

Front End Mobile Unit Technical Specifications

June 2011

Revision Summary

Previous version: RTTMV Technical Specification v3.2

Current version: RTTMV Technical Specification v3.3

Changes:

1. Part III – FEMU Functional Requirements:
 - ✓ added ‘All reported data must be stored as virgin data to removable non-volatile memory’
2. Part V – Hardware Specification:
 - ✓ revised integrity checksum with calculation algorithm
 - ✓ add digital signature format
 - ✓ added embedded information and integrity checksum to captured photo
 - ✓ revised digital camera minimum requirement
3. Part VI – Communication Protocol:
 - ✓ added command for requesting missing photo taken by FEMU
 - ✓ added commands for updating and requesting digital signatures
 - ✓ define ‘idle’ and ‘near’ in reporting and recording intervals
 - ✓ removed ‘<CR><LF>’ from \$GPRMC statement in virgin data
 - ✓ minor changes on update and request disposal sites records

Declarations

Requirements presented in this document have taken into account the latest technology available in the market which is suitable for RTTMV and FEMU and is cost-effective. The specification does not contain any patented hardware, software and program. It presents a general requirement for FEMU suppliers for developing their FEMU hardware and software. FEMU software will be able to communicate with the RTTMV of EPD for data and command transmissions based on this specification.

PART I – RTTMV System Design

The RTTMV system employs hot standby configuration. Two identical servers are used to handle and store data reported from data logger (FEMU). Application software, such as web user interface, is provided by a standalone web server. The web user interface enables users to view the data record; analyze the data records and generate reports.

The system is connected to the internet via two separate broadband networks. Each network is protected by network firewall. The firewall prevents unauthorized access to the system and route connection requests to the appropriate servers.

PART II – FEMU System Components

The FEMU system consists of a main unit (for data capturing, processing, storage and communication), a display, a keypad, a GPS receiver, a draught sensor, a split-bottom control button, a siren and buzzer, a IP camera, a memory card writer, a printer interface and backup batteries. The FEMU is housed in a waterproof enclosure with key locks.

Data records are sent back to Control Center for real-time monitoring and short dumping detection. Data records transmitted and stored in Control Center should be identical to the corresponding virgin data captured and stored in FEMU. SHA-256 digital digest must be appended to each data record for data integrity verification.

PART III – FEMU Functional Requirements

Data collection and processing

- Capture GPS positioning data from GPS receiver.
- Capture draught level from draught sensor and convert it from analog electrical signal to digital data.
- Detect split-bottom control button status.
- Combine GPS positioning data, draught level, number of satellite in view and split-bottom control button status to form unprocessed data record.
- Generate data integrity checksum.
- Store virgin data, which are composed of unprocessed data records appended with data integrity checksum, to removable non-volatile memory according to recording interval settings and reporting interval settings.
- Communicate with Control Center and report virgin data to Control Center via GSM/GPRS according to reporting interval settings. All reported data must be stored as virgin data to removable non-volatile memory.
- Change and request system settings and parameters locally or remotely via GSM/GPRS.
- Report stored data via GSM/GPRS upon requested by Control Center.
- Submit the removable non-volatile memory to EPD upon request, if necessary.

Photo capturing

- Control IP camera and take snapshots locally or remotely via GSM/GPRS.
- Take and report snapshot automatically within first 5 seconds of dumping activity (for split-bottom hopper barge only).
- Take and report snapshot regularly (configurable locally or remotely via GSM/GPRS from 15 minutes to 4 hours).
- Take and report snapshots by request locally or remotely via GSM/GPRS.
- Report stored snapshots via GSM/GPRS upon requested by Control Center.

User interface and data storage

- Interface with key locks for managing system configuration and data downloading.
- Authenticate user.
- Display basic information including date and time, position and speed of vessel, accuracy of GPS positioning, draught level, split-bottom control button status, distance from dumping site etc.
- Process and analyze data in real-time.
- Produce visual and audio signal when vessel enters or leaves specified marine dumping site.

- Produce visual and audio signal on system alerts.
- Retrieve data from data storage media and send to printer.
- Retrieve data from data storage media and send copy to removable media.
- Capable for storing 12 months virgin data and 2000 JPEG images.

PART IV – FEMU Operational Requirements

FEMU must be operated properly and continuously under the following conditions:

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| Input voltages: | 20 to 28VDC |
| Ambient temperature: | 0 to 40°C |
| Relative humidity: | 20 to 80% |
| Geographical: | Within Hong Kong Seas and Pearl River Delta area |
| GSM/GPRS network: | Under GPRS network coverage |

PART V – Hardware & Software Specifications

| FEMU | |
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| Features | |
| Signal range and data rate: | Analog input: 0 to 20 mA for draught sensor Digital input: Open/close detection for split-bottom button RS232 input: Baud rate 4800bps for GPS receiver RS232 output: User selectable for portable printer Network: 10 Base-T or 100 Base-TX for digital camera |
| Communication: | Type: Wireless Network: GSM/GPRS/EDGE/UMTS 900/1800 MHz Protocol: TCP/IP, FTP |
| Display: | Type: LCD, color or black/white Character: Alpha numeric, English and Chinese |
| Indicators/alerts: | LCD, LED, buzzer on events: <ul style="list-style-type: none"> ◆ System status ◆ Communication status ◆ Sensors and button status ◆ Distance from specified marine dumping site ◆ Audible signal when vessel enters and leaving specified marine dumping ground ◆ Battery level and battery low alert ◆ AC power outage (if appropriate) |
| Input: | Numeric keypad |
| Access: | Key locks User ID and password |
| Settings: | Updated locally or remotely <ul style="list-style-type: none"> ◆ Loading and dumping site coordinates ◆ Vessel information ◆ Trip information ◆ Data recording intervals ◆ Data reporting intervals ◆ Usernames and passwords |
| Data recording and reporting | |
| Data types: | Unprocessed (virgin) data from GPS receiver, draught sensor and split-bottom button |

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| Recording intervals: | <p>6 user configurable intervals for: Idle and far away from disposal sites (default 300 seconds) Idle and near disposal sites (default 300 seconds) Sailing and far away from disposal sites (default 60 seconds) Sailing near disposal sites (default 20 seconds) Inside disposal sites (default 10 seconds) Dumping (default 5 seconds)</p> <p>* Please refer to Part VI on definitions of ‘Near’ and ‘Far away’</p> |
| Reporting intervals: | <p>6 user configurable intervals for: Idle and far away from disposal sites (default 300 seconds) Idle and near disposal sites (default 300 seconds) Sailing and far away from disposal sites (default 120 seconds) Sailing near disposal sites (default 60 seconds) Inside disposal sites (default 10 seconds) Dumping (default 5 seconds)</p> <p>* Please refer to Part VI on definitions of ‘Near’ and ‘Far away’</p> |
| Virgin data | |
| Format: | <p>Syntax: <1>,<2>,<3>,<4>,<5>,<6> <1> = Vessel ID, 000001 – 999999 <2> = Draught (direct analog-to-digital input), 0000 – 9999 <3> = Split-bottom sensor, 0 = idle, 1 = opening, 2 = closing <4> = Number of satellites in view, 00 to 12 (leading zeros will be transmitted) <5> = Complete ‘Recommended Minimum Specific GPS/TRANST Data’ (\$GPRMC) sentence defined in NMEA 0183 Version 2.0 or later version agreed by EPD, from \$GPRMC to checksum *hh <6> = SHA-256 integrity checksum, (presented in corresponding ASCII characters of their hex values)</p> |

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| Integrity checksum: | <p>Digest (D3) computed by SHA-256 algorithms</p> <p>Input to SHA-256 calculation:</p> <ul style="list-style-type: none"> - Payload := <1>,<2>,<3>,<4>,<5> - S1 := Digital signature of EPD (updated regularly) - S2 := Digital signature of barge operator (updated regularly) <p>Algorithm:</p> <p>Digest D1 := <i>SHA256</i>(Payload + S1)</p> <p>Digest D2 := <i>SHA256</i>(D1 + S2)</p> <p>Digest D3 := <i>SHA256</i>(D2 + Payload)</p> <p>Remark:</p> <p>All digests (D1, D2, D3) are presented in ASCII upper character string compose of ('0' - '9', 'A' to 'F') of their corresponding hex values.</p> |
| Digital Signatures | |
| Encryption: | <p>Digital signatures must be encrypted and stored locally</p> <p>FEMU developer has to provide an encryption program to EPD for encrypting the digital signatures</p> <p>The encryption program must be running on Microsoft Windows Operating System</p> <p>Digital signatures can be updated locally or remotely via GSM/GPRS</p> |
| Format: | <p>both “EPD Digital Signature” and “Barge Digital Signature” are presented in 16 nos. of ASCII upper character string compose of ('0' - '9', 'A' to 'Z' except 'I' and 'O')</p> |
| Storage | |
| Storage: | <p>Removable non-volatile memory</p> <p>At least 12 months complete virgin data records</p> <p>At least 2000 JPEG images at 320x240 resolutions</p> |
| Data Retrieval | |
| Peripheral: | <p>Memory cards: SD card or CF card</p> |
| Access: | <p>Key lock</p> <p>User ID and password</p> |

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| Output: | <p>Vessel ID</p> <p>Selected trip information:</p> <ul style="list-style-type: none"> - Dump site - Dump site position - Trip date (YYYY-MM-DD) - Trip time (From HH:MM:SS to HH:MM:SS) - Number of records <p>Selected data records (copy of virgin data)</p> <p>Selected images</p> |
| Image Capturing | |
| Capturing: | <p>Auto capture during dumping</p> <p>By request (local or remote)</p> |
| Configuration: | <p>Select preset position (local or remote, for PTZ camera only)</p> <p>Adjust pan-tilt-zoom (local or remote, for PTZ camera only)</p> <p>Change resolutions (local or remote)</p> <p>Cover at least 90% of the loading compartment</p> |
| Filename: | <p>Syntax: IMGnnnnnn_c_YYYYMMDDhhmmss.jpg</p> <p>nnnnnn = Vessel ID</p> <p>c = camera Id</p> <p>YYYYMMDD = capture date</p> <p>hhmmss = capture time</p> |
| Embedded data in image file: | <ul style="list-style-type: none"> - Vessel ID - Capture date YYYYMMDD - Capture time hhmmss - D3 := SHA-256 digest |
| Integrity checksum: | <p>SHA-256 digest appended to image data</p> <p>Inputs to SHA-256 calculation:</p> <ul style="list-style-type: none"> - I := Image data - V := Vessel ID - CD := Capture date YYYYMMDD - CT := Capture time hhmmss - S1 := Digital signature of EPD - S2 := Digital signature of barge operator <p>Algorithm:</p> <p>Digest D1 := <i>SHA256</i>(I + V + CD + CT + S1)</p> <p>Digest D2 := <i>SHA256</i>(D1 + S2)</p> <p>Digest D3 := <i>SHA256</i>(D2 + I + V + CD + CT)</p> |
| Printing | |
| Peripheral: | Serial impact dot matrix printer |

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| Interface: | Standard RS232, DB9 male |
| Access: | Key lock User ID and password |
| Output: | <ul style="list-style-type: none"> - Vessel ID - Dump site - Dump site position - Trip date (YYYY-MM-DD) - Trip time (From HH:MM:SS to HH:MM:SS) - Number of records - Snapshots taken at records (XX, YY, ZZ ..., or nil) - In each record: <ul style="list-style-type: none"> ◆ Trip time (HHMMSS) ◆ Latitude and Longitude (dd.mmmm, ddd.mmmm) ◆ Number of satellite signals received ◆ Draught level ◆ Bottom status (open, close and idle) ◆ 8-bit checksum for each record <p>SHA-1 data integrity signature (presented in corresponding 40 ASCII characters of their hex values) for all printed records</p> |
| Physical | |
| Enclosure: | IP 65 or NEMA 4X weather proof |
| Protection: | Key locks |
| Environmental: | Operating temperature: 0 – 60°C (internal) Operating humidity: 20% – 80% relative humidity, non-condensing (internal) |
| Power | |
| Input voltage: | 110/220 VAC 9 to 40 VDC |
| Backup power: | Battery charger Rechargeable battery, sustainable for 72 hours continuous operation |

| Draught Sensor | |
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| Features | |
| Type: | Level pressure sensor |
| Measure range: | 0.25 to 5.00 meters |
| Resolution: | ±0.06% |
| Accuracy: | ±0.1% Full Scale Baltic Sea Level (BSL) maximum |
| Interface (output): | 2 wires 4 to 20 mA proportional for zero to FS pressure Output impedance: 2K ohms nominal |
| Temperature compensation: | Built-in |
| Physical | |
| Enclosure: | IP 65 or NEMA 4X, immersed in seawater |
| Environmental: | Operating temperature: -20 to 60°C |
| Power | |
| Input voltage: | 12 to 28 VDC |
| Protection: | Surge arrestor |

| GPS Receiver | |
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| Receiver: | 12 channels |
| Acquisition times: | 20 seconds warm (all data known) 60 seconds cold (initial position, time and almanac known) 10 minutes search the sky (no data known) |
| Update rate: | 1 second, continuous |
| Accuracy: | 20 meters RMS |
| Interfaces: | RS-232 compatible with baud rate 4800bps NMEA 0183 version 2.0 ASCII output (GPGGA, GPGSV, GPRMC) |
| Physical | |
| Antenna: | Active antenna with outdoor weather proof |
| Environmental: | Operating temperature: -20°C to +80°C (internal) |
| Power | |
| Input voltage: | 9 to 30 VDC, unregulated |
| Backup power: | Internal rechargeable battery |

| Digital Camera (minimum requirement) | |
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| Image/video compression: | JPEG or MJPEG or MPEG1/2/4 or H.264 |
| Image/video resolutions: | 640x480 |
| Pan, tilt and zoom (optional): | ±45° Pan, >30° Tilt and >4x optical zoom |
| Preset positions (for PTZ camera only): | 3 |
| Sensor type: | CCD 300,000 pixels |
| Focus (for zoom camera only): | Auto |
| Exposure: | Auto |
| Illumination: | 1 lux |
| Interfaces: | 10 Base-T or 100 Base-TX |
| Field of view: | Cover 90% of compartment |
| Physical | |
| Enclosure: | IP 65 or NEMA 4X, outdoor weather proof |
| Environmental: | Operating temperature: 0 to 40°C (internal) Operating humidity: 20% to 80% relative humidity, non-condensing (internal) |
| Power | |
| Input voltage: | 110/220 VAC 9 to 30 VDC, unregulated |

PART VI – Communication Protocol

FEMU – to – Server

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| <p>Front-End Mobile Unit Minimum Sensor Reading (MSR)</p> <p>\$FEMUMSR,<1>,<2>,...,<n>*hh<CR><LF> <1> = Number of virgin data records, 0 – 9 <2>...<n> = Virgin data records</p> |
| <p>Front-End Mobile Unit System Status Information (SSI)</p> <p>\$FEMUSSI,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Battery level, 00.00 – 99.99 <3> = AC/DC power source, A = available, U = unavailable</p> |
| <p>Front-End Mobile Unit Captured Image Data (CID)</p> <p>\$FEMUCID,<1>,<2>,<3>,<4>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Filename <3> = Size in bytes of image data, 00001 – 99999 <4> = Image data, binary data string</p> |
| <p>Front-End Mobile Unit Response to Command (R2C)</p> <p>\$FEMUR2C,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Response to message type, RAR; RCI; SCP; CRI; CCI; SDS; CGS; RGS; RVD; RIS; RDS; VER; PRT; RMP; SDX <3> = Response, ACK = Acknowledged, NAK = Not acknowledged</p> |
| <p>Front-End Mobile Unit User Specific Response (USR)</p> <p>\$FEMUUSR,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Response message length, 0000 – 9999 <3> = Response message content, text/binary data string</p> |

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| <p>Extended Control Command Return Gateway Settings (RGS)</p> <p>\$XCCRGS,<1>,[<2> <3> <4>],[<2> <3> <4>],....*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999 <2> = Setting ID, 0 – 99 <3> = IP address or host name <4> = Port</p> |
| <p>Extended Control Command Return Record Intervals (RRI)</p> <p>\$XCCRRI, <1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12>,<13>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999 <2> = Recording interval for idle and far away from disposal site, 000 – 999 seconds <3> = Recording interval for idle and near disposal site, 000 – 999 seconds <4> = Recording interval for sailing and far away from disposal sites, 000 – 999 seconds <5> = Recording interval for sailing and near disposal sites, 000 – 999 seconds <6> = Recording interval for inside disposal sites, 000 – 999 seconds <7> = Recording interval for dumping, 000 – 999 seconds <8> = Reporting interval for idle and far away from disposal site, 000 – 999 seconds <9> = Reporting interval for idle and near disposal site, 000 – 999 seconds <10> = Reporting interval for sailing and far away from disposal sites, 000 – 999 seconds <11> = Reporting interval for sailing and near disposal sites, 000 – 999 seconds <12> = Reporting interval for inside disposal sites, 000 – 999 seconds <13> = Reporting interval for dumping, 000 – 999 seconds</p> <p>* ‘Idle’ is defined as vessel’s speed less than 1 knot * ‘Near’ is defined as vessel’s position is within the “Alert Distance” from the corresponding dumping zone boundary, noting that different Alert Distance may be set for different dumping zone and different type of sediment to be disposed of * Reported data should also be saved in the FEMU</p> |
| <p>Extended Control Command Return Version Information (VER)</p> <p>\$XCCVER, <1>,<2>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999 <2> = Version string</p> |
| <p>Extended Control Command Return Disposal Sites (RDS)</p> <p>\$XCCRDS,<1>,<2>,<3>,<4>,<5>,<6>,...,<7>,<8>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999 <2> = Zone name, character string 0 – 20 characters <3> = Zone ID, 0 – 10 <4> = Number of vertices, 3 – 20 <5> = Latitude of vertex 1, ddmm.mmmm format (with leading zeros) <6> = Longitude of vertex 1, dddmm.mmmm format (with leading zeros) Repeat <5>,<6> for all vertices <7> = Alert distance, 0000 – 9999 meters <8> = Active (A) or Not in use (N)</p> |

Extended Control Command Return Digital Signature (RDX)

\$XCCRDX,<1>,<2>,<3>*hh<CR><LF>

<1> = Vessel ID, 0000001 - 999999

<2> = Encrypted EPD digital signature


<3> = Encrypted Barge digital signature

Server – to – FEMU

| EPD Control Center Request Ad-Hoc Readings (RAR) |
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| <p>\$ECCRAR,<1>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999</p> |
| EPD Control Center Request Capture Image (RCI) |
| <p>\$ECCRCI,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Image resolutions, 0 = 160 x 120, 1 = 320 x 240, 2 = 640 x 480, 3 = 176 x 144, 4 = 352 x 288, 5 = 704 x 576, or Width ‘x’ Height (in pixels) in text, e.g. ‘1024 x 768’ <3> = Image quality, 0 = Lowest quality, 1 = Standard quality, 2 = High quality, 3 = Default quality.</p> |
| EPD Control Center Set Camera Position (SCP) |
| <p>\$ECCSCP,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Preset position, 1 – 9, M = move or zoom <3> = Move direction, L = Move left, R = Move right, U = Move up, D = Move down, Z = Zoom in, P = Pan out.</p> |

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| <p>EPD Control Center Change Reporting Interval (CRI)</p> <p>\$ECCCRI,<1>,<2>,<3>,<4>,<5>,<6>,<7>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999</p> <p><2> = Reporting interval for idle and far away from disposal site, 000 – 999 seconds</p> <p><3> = Reporting interval for idle and near disposal site, 000 – 999 seconds</p> <p><4> = Reporting interval for sailing and far away from disposal sites, 000 – 999 seconds</p> <p><5> = Reporting interval for sailing and near disposal sites, 000 – 999 seconds</p> <p><6> = Reporting interval for inside disposal sites, 000 – 999 seconds</p> <p><7> = Reporting interval for dumping, 000 – 999 seconds</p> |
| <p>EPD Control Center Change Recording Interval (CCI)</p> <p>\$ECCCCI,<1>,<2>,<3>,<4>,<5>,<6>,<7>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999</p> <p><2> = Recording interval for idle and far away from disposal site, 000 – 999 seconds</p> <p><3> = Recording interval for idle and near disposal site, 000 – 999 seconds</p> <p><4> = Recording interval for sailing and far away from disposal sites, 000 – 999 seconds</p> <p><5> = Recording interval for sailing and near disposal sites, 000 – 999 seconds</p> <p><6> = Recording interval for inside disposal sites, 000 – 999 seconds</p> <p><7> = Recording interval for dumping, 000 – 999 seconds</p> |
| <p>EPD Control Center Set Disposal Sites (SDS)</p> <p>\$ECCSDS,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999</p> <p><2> = Zone name, character string 0 – 20 characters</p> <p><3> = Zone ID, 0 – 10</p> <p><4> = Number of vertices, 3 – 20</p> <p><5> = Latitude of vertex 1, ddmm.mmmm format (with leading zeros)</p> <p><6> = Longitude of vertex 1, dddmm.mmmm format (with leading zeros)</p> <p>Repeat <5>,<6> for all vertices</p> <p><7> = Alert distance, 0000 – 9999 meters</p> <p><8> = Active (A) or Not in use (N)</p> |
| <p>Extended Control Command Change Gateway Settings (CGS)</p> <p>\$XCCCGS,<1>,<2>,<3>,<4>,<2>,<3>,<4>,...*hh<CR><LF></p> <p><1> = Vessel ID, 000001 – 999999</p> <p><2> = Setting ID, 0 – 99</p> <p><3> = IP address or host name</p> <p><4> = Port</p> |

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| Extended Control Command Request Gateway Settings (RGS) |
| \$XCCRGS,<1>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 |
| Extended Control Command Request Missing Data (RVD) |
| \$XCCRVD,<1>,<2>,<3>,<4>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Request date in UTC, DDMMYY <3> = Request start time in UTC, hhmmss <4> = Request end time in UTC, hhmmss |
| Extended Control Command Request Interval Settings (RIS) |
| \$XCCRIS,<1>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 |
| Extended Control Command Request Disposal Sites (RDS) |
| \$XCCRDS,<1>,<2>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Zone ID, 0 – 10 |
| Extended Control Command Request Version Information (VER) |
| \$XCCVER,<1>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 |
| Extended Control Command Request Photo Taken (RPT) |
| \$XCCRPT,<1>,<2> <1> = Vessel ID, 000001 – 999999 <2> = Photo filename (.jpg), supports wildcard |
| Extended Control Command Request Missing Photo (RMP) |
| \$XCCRMP,<1>,<2>,<3>,<4>*hh<CR><LF> <1> = Vessel ID, 000001 – 999999 <2> = Request date in UTC, DDMMYY <3> = Request start time in UTC, hhmmss <4> = Request end time in UTC, hhmmss |
| Extended Control Command Set Digital Signature (SDX) |
| \$XCCSDX,<1>,<2>,<3>*hh<CR><LF> <1> = Vessel ID, 000001 - 999999 <2> = Encrypted EPD digital signature; empty string means 'no change' <3> = Encrypted Barge digital signature; empty string means 'no change' |
| Extended Control Command Request Digital Signature (RDX) |
| \$XCCRDY,<1>*hh<CR><LF> <1> = Vessel ID, 000001 - 999999 |

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| Photos captured on FEMU are transmitted to server via FTP. | |
| Format and content: | JPEG with embedded vessel information and digest |
| Filename syntax: |  nnnnnn = Vessel ID c = camera Id YYYYMMDD = capture date hhmmss = capture time |

Notes:

1. The IP address, host name, port number, vessel ID, alert distance, FTP account name and password will be provided by EPD on a case-by-case base.