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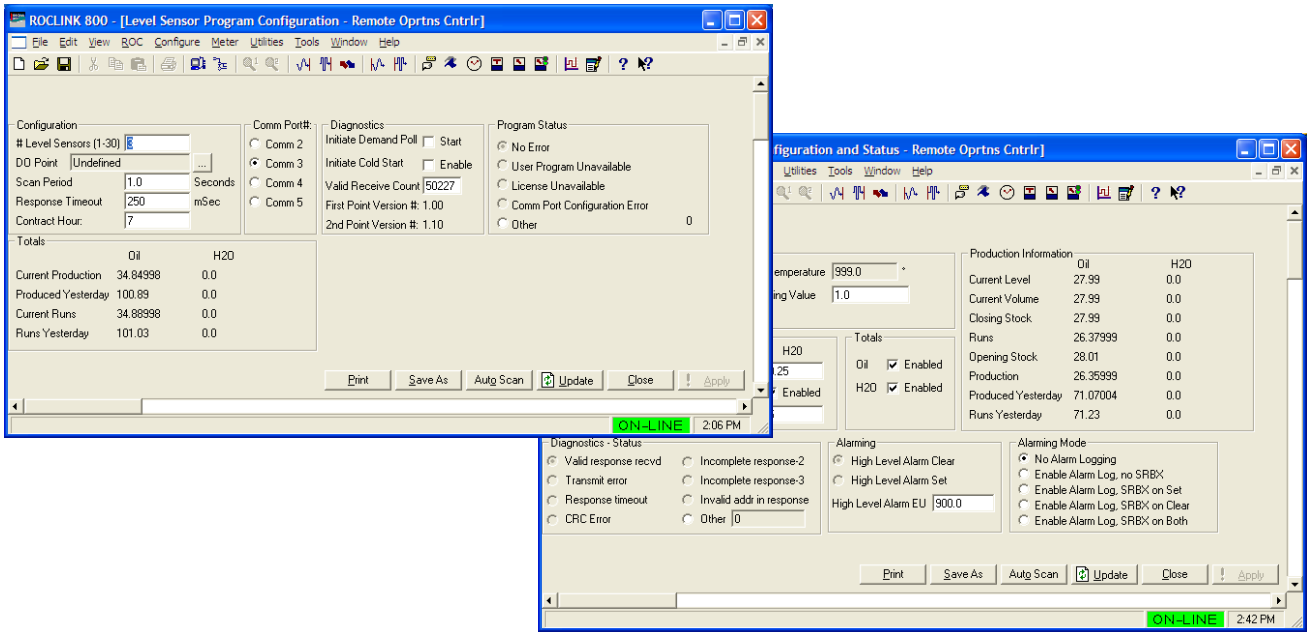
July 2010

Digital Level Sensor Program (for ROC800-Series) User Manual



Remote Automation Solutions

EMERSON. Process Management

Revision Tracking Sheet

July 2010

This manual may be revised periodically to incorporate new or updated information. The revision date of each page appears at the bottom of the page opposite the page number. A change in revision date to any page also changes the date of the manual that appears on the front cover. Listed below is the revision date of each page (if applicable):

Page	Revision
All Pages	Jul-10
All Pages	Jun-05
All Pages	Jul-03
Initial release	Apr-03

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Chapter 1 – Introduction

This chapter describes the structure of this manual and presents an overview of the Digital Level Sensor user program for the ROC800-Series Remote Operations Controller.

1.1 Scope and Organization

This document serves as the user manual for the Digital Level Sensor user program, which is intended for use in a ROC800-Series Remote Operations Controller (ROC800). This manual describes how to install and configure the Digital Level Sensor user program (referred to as the "DLS program" or "the program" throughout the rest of this manual). You access and configure this program using ROCLINK™ 800 Configuration Software loaded on a personal computer running Windows® 2000 (with Service Pack 2), Windows XP, or Windows Vista®.

The sections in this manual provide information in a sequence appropriate for first-time users. Once you become familiar with the procedures and the software, the manual becomes a reference tool.

This manual has the following major sections:

- *Chapter 1 – Introduction*
- *Chapter 2 – Installation*
- *Chapter 3 – Configuration*
- *Chapter 4 – Reference*

This manual assumes that you are familiar with the ROC800 and its configuration. For more information, refer to the following manuals:

- *ROC809 Remote Operations Controller Instruction Manual (Form A6116).*
- *ROC827 Remote Operations Controller Instruction Manual (Form A6175).*
- *ROCLINK 800 Configuration Software User Manual (Form A6121).*

1.2 Product Overview

The DLS program enables the ROC800 to communicate directly with up to 30 level sensors (reporting on oil or water or both) on the same EIA-232 (RS-232) or EIA-485 (RS-485) communications port. The program supports the Advanced Telemetrics digital tank gauges or any other level sensor using the protocol described in the Advanced Telemetrics document *Tank Gauge Commands – Model ATL-TGM1000C*. The program polls the level sensor for data at a user-configured interval, validates the retrieved data, and updates the appropriate production totals using that data.

The program polls each sensor and requests current tank levels and fluid temperatures. As each sensor responds, the program compares the current tank level value against that sensor's last good level value.

If the sensor reports a difference (representing a drop in the level), the program multiplies that difference by a conversion factor ("strapping value") you define, reflects that change in the accumulated runs, and calculates and updates the closing stock value. For this program, the drop in level value represents a load. The program also determines production values (representing an increase in the level) using the following calculations:

Closing Stock = (Current Tank Level) X (Conversion Factor)

Production = (Closing stock) + (Accumulated runs) – (Opening stock)

At the contract hour (user-defined in the program), the program:

- Copies the total production values for all tanks to yesterday's total production and initializes total production.
- Copies the closing stock values to the opening stock values and initializes the accumulated runs and production.

This program has been tested to work with the Rosemount™ 3300 series level sensor using Levelmaster (also known as "Siemens" or "Tank" protocol) communication. For more information see the *Rosemount 3300 Series with HART to Modbus Converter,* Manual Supplement 00809-0300-4811.

1.2.1 Wave Smoothing

The program uses an algorithm to limit the detection of "waves," or false changes in fluid level. You use the Level Sensor Data screen (see *Section 3.3*) to configure the wave smoothing parameters, which include:

- Maximum wave limit (distance in inches above or below the last valid reading).
- Scan periods (the number of times the program reads the level to validate the wave height).
- Wave timeout (the number of scans to determine if level variations are due to liquid movement or "sloshing"). This parameter enables you to validate and count level changes that are smaller than the maximum wave limit.

To assist in the calculations, the program also tracks the following values and displays them on the Level Sensor Data screen:

- Current level (the actual measured level).
- Production accumulation (positive changes in level).
- Load accumulation (negative changes in level).
- Change (sensor level minus production or load level).

Once each scan period, the program reads the sensors and performs wave smoothing calculations. You can configure maximum wave limits (typically 1 inch) and specify the number of scan periods (typically one per second) until the program considers a wave a valid reading for oil or water.

When the program first reads the sensor, the program stores that value as the production or load level. When the next sensor reading occurs, the program compares the stored production level value to the actual reading and, depending on the amount of change, performs one of three actions:

No Change	If the difference between one reading and the next is **less than or equal to the maximum wave limit value**, the program retains the current value for the specified number of scan periods until wave timeout value expires. At that time the level becomes the production or load level and the program adjusts the accumulators accordingly.
Positive Change	If the difference between one reading and the next is **positive and greater than the maximum wave limit value**, the program adds the change to the production accumulator and the new level becomes the production or load level. The program continues to add positive changes to the production accumulator until there are no more changes outside of the maximum wave limit and the wave timeout value expires. At that time the level becomes the production or load level.
Negative Change	If the difference between one reading and the next is **negative and greater than the maximum wave limit value**, the program adds the change to the load accumulator and continues adding subsequent values to the load accumulator as long as the level continues to drop and the wave timeout value has not expired.

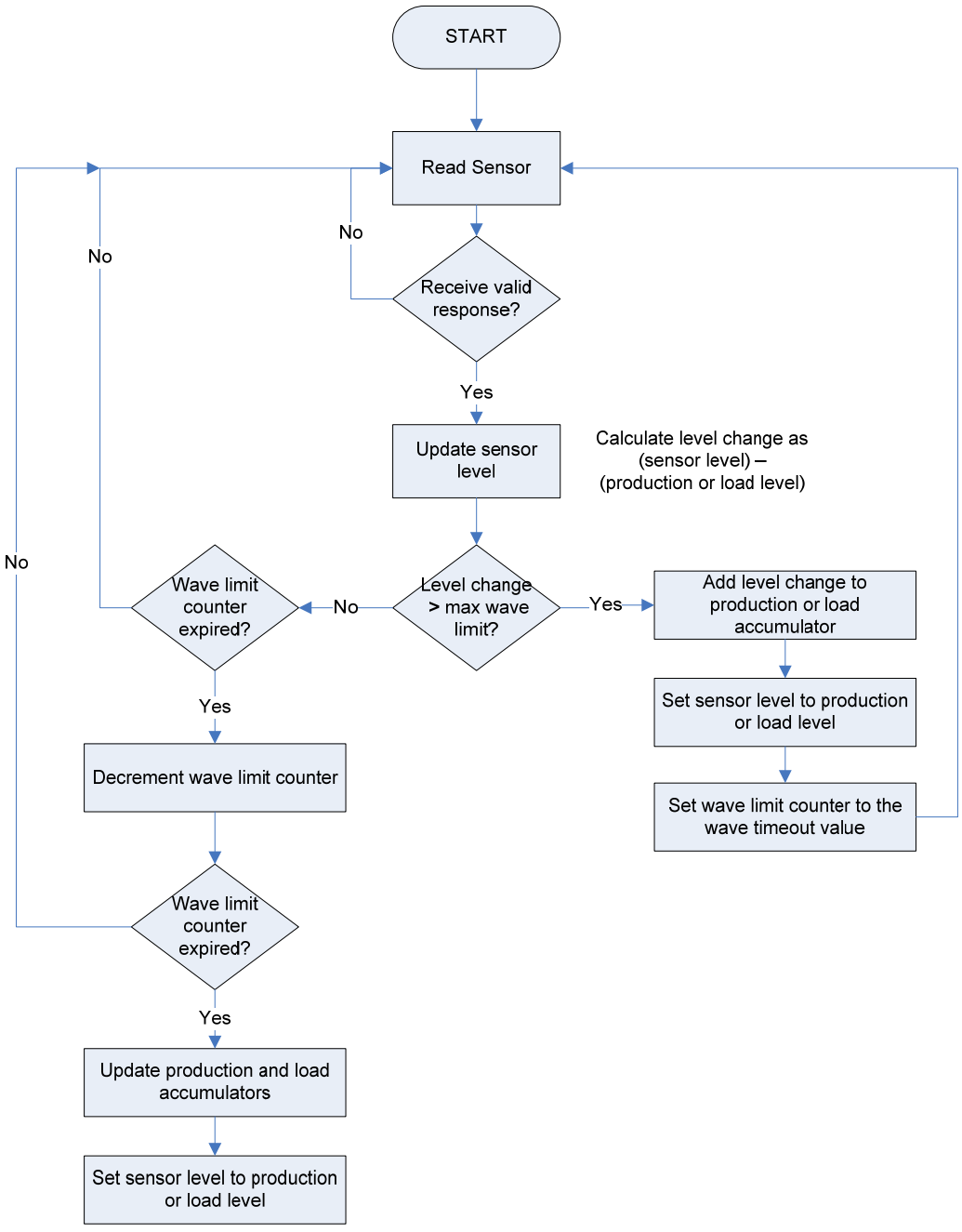

Figure 1. Wave Smoothing Flow Chart

1.2.2 Communications

The ROC800 can communicate with the level sensors using the following methods:

- The EIA-232 (RS232) serial communications port on the CPU for distances up to 15 meters (50 feet). This port is designated Comm2.
- An optional EIA-232 serial communications module, for distances up to 15 meters (50 feet), can be installed in module slots 1–3. These ports are designated Comm3, Comm4, or Comm5, depending on the module slot location.
- An optional EIA-485 (RS485) serial communications module, for distances of up to 605 meters (2000 feet), can be installed in module slots 1–3. These ports are designated Comm3, Comm4, or Comm5, depending on the module slot location. EIA-485 (RS-485) communications supports multiple field devices (multi-drop) and use two conductors (A, B).

1.2.3 Module Wiring

Connect the sensor(s) to the communications port on the module using between 16 and 24 AWG wiring. *Figure 2* shows example wiring between the module and several sensors.

Note: Level sensors can be either externally powered or obtain power through the sensor wiring itself.

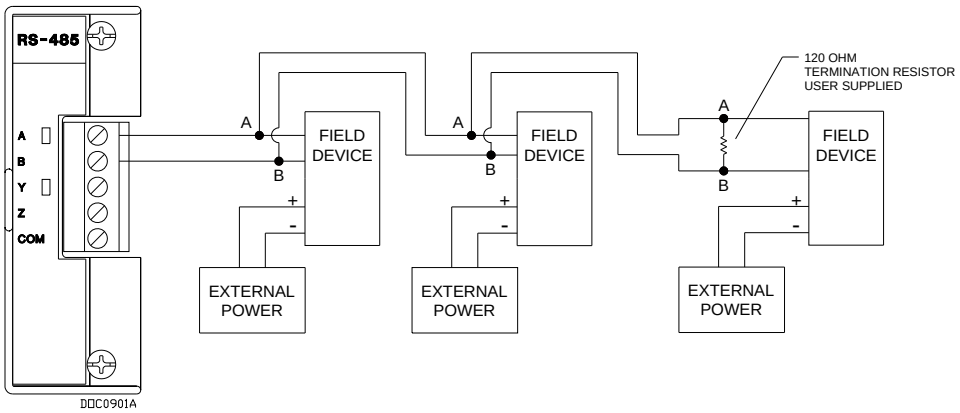

Figure 2. Module Wiring

DO Points	You can specify a DO point controlled by the program. This discrete output enables you to power on a level sensor before it is polled and then power it off after polling. This is typically a DO status point (102,x,8). To accomplish this, you need to connect to a DOR module on the ROC800 or supply your own relay.

1.3 Program Requirements

The DLS program is compatible with version 3.10 (or greater) of the ROC800 Series 2 firmware, version 2.16 (or greater) of the ROC800 Series 1 firmware, and with version 1.87 (or greater) of the ROCLINK 800 software. The software requires you to install a hardware based License Key.

Program specifics include:

File Name	Target Unit/ Version	User Defined Point (UDP)	Flash Used (in bytes)	SRAM Used (in bytes)	DRAM Used (in bytes)	ROCLINK 800 Version	Display Number
LevelSensorIF.tar	ROC800 Series 2 3.10 ROC800 Series 1 2.16	63, 64	35976	3912	86016	1.87	7, 8

Note: You must connect a PC to the ROC800's LOI or Ethernet port **before** starting the download.

For information on viewing the memory allocation of user programs, refer to *Section 7.7* of the *ROCLINK 800 Configuration Software User Manual* (Form A6121).

1.3.1 License Keys

License keys, when matched with valid license codes, grant access to applications such as DLS program.

The term "license key" refers to the physical piece of hardware that can contain up to seven different licenses (refer to *Figure 3*). Each ROC800 can have none, one, or two license keys installed. If you remove a license key after enabling an application, the firmware disables the task from running. This prevents unauthorized execution of protected applications in a ROC800.

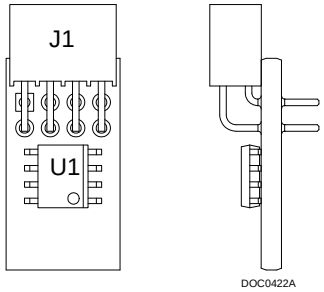

Figure 3. License Key

Note: You must install the Level Sensor I/F license key to use the DLS program.

Chapter 2 – Installation

This chapter provides instructions for installing the DLS program. Read *Section 1.3* of this manual for program requirements.

2.1 Installing the License Key

If you order the DLS program for a new ROC800, your ROC800 is delivered with the license key installed. Go to *Section 2.2.* If you order the program for an existing ROC800, you must install the license key yourself.

Caution

Failure to exercise proper electrostatic discharge precautions, such as wearing a grounded wrist strap may reset the processor or damage electronic components, resulting in interrupted operations.

When working on units located in a hazardous area (where explosive gases may be present), make sure the area is in a non-hazardous state before performing these procedures. Performing these procedures in a hazardous area could result in personal injury or property damage.

To install a license key:

1. Remove power from the ROC800.
2. Remove the wire channel cover.
3. Unscrew the screws from the Central Processing Unit (CPU) faceplate.
4. Remove the CPU faceplate.
5. Place the license key in the appropriate terminal slot **(P4** or **P6)** in the CPU.

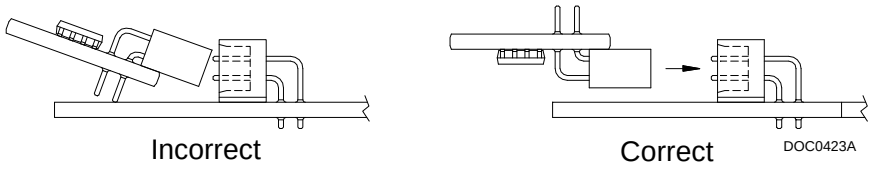

Figure 4. License Key Installation

Note: When using a single license key, install it in **slot P4**.

6. Press the license key into the terminal slot until the key firmly seats (refer to *Figure 4*).
7. Replace the CPU faceplate.
8. Replace the screws on the CPU faceplate.

9. Replace the wire channel cover.
10. Restore power to the ROC800.
11. Proceed to *Section 2.2.1* to verify the license key installation.

2.1.1 Verifying the License Key Installation

After you install the license key, you can verify whether the ROC800 recognizes the key. From the ROCLINK 800 screen, select **Utilities** > **License Key Administrator**. The License Key Administrator screen displays:

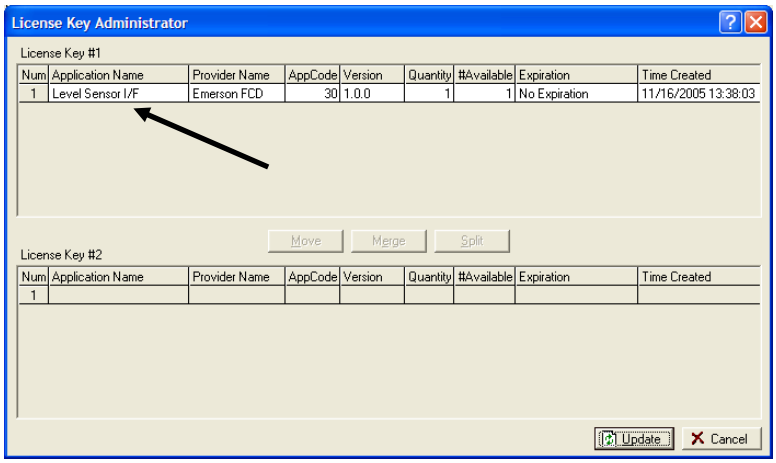

Figure 5. License Key Administrator

Level Sensor I/F appears in the Application Name column. (For further information on the License Key Administrator screen, refer to the *ROCLINK 800 Configuration Software User Manual*, Form A6121.)

After you verify that the license key is correctly installed and recognized, proceed to *Section 2.3*.

2.2 Downloading the LevelSensorIF.tar Program

This section provides instructions for installing the LevelSensorIF.tar program file into the Flash memory on the ROC800.

To download the program using ROCLINK 800 software:

1. Connect the ROC to your computer using the LOI port.
2. Start and logon to ROCLINK 800.
3. Select **Utilities** > **User Program Administrator** from the ROCLINK menu bar. The User Program Administrator screen displays (see *Figure 6*):

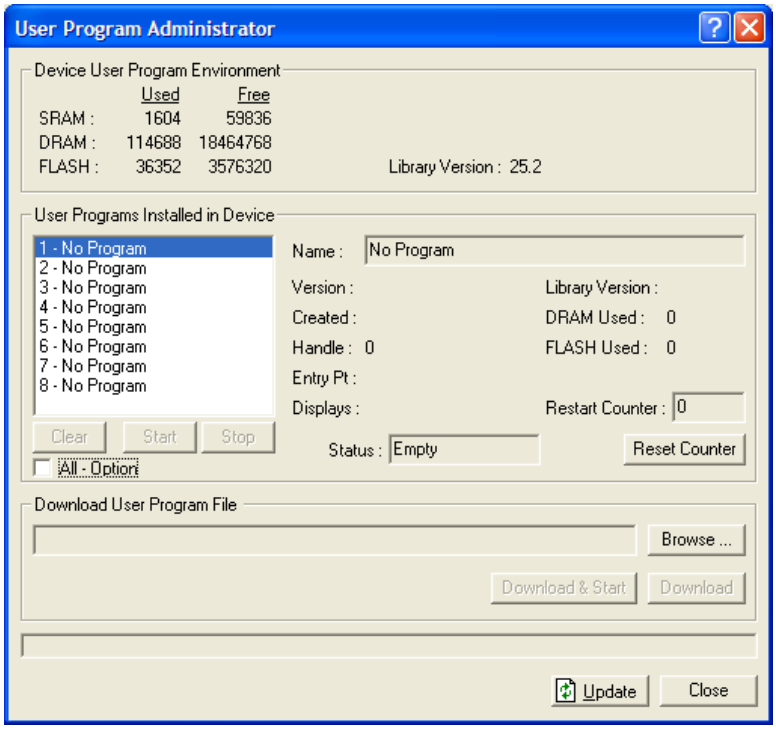

Figure 6. User Program Administrator

4. Select any empty program number (in this case, number 1) into which to download the program.
5. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 7*).
6. Select the path and user program file to download from the CD-ROM. (Program files are typically located in the Program Files folder on the CD-ROM.) As *Figure 7* shows, the screen lists all valid user program files with the .TAR extension:

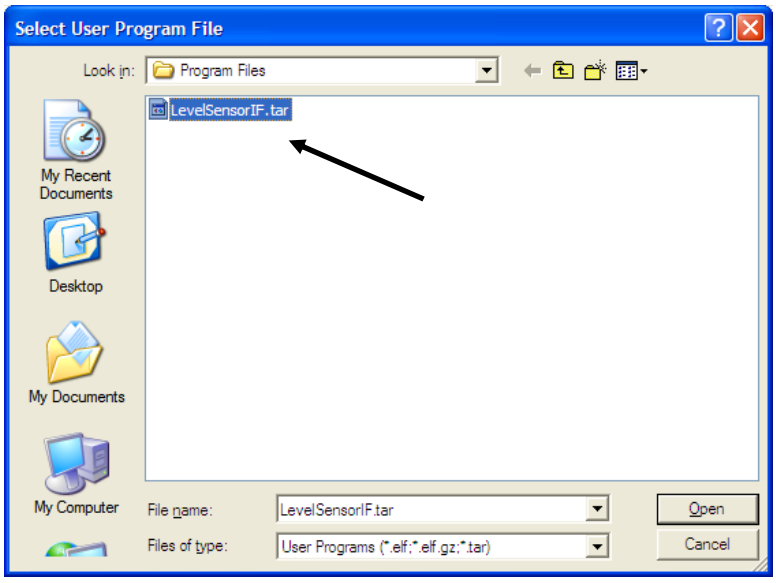

Figure 7. Select User Program File

7. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 8*, note that the Download User Program File frame identifies the selected program and that the **Download** button is active:

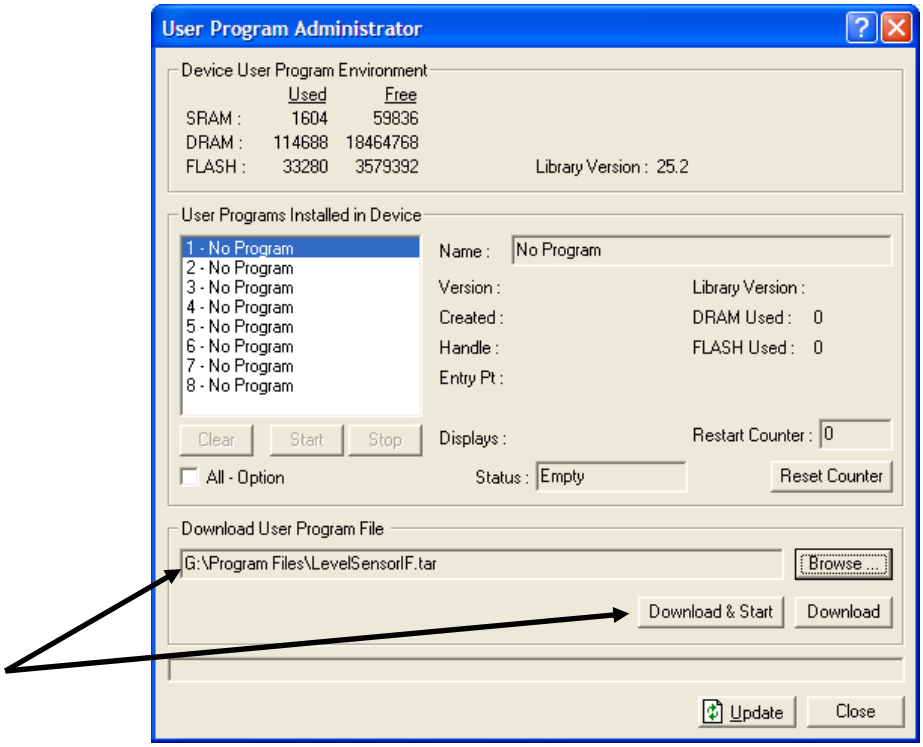

Figure 8. User Program Administrator

8. Click **Download & Start** to begin loading the selected program. The following message displays:

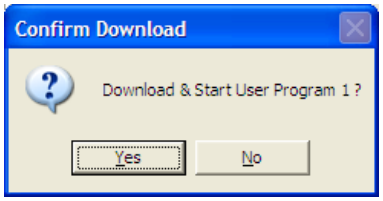

Figure 9. Confirm Download

9. Click **Yes** to begin the download. When the download completes, the following message displays:

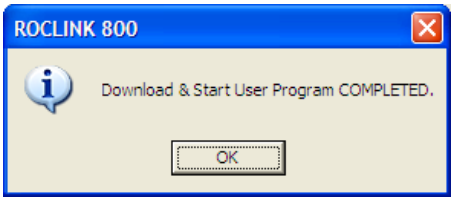

Figure 10. ROCLINK 800 Download Confirmation

10. Click **OK**. The User Program Administrator screen displays (see *Figure 11*). Note that:

- The Device User Program Environment frame reflects the use of system memory.
- The User Programs Installed in Device frame identifies the installed program(s).
- The Status field indicates that the program is running.

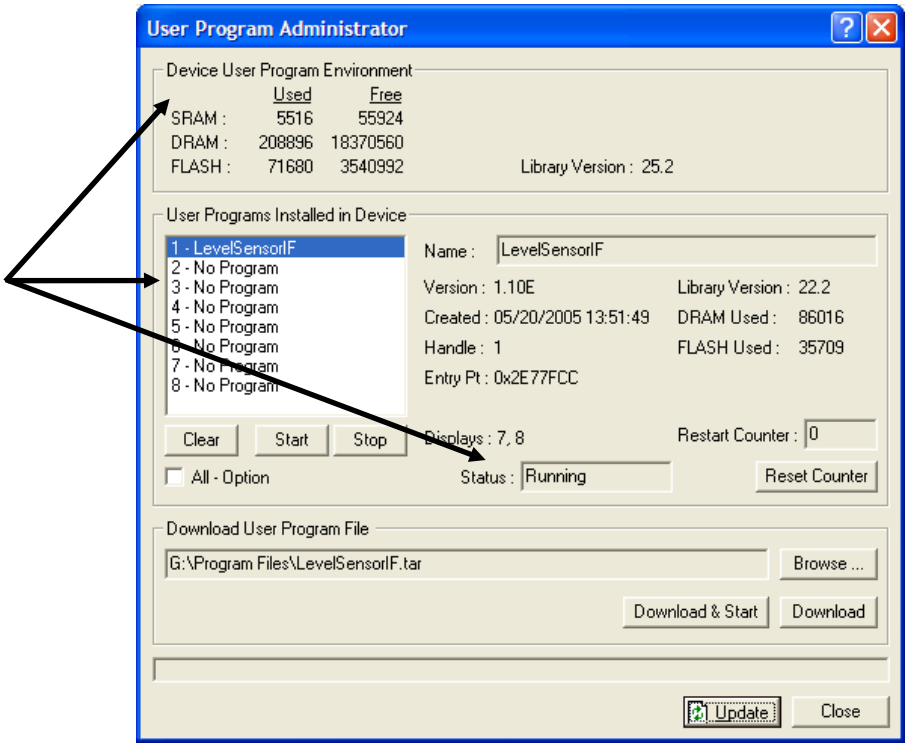

Figure 11. User Program Administrator

11. Click **Close** and proceed to *Section 3* to configure the DLS program.

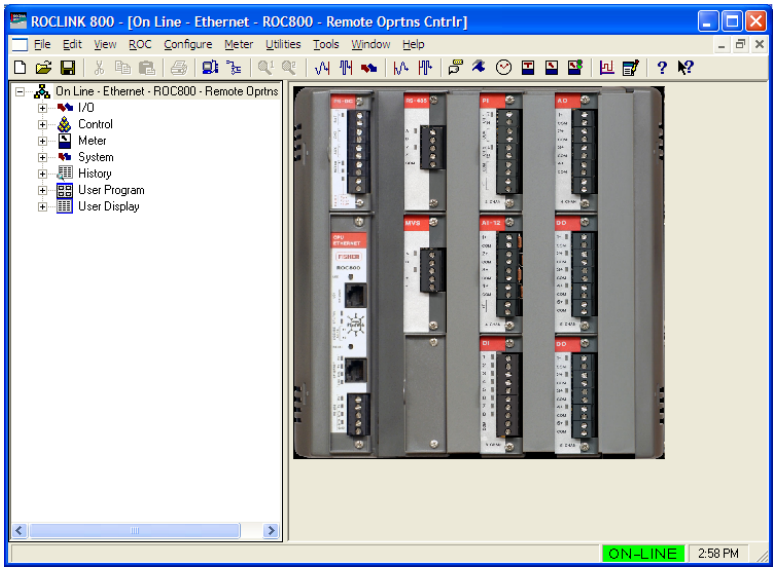

Figure 12. ROCLINK 800

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Chapter 3 – Configuration

After you have successfully downloaded and started the DLS program in the ROC800, you configure the program using one standard ROCLINK 800 screen and two program-specific screens (Level Sensor Program Configuration and Level Sensors-Configuration and Status):

- Use the Comm Port screen to configure the ROC800 communications port used by the program.
- Use the Level Sensor Program Configuration screen to define the number of sensors; assign a DO point to the user program; and set scan, polling, and communication parameters.
- Use the Level Sensor- Configuration and Status screen to set sensor-specific parameters such as labels, alarms, and wave smoothing values. This screen also displays production information and polling status.

You must configure the program **before** you can establish communications with the level sensors. To configure the program (after logging onto ROCLINK 800 and successfully installing the program), proceed through the screens as shown in this chapter.

You can access all the program-specific screens from the main ROCLINK 800 screen:

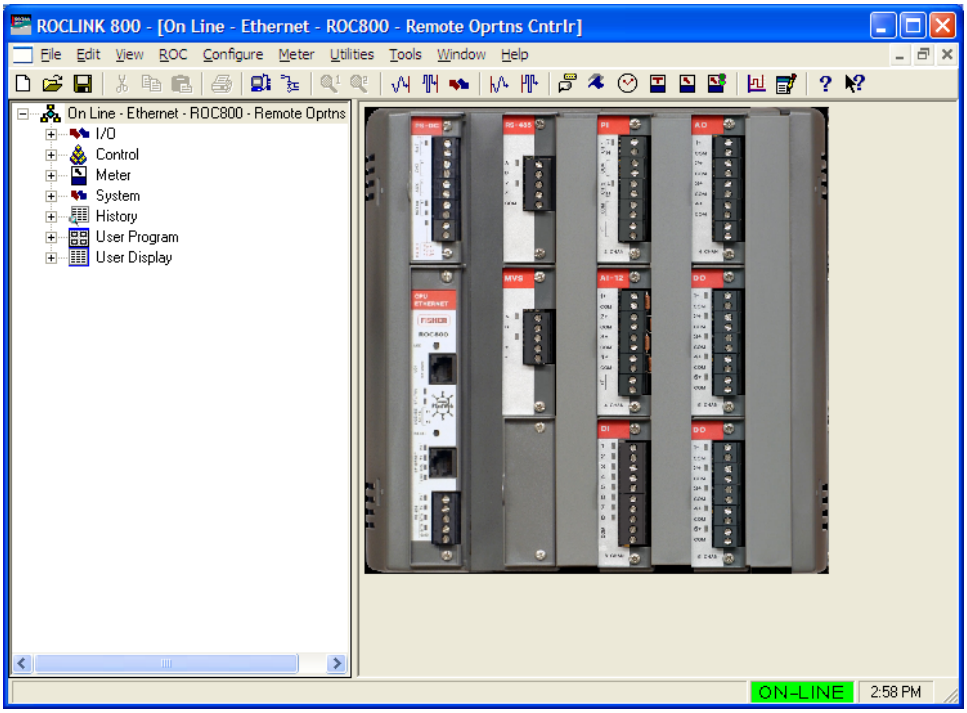

Figure 13. ROCLINK 800

3.1 Communication Ports

Use this screen to configure the ROC800 communication port used by the program to communicate with the level sensors.

Note: The data link between the ROC and the level sensor is typically an EIA-232 (RS-232) or EIA-485 (RS-485) serial link operating at up to 9600 bps baud rate. Each character sent is composed of a START bit, 8/7 DATA bits, and one/two STOP bits with EVEN/ODD/NO parity. Each individual level sensor unit must be addressed correctly.

To access this screen:

1. From the main ROCLINK 800 screen, select **ROC > Comm Ports**. The Comm Port screen displays:

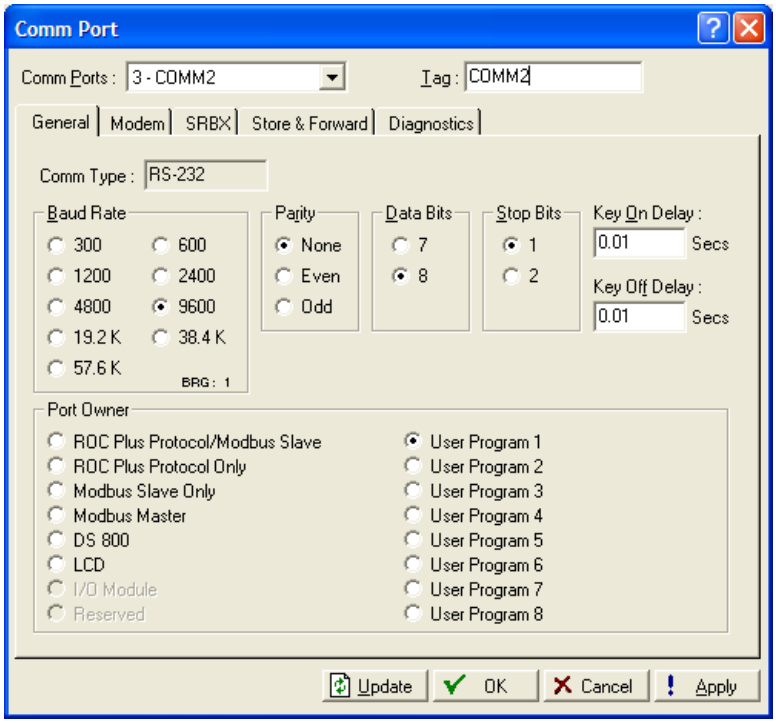

Figure 14. Comm Port

2. Select the communication port the program uses to communicate with the level sensors from the Comm Ports drop-down box (shown here as 3-COMM2).
3. Select the baud rate used by the selected communication port from the Baud Rate frame (shown here as 9600).
4. Click **Apply** to save any changes you have made to this screen.
5. Click **Close** to return to the ROCLINK 800 screen. Proceed to *Section 3.2* to configure the Level Sensor Configuration screen.

3.2 Level Sensor Program Configuration Screen

Use this screen to configure communications with one or more level sensors; associate a digital output point with the program; and enable and set polling, scan, and communications parameters.

Note: Changes made to this screen affect all level sensors handled by the program.

To access this screen:

1. From the Directory Tree, select **User Program > Program #1, LevelSensorIF**.
2. Double-click **Display #7, Level Sensor Program Configuration**. The Level Sensor Program Configuration screen displays:

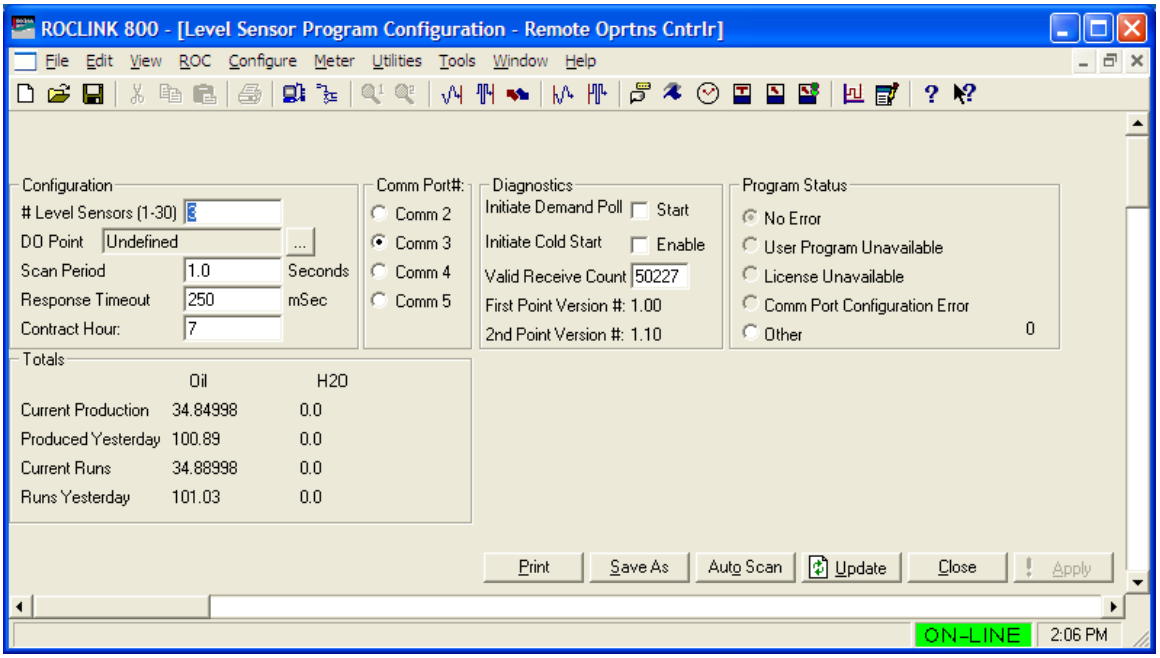

Figure 15. Level Sensor Program Configuration

3. Review the values in the following fields:

Field	Description
# Level Sensors	Sets the maximum number of level sensors. Valid values are **1** to **30**. The default is **1**.
DO Point	Sets the digital output TLP associated with the module for power control. Enter either a specific TLP or click ... to display the Select TLP screen and use it to define the TLP. To save power, you can use this field to specify a DO point the program controls, turning sensors on before they are polled and turning them off after polling completes.

Field	Description
Scan Period	Sets, in seconds, how often the program scans the sensors for level information. Valid values are **1** to **9999999**. The default is **1.0** second.
Response Timeout	Sets, in seconds, how long the program waits for a response from a level sensor before timing out the connection. Valid values are **0** to **65535**. The default is **1** second.
Contract Hour	Sets the hour (in a 24-hour clock format) at which the program moves production and load totals from current to yesterday's totals. Valid values are **0** (midnight) to **23** (11PM). **Note**: At startup, this value defaults to the contract hour defined in the ROC800. You can reset this value specifically for this program.
Comm Port#	Sets the communication port used by the program to communicate with the level sensors. Valid options are Comm 2, Comm 3, Comm 4, and Comm 5.
Initiate Demand Poll	Select this checkbox to start a poll of all sensors, regardless of the value in the Scan Period field. The program clears this checkbox after it completes polling, calculates levels, and includes those values in the current levels. **Note**: The program ignores the Wave Limit and Wave Limit Counts when you issue an on-demand poll.
Initiate Cold Start	Select this checkbox to enable the system to perform a cold start and reset the total values on this display.
Valid Receive Count	This **read-only** field shows how many valid messages have been received by the ROC800 from any of the sensors.
First Point Version #	This **read-only** field shows the revision level of the first user-defined point types used by the program.
2nd Point Version #	This **read-only** field shows the revision level of the second user-defined point types used by the program.
Program Status	This **read-only** field shows the operational condition of the program. Valid values are No Error, User Program Unavailable, License Unavailable, Comm Port Configuration Error, and Other.
Current Production	This **read-only** field shows, for oil and H_2O, the sum production for all configured level sensors for the current day.

Field	Description
Produced Yesterday	This **read-only** field shows, for oil and H_2O, the sum production for all configured level sensors for the previous day.
Current Runs	This **read-only** field shows, for oil and H_2O, the sum of all runs for all configured level sensors for the current day.
Runs Yesterday	This **read-only** field shows, for oil and H_2O, the sum of all runs for all configured level sensors for the previous day.

4. Click **Apply** to save any changes you have made to this screen.
5. Click **Close** to return to the ROCLINK 800 screen. Proceed to *Section 3.3* to define sensor data for each sensor.

3.3 Level Sensors – Configuration and Status Screen

Use this screen to set sensor-specific parameters such as labels, alarms, and wave smoothing values. This screen also displays production information and polling status. The program provides one iteration of this screen for up to 30 defined sensors. You can move between sensor data displays using the Point Number drop-down box on this screen.

Note: Changes made to this screen affect only the sensor selected in the Point Number drop-down box.

To access this screen:

1. From the Directory Tree, select **User Program** > **Program #1, LevelSensorIF**.
2. Double-click **Display #8, Level Sensors – Configuration and Status**.
3. Double-click **#1, Sensor 1**. The Level Sensors – Configuration and Status screen displays:

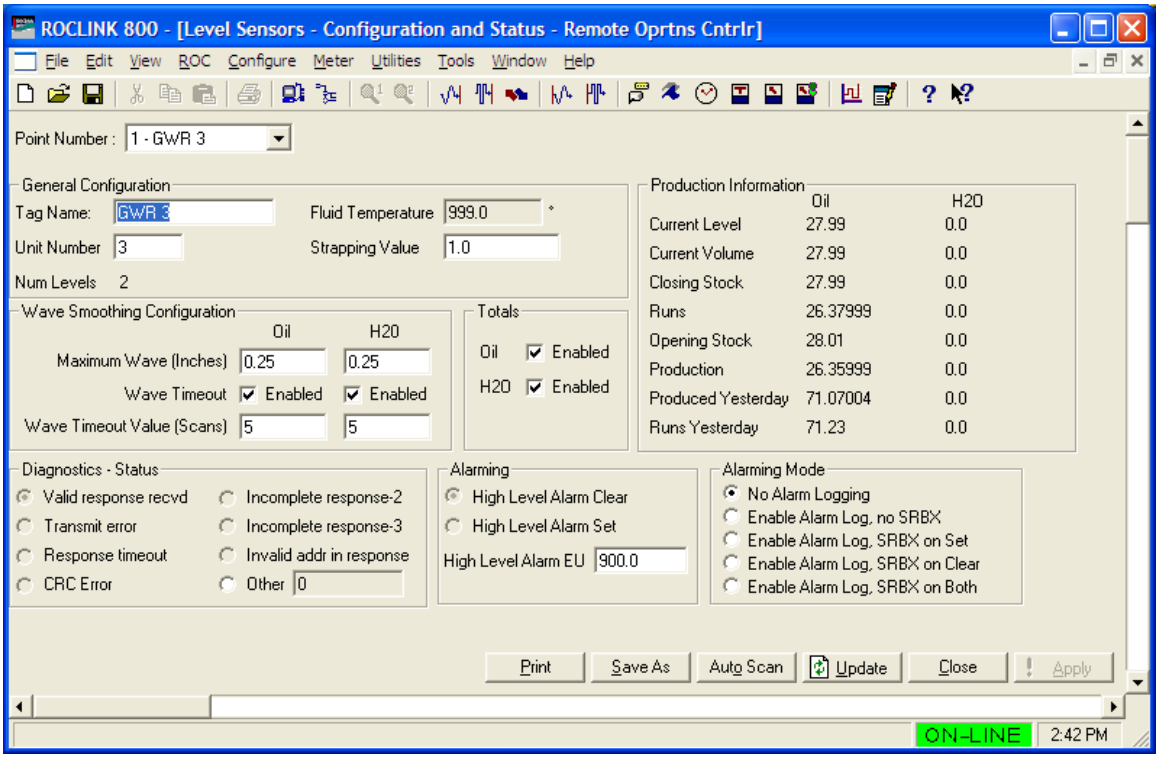

Figure 16. Level Sensors – Configuration and Status

4. Review—and change as necessary—the values in the following fields:

Field	Description	
Point Number	Identifies the sensor number (up to 30) for this screen. Click ▼ to display all defined sensors.	
General Configuration	Sets general information for the selected sensor.	
	Tag Name	Sets a 10-character label for the selected sensor. The default is **Sensor X (**where **X** is a number between 1 and 30).
	Unit Number	Identifies the unit number of the tank associated with this sensor.
	Num Levels	This **read-only** field shows the number of levels the sensor reports. Typically, this is two: oil and water.
	Fluid Temperature	This **read-only** field shows, in degrees Fahrenheit, the current temperature of the fluid in the tank.

Field	Description	
General Configuration (continued)	**Strapping Value**	Sets the conversion factor the program uses to convert linear measurement to volume. The program multiplies the level value by this strapping value to determine the volume of the fluid.
Wave Smoothing Configuration	Sets parameters that average (or smooth) variations (waves) in fluid (both oil and water) levels.	
	Maximum Wave	Sets, in inches, a maximum wave height for smoothing. The program ignores level changes less than or equal to this value, attributing them to sloshing in the tank and ignoring them when determining production or accumulated values. Changes in height in excess of this value trigger an alarm.
	Wave Timeout	Enables the program, if selected, to process the current oil or water levels after completing the number of polls specified in the Wave Timeout Value field, even if the level change has not exceeded the wave limit for either oil or water.
	Wave Timeout Value	Sets the number of polls the program must complete before calculating oil or water levels.
Totals	These fields, if selected, enable the program to calculate the total production and run values for oil and/or water and display those values on the Level Sensor Configuration screen.	
Production Information	These **read-only** fields show the current production totals for both oil and water and include:	

Field	Description	
Production Information (continued)	**Current Level**	For oil, this **read-only** field shows the value representing the level of the top float in inches. This value represents the location of the float, but does not represent the true oil level because it does not compensate for the body of H2O below. The actual or corrected oil level is equivalent to the current oil level minus the current H2O level. The delta (change in) oil level is determined by taking the difference between the current corrected oil level and the previous corrected oil level. For water (H2O), this **read-only** field shows the value representing the level of the bottom float in inches. Note that delta (change in) H2O level is equivalent to the difference between the current H2O level and the previous good H2O level.
	Current Volume	This **read-only** field shows the current level of the oil or H2O multiplied by the Tank Strapping Value factor.
	Closing Stock	This **read-only** field shows the Corrected Oil Level or Current H2O Level multiplied by the Tank Strapping Value.
	Runs	This **read-only** field shows summation of any volume losses between scans. A volume loss occurs when the delta (change in) Oil Level or delta (change in) H2O Level is negative, indicating that the level has dropped and oil and/or H2O is being extracted.
	Opening Stock	This **read-only** field shows the volume at contract hour (the Oil Current Level or H2O Current Level at contract hour multiplied by the Tank Strapping Value).
	Production	This **read-only** field shows the Oil or H2O Closing Stock plus Oil or H2O Runs minus Oil or H2O Opening Stock.

Field	Description	
Production Information (continued)	**Produced Yesterday**	This **read-only** field shows the total Oil and/or H2O production for this point yesterday.
	Runs Yesterday	This **read-only** field shows the total oil and/or H2O runs for this tank point yesterday.
Diagnostics – Status	These **read-only** fields show the status of sensor communications. Valid values are:	
	Valid response recvd	No alarms are present.
	Transmit error	An error occurred when the level sensor was transmitting information to the ROC800.
	Response timeout	The level sensor did not respond within the user-defined time period.
	CRC Error	The CRC (Cyclic Redundancy Check) from the level sensor does not match the value calculated by the program.
	Incomplete response-2	The last received response did not include an expected element, such as the temperature or CRC.
	Incomplete response-3	The last received response did not include all the expected level values.
	Invalid addr in response	The address returned does not match the unit that was polled for.
	Other	An unknown error has occurred.
Alarming	These fields indicate the current alarm status and allow you to set the tank level above which alarming occurs.	
	High Level Alarm Clear	This **read-only** field indicates that the high level alarm is currently inactive. **Note**: Alarms occur **only** on oil levels.
	High Level Alarm Set	This read-only field indicates that the high level alarm is currently active. **Note**: Alarms occur **only** on oil levels.

Field	Description	
Alarming (continued)	**High Level Alarm EU**	Sets the tank level, in engineering units (EUs), above which the high level alarm occurs. The default is **900**.
Alarming Mode	Sets how the program logs alarms with Spontaneous Report by Exception (SRBX) notification. Click ▼ to select a mode (described below). **Note**: The system generates one alarm, regardless of the number of different errors that may occur in the time before the alarm clears. SRBX notification occurs based on the Alarm Logging Mode. For the system to generate an alarm (such as for a Poll Sequence Failure error), you must first enable the Alarm Logging Mode parameter on the current logical stream.	
	No Alarm Logging	No logging occurs.
	Enable Alarm Log, no SRBX	Logging occurs, but without generating SRBX notifications.
	Enable Log, SBRX on Set	Logging occurs, and SRBX notifications occur on alarm set.
	Enable Log, SRBX on Clear	Logging occurs, and SRBX notifications occur on alarm clear.
	Enable Log, SRBX on Both	Logging occurs, and SRBX notifications occur on both alarm set and alarm clear.
Production Information	These **read-only** fields show the current production totals for both oil and water.	

5. Click **Apply** to save your changes.
6. Click **Close** to return to the ROCLINK 800 screen. Proceed to *Section 3.4* to save your configuration.

3.4 Saving the Configuration

Whenever you modify or change the configuration, it is a good practice to save the final configuration to memory. To save the configuration:

1. Select **ROC** > **Flags**. The Flags screen displays:

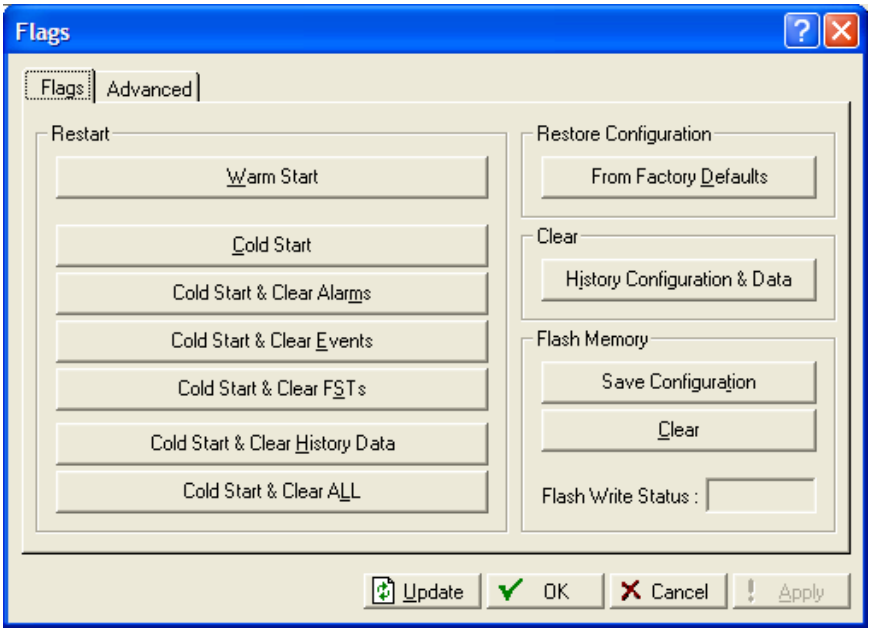

Figure 17. Flags screen

2. Click **Save Configuration**. A verification message displays:

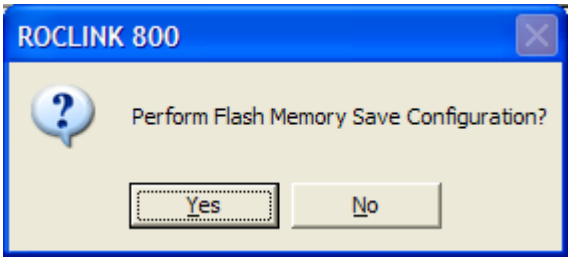

Figure 18. Perform screen

3. Click **Yes** to begin the save process. The Flash Write Status field on the Flags screen displays *In Progress*. When the process ends, the Flash Write Status field on the Flags screen displays *Completed*.

4. Click **Update** on the Flags screen. This completes the process of saving your new configuration.

Note: For archive purposes, you should also save this configuration to your PC's hard drive or a removable media (such as a diskette or a flash drive) using the **File > Save Configuration** option on the ROCLINK 800 menu bar.

Chapter 4 – Reference Materials

This section provides tables of information on the point types the DLS program uses.

- Point Type 63 (Digital Level Sensor Program Configuration)
- Point Type 64 (Tank Gauge Parameters)

4.1 Point Type 63: Digital Level Sensor Program Configuration

Point type 63 contains the parameters for configuring the Digital Level Sensor program and houses the status information from the sensors. The program maintains one logical point of this point type.

Point Type 63: Digital Level Sensor Program Configuration

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
0	Point Tag ID	R/W	User	AC	10	0x20 → 0x7E for each ASCII character	"DLS Config"	1.00	Identification name for the user program. Values must be printable ASCII characters.
1	Point Version Number	R/O	User	AC	12	0x20 → 0x7E for each ASCII character	"1.00"	1.00	Version number of this user defined point. Version number of user defined point must match version of user program for calculation to run.
2	Calculation Status	R/O	User Program	UINT8	1	0 → 3	0	1.00	0 = Program Running 1 = User Program Unavailable 2 = License Unavailable 3 = Comm port configuration error
3	Number of Units	R/W	User	U8	1	0→30	1	1.00	Enter the number of level sensors (as many as 30) connected to this ROC. This will determine the number of Tank Parameter points/screens that are used. Note that inactive screens are still displayed, but they have no effect.
4	Comm Port Number	R/W	User	U8	1	0,2→5	2	1.00	The communications port, on the ROC800, that is to be used for communicating with the devices. The communications port needs to be configured to be used by the User Program number that this has been downloaded to. 2-5: Comm 2-5.

Point Type 63: Digital Level Sensor Program Configuration

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
5	DO Relay Number	R/W	User	TLP	3	{0,0,0} or 102,X,8; where X is any currently installed DO Location	{0,0,0}	1.00	Enter the DO Relay Point on the ROC that you want to use to switch power to the level sensors off between scans. The default is “Undefined”.
6	Poll Mode	R/W	User	U8	1	0→1	0	1.00	A poll of all level sensors is initiated when this is set to 1. The valued is cleared by the program after polling and level calculations have been completed. The configured wave limit and wave count are ignored when demand poll is issued. The current levels are always updated and used in level calculations as a result of a demand poll. 0 = Normal Poll; 1 = Demand Poll.
7	Scan Period	R/W	User	FL	4	Any IEEE Float	1.0	1.00	Enter the time intervals (in seconds) that you want the DO Relay output to be off between scans. For example, 60.0 would be one minute. Note that the time the power is turned on by the DO output is in addition to this Scan Period time. Furthermore, the time on varies depending on the number of sensors defined above and the key-on and key-off delays.
8	Response Timeout	R/W	User	U16	2	0→65535	250	1.00	The number of milliseconds to wait for a response from the level sensor before timing out.

Point Type 63: Digital Level Sensor Program Configuration

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
9	Valid Receive Counter	R/W	User Program	U16	2	0→65535	0	1.00	A counter representing how many valid messages have been received by the ROC800 from any of the sensors. Note: A zero can be written to clear the counter.
10	Current Oil Production	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of current (today's) production values from all configured tank points.
11	Current H2O Production	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of current (today's) production values from all configured tank points.
12	Yesterday's Oil Production	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of yesterday's production from all configured tank points.
13	Yesterday's H2O Production	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of yesterday's production from all configured tank points.
14	Current Oil Runs	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of current (today's) oil runs from all configured tank points.
15	Current H2O Runs	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of current (today's) water runs from all configured tank points.
16	Runs Yesterday – Oil	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of yesterday's oil runs from all configured tank points.
17	Runs Yesterday – H2O	R/O	User Program	FL	4	Any IEEE Float	0.0	1.00	This is the total of yesterday's water runs from all configured tank points.
18	Contract Hour	R/W	User	U8	1	0→23	0	1.00	The contract hour when current production/runs gets copied to yesterday's production/runs.
19	Cold Start	R/W	User	U8	1	0→1	1	1.00	Reset totalization values back to zero.

4.2 Point Type 64: Tank Gauge Parameters

Point type 64 contains the parameters for level sensor data. The program maintains 30 logical points of this point type (where logical 0 is sensor 1, logical 1 is sensor 2, and so on).

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
0	Point Tag Id.	R/W	User	AC	10	0x20 → 0x7E for each ASCII character	"Sensor X" where X is the logical number + 1	1.00	Identification name for the specific Tank. Values must be printable ASCII characters.
1	Point Version Number	R/O	User	AC	12	0x20 → 0x7E for each ASCII character	"1.10"	1.10	Version number of this user defined point. Version number of user defined point must match version of user program for calculation to run.
2	Unit Number	R/W	User	U8	1	0→99	0	1.00	The unit number of the level sensor associated with this tank point.
3	Tank Strapping Value	R/W	User	FL	4	Any Valid IEEE Float	1	1.00	This is a conversion factor to equate linear level measurement to volume. The level is multiplied by the conversion factor to equate to the desired volume.
4	Fluid Temperature	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is the temperature of the fluid in the tank communicated by the level sensor.

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
5	Error	R/O	User Program	U8	1	0,1,2,3,6,7,8	0	1.00	This indicates an error code interpreted as follows (do not make entries in this field): 0 = Valid response received 1 = Response timeout 2 = Incomplete response 3 = Incomplete response 6 = Receive CRC error 7 = Received invalid sensor address in response 8 = Error transmitting to comm port
6	Number of Levels	R/O	User Program	U8	1	0→255	0	1.00	Number of Levels returned from the sensor on startup.
7	Wave Limit – Oil	R/W	User	FL	4	Any Valid IEEE Float	0.25	1.00	Enter the height (in inches) of oil waves to be used as a limit in the wave smoothing calculations (see Section 2.1).
8	Wave Limit - H2O	R/W	User	FL	4	Any Valid IEEE Float	0.25	1.00	Enter the height (in inches) of H20 waves to be used as a limit in the wave smoothing calculations (see Section 2.1).
9	Limit Count - Oil	R/W	User	U8	1	0→255	5	1.00	Enter the number of sensor reads to determine the end of a wave in the wave smoothing calculations (see Section 2.1). The current oil level will be processed when this number of consecutive reads have been completed, even if the change in oil level has not exceeded the oil wave limit. A value of “255” in this field will disable this feature.

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
10	Limit Count - H2O	R/W	User	U8	1	0→255	5	1.00	Enter the number of sensor reads to determine the end of a wave in the wave smoothing calculations (see Section 2.1). The current water level will be processed when this number of consecutive reads have been completed, even if the change in water level has not exceeded the water wave limit. A value of "255" in this field will disable this feature.
11	Current Level – Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is the value representing the level of the top float in inches. This value represents the location of the float but does not represent the true oil level because it does not compensate for the body of water below. Therefore, the actual or Corrected Oil Level is equivalent to the Current Oil Level minus the Current H2O Level. The Delta Oil Level can be determined by taking the difference between the Corrected Oil Level and the past good Corrected Oil Level.
12	Current Level - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is the value representing the level of the bottom float in inches. Note that Delta H2O Level is equivalent to the difference between the Current H2O Level and the past good Current H2O Level.
13	Closing Stock – Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the Corrected Oil Level multiplied by the Tank Strapping Value.

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
14	Closing Stock - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the Current H2O Level multiplied by the Tank Strapping Value.
15	Runs - Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to summation of any volume losses between scans. A volume loss occurs when the Delta Oil Level is negative, indicating that the level has dropped and oil is being extracted.
16	Runs - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to summation of any volume losses between scans. A volume loss occurs when the Delta H2O Level is negative indicating that the level has dropped and H2O is being extracted.
17	Opening Stock - Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the volume at contract hour (the Oil Current Level at contract hour multiplied by the Tank Strapping Value).
18	Opening Stock - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the volume at contract hour (the H2O Current Level at contract hour multiplied by Tank Strapping Value).
19	Production - Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the Oil Closing Stock plus Oil Runs minus Oil Opening Stock.
20	Production - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	This is equivalent to the H2O Closing Stock plus H2O Runs minus the H2O Opening Stock.
21	New Level – Oil	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	Level read from the last valid response to a request.
22	New Level - H2O	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	Level read from the last valid response to a request.

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
23	Wave Counter – Oil	R/O	User Program	U8	2	0→255	0	1.00	Current Number of counts.
24	Wave Counter – H2O	R/O	User Program	U8	2	0→255	0	1.00	Current Number of counts.
25	Enable Oil Totals	R/W	User	U8	1	0→1	1	1.00	1: Enable; 0: Disable totaling. Both the oil and water levels of each tank have an Enable Totals field. Toggling this field allows the user to enable or disable the addition of volume, for the associated level, to tank and site production and run totals. The actual level, opening stock, and closing stock fields will continue to be updated and reflect current conditions.
26	Enable H2O Totals	R/W	User	U8	1	0→1	1	1.00	1: Enable; 0: Disable totaling. Both the oil and water levels of each tank have an Enable Totals field. Toggling this field allows the user to enable or disable the addition of volume, for the associated level, to tank and site production and run totals. The actual level, opening stock, and closing stock fields will continue to be updated and reflect current conditions.
27	Enable cold start	R/W	User	U8	1	0→1	1	1.00	Enable cold start to reset the total values.
28	Yesterday's Oil Production	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	The total oil production for this point yesterday.
29	Yesterday's H2O Production	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	The total H2O production for this point yesterday.
30	Enable Wave Smoothing - Oil	R/W	User	U8	1	0→1	1	1.00	Enable the wave smoothing algorithm for oil.

Point Type 64: Tank Gauge Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
31	Enable Wave Smoothing - H2O	R/W	User	U8	1	0→1	1	1.00	Enable the wave smoothing algorithm for H2O.
32	Yesterday's Oil Runs	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	The total oil runs for this point yesterday.
33	Yesterday's H2O Runs	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.00	The total H2O runs for this point yesterday.
34	Current Oil Volume	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.10	The current volume of the oil (current oil level multiplied with tank strapping value).
35	Current H2O Volume	R/O	User Program	FL	4	Any Valid IEEE Float	0.0	1.10	The current volume of the water (current water level multiplied with tank strapping value).
36	High Level Alarm EU	R/W	User	FL	4	Any Valid IEEE Float	900	1.10	Maximum tank level allowed before alarm condition exists.
37	High Level Alarm Enable	R/W	User	U8	1	0→4	0	1.10	Allow user to log high level alarms. 0 = Disable logging 1 = Enable logging of alarms, No SRBX 2 = Enable logging of alarms, SRBX on Set 3 = Enable logging of alarms, SRBX on Clear 4 = Enable logging of alarms, SRBX on Both
38	High Level Alarm Indicator	R/O	User Program	U8	1	0→1	0	1.10	Indicates if alarm is set or clear. 0 = Alarm Clear 1 = Alarm Set

If you have comments or questions regarding this manual, please direct them to your local sales representative or contact:

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