REV -

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Wayne

9/28/94 424

ELECTRONIC DISPENSER CONTROLLER INTERFACE SPECIFICATION

for

CURRENT LOOP OR RS-422

TWOTP-HW-V50.0-M

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REVISIONS

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1. PURPOSE

The Purpose of this document is to provide an overview of the RS-422 and the current loop interface to the PA0261XXXXXXX Universal Distribution Box. And to give a detailed account of the electrical and timing specifications required for interfacing to GILBARCO Electronic Dispensers via the Universal Distribution Box by a third party controller.

2. SCOPE

The scope of this specification is intended to cover the current loop and RS-422 circuit description from a third party controller to the PA0261XXXXXXX Universal Distribution Box and no other components in the Gilbarco Electronic Dispenser System.

3. RELATED DOCUMENTS

TW0TP-IS-S1.0-S	GILBARCO Two-wire Protocol Definition for Third Party Pump Controller's
MDE - 2713	Universal Distribution Box Installation Manual
MDE - 2714	Universal Distribution Box Service Manual
EIA RS-422 - A	RS-422 Standard

4. TECHNICAL DESCRIPTION

4.1 OVERVIEW

This section details the interface requirements for external third party controllers to follow in providing either an active current source or an RS-422 interface to the PA0261 Universal Distribution Box for controlling Gilbarco electronic despencers. The PA0261 Universal Distribution Box can be ordered with either input interface. The PA0261 Universal Distribution Box can also be ordered with either one or two 8 channel boards. The single board unit will support up to 8 dispensers (single, dual or a mix). The two board unit with one input will support up to 16 dispensers (single, dual or a mix). The two board unit with two independent inputs, one for each board, can support 8 duals or 8 singles on each board. Refer to the Universal Distribution Box Installation MDE-2713 for further installation and usage instructions. A system block diagram is shown in Figure 1.

4.1.1 ELECTRICAL REQUIREMENTS

4.1.1.1 RS-422 INTERFACE

The RS-422 interface must meet all EIA RS-422-A STANDARDS.

The interconnection cable between the third party's controller and the Universal Distribution Box is to be supplied by the third party.

The input from the third party's controller to the Universal Distribution Box's RS-422 interface is via a nine (9) pin D-Sub connector with Male inserts mounted in a Female housing. The input pin out and signal definition is:

Pin 1 Signal Gnd (Do not connect to shield or D-Sub shell)
Pin 2 Positive data OUT
Pin 3 Positive data IN
Pin 6 Negative data OUT
Pin 7 Negative data IN
Shield (Earth ground not Logic ground)

To provide greater noise immunity, than that provided by the RS-422 interface itself, the use of shielded cable is required. The shield of the cable must be connected to the shell of the D-Sub connector. The mating shell of the D-Sub connector is connected to Earth Ground in the Universal Distribution Box. To prevent ground noise the Signal Ground must not be tied to Earth Ground.

4.1.1.2 TWO WIRE CURRENT LOOP INTERFACE

The current loop operates at a nominal 45ma +/- 5% , for a mark (loop idle or logic 1) and less than 2ma for a space (logic 0). The current regulator must be designed to within plus or minus 5 percent of the nominal marking current over the operating temperature range of 0 to 50 degrees centigrade.

The current loop supply voltage must be between 12 volts D.C. and 42 volts D.C. The supply voltage must be of sufficient magnitude to allow for cable voltage drops, and worst case input voltage drop of 3.0 volts D.C. at the distribution box. Thus, at 12 volts D.C. nominal:

Supply voltage	= 12 vdc	
Distribution box drop	= -3 vdc	
	9.0 vdc	Loop voltage margins to allow for cable drop, current loop supply variations, and current regulator drop.

A simple current regulator is shown in Figure 2 for reference only. This type of circuit does not provide controller isolation from the input of the Universal Distribution Box. If isolation is required or desired, the controller's signal interface will require opto-couplers and an isolated (floating) loop power supply. High speed opto-couplers, such as the 6N136 are recommended if controller isolation is desired. The Universal Distribution Box does opto-isolate the Dispensers from the Controller.

The interconnection cable between the third party's controller and the Universal Distribution Box is to be supplied by the third party.

The input from the third party's controller to the Universal Distribution Box's current interface is via a nine pin D-Sub connector with Female inserts mounted in a Male housing. The input pin out and signal definition is:

Pin 6	Loop supply to the distribution box from the controller, + voltage.
Pin 7	Loop return from the distribution box to the controller.
Shield	(Earth ground not Logic ground)

To provide greater noise immunity than that provided by the current loop itself, the use of shielded cable is required. The shield of the cable must be connected to the shell of the D-Sub connector. The mating shell of the D-Sub connector is connected to Earth Ground in the Universal Distribution Box.

4.1.2 REGULATORY REQUIREMENTS

The third party supplier of the controller is responsible for complying with all U.L., National Electric Code, and Local Fire Marshals requirements for their equipment and cables to the PA0261XXXXXXX Universal Distribution Box.

The third party supplier of the controller is responsible for complying with all FCC requirements. Gilbarco supplied equipment complies with part 15 of FCC rules, and is labeled as follows:

" This equipment has been tested with a Class A computing device and has been found to comply with part 15 of the FCC rules. See Instruction Manual. Operation in a residential area may cause unacceptable Interference to radio and TV reception, requiring the operator to take whatever steps are necessary to correct the Interference."

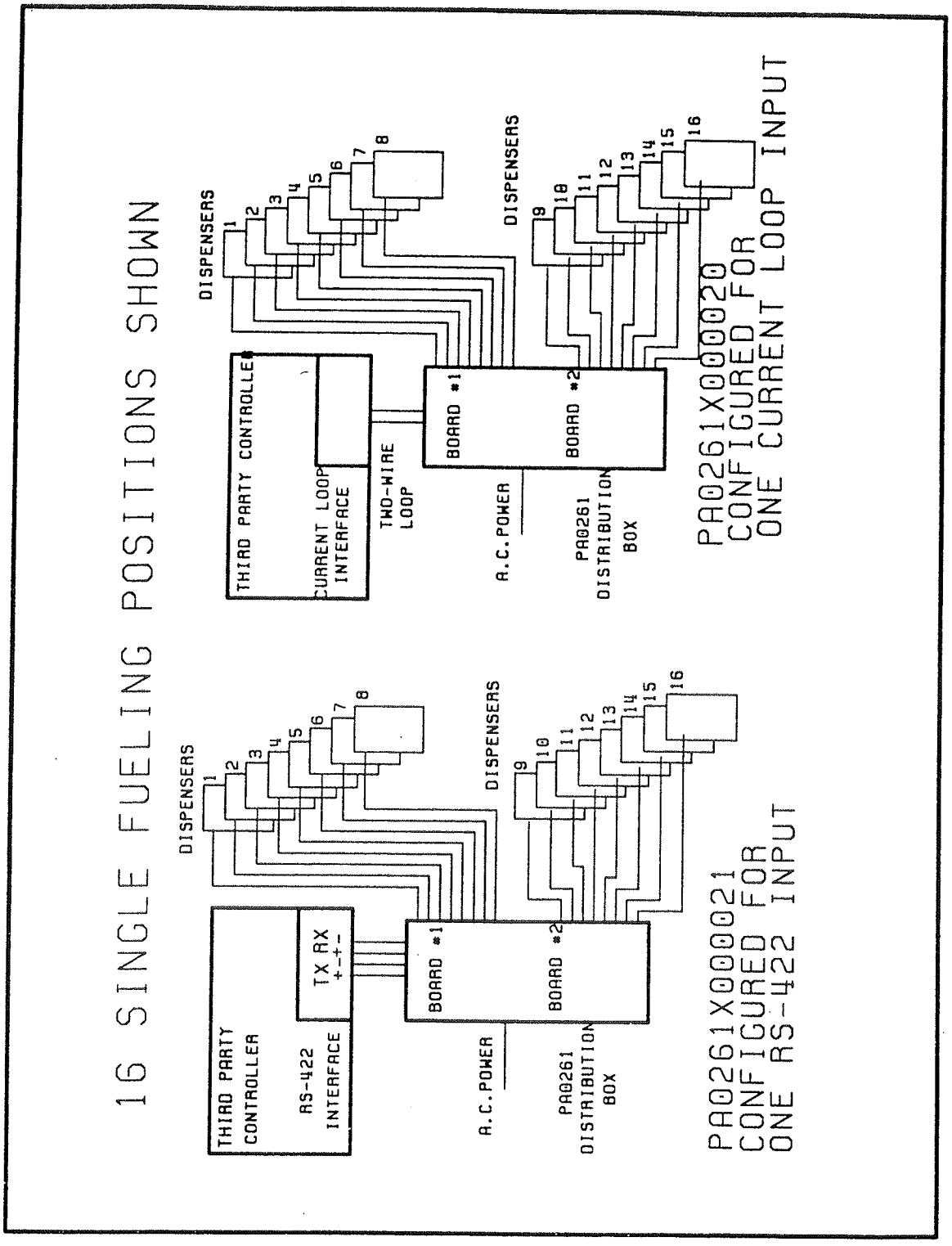

16 SINGLE FUELING POSITIONS SHOWN
DISPENSERS
1
2
3
4
5
6
7
8
THIRD PARTY CONTROLLER
CURRENT LOOP INTERFACE
TWO-WIRE LOOP
BOARD #1
BOARD #2
DISPENSERS
9
10
11
12
13
14
15
16
A.C. POWER
PA0261 DISTRIBUTION BOX
PA0261X000020
CONFIGURED FOR
ONE CURRENT LOOP INPUT
DISPENSERS
1
2
3
4
5
6
7
8
THIRD PARTY CONTROLLER
RS-422 INTERFACE
TX RX
+-+-
BOARD #1
BOARD #2
DISPENSERS
9
10
11
12
13
14
15
16
A.C. POWER
PA0261 DISTRIBUTION BOX
PA0261X000021
CONFIGURED FOR
ONE RS-422 INPUT

Figure 1

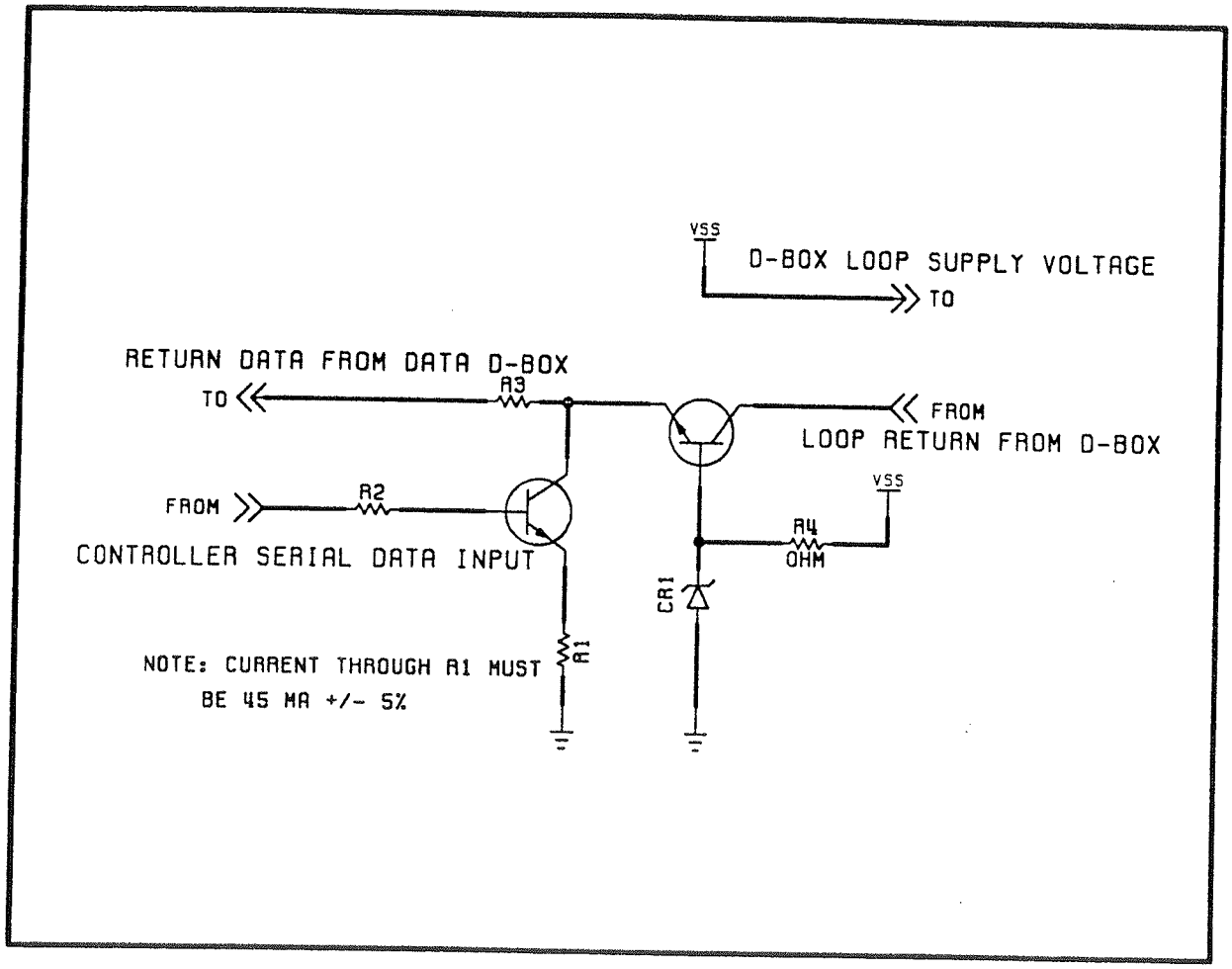

VSS
D-BOX LOOP SUPPLY VOLTAGE
TO
RETURN DATA FROM DATA D-BOX
TO
R3
FROM
LOOP RETURN FROM D-BOX
VSS
FROM
R2
CONTROLLER SERIAL DATA INPUT
R4
OHM
CR1
R1
NOTE: CURRENT THROUGH R1 MUST
BE 45 MA +/- 5%

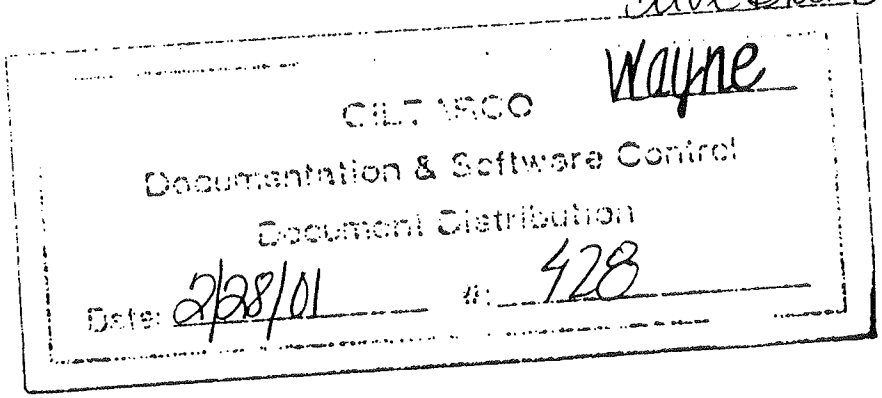
FIGURE 2

GILBARCO
TWO–WIRE PROTOCOL
DEFINITION FOR THIRD PARTY
PUMP CONTROLLERS

TWOTP-IS-S1.0-M

by
Two–Wire Review Committee

Dave Blanchard
Wayne



Issued: 05/92
Revised: 12/92

GILBARCO
TWO–WIRE PROTOCOL
DEFINITION FOR THIRD PARTY
PUMP CONTROLLERS

TWOTP-IS-S1.0-M:

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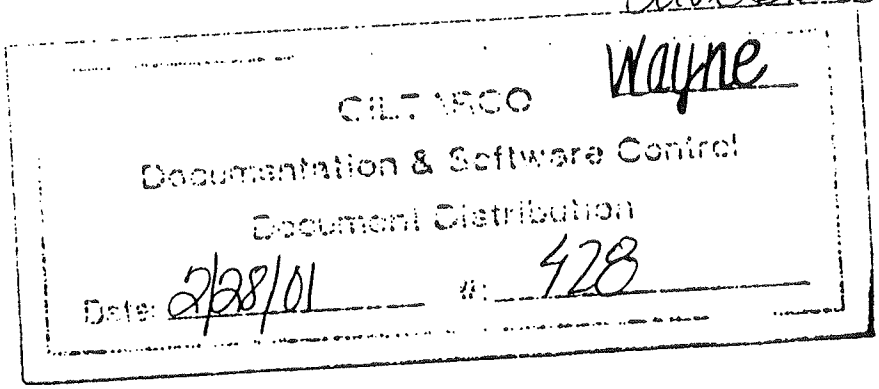

Issued: 05/92
Revised: 12/92

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REVISION HISTORY

Revised: 12-21-92

1. Table of Contents – Corrected section titles under 3.9.

2. Section 2.3.3 – Deleted the last double bullet under the 4th Error Recovery Rule.

3. Section 3.8 – Corrected the Valid Pump State information for Special Functions.
   Added Note 3.
   Corrected the Special Function Command Table.

4. Section 3.9.2.2 – Added Epsilon note concerning Software Version Number.

5. Section 3.9.2.3 – Added 4 new pump unit types.

6. Section 3.9.2.4 – Modified Extended Pump Status definition.

7. Section 3.9.2.6 – Added second set of Pure Product Totals.

8. Section 3.11.1 – Modified Note 1 for both Preset and Alternate Preset. Clarified volume preset prohibition for 6 digit form.

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TABLES

SECTION 1 – INTRODUCTION

1.1 GENERAL DESCRIPTION

The purpose of this report is to describe the *Gilbarco* two–wire communication protocol which was designed to transmit commands and data between electronic pumps and consoles. This report describes the protocol level, message level, timing, and the effects of two–wire commands on the pump.

The two–wire protocol is a *Gilbarco* proprietary protocol which uses an 11 bit data format. The protocol was designed to support up to 16 active fueling positions on one communications loop. A single word command format and multiple word data block are used in this protocol to obtain maximum communication throughput. Throughout the specification, console means any devices that can be connected to the pumps.

1.2 FUNCTIONAL SUMMARY

The protocol and message contents provide the following functions between the pumps and console.

1. Authorization, pump stop, and all stop to the pumps.
2. Money/Volume preset (with or without grade or price level) to the pumps.
3. Price level changes to pumps (from Level 1 to 2 or from Level 2 to 1).
4. Price change to pumps.
5. Pump status polling and responses.
6. Pump transaction data number to the console.
7. Pump totals to the console.
8. Real time money transmission to the console.
9. Special Functions.

1.3 DOCUMENT SCOPE

It is the intention of this document to define the Two-Wire Protocol, message, timing, and the effects of Two-Wire commands on the pump. The definition will only include the logical interface conventions and effects. The hardware conventions can be found in separate *Gilbarco* documents.

The presence of any feature or function in this document does not guarantee its presence in any pump. Each product's functional content is determined by its own functional specification. However, whenever a feature covered by this document is implemented by a pump or a console, it must be implemented in compliance with this document.

1.4 APPLICABLE REFERENCE DOCUMENTS

Two-Wire Hardware Specification – TWOTP-HW-S1.0-S

SECTION 2 – LINE LEVEL COMMUNICATION PROTOCOL

This section describes the line level of the two–wire protocol between the pumps and the console.

The line level protocol is basically a multi–drop protocol which supports up to 16 terminals (pumps). When the master (i.e., Console) sends the data or the terminal (pumps) responds, every unit in the loop will receive the same data. Only the addressed terminal (pump) should respond and the rest of the terminals should ignore the data. The master (i.e., Console) will be the only unit in the loop which is allowed to initiate communication.

2.1 NOTATION CONVENTIONS AND TERMINOLOGIES

This section defines some notations and terminologies that are used in this document.

a. Command Code

A command code is an 8 bit word which is sent by the console to command the pump to perform defined actions. (See Section 2.7).

b. Data Control Word (DCW)

DCW is an 8 bit word, as part of a data block, which is used to indicate what the next words are. The most significant nibble of a data control word is always F.

c. LRC Check Character

LRC is a 4 bit word, as part of a data block, which is used to detect longitudinal bit errors (See Section 2.5).

d. Data Length (DL)

DL is an 8 bit word, as part of a data block, which is used to indicate how many words are being transmitted. (See Section 2.4).

e. No Response Timer

No response timer is a time interval which is set up by the console to wait for pump responses before retransmitting the request or taking any actions.

f. Retry Counter

Retry counter indicates the number of tries a requesting device will attempt to obtain the appropriate response before it takes an appropriate action.

g. Pump ID

Pump ID is a four bit address which is set at the pump at installation time to indicate the address of the pump.

h. Data Word

Data Word is an 8 bit word, as part of a data block, which conveys the actual message. The most significant nibble of a Data Word is always 'E'.

i. Pump, dispenser, fueling positions are used in this specification interchangeably. It indicates a unique addressable communication position. For example, a dual MPD will have two fueling positions, but could have up to 8 hoses.

j. The following notation will be used throughout the report.

< > – Encloses symbols reference
{ } – Enclosed optional data
' ' – Encloses a four bit nibble
DL – Data Length
STX – Start of Text
ETX – End of Text
LRC – LRC – 4 check character (least significant nibble)
DCW – Data Control Word

2.2 WORD FORMAT

Each word on the two-wire system consists of 11 bits. They are:

- Start bit (space)
- 8 data bits (least significant bit transmitted first)
- Even parity
- Stop bit

The baud rate (or bit rate) is 5787 bits/second. The nominal word length is 1.9 msec. (11 bits).

2.3 LINE PROTOCOL, TIMING REQUIREMENTS, AND ERROR RECOVERY

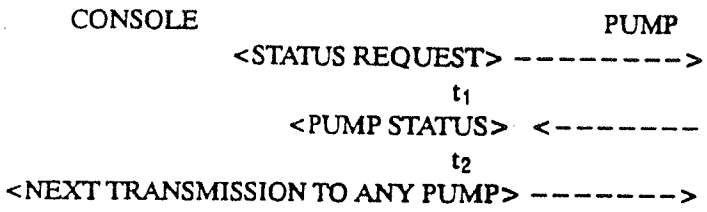
This section describes the five types of data and their timing requirements and error recovery. They are:

- status
- a single word command
- send data to pump
- send data to console
- special function command.

Note that all the timing requirements in this section indicate the time interval between the last bit of the previous word and the first bit of the next word.

2.3.1 STATUS

The pump will respond with one of the status words (see Section 2.8) upon receipt of a STATUS REQUEST Command Code with a matched pump ID, from the console. It will ignore the STATUS REQUEST Command Code if it does not have a matched pump ID. The protocol exchanges are as follows:



t_1 = 0 – 68 msec
t_2 = at least 5 msec

Error Recovery Rules:

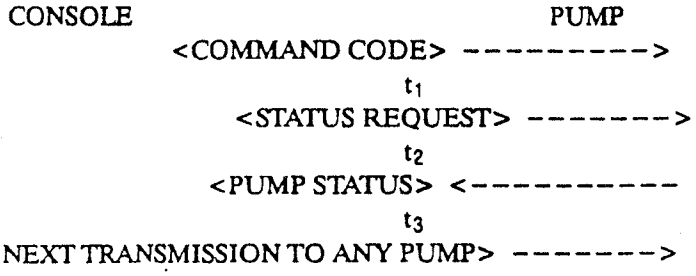
1. No–response timer should be at least 68 msec.

2. Retry counter should be set by the console, depending on the application program. It is recommended that it should be at least 5.
3. It is advised that the console check whether or not the response comes from the polled pump.

4. The console should check the pump status frequently. The appropriate actions should be taken if the pump state is not compatible to the console state.

2.3.2 A SINGLE WORD COMMAND

A single word command can be sent from the console to direct the pumps to perform certain tasks. There is no response to the command from the pump. Therefore, it is advised that the console request the status from the affected pump and ensure the proper command has been received and processed. All commands except All Stop (FC) are only for one pump at a time. The protocol exchanges are as follows:



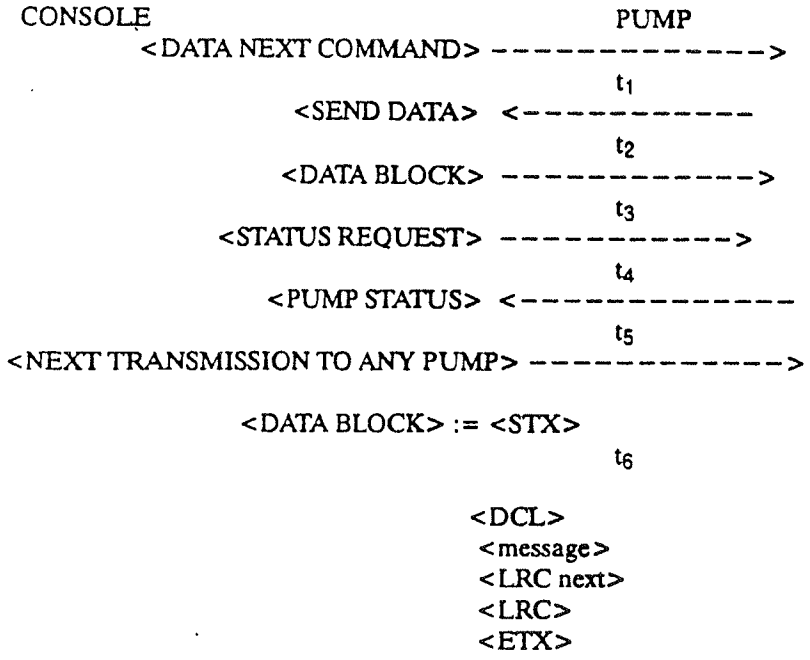
t_1 = at least 68 msec
t_2 = 0 – 68 msec
t_3 = at least 5 msec

Error Recovery Rules:

1. No-response timer should be at least 68 msec.
2. Retry counter for status should be set by the console depending on the application program. It is recommended that it should be at least 5.
3. It is advised that the console check whether or not the response comes from the polled pump.
4. The console should check if the command is received and processed correctly. A re-transmission of the command should be attempted by the console if it detects that the pump failed to process the command correctly. The exact retry counter should depend on the application program and at least 5 retries are recommended.
5. If the pump is not in one of the valid pump states for the command, it shall ignore the command.
6. If the pump receives a single word command with transmission error, it shall ignore the command.

2.3.3 DATA TO PUMP

The two–wire protocol utilizes a command word to place the pump in a DATA state so that the console can send the data to the pump. The protocol exchanges are as follows:



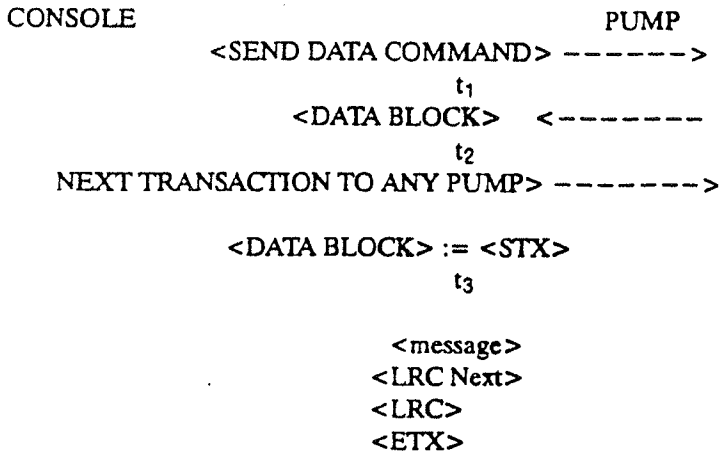
t_1 = 0 – 68 msec
t_2 = at least 5 msec
t_3 = at least 68 msec
t_4 = 0 – 68 msec
t_5 = at least 5 msec
t_6 = The time interval between words in the data block should be at least 68 msec.

Error Recovery Rules:

1. No-response timer should be at least 68 msec.
2. If any transmission error occurs in DATA BLOCK, the pump will send ERROR status in response to the next STATUS REQUEST or DATA NEXT command. The term "transmission error" includes parity error, block length error, framing error, overrun error and checksum error. The console must re-transmit the whole sequence starting from <DATA NEXT> Command, unless a correct status is received. The exact retry counter should depend on the application program and at least 5 retries are recommended.
3. The pump should enter the DATA STATE when it receives DATA NEXT Command and exit from the DATA STATE as soon as it receives any word which is not a data or a data control word. The most significant nibble of a data word is always an E and that of a data control word is F (See Section 2.6).
4. The console must not transmit a DATA BLOCK to a pump which has a preset transaction pending. "Preset transaction pending" means that:
   - a pump has received either a money or a volume preset message.
   - the pump did not enter the ERROR state in response to the preset message,
   - the pump has not yet "completed" the preset transaction by:
     - receiving a pump stop or universal stop command (without an authorization command), OR
     - receiving an authorization command followed by a handle on to handle off transition, with or without fuel being dispensed).

2.3.4 DATA TO CONSOLE

These commands are used by the console to obtain data, such as transaction data or pump totals, from the pumps. The line level protocol exchange is as follows.



t_1 = 0 – 68 msec.
t_2 = at least 5 msec
t_3 = all data blocks transmitted to the console must meet this condition:
The interval between words must be between 2 and 68 msec.

Error Recovery Rules:

1. No–response timer should be at least 68 msec.

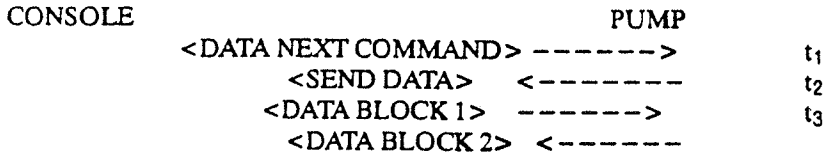
2. Retry counter should be set by the console depending on the application program. It is recommended that it should be at least 5.

2.3.5 SPECIAL FUNCTION COMMAND

These commands are used by a device communicating with pumps beginning with the Advantage series and beyond to determine or change the pump configuration, read areas of pump memory, or program / read totals kept by the pump. Only Advantage series pumps and beyond support these commands.

2.3.5.1 SPECIAL FUNCTION DATA REQUEST COMMAND

This command sequence is used by the console to request pump data other than pump totals and transaction totals. The protocol exchanges are as follows:



t_1 = 0 – 68 msec.
t_2 = at least 5 msec.
t_3 = 0 – 68 msec.

The interval between the words in <DATA BLOCK 1> shall be at least 68 msec and the interval between the words in <DATA BLOCK 2> should be 2 to 68 msec.

Refer to Section 3.9 for message level protocol.

Error Recovery Rules

1. No–response timer should be at least 68 msec.
2. The pump should enter the DATA STATE when it receives DATA NEXT Command and exit from the DATA STATE as soon as it receives any word which is not a data or a data control word. The most significant nibble of a data or data control word is E or F (See Section 2.6).
3. The console should check and make sure that the response comes from the polled pump. If not, it should start the whole sequence to obtain the data.
4. <DATA BLOCK 2> will not be transmitted if transmission error is detected in <DATA BLOCK 1>. After time out, the console should start from <DATA NEXT COMMAND> and the pump will send ERROR STATUS and the console can continue in the sequence.

2.4 DATA LENGTH (DL)

The data length is included only in the data block from the console to the pump. The lower nibble of DL is the modulo 16 of the Two's complement of number of words in the data block excluding Start of Text and DL.

2.5 LRC CHECK CHARACTER

The LRC check character is included in every data block transmitted between the console and the pumps except the Special Function Data Request Command sequences from the pumps (refer to section 3.9). It is a 2's complement of the summation of the least significant nibbles of all words in a data block.

2.6 DATA AND DATA CONTROL WORD (DCW)

The message in a data block consists of Data and Data Control Words. Each group of data must be preceded by a Data Control Word (DCW) to indicate the type of data. The most significant nibble of Data is always E and that of Data Control Words F. Table 1 describes all DCW.

	WORD FORMAT	
A. Data Words	E	0–F
B. Data Control Words		
1. End of Text	F	0
2. Volume Preset	F	1
3. Money Preset	F	2
4. Fill–Up	F	3
5. Level 1	F	4
6. Level 2	F	5
7. Grade Data Next	F	6
8. PPU Data Next	F	7
9. Pump Identifier Next (from pump) Preset Amount Next (from Console)	F	8
10. Volume Totals Next	F	9
11. Money Totals Next	F	A
12. LRC Next	F	B
13. Unused	F	D
14. Special Function Mode Next	F	E
15. Start of Text	F	F

TABLE 1: DATA AND DATA CONTROL WORD FORMAT

2.7 COMMAND CODE

Each Command code except ALL STOP has the following format:

Four least significant bits -- pump ID

1 ----- Pump 1
2 ----- Pump 2
:
F ----- Pump 15
0 ----- Pump 16

Four most significant bits ---- Command Code

Table 2 describes all the command codes used in the two-wire protocol. Note that only the console can send the command code.

COMMAND CODES	REPRESENTATION
0	Status Request
1	Authorization
2	Data Next
3	Pump Stop
4	Transaction Data Request
5	Pump Totals Data Request
6	Real Time Money Request
FC	ALL STOP

TABLE 2: COMMAND CODE.

Note that ALL STOP Command Code has a different data format and every pump, upon receipt of this command, should process it (see Section 3.4 for details)

2.8 PUMP STATUS WORDS

Upon the receipt of a STATUS REQUEST Command, the pump with a matched pump ID will respond with one of the following pump status to the console. The pumps without a matched pump ID shall ignore the command. The pump status words have the following data format.

Four least significant bits ---------- pump ID

1 ----- Pump 1
2 ----- Pump 2
:
F ----- Pump 15
0 ----- Pump 16

Four most significant bits ---------- Pump Status

Table 3 describes all the pump status used in the two-wire protocol. Note that only the pumps can send the pump status.

CODE	STATUS
0	Error
6	Off
7	Call
8	Authorized/Not Delivering
9	Busy
A	Transaction Complete
B	Transaction Complete
C	Pump Stop
D	Send Data *

* This status is returned only to the <DATA NEXT COMMAND>.

For details, please refer to Section 3.1

TABLE 3: PUMP STATUS WORDS

SECTION 3 – MESSAGE LEVEL COMMUNICATION PROTOCOL

This section describes the message level of the two–wire protocol. It will also describe the appropriate pump response and console responses. Please refer to Section 2 for line level, error recovery and timing requirement.

3.1 STATUS POLLS: COMMAND '0'

The command may be sent only by the console to request the current pump status from the pump. Only the pump with a matched ID should respond.

Command/Response Syntax:

Valid Pump State: Any pump state.

Command :

'0' '<p>'

<p> : Pump Number

1 ----- Pump 1
2 ----- Pump 2
:
F ----- Pump 15
0 ----- Pump 16

Response :

'<r>''<p>'

<r>	:	Pump Status
0	:	ERROR
6	:	OFF
7	:	Call
8	:	AUTH (authorized but not yet delivered)
9	:	BUSY (delivering gasoline)
A	:	PEOT (transaction complete)
B	:	FEOT (transaction complete)
C	:	STOP (pump stop)

State after pump accepts the Command :

A Pump may change its two–wire status as a result of a status poll only as follows:

1. clear ERROR condition,
2. transition from FEOT or PEOT to OFF or CALL.

Note:

1) Pumps will respond FEOT/PEOT repeatedly to status polls, until another pump ID is polled or the pump receives some command other than status poll.

Interpretation of the pump status

0(ERROR) : The pump must enter the ERROR state under the following conditions:

1. The pump is in DATA STATE when it receives an invalid data block including
   - Any word that the most significant nibble is not an E or F.
   - Any transmission error such as parity error, checksum, or overrun or framing error.

6 (OFF) : Pump handle is off and it is not authorized.

7 (CALL) : The pump handle is ON, but not authorized. The CASH/CREDIT option, preset option or others at the pump may already be activated.

8 (AUTH): The pump is authorized but not ready to deliver fuel. This may mean that one of delivery conditions is not met such as CASH/CREDIT option, key lock option, Push-to-Start, pump handle or other options.

9 (BUSY) : The pump is authorized and all delivery conditions (CASH/CREDIT option, key lock option, Push-to-Start option, pump handle or other options) are met. The pump is in a state which is ready to deliver fuel, delivering fuel, has reached a preset goal, or is performing lamp test.

A (PEOT) : The pump has completed a delivery with the pump handle at 'OFF' position.

B (FEOT) : The pump has completed a delivery with pump handle at OFF position.

C (STOP) : The pump is in a PUMP STOP state.

The pump will enter ERROR STATE if it is in DATA STATE and detect a break condition as defined in the RS232 standard. The pump will process an ALL-STOP command if it detects a loop-break condition for at least 500 msec.

3.2 AUTHORIZE OR RE-AUTHORIZE: COMMAND '1'

The command is used to enable a pump to deliver or to resume the delivery of the fuel product. Only the pump with a matched pump ID should accept this command.

Command/Response Syntax:

Valid pump state	: OFF or CALL for authorization STOP for re-authorization
Command	: '1''<p>' <p> : pump number 1 ---- pump 1 2 ---- pump 2 : F ---- pump 15 0 ---- pump 16
Response	: None
State after pump accepts this command	: AUTH or BUSY

3.3 PUMP STOP: COMMAND '3'

This command is used to de-authorize an authorized pump. Only the pump with a matched pump ID should accept this command.

Command/Response Syntax:

Valid pump state	: AUTH or BUSY
Command	: '3''<p>' <p>: pump number 1 ---- pump 1 2 ---- pump 2 : F ---- pump 15 0 ---- pump 16
Response :	None
State after pump accepts this command :	OFF, CALL or STOP

3.4 ALL STOP: COMMAND 'F' 'C'

This command is used by the console to stop every pump in the loop.

Command/Response Syntax :	
Valid pump state :	AUTH or BUSY
Command :	'F' 'C'
Response :	None
State after pump accepts this command:	OFF, CALL or STOP

3.5 REQUEST FOR TRANSACTION DATA: COMMAND '4'

The command is used by the console to request the transaction data.

Command Response Syntax:

Valid pump state : OFF, CALL, FEOT, PEOT, and STOP

Command : '4' '<p>'
<p>: pump number
1 ---- pump 1
2 ---- pump 2
:
F ---- pump 15
0 ---- pump 16

Response :

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<pt>	FX	1	Reserved: (preset type: obsolete) Pump will send X=1, 2, or 3. Console should ignore this word.
<pin>	F8	1	Pump identifier next
<pi> *1	EY EX EX EX EX	5	Pump identifier data, for details. (See page 23) Y = A or B X = 0 ~ F.
<gn>	F6	1	Grade data next
<g>	EX	1	Grade X = 0 : Grade 1 | | | F : Grade 16
<tt>	FX	1	Transaction Type i.e., what PPU is used for this transaction X = 4 : Level 1 5 : Level 2

Response (cont'd):

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<ppun>	F7	1	PPU data next
<ppu>	EX EX EX EX	4	Price per unit in XXXX format (BCD) X = 0 to 9 Least significant digit (LSD) is transmitted first. LSD is the LSD of the displayed PPU at the pump. Normally the tenth penny digit (U.S. currency) for non-Advantage pumps. For Advantage series, decimal position is defined in S.F. 00E.
<vn>	F9	1	Transaction Volume data next
<v>	EX EX EX EX EX EX	6	Transaction volume in XXX.XXX format (BCD) X = 0 to 9 Least significant digit is transmitted first
<cn>	FA	1	Transaction Money data next
<c>	EX EX EX EX EX EX	6	Transaction Money in XXXXXX format (BCD) X = 0 to 9 Least significant digit (LSD) is transmitted first. In 5 digit mode, LSD is the hidden digit which is not displayed at the pump. It is a tenth penny digit in US currency. In 6 digit mode, all 6 digits are significant and the value depends on the money decimal point configuration programmed.
<LRCn>	FB	1	LRC check character next
<LRC>	EX	1	LRC check character X = 0 – F
<ETX>	F0	1	end of text
	Total bytes	33	

Refer to section 2.3.4 for the line level communication requirement.

State after pump : OFF, CALL or STOP.
accepts this
Command

*1 There are two types of pump identifier data which can be included in the pump identifier. The EA response form does not include ERROR information, and the console should ignore EX data words. If received EC, ED, EE and EF should be interpreted as EA.

A. EA Ep Ex Ex Ex

p: Pump number
0 ---- pump 1
1 ---- pump 2
:
F ---- pump 16

x: 0 to F don't care

B. EB Ep Eh Ea Eb

p: Pump number
0 --- pump 1
1 --- pump 2
:
F --- pump 16

h: 0 ---- no error
1 – F --- hose number
1 ---- left most hose at side A or
right most hose at side B
2 ---- next to hose 1
: :

a,b: a and b are used as error code and identification bits.
Error code: b_1, a_4, a_3, a_2, a_1 ---- a combined 5 bit word.
b_1 is the least significant bit of b.

E	b_4	b_3	b_2	b_1

E	a_4	a_3	a_2	a_1

$b_4 b_3 b_2$ should be ignored.

3.6 REQUEST FOR PUMP TOTALS: COMMAND 5

The command is used by the console to request the pump electronic volume and money totals that are stored in the pump by grade. Only the pump with a matched pump ID should respond to the command. Also the PPU is included in the data block which can be used to check if the pump has the correct price per unit.

Command/Response Syntax :

Valid Pump State : OFF, CALL, FEOT, PEOT and STOP

Command : '5' '<p>'
<p> : pump number
1 ---- pump 1
2 ---- pump 2
:
F ---- pump 15
0 ---- pump 16

Response :

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<gn>	F6	1	Grade data next
<g>	EX	1	Grade, X=0, 1...5 for Grade 1,2,...6.
<vn>	F9	1	Pump volume total data next
<v>*1	EX EX EX EX EX EX EX EX	8	Pump volume totals in the format of XXXXXX.XX (BCD). X = 0 to 9 Least significant digit is transmitted first
<cn>	FA	1	Pump money total data next
<c>*1	EX EX EX EX EX EX EX EX	8	Pump money totals in the format of XXXXXXXX (BCD). X = 0 to 9 Least significant digit (LSD) is transmitted first. LSD is the LSD of the displayed pump totals at the pump. The number of decimal places will be equal to the number programmed via the money decimal point configuration programming.

*1 <v> and <c> will be updated when a transaction that has at least 10 pulses is complete. The pump totals are updated before the pump transmits EOT status.

Response (cont'd)

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<ppun>	F4	1	Level 1 PPU next
<ppu1>	EX	4	Level 1 PPU in the
EX			Format of XXXX (BCD)
	EX		X = 0 to 9
	EX		Least significant digit (LSD) is transmitted first. LSD is the LSD of the displayed PPU at the pump. In non–Advantage pumps, it is a tenth penny digit in the US currency. In Advantage series pumps the decimal position of this field matches the PPU decimal point configuration.
<ppun>	F5	1	Level 2 PPU next
<ppu2>	EX	4	Level 2 PPU in the
	EX		Format of XXXX (BCD)
	EX		X = 0 to 9
	EX		Least significant digit (LSD) is transmitted first. LSD is the LSD of the displayed PPU at the pump. In non–Advantage pumps, it is a tenth penny digit in the US currency. In Advantage series pumps, the decimal position of this field matches the PPU decimal point configuration.
	(Repeat from <gn> Grade Data Next through <ppu2> digits for Grade 2, 3, 4, 5, and 6).		
<LRCn>	FB	1	LRC check character next
<LRC>	EX	1	LRC check character X = 0 to F
<ETX>	F0	1	End of text

Total bytes:

34 for a pump sending 1 grade
64 for a pump sending 2 grades
94 for a pump sending 3 grades
124 for a pump sending 4 grades
154 for a pump sending 5 grades
184 for a pump sending 6 grades

Refer to section 2.3.4 for line level communication requirement.

State after pump accepts the Command : OFF, CALL or STOP.

3.7 REQUEST FOR REAL TIME MONEY: COMMAND '6'

This command is used by the console to request the currently running transaction amount while the pump is delivering gasoline. Only the pump with a matched pump ID should respond to this command.

Command/Response Syntax	:
Valid Pump State	: BUSY
Command	: '6''<p>' <p> : pump number 1 ---- pump 1 2 ---- pump 2 : F ---- pump 15 0 ---- pump 16
Response	: EX EX EX EX EX EX X = 0 to 9 in BCD format, the current money display The least significant digit is transmitted first. The LSD is the hidden digit (10th penny digit, in US currency) of the current transaction amount display at the pump. With the Advantage series (in 6 digit money mode only) the decimal position of this field matches the money decimal point configuration.
State after Pump Accepts the Command	: The pump should not change the STATE unless other events occur, such as pump handle position, during transmission.

3.8 SPECIAL FUNCTION COMMAND

The special function command is an extension to the original Two-Wire command set. In general, they are used to transmit programming data to the pump and to retrieve data stored by the pump. Some pump models do not support Special Functions; blending pumps support the Special functions specifically for blenders but may not support all Special Functions; and some models (such as the Advantage Series) support all Special Functions.

To correctly interpret the programmed data returned by a pump, refer to the appropriate *Gilbarco* documentation (MDE) for the model with which you are communicating. Installations may have a number of different models of pumps. Some of these pumps may support all Special Functions and some may not. The following procedures should be used to determine, via the Two Wire loop, which pumps support all functions.

1. First send SF 001 (Version #) to the pump. If the pump does not return the Version number data block, it does not support Special Functions.

2. If the pump responded with its Version number, send SF 00E (Miscellaneous Pump Data) to the pump. If it responds with a data block, that pump supports Special Functions. If it does not respond or responds with a Null Block, that pump does not support Special Functions.

Notes:

1. Some pump software versions will respond correctly to SF 001 but do not support all Special Functions.

Only the pump with a matched pump ID should send the data requested.

Command/Response Syntax :

Valid Pump State : OFF, CALL, AUTH – for commands sending parameters to the pump.
OFF, CALL, AUTH, STOP, FEOT/PEOT – for commands requesting data from the pump.

Command : '2' '<p>'
<p> : pump number
1 ---- pump 1
2 ---- pump 2
:
F ---- pump 15
0 ---- pump 16

Response : 'D' '<p>'
<p> : pump number

Command : <DATA BLOCK>

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<DL>	EX	1	Data length X : 0 ~ F
<sf>	FE	1	Special Function Command next
<sfc>	EX1 EX2 EX3	3	Special Function Command See table 4 for details X_1, X_2, X_3 : 0 – F X3: Category code X2 Sub command X1
<m>	EX	Up to 32	The message of the command up to 32 words
<LRCn>	FB	1	LRC check character next
<LRC>	EX	1	X : 0 – F LRC check character
<ETX>	F0	1	End of text
	Up to	41	

Response : <DATA BLOCK>

See Section 2.3.5 for line level protocol.

State after :	The pump should not change the STATE unless
Pump Accepts	other events occur, such as pump handle
This Command	position, during transmission.

Notes:

1. Special Function Commands which have no data to transmit to the pump use the above format with <m> omitted and a total message size of 9 bytes.

2. If the pump does not return SEND DATA, the controller must not send the Data Block regardless of the Status of the pump prior to the initiation of the exchange.

Category Code X_3	*Sub Command* X_2 X_1	*Functions*
0	01	VERSION NUMBER REQUEST, SOFTWARE RELEASE DATE, ELAPSED OPERATION TIME AND POWER UP COUNTER DATA
0	0E	MISCELLANEOUS PUMP DATA REQUEST
0	10	EXTENDED PUMP STATUS
4	01	BLEND RATIO DATA REQUEST
4	05	PURE PRODUCT TOTALS REQUEST
4	12	KEYBOARD BLEND RATIO CHANGE COUNTERS REQUEST

TABLE 4: SPECIAL FUNCTION COMMAND

3.9 SPECIAL FUNCTION RESPONSE

This section defines some general rules which are used throughout the Special Function Responses.

a. All data blocks must conform to the Data Block Format which will be described in the Section 3.9.1

b. In general, Most Significant Digit (MSD) will be transmitted first unless otherwise specified.

c. All words are transmitted in a modified ASCII format. The most significant bit of the word is set to 1. The following table describes the words.

Transmitted Code	*ASCII Code*	*Interpretation*
BA	3A	Colon, Data Length Next
B0 – B9	30 – 39	Digit 0 – 9
C1 – C6	41 – 46	Letter A – F
8D	0D	Carriage Return
8A	0A	Line Feed

d. The numbers are transmitted in BCD format unless otherwise specified.

e. Block length equals the number of words in the message (not including overhead) divided by 2.

f. Check sum is 2's complement of summation of all translated words in the Data Block excluding Block – Length Next control word and Carriage Return and Line Feed. The translated words are the hexadecimal representation of two consecutive words in the data block starting with MSD of Data Length (see examples).

Data Field	*Data on the Block*	*Translated Words*
Block Length Next	BA	(not included in checksum)
Block Length MSD	B0	01
Block Length LSD	B1	
Pump Number	B2	23
Category Command (SF3)	B3	
MS Command Nibble (SF2)	B4	45
LS Command Nibble (SF1)	B5	
Remaining Block Count MSD	B6	67
Remaining Block Count LSD	B7	
1st Byte Data	B8	89
2nd Byte Data	B9	
Checksum MSD	C1	A7
Checksum LSD	B7	
Carriage Return	8D	(not included in checksum)
Linefeed	8A	(not included in checksum)

The modulo 100h sum of the translated bytes is 59h
The twos complement of 59h is a a7h.

g. Data Block is a block of words (data) including the Block Length, pump number, echoed commands, block number, message, Carriage Return, and Line Feed.

h. In general, the counters are cumulative and can be reset only at the Master RAM Reset, unless otherwise specified.

i. Pump shall respond with null data block under a number of conditions as follows:

- Pump receives a valid Special Function but it is not supported by the pump's version of softwrae. (i.e.; blender Special Function sent to non-blender pump.)

- Pump receives a valid special function but some data in the data block is invalid (out of range).(i.e.; memory address or incorrect configuration data.)

j. Supported Special functions which cannot be executed for any reason will cause the pump to respond with an Error status to the next poll.

k. Under certain conditions the pump is allowed to ignore Special Function Commands (e.g.; blend ratios sent to a pump whose ratios are not programmable). The conditions are indicated in the sections dealing with the relevant Commands/Responses. Ignore means neither an Error Status nor a Null Block will be returned in response to the poll following the Special Function Command which has been ignored.

3.9.1 Data Block Format

This section describes the format of the Response Data Block. The response to a Special Function Command must conform to this format.

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<pLn>	BA	1	Block length next
<pL>	XY XY	2	Block length XY = B0 – B9 or C1 – C6 MSD transmitted first
<pn>	XY	1	Pump number XY = B0 – B9 or C1 – C6 B0 – – – Pump 16 B1 – – – pump 1 : : C1 – – – Pump 10 : : C6 – – – Pump 15
<sfc>	SF3 SF2 SF1	3	Special function command code Code (echoed back from the request) SF1,SF2,SF3 = B0 – B9 or C1 – C6 SF3 is the modified ASCII of X3 SF2 is the modified ASCII of X2 SF1 is the modified ASCII of X1
<bn>	XY	2	The remaining total number of blocks to be transmitted for this request. XY = B0 – B9 or C1 – C6 MSD transmitted first The last block will have B0 B0
<m>	message	up to 32	The message of the response 32 words
<CS>	XY XY	2	Check sum XY = B0 – B9 XY = C1 – C6 MSD transmitted first
<cr>	8D	1	Carriage return
<lf>	8A	1	Line feed

Note: Modular non–blenders and some early Advantage non–blending pumps will respond to a S.F. 001 with a data block which contains an additional character (F0). This character is at the end of the line feed which should be the last character (e.g. 8A F0) and should be ignored.

3.9.2 MESSAGE

This section describes the response messages in the Data Block.

3.9.2.1 The Definition of a Null Block

WORDS	*INTERPRETATION*	*COMMENTS*
No data <m> in the data block.		

3.9.2.2 Version Number Request ($X_3X_2X_1$ = 001)

WORDS	*INTERPRETATION*	*COMMENTS*
'BX'	software version number	Version number MS digit (X=0–9)
'BX'	(C6 is a blank)	Version Number Digit (X=0–9)
'BX'		Version Number Digit (X=0–9)
'BX'		Version Number LS Digit (X=0–9)
'BX'	software release date	Month 10's Digit (X=0–1)
'BX'		Month 1's Digit (X=0–9)
'BX'		Day 10's Digit (X=0–3)
'BX'		Day 1's Digit (X=0–9)
'BX'		Year 10's Digit (X=0–9)
'BX'		Year 1's Digit (X=0–9)
'BX'	accumulated operation	100,000 Hours Digit (X=0–9)
'BX'	time since last cold	10,000 Hours Digit (X=0–9)
'BX'	start	1,000 Hours Digit (X=0–9)
'BX'		100 Hours Digit (X=0–9)
'BX'		10 Hours Digit (X=0–9)
'BX'		1 Hour Digit (X=0–9)
'BX'		10 Minutes Digit (X=0–9)
'BX'		1 Minute Digit (X=0–9)
'BX'	accumulated number of	1000's Digit (X=0–9)
'BX'	warm starts	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)

Note: Epsilon units will send the last 4 digits of their 8 digit version number.

3.9.2.3 Miscellaneous Pump Data Request ($X_3X_2X_1$ = 00E)

WORDS	*INTERPRETATION*	*COMMENTS*
'BX'	Unit Type Code	MSD (X = 0 – 9)
'BX'	Unit Type Code	LSD (X = 0 – 9)
'BX'	Conversion Factor Code	MSD (X = 0 – 9)
'BX'	Conversion Factor Code	LSD (X = 0 – 9)
'BX'	Money Decimal Point Code	MSD (X = 0 – 9)
'BX'	Money Decimal Point Code	LSD (X = 0 – 9)
'BX'	Volume Decimal Point Code	MSD (X = 0 – 9)
'BX'	Volume Decimal Point Code	LSD (X = 0 – 9)
'BX'	PPU Decimal Point Code	MSD (X = 0 – 9)
'BX'	PPU Decimal Point Code	LSD (X = 0 – 9)
'BX'	5/6 Digit Money Mode	MSD (X = 0 – 9)
'BX'	5/6 Digit Money Mode	LSD (X = 0 – 9)
'BX'	Auto On/Push to Start Mode	MSD (X = 0 – 9)
'BX'	Auto On/Push to Start Mode	LSD (X = 0 – 9)

The UNIT TYPE Code returned in response to SPECIAL FUNCTION COMMAND 00E, MISC. PUMP DATA is as follows:

WORDS	*INTERPRETATION*	*COMMENTS*
Unit Type	Advantage Units	
10	MPD 1 grade	
11	MPD 2 grade	
12	MPD 3 grade	
13	MPD 4 grade	
14	MPD 5 grade	
15	MPD 6 grade	
Unit Type	SHMPD	
20	2 + 0 grade (2 grades/1 hose per side)	
21	2 + 1 grade (3 grades /2 hoses per side)	
22	3 + 0 grade (3 grades/1 hose per side)	
23	3 + 1 grade (4 grades/2 hoses per side)	
Unit Type	Fixed Blender	
30	3 + 1 (3 blend hoses/1 non–blend hose) or 3 + 0 (3 blend hoses)	
32	X + 2 (2 pure products / 2 non–blend hoses)	
34	X + 0 (4 pure products / 2 blend manifolds)	
Unit Type	Selectable Blender	
40	5 + 1 (5 blends / 1 non–blend hose) or 5 + 0 (5 blend hoses)	
42	X + 2 (2 pure products / 2 non–blend hoses)	
44	X + 0 (4 pure products / 2 blend manifolds)	
50 – 99	Reserved	

3.9.2.4 Extended Pump Status ($X_3X_2X_1$ = 010)

WORDS	*INTERPRETATION*	*COMMENTS*
BX	Reserved	
BX	Price Level Selection Needed	0 = Needed; 1 = Not Needed
BX	Grade Selection Needed	0 = Needed; 1 = Not Needed
BX	Pump Handle / Nozzle Operation	0 = Off/In; 1 = On/Out
BX	Push to Start Needed	0 = Needed; 1 = Not Needed
BX	Selected Grade	0 = Unknown 1 – F = Grade Digit

Notes:
1. True means operation not needed. False means operation needed. All operations are pump related. For example, if the price level has been selected by the controller, it will have no effect on the Extended Pump Status. Only selecting price level at the pump can do that.
2. The Grade Selected will always be non–zero once a grade is selected by the customer, even if that grade is not available. For example, if a pump is preset for grades 1 or 3 (only) and the customer selects grade 2 the Selected Grade will be 2 but the Grade Selected flag will still be = 0 since an authorizable grade has not yet been selected.
3. Any option not present at the pump (e.g.; Push–To–Start) will default to Not Needed.
4. An Auto–On SHMPD with Cash/Credit could set Price Level Selection Needed, Grade Selection Needed, and Push–To–Start Needed all to zero when in the CALL state. Subsequently pressing one of the price level buttons would set all 3 flags to 1.

3.9.2.5 Blend Ratio Data Request ($X_3X_2X_1$ = 401)

WORDS	*INTERPRETATION*	*COMMENTS*
'BX'	Grade 1 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 1 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 1 Blend Ratio LSD Digit	(X = 0 – 9)
'BX'	Grade 2 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 2 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 2 Blend Ratio LSD Digit	(X = 0 – 9)
'BX'	Grade 3 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 3 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 3 Blend Ratio LSD Digit	(X = 0 – 9)
'BX'	Grade 4 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 4 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 4 Blend Ratio LSD Digit	(X = 0 – 9)
'BX'	Grade 5 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 5 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 5 Blend Ratio LSD Digit	(X = 0 – 9)
'BX'	Grade 6 Blend Ratio MSD Digit	(X = 0 – 1)
'BX'	Grade 6 Blend Ratio Digit	(X = 0 – 9)
'BX'	Grade 6 Blend Ratio LSD Digit	(X = 0 – 9)

This data block contains the Grade 1 – Grade 6 blend ratio that will be used for the next transaction.

3.9.2.6 Pure Product Totals Request 405 ($X_3X_2X_1$ = 405)

WORDS	*INTERPRETATION*	*COMMENTS*
'BX'	Pure Product total for	1,000,000 Digit (X=0–9)
'BX'	High Product (volume)	100,000 Digit (X=0–9)
'BX'	Blend Manifold #1	10,000 Digit (X=0–9)
'BX'		1,000 Digit (X=0–9)
'BX'		100 Digit (X=0–9)
'BX'		10 Digit (X=0–9)
'BX'		1 Digit (X=0–9)
'BX'		0.1 Digit (X=0–9)
'BX'		0.01 Digit (X=0–9)
'BX'		0.001 Digit (X=0–9)
'BX'	Pure Product total for	1,000,000 Digit (X=0–9)
'BX'	Low Product (volume)	100,000 Digit (X=0–9)
'BX'	Blend Manifold #1	10,000 Digit (X=0–9)
'BX'		1,000 Digit (X=0–9)
'BX'		100 Digit (X=0–9)
'BX'		10 Digit (X=0–9)
'BX'		1 Digit (X=0–9)
'BX'		0.1 Digit (X=0–9)
'BX'		0.01 Digit (X=0–9)
'BX'		0.001 Digit (X=0–9)
'BX'	Pure Product total for	This second data Block will only
'BX'	High Product (volume)	be returned by pumps with a
'BX'	Blend Manifold #2	Unit Type of 34 or 44.
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		
'BX'	Pure Product total for	
'BX'	Low Product (volume)	
'BX'	Blend Manifold #2	
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		
'BX'		

3.9.2.7 Keyboard Blend Ratio Change Counters Request ($X_3X_2X_1$ = 412)

WORDS	*INTERPRETATION*	*COMMENTS*
'BX'	Grade 1 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)
'BX'	Grade 2 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)
'BX'	Grade 3 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)
'BX'	Grade 4 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)
'BX'	Grade 5 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)
'BX'	Grade 6 blend ratio change	1000's Digit (X=0–9)
'BX'	Counter from pump keyboard	100's Digit (X=0–9)
'BX'		10's Digit (X=0–9)
'BX'		1's Digit (X=0–9)

3.10 SEND DATA TO PUMP: COMMAND '2'

This section describes how the console sends the data to the pump. Refer to Section 2.3.3 for line level protocol information.

3.10.1 PRESET DATA

This command sequence allows the console to send the preset amount to the pump. An authorization command code is required to authorize the pump even if the pump accepts the preset data. All authorizations for a preset amount/volume should be immediately preceded by a preset data message. Also, once the preset amount is accepted by the pump, it will not allow the customer to set or change price level or grade selection (volume preset only) at the pump. The pumps support both the money preset and volume preset.

This section only describes the format and contents of the data block. Refer to Section 2.3.3 for line level protocol information.

Valid Pump State : OFF, CALL
Do not issue this command to a pump which has a preset transaction pending (see note 4, Section 2.3.3).

Command : '2' '<p>'
<p> : pump number
1 ---- pump 1
2 ---- pump 2
:
F ---- pump 15
0 ---- pump 16

Response : 'D' '<p>'
<p> : pump number
Command : <DATA BLOCK>

<DATA BLOCK> for preset amount

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<DL>	EX	1	Data length
		X =	3 -- grade and price level specified
			5 -- price level specified
			6 -- neither grade nor price level are specified
			Data length for Advantage series in 6 digit money display mode
			x = 2 – grade and price level specified
			x = 4 – price level specified
			x = 5 – neither grade nor price level specified.

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<pt>	FX	1 X =	Preset type for this preset 1 – – – Volume preset 2 – – – Money preset
<pput> *1	FX	1	Price level for this preset X = 4 – – – Level 1 5 – – – Level 2
<gn> *2*3	F6	1	Grade digit next
<g> *2*3	EX	1 X = 0 – F for grade 1 – 16	Grade digit
<pn>	F8	1	Preset amount next
<p>	EX EX EX EX EX	5	Preset amount XXXXX X = 0 to 9 The least significant digit (LSD) is trans– mitted first. The LSD is the LSD of the displayed transaction cash amount at the pump in case of a money preset or a hundredth of a volume unit in case of a volume preset. It is the penny digit in the US currency. XXXXX must be greater than or equal to 00010.
	Or		
	EX EX EX EX EX EX	6	The LSD is the LSD of the displayed amount of the transaction with the decimal position matching the money decimal configuration for money presets. Volume presets are not possible. The pump will return an Error status in response to the next poll. XXXXXX must be greater than or equal to 000010.
<LRCn>	FB	1	LRC character next
<LRC>	EX	1	LRC character
<ETX>	F0	1	End of text

*1 Price level is optional for a money preset. The pump will assume the previous transaction price level for this transaction if it is not specified in the block.

*2 The grade 4 or higher grade can be sent only to the pumps that support them. A volume preset requires grade and level in the preset block. The grade must not be sent in a money preset.

*3 The pump will enter ERROR state and ignore the preset data block if the grade or level fields (volume or money preset) do not match a grade or level selection at the pump. The console shall not transmit 'AUTH' command to the pump until the console receives a CALL or OFF response from this pump. Once the price level/grade is accepted by the pump, it shall not allow delivery from other level/grade.

*4 The pump will ignore the preset data block and enter ERROR state with 5 digit money preset value of 980.XX or 981.XX. (X is digit 0 – 9) if this option is enabled at the pump. Those are special commands to control the pump display. 980.XX is to turn off pump display and 981.XX is to turn on pump display.

State after Pump Accepts This Command :	OFF, CALL

When in the 6 digit money mode, the pump does not support this function. Special Function 20A can be used to turn the displays on and off.

Note: The only valid commands which may follow a preset message are status poll, ALL STOP, pump stop, and Authorize after the pump accepts the preset message.

Alternative format for "range of grades" money or volume preset.

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<DL>	EX	1 X =	Data length 2 --- grade group and price level specified 3 --- grade group specified 5 --- price level specified 6 --- neither grade group nor price level specified
		X =	Data length for Advantage series in 6 digit money display mode 1 --- grade group and price level specified 2 --- grade group specified 4 --- price level specified 5 --- neither grade group nor price level specified
<pt>	FX	1 X =	Preset type for this preset 1 --- Volume preset 2 --- Money preset
<pput>	FX *1	1 X =	Price level for this preset 4 --- Level 1 5 --- Level 2
<gn>	F6 *2*3	1	Grade group next
<g>	EX *2*3 EX	2	Grade group data First byte: X = Bit 0 = Grade 1, 1 = Grade 2, 2 = Grade 3, 3 = Grade 4 Second byte: X = Bit 0 = Grade 5, 1 = Grade 6, 2 = Grade 7, 3 = Grade 8
<pn>	F8	1	Preset amount next

<p>	EX *5	5	Preset amount
	EX		XXXXX X = 0 to 9
	EX		
	EX		
	EX		
	Or		
	EX	6	6 digit money mode
	EX		
	EX		
	EX		
	EX		
	EX		
<LRCn>	FB	1	LRC character next
<LRC>	EX	1	LRC character
<ETX>	F0	1	End of text

*1 Price level is optional for a money preset. The pump will assume the previous transaction price level for this transaction if it is not specified in the block.

*2 The grade 4 or higher grade can be sent only to the pumps that support them. A volume preset requires grade(s) and level in the preset block. The grades may optionally be sent in a money preset.

*3 The pump will enter ERROR state and ignore the preset data block if the grade or level fields (volume or money preset) do not match a grade or level selection at the pump. The console shall not transmit 'AUTH' command to the pump until the console receives a CALL or OFF response from this pump. Once the price level/grade is accepted by the pump, it shall not allow delivery from other level/grade.

*4 The pump will ignore the preset data block and enter ERROR state with 5 digit money preset value of 980.XX or 981.XX. (X is digit 0 – 9) if this option is enabled at the pump. Those are special commands to control the pump display. 980.XX is to turn off pump display and 981.XX is to turn on pump display.

State after : OFF, CALL
Pump Accepts
This Command

When in the 6 digit money mode, the pump does not support this function. Special Function 20A can be used to turn the displays on and off.

Note: The only valid commands which may follow a preset message are status poll, ALL STOP, pump stop, and Authorize after the pump accepts the preset message.

*5 The comments associated with the Preset Amount are the same for this alternative format as the ones shown for the previous format.

3.10.2 PRICE CHANGE DATA

This command sequence allows the console to set the price at the pump. This section describes the format and contents of the data block. Refer to Section 2.3.3 for protocol level information.

Valid Pump State : OFF, CALL
Do not issue this command to a pump which has a preset transaction pending (see note 4, Section 2.3.3).

Command : '2''<p>'
<p> : pump number
1 ---- pump 1
2 ---- pump 2
:
F ---- pump 15
0 ---- pump 16

Response : 'D''<p>'
<p> : pump number
Command : <DATA BLOCK>

<DATA BLOCK> for price change data

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<DL>	E5	1	Data length
<pput>	FX	1	Price level X = 4 --- Level 1 5 --- Level 2
<gn>	F6	1	Grade digit next
<g>	EX	1	Grade X=0 – F for grade 1 – 16 *1
<ppun>	F7	1	PPU digit next
<ppu>	EX EX EX EX	4	PPU XXXX (BCD) X = 0 to 9 Least significant digit (LSD) is transmitted first. The LSD is the LSD of the displayed PPU at the pump.
<LRCn>	FB	1	LRC character next
<LRC>	EX	1	LRC character
<ETX>	F0	1	End of text
	Total bytes	13	

*1 The grade 4 or higher grade can be sent only to the pumps that support them.

State after Pump Accepts this Command : OFF and CALL

3.10.3 LEVEL CHANGE DATA

This command sequence allows the console to switch the price level at the pump without sending the whole price per unit. This section describes the format and contents of the data block. Refer to Section 2.3.3 for protocol level information.

Valid Pump State : OFF, CALL
Do not issue this command to a pump which has a preset transaction pending (see note 4, section 2.3.3).

Command : '2' '<p>'
<p> : pump number
1 – – – – pump 1
2 – – – – pump 2
:
F – – – – pump 15
0 – – – – pump 16

Response : 'D' '<p>'
<p> : pump number
Command : <DATA BLOCK>

<DATA BLOCK> for level change data

SYMBOL	*WORDS*	*# OF BYTES*	*INTERPRETATION*
<STX>	FF	1	Start of text
<DL>	EC	1	Data length
<pput>	FX	1	PPU level X = 4 – – – Level 1 5 – – – Level 2
<LRCn>	FB	1	LRC character next
<LRC>	EX	1	LRC character
<ETX>	F0	1	End of text
	Total bytes	6	

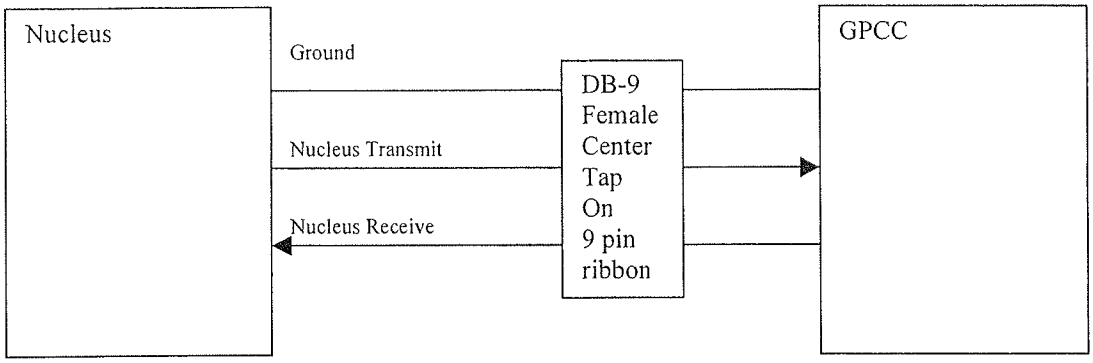
State after Pump Accepts this Command : OFF, CALL

Cable Diagrams
For
GCAP.EXE

NOT
controlled

July 16, 1997

GCAPcable.DOC
Word 97 Document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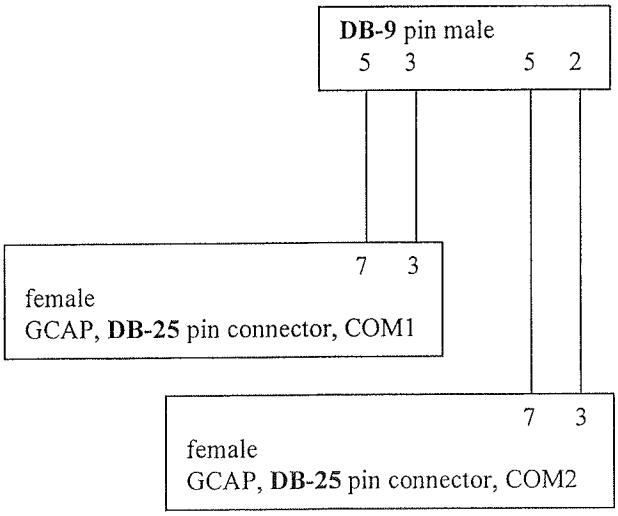
Ground
Nucleus Transmit
Nucleus Receive
DB-9
Female
Center
Tap
On
9 pin
ribbon
GPCC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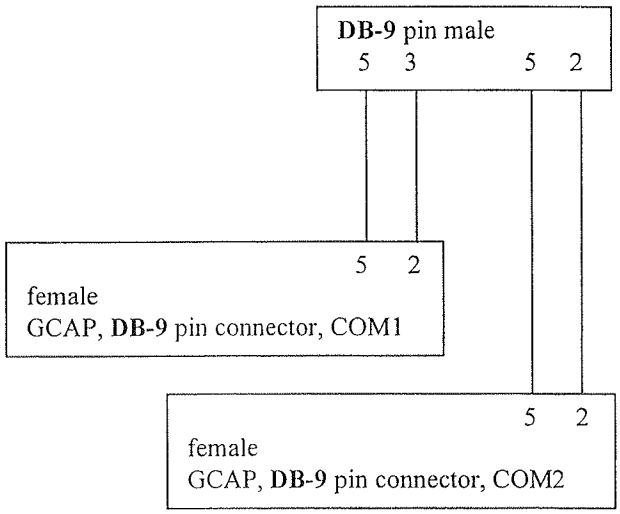
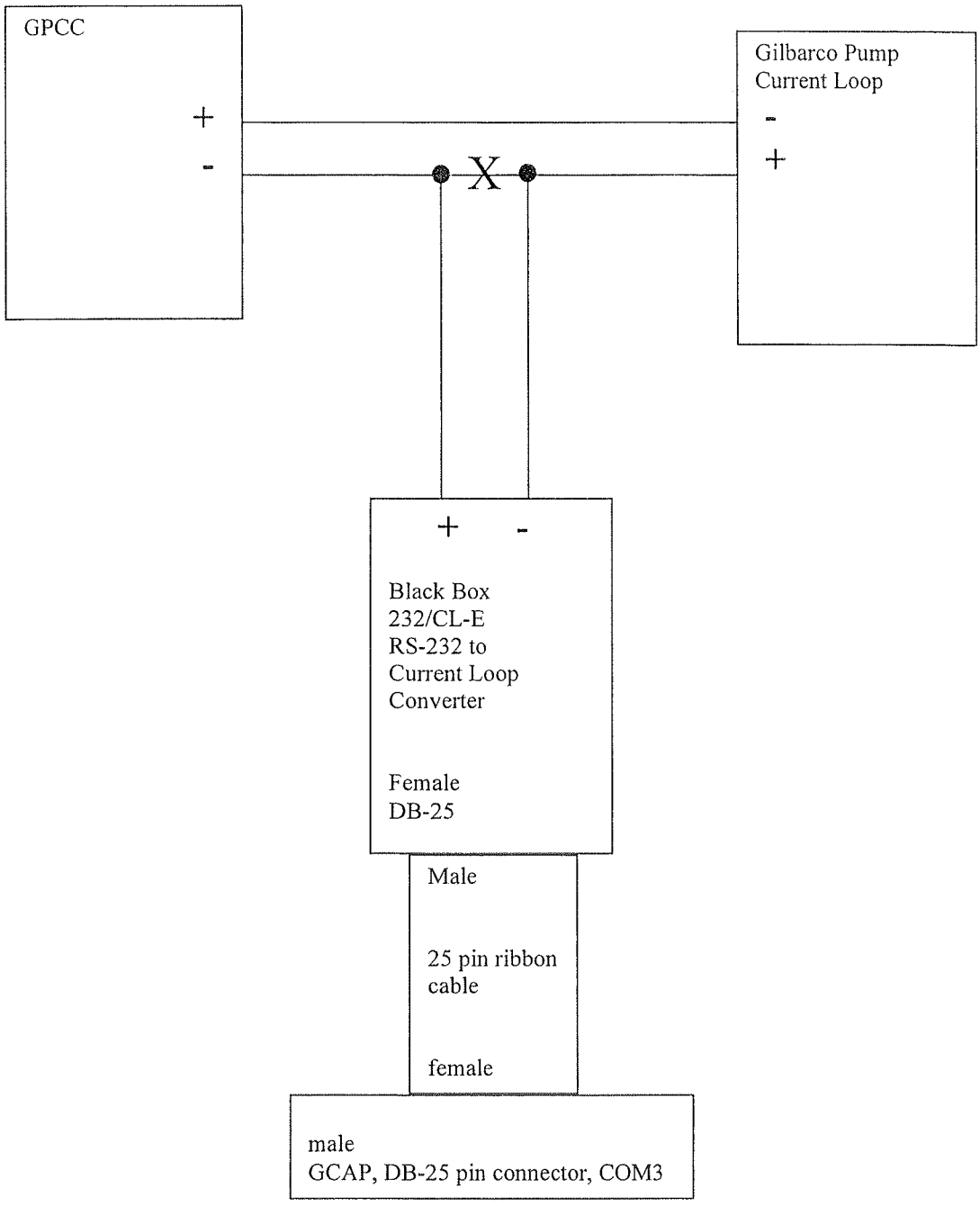
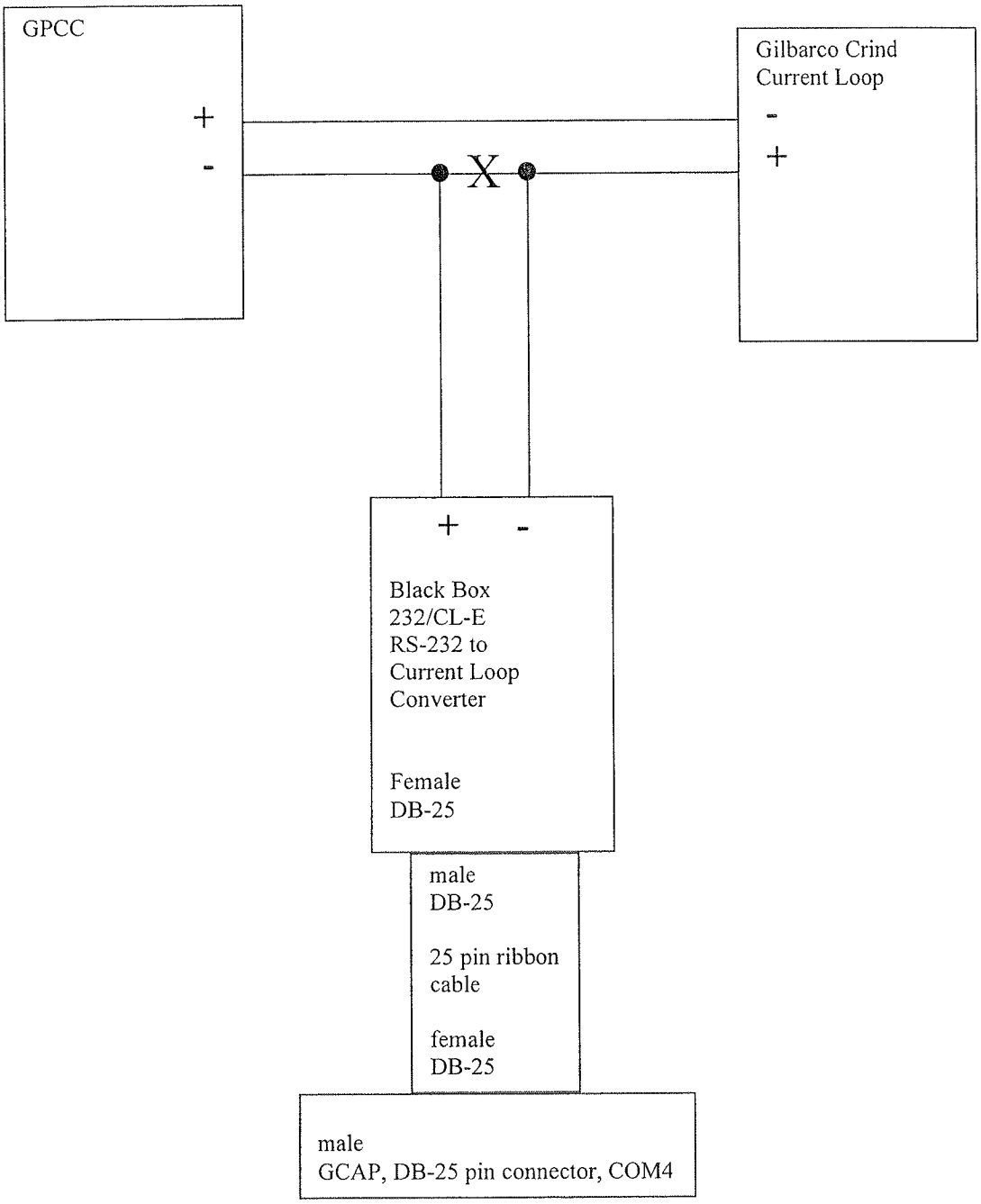
5 3 5 2
7 3
female
GCAP, DB-25 pin connector, COM1
7 3
female
GCAP, DB-25 pin connector, COM2


DB-9 pin male
5 3 5 2
5 2
female
GCAP, DB-9 pin connector, COM1
5 2
female
GCAP, DB-9 pin connector, COM2


GPCC
+
-
Gilbarco Pump
Current Loop
-
+
X
+
-
Black Box
232/CL-E
RS-232 to
Current Loop
Converter
Female
DB-25
Male
25 pin ribbon
cable
female
male
GCAP, DB-25 pin connector, COM3


GPCC
+
-
Gilbarco Crind
Current Loop
-
+
X
+
-
Black Box
232/CL-E
RS-232 to
Current Loop
Converter
Female
DB-25
male
DB-25
25 pin ribbon
cable
female
DB-25
male
GCAP, DB-25 pin connector, COM4