

# Realift

## Rod Pump Configuration Manual

**Version:** 4.00.0

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# 1 Legal Information

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

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## 2 Technical Support

Questions and requests related to any part of this documentation can be directed to one of the following support centers.

### **Technical support: Americas, Europe, Middle East, Asia**

Available Monday to Friday 8:00am – 6:30pm Eastern Time

Toll free within North America      1-888-226-6876

Direct Worldwide                      +1-613-591-1943

Email                                      [supportTRSS@se.com](mailto:supportTRSS@se.com)

### **Technical support: Australia/New Zealand (Pacific)**

Inside Australia                      13 73 28 (13 SEAU)

Inside New Zealand                  0800 652 999

Email                                      [techsupport.pz@se.com](mailto:techsupport.pz@se.com)

### 3 Safety Information

#### Important information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

#### DANGER

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

#### WARNING

**WARNING** indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

#### CAUTION

**CAUTION** indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.

#### NOTICE

**NOTICE** is used to address practices not related to physical injury.

#### Please note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

## Before you begin

### **WARNING**

#### **EQUIPMENT OPERATION HAZARD**

- Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.
- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

**Failure to follow these instructions can result in death or serious injury.**

### **NOTICE**

#### **UNINTENDED EQUIPMENT OPERATION**

- Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future reference.
- Test all software in both simulated and real environments.
- Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to help prevent accidental equipment damage.

**Failure to follow these instructions can result in equipment damage.**

## Operation and adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

## Acceptable use

### **WARNING**

#### **UNACCEPTABLE USE**

Do not use this solution as an integral part of a safety system. The components in this solution are not safety products.

**Failure to follow these instructions can result in death or serious injury.**

### **CAUTION**

#### **EQUIPMENT OPERATION HAZARD**

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Use only Schneider Electric software or approved software with Schneider Electric hardware products.

**Failure to follow these instructions can result in minor or moderate injury.**

## Important notices

### **DANGER**

#### **HAZARD OF ELECTRIC SHOCK**

Installation, adjustment, repair, and maintenance must be performed by qualified personnel.

Ensure power has been removed before servicing.

**Failure to follow these instructions will result in death or serious injury.**

## 4 About the Book

### Audience

This manual describes how to use a Schneider Electric Magelis Human Machine Interface (HMI) to configure Realift Rod Pump Controller (RPC) operation. It is written for people who already understand:

- The physical set up of the well, including drive, pump, motor, rod, and sensor information
- The characteristics and relationships among flow, pressure, temperature, and signal noise in the well
- The mix of oil, water, gas, and solids typically found in the well and how this mix affects pump operation and well production.

### Document scope

This manual describes:

- How to use the Magelis HMI
- Configuring Realift Rod Pump parameters
- Controlling your pump
- Optimizing operation with dynamometer or dynagraph cards (dynacards)
- Viewing system status
- Viewing and creating trend graphs
- Changing passwords

### Validity note

This document is valid for Realift Rod Pump version 4.00.0.

### Related documents

The Realift Rod Pump Hardware Installation Manual provides information about installing the Realift Rod Pump.

### Product related information

 **WARNING****UNINTENDED EQUIPMENT OPERATION**

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise are allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

**Failure to follow these instructions can result in death or serious injury.**

## 5 Cybersecurity

Cybersecurity is a branch of network administration that addresses attacks on or by computer systems and through computer networks that can result in accidental or intentional disruptions. The objective of cybersecurity is to help provide increased levels of protection for information and physical assets from theft, corruption, misuse, or accidents while maintaining access for intended users.

No single cybersecurity approach is adequate. Schneider Electric recommends a defense-in-depth approach. This approach layers the network with security features, appliances, and processes. The basic components of this approach are:

- Risk assessment: A systematic security analysis of the environment and related systems.
- A security plan built on the results of the risk assessment
- A multi-phase training campaign
- Network separation and segmentation: Physical separation of the control network from other networks, and the division of the control network itself into segments and security zones.
- System Access Control: Controlling access to the system with firewalls, authentication, authorization, and other software means, and traditional physical security measures such as video surveillance, fences, locked doors and gates, and locked equipment cabinets.
- Device hardening: The process of configuring a device against communication-based threats. Device hardening measures include disabling unused network ports, password management, access control, and the disabling of all unnecessary protocols and services.
- Network monitoring and maintenance: An effective defense-in-depth campaign requires continual monitoring and system maintenance to meet the challenge of new threats as they develop.

### Contact us

For more information, refer to the Schneider Electric Cybersecurity Support Portal at <http://www.schneider-electric.com/b2b/en/support/cybersecurity/overview.jsp>.

### Additional Resources

Industrial Control Systems Cyber Emergency Response Team (ICS-CERT)  
<https://ics-cert.us-cert.gov>

ICS-CERT Recommended Practices  
<https://ics-cert.us-cert.gov/Recommended-Practices>

Center for Internet Security (CIS) Top 20 Critical Security Controls  
<https://www.cisecurity.org/cybersecurity-best-practices>

FBI Cyber Crime  
<https://www.fbi.gov/investigate/cyber>

Guide to Industrial Control Systems (ICS) Security  
<https://www.nist.gov/publications/guide-industrial-control-systems-ics-security>

WaterISAC Water Security Network  
<https://www.waterisac.org>

## 6 Introduction

This manual describes how to configure the Realift RPC using the Magelis HMI. The information in this manual applies to Version 4.00.0 of the Realift Rod Pump.

The Realift Rod Pump Hardware Installation Manual is also available. The Realift Rod Pump Hardware Installation Manual describes the installation of the Realift Rod Pump enclosure and additional hardware, such as the load cell or proximity sensor.

### DANGER

#### ELECTRIC SHOCK HAZARD

- Read and understand this manual and the relevant drive installation manual before installing or operating the Realift Rod Pump system. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to wiring and grounding of all equipment.
- Many parts of the Realift Rod Pump system, including the printed circuit boards, operate at the line voltage. Do not touch. Use only electrically-insulated tools.
- Do not touch unshielded components or terminal strip connections with voltage present.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, and OSHA 1910.
- Before servicing the drive:
  - o Follow the applicable lock out/tag out (LOTO) procedure.
  - o Disconnect all power sources, including external control power.
  - o Place a Do Not Turn On label on all power disconnects.
  - o Lock all power disconnects in the open position.
- Install and close all covers before applying power or starting and stopping the drive.

**Failure to follow these instructions will result in death or serious injury.**

### CAUTION

#### UNINTENDED EQUIPMENT OPERATION

Do not install or operate any equipment that appears damaged.

**Failure to follow these instructions can result in minor or moderate injury.**

## 6.1 Key Terms

The following table defines key terms used in this document.

| Term | Expansion                           | Definition                                                                                                                                                                    |
|------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACK  | Acknowledge                         | Recognition that an event has occurred.                                                                                                                                       |
| API  | American Petroleum Institute        | A trade association that represents the USA's oil and natural gas industry.                                                                                                   |
| BDC  | bottom dead center                  | The position of minimum extension of a crank and a connecting rod, in which both are in the same straight line.                                                               |
| BHP  | bottom hole pressure                | The pressure measured at the pump intake.                                                                                                                                     |
| BPS  | bits per second                     | A measure used to show the average rate at which data is transferred between a computer and a data transmission system.                                                       |
| CW   | clockwise                           | A motion that proceeds in the same direction as a clock's hands: from the top to the right, then down, then to the left, and back up to the top.                              |
| CCW  | counter clockwise                   | A motion that proceeds in the opposite direction as a clock's hands: from the top to the left, then down, then to the right, and back up to the top.                          |
| DHCP | dynamic host configuration protocol | A client/server protocol that automatically provides an IP host with its IP address and other related configuration information, such as the subnet mask and default gateway. |
| ESD  | emergency shut down                 | A system, usually independent of the main control system, that is designed to safely shut down an operating system.                                                           |
| ENA  | energy adaptation                   | ENA System is a control profile designed for rotating machines with unbalanced load. It is used primarily for oil pumps.                                                      |
| GOR  | gas oil ratio                       | The ratio of the volume of gas that comes out of solution to the volume of oil at standard conditions                                                                         |
| HMI  | human machine interface             | The user interface in a manufacturing or process control system.                                                                                                              |
| IP   | internet protocol                   | The communications protocol of digital messages between computers across a single network or a series of interconnected networks.                                             |

|       |                                          |                                                                                                                                                                                                                                                                                       |
|-------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| kbps  | kilobits per second                      | A measure of bandwidth representing thousands of bits per second.                                                                                                                                                                                                                     |
| MPRL  | minimum polished rod load                | The minimum load on the polished rod during upstroke.                                                                                                                                                                                                                                 |
| PIP   | pump intake pressure                     | The Pump Intake Pressure is calculated by utilizing the results of a dynamometer test, such as pump net lift (fluid loading), tubing pressure, tubing fluid gradient, pump run-in depth, and the area of a downhole pump.                                                             |
| PPRL  | peak polished rod load                   | The maximum load on the polished rod during upstroke.                                                                                                                                                                                                                                 |
| RTU   | remote terminal unit                     | A microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA system by transmitting telemetry data to a master system, and by using messages from the master supervisory system to control connected objects. |
| SCADA | supervisory control and data acquisition | A system that monitors and controls industrial processes.                                                                                                                                                                                                                             |
| SG    | specific gravity                         | The ratio of the density of a substance to the density of a reference substance.                                                                                                                                                                                                      |
| STR   | stroke                                   | One complete round of the polished rod (surface stroke).                                                                                                                                                                                                                              |
| SPM   | strokes per minute                       | The number of strokes the polished rod completes in one minute.                                                                                                                                                                                                                       |
| SRP   | sucker rod pump                          | An artificial-lift pumping system using a surface power source to drive a downhole pump assembly.                                                                                                                                                                                     |
| TDC   | top dead center                          | The position of maximum extension of a crank and a connecting rod, in which both are in the same straight line.                                                                                                                                                                       |
| VFD   | variable frequency drive                 | Used to control large electric motors by changing or maintaining the speed of the motor.                                                                                                                                                                                              |

## 6.2 System Components

Realift RPC is an advanced pump-off controller for automating a rod pump (RPC). It is comprised of the following components:

- A Schneider Electric SCADAPack 334E that manages operation of the variable frequency drive (VFD) or contactor when an electric motor is used, or a starter when a motor is used without a VFD
- A Schneider Electric Magelis HMI panel that runs the Realift RPC application. The Realift RPC application lets you view, configure and manage well operations. For details, see [Using the Magelis HMI](#) <sup>23</sup>.

### WARNING

#### LOSS OF CONFIGURATION CONTROL

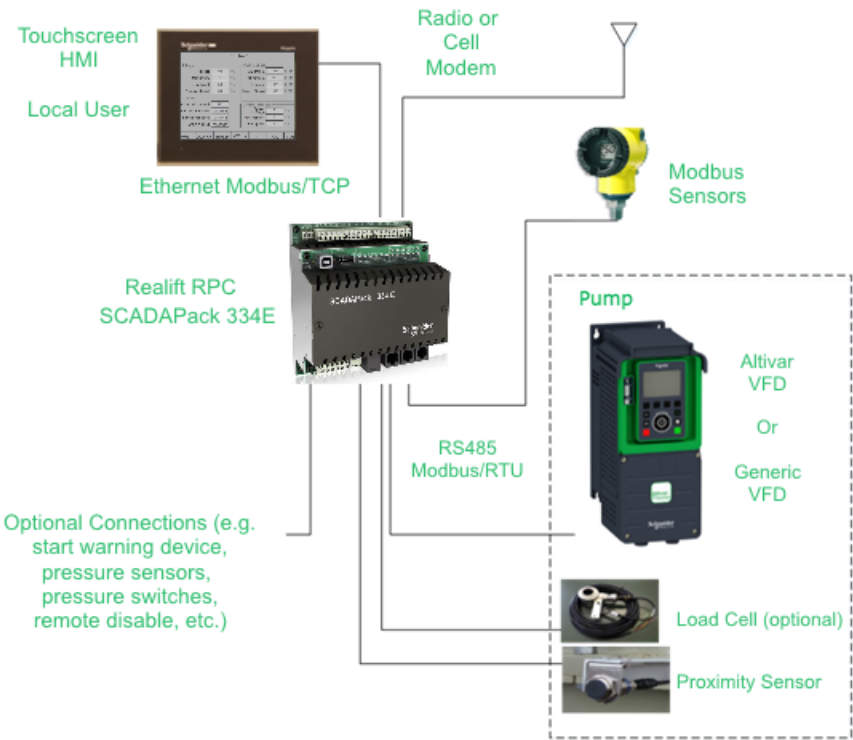
Storing and operating the Magelis HMI outside of its supported temperature ranges can render the Magelis HMI unusable.

To help maintain access to the Magelis HMI configuration parameters:

- Store the Magelis HMI at temperatures between -20 °C (-4 °F) and 60 °C (140 °F)
- Operate the Magelis HMI with a heater when temperatures are between -40 °C (-40 °F) and 0 °C (32 °F)
- Do not operate the Magelis HMI at temperatures below -40 °C (-40 °F), even with a heater
- Do not operate the Magelis HMI at temperatures above 55 °C (131 °F)

**Failure to follow these instructions can result in death or serious injury.**

The figure below shows an example of the Realift RPC components.



6.3 Realift Rod Pump Measurements Units

Realift Rod Pump displays measurement values in imperial units.

NOTICE

**UNINTENDED EQUIPMENT OPERATION**

Because Realift Rod Pump displays measurement values in imperial units, you may need to convert measurements to and from their metric equivalent.

Verify that values are entered in the appropriate measurement unit in Realift Rod Pump.

**Failure to follow these instructions can result in equipment damage.**

The following table summarizes the imperial measurement units used in Realift Rod Pump and provides the metric conversion.

| Measurement Type | Imperial Measurement Unit                       | Metric Conversion                                                              |
|------------------|-------------------------------------------------|--------------------------------------------------------------------------------|
| Area             | square inches (in <sup>2</sup> )                | 1 square inch (in <sup>2</sup> ) = 6.452 square centimeters (cm <sup>2</sup> ) |
| Density          | grams per cubed centimeter (g/cm <sup>3</sup> ) | 1 gram per cubed centimeter = 0.58 ounces per cubic inch (oz/in <sup>3</sup> ) |

|                    |                                                                                 |                                                                                                                                                                                                                  |
|--------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diameter           | inches (in)                                                                     | 1 inch (in) = 2.540 centimeters (cm)                                                                                                                                                                             |
| Displacement       | cubic inches (in <sup>3</sup> )                                                 | 1 cubic inch (in <sup>3</sup> ) = 16.387 cubic centimeters (cm <sup>3</sup> )                                                                                                                                    |
| Energy consumption | kilowatt hours (kWh)                                                            | 1 kWh = 3.6 x 10 <sup>6</sup> J; 1 kWh = 3412 BTU                                                                                                                                                                |
| Flow               | barrels per day (bbl/d)<br>barrels per 100 revolutions per minute (bbl/100 rpm) | 1 barrel per day (bbl/d) = 0.159 cubic meters per day (m <sup>3</sup> /d)<br>1 barrel per 100 revolutions per minute (bbl/100 rpm) = 0.159 meters cubed per 100 revolutions per minute (m <sup>3</sup> /100 rpm) |
| Gas Volume         | thousand cubic feet (MCF)<br>standard cubic foot (SCF)                          | 1 MCF = 28.3168 cubic meters (m <sup>3</sup> )<br>1 SCF = 0.028 cubic meters (m <sup>3</sup> )                                                                                                                   |
| Length/Depth       | inches (in), feet (ft)                                                          | 1 inch (in) = 2.540 centimeters (cm), 1 foot = 0.3048 meters (m)                                                                                                                                                 |
| Power              | hydraulic horsepower                                                            | 1 hydraulic horsepower (HP) = 0.745699872 kilowatts (kW)                                                                                                                                                         |
| Pressure           | pounds per square inch (psi)<br>megapounds per square inch (mpsi)               | 1 pound per square inch (psi) = 6.894 kilopascals (kPa)<br>1 megapound per square inch (mpsi) = 6894744.8 kilopascals (kPa)                                                                                      |
| Torque             | foot pounds (lbf)<br>inch pounds (in lb)                                        | 1 foot pound (lbf) = 1.356 Newton meters (Nm)<br>1 inch pound (in lb) = 0.1130 Newton meters (Nm)                                                                                                                |
| Viscosity          | centipoise (CP)                                                                 | 1 centipoise = 0.01 grams per centimeter-second                                                                                                                                                                  |
| Volume             | US barrels (bbl)                                                                | 1 US barrel = 158.9873 liters (L)                                                                                                                                                                                |
| Weight             | pounds (lbs)                                                                    | 1 pound = 4.4482 Newtons (N)                                                                                                                                                                                     |

## 7 Configuring the Realift RPC for the First Time

This section describes the key concepts you need to consider before configuring Realift RPC and the steps required to configure and start Realift RPC for the first time.

Before configuring Realift RPC for the first time, determine:

- The control method you want to use to determine the speed of your pump
- The method you will use to determine the pump fillage to protect your system from operating in situations that could damage the pumping systems
- How you need to set up protections so that Realift RPC takes the appropriate action when configured limits are breached, but does not necessarily stop pump operation
- How Realift RPC reacts when unexpected conditions such as a power interruption occurs

### 7.1 Starting Realift RPC

Realift Rod Pump starts when power is applied to the components.

#### NOTICE

##### RISK OF EQUIPMENT DAMAGE

When power is cycled, wait at least 10 seconds before restoring the power to the Realift RPC. Switching the power OFF and ON quickly can damage the unit.

**Failure to follow these instructions can result in equipment damage.**

#### WARNING

##### EQUIPMENT OPERATION HAZARD

Each time Realift Rod Pump is powered up, if so configured, it can attempt to start the pump with the configured parameters.

If you do not want your pump to start, ensure that the Control Pump switch is set to Off .

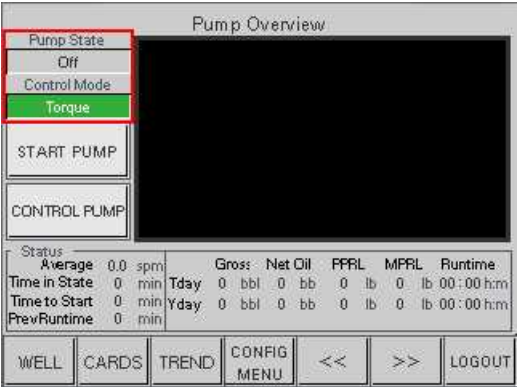
Press STOP PUMP, then verify that the Pump State field on the Pump Overview screen reads Off to confirm the system is stopped.

**Failure to follow these instructions can result in death or serious injury.**

While the application is loading, the Magelis HMI displays the following screen:

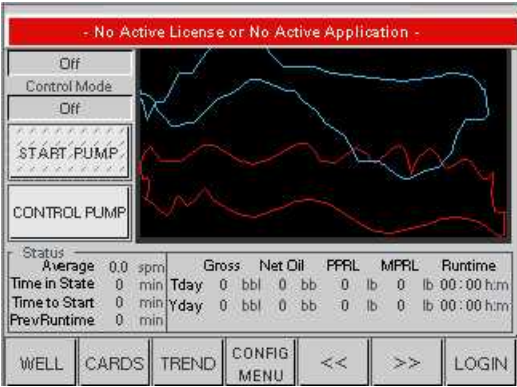


When the system has finished loading, the **Pump Overview** screen is displayed. The figure below shows the location of the **Pump State** and **Control Mode** fields on the **Pump Overview** screen.



When Realift Rod Pump is on, you can explore the HMI screens and proceed with the initial configuration. For more information about the system status field, see [Viewing System Status](#) [ 88 ].

Any current alarm is displayed in a banner at the top of the screen. It is also displayed on the **Active Alarm Summary** screen. Once an alarm is cleared, it is no longer displayed on the **Active Alarm Summary** screen and is now displayed on the **Historical Alarms Summary** screen. For more information on the alarm summary screens, see [Managing Alarms and Alerts](#) [ 112 ].



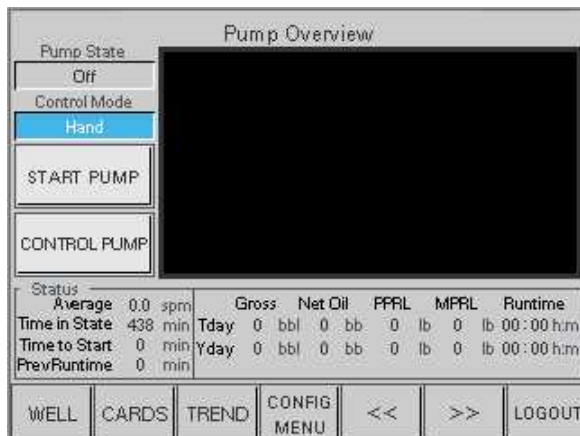
## 7.2 Using the Magelis HMI

The Realift RPC provides a touch screen interface that gives you access to operational information and configuration parameters for your Realift Rod Pump.

When you first start Realift Rod Pump, the **Pump Overview** screen is displayed. After you configure the control method the values for those parameters are displayed on the **Pump Overview** screen.

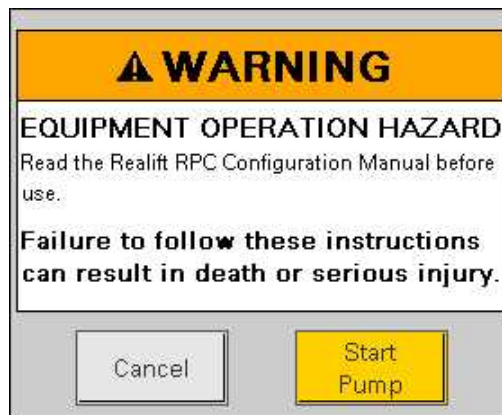
For information about configuring the control method, see [Control Methods](#) <sup>71</sup>.

For information about status screens, see [Viewing System Status](#) <sup>88</sup>.

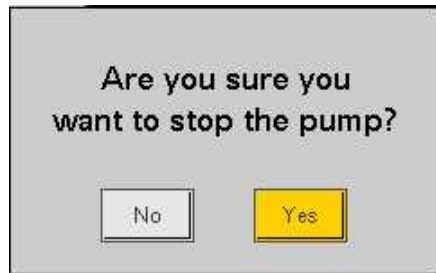


The **Pump Overview** screen also gives you access to configuration parameters and status information for pump operation:

- **START PUMP:** Starts the pump with the currently configured settings. When pressed, the following warning appears:



- **STOP PUMP:** Stops the pump. When pressed, the following confirmation message appears:

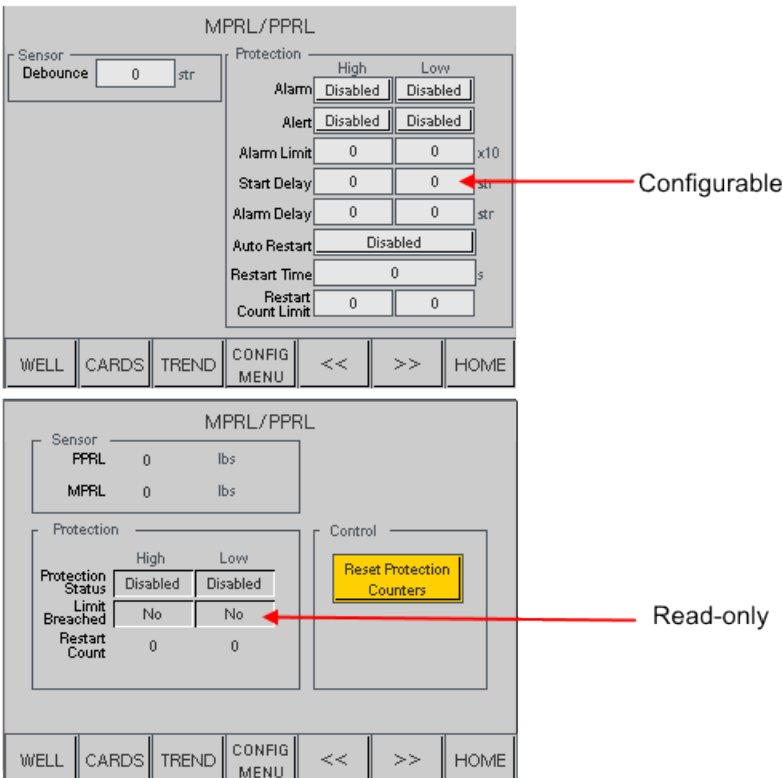


- **CONTROL PUMP:** Displays the Control Pump options, allowing you to change the control mode, speed, and target fillage
- **WELL/ALARM:** Displays:
  - o The **Well Configuration** screen. For more information, see [Entering Well and Pump Information](#) <sup>[49]</sup>
  - o The **Alarm Summary** screen, when an alarm is raised. For more information, see [Managing Alarms and Alerts](#) <sup>[112]</sup>
- **CARDS:** Displays the dynacards list. For more information, see [Optimizing Operation with Dynagraph Cards](#) <sup>[103]</sup>
- **TREND:** Displays the trend data options provided with Realift Rod Pump. For more information, see [Viewing Trends](#) <sup>[100]</sup>
- **CONFIG MENU:** Provides access to:
  - o Well Configuration
  - o System Configuration
  - o Alarms and Alerts
- **<< and >>:** Moves backwards and forwards through the status screens for the Realift Rod Pump

To configure any of the parameters available through the CONFIG MENU, you need to log in as described in [Logging in to the Magelis HMI](#) <sup>[26]</sup>.

### 7.2.1 Entering Information

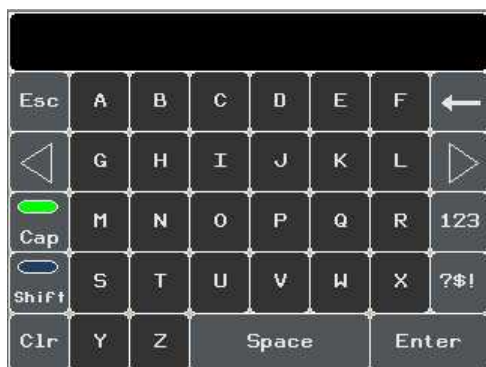
Parameters that you can change are displayed with a light gray background and parameters that are for information only are displayed with a darker gray background.



When you select a parameter value with a light gray background, a numeric or alphabetic keypad is displayed. Numeric keypads show the minimum and maximum value for the parameter.

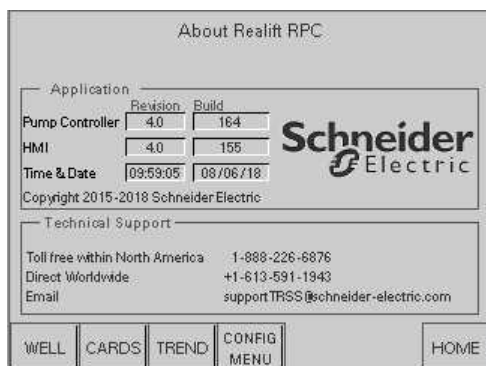
Enter the required information on the keypad, then press **Enter** to confirm your entry.





### 7.2.2 Displaying Realift RPC Software Version Information

The **About** screen, shown below, displays the Application version and build number information of the SCADAPack 334E. The **Pump Controller** fields display the Revision and Build numbers of the pump controller. The **HMI** field displays the Realift Rod Pump software Revision and Build numbers of the HMI. The **Time** field displays the time (24-hour clock) and date.



To access the **About Screen**, select **CONFIG MENU > System Configuration > About**.

### 7.3 Logging in to the Magelis HMI

Any HMI operator can start and stop the pump, view status, alarm, event and trend information, for the Realift Rod Pump, however to configure most Realift Rod Pump parameters you need to log in to the HMI as Admin or Master.

For more information about changing passwords, see [Changing Passwords](#) <sup>29</sup>.

## NOTICE

### UNAUTHORIZED SYSTEM ACCESS

Change the default password immediately after logging in for the first time.

**Failure to follow these instructions can result in equipment damage.**

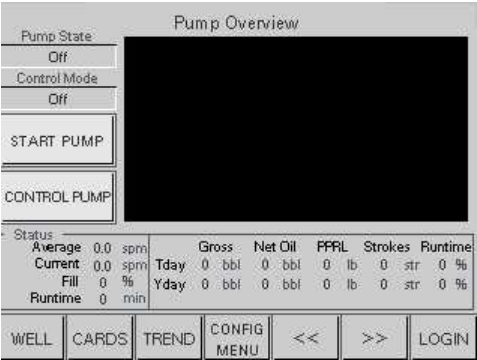
 **WARNING**

**UNAUTHORIZED SYSTEM ACCESS**

In addition to passwords, use physical locks and a security system to help prevent unauthorized access to Realift Rod Pump and to help protect the physical security of the Realift Rod Pump components.

Change the default password immediately after logging in for the first time.

**Failure to follow these instructions can result in death or serious injury.**



Realift RPC User Accounts

Realift RPC provides four password-protected user accounts:

- 1 Master account
- 1 Administrator account
- 2 Operator accounts (OP1 and OP2)

Each account type provides a different level of access privilege and is already created when you first start Realift RPC. You cannot create new user accounts or delete existing user accounts. Users who do not have an account can reset alarms, start and stop the pump, and view other parameters.

When you first log in, use the credentials described below. User names and passwords are case-sensitive.

| User name | Password | Requirements                                                                    |
|-----------|----------|---------------------------------------------------------------------------------|
| MASTER    | well1    | Can modify everything                                                           |
| ADMIN     | well2    | Can modify everything except the MASTER account's password                      |
| OP1       | well3    | Can change the control method used and the configuration of each control method |
| OP2       | well4    | Can change the control method used and the configuration of each control method |

### To log in to the Magelis HMI

1. On the **Pump Overview** screen, press **LOGIN**.

The **Login** dialog box is displayed.

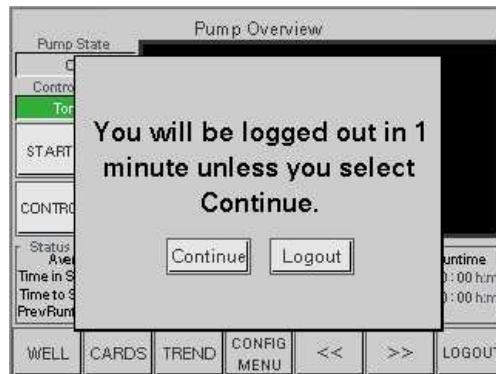
2. Press **Username**, use the keypad to enter the user name, and press **Enter**.
3. Press **Password**, use the keypad to enter the password, and press **Enter**.
4. Press **LOGIN**.

The **Current User** changes to **ADMIN** or **MASTER**.

The Magelis HMI automatically logs you out after 15 minutes of inactivity.

5. Press **HOME** to return to the **Pump Overview** screen or press **BACK** to return to the **Configuration Status** screen.

15 minutes after a user logs in, the Magelis HMI opens a pop-up screen asking the user to continue or to log out, as shown below.



If there is no user feedback within one minute, the pop-up automatically closes, the Magelis HMI logs the user out, and the active screen is changed to the **Pump Overview** screen.

If the user selects **Continue**, the user remains logged in and the process will repeat 15 minutes later.

### 7.3.1 Updating Passwords

Use the **User Management** screen to change Realift RPC user account passwords.

#### **WARNING**

##### **LOSS OF CONFIGURATION CONTROL**

An Admin or Master password is required to fully configure Realift Rod Pump.

To avoid loss of configuration control, record and store a copy of each user account password in a safe backup location for later retrieval, if needed.

**Failure to follow these instructions can result in death or serious injury.**

#### **NOTICE**

##### **UNAUTHORIZED SYSTEM ACCESS**

Change the default password immediately after logging in for the first time.

In addition to passwords, use physical locks and a security system to help prevent unauthorized access to the Realift Rod Pump and to help protect the physical security of the Realift Rod Pump components.

**Failure to follow these instructions can result in equipment damage.**

### Changing account passwords

When you are logged in to the Magelis HMI, you can change the password for your user account and for user accounts with fewer privileges. The procedure below shows the screens for a user who is logged in as MASTER. Follow the same steps if you are logged in as Admin.

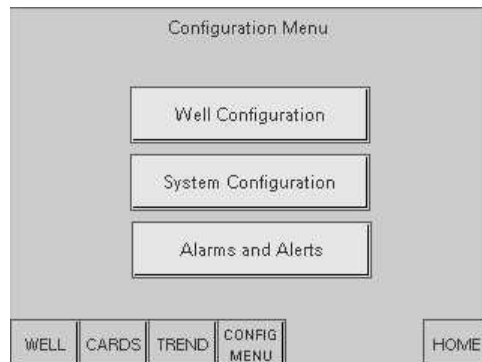
The table below lists the accounts for which the Administrator and Master users can change passwords.

| User Account | Can Change Password For       |
|--------------|-------------------------------|
| MASTER       | Master<br>Admin<br>OP1<br>OP2 |
| ADMIN        | Admin<br>OP1<br>OP2           |
| OP1          | OP1                           |
| OP2          | OP2                           |

### To change the account password

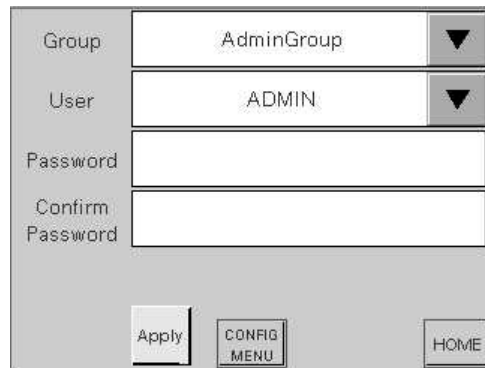
1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Home** screen, press **CONFIG MENU**.

The **Configuration Menu** screen is displayed.

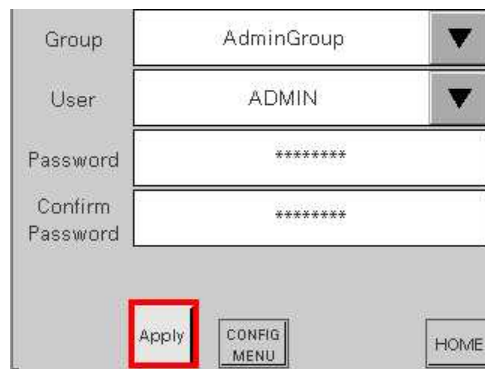


3. Press **System Configuration > User Management**.

The **User Management** screen is displayed.



4. From the Group drop-down list, select the group that contains the user account for which you want to change the password.
5. From the User drop-down list, select the user for which you want to change the password.
6. Enter the New Password, then enter it again to confirm it.
7. Press the **Apply** button, as shown in the figure below.



8. Press **Home** to return to the **Home** screen.

## 7.4 Configuring Network Parameters

The following sections describe how to configure network parameters for the Realift RPC.

### 7.4.1 HMI Configuration

The first step in connecting the Magelis HMI and the Realift Rod Pump is configuring an IP address on the Magelis HMI that works with the Realift Rod Pump's default IP address.

The default IP addresses are:

- Pump Controller: 192.168.0.11
- Magelis HMI: 192.168.0.10

### To configure the IP address and subnet mask of the Magelis HMI

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.

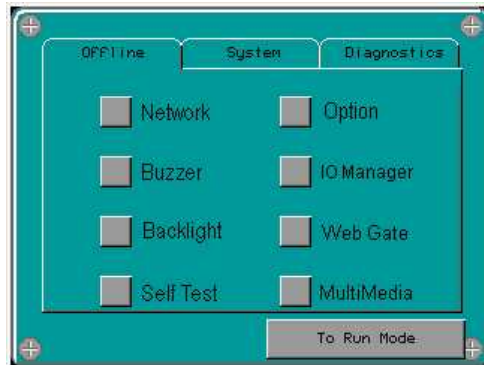
2. On the **Home** screen (**Status 1** screen), press **CONFIG MENU**.

The **Configuration Menu** screen is displayed.

3. Press **System Settings > HMI**.

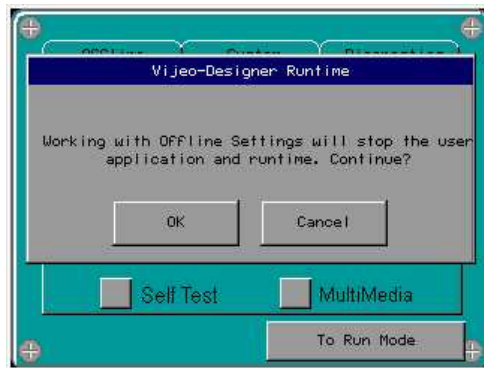
The **HMI Configuration** screen is displayed with the **System** tab active.

4. Press the **Offline** tab.



5. Press **Network**.

A message is displayed informing you that the user application and runtime stops when you work with offline settings.



6. Press **OK**.

A dialog box is displayed where you can enter the IP address of the Magelis HMI.



7. Press each segment of the IP address and enter an IP address compatible with the IP address of the drive or RTU.
8. Set the first three numbers of the IP address to match the drive or RTU's address, but set the fourth number to something different from the Realift Rod Pump's IP address.

For example, if the drive or RTU's IP address is 10.10.179.101, set the IP address of the Magelis HMI to 10.10.179.X, where X is any number from 1 to 254 other than 101.

9. If needed, enter the **Subnet** mask by pressing each segment of the mask.
10. To return to the **Offline** tab of the **HMI Configuration** screen, press **OK**.
11. To return to the **Configuration Menu** screen, press **To Run Mode**.

A message is displayed informing you that the HMI will restart.

12. Press **OK**.

#### 7.4.2 Configuring the IP address of the Realift Rod Pump

The next step in connecting the Magelis HMI and the Realift Rod Pump is entering the IP address of the RTU using the SCADAPack E Configurator software application.

The IP address that the Magelis HMI polls is updated automatically.

The default factory address for Ethernet1 is 192.168.0.11. This address is intended to support your network or a remote communication device such as a cell modem.

After you first connect to the Realift Rod Pump using its factory IP address, you can change the IP address to an address that works with your network.

Use the following suggestions to determine the new IP address:

- If the Realift Rod Pump is connected to an already existing network, you can choose an IP address within an appropriate range for that network.
- If the Realift Rod Pump is connected behind a router to a stationary server, configure the router so that it does not dynamically assign any device to the same IP address as the address given to the Realift Rod Pump. This can be done by limiting the range of addresses the router uses for DHCP.

#### To configure the IP address of the Realift Rod Pump

1. Open your RTU configuration file.
2. Save the file with a new name.
3. Navigate to the TCP/IP screen by selecting **TCP/IP > TCP/IP** from the navigation pane on the left.
4. In the TCP/IP screen, enter the new IP address and, if required, Subnet Mask.
5. Move the cursor to another field or select another screen and click **Save**.
6. Update the RTU Configuration File as described below.

## Updating the RTU Configuration File

1. Select **File > RTU Write Configuration**.
2. Click **Yes** to confirm the download. The configuration file is written to the RTU, and then read back.
3. When the download is complete, verify that the TCP/IP address has been loaded and is displayed:
  - a. Navigate to the **TCP/IP** screen.
  - b. Click the **Refresh Current Page** button.
  - c. Confirm the updated **TCP/IP Address** and **Subnet Mask** are displayed.

### 7.4.3 Communication Configuration

Using the Magelis HMI, you can configure Serial Port 3 to communicate with serial devices such as modems, and configure the serial port or Modbus/TCP connection used to communicate with an Altivar drive.

## To configure Serial Port 3

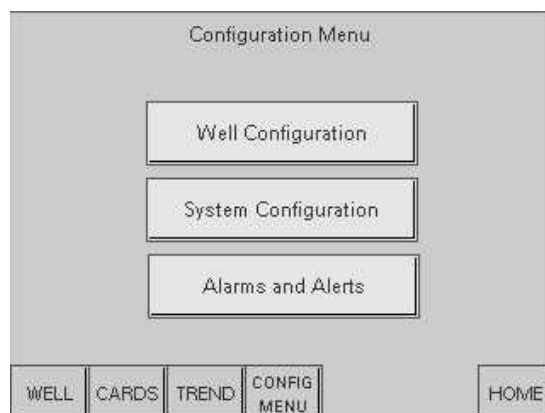
By default, Serial Port 3 is configured to use 8-N-1:

- 8 data bits
- No (N) parity bit
- 1 stop bit

The following procedure describes how to configure Serial Port 3. To configure Serial Port 1 and 2, refer to [Appendix C - Configuring Serial Ports 1 and 2](#)<sup>143</sup>.

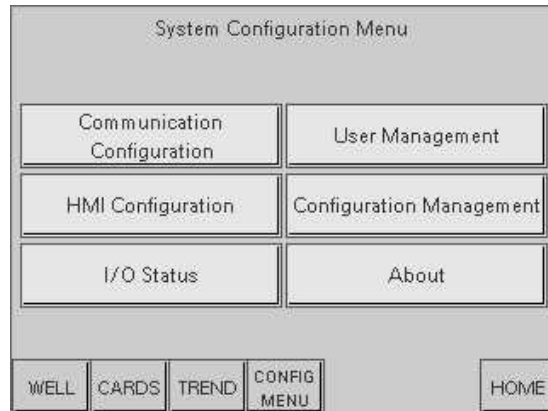
1. Log in to the Magelis HMI, as described in [Logging in to the Realift RPC](#)<sup>26</sup>.
2. On the **Home** screen, press **CONFIG MENU**.

The **Configuration Menu** is displayed.



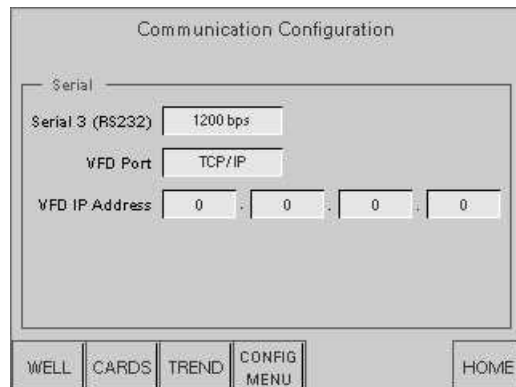
3. Press **System Configuration**.

The **System Configuration** screen is displayed.



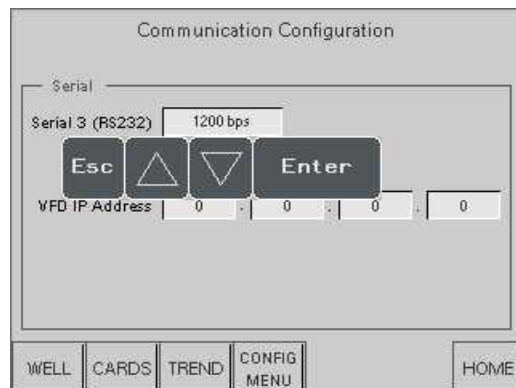
4. Press **Serial Configuration**.

The **Serial Configuration** screen is displayed.



5. Press the **Serial 3 (RS232)** field.

Controls appear that enable you to scroll through the available baud rates.



6. Press the up and down arrows until the baud rate of the modem is displayed and press **Enter**.

## To configure Altivar drive communications

1. Press the **VFD Port** field.

Controls appear that enable you to scroll through the available ports.

2. Press the up and down arrows until the VFD port is displayed and press **Enter**.

If you are using Modbus or TCP to communicate with your drive, select **TCP/IP** and press **Enter**.

3. Press the **VFD IP Address** field.

The numeric keypad appears.

4. Enter the IP address of the VFD, if applicable.

### **WARNING**

#### **LOSS OF CONTROL**

- Only employ Modbus/TCP control of an Avitar drive after a thorough risk assessment, including cybersecurity.
- To prevent unauthorized command of the drive, use the Altivar DTM to set the IP master parameter to the IP address of the SCADAPack.
- When remote access is used with the Realift RPC, ensure your network is secure by using a VPN or firewall device.

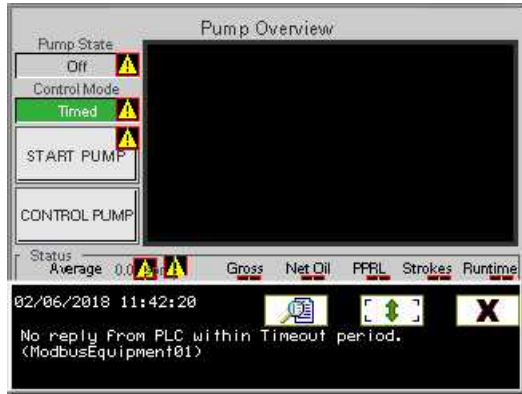
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Parameters

- **Serial 3 (RS232)**
  - o Specifies the baud rate
  - o Options: 300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps
- **VFD Port**
  - o Specifies the serial port of the VFD
  - o Options: COM1, COM2, TCP/IP
- **VFD IP Address**
  - o Specifies the IP address of the VFD if **VFD Port** is set to **TCP/IP**
  - o Range: 0...255

#### 7.4.4 Verifying Communications

If the Realift Rod Pump cannot communicate properly with the Magelis HMI due to a configuration mismatch, the Magelis HMI displays an error message and alarm similar to the following image:



The alarms can also be seen on the **Active Alarm Summary** screen. The alarm persists until communication is restored. It then is no longer displayed on the **Active Alarm Summary** screen and is now displayed on the **Historical Alarms Summary** screen. For more information on the alarm summary screens, see [Managing Alarms and Alerts](#) <sup>112</sup>.

Verify communications before you proceed.

There are several reasons why Realift Rod Pump may not be able to communicate properly, such as the RTU may not be powered up or physically connected to the Magelis HMI, the connection may be poor, or IP addresses or subnet masks may not match.

#### Troubleshooting a disconnected communication state

1. Confirm that the Realift Rod Pump system's Ethernet card is connected to the Magelis HMI and powered up.
2. Check the IP address of the Magelis HMI. See [HMI Configuration](#) <sup>31</sup> for more information.
3. Check the IP address of the pump controller. See [Configuring the IP address of the Realift Rod Pump](#) <sup>33</sup> for more information.

## 7.5 Configuring the Drive

After you have configured the connection settings between the computer and the Realift Rod Pump system, configure the drive's parameters.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

- Read and understand this manual and the manuals for your drive and pumpjack before operating the Realift Rod Pump system.
- Any changes made to parameter settings must be performed by qualified personnel.

**Failure to follow these instructions can result in death or serious injury.**

The screens available depend on whether you are using an RTU and Realift Rod Pump with an Altivar or a generic drive. See [Configuring the Interface for an Altivar Drive](#)<sup>[38]</sup> for more information.

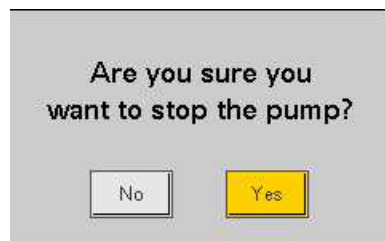
### 7.5.1 Configuring the Interface for an Altivar Drive

The Realift RPC is designed to support Altivar 61, 71, 320, 340, 600, and 900 model VFDs. Perform the following procedure to configure the Realift RPC for use with an Altivar VFD.

#### To configure the drive interface for an Altivar drive

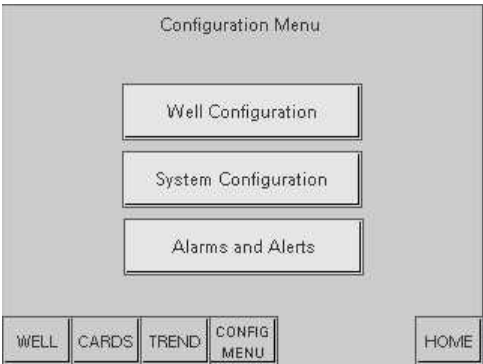
1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#)<sup>[26]</sup>.
2. On the **Home** screen (**Pump Overview** screen), stop the pump by pressing **STOP PUMP**.

The Stop Pump dialog is displayed.



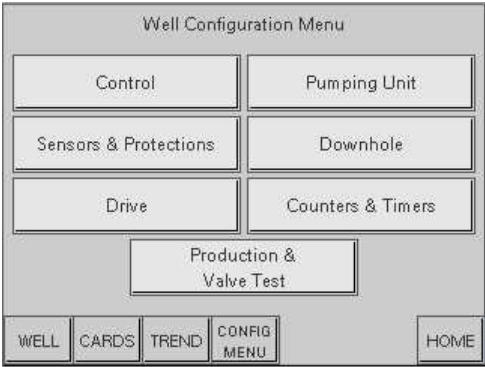
3. Press **Yes** and wait until the **Pump Status** is **Off**.
4. Press **CONFIG MENU** on the home screen.

The **Configuration Menu** screen is displayed.



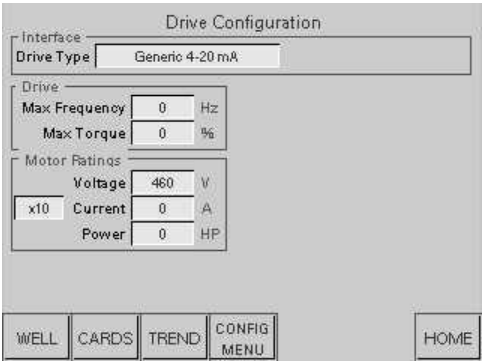
5. Press **Well Configuration**.

The **Well Configuration** menu is displayed.



6. Press **Drive**.

The **Drive Configuration** screen is displayed.



7. In the **Interface** pane, press the **Drive Type** field.

Controls are displayed that enable you to scroll through the drive types.

8. Press the up and down arrows until **Altivar** is displayed and press **Enter**.
9. Configure the parameters as described below.
10. Press **>>**

The **Altivar Configuration** screen is displayed.

11. Configure the remaining parameters as described below.
12. Press **Write Configuration To Altivar**

### Altivar drive interface parameters

- **Read Configuration from Altivar**
  - o Reads the configuration on the Altivar drive and writes it to the controller
  - o This can only be used when the pump is stopped
- **Write Configuration to Altivar**
  - o Writes the configuration that is currently on the controller and displayed on the Magelis HMI to the Altivar drive
  - o This can only be used when the pump is stopped

## Interface

- **Drive Type**

- o Specifies the drive type to be configured
- o Valid Options: Altivar, Generic 0-20mA, Generic 4-20mA, Start Contactor

- **HOA Type**

- o Options: Soft, Local, Custom
- o If set to **Soft**, the Realift RPC configures the drive to use "channel 1 active" for the Reference 2 channel switching. Therefore you can switch the drive from Hand to Auto using the Magelis HMI. This is the recommended setting.
- o If set to **Local**, the Realift RPC configures the drive to use "LI3" for the Reference 2 channel switching. This setting may be used if there is a physical HOA switch on the drive panel.
- o If set to **Custom**, the Realift RPC does not configure the reference 2 channel switch setting on the drive. This setting should be used if a physical switch is employed on the drive panel and an atypical configuration is used on the drive. If this setting is used, you need to configure the channel switching directly on your drive.

## Speed

- **High Speed**

- o The highest frequency to which the drive speed can be set.
- o Units: hertz (Hz)
- o Range: 10...255

- **Max Frequency**

- o The highest frequency at which the drive operates.
- o If the drive is set to its high speed, the pump will go faster than the high speed during the downstroke due to gravity and the pumpjack's imbalance. This parameter should be set at least 5 Hz above the High Speed.
- o Units: hertz (Hz)
- o Range: 10...255

- **Line Frequency**

- o The nominal motor frequency from the name plate on the motor
- o Units: hertz (Hz)
- o Options: 50, 60

## Acceleration Time

- **Acceleration**

- o The acceleration time for the drive. Acceleration time is typically defined as the time from stop to nominal frequency.

- o Units: seconds (s)
- o Range: 0.1...25.0
- **Deceleration**
  - o The deceleration time for the drive. Deceleration time is typically defined as the time from nominal frequency to stop.
  - o Units: seconds (s)
  - o Range: 0.1...25.0

### Motor Ratings

- **Voltage**
  - o Specifies the nominal motor voltage from the name plate on the motor
  - o Units: 10 x volts (10xV)
  - o Range: 1...99
- **Power**
  - o Displays the nominal motor power
  - o Units:
    - kilowatts (kW) when Line Frequency is 50 Hz
    - horsepower (HP) when Line Frequency is 60 Hz
  - o Range: 0...255
- **Multiplier**
  - o Specifies a multiplier for the rated Power and Current values
  - o Options: x1, x10
- **Current**
  - o The nominal motor current from the name plate on the motor
  - o Units: amperes (A)
  - o Range: 0...255
- **Speed**
  - o The nominal motor speed from the name plate on the motor
  - o Units: 10 x RPM
- **Torque**
  - o Displays the calculated nominal motor torque
  - o Units: foot-pound (lbf)

## Alarm

- **Enabled**
  - o If set to enabled, the drive is set to stop and report a fault if the respective alarm condition is active. The Realift RPC will report a drive fault when the drive detects a fault.
- **Level**
  - o The threshold when an alarm is reported.
- **Delay**
  - o The amount of time that the Altivar drive waits after a configured limit is initially breached before considering the threshold as violated.
- **High Torque**
  - o The high torque threshold, in 10 x % of the drive's rated torque
  - o Valid range: 10...300%
- **Undervoltage**
  - o Indicates when the mains voltage supplying the drive is less than the drive's rated minimum voltage.
  - o This alarm is always enabled.
  - o Units: 10 x seconds (10xs)
- **Over Temperature**
  - o Indicates that the drive is operating at a temperature above the drive's rated operating temperature.
  - o Valid range: 0...118 %
- **Input Phase Loss**
  - o Indicates that one of the mains voltage phases supplying the drive is less than the drive's rated minimum.
- **Output Phase Loss**
- **Motor Thermal**
  - o Indicates when the internal temperature of the drive, in % of rated temperature, is exceeded.
  - o Valid range: 0...118%

## ENA

- **Enabled**
  - o Enables and disables ENA
- **Integral Gain**
  - o Specifies the integral gain
  - o Range: 0...254

- **Proportional Gain**

- o Specifies the proportional gain
- o Range: 0...254

### To set the Altivar drive communication parameters

1. On the control pad of the drive, on the Drive Menu > 1.9 Communications > Modbus Network menu, set the communication parameters as follows:
  - a. Modbus Address: 1
  - b. Modbus Baud Rate: 19.2 kbps
  - c. Modbus format: 8-N-1
  - d. Modbus time out: 30 seconds
2. Turn the drive off and then turn it on again.

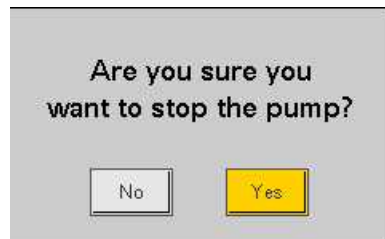
#### 7.5.2 Configuring the Interface for a Generic Drive

Perform the following procedure to configure the interface for a generic drive.

### To configure the drive interface for a generic drive

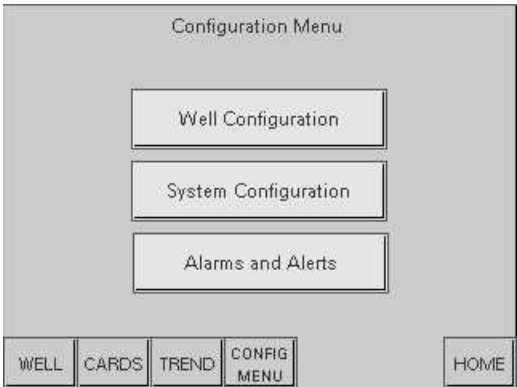
1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Home** screen (**Pump Overview** screen), stop the pump by pressing **STOP PUMP**.

The Stop Pump dialog is displayed.



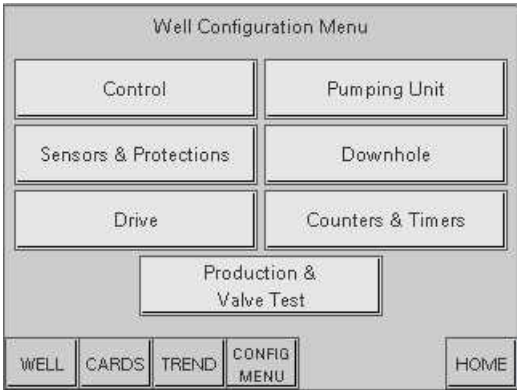
3. Press **Yes** and wait until the **Pump Status** is **Off**.
4. Press **CONFIG MENU** on the home screen.

The **Configuration Menu** screen is displayed.



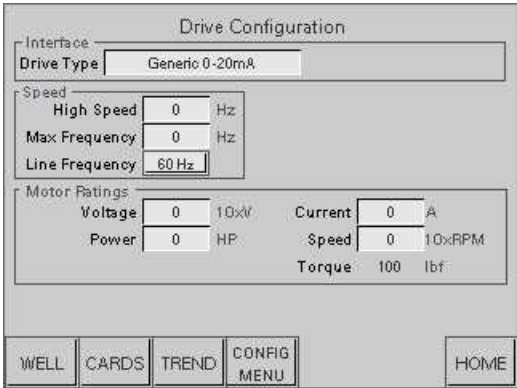
- 5. Press **Well Configuration**.

The **Well Configuration** menu is displayed.



- 6. Press **Drive**.

The **Drive Configuration** screen is displayed.



- 7. In the **Interface** pane, press the **Drive Type** field.

Controls are displayed that enable you to scroll through the drive types.

The screenshot shows a 'Drive Configuration' window. At the top, 'Interface' is set to 'Generic 0-20mA'. Below this, there are three large buttons: 'Esc', an up arrow, and a down arrow, followed by an 'Enter' button. The 'Max Frequency' is set to '0' and 'Line Frequency' is set to '60 Hz'. Under 'Motor Ratings', there are fields for 'Voltage' (0), 'Current' (0), 'Power' (0), 'Speed' (0), and 'Torque' (100). At the bottom, there are buttons for 'WELL', 'CARDS', 'TREND', 'CONFIG MENU', and 'HOME'.

8. Press the up and down arrows until **Generic 0-20mA** or **Generic 4-20 mA** is displayed and press **Enter**.
9. Configure the parameters as described below.

## Generic drive parameters

The following parameters appear for generic drives.

### Interface

- **Drive Type**
  - o Specifies the drive type to be configured
  - o Valid Options: Altivar, Generic 0-20mA, Generic 4-20mA, Start Contactor

### Speed

- **High Speed**
  - o The highest frequency to which the drive speed can be set.
  - o This parameter should be less than or equal to the highest set frequency of the generic drive
  - o Units: hertz (Hz)
  - o Range: 10...254
- **Max Frequency**
  - o The highest frequency at which the drive operates. The drive limits its maximum output speed to this frequency value.
  - o Units: hertz (Hz)
  - o Range: 10...254
- **Line Frequency**
  - o The nominal motor frequency from the name plate on the motor
  - o Units: hertz (Hz)
  - o Options: 50, 60

### Motor Ratings

- **Voltage**
  - o Specifies the nominal motor voltage from the name plate on the motor
  - o Units: 10 x volts (10xV)
  - o Range: 1...99
- **Power**
  - o Displays the nominal motor power from the name plate on the motor
  - o Units: horsepower (HP)
  - o Range: 0...255
- **Current**
  - o The nominal motor current from the name plate on the motor
  - o Units: amperes (A)
  - o Range: 0...255
- **Torque**
  - o Displays the motor torque
  - o Units: foot-pound (lbf)

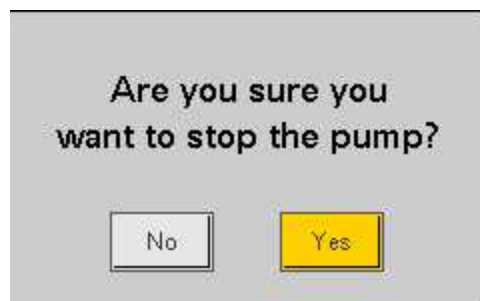
### 7.5.3 Configuring the Interface for a Starter or Contactor

Perform the following procedure to configure the interface for a starter or contactor.

#### To configure the drive interface for a starter or contactor

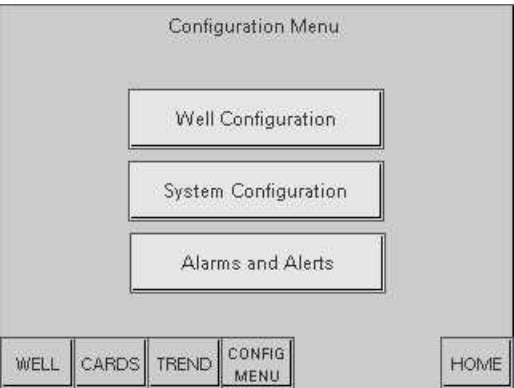
1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Home** screen (**Pump Overview** screen), stop the pump by pressing **STOP PUMP**.

The Stop Pump dialog is displayed.



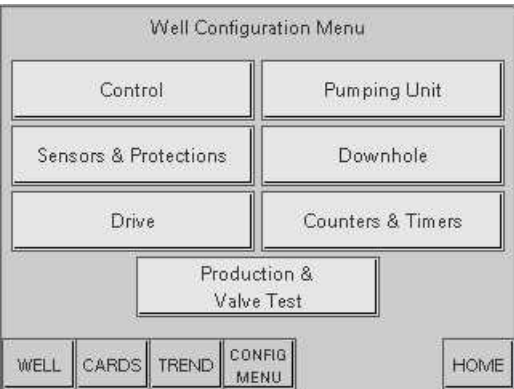
3. Press **Yes** and wait until the **Pump Status** is **Run Disabled**.
4. Press **CONFIG MENU** on the home screen.

The **Configuration Menu** screen is displayed.



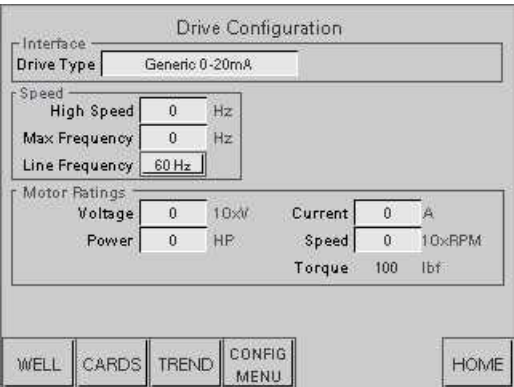
- 5. Press **Well Configuration**.

The **Well Configuration** menu is displayed.



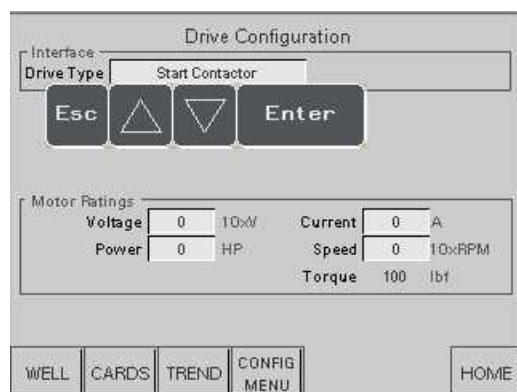
- 6. Press **Drive**.

The **Drive Configuration** screen is displayed.



- 7. In the **Drive Interface** pane, press the **Drive Type** field.

Controls are displayed that enable you to scroll through the drive types.



8. Press the up and down arrows until **Start Contactor** is displayed and press **Enter**.
9. Configure the parameters as described below.

### Starter or Contactor parameters

- **Voltage**
  - o Specifies the nominal motor voltage from the name plate on the motor
  - o Units: 10 x volts (10xV)
  - o Range: 1...99
- **Current**
  - o The nominal motor current from the name plate on the motor
  - o Units: amperes (A)
  - o Range: 0...255
- **Power**
  - o Displays the nominal motor power from the name plate on the motor
  - o Units: horsepower (HP)
  - o Range: 0...255
- **Torque**
  - o Displays the motor torque
  - o Units: foot-pound (lbf)

## 7.6 Entering Well and Pump Information

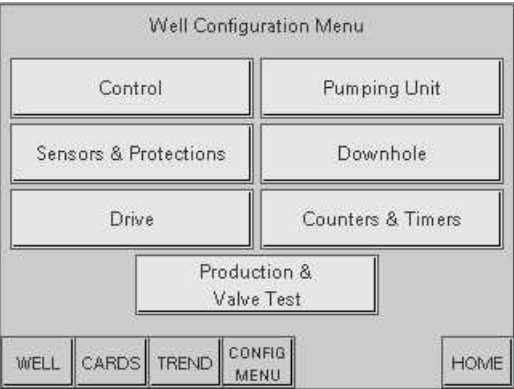
You can configure the well data by pressing **Well** from the **Home** screen or by pressing **Well Configuration** from the **Configuration Menu**.

The **Well Configuration Menu** screens enable you to configure:

- Pump control information
- Pumping unit information

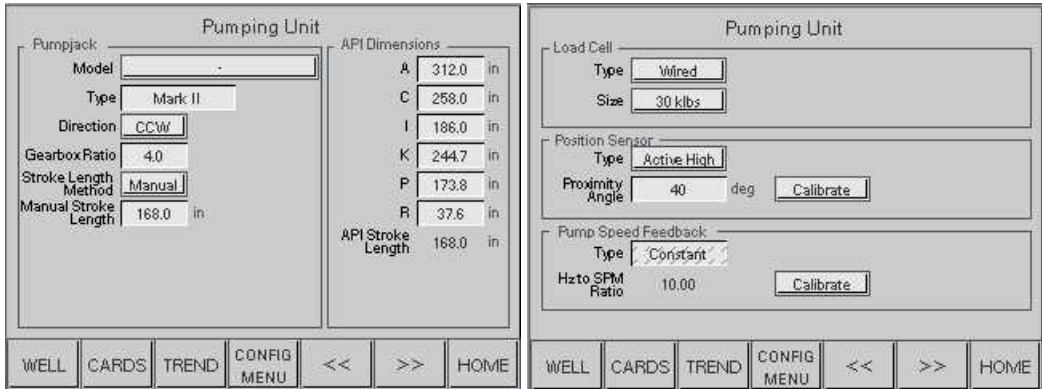
- Sensors and protection information
- Downhole calculation parameters
- Drive information
- Counters and timers
- Inferred production and valve testing information

The Well Configuration menu is shown below.



7.6.1 Entering Pumping Unit Information

Use the **Pumping Unit** screens to enter pumping unit information.



To enter Pumping Unit information

1. Log in to the Magelis HMI as described in [Logging in to the Magelis HMI](#)<sup>26</sup>.
2. Press **CONFIG MENU**.  
The **Configuration Menu** screen is displayed.
3. Press **Well Configuration**.  
The **Well Configuration Menu** screen is displayed.
4. Press **Pumping Unit**.

The first **Pumping Unit** screen is displayed.

5. Configure the parameters, as described below.
6. Press >> to advance to the next screen and continue configuring the parameters.

## Parameters

The following parameters appear on the **Pumping Unit** screens.

### Load Cell

#### NOTICE

##### UNINTENDED EQUIPMENT OPERATION

Using a wired load cell with pumps operating at 12 spm or greater can cause Pump Fillage calculations to become distorted. For pumps operating at this speed or greater, it is recommended that you either:

- Use a wireless load cell
- Run the pump in Timed mode

**Failure to follow these instructions can result in equipment damage.**

- **Type**
  - o Specifies the load cell type
  - o Valid Options: Wired, Wireless
- **Size**
  - o Specifies the load cell size
  - o Valid Options: 30 klbs, 50 klbs

### Position Sensor

- **Type**
  - o Specifies the type of position sensor
  - o Valid Options: Active High, Active Low
- **Proximity Angle**
  - o Indicates the proximity angle of the pumpjack. See [To Calibrate the proximity angle](#)<sup>53)</sup> and [To manually set the proximity angle](#)<sup>54)</sup> below for more information about calculating the **Proximity Angle**.
- **Calibrate**
  - o Calibrates the proximity angle
  - o The button is only available when the Realift RPC is running in Hand Mode

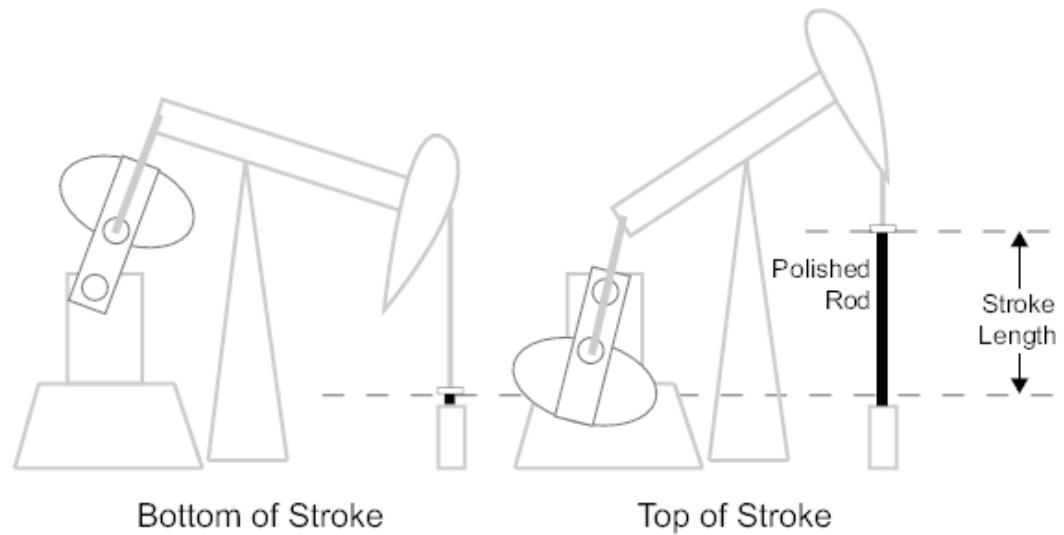
### Pump Speed Feedback

- **Type**
  - o Specifies the type of pump speed feedback sensor used
  - o Analog speed feedback should be used, if available
  - o Valid Options: Constant, Analog Input, Altivar, or Counter
- **Hz to SPM Ratio**
  - o A calculated ratio of drive speed in Hz compared to pumpjack speed in strokes per minute (spm)
  - o Displays the Hz to SPM ratio
- **Calibrate**
  - o Calibrates the Hz to SPM ratio
  - o When calibration is active, the button is locked and the text changes to **Calibrating**
  - o The button is only available when the Realift RPC is running in Hand Mode

### Pumpjack

- **Model**
  - o Specifies the pumpjack model
- **Type**
  - o Specifies the type of pumpjack in use
  - o Valid options: Conventional, Mark II, Airbalanced
- **Direction**
  - o Selects the direction of rotation. The crank arm direction of rotation is either clockwise or counterclockwise when the pumpjack is viewed from the side with the polished rod on the right.
  - o Valid Options: CW (Clockwise), CCW (Counter Clockwise)
  - o If you select Mark II as **Type**, the **Direction** parameter is automatically set to CCW
- **Gearbox Ratio**
  - o Specifies the internal drive head gear ratio, expressed as x to 1. When a direct drive is used, the ratio should be 1.
  - o Valid range: 0.1...100.0
- **Stroke Length Method**
  - o Indicates the method used to calculate the stroke length.
  - o Valid options: Manual, API
- **Manual Stroke Length**
  - o Specifies the stroke length. You can determine the stroke length using the Stroke Length

diagram, shown below.



#### API Dimensions

- **A, C, I, K, P, R**
  - o Specifies the API dimensions. See [Entering Stroke Length](#)<sup>[56]</sup> for more information.
  - o Units: inches (in)
  - o Range: 0.0...1000.0
- **API Stroke Length**
  - o Displays the API stroke length

#### To calibrate the proximity angle

The Realift RPC can automatically calculate the proximity sensor angle.

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#)<sup>[26]</sup>.
2. Put the pump in **Hand** mode, as described in [Control Methods](#)<sup>[71]</sup>, and run the pump at its slowest speed.
3. On the **Home** screen, press **CONFIG MENU**.  
The **Configuration Menu** screen is displayed.
4. Press **Well Data**.  
The **Pumping Unit Information** screen is displayed.
5. Press >> to advance to the next screen.
6. When the pump is at the top of a stroke, press the **Calibrate** button in the Position Sensor section of the screen.

A timer starts and records how long it takes for the pump head to move from the top position

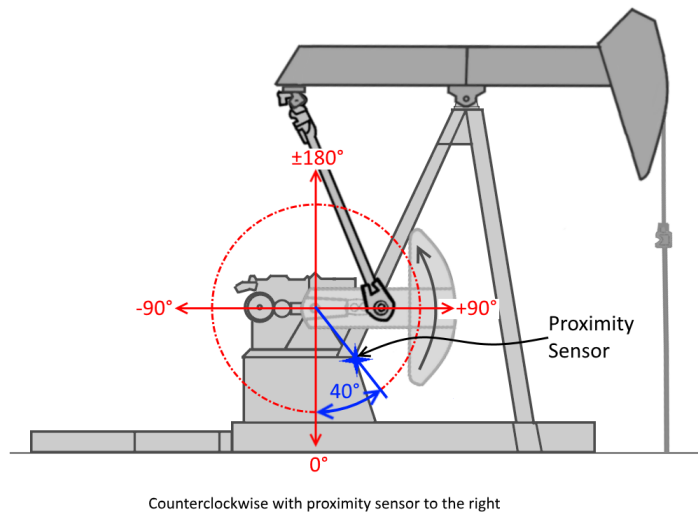
to when the proximity detector is activated. This time is then converted to degrees of rotation to determine the exact angle of the proximity switch.

### To manually set the proximity angle

1. Determine the proximity angle using the procedure in this section.
2. Enter the resultant value into the **Proximity Angle** field.

The Realift Rod Pump uses the Proximity Angle to determine the location of the center axis of the Pitman Arm wrist pin relative to the position at which the crank arm first triggers the proximity sensor. The Proximity Angle is measured from the BDC in a counter-clockwise direction when viewing the pumpjack from its side with the polished rod on the right.

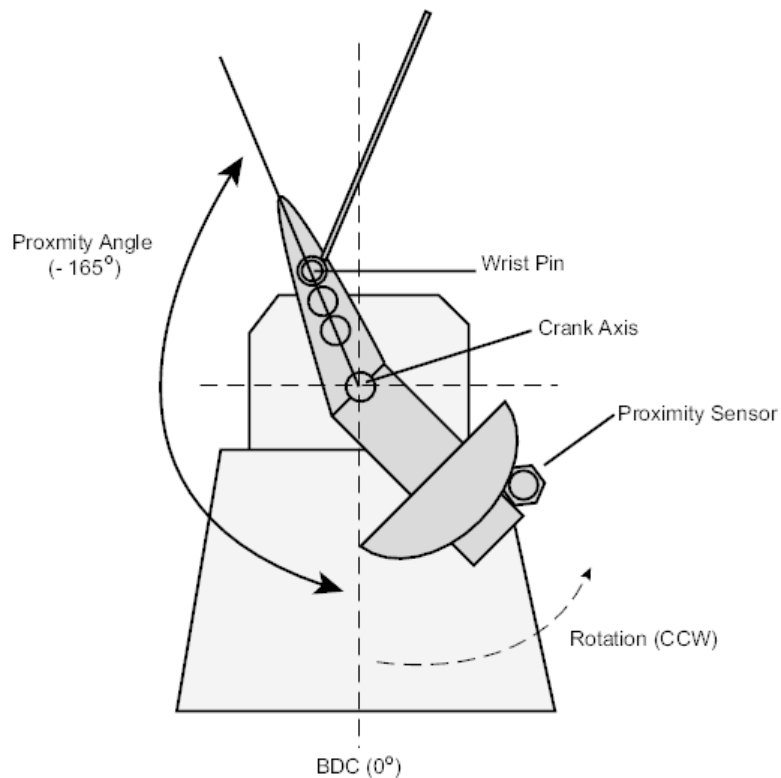
The figure below shows the proximity angle, conventional pumpjack.



The direction of rotation dictates whether the Proximity Angle is positive or negative. A positive proximity angle means that the proximity sensor is triggered after the wrist pin is at Bottom Dead Center (BDC). A negative proximity angle means the proximity sensor is triggered before the wrist pin is at BDC. If the wrist pin is at BDC (i.e., straight down) when the proximity sensor is activated, the proximity angle is 0°. If the wrist pin is at Top Dead Center (TDC) when the proximity sensor is activated, the proximity angle is 180°.

In the figure above, the crank arm is rotating counter-clockwise and triggers the proximity sensor after it passes BDC. The Proximity Angle in this instance is positive (+).

The location of the Pitman Arm wrist pin can vary by design. The Mark II pumpjack places the wrist pin on the opposite side of the crank axis from the portion of the arm that is likely to trigger the proximity sensor. The angle that should be entered is the angle of the wrist pin side of the crank arm relative to BDC when the proximity sensor is triggered (see figure below).



Set the Proximity Angle by determining the point at which the crank arm first triggers the proximity sensor during a stroke. It is recommended that someone else operate the pumpjack hand brake when performing the following procedure.

### To manually determine the proximity sensor angle

1. Set the pumpjack speed at or just above its minimum value.
2. Place the Realift Rod Pump in **Hand** mode and slowly rotate the crank arm.

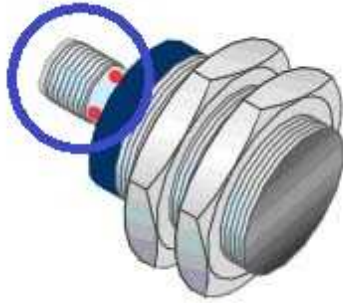
#### **⚠ CAUTION**

##### **UNINTENDED EQUIPMENT OPERATION**

- Read and understand this manual before operating the Realift Rod Pump system.
- Ensure that the pumpjack is stopped with handbrake engaged before approaching it to make observations, take measurements, or adjust the equipment.

**Failure to follow these instructions can result in minor or moderate injury.**

3. Stop the pump as the helper quickly applies the pumpjack brake, stopping the crank arm just as it triggers the proximity sensor.
4. After the pumpjack is stopped with the hand brake engaged, confirm that the LED indicator on the base of the proximity sensor is lighted, as shown below.



With the crank arm held in place by the hand brake, the Proximity Angle can now be determined.

If you have access to a hand-held protractor with plumb-bob or similar tool (there are also a number of smart phone applications that do this), use this tool to measure the angle from vertical (BDC, or 0°) to the center axis of the wrist pin to obtain the Proximity Angle in degrees (°).

## NOTICE

### INACCURATE DATA

The proximity angle is used in calculations to determine the load and the productivity of the well. Ensure that any tools you use to determine the proximity angle have been properly calibrated.

**Failure to follow these instructions can result in inaccurate data.**

## 7.6.2 Entering Stroke Length

Using API (American Petroleum Institute) dimensions is the preferred method for determining **Stroke Length** in **Surface** or **Downhole** mode. These dimensions are entered in the **Pumping Unit** screen.

| Pumping Unit                      |              |
|-----------------------------------|--------------|
| Sensors                           |              |
| Load Cell Size                    | 30 klbs      |
| H2to SPM Ratio                    | Calibrate    |
| Proximity Angle                   | 0 deg        |
|                                   | Calibrate    |
| Pumpjack                          |              |
| Type                              | Conventional |
| Direction                         | CCW          |
| Gearbox Ratio                     | 0.0          |
| Stroke Length Method              | Manual       |
| Manual Stroke Length              | 0.0 in       |
| Reference Belt Slippage           | Set          |
| API Dimensions                    |              |
| A                                 | 6.0 in       |
| C                                 | 5.0 in       |
| I                                 | 1.0 in       |
| K                                 | 9.0 in       |
| P                                 | 7.0 in       |
| R                                 | 0.6 in       |
| Stroke Length                     | 0.0 in       |
| WELL CARDS TREND CONFIG MENU HOME |              |

API dimensions are a series of six measurements on a typical pumpjack, used to calculate **Stroke Length** based on the geometry of the pumpjack unit.

## NOTICE

### RISK OF EQUIPMENT DAMAGE

Ensure that the pumping unit information is accurate. Inaccurate pumping unit information can negatively affect the operation of the rod pump and, in some cases, cause equipment damage.

**Failure to follow these instructions can result in equipment damage.**

### To enter the API dimensions

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Home** screen, press **CONFIG MENU**.

The **Configuration Menu** screen is displayed.

3. Press **Well Data**.

The **Pumping Unit Information** screen is displayed.

4. Enter the appropriate measurements for that particular pumpjack.
5. On the **Pumping Unit Information** screen, press the **Stroke Length Method** field to change it from **Manual** to **API**.

If any of the API dimensions are left blank (i.e., "0"), the **Stroke Length Method** is set to **Not Using API** and cannot be changed until correct API dimensions are entered.

### 7.6.3 Setting a Measured Stroke Length

When API dimensions are unavailable, use a measured stroke length. You should use API dimensions whenever available, particularly when operating in **Surface** or **Downhole** mode.

Using a measured stroke length assumes that the up and down motion of the rod string follows a sinusoidal pattern. Differences in pumpjack geometry mean this is often not the case, and surface and downhole card shapes can be distorted. When you set a measured stroke length, set the parameter on the **Pumping Unit** screen.

The screenshot shows the 'Pumping Unit' configuration screen. It is divided into several sections: 'Sensors', 'Pumpjack', and 'API Dimensions'. The 'Sensors' section includes 'Load Cell Size' (30 klbs) and 'Hz to SPM Ratio' (Calibrate). The 'Pumpjack' section includes 'Type' (Conventional), 'Direction' (CCW), 'Gearbox Ratio' (0.0), 'Stroke Length Method' (Manual), 'Manual Stroke Length' (0.0 in), and 'Reference Belt Slippage' (Set). The 'API Dimensions' section lists various dimensions: A (6.0 in), C (5.0 in), I (1.0 in), K (9.0 in), P (7.0 in), R (0.6 in), and Stroke Length (0.0 in). The 'Manual Stroke Length' field is highlighted with a red box. At the bottom, there are navigation buttons: WELL, CARDS, TREND, CONFIG MENU, and HOME.

### 7.6.4 Entering Downhole Parameters

Use the **Downhole 1** and **Downhole 2** screens to enter downhole parameters for the well.

**Downhole 1**

Downhole Parameters

Stuffing Box Friction: 0 lbs

Damping Factor: 0.00

Tubing

Anchor Depth: 0 ft

Tubing Size: 0.00 in

Tapers

Number: 0

Total Length: 10000 ft

WELL CARDS TREND CONFIG MENU << >> HOME

**Downhole 2**

Tapers

|          | 1    | 2    |       |
|----------|------|------|-------|
| Length   | 2000 | 0    | ft    |
| Diameter | 5/8" | 3/4" | in    |
| Weight   | 0.00 | 0.00 | lb/ft |
| Speed    | 0    | 0    | ft/s  |
| Modulus  | 0.0  | 0.0  | MPSI  |

Config Config

WELL CARDS TREND CONFIG MENU << >> HOME

#### To enter Downhole parameters

1. Log in to the Magelis HMI as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. Press **CONFIG MENU**.  
The **Configuration Menu** screen is displayed.
3. Press **Well Configuration**.  
The **Well Configuration Menu** screen is displayed.
4. Press **Downhole**.  
The **Downhole 1** screen is displayed.
5. Configure the parameters, as described below.

#### Parameters

The following parameters appear on the **Downhole 1** and **Downhole 2** screens.

##### Downhole Parameters

- **Stuffing Box Friction**
  - o The term for load added by friction where the polished rod enters the stuffing box. When the rod moves downward, the amount of force is added to the load cell reading. When the rod moves upward, the amount of force is subtracted from the load cell reading.
  - o Units: pounds (lbs)
  - o Suggested value: 50...100 pounds
- **Damping Factor**
  - o The downhole calculation parameter that affects the shape of the Downhole Card
  - o Suggested value: 0.080

### Tubing

- **Anchor Depth**
  - o The depth of the tubing anchor
  - o Units: feet (ft)
- **Tubing Size**
  - o The diameter of the tubing
  - o Units: inches (in)
  - o Valid range: 0.00... 99.99

### Tapers

- **Number**
  - o The number of rod string sections currently installed in the well
  - o Range: 1...6
- **Total Length**
  - o Displays the length of the tapers added together

The following parameters appear on the Downhole 2 screen.

- **Length**
  - o The length of the rod string sections in the well
  - o Units: feet (ft)
- **Diameter**
  - o The diameter of the rod string sections in the well, excluding joints
  - o Units: inches (in)
- **Weight**
  - o The weight per foot of the rod tapers in the well
  - o Units: pounds per foot (lb/ft)

| Rod Size (in) | Weight, Fiberglass (lbs/ft) | Weight, Steel (lbs/ft) |
|---------------|-----------------------------|------------------------|
| 0             | 0.000                       | 0.000                  |
| 5/8           | 0.307                       | 1.135                  |
| 3/4           | 0.480                       | 1.634                  |
| 7/8           | 0.640                       | 2.224                  |
| 1             | 0.800                       | 2.904                  |
| 1 1/8         | 0.994                       | 3.676                  |
| 1 1/4         | 1.290                       | 4.538                  |
| 1 3/8         | 1.640                       | 5.000                  |
| 1 1/2         | 1.950                       | 6.000                  |
| 1 5/8         | 2.290                       | 7.000                  |
| 1 3/4         | 2.650                       | 8.200                  |
| 2             | 3.460                       | 10.660                 |

- **Speed**

- o The speed at which the taper moves
- o Units: feet per second (ft/s)

- **Modulus**

- o The elasticity of the material of the rod string sections in the well. The Modulus for steel is 30.5 Mpsi (210.23 GPa). For fiberglass, it is 7.2 Mpsi (49.64GPa).
- o Units: millions of psi (Mpsi)

- **Config**

- o Displays the **Taper** configuration screen

### Taper configuration screen

The following image displays the Taper configuration screen.

- **Length**
  - o Specifies the length of the taper
  - o Units: feet (ft)
  - o Valid range: 0...99999
- **Diameter**
  - o Specifies the diameter of the taper
  - o Units: inches (in)
  - o Valid options: 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 2
- **Weight**
  - o The weight per foot of the rod tapers in the well
  - o Units: pounds per foot (lb/ft)
  - o Valid Range: 0.01...999.99
- **Material**
  - o Specifies the material of which the rod taper is made
  - o When set to Steel or Fiberglass, the Realift RPC automatically populates the **Weight**, **Speed**, and **Modulus** parameters
  - o Valid options: Steel, Fiberglass, Other
- **Speed**
  - o Displays the speed at which the taper moves
  - o Units: feet per second (ft/s)
- **Modulus**
  - o The elasticity of the material of the rod string sections in the well. The Modulus for steel is 30.5 Mpsi (210.23 GPa). For fiberglass, it is 7.2 Mpsi (49.64GPa).
  - o Units: millions of psi (MPSI)

7.6.5 Entering Inferred Production Parameters

Realift RPC can estimate the production of your well. Configuring parameters on the **Inferred Production** screen, shown below, allows you to estimate gross production, net oil production, and net gas production.

Inferred Production

Production

Pump Efficiency

16

%

Pump Diameter

1.50

in

Gauge Off Time

18

HH

Plunger Clearance

11

0.001in

Plunger Seal Length

0.15

in

Fluid

Gas Oil Ratio

1.0

SCF/bbl

SG Oil

0.16

g/cm3

SG Water

0.00

g/cm3

Water Cut

20

%

Viscosity

0.12

CP

Counterbalance & Valve Leak

Counterbalance Load

0

10xlbs

Counterbalance Angle

0

deg

Structural Imbalance Load

4000

10xlbs

Standing Valve Leakage

2.00

bbl/d

Traveling Valve Leakage

3.04

bbl/d

WELL

CARDS

TREND

CONFIG MENU

>>

HOME

To configure inferred production parameters

1. Log in to the Magelis HMI, as described in [Logging in to the Realift RPC](#)

2. On the **Home** screen, press **Well**.

The **Well Configuration** screen is displayed.

Well Configuration Menu

Control

Pumping Unit

Sensors & Protections

Downhole

Drive

Counters & Timers

Production & Valve Test

WELL

CARDS

TREND

CONFIG MENU

HOME

3. Press **Production & Valve Test**.

The **Inferred Production** screen is displayed.

4. Configure the parameters, as needed.

## Parameters

The following parameters appear on the **Inferred Production** screen.

### Production

- **Pump Efficiency**

- o The Pump Efficiency Factor is multiplied by the theoretical production to result in the Realift RPC production values.
- o It is suggested to set the value to 80%, until enough time has elapsed that Realift RPC estimated production can be compared to actual production and the Pump Efficiency Factor adjusted accordingly.
- o Units: percentage (%)

- **Pump Diameter**

- o The diameter of the pump, used to calculate the gross production of the pump
- o Units: inches (in)
- o Range: 0.00...10.00

- **Gauge Off Time**

- o The time of day to start and end the 24-hour production accumulations. Enter the time on the 24-hour clock. For example, enter:
  - 2 for 2:00 am. For single-digit hours you can enter the leading 0, but it is not displayed.
  - 11 for 11:00 am
  - 22 for 10:00 pm
- o Every day at the specified time, Realift RPC determines the accumulated production for the previous 24 hours
- o Units: Hours (HH)
- o Range: 0...23

- **Plunger Clearance**

- o The amount of space between the plunger and the barrel
- o Typically this value is between 0.003 and 0.008 inches
- o Units: inches (in)

- **Plunger Seal Length**

- o Displays the length of the plunger seal
- o Typically this value is between 1 and 5 inches
- o Units: inches (in)
- o Range: 0.00...10.00

- **Gas Oil Ratio**

- o The gas/oil ratio (GOR) is the ratio of the volume of gas that comes out of solution to the volume of oil at standard conditions
- o Units: standard cubic feet per barrel (SCF/bbl)
- o Range: 0.0...99.9

- **SG Oil**

- o Specific Gravity Oil
- o The measured density of oil in the well. This is used to calculate pump intake pressure and the fluid height in the casing.
- o Units: grams per cubic centimeter (g/cm<sup>3</sup>)
- o Range: 0.00...99.99

- **SG Water**

- o Specific Gravity Water
- o The measured density of water in the well. This is used to calculate pump intake pressure and the fluid height in the casing.
- o This parameter is typically set to 1
- o Units: grams per cubic centimeter (g/cm<sup>3</sup>)

- **Water Cut**

- o The ratio of water produced compared to the volume of total fluid produced from by the well.
- o Units: percentage (%)

- **Viscosity**

- o Specifies the fluid viscosity
- o Fluid viscosity should be determined by testing the fluid produced by the well. It may vary significantly, depending on the properties of the fluid and its temperature.
- o Units: Centipoise (CP)

### Counterbalance and Valve Leak

- **Counterbalance Load**

- o Specifies the counterbalance load of the pump
- o Units: 10 x pounds (10xlbs)

- **Counterbalance Angle**

- o Specifies the counterbalance angle of the pump
- o Units: degrees (deg)

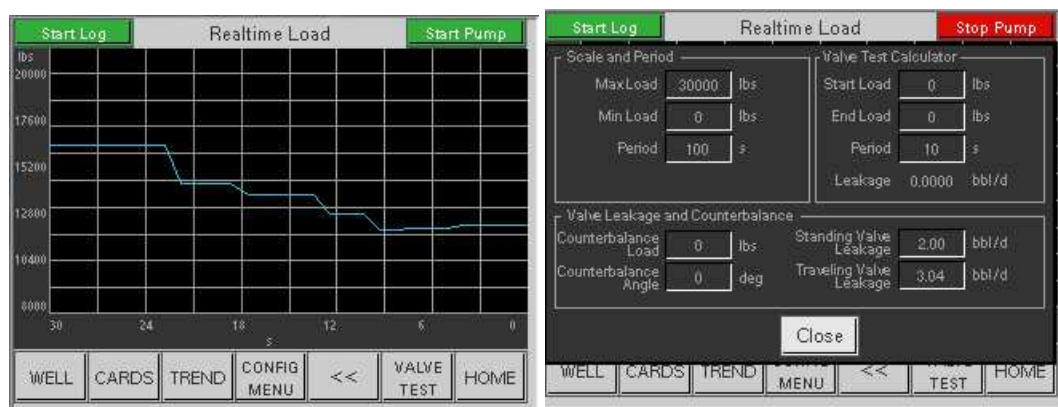
- **Structural Imbalance Load**

- o Specifies the structural imbalance load
- o Units: 10 x pounds (10xlbs)

- **Standing Valve Leakage**
  - o Specifies the leakage of the standing valve
  - o Units: barrels per day (bbl/d)
- **Traveling Valve Leakage**
  - o Specifies the leakage of the traveling valve
  - o Units: barrels per day (bbl/d)

### 7.6.6 Using the Realift RPC to conduct valve and counterbalance tests

You can use the Realift RPC to conduct valve and counterbalance tests. The **Realtime Load** and **Test Parameter Pop-up** screens are shown below.



### To perform a valve test

It is recommended that this procedure be performed with an assistant located at the pump.

1. Log in to the Magelis HMI, as described in [Logging in to the Realift RPC](#) <sup>261</sup>
2. Run the pump at a slow and steady state for approximately four minutes.
3. On the **Home** screen, press **Well**.

The **Well Configuration** screen is displayed.

4. Press **Production & Valve Test**.

The **Inferred Production** screen is displayed.

5. Press **>>**.

The **Valve Test** screen is displayed, as shown below.



6. Press **Stop Pump** and **Start Log**.
7. Allow the pumping unit to coast to a gentle stop and apply the brake:
  - a. For Traveling Valve measurement, stop the pump during the upstroke.
  - b. For Standing Valve measurement, stop the pump during the downstroke.
8. Monitor the changes of the load for 10 to 15 seconds.
9. Press **Stop Log**.
10. Press **Valve Test**.

The **Valve Test Pop-up** screen is displayed.

11. Enter the **Start Load**, **End Load**, and **Period** values in the **Valve Test Calculator** section of the screen.

The Leakage is displayed in bbl/s.

12. In the **Valve Leakage and Counterbalance** section of the screen, record the **Standing Valve** and **Traveling Valve** leakage values .

## To perform a Counterbalance test

It is recommended that this procedure be performed with an assistant located at the pump.

1. Log in to the Magelis HMI, as described in [Logging in to the Realift RPC](#)<sup>[26]</sup>.
2. Put the pump in **Hand** mode, as described in [Control Methods](#)<sup>[71]</sup>.
3. Run the pump at a steady state on its lowest speed.
4. On the **Home** screen, press **Well**.

The **Well Configuration** screen is displayed.

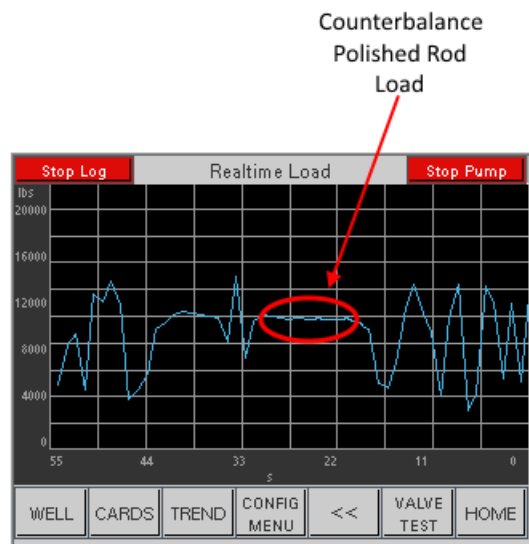
5. Press **Production & Valve Test**.

The **Inferred Production** screen is displayed.

6. Press **>>**.

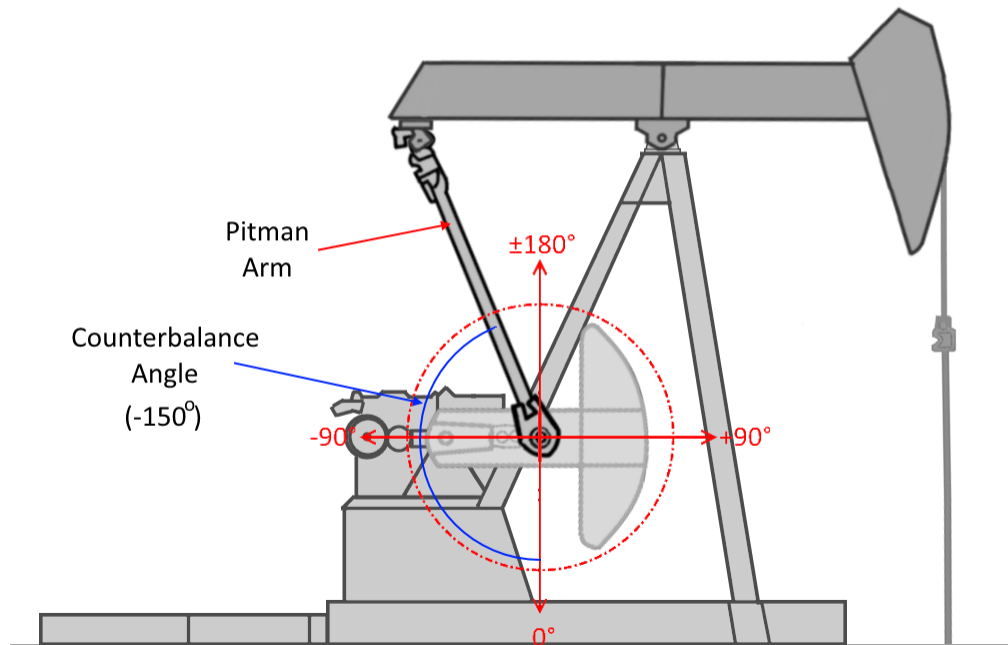
The **Realtime Load** screen is displayed.

7. Stop the pump during the upstroke with the crank at 90° and gently apply the brake.
8. Alternately release and set the brake at intervals of a few seconds until the crank arm remains at rest.
9. Observe and record:
  - a. The load on the polished rod, as show below.



- b. The angle of the Pitman arm of the pump.

The figure below shows the counterbalance angle for a pump running in counter-clockwise direction.



10. Press **Valve Test**.

The **Valve Test Pop-up** screen appears.

11. Record the **Counterbalance Load** and **Counterbalance Angle** in the **Valve Leakage and Counterbalance** section.

### Test Parameter Pop-up screen parameters

The following parameters appear on the Valve Test Pop-up screen.

#### Scale and Period

- **Max Load**

- o Specifies the maximum load to be graphed
- o This value should be set to just above the expected value
- o Units: pounds (lbs)
- o Range: 1...50000

- **Min Load**

- o Specifies the minimum load to be graphed
- o This value should be set to just below the expected value
- o Units: pounds (lbs)
- o Range: 0...29999

- **Period**
  - o Specifies the amount of time to be graphed.
  - o Units: seconds (s)
  - o Range: 30...800

#### Valve Test Calculator

- **Start Load**
  - o Specifies the load at the start of the valve test
  - o Units: pounds (lbs)
- **End Load**
  - o Specifies the load at the end of the valve test
  - o Units: pounds (lbs)
- **Period**
  - o Specifies the length of time for which the test was performed
- Units: seconds (s)
- **Leakage**
  - o Displays the calculated value of the valve leakage
  - o Units: barrels per second (bbl/s)

#### Valve Leakage and Counterbalance

- **Counterbalance Load**
  - o Specifies the counterbalance load
  - o Enter the load determined by your counterbalance test
  - o Units: pounds (lbs)
- **Counterbalance Angle**
  - o Specifies the counterbalance angle
  - o Enter the angle determined from your counterbalance test
  - o Units: degrees (deg)
- **Standing Valve Leakage**
  - o Specifies the standing valve leakage
  - o Enter the value determined from your standing valve test
  - o Units: barrels per day (bbl/d)
- **Traveling Valve Leakage**
  - o Specifies the traveling valve leakage
  - o Enter the value determined from your traveling valve test

- o Units: barrels per day (bbl/d)

7.7 Controlling the Pump

NOTICE

**RISK OF EQUIPMENT DAMAGE**

Running your pump too quickly without using downhole or surface control can cause your pump to continue running in situations such as fluid pound. It is recommended that you use the **Downhole** control method and set your Fillage minimum to no less than 85% to avoid fluid pound.

**Failure to follow these instructions can result in equipment damage.**

Use the **Control** configuration screens to configure the pump settings. Pump control settings determine how the Realift Rod Pump controls the pumpjack, including:

- What **Control Method** is used
- When different controls take effect
- When speed is adjusted
- How the pump fillage is calculated
- How long the Realift Rod Pump system runs with a low pump fill before stopping and entering a **Pump Off** state.

The **Control** screens are shown below.



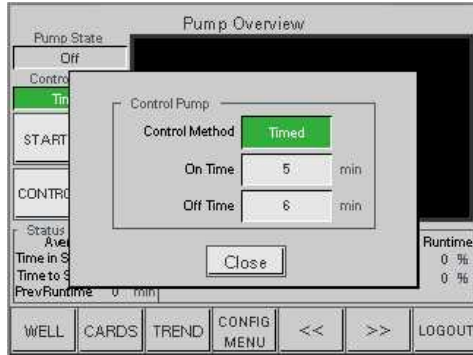
To access the pump control screens

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. Press **Well**.
3. Press **Control**.  
The **Control 1** screen is displayed.
4. Press >> to proceed to the next screen (**Control 2**).

### 7.7.1 Control Methods

The control method determines how Realift RPC manages its speed to regulate the flow and volume of fluid in the well.

You can select the control mode from the **Pump Overview** screen. The figure below shows the **Pump Overview** screen with the **Control Pump** pop-up window.



You have five options for controlling the well:

- **Off**
- **Hand** (manual)
- **Timed**
  - o Realift Rod Pump operates as a timer, running for On Time and stopping for Pump Off Time, both of which are fixed, user-entered values.
- **Surface**
  - o Realift Rod Pump system repeats running cycles until the Surface Fill falls below the Fill Minimum for the Pump Off Count Limit, remaining off for Pump Off Time. While running, speed is increased if the Surface Fill is above the Fill Target and decreased if below.
- **Downhole**
  - o Realift Rod Pump system repeats running cycles until the Downhole Fill falls below the Fill Minimum for the Pump Off Count Limit, remaining off for Pump Off Time. While running, speed is increased if the Downhole Fill is above the Fill Target and decreased if below.

### Timed mode optimization

When running in **Surface** or **Downhole mode**, the pump jack can maximize the off time in order to minimize power consumption due to restarting the pump.

There are three parameters, located on the **Control 2** screen, used to automate the on/off time of the pump:

- **Min Off Time**: The minimum allowable time that the pump will remain in the off state before restarting
- **Max Off Time**: The maximum allowable time that the pump will remain in the off state before restarting
- **Auto Adjust**: Enables and disables the auto adjust feature

When the pump is first started or **Auto Adjust** is switched from Disabled to Enabled, the off time for the unit is set to the minimum off time.

The ratio between the amount of time that the pump remains off compared to the amount of time the pump runs during the next restart will determine the optimal amount of production the well is capable of. Once this ratio has been determined, the off time of the pump is incrementally increased by 20% or for 1 minute (whichever is smaller), until one of the following two conditions are met:

- The new ratio of On Time to Off Time falls below 90% of the optimal ratio
- The new off time reaches the Max Off Time

See [Control 2 parameters](#)<sup>76</sup> for more information.

## To select the control mode

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#)<sup>26</sup>.
2. On the Pump Overview screen, press **CONTROL PUMP**.

The **Control Pump** pop-up screen appears.

3. Press the **Control Method** field.

Controls are displayed that enable you to scroll through the Control types.

4. Configure the remaining parameters, as described below.

## Parameters

- **Control Method**
  - o Specifies the method used to control the pump
  - o Valid Options: Off, Hand, Timed, Surface, Downhole
- **On Time**
  - o Specifies the length of time the pump should run when using the Timed control method
  - o This parameter only appears when **Control Method** is set to **Timed**
  - o Units: minutes (min)
- **Off Time**
  - o Specifies the length of time the pump should not run when using the Timed control method
  - o This parameter only appears when **Control Method** is set to **Timed**
  - o Units: minutes (min)
- **Target Fillage**
  - o Specifies the target fillage of the well
  - o This parameter does not appear when **Control Method** is set to **Timed**
  - o Units: percentage (%)

7.7.2 Entering Pump Control settings

You can configure control of the pump on the Control 1 and Control 2 screens.

Control 1

Fillage

Target

0

%

Minimum

0

%

Deadband

0

%

Fill Base

0

%

Pump Speed

Maximum

0.0

spm

Minimum

0.0

spm

Hand/Typed

0.0

spm

Restart

0.0

spm

Control

Control Method

Off

Timed Fallback

Disabled

Restart Speed

Auto

Control Strokes

Speed Change

0

str

Pre-control

0

str

Pump Off

0

str

Control 2

Timed Control

On Time

0

min

Off Time

0

min

Min Off Time

0

min

Max Off Time

0

min

Auto Adjust

Disabled

Floating Rod

Min Speed

0.0

spm

Alpha

0

Time Constant

0

Load Limit

0

lbs

Floating Rod

Disabled

Power Cycle Management

Delay Time

0

s

Auto-restart

Enabled

Pump Start

Warning Time

0

s

WELL

CARDS

TREND

CONFIG MENU

<<

>>

HOME

WELL

CARDS

TREND

CONFIG MENU

<<

>>

HOME

To configure Pump Control settings

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#)<sup>[26]</sup>.

2. On the **Pump Overview** screen, press **Well**.  
The **Well Configuration Menu** screen appears.

3. Press **Control**.  
The **Control 1** screen appears.

4. Configure the parameters, as described below.

5. Press >>.  
The **Control 2** screen appears.

6. Configure the parameters, as described in [Control 1 parameters](#)<sup>[73]</sup> and [Control 2 parameters](#)<sup>[76]</sup>.

7.7.2.1 Control 1 parameters

The following parameters appear on the Control 1 screen.

Control 1

Fillage

Target

0

%

Minimum

0

%

Deadband

0

%

Fill Base

0

%

Pump Speed

Maximum

0.0

spm

Minimum

0.0

spm

Hand/Typed

0.0

spm

Restart

0.0

spm

Control

Control Method

Off

Timed Fallback

Disabled

Restart Speed

Auto

Control Strokes

Speed Change

0

str

Pre-control

0

str

Pump Off

0

str

WELL

CARDS

TREND

CONFIG MENU

<<

>>

HOME

## Fillage

- **Target**
  - o Specifies the ideal pump fillage for the rod pump
  - o Units: percentage (%)
  - o Target values are determined through observation after configuration is complete and the Realift RPC is started for initial monitoring.
- **Minimum**
  - o Specifies the pump fillage where the Realift RPC detects a Pump Off state
  - o Units: percentage (%)
- **Deadband**
  - o The maximum change in pump fillage for which the Realift RPC does not compensate with a change in pump speed
  - o Units: percentage (%)
  - o The suggested value is 3%
- **Fill Base**
  - o Displays the full range load percentage of the downhole card at which the Realift RPC, in the downstroke, starts to look for the slope change indicating plunger contact with fluid in the pump barrel. The adjustable fill base allows the Realift RPC to find accurate net stroke with a variety of unusual pump conditions. If net stroke calculation results do not appear to be reasonable, adjust the fill base up or down for more logical results.
  - o Units: percentage (%)
  - o The suggested value is 30%

## Pump Speed

- **Maximum**
  - o Specifies the fastest drive speed when the pump is in Auto Mode and is adjusting to the speed based on the pump fill
  - o Units: strokes per minute (spm)
  - o Range: 0.1...20.0
- **Minimum**
  - o Specifies the slowest drive speed when the pump is in Auto Mode and is adjusting to the speed based on the pump fill
  - o Units: strokes per minute (spm)
  - o Range: 0.1...20.0
- **Hand/Timed**
  - o Specifies the pump speed when in Hand or Timed mode

- o Units: strokes per minute (spm)
- o Range: 0.1...20.0
- **Restart**
  - o This parameter only appears when **Restart Speed** is set to **Auto**
  - o Displays the pump speed after it restarts
  - o Units: strokes per minute (spm)
  - o This value is calculated by Realift RPC.

## Control

- **Control Method**
  - o Specifies the control method to use
  - o See [Control Methods](#) <sup>71</sup>
- **Timed Fallback**
  - o Enables Timed Fallback
  - o Signals from the proximity sensor or inclinometer, and load cell are used to generate dynacards. If the position sensor signal is lost, Realift RPC employs a timed fallback control mode system to try to keep the pump running as efficiently as possible.
- **Restart Speed**
  - o Specifies the speed at which the pump restarts
  - o Options:
    - Minimum: The pump starts at the minimum speed
    - Auto: The pump starts at 85% of the previous pump speed

## Control Strokes

- **Speed Change**
  - o Specifies the minimum number of strokes between speed changes
  - o Units: strokes (str)
  - o Suggested setting: 1 str
- **Pre-control**
  - o Specifies the number of strokes the pumpjack runs at its start speed before the Realift RPC controls the speed
  - o Units: strokes (str)
  - o Suggested strokes vary with time required for any start-up transients to disappear, but a typical value is 20 str
- **Pump Off**
  - o When the pump detects a persistent pump fill at less than the Fill Min (such as a Pump Off

situation), specifies the number of strokes the pump will continue to run before it finally switches to Pump Off and the pump stops

- o Units: strokes (str)
- o Suggested setting: 3 str

### 7.7.2.2 Control 2 parameters

The following parameters appear on the **Control 2** screen.

The screenshot shows the 'Control 2' screen with the following parameters:

| Timed Control |          | Floating Rod  |          |
|---------------|----------|---------------|----------|
| On Time       | 0 min    | Min Speed     | 0.0 spm  |
| Off Time      | 0 min    | Alpha         | 0        |
| Min Off Time  | 0 min    | Time Constant | 0        |
| Max Off Time  | 0 min    | Load Limit    | 0 lbs    |
| Auto Adjust   | Disabled | Floating Rod  | Disabled |

| Power Cycle Management |         | Pump Start   |     |
|------------------------|---------|--------------|-----|
| Delay Time             | 0 s     | Warning Time | 0 s |
| Auto-restart           | Enabled |              |     |

Navigation buttons at the bottom: WELL, CARDS, TREND, CONFIG MENU, <<, >>, HOME

#### Timed Control

- **On Time**
  - o The amount of time the pump runs in **Timed Mode**. Select an appropriate **On Time**, even if **Timed** is not the preferred mode.
  - o Units: minutes (min)
  - o Range: 1...255
  - o Suggested value: 30 min
- **Off Time**
  - o Set this parameter large enough for the pump to refill to the required pump fill before restart.
  - o If it is required that the system pump off periodically when in Timed mode, you can set Off Time to a non-zero value. Set it large enough for pump fill to increase slightly during the idle period. This reduces fluid pound and hammer.
  - o Units: minutes (min)
  - o Range: 1...255
  - o Suggested Value: 30 min
- **Min Off Time**
  - o The minimum allowable time that the pump will remain in the off state before restarting when in Auto Off Time Adjust Mode
  - o Units: minutes (min)
  - o Suggested value: 5 min

- **Max Off Time**

- o The maximum allowable time that the pump will remain in the off state before restarting when in Auto Off Time Adjust Mode
- o Units: minutes (min)
- o Suggested value: 90 min

- **Auto Adjust**

- o Determines whether the system adjusts Pump Off Time based on operating conditions

### Floating Rod

See [Managing your pump if it has a floating rod](#)<sup>77</sup> for more information.

### Power Cycle Management

See [Controlling when your pump restarts](#)<sup>79</sup> for more information.

### Pump Restart

See [Controlling when your pump restarts](#)<sup>79</sup> for more information.

## 7.7.3 Managing your pump if it has a floating rod

You can enter the floating rod parameters on the **Control 2** screen.

The screenshot shows the 'Control 2' screen with the following sections:

- Timed Control:** On Time (0 min), Off Time (0 min), Min Off Time (0 min), Max Off Time (0 min), Auto Adjust (Disabled).
- Power Cycle Management:** Delay Time (0 s), Auto-restart (Enabled).
- Pump Start:** Warning Time (0 s).
- Floating Rod (highlighted with a red box):** Min Speed (0.0 spm), Alpha (0), Time Constant (0), Load Limit (0 lbs), Floating Rod (Disabled).

At the bottom are navigation buttons: WELL, CARDS, TREND, CONFIG MENU, <<, >>, and HOME.

The floating rod algorithm reduces downstroke speed if the minimum load is approached. The pump speed is reduced to the floating rod absolute minimum speed, or, if this is set to 0, stops if the minimum load is reached during the downstroke. **Alpha** determines how sharply the speed reduction occurs as the minimum load is approached.

**Floating Rod** detection does not work when the system is operating in Timed control mode. If the pump reverts to Timed control mode, configure the Realift Rod Pump Controller to run at a speed below that which may cause damage to the pump.

The **Belt Slip** protection should be disabled when **Floating Rod** is enabled.

Floating Rod control may be useful for wells that do not have heavy oil, but do have significantly deviated wellbores.

### To enter the floating rod parameters

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Pump Overview** screen, press **Well**.  
The **Well Configuration Menu** screen appears.
3. Press **Control**.  
The **Control 1** screen appears.
4. Press >> to navigate to the **Control 2** screen.
5. Enter the floating rod parameters by pressing the field and entering the parameter using the keypad that is displayed.

#### Parameters

- **Min Speed**
  - o A speed, which may be zero, required for the safe mechanical operation of the system since the lubrication provided during the upstroke may not be sufficient if the downstroke speed is very low. This parameter is only used when Floating Rod is enabled and during the downstroke.
  - o Units: strokes per minute (spm)
- **Alpha**
  - o An exponential factor controlling the sharpness of the floating rod control when approaching the minimum load. Alpha controls how close the actual load needs to be to the load limit for the unit to operate at 50% speed. A high Alpha might cause the unit to operate more slowly than necessary, even when the load is much higher than the limit. A low Alpha might cause the rods to float because speed is not reduced until the load limit is nearly reached
- **Time Constant**
  - o A constant of the speed command used in the floating rod algorithm. The speed command is filtered to prevent speed oscillations. Set the Filter TC value to the lowest value that prevents unwanted speed oscillations during the downstroke.
- **Load Limit**
  - o The point at which the pump stops pushing the load down and lets it sink on its own
  - o Unit: Pounds (lbs)
- **Floating Rod**
  - o Controls whether the floating rod algorithm is enabled or not
  - o Valid options: Disabled, Enabled

### 7.7.4 Controlling when your pump restarts

Using the Control 2 screen, you can control when your pump restarts after the power is cycled.

| Control 2                     |          |     |
|-------------------------------|----------|-----|
| <b>Timed Control</b>          |          |     |
| On Time                       | 0        | min |
| Off Time                      | 0        | min |
| Min Off Time                  | 0        | min |
| Max Off Time                  | 0        | min |
| Auto Adjust                   | Disabled |     |
| <b>Floating Rod</b>           |          |     |
| Min Speed                     | 0.0      | spm |
| Alpha                         | 0        |     |
| Time Constant                 | 0        |     |
| Load Limit                    | 0        | lbs |
| Floating Rod                  | Disabled |     |
| <b>Power Cycle Management</b> |          |     |
| Delay Time                    | 0        | s   |
| Auto-restart                  | Enabled  |     |
| <b>Pump Start</b>             |          |     |
| Warning Time                  | 0        | s   |

WELL CARDS TREND CONFIG MENU << >> HOME

#### To control when the pump restarts

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Pump Overview** screen, press **Well**.  
The **Well Configuration Menu** screen appears.
3. Press **Control**.  
The **Control 1** screen appears.
4. Press >> to navigate to the **Control 2** screen.
5. Enter the **Power Cycle Management** and **Pump Start** parameters by pressing the field and entering the parameter using the keypad that is displayed.

#### Power Cycle Management

- **Delay Time**
  - o Specifies the amount of time before restarting the pump after a power cycle.
  - o When **Auto-restart** is enabled and power is cycled, the Realift RPC waits until the **Delay Time** has elapsed before automatically restarting the pump. This is used when there are multiple pumps on the same electrical grid to manage the electric load, limiting the surges created when the pumps restart.
  - o The delay time is canceled if the user takes any manual action, for example, changing the control mode.
  - o Units: seconds (s)
- **Auto-restart**
  - o Specifies whether **Auto-restart** is enabled or disabled.
  - o When enabled, the Realift RPC will restart the pump following a power cycle after the Delay Time has elapsed if and only if the pump had been running or stopped in a Pump Off state.

- o When disabled, the pump will not restart after a power cycle until a user intervenes and starts the pump. Typically this parameter is set to Enabled.

### Pump Start

- **Warning Time**

- o If a Start Warning Indicator (SWI), such as a horn or flashing light is used, you can set the amount of time the unit delays starting up while the SWI operates
- o Connecting the SWI to the pump controller is explained in the Realift Rod Pump Hardware Installation Manual
- o Units: seconds (s)
- o Suggested time: 5...10 seconds

## 7.8 Configuring Sensors and Protections

You can connect downhole and surface sensors to the system and configure the protection settings for those sensors using the **Sensor and Protections** screens. Connect the sensor before you configure its protection settings. Connecting a sensor tells Realift RPC that the sensor is wired to the terminal block in the cabinet.

You can change sensor and protection settings when the pump is running.

### **WARNING**

#### **UNACCEPTABLE USE**

Do not use Realift RPC protections as an integral part of a safety system. The Realift RPC is not a safety product.

**Failure to follow these instructions can result in death or serious injury.**

After you configure the well data, you can set protections by pressing **Sensors and Protections** on the **Well Configuration Menu** screen.

On the **Sensors and Protections** screens you can set operational limits that define when the Realift Rod Pump stops the pump to avoid hardware damage, if well operating conditions fall outside these limits.

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

- Read and understand this manual before operating the Realift Rod Pump system.
- Any changes made to parameter settings must be performed by qualified personnel.

**Failure to follow these instructions can result in death or serious injury.**

The system reports a **Well Alarm** or **Well Fault** when a data value consistently falls outside of a defined range for a specified period of time or number of strokes. Well faults and alarms apply

in hand and auto mode.

Changing the Realift Rod Pump from **Auto** to **Hand** mode while it is running resets the current values of the **Well Alarm Detection Count** to zero, but not the current values of the **Well Fault Detection Count**.

Changing the Realift Rod Pump from **Auto** to **Hand** mode while it is in a **Pump Off** state, for example, due to an alarm or a fault state, clears any existing alarms or faults and causes the pump to restart.

## To access the Sensor and Protection screens

1. Log in to the Magelis HMI as MASTER or ADMIN, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. Press **CONFIG MENU** on the home screen.
3. Press **Well Configuration**.
4. Press **Sensors & Protections**.
5. Press the name of the protection that you want to configure, as described in the following sections.
6. Press **>>** to move to the next screen of protections.
7. Set the limits, timers, and counters, as needed.

### 7.8.1 Protection Overview

The following table describes the available protections.

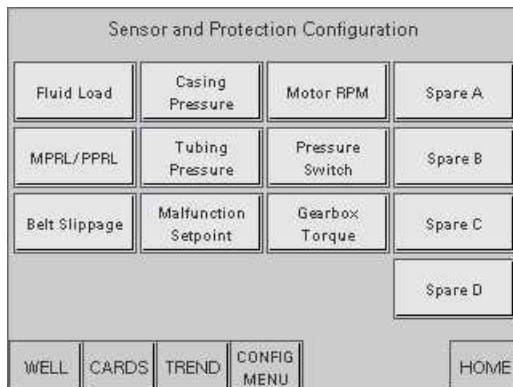
| Protection    | Per-Stroke/<br>Timed | Source     | High<br>Available | Low<br>Available | Restart<br>when<br>Breached | Notes                                                |
|---------------|----------------------|------------|-------------------|------------------|-----------------------------|------------------------------------------------------|
| Fluid Load    | Per-Stroke           | Calculated | Yes               | Yes              | Yes                         | Calculated from dynacard.                            |
| MPRL          | Per-Stroke           | Calculated | Yes               | No               | Yes                         | Calculated from dynacard.                            |
| PPRL          | Per-Stroke           | Calculated | No                | Yes              | Yes                         | Calculated from dynacard.                            |
| Belt Slippage | Per-Stroke           | Calculated | Yes               | No               | Yes                         | Detected by constantly monitoring the speed feedback |

| Protection           | Per-Stroke/<br>Timed | Source                 | High<br>Available | Low<br>Available | Restart<br>when<br>Breached | Notes                                                                                                                             |
|----------------------|----------------------|------------------------|-------------------|------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                      |                      |                        |                   |                  |                             | from the drive and the detected pump stroke period, and comparing the two values.                                                 |
| Malfunction Setpoint | Per-Stroke           | Calculated             | No                | Yes              | Yes                         | Calculated from dynacard.                                                                                                         |
| Casing Pressure      | Timed                | Register, AI, Constant | Yes               | Yes              | Yes                         | If no sensor is connected, the <b>Sensor Type</b> should be set to <b>Constant</b> and the <b>Predicted Casing Pressure</b> used. |
| Tubing Pressure      | Timed                | Register, AI, Constant | Yes               | Yes              | Yes                         | If no sensor is connected, the <b>Sensor Type</b> should be set to <b>Constant</b> and the <b>Predicted Tubing Pressure</b> used. |
| Pressure Switch      | Timed                | DI1                    | Yes               | Yes              | No                          | Used to indicate an emergency shutdown or for devices such as pressure switches.                                                  |

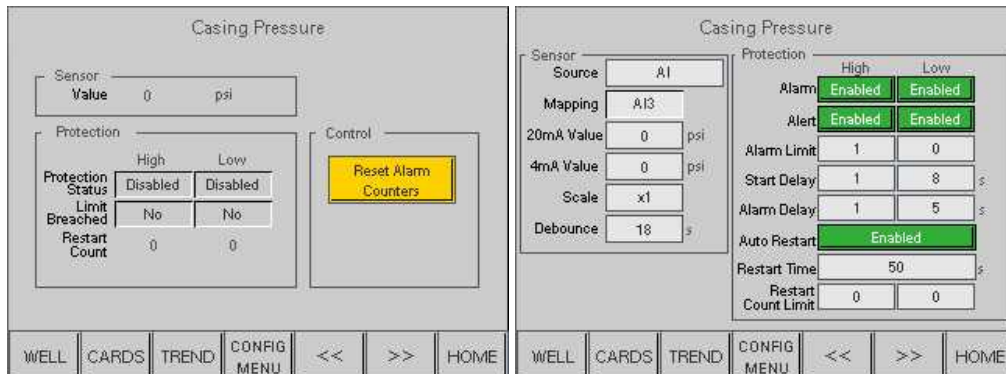
| Protection        | Per-Stroke/<br>Timed | Source              | High<br>Available | Low<br>Available | Restart<br>when<br>Breached | Notes |
|-------------------|----------------------|---------------------|-------------------|------------------|-----------------------------|-------|
| Spare A/B/<br>C/D | Timed                | Register, AI,<br>DI | Yes               | Yes              | Yes                         |       |

### 7.8.2 Sensor and Protection Parameters

Configure sensor and protections on the relevant Sensor and Protections configuration screen. The figure below displays the Sensor and Protection Configuration menu.



The parameters to be configured depend on the sensor type. The figures below display the **Casing Pressure** sensor and protection configuration screens.



### Screen 1 parameters

The following parameters appear on Screen 1.

#### Sensor

- **Value**
  - o Displays the latest scaled reading from the sensor

## Protection

- **Protection Status**

- o Indicates if the protection is enabled and the state of the protection
- o Values:
  - Disabled: The protection is not enabled
  - Normal: The protection is enabled and the sensor value is within the protection limits
  - Alert: The Realift RPC generates alerts for enabled protections when the feedback values are outside of the limits defined for the protection and the Debounce Timer or counter has elapsed.
  - Alarm: The Realift RPC generates alarms for enabled protections when the feedback values are outside of the limits defined for the protection and the Alarm Delay timer or counter has elapsed. When an alarm is generated, the Realift RPC will attempt to restart the pump after the restart timer has elapsed.

- **Limit Breached**

- o Indicates if the alarm limit is breached.

- **Restart Count**

- o Indicates the number of alarms generated due to the breach of a threshold value. When this counter reaches the **Alarm Counter Limit**, the Realift RPC reports a fault, the pump is stopped, and cannot be restarted until the counter and alarm are reset.

## Control

- **Reset Alarm Counters**

- o Resets the alarm counters for all protections to zero.

## Screen 2 parameters

The following parameters appear on Screen 2.

## Sensor

- **Source**

- o Specifies the type of data provided to the sensor parameter in the Realift RPC.
- o If the sensor data is calculated, it is automatically provided by the Realift RPC.
- o Valid values: Disabled, Constant, DI, AI, Register

- **Mapping**

- o Specifies the point to map the sensor readings from
- o If **Source** is set to **Register**, locate the parameter to be monitored in [Appendix B - Communications Map](#)<sup>121</sup> and enter its **Point Number** in the **Mapping** field. The sensor will

read and process the register value as a signed Modbus integer.

- o If **Source** is set to **AI**, select the analog input to which your 4-20 mA sensor is connected. User-configurable sensors can be connected to AI3 (default), AI4, AI5, AI6, or AI7. When you change **Source** to Analog input, the Realift RPC will set the default mapping to AI3.
- o If **Source** is set to **DI**, enter the digital input to which your sensor is connected. User-configured sensors can be connected to DI4 (default), DI5, DI6, or DI7. When you change the source type to DI, the Realift RPC will set the default mapping to DI4

- **Parameter Value**

- o Specifies the constant value to be used when **Source** is configured as Constant.

- **20mA Value**

- o The parameter value at 20 mA. The Realift RPC uses this value to calibrate the sensor range and calculate the Scaled Value as a percentage based on the Raw Value, which is provided in mA.
  - o This parameter only appears when **Source** is set to AI.

- **4mA Value**

- o The parameter value at 4 mA. The Realift RPC uses this value to calibrate the sensor range and calculate the Scaled Value as a percentage based on the Raw Value, which is provided in mA.
  - o This parameter only appears when **Source** is set to AI.

- **Scale**

- o A value used to scale the fixed point of the sensor data used by the Realift RPC. The Realift RPC uses this value to calculate the Scaled value based on the Raw Value which is provided in mA. Normally this value should be set to 1.
  - o Valid values: 0.0001, 0.001, 0.01, 0.1, 1 (default), 10, 100, 1000, 10000

- **Debounce**

- o The amount of time or strokes that the Realift RPC waits after a configured limit is initially breached before considering the threshold as violated. This delay allows temporary conditions, such as noise on a signal, to clear before any action is taken. If the Debounce timer passes, the limit is still breached, and the alarm delay is greater than 0, the Realift RPC generates an alert.
  - o Units: seconds (s), strokes (str)

- **Malfunction Position**

- o Specifies the stroke height, during upstroke, at which the load is assessed.
  - o This protection is used to check for rod parts or other pump malfunctions that cause no fluid load to be picked up by the pump.
  - o When Load Lines are enabled for dynacards, this value appears as an X on the **Dynacards** screen. See [Viewing Dynacards](#)<sup>[105]</sup> for more information.

## Name

- **Name**
  - o Specifies the name of the protection
  - o This parameter only applies to Spare A/B/C/D
  - o Alarm banners and Trends display Spare A/B/C/D, and do not display the user-entered names

## Protection

- **Alarm**
  - o Specifies whether alarm protection is enabled for the sensor.
  - o Values:
    - Enabled: An alarm is generated when the sensor feedback values are outside of the user-defined limits. Alarms are listed on the Alarms screen, as described in [Managing Alarms and Alerts](#)<sup>112</sup>, and indicated with red banners on Magelis HMI screens and red parameter values on status screens. Enabling an alarm automatically enables its corresponding alert.
    - Disabled: No alarms or faults are generated when a configured limit is breached.
  - o When this parameter is changed, a message appears warning that protections on the Realift RPC should not be used as an integral part of a safety system, as shown below:



- **Alert**
  - o Specifies whether alert protection is enabled for the sensor.
  - o Values:
    - Enabled: If a protection limit is reached the alert is raised after the start delay and debounce time or counter has elapsed.  
  
If an alert is enabled, but not the corresponding alarm, the pump does not stop and no other action is taken while the alert is active.
    - Disabled: The protection is turned off. No alerts are generated, and no action is taken when a configured limit is breached.
- **Alarm Limit**
  - o Specifies the high and low limits at which an alarm or alert is generated.

- o If the sensor type is set to DI, the high protection is active when the DI is a logic high, and the low protection is active when the DI is a logic low.
- o Some alarm limit values are scaled, for example MPRL/PPRL and Malfunction Setpoint.

- **Start Delay**

- o The amount of time or number of strokes that the protection is disabled, starting from the moment the Realift RPC attempts to restart the pump after an alarm. When this timer elapses, the protection is re-enabled.
- o If the timer or stroke count is set to 0, alarms are enabled starting with the first stroke.
- o Units: seconds (s), strokes (str)

- **Alarm Delay**

- o The amount of time that the Realift RPC waits before generating an alarm once the Debounce timer elapses and an alert has been generated. This delay allows the condition to correct itself before an alarm is generated. If this delay is set to 0, an alarm is generated immediately after the Debounce timer has elapsed.
- o Units: seconds (s), strokes (str)

- **Auto Restart**

- o Specifies whether the Realift RPC automatically resets the alarm and tries to restart the pump after an alarm is generated.
- o Values:
  - Enabled: After an alarm has been raised and the pump stopped, the Realift RPC will, if the restart does not exceed the restart count limit, attempt to restart the pump when the **Restart Time** has elapsed.
  - Disabled: After an alarm has been raised, the Realift RPC will stop the pump and report a fault. The Realift RPC will not restart the pump until the user intervenes to reset the alarms.

- **Restart Time**

- o The amount of time that the Realift RPC waits before automatically resetting the alarm and attempting to restart the pump. This timer is applied only when the Auto Restart function is enabled. If a configured limit remains breached, the restart action that the Realift RPC takes depends on the protection type.
- o Units: seconds (s)

- **Restart Count Limit**

- o The number of alarms that can be generated before the pump is stopped and cannot be restarted until the Restart Counter is reset. If the Restart Counter Limit is exceeded, the Realift RPC will stop the pump and report a fault.
- o If set to 0, the Realift RPC will not restart pump.

## 8 Viewing System Status

You can get an overview of Realift Rod Pump system operation from the **Pump Overview**, **Sensor and Protection Overview**, and **Drive and Production Overview** screens. You can view these screens even when you are not logged in, although you need to be logged in to make changes to the parameters displayed.

The displayed screens can be divided into several categories:

- The run status of the pump, including the **Pump Status**, and the **Drive Status**
- A summary of various Realift Rod Pump parameters, including the active control mode, the pump fillage level, frequency command, pump rate, and fluid load
- A summary of protection statuses
- Surface and downhole data, including total, and effective strokes
- Drive parameters

### 8.1 Pump Overview

#### To access the Pump Overview screen

- Press the **Home** button.

The **Pump Overview** screen is displayed.

| Status        |         | Gross | Net Oil | PPRL | MPRL | Runtime        |
|---------------|---------|-------|---------|------|------|----------------|
| Average       | 0.0 spm |       |         |      |      |                |
| Time in State | 438 min | Tday  | 0 bbl   | 0 bb | 0 lb | 0 lb 00:00 h:m |
| Time to Start | 0 min   | Yday  | 0 bbl   | 0 bb | 0 lb | 0 lb 00:00 h:m |
| Prev Runtime  | 0 min   |       |         |      |      |                |

#### Parameters

- **Pump State**
  - o Displays the current state of Realift Rod Pump system operation. Pump status values are listed and defined in the table below:

| Status            | Action                                                                                                                                                                                                                                                                           |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Off               | Realift RPC is <b>OFF</b> and the pump does not move                                                                                                                                                                                                                             |
| Hand              | Realift RPC is running at a specified speed                                                                                                                                                                                                                                      |
| Power Cycle Delay | Realift RPC has restarted and is waiting for the <b>Power Cycle Delay</b> to elapse prior to proceeding to the Auto startup sequence.                                                                                                                                            |
| Power Cycle Stop  | Realift RPC has restarted, and is waiting for an operator to restart the pump.                                                                                                                                                                                                   |
| Alarm             | Realift RPC is not running due to the detection of a Well Alarm and is waiting for the alarm delay time to elapse state prior to restarting the pump.                                                                                                                            |
| Fault             | Realift RPC is not running due to the detection of a <b>Well Fault</b> . The pump will not restart until the well fault is reset.                                                                                                                                                |
| Start Warning     | Realift RPC activates the start warning digital output and any devices such as a light or annunciator connected to it for the <b>Start Warning</b> time prior to starting the pump.                                                                                              |
| Startup           | Realift RPC is starting up, and the pump will run at the startup speed                                                                                                                                                                                                           |
| Timed             | Realift RPC is in <b>Timed</b> mode                                                                                                                                                                                                                                              |
| Pump Off          | Realift RPC is not running and is in <b>Pump Off</b> state. The Realift Rod Pump will restart once the <b>Pump Off</b> time has elapsed.                                                                                                                                         |
| Bypass            | Realift RPC is in <b>Drive Bypassed</b> state. The drive is disconnected from the motor and, if running, performs a freewheel stop. While in the bypass state, the Realift RPC does not control the operation of the drive or the pump, but will monitor the status of the pump. |
| Auto              | Realift RPC is running in <b>Auto</b> mode using Surface or Downhole control.                                                                                                                                                                                                    |

- **Control Mode**
  - o Displays the current state of the Realift Rod Pump
- **START/STOP PUMP**
  - o Pressing the START/STOP button starts or stops the Realift Rod Pump
- **CONTROL PUMP**
  - o Pressing the CONTROL PUMP button opens the Pump Control window

## Status

- **Average Pump Speed**

- o Displays the average speed of the pump when it has been running during the current day (starting at the gauge off time)
- o Units: strokes per minute (spm)

- **Current Pump Speed**

- o Displays the current speed of the pump
- o Units: strokes per minute (spm)

- **Fill**

- o Displays the current pump fillage
- o Current pump fillage is calculated using the downhole card, unless the pump is using Surface control. When using Surface control, the surface card is used for calculation.
- o Units: percent (%)

- **Runtime**

- o Displays the time the pump has been running since last turned on
- o Units: Hours and Minutes if less than 24 hours, Days and Hours if more than 24 hours
- o Format: HH:MM (less than 24 hours), DD:HH (greater than 24 hours)

- **Gross**

- o Displays the gross fluid production for the current day and for yesterday
- o Units: barrels (bbl)

- **Net Oil**

- o Displays the net oil production for the current day and for yesterday
- o Units: barrels (bbl)

- **PPRL**

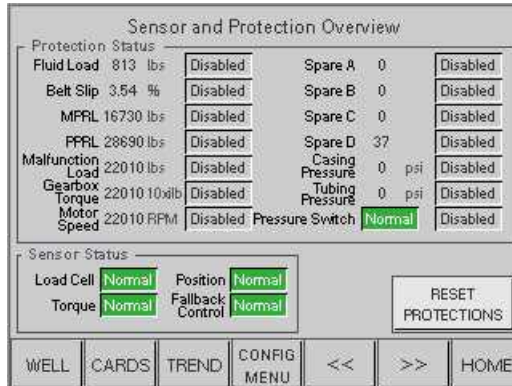
- o Displays the highest PPRL recorded from a dynacard for the current day (starting at the gauge off time) and for yesterday

- **Runtime**

- o Displays the length of time that the pump has been running in the current day and for yesterday
- o Format: HH:MM if less than 24 hours, DD:HH if greater than 24 hours

## 8.2 Sensor and Protection Overview

You can view the status of sensors and protections using the **Sensor and Protection Overview** screen.



### To view sensor and protection status

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>26</sup>.
2. On the **Pump Overview** screen, press >> until the **Sensor and Protection Overview** page is displayed.

### Parameters

The following parameters appear on the Sensor and Protection Overview screen.

#### Protection Status

- **Fluid Load**
  - o Displays the current **Fluid Load** sensor reading and status
- **Belt Slip**
  - o Displays the current **Belt Slippage** sensor reading and status
- **MPRL**
  - o Displays the current **MPRL** sensor reading and status
- **PPRL**
  - o Displays the current **PPRL** sensor reading and status
- **Gearbox Torque**
  - o Displays the current **Gearbox Torque** sensor reading and status
- **Motor Speed**
  - o Displays the current **Motor Speed** sensor reading and status
- **Spare A/B/C/D**
  - o Displays the current Spare sensor reading and status

- o If you have renamed the sensor, the new name appears on the screen
- **Casing Pressure**
  - o Displays the current Casing Pressure sensor reading and status
- **Tubing Pressure**
  - o Displays the current Tubing Pressure sensor reading and status
- **Pressure Switch**
  - o Displays the current Pressure Switch sensor reading and status

#### Sensor Status

- **Load Cell**
  - o Displays the current **Load Cell** sensor status
- **Torque**
  - o Displays the current Torque sensor status
- **Position**
  - o Displays the current Position sensor status
- **Fallback Control**
  - o Displays the current Fallback Control status
- **Reset Protections**
  - o Opens the Reset Protections screen

#### Reset Protections screen

- **Reset Protections**
  - o Resets protections
  - o When active, the button turns red and is locked until the action is complete
- **Preset Protection Counters**
  - o Resets protection counters to zero
  - o When active, the button turns red and is locked until the action is complete

## 8.3 Drive and Production Overview

You can get an overview of well production and pump parameters using the Drive and Production Overview screen.

#### To access the Drive and Production Overview screen

- From the **Home** screen (**Pump Overview** screen), press >> twice.  
The **Drive and Production Overview** screen appears.

| Drive and Production Overview                                                                                                                                                                                                                                                                                                                                     |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <div>Drive</div> <div>Status <b>Fault</b></div> <div>Last Fault Code Modbus</div> <div>Frequency 0.0 Hz</div> <div>Mains Voltage 0.0 V</div> <div>DC Bus Voltage 0.0 V</div> <div>Motor Current 0.0 A</div> <div>Motor Voltage 0 V</div> <div>Motor Torque 0.0 %</div> <div>Motor Power 0 %</div> <div>Energy Today 0 kWh</div> <div>Energy Yesterday 0 kWh</div> |  |  |
| <div>Production</div> <div>Gross 0 0 bbl</div> <div>Net Oil 0 0 bbl</div> <div>Gas 0 0 MCF</div> <div>Average Speed 0.0 0.0 rpm</div>                                                                                                                                                                                                                             |  |  |
| <div>Pump Parameters</div> <div>Gross Rate 0 bbl/d</div> <div>Bottom Hole Pressure 0 psi</div> <div>Pump Intake Pressure 0 psi</div> <div>Pump Slippage 0.00 bbl/d</div> <div>Counterbalance 0 %</div> <div>Polished Rod Power 0 HP</div> <div>Fluid Height in Casing 0 ft</div> <div>Tubing Stretch 0 in</div>                                                   |  |  |
| <div>WELL CARDS TREND CONFIG MENU &lt;&lt; &gt;&gt; HOME</div>                                                                                                                                                                                                                                                                                                    |  |  |

## Parameters

The following parameters appear on the **Drive and Production Overview** screen.

### Drive

The following parameters appear in the Drive section. The parameters that appear depend on the type of drive.

| Parameter       | Description                                                                               | Appears for                           |
|-----------------|-------------------------------------------------------------------------------------------|---------------------------------------|
| Status          | Displays the current state of the drive.<br>Valid states: Forward, Ready, Normal, Waiting | Altivar<br>Generic<br>Start Contactor |
| Fault Code      | Displays the current fault code displayed on the drive.                                   | Generic<br>Start Contactor            |
| Last Fault Code | Displays the last fault code displayed on the drive.                                      | Altivar                               |
| Frequency       | Displays the speed at which the Realift RPC is currently running                          | Altivar<br>Generic                    |
| Mains Voltage   | Displays the line voltage in Volts (V)                                                    | Altivar                               |
| DC Bus Voltage  | Displays the DC Bus voltage in Volts (V)                                                  | Altivar                               |
| Motor Current   | Displays the estimated effective motor current of the drive in Amperes (A)                | Altivar                               |
| Motor Voltage   | Displays the voltage of the drive motor in Volts (V)                                      | Altivar                               |

|                  |                                                                                       |         |
|------------------|---------------------------------------------------------------------------------------|---------|
| Motor Torque     | Displays the torque of the drive motor as a percentage of the motor's rated torque    | Altivar |
| Motor Power      | Displays the motor power of the drive as a percentage of the motor's rated power      | Altivar |
| Energy Today     | Displays the amount of energy consumed by the drive today in kilowatt hours (kWh)     | Altivar |
| Energy Yesterday | Displays the amount of energy consumed by the drive yesterday in kilowatt hours (kWh) | Altivar |

### Production

- **Gross**
  - o Displays the gross production for today and yesterday
  - o Units: Barrels (bbl)
- **Net Oil**
  - o Displays the net oil production for today and yesterday
  - o Units: barrels (bbl)
- **Gas**
  - o Displays the total gas production for today and yesterday
  - o Units: millions of Cubic Feet (MCF)
- **Average Speed**
  - o Displays the average speed of the pumpjack
  - o Units: strokes per minute (spm)

### Pump Parameters

- **Gross Rate**
  - o Displays the gross rate of production for the pump
  - o Units: barrels per day (bbl/d)
- **Bottom Hole Pressure**
  - o Displays the bottom hole pressure of the pump
  - o Units: pounds per square inch (psi)
- **Pump Intake Pressure**
  - o The pressure in the casing at the depth specified as the pump intake
  - o Units: pounds per Square Inch (psi)
- **Pump Slippage**

- o Displays the pump slippage
- o Units: barrels per Day (bbl/d)
- **Counterbalance**
  - o Displays the calculated value indicating the balance between the counter weight and the rod string weight.
  - o Counterbalance is calculated per stroke, if torque feedback is available, using the formula:  

$$\text{Counterbalance} = 100\% * (\text{Maximum Upstroke Torque} - \text{Maximum Downstroke Torque}) / \text{Rated Torque}$$
  - o If Counterbalance is a positive value, the unit is rod-heavy or underbalanced. If it is a negative value, the unit is crank-heavy or overbalanced. It is recommended that you assess the counterbalance of your well when the pump is pumped off or operating at a steady-state speed with constant well conditions.
  - o Units: percentage (%)
- **Polished Rod Power**
  - o The calculated value indicating the peak polished rod horsepower
  - o Units: horsepower (HP)
- **Fluid Height in Casing**
  - o The height of the fluid within the well casing
  - o Units: feet (ft)
- **Tubing Stretch**
  - o Displays the calculated value indicating the tubing stretch
  - o Units: inches (in)

## 8.4 Viewing Runtime Timers and Stroke Counters

The **Counters and Timers** screen allows you to reset the stroke and runtime timers and counters for today and yesterday. The following runtime timers and counters are reset:

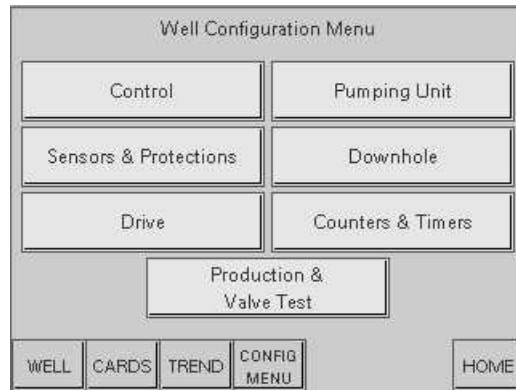
- |                            |                                |
|----------------------------|--------------------------------|
| • Previous Runtime         | • Runtime Yesterday            |
| • Runtime Today            | • Average Pump Speed Yesterday |
| • Average Pump Speed Today | • Energy Consumption Yesterday |
| • Energy Consumption Today | • Gas Production Yesterday     |
| • Gas Production Today     | • Gross Production Yesterday   |
| • Net Production Today     | • Net Production Yesterday     |
| • Maximum PPRL Today       | • Maximum PPRL Yesterday       |
| • Minimum MPRL Today       | • Minimum MPRL Yesterday       |
| • Stroke Count Today       | • Stroke Count Yesterday       |

The following procedures describe how to view and reset Runtime Timers and Stroke Counters.

## To view Counters and Timers

1. From the **Pump Overview** screen, press **Well**.

The **Well Configuration Menu** appears.



2. Press **Counters & Timers**.

The **Counter and Timers** screen appears.



## Parameters

- **Total Rod**
  - o Displays the total rod stroke count since the Reset Total Rod Stroke Count was last employed. This parameter is used to measure the current rod set's strokes and should be reset when the rods are changed.
- **Total Pump**
  - o Displays the total (downhole) pump stroke count since the **Reset Total Pump Stroke Count** was last employed. This parameter is used to measure the current pump's strokes and should be reset when the pump is replaced.
- **Today**
  - o Displays today's total stroke count

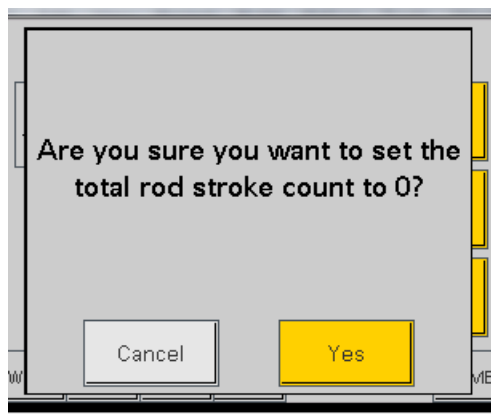
- **Yesterday**
  - o Displays yesterday's total stroke count
- **Current Run**
  - o Displays the total stroke count since the pump was last started
- **Reset Total Rod Stroke Count**
  - o Resets the total rod stroke count to zero
- **Reset Total Pump Stroke Count**
  - o Resets the total pump stroke count to zero
- **Reset Timers & Counters**
  - o Resets the stroke and runtime timers and counters to zero, excepting the rod and pump stroke counts

### To reset Timers and Counters

On the **Counters and Timers** screen, press:

- **Reset Total Rod Stroke Count** to reset the total rod stroke count.

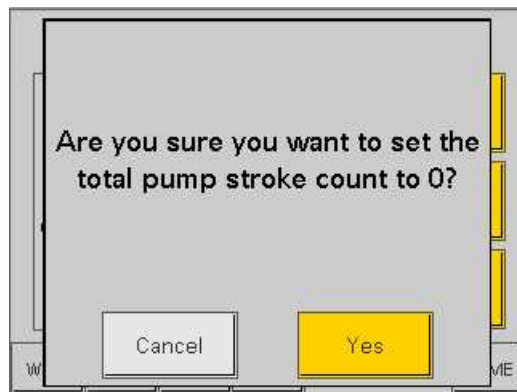
A confirmation dialog appears, as shown below.



Press **Yes** to continue with the reset, or **Cancel** to cancel the operation.

- **Reset Total Pump Stroke** count to reset the total pump stroke count.

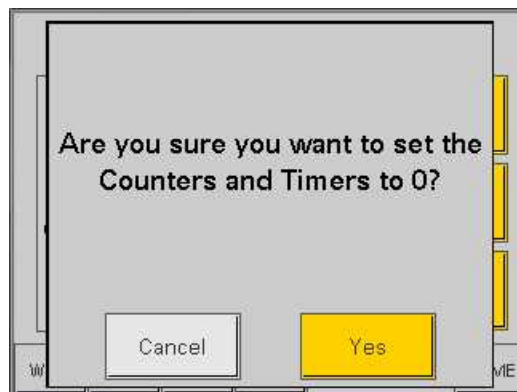
A confirmation dialog appears, as shown below.



Press **Yes** to continue with the reset, or **Cancel** to cancel the operation.

- **Reset Timers and Counters** to reset the stroke and runtime timers and counters.

A confirmation dialog appears, as shown below.



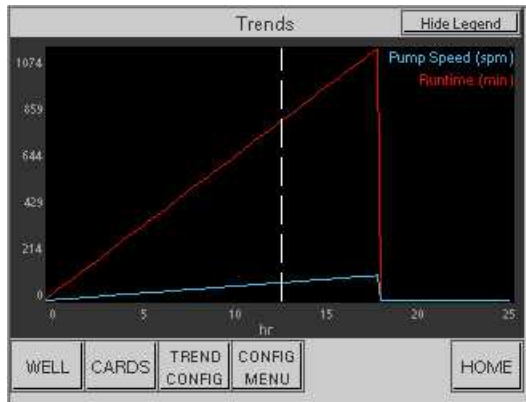
Press **Yes** to continue with the reset, or **Cancel** to cancel the operation.

## 9 Trends

The **Trend** screen provides the ability to track Realift Rod Pump and pump parameters over a period of time. It can be configured to show a series of parameters. You can view trend information without stopping the pump and without logging in to the Realift RPC.

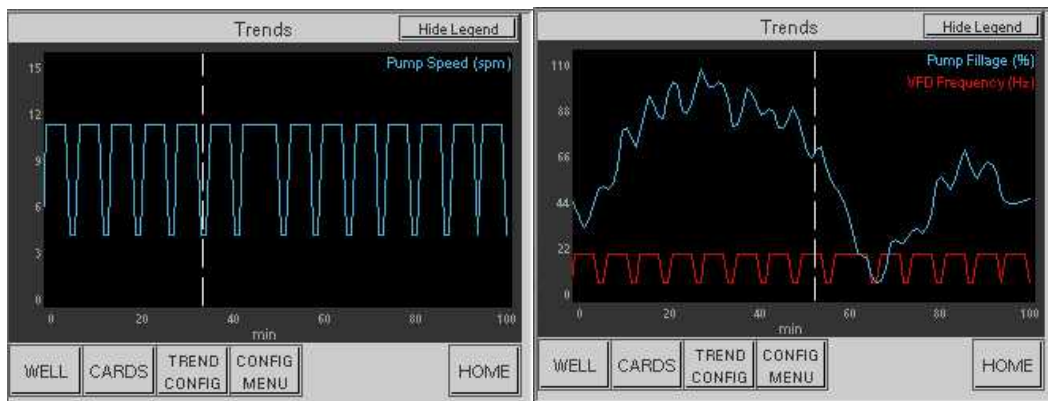
Realift RPC stores the last 4.5 hours of data in memory. Data older than 4.5 hours is stored in the Magelis HMI's SD card.

An example of a **Trend** screen is shown below.



### 9.1 Trend Graph Layout

The graph format is the same for each trend provided on the **Trend Configuration** screen. The figures below show examples of trend graphs.



The X (Horizontal) axis) shows time.

The Y (Vertical) axis shows the minimum and maximum values of the parameters displayed.

The white vertical dashed line indicates the data sample being written.

The parameters that are displayed are configured on the **Trend Configuration** screen.

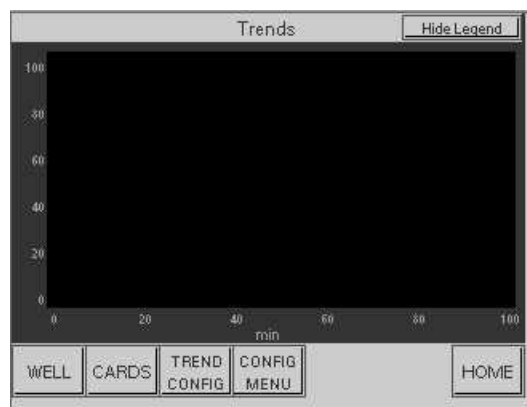
## 9.2 Viewing Trends

Realift Rod Pump records only significant changes in trends in the database. Therefore, if the current reading is not significantly different from the last recorded reading, the date and time listed under **Latest Data** are the date and time of the last significant change in the trend.

### To view Trends

1. Log in to the Magelis HMI, as described in [Logging in to the Realift RPC](#)<sup>[26]</sup>.
2. On the **Home (Pump Overview)** screen, press **TREND**.

The **Trend** screen is displayed.



3. Press **Trend Config**.

The **Trend Configuration** screen is displayed, as shown below.

The screenshot shows the 'Trends' screen with a configuration overlay. The overlay has a title bar with 'Trends' and a 'Hide Legend' button. Below the title bar, there is a section titled 'Trend Type and Scale' with five rows: 'Trend 1', 'Trend 2', 'Trend 3', 'Trend 4', and 'Trend 5'. Each row has a text field and a scale field. 'Trend 1' is set to 'Pump Filtrage (%)' and 'x1'. 'Trend 2' is set to 'None' and 'x1'. 'Trend 3' is set to 'None' and 'x1'. 'Trend 4' is set to 'None' and 'x1'. 'Trend 5' is set to 'None' and 'x1'. Below this section, there is a 'Trend Period' section with a 'Period' field set to '100 Minutes'. At the bottom of the overlay is a 'Close' button. The background of the screen shows the same navigation buttons as the previous screenshot.

4. Select the trends to chart:
  - a. Press the **Trend 1** field.  
A keypad is displayed.
  - b. Press the up and down arrows to scroll through the parameters that can be displayed in the trend screen. For a list of the parameters available, see [Real-Time Parameters Available for Trending](#)<sup>[102]</sup>.

- c. Press the **Scale** field.  
A keypad is displayed.
  - d. Enter the scale of the trend line to be charted.
  - e. If needed, repeat a to d to define another parameter to be displayed in the same trend screen.
5. Configure the time period that you want to view trends for:
- a. Press the **Period** field.  
A keypad is displayed.
  - b. Select the time period that you want to view trends for.
6. Press **Close**.  
The trends you selected appear on the screen.

## Parameters

- **Trend 1/2/3/4/5**
  - o Specifies the parameter that you want to view the trend for
  - o See [Real-Time Parameters Available for Trending](#)<sup>102</sup> for more information.
- **Scale**
  - o A multiplier for the trend to allow the viewing of several trend lines with different values
  - o Options:
    - x 1: Actual values are displayed
    - x 10: The values are multiplied by 10
- **Period**
  - o Specifies the time period you want to view trends for
  - o Options:
    - 100 minutes: The parameter values from the past 100 minutes are displayed in the Trend graph
    - 24 hours: The parameter values from the past 24 hours are displayed in the Trend graph
    - 100 days: The parameter values from the last 100 days are displayed in the Trend graph

### 9.3 Real-Time Parameters Available for Trending

You can select up to 5 of the following parameters to be displayed on the **Trends** screen.

- Gross Production Rate (bbl/day)
- Gross Production (bbl)
- Net Oil Production (bbl)
- Gas Production (MCF)
- VFD Mains Voltage (V)
- VFD DC Bus Voltage (V)
- VFD Frequency (Hz)
- Motor Torque (lbf)
- Motor Current (A)
- Motor Voltage (V)
- Motor Power (HP)
- Pump Speed (spm)
- Bottom Hole Pressure (psi)
- Pump Intake Pressure (psi)
- Fluid Height in Casing (ft)
- Counterbalance (lb)
- Fluid Load (lb/10)
- Belt Slippage (%)
- MPRL (lb/10)
- PPRL (lb/10)
- Pump Fillage (%)
- Runtime (min)
- Tubing Pressure (psi)
- Casing Pressure (psi)
- Spare A<sup>1</sup>
- Spare B<sup>1</sup>
- Spare C<sup>1</sup>
- Spare D<sup>1</sup>

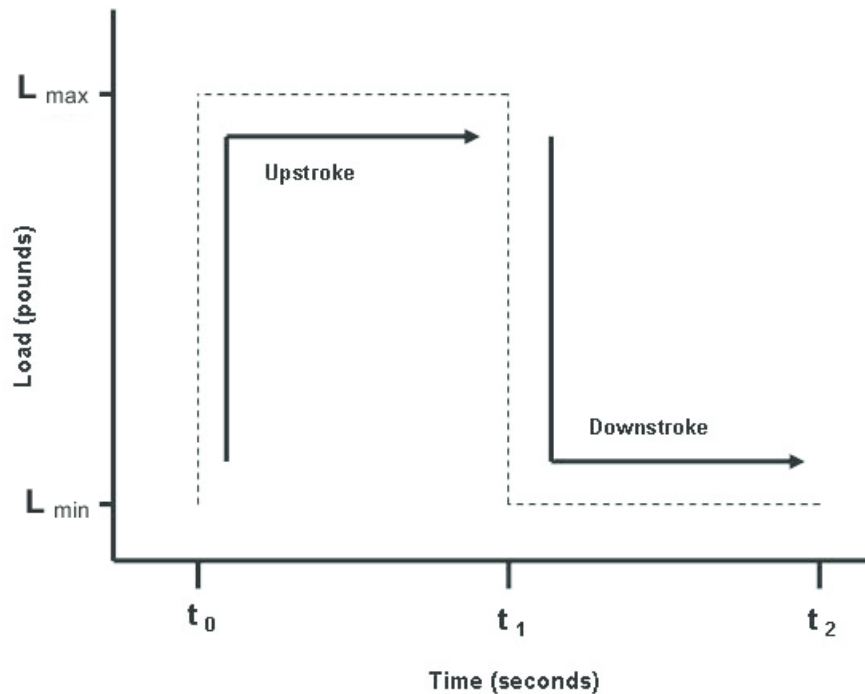
1- Configured names for Spare sensors do not appear in Trends.

## 10 Optimizing Operation with Dynacards

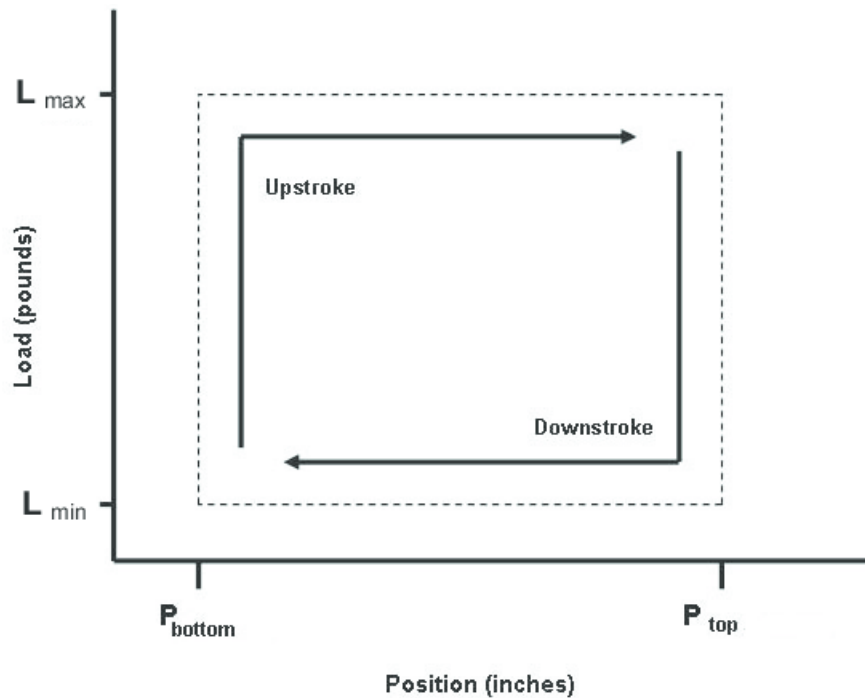
A dynacard is a graphical representation of the forces acting on the pump plunger as it moves upward and downward in the well, capturing and releasing fluid with each stroke. Surface and Downhole dynacards measure the load on the polished rod and this load is plotted in relation to the polished rod position as the pump moves through each stroke cycle. A complete stroke cycle is one up and down stroke. For Torque dynacards, torque is measured instead of load.

The controller uses this data to create an x-y plot. By observing the graphs, you can collect information about the efficiency of your pump operation.

Rather than being a plot of Load vs. Time, as shown below,



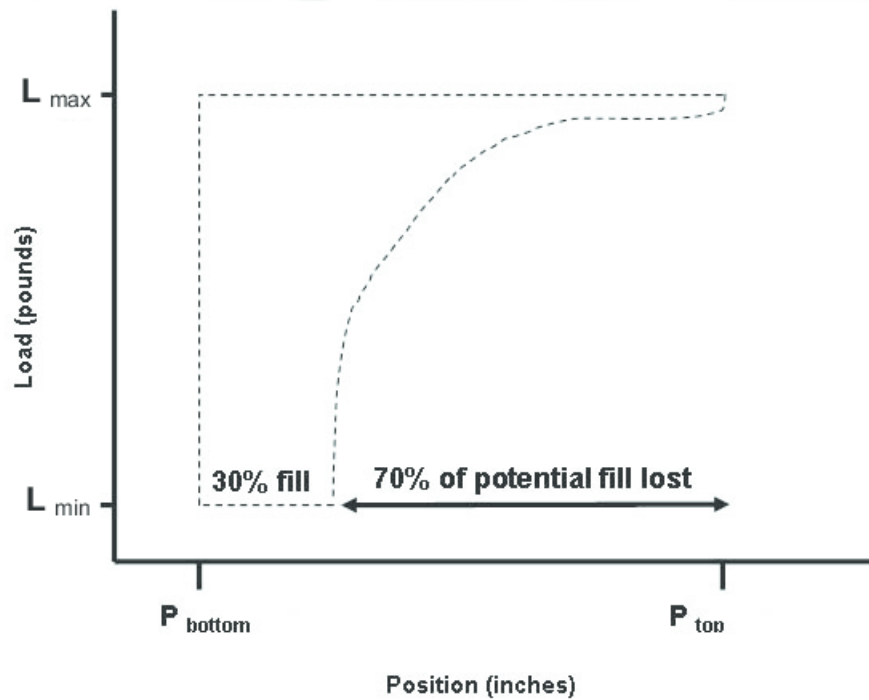
a dynacard is a plot of Load vs. Position, as shown below. The resulting shape is sometimes referred to as folded onto itself or a circular plot.



Ideally, the Realift RPC should have good fluid flow with valves working properly. The ideal card, as shown above, demonstrates the instantaneous increase in load from  $L_{min}$  to  $L_{max}$  as the pump plunger begins its upward stroke, the load remains constant as it travels to the top. As soon as the pump plunger starts back down, the load instantaneously falls back to  $L_{min}$  where it remains constant as the pump travels to its bottom position again.

If the traveling valve on the pump opens properly, the load falls instantly to  $L_{min}$  and remains constant for the entire downstroke ( $P_{top}$  to  $P_{bottom}$ ) and fluid is transferred from the pump to the tubing. When the pump plunger reaches the bottom, the barrel is empty and the reciprocating motion of the pumpjack begins to lift the entire column of fluid up to the top again, causing more fluid to be pulled in from the reservoir through the standing valve.

When a condition such as low fluid level or trapped gas stops the traveling valve from opening properly as the plunger starts downward, transfer of the contents of the pump to the tubing does not begin at the top of the stroke. The fluid in the tubing descends with the traveling valve, maintaining the load at  $L_{max}$ , until fluid is encountered or the gas compresses enough to open the traveling valve. Only when the plunger re-immerses in the fluid can the traveling valve open and transfer of fluid through the traveling valve occur.



For more information about:

- Downhole cards, see [Reading downhole cards](#)<sup>[109]</sup>
- Surface cards, see [Reading surface cards](#)<sup>[110]</sup>
- Torque cards, see [Reading torque cards](#)<sup>[111]</sup>

## 10.1 Viewing Dynacards

The Realift RPC can display up to five dynacards. To view the **Dynacards** screens:

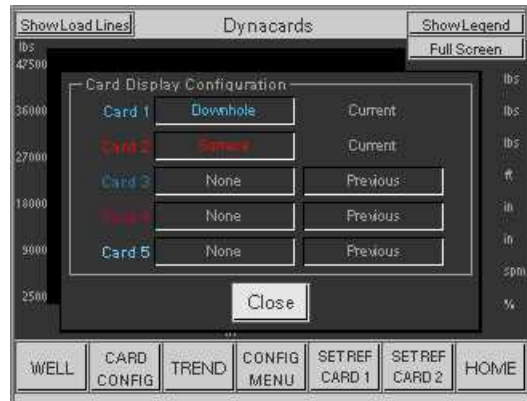
1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#)<sup>[26]</sup>.
2. On the **Pump Overview** screen, press **CARDS**.

The **Dynacards** screen is displayed, as shown below.



3. Press **CARD CONFIG**.

The **Card Display Configuration** screen is displayed, as shown below:



4. Press the **Card 1** field.

Controls are displayed that enable you to scroll through the available dynacards.

5. Select the dynacard you want to view and press **Enter**.

6. Press the **Period** field, if applicable.

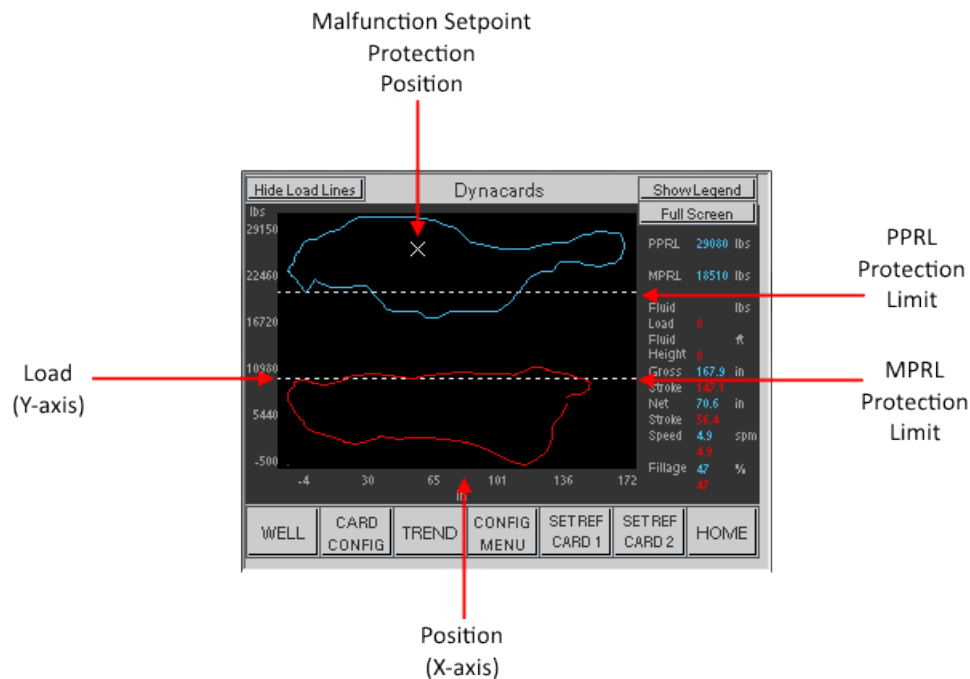
Controls are displayed that enable you to scroll through the available periods.

7. Select the period that you want to view and press **Enter**.

8. Repeat for each card you want to view, up to a maximum of five.

## Dynacard graph layout

The figure below displays a dynacard example.



The graph format is the same for each dynacard provided on the **Dynacards** screen:

- The X (horizontal) axis displays the position in inches (in.)
- The Y (vertical) axis displays the load.

The PPRL and MPRL protection limits are indicated on the screen by two horizontal lines. The Malfunction Setpoint Protection position is indicated with an X.

The parameters that are displayed are configured on the **Card Display Configuration** screen.

## Parameters

The following parameters appear on the **Dynacards** and **Card Display Configuration** screens.

### Dynacards

- **Show/Hide Load Lines**
  - o Displays or hides lines on the graph that indicate the PPRL and MPRL protection limits, and an X to indicate the Malfunction Setpoint Protection position.
- **Show/Hide Legend**
  - o Displays or hides the graph legend
- **Full Screen**
  - o Expands the Dynacard display to encompass the entire screen
  - o Press **Close** to exit Full Screen
- **CARD CONFIG**

- o Opens the **Card Display Configuration** window
- **SET REF CARD 1**
  - o Saves the current downhole and surface cards as the Reference 1 Dynacards. These cards can be viewed later as the Reference 1 Dynacards.
  - o This parameter is only applicable for Surface and Downhole cards. Reference cards are not available for Torque dynacards.
- **SET REF CARD 2**
  - o Saves the current downhole and surface cards as the Reference 2 Dynacards. These cards can be viewed later as the Reference 2 Dynacards.
  - o This parameter is only applicable for Surface and Downhole cards. Reference cards are not available for Torque dynacards.

### Card Display Configuration

- **Card**
  - o Specifies the dynacard type that you want to view
  - o Options:
    - Surface
    - Downhole
    - Torque
- **Period**
  - o Specifies the period for which you want to view the dynacard
  - o This parameter is not applicable for Card 1 and Card 2, as they display the most recent dynacard
  - o Options:
    - 100 Minutes
    - 24 Hours
    - 100 Days

## 10.2 Automated Control Using Dynacards

If you are using the Surface or Downhole control method, based on how much fluid there is in the well, the Realift RPC dynamically runs at the optimal speed.

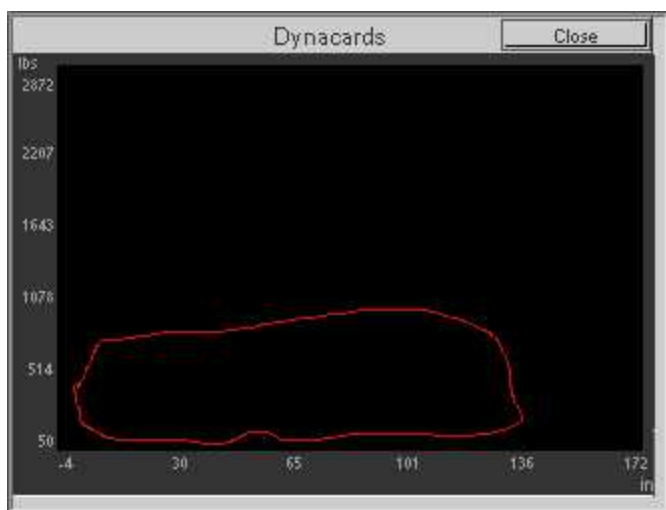
- If the pump Fill Base is greater than Target, speed is increased
- If the pump Fill Base is less than Target, speed is decreased
- If speed decreases to Minimum Speed and the pump Fill Base continues to decrease from Target, Pump Speed is held at Minimum
- If Fillage Minimum is greater than 100%, the Realift RPC runs at its minimum speed

### 10.3 Reading downhole cards

Downhole control uses an advanced algorithm, employing Gibb's wave equation, to determine rod load at the bottom of the well. A Downhole card is a plot of Load vs Position at the load cell for one complete stroke that also corrects for rod stretching, flexing, and stress wave propagation.

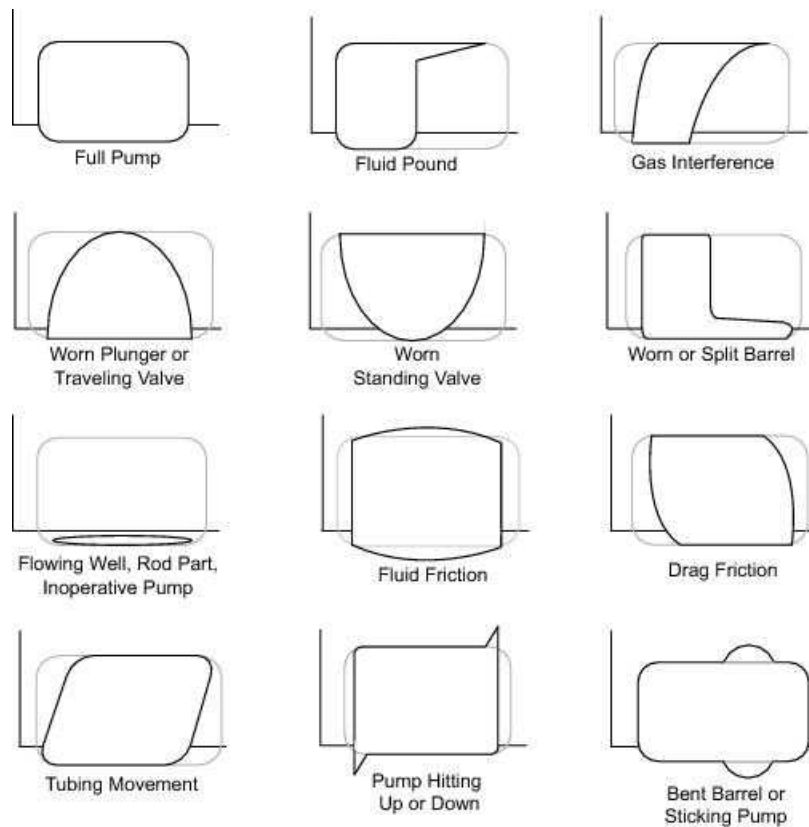
While acceptable well operation can be obtained by observing the surface load, the Downhole card is the preferred method to obtain optimal performance.

A Downhole card plot may resemble the plot shown in the figure below. Ideal Downhole cards have a roughly rectangular shape when the tubing is anchored. Downhole cards have a roughly parallelogram-like shape when the tubing is not anchored.



### 10.4 Sample downhole card shapes

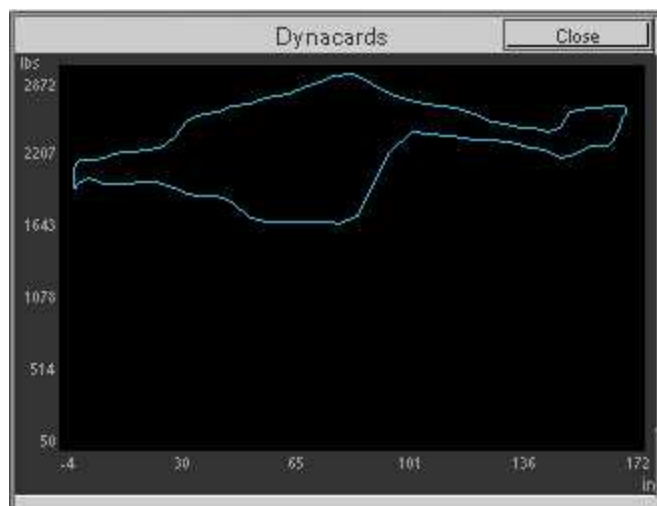
The figure below illustrates possible **Downhole** card shapes.



## 10.5 Reading surface cards

Surface control determines rod load at the surface of the well. A Surface card is a plot of Load vs Position at the load cell for one complete cycle. A Surface card plot can show the structure load and the rod load, but there may still be downhole problems that can affect the rod loads.

When viewing a **Surface** card, the plot may be similar to the **Surface** plot shown in the figure below.



10.6 Reading torque cards

A **Torque** card is a plot of Torque (as a percentage of drive maximum torque) vs Position for one complete stroke.

While the Downhole card is the preferred method of analyzing the state of the well if problems are being experienced, the **Torque** card can be used to determine the pump fill level as accurately as the Downhole card.

A **Torque** card plot for a conventional well with a pump fill greater than 50% may resemble the plot shown below. If the pumpjack speed changes mid-stroke, the shape of the torque card may be distorted.



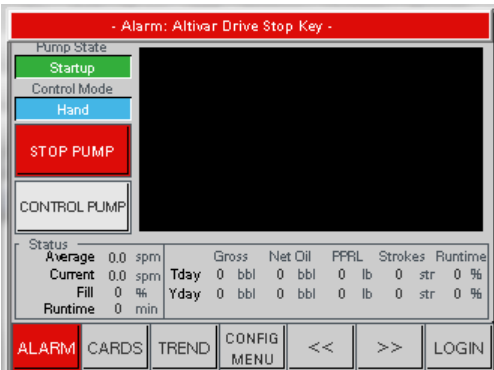
There are no reference, start, or stop cards available for **Torque**. **Torque** cards are only available for periodic and current cards.

## 11 Managing Alarms and Alerts

The **Alarm Summary** screens provide logs of alarms and faults. Active alarms are displayed on the active **Alarm Summary** screen. When the protection that caused the alarm returns to normal, the alarm is no longer displayed on the **Alarm Summary** screen and is now displayed on the **Historical Alarm Summary** screen.

- **Alarms:** Realift Rod Pump generates an alarm for each protection that is enabled when the measured value is outside of the limits defined for the protection. When an alarm is generated, it is added to the **Active Alarm Summary** screen in red.
- **Faults:** Realift Rod Pump generates a fault when the enabled protection has generated more than the defined number of alarms. When a fault is generated, it is added to the **Active Alert Summary** screen in red.

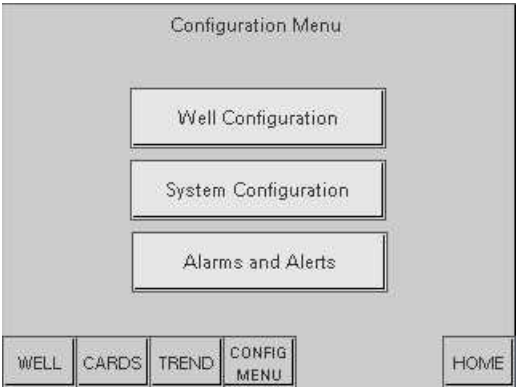
| Active Alarms |       |                       |   | Historic Alarms |                                 |        |   |
|---------------|-------|-----------------------|---|-----------------|---------------------------------|--------|---|
| Date          | Time  | Message               |   | Date            | Message                         | Active |   |
| ▶ 01/16       | 14:49 | - No Active License - | ▲ | ▶ 05/25         | - Alarm: Altivar Drive -        | 11:08  | ▲ |
|               |       |                       | ▲ | 05/25           | - Alarm: Drive Communications - | 11:08  | ▲ |
|               |       |                       |   | 05/25           | - Alarm: Drive Fault -          | 11:08  |   |
|               |       |                       |   | 05/25           | - Load Cell No Signal -         | 11:08  |   |
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- On the **Pump Overview** screen, press **ALARM**.  
The **Active Alarms** screen is displayed.

To view historic alarms and events

- On the **Pump Overview** screen, press **CONFIG MENU**.  
The **Configuration Menu** screen is displayed.



- Press **Alarms and Alerts**.  
The **Active Alarms** screen is displayed.

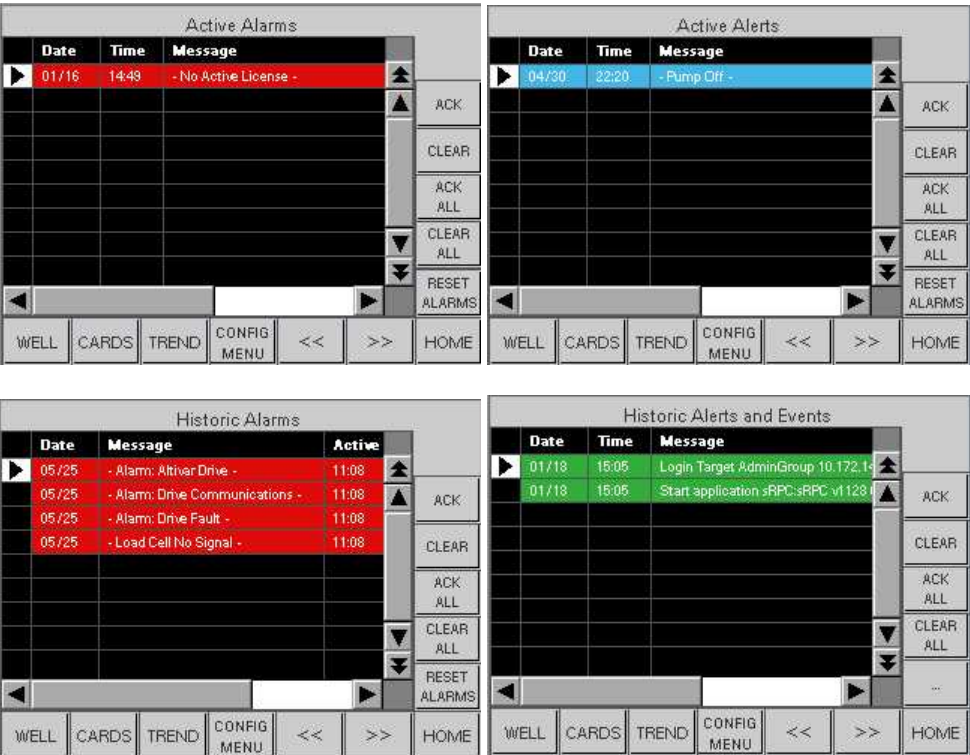


- Press the << and >> buttons to navigate to the alarm and alert summary screens.

You can move the screen contents up and down or left and right by pressing the arrows in the scroll bars, or by pressing the white space in the scroll bars.

11.2 Using the Alarms and Alerts screens

The figures below show the Alarms and Alerts screens.



The following table describes the information contained on the **Alarms and Alerts** screens.

| Column      | Description                                       |
|-------------|---------------------------------------------------|
| Date        | The date the alarm or alert was detected          |
| Time        | The time the alarm or alert was detected          |
| Message     | A description of the alarm or alert               |
| Active Time | The time the alarm or alert was active            |
| ACK Time    | The time the alarm or alert was acknowledged      |
| RTN Time    | The time the alarm or alert condition was removed |

Alarms and alerts appear on the screen with different colors. The following table describes the Alarm and Alert colors.

| Color  | Description                                                                                        |
|--------|----------------------------------------------------------------------------------------------------|
| Red    | The alarm or alert is active and has not been acknowledged                                         |
| Yellow | The alarm or alert has been acknowledged                                                           |
| Green  | The alarm or alert has been cleared and the condition that caused the message is no longer present |
| Blue   | The alert or event is active                                                                       |

To move the screen contents up and down or left and right, press the arrows in the scroll bars or press the white space in the scroll bars:

-  Moves the cursor to the top of the list of alarms or alerts
-  Moves the cursor up one entry in the list of alarms or alerts
-  Moves the cursor down one entry in the list of alarms or alerts
-  Moves the cursor to the bottom of the list of alarms or alerts
-  Scrolls the screen to the left
-  Scrolls the screen to the right

At the side of the Alarm Summary screens, there are the following additional options:

| Button                                                                              | Function        | Description                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Acknowledge     | Acknowledges the selected alarm or fault, indicating that you have read the message and are working to clear the condition that caused it.                                                                                                                                                              |
|  | Clear           | Clears the selected alarm. Cleared alarms no longer appear in the log.                                                                                                                                                                                                                                  |
|  | Acknowledge All | Acknowledges all alarms or alerts in the log.                                                                                                                                                                                                                                                           |
|  | Clear All       | Clears all alarms or alerts in the log.                                                                                                                                                                                                                                                                 |
|  | Reset Alarms    | Resets the Alarms and Restart Counters on the RTU.<br>Alarms are not cleared or acknowledged on the Magelis HMI.<br>When Reset Alarms is active, the button is disabled and the text changes to "RESET ACTIVE." When the action is complete, the button unlocks and the text reverts to "RESET ALARMS." |

### 11.3 List of Alarms and Alerts

| Name                                       | Type  | Description                                                                                               |
|--------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------|
| Altivar Drive                              | Alarm | The Altivar drive has reported a drive alarm or fault is active.                                          |
| Drive Fault                                | Alarm | The VFD Fault input, DI2, is active indicating a drive fault.                                             |
| Drive Communications                       | Alarm | There is no Modbus/RTU communication with the Altivar drive                                               |
| No Active License or No Active Application | Alert | The SP334E RTU is not licensed to run the RPC application, or no active application is on the SP334E RTU  |
| Load Cell No Signal                        | Alarm | The load cell input, AI0, is not reporting a load measurement.                                            |
| Proximity Sensor No Signal                 | Alarm | While the pump is running, the proximity sensor has not reported a stroke within the previous 90 seconds. |
| Spare A High                               | Alarm | The Spare A protection has reported an alarm or fault.                                                    |
| Spare A Low                                | Alarm | The Spare A protection has reported an alarm or fault.                                                    |
| Spare B High                               | Alarm | The Spare B protection has reported an alarm or fault.                                                    |
| Spare B Low                                | Alarm | The Spare B protection has reported an alarm or fault.                                                    |
| Spare C High                               | Alarm | The Spare C protection has reported an alarm or fault.                                                    |
| Spare C Low                                | Alarm | The Spare C protection has reported an alarm or fault.                                                    |
| Spare D High                               | Alarm | The Spare D protection has reported an alarm or fault.                                                    |
| Spare D Low                                | Alarm | The Spare D protection has reported an alarm or fault.                                                    |
| Casing Pressure High                       | Alarm | The Casing Pressure protection has reported an alarm or fault.                                            |

|                                       |       |                                                                                                                 |
|---------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------|
| Casing Pressure Low                   | Alarm | The Casing Pressure protection has reported an alarm or fault.                                                  |
| Tubing Pressure High                  | Alarm | The Tubing Pressure protection has reported an alarm or fault.                                                  |
| Tubing Pressure Low                   | Alarm | The Tubing Pressure protection has reported an alarm or fault.                                                  |
| Pressure Switch                       | Alarm | The Pressure Switch input, DI1, is active indicating an alarm or fault.                                         |
| Malfunction Setpoint Load             | Alarm | The Malfunction Point Load sensor has reported an alarm or fault.                                               |
| Fluid Load High                       | Alarm | Following the previous stroke(s), the fluid load protection reported an alarm or fault.                         |
| Fluid Load Low                        | Alarm | Following the previous stroke(s), the fluid load protection reported an alarm or fault.                         |
| Belt Slip (Belt Slippage) High        | Alarm | Following the previous stroke(s), the belt slippage protection reported an alarm or a fault.                    |
| Peak Polished Rod Level (PPRL) High   | Alarm | Following the previous stroke(s), the (PPRL) protection reported an alarm or a fault.                           |
| Minimum Polished Rod Load (MPRL) High | Alarm | Following the previous stroke(s), the Minimum Polished Rod Load (MPRL) protection reported an alarm or a fault. |
| Pump Off                              | Alert | The Realift RPC is in a Pump Off state.                                                                         |

## 12 Configuration Management

Using the Configuration Management screen, shown below, you can:

- Save a well configuration
- Load a well configuration
- Apply Factory Default settings

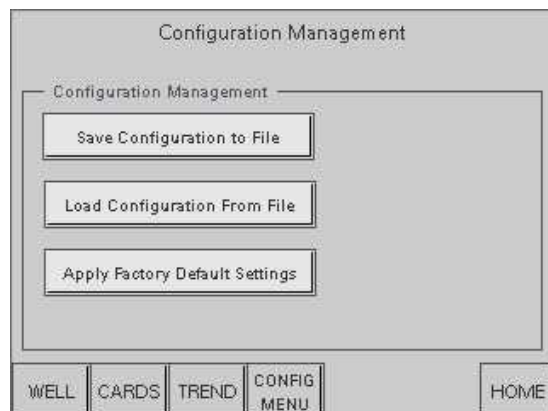
### To access Configuration Management

1. Log in to the Magelis HMI, as described in [Logging in to the Magelis HMI](#) <sup>261</sup>.
2. Press **CONFIG MENU**.

The **Configuration Menu** screen is displayed.

3. Press **System Configuration**.

The **Configuration Management** screen is displayed.



### To save a well configuration

1. Press **Save Configuration to File**.
2. Press **Yes** to save the configuration.

### To load a well configuration

1. Press **Load Configuration From File**.
2. Press **Yes** to load the configuration.

## To apply Factory Default Settings

### ***NOTICE***

#### **DATA LOSS**

Applying the factory default settings to the Realift RPC configuration will delete any logged information stored on the Realift RPC's Magelis HMI and SCADAPack 334E RTU.

Ensure that you have stored any data you want from the Realift RPC on an external device prior to resetting it to factory settings.

**Failure to follow these instructions can result in equipment damage.**

1. Press **Apply Factory Default Settings**.
2. Press **Yes** to apply factory default settings.

## 13 Appendix A - User Privileges

The user privilege levels of the three types of users described in Creating and Deleting Users are described in the following table. For each parameter, a user's privilege level can be Active, Disabled, or Read-only:

- Yes: The user has the right to modify this parameter.
- No: The user does not have the right to modify this parameter.
- Read-Only: This parameter is displayed but cannot be modified.

|                                       | Master | Admin | OP1       | OP2       | None      |
|---------------------------------------|--------|-------|-----------|-----------|-----------|
| Reset Protections                     | Yes    | Yes   | Yes       | Yes       | Yes       |
| Well Configuration                    | Yes    | Yes   | Read-only | Read-only | Read-only |
| Update Master password                | Yes    | No    | No        | No        | Read-only |
| Update Admin password                 | Yes    | Yes   | No        | No        | Read-only |
| Update OP1 password                   | Yes    | Yes   | Yes       | No        | Read-only |
| Update OP2 password                   | Yes    | Yes   | No        | Yes       | Read-only |
| Trends                                | Yes    | Yes   | Yes       | Yes       | Yes       |
| Drive Configuration                   | Yes    | Yes   | Read-only | Read-only | Read-only |
| Pump Configuration                    | Yes    | Yes   | Yes       | Yes       | Read-only |
| Sensors and Protections Configuration | Yes    | Yes   | Read-only | Read-only | Read-only |
| Counters and Timers                   | Yes    | Yes   | Read-only | Read-only | Read-only |
| Configuration management              | Yes    | Yes   | Read-only | Read-only | Read-only |

## 14 Appendix B - Communications Map

### NOTICE

#### UNINTENDED EQUIPMENT OPERATION

Before using the information provided in the communications map below, ensure that you have applied appropriate network security to prevent unauthorized access to Realift RPC.

**Failure to follow these instructions can result in equipment damage.**

The table below provides details about the parameters used in Realift Rod Pump.

The Point # column is the DNP3 point number in the header bit.

| Name                        | Type | Bit | Point # | Modbus | Scale | Units        | Notes                                                                             |
|-----------------------------|------|-----|---------|--------|-------|--------------|-----------------------------------------------------------------------------------|
| Syst.Config.iActiveWell     | BYTE | 0   | 20001   | 420001 | 0     | Well         | Reserved                                                                          |
| Syst.Config.iCommand        | BYTE | 1   | 20001   | 420001 | 0     |              | Saves or loads well configuration from file<br><br>Min: 0<br>Max: 3<br>Default: 0 |
| Syst.Config.iCardSource_01  | BYTE | 0   | 20002   | 420002 | 0     | eCard Source | Controls dynacard displayed in buffer 1.<br><br>Min: 0<br>Max: 3<br>Default: 0    |
| Syst.Config.iCardSource_02  | BYTE | 1   | 20002   | 420002 | 0     | eCard Source | Controls dynacard displayed in buffer 2.<br><br>Min: 0<br>Max: 3<br>Default: 0    |
| Syst.Config.iTrendSource_01 | BYTE | 0   | 20003   | 420003 | 0     | eCard Source | Controls trend displayed in buffer 1.<br><br>Min: 0<br>Max: 3<br>Default: 0       |
| Syst.Config.iTrendSource_02 | BYTE | 1   | 20003   | 420003 | 0     | eCard Source | Controls trend displayed in buffer 2.                                             |

| Name                                     | Type | Bit | Point # | Modbus | Scale | Units      | Notes                                                                           |
|------------------------------------------|------|-----|---------|--------|-------|------------|---------------------------------------------------------------------------------|
|                                          |      |     |         |        |       | e          | Min: 0<br>Max: 3<br>Default: 0                                                  |
| Syst.Config.iSerialBaudRate              | BYTE | 0   | 20004   | 420004 | 0     | eBaud rate | Serial 3 baud rate<br>Min: 0<br>Max: 3<br>Default: 0                            |
| Well[0].Config.Altivar.bENA_Enabled      | BOOL | 0   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bProtInputPhase   | BOOL | 1   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bProtMotorThermal | BOOL | 2   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bProtOutputPhase  | BOOL | 3   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bProtOvertemp     | BOOL | 4   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bProtTorque       | BOOL | 5   | 20010   | 420010 | 0     | T/F        |                                                                                 |
| Well[0].Config.Altivar.bRatedFrequency   | BOOL | 6   | 20010   | 420010 | 0     | T/F        | TRUE if rated frequency is NOT 60 Hz (NEMA), FALSE if 50 Hz (IEC)<br>Default: 1 |
| Well[0].Config.Altivar.iAccelerationTime | BYTE | 0   | 20011   | 420011 | 0     | sec x 0.1  | Min: 0<br>Max: 250<br>Default: 100                                              |
| Well[0].Config.Altivar.iDecelerationTime | BYTE | 1   | 20011   | 420011 | 0     | sec x 0.1  | Min: 0<br>Max: 250<br>Default: 100                                              |
| Well[0].Config.Altivar.iENA_IntegralGain | BYTE | 0   | 20012   | 420012 | 1     | Gain       | 0..9999 on ATV<br>Min: 0<br>Max: 254<br>Default: 100                            |

| Name                                            | Type | Bit | Point # | Modbus | Scale | Units      | Notes                                                                                                  |
|-------------------------------------------------|------|-----|---------|--------|-------|------------|--------------------------------------------------------------------------------------------------------|
| Well[0].Config.Altivar.iENA_ProportionalGain    | BYTE | 1   | 20012   | 420012 | 1     | Gain       | 0..9999 on ATV<br>Min: 0<br>Max: 254<br>Default: 100                                                   |
| Well[0].Config.Altivar.iProtHighTorque          | BYTE | 0   | 20013   | 420013 | 1     | %          | low torque .. 300 on ATV<br>Min: 0<br>Max: 30<br>Default:10                                            |
| Well[0].Config.Altivar.iProtHighTorqueDelay     | BYTE | 1   | 20013   | 420013 | 2     | sec        | scaled to 0..9999 ms on ATV<br>Min: 1<br>Max: 99<br>Default: 1                                         |
| Well[0].Config.Altivar.iProtModbusAction        | BYTE | 0   | 20014   | 420014 | 0     | eMB_Action | Min: 0<br>Max: 4<br>Default: 1                                                                         |
| Well[0].Config.Altivar.iProtModbusFallbackSpeed | BYTE | 1   | 20014   | 420014 | 1     | Hz         | scaled to 0.0...599.0 Hz on ATV<br>Min: 0<br>Max: 60<br>Default: 0                                     |
| Well[0].Config.Altivar.iProtMotorThermalLevel   | BYTE | 0   | 20015   | 420015 | 0     | A          | Default depends on drive size, 20 to 110% of drive rated current<br>Min: 0<br>Max: 118<br>Default: 118 |
| Well[0].Config.Altivar.iProtOutputPhaseTime     | BYTE | 1   | 20015   | 420015 | 0     | sec        | scaled to 0.5 to 10 s on ATV<br>Min: 5<br>Max: 100<br>Default: 10                                      |

| Name                                         | Type | Bit | Point # | Modbus | Scale | Units | Notes                                                                                    |
|----------------------------------------------|------|-----|---------|--------|-------|-------|------------------------------------------------------------------------------------------|
| Well[0].Config.Altivar.iProtOvertempLevel    | BYTE | 0   | 20016   | 420016 | 0     | %     | Min: 0<br>Max: 118<br>Default: 100                                                       |
| Well[0].Config.Altivar.iProtUndervoltageTime | BYTE | 1   | 20016   | 420016 | 2     | sec   | scaled to 0.2..999.9 on ATV<br>Min: 1<br>Max: 250<br>Default: 1                          |
| Well[0].Config.Altivar.iHOA_Config           | INT  |     | 20017   | 420017 | 2     | sec   | scaled to 0.2..999.9 on ATV<br>Min: 1<br>Max: 250<br>Default: 1                          |
| Well[0].Config.Drive.iMaximumFrequency       | BYTE | 0   | 20018   | 420018 | 1     | Hz    | high speed on atv<br>scaled to 10.0...599.0 on ATV<br>Min: 10<br>Max: 250<br>Default: 50 |
| Well[0].Config.Drive.iRatedSpeed             | BYTE | 1   | 20018   | 420018 | 0     | %     | scaled to 10.0...599.0 Hz on ATV<br>Min: 10<br>Max: 250<br>Default: 100                  |
| Well[0].Config.Drive.iRatedCurrent           | BYTE | 0   | 20019   | 420019 | 0     | A     | Rated motor current<br>Min: 0<br>Max: 250<br>Default: 0                                  |
| Well[0].Config.Drive.iRatedPower             | BYTE | 1   | 20019   | 420019 | 0     | kW/HP | Rated motor power<br>Min: 0<br>Max: 250<br>Default: 0                                    |

| Name                                       | Type | Bit | Point # | Modbus | Scale | Units       | Notes                                                                                                                                   |
|--------------------------------------------|------|-----|---------|--------|-------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Well[0].Config.Drive.iRatedVoltage         | BYTE | 0   | 20020   | 420020 | 0     | V x 10      | rated motor voltage in units of 10s of volts<br><br>Min: 1<br>Max: 99<br>Default: 0                                                     |
| Well[0].Config.Drive.iType                 | BYTE | 1   | 20020   | 420020 | 0     | eDrive Type | 1 = Altivar Modbus<br>2 = Generic 0-20mA<br>3 = Generic 4-20mA<br>4 = Starter Contactor (Default)                                       |
| Well[0].Config.Drive.iAbsoluteMaxFrequency | INT  |     | 20021   | 420021 | 0     | Hz          | max frequency on ATV<br><br>Min: 0<br>Max: 251<br>Default: 90                                                                           |
| Well[0].Config.Fill.iDeadband              | BYTE | 0   | 20022   | 420022 | 0     | %           | Min: 0<br>Max: 100<br>Default: 5                                                                                                        |
| Well[0].Config.Fill.iFillControlLevel      | BYTE | 1   | 20022   | 420022 | 0     | %           | When in downhole, or surface control, the change in pump fillage required to change pump speed<br><br>Min: 0<br>Max: 100<br>Default: 30 |
| Well[0].Config.Fill.iFillMinimum           | BYTE | 0   | 20023   | 420023 | 0     | %           | Min: 0<br>Max: 100<br>Default: 85                                                                                                       |
| Well[0].Config.Fill.iFillTarget            | BYTE | 1   | 20023   | 420023 | 0     | %           | Min: 0<br>Max: 100<br>Default: 95                                                                                                       |
| Well[0].Config.Fill.iSpeedChangeCount      | BYTE | 0   | 20024   | 420024 | 0     | strokes     | Min: 0<br>Max: 255                                                                                                                      |

| Name                                      | Type | Bit | Point # | Modbus | Scale | Units    | Notes                                                                      |
|-------------------------------------------|------|-----|---------|--------|-------|----------|----------------------------------------------------------------------------|
|                                           |      |     |         |        |       |          | Default: 3                                                                 |
| Well[0].Config.Fill.iSpeedMax             | BYTE | 1   | 20024   | 420024 | 1     | spm      | Min: 0.1<br>Max: 20<br>Default: 70                                         |
| Well[0].Config.Fill.iSpeedMin             | BYTE | 0   | 20025   | 420025 | 1     | spm      | Min: 0.1<br>Max: 15<br>Default: 30                                         |
| Well[0].Config.Production.iGaugeOffTime   | BYTE | 0   | 20026   | 420026 | 0     | Hr       | Min: 0<br>Max: 23<br>Default: 0                                            |
| Well[0].Config.Production.iPumpEfficiency | BYTE | 0   | 20027   | 420027 | 0     | %        | Min: 1<br>Max: 100<br>Default: 1000                                        |
| Well[0].Config.Production.iWaterCut       | BYTE | 1   | 20027   | 420027 | 0     | %        | Min: 0<br>Max: 100<br>Default: 0                                           |
| Well[0].Config.Production.iGasOilRatio    | INT  |     | 20028   | 420028 | 1     | SPF: bbl | Min: 1<br>Max: 1000<br>Default: 1000                                       |
| Well[0].Config.Production.iGravityOil     | INT  |     | 20029   | 420029 | 2     | g/cm3    | Min: 0<br>Max: 9999<br>Default: 876                                        |
| Well[0].Config.Production.iGravityWater   | INT  |     | 20030   | 420030 | 2     | g/cm3    | Min: 0<br>Max: 9999<br>Default: 1000                                       |
| Well[0].Config.Production.iFluidViscosity | INT  |     | 20033   | 420033 | 0     | CP x 100 | Determined in counterbalance test<br>Min: 0<br>Max: 32000<br>Default: 1000 |

| Name                                            | Type | Bit | Point # | Modbus | Scale | Units       | Notes                                                                   |
|-------------------------------------------------|------|-----|---------|--------|-------|-------------|-------------------------------------------------------------------------|
| Well[0].Config.Production.iPumpDiameter         | INT  |     | 20031   | 420031 | 0     | T/F         | reserved                                                                |
| Well[0].Config.Production.iPumpPungerSealLength | INT  |     | 20032   | 420032 | 0     | in x 10     | Determined in counterbalance test<br>Min: 0<br>Max: 32000<br>Default: 0 |
| Well[0].Config.Production.iPumpPungerClearance  | INT  |     | 20034   | 420034 | 0     | in x 1000   | Determined in counterbalance test<br>Min: 0<br>Max: 32000<br>Default: 0 |
| Well[0].Config.Protections[13].bAlarmEnableHigh | BOOL | 0   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].bAlarmEnableLow  | BOOL | 1   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].bAlertEnableHigh | BOOL | 2   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].bAlertEnableLow  | BOOL | 3   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].bAutoRestart     | BOOL | 4   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].bClearAlarm      | BOOL | 5   | 20035   | 420035 | 0     | T/F         |                                                                         |
| Well[0].Config.Protections[13].iAlarmDelayHigh  | BYTE | 0   | 20048   | 420048 | 0     | sec/strokes | Min: 0<br>Max: 255<br>Default: 5                                        |
| Well[0].Config.Protections[13].iAlarmDelayLow   | BYTE | 1   | 20048   | 420048 | 0     | sec/strokes | Min: 0<br>Max: 255<br>Default: 5                                        |
| Well[0].Config.Protections[13].iCountLimitHigh  | BYTE | 0   | 20061   | 420061 | 0     | counts      | Min: 0<br>Max: 255<br>Default: 5                                        |

| Name                                            | Type | Bit | Point # | Modbus | Scale | Units       | Notes                                                                          |
|-------------------------------------------------|------|-----|---------|--------|-------|-------------|--------------------------------------------------------------------------------|
| Well[0].Config.Protections[13].iCountLimitLow   | BYTE | 1   | 20061   | 420061 | 0     | counts      | Min: 0<br>Max: 255<br>Default: 5                                               |
| Well[0].Config.Protections[13].iStartDelayHigh  | BYTE | 0   | 20074   | 420074 | 0     | sec/strokes | Min: 0<br>Max: 255<br>Default: 5                                               |
| Well[0].Config.Protections[13].iStartDelayLow   | BYTE | 1   | 20074   | 420074 | 0     | sec/strokes | Min: 0<br>Max: 255<br>Default: 5                                               |
| Well[0].Config.Protections[13].iAutoRestartTime | INT  |     | 20087   | 420087 | 0     | sec         | Time between auto restarts in seconds<br>Min: 0<br>Max: 32000<br>Default: 3600 |
| Well[0].Config.Protections[13].iDebounce        | INT  |     | 20100   | 420100 | 0     | sec/strokes | Min: 0<br>Max: 3600<br>Default: 10                                             |
| Well[0].Config.Protections[13].iThresholdHigh   | INT  |     | 20113   | 420113 | 0     |             | Units Depend on Sensor<br>Min: 0<br>Max: 32000<br>Default: 10                  |
| Well[0].Config.Protections[13].iThresholdLow    | INT  |     | 20126   | 420126 | 0     |             | Units Depend on Sensor<br>Min: 0<br>Max: 32000<br>Default: 10                  |
| Well[0].Config.PumpJack.iAPI_Model              | BYTE | 0   | 20139   | 420139 |       | eAPI        | Pumpjack type<br>Min: 0<br>Max: 2<br>Default: 0                                |
| Well[0].Config.PumpJack.iLengthOverride         | INT  |     | 20140   | 420140 | 1     | in          | Stroke length if entered manually                                              |

| Name                                         | Type | Bit | Point # | Modbus | Scale | Units | Notes                                                                    |
|----------------------------------------------|------|-----|---------|--------|-------|-------|--------------------------------------------------------------------------|
|                                              |      |     |         |        |       |       | Min: 0<br>Max: 32000<br>Default: 0                                       |
| Well[0].Config.PumpJack.iA                   | INT  |     | 20141   | 420141 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iC                   | INT  |     | 20142   | 420142 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iI                   | INT  |     | 20143   | 420143 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iK                   | INT  |     | 20144   | 420144 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iP                   | INT  |     | 20145   | 420145 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iR                   | INT  |     | 20146   | 420146 | 1     | in    | Min: 1<br>Max: 1000<br>Default: 1                                        |
| Well[0].Config.PumpJack.iCounterbalance      | INT  |     | 20147   | 420147 | 0     | lbs   | Determined in counterbalance test<br>Min: 0<br>Max: 32000<br>Default: 0  |
| Well[0].Config.PumpJack.iStructuralImbalance | INT  |     | 20148   | 420148 | 0     | lbs   | Specified by pumpjack manufacturer<br>Min: 0<br>Max: 32000<br>Default: 0 |

| Name                                         | Type | Bit | Point # | Modbus | Scale | Units   | Notes                                                                                 |
|----------------------------------------------|------|-----|---------|--------|-------|---------|---------------------------------------------------------------------------------------|
| Well[0].Config.PumpJack.iCounterbalanceAngle | INT  |     | 20149   | 420149 | 0     | lbs     | Determined in counterbalance test<br><br>Min: 0<br>Max: 32000<br>Default: 0           |
| Well[0].Config.PumpJack.iGearBoxRatio        | INT  |     | 20150   | 420150 | 3     | RATIO   | Gearbox Ratio<br><br>Min: 1<br>Max: 1000<br>Default: 1                                |
| Well[0].Config.RodFloat.iAlpha               | BYTE | 0   | 20151   | 420151 | 0     | Alpha   | Floating Rod<br><br>Min: 1<br>Max: 255<br>Default: 1                                  |
| Well[0].Config.RodFloat.iMinSpeed            | BYTE | 1   | 20151   | 420151 | 0     | Hz      | Floating Rod<br><br>Min: 1<br>Max: 255<br>Default: 1                                  |
| Well[0].Config.RodFloat.iTimeConstant        | BYTE | 0   | 20152   | 420152 | 0     | msec    | Floating Rod<br><br>Min: 1<br>Max: 255<br>Default: 1                                  |
| Well[0].Config.RodFloat.iLoadLimit           | INT  |     | 20153   | 420153 | -1    | lbs     | Floating Rod                                                                          |
| Well[0].Config.Sensors[6].iScale             | BYTE | 0   | 20154   | 420154 | 0     | Scale   | Decimal places of sensor (ie 1 = 0.1, -1 = 10)<br><br>Min: -5<br>Max: 5<br>Default: 0 |
| Well[0].Config.Sensors[6].iSource            | BYTE | 1   | 20154   | 420154 | 0     | eSOURCE | AI, DI, Register, Constant<br><br>Min: 0<br>Max: 6<br>Default: 0                      |

| Name                                     | Type | Bit | Point # | Modbus | Scale | Units  | Notes                                                                                                                  |
|------------------------------------------|------|-----|---------|--------|-------|--------|------------------------------------------------------------------------------------------------------------------------|
| Well[0].Config.Sensors[6].iCalibrate20mA | INT  |     | 20160   | 420160 | 0     | mA     | If source AI<br>Min: 0<br>Max: 32000<br>Default: 20                                                                    |
| Well[0].Config.Sensors[6].iCalibrate4mA  | INT  |     | 20166   | 420166 | 0     | mA     | If source AI<br>Min: 0<br>Max: 32000<br>Default: 4                                                                     |
| Well[0].Config.Sensors[6].iMapping       | INT  |     | 20172   | 420172 | 0     | DNP    | Source of sensor data, DNP point number if register, or AI or DI if physical I/O<br>Min: 0<br>Max: 32000<br>Default: 0 |
| Well[0].Config.Tapers[6].iDiameter       | INT  |     | 20178   | 420178 | 2     | in     | Min: 0<br>Max: 1000<br>Default: 1000                                                                                   |
| Well[0].Config.Tapers[6].iLength         | INT  |     | 20184   | 420184 | 0     | ft     | Min: 1<br>Max: 32000<br>Default: 1000                                                                                  |
| Well[0].Config.Tapers[6].iModulus        | INT  |     | 20190   | 420190 | 1     | MPSI   | Min: 1<br>Max: 32000<br>Default: 305                                                                                   |
| Well[0].Config.Tapers[6].iSpeedOfSound   | INT  |     | 20196   | 420196 | 0     | ft/sec | Min: 1<br>Max: 32000<br>Default: 1                                                                                     |
| Well[0].Config.Tapers[6].iWeight         | INT  |     | 20202   | 420202 | 2     | lbs/ft | Min: 1<br>Max: 32000<br>Default: 100                                                                                   |
| Well[0].Config.Timed.iOffTime            | INT  |     | 20208   | 420208 | 0     | min    | Min: 0                                                                                                                 |

| Name                                       | Type | Bit | Point # | Modbus | Scale | Units      | Notes                                           |
|--------------------------------------------|------|-----|---------|--------|-------|------------|-------------------------------------------------|
|                                            |      |     |         |        |       |            | Max: 32000<br>Default: 15                       |
| Well[0].Config.Timed.iOffTimeMax           | INT  |     | 20209   | 420209 | 0     | min        | Min: 0<br>Max: 32000<br>Default: 60             |
| Well[0].Config.Timed.iOffTimeMin           | INT  |     | 20210   | 420210 | 0     | min        | Min: 0<br>Max: 32000<br>Default: 15             |
| Well[0].Config.Timed.iOnTime               | INT  |     | 20211   | 420211 | 0     | min        | Min: 0<br>Max: 32000<br>Default: 15             |
| Well[0].Config.ValveTest.iMode             | BYTE | 0   | 20212   | 420212 | 0     | eValveMode | Reserved<br>Min: 0<br>Max: 1<br>Default: 1      |
| Well[0].Config.ValveTest.iTestTime         | BYTE | 1   | 20212   | 420212 | 2     | sec        | Reserved<br>Min: 0<br>Max: 320<br>Default: 100  |
| Well[0].Config.ValveTest.iLoadChange       | INT  |     | 20213   | 420213 | -1    | lbs        | Reserved<br>Min: 0<br>Max: 320<br>Default: 5000 |
| Well[0].Config.ValveTest.iLeakageStanding  | INT  |     | 20214   | 420214 |       |            | Default: 0                                      |
| Well[0].Config.ValveTest.iLeakageTraveling | INT  |     | 20215   | 420215 |       |            | Default: 0                                      |
| Well[0].Config.bAutoAdjustTime             | BOOL | 0   | 20216   | 420216 | 0     | T/F        | Default: 0                                      |
| Well[0].Config.bClockWise                  | BOOL | 1   | 20216   | 420216 | 0     | T/F        | Default: 0                                      |

| Name                                     | Type | Bit | Point # | Modbus | Scale | Units   | Notes                              |
|------------------------------------------|------|-----|---------|--------|-------|---------|------------------------------------|
| Well[0].Config.bDisablePowerCycleRestart | BOOL | 2   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bFallbackTimed            | BOOL | 3   | 20216   | 420216 | 0     | T/F     | Default: 1                         |
| Well[0].Config.bPositionActiveLow        | BOOL | 4   | 20216   | 420216 | 0     | T/F     | Default: 2                         |
| Well[0].Config.bLoadCell50K              | BOOL | 5   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bLow ProductionWell       | BOOL | 6   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bRodFloat                 | BOOL | 7   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bUseAPI                   | BOOL | 8   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bUseAutoStartSpeed        | BOOL | 9   | 20216   | 420216 | 0     | T/F     | Default: 0                         |
| Well[0].Config.bWellSimulator            | BOOL | 10  | 20216   | 420216 | 0     | T/F     | Reserved                           |
| Well[0].Config.bWirelessLoadCell         | BOOL | 11  | 20216   | 420216 | 0     | T/F     | Reserved                           |
| Well[0].Config.iPreControlCount          | BYTE | 0   | 20217   | 420217 | 0     | strokes | Min: 0<br>Max: 999<br>Default: 0   |
| Well[0].Config.iPumpOffCount             | BYTE | 1   | 20217   | 420217 | 0     | strokes | Min: 0<br>Max: 999<br>Default: 0   |
| Well[0].Config.iPumpJackNumber           | INT  |     | 20218   | 420218 | 1     |         | Reserved                           |
| Well[0].Config.iDampingFactor            | INT  |     | 20219   | 420219 | 2     |         | Min: 0<br>Max: 32000<br>Default: 5 |
| Well[0].Config.iPositionAngle            | INT  |     | 20220   | 420220 | 0     | deg     | Proximity Switch Angle<br>Min: 0   |

| Name                                | Type | Bit | Point # | Modbus | Scale | Units | Notes                                |
|-------------------------------------|------|-----|---------|--------|-------|-------|--------------------------------------|
|                                     |      |     |         |        |       |       | Max: 359<br>Default: 0               |
| Well[0].Config.iPowerCycleDelay     | INT  |     | 20221   | 420221 | 0     | min   | Min: 0<br>Max: 1440<br>Default: 0    |
| Well[0].Config.iRodStringCount      | INT  |     | 20222   | 420222 | 0     | count | Min: 1<br>Max: 6<br>Default: 1       |
| Well[0].Config.iStuffingBoxFriction | INT  |     | 20223   | 420223 | 0     | lbs   | Min: 0<br>Max: 32000<br>Default: 100 |
| Well[0].Config.iTubingAnchorDepth   | INT  |     | 20224   | 420224 | -1    | ft    | Min: 0<br>Max: 32000<br>Default: 0   |
| Well[0].Config.iTubingSize          | INT  |     | 20225   | 420225 | 2     | in    | Min: 1<br>Max: 32000<br>Default: 100 |
| Well[0].Config.iSpeedFeedback       | BYTE | 0   | 20226   | 420226 | 0     |       |                                      |
| Well[0].Config.iStartWarningTime    | BYTE | 1   | 20226   | 420226 | 0     | sec   | Min: 0<br>Max: 3600<br>Default: 0    |
| Well[0].Control.bAlarmReset         | BOOL | 0   | 20250   | 420250 | 0     | T/F   |                                      |
| Well[0].Control.bCalibrateProx      | BOOL | 1   | 20250   | 420250 | 0     | T/F   |                                      |
| Well[0].Control.bCounterReset       | BOOL | 2   | 20250   | 420250 | 0     | T/F   |                                      |
| Well[0].Control.bFactoryReset       | BOOL | 3   | 20250   | 420250 | 0     | T/F   |                                      |

| Name                                         | Type | Bit | Point # | Modbus | Scale | Units | Notes                             |
|----------------------------------------------|------|-----|---------|--------|-------|-------|-----------------------------------|
| Well[0].Control.bReadDriveConfiguration      | BOOL | 4   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bSaveReferenceCard1          | BOOL | 5   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bSaveReferenceCard2          | BOOL | 6   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bTotalizerTimerReset         | BOOL | 7   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bWriteDriveConfiguration     | BOOL | 8   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bWellEnabled                 | BOOL | 9   | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bCalibrateProxAngle          | BOOL | 10  | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bCounterResetRods            | BOOL | 11  | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bCounterResetPump            | BOOL | 12  | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bLoadConfig                  | BOOL | 13  | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bSaveConfig                  | BOOL | 14  | 20250   | 420250 | 0     | T/F   |                                   |
| Well[0].Control.bLoadPumpjack                | BOOL | 15  | 20250   | 420250 | 0     | T/F   | Reserved                          |
| Well[0].Control.iHandSpeed                   | BYTE | 0   | 20251   | 420251 | 1     | spm   | Min: 0<br>Max: 9000<br>Default: 0 |
| Well[0].Control.iMode                        | BYTE | 1   | 20251   | 420251 | 0     | eMODE | Min: 0<br>Max: 3<br>Default: 0    |
| Well[0].Control.iAnalytic                    | INT  |     | 20252   | 420252 | 0     |       | Reserved                          |
| Well[0].Control.bInitialFactoryResetComplete | BOOL | 0   | 20262   | 420262 | 0     | T/F   | Reserved                          |

| Name                          | Type | Bit | Point # | Modbus | Scale | Units        | Notes                                     |
|-------------------------------|------|-----|---------|--------|-------|--------------|-------------------------------------------|
| Well[0].Control.bDemoMode     | BOOL | 1   | 20262   | 420262 | 0     | T/F          | Reserved                                  |
|                               |      |     |         |        |       |              |                                           |
| PhysIO.PhsyIO.bDigitalInputs  | BOOL |     | 1000    |        | 0     | T/F          |                                           |
| PhysIO.PhsyIO.iAnalogInputs   | INT  |     | 3000    |        | 0     | counts       |                                           |
| PhysIO.PhsyIO.bDigitalOutputs | BOOL |     | 0       |        | 0     | T/F          |                                           |
| PhysIO.PhsyIO.iAnalogOutputs  | INT  |     | 4000    |        | 0     | counts       |                                           |
| Syst.About.iBuild             | BYTE | 0   | 10001   | 320001 | 0     |              | 0 = no license<br>1 = SRPC                |
| Syst.About.iVersion           | BYTE | 1   | 10001   | 320001 | 0     | Build        | Build Number                              |
| Syst.About.iType              | INT  |     | 10002   | 320002 | 3     | Version      | 4000 = 4.00.0                             |
| Syst.Clock.iYear              | INT  |     | 10003   | 320003 | 0     |              | Dynacard                                  |
| Syst.Clock.iMonth             | INT  |     | 10004   | 320004 | 0     |              | Dynacard                                  |
| Syst.Clock.iDay               | INT  |     | 10005   | 320005 | 0     |              | Dynacard                                  |
| Syst.Clock.iHour              | INT  |     | 10006   | 320006 | 0     |              | Dynacard                                  |
| Syst.Clock.iMinute            | INT  |     | 10007   | 320007 | 0     |              | Dynacard                                  |
| Syst.Status.iActiveWell       | BYTE | 0   | 10008   | 320008 | 0     | Well         | Reserved                                  |
| Syst.Status.iCommand          | BYTE | 1   | 10008   | 320008 | 0     | Well         |                                           |
| Syst.Status.iCardSource_01    | BYTE | 0   | 10009   | 320009 | 0     | eCard Source | Indicates the card displayed in buffer 1  |
| Syst.Status.iCardSource_02    | BYTE | 1   | 10009   | 320009 | 0     | eCard Source | Indicates the card displayed in buffer 2  |
| Syst.Status.iTrendSource_01   | BYTE | 0   | 10010   | 320010 | 0     | eCard Source | Indicates the trend displayed in buffer 1 |

| Name                               | Type | Bit | Point # | Modbus | Scale | Units        | Notes                                     |
|------------------------------------|------|-----|---------|--------|-------|--------------|-------------------------------------------|
| Syst.Status.iTrendSource_02        | BYTE | 1   | 10010   | 320010 | 0     | eCard Source | Indicates the trend displayed in buffer 2 |
| Syst.Status.iTrendPointerMinute    | BYTE | 0   | 10011   | 320011 | 0     |              | Indicates the current minute of the trend |
| Syst.Status.iTrendPointerHour      | BYTE | 1   | 10011   | 320011 | 0     |              | Indicates the current minute of the trend |
| Syst.Status.iTrendPointerDay       | BYTE | 0   | 10012   | 320012 | 0     |              | Indicates the current minute of the trend |
| Syst.Cards[2].iFillage             | INT  |     | 10050   | 320050 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iFluidHeight         | INT  |     | 10052   | 320052 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iFluidLoad           | INT  |     | 10054   | 320054 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iGrossStroke         | INT  |     | 10056   | 320056 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iMPRL                | INT  |     | 10058   | 320058 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iNetStroke           | INT  |     | 10060   | 320060 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iPPRL                | INT  |     | 10062   | 320062 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iSPM                 | INT  |     | 10064   | 320064 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iCounterBalance      | INT  |     | 10066   | 320066 | 0     |              | Dynacard                                  |
| Syst.Cards[2].iX                   | INT  |     | 10100   | 320100 | 0     | in           | Dynacard                                  |
| Syst.Cards[2].iY                   | INT  |     | 10300   | 320300 | -1    | lbs          | Dynacard                                  |
| Well[0].Status.Drive.iDCBusVoltage | INT  |     | 10500   | 320500 | 0     | V            |                                           |
| Well[0].Status.Drive.iFault        | INT  |     | 10501   | 320501 | 0     | eDrive Fault |                                           |
| Well[0].Status.Drive.iMainsVoltage | INT  |     | 10502   | 320502 | 0     | V            |                                           |
| Well[0].Status.Drive.iMotorCurrent | INT  |     | 10503   | 320503 | 1     | A            |                                           |
| Well[0].Status.Drive.iMotorPower   | INT  |     | 10504   | 320504 | 1     | KW/HP        |                                           |

| Name                                             | Type | Bit | Point # | Modbus | Scale | Units         | Notes                  |
|--------------------------------------------------|------|-----|---------|--------|-------|---------------|------------------------|
| Well[0].Status.Drive.iMotorTorque                | INT  |     | 10505   | 320505 | 1     | %             |                        |
| Well[0].Status.Drive.iMotorVoltage               | INT  |     | 10506   | 320506 | 0     | V             |                        |
| Well[0].Status.Drive.iOutputFrequency            | INT  |     | 10507   | 320507 | 1     | Hz            | Current speed of drive |
| Well[0].Status.Drive.iStatus                     | INT  |     | 10508   | 320508 | 0     | eDrive Status |                        |
| Well[0].Status.Protections[13].bAlarmHigh        | BOOL | 0   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bAlarmLow         | BOOL | 1   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bAlertHigh        | BOOL | 2   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bAlertLow         | BOOL | 3   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bBrakeReachedHigh | BOOL | 4   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bBrakeReachedLow  | BOOL | 5   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bFaultHigh        | BOOL | 6   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].bFaultLow         | BOOL | 7   | 10509   | 320509 | 0     | T/F           |                        |
| Well[0].Status.Protections[13].iAlarmCountHigh   | BYTE | 0   | 10522   | 320522 | 0     | counts        |                        |
| Well[0].Status.Protections[13].iAlarmCountLow    | BYTE | 1   | 10522   | 320522 | 0     | counts        |                        |
| Well[0].Status.Sensors[6].bFault                 | BOOL | 0   | 10535   | 320535 | 0     | T/F           |                        |
| Well[0].Status.Sensors[6].iValue                 | INT  |     | 10541   | 320541 | 0     |               | Units Depend on Sensor |
| Well[0].Status.Now.iEnergy                       | INT  |     | 10547   | 320547 | 0     | Wh            | Instantaneous          |
| Well[0].Status.Now.iGasProduction                | INT  |     | 10548   | 320548 | 0     | SCF/day       | Rate                   |

| Name                                      | Type | Bit | Point # | Modbus | Scale | Units   | Notes                                        |
|-------------------------------------------|------|-----|---------|--------|-------|---------|----------------------------------------------|
| Well[0].Status.Now.iGrossProduction       | INT  |     | 10549   | 320549 | 1     | bbl/day | Rate                                         |
| Well[0].Status.Now.iNetProduction         | INT  |     | 10550   | 320550 | 1     | bbl/day | Rate                                         |
| Well[0].Status.Now.iPumpSpeed             | INT  |     | 10551   | 320551 | 1     | spm     | Current speed of the pump                    |
| Well[0].Status.Now.iRunTime               | INT  |     | 10552   | 320552 | 0     | %       | Runtime of the pump since last started       |
| Well[0].Status.Now.iPPRL                  | INT  |     | 10553   | 320553 | 0     | %       |                                              |
| Well[0].Status.Now.iMPRL                  | INT  |     | 10554   | 320554 | 0     | %       |                                              |
| Well[0].Status.Now.iStrokeCount           | INT  |     | 10555   | 320555 | 0     | %       | Number of strokes since the pump was started |
| Well[0].Status.Today.iEnergy              | INT  |     | 10556   | 320556 | 0     | Watts   | Accumulated                                  |
| Well[0].Status.Today.iGasProduction       | INT  |     | 10557   | 320557 | 0     | SCF     | Accumulated                                  |
| Well[0].Status.Today.iGrossProduction     | INT  |     | 10558   | 320558 | 1     | bbl     | Accumulated                                  |
| Well[0].Status.Today.iNetProduction       | INT  |     | 10559   | 320559 | 1     | bbl     | Accumulated                                  |
| Well[0].Status.Today.iPumpSpeed           | INT  |     | 10560   | 320560 | 1     | spm     | Average pump speed today                     |
| Well[0].Status.Today.iRunTime             | INT  |     | 10561   | 320561 | 0     | min     | Runtime today                                |
| Well[0].Status.Today.iPPRL                | INT  |     | 10562   | 320562 | 1     | lbs     | Largest PPRL recorded today                  |
| Well[0].Status.Today.iMPRL                | INT  |     | 10563   | 320563 | 1     | lbs     | Accumulated                                  |
| Well[0].Status.Today.iStrokeCount         | INT  |     | 10564   | 320564 | 0     | strokes |                                              |
| Well[0].Status.Yesterday.iEnergy          | INT  |     | 10565   | 320565 | 0     | Watts   |                                              |
| Well[0].Status.Yesterday.iGasProduction   | INT  |     | 10566   | 320566 | 0     | SCF     | Accumulated                                  |
| Well[0].Status.Yesterday.iGrossProduction | INT  |     | 10567   | 320567 | 1     | bbl     | Accumulated                                  |

| Name                                        | Type | Bit | Point # | Modbus | Scale | Units   | Notes                                   |
|---------------------------------------------|------|-----|---------|--------|-------|---------|-----------------------------------------|
| Well[0].Status.Yesterday.iNetProduction     | INT  |     | 10568   | 320568 | 1     | bbl     | Accumulated                             |
| Well[0].Status.Yesterday.iPumpSpeed         | INT  |     | 10569   | 320569 | 1     | spm     | Accumulated                             |
| Well[0].Status.Yesterday.iRunTime           | INT  |     | 10570   | 320570 | 0     | min     | Average pump speed yesterday            |
| Well[0].Status.Yesterday.iPPRL              | INT  |     | 10571   | 320571 | 1     | lbs     | Runtime today                           |
| Well[0].Status.Yesterday.iMPRL              | INT  |     | 10572   | 320572 | 1     | lbs     | Largest PPRL recorded yesterday         |
| Well[0].Status.Yesterday.iStrokeCount       | INT  |     | 10573   | 320573 | 0     | strokes | Accumulated                             |
| Well[0].Status.bLoadFault                   | BOOL | 0   | 10574   | 320574 | 0     | T/F     | No load cell feedback                   |
| Well[0].Status.bPositionFault               | BOOL | 1   | 10574   | 320574 | 0     | T/F     | No stroke reported within previous 60 s |
| Well[0].Status.bTorqueFault                 | BOOL | 2   | 10574   | 320574 | 0     | T/F     | No stroke reported within previous 60 s |
| Well[0].Status.bPumpOff Fault               | BOOL | 0   | 10575   | 320575 | 0     | T/F     |                                         |
| Well[0].Status.bStartWarning                | BOOL | 1   | 10575   | 320575 | 0     | T/F     |                                         |
| Well[0].Status.bStrokeComplete              | BOOL | 2   | 10575   | 320575 | 0     | T/F     |                                         |
| Well[0].Status.bWellEnabled                 | BOOL | 3   | 10575   | 320575 | 0     | T/F     | Reserved                                |
| Well[0].Status.bConfigComplete              | BOOL | 4   | 10575   | 320575 | 0     | b       | Reserved                                |
| Well[0].Status.bInitialFactoryResetComplete | BOOL | 5   | 10575   | 320575 | 0     | b       | Reserved                                |
| Well[0].Status.bFallback                    | BOOL | 6   | 10575   | 320575 | 0     | b       | Reserved                                |
| Well[0].Status.iBottomHolePressure          | INT  |     | 10576   | 320576 | 0     | psi     |                                         |
| Well[0].Status.iFillageActive               | INT  |     | 10577   | 320577 | 0     | %       |                                         |

| Name                                | Type | Bit | Point # | Modbus | Scale | Units                 | Notes                                                |
|-------------------------------------|------|-----|---------|--------|-------|-----------------------|------------------------------------------------------|
| Well[0].Status.iGearboxTorque       | INT  |     | 10578   | 320578 | 0     | inch<br>lbs x<br>1000 |                                                      |
| Well[0].Status.iFluidHeightInCasing | INT  |     | 10579   | 320579 | 0     | ft                    |                                                      |
| Well[0].Status.iGrossProductionRate | INT  |     | 10580   | 320580 | 0     | bbl                   |                                                      |
| Well[0].Status.iHzToSPM             | INT  |     | 10581   | 320581 | 3     | RATIO                 |                                                      |
| Well[0].Status.iLoad                | INT  |     | 10582   | 320582 | -1    | lbs                   |                                                      |
| Well[0].Status.iMode                | INT  |     | 10583   | 320583 | 0     | eSTATE                | Status of RPC                                        |
| Well[0].Status.iPosition            | INT  |     | 10584   | 320584 | 1     | in                    |                                                      |
| Well[0].Status.iProtectionAction    | INT  |     | 10585   | 320585 | 0     | eACTION               | Indicates status of most<br>severe active protection |
| Well[0].Status.iPumpIntakePressure  | INT  |     | 10586   | 320586 | 0     | psi                   |                                                      |
| Well[0].Status.iPolishedRodPower    | INT  |     | 10587   | 320587 | 0     | stroke<br>s           | Reserved                                             |
| Well[0].Status.iTargetSpeed         | INT  |     | 10588   | 320588 | 1     | spm                   | Speed the pump is<br>supposed to be at               |
| Well[0].Status.iTorque              | INT  |     | 10589   | 320589 | 1     | %                     |                                                      |
| Well[0].Status.iTubingStretch       | INT  |     | 10590   | 320590 | 1     | in                    |                                                      |
| Well[0].Status.iStrokeLength        | INT  |     | 10591   | 320591 | 1     | in                    |                                                      |
| Well[0].Status.iBeltSlip            | INT  |     | 10592   | 320592 | 2     | %                     |                                                      |
| Well[0].Status.iCounterBalance      | INT  |     | 10593   | 320593 | 1     | %                     |                                                      |
| Well[0].Status.iRatedTorque         | INT  |     | 10594   | 320594 | 1     | lbs                   |                                                      |
| Well[0].Status.iDownholeFluidLoad   | INT  |     | 10595   | 320595 | 1     | lbs                   |                                                      |
| Well[0].Status.iTimeInState         | INT  |     | 10596   | 320596 | 0     | min                   | The time the RPC has<br>been in its current status   |
| Well[0].Status.iTimeToRestart       | INT  |     | 10597   | 320597 | 0     | min                   | If stopped and will                                  |

| Name                                | Type | Bit | Point # | Modbus | Scale | Units   | Notes                                                            |
|-------------------------------------|------|-----|---------|--------|-------|---------|------------------------------------------------------------------|
|                                     |      |     |         |        |       |         | automatically restart, the time until which the rpc will restart |
| Well[0].Status.iAutoRestartSpeed    | INT  |     | 10598   | 320598 | 1     | spm     | Auto restart speed calculated by RPC                             |
| Well[0].Status.iPreviousRuntime     | INT  |     | 10599   | 320599 | 0     | min     | The duration which the pump was on before the previous stop      |
| Well[0].Status.iStrokesTotalRod     | DINT |     | 10600   | 320600 | 0     | strokes | The total number of strokes recorded by the rpc for the rod      |
| Well[0].Status.iStrokesTotalPump    | DINT |     | 10602   | 320602 | 0     | strokes | The total number of strokes recorded by the RPC for the pump     |
| Well[0].Status.iMalfunctionLoad     | INT  |     | 10604   | 320604 | 0     | lbs/10  |                                                                  |
| Well[0].Status.iMotorSpeed          | INT  |     | 10605   | 320605 | 0     | rpm     |                                                                  |
| Well[0].Status.iPumpSlippage        | INT  |     | 10606   | 320606 | 0     | bbf/day |                                                                  |
| Well[0].Status.iPumpSlippagePercent | INT  |     | 10607   | 320607 | 0     | %       |                                                                  |

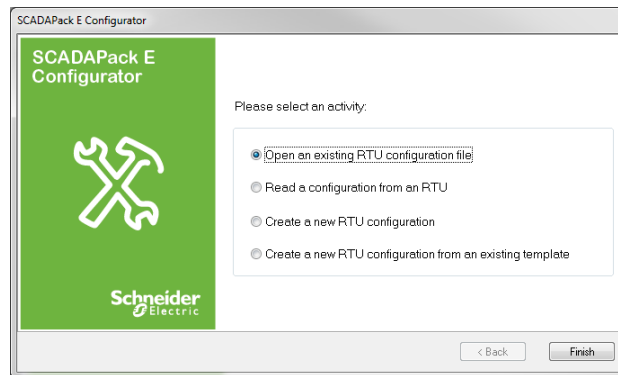
## 15 Appendix C - Configuring Serial Ports 1 and 2

You can configure Serial Port 1 and Serial Port 2 to communicate with an attached serial device using the SCADAPack E Configurator.

### To configure Serial Ports 1 and 2

1. Connect your computer to the SCADAPack 334E USB device port.
2. Select Start > Schneider Electric SCADAPack E > SCADAPack E Configurator.

The SCADAPack E Configurator opens.



3. Select **Open an existing RTU configuration file** and click **Finish**.

The **Open** dialog box is displayed.

4. Navigate to the following folder on your computer:
  - a. On 32-bit Windows (x86): C:\Program Files\Schneider Electric\Realift Rod Pump\ConfigurationFiles
  - b. On 64-bit Windows (x64): C:\Program Files (x86)\Schneider Electric\Realift Rod Pump\ConfigurationFiles
5. In the ConfigurationFiles folder, select CONFIGFILE.rtu and click Open.
6. In the tree control displayed on the left-hand side of the SCADAPack E Configurator, expand the Ports folder and select Ports 0-3.
7. Configure the parameters for Port 1 Function and Port 2 Function, as described below.
8. On the toolbar, click Write RTU configuration  icon. Wait for the traffic light control on the lower right-hand side of the screen to become green again.
9. Restart the controller if SCADAPack E Configurator requests it.

### Parameters

- **Port Function**
  - o Sets the usage of the port. The following table lists the available port functions.

| Port Function | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NONE          | A SCADAPack E RTU port assigned to NONE will have no communication functions available.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ISaGRAF       | <p>A single ISaGRAF port may be assigned to an SCADAPack E RTU port. This port provides a means for directly connecting ISaGRAF Monitoring/Diagnostic or ISaGRAF Workbench tools for loading, monitoring, controlling, or debugging an ISaGRAF application. An ISaGRAF application previously loaded on a SCADAPack E Smart RTU (through an ISaGRAF Port or through DNP3 File Transfer command) will execute whether or not an ISaGRAF port is assigned to the RTU. Access to either of the RTU's ISaGRAF kernel targets is available through the same ISaGRAF port. The ISaGRAF Workbench's debug set-up options select with which of the two SCADAPack E RTU ISaGRAF targets the Workbench communicates.</p> <p>The ISaGRAF port supports Command-line Shell operations including RTU diagnostic display session when IEC 61131-3 Target 3 is enabled. Command line shell is not available with Target 5.</p> <p>This is the default setting for Port 3 on the SCADAPack 300E RTU types.</p> |
| DNP3          | Any port on an SCADAPack E RTU can be assigned as a DNP3 protocol port. Multiple DNP3 ports are support simultaneously, allowing multiple devices to simultaneously access the SCADAPack E RTU. Messages may be routed between any of the DNP3 ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cmd Line      | A SCADAPack E RTU port configured as a Cmd Line port will be permanently available for command line functions and SCADAPack E RTU diagnostic output. For more information see the SCADAPack E Operations Technical Reference Manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| PLC Device    | Any serial port on the SCADAPack E RTU can be assigned as a PLC Device. When configured, these ports provide serial connection to PLC devices for access through special ISaGRAF PLC Device I/O Boards. Configuring an SCADAPack E port to PLC Device starts an RTU PLC Cache Task which provides PLC communication functions on that port and presents data to ISaGRAF.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ISaGRAF-User  | Any serial port on the SCADAPack E RTU can be configured as an ISaGRAF-User port for an ISaGRAF application to communicate with ASCII peripheral devices. SCADAPack E ISaGRAF C functions are provided for user interface to the ISaGRAF-User ports. Multiple ISaGRAF-User ports can be configured if required by an ISaGRAF application and accessed by these ISaGRAF functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| PPP / TCP/IP  | Any serial port on the SCADAPack E RTU can be configured as a PPP / TCP/IP port. Multiple PPP ports may be used simultaneously on the same RTU. For more information about configuring PPP ports, see the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | SCADAPack E TCP/IP Technical Reference manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| TCP Service                | Any serial port on the SCADAPack E RTU can be configured as a TCP Service port. Multiple TCP Service ports can be used simultaneously on the same SCADAPack E RTU. A TCP Service port can operate in either client or server mode. Multiple TCP Service ports can operate in any mixture of client and server modes on the same RTU. For more information about configuring and using TCP Service ports, see the SCADAPack E TCP/IP Technical Reference Manual.                                                                                                                                                                                                                                                             |
| Modbus Master (Modbus RTU) | <p>Any serial port on the SCADAPack E RTU can be configured as a Modbus RTU Master port that uses the Modbus RTU protocol to communicate with the Modbus RTU Slave.</p> <p>Once you configure a serial port as Modbus RTU Master (Modbus RTU), you can use the Modbus Scanner property page to specify the Modbus RTU Slaves that operate with this Modbus RTU Master.</p> <p>Alternatively, you can use SCADAPack Workbench or ISaGRAF 3 Workbench to define Modbus RTU Master operation.</p>                                                                                                                                                                                                                              |
| Modbus Slave               | <p>Any port on the SCADAPack E RTU can be configured as a Modbus Slave port. When configured, these ports provide access to the native Modbus Slave functionality of the RTU. This Modbus Slave implementation does not require SCADAPack Workbench or ISaGRAF 3 Workbench. Setting a port to Modbus Slave starts a Modbus Slave Task to service Modbus requests received on the port.</p> <p>Where the communication protocol and media from the serial port allows, multiple devices can be connected to the same Modbus Slave port. The single configurable Modbus Slave Address is applied to each Modbus Slave ports.</p> <p>For more information, see the SCADAPack E Modbus Protocol Technical Reference Manual.</p> |
| DNP VT Service             | Any serial port on the SCADAPack E RTU can be configured as a DNP VT Service port. Multiple DNP VT Service ports can be used simultaneously on the same SCADAPack E RTU. Devices connected to this port can communicate with other similar devices across a DNP3 network using DNP3 Virtual Terminal objects. In general, the DNP3 Virtual Terminal protocol allows passing of unstructured data between Master and Slave sides of a DNP3 communication link, allowing local terminal interfaces on specific SCADAPack E RTU ports to be accessed remotely using the DNP3 Virtual Terminal objects.                                                                                                                         |
| IEC--103 M                 | Any serial port on the SCADAPack E RTU can be configured as a 60870-5-103 M (Master) port. When configured, these ports provide connection to IEC 60870-5-103 slave devices whereby the SCADAPack E RTU behaves as an IEC 60870-5-103 Master. IEC 60870-5-103 M protocol support requires firmware licensing.                                                                                                                                                                                                                                                                                                                                                                                                               |

|              |                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC--101 S   | Any serial port on the SCADAPack E RTU can be configured as a 60870-5-101 S (Slave) port. When configured, these ports provide connection to IEC 60870-5-101 master devices whereby the SCADAPack E RTU behaves as an IEC 60870-5-103 Slave. IEC 60870-5-101 slave protocol support requires firmware licensing.                                                                                             |
| NTP GPS Rec. | <p>The SCADAPack E RTU supports Trimble and NMEA GPS receivers that have a PC Serial port compatible connection. The antenna can be connected to any configured serial port on the RTU. This effectively turns the RTU into an NTP Stratum 1 time server, to which other NTP client devices can be time synchronized.</p> <p>For more information see the SCADAPack E TCP/IP Technical Reference Manual.</p> |
| SLIP         | Some ports on the SCADAPack E RTU may be configured as a SLIP port. Multiple SLIP ports may be used simultaneously on the same RTU. For more information about configuring SLIP ports, see the SCADAPack E TCP/IP Technical Reference manual.                                                                                                                                                                |
| CSLIP        | Some ports on the SCADAPack E RTU may be configured as a CSLIP port. Multiple CSLIP ports may be used simultaneously on the same RTU. For more information about configuring CSLIP ports, see the SCADAPack E TCP/IP Technical Reference manual.                                                                                                                                                             |

- **Port Mode**

- o Specifies the hardware communication format for the port. The following table lists the available port modes.

| Port Mode         | Description                                                                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (RTS On)          | Select this mode for RS-232 communication where the RTS (Request to Send) signal needs to be constantly asserted. No hardware hand shaking is required or supported when this mode is selected.<br><br>This is the default setting for serial ports.                                                        |
| RS232 (RTS Keyed) | Select this mode for RS-232 communication where RTS / CTS flow control is required. When this mode is selected the Network Access Parameters section of the Ports property page defines how the flow control operates.                                                                                      |
| RS422             | Select this mode for RS-422 communication. No hardware hand shaking is required or supported.                                                                                                                                                                                                               |
| RS485 2w          | Select this mode for RS-485 2-wire communication. No hardware hand shaking is required or supported. Devices on the network need to support RS-485 2-wire communication. When this mode is selected the Network Access Parameters section of the Ports property page defines how the flow control operates. |
| Hayes Modem       | Select this mode for dial-up communications. When this mode is selected the Network Access Parameters section of the Ports property page and the <a href="#">Hayes Modem Property Page</a> <sup>[143]</sup> define the port's operation.                                                                    |
| GPRS              | Select this mode for GPRS (General Packet Radio Service). When this mode is selected the <a href="#">GPRS Property Page</a> <sup>[143]</sup> defines the GPRS operation.                                                                                                                                    |
| 1xRTT             | Select this mode for X.29 communication. When this mode is selected the <a href="#">1xRTT Property Page</a> <sup>[143]</sup> defines the 1xRTT operation.                                                                                                                                                   |
| USB               | The USB Slave port on the is designated as Port 0 on the SCADAPack 300E RTU. The only valid Port Function for this port is DNP3.                                                                                                                                                                            |
| RS232 (RTS Off)   | Select this mode for RS-232 communication where the RTS (Request to Send) signal needs to be constantly de-asserted. No hardware hand shaking is required or supported when this mode is selected.                                                                                                          |

- **Port Baud**

- o Specifies the data rate for each RTU port.
- o Options: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200

- **Port Data Mode**

- o Specifies the data mode for the port
- o Options: 8-bit No Parity, 8-bit Even Parity, 8-bit Odd Parity, 7-bit Even Parity, 7-bit No Parity, 8-bit No Parity 2 Stop Bits

## 16 Appendix D - Commissioning Checklist

The topics in this section provide checklists for:

- [Security and Communications](#) <sup>148</sup>
- [Drive Configuration](#) <sup>149</sup>
- [Well and Pumping Unit](#) <sup>149</sup>
- [Control](#) <sup>150</sup>
- [Sensors and Protections](#) <sup>150</sup>
- [Final Steps](#) <sup>151</sup>

### 16.1 Security and Communications

#### Security

| Checklist Item                                    | Verification |   |
|---------------------------------------------------|--------------|---|
| Did you update the passwords for the Magelis HMI? | Y            | N |
| Did you install a lock on the Realift RPC panel?  | Y            | N |

#### Communications

| Checklist Item                                                                                                                           | Verification |   |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------|---|
| If you updated the IP addresses of the Magelis HMI and Realift RPC, did you confirm the devices are still communicating with each other? | Y            | N |
| Have you verified your modem, radio, or network can communicate with the Realift RPC?                                                    | Y            | N |
| Have you applied network security?                                                                                                       | Y            | N |

## 16.2 Drive Configuration

| Checklist Item                                                                        | Verification |   |
|---------------------------------------------------------------------------------------|--------------|---|
| Did you verify that the pumpjack moves in the correct direction when the drive is on? | Y            | N |
| Did you verify the drive stops when the Realift RPC stops the pump?                   | Y            | N |
| Did you verify the Realift RPC records a fault when the drive issues an alarm?        | Y            | N |
| Did you verify the Realift RPC can reset alarms on the drive?                         | Y            | N |
| Did you verify you are receiving speed and torque feedback?                           | Y            | N |
| Have you set protections such as torque on your VFD?                                  | Y            | N |
| Have you tested your bypass contactor?                                                | Y            | N |

## 16.3 Well and Pumping Unit

| Checklist Item                                                                                      | Verification |   |
|-----------------------------------------------------------------------------------------------------|--------------|---|
| Did you select the correct loadcell size and type?                                                  | Y            | N |
| Did you select the correct position and sensor type?                                                | Y            | N |
| Have you confirmed the proximity angle?                                                             | Y            | N |
| Did you select the correct pumpjack model?                                                          | Y            | N |
| Did you confirm the API dimensions? This is especially important when using configurable pumpjacks. | Y            | N |
| Did you confirm the downhole configuration?                                                         | Y            | N |
| Have you entered production and fluid configuration?                                                | Y            | N |
| Did you test the standing valve leakage, traveling valve leakage, and counterbalance?               | Y            | N |

## 16.4 Control

| Checklist Item                                                                    | Verification |   |
|-----------------------------------------------------------------------------------|--------------|---|
| If using surface or downhole control, did you configure timed fallback control?   | Y            | N |
| Have you selected your control method?                                            | Y            | N |
| Have you configured your deadband, control strokes, pump off time, and fill base? | Y            | N |
| Have you configured power cycle management?                                       | Y            | N |
| Have you configured your start warning time and device?                           | Y            | N |
| If you have heavy oil, have you configured and tested the floating rod control?   | Y            | N |

## 16.5 Sensors and Protections

| Checklist Item                                                                                             | Verification |   |
|------------------------------------------------------------------------------------------------------------|--------------|---|
| Have you enabled any alarms?                                                                               | Y            | N |
| Have you enabled any alerts?                                                                               | Y            | N |
| Have you considered if your pump should automatically restart after an alarm occurs?                       | Y            | N |
| Have you confirmed you are receiving load cell data?                                                       | Y            | N |
| Have you verified you are receiving position data?                                                         | Y            | N |
| Have you confirmed other sensors such as the pressure switch or casing pressure sensor are providing data? | Y            | N |

16.6 Final Steps

| Checklist Item                                                                      | Verification |   |
|-------------------------------------------------------------------------------------|--------------|---|
| Did you verify you can start and stop the pump?                                     | Y            | N |
| Did you verify the pump runs at the expected speed?                                 | Y            | N |
| Did you observe a normal pump-off cycle?                                            | Y            | N |
| Did you assess the shape of the dynacard?                                           | Y            | N |
| Did you verify the operation of your protections?                                   | Y            | N |
| Have you confirmed data such as gearbox torque, imbalance, and inferred production? | Y            | N |
| Did you save and backup your configuration?                                         | Y            | N |

## 17 Appendix E - Maintenance

The Power Mode LED indicates the status of the 5 Vdc supply.

If the LED is off, the on-board fuse F1 may require replacing. The fuse is a Littelfuse Nano-SMF, part number 045301.5 or R45101.5. This fuse is available in a package of 10 from Schneider Electric as part number TBUM297327.

If the program is lost during power outages, the lithium battery may require replacement. See [Replacing the Battery](#)<sup>155</sup> for details.

The analog input and output circuitry (where available) is calibrated at the factory and does not require periodic calibration. Calibration may be necessary if the module has been repaired as a result of damage.

If the RTU is not functioning correctly, contact Schneider Electric Technical Support for information regarding returning the RTU for repair.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the device before removing power.

**Failure to follow these instructions can result in death or serious injury.**

### WARNING

#### HAZARD OF ELECTRIC SHOCK

Remove power from all devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware.

**Failure to follow these instructions can result in death or serious injury.**

For more information, see the following sections:

- [Calibration](#)<sup>152</sup>
- [Preventative Maintenance](#)<sup>153</sup>
- [Routine Maintenance](#)<sup>154</sup>
- [Replacing the Battery](#)<sup>155</sup>
- [Updating Firmware](#)<sup>157</sup>
- [Fuses](#)<sup>158</sup>

### 17.1 Calibration

The RTU is electronically calibrated at the factory during the manufacturing process and after any repair procedures.

There are no user calibration procedures.

## 17.2 Preventative Maintenance

Keep circuit boards free from contaminants such as dust and moisture.

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

Evaluate the operational state of the equipment being monitored or controlled by the RTU or the I/O expansion module before removing power.

**Failure to follow these instructions can result in death or serious injury.**

### **WARNING**

#### **HAZARD OF ELECTRIC SHOCK**

Remove power from the RTU before removing the RTU cover.

Remove power from the RTU before servicing.

**Failure to follow these instructions can result in death or serious injury.**

## Battery Handling Procedures

### **NOTICE**

#### **UNINTENDED EQUIPMENT OPERATION**

- Treat batteries with care.
- Follow the manufacturers' instructions concerning battery storage, use and disposal.
- Keep batteries clean and free from contaminants or other materials that could short the terminals.
- Connect new batteries using the correct polarity.
- Replace batteries with new units of the same chemistry, capacity and make.
- Observe the manufacturers' instructions regarding disposal of batteries. Considerable energy remains in the battery.

**Failure to follow these instructions can result in equipment damage.**

## Electrostatic Discharge (ESD) Procedures

### NOTICE

#### STATIC ELECTRICITY DAMAGE

The electronics inside the RTU can be damaged by static electricity. If you need to remove the RTU cover, wear an anti-static wrist strap that is connected to ground. Failing to follow this simple step can cause intermittent or total loss of RTU operation and will void the warranty.

**Failure to follow these instructions can result in equipment damage.**

## 17.3 Routine Maintenance

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the RTU or the I/O expansion module before removing power.

**Failure to follow these instructions can result in death or serious injury.**

### WARNING

#### HAZARD OF ELECTRIC SHOCK

Remove power from the RTU before removing the RTU cover.

Remove power from the RTU before servicing

**Failure to follow these instructions can result in death or serious injury.**

### NOTICE

#### STATIC ELECTRICITY DAMAGE

The electronics inside the RTU can be damaged by static electricity. If you need to remove the RTU cover, wear an anti-static wrist strap that is connected to ground. Failing to follow this simple step can cause intermittent or total loss of RTU operation and will void the warranty.

**Failure to follow these instructions can result in equipment damage.**

## Primary Power Supply

The primary power for the RTU is a DC power supply. If this is a mains-operated power supply charger with battery backup, replace the batteries every 36 months or earlier if necessary.

## Real-Time Clock and Onboard RAM Back-up Battery

The RTU includes a lithium-powered back-up battery on the controller board. The main task of the battery is to back-up the microprocessor RAM chips and the real-time clock. However, the back-up battery also maintains the RTU configuration during a power-supply interruption.

RTU memory contents are lost when:

- The onboard RAM back-up battery goes flat.
- The onboard RAM back-up battery is replaced while power to the RTU is disconnected.

### NOTICE

#### DATA LOSS

Before replacing the onboard RAM back-up battery, save a copy of the RTU configuration information, user-created applications, logs and other data to an external drive so it can be reloaded when the procedure is complete.

**Failure to follow these instructions can result in equipment damage.**

## 17.4 Replacing the Battery

A flat-package lithium battery located on the controller board provides back-up power to the RTU's real-time clock and RAM memory.

Replace this battery with one of the following 3.6 V lithium batteries recommended by Schneider Electric as soon as possible after the RTU reports that the RAM battery status is low and at the intervals recommended in the [Routine Maintenance](#)<sup>154</sup> section:

- Tadiran TL-5186
- Omni Cell ER22G68
- Eve Energy ER22G68

The RAM battery status is provided on the Controller Status property page in the SCADAPack Configurator software. Take care not to confuse this status with an external power supply low condition.

The following procedure requires the RTU to be powered off briefly. It also requires restarting the RTU in Cold Boot mode. Consider the following precautions before proceeding.

### Back Up Data Before Replacing the Battery

RTU memory contents are lost when:

- The onboard RAM back-up battery goes flat.
- The onboard RAM back-up battery is replaced while power to the RTU is disconnected, as required in the procedure below.
- The RTU is started in Factory Boot mode or in Cold Boot mode. Staring in Cold Boot mode is required in the procedure below.

When memory contents are lost, you need to reload user-created applications and RTU configuration information for correct RTU operation.

### NOTICE

#### DATA LOSS

Before replacing the onboard RAM back-up battery or starting the RTU in Factory Boot mode or Cold Boot mode, save a copy of the RTU configuration information, user-created applications, logs and other data to an external drive so it can be reloaded when the procedure is complete.

**Failure to follow these instructions can result in equipment damage.**

### To replace the onboard RAM back-up battery:

1. Back-up RTU configuration information, user-created applications, logs and other data to an external drive so it can be reloaded when the procedure is complete.

### ⚠ WARNING

#### UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the RTU before removing power.

**Failure to follow these instructions can result in death or serious injury.**

2. Remove power from the RTU.

### NOTICE

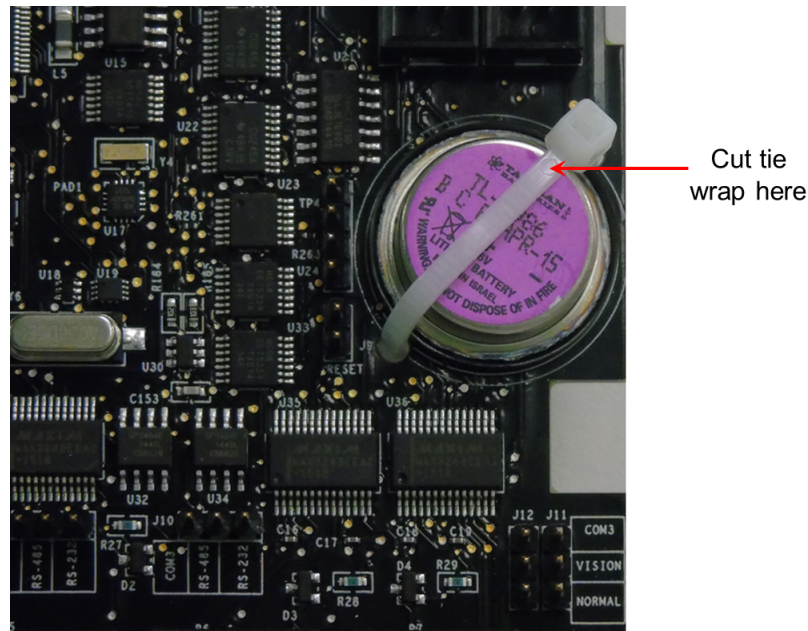
#### STATIC ELECTRICITY DAMAGE

The electronics inside the RTU can be damaged by static electricity. If you need to remove the RTU cover, wear an anti-static wrist strap that is connected to ground. Failing to follow this simple step can cause intermittent or total loss of RTU operation and will void the warranty.

**Failure to follow these instructions can result in equipment damage.**

3. Put on an anti-static wrist strap and verify that it is connected to ground.
4. Remove the RTU cover.
5. Keeping your cutting tool away from the circuit board, carefully cut the tie wrap on the side of the battery that is closest to the top edge of the board.

The figure below indicates where to cut the tie wrap.



6. Gently remove the battery from its socket.
7. Insert the new 3.6 V lithium battery. The tie wrap is intended to keep the battery in place during shipping and does not need to be replaced.
8. Reattach the RTU cover.
9. Apply power to the RTU and start it in Cold Boot mode by holding the LED POWER button down for 20 seconds until the STAT LED begins blinking on and off.
10. Reload the RTU configuration and user-created applications from back-up.

## 17.5 Updating Firmware

You can update the firmware on your SCADAPack RTU using SCADAPack Configurator or Telepace Studio.

### NOTICE

#### UNINTENDED EQUIPMENT OPERATION

Before you install any firmware updates, check the Release Notes for the firmware update to determine the most suitable firmware versions for the functionality you are using and to confirm version compatibility.

**Failure to follow these instructions can result in equipment damage.**

#### To update firmware

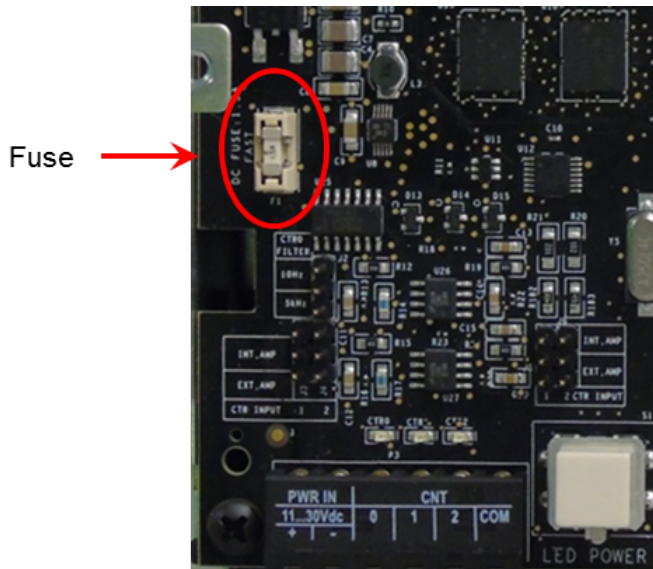
1. Verify that your PC is connected to a valid port on the RTU.
2. In SCADAPack Configurator or in Telepace Studio, click on Firmware Loader.

3. In the Firmware Loader page, click Update Firmware.

For more information about updating firmware, see the Configurator User Manual or the Telepace Studio User and Reference Manual.

## 17.6 Fuses

A single 1.5 Amp fast-blow fuse provides protection for the power supply. The fuse is mounted under the cover. See the following image for the location.



### ⚠ WARNING

#### RISK OF EXPLOSION

Before replacing the fuse:

- Verify that the area is non-hazardous.
- Assess the impact that disconnecting power may have on other devices.
- Disconnect power.

**Failure to follow these instructions can result in death or serious injury.**

### ⚠ WARNING

#### UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment monitored and controlled by the SCADAPack RTU.

**Failure to follow these instructions can result in death or serious injury.**

 **WARNING****UNINTENDED EQUIPMENT OPERATION**

Replace the fuse with a fuse of the same rating. Under no circumstances would a fuse be bypassed or replaced with a fuse of a higher rating.

**Failure to follow these instructions can result in death or serious injury.**

The fuse is a Littelfuse Nano-SMF, part number 045301.5 or R45101.5. This fuse is available in a package of 10 from Schneider Electric as part number TBUM297327.

In every case, investigate and correct the cause of the blown fuse before replacement. Common causes of a blown fuse are short circuits and excessive input voltages.

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