

EMR³

OBC Serial Commands Protocol

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Introduction

General

The mobile On Board Computer (OBC) for Fuel Delivery Systems communicates with and operates the EMR3 System. The scope of OBC to EMR3 interface is limited to all activities required for a regular fuel delivery (no initial meter setup or meter calibration).

The physical connection between the OBC and EMR3 uses the asynchronous serial communication protocol RS-232 (with no h/w flow control; 9600 baud, none parity, 8 bit data, 1 bit stop).

Packet Definition

All information between the OBC and the EMR3 is formatted into packets containing the following fields:

[DelimiterFlag] [DestinationAddress] [SourceAddress] [Body of Message] [CS] [DelimiterFlag]

Table 1 describes the OBC data packets.

Table 1. OBC Packet Formats

Field	Description
[DelimiterFlag]	1 Byte defined as 0x7E
[DestinationAddress] [SourceAddress]	1 Byte representing a destination / source address: 0x01 - 0x20 - Single Meter address; 0x41 - 0x60 - Printer Device address; 0x81 - 0x90 - Interface Box address; x00 - broadcast address (both meters attached to an IB); 0xFF - OBC address
[Body of Message]	1- n Bytes formatted according to interface protocol
[CS]	1 Byte check sum* defined as: 0x00 - { [DestinationAddress] + [SourceAddress] + [Body of Message]}

*Checksum calculated according to CCITT CRC-16.

NOTE:

To eliminate forbidden characters (0x7E, 0x7D) inside the packet (defined as data between delimiter flags), the following "escape" needs to be performed:

1. XOR operation between CONTROL_CHAR (0x20) and a forbidden char.
2. Inserting an ESCAPE_CHAR (0x7D) in front of the result of step (1).

Whenever the packet contains the ESCAPE_CHAR (0x7D) the reverse operation should be performed:

1. Remove ESCAPE_CHAR from the packet.
2. XOR the following character with the CONTROL_CHAR (0x20).

Interface Definition

General Rules

The communication between OBC and third party meter will be guided by following rules:

1. All information (i.e. command type, exchanged data) is located in <Body of the Message> portion of interface packet;
2. The <Body of the Message> always starts with Command Code (1 BYTE) sometimes followed by Field Code (1 BYTE) and proper parameters;
3. There is only a single command (represented by Command Code) inside of each interface packet;
4. Check sum ([CS] in Table 1) is calculated before the "escape" operation and validated on a destination side after the "escape" operation is performed;
5. All message exchanges are solicited by the OBC - the EMR3 does not send any message without a request from the OBC;
6. Incorrectly formatted packets (missing delimiter flags, incorrect CS) will be discarded;
7. The OBC will apply 1 second timeout before retrying a message;

Message Description

Table 4 identifies and defines the interface messages between the OBC and EMR3 required for fuel delivery processing.

NOTES TO TABLES

Entries in the Binary Code column of tables 6, 7, 8, 9, 10, 13, and 14 are in the form of a numeric (1 Byte) value.

Definitions:

CHAR - Signed byte (1 byte)

UCHAR - Unsigned byte (1 byte)

SHORT - Signed Short Integer (2 bytes)

USHORT - Unsigned Short Integer (2 bytes)

LONG - Signed Long Integer (4 bytes)

ULONG - Unsigned Long Integer (4 bytes)

FLOAT - signed 4-byte IEEE floating-point number that always contains a positive number

SFLOAT - signed 4-byte IEEE floating-point number

DOUBLE - signed 8-byte IEEE floating-point number

Data transmission structure is type little-endian in which the last significant byte is transmitted first.

IEEE Floating Point Format

The 32-bit float is arranged as follows:

Table 2. IEEE 32-Bit Float

Byte	1		2		3		4	
	S EEE	EEEE	E MMM	MMMM	MMMM	MMMM	MMMM	MMMM
Nibble	1	2	3	4	5	6	7	8

- S is the sign bit (0 if positive, 1 if negative).
- EEE EEEE E represents the 2's exponent. It is a 2's complement value biased by 127 (7F Hex). The exponent can be determined by subtracting 127 from the value of the E field and raising 2 to the resulting power.
- MMM MMMM MMMM MMMM MMMM MMMM represents the 23-bit mantissa. Since the mantissa describes a value which is greater than or equal to 1.0 and less than 2.0, the 24th bit is always assumed to be equal to 1 and is not transmitted or stored. The value of the mantissa can be determined by dividing the value of the M field by 8,388,608 (2^{23}) and adding 1.0.

The complete value of the floating point number can then be determined by multiplying the exponent by the mantissa and attaching the appropriate positive or negative sign.

By convention, 00 00 00 00 represents the value 0.0 even though it actually converts to 5.8775×10^{-39} .

The eight "nibbles" are transmitted in sequence from 1 through 8 as shown in Table 2.

IEEE Floating Point Format Examples

1. 3F800000 hex = 0011 1111 1000 0000 0000 0000 0000 0000 bin

$$S = 0 = +(\text{positive})$$

$$E = 011\ 1111\ 1\ \text{bin} = 7F\ \text{hex} = 127\ \text{dec}$$

$$M = 000\ 0000\ 0000\ 0000\ 0000\ 0000\ \text{bin} = 0\ \text{hex} = 0\ \text{dec}$$

$$\text{Exponent} = 2^{(127-127)} = 1.0$$

$$\text{Mantissa} = 1.0 + (0/8,388,608) = 1.0$$

$$\text{Decimal Value} = +1.0 \times 1.0 = 1.0$$

2. B8D1B717 hex = 1011 1000 1101 0001 1011 0111 0001 0111 bin

$$S = 1 = -(\text{negative})$$

$$E = 011\ 1000\ 1\ \text{bin} = 71\ \text{hex} = 113\ \text{dec}$$

$$M = 101\ 0001\ 1011\ 0111\ 0001\ 0111\ \text{bin} = 51\ B7\ 17\ \text{hex} = 5,355,287\ \text{dec}$$

$$\text{Exponent} = 2^{(113-127)} = 0.0000610352$$

$$\text{Mantissa} = 1.0 + (5,355,287/8,388,608) = 1.63840$$

$$\text{Decimal Value} = -0.0000610352 \times 1.63840 = -0.0001$$

3. C2C7FAE1 hex = 1100 0010 1100 0111 1111 1010 1110 0001 bin

S = 1 = -(negative)

E = 100 0010 1 bin = 85 hex = 133 dec

M = 100 0111 1111 1010 1110 0001 bin = 47 FA E1 hex = 4,717,281 dec

Exponent = $2^{(133-127)} = 64$

Mantissa = $1.0 + (4,717,281/8,388,608) = 1.56234$

Decimal Value = $-64 \times 1.56234 = -99.99$

4. 461C4000 hex = 0100 0110 0001 1100 0100 0000 0000 0000 bin

S = 0 = +(positive)

E = 100 0110 0 bin = 8C hex = 140 dec

M = 001 1100 0100 0000 0000 0000 bin = 1C 40 00 hex = 1,851,392 dec

Exponent = $2^{(140-127)} = 8,192$

Mantissa = $1.0 + (1,851,392/8,388,608) = 1.22070$

Decimal Value = $+8,192 \times 1.22070 = 10,000$

Table 3. IEEE 64-Bit Float*

Byte	1		2		3		4		5		6		7		8	
	S	EEE	EEEE	EEEE	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
Nibble	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

*1st bit is sign bit (S), next 11 bits are exponent bits (E), and final 52 bits are the fraction (F).

Table 4. List of Command/Response Codes¹

COMMAND				RESPONSE		
From/To	Command Code (ASCII)	Description	Field Code (R = read only)	From/To	Response Code (ASCII)	Field Code (R = read only)
OBC/Meter	D	Set register configuration	See Table 13	Meter/OBC	A	See Table 7
	O	Set delivery status	See Table 6			
	P	Print the following buffer in "print through" mode. Print status bit 1 must be true.	STRING [100] - null terminated			
	R	Reset meter request, bring it to default state (i.e., "on power up", with ACK code 2 if meter in a maintenance/C&C mode)	None			
	S	Set Meter Fields	See Table 5			

Table 4. List of Command/Response Codes¹

COMMAND				RESPONSE		
From/To	Command Code (ASCII)	Description	Field Code (R = read only)	From/To	Response Code (ASCII)	Field Code (R = read only)
OBC/Meter	E	Get Register Configuration	See Table 14	Meter/OBC	C	See Table 13
OBC/Meter	G	Get Meter Fields	See Table 5	Meter/OBC	F	See Table 5
OBC/Meter	H	Transaction Record Request w/o Custom Fields	See Table 9	Meter/OBC	I	See Table 10
OBC/Meter	J	Transaction Record Request with Custom Fields	See Table 9	Meter/OBC	K	See Table 10
OBC/Meter	T	Get Meter Status	See Table 8 (R)	Meter/OBC	M	See Table 8
OBC/Meter	V	Request version numbers of device addressed. Field Code = 0	None (R)	Meter/OBC	U	CHAR Main Number[15] BootNumber[2] (R)
OBC/Printer	p	Print device control	See Table 17	Printer/OBC	p	See Table 18

¹ASCII codes W, X, Y, and Z are reserved.

Table 5. GET and SET Field Codes

ASCII Code	Description	Parameters (R = read only)
a	Net total quantity of current shift (for current product, counted from last reset)	DOUBLE - volume (R)
b	Gross total quantity of current shift (for current product, counted from last reset)	DOUBLE - volume (R)
c	Preset volume (compensated) for current product	FLOAT - volume
d	Current date	BYTE - century [20-99] BYTE - year [1-99] BYTE - month [1-12] BYTE - day [1-31]
e	Meter net totalizer reading for current product	DOUBLE - volume (R)
f	Meter gross totalizer reading for current product	DOUBLE - volume (R)
g	Gross volume (quantity) of current delivery	DOUBLE - volume (R)
h	Number of decimal digits for all volume values	BYTE - [0,1,2] (R)
i	Current time	BYTE - hour [00-23] BYTE - minutes [00-59] BYTE - seconds [00-59]
j	Gross totalizer	DOUBLE - volume (R)
k	Get register string. First byte is the MODE of the register [0 = volume, 1 = currency, 2 = rate, 3 = setup], the remaining portion of the string is value of the register	Null terminated string of current value in the register, In volume mode it is the volume, in currency mode it is the current sale, in rate mode it is the rate of fuel flow.
l	Get totalizer string	Null terminated string of current value in the totalizer register (R)
m	Timeout for no flow delivery - it will terminate delivery when paused	USHORT - time in seconds. 5 sec < timeout < 20 min
n	Preset volume (gross) for current product	FLOAT - volume
o	Get preset countdown string	Null terminated string of the value displayed in the preset display.
p	Current (active) product	1 byte - product index [0,1,2]
q	Print pause. When On, the meter will not attempt to print at the printer. New transactions can not be started until print pause is set Off and queued transaction is printed	1 Byte [0=Off, 1=On]
r	Meter serial number	STRING[20] - Null terminated (R)
s	Current sale number	ULONG - incremental number (R)
t	Current product temperature	SFLOAT - temperature (R)

Table 5. GET and SET Field Codes

ASCII Code	Description	Parameters (R = read only)
u	Enters key stroke into EMR3 head. Write only.	1 byte, key to enter 0 = Start, 1=Finish, 2=Mode, 3=Preset, 4=Next, 5=Plus, 6=Minus, 7=Clr, 8=Enter, 9=key-pad 0, 10=K1, 11=K2, 12=K3, 13=K4, 14=K5, 15=K6, 16=K7, 17=K8, 18=K9
v	Compensated volume (quantity) of current delivery	DOUBLE - volume (R)
w	Current tank ID	ASCII string, UCHAR TankID[N] where N <= 10.
K	Real-time volume displayed during delivery. Unformatted, no rounding applied	DOUBLE - volume (R)
L	Real-time totalizer displayed. Unformatted, no rounding applied.	DOUBLE - volume (R)
O	Preset countdown value displayed. Only valid when preset is active. Unformatted, no rounding applied	SFLOAT - preset (R)
R	Delivery rate as seen on the display. Only valid during delivery. Unformatted, no rounding applied	DOUBLE - volume (R)

Table 6. SET Meter Delivery Status Codes

Binary Code	Description	Parameters
1	Start, resume a delivery, use optional byte to select product code when starting a delivery - no effect when resuming a delivery	1 byte (optional) 0, 1, 2, product index
2	Pause a delivery	None
3	End a delivery	
4	Force a mandatory ticket printing for current delivery	
5	Start multiple delivery, use optional byte to select product code when starting a delivery - no effect when resuming a delivery	1 byte (optional) 0, 1, 2, product index
6	Authorize delivery state	1 byte 0 = delivery not authorized 1 = delivery authorized

Table 7. ACK Field Codes

Binary Code	Description
0	No error - OBC message acknowledged
1	Error - requested code/action not understood
2	Error - requested action can not be performed

Table 8. Meter Status Field Codes

Binary Code	Description	Parameters
1	Meter status	<p>1 BYTE bit coded:</p> <ul style="list-style-type: none"> Bit 0 - delivery mode = No, product flowing=No Bit 1 - delivery mode = Yes, product flowing=Yes Bit 2 - delivery mode = Yes, product flowing=No Bit 3 - delivery mode = No, product flowing=Yes Bit 4 - the printer is busy Bit 5 - incorrect meter UI position. Set when meter cannot perform requested command due to state of user switch/button e.g., can't reset if C&C switch enabled) Bit 6 - meter error Bit 7 - Set if C&C mode enabled
2	Printer status	<p>1 BYTE bit coded:</p> <ul style="list-style-type: none"> Bit 0 - delivery ticket requested (insert invoice) Bit 1 - set after ticket printing is complete and waiting for slip/paper to be removed. This is the only time "pass through" printing is allowed. (For use with slip printer only!) Bit 2 - printer is busy Bit 3 - printer error
3	Delivery status	<p>2 BYTES bit coded:</p> <ul style="list-style-type: none"> Bit 0 - ATC error Bit 1 - pulser/encoder error Bit 2 - preset error Bit 3 - preset stop. Set when delivery stopped after reaching preset volume. Bit 4 - no flow stop (timeout) Bit 5 - pause delivery request Bit 6 - delivery end request Bit 7 - waiting for authorization Bit 8 - delivery ticket is pending Bit 9 - flow is active Bit 10 - delivery is active Bit 11 - net preset is active Bit 12 - gross preset is active Bit 13 - ATC is active Bit 14 - delivery completed Bit 15 - delivery error

Table 9. Transaction Request Field Codes

Binary Code	Description	Parameters (R = read only)
0	Total number of transaction records in device addressed	None (R)
1	Transaction with the matching index for device addressed	2 byte index number [0...199] (R)
2	Transaction with the matching ticket number in device addressed	4 byte ticket number (R)
3	Number of transaction records in device address that match parameter address. When polling the head, the head address parameter is ignored if it is included. It is required when polling the IB.	1 byte head address of meter [1...32] (R)
4	Transaction in device addressed that matches head & index parameters. When polling the head, the head address parameter is ignored if it is included. It is required when polling the IB.	2 byte index number [0...199] 1 byte head address of meter [1...32] (R)

Table 10. Transaction Response Field Codes

Binary Code	Description	Parameter
0	Number of transaction records in device	2 byte number of records stored
3	Transaction record	See Table 11 or Table 12, as req'd., for record description.

Table 11. Transaction Record Table w/o Custom Fields

Field Description	Size (Bytes)	Type
Ticket #	4	LONG
Transaction Type 0 = Single delivery Record 1 = Multiple Delivery Record 2 = Summary Record 3 = Calibration Record	2	CHAR
Index: 0 for single, 1-N for multiple, -1 for summary	1	CHAR
# of summary records	1	CHAR
# of records summarized	1	CHAR
Product ID 0-2 (MAX_PRODUCTS - 1)	1	UCHAR
Product Info	15	CHAR

Table 11. Transaction Record Table w/o Custom Fields

Field Description	Size (Bytes)	Type
Product Info Null Termination	1	CHAR
Start time date		
Minute 00-59	1	UCHAR
Hour 00-23	1	UCHAR
Day of month 01-31	1	UCHAR
Second 00-59	1	UCHAR
Month 01-12 (01=January)	1	UCHAR
Year 00-255 (2000-2255)	1	UCHAR
Finish time date - Same format as Start time date	6	
Tank Load	4	FLOAT
Subtotal	4	FLOAT
TotalizerStart	8	DOUBLE
TotalizerEnd	8	DOUBLE
GrossVolume. This is always the raw, uncompensated volume	8	DOUBLE
Volume. This is either gross or TC, depending on fuel	8	DOUBLE
Average temp	4	FLOAT
Unit price (if Transaction type is 3 = New calibration factor)	4	FLOAT
Six individual tax/discount fields, each 6 bytes (if Transaction type is 3 = unused)	36	
Tax discount type (percent, money/volume, surcharge) - 1 byte		CHAR
Assigned lines mask - 1 byte		CHAR
Tax/discount value - 4 bytes		FLOAT
Number non-zero flow - counts the number of 0.1 second periods with flow >0 for use in estimating average flow rate	2	USHORT
Bit field: #number of bits	2	USHORT
isVolumeOnly:1 (if Transaction is type 3 = 1) We have 16 bits available (2 bytes)		
Is TCProduct:1		
IsOdometerUsed:1		
IsPresetUsed:1		
IsStarted:1 (used to control multiple delivery)		
IsStopped:1 (used to control multiple delivery)		
IsFirstPrint:1 (used to denote duplicate ticket print)		
IsBackedUp:1 (used to denote that it was saved to IB NVRAM)		
IsEncoderError:1 (used to indicate encoder sequence error)		
IsOverspeed:1 (used to indicate encoder too fast)		
UnusedBits:6 (unused bits)		

Table 11. Transaction Record Table w/o Custom Fields

Field Description	Size (Bytes)	Type
Tank ID[10]	10	CHAR
Tank ID Null Termination	2	CHAR
Total cost	8	DOUBLE
CRC of entire transaction data record	2	USHORT
Total Bytes	146	

Table 12. Transaction Record Table w/Custom Fields

Field Description	Size (Bytes)	Type
Ticket #	4	LONG
Transaction Type 0 = Single delivery Record 1 = Multiple Delivery Record 2 = Summary Record 3 = Calibration Record	2	CHAR
Index: 0 for single, 1-N for multiple, -1 for summary	1	CHAR
# of summary records	1	CHAR
# of records summarized	1	CHAR
Product ID 0-2 (MAX_PRODUCTS - 1)	1	UCHAR
Product Info	15	CHAR
Product Info Null Termination	1	CHAR
Field Description	Size (Bytes)	Type
Start time date		
Minute 00-59	1	UCHAR
Hour 00-23	1	UCHAR
Day of month 01-31	1	UCHAR
Second 00-59	1	UCHAR
Month 01-12 (01=January)	1	UCHAR
Year 00-255 (2000-2255)	1	UCHAR
Finish time date - Same format as Start time date	6	

Table 12. Transaction Record Table w/Custom Fields

Field Description	Size (Bytes)	Type
Tank Load	4	FLOAT
Subtotal	4	FLOAT
TotalizerStart	8	DOUBLE
TotalizerEnd	8	DOUBLE
GrossVolume. This is always the raw, uncompensated volume	8	DOUBLE
Volume. This is either gross or TC, depending on fuel	8	DOUBLE
Average temp	4	FLOAT
Unit price (if Transaction type is 3 = New calibration factor)	4	FLOAT
Six individual tax/discount fields, each 6 bytes (if Transaction type is 3 = unused) Tax discount type (percent, money/volume, surcharge) - 1 byte Assigned lines mask - 1 byte Tax/discount value - 4 bytes	36	CHAR CHAR FLOAT
Number non-zero flow - counts the number of 0.1 second periods with flow >0 for use in estimating average flow rate	2	USHORT
Bit field: #number of bits isVolumeOnly:1 (if Transaction is type 3 = 1) We have 16 bits available (2 bytes) Is TCProduct:1 IsOdometerUsed:1 IsPresetUsed:1 IsStarted:1 (used to control multiple delivery) IsStopped:1 (used to control multiple delivery) IsFirstPrint:1 (used to denote duplicate ticket print) IsBackedUp:1 (used to denote that it was saved to IB NVRAM) IsEncoderError:1 (used to indicate encoder sequence error) IsOverspeed:1 (used to indicate encoder too fast) UnusedBits:6 (unused bits)	2	USHORT
Tank ID[10]	10	CHAR
Tank ID Null Termination	2	CHAR
Total Cost	8	DOUBLE
Custom Field 1: Customers use these Custom Fields (1 to 7) for different purposes, the names of these data fields should be customizable (Plus Null).	13+1	CHAR
Custom Field 2	13+1	CHAR
Custom Field 3	8+1	CHAR
Custom Field 4	6+1	CHAR
Custom Field 5	6+1	CHAR
Custom Field 6	6+1	CHAR

Table 12. Transaction Record Table w/Custom Fields

Field Description	Size (Bytes)	Type
Custom Field 7	6+1	CHAR
Null Termination	1	CHAR
CRC of entire transaction data record	2	USHORT
Total Bytes	214	

Table 13. Set Register Configuration Field Codes

Binary Code	Description	Parameters
0	Price configuration	1 byte CHAR Price code index (1-15) of price code of interest 1 byte CHAR Tax code index (1-15) assigned to this price code 4 bytes FLOAT raw price value
1	Tax code configuration	1 byte CHAR tax code index (1-15) of tax code of interest 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 1 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 2 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 3 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 4 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 5 1 byte CHAR tax type (See Table 15) 1 byte CHAR tax line mask (see Table 16) 4 bytes FLOAT amount of tax for line 6
2	Delivery report format	Null terminated string of report codes (see Table 19 for report code definition) UCHAR formatCode[N] where n<50. Note: meter will only accept new format if C&C mode is enabled.

Table 13. Set Register Configuration Field Codes

Binary Code	Description	Parameters
3	Shift Report format	Null terminated string of report codes (see Table 20 for report code definition) UCHAR formatCode[N] where N<50. Note: meter will only accept new format if C&C mode is enabled.
4		Reserved
5	Tank ID default	Null terminated ASCII string. UCHAR TankID[N] where N<=10. Note: meter will only accept new format if C&C mode is enabled.

Table 14. Get Register Configuration Field Codes

Binary Code	Description	Parameters
0	Price configuration	1 byte CHAR Price code index (1-15) of price code of interest
1	Tax code configuration	1 byte CHAR Tax code index (1-15) of tax code of interest
2	Delivery report format	Null terminated string of report codes (see Table 19). UCHAR format-Code[N] where N<50
3	Shift report format	Null terminated string of report codes (see Table 20). UCHAR format-Code[N] where N<50
4		Reserved
5	Tank ID default	Null terminated ASCII string. UCHAR TankID[N] where N<=10.

Table 15. Tax Discount Types

Type	Value
Tax discount unused	-1
Tax percent	0
Tax per unit volume	1
Tax surcharge	2
Discount percent	3
Discount per unit volume	4
Discount surcharge	5

Table 16 shows the meaning of each bit in the mask (left of the thick line). It also shows the set of bits each tax line can use (right of thick line). Tax line 2 can only be applied to Line 1 and Unit price (bit 0 and 1) resulting in a YES in the first two rows. Tax line 2 can not be applied to Tax lines 3 - 6 that follow. Note: none of the Tax lines can be applied to Tax line 6, which is why the mask does not include a bit for line 6. However, line 6 can be applied to the Unit price and all lines that precede it.

Table 16. Tax Mask Table

Mask Definition		Mask bit can be used by Tax Line					
Bit	Tax applied to	1	2	3	4	5	6
0	Unit price	Yes	Yes	Yes	Yes	Yes	Yes
1	Line 1	No	Yes	Yes	Yes	Yes	Yes
2	Line 2	No	No	Yes	Yes	Yes	Yes
3	Line 3	No	No	No	Yes	Yes	Yes
4	Line 4	No	No	No	No	Yes	Yes
5	Line 5	No	No	No	No	No	Yes

Table 17. Print Device Control Field Codes

Binary Code	Description	Parameters	Field Code
0	Printer Request - ready to print (see Figure 1).	None	Table 18: 0,1,2
1	Print Start, Beginning of data buffer	None	Table 7
2	Print Data, format and send a data buffer to printer. Repeat for additional data buffers (number constrained by printer's memory).	n data bytes $n \leq 150$ bytes	Table 7
3	Print End, print set of data buffers sent - no more data buffers to follow, release printer.	1 Byte. Number buffers sent.	Table 18: 03 No error, Table 18: 04 - 08 Error
4	Flush Buffer. Same as P_END, printer not released, new P_START, P_DATA sequence to follow. Print buffer limited to 4096 bytes. To exceed this limit flush the buffers sent with P_DATA and then continue. Print does not occur until this command or P_END is sent.	Number of packets sent since Print Start was sent.	Table 18: 04-08 Error
5	Removal of paper (slip printer) and cut of paper (roll printer) controlled by OBC, not automatic by printer driver. Sent after Print Request before Print Start. Power up default is Off. Only needs to be turned On once after power up. Allowable sequence to set remote operation: Print Request, Print Remote, Print End.	1 byte - 0=Off (normal operation) 1=On (remote operation)	Table 18: 09

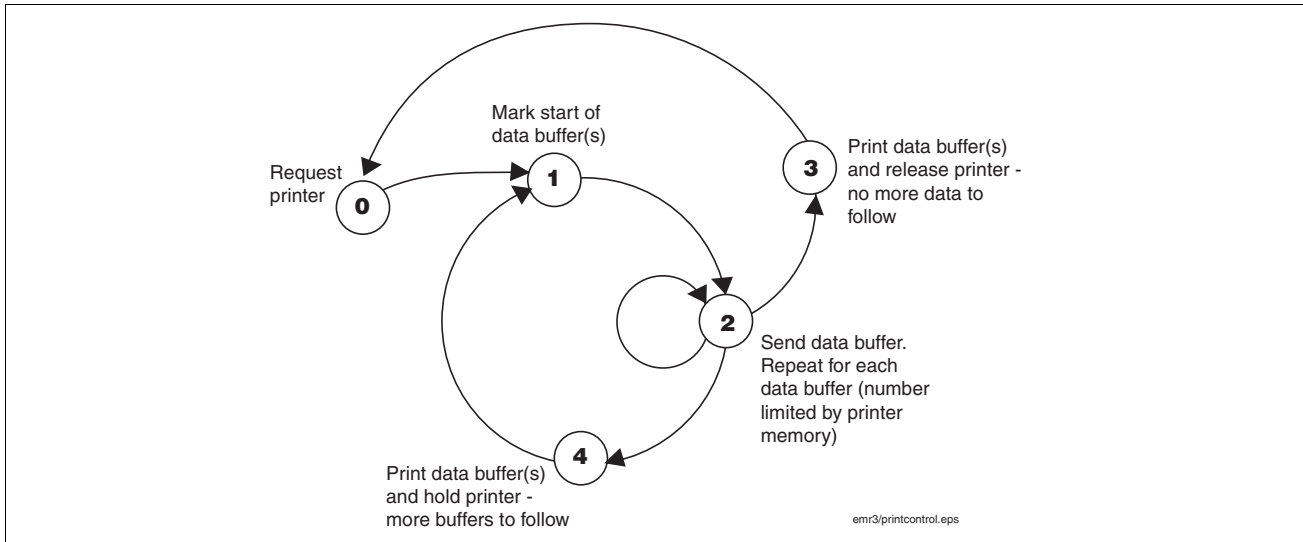


Figure 1. Print Device Control Flow Diagram

Table 18. Print Device Response Field Codes

Binary Code	Description	Parameters
00	Printer granted	None
01	Printer busy	None
02	Printer needs service	None
03	Print complete	None
04	Print data error	None
05	Print comm abort	None
06	Print error abort	None
07	Print remove slip	None
08	Printer paper out	None
09	Print remote end	None
0A	Print data flush complete	None

Table 19. Delivery Report Line Codes

Report Line Description	Binary Code
Printer advance (must be first code)	1
Full row of asterisks	2
Blank line	3
Blank line with an asterisk at each end	4
1st line of header	5
2nd line of header	6
3rd line of header	7
4th line of header	8
1st line of header with an asterisk at each end	9
2nd line of header with an asterisk at each end	10
3rd line of header with an asterisk at each end	11
4th line of header with an asterisk at each end	12
1st line of trailer	13
2nd line of trailer	14
3rd line of trailer	15
4th line of trailer	16
Start time	17
End time	18
Start volume	19
Gross end volume	20
Net end volume	21
Delivery temperature (if TC)	22
Reference temperature (if TC)	23
Temperature coefficient (if TC)	24
Ticket number	25
Ticket status (e.g., multiple delivery, summary, ...)	26
Meter identification	27
Unused	28
Product name	29

Table 19. Delivery Report Line Codes

Report Line Description	Binary Code
Totalizer start volume	30
Totalizer end volume	31
Average flow rate	32
Gross price per unit volume	33
Total price without taxes/discounts	34
Taxes/discounts	35
net price per unit volume	36
total of all taxes	37
Total of all non-taxes (e.g., discounts, surcharges, ...)	38
Total price with all taxes	39
Total price with all non-taxes	40
Grand total	41
Reserved	42
Error message (when required)	43

Table 20. Shift Report Line Codes

Report Line Description	Binary Code
Printer advance (must be first line)	1
Full row of asterisks	
1st line of header with an asterisk at each end	3
2nd line of header with an asterisk at each end	4
3rd line of header with an asterisk at each end	5
4th line of header with an asterisk at each end	6
1st line of header	7
2nd line of header	8
3rd line of header	9
4th line of header	10
Blank line	11

Table 20. Shift Report Line Codes

Report Line Description	Binary Code
Starting date-time of shift	12
Ending date-time of shift	13
Odometer reading at start of shift	14
Odometer reading at end of shift	15
Distance (end odometer - start odometer)	16
Product name	17
Meter identification	18
Totalizer volume at start of shift	19
Loaded volume	20
Totalizer volume at end of shift	21
Total gross volume	22
Number of single deliveries	23
Number of multiple deliveries	24
Total number of deliveries (single + multiple)	25
Total net volume	26
Total unpriced volume	27
Total priced volume	28
Total sales without taxes/discounts	29
Total sales contribution from tax line 1	30
Total sales contribution from tax line 2	31
Total sales contribution from tax line 3	32
Total sales contribution from tax line 4	33
Total sales contribution from tax line 5	34
Total sales contribution from tax line 6	35
Grand total	36
1st line of trailer	37
2nd line of trailer	38
3rd line of trailer	39
4th line of trailer	40

Sample Commands

1. Set a product (index 0) as a current product for meter address 01:

7E 01 FF 53 70 00 3D 7E

where:

7E - delimiter flag

01 - destination address (meter 1);

FF - source address (OBC);

53 - 'S' - set the meter field command (from Table 4 on page 4)

70 - 'p' current (active product) (from Table 5 on page 6)

00 - product index

3D - check sum calculated as: (BYTE)(0 - (01+FF+53+70+00))

2. Read (Get) the meter (address 1) current product:

7E 01 FF 47 70 49 7E

3. Meter answers to the "Read current product" command:

7E FF 01 46 70 00 4A 7E



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other assistance, please visit:
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