation on the optical port. These are the Unique Key (MK), the Provisioning Key (PK), and the Read-only Key (RK). Constraints on these keys are described below.

Unique Key (MK)

Has access to all procedures and tables.

May be limited during meter production to lock out features such as calibration data, manufacturer's identification information, writing of register data and keys, etc. For more information, see the *Hardware Lock* section.

Provisioning Key (PK)

Can be disabled via table ET04.

Cannot read or write security key values.

Cannot be used to download firmware.

Read-only Key (RK)

Can be used to read all tables except security keys, calibration, and download information.

Hardware Lock

In addition to the keys, the meter employs 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 meter. 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 ANSI 12.18 error message "Insufficient Security Clearance". The hardware lock settings for your meter depend on the country in which the meter is installed.

Sharing the Optical Port with the MEP Interface (Gen 2.X and 3.X Meters Only)

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

Gen 2.X and Gen 3.X meters share a single serial port between the optical port and the optional MEP interface whenever the "MEP Interface" flag in the "Hardware Options" field of ET29 is set. This means that the MEP and optical interfaces are exclusive of each other, and must operate in

separate sessions. By default, the meter directs this port to the MEP interface and gives priority to the MEP interface. The meter switches back to the optical port whenever it detects the start of an ANSI C12.18 communication (unless the meter has “locked out” the optical port as the result of a denial of service condition described below).

The C12.18 <stp>, or Start of Packet character (0xEE), signals the start of an optical session. The meter will switch to the optical port upon recognition of this character, however typically this first Layer 2 frame will not be received accurately. In this case, the meter will respond with the C12.18 <nak> (0x15) and the optical port client should follow the C12.18 retry guidelines and repeat the original frame. At this point the meter will still be switched to the optical port and further communications will succeed.

The meter can employ a form of “Denial of Service” prevention that will time-out an overly long optical session, thus assuring eventual access to the meter by the MEP device. ET51 contains configuration fields you can use to enable this behavior. If the optical session remains active beyond the configured interval, then that session will be terminated by the meter and further optical session attempts will be ignored for the configured hold-off period.

ET51 (2099, 0x0833): MEP Device Configuration

This table holds configuration parameters for the MEP device connected to the meter that control how the meter will manage the MEP interface. Consult the *MEP Client Developer’s Guide* for more information on MEP devices.

Read access: MK, PK

Write access: MK, PK

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 devices that can be connected to the meter. For meters running firmware versions 4.0 and higher, this is usually set to 2. For all other devices types, this is set to 1. For more information on MEP clients, see the MEP Client Developer’s Guide.			
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 False, the meter will not enforce D.O.S. timers. This field is not applicable to meters running firmware versions 4.0 and higher. For these meters, use the “Enable Optical D.O.S. Timer” field in ET55 to set the D.O.S. timer preferences.
Monitor MEP Health	BOOL(1)	0	0	H	If set to True, monitoring of the MEP serial port requests for device status purposes will be enabled.

Field Name	Type	Offset	Value	VCI	Description
Reset Device Down MEP	BOOL(2)	0	0	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.” This field is applicable to firmware versions 3.40 and higher.
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 firmware versions 3.60 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.
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 meters running firmware versions 4.0 and higher. For these meters, use the “Optical Session Timeout” field in ET55 to set the optical session timeout.
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 meters running firmware versions 4.0 and higher. For these meters, use the “Optical Session Hold-Off” field in ET55 to set the optical session hold-off.
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 firmware versions 3.40 and higher.

Field Name	Type	Offset	Value	VCI	Description
Deactivate HAN	BOOL(0)	9		H	Boolean indicating 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 not applicable to meters running firmware versions 4.0 and higher. For these meters, use the "Deactivate HAN" field in ET55 instead.
Unused	BOOL(1..7)	9			

Chapter 2:
Reading Meter Tables

This chapter describes how to interpret the data you retrieve from the meter tables.

Reading Meter Tables

This chapter provides information you will find useful when reading meter tables to perform the following tasks over the meter's optical port interface:

- Reading the meter's utility serial number
- Reading the meter firmware version
- Reading on-demand register data
- Reading historical register data
- Reading load profile data
- Reading M-Bus data
- Reading the meter alarms
- Reading the event log
- Reading instantaneous measurement values
- Reading configuration of optional inputs/outputs

When reading this document, you should be aware that meter tables may be modified to add new features or expand existing features in future releases. Every effort will be made to maintain backward compatibility with existing software programs that interface the meter. In most cases, this means that new fields will be added only to the end of tables. In other cases, where arrays of data structures are used, the arrays may be expanded in the middle of a table, affecting the offsets of all fields following. Array dimensions are specified in a separate table. In Basic Tables the dimension table is the 0^{th} table of the decade, for example table 50 or 60. When the arrays are expanded, the dimensions will be updated. It is incumbent upon software programs to read the dimension properties as needed and be able to adapt to any differences. It is recommended that dimension properties be read once per meter communication session.

For example, BT54 contains an array of recurring date entries. The maximum number of recurring dates available for use can be read in BT50.4 (the "Number of Recurring Dates" field). To read fields after this array at the proper offset, BT50 should be read first to determine the dimension of this and all arrays in BT54.

Reading the Meter's Utility Serial Number

The meter utility serial number is contained in Extended Table 03 (ET03). You can read the serial number from the field shown below.

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.

Read access: Open, key not required.

ET03: Utility Information

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..142		Remainder of table fields reserved for other uses. Do not overwrite.

Reading the Meter Firmware Version

You can read the meter firmware version in Basic Table 01 (BT01), in fields BT01.14-15.

BT01 (0x0001): General Manufacturer Identification

This table contains manufacturer identification information.

Read access: Open, key not required

BT01: General Manufacturer Identification

Field Name	Type	Offset	Value	VCI	Description
Manufacturer	ARRAY[4] OF CHAR	0		H	Name of meter manufacturer.
Model	ARRAY[8] OF CHAR	4		H	Identifier of the meter model, left-justified.
Hardware Version Number	UINT8	12		M	These two fields are a combined 2-byte field expressing the 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
Hardware Revision Number	UINT8	13		M	
Main Firmware Version Number	UINT8	14		M	These two fields are used as a combined 2-byte packed field (offset 14 is MSB) expressing the legally relevant application version number in the format x.yyz 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	
Manufacturer Serial Number	ARRAY[16] OF BCD	16		H	Manufacturer's serial number. (Field is 8 bytes in length)

Reading On-Demand Register Data

The on-demand register data for all four tiers, as well as total registers, can be found in Basic Table 23 (BT23). Proper interpretation of the registers and offsets in this table relies on first reading Basic Table 20 (BT20) for 2.0 and 2.10 meters, Basic Table 21 (BT21) for 2.12 and 3.0 meters, and Basic

Tables 21 (BT21) and 22 (BT22) for 3,1 and later meters to determine the presently configured dimensions of this table. BT22 identifies which registers have been included, if any, for demand values.

BT20 (0x0014): Dimension Register

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

Read access: MK, PK, RK

BT20: Dimension Register

Field Name	Type	Off set	Value	V CI	Description
Season Information Field	BOOL(0)	0	TRUE	F	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	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	TRUE (in firmware versions 3.10 and higher)	P	Meter reports the count of the number of demand resets that have occured since billing registers were last cleared. The maximum value for this field is 255, after which it resets to 0. Supported by firmware versions 3.10 and higher.
Demand Reset Lockout	BOOL(3)	0	TRUE (in firmware versions 3.10 and higher)	P	Meter supports a configurable lockout period for sequential demand resets. Supported by firmware versions 3.10 and higher.
Cumulative Demand	BOOL(4)	0	TRUE (in firmware versions 3.10 and higher)	P	Cumulative demand is supported by firmware versions 3.10 and higher.
Continuous Cumulative Demand	BOOL(5)	0	TRUE (in firmware versions 3.10 and higher)	P	Continuous cumulative demand is supported by firmware versions 3.10 and higher.
Time Remaining	BOOL(6)	0	FALSE	P	Not applicable.
Filler	FILL(7.. 7)	0	0		
Self-read Inhibit Overflow	BOOL(0)	1	FALSE	F	Meter does not inhibit self-reads once a memory overflow occurs.
Self-read Sequence Number	BOOL(1)	1	TRUE	P	A 2-byte field is maintained within BT26 for purposes of configuration identification.
Daily Self-read	BOOL(2)	1	TRUE	F	Daily self-reads are supported, programmable via BT54.

Field Name	Type	Offset	Value	VCI	Description
Weekly Self-read	BOOL(3)	1	TRUE	F	Weekly self-reads are supported, programmable via BT54.
Self-read Demand Reset	UINT(4..5)	1	0	P	Meter 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	
Number of Self-reads	UINT8	2	See description.	P	Meter supports up to this many self-read entries in BT26: 12 (FW 2.0) 24 (FW 2.10) 214 (FW 3.0) 253 (FW 3.10 and higher)
Number of Summations	UINT8	3	15 or 19	P	Meter records this many accumulations in BT23. For meters running firmware versions 4.0 and higher, this is set to 19. For all other devices, this is set to 15. For a description of the summations, see tables BT22 and BT23.
Number of Demands	UINT8	4	8	P	Number of demand registers supported in the meter.
Number of Coincident Values	UINT8	5	16	P	Total number of coincident values supported.
Number of Occurrences	UINT8	6	1	P	Number of maximum demands reported for each demand register.
Number of Tiers	UINT8	7	4 or 8	P	Meters running firmware versions 3.70 and higher optionally support up to 8 TOU tiers (rates). All other meters support 4 TOU tiers.
Number of Present demands	UINT8	8	8	P	Maximum number of present demands supported.
Number of Present Values	UINT8	9	41 or 72	P	The number of instantaneous measurement values recorded in the meter. For meters running firmware versions 4.0 and higher, this is set to 72. For all other devices, this is set to 41. For a description of the present values, see tables BT27 and BT28.

BT21 (0x0015): Actual Register

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

Read access: MK, PK, RK

BT21: Actual Register

Field Name	Type	Off set	Value	VCI	Description
Season Information Field	BOOL(0)	0	TRUE	F	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	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	FALSE	M	Set to True if the count of the number of demand resets that have occurred since billing registers were last cleared is included in billing data. Set to False if not.
Demand Reset Lock	BOOL(3)	0	FALSE	M	Meter supports a configurable lockout period for sequential demand resets.
Cumulative Demand	BOOL(4)	0	FALSE	M	Set to True if cumulative demand is configured..
Continuous Cumulative Demand	BOOL(5)	0	FALSE	M	Set to True if continuous cumulative demand is configured.
Time Remaining	BOOL(6)	0	FALSE	P	If True, the meter reports the time remaining in the present demand interval. If False, the meter does not report the time remaining.
Filler	FILL(7..7)	0	0		
Self-read Inhibit Overflow	BOOL(0)	1	FALSE	F	Meter does not inhibit self-reads once a memory overflow occurs.
Self-read Sequence Number	BOOL(1)	1	FALSE	P	The meter does not provide a 4-byte sequence number with self-reads. However 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 and programmable via BT54.
Weekly Self-read	BOOL(3)	1	TRUE	F	Weekly self-reads are supported and programmable via BT54.
Self-read Demand Reset	UINT(4..5)	1	0	P	Meter 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	
Number of Self-reads	UINT8	2	0..BT20.2	M	The number of self-read entries currently configured in the meter.

Field Name	Type	Offset	Value	VCI	Description
Number of Summations	UINT8	3	11, 19 or BT20.03	M	The number of accumulations reported in BT23. For meters running firmware versions 3.X, this varies depending on the demand configuration, and may be set to either 11 or the value of the “Number of Summations” field in BT20. For 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 currently configured in the meter.
Number of Coincident Values	UINT8	5	0..BT20.05	M	The total number of coincident values currently configured.
Number of Occurrences	UINT8	6	0..BT20.06	M	Number of maximum demands reported for each demand register.
Number of Tiers	UINT8	7	4 or 8	M	Meters running firmware versions 3.70 and optionally support up to 8 TOU tiers (rates). All other meters support 4 TOU 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 meter. 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.

Read access: MK, PK, RK

Write access: None

BT22: Data Selection

Field Name	Type	Offset	Value	VCI	Description
Summation Sources	ARRAY[BT21.3] of UINT8	0		M	A list of source identification numbers for each summation. For a description of the summations, see BT23.
Demand Select	ARRAY[BT21.4] of UINT8	BT21.3		M	A list of source identification number for the demand soruces. Source identification should be handled by the head-end utility software.
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 = minimum True = maximum

Field Name	Type	Offset	Value	VCI	Description
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 identification 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.

BT23 (0x0017): Current Register Data

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

Read access: MK, PK, RK

Proper interpretation of the registers and offsets in BT23 relies on first reading BT20 (firmware versions 2.01 and 2.10), BT21 (firmware versions 2.12 and 3.0 and 3.01), or BT21 and BT22 (firmware versions 3.10 and higher) to determine the presently configured dimensions of this table. In all places where BT21 is referenced below, if that table does not exist on the meter, the ANSI 12.18 error message "Inappropriate Action Requested" will be returned. In this case, the command should be attempted again using BT20.

In meter versions 2.0 and 2.1, these registers are clamped at 0 as a result of any arithmetic operations, for example Fwd-Rev Wh will never show a negative number.

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. For more information on these ratios, see Setting the Meter's CT/VT Ratio *on page* ***Error! Bookmark not defined.****.*

In addition, CT meters running firmware versions 3.70 and higher support configurable energy register units, meaning that measurements stored in BT23 that are measured in varh and Wh can be recorded into memory in units of 1, 10 or 100. This is configured via the "Energy Register Unit" field in ET55. Consult the MEP Client Developer's Guide for more information on ET55.

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

Symbol	Value
A	IF BT21.0.2 THEN 1 ELSE 0
B	A + 4*BT21.3
C	B + BT21.4*DmdRcd
D	C + BT21.5*CoinRcd

BT23: Current Register Data

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 meter
Total Data Block: Summations, Demands, and Coincidents						
Summations: Array[BT21.3] of NI_FMAT1 as shown below						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 meter 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	These fields contain the present import and export reactive energy, in Varh, for all phases L1L2L3. These values are updated by the meter 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 (in minutes for version 2.0 meters). This field not populated in tier groups.
5	Power Outage Qty	NI_FMAT1	A+20		M	This field not populated in tier groups
6	Fwd+Rev Active Wh L1L2L3	NI_FMAT1	A+24		M	These fields contain the present forward+reverse and

Number	Field Name	Type	Offset	Value	VCI	Description
7	Fwd-Rev Active Wh L1L2L3	NI_FMAT1	A+28		M	forward-reverse active energy measurements, in Wh, for all phases L1L2L3. These values are updated by the meter 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.
8	Pulse Input 1	NI_FMAT1	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 meter. These fields are not populated in tier groups.
9	Pulse Input 2	NI_FMAT1	A+36		M	
10	Error Counter	NI_FMAT1	A+40		M	Increments by 1 every instance of one the following alarms: RAM failure Non-volatile memory failure Clock error (only for firmware versions up to 3.4X) Measurement error Save-all aborted This field is not populated in tier groups.
11	Reactive VArh Q1	NI_FMAT1	A+44		M	Reactive energy for quadrant 1
12	Reactive VArh Q2	NI_FMAT1	A+48		M	Reactive energy for quadrant 2
13	Reactive VArh Q3	NI_FMAT1	A+52		M	Reactive energy for quadrant 3
14	Reactive VArh Q4	NI_FMAT1	A+56		M	Reactive energy for quadrant 4
15	Apparent Energy Q1	NI_FMAT1	A+60		M	Apparent energy for quadrant 1
16	Apparent Energy Q2	NI_FMAT1	A+64		M	Apparent energy for quadrant 2

Number	Field Name	Type	Offset	Value	VCI	Description
17	Apparent Energy Q3	NI_FMAT1	A+68		M	Apparent energy for quadrant 3
18	Apparent Energy Q4	NI_FMAT1	A+72		M	Apparent energy for quadrant 4
Demands: 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_FMAT1	B + 5*BT21.6		M	Cumulative demand measurment
	IF BT21.0.5 THEN Contin Cum Demand	NI_FMAT1	B + 5*BT21.6 + 4		M	Continuous cumulative demand measurement
	Demand	ARRAY[BT21.6] of NI_FMAT2	B + 5*BT21.6 +8		M	Demand measurements
Coincidents: ARRAY[BT21.5] of CoinRcd						
CoinRcd:						
	Coincidents	ARRAY[BT21.6] of NI_FMAT2	C		M	The selected sources collected with the demand measurements.
Tier Data Block: Array[BT21.7] of BT23.TotalDataBlock						
	Summations		D		M	
	Demands				M	
	Coincidents				M	

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 (2.12 and 3.0), or BT21 and BT22 (firmware versions 3.10 and higher) 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 **NumberOfValidEntries** field indicates how many entries in the queue contain data. **LastEntryElement** is the array element of the most recently recorded entry. The **NumberOfUnreadEntries** 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. It is recommended that you read the entire list, and that you use the **LastEntryElement** 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. **They should NOT be changed by the optical reader.**

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.

Read access: MK, PK, RK

BT26: Self Read Data

Number	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.

Number	Field Name	Type	Offset	Value	VCI	Description
Self read entries: Array[BT21.2] of SelfReadDataRecord						
SelfReadDataRecord:						
	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.
	RegisterDataRcd = BT23		14			Snapshots of Total and Tier summations and demand.

Reading Load Profile Data

Load profiling is the periodic storage of interval energy measurement. Meters running firmware version 3.50 (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.

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.

Load Profile Configuration

The meter supports several configurations for load profiling. Load profile configuration can be found in BT61 “Actual Load Profile,” BT62 “Load Profile Control,” and BT63 “Load Profile Status,”

Load profile data can be found in any of the following tables, depending on how many load profile data sets are supported by the meter: 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 that multiple load profile data sets are only supported by meters running firmware versions 3.50 and higher. For meters running earlier firmware versions, BT64 contains all load profile data.

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.

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 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

   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.

Primary Load Profile Data Set Designation

If the meter 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.

BT61 (0x003d): Actual Load Profile

This table lists the current configuration of the load profile in the meter.

Read access: MK, PK, RK

BT61: Actual Load Profile

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.
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.

Field Name	Type	Offset	Value	VCI	Description
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, this consists of one element for the meter load profile.				
Number of Blocks in Set N	UINT16	7		M	The number of blocks that Data Set N can hold. This is equivalent to the days of storage since one block always represents one calendar day.
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.

Read access: MK, PK, RK

BT62: Load Profile Control

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, this consists of one element for the meter load profile.				
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).

Field Name	Type	Offset	Value	VCI	Description
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	BT61.11 N * 3 + 1		H	Scalars applied to interval data before being recorded.
Divisors	ARRAY[BT61.11N] of UINT16	BT61.11 N * 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.

Read access: MK, PK, RK

BT63: Load Profile Status

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, this consists of one element for the meter load profile.				
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 meter. A manufacturer alarm 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 meter memory. 0 = FIFO (first in, first out). Reads this if maximum entries is set to 0. 1 = circular queue

Field Name	Type	Offset	Value	VCI	Description
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 Tables 64, and as transported. 0 = Ascending order.
Active Mode	BOOL(5)	0		M	Describes the current state of the data set. True = set is presently collecting data. Falso = set is not presently collecting data or is disabled.
Test Mode	BOOL(6)	0	FALSE	P	Test mode is not supported.
Number 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 meter and decremented by the host via procedure. Range is 0 to BT61.7.
Number 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 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

Note that BT65, BT66 and BT67 match the structure of BT64 (described below) exactly.

Read access: MK, PK, RK

BT64: Load Profile Data, Data Set 1

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, always midnight of the following day.
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. One bit for each interval in the block. If the bit is set to 1 the interval has been processed. If the bit is set to 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 Simple Status may contain nonzero 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. For M-Bus load profiling, this space holds the next 4-byte segment in the stream of raw data from the M-Bus device.

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 meter 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.
- 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 worth of data would have actually 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 worth 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 actually 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.
- 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 the 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).

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

This table holds extra information on the load profile configuration and status. It is not necessary to read this table on a regular basis.

Read access: MK, PK

ET21: Load Profile Internal Configuration

Field Name	Type	Offset	Value	VCI	Description
Data Set Internal Configuration	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, this consists of one element for the meter load profile.				
Current Block Address	UINT32	0		M	Physical address of the current block.
Current Interval Address	UINT32	4		M	Physical address of the current interval.
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.

Field Name	Type	Offset	Value	VCI	Description
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 Expansion" field in ET21 for the expanded source list.
Following fields added in firmware version 2.10q					
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.
Following fields added in firmware version 2.10s					
Sources Expansion	ARRAY[8] of UINT8	70		M	The list of sources from source 8 through 16.
LP Config ID	UINT32	78		M	Identifier representing the present load profile configuration.
MEP Billing Start Channel	UINT8	82		M	Channel number where M-Bus billing data begins in the interval. The M-Bus data continues from this channel to the end of the interval.
Following fields added in firmware version 3.10					
Block Start Time	LTIME_DATE	83		M	The 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	Set to 0 if no interval is pending. Non-zero values represent the current interval number in process of closing (i.e. waiting for MEP data to be returned).
Load Profile Options:	UINT8	93		M	
End Readings	BOOL(0)			H	Must be zero
Scalar Divisor	BOOL(1)			H	Must be zero
Data Reference	BOOL(2)			H	Must be zero
ANSI Compliance	BOOL(3)			H	If this is set to 1, the load profile is ANSI-compliant which means the following: a. Intervals in minutes only. b. Only standard extended status are used. c. Resets don't count as power cycles in common status.
Following fields added in firmware version 3.30					
Interval End Time (UTC)	LTIME_DATE	94		M	End time of last interval in UTC.

Field Name	Type	Offset	Value	VCI	Description
Interval End Time (local)	LTIME_DATE	101		M	End time of last interval in local time.
Following fields added in firmware version 3.50					
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.
Reserved	Array[20] of UINT8	111		M	Reserved for future use.
Following fields were added in firmware version 3.60					
Flags	UINT8	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.

Reading M-Bus Data (2.10 Meters and Later)

The M-Bus register data is contained in ET16. ET11 contains dimension information related to other M-Bus tables. Specifically, you should read the ET11.0 (number of devices) and ET11.5 (data entry size) fields first to predict the size of ET16.

ET11 (2059, 0x80B): MFG Dimension

This table contains the dimensions of the remaining MEP-related and other MFG (manufacturer) tables.

Read access: MK, PK, RK

ET11: MFG Dimension

Field Name	Type	Offset	Value	VCI	Description
Nbr of Devices	UINT8	0	5 or 6	F	Maximum number of MEP devices supported. For Gen 3.X meters up to 5 devices are supported (one MEP client and 4 M-Bus devices). For Gen 4.X meters, up to 6 devices are supported (two MEP clients and 4 M-Bus devices).
Config Entry Size	UINT8	1	66	F	Size in bytes of a MEP confiuration table entry (for M-Bus ET13)
Status Entry Size	UINT8	2	36	F	Size in bytes of a MEP status table entry (for M-Bus ET14)
On-demand Request Queue Size	UINT8	3	5	F	Maximum number of entries in the MEP on-demand request queue

Field Name	Type	Offset	Value	VCI	Description
On-demand Request Entry Size	UINT8	4	6	F	Size in bytes of a MEP on-demand request table entry (for M-Bus ET15)
Data Entry Size	UINT16	5	517	F	Size in bytes of a MEP devce data table entry (for M-Bus ET16)
Transaction Request Length	UINT16	7	896	F	Transaction Request Table length in bytes
Transaction Response Length	UINT16	9	1785	F	Transaction Response Table length in bytes
On-demand Write Entry Size	UINT8	11	25	F	Maximum length of the MEP on-demand write entry (length + msg), per device.
Phase Measurement Data Size	UINT8	12	16	P	Size in bytes of per phase measurement data.
Configuration Entry 2 Size	UINT8	13	22	P	Size in bytes of a MEP configuration table 2 entry for M-Bus ET34.
Meter One-time Read Queue Size	UINT8	14	3	P	Maximum number of entries in the meter one-time read request queue.
M-Bus One-Time Read Queue Size	UINT8	15	4	P	Maximum number of entries in the M-Bus one-time read request queue.
Meter One-time Read Request Entry Size	UINT8	16	17	P	Size in bytes of a meter one-time read request queue entry for ET19.
M-Bus One-time Read Request Entry Size	UINT8	17	17	P	Size in bytes of an M-Bus one-time read request queue entry for ET20.
Number of Group IDs	UINT8	18	10	P	Maximum number of group IDs that can be assigned to the meter.
Number of Harmonics	UINT8	19	10	P	Number of the harmonics are calculated, currently the 1st to 10th harmonic are calculated. Reflects the dimensions of the harmonics magnitude and phase arrays.
M-Bus Multicast Message Length	UINT8	20	65	P	Max length in bytes of an M-Bus multicast message (length + C field + CI field + User Data).
ET22 Alarm Size	UINT8	21	120	P	Number of bytes in first ET22 array.
MEP Data Sources	UINT8	22	6	P	Number of MEP data sources in ET50.
ET48 Entry Count	UINT8	23	10	P	Maximum number of entries in ET48.
Following fields added in firmware version 3.30:					
Max Critical Event Bitmaps	UINT8	24	10	P	Maximum number of bitmasks available for critical events. Consult the Critical Event Logging section of the appropriate IEC Electric Meter User's Guide for more information on critical events.

Field Name	Type	Offset	Value	VCI	Description
ET57 Entry Count	UINT8	25	16	P	Maximum number of MDT entries in ET57.
Time-Based Relay Switches	UINT8	26	80	P	Total number of switches in the Time-Based Relay calendar in ET61 for each control relay (some meters running firmware versions 4.30 and higher support a 2nd control relay).
Following fields added in firmware version 3.40:					
MEP Delta Data Alert Sources	UINT8	27	10	P	The number of MEP delta data alert sources in ET71. For more information on MEP delta data alerts, see the Delta Data Alerts section of the MEP Client Developer's Guide.
Following fields added in firmware version 3.50:					
RAM-only Transaction Request Length	UINT16	28	261	P	RAM-only Transaction Request Table length, in bytes.
RAM-only Transaction Response Length	UINT16	30	769	P	RAM-only Transaction Response Table length, in bytes.
Following fields added in firmware version 4.0:					
Firmware Module Entry Count	UINT8	32	6	P	The maximum number of meter firmware modules.
Firmware Module Entry Length	UINT8	33	7	P	The number of bytes in each firmware module entry.
MEP Channel Count	UINT8	34	2	P	Maximum number of MEP devices.
Reserved	UINT8	35	10	P	Reserved
ET17 Verification Bitmap Size	UINT16	36	1250	P	The size (bytes) of the ET17 verification bitmap.
Following fields added in firmware version 4.20:					
Error/Caution Screen Count	UINT8	38	3	P	The number of error/caution screens shown on the LCD.

ET16 (2064, 0x0810): MEP Device Data

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

Read access: MK, PK, RK

ET16: MEP Device Data

Field Name	Type	Offset	Value	VCI	Description
Device Table	ARRAY[ET11.0] of ET11.5-byte structure:				Billing data for M-Bus paired devices
Timestamp	LTIME_DATE	0		M	Timestamp (local time) of last successful read of user data (CI=72h)
Response Info	UINT8	6		M	Information for interpreting the device data
Data Order	BOOL(0)	6			0 = Mode 1 (LSB of a multipbyte record first) 1 = Mode 2 (MSB first)
Response Type	BOOL(1)	6			0 = Variable data structure 1 = Fixed data structure See The M-Bus: A Documentation version 4.8 for more information.
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 Load Profile channels) 0 = Passed 1 = Failed
NOTE: For response type “variable data structure”, this table has the following format corresponding to the 12-byte header of response message CI=0x72. See The M-Bus: A Documentation version 4.8 for more information.					
Billing Response:					An array of 1 or more telegrams, up to the capacity of the table. 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
Telegram Header:					
Serial Nbr	4-byte Packed BCD	8		M	Identificaton (serial) number of the device
MFG ID	UINT16	12		M	Manufacturer ID, special format as defined in page 36 of The M-Bus: A Documentation version 4.8: 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. 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. See M-Bus Dedicated Application Layer (DIN / EN 13757-3) for more information.
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. See ANSI C12.19-1997, Utility Industry End Device Data Tables, for more information.
NOTE: For response type “fixed data structure”, this table has the following format corresponding to the response message CI=0x73. See The M-Bus: A Documentation version 4.8 for more information.					
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
	BOOL(2)				1 = Power low
	BOOL(3)				1 = Permanent error

Field Name	Type	Offset	Value	VCI	Description
	BOOL(4)				1 = Temporary error
	UINT(5..7)				Manufacturer specific
Medium/Unit	UINT16	14		M	See The M-Bus: A Documentation version 4.8 for the.format of this field (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.

Reading Meter Alarms

The meter alarms are all contained in Basic Table 03 (BT03). See the documentation for your meter for a description of each and for more information on alarms.

BT03 (0x0003): End Device Mode Status

Read access: MK, PK, RK

BT03: End Device Mode Status

Field Name	Type	Offset	VCI
Metering Mode	BOOL(0)	0	F
Test Mode	BOOL(1)	0	P
Meter Shop Mode	BOOL(2)	0	F
Filler	FILL(3..7)	0	
Unprogrammed	BOOL(0)	1	M
Configuration Error	BOOL(1)	1	M
System Reset	BOOL(2)	1	M
RAM Failure	BOOL(3)	1	M
ROM Failure	BOOL(4)	1	M
Non-volatile Memory Failure	BOOL(5)	1	M
Clock Error	BOOL(6)	1	M
Measurement Error	BOOL(7)	1	M
Low Battery	BOOL(8)	1	M
Low Loss Potential	BOOL(9)	1	M
Demand Overload	BOOL(10)	1	M

Field Name	Type	Offset	VCI
Power Failure	BOOL(11)	1	M
Cover Removed	BOOL(12)	1	M
Reverse Energy	BOOL(13)	1	M
Data Backup Incomplete	BOOL(14)	1	M
Disconnect Switch Error	BOOL(15)	1	M
Extended Alarms. The following alarms (Load Profile X Unread Entries Exist) are only applicable to meters running firmware versions 3.50 and higher.	SET(1)	3	M
Load Profile Data Set 2 Unread Entries Exist	BOOL(0)	3	M
Load Profile Data Set 3 Unread Entries Exist	BOOL(1)	3	M
Load Profile Data Set 4 Unread Entries Exist	BOOL(2)	3	M
Neutral Current Deviation for meter firmware versions 3.60 and higher. For meters running firmware versions 4.0 and higher, this may represent the Earth Fault Detection alarm (if the “Earth Fault” bit at ET29.33.7 is set to True).	BOOL(3)	3	M
Reserved	FILL(4…7)	3	M
Mfg-defined alarms consist of the remaining alarms listed below and dimensioned by BT00.17 (described later).	SET(BT00.17)		
Load Profile Overflow. Note that for meters running firmware version 3.50 and higher, this alarm is only triggered for the load profile data set designated as the primary data set.	BOOL(0)	4	M
Self-Read Occurred	BOOL(1)	4	M
Load Disconnect Has Changed State	BOOL(2)	4	M
Control Relay (1) Open. Some meters running firmware versions 4.30 and higher include two control relays. For those meters, the “Control Relay (2) Open” alarm (BT03.9.0) indicates the status of the second control relay. For meters that only include a single control relay, this bit indicates the status of that control relay.	BOOL(3)	4	M
Phase Loss	BOOL(4)	4	M
Phase Inversion	BOOL(5)	4	M
PLC Config Failure	BOOL(6)	4	M
General Error	BOOL(7)	4	M
Invalid Password	BOOL(0)	5	M
Remote Communications Inactive	BOOL(1)	5	M
Current on Missing or Unused Phase	BOOL(2)	5	M
Pulse Input 1 Tamper	BOOL(3)	5	M
Pulse Input 2 Tamper	BOOL(4)	5	M
Software CRC Error	BOOL(5)	5	M
Code Bank Changed	BOOL(6)	5	M
Load Profile Backfill Failed	BOOL(7)	5	M
Following fields added in firmware version 2.10			
MEP Installed or Removed	BOOL(0)	6	M
M-Bus Alarm	BOOL(1)	6	M
M-Bus Auto-Discovery Complete	BOOL(2)	6	M

Field Name	Type	Offset	VCI
Phase Rotation Changed	BOOL(3)	6	M
Prepay Credit Exhausted	BOOL(4)	6	M
Prepay Warning Acknowledged	BOOL(5)	6	M
Following fields added in firmware versions 2.12 and 3.01			
Event Log Overflow Pending (available in 2.0 meters)	BOOL(6)	6	M
Mfg Log Entry Available	BOOL(7)	6	M
Dimension Change	BOOL(0)	7	M
Magnetic Tamper Detected	BOOL(1)	7	M
Access Lockout Override	BOOL(2)	7	M
Power Quality Event Detected	BOOL(3)	7	M
Event Log Unread Entries	BOOL(4)	7	M
THD State Changed	BOOL(5)	7	M
Following fields added in firmware version 3.10			
Load Profile 1 Unread Entries Exist. Note that this alarm is the one triggered for meters running firmware versions prior to 3.50, that only support a single load profile data set.	BOOL(6)	7	M
Following fields added in firmware version 3.30			
Load Side Voltage Detected	BOOL(7)	7	M
Following fields added in firmware version 3.60			
Unbalanced Voltage Detected	BOOL(0)	8	M
Following fields added in meter firmware version 3.70.			
Password Table Written To	BOOL(1)	8	M
Following field added in meter firmware version 3.80. This field has also been added to meter firmware versions 2.04, 2.13 and 3.13. However, this alarm is not propogated to the meter display for firmware versions 2.04 and 2.13, as the other alarms in BT03 are.			
Password (Key) Expiration Pending	BOOL(2)	8	M
Following fields added in meter firmware version 4.10			
P2P Security	BOOL(3)	8	M
Firmware Separation Violation	BOOL(4)	8	M
Modem Error	BOOL(5)	8	M
Following fields added in meter firmware version 4.20			
G3 Alarm	BOOL(6)	8	M
G3 Event Logged	BOOL(7)	8	M
Following fields added in meter firmware version 4.30			
Control Relay (2) Open. Some meters running firmware versions 4.30 and higher include two control relays. For those meters, this bit indicates the status of the second control relay. For meters that only include a single control relay, this bit is not applicable.	BOOL(0)	9	M

BT00 (0x0000): General Configuration

This table describes the general configuration and layout of the remaining tables and procedures in the meter, and how to read the data contained in those tables.

Read access: Open, password not required

Write access: None

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 least significant byte (LSB) first. 1 = Big endian or most significant byte (MSB) first.
Character 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			
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 meter identifier fields in tables 1, 5, and 6. 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 ANSI C12.19 section 6.2.
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 ANSI C12.19 section 6.2.
Manufacturer	ARRAY[4] of CHAR	3	NES or ELON	P	Meter 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, ANSI C12.10 default sets are used. 0 = No default sets are supported.
Procedure Parameter Length	UINT8	9	255	P	Maximum length in bytes of parameters passed to procedures in BT07.

Field Name	Type	Offset	Value	VCI	Description
Response Data Length	UINT8	10	12	P	Maximum length (in bytes) of parameters returned by procedures in ET59, ET85 or BT08.
Standard Version	UINT8	11	1	F	Version of ANSI C12.19 standard in use in the meter. 2..255 = Reserved by Standards Committee
Standard Revision	UINT8	12	0	P	Revision number of ANSI C12.19 standard in use in the meter.
Diminseion Basic Tables Used	UINT8	13	10	P	Number of bytes required to represent the set of Basic Tables used in the meter, where each bit in the set represents a specific Basic Table.
Diminsion Extended Tables Used	UINT8	14	13 or 20	P	Number of bytes required to represent the set of Extended Tables used in the meter, where each bit in the set represents a specific Extended Table. For meters running firmware versions 4.0 and higher, this is set to 20. For all other device types, this is set to 13.
Diminseion Basic Procedures Used	UINT8	15	2	P	Number of bytes required to represent the set of standard procedures used in the meter, where each bit in the set represents a specific standard procedure.
Diminsion Extended Procedures Used	UINT8	16	12	P	Number of bytes required to represent the set of manufacturer procedures used in the meter, where each bit in the set represents a specific manufacturer procedure.
Manufacturer Status Length	UINT8	17	4	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 meter. This is set to 4 for meters running firmware versions 4.0 and higher, and 2 or 3 for all other device types.

Reading the Event Log

The event log holds a chronological time-stamped record of alarms and events that occur in the meter. Event log data for the primary event log can be found in BT74. Although this log is referred to as an event log in this document, the meter has in fact implemented it as a "history log", as defined by ANSI C12.19. Dimension information pertaining to both logs is in BT70 and BT71. Proper interpretation of the offsets in BT74 relies on reading BT70 (firmware versions 2.01 and 2.10) or BT71 (firmware versions 2.12 and later) first to determine the presently configured dimensions of the event log.

Note: Meters running firmware versions 3.70 and support an alternate event log, in addition to the primary event log. Event log data for the alternate event log is stored in ET79. ET79 uses the same syntax as BT74, and event log entries can be read from ET79 in the same manner as from BT74.

For more information on ET79, consult the MEP Client Developer's Guide.

BT74 is implemented as a circular queue of entries. The header fields (bytes 0...9) 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" 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 the optical

reader. It is recommended that you read the entire list and 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 Head-End System Software. **They should NOT be changed by the optical reader.**

Consult your meter's documentation for descriptions of the alarms and events that will be recorded in the event log.

BT70 (0x0046): Dimension Log

This table lists the maximum dimensions of the remaining tables in this decade (i.e. BT70-BT79) which contain the History and Event logs.

Read access: MK, PK, RK

BT70: Dimension Log

Field Name	Type	Offset	Value	VCI	Description
Event Number	BOOL(0)	0	FALSE	F	A common event number is maintained in both logs when an event occurs that is configured for both logs.
History Date/time	BOOL(1)	0	TRUE	F	Date/time stamps are maintained in both logs.
History Sequence Number	BOOL(2)	0	TRUE	F	Sequence numbers are maintained in both logs.
History Inhibit Overflow	BOOL(3)	0	FALSE	F	Meter does not inhibit History Log entries once a memory overflow occurs.
Event Inhibit Overflow	BOOL(4)	0	FALSE	F	Meter does not inhibit Event Log entries once a memory overflow occurs.
Filler	FILL(5..7)	0		F	
Number of Standard Events	UINT8	1	Varies	F	Up to 64 standard events are supported, depending on the firmware version you are using. Consult the documentation for the firmware version your meter is running for supported standard events.
Number of Manufacturer Events	UINT8	2	Varies	P	Up to 152 manufacturer-defined events are supported, depending on the firmware version you are using. Consult the documentation for the firmware version your meter is running for supported manufacturer events.
History Data Length	UINT8	3	2	F	Two bytes of arguments are supported in the History Log.
Event Data Length	UINT8	4	2	F	Two bytes of arguments are supported in the Event Log.
Number of History Entries	UINT16	5	Varies	P	Up to this many entries can be stored in the History Log. The default for most meter models is 100 or 200, although other values are supported, depending on meter model.
Number of Event Entries	UINT16	7	0	P	Up to 0 entries can be stored in the Event Log.

BT71 (0x0047): Actual Log

This table lists the currently configured dimensions of the remaining tables in this decade (i.e. BT70-BT79) which contain the History and Event logs.

Read access: MK, PK, RK

BT71: Actual Log

Field Name	Type	Offset	Value	VCI	Description
Event Number	BOOL(0)	0	FALSE	F	A common event number is maintained in both logs when an event occurs that is configured for both logs.
History Date/time	BOOL(1)	0	TRUE	F	Date/time stamps are maintained in both logs.
History Sequence Number	BOOL(2)	0	TRUE	F	Sequence numbers are maintained in both logs.
History Inhibit Overflow	BOOL(3)	0	FALSE	F	Meter does not inhibit History Log entries once a memory overflow occurs.
Event Inhibit Overflow	BOOL(4)	0	FALSE	F	Meter does not inhibit Event Log entries once a memory overflow occurs.
Filler	FILL(5..7)	0		F	
Number of Standard Event Bytes	UINT8	1	8	F	Up to 64 standard events are supported, depending on the firmware version you are using. Consult the documentation for your meter for supported standard events.
Number of Manufacturer Event Bytes	UINT8	2	19	F	Up to 152 manufacturer-defined events are supported, depending on the firmware version you are using. Consult the documentation for your meter for supported manufacturer events.
History Data Length	UINT8	3	2	F	Two bytes of arguments are supported in the History Log.
Event Data Length	UINT8	4	2	F	Two bytes of arguments are supported in the Event Log.
Number of History Entries	UINT16	5	0..BT70.5	M	Number of entries stored in the History Log (manufacturer default: 100)
Number of Event Entries	UINT16	7	0	F	Up to 0 entries can be stored in the Event Log.

BT74 (0x004a): History Log Data (Primary Event Log)

This table holds the History Log and pointer information required for reading it.

Read access: MK, PK, RK

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 and as transported. 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.

Field Name	Type	Offset	Value	VCI	Description
					0 = FIFO (reads this if max 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 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, this value is never reset. For all other meters, 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 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, For example, events 1-10 may occur in the primary log, events 11-15 may occur in the alternate log, and events 16-20 may occur in the primary log. This means that events 11-15 will not appear in the primary log.
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, G3 or P2P message was being processed at the time, this field is 0xFFFE. If a MEP device's operation was being processed at the time, this field will be set to 0xFFFD.

Field Name	Type	Offset	Value	VCI	Description
Event	UINT(0..11)	21		M	Event ID logged. Consult the documentation for your meterfor 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.

Reading Instantaneous Measurement Values

The instantaneous measurement values such as power, voltage, and current can be found in BT28. BT20 (firmware versions 2.01 and 2.10), BT21 (firmware versions 2.12, 3.0 and 3.01), or BT21 and BT22 (firmware versions 3.10 and higher) should be read first to determine the dimensions of BT28. 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. BT22 identifies which registers have been included, if any, for demand values.

BT28 (0x001c): Present Register Data

This table contains the recorded instantaneous measurement values.

Read access: MK, PK, RK

BT28: Present Register Data

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_FMAT2	3		M	The present demand value
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_FMAT1			M	If BT21.0.6 = TRUE, then then A = 3. Otherwise, A = 0.
1	Rev Active W L1L2L3	NI_FMAT1			M	
2	Import Reactive VAr L1L2L3	NI_FMAT1			M	
3	Export Reactive VAr L1L2L3	NI_FMAT1			M	

Number	Field Name	Type	Offset	Value	VCI	Description
4	RMS Current (mA) L1	NI_FMAT1			M	
5	RMS Current (mA) L2	NI_FMAT1			M	
6	RMS Current (mA) L3	NI_FMAT1			M	
7	RMS Voltage (mV) L1	NI_FMAT1			M	
8	RMS Voltage (mV) L2	NI_FMAT1			M	
9	RMS Voltage (mV) L3	NI_FMAT1			M	
10	Power Factor L1 (1/1000)	NI_FMAT1			M	
11	Frequency (mHz)	NI_FMAT1			M	
12	VA L1L2L3	NI_FMAT1			M	
13	Power Factor L2 (1/1000)	NI_FMAT1			M	
14	Power Factor L3 (1/1000)	NI_FMAT1			M	
15	Sin(PA) L1 (1/1000)	NI_FMAT1			M	
16	Sin(PA) L2 (1/1000)	NI_FMAT1			M	
17	Sin(PA) L3 (1/1000)	NI_FMAT1			M	
Following fields added in firmware version 2.12						
18	Fwd Active W L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT1			M	
19	Rev Active W L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT1			M	
20	Import Reactive VAr L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT1			M	
21	Export Reactive VAr L1L2L3 multiplied by CT/VT ratio if enabled	NI_FMAT1			M	
Following fields added in firmware version 3.10						
22	Q1 Reactive Var L1L2L3	NI_FMAT1			M	Reactive power for quadrant 1
23	Q2 Reactive Var L1L2L3	NI_FMAT1			M	Reactive power for quadrant 2
24	Q3 Reactive Var L1L2L3	NI_FMAT1			M	Reactive power for quadrant 3

Number	Field Name	Type	Offset	Value	VCI	Description
25	Q4 Reactive Var L1L2L3	NI_FMAT1			M	Reactive power for quadrant 4
Following fields added in firmware version 3.50						
26	Fwd Active W L1	NI_FMAT1			M	
27	Fwd Active W L2	NI_FMAT1			M	
28	Fwd Active W L3	NI_FMAT1			M	
29	Rev Active W L1	NI_FMAT1			M	
30	Rev Active W L2	NI_FMAT1			M	
31	Rev Active W L3	NI_FMAT1			M	
32	Fwd Active W L1 Post CT/VT Ratio	NI_FMAT1			M	
33	Fwd Active W L2 Post CT/VT Ratio	NI_FMAT1			M	
34	Fwd Active W L3 Post CT/VT Ratio	NI_FMAT1			M	
35	Rev Active W L1 Post CT/VT Ratio	NI_FMAT1			M	
36	Rev Active W L2 Post CT/VT Ratio	NI_FMAT1			M	
37	Rev Active W L3 Post CT/VT Ratio	NI_FMAT1			M	
38	RMS Current (mA) L1 Post CT Ratio	NI_FMAT1			M	
39	RMS Current (mA) L2 Post CT Ratio	NI_FMAT1			M	
40	RMS Current (mA) L3 Post CT Ratio	NI_FMAT1			M	
Following fields added in meter firmware version 3.70						
41	RMS Voltage (mV) L1 - Continuous	NI_FMAT1			M	
42	RMS Voltage (mV) L2 - Continuous	NI_FMAT1			M	
43	RMS Voltage (mV) L3 - Continuous	NI_FMAT1			M	
44	RMS Voltage (mV) L1 – Average	NI_FMAT1			M	
45	RMS Voltage (mV) L2 – Average	NI_FMAT1			M	
46	RMS Voltage (mV) L3 – Average	NI_FMAT1			M	

Number	Field Name	Type	Offset	Value	VCl	Description
47	Average Fwd Active W L1L2L3	NI_FMAT1			M	
48	Average Rev Active W L1L2L3	NI_FMAT1			M	
49	Average Fwd Active W L1	NI_FMAT1			M	
50	Average Fwd Active W L2	NI_FMAT1			M	
51	Average Fwd Active W L3	NI_FMAT1			M	
52	Average Rev Active W L1	NI_FMAT1			M	
53	Average Rev Active W L2	NI_FMAT1			M	
54	Average Rev Active W L3	NI_FMAT1			M	
Following fields added in meter firmware version 4.0						
55	Apparent Power Q1 VA L1L2L3	NI_FMAT1			M	
56	Apparent Power Q2 VA L1L2L3	NI_FMAT1			M	
57	Apparent Power Q3 VA L1L2L3	NI_FMAT1			M	
58	Apparent Power Q4 VA L1L2L3	NI_FMAT1			M	
59	Apparent Power Q1 VA L1	NI_FMAT1			M	
60	Apparent Power Q2 VA L1	NI_FMAT1			M	
61	Apparent Power Q3 VA L1	NI_FMAT1			M	
62	Apparent Power Q4 VA L1	NI_FMAT1			M	
63	Apparent Power Q1 VA L2	NI_FMAT1			M	
64	Apparent Power Q2 VA L2	NI_FMAT1			M	
66	Apparent Power Q3 VA L2	NI_FMAT1			M	
66	Apparent Power Q4 VA L2	NI_FMAT1			M	
67	Apparent Power Q1 VA L3	NI_FMAT1			M	
68	Apparent Power Q2 VA L3	NI_FMAT1			M	
69	Apparent Power Q3 VA L3	NI_FMAT1			M	

Number	Field Name	Type	Offset	Value	VCl	Description
70	Apparent Power Q4 VA L3	NI_FMAT1			M	
71	Neutral Current mA	NI_FMAT1			M	
Following fields added in meter firmware version 4.1.						
72	Average RMS Current mA L1	NI_FMAT1			M	
73	Average RMS Current mA L2	NI_FMAT1			M	
74	Average RMS Current mA L3	NI_FMAT1			M	
Following fields added in meter firmware version 4.30.						
75	Voltage Angle A to B	NI_FMAT1			M	Angles between adjacent phase voltages, in 1/100 of a degree (e.g. 12340 = 123.40°)
76	Voltage Angle B to C	NI_FMAT1			M	
77	Voltage Angle C to A	NI_FMAT1			M	
78	Imp Reactive VAr A	NI_FMAT1			M	Import or export reactive power, per-phase, in VAr.
79	Imp Reactive VAr B	NI_FMAT1			M	
80	Imp Reactive VAr C	NI_FMAT1			M	
81	Exp Reactive VAr A	NI_FMAT1			M	
82	Exp Reactive VAr B	NI_FMAT1			M	
83	Exp Reactive VAr C	NI_FMAT1			M	

Appendix A: Additional Meter Tables and Procedures

This appendix summarizes additional meter tables and procedures that can be read or written via an optical port application, but are not described in this document. For more information on these tables and procedures, consult the *MEP Client Developer's Guide.*

Additional Meter Tables

Tables A.1 summarizes additional meter tables that can be read via an optical port application, but are not described in this document. Table A.1 also specifies which keys are required for optical port access to these tables and procedures. For more information on these tables and procedures, consult the *MEP Client Developer's Guide*.

Table A.1 Additional Meter Tables

Table Name	Description	Read Access
BT15: Constants	Lists the metering constants used and applied to data in the meter, including the current transformer (CT) and the voltage transformer (VT) ratios.	MK, PK, RK
BT24: Previous Season Data	A snapshot of the current register data (BT23) taken at the time of the last season change. This table is read-only for meter firmware versions 3.7X and all meter firmware versions 4.10 and higher. Write access is granted to MK and PK for all other device firmware versions.	MK, PK, RK
BT25: Previous Demand Reset Data	Contains the previous demand data recorded at the last demand reset for the totals and all 4 TOU tiers.	MK, PK, RK
BT27: Present Register Selection	Lists the instantaneous measurement sources (by number) that are recorded in BT28 "Present Register Data" and other tables derived from BT28.	MK, PK, RK
BT30: Dimension Display	Lists the maximum dimensions of fields and tables that control the meter's LCD display.	MK, PK, RK
BT33: Primary Display List	Used to configure what items show in what order and for how long on the meter display.	MK, PK, RK
BT60: Dimension Load Profile	Lists the maximum dimensions of the meter tables that contain the load profile configuration and records.	MK, PK, RK
ET02: Battery Information	Contains battery-related information such as the voltage threshold indicating when a Low Battery alarm should be triggered.	MK, PK, RK
ET07: LCD Display Configuration Table	Used to configure the format and source ID codes of the meter's LCD display.	MK, PK, RK
ET14: M-Bus/MEP Device Status	Contains the status information and alarms for each of the M-Bus and MEP devices connected to the meter.	MK, PK, RK
ET15: M-Bus/MEP On-demand Requests	Contains a circular queue of on-demand requests.	MK, PK, RK
ET30: Maximum Power or Current Level Control	Contains configuration and status information for the maximum power and current level threshold values.	MK, PK, RK

Table Name	Description	Read Access
ET31: Meter One-time-read Log	This table contains a log of the meter's One-time-reads.	MK, PK, RK
ET36: Extended Table Actual Dimensions	Holds the actual configuration dimensions of the Extended Tables that are adjustable.	MK, PK, RK
ET42: Interface Definition	Holds the meter-specific interface definition data. All parameters that affect the dimension and/or semantics of readable data that can be modified are reflected here.	MK, PK, RK
ET45: MEP Recurring Read Log	A log of MEP billing data.	MK, PK, RK
ET46: Control Output Read-Only Data	Contains read-only configuration data for the configuration of the load disconnect contactor.	MK, PK, RK
ET47: Calendar Override Settings	Used to initiate and terminate manual overrides to the TOU calendar and active tariff.	MK, PK, RK
ET50: MEP Inbound Data Space	Holds status and controls relevant to the MEP device, and is normally only modified by the MEP device during the auto-discovery process.	MK, PK, RK
ET52: MEP Transaction Request Table	Contains transaction requests from the MEP device. Access levels of the operations within this transaction table are controlled by the access level at which the table is written to.	MK, PK, RK
ET53: MEP Transaction Response Table	Contains transaction responses for the transactions requested in ET52.	MK, PK, RK
ET55: Meter Configuration	Holds various configuration data for the meter, including fields controlling the scheduled messages that can be displayed on the meter's LCD display.	MK, PK, RK
ET57: M-Bus/MEP Data Type Table	Contains the configuration of each M-Bus/MEP Data Type defined on the meter.	MK, PK, RK
ET58: MEA Status Extension	Holds an array of M-Bus/MEP status by index.	MK, PK, RK
ET59: MEP Procedure Response	The meter can be configured so that responses to procedures are written into ET59.	MK, PK, RK
ET62: 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 which ID codes will be used for each load profile channel.	MK, PK, RK
ET66: Load Profile Source ID Mapping Table	This table contains a mapping of mapped load profile source IDs to extended source IDs.	MK, PK, RK

Table Name	Description	Read Access
ET67: Display Source ID Mapping Table	This table contains a mapping of mapped display source IDs to extended source IDs.	MK, PK, RK
ET70: RAM Only Status	This table can be used by MEP clients to determine which MEP port they are connected to.	MK, PK, RK
ET71:Delta Data Alerts	This table contains control and status information for the delta data alert feature.	MK, PK, RK
ET74: MEP Recurring Read Extended Log	This table is an extension of ET45, which is a log of MEP billing data.	MK, PK, RK
ET75: Primary Load Profile Channel Change Log	This table records changes to the channel sources in the primary load profile data set. It is applicable with meters that are configured to comply with the Welmec 11.2 interval billing guidelines.	MK, PK, RK
ET77: Secondary Display List	This table holds the configuration of the meter's secondary display list. It is applicable to meters running firmware versions 3.70 and only.	MK, PK, RK
ET79: History Log Data (Alternate Event Log)	Contains event log data for the alternate event log. It is applicable to meters running firmware versions 3.70 and higher only.	MK, PK, RK
ET80: Average Power Settings	Contains the average power control settings for the meter. It is applicable to meters running firmware versions 3.70 and higher only.	MK, PK, RK
ET81: Power Outage Log	A log of power outages. It is applicable to meters running firmware versions 3.70 and higher only.	MK, PK, RK
ET85: MEP Procedure Response (MEP2)	The procedure response table for MEP client 2. It is applicable to meters running firmware versions 4.0 and higher only.	MK, PK, RK
ET90: 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, as well as for settings used by the P2P Gateway Module. It is applicable to meters running firmware versions 3.82 and 4.02 and higher.	MK, PK, RK
ET92: P2P Connection Configuration	This table is applicable to P2P meters only. It is used to store configuration information for the P2P Gateway Module, such as the connection type and IP address used to connect to Head-End System Software.	MK, PK, RK

Table Name	Description	Read Access
ET93: P2P Connection Status	This table is applicable to OSGP P2P meters only. It is used to store status information for the meter's P2P connections, such as the date/time of the last connection with Head-End System Software.	MK, PK, RK
ET94: P2P Gateway Module Configuration	This table is applicable to OSGP P2P meters only. It is used to store configuration information for the P2P Gateway Module.	MK, PK, RK
ET95: P2P Gateway Module Status	This table is applicable to OSGP P2P meters only. It is used to store status information for the P2P Gateway Module.	MK, PK, RK
ET96: P2P Gateway Model Socket Status	This table is applicable to OSGP P2P meters only. It is used to store status information for the P2P Gateway Module's modem socket.	MK, PK, RK
ET97: Meter Configuration LN	This table stores the contents of the FTz messages most recently received by the meter. It is applicable to meters running firmware versions 3.82 and 4.02 and higher.	MK, PK, RK
ET98: P2P AT Command Response	This table is applicable to OSGP P2P meters running firmware versions 4.20 and higher only. It holds an extended version of the response to the last AT command sent to the P2P Gateway Module modem.	MK, PK, RK

Appendix B:
Version Changes

Revision A

Item Added or Changed	Reference Pages
Initial Release for OSGP Alliance	N/A