VEEDER-ROOT
Dispenser Interface Protocol

PROPRIETARY

TABLE OF CONTENTS

1 Introduction

This document describes the command protocol for the RS-232 dispenser interface. In particular it focuses on the ASR event reports and responses. The Dispenser Interface Module (DIM) will accept both ASR event reports as described in this document, and standard RS-232 commands described in the TLS-350 UST Monitoring Systems RS-232 Interface (Manual No. 576013-635) and TLS-250 & TLS-250i Tank Level Sensing System RS-232 Interface for General Purpose Use (Manual No. 576013-693) serial interface manuals .

The TLS reconciliation software requires information about dispensing activity. This protocol provides a reporting method that allows fuel pump system controllers and point of sale terminals to input this data into the TLS as events occur. This document defines the event reports that can be sent to the DIM and how the TLS will respond.

2 Hardware Configuration

The TLS requires a properly configured RS-232 dispenser interface module installed on the communication bus of the TLS-350. enhanced platform.

2.1 Connections

The RS-232 signals on TLS D-connector are as follows:

PIN	Description	Direction
2	Transmit Data	Out
3	Receive Data	In
7	Signal Ground	–

2.2 Communication Parameters

The TLS operates in full duplex mode (transmit and receive can occur simultaneously). However, the protocol limits communication to one command at a time. **A second command should not be sent before the first command has received a response.** Communication parameters are programmable at the TLS-350 front panel. **Do not enable the programmable ETX feature on the TLS.** This protocol requires the ASCII 03 ETX.

Start bit:	1
Data bits:	7 or 8
Parity:	odd, even or none
Stop bits:	1 or 2
Communication rate:	9600.

3 Terminology

In order to minimize confusion, the terminology used in this protocol is defined in this section. Refer to diagram in Appendix A.

FUELING POSITION	A fueling dispenser that is uniquely identified by the **SYSTEM CONTROLLER** and is capable of only one **TRANSACTION** at a time.
METER	A device that measures the dispensed product volume at a **FUELING POSITION**. This device is not connected to more than one product (tank) and is not active for more than one **FUELING POSITION** at a time. For a two product blender, two meters would be required to report the total volume for one **TRANSACTION**.
TRANSACTION	A complete fueling cycle. A transaction consists of a **START EVENT** and **STOP EVENT**.
START EVENT	The beginning of a **TRANSACTION**. A **FUELING POSITION** has been selected and is authorized to dispense a product. From this point on the customer is in control of the fuel dispensing.
STOP EVENT	The end of a **TRANSACTION**. Dispensing is complete, and the **FUELING POSITION** is no longer authorized to dispense fuel without beginning another **TRANSACTION**. At this point, the meters will be read to determine the volume dispensed.
TRANSACTION VOLUME	The total amount of product dispensed through a **METER** for a single **TRANSACTION**. **METER** total is reset to 0 after each **TRANSACTION**.
CUMULATIVE VOLUME	The total of all product volume **TRANSACTIONS** to pass though a **METER**. **METER** total is not reset after each **TRANSACTION**.
SYSTEM CONTROLLER	Controls fuel pump activity and reports **TRANSACTION** events to the TLS.

4 Event Data

A fueling transaction includes selecting a fuel position, fuel dispensing, and deselecting the fuel position. The complete transaction is documented in two events, a start event and stop event. This section describes the data required to report them.

4.1 Fueling Position ID

Identifies the active fueling position. Only one transaction can occur at a fueling position at a time. Therefore, simultaneous events cannot share the same fueling position ID. A fueling position ID is required for a valid start event. See 8.1

4.2 Meter ID

Identifies the active meter at the fueling position. If the meter ID is reported, the metered volume must also be reported. Blends require both high and low feedstock meter IDs. This information is not required for a start event but is required for a stop event when volumes are reported. See 8.2

4.3 Metered Volume

This is the volume dispensed at a meter. Stop events report both a transaction volume and cumulative volume for each meter used in the transaction. The transaction volume is the amount of product dispensed during that one transaction. Cumulative volume is the total product volume of all transactions dispensed through that meter. TLS requires transaction totals for each reported meter. Cumulative totals enable enhanced TLS error recovery and should be provided if available.

The TLS can be configured to accept event report volumes in three different units, U.S., Imperial and Metric. The system controller must report all volumes with the same unit.

4.4 Time Delay

This is the number of seconds the report was delayed before it was transmitted to the TLS. **Events must be sent to the TLS in the order that they occur.** Event reports are considered instantaneous to the second. However, if communication is delayed and the event reports are queued up, this data reports the length of the delay. Time delay should normally be 0.

4.5 Event Queues

If communication is interrupted, and the queue of events on the system controller is full, overwrite old events in the queue with new events.

5 Report Message Format

All event report messages are configured in a format consistent with the TLS-350 and TLS-250 serial interface command protocol. Standard RS-232 protocol messages are called commands, event data messages are referred to as reports. Event report messages have the following structure:

SOH	Security Code	Function Code	Data Field	EOT

5.1 SOH

Control-A character (01_{16}) marks the beginning of the message string.

5.2 Security Code

The security code is a six-digit code used to limit RS-232 access to the TLS for security or networking purposes. This field is optional on TLS-250 and TLS-350 command formats and is also optional when using the dispenser interface. Event command security code follows the same rules and format as the RS-232 TLS commands.

5.3 Function Code

This field contains the command codes that the TLS interprets to determine the required action. ASR report codes, TLS-350 command codes and TLS-250 command codes can be used in this field. The field length will vary depending on the function code.

5.3.1 ASR Reports

ASR report function codes are 1 character symbols that identify which report is being sent in the data field.

Event Report Code Commands	
Symbol	**Definition**
B	Start Event data report.
C	Stop Event data report.
D	Event status report.

5.3.2 TLS-250 Commands

The dispenser interface supports TLS-250 3 character command. See TLS-250 & TLS-250i Tank Level Sensing System RS-232 Interface for General Purpose Use (Manual No. 576013-693) serial interface manual.

5.3.3 TLS-350 Commands

The dispenser interface supports TLS-350 6 character command. See TLS-350 UST Monitoring Systems RS-232 Interface (Manual No. 576013-635) serial interface manual.

5.4 Data Field

This field contains data required to execute the command specified in the function code field. The length of this field depends on the data requirements for the function code.

5.5 EOT

Control-D character (04_{16}) marks the end of the message string.

6 ASR Reports

This section describes the function codes and data fields for ASR event and status reports.

6.1 Data Symbols

The symbols defined here are used to specify the event report data field requirements. Each symbol character represents one ASCII character byte.

Data Symbol Description Table	
SYMBOL	DESCRIPTION
I	Event Message Identifier. Start and Stop Events contain this ID to help identify transmissions that are repeated as a result of communication errors. Each event will get the next ID in the sequence 0 - 9. The event will keep that ID until it is successfully transmitted. The status report does not require an ID. Format: ASCII Decimal Range '0' to '9'

Data Symbol Description Table	
SYMBOL	DESCRIPTION
EE	Error Flag byte. Bit mapped errors where each active high bit represents an error condition. Bit Map: (MSB) 7 6 5 4 3 2 1 0 (LSB) Format: ASCII Hexadecimal. Range '00' to 'FF' BIT ERROR 0 Data lost. (Queue overwrite.) 1-7 Reserved, should be 0.
SSSS	Seconds Delay. Number of seconds the event was delayed before it was transmitted. Format: ASCII Decimal Range: '0000' to '9999'
PP	Fueling Position. Dispensing location identifier. Format: ASCII Decimal Range: '00' to '99' Each position must have a unique identifier. See 8.1
N	Number of Meter ID and volume sets to follow. Format: ASCII Decimal Range: '0' to '9' '0' Meter ID and volume not reported. This value implies that no product was dispensed during that transaction. '1' Single product (one meter & volume set) '2' Blended product (two meter & volume sets) Meter ID and volume set consists of: 1 Meter Identifier 1 Cumulative volume 1 Transaction volume This field is only used in a stop event report.
M	Meter Identifier. Format: ASCII Decimal Range: '0' to '9' Each meter at a fueling position must have a unique identifier. IDs must start at '0' and be consecutive (0,1,2,3,...). A fueling position with 4 meters will have meter ids 0,1,2 and 3. This field is only used in a stop event report. See 8.2

Data Symbol Description Table	
SYMBOL	DESCRIPTION
DDDDDD.DD	Cumulative Volume for meter identified in previous **M** field. Format: ASCII Decimal This field is required for all meter volume reports in a stop event report. The data provides enhanced TLS error recovery and should be provided if available. 0 fill unused digits. The decimal point is included in the string. If this information is not available from a calibrated meter, fill this field with '?' characters. ('??????????'). **Do not fill both transaction and cumulative volume fields with '?' in the same event report.**
dddd.ddd	Transaction Volume for meter identified in previous **M** field Format: ASCII Decimal This field is required for all volume reports in a stop event. 0 fill unused digits. The decimal point is included in the string. If this information is not available from a calibrated meter (do not use blend ratios of a transaction meter), fill this field with '?' characters. ('????????'). **Do not fill both transaction and cumulative volume fields with '?' in the same event report.**
CCCC	Two byte check sum. Format: ASCII Hexadecimal The four characters represent a 16-bit binary count which is the 2's complemented sum of all the preceding characters transmitted in the message, including the <SOH>. Overflows are ignored. The data integrity check is done by converting the four check sum characters to the 16-bit binary number and adding the transmitted data field characters to it. The binary result should be 0.

6.2 Event Reports

These reports are used to send the transaction event data to the TLS.

6.2.1 Start Event

<SOH>BIEESSSSPPCCCC<EOT>	
<SOH>	Start of message marker. (01_{16})
B	Function code '8', Start event report.
I	Event ID
EE	Error flag
SSSS	Seconds delay
PP	Fueling Position
CCCC	Check sum of preceding characters.
<EOT>	End of message marker. (04_{16})

Example Report 1: <SOH>B000000012FE0A<EOT>
- Event ID = 0
- Transmission delay = 0 seconds
- Selected Fueling Position = 12

Example Report 2: <SOH>B100000501FE06<EOT>
- Event ID = 1
- Transmission delay = 5 seconds
- Selected Fueling Position = 1

6.2.2 Stop Event Report

<SOH>CIEESSSSPPNM$_1$DDDDDD.DD$_1$dddd.ddd$_1$...M$_N$DDDDDD.DD$_N$dddd.ddd$_N$CCCC<EOT>	
<SOH>	Start of message marker. (01_{16})
C	Function code 'C', stop event report.
I	Event ID
EE	Error flag
SSSS	Seconds delay
PP	Fueling Position
N	Number of Meter ID and volume sets to follow.
M_x	Meter Identifier
DDDDDD.DD$_x$	Cumulative volume for meter identified in previous M field.
dddd.ddd$_x$	Transaction volume for meter identified in previous M field.
CCCC	Check sum of preceding characters.
<EOT>	End of message marker. (04_{16})

Note: The subscript X will range from 1 to N, where N = the Number of Meter ID and volume pairs field.

Example Report 1:

<SOH>C20000021211002366.340010.112FA5A<EOT>

- Event ID = 2
- Selected Fueling Position = 12
- Selected meter = 1
- Cumulative total = 2366.34
- Transaction total = 10.112

Example Report 2:

<SOH>C300000205212????????0005.1122002357.710005.650F65A<EOT>

- Event ID = 3
- Transmission delay = 2 seconds
- Selected Fueling Position = 5
- Selected meter = 1,2 (blend)
- Cumulative totals = *unknown*$_1$, 2357.71$_2$
- Transaction totals = 5.112$_1$, 5.65$_2$

Example Report 3:

<SOH>C20000071211002366.340010.112FA59<EOT>

- The TLS did not respond to example 1 message after 5 seconds so it is repeated.

6.3 Status Report

When there are no transmissions from the system controller (event reports or TLS commands) in a 60 second period, the TLS expects a status report to ensure communication has not been broken. Otherwise, after 60 seconds of no communication, the TLS assumes there is a communication fault.

<SOH>D<EOT>	
<SOH>	Start of message marker. (01_{16})
D	Function code 'D', event status report.
<EOT>	End of message marker. (04_{16})

7 TLS Response

This section describes the TLS response to ASR event and status reports only. The TLS responses to standard RS-232 TLS-350 and TLS-250 commands are described in TLS-350 UST Monitoring Systems RS-232 Interface (Manual No. 576013-635) and TLS-250 & TLS-250i Tank Level Sensing System RS-232 Interface for General Purpose Use (Manual No. 576013-693) serial interface manuals.

ASR Report Responses	
Response	**Description**
ACK	(06_{16}) Acknowledge: message received, no errors.
NAK	(15_{16}) Negative acknowledge: check sum or transmit error . Retransmit.
timeout	Incomplete transmission. Retransmit.

If a NAK or *timeout* occurs, the system controller must retransmit ASR event reports with the delay field updated. Timeout period should not be less than 3 seconds.

8 Reconciliation System Limitations

The reconciliation systems have predefined data limitations. Please notify Veeder-Root if the system implementing this protocol can exceed the boundaries defined here.

8.1 Fuel Positions

The total number of fueling positions supported is **36**. The fuel position unique identifier (See 4.1,6.1) my be larger than 36. However, there can not be more than 36 unique identifiers reported.

8.2 Fuel Position Meters

The total number of meters (See 4.2,6.1) that a single fuel position can report is 4. Therefore, fuel positions should never report a meter identifier "4". A four meter fuel position would report using meter IDs "0", "1", "2" and "3".

9 Configuration String.

This is a 12 character string that is entered at the TLS keypad and is sent to the DIM over the RS232 communication port. It defines for the DIM the external communication port parameters and conversion factors for the event data. The following parameters can be entered in any order. Omitted parameters will cause the DIM to use the highlighted default.

9.1 Baud Rate

Baud Rate	
String	Rate
B9	**9600**
B4	4800
B2	2400
B1	1200
B6	600
B3	300

9.2 Data Bits

Number of Data Bits	
String	Bits
V	7
D	8

9.3 Parity

Parity	
String	Type
N	No Parity
E	Even
O	Odd

9.4 Stop Bits

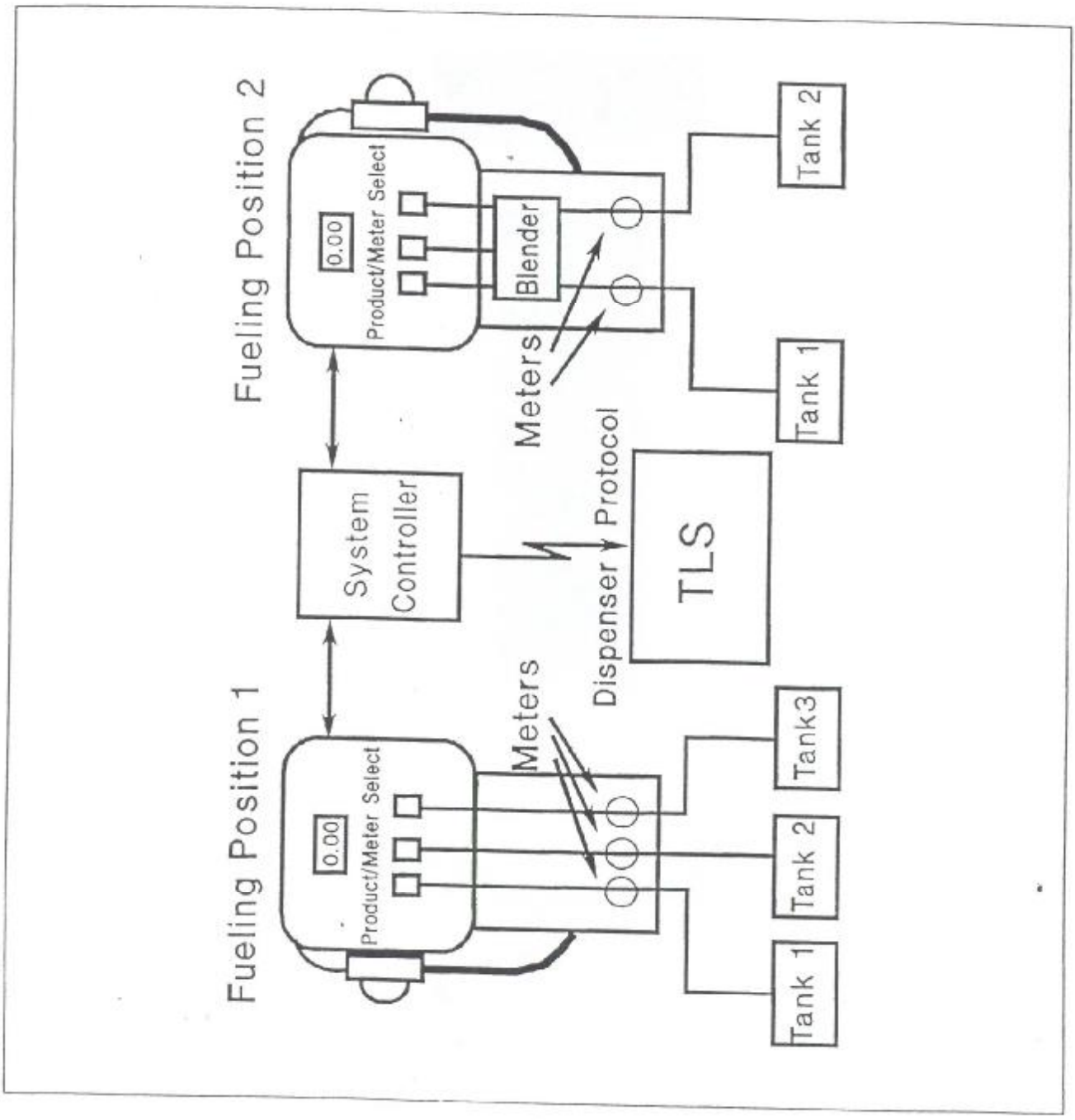
Number of Stop Bits	
String	Bits
H	1
S	2

9.5 Dispenser Data Unit Conversion

Specifies the units reported in the transaction and cumulative data fields of the stop event.

Conversion	
String	Unit
G	Gallons
M	Metric (Liters)
I	Imperial Gallon

A Appendix


Fueling Position 2
0.00
Product/Meter Select
Blender
Meters
Tank 2
Tank 1
System Controller
Protocol
Dispenser
TLS
Fueling Position 1
0.00
Product/Meter Select
Meters
Tank3
Tank 2
Tank 1