ALiEn² Lite
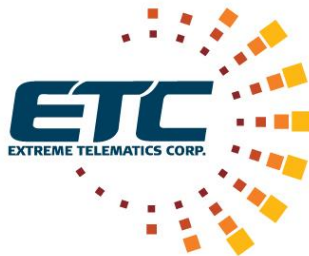# ALiEn²
ALiEn² Expert

Modbus Communications User Guide

v2.1.x 01-Sept-21

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Revision History

Rev	Date (dd/mm/yy)	Author	Comments
1.x.x	17/12/10	Mark Scantlebury	Initial Version
1.1.x	8/2/11	Ahmad Haydar	Add support for grayed register. And added Cycle restart state and duration, and close CP type
1.1.x	12/4/11	Ahmad Haydar	Add danger velocity and clean up the time remaining description.
1.1.1	25/4/11	Ahmad Haydar	Add Valve Auto Catch Status to Modbus Add more details to cycle log and daily production.
1.3.x	29/2/12	Mark Scantlebury	Add in the new registers for Afterflow and Close time that is the combination of the Min and Extended times. Renamed Max Open to Max Afterflow.
1.4.x	27/04/12	Mark Scantlebury	Add in the ability to get/set units. Add in more optimization modes Additional plunger arrival sensor settings and statuses.
1.6.x	19/09/13	Mark Scantlebury	Add in vent time tracking, total stats and plunger stats. Add in Valve B Purge
1.7.x	28/01/14	Mark Scantlebury	Add in tubing pressure Add in Device Logs Dynamically Change Units (Metric vs. Imperial) Add manual valve operations Allow full log access (Cycle and Daily)
2.0.x	10/02/16	Mark Blackburn	Target Surface Velocity Danger/Fast Trip Source Casing Pressure Rate Trip Delay Average/Surface Velocity Log entries Correct modbus error address in modbus error register description H:M:S Date/Time Register Not Consistent with User Guide

2.0.x	28/04/16	Mark Blackburn	Add Average/Surface Velocity Log entries to full log access (3:5000/3:6000 address ranges) Add velocity sensor option to Arrival Sensor Configuration register
2.1.x	08/12/16	Mark Blackburn	Added Auto Catcher Config, Auto Catcher Hold time, and Purge Time. Move the virtual sensor entries to 4:370. Confidence code 6,7 added to in Plunger Cycle Log – Full Implementation
2.1.x	17/01/17	Mark Blackburn	Documented remaining virtual sensors in 4:0371 – 4:0375 block
2.1.x	02/10/17	Mark Blackburn	Added virtual sensors to device configuration holding registers (4:0241, 4:0261, 4:0311, 4:0331). Added notes that virtual sensors and velocity logs are not available in all software builds. Added Current Cycle Log coil
2.1.x	01/09/21	Mark Scantlebury	Added Gas Assisted Plunger Lift (GAPL) Added Load Factor Remove obsolete features Remove Branding

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1 Introduction

The Remote Access Interface allows access to functions which are normally accessed using the integral front panel interface.
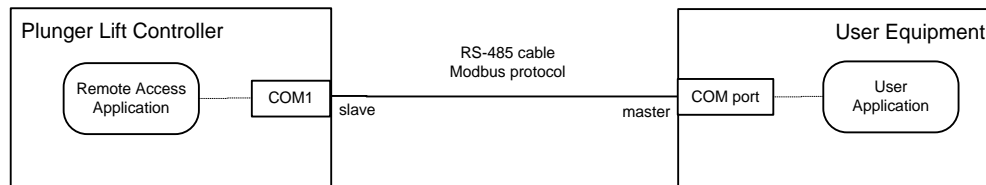
Figure 1 - High Level Connection Overview

This document describes how to use Modbus commands to operate the *Remote Access Application*. The Modbus registers and functionality described in this document are for the monitoring and modification of typical controller parameters.

1.1 References

[1] *ALiEn² Installation and Operations Manual*; v 2.2.x July 1, 2020; Extreme Telematics Corp.

[2] *Modicon Modbus Protocol Reference Guide*; PI-MBUS-300 Rev. J; June 1996; MODICON Inc.

[3] *Modbus Application Protocol Specification*; modbus.org; May 8, 2002.

2   Controller Setup

Access to the settings used for Modbus Communications are only available through the controller menus. The following sections give a brief overview of the initial setup required. More detailed descriptions are available in the ALiEn^2 Installation and Operations Manual.

2.1   Communication Settings

The Modbus menu is available inside the Install menu. This menu allows you to configure the settings of the controller. Please note that these settings must match the settings of your communications network and SCADA Host in order to function properly.

2.1.1   Station Address

The station address is a unique identifier that will be used by the host to communicate with a single controller. This address must not be duplicated within the same segment of your network. Valid addresses are 1 to 247. The default is 1.

2.1.2   Protocol

The protocol can be set to either RTU(binary) or ASCII (text). RTU is definitely more common as it takes less bits to transmit the same amount of information. This must match the same setting that is used by your SCADA Host. The default is RTU.

2.1.3   Baud Rate

The baud rate can be set to 1200, 2400, 4800, 9600, or 19200. This is used to se the bit rate of data transmitted on the communication line. This must match the same baud rate as the rest of your network. A mismatched baud rate will result in all communication being discarded at the controller. The default is 9600 bps.

2.1.4   Data Bits

The data bits parameter sets the number of bits in each transmitted or received character. This can be set to 7 or 8. The default is 8.

2.1.5   Parity

This parameter will set the parity of the character. It can be set to even, odd, or none. The default is none.

2.1.6   Stop Bits

The stop bits controls the number of stop bits that are to be present at the end of each character. This parameter can be set to 1 or 2. The default is 1.

3   Layer 1 Operation

The ALiEn^2 has a 2-wire RS-485 port (COM 1) that operates as a Modbus Slave. COM 2 on the ALiEn^2 Expert acts as a Modbus Master to interact with the Sasquatch Plunger Velocity Sensor. See [1], for wiring details.

Supported bit rates: 1200, 2400, 4800, 9600, and 19,200 bps.

Supported character formats:

Table 1 - Supported Communication Rates and Formats

Data bits	Parity	Stop Bits	Protocol
7	None	2	ASCII, RTU
7	Odd	1	ASCII, RTU
7	Odd	2	ASCII, RTU
7	Even	1	ASCII, RTU
7	Even	2	ASCII, RTU
8	None	1	ASCII, RTU
8	None	2	ASCII, RTU
8	Odd	1	ASCII, RTU
8	Odd	2	ASCII, RTU
8	Even	1	ASCII, RTU
8	Even	2	ASCII, RTU

The bit rate and character format are configured using the front panel only. Technically, all character formats for RTU protocol support must be 11-bits in length with 8-bits of data. This allows for 1 start bit, 8 bits of data, and two bits for parity and stop. In actual practice, this is rarely followed, so all combinations are allowed.

4　Layer 2 Operation

The ALiEn^2 supports both the Modbus ASCII and RTU protocols (see [2]). Protocol selection is configured from the front panel only, and defaults to RTU mode.

ALiEn^2 Modbus station address is configured using the front panel only (range: 1 – 247), but has a default value of 1. The ALiEn^2 will act on, but not respond to, commands using the broadcast address (i.e. zero).

The maximum byte-length of Modbus commands and responses is limited to 256 characters (see [3], §4.1).

When operating in ASCII mode, ALiEn^2 performs the following required layer 2 checks on incoming commands:

  - Parity
  - LRC
  - character silence period (1 second)
ASCII commands can be accepted upon silence detection without a terminating CR/LF.

When operating in RTU mode, ALiEn^2 performs the following required layer 2 checks on incoming commands:

  - Parity
  - CRC
  - character timeout period (1.5 character times)
  - frame silence period (3.5 character times)

5   Layer 3 Operation

The following Modbus commands are supported:

Table 2 - Supported Modbus Commands

Code	Current Terminology	Classic Terminology	Data Resolution
01	Read Coils	Read Coil Status	1-bit
02	Read Input Discretes	Read Input Status	1-bit
03	Read Multiple Registers	Read Holding Registers	16-bit
04	Read Input Registers	Read Input Registers	16-bit
05	Write Coil	Force Single Coil	1-bit
06	Write Single Register	Preset Single Register	16-bit
15	Force Multiple Coils	Force Multiple Coils	16-bit
16	Write Multiple Registers	Preset Multiple Registers	16-bit

Normal responses are issued as required by [2].

Modbus allows for exception responses to be returned under certain failure conditions. Once again, this is not typically desired in the process control industry. As such, the controller does not normally return any exception responses. This can however be enabled through the user interface if desired. The following Modbus Exception Responses are supported:

Table 3 - Supported Modbus Exception Responses

Code	Response
01	Illegal Function
02	Illegal Data Address
03	Illegal Data Value
04	Slave Device Failure

The ALiEn² performs consistency checks on the following items received in commands:

  - number of bytes received[1]

  - *Number of Points* field

  - *Byte Count* field (if present).

If any of these checks fail, an *Illegal Data Value* exception is returned.

If an *Address* field, either explicit or implicit, is outside the known range, an *Illegal Data Address* exception is returned. The *User Application* may read Input Registers 3:1001 and 3:1002 to determine the first bank and address in the command which caused the exception. No part of the command is executed.

A *Slave Device Failure* exception is used to indicate Application Layer errors. The *User Application* may read Input Registers 3:1001 and 3:1002 to determine the bank and address in the command which caused the exception. Execution of the command terminates at this address.

5.1 Address Coding

Each register of the ALiEn² is accessed via a specific Modbus operation. Each operation contains an implied address offset. The mapping between traditional Modbus address notation, the operation performed, and the address sent in Modbus messages is shown below.

Table 4 - Modbus Message Coding

Code	Operation	Modbus Address Notation	Message Address
01	Read Coils	0: *abcd*	*abcd*
02	Read Input Discretes	1: *abcd*	*abcd*
03	Read Multiple Registers	4: *abcd*	*abcd*
04	Read Input Registers	3: *abcd*	*abcd*

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[1] In the Modbus ASCII protocol, a single byte is sent as 2 HEX-ASCII characters.

05	Write Coil	0: *abcd*	*abcd*
06	Write Single Register	4: *abcd*	*abcd*
15	Force Multiple Coils	0: *abcd*	*abcd*
16	Write Multiple Registers	4: *abcd*	*abcd*

For example, accessing register 4:4000 is done via the following operations: ReadMultipleRegisters, WriteSingleRegister, and WriteMultipleRegisters. All of these operations use the address value 4000. Accessing register 0:4000 is done with the following operations: ReadCoils and WriteCoils. These two operations also use the address value 4000, but access a different register.

6   Application Layer Operation

6.1   Basic Operation

The ALiEn² is designed to allow concurrent operation from the front panel and Modbus interface. This requires that the front panel user (*UI Application*) and the *User Application* (via the *Remote Access Interface*) not access data at the same time or overwrite each other's data. This is achieved by allowing each application to have a copy of the ALiEn² parameters to read and modify. This imposes special requirements on the *User Application*.

The information within ALiEn² is grouped into a number of data-sets. Before accessing any data within a data-set, it must be retrieved by the *Remote Access Application*. This is done so that:

- The *User Application* can read a consistent data-set: That is, one in which the data is not changing while it is being read. This means that, in general, the data-set will be out-of-date. The *User Application* should have the *Remote Access Application* retrieve a fresh copy of a data-set before each read "session".

- Changes made to a data-set will not be lost: If parameters are changed using the front panel and *User Application* at the same time, there is a potential for changes to be lost. For this reason, a lock-out mechanism is provided. The *User Application* can retrieve a data-set "for writing". This will lock-out changes to the data-set by the front panel.

6.1.1   History Logs
The ALiEn² provides access to history records. These history records are provided in a format that allows various aspects of the history to be compared. One must keep in mind that the history data is constantly changing.

The controller however does not write data to the history until a predetermined even happens. For the plunger cycle logs, the history is written each time that a cycle starts (controller moves from Close to Rise). Daily production logs are modified at the specified Day Start Time. Reading the history at the exact time that the history is being updated could lead to inconsistent data. Therefore, it is best to avoid reading the history at these times.

6.1.2   Register Set Access
A register set is defined as a fixed number of contiguous 16-bit memory locations that represent a single ALiEn² parameter. For a register set to be valid it must be accessed as an aggregate from the start address.

For read operations, the *User Application* should query the starting register address and read the entire length of the register set. Register sets must be written from low to high order with no intervening write operations. The register set is validated, by the *Remote Access Application*, as an aggregate when the high order register is written.

ALiEn^2 register set formats are defined in 7 Register Formats.

6.2   Automatic Dependent Parameter Update

The range of values for some control parameters depend on the current value of other parameters. This means that when a parameter is changed, its dependent parameters may become invalid. In this case, the dependent parameters are automatically changed in order to avoid an invalid configuration. Register assignments are such that dependent parameters have a higher register number than their "parent". This allows a group of parameters to be written with a single Modbus command with no undesired side-effects.

6.3   Concurrency Issues

6.3.1   Plunger Lift Controller Algorithm

Changes to plunger lift control parameters may be made while the control algorithm is running. These changes are saved when the Modbus Write Time expires, but are not applied until the start of the next plunger lift cycle or controller cycle restart.

The following Historical Logs are updated by the control algorithm:

Table 5 - Available Logs

Log	Updated
Cycle	At the end of each plunger lift cycle when the controller moves from Close to Rise.
Daily Production	Every 24 hours at the Day Start Time "Today's" daily production is updated every second at minimum.

It is possible, therefore, that the history us being updated while it is being read by the *User Application*. For example, at the end of the gas day, the Log 1 data becomes Log 2 and Log 7 data is removed. It is the responsibility of the *User Application* to manage this sliding window of log data at the gas day or plunger cycle boundary.

6.3.2   History Logs

All logs may be reset from the front panel. It is possible, therefore, that the currently selected log may be updated while it is being read by the *User Application*.   It is the responsibility of the *User Application* to manage this concurrent access to log data.

6.4 Error Reporting

When a *Slave Device Failure* exception is returned, the *User Application* may read Input Register 3:2001 to determine the type of failure, as follows:

Table 6 - Supported Modbus Error Codes

Error Type	Code	Description
MODBUS_ACCESS_DENIED	01	Modbus access to registers has been lockout from the device front panel. Only registers 1:0300, and 3:0300-3:0302 are accessible.
FUNCTION_NOT_SUPPORTED	02	The specified functionality of this register is not available in this firmware version.
FEATURE_NOT_ENABLED	03	The application attempted to access a data item belonging to a disabled value-added firmware feature. These features may only be enabled from the front panel.
FUNCTION_NOT_ENABLED	04	The application attempted to access a data item that requires activation via another register.
DEVICE_NOT_ENABLED	05	The application attempted to access a real device which is not present (i.e. enabled) in the ALiEn² configuration.
DATASET_NOT_LOCKED	06	The application attempted to write to a dataset which was not locked.
DEPENDENT_DATASET_NOT_LOCKED	07	The application attempted to modify parameter in a locked dataset that required an auto update parameter in an unlocked dependent dataset.
DATASET_ALREADY_LOCKED	08	The application attempted to lock a dataset which is currently locked by the integral control panel user. Try the request at a later time.
VALUE_OUT_OF_RANGE	09	The preset value for a register was outside the acceptable range of values.

Error Type	Code	Description
WRITE_SEQUENCE_ERROR	10	The registers in a register set were not written in the proper order.
LOG_NOT_SELECTED	11	The application attempted to read a data value belonging to a historical log which has not been loaded.
LOW_BATTERY	12	The request could not be performed because the ALiEn^2 is in a low battery condition.

7   Register Formats

The following sections outline the available register formats that are used throughout the register map.

- MSW = most significant word (16 bits)
- LSW = least significant word (16-bits)

7.1   Date/Time Register

- Range: 0 – 4,294,967,295

- Write MSW first when writing in seconds format, followed by LSW

- Use the Time Format coil to switch the format

Table 7 - Date/Time Register Format

Number	Description (Seconds Format)	Description(H:M:S Format)
Start	Seconds since January 1, 2000 (MSW)	Years since 2000 (e.g. value of 16 means year 2016)
Start + 1	Seconds since January 1, 2000 (LSW)	Month
Start + 2	Reserved	Day
Start + 3	Reserved	Hours
Start + 4	Reserved	Minutes
Start + 5	Reserved	Seconds

7.2   Elapsed Time Register

- Range: 0 – 3,599,999 seconds (1000 hours)

- Write LSW first when writing in seconds format

- Use the Time Format coil to switch the format

Table 8 - Elapsed Time Register Format

Number	Description (Seconds Format)	Description(H:M:S Format)
Start	Seconds (MSW)	Hours
Start + 1	Seconds (LSW)	Minutes

Start + 2	Reserved	Seconds

7.3 Double Word Register

Table 9 - Double Word Register Format

Number	Description
Start	MSW
Start + 1	LSW

8   Register Map

The following sections outline each of the sections of registers as defined by the Modbus protocol. These groups are as follows:

- Coils – Single bit registers that can be written to cause an action
- Input Discretes – single bit registers that are a read only status
- Input Registers – 16 bit registers that are a read only status
- Holding Registers – 16 bit registers that can be read and read.

Note: Any registers that are grayed out have not been implemented. Writes to these registers will be ignored. Reads from these registers will return unpredictable results.

Note: Modbus uses a register number, which starts at 1 to describe the location of data. The actual address that is passed in the protocol layer is 0. This means that depending on the tool you are using, you may need to subtract 1 from the register number to access the appropriate data.

8.1   Coils

Table 10 - Available Coils

Register	Description	Read	Write
Basic Control			
0:0001	Open Mimic the Open button functionality from the keypad.	N/A	1 – Open
0:0002	Close Mimic the Close button functionality from the keypad.	N/A	1 – Close
0:0003	Restart Controller	N/A	1 - Restart Controller
0:0004	Reset Cycle Log	N/A	1 - Reset Log
0:0005	Reset Daily Statistics Log This resets all previous days, but does not reset the current day.	N/A	1 - Reset Log
0:0006	Reset Error Logs	N/A	1 - Reset Log

Register	Description	Read	Write
0:0007	Time Format	Current Value	0 – Seconds 1 – H:M:S
0:0008	Stop Hold Open	N/A	1 – Open
0:0009	Stop Hold Closed	N/A	1 – Close
0:0010	Units	N/A	0 - Imperial 1 - Metric
0:0011	Reset Total Production Log	N/A	1 - Reset Log
0:0012	Reset Plunger Statistics	N/A	1 - Reset Log
0:0013	Manually Open Sales	N/A	1 – Open
0:0014	Manually Close Sales	N/A	1 – Close
0:0015	Manually Open Valve B	N/A	1 – Open
0:0016	Manually Close Valve B	N/A	1 – Close
0:0017	Manually Open Auto Catch	N/A	1 – Open
0:0018	Manually Close Auto Catch	N/A	1 – Close
0:0019	Clear Device Log 1	N/A	1 - Reset Log
0:0020	Clear Device Log 2	N/A	1 - Reset Log
0:0021	Current Cycle Log First cycle log entry is current cycle when enabled	Current Value	0 – Disabled 1 – Enabled

8.2 Input Discretes

Table 11 - Available Input Discretes

Register	Description	Read
Controller Information		
1:0001	Operator Present	0 – No operator at the controller 1 – An operator is currently using the controller
1:0002	Slave Device Access This register may be read to determine if access to data registers in the Modbus slave device is permitted.	0 – Modbus slave access disabled 1 – Modbus slave access enabled
1:0003	Date/Time Set	0 – date/time not set 1 - date/time set
1:0004 – 1:0013	Reserved	N/A
1:0014	Product Feature – Timer Based Optimization	0 – Feature disabled 1 – Feature enabled
1:0015 – 1:0020	Reserved	N/A
Output Status		
1:0021	Sales Valve A Status	0 - Valve A closed 1 - Valve A open
1:0022	Valve B Status This valve status is only valid when valve B is enabled.	0 - Valve B closed 1 - Valve B open
1:0023	Auto Catch Status	0 - Valve Auto Catch closed 1 - Valve Auto Catch open
1:0024	Plunger Status	0 – Absent 1 - Present

Register	Description	Read
1:0025 – 1:0030	Reserved	N/A
Input Device Status		
1:0031	Battery Switch Value	0 – Battery Good 1 – Battery Low
1:0032	Line Pressure Switch Value The registers may only be read when the *Line Pressure Device* is enabled as a switch (see register 4:0241) The value returned from this register may be invalid. The validity of the reading can be determined by reading the Line Pressure Device Status (see register 3:0052).	0 – Line Pressure Reset 1 – Line Pressure Tripped
1:0033	Casing Pressure Switch Value The registers may only be read when the *Casing Pressure Device* is enabled as a switch (see register 4:0261) The value returned from this register may be invalid. The validity of the reading can be determined by reading the Casing Pressure Device Status (see register 3:0053).	0 – Casing Pressure Reset 1 – Casing Pressure Tripped
1:0034	Differential Pressure Switch Value The registers may only be read when the *Differential Pressure Device* is enabled as a switch (see register 4:0291) The value returned from this register may be invalid. The validity of the reading can be determined by reading the Differential Pressure Device Status (see register 3:0054).	0 – Flow DP Reset 1 – Flow DP Tripped

Register	Description	Read
1:0035	Flow Switch Value The registers may only be read when the *Flow Device* is enabled as a switch (see register 4:0311) The value returned from this register may be invalid. The validity of the reading can be determined by reading the Flow Device Status (see register 3:0055).	0 – Flow Reset 1 – Flow Tripped
1:0036	Tubing Pressure Switch Value The registers may only be read when the *Tubing Pressure Device* is enabled as a switch (see register 4:0331) The value returned from this register may be invalid. The validity of the reading can be determined by reading the Tubing Pressure Device Status (see register 3:0056).	0 – Tubing Pressure Reset 1 – Tubing Pressure Tripped

8.3   Input Registers

Register	Description	Read
Controller Information		
3:0001 – 3:0002	Controller Serial Number	Double Word format: 0 - 99999
3:0003	Firmware Version – Major Version	0 – 99
3:0004	Firmware Version – Minor Version	0 – 99
3:0005	Firmware Version – Fix Version	0 – 99
3:0006 – 3:0010	Reserved	N/A
3:0011	Current Controller State	0 = Afterflow 1 = Afterflow Delay 2 = Close 3 = Non-Arrival Close 4 = Extended Afterflow 5 = Rise 6 = Stopped 7 = Extra Close
3:0012 – 3:0014	Controller Status Time Remaining If the controller is stopped, the contents of these registers are zero.	Elapsed Time format
3:0015 – 3:0020	Current State Begin Time	Date/Time format

Register	Description	Read
3:0021	Controller Status Reason	0 = Fast Trip 1 = High Line Pressure 2 = High Casing Line Diff 3 = Low CP Rate of Change 4 = Low Casing Pressure 5 = Low Battery 6 = Low Flow 7 = Max Open Time Expired 8 = Non-Arrival 9 = Normal Operation 10 = Operator Command 11 = Startup 12 = Danger Velocity 13 = Hold Closed 14 = Hold Open 15 = Low Tubing Pressure
3:0022 – 3:0030	Reserved	N/A
Input Device Value		
3:0031	Battery Voltage Value The value returned from this register may be invalid. The validity of the reading can be determined by reading the Battery Voltage Valid Flag (input discrete 1:0010).	350 – 999 (centi-volts)
3:0032	Line Pressure Value The registers may only be read when the *Line Pressure Device* is enabled as a sensor (see register 4:6030). The value returned from this register may be invalid. The validity of the reading can be determined by reading the Line Pressure Valid Flag (input discrete 1:0011).	0 – Max Line Pressure kPa (psi) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 psi)

Register	Description	Read
3:0033	Casing Pressure Value	0 – Max Casing Pressure kPa (psi) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 psi)
3:0034	Differential Pressure Value	0 – Max Differential mbar(" WC) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 " WC)
3:0035	Flow Value	0 – Max Flow e3m3/d (mcf/d) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 e3m3/d)
3:0036	Tubing Pressure Value	0 – Max Tubing Pressure kPa (psi) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 psi)
3:0037 – 3:0050	Reserved	N/A
3:0051	Battery Voltage Status The contents of this address are latched after executing a read operation of the Battery Voltage Value (register 3:0002).	1 - scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid

Register	Description	Read
3:0052	Line Pressure Device Status The contents of this address are latched after executing a read operation of the Line Pressure Switch Value (input discrete 1:0003) or the Line Pressure Sensor Value (register 3:0003).	0 - disabled 1 – scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid
3:0053	Casing Pressure Device Status	0 - disabled 1 – scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid
3:0054	Differential Pressure Device Status	0 - disabled 1 – scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid
3:0055	Flow Device Status	0 - disabled 1 – scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid
3:0056	Tubing Pressure Device Status	0 - disabled 1 – scan pending 2 - def change pending 3 – value under range 4 – value over range 5 – value invalid 6 – value valid
3:0057 – 3:0100	Reserved	N/A

Register	Description	Read
Daily Production Log – Backward Compatible		
3:0101	Daily Production Log Count	0 - 8
3:0102 – 3:0149	Daily Production Log - Save Time – 8 Entries 3:0102 – 3:0107 – Entry -1 (Newest Entry) 3:0108 – 3:0113 – Entry -2 3:0114 – 3:0119 – Entry -3 3:0120 – 3:0125 – Entry -4 3:0126 – 3:0131 – Entry -5 3:0132 – 3:0137 – Entry -6 3:0138 – 3:0143 – Entry -7 3:0144 – 3:0149 – Entry -8 (Oldest Entry)	Array(8): Date/Time format
3:0150 – 3:0173	Daily Production Log - Open Time – 8 Entries 3:0153 – 3:0155 – Entry -1 (Newest Entry) 3:0156 – 3:0158 – Entry -2 3:0159 – 3:0161 – Entry -3 3:0162 – 3:0164 – Entry -4 3:0165 – 3:0167 – Entry -5 3:0168 – 3:0170 – Entry -6 3:0171 – 3:0173 – Entry -7 3:0174 – 3:0176 – Entry -8 (Oldest Entry)	Array(8): Elapsed Time format
3:0174 – 3:0197	Daily Production Log - Close Time - 8 Entries 3:0174 – 3:0176 – Entry -1 (Newest Entry) 3:0177 – 3:0179 – Entry -2 3:0180 – 3:0182 – Entry -3 3:0183 – 3:0185 – Entry -4 3:0186 – 3:0188 – Entry -5 3:0189 – 3:0191 – Entry -6 3:0192 – 3:0194 – Entry -7 3:0195 – 3:0197 – Entry -8 (Oldest Entry)	Array(8): Elapsed Time format

Register	Description	Read
3:0198 – 3:0213	Daily Production Log - Prod Volume - 8 Entries 3:0198 – 3:0199 – Entry -1 (Newest Entry) 3:0200 – 3:0201 – Entry -2 3:0202 – 3:0203 – Entry -3 3:0204 – 3:0205 – Entry -4 3:0206 – 3:0207 – Entry -5 3:0208 – 3:0209 – Entry -6 3:0210 – 3:0211 – Entry -7 3:0212 – 3:0213 – Entry -8 (Oldest Entry)	Array(8): 0 – 4294967296 e3m3 (mcf) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 e3m3)
3:0214 – 3:0221	Daily Production Log - Cycle Count – 8 Entries 3:0214 – Entry -1 (Newest Entry) 3:0215 – Entry -2 3:0216 – Entry -3 3:0217 – Entry -4 3:0218 – Entry -5 3:0219 – Entry -6 3:0220 – Entry -7 3:0221 – Entry -8 (Oldest Entry)	Array(8): 0 - 65535
3:0222 – 3:0229	Daily Production Log - Normal Arrival Count – 8 Entries 3:0222 – Entry -1 (Newest Entry) 3:0223 – Entry -2 3:0224 – Entry -3 3:0225 – Entry -4 3:0226 – Entry -5 3:0227 – Entry -6 3:0228 – Entry -7 3:0229 – Entry -8 (Oldest Entry)	Array(8): 0 - 65535
3:0230 – 3:0237	Daily Production Log - Non-Arrival Count – 8 Entries 3:0230 – Entry -1 (Newest Entry) 3:0231 – Entry -2 3:0232 – Entry -3 3:0233 – Entry -4 3:0234 – Entry -5 3:0235 – Entry -6 3:0236 – Entry -7 3:0237 – Entry -8 (Oldest Entry)	Array(8): 0 - 65535

Register	Description	Read
3:0238 – 3:0245	Daily Production Log - Fast Trip Count – 8 Entries 3:0238 – Entry -1 (Newest Entry) 3:0239 – Entry -2 3:0240 – Entry -3 3:0241 – Entry -4 3:0242 – Entry -5 3:0243 – Entry -6 3:0244 – Entry -7 3:0245 – Entry -8 (Oldest Entry)	Array(8): 0 - 65535
3:0239	Daily Production Log - Line Pressure Shut-in Count - 8 Entries 3:0246 – Entry -1 (Newest Entry) 3:0247 – Entry -2 3:0248 – Entry -3 3:0249 – Entry -4 3:0250 – Entry -5 3:0251 – Entry -6 3:0252 – Entry -7 3:0253 – Entry -8 (Oldest Entry)	Array(8): 0 - 65535
3:0254 – 3:0261	Daily Production Log – Max Open Count – 8 Entries 3:0254 – Entry -1 (Newest Entry) 3:0255 – Entry -2 3:0256 – Entry -3 3:0257 – Entry -4 3:0258 – Entry -5 3:0259 – Entry -6 3:0260 – Entry -7 3:0261 – Entry -8 (Oldest Entry)	0 - 65535

Register	Description	Read
3:0262 – 3:0269	Daily Production Log – Low Battery Count – 8 Entries 3:0262 – Entry -1 (Newest Entry) 3:0263 – Entry -2 3:0264 – Entry -3 3:0265 – Entry -4 3:0266 – Entry -5 3:0267 – Entry -6 3:0268 – Entry -7 3:0269 – Entry -8 (Oldest Entry)	0 - 65535
3:0270 – 3:0277	Daily Production Log – Operator Change Count – 8 Entries 3:0270 – Entry -1 (Newest Entry) 3:0271 – Entry -2 3:0272 – Entry -3 3:0273 – Entry -4 3:0274 – Entry -5 3:0275 – Entry -6 3:0276 – Entry -7 3:0277 – Entry -8 (Oldest Entry)	0 - 65535
3:0278 – 3:0285	Daily Production Log – Startup Count – 8 Entries 3:0278 – Entry -1 (Newest Entry) 3:0279 – Entry -2 3:0280 – Entry -3 3:0281 – Entry -4 3:0282 – Entry -5 3:0283 – Entry -6 3:0284 – Entry -7 3:0285 – Entry -8 (Oldest Entry)	0 - 65535

Register	Description	Read
3:0286 – 3:0293	Daily Production Log – Danger Count – 8 Entries 3:0286 – Entry -1 (Newest Entry) 3:0287 – Entry -2 3:0288 – Entry -3 3:0289 – Entry -4 3:0290 – Entry -5 3:0291 – Entry -6 3:0292 – Entry -7 3:0293 – Entry -8 (Oldest Entry)	0 - 65535
3:0294 - 3:0317	Daily Production Log - Vent Time – 8 Entries 3:0294 - 3:0296 – Entry -1 (Newest Entry) 3:0297 - 3:0299 – Entry -2 3:0300 - 3:0302 – Entry -3 3:0303 - 3:0305 – Entry -4 3:0306 - 3:0308 – Entry -5 3:0309 - 3:0311 – Entry -6 3:0312 - 3:0314 – Entry -7 3:0315 - 3:0317 – Entry -8 (Oldest Entry)	Elapsed Time format
3:0318 – 3:0335* * Not in all software builds	Daily Production Log – Minimum Average Velocity – 8 Entries 3:0318 – Entry -1 (Newest Entry) 3:0319 – Entry -2 3:0320 – Entry -3 3:0321 – Entry -4 3:0322 – Entry -5 3:0323 – Entry -6 3:0324 – Entry -7 3:0325 – Entry -8 (Oldest Entry)	Array(8): 0 – 65535

Register	Description	Read
3:0326 – 3:0333* * Not in all software builds	Daily Production Log – Maximum Average Velocity – 8 Entries 3:0326 – Entry -1 (Newest Entry) 3:0327 – Entry -2 3:0328 – Entry -3 3:0329 – Entry -4 3:0330 – Entry -5 3:0331 – Entry -6 3:0332 – Entry -7 3:0333 – Entry -8 (Oldest Entry)	Array(8): 0 – 65535
3:0334– 3:0341* * Not in all software builds	Daily Production Log – Minimum Surface Velocity – 8 Entries 3:0334 – Entry -1 (Newest Entry) 3:0335 – Entry -2 3:0336 – Entry -3 3:0337 – Entry -4 3:0338 – Entry -5 3:0339 – Entry -6 3:0340 – Entry -7 3:0341 – Entry -8 (Oldest Entry)	Array(8): 0 – 65535
3:0342 – 3:0349* * Not in all software builds	Daily Production Log – Minimum Surface Velocity – 8 Entries 3:0342 – Entry -1 (Newest Entry) 3:0343 – Entry -2 3:0344 – Entry -3 3:0345 – Entry -4 3:0346 – Entry -5 3:0347 – Entry -6 3:0348 – Entry -7 3:0349 – Entry -8 (Oldest Entry)	Array(8): 0 – 65535
3:0350– 3:0900	Reserved	N/A
Total Production Log		
3:0901 - 3:0906	Total Production Log - Reset Time	Date/Time format
3:0907 - 3:0909	Total Production Log - Open Time	Elapsed Time format
3:0910 - 3:0912	Total Production Log - Close Time	Elapsed Time format

Register	Description	Read
3:0913 - 3:0914	Total Production Log - Prod Volume	0 – 4294967296 e3m3 (mcf) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 e3m3)
3:0915	Total Production Log - Cycle Count	0 - 65535
3:0916	Total Production Log - Normal Arrival Count	0 - 65535
3:0917	Total Production Log – Non-Arrival Count	0 - 65535
3:0918	Total Production Log - Fast Trip Count	0 - 65535
3:0919	Total Production Log - Line Pressure Shut-in Count	0 - 65535
3:0920	Total Production Log – Max Open Count	0 - 65535
3:0921	Total Production Log – Low Battery Count	0 - 65535
3:0922	Total Production Log – Operator Change Count	0 - 65535
3:0923	Total Production Log – Startup Count	0 - 65535
3:0924	Total Production Log – Danger Count	0 - 65535
3:0925 - 3:0927	Total Production Log - Vent Time	Elapsed Time format
3:0928*	Total Production Log – Minimum Average Velocity	0 – 65535
3:0929*	Total Production Log – Maximum Average Velocity	0 - 65535
3:0930*	Total Production Log – Minimum Surface Velocity	0 - 65535
3:0931*	Total Production Log – Maximum Surface Velocity	0 - 65535
* Not in all software builds		
3:0928 – 3:0980	Reserved	N/A

Register	Description	Read
Plunger Statistics		
3:0981 - 3:0986	Plunger Statistics - Reset Time	Date/Time format
3:0987 – 3:0988	Total Plunger Arrivals	0 - 4294967296
3:0989 – 3:0990	Total Plunger kms Travelled	0 - 4294967296
3:0991 – 3:1000	Reserved	N/A
Plunger Cycle Log – Backward Compatible		
3:1001	Cycle Log Count	0 - 20
3:1002 -3:1121	Cycle Log Start Time – 20 Entries 3:1002 - 3:1007 – Entry -1 (Newest Entry) 3:1008 - 3:1013 – Entry -2 3:1014 - 3:1019 – Entry -3 3:1020 - 3:1025 – Entry -4 3:1026 - 3:1031 – Entry -5 3:1032 - 3:1037 – Entry -6 3:1038 - 3:1043 – Entry -7 3:1044 - 3:1049 – Entry -8 3:1050 - 3:1055 – Entry -9 3:1056 - 3:1061 – Entry -10 3:1062 - 3:1067 – Entry -11 3:1068 - 3:1073 – Entry -12 3:1074 - 3:1079 – Entry -13 3:1080 - 3:1085 – Entry -14 3:1086 - 3:1091 – Entry -15 3:1092 - 3:1097 – Entry -16 3:1098 - 3:1103 – Entry -17 3:1104 - 3:1109 – Entry -18 3:1110 - 3:1115 – Entry -19 3:1116 - 3:1121 – Entry -20 (Oldest Entry)	Array(20): Date/Time format

Register	Description	Read
3:1122	Cycle Log Type – 20 Entries 3:1122 – Entry -1 (Newest Entry) 3:1123 – Entry -2 3:1124 – Entry -3 3:1125 – Entry -4 3:1126 – Entry -5 3:1127 – Entry -6 3:1128 – Entry -7 3:1129 – Entry -8 3:1130 – Entry -9 3:1131 – Entry -10 3:1132 – Entry -11 3:1133 – Entry -12 3:1134 – Entry -13 3:1135 – Entry -14 3:1136 – Entry -15 3:1137 – Entry -16 3:1138 – Entry -17 3:1139 – Entry -18 3:1140 – Entry -19 3:1141 – Entry -20 (Oldest Entry)	Array(20): Enumeration 0 = Normal 1 = Fast-Trip 2 = Non-Arrival 3 = Max Open 4 = Low Battery Shutdown 5 = Operator Change 6 = Line Pressure Shut In 7 = Startup 8 = Danger Velocity
3:1142 - 3:1201	Cycle Log Rise Time – 20 Entries 3:1142 - 3:1144 – Entry -1 (Newest Entry) 3:1145 - 3:1147 – Entry -2 3:1148 - 3:1150 – Entry -3 3:1151 - 3:1153 – Entry -4 3:1154 - 3:1156 – Entry -5 3:1157 - 3:1159 – Entry -6 3:1160 - 3:1162 – Entry -7 3:1163 - 3:1165 – Entry -8 3:1166 - 3:1168 – Entry -9 3:1169 - 3:1171 – Entry -10 3:1172 - 3:1174 – Entry -11 3:1175 - 3:1177 – Entry -12 3:1178 - 3:1180 – Entry -13 3:1181 - 3:1183 – Entry -14 3:1184 - 3:1186 – Entry -15 3:1187 - 3:1189 – Entry -16 3:1190 - 3:1192 – Entry -17 3:1193 - 3:1195 – Entry -18 3:1196 - 3:1198 – Entry -19 3:1199 - 3:1201 – Entry -20 (Oldest Entry)	Array(20): Elapsed Time format

Register	Description	Read
3:1202 - 3:1261	Cycle Log Afterflow Time – 20 Entries 3:1202 - 3:1204 – Entry -1 (Newest Entry) 3:1205 - 3:1207 – Entry -2 3:1208 - 3:1210 – Entry -3 3:1211 - 3:1213 – Entry -4 3:1214 - 3:1216 – Entry -5 3:1217 - 3:1219 – Entry -6 3:1220 - 3:1222 – Entry -7 3:1223 - 3:1225 – Entry -8 3:1226 - 3:1228 – Entry -9 3:1229 - 3:1231 – Entry -10 3:1232 - 3:1234 – Entry -11 3:1235 - 3:1237 – Entry -12 3:1238 - 3:1240 – Entry -13 3:1241 - 3:1243 – Entry -14 3:1244 - 3:1246 – Entry -15 3:1247 - 3:1249 – Entry -16 3:1250 - 3:1252 – Entry -17 3:1253 - 3:1255 – Entry -18 3:1256 - 3:1258 – Entry -19 3:1259 - 3:1261 – Entry -20 (Oldest Entry)	Array(20): Elapsed Time format
3:1262 - 3:1321	Cycle Log Close Time – 20 Entries 3:1262 - 3:1264 – Entry -1 (Newest Entry) 3:1265 - 3:1267 – Entry -2 3:1268 - 3:1270 – Entry -3 3:1271 - 3:1273 – Entry -4 3:1274 - 3:1276 – Entry -5 3:1277 - 3:1279 – Entry -6 3:1280 - 3:1282 – Entry -7 3:1283 - 3:1285 – Entry -8 3:1286 - 3:1288 – Entry -9 3:1289 - 3:1291 – Entry -10 3:1292 - 3:1294 – Entry -11 3:1295 - 3:1297 – Entry -12 3:1298 - 3:1300 – Entry -13 3:1301 - 3:1303 – Entry -14 3:1304 - 3:1306 – Entry -15 3:1307 - 3:1309 – Entry -16 3:1310 - 3:1312 – Entry -17 3:1313 - 3:1315 – Entry -18 3:1316 - 3:1318 – Entry -19 3:1319 - 3:1321 – Entry -20 (Oldest Entry)	Array(20): Elapsed Time format

Register	Description	Read
3:1322 - 3:1381	Cycle Log Vent Time – 20 Entries 3:1322 - 3:1324 – Entry -1 (Newest Entry) 3:1325 - 3:1327 – Entry -2 3:1328 - 3:1330 – Entry -3 3:1331 - 3:1333 – Entry -4 3:1334 - 3:1336 – Entry -5 3:1337 - 3:1339 – Entry -6 3:1340 - 3:1342 – Entry -7 3:1343 - 3:1345 – Entry -8 3:1346 - 3:1348 – Entry -9 3:1349 - 3:1351 – Entry -10 3:1352 - 3:1354 – Entry -11 3:1355 - 3:1357 – Entry -12 3:1358 - 3:1360 – Entry -13 3:1361 - 3:1363 – Entry -14 3:1364 - 3:1366 – Entry -15 3:1367 - 3:1369 – Entry -16 3:1370 - 3:1372 – Entry -17 3:1373 - 3:1375 – Entry -18 3:1376 - 3:1378 – Entry -19 3:1379 - 3:1381 – Entry -20 (Oldest Entry)	Array(20): Elapsed Time format
3:1382 - 3:1401* * Not in all software builds	Cycle Log Average Velocity – 20 Entries 3:1382 – Entry -1 (Newest Entry) 3:1383 – Entry -2 3:1384 – Entry -3 3:1385 – Entry -4 3:1386 – Entry -5 3:1387 – Entry -6 3:1388 – Entry -7 3:1389 – Entry -8 3:1390 – Entry -9 3:1391 – Entry -10 3:1392 – Entry -11 3:1393 – Entry -12 3:1394 – Entry -13 3:1395 – Entry -14 3:1396 – Entry -15 3:1397 – Entry -16 3:1398 – Entry -17 3:1399 – Entry -18 3:1400 – Entry -19 3:1401 – Entry -20 (Oldest Entry)	Array(20): 0 - 65535

Register	Description	Read
3:1402 - 3:1421* * Not in all software builds	Cycle Log Surface Velocity – 20 Entries 3:1402 – Entry -1 (Newest Entry) 3:1403 – Entry -2 3:1404 – Entry -3 3:1405 – Entry -4 3:1406 – Entry -5 3:1407 – Entry -6 3:1408 – Entry -7 3:1409 – Entry -8 3:1410 – Entry -9 3:1411 – Entry -10 3:1412 – Entry -11 3:1413 – Entry -12 3:1414 – Entry -13 3:1415 – Entry -14 3:1416 – Entry -15 3:1417 – Entry -16 3:1418 – Entry -17 3:1419 – Entry -18 3:1420 – Entry -19 3:1421 – Entry -20 (Oldest Entry)	Array(20): 0 – 65535

Register	Description	Read
3:1422 - 3:1441* * Not in all software builds	Cycle Log Surface Velocity Confidence Code – 20 Entries 3:1422 – Entry -1 (Newest Entry) 3:1423 – Entry -2 3:1424 – Entry -3 3:1425 – Entry -4 3:1426 – Entry -5 3:1427 – Entry -6 3:1428 – Entry -7 3:1429 – Entry -8 3:1430 – Entry -9 3:1431 – Entry -10 3:1432 – Entry -11 3:1433 – Entry -12 3:1434 – Entry -13 3:1435 – Entry -14 3:1436 – Entry -15 3:1437 – Entry -16 3:1438 – Entry -17 3:1439 – Entry -18 3:1440 – Entry -19 3:1441 – Entry -20 (Oldest Entry)	Array(20): -32768 = Uninitialized -4 = Velocity Calc Error -3 = Velocity Calc Error -2 = Velocity Over-range -1 = Velocity Under-range 0 = Reserved 1 = Reserved 2 = Valid, 2 Points Used 3 = Valid, 3 Points Used 4 = Valid, 4 Points Used 5 = Valid, 5 Points Used 6 = Valid, 6 Points Used 7 = Valid, 7 Points Used 8 = Valid, 8 Points Used
3:1382 – 3:2000	Reserved	N/A
Modbus Error Log		
3:2001	Slave Access Failure Type This register may be read to view details of the last *Slave Device Failure* or *Illegal Data Address* exception response (see §6.4).	0 – 12
3:2002	Slave Access Failure Bank Contains the Modbus bank in which the last *Slave Device Failure* or *Illegal Data Address* exception response occurred. The bank returned does not include any address information.	0 – 4

Register	Description	Read
3:2003	Slave Access Failure Register Contains the register number at which the last *Slave Device Failure* or *Illegal Data Address* exception response occurred. The address returned does not include any bank information. For example, *abcd* is returned for an error at address 0:*abcd*, 1:*abcd*, 3:*abcd*, or 4:*abcd*.	0 – 65535
3:2004 – 3:2010	Reserved	N/A
Firmware Error Log		
3:2011	Number of Log Entries	0 - 20
3:2012 + 3(n – 1)	Error Log Type 20 Available error logs. "n" in the register column represents the error log number.	1 = System Definition Error 2 = Assertion Failure 3 = Check Failure 255 = No Error Log Available
3:2013 + 3(n – 1)	Error Log Data 1	Contact for Details
3:2014 + 3(n – 1)	Error Log Data 2	Contact for Details
3:2072 – 3:2100	Reserved	N/A
Device Log 1		
3:2101	Device Log Samples	0 - 500
3:2102 -3:2107	Last Sample Time	Date/Time format

Register	Description	Read
3:2108 + (n -1)	Sample n 500 Available device samples. "n" in the register column represents the sample number.	0 – 65535 Units, scale, and range are the same as corresponding device value input register. (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 psi)
3:2508 – 3:3000	Reserved	N/A
Device Log 2		
3:3001	Device Log Samples	0 - 500
3:3002 -3:3007	Last Sample Time	Date/Time format
3:3008 + (n -1)	Sample n 500 Available device samples. "n" in the register column represents the sample number.	0 – 65535 Units, scale, and range are the same as corresponding device value input register. (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 psi)
3:3508 – 3:5000	Reserved	N/A
Daily Production Log – Full Implementation		
3:5001	Daily Production Log Count	0 - 8

Register	Description	Read
3:5002 - 3: 5091	Daily Production Log - Save Time – 15 Entries 3:5002 - 3:5007 – Entry -1 (Newest Entry) 3:5008 - 3:5013 – Entry -2 3:5014 - 3:5019 – Entry -3 3:5020 - 3:5025 – Entry -4 3:5026 - 3:5031 – Entry -5 3:5032 - 3:5037 – Entry -6 3:5038 - 3:5043 – Entry -7 3:5044 - 3:5049 – Entry -8 3:5050 - 3:5055 – Entry -9 3:5056 - 3:5061 – Entry -10 3:5062 - 3:5067 – Entry -11 3:5068 - 3:5073 – Entry -12 3:5074 - 3:5079 – Entry -13 3:5080 - 3:5085 – Entry -14 3:5086 - 3:5091 – Entry -15 (Oldest Entry)	Array(15): Date/Time format
3:5092 - 3:5136	Daily Production Log - Open Time – 15 Entries 3:5092 - 3:5094 – Entry -1 (Newest Entry) 3:5095 - 3:5097 – Entry -2 3:5098 - 3:5100 – Entry -3 3:5101 - 3:5103 – Entry -4 3:5104 - 3:5106 – Entry -5 3:5107 - 3:5109 – Entry -6 3:5110 - 3:5112 – Entry -7 3:5113 - 3:5115 – Entry -8 3:5116 - 3:5118 – Entry -9 3:5119 - 3:5121 – Entry -10 3:5122 - 3:5124 – Entry -11 3:5125 - 3:5127 – Entry -12 3:5128 - 3:5130 – Entry -13 3:5131 - 3:5133 – Entry -14 3:5134 - 3:5136 – Entry -15 (Oldest Entry)	Array(15): Elapsed Time format

Register	Description	Read
3:5137 - 3:5181	Daily Production Log - Close Time – 15 Entries 3:5137 - 3:5139 – Entry -1 (Newest Entry) 3:5140 - 3:5142 – Entry -2 3:5143 - 3:5145 – Entry -3 3:5146 - 3:5148 – Entry -4 3:5149 - 3:5151 – Entry -5 3:5152 - 3:5154 – Entry -6 3:5155 - 3:5157 – Entry -7 3:5158 - 3:5160 – Entry -8 3:5161 - 3:5163 – Entry -9 3:5164 - 3:5166 – Entry -10 3:5167 - 3:5169 – Entry -11 3:5170 - 3:5172 – Entry -12 3:5173 - 3:5175 – Entry -13 3:5176 - 3:5178 – Entry -14 3:5179 - 3:5181 – Entry -15 (Oldest Entry)	Array(15): Elapsed Time format
3:5182 - 3:5211	Daily Production Log - Prod Volume – 15 Entries 3:5182 - 3:5183 – Entry -1 (Newest Entry) 3:5184 - 3:5185 – Entry -2 3:5186 - 3:5187 – Entry -3 3:5188 - 3:5189 – Entry -4 3:5190 - 3:5191 – Entry -5 3:5192 - 3:5193 – Entry -6 3:5194 - 3:5195 – Entry -7 3:5196 - 3:5197 – Entry -8 3:5198 - 3:5199 – Entry -9 3:5200 - 3:5201 – Entry -10 3:5202 - 3:5203 – Entry -11 3:5204 - 3:5205 – Entry -12 3:5206 - 3:5207 – Entry -13 3:5208 - 3:5209 – Entry -14 3:5210 - 3:5211 – Entry -15 (Oldest Entry)	Array(15): 0 – 4294967296 e3m3 (mcf) (Multiplied by 10 to show decimal resolution. i.e. 100 = 10.0 e3m3)

Register	Description	Read
3:5212 - 3:5226	Daily Production Log - Cycle Count – 15 Entries 3:5212 - 3:5212 – Entry -1 (Newest Entry) 3:5213 - 3:5213 – Entry -2 3:5214 - 3:5214 – Entry -3 3:5215 - 3:5215 – Entry -4 3:5216 - 3:5216 – Entry -5 3:5217 - 3:5217 – Entry -6 3:5218 - 3:5218 – Entry -7 3:5219 - 3:5219 – Entry -8 3:5220 - 3:5220 – Entry -9 3:5221 - 3:5221 – Entry -10 3:5222 - 3:5222 – Entry -11 3:5223 - 3:5223 – Entry -12 3:5224 - 3:5224 – Entry -13 3:5225 - 3:5225 – Entry -14 3:5226 - 3:5226 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535
3:5227 - 3:5241	Daily Production Log - Normal Arrival Count – 15 Entries 3:5227 - 3:5227 – Entry -1 (Newest Entry) 3:5228 - 3:5228 – Entry -2 3:5229 - 3:5229 – Entry -3 3:5230 - 3:5230 – Entry -4 3:5231 - 3:5231 – Entry -5 3:5232 - 3:5232 – Entry -6 3:5233 - 3:5233 – Entry -7 3:5234 - 3:5234 – Entry -8 3:5235 - 3:5235 – Entry -9 3:5236 - 3:5236 – Entry -10 3:5237 - 3:5237 – Entry -11 3:5238 - 3:5238 – Entry -12 3:5239 - 3:5239 – Entry -13 3:5240 - 3:5240 – Entry -14 3:5241 - 3:5241 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535

Register	Description	Read
3:5242 - 3:5256	Daily Production Log - Non-Arrival Count – 15 Entries 3:5242 - 3:5242 – Entry -1 (Newest Entry) 3:5243 - 3:5243 – Entry -2 3:5244 - 3:5244 – Entry -3 3:5245 - 3:5245 – Entry -4 3:5246 - 3:5246 – Entry -5 3:5247 - 3:5247 – Entry -6 3:5248 - 3:5248 – Entry -7 3:5249 - 3:5249 – Entry -8 3:5250 - 3:5250 – Entry -9 3:5251 - 3:5251 – Entry -10 3:5252 - 3:5252 – Entry -11 3:5253 - 3:5253 – Entry -12 3:5254 - 3:5254 – Entry -13 3:5255 - 3:5255 – Entry -14 3:5256 - 3:5256 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535
3:5257 - 3:5271	Daily Production Log - Fast Trip Count – 15 Entries 3:5257 - 3:5257 – Entry -1 (Newest Entry) 3:5258 - 3:5258 – Entry -2 3:5259 - 3:5259 – Entry -3 3:5260 - 3:5260 – Entry -4 3:5261 - 3:5261 – Entry -5 3:5262 - 3:5262 – Entry -6 3:5263 - 3:5263 – Entry -7 3:5264 - 3:5264 – Entry -8 3:5265 - 3:5265 – Entry -9 3:5266 - 3:5266 – Entry -10 3:5267 - 3:5267 – Entry -11 3:5268 - 3:5268 – Entry -12 3:5269 - 3:5269 – Entry -13 3:5270 - 3:5270 – Entry -14 3:5271 - 3:5271 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535

Register	Description	Read
3:5272 - 3:5286	Daily Production Log - Line Pressure Shut-in – 15 Entries 3:5272 - 3:5272 – Entry -1 (Newest Entry) 3:5273 - 3:5273 – Entry -2 3:5274 - 3:5274 – Entry -3 3:5275 - 3:5275 – Entry -4 3:5276 - 3:5276 – Entry -5 3:5277 - 3:5277 – Entry -6 3:5278 - 3:5278 – Entry -7 3:5279 - 3:5279 – Entry -8 3:5280 - 3:5280 – Entry -9 3:5281 - 3:5281 – Entry -10 3:5282 - 3:5282 – Entry -11 3:5283 - 3:5283 – Entry -12 3:5284 - 3:5284 – Entry -13 3:5285 - 3:5285 – Entry -14 3:5286 - 3:5286 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535
3:5287 - 3:5301	Daily Production Log – Max Open Count – 15 Entries 3:5287 - 3:5287 – Entry -1 (Newest Entry) 3:5288 - 3:5288 – Entry -2 3:5289 - 3:5289 – Entry -3 3:5290 - 3:5290 – Entry -4 3:5291 - 3:5291 – Entry -5 3:5292 - 3:5292 – Entry -6 3:5293 - 3:5293 – Entry -7 3:5294 - 3:5294 – Entry -8 3:5295 - 3:5295 – Entry -9 3:5296 - 3:5296 – Entry -10 3:5297 - 3:5297 – Entry -11 3:5298 - 3:5298 – Entry -12 3:5299 - 3:5299 – Entry -13 3:5300 - 3:5300 – Entry -14 3:5301 - 3:5301 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535

Register	Description	Read
3:5302 - 3:5316	Daily Production Log – Low Battery Count – 15 Entries 3:5302 - 3:5302 – Entry -1 (Newest Entry) 3:5303 - 3:5303 – Entry -2 3:5304 - 3:5304 – Entry -3 3:5305 - 3:5305 – Entry -4 3:5306 - 3:5306 – Entry -5 3:5307 - 3:5307 – Entry -6 3:5308 - 3:5308 – Entry -7 3:5309 - 3:5309 – Entry -8 3:5310 - 3:5310 – Entry -9 3:5311 - 3:5311 – Entry -10 3:5312 - 3:5312 – Entry -11 3:5313 - 3:5313 – Entry -12 3:5314 - 3:5314 – Entry -13 3:5315 - 3:5315 – Entry -14 3:5316 - 3:5316 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535
3:5317 - 3:5331	Daily Production Log – Operator Change – 15 Entries 3:5317 - 3:5317 – Entry -1 (Newest Entry) 3:5318 - 3:5318 – Entry -2 3:5319 - 3:5319 – Entry -3 3:5320 - 3:5320 – Entry -4 3:5321 - 3:5321 – Entry -5 3:5322 - 3:5322 – Entry -6 3:5323 - 3:5323 – Entry -7 3:5324 - 3:5324 – Entry -8 3:5325 - 3:5325 – Entry -9 3:5326 - 3:5326 – Entry -10 3:5327 - 3:5327 – Entry -11 3:5328 - 3:5328 – Entry -12 3:5329 - 3:5329 – Entry -13 3:5330 - 3:5330 – Entry -14 3:5331 - 3:5331 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535

Register	Description	Read
3:5332 - 3:5346	Daily Production Log – Startup Count – 15 Entries 3:5332 - 3:5332 – Entry -1 (Newest Entry) 3:5333 - 3:5333 – Entry -2 3:5334 - 3:5334 – Entry -3 3:5335 - 3:5335 – Entry -4 3:5336 - 3:5336 – Entry -5 3:5337 - 3:5337 – Entry -6 3:5338 - 3:5338 – Entry -7 3:5339 - 3:5339 – Entry -8 3:5340 - 3:5340 – Entry -9 3:5341 - 3:5341 – Entry -10 3:5342 - 3:5342 – Entry -11 3:5343 - 3:5343 – Entry -12 3:5344 - 3:5344 – Entry -13 3:5345 - 3:5345 – Entry -14 3:5346 - 3:5346 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535
3:5347 - 3:5361	Daily Production Log – Danger Count – 15 Entries 3:5347 - 3:5347 – Entry -1 (Newest Entry) 3:5348 - 3:5348 – Entry -2 3:5349 - 3:5349 – Entry -3 3:5350 - 3:5350 – Entry -4 3:5351 - 3:5351 – Entry -5 3:5352 - 3:5352 – Entry -6 3:5353 - 3:5353 – Entry -7 3:5354 - 3:5354 – Entry -8 3:5355 - 3:5355 – Entry -9 3:5356 - 3:5356 – Entry -10 3:5357 - 3:5357 – Entry -11 3:5358 - 3:5358 – Entry -12 3:5359 - 3:5359 – Entry -13 3:5360 - 3:5360 – Entry -14 3:5361 - 3:5361 – Entry -15 (Oldest Entry)	Array(15): 0 - 65535

Register	Description	Read
3:5362 - 3:5406	Daily Production Log - Vent Time – 15 Entries 3:5362 - 3:5364 – Entry -1 (Newest Entry) 3:5365 - 3:5367 – Entry -2 3:5368 - 3:5370 – Entry -3 3:5371 - 3:5373 – Entry -4 3:5374 - 3:5376 – Entry -5 3:5377 - 3:5379 – Entry -6 3:5380 - 3:5382 – Entry -7 3:5383 - 3:5385 – Entry -8 3:5386 - 3:5388 – Entry -9 3:5389 - 3:5391 – Entry -10 3:5392 - 3:5394 – Entry -11 3:5395 - 3:5397 – Entry -12 3:5398 - 3:5400 – Entry -13 3:5401 - 3:5403 – Entry -14 3:5404 - 3:5406 – Entry -15 (Oldest Entry)	Array(15): Elapsed Time format
3:5407 - 3:5421* * Not in all software builds	Daily Production Log - Minimum Average Velocity – 25 Entries 3:5407 – Entry -1 (Newest Entry) 3:5408 – Entry -2 3:5409 – Entry -3 3:5410 – Entry -4 3:5411 – Entry -5 3:5412 – Entry -6 3:5413 – Entry -7 3:5414 – Entry -8 3:5415 – Entry -9 3:5416 – Entry -10 3:5417 – Entry -11 3:5418 – Entry -12 3:5419 – Entry -13 3:5420 – Entry -14 3:5421 – Entry -15 (Oldest Entry)	Array(25) 0 - 65535

Register	Description	Read
3:5422 - 3:5436* * Not in all software builds	Daily Production Log - Maximum Average Velocity – 25 Entries 3:5422 – Entry -1 (Newest Entry) 3:5423 – Entry -2 3:5424 – Entry -3 3:5425 – Entry -4 3:5426 – Entry -5 3:5427 – Entry -6 3:5428 – Entry -7 3:5429 – Entry -8 3:5430 – Entry -9 3:5431 – Entry -10 3:5432 – Entry -11 3:5433 – Entry -12 3:5434 – Entry -13 3:5435 – Entry -14 3:5436 – Entry -15 (Oldest Entry)	Array(25) 0 - 65535
3:5437 - 3:5451* * Not in all software builds	Daily Production Log - Minimum Surface Velocity – 25 Entries 3:5437 – Entry -1 (Newest Entry) 3:5438 – Entry -2 3:5439 – Entry -3 3:5440 – Entry -4 3:5441 – Entry -5 3:5442 – Entry -6 3:5443 – Entry -7 3:5444 – Entry -8 3:5445 – Entry -9 3:5446 – Entry -10 3:5447 – Entry -11 3:5448 – Entry -12 3:5449 – Entry -13 3:5450 – Entry -14 3:5451 – Entry -15 (Oldest Entry)	Array(25) 0 - 65535

Register	Description	Read
3:5452 - 3:5466* 8.3.1.1 *Not in all software builds*	Daily Production Log - Maximum Surface Velocity – 25 Entries 3:5452 – Entry -1 (Newest Entry) 3:5453 – Entry -2 3:5454 – Entry -3 3:5455 – Entry -4 3:5456 – Entry -5 3:5457 – Entry -6 3:5458 – Entry -7 3:5459 – Entry -8 3:5460 – Entry -9 3:5461 – Entry -10 3:5462 – Entry -11 3:5463 – Entry -12 3:5464 – Entry -13 3:5465 – Entry -14 3:5466 – Entry -15 (Oldest Entry)	Array(25) 0 - 65535
3:5407 – 3:6000	Reserved	N/A
Plunger Cycle Log – Full Implementation		
3:6001	Cycle Log Count	0 - 25

Register	Description	Read
3:6002 - 3:6151	Cycle Log Start Time – 25 Entries 3:6002 - 3:6007 – Entry -1 (Newest Entry) 3:6008 - 3:6013 – Entry -2 3:6014 - 3:6019 – Entry -3 3:6020 - 3:6025 – Entry -4 3:6026 - 3:6031 – Entry -5 3:6032 - 3:6037 – Entry -6 3:6038 - 3:6043 – Entry -7 3:6044 - 3:6049 – Entry -8 3:6050 - 3:6055 – Entry -9 3:6056 - 3:6061 – Entry -10 3:6062 - 3:6067 – Entry -11 3:6068 - 3:6073 – Entry -12 3:6074 - 3:6079 – Entry -13 3:6080 - 3:6085 – Entry -14 3:6086 - 3:6091 – Entry -15 3:6092 - 3:6097 – Entry -16 3:6098 - 3:6103 – Entry -17 3:6104 - 3:6109 – Entry -18 3:6110 - 3:6115 – Entry -19 3:6116 - 3:6121 – Entry -20 3:6122 - 3:6127 – Entry -21 3:6128 - 3:6133 – Entry -22 3:6134 - 3:6139 – Entry -23 3:6140 - 3:6145 – Entry -24 3:6146 - 3:6151 – Entry -25 (Oldest Entry)	Array(25) Date/Time Format

Register	Description	Read
3:6152 - 3:6176	Cycle Log Type – 25 Entries 3:6152 - 3:6152 – Entry -1 (Newest Entry) 3:6153 - 3:6153 – Entry -2 3:6154 - 3:6154 – Entry -3 3:6155 - 3:6155 – Entry -4 3:6156 - 3:6156 – Entry -5 3:6157 - 3:6157 – Entry -6 3:6158 - 3:6158 – Entry -7 3:6159 - 3:6159 – Entry -8 3:6160 - 3:6160 – Entry -9 3:6161 - 3:6161 – Entry -10 3:6162 - 3:6162 – Entry -11 3:6163 - 3:6163 – Entry -12 3:6164 - 3:6164 – Entry -13 3:6165 - 3:6165 – Entry -14 3:6166 - 3:6166 – Entry -15 3:6167 - 3:6167 – Entry -16 3:6168 - 3:6168 – Entry -17 3:6169 - 3:6169 – Entry -18 3:6170 - 3:6170 – Entry -19 3:6171 - 3:6171 – Entry -20 3:6172 - 3:6172 – Entry -21 3:6173 - 3:6173 – Entry -22 3:6174 - 3:6174 – Entry -23 3:6175 - 3:6175 – Entry -24 3:6176 - 3:6176 – Entry -25 (Oldest Entry)	Array(25) 0 = Normal 1 = Fast-Trip 2 = Non-Arrival 3 = Max Open 4 = Low Battery Shutdown 5 = Operator Change 6 = Line Pressure Shut In 7 = Start-up 8 = Danger Velocity

Register	Description	Read
3:6177 - 3:6251	Cycle Log Rise Time – 25 Entries 3:6177 - 3:6179 – Entry -1 (Newest Entry) 3:6180 - 3:6182 – Entry -2 3:6183 - 3:6185 – Entry -3 3:6186 - 3:6188 – Entry -4 3:6189 - 3:6191 – Entry -5 3:6192 - 3:6194 – Entry -6 3:6195 - 3:6197 – Entry -7 3:6198 - 3:6200 – Entry -8 3:6201 - 3:6203 – Entry -9 3:6204 - 3:6206 – Entry -10 3:6207 - 3:6209 – Entry -11 3:6210 - 3:6212 – Entry -12 3:6213 - 3:6215 – Entry -13 3:6216 - 3:6218 – Entry -14 3:6219 - 3:6221 – Entry -15 3:6222 - 3:6224 – Entry -16 3:6225 - 3:6227 – Entry -17 3:6228 - 3:6230 – Entry -18 3:6231 - 3:6233 – Entry -19 3:6234 - 3:6236 – Entry -20 3:6237 - 3:6239 – Entry -21 3:6240 - 3:6242 – Entry -22 3:6243 - 3:6245 – Entry -23 3:6246 - 3:6248 – Entry -24 3:6249 - 3:6251 – Entry -25 (Oldest Entry)	Array(25) Elapsed Time format

Register	Description	Read
3:6252 - 3:6326	Cycle Log Afterflow Time – 25 Entries 3:6252 - 3:6254 – Entry -1 (Newest Entry) 3:6255 - 3:6257 – Entry -2 3:6258 - 3:6260 – Entry -3 3:6261 - 3:6263 – Entry -4 3:6264 - 3:6266 – Entry -5 3:6267 - 3:6269 – Entry -6 3:6270 - 3:6272 – Entry -7 3:6273 - 3:6275 – Entry -8 3:6276 - 3:6278 – Entry -9 3:6279 - 3:6281 – Entry -10 3:6282 - 3:6284 – Entry -11 3:6285 - 3:6287 – Entry -12 3:6288 - 3:6290 – Entry -13 3:6291 - 3:6293 – Entry -14 3:6294 - 3:6296 – Entry -15 3:6297 - 3:6299 – Entry -16 3:6300 - 3:6302 – Entry -17 3:6303 - 3:6305 – Entry -18 3:6306 - 3:6308 – Entry -19 3:6309 - 3:6311 – Entry -20 3:6312 - 3:6314 – Entry -21 3:6315 - 3:6317 – Entry -22 3:6318 - 3:6320 – Entry -23 3:6321 - 3:6323 – Entry -24 3:6324 - 3:6326 – Entry -25 (Oldest Entry)	Array(25) Elapsed Time format

Register	Description	Read
3:6327 - 3:6401	Cycle Log Close Time – 25 Entries 3:6327 - 3:6329 – Entry -1 (Newest Entry) 3:6330 - 3:6332 – Entry -2 3:6333 - 3:6335 – Entry -3 3:6336 - 3:6338 – Entry -4 3:6339 - 3:6341 – Entry -5 3:6342 - 3:6344 – Entry -6 3:6345 - 3:6347 – Entry -7 3:6348 - 3:6350 – Entry -8 3:6351 - 3:6353 – Entry -9 3:6354 - 3:6356 – Entry -10 3:6357 - 3:6359 – Entry -11 3:6360 - 3:6362 – Entry -12 3:6363 - 3:6365 – Entry -13 3:6366 - 3:6368 – Entry -14 3:6369 - 3:6371 – Entry -15 3:6372 - 3:6374 – Entry -16 3:6375 - 3:6377 – Entry -17 3:6378 - 3:6380 – Entry -18 3:6381 - 3:6383 – Entry -19 3:6384 - 3:6386 – Entry -20 3:6387 - 3:6389 – Entry -21 3:6390 - 3:6392 – Entry -22 3:6393 - 3:6395 – Entry -23 3:6396 - 3:6398 – Entry -24 3:6399 - 3:6401 – Entry -25 (Oldest Entry)	Array(25) Elapsed Time format

Register	Description	Read
3:6402 - 3:6476	Cycle Log Vent Time – 25 Entries 3:6402 - 3:6404 – Entry -1 (Newest Entry) 3:6405 - 3:6407 – Entry -2 3:6408 - 3:6410 – Entry -3 3:6411 - 3:6413 – Entry -4 3:6414 - 3:6416 – Entry -5 3:6417 - 3:6419 – Entry -6 3:6420 - 3:6422 – Entry -7 3:6423 - 3:6425 – Entry -8 3:6426 - 3:6428 – Entry -9 3:6429 - 3:6431 – Entry -10 3:6432 - 3:6434 – Entry -11 3:6435 - 3:6437 – Entry -12 3:6438 - 3:6440 – Entry -13 3:6441 - 3:6443 – Entry -14 3:6444 - 3:6446 – Entry -15 3:6447 - 3:6449 – Entry -16 3:6450 - 3:6452 – Entry -17 3:6453 - 3:6455 – Entry -18 3:6456 - 3:6458 – Entry -19 3:6459 - 3:6461 – Entry -20 3:6462 - 3:6464 – Entry -21 3:6465 - 3:6467 – Entry -22 3:6468 - 3:6470 – Entry -23 3:6471 - 3:6473 – Entry -24 3:6474 - 3:6476 – Entry -25 (Oldest Entry)	Array(25) Elapsed Time format

Register	Description	Read
3:6477 - 3:6501* * Not in all software builds	Cycle Log Average Velocity – 25 Entries 3:6477 – Entry -1 (Newest Entry) 3:6478 – Entry -2 3:6479 – Entry -3 3:6480 – Entry -4 3:6481 – Entry -5 3:6482 – Entry -6 3:6483 – Entry -7 3:6484 – Entry -8 3:6485 – Entry -9 3:6486 – Entry -10 3:6487 – Entry -11 3:6488 – Entry -12 3:6489 – Entry -13 3:6490 – Entry -14 3:6491 – Entry -15 3:6492 – Entry -16 3:6493 – Entry -17 3:6494 – Entry -18 3:6495 – Entry -19 3:6496 – Entry -20 3:6497 – Entry -21 3:6498 – Entry -22 3:6499 – Entry -23 3:6500 – Entry -24 3:6501 – Entry -25 (Oldest Entry)	Array(25) 0 - 65535

Register	Description	Read
3:6502 - 3:6526* * Not in all software builds	Cycle Log Surface Velocity – 25 Entries 3:6502 – Entry -1 (Newest Entry) 3:6503 – Entry -2 3:6504 – Entry -3 3:6505 – Entry -4 3:6506 – Entry -5 3:6507 – Entry -6 3:6508 – Entry -7 3:6509 – Entry -8 3:6510 – Entry -9 3:6511 – Entry -10 3:6512 – Entry -11 3:6513 – Entry -12 3:6514 – Entry -13 3:6515 – Entry -14 3:6516 – Entry -15 3:6517 – Entry -16 3:6518 – Entry -17 3:6519 – Entry -18 3:6520 – Entry -19 3:6521 – Entry -20 3:6522 – Entry -21 3:6523 – Entry -22 3:6524 – Entry -23 3:6525 – Entry -24 3:6526 – Entry -25 (Oldest Entry)	Array(25) 0 - 65535

Register	Description	Read
3:6527 - 3:6551* * Not in all software builds	Cycle Log Surface Velocity Confidence Code – 25 Entries 3:6527 – Entry -1 (Newest Entry) 3:6528 – Entry -2 3:6529 – Entry -3 3:6530 – Entry -4 3:6531 – Entry -5 3:6532 – Entry -6 3:6533 – Entry -7 3:6534 – Entry -8 3:6535 – Entry -9 3:6536 – Entry -10 3:6537 – Entry -11 3:6538 – Entry -12 3:6539 – Entry -13 3:6540 – Entry -14 3:6541 – Entry -15 3:6542 – Entry -16 3:6543 – Entry -17 3:6544 – Entry -18 3:6545 – Entry -19 3:6546 – Entry -20 3:6547 – Entry -21 3:6548 – Entry -22 3:6549 – Entry -23 3:6550 – Entry -24 3:6551 – Entry -25 (Oldest Entry)	Array(25) Signed Integer -32768 = Uninitialized -4 = Velocity Calc Error -3 = Velocity Calc Error -2 = Velocity Over-range -1 = Velocity Under-range 0 = Reserved 1 = Reserved 2 = Valid, 2 Points Used 3 = Valid, 3 Points Used 4 = Valid, 4 Points Used 5 = Valid, 5 Points Used 6 = Valid, 6 Points Used 7 = Valid, 7 Points Used 8 = Valid, 8 Points Used

8.4   Holding Registers

Table 13 - Available Holding Registers

Register	Description	Read/Write
General Controller Settings		
4:0001 – 4:0002	Operator ID Write either the operator ID or the Installer ID to gain access to protected registers.	Double Word format: 0 - 9999999
4:0003 – 4:0004	Reserved	N/A
4:0005	Modbus Write Time The amount of time to wait after the last written value before saving all changes to the controller.	0 – 65535 seconds. Writing zero (which is the default) will save all changes as they are made.
4:0006 – 4:0011	Controller Date/Time	Date/Time
4:0012	Daylight Savings Time configuration	0 = Disabled 1 = Enabled
4:0013 – 4:0014	Day Start Time – Start of the gas day.	Elapsed Time format: 0 – 86340 (00:00: – 23:59) When in HH:MM:SS format, only Hours and Minutes are available.
4:0015	Cycle Restart Request State This is will restart the controller with the selected state	0 = Close 1 = Rise 2 = AfterFlow
4:0016 – 4:0018	Cycle Restart Request Duration The controller stays in the above state for this duration	Elapsed Time format: 0 – 1,800,000 (000:00:00 – 500:00:00)
4:0019– 4:0089	Reserved	N/A

Register	Description	Read/Write
Well Information		
4:0089	Target Surface Velocity	1 – 999 m/min (ft/min)
4:0090	Danger/Fast Trip Source	0 = Average Velocity (Default) 1 = Surface Velocity
4:0091	Plunger Type	0 = Conventional 1 = Free Cycle 2 = Continuous
4:0092	Well Depth	1 – 50,000 m (ft)
4:0093	Fast Trip Velocity	1 – 2500 m/min (ft/min)
4:0094	Rise Velocity	1 – 2500 m/min (ft/min)
4:0095	Target Velocity	1 – 2500 m/min (ft/min)
4:0096	Close Velocity	1 – 2500 m/min (ft/min)
4:0097	Danger Velocity	1 – 2500 m/min (ft/min)
Timer Settings		
4:0098 – 4:0100	Danger Time	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 499:59:56) A value of zero disables the timer.
4:0101 – 4:0103	Minimum Close Time	Elapsed Time format: 1 – 1,800,000 (000:00:01 – 500:00:00)
4:0104 – 4:0106	Non-Arrival Close Time	Elapsed Time format: 1 – 1,800,000 (000:00:01 – 500:00:00)

Register	Description	Read/Write

4:0107 – 4:0109	Rise Time
	
	If the *Rise Duration* is modified the following parameters *may* be auto-updated:
	
	   • *Max Open Time*
	
	   • *Tank Delay Time*
		Elapsed Time format: 0 – 1,799,999 (000:00:00 – 499:59:59)

4:0110 – 4:0112	Tank Delay Time The maximum value for the *Tank Delay Time* parameter is the lesser of: 499h59m59s and the current *Rise Time* parameter value. Valid only if Valve B is configured as a Tank Valve and the *Arrival Sensor* is enabled.	Elapsed Time format: 0 – 1,799,999 (000:00:00 – 499:59:59)
4:0113 – 4:0115	Fast Trip Time	Elapsed Time format: 0 – 1,799,997 (000:00:00 – 499:59:57) A value of zero disables the timer.
4:0116 – 4:0118	Target Rise Time	Elapsed Time format: 1 – 1,799,998 (000:00:01 – 499:59:58)
4:0119 – 4:0121	Afterflow Delay	Elapsed Time format: 0 – 36,000 (00:00:00 – 10:00:00)
4:0122 – 4:0124	Minimum Afterflow Time	Elapsed Time format: 1 – 1,800,000 (000:00:01 – 500:00:00)
4:0125 – 4:0127	Arrival Guard Time	Elapsed Time format: 1 – 600 (000:00:00 – 00:10:00)

Register	Description	Read/Write
4:0128 – 4:0130	Extended Afterflow Time	Elapsed Time format: 0 – 1,799,999 (000:00:00 – 499:59:59)
4:0131 – 4:0133	Max Afterflow Time	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0134 – 4:0136	Extended Close Time	Elapsed Time format: 0 – 1,799,999 (000:00:00 – 499:59:59)
4:0137 – 4:0139	Max Close Time	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0140 – 4:0142	PAS Delay Time	Elapsed Time format: 0 – 1,799,999 (000:00:00 – 499:59:57)
4:0143 – 4:0145	Close Time (Sum of Min Close Time and Extended Close Time)	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0146 – 4:0148	Afterflow Time (Sum of Min Afterflow Time and Extended Afterflow Time)	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0149 – 4:0151	Casing Pressure Rate Trip Delay	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0152 – 4:0154	Purge Time Rise Delay Time for Gas Assisted Plunger Lift (GAPL)	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0155 – 4:0157	Auto Catcher Hold Time	Elapsed Time format: 1 – 1,800,000 (000:00:00 – 500:00:00)
4:0158 – 4:0170	Reserved	N/A

Register	Description	Read/Write
Exception Handling		
4:0171	Non-Arrival Count	0 – 99
4:0172	Fast-Trip Count	0 – 99
4:0173	Low Battery Fail Mode	0 – Fail Closed 1 – Fail Open
4:0174	Fast Trip Fail Mode	0 – Fail Closed 1 – Fail Open
4:0175	Non-Arrival Fail Mode	0 – Fail Closed 1 – Fail Open
4:0176	Pre Non-Arrival Count	0-99
4:0200	Optimization Velocity Source	0 = Average Velocity (Default) 1 = Surface Velocity
4:0201	Optimization Type Specifies the type of optimization scheme to use. Only optimization types that have been enabled are available here.	0 = Disabled 1 = Pressure Optimization 2 = Afterflow Timer Optimization 3 = Close Timer Optimization 4 = Close Then Afterflow Optimization
4:0202	Afterflow Scale Factor Is used to scale the adjustments that are made to the Afterflow Time.	0 – 100% 0 will disable all adjustments
4:0203	Close Casing Pressure Type	0 = Disabled 1 = Rate Drop 2 = Absolute

Register	Description	Read/Write
4:0204	Close Scale Factor Is used to scale the adjustments that are made to the Close Time.	0 – 100% 0 will disable all adjustments
4:0205	Valve B Configuration When the valve is enabled: • its wiring location defaults to the first free location • The valve is closed If the *Valve B configuration* is modified the following parameters *may* be auto-updated: • *Tank Delay Time*	0 = Disabled 1 = Line, Valve A only open during After-Flow 2 = Line, Valves A and B open during After-Flow 3 = Tank 4 = Flow Control 5 = Purge 6 = Tank with Sales open during vent 7 = Gas Assisted Plunger Lift (GAPL) or LP/TP select for some Load Factor Firmware (2.1.8 and prior) 8 = Possible Future setting for LP/TP select
4:0206	Proportional Adjustment Type Adjusts using difference between the Maximum and Minimum times for a given parameter or uses the current time. i.e. When using Afterflow optimization, scale adjustments based on Maximum Afterflow – Min Afterflow or the current Afterflow Time.	0 – Max – Min 1 – Current Time

Register	Description	Read/Write
4:0207	Skip Afterflow on Vent Tells the controller to skip Afterflow and go directly to Close once the plunger arrives if we vented.	0 –Disabled 1 - Enabled
4:0208	Auto Catcher Configuration	0 – Disabled 1 – Enable On Rise 2 – Enable On Arrival 3 – LP/TP Select (Load Factor firmware)
4:0208 – 4:0220	Reserved	
4:0221	Arrival Sensor Configuration	0 = Disabled 1 = Plunger Arrival Sensor 2 = Plunger Velocity Sensor* *: supported firmware only
4:0222	Arrival Switch Mode	0 = Normally Open 1 = Normally Closed
4:0223	Arrival Sensor Power	0 = Rise Only 1 = When Open 2 = Always On
4:0224 – 4:0240	Reserved	
4:0241	Line Pressure Device Configuration	0 = Disabled 1 = Line Pressure Switch 2 = Line Pressure Sensor 3 = Line Pressure Virtual* * not in all software builds
4:0242	Line Pressure Switch Mode	0 = Normally Open 1 = Normally Closed

Register	Description	Read/Write
4:0243	Line Pressure Sensor Range If the *Line Pressure Sensor Range* is modified the following parameters *may* be auto-updated: • *Line Pressure Trip Point* • *Line Pressure Reset Point* • *Open Casing-Line Differential Pressure Trip Point* • *Open Casing-Line Differential Pressure Reset Point*	100.0 – 5000.0 psi (kpA) Where 1000 = 100.0
4:0244	Line Pressure Trip Point A value must be entered in the range: • *current dead-band*, to • *Line Pressure Sensor Maximum Value*. Where *current dead-band* = *Line Pressure Trip Point* –*Line Pressure Reset Point* If the *Line Pressure Trip Point* is modified the following parameters will be auto-updated: • *Line Pressure Reset Point*	0 – Line Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0245	Line Pressure Reset Point A value must be entered in the range: • *0 to Line Pressure Trip Point* – 1.	0 – Line Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0246 – 4:0248	Line Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)

Register	Description	Read/Write
4:0249	Line Pressure Close Enable Monitor Line Pressure during the Close portion of the cycle.	0 – Disabled 1 – Enabled
4:0250	Line Pressure Rise Enable Monitor Line Pressure during the Rise portion of the cycle.	0 – Disabled 1 – Enabled
4:0251	Line Pressure Afterflow Enable Monitor Line Pressure during the Afterflow portion of the cycle.	0 – Disabled 1 – Enabled
4:0252 – 4:0260	Reserved	
4:0261	Casing Pressure Device Configuration	0 = Disabled 1 = Casing Pressure Switch 2 = Casing Pressure Sensor 3 = Casing Pressure Virtual* * not in all software builds
4:0262	Casing Pressure Switch Mode	0 = Normally Open 1 = Normally Closed
4:0263	Casing Pressure Sensor Range If the *Casing Pressure Sensor Range* is modified the following parameters *may* be auto-updated: • *Open Casing Pressure Trip Point* • *Open Casing Pressure Reset Point* • *Open Casing-Line Differential Pressure Trip Point* • *Open Casing-Line Differential Pressure Reset Point*	100.0 – 5000.0 kPa (psi) Where 1000 = 100.0

Register	Description	Read/Write

4:0264	**Open Casing Pressure Trip Point**
	
	A value must be entered in the range:
	
	  • *current dead-band*, to
	
	  • *Casing Pressure Sensor Maximum Value*.
	
	Where *current dead-band = Open Casing Pressure Trip Point – Open Casing Pressure Reset Point*
	
	If the *Open Casing Pressure Trip Point* is modified the following parameters will be auto-updated:
	
	  • *Open Casing Pressure Reset Point*
		0 – Casing Pressure Sensor Range kPa (psi)
		
		Where 1000 = 100.0

4:0265	**Open Casing Pressure Reset Point** A value must be entered in the range: • *0 to Open Casing Pressure Trip Point – 1.*	0 – Casing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0266 – 4:0268	Open Casing Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)
4:0269 – 4:273	Reserved	

Register	Description	Read/Write
4:0274	Open Casing-Line Differential Pressure Trip Point A value must be entered in the range: • *current dead-band*, to • *Open Casing-Line Differential Pressure Sensor Maximum Value*. Where *current dead-band = Open Casing-Line Differential Pressure Trip Point – Open Casing-Line Differential Pressure Reset Point* If the *Open Casing-Line Differential Pressure Trip Point* is modified the following parameters will be auto-updated: • *Open Casing-Line Differential Pressure Reset Point*	0 – Casing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0275	Open Casing-Line Differential Pressure Reset Point A value must be entered in the range: • *0 to Open Casing-Line Differential Pressure Trip Point – 1.*	0 – Casing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0276-4:0278	Open Casing-Line Differential Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)
4:0279	Close Casing Pressure Threshold Defines the rate of change at which the casing pressure is low enough to start the Trip Delay Timer or the turnaround point for the minimum casing pressure for Low Rise.	0 – Casing Pressure Sensor Range kPa/min (psi/min) Where 1000 = 100.0

Register	Description	Read/Write
4:0280	Close Casing Pressure Trip Point A value must be entered in the range: • *0 to Casing Pressure Sensor Maximum -1*	0 – Casing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0281	Close Casing Pressure Reset Point A value must be entered in the range: • *Casing Pressure Sensor Maximum to Close Casing Pressure Trip Point - 1*	0 – Casing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0282-4:0284	Close Casing Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)
4:0285	Open Casing Pressure Enable	0 – Disabled 1 – Enabled
4:0286	Open Casing-Line Differential Enable	0 – Disabled 1 – Enabled
4:0287	Close Casing Pressure Enable	0 = Disabled 1 = Rate Drop 2 = Absolute
4:0288 – 4:0290	Reserved	
4:0291	Differential Pressure Device Configuration	0 = Disabled 1 = Flow DP Switch 2 = Flow DP Sensor
4:0292	Differential Pressure Switch Mode	0 = Normally Open 1 = Normally Closed

Register	Description	Read/Write
4:0293	Differential Pressure Sensor Range If the *Differential Pressure Sensor Range* is modified the following parameters *may* be auto-updated: • *Differential Pressure Trip Point* • *Differential Pressure Reset Point*	30.0 – 3000.0 mbar ("H2O) Where 1000 = 100.0
4:0294	Differential Pressure Trip Point A value must be entered in the range: • *current dead-band*, to • *Differential Pressure Sensor Maximum Value*. Where *current dead-band = Differential Pressure Trip Point – Differential Pressure Reset Point* If the *Differential Pressure Trip Point* is modified the following parameters will be auto-updated: • *Differential Pressure Reset Point*	0 – Differential Pressure Sensor Range mbar ("H2O) Where 1000 = 100.0
4:0295	Differential Pressure Reset Point A value must be entered in the range: • *0 to Differential Pressure Trip Point* – 1.	0 – Differential Pressure Sensor Range mbar ("H2O) Where 1000 = 100.0
4:0296 – 4:0298	Differential Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)
4:0299 – 4:0310	Reserved	

Register	Description	Read/Write
4:0311	Flow Device Configuration	0 = Disabled 1 = Flow Switch 3 = Flow Virtual* * not in all software builds
4:0312	Flow Switch Mode	0 = Normally Open 1 = Normally Closed
4:0313	Flow Sensor Range If the *Flow Sensor Range* is modified the following parameters *may* be auto-updated: • *Flow Trip Point* • *Flow Reset Point*	0 = 500 e3m3/d (mcf/d)
4:0314	Flow Trip Point A value must be entered in the range: • *current dead-band*, to • *Flow Sensor Maximum Value*. Where *current dead-band = Flow Trip Point – Flow Reset Point* If the *Flow Trip Point* is modified the following parameters will be auto-updated: • *Flow Reset Point*	0 – Flow Sensor Range e3m3/d (mcf/d) Where 5000 = 500.0
4:0315	Flow Reset Point A value must be entered in the range: • *0 to Flow Trip Point – 1.*	0 – Flow Sensor Range e3m3/d (mcf/d) Where 5000 = 500.0
4:0316 – 4:0318	Flow Stable Time	Elapsed Time format: 0 – 7199 (00:00:00 – 01:59:00)
4:0319 – 4:330	Reserved	

Register	Description	Read/Write
4:0331	Tubing Pressure Device Configuration	0 = Disabled 1 = Tubing Pressure Switch 2 = Tubing Pressure Sensor 3 = Tubing Pressure Virtual* * not in all software builds
4:0332	Tubing Pressure Switch Mode	0 = Normally Open 1 = Normally Closed
4:0333	Tubing Pressure Sensor Range If the *Tubing Pressure Sensor Range* is modified the following parameters *may* be auto-updated: • *Open Tubing Pressure Trip Point* • *Open Tubing Pressure Reset Point*	100.0 – 5000.0 kPa (psi) Where 1000 = 100.0
4:0334	Open Tubing Pressure Trip Point A value must be entered in the range: • *current dead-band*, to • *Tubing Pressure Sensor Maximum Value*. Where *current dead-band = Open Tubing Pressure Trip Point – Open Tubing Pressure Reset Point* If the *Open Tubing Pressure Trip Point* is modified the following parameters will be auto-updated: • *Open Tubing Pressure Reset Point*	0 – Tubing Pressure Sensor Range kPa (psi) Where 1000 = 100.0
4:0335	Open Tubing Pressure Reset Point A value must be entered in the range: • *0 to Open Tubing Pressure Trip Point – 1.*	0 – Tubing Pressure Sensor Range kPa (psi) Where 1000 = 100.0

Register	Description	Read/Write
4:0336 – 4:0338	Open Tubing Pressure Stable Time	Elapsed Time format: 0 – 7199s (00:00:00 – 01:59:00)
4:0339	Open Tubing Pressure Enable	0 – Disabled 1 – Enabled
4:0340 – 4:0350	Reserved	N/A
Load Factor		
4:0351	Load Factor Enable	0 – Disabled 1 – Enabled
4:0352	Load Factor Reset Point	0 % – 100 %
4:0353-4:0355	Load Factor Reset Stable Time	Elapsed Time format: 0 – XXX (00:00:00 – XX:XX:XX)
4:0354 – 4:0370	Reserved	N/A
Virtual Sensors		
4:0371	Virtual Casing Pressure Value* * not in all software builds	0 – 5000 psi The maximum value is capped by the Casing Pressure Sensor Range setting (4:0263)
4:0372	Virtual Flow Differential Pressure Value* * not in all software builds	0 – 500.0 psi (50000 = 5000.0) The maximum value is capped by the Differential Pressure Sensor Range setting (4:0293)
4:0373	Virtual Flow Value* * not in all software builds	0 – 500.0 e3m3/d (mcf/d) (5000 = 500.0)

Register	Description	Read/Write
4:0374	Virtual Line Pressure Value* * not in all software builds	0 – 500.0 psi The maximum value is capped by the Line Pressure Sensor Range setting (4:0243) (50000 = 5000.0)
4:0375	Virtual Tubing Pressure Value* * not in all software builds	0 – 500.0 psi The maximum value is capped by the Tubing Pressure Sensor Range setting (4:0333) (50000 = 5000.0)
4:0376 – 4:0100	Reserved	N/A
Device Log Configuration		
4:0401	Device Log 1 Type Specifies the type of device reading to save to the log.	0 = Disabled 3 = Line Pressure 4 = Tubing Pressure 5 = Casing Pressure 6 = Differential Pressure 9 = Casing Line Differential 10 = Flow Rate
4:0402 – 4:0404	Device Log 1 Frequency The frequency at which to save readings from the specified sensor.	Elapsed Time format: 0 – 36,000s (00:00:00 – 10:00:00)
4:0405	Device Log 2 Type Specifies the type of device reading to save to the log.	0 = Disabled 3 = Line Pressure 4 = Tubing Pressure 5 = Casing Pressure 6 = Differential Pressure 9 = Casing Line Differential 10 = Flow Rate

Register	Description	Read/Write
4:0406 – 4:0408	Device Log 2 Frequency The frequency at which to save readings from the specified sensor.	Elapsed Time format: 0 – 36,000s (00:00:00 – 10:00:00)

9   Acronyms

ADC	**Analog-to-Digital Converter**
AI	**Analog Input**
ALiEn	**Artificial Lift Enhancement**
CVC	**Configurable Valve Controller**
DAC	**Digital-to-Analog Converter**
DI	**Digital Input**
DO	**Digital Output**
ESD	**Emergency Shut Down**
ETC	**Extreme Telematics Corp.**
N/C	**Normally Closed**
N/O	**Normally Open**
PAS	**Plunger Arrival Sensor**
PSI	**Pounds per Square Inch**
R	**Read Permission**
RTU	**Remote Terminal Unit**
R/W	**Read/Write Permission**
SCADA	**Supervisory Control And Data Acquisition**
V	**Volts**
VFD	**Vacuum Fluorescent Display**
VI	**Virtual Input**

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