HYPERION ENERGY METER - MIOTY PAYLOAD DOCUMENTATION

OVERVIEW

The Hyperion energy meter is a Sentinum device that transmits energy measurement data via MIOTY communication protocol. This document describes the payload structure, available profiles, and field definitions for firmware version 1.3 and above.

Device Information:

- Type EUI: FCA84A0000000006
- Vendor: Sentinum
- Protocol: MIOTY
- Supported Version: 1.3+

PAYLOAD STRUCTURE

Header (Common to all profiles)

Every Hyperion payload begins with a common header structure:

FIELD	SIZE	TYPE	DESCRIPTION
FW_BASE_ID	4 bits	Uint	Firmware base identifier
FW_MAJOR_VER	4 bits	Uint	Major firmware version
FW_MINOR_VER	4 bits	uint	Minor firmware version
DEV_SUB_TYPE	4 bits	uint	Device subtype identifier
MSG_COUNTER	8 bits	uint	Uplink message counter
STATUS	8 bits	uint	Device status (0 = normal operation)
SERIAL_NUM	32 bits	Uint	Visible device serial number
APP_VERSION	32 bits	uint	Visible application version
MID_VERSION	32 bits	Uint	Visible middleware version
PROFILE	32 bits	uint	Payload profile selector (0-4)

Conditions for payload data:

- Payload data is only transmitted when `fw_minor_ver` >= 3 and `status == 0`
- Profile selection is controlled by the profile field

PAYLOAD PROFILES

PROFILE 0: COMPLETE ENERGY DATA (BIG-ENDIAN)

Purpose: Comprehensive electrical measurements including power, current, voltage, energy counters, and power quality metrics.

Fields:

- Power Measurements (W):
  - p_l1_a, p_l2_a, p_l3_a: Active power per phase
  - p_l123_a: Total active power (sum of all phases)
- Current Measurements (mA):
  - i_l1, i_l2, i_l3: Current per phase
  - i_l123: Total current
- Voltage Measurements (V, scaled by /10):
  - u_l1, u_l2, u_l3: Phase voltages
  - u_l12, u_l23, u_l31: Line-to-line voltages
- Energy Counters (Wh):
  - e_ta_a_i: Total active energy import
  - e_ta_a_e: Total active energy export
  - e_ta_r_i: Total reactive energy import
  - e_ta_r_e: Total reactive energy export
- Power Quality:
  - pf_l1, pf_l2, pf_l3: Power factor per phase (scaled by /100)
  - f: Frequency in Hz (scaled by /10)
- System Status:
  - pwr_fail: Power failure counter

PROFILE 1: VOLTAGE AND CURRENT FOCUS (BIG-ENDIAN)

Purpose: Detailed voltage and current measurements with power quality metrics.

Fields:

- Voltage Measurements (V, scaled by /10):
  - u_l1, u_l2, u_l3: Phase voltages
  - u_l12, u_l23, u_l31: Line-to-line voltages
- Current Measurements (mA):
  - i_l1, i_l2, i_l3: Current per phase
  - i_l123: Total current
- Power Quality:
  - pf_l1, pf_l2, pf_l3: Power factor per phase (scaled by /100)
  - f: Frequency in Hz (scaled by /10)

PROFILE 2: POWER AND CURRENT ANALYSIS (BIG-ENDIAN)

Purpose: Focused on power measurements and current analysis with power quality.

Fields:

- Power Measurements (W):
  - p_l1_a, p_l2_a, p_l3_a: Active power per phase
  - p_l123_a: Total active power
- Current Measurements (mA):
  - i_l1, i_l2, i_l3: Current per phase
  - i_l123: Total current
- Power Quality:
  - pf_l1, pf_l2, pf_l3: Power factor per phase (scaled by /100)
  - f: Frequency in Hz (scaled by /10)

PROFILE 3: ENERGY COUNTERS ONLY (BIG-ENDIAN)

Purpose: Energy accumulation data for billing and monitoring applications.

Fields:

- Energy Counters (Wh):
  - e_ta_a_i: Total active energy import
  - e_ta_a_e: Total active energy export
  - e_ta_r_i: Total reactive energy import
  - e_ta_r_e: Total reactive energy export

PROFILE 4: EXTENDED HISTORICAL DATA (LITTLE-ENDIAN)

Purpose: Comprehensive historical data with time-based energy records and configuration parameters.

Fields:

- Time and Index
  - index: Data record index
  - epoch: Current timestamp
  - epoch_old: Previous timestamp
- Time-based energy counters
  - Tariff 1 (T1)
    - e_t1_a_i: Active energy import
    - e_t1_a_e: Active energy export
    - e_t1_r_i: Reactive energy import
    - e_t1_r_e: Reactive energy export
  - Tariff 2 (T2)
    - e_t2_a_i: Active energy import

    - e_t2_a_e: Active energy export
    - e_t2_r_i: Reactive energy import
    - e_t2_r_e: Reactive energy export
- Current Measurements (mA)
    - i_l1, i_l2, i_l3: Current per phase
    - i_l4: Additional current measurement
    - i_l123: Total current
- Power Measurements (W)
    - p_l1_a, p_l2_a, p_l3_a: Active power per phase
    - p_l123_a: Total active power
    - p_l123_a_avg: Average total active power
- Voltage Measurements (V, scaled by ÷10)
    - u_l1, u_l2, u_l3: Phase voltages
- Power Quality
    - f: Frequency in Hz (scaled by ÷10)
    - pf_l1, pf_l2, pf_l3: Power factor per phase (scaled by ÷10)
- Transformer Configuration
    - ct_act_prim: Current Transformer Actual Primary ratio
    - ct_old_prim: Current Transformer Old Primary ratio
    - ct_act_sec: Current Transformer Actual Secondary ratio
    - ct_old_sec: Current Transformer Old Secondary ratio
    - vt_act_prim: Voltage Transformer Actual Primary ratio
    - vt_old_prim: Voltage Transformer Old Primary ratio
    - vt_act_sec: Voltage Transformer Actual Secondary ratio
    - vt_old_sec: Voltage Transformer Old Secondary ratio

DATA ENCODING

Endianness

- Profiles 0-3: Big-endian encoding
- Profile 4: Little-endian encoding

Data Types and Scaling

COMPONENT	SIZE	TYPE	SCALING	UNIT	DESCRIPTION
VOLTAGE_*	32-bit	int	÷10	V	Voltage measurements
CURRENT_*	32-bit	int	1:1	mA	Current measurements
POWER_*	32-bit	int	1:1	W	Power measurements
ENERGY_*	64-bit	uint	1:1	Wh	Energy accumulation
POWER_FACTOR	8-bit	int	÷100 (÷10 for LE)	-	Power factor (-1.0 to 1.0)
FREQUENCY	16-bit	int	÷10	Hz	Line frequency
EPOCH	64-bit	uint	1:1	seconds	Unix timestamp
CT_* / VT_*	16-bit	uint	1:1	-	Transformer ratios

Field Naming Convention

- Voltage: `u_lX` (X = phase number or line designation)
- Current: `i_lX` (X = phase number or total)
- Power: `p_lX_a` (active power, X = phase or total)
- Energy: `e_tX_Y_Z` where:
    - `t` = tariff type (ta = total, t1 / t2 = tariff 1 / 2)
    - `Y` = energy type (a = active, r = reactive)
    - `Z` = direction (i = import, e = export)
- Power Factor: pf_lX (X = phase number)
- Frequency: f
- Transformer Ratios: `ct_*` = Current Transformer, `vt_*` = Voltage Transformer
    - Format: `{ct|vt}_{act|old}_{prim|sec}` for actual/old primary/secondary values

USAGE EXAMPLES

PROFILE SELECTION STRATEGY

- Profile 0: Use for comprehensive monitoring requiring all parameters
- Profile 1: Use for voltage quality analysis and load monitoring
- Profile 2: Use for power analysis and demand monitoring
- Profile 3: Use for billing applications requiring energy totals only
- Profile 4: Use for historical data collection and advanced analytics

DATA INTERPRETATION

```
// Example: Converting voltage reading
const voltage_raw = 2350; // Raw value from u_l1
const voltage_actual = voltage_raw / 10; // = 235.0 V

// Example: Converting power factor
const pf_raw = -85; // Raw value from pf_l1 (big-endian profiles)
const pf_actual = pf_raw / 100; // = -0.85 (capacitive load)

// Example: Energy consumption calculation
const energy_import = e_ta_a_i; // in Wh
const energy_export = e_ta_a_e; // in Wh
const net_consumption = energy_import - energy_export; // Net energy

// Example: Transformer ratio interpretation
const ct_primary = ct_act_prim; // Current transformer primary ratio
const ct_secondary = ct_act_sec; // Current transformer secondary ratio
const ct_ratio = ct_primary / ct_secondary; // Actual CT ratio
```

VERSION COMPATIBILITY

This blueprint supports Hyperion firmware version 1.3 and above.

The payload structure is conditional on:

- `fw_minor_ver >= 3`: Required for payload data transmission
- `status == 0`: Normal operation status required for data payload

For versions below 1.3, only header information will be available.

TECHNICAL NOTES

1. **No Hidden Fields:** All data fields are visible and accessible in the decoded payload
2. **Visible Components:** Serial numbers, version information, and CT/VT ratios are all visible
3. **Conditional Logic:** All payload fields are conditional based on version, status, and profile selection
4. **Data Validation:** Ensure proper endianness handling when implementing decoders
5. **Profile Optimization:** Different profiles optimize payload size for specific use cases
6. **Time-based Data:** Profile 4 includes historical data with epoch timestamps for time-series analysis
7. **Transformer Ratios:** CT/VT ratios are transmitted as 16-bit values representing transformer configuration
8. **Optimized Blueprint**: Streamlined component definitions remove unnecessary complexity while maintaining full functionality