TWO WIRE PROTOCOL FOR PUMP COMMUNICATION

GENERAL DESCRIPTION

The scope of this document is to describe commands transmitted to pump and the data between the host and the pump.

This multi-drop protocol supports up to 12 pumps.

FUNCTIONS:

1. Authorization of the pump, pump stop command.
2. Money/Volume preset with or without grade or price level.
3. Pric e level change to pumps (from level 1 to 2, from level 2 to level 1)
4. Price change to pumps.
5. Pump status polling and responses.
6. Pump transaction data to the host.
7. Pump totals to the host.
8. Real time money transaction to the host.

EXPLANATION:

Command code : is an 8 bit word sent by yhe host

Data control word : is an 8 bit word, as part of data block. The most signifaicant nibble of the data control word is always F.

LRC Check character : is a 4 bit word, as part of the data block, used to detect longitudinal bit errors.

Data length : is an 8 bit word, is part of data block indicating the how many words to be transmitted.

Pump ID : is 4 bit address set at the pump at installation to indicate the address of the pump.

Each word consists of 11 bits.

Start bit.

8 data bits.

Even parity.

Stop bit.

The baud rate is 5787 bits/second (5787 8E1)

PROTOCOL

There are five types of data, these are:

Status

A single word command

Send data to pump

Send data to host

Special function command.

COMMAND CODES:

0	STATUS REQUEST
1	AUTHORIZATION
2	DATA NEXT
3	PUMP STOP
4	TRANSACTION DATA REQUEST
5	PUMP TOTALS DATA REQUEST
6	REAL TIME MONEY DATA REQUEST
FC	ALL STOP

PUMP STATUS WORDS:

1	ERROR
6	OFF (IDLE)
7	CALL
8	AUTHORIZED/NOT DELIVERING
9	BUSY (DELIVERING FUEL)
A	TRANSACTION COMPLETE
B	TRANSACTION COMPLETE
C	PUMP STOP
D	SEND DATA (This status is returned only to the "data next command")

STATUS

The pump responds to status command if ID matches.

Host (Console) : Status command with ID

t1

Pump : Status with ID

t2

Next Transmission to any pump.

t1 : 0-68 msec

t2 : at least 5 msec

Number of retries is atleast 5 times in case of no response.

The console (host) must frequently check the status of the pump.

STATUS POLLING:

Pump address= 1

HOST : 01

PUMP : 61 (OFF)
71 (CALL)
91 (BUSY/DELIVERING)
B1 (END OF TRANSACTION)
01 (ERROR)

LRC CHECK CHARACTER:

LRC IS A 2'S COMPLEMENT OF THE SUMMATION OF THE LEAST SIGNIFICANT NIBBLES OF ALL WORDS IN A DATA BLOCK.

DATA LENGTH:

THE LOWER NIBBLE OF DATA LENGTH IS THE MODULO 16 OF THE 2'S COMPLEMENT OF NUMBER OF WORDS IN THE DATA BLOCK EXCLUDING START OF TEXT AND DATA LENGTH CHARACTER.

AUTHORIZATION:

Pump address=1

HOST : 11

PUMP : NO RESPONSE

State after pump accepts this command: BUSY or AUTH (81 OR 91)

PUMP STOP COMMAND:
Pump address=1
HOST : 31
PUMP : NO RESPONSE
Pump state after this command: OFF, CALL OR STOP.

ALL STOP COMMAND:
Pump address=1
Valid pump state: BUSY or AUTH
HOST : 31
PUMP : NO RESPONSE
Pump state after this command: OFF, CALL OR STOP.

REQUEST FOR TRANSACTION DATA:
Pump address=1
Valid pump state : OFF , CALL, FEOT, PEOT and STOP
HOST : 41

PUMP : FF START OF TEXT
F1
F8 PUMP IDENTIFIER NEXT

EA PUMP IDENTIFIER DATA
E0 E0 PUMP 1; E1 PUMP 2; E2 PUMP3….
E0 E0

F6 GRADE DATA NEXT
E0 X=0 GRADE 1
X=F GRADE 16
F4 TRANSACTION TYPE
E4 X=4 LEVEL 1
X=5 LEVEL 2

F7 PPU DATA NEXT
EX EX EX EX PPU XXXX FORMAT (BCD)
LSD TRANSMITTED FIRST
X=0-9

F9 TRANSACTION VOLUME DATA NEXT
EX EX EX EX EX EX MONEY XXX.XXX FORMAT (BCD)
LCD TRANSMITTED FIRST
X=0-9
FA TRANSACTION MONEY DATA NEXT
EX EX EX EX EX EX XXXXXX FORMAT (BCD)
LCD TRANSMITTED FIRST
X=0-9
FB LRC CHECK CHARACTER NEXT
EX LRC CHECK CHARACTER

F0 END OF TEXT
TOTAL BYTE NUMBER = 33 BYTES

REQUEST FOR PUMP TOTALS:
Pump address=1
Valid pump state : OFF , CALL, FEOT, PEOT and STOP
HOST : 51

FF START OF TEXT
F6 GRADE DATA NEXT
EX X=0 FOR GRADE 1
F9 PUMP VOLUME TOTAL DATA NEXT
EX EX EX EX EX EX EX EX VOLUME TOTAL
XXXXXXXX (BCD) LEAST SIGNIFICANT DIGIT TRANSMITTED FIRST.
X=0-9
FA MONEY TOTAL NEXT
EX EX EX EX EX EX EX EX MONEY TOTAL
XXXXXXXX (BCD) LEAST SIGNIFICANT DIGIT TRANSMITTED FIRST.
X=0-9

F4 PEVEL 1 PPU NEXT
EX EX EX EX LEVEL 1 PPU DATA
XXXX (BCD) LEAST SIGNIFICANT DIGIT TRANSMITTED FIRST.
X=0-9

F5 PEVEL 2 PPU NEXT
EX EX EX EX LEVEL 2 PPU DATA
XXXX (BCD) LEAST SIGNIFICANT DIGIT TRANSMITTED FIRST.
X=0-9
FB LRC CHECK CHARACTER NEXT
EX LRC CHECK CHARACTER
F0 END OF TEXT
TOTAL BYTE NUMBER = 34 BYTES FOR A PUMP SELLING 1 GRADE.

REQUEST FOR REAL TIME MONEY COMMAND:
Pump address=1
Valid pump state : BUSY
HOST : 61
PUMP :
EX EX EX EX EX EX :X=0-9
XXXXXX (BCD) LEAST SIGNIFICANT DIGIT TRANSMITTED FIRST.
THE PUMP DOES NOT CHANGE STATE AFTER THIS COMMAND.

EXTENDED STATUS COMMAND:
Pump address=1
HOST :

FF	:START OF TEXT
E9	:EX=E9 9 BYTES DATA
FE E0 E1 E0	
FB	:LRC NEXT
EX	:LRC CHARACTER
F0	:END OF TEXT

TOTAL OF 9 BYTES.

PUMP:
IDLE : BA B0 B3 B1 B0 B1 B0 B0 B0 B0 B0 B1 B0 B1 B1 C2 B1 8D 8A
CALL : BA B0 B3 B1 B0 B1 B0 B0 B0 B0 B0 B1 B1 B1 B1 C2 B1 8D 8A
Pump no off/call
:B0 PUMP1, B1 PUMP1,….. C1 PUMP10…

PRESET DATA:
VALID PUMP STATE: OFF, CALL
PUMP ADDRESS=1
HOST :21
PUMP :D1
HOST :

FF	:START OF TEXT
EX	:DATA LENGTH
	X=3 GRADE AND PRICE LEVEL
	X=5 PRICE LEVEL
FX	:PRESET TYPE
	X=1 VOLUME PRESET
	X=2 MONEY PRESET
FX	:PRICE LEVEL
	X=4 LEVEL 1
	X=5 LEVEL 2
F6	:GRADE DIGIT NEXT
EX	:X=0-F FOR GRADE 1-16
F8	:PRESET AMOUNT NEXT
EX EX EX EX EX	:XXXXX

X=0-9

OR

EX EX EX EX EX EX	:XXXXXX
FB	:LRC CHARACTER NEXT
EX	:LRC CHARACTER
F0	:END OF TEXT

PRICE CHANGE DATA:
VALID PUMP STATE: OFF, CALL
PUMP ADDRESS=1
HOST :21
PUMP :D1
HOST :

FF	:START OF TEXT
E5	:DATA LENGTH
FX	:PRICE LEVEL
	X=4 LEVEL 1, X=5 LEVEL 2
F6	:GRADE DIGIT NEXT
EX	:GRADE DIGIT
	E0 FOR PUMP1
	E1 FOR PUMP2……
F7	PPU NEXT
EX EX EX EX	:E0 E0 E0 E1 FOR 1.000 (LSD FIRST)
FB	:LRC CHARACTER NEXT
EX	:LRC CHARACTER
F0	:END OF TEXT

LEVEL CHANGE DATA:
VALID PUMP STATE : OFF, CALL
PUMP ADDRESS=1
HOST :21
PUMP :D1
HOST :

FF	:START OF TEXT
EC	:DATA LENGTH
FX	:PPU LEVEL
	X=4 FOR LEVEL 1, X=5 FOR LEVEL 2
FB	:LRC CHARACTER NEXT
EX	:LRC CHARACTER
F0	:END OF TEXT

DATA WORDS:

EX : X=0-F

DATA CONTROL WORDS

F0	:END OF TEXT
F1	:VOLUME PRESET
F2	:MONEY PRESET
F3	:FILL UP
F4	:LEVEL 1
F5	:LEVEL 2
F6	:GRADE DATA NEXT
F7	:PPU DATA NEXT
F8	:PUMP IDENTIFIER (FROM PUMP) PRESET AMONUT NEXT (FROM HOST-CONSOLE)
F9	:VOLUME TOTAL NEXT
FA	:MONEY TOTAL NEXT
FB	:LRC NEXT
FD	:UNUSED
FE	:SPECIAL FUNCTION MODE NEXT
FF	: START OF TEXT