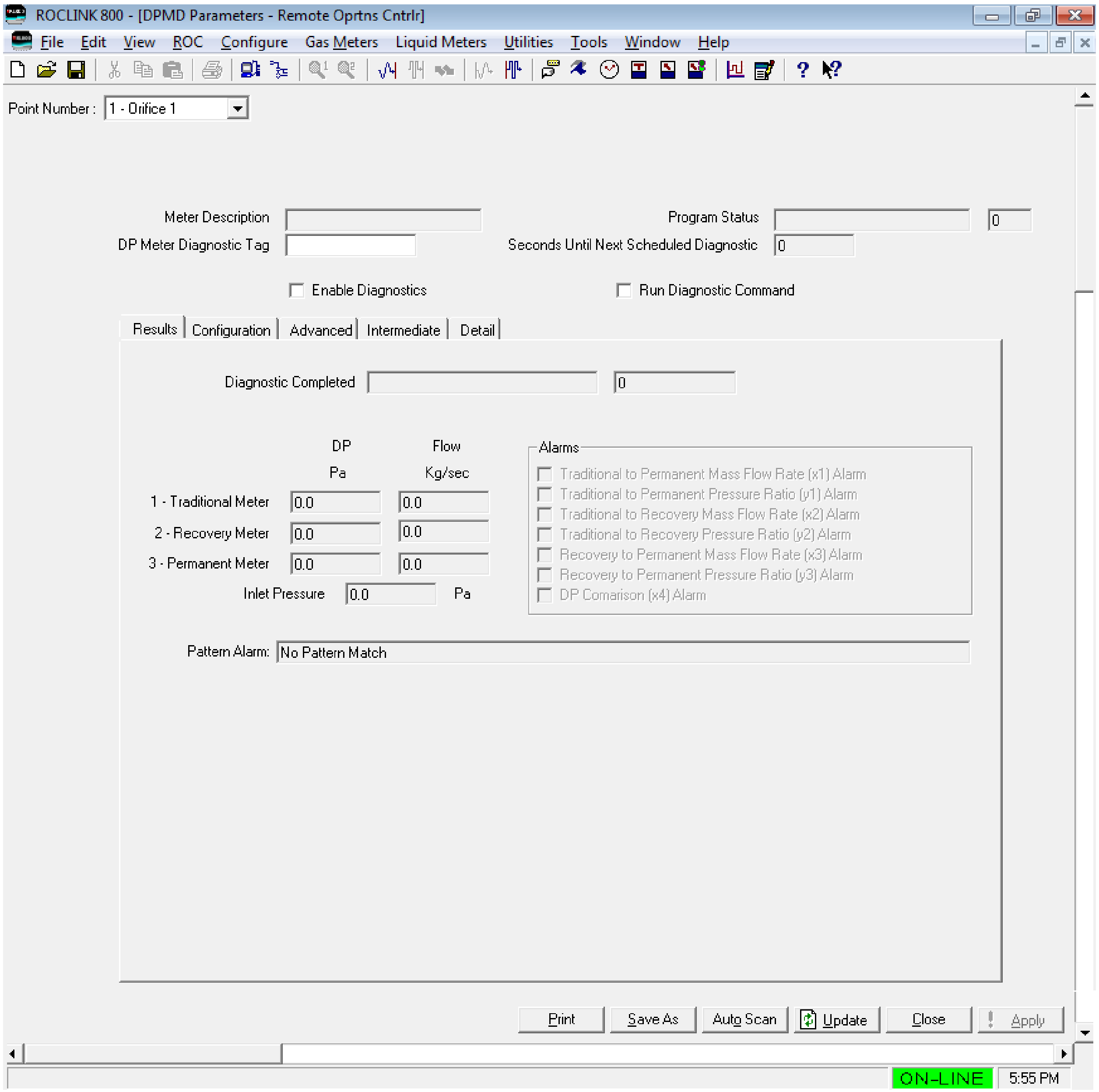
Part Number D301813X012

QER 17Q001

January 2017

DP – Prognosis™ FC User Manual (for ROC800-Series)



Remote Automation Solutions

Revision Tracking Sheet

January 2017

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**
Initial release	January-2017

Contents

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Chapter 1 – Introduction

⚠ Caution **When implementing control using this product, observe best industry practices as suggested by applicable and appropriate environmental, health, and safety organizations. While this product can be used as a safety component in a system, it is NOT intended or designed to be the ONLY safety mechanism in that system.**

This chapter describes the structure of this manual and an overview of the DP – Prognosis™ FC program for the ROC800-Series Remote Operations Controller (ROC800).

1.1 Scope and Organization

This document serves as the user manual for the DP – Prognosis FC program, which is intended for use in the ROC800-Series Remote Operations Controllers (ROC800).

This manual describes how to download and configure this program (referred to as the "DP – Prognosis FC program" or "the program" throughout the rest of this manual). You access and configure this program using ROCLINK™ 800 Configuration Software (version 2.41 or greater) loaded on a personal computer (PC) running Windows® 7 (32 or 64-bit).

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 running in ROC800, 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:

- *ROC800 Remote Operations Controller Instruction Manual* (part D301217X012)
- *ROCLINK 800™ Configuration Software User Manual (for ROC800-Series)* (part D301250X012)

1.2 Product Overview

The DP – Prognosis FC program is used to verify the operation of a differential pressure (DP) meter element and its differential pressure instrumentation. The program is designed to work with Orifice Meters, Venturi meters or Cone meters.

1.2.1 Theory of Operation

A DP meter uses a geometric constriction to produce momentum change in a flow. *Figure 1-1* shows an orifice meter and the associated pressure profile in the pipe.

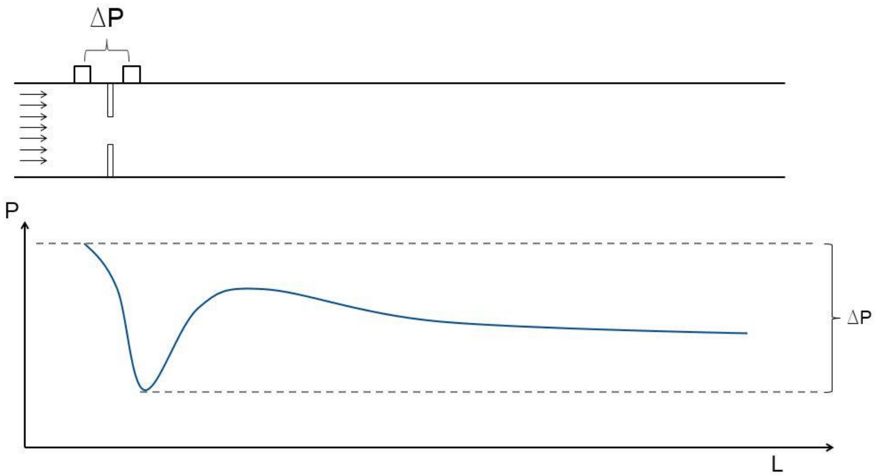

Figure 1-1. Traditional orifice meter pressure profile

Applying mass and energy conservation equations between pipe cross sections upstream and in the vicinity of the constriction produces a flow rate equation dependent on geometry, fluid density and DP.

Traditionally, the differential pressure is measured between a point upstream of the restriction and the point of lowest pressure (vena contracta). Flow calculations are performed using this differential pressure value.

It has been shown that the constriction in a DP meter element actually produces three predictable and repeatable pressure changes in the flow stream. The *Traditional DP* ($\triangle P_t$) – mentioned previously - is measured across the restriction. The *Recovery DP* ($\triangle P_{rec}$) can be measured between the downstream tap and a far downstream tap (~6 diameters downstream for an orifice meter). The *Permanent DP* ($\triangle P_{ppl}$) is measured between the upstream pressure tap and the far downstream tap. *Figure 1-2* shows how these three values can be observed.

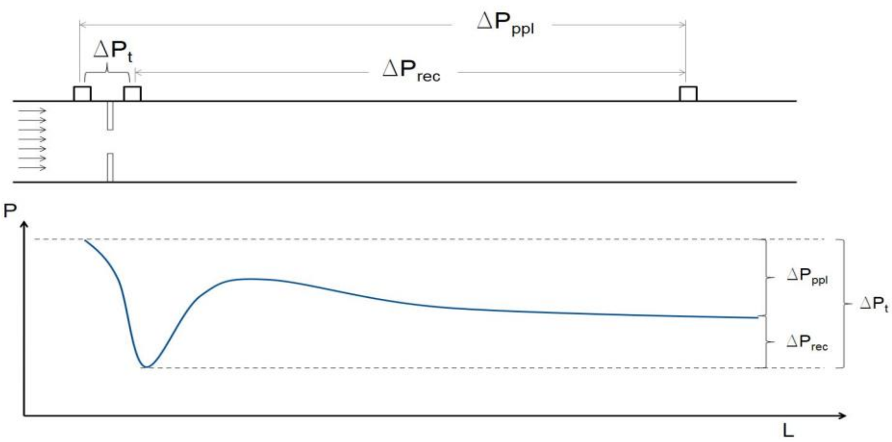

Figure 1-2. Three differential pressures for the DP meter

The DP – Prognosis FC approach involves:

- Measuring all three DPs at the meter element (optionally, two of the DPs can be measured and one can be inferred, but this produces less reliable results).
- Performing flow calculations for all three meters.
- Comparing the flow rates of the three meters – producing three diagnostic values (*diagnostics*).
- Comparing the pressure loss ratios of the three DPs to theoretical values for pressure loss ratios – producing three diagnostic values (*diagnostics*).
- Comparing the numerical values of the three DPs for consistency ($\triangle P_t = \triangle P_{rec} + \triangle P_{ppl}$).

As can be seen, this results in seven different uncertainty parameters – referred to as *diagnostics*. Customarily, the seven diagnostics are each compared to allowable uncertainty setpoints – thereby converting the values to dimensionless form. For instance,

Calculated *traditional* flow rate = 10.100

Calculated *permanent* flow rate = 10.800

Percent Difference = 100 * (10.800 – 10.100) / 10.100 = 6.93%

If the allowable percentage for this difference was configured to 2%, then the dimensionless value of the first diagnostic (x1) would be:

6.93% / 2% = 3.47

In dimensionless form, any value between -1.0 and 1.0 is considered to be indicative of a properly-performing meter.

1.2.2 Practical Application

The DP – Prognosis FC approach can be used to monitor the operation of a DP meter with the intent of identifying uncertainty in the traditional calculated measurement. Using the DP diagnostic approach, the following conditions have been identified in orifice meters:

- Orifice plate installed backwards
- Damaged orifice plate (worn sharp edge, warped plate, dirty plate)
- Obstructed flow in meter tube or through orifice
- Physical plate or meter tube size different from values configured in flow computer
- Plugged or leaking transmitter impulse line
- Transmitter calibration error
- Transmitter calibration drift
- Equalizing valve on instrument manifold leaking
- Wet gas

1.2.3 Operational Benefits

The DP – Prognosis FC operating at a meter installation, the meter can be managed by exception. Routine, scheduled inspection/calibration procedures can be modified such that technicians address known measurement problems immediately when exceptions are noted – rather than waiting until the problem is discovered during the next scheduled inspection. Furthermore, the time of onset of the exception can be precisely identified – assisting in proper correction to flow data.

Common operating mistakes (installing plate backwards, changing plate without changing flow computer configuration) are quickly identified and clarified when DP diagnostics is running in the Flow Computer.

1.3 Program Features

1.3.1 DP – Prognosis FC for up to 12 Meter runs

The single license enables the Prognosis feature for all meters on the ROC800.

1.3.2 Three Supported Meter Types

The program works with Orifice, Venturi, and Cone meters.

1.3.3 Customary Seven Diagnostics

The program produces the customary seven diagnostic values.

1.3.4 Support for Stacked DPs

The program supports use of stacked DP instruments for Recovery and for Permanent DP instruments

1.3.5 Supports two or three measured DPs

Although it is not recommended, the program can function using just one additional DP instrument (plus the traditional DP). When either the Recovery DP or the Permanent DP instruments are not configured, the value of the unmeasured DP will be calculated from the other two DPs.

1.3.6 Adjustable Diagnostic Frequency

The diagnostic calculations can be run at a frequency ranging from once per second to once per 255 days.

When main processor loading is a concern, the frequency of the calculation can be reduced to alleviate processor loading.

1.3.7 Multi-pass Averaging

The program can be configured to perform multiple calculation cycles and use the resulting average value of the seven diagnostics. This feature can be used when there is high latency in DP measured values or when wet gas is expected – to reduce nuisance alerts.

1.3.8 Pattern Matching

After the seven diagnostic values are calculated, the relationship of these values to each other is compared with known pattern signatures. This results in a pattern match code and text message which can provide insight as to the particular problem – if any – with the meter.

1.4 Program Requirements

The DP – Prognosis FC program is compatible with version 3.61 (or greater) of the ROC800 firmware or version 1.60 (or greater) of ROC800L with version 2.41 (or greater) of the ROCLINK 800 software.

Program specifics include:

File Name	Target Unit/ Version	User Defined Points (UDP)	Flash Used (in bytes)	DRAM Used (in bytes)	ROCLINK 800 Version	Display Number
DPMD.tar	ROC800 v3.61 or ROC800L v1.60	220	68653	131072	2.41	221

For information on viewing the memory allocation of user programs, refer to the *ROCLINK 800 Configuration Software User Manual (for ROC800)* (part D301250X012).

1.4.1 License Key

License keys, when matched with valid license codes, grant access to applications such as the DP – Prognosis FC program.

For **ROC800 and ROC800L**, the term "license key" refers to the physical piece of hardware that can contain up to seven different licenses (refer to *Figure 1-1*). Each ROC800-series 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.

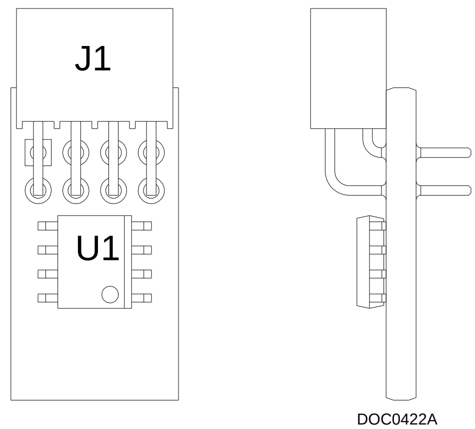

Figure 1-4. License Key

Note: A single license of the DP – Prognosis FC program for **ROC800-series** enables Prognosis FC for all meter runs.

Chapter 2 – Installation

This section provides instructions for installing the DP – Prognosis FC program into the ROC800. Read *Section 1.4* of this manual for program requirements.

Note: The program and license key can be installed in any order. The manual shows the installation of the license key first.

2.1 Installing the License Key

If you order the DP – Prognosis FC program for a new ROC800, your ROC800 is delivered with the license key installed.

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. If necessary, 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 (refer to *Figure 2-1*).

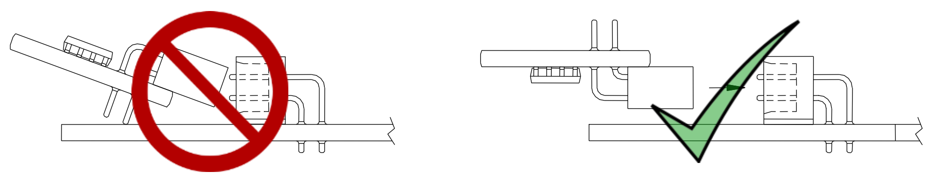

Figure 2-1. License Key Installation

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

6. Press the license key into the terminal until it is firmly seated (refer to *Figure 2-1*).
7. Re-attach the CPU faceplate.

8. Re-attach the screws on the CPU faceplate.
9. If necessary, re-attach the wire channel cover.
10. Restore power to the ROC800.

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:

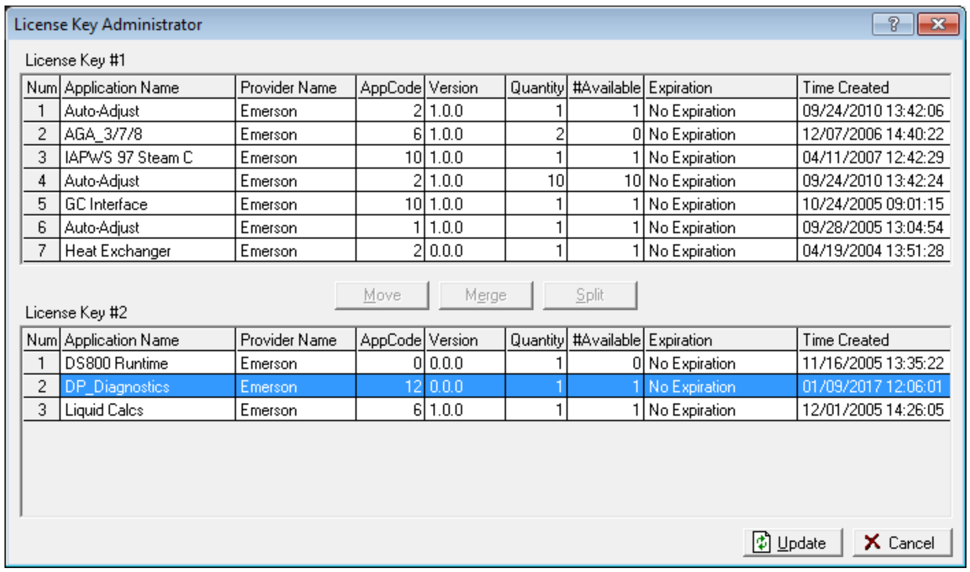

Figure 2-2. License Key Administrator

The DP – Prognosis FC program appears in the Application Name column. (For further information on the License Key Administrator screen, refer to the *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)*, part D301250X012.)

After you verify that the license key is correctly installed and recognized, proceed to *Section 2.2*.

2.2 Downloading the Program

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

To download the user program using ROCLINK 800 software:

1. Connect the ROC800 to your computer.
2. Start and logon to the ROCLINK 800.
3. Select **ROC** > **Direct Connect** to connect to the ROC800.

4. Select **Utilities** > **User Program Administrator** from the ROCLINK menu bar. The User Program Administrator screen displays (see *Figure 2-3*):

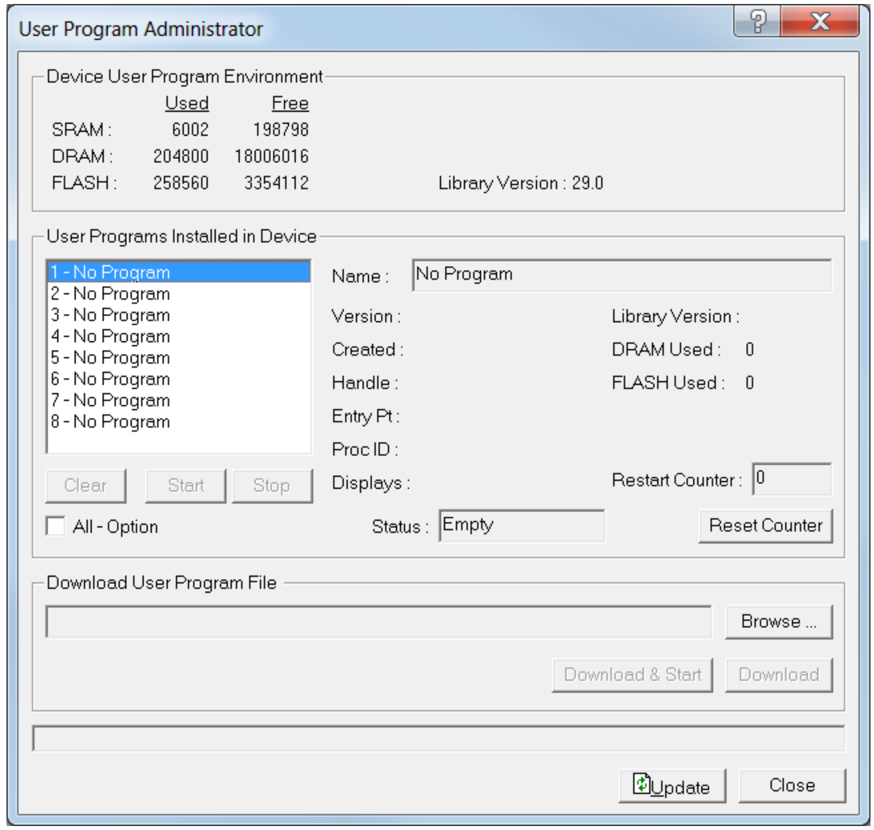

Figure 2-3. User Program Administrator

5. Select any empty program number (in this case, number 1) into which to download the program.
6. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 2-4*).
7. 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 2-4* shows, the screen lists all valid user program files with the .TAR extension:

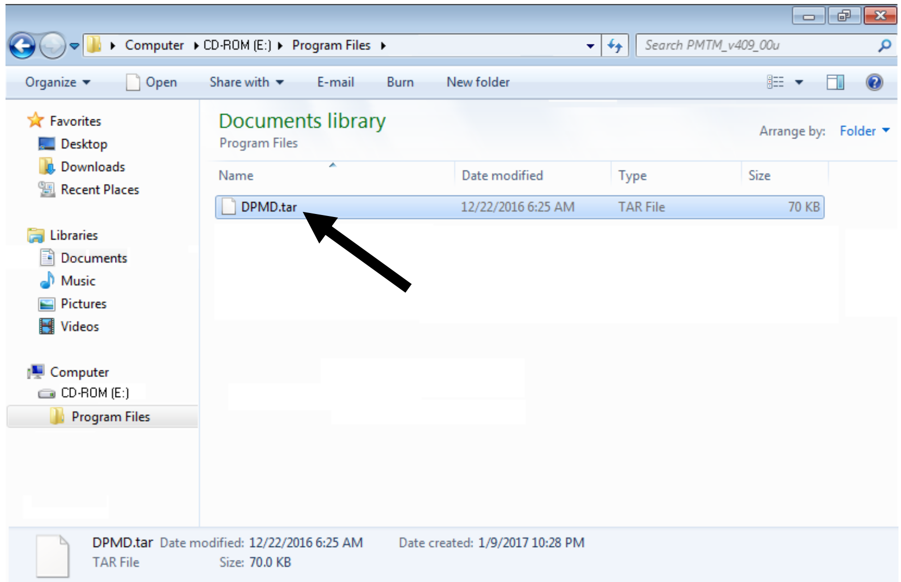

Figure 2-4. Select User Program File

8. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 2-5*, note that the Download User Program File frame identifies the selected program and that the **Download & Start** button is active:

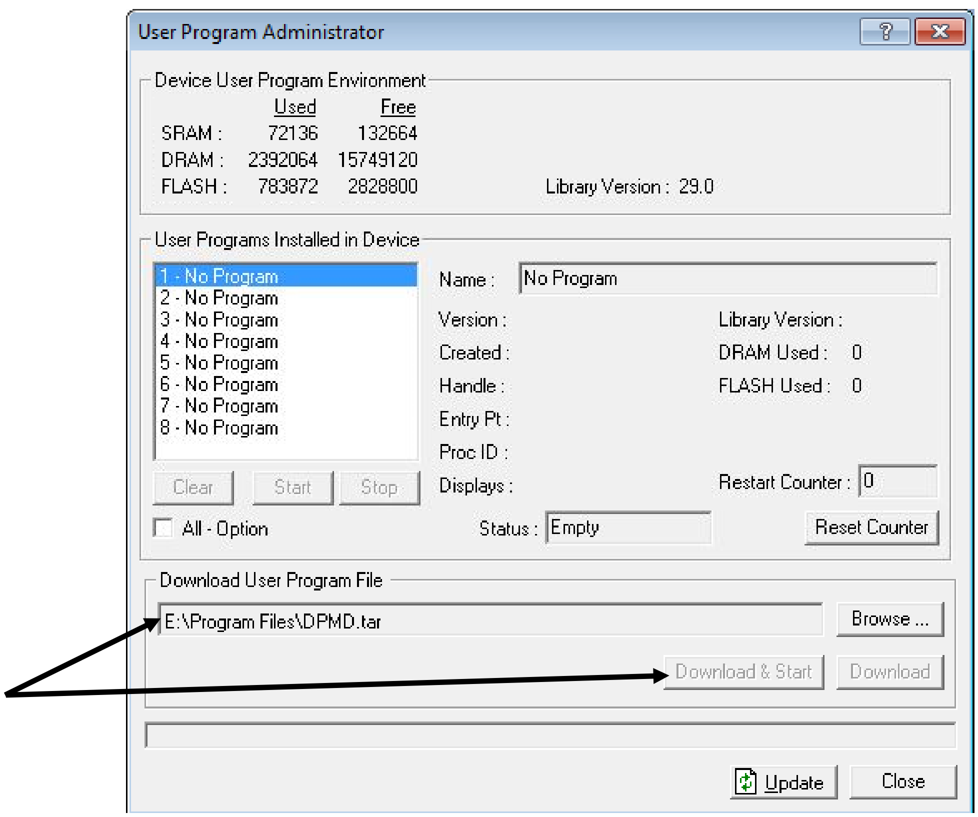

Figure 2-5. User Program Administrator

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

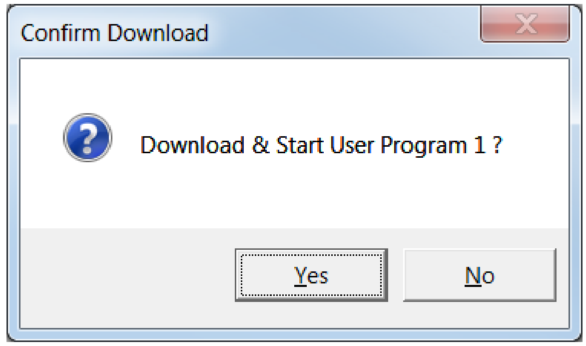

Figure 2-6. Confirm Download

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

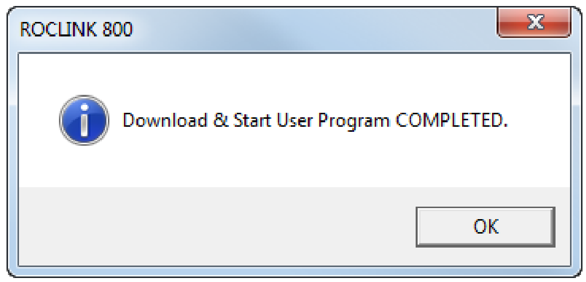

Figure 2-7. ROCLINK 800 Download Confirmation

11. Click **OK**. The User Program Administrator screen displays (see *Figure 2-8*). 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.

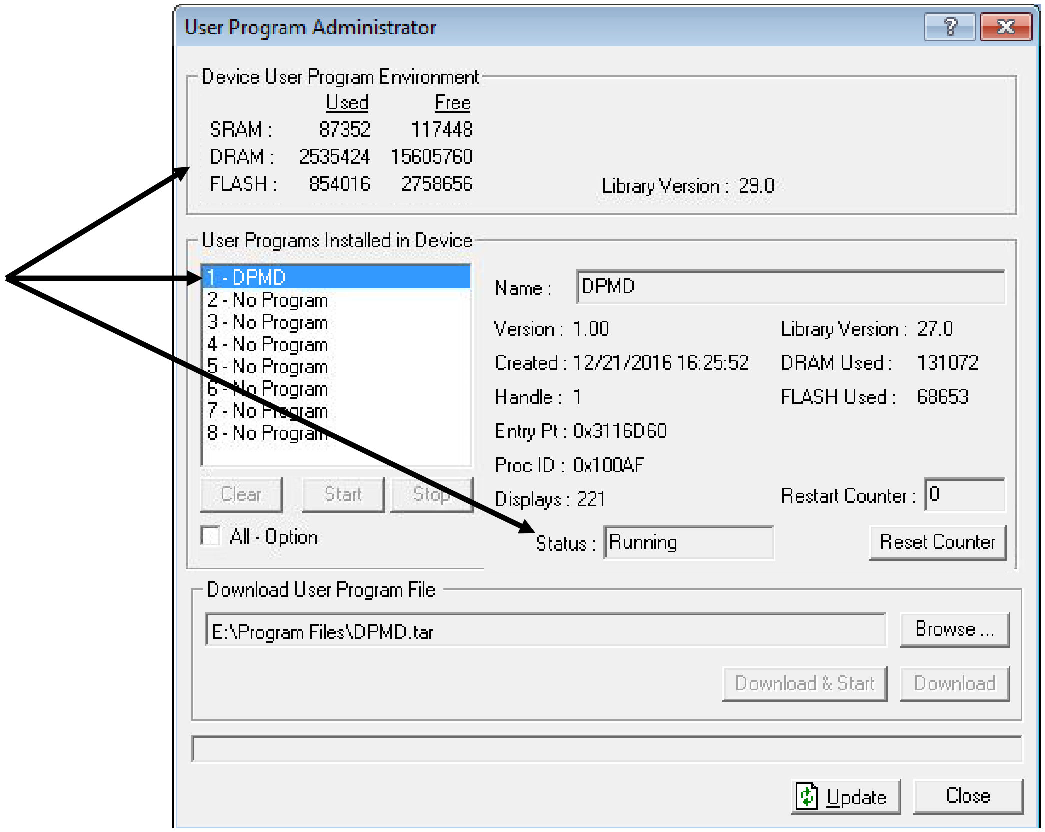

Figure 2-8. User Program Administrator

12. Click **Close**. Proceed to Chapter 3 – Configuration to configure the program.

2.3 MPU Loading Threshold

To maximize the performance of your ROC800 device, always verify the performance of specific application combinations before using them in the field to ensure the MPU load typically remains **below** 85% with peak MPU loading levels **below** 95%.

To check the current MPU load at any time, select **ROC** > **Information** > **Other Information** and review the value in the MPU loading field.

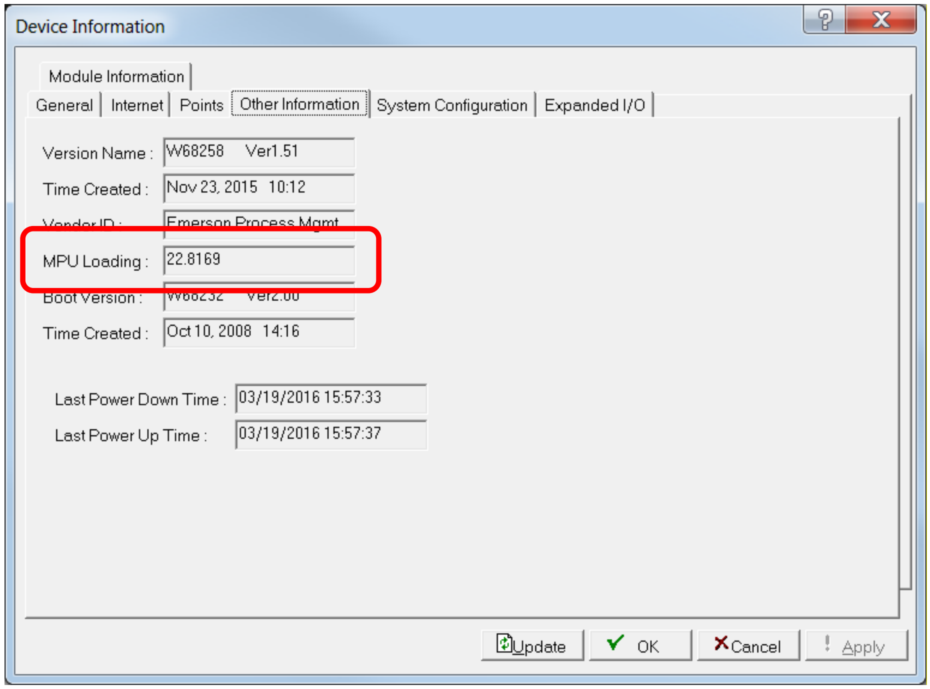

Figure 2-9. MPU Loading

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Chapter 3 – Configuration

This section provides information to configure the DP – Prognosis FC program.

Once you have successfully loaded the DP – Prognosis FC program into the ROC800, a single user display is available. This display contains these tabs:

- Results
- Configuration
- Advanced
- Intermediate
- Detail

Note: The DP – Prognosis FC meter runs corresponds to orifice meter number 1 in the ROC800. For example, Prognosis FC Point Number 1 corresponds to meter number 1 in the ROC. The corresponding meter run in the ROC should be configured and calculating flow before configuring DP meter diagnostics for the run. For further information on the configuration of the orifice meter runs, refer to the *ROCLINK 800™ Configuration Software User Manual (for ROC800-Series)* (part D301250X012).

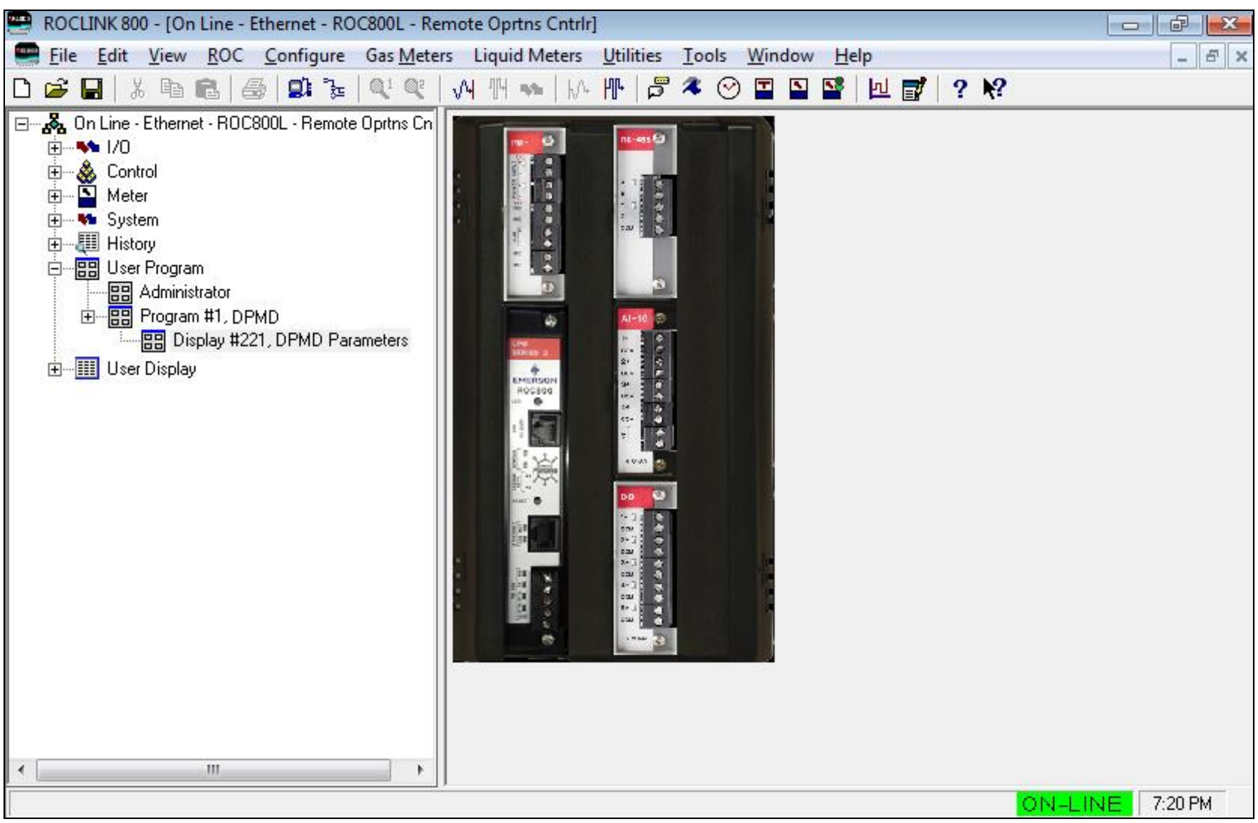


Figure 3-1. Main ROCLINK 800 screen

To access the program:

1. From the Directory Tree, select **User Program** > **Program #1, DPMD.**
2. Double-click **Display #221, DPMD Parameters.**

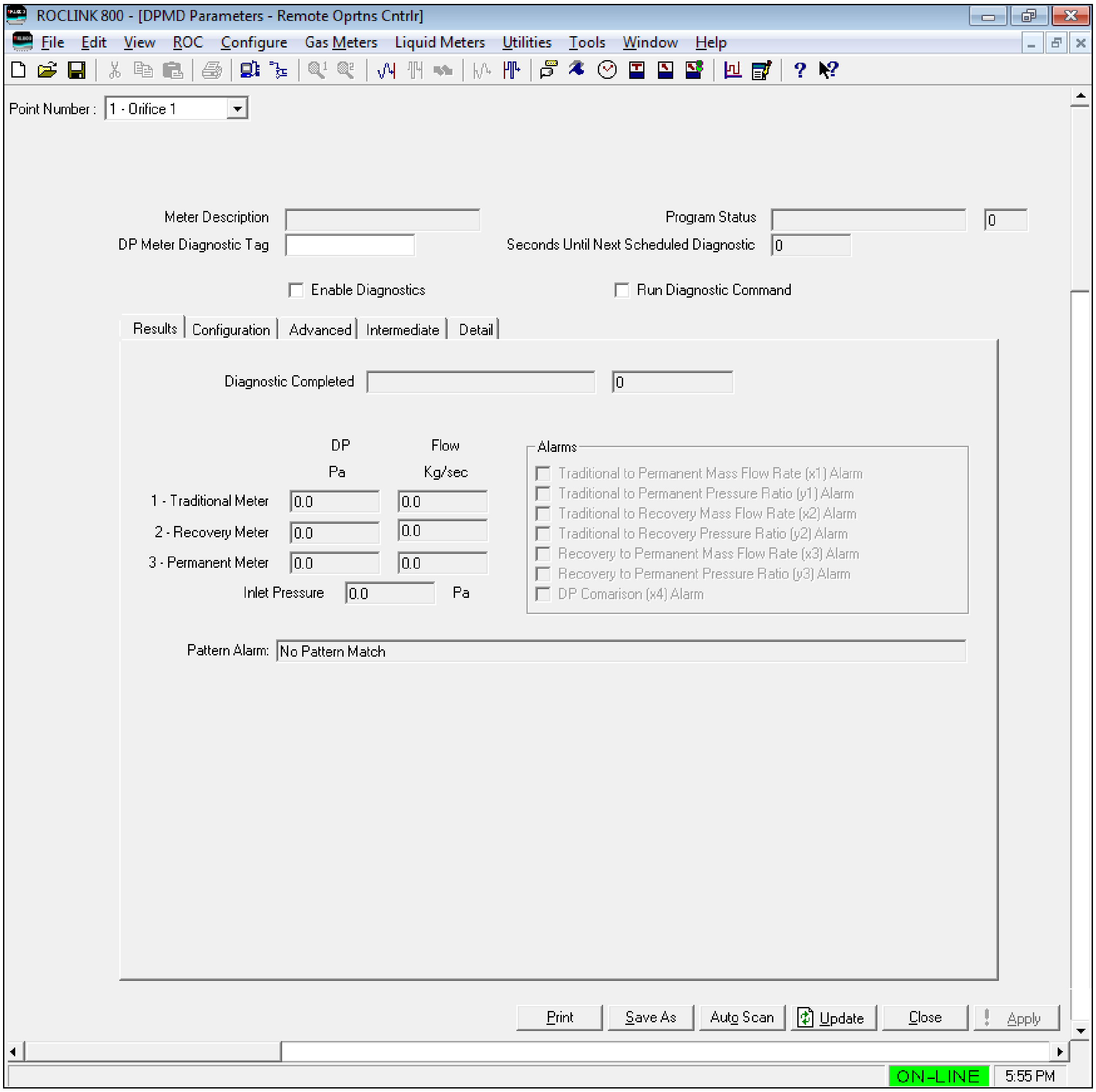


Figure 3-2. DPMD Parameters

1. Review the following fields:

Field	Description
Point Number	Sets the meter for diagnostic.
Meter Description	This **read-only** field displays the meter description.
DP Meter Diagnostic Tag	Sets the description of the meter.

Field	Description
Program Status	This **read-only** field displays the program status. For possible status codes and messages, see Section 4.2 of this manual.
Seconds Until Next Scheduled Diagnostic	This **read-only** field displays the next scheduled diagnostic in seconds.
Enable Diagnostics	Enables diagnostics for the specified meter.
Run Diagnostic Command	Select this option to perform an instantaneous diagnostic of the meter.

2. Proceed to the *Section 3.1 – Results tab*.

3.1 Results

Each time the Prognosis FC calculations complete, the Results tab of the Configuration screen provides the summary results of the calculations.

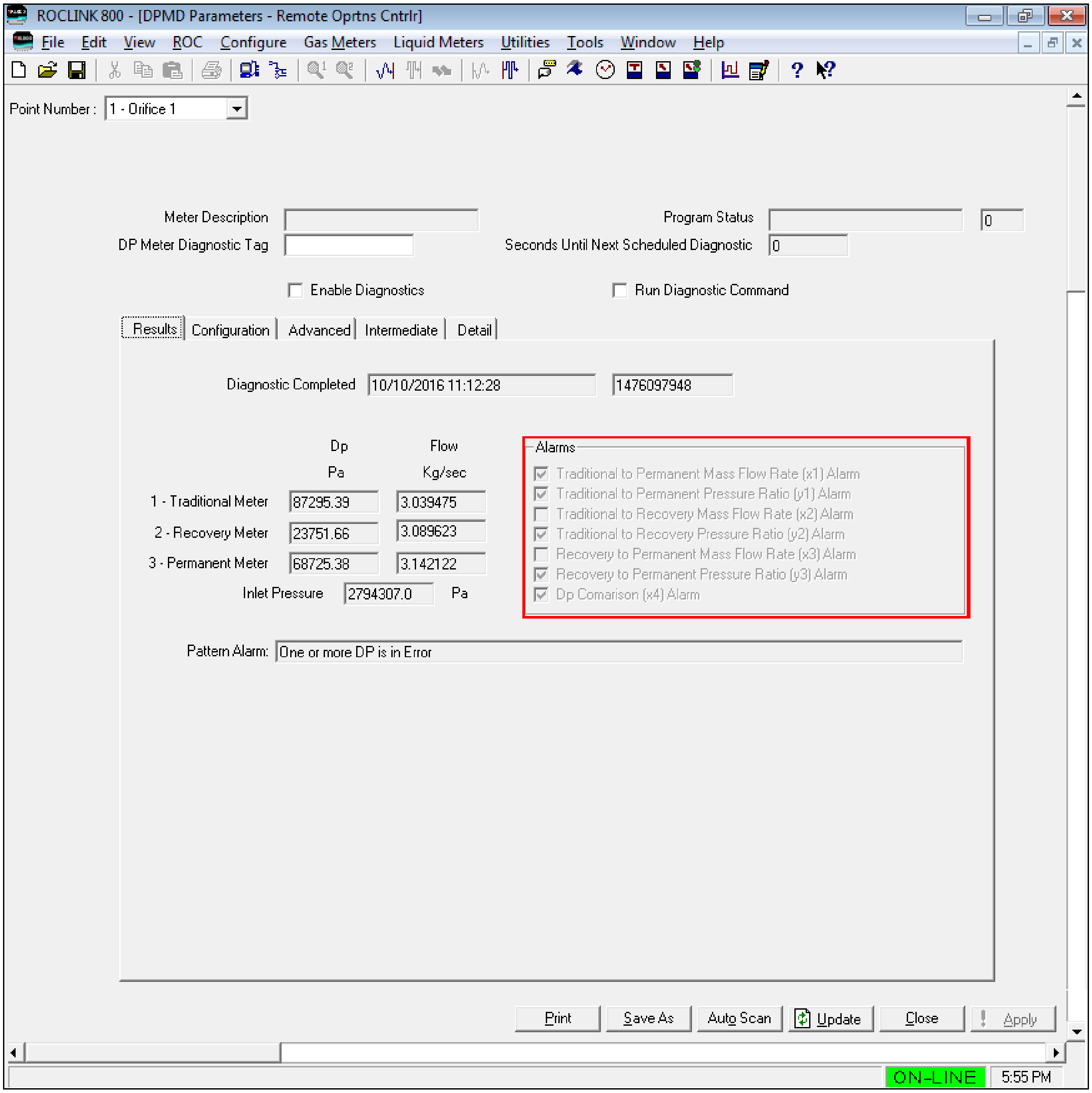


Figure 3-3. Results tab

1. Review the following fields:

Field		Description
Diagnostic Completed		This **read-only** field displays the timestamp of the most recent diagnostic run. Provides both UNIX timestamp and the formatted date/time.
1 – Traditional Meter		Lists the values for the Traditional Meter. **Note**: The Prognosis FC calculations are performed in metric units – regardless of the units of measure configured in the ROC800.
	Dp	This **read-only** field displays the Traditional Dp used for the calculations.
	Flow	This **read-only** field displays the Mass Flow Rate as calculated via the Traditional meter.

Field	Description
2 – Recovery Meter	Lists the values for the Recovery Meter. **Note**: The Prognosis FC calculations are performed in metric units – regardless of the units of measure configured in the ROC800.
Dp	This **read-only** field displays the Recovery Dp used for the calculations.
Flow	This **read-only** field displays the Mass Flow Rate as calculated via the recovery meter.
3 – Permanent Meter	Lists the values for the Permanent Meter. **Note**: The Prognosis FC calculations are performed in metric units – regardless of the units of measure configured in the ROC800.
Dp	This **read-only** field displays the Permanent Dp used for the calculations.
Flow	This **read-only** field displays the Mass Flow Rate as calculated via the Permanent meter.
Inlet Pressure	This **read-only** field displays the inlet pressure for the meter(s). **Note**: The Prognosis FC calculations are performed in metric units – regardless of the units of measure configured in the ROC800.
Alarms	Checkboxes indicate which – if any – of the seven diagnostic parameters exceeds configured acceptable values. When one or more parameters exceeds acceptable values, the red box is displayed around this section of the screen.
Traditional to Permanent Mass Flow Rate (x1) Alarm	When this alarm is selected, there is excessive difference between the mass flow rates derived from the traditional and the permanent meters.
Traditional to Permanent Pressure Ratio (y1) Alarm	When this alarm is selected, there is excessive difference between the observed and theoretical values for permanent pressure ratio.
Traditional to Recovery Mass Flow Rate (x2) Alarm	When this alarm is selected, there is excessive difference between the mass flow rates derived from the traditional and the recovery meters.
Traditional to Recovery Pressure Ratio (y2) Alarm	When this alarm is selected, there is excessive difference between the observed and theoretical values for recovery to traditional pressure ratio.
Recovery to Permanent Mass Flow Rate (x3) Alarm	When this alarm is selected, there is excessive difference between the mass flow rates derived from the recovery and the permanent meters.
Recovery to Permanent Pressure Ratio (y3) Alarm	When this alarm is selected, there is excessive difference between the observed and theoretical values for recovery to permanent pressure ratio.

Field	Description
Dp Comparison (x4) Alarm	When this alarm is selected, there is excessive difference between the observed traditional Dp value and the sum of the recovery and permanent pressure values
Pattern Alarm	This **read-only** field displays a text message describing the results of the pattern matching algorithm.

2. Proceed to the *Section 3.2 – Configuration*.

3.2 Configuration

The Configuration tab provides most of the parameters needed to configure Prognosis FC.

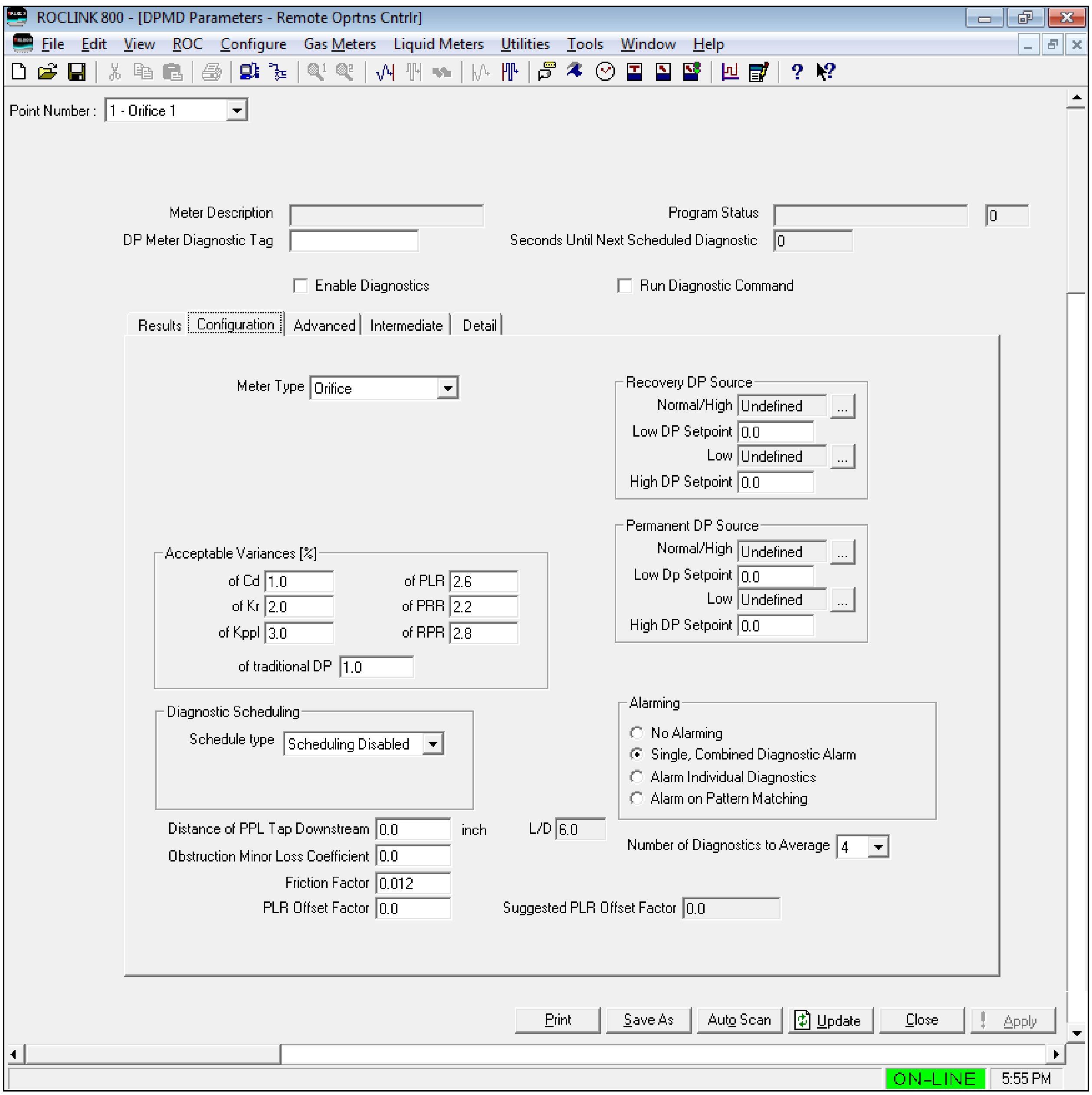


Figure 3-4. Configuration tab

1. Review the values in the following fields:

Field	Description
Meter Type	Selects the appropriate meter type. Click [▼] to select a valid option: ▪ Orifice ▪ Venturi ▪ Cone
Acceptable Variances [%]	These values serve as the alarm thresholds for the different diagnostic parameters. You can increase these values if nuisance alarms are occurring.
of Cd	Sets the acceptable variance (in percent) of the discharge coefficient for the traditional meter.
of Kr	Sets the acceptable variance (in percent) of the flow coefficient for the recovery meter.
of Kppl	Sets the acceptable variance (in percent) of the flow coefficient for the permanent meter.
of PLR	Sets the acceptable variance (in percent) of the ratio of permanent to traditional pressure loss.
of PRR	Sets the acceptable variance (in percent) of the ratio of recovery to traditional pressure loss.
of RPR	Sets the acceptable variance (in percent) of the ratio of recovery to permanent pressure loss.
of traditional Dp	Sets the acceptable variance (in percent) of the traditional DP.
Diagnostic Scheduling	This frame sets the diagnostic calculations for the meter are to be scheduled. If scheduled, select the Schedule Type. Click [▼] to select a valid option: ▪ Scheduling Disabled ▪ Scheduling in Days ▪ Scheduling in Hours ▪ Scheduling in Minutes ▪ Scheduling in Seconds
Schedule Type	Sets the time interval between scheduled runs of Prognosis FC calculations for the meter. The units of time for the interval are specified with the Diagnostic Scheduling parameter. ▪
Distance to PPL Tap Downstream	Sets the distance from the restriction to the far downstream tap. If this number is less than the 6 diameters, it will be ignored. If the value is greater than 6 diameters, a correction value will be applied to the permanent pressure loss reading to compensate for excessive distance downstream.
L/D	This **read-only** field displays the ratio of the far downstream tap distance to the diameter of the meter. Ideally, this value should be 6.0.

Field	Description
Obstruction Minor Loss Coefficient	This coefficient is used to compensate for pressure losses caused by obstructions in the meter tube located between the downstream tap and the far downstream tap. One example of such an obstruction would be a thermowell. **Note:** If a thermowell or other obstruction exists in the flow stream between the downstream tap and the far downstream tap.
Friction Factor	Sets the friction factor used to calculate additional pressure loss if far downstream tap is located more than 6 diameters downstream.
PLR Offset Factor	Can be used to “zero” the error produced by anomalies, such as wet gas, non-standard tap location, and other pressure losses within the meter
Suggested PLR Offset Factor	This **read-only** field displays the PLR offset factor calculated by the program which can be used to “zero” the Diagnostics for the meter
Recovery DP Source	Specifies where the value of the Recovery DP should be read and the conditions (if applicable) which will control switching between stacked DP sensors.
Normal/High	Click ... to designate input variable from which the DP should be read for non-stacked DP installations. For stacked DP installations, this location designates the parameter for the high DP instrument value.
Low DP Setpoint	Sets the value which provides the threshold for switching from the high DP instrument to the low DP instrument. This is for stacked DP installations.
Low	Click ... to designate input variable from which the Low DP should be read for stacked DP installations.
High DP Setpoint	Sets the value which provides the threshold for switching from the low DP instrument to the high DP instrument. This is for stacked DP installations.
Permanent DP Source	Specify where the value of the Permanent DP should be read and the conditions (if applicable) which will control switching between stacked DP sensors.
Normal/High	Click ... to designate input variable from which the DP should be read for non-stacked DP installations. For stacked DP installations, this location designates the parameter for the high DP instrument value.
Low DP Setpoint	Sets the value which provides the threshold for switching from the high DP instrument to the low DP instrument. This is for stacked DP installations.

Field	Description
Low	Click … to designate input variable from which the Low DP should be read for stacked DP installations.
High DP Setpoint	Sets the value which provides the threshold for switching from the low DP instrument to the high DP instrument. This is for stacked DP installations.
Alarming	Specifies the type of alarms to be entered into the ROC800 Alarm log: **No Alarming**: No alarms will be entered into the ROC800 alarm log. **Single,Combined Diagnostic Alarm**: If any of the seven diagnostics are outside of acceptable ranges, an alarm is set. The alarm is not cleared until all of the diagnostics are within range. **Alarm Individual Diagnostics**: Alarms are set and cleared individually for each of the seven diagnostics. **Warning:** This mode can create numerous alarms. **Alarm on Pattern Match**: If the pattern match feature reveals a non-conforming pattern, an alarm is set for that pattern. The alarm is cleared either when the pattern returns a conforming pattern or when a different non-conforming pattern is matched.
Number of Diagnostics to Average	When Prognosis FC calculations are executed, the program can perform multiple consecutive calculations rapidly and average the results. Click ▼ to specify the number of calculation repetitions to perform and average at each scheduled interval. **Note:** Improper configuration of this parameter might result in unexpected or unwanted behavior. For example, setting the **scheduling type** to seconds and setting the **schedule** to 5 but setting the **number of diagnostics to average** to 7 will result in continuous execution of the Prognosis FC at 1-second intervals. In some applications, this may place an undesirable load on the ROC800's main processor.

2. Enable the **Run Diagnostic Command** check box and click **Apply** to save the changes.
3. Observe the **Program Status Description** and Code for indications of either success of operation or configuration problems.
4. Make corrections as necessary.
5. Proceed to *Section 3.3 – Advanced*.

3.3 Advanced

Once you have successfully configured the DP Meter Diagnostics program for a meter run, you can make adjustments to the Advanced configuration parameters if so you desired.

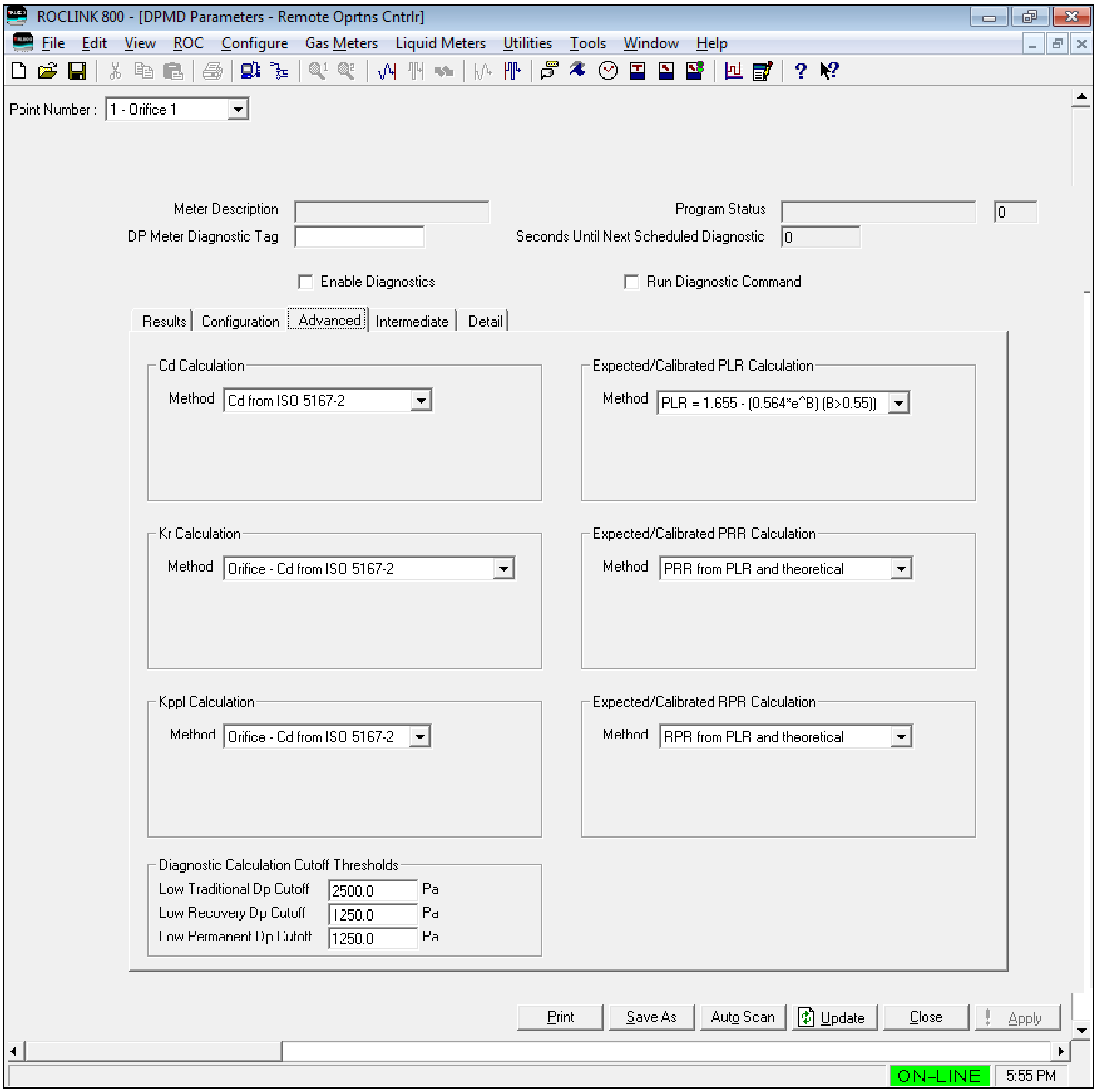


Figure 3-5. Advanced tab

1. Review the following fields:

Field	Description
Cd Calculation Method	The coefficient of discharge for the traditional flow rate calculation can be calculated either from ISO 5167 or from a curve fit. If the meter has been calibrated to derive a more precise definition of discharge coefficient vs Reynolds number, a curve fit of that calibration data can be entered here.
Kr Calculation Method	The flow coefficient for the recovery flow rate calculation can be calculated either from ISO 5167 or from a curve fit. If the meter has been calibrated to derive a more precise definition of flow coefficient vs Reynolds number, a polynomial curve fit of that calibration data can be entered here.
Kppl Calculation Method	The flow coefficient for the permanent pressure loss rate calculation can be calculated either from ISO 5167 or from a curve fit. If the meter has been calibrated to derive a more precise definition of flow coefficient vs Reynolds number, a curve fit of that calibration data can be entered here.
Expected/Calibrated PLR Calculation	The ratio of traditional DP to permanent pressure loss DP can be calculated either from a published equation or from a curve fit. If the meter has been calibrated to derive a more precise definition of pressure loss ratio vs Reynolds number, a curve fit of that calibration data can be entered here.
Expected/Calibrated PRR Calculation	The ratio of recovery DP to permanent pressure loss DP can be calculated either from a published equation or from a curve fit. If the meter has been calibrated to derive a more precise definition of pressure loss ratio vs Reynolds number, a curve fit of that calibration data can be entered here.
Expected/Calibrated RPR Calculation	The ratio of traditional DP to recovery pressure loss DP can be calculated either from a published equation or from a curve fit. If the meter has been calibrated to derive a more precise definition of pressure loss ratio vs Reynolds number, a curve fit of that calibration data can be entered here.
Diagnostic Calculations Cutoff Thresholds	Specifies the low DP limits for the diagnostic calculations:
Low Traditional DP cutoff	Sets the threshold for diagnostic calculations based on the traditional DP value. When the traditional DP value falls below this threshold, the diagnostic calculations will not be executed. This feature can be used to prevent extraneous alarms at very low flow rates.

Field	Description
Low Recovery DP cutoff	Sets the threshold for diagnostic calculations based on the recovery DP value. When the recovery DP value falls below this threshold, the diagnostic calculations will not be executed. This feature can be used to prevent extraneous alarms at very low flow rates.
Low Permanent DP cutoff	Sets the threshold for diagnostic calculations based on the permanent DP value. When the permanent DP value falls below this threshold, the diagnostic calculations will not be executed. This feature can be used to prevent extraneous alarms at very low flow rates.

2. Click **Apply** to save the changes.
3. Proceed to *Section 3.4 – Intermediate*.

3.4 Intermediate

The Intermediate tab provides information about intermediate values calculated during the Prognosis FC calculations.

Note: The Prognosis FC calculations are performed in metric units – regardless of the units of measure configured in the ROC800.

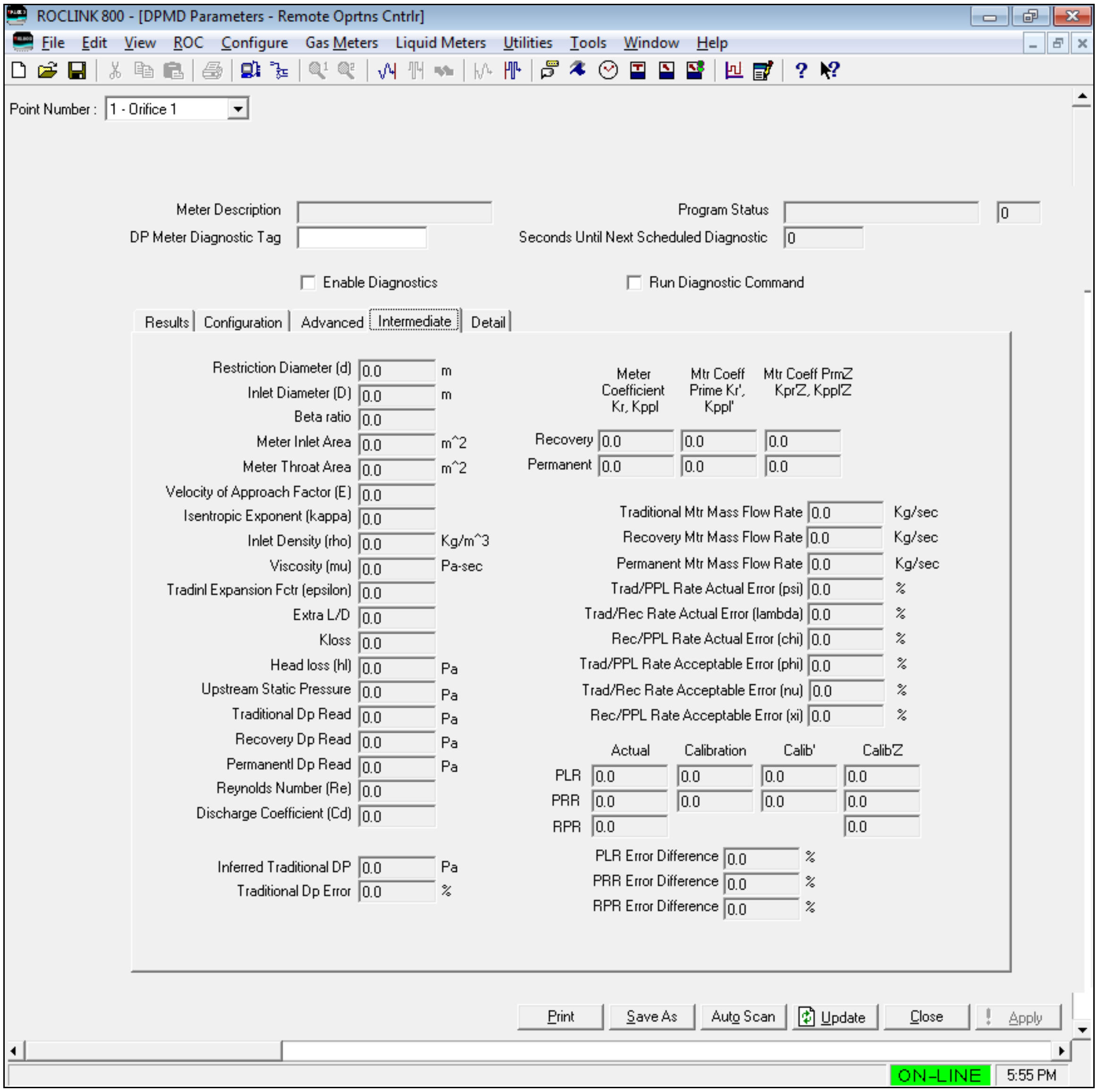


Figure 3-6. Intermediate tab

1. Review the following fields:

Field	Description
Restriction Diameter (d)	This **read-only** field displays the temperature-corrected meter restriction diameter.
Inlet Diameter (D)	This **read-only** field displays the temperature-corrected meter inlet diameter.
Beta	This **read-only** field displays the calculated Beta ratio
Meter Inlet Area	This **read-only** field displays the cross-sectional area of the meter inlet.
Meter Throat Area	This **read-only** field displays the cross-sectional area of the meter restriction.
Velocity of Approach factor (E)	This **read-only** field displays the dimensionless velocity of approach factor for the meter.
Isentropic Exponent (kappa)	This **read-only** field displays the dimensionless isentropic exponent for the flowing fluid.
Inlet Density (rho)	This **read-only** field displays the density of the flowing fluid at the meter inlet.
Viscosity (mu)	This **read-only** field displays the dynamic viscosity of the flowing fluid.
Tradinl Expansion Factor (epsilon)	This **read-only** field displays the expansion factor of the traditional meter.
Extra L/D	This **read-only** field displays the additional dimensionless pipe diameters between the ideal and actual location of the far downstream tap.
Kloss	This **read-only** field displays the total amount of equivalent dimensionless pipe diameters (including Extra L/D and any obstructions) for correcting the far downstream pressure reading.
Head loss (hl)	This **read-only** field displays the amount by which the far downstream Dp reading will be corrected to account for additional losses.
Upstream Static Pressure	This **read-only** field displays the upstream static pressure.
Traditional Dp Read	This **read-only** field displays the traditional Dp value read from the configured input.
Recovery Dp Read	This **read-only** field displays the recovery Dp value read from the configured input.
Permanent Dp Read	This **read-only** field displays the permanent Dp value read from the configured input.
Reynolds Number (Re)	This **read-only** field displays the calculated Reynold number.
Discharge Coefficient (Cd)	This **read-only** field displays the coefficient of discharge for the traditional meter.
Inferred Traditional Dp	This **read-only** field displays the sum of the **Recovery DP Read** and the **Permanent Dp Read**.
Traditional DP Error %	This **read-only** field displays the difference [%] between the **Traditional Dp Read** and the **Inferred Traditional Dp**.
Recovery	This **read-only** field displays the recovery meter coefficient and corrections made to it.
Meter Coefficient Kr, Kppl	This **read-only** field displays the meter coefficient Kr calculated (vs Reynolds number) using the method selected on the **Advanced** tab.

Field	Description
Meter Coefficient Kr', Kppl'	This **read-only** field displays the meter coefficient Kr corrected for **Head Loss (hl)**.
Meter Coefficient Kr'Z, Kppl'Z	This **read-only** field displays the meter coefficient Kr corrected for **Head Loss (hl)** and **PLR Offset Factor** defined on the **Configuration** tab.
Permanent	This **read-only** field displays the permanent meter coefficient and corrections made to it
Meter Coefficient Kr, Kppl	This **read-only** field displays the meter coefficient Kppl calculated (vs Reynolds number) using the method selected on the **Advanced** tab.
Meter Coefficient Kr', Kppl'	This **read-only** field displays the meter coefficient Kppl corrected for **Head Loss (hl)**.
Meter Coefficient Kr'Z, Kppl'Z	This **read-only** field displays the meter coefficient Kppl corrected for **Head Loss (hl)** and **PLR Offset Factor** defined on the **Configuration** tab.
Traditional Mass Flow Rate	This **read-only** field displays the mass flow rate as calculated from the traditional meter.
Recovery Mass Flow Rate	This **read-only** field displays the mass flow rate as calculated from the recovery meter.
Permanent Mass Flow Rate	This **read-only** field displays the mass flow rate [Kg/sec] as calculated from the permanent meter.
Trad/PPL Rate Actual Error (psi)	This **read-only** field displays the actual error between the traditional and permanent meter flow rates.
Trad/Rec Rate Actual Error (lambda)	This **read-only** field displays the actual error between the traditional and recovery meter flow rates.
Rec/PPL Rate Actual Error (chi)	This **read-only** field displays the actual error [%] between the recovery and permanent meter flow rates.
Trad/PPL Rate Aceptable Error (phi)	This **read-only** field displays the acceptable error between the traditional and permanent meter flow rates.
Trad/Rec Rate Aceptable Error (nu)	This **read-only** field displays the acceptable error between the traditional and recovery meter flow rates.
Rec/PPL Rate Acceptable Error (xi)	This **read-only** field displays the acceptable error [%] between the recovery and permanent meter flow rates.
PLR	This **read-only** field displays the uncorrected and corrected pressure loss ratio information for the traditional to permanent pressure loss ratio.
Actual	This **read-only** field displays the actual pressure ratio.
Calibration	This **read-only** field displays the theoretical (uncorrected) pressure ratio.
Calib'	This **read-only** field displays the theoretical pressure loss ratio corrected for meter coefficient Kr corrected for **Head Loss (hl)**.
Calib'Z	This **read-only** field displays the theoretical pressure loss ratio corrected for **Head Loss (hl)** and **PLR Offset Factor**.

Field		Description
PRR		This **read-only** field displays the uncorrected and corrected pressure loss ratio information for the traditional to recovery pressure loss ratio.
	Actual	This **read-only** field displays the actual pressure ratio.
	Calibration	This **read-only** field displays the theoretical (uncorrected) pressure ratio.
	Calib'	Displays the theoretical pressure loss ratio corrected for meter coefficient Kr corrected for **Head Loss (hl)**.
	Calib'Z	Displays the theoretical pressure loss ratio corrected for **Head Loss (hl)** and **PLR Offset Factor**.
RPR		This **read-only** field displays the uncorrected and corrected pressure loss ratio information for the recovery to permanent pressure loss ratio.
	Actual	This **read-only** field displays the actual pressure ratio.
	Calib'Z	This **read-only** field displays the theoretical pressure loss ratio corrected for **Head Loss (hl)** and **PLR Offset Factor**. This will be identical to the **Actual** value for **RPR**
PLR Error Difference		This **read-only** field displays the calculated difference between the actual and the corrected theoretical PLR
PRR Error Difference		This **read-only** field displays the calculated difference between the actual and the corrected theoretical PRR.
RPR Error Difference		This **read-only** field displays the calculated difference between the actual and the corrected theoretical RPR.

2. Proceed to *Section 3.5 – Detail*.

3.5 Detail

The Detail tab provides more detailed information that the summary tab. It also contains a limited amount of diagnostic information:

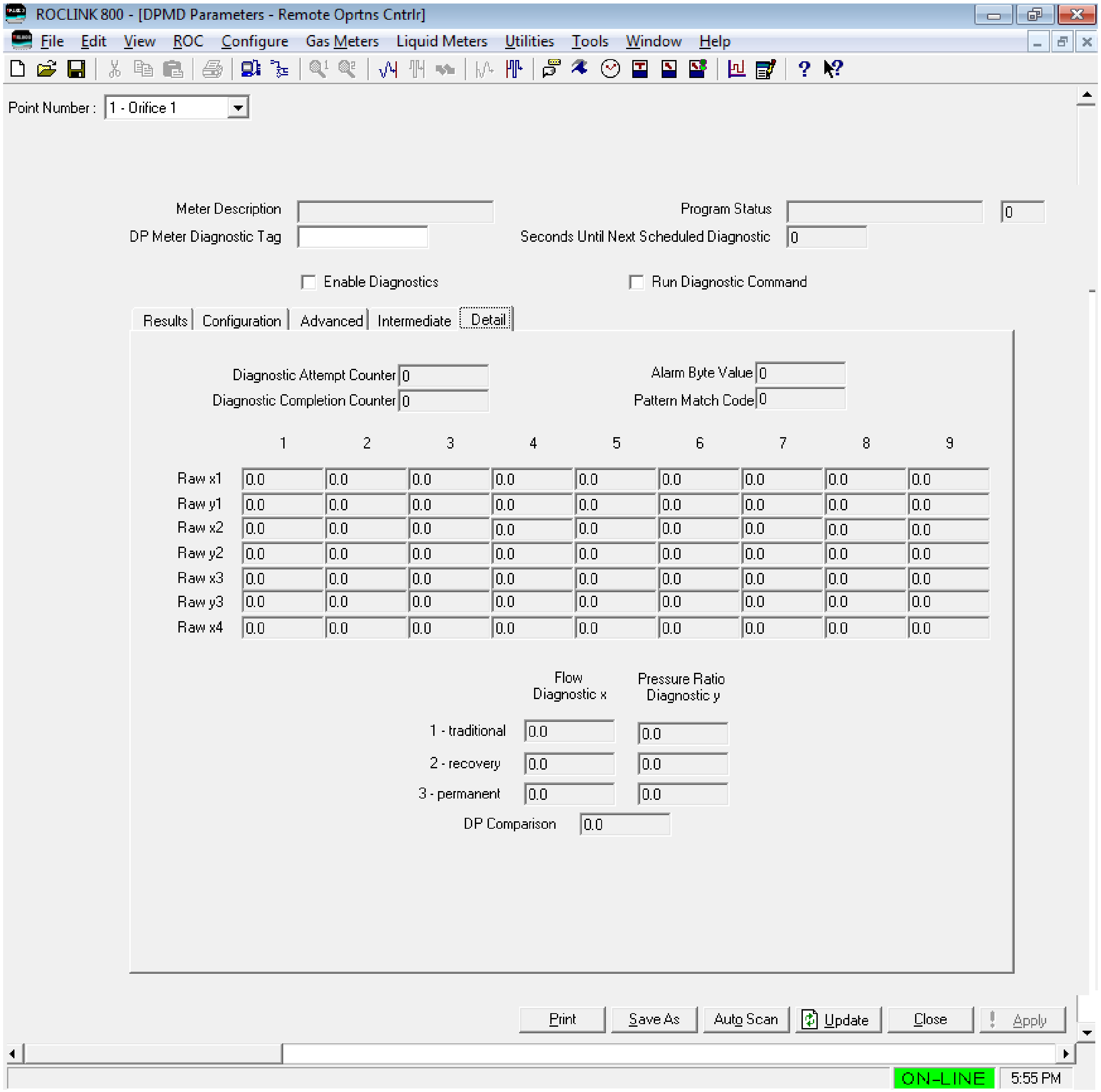


Figure 3-7. Detail tab

1. Review the following fields:

Field	Description
Diagnostic Attempt Counter	This **read-only** field displays each time a diagnostic run begins; this counter is increased.
Diagnostic Completion Counter	This **read-only** field displays each time a diagnostic run reaches successful completion, this counter is incremented. If the **Diagnostic Attempt Counter** is increasing faster than the **Diagnostic Completion Counter**, an error condition is indicated.

Field	Description
Alarm Byte Value	This **read-only** field displays the numeric representation of currently-active alarms is displayed in this field. This is a bit-mapped 8-bit integer: ▪ Bit 0 – Traditional to Permanent Mass Flow Rate Alarm ▪ Bit 1 – Traditional to Permanent Pressure Ratio Alarm ▪ Bit 2 – Traditional to Recovery Mass Flow Rate Alarm ▪ Bit 3 – Traditional to Recovery Pressure Ratio Alarm ▪ Bit 4 – Recovery to Permanent Mass Flow Rate Alarm ▪ Bit 5 – Recovery to Permanent Pressure Ratio Alarm ▪ Bit 6 – Dp Comparison Alarm ▪ Bit 7 – Not used **Note:** This field is a numeric representation of the **Alarms** section displayed on the **Results** tab
Pattern Match Code	This **read-only** field displays the numeric version of the results of pattern matching. *See Chapter 4 – Reference* of this document for a listing of the coded values.
Raw x1, y1, x2, y2, x3, y3, x4	This **read-only** field displays the individual diagnostic values from each repetition. All of the unused repetition columns are filled with zeros The Prognosis FC functions can be configured to run from 1 to 9 repetitions of calculations for each commanded execution. The results of this set of runs is averaged.
1 – traditional	This **read-only** field displays the averaged values of the individual parameters.
Flow Diagnostic x	This **read-only** field displays the flow diagnostic (x1) for the traditional meter.
Pressure Ratio Diagnostic y	This **read-only** field displays the pressure ratio diagnostic (y1) for the traditional meter.
2 – recovery	This **read-only** field displays the averaged values of the individual parameters.
Flow Diagnostic x	This **read-only** field displays the flow diagnostic (x2) for the recovery meter.
Pressure Ratio Diagnostic y	This **read-only** field displays the pressure ratio diagnostic (y2) for the recovery meter.
3 - permanent	This **read-only** field displays the averaged values of the individual parameters.
Flow Diagnostic x	This **read-only** field displays the flow diagnostic (x3) for the permanent meter.
Pressure Ratio Diagnostic y	This **read-only** field displays the pressure ratio diagnostic (y3) for the permanent meter.
Dp Comparison	This **read-only** field displays the averaged value of the DpL-comparison diagnostic.

2. Proceed to *Section 3.6 – Saving the Configuration.*

3.6 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:

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

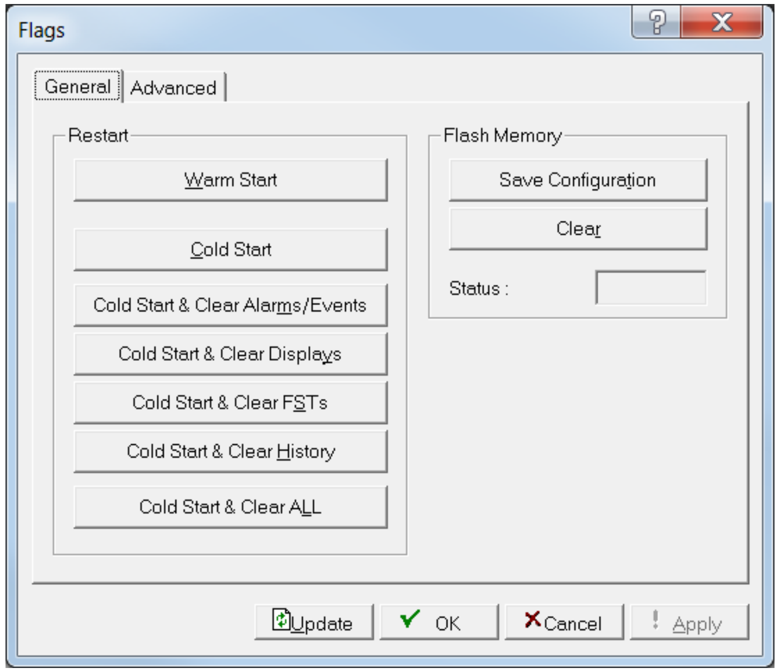


Figure 3-8. Flags

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

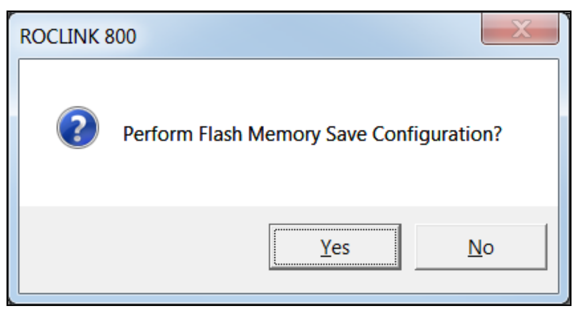


Figure 3-9. Save Verification

2. Click **Yes.** When the save process completes, a confirmation message displays:

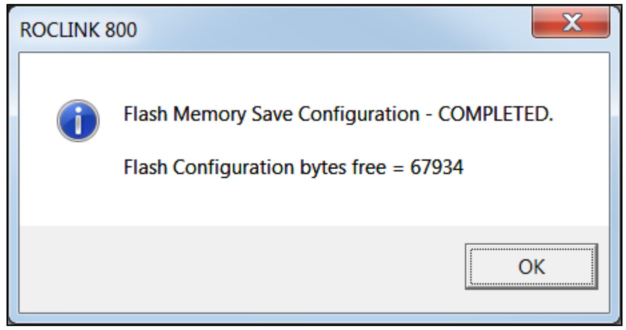


Figure 3-10. Confirmation

Note: Depending on the size and complexity of the user program, this process may take several minutes. When the process ends, the Status field on the Flags screen displays *Completed*.

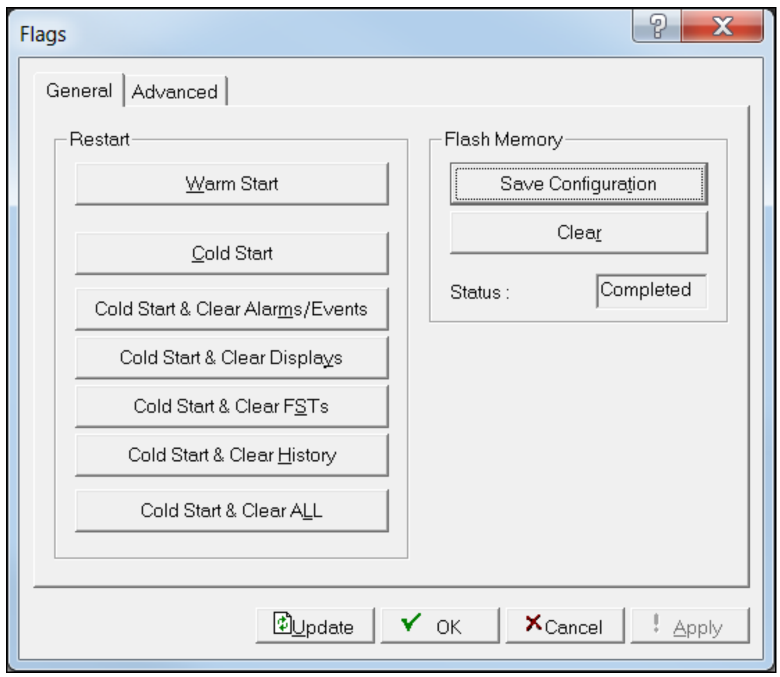


Figure 3-11. Flags, Status - Completed

3. 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 flash drive) using the **File** > **Save Configuration** option on the ROCLINK 800 menu bar.

Chapter 4 – Reference

This section provides information on the user-defined point types the DP Meter Diagnostics program uses:

- Point Type 220: DP Meter Diagnostics Parameters

The following topics are discussed in this section:

- Program Status Codes and Messages
- Pattern Match Codes and Messages
- Zeroing the meter for Prognosis FC

4.1 Point Type 220: DP – Prognosis FC Parameters

Point type 220 contains the parameters for the configuration and the output parameters of the DP – Prognosis FC user program. The program supports up to 12 logicals of point type 220.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
0	Tag	R/W	User	AC	10	0x20 → 0x7E for each ASCII character	“”	1.00	An alternate text descriptor
1	Cd Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating Cd of Cd Method is anything other than “ISO 5167 equation”
2	Cd Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating Cd of Cd Method is anything other than “ISO 5167 equation”
3	Cd Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating Cd of Cd Method is anything other than “ISO 5167 equation”
4	Cd Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating Cd of Cd Method is anything other than “ISO 5167 equation”
5	Kr Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kr Method = “derive Kr from curve-fit polynomial” then Kr is calculated using a Cd computed = KrA+(KrB*Re)+(KrC*(Re ^2))+(KrD*(Re ^3))
6	Kr Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kr Method = “derive Kr from curve-fit polynomial” then Kr is calculated using a Cd computed = KrA+(KrB*Re)+(KrC*(Re ^2))+(KrD*(Re ^3))
7	Kr Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kr Method = “derive Kr from curve-fit polynomial” then Kr is calculated using a Cd computed = KrA+(KrB*Re)+(KrC*(Re ^2))+(KrD*(Re ^3))
8	Kr Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kr Method = “derive Kr from curve-fit polynomial” then Kr is calculated using a Cd computed = KrA+(KrB*Re)+(KrC*(Re ^2))+(KrD*(Re ^3))

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
9	Kppl Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kppl Method = “derive Kppl from curve-fit polynomial” then Kppl is calculated using a Cd computed = KpplA+(KpplB*Re)+(KpplC*(Re ^2))+(KpplD*(Re ^3))
10	Kppl Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kppl Method = “derive Kppl from curve-fit polynomial” then Kppl is calculated using a Cd computed = KpplA+(KpplB*Re)+(KpplC*(Re ^2))+(KpplD*(Re ^3))
11	Kppl Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kppl Method = “derive Kppl from curve-fit polynomial” then Kppl is calculated using a Cd computed = KpplA+(KpplB*Re)+(KpplC*(Re ^2))+(KpplD*(Re ^3))
12	Kppl Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	If Kppl Method = “derive Kppl from curve-fit polynomial” then Kppl is calculated using a Cd computed = KpplA+(KpplB*Re)+(KpplC*(Re ^2))+(KpplD*(Re ^3))
13	PLR Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PLR if PLR Method is anything other than “ISO 5167 equation”
14	PLR Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PLR if PLR Method is anything other than “ISO 5167 equation”
15	PLR Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PLR if PLR Method is anything other than “ISO 5167 equation”
16	PLR Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PLR if PLR Method is anything other than “ISO 5167 equation”
17	PRR Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PRR if PRR Method is anything other than “calculate from PLR and theoretical relationships”

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
18	PRR Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PRR if PRR Method is anything other than “calculate from PLR and theoretical relationships”
19	PRR Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PRR if PRR Method is anything other than “calculate from PLR and theoretical relationships”
20	PRR Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating PRR if PRR Method is anything other than “calculate from PLR and theoretical relationships”
21	RPR Polynomial A	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating RPR if RPR Method is anything other than “calculate from PLR and theoretical relationships”
22	RPR Polynomial B	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating RPR if RPR Method is anything other than “calculate from PLR and theoretical relationships”
23	RPR Polynomial C	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating RPR if RPR Method is anything other than “calculate from PLR and theoretical relationships”
24	RPR Polynomial D	R/W	User	FL	4	Any IEEE floating point value	0.0	1.00	Coefficient used for calculating RPR if RPR Method is anything other than “calculate from PLR and theoretical relationships”
25	PPL Tap Distance	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Distance between the restriction (orifice plate) and the PPL pressure tap. Units of measure are same as used for orifice and pipe diameter.
26	Obstruction Minor Loss Coefficient	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Sum of minor loss coefficients for any obstructions between the flow restriction (orifice plate) and the PPL pressure tap
27	Friction Factor	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.012	1.00	Friction factor for calculating pressure loss in the meter body

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
28	PLR Offset Factor	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Factor for offsetting the PLR of the meter
29	Acceptable Variance of Cd	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	1.0	1.00	Maximum acceptable variance percentage of discharge coefficient
30	Acceptable Variance of Kr	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	2.0	1.00	Maximum acceptable variance percentage of recovery meter coefficient
31	Acceptable Variance of Kppl	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	3.0	1.00	Maximum acceptable variance percentage of permanent pressure loss meter coefficient
32	Acceptable Variance of PLR	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	2.6	1.00	Maximum acceptable variance permanent pressure loss ratio
33	Acceptable Variance of PRR	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	2.2	1.00	Maximum acceptable variance recovery pressure loss ratio
34	Acceptable Variance of RPR	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	2.8	1.00	Maximum acceptable variance of ratio of pressure recovery pressure to permanent pressure loss
35	Acceptable Variance of Traditional Dp	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	1.0	1.00	Maximum acceptable variance of the measured traditional Dp from the inferred traditional Dp
36	Cd Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Cd polynomial coefficient A
37	Cd Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Cd polynomial coefficient B
38	Cd Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Cd polynomial coefficient C
39	Cd Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Cd polynomial coefficient D
40	Kr Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kr polynomial coefficient A

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
41	Kr Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kr polynomial coefficient B
42	Kr Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kr polynomial coefficient C
43	Kr Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kr polynomial coefficient D
44	Kppl Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kppl polynomial coefficient A
45	Kppl Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kppl polynomial coefficient B
46	Kppl Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kppl polynomial coefficient C
47	Kppl Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the Kppl polynomial coefficient D
48	PLR Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PLR polynomial coefficient A
49	PLR Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PLR polynomial coefficient B
50	PLR Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PLR polynomial coefficient C
51	PLR Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PLR polynomial coefficient D
52	PRR Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PRR polynomial coefficient A
53	PRR Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	“0.0”	1.00	Text version of the PRR polynomial coefficient B

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
54	PRR Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the PRR polynomial coefficient C
55	PRR Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the PRR polynomial coefficient D
56	RPR Text Polynomial A	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the RPR polynomial coefficient A
57	RPR Text Polynomial B	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the RPR polynomial coefficient B
58	RPR Text Polynomial C	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the RPR polynomial coefficient C
59	RPR Text Polynomial D	RW	User	AC	20	Any valid numerical ASCII characters	"0.0"	1.00	Text version of the RPR polynomial coefficient D
60	Recovery Low DP Setpoint	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	If Regular Dp source is being used and Dp falls below this setpoint value, the system will switch to using the Low DP source.
61	Recovery High Dp Setpoint	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	If low DP source is being used and Dp rises above this value, the system will switch to use the Regular Dp source
62	Permanent Low DP Setpoint	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	If Regular Dp source is being used and Dp falls below this setpoint value, the system will switch to using the Low DP source.
63	Permanent High Dp Setpoint	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	If low DP source is being used and Dp rises above this value, the system will switch to use the Regular Dp source
64	Recovery Dp Source	R/W	User	TLP	3	Any valid TLP (assumed to be a floating point TLP)	0,0,0	1.00	Source of differential pressure signal measured from downstream tap to PPL tap.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
65	Recovery Low Dp Source	R/W	User	TLP	3	Any valid TLP (assumed to be a floating point TLP)	0,0,0	1.00	Source of differential pressure signal measured from downstream tap to PPL tap to be used for “low” side of a stacked DP arrangement.
66	Permanent Dp Source	R/W	User	TLP	3	Any valid TLP (assumed to be a floating point TLP)	0,0,0	1.00	Source of differential pressure signal measured from upstream tap to PPL tap.
67	Permanent Low Dp Source	R/W	User	TLP	3	Any valid TLP (assumed to be a floating point TLP)	0,0,0	1.00	Source of differential pressure signal measured from upstream tap to PPL tap to be used for “low” side of a stacked DP arrangement.
68	Enable DPMD	R/W	User	UINT8	1	0-1	0	1.00	Valid values are: **0** = Disable DPMD for this meter **1** = Enable DPMD for this meter
69	Meter Type	R/W	User	UINT8	1	0-2	0	1.00	Valid values are: **0** = Orifice **1** = Venturi **2** = Cone

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
70	PLR Method	R/W	User	UINT8	1	0-8	1	1.00	Valid values are: **0** – Use ISO 5167-2 equation 7 for all Beta ratios **1** – Use f(Beta) equation disclosed by Stevens in 2012 for Beta ratios above 0.55 **2** – Direct polynomial curve-fit PLR = A + B*Re + C*Re^2 + D*Re^3 **3** – Direct curve fit PLR = A + B*(e^(C*Re)) **4** – Direct curve fit PLR = A + B*(10^(C*Re)) **5** – Direct curve fit PLR = A + B*ln((C*Re)) **6** – Direct curve fit PLR = A + B*log((C*Re)) **7** – Direct curve fit PLR = A + B*(C^(D*Re)) **8** – Direct curve fit PLR = A + B *((C*Re)^D) **Note:** Methods 0 and 1 are only valid for an Orifice Meter.
71	Generate Events	R/W	User	UINT8	1	0-1	1	1.00	Valid values are: **0** – Generate events in the event log when meter diagnostic configuration parameters are modified **1** – Do not generate events
72	Generate Alarms	R/W	User	UINT8	1	0-3	3	1.00	Valid values are: **0** – Do not generate alarms **1** – Generate only a single, combined alarm for all diagnostics **2** – Generate alarms based on the seven individual diagnostics **3** – Generate alarm based upon pattern matching

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
73	Kr Method	R/W	User	UINT8	1	0-8	0	1.00	Valid values are: **0** – Derive Kr using Cd derived ISO 5167 equation 4 **1** – Derive Kr using Cd from polynomial curve-fit Cd = A + B*Re + C*Re^2 + D*Re^3 **2** – Direct polynomial curve-fit Kr = A + B*Re + C*Re^2 + D*Re^3 **3** – Direct curve fit Kr = A + B*(e^(C*Re)) **4** – Direct curve fit Kr = A + B*(10^(C*Re)) **5** – Direct curve fit Kr = A + B*ln((C*Re)) **6** – Direct curve fit Kr = A + B*log((C*Re)) **7** – Direct curve fit Kr = A + B*(C^(D*Re)) **8** – Direct curve fit Kr = A + B *((C*Re)^D) **Note:** Methods 0 and 1 are only valid for an Orifice Meter.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
74	Kppl Method	R/W	User	UINT8	1	0-8	0	1.00	Valid values are: **0** – Derive Kppl using Cd derived ISO 5167 equation 4 **1** – Derive Kppl using Cd from polynomial curve-fit Cd = A + B*Re + C*Re^2 + D*Re^3 **2** – Direct polynomial curve-fit Kppl = A + B*Re + C*Re^2 + D*Re^3 **3** – Direct curve fit Kppl = A + B*(e^(C*Re)) **4** – Direct curve fit Kppl = A + B*(10^(C*Re)) **5** – Direct curve fit Kppl = A + B*ln((C*Re)) **6** – Direct curve fit Kppl = A + B*log((C*Re)) **7** – Direct curve fit Kppl = A + B*(C^(D*Re)) **8** – Direct curve fit Kppl = A + B *((C*Re)^D) **Note:** Methods 0 and 1 are only valid for an Orifice Meter.
75	Run Command	R/W	User	UINT8	1	0-1	0	1.00	Set this parameter to 1 to initiate a diagnostic. The system will set the value to zero at the end of the diagnostic.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
76	Scheduling Enabled	R/W	User	UINT8	1	0-4	0	1.00	Valid values are: **0** = Scheduling of diagnostic is disabled **1** = The program will schedule a diagnostic using the specified number as an interval in minutes. **2** = The program will schedule a diagnostic using the specified number as an interval in hours. **3** = The program will schedule a diagnostic using the specified number as an interval in days. **4** = The program will schedule a diagnostic using the specified number as an interval in seconds.
77	Schedule Interval	R/W	User	UINT8	1	1-255	1	1.00	Interval to use in scheduling diagnostics (see “Enable Scheduling”)
78	Number to Average	R/W	User	UINT8	1	1-9	4	1.00	Number of consecutive diagnostics to run and average for result values

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
79	Cd Method	R/W	User	U8	1	0-7	1	1.00	Method for calculating Cd: **0** – ISO 5167 equation **1** – Direct polynomial curve-fit Cd = A + B*Re + C*Re^2 + D*Re^3 **2** – Direct curve fit Cd = A + B*(e^(C*Re)) **3** – Direct curve fit Cd = A + B*(10^(C*Re)) **4** – Direct curve fit Cd = A + B*ln((C*Re)) **5** – Direct curve fit Cd = A + B*log((C*Re)) **6** – Direct curve fit Cd = A + B*(C^(D*Re)) **7** – Direct curve fit Cd = A + B *((C*Re)^D) **Note:** Method 0 is only valid for an Orifice Meter.
80	PRR Method	R/W	User	UINT8	1	0-7	1	1.00	Valid values are: **0** – Calculate from PLR and theoretical relationships **1** – Direct polynomial curve-fit PRR = A + B*Re + C*Re^2 + D*Re^3 **2** – Direct curve fit PRR = A + B*(e^(C*Re)) **3** – Direct curve fit PRR = A + B*(10^(C*Re)) **4** – Direct curve fit PRR = A + B*ln((C*Re)) **5** – Direct curve fit PRR = A + B*log((C*Re)) **6** – direct curve fit PRR = A + B*(C^(D*Re)) **7** – direct curve fit PRR = A + B *((C*Re)^D)

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
81	RPR Method	R/W	User	UINT8	1	0-7	1	1.00	Valid values are: **0** – Calculate from PLR and theoretical relationships **1** – Direct polynomial curve-fit RPR = A + B*Re + C*Re^2 + D*Re^3 **2** – Direct curve fit RPR = A + B*(e^(C*Re)) **3** – Direct curve fit RPR = A + B*(10^(C*Re)) **4** – Direct curve fit RPR = A + B*ln((C*Re)) **5** – Direct curve fit RPR = A + B*log((C*Re)) **6** – Direct curve fit RPR = A + B*(C^(D*Re)) **7** – Direct curve fit RPR = A + B *((C*Re)^D)
82	Pattern Alarm Text	RO	System	AC	30	0x20 → 0x7E for each ASCII character	"No Pattern Match"	1.00	Text description related to the pattern match
83	Program Status Description	RO	System	AC	20	0x20 → 0x7E for each ASCII character	""	1.00	Text Description of the Program's status
84	Last Diagnostic Completed Datetime Text	RO	System	AC	20	0x20 → 0x7E for each ASCII character	""	1.00	Text representation of the last diagnostic completion timestamp. Format is MM/DD/YYYY HH:NN:SS.
85	Traditional to PPL Rate Error Percent Limit (phi)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value used to Normalize output data.
86	Traditional to Recovery Rate Error Percent Limit (nu)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value used to Normalize output data.
87	Recovery to PPL Rate Error Percent Limit (xi)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value used to Normalize output data.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
88	Traditional to PPL Mass Flow Difference Percent (psi)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value expressing difference between mass flow rates of the two meters in percent
89	Traditional to Recovery Mass Flow Difference Percent (lambda)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value expressing difference between mass flow rates of the two meters in percent
90	Recovery to PPL Mass Flow Difference Percent (chi)	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Intermediate value expressing difference between mass flow rates of the two meters in percent
91	Upstream Static Pressure	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Upstream pressure from the meter (ex: 114, #, 17) in absolute pressure but converted to Pa as necessary
92	Isentropic Exponent	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Also known as ratio of specific heats. Copied from (113, #,19)
93	Temperature Corrected Beta Ratio	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Ratio of restriction diameter to meter body diameter. Uses temperature corrected values. Copied from (114, #, 14)
94	Temperature Corrected Restriction Diameter	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Temperature corrected restriction (orifice bore) diameter (114, #, 8) converted to meters
95	Temperature Corrected Inlet Diameter	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Temperature corrected meter body diameter (114, #, 13) converted to meters
96	Inlet Density	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Flowing gas density at inlet conditions converted to Kg/M3as necessary
97	Viscosity	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Flowing gas (dynamic) viscosity converted to Pa-sec as necessary
98	Meter Inlet Area	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Temperature corrected cross-sectional area of the meter inlet in M2

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
99	Velocity of Approach Factor	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Copied from (114, #, 6)
100	Meter Throat Area	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Temperature corrected cross-sectional area of the meter restriction in M2
101	Extra L over D	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Measure of non-standard distance between 6D and actual location of the PPL tap
102	Traditional Dp Read	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Copy of (113, #, 26) converted to Pa
103	Recovery Dp Read	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Value gained from the Recovery Dp Source TLP and converted to Pa. The conversion assumes that the Recovery Dp value is in the same units of measure as the Traditional Dp.
104	Permanent Dp Read	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Value gained from the Permanent Dp Source TLP and converted to Pa. The conversion assumes that the Permanent Dp value is in the same units of measure as the Traditional Dp.
105	Traditional Mass Flow Rate	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Mass flow rate calculated using the traditional meter [Kg/sec]
106	Recovery Mass Flow Rate	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Mass flow rate calculated using the recovery meter [Kg/sec]
107	PPL Mass Flow Rate	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Mass flow rate calculated using the permanent pressure loss meter [Kg/sec]
108	Actual PLR	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Ratio of measured Permanent Pressure Loss Dp to measured Traditional Dp
109	Actual PRR	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Ratio of measured Recovery Dp to measured Traditional Dp

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
110	Actual RPR	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Ratio of measured recovery Dp to permanent pressure loss Dp
111	Calibration PLR	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	PLR as defined by either theoretical or calibration source. Source depends upon meter type and other options.
112	Calibration PRR	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	PRR as defined by either theoretical or calibration source. Source depends upon meter type and other options.
113	Calibration PLR Prime	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Calibration PLR corrected for non-standard pressure losses upstream of the PPL tap
114	Calibration PRR Prime	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Calibration PRR corrected for non-standard pressure losses upstream of the PPL tap
115	Calibration PLR Prime Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Calibration PLR Prime corrected for a fixed meter bias. This is the final theoretical PLR – including all corrections.
116	Calibration PRR Prime Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Calibration PRR Prime corrected for a fixed meter bias. This is the final theoretical PRR – including all corrections.
117	Calibration RPR Prime Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	RPR calculated from Calibration PLR PrimeZ and Calibration PRR PrimeZ. This is the final theoretical PRR – including all corrections.
118	K Loss	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Loss Coefficient including obstructions and extra distance (beyond 6D) of PPL tap downstream
119	Head Loss	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Head loss associated with K Loss [meter]
120	Inferred Traditional Dp	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Traditional Dp derived from recovery DP and PPL Dp. This value is only calculated if all three Dp's are measured.

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
121	Traditional Dp Error Percent	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Percent difference between inferred traditional DP and measured traditional Dp
122	Traditional Expansion Factor	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Expansion factor calculated for the traditional meter
123	Reynolds Number	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Reynolds number calculated at inlet conditions
124	Discharge Coefficient Cd	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Discharge Coefficient for the traditional meter calculated using ISO 5167-2 equation 4
125	Recovery Meter Coefficient Kr	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Meter coefficient for the recover meter
126	Recovery Meter Coefficient Kr Prime	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Recovery meter coefficient Kr corrected for non-standard pressure losses upstream of the PPL tap
127	Recovery Meter Coefficient Kr Prime Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Recovery meter coefficient Kr Prime corrected for a fixed meter bias. This is the final Kr – including all corrections.
126	PPL Meter Coefficient Kppl	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Meter Coefficient for the PPL meter
129	PPL Meter Coefficient Kppl Prime	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	PPL meter coefficient Kppl corrected for non-standard pressure losses upstream of the PPL tap
130	PPL Meter Coefficient Kppl Prime Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	PPL meter coefficient Kpplprime corrected for a fixed meter bias. This is the final Kr – including all corrections.
131	Diagnostic x1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, horizontal error of diagnostic point 1
132	Diagnostic y1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, vertical error of diagnostic point 1

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
133	Diagnostic x2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, horizontal error of diagnostic point 2
134	Diagnostic y2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, vertical error of diagnostic point 2
135	Diagnostic x3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, horizontal error of diagnostic point 3
136	Diagnostic y3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, vertical error of diagnostic point 3
137	Diagnostic x4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Normalized, horizontal error of diagnostic point 4
138	Raw x1 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the first averaging iteration
139	Raw x1 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 2nd averaging iteration
140	Raw x1 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 3rd averaging iteration
141	Raw x1 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 4th averaging iteration
142	Raw x1 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 5th averaging iteration
143	Raw x1 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 6th averaging iteration
144	Raw x1 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 7th averaging iteration
145	Raw x1 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 8th averaging iteration

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
146	Raw x1 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x1 from the 9th averaging iteration
147	Raw x2 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the first averaging iteration
148	Raw x2 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 2nd averaging iteration
149	Raw x2 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 3rd averaging iteration
150	Raw x2 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 4th averaging iteration
151	Raw x2 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 5th averaging iteration
152	Raw x2 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 6th averaging iteration
153	Raw x2 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 7th averaging iteration
154	Raw x2 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 8th averaging iteration
155	Raw x2 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x2 from the 9th averaging iteration
156	Raw x3 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3from the first averaging iteration
157	Raw x3 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 2nd averaging iteration
158	Raw x3 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 3rd averaging iteration

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
159	Raw x3 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 4th averaging iteration
160	Raw x3 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 5th averaging iteration
161	Raw x3 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 6th averaging iteration
162	Raw x3 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 7th averaging iteration
163	Raw x3 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 8th averaging iteration
164	Raw x3 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x3 from the 9th averaging iteration
165	Raw x4 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the first averaging iteration
166	Raw x4 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 2nd averaging iteration
167	Raw x4 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 3rd averaging iteration
168	Raw x4 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 4th averaging iteration
169	Raw x4 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 5th averaging iteration
170	Raw x4 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 6th averaging iteration
171	Raw x4 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 7th averaging iteration

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
172	Raw x4 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 8th averaging iteration
173	Raw x4 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	x4 from the 9th averaging iteration
174	Raw y1 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the first averaging iteration
175	Raw y1 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 2nd averaging iteration
176	Raw y1 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 3rd averaging iteration
177	Raw y1 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 4th averaging iteration
178	Raw y1 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 5th averaging iteration
179	Raw y1 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 6th averaging iteration
180	Raw y1 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 7th averaging iteration
181	Raw y1 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 8th averaging iteration
182	Raw y1 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y1 from the 9th averaging iteration
183	Raw y2 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the first averaging iteration
184	Raw y2 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 2nd averaging iteration

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
185	Raw y2 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 3rd averaging iteration
186	Raw y2 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 4th averaging iteration
187	Raw y2 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 5th averaging iteration
188	Raw y2 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 6th averaging iteration
189	Raw y2 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 7th averaging iteration
190	Raw y2 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 8th averaging iteration
191	Raw y2 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y2 from the 9th averaging iteration
192	Raw y3 1	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the first averaging iteration
193	Raw y3 2	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 2nd averaging iteration
194	Raw y3 3	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 3rd averaging iteration
195	Raw y3 4	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 4th averaging iteration
196	Raw y3 5	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 5th averaging iteration
197	Raw y3 6	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 6th averaging iteration

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
198	Raw y3 7	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 7th averaging iteration
199	Raw y3 8	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 8th averaging iteration
200	Raw y3 9	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	y3 from the 9th averaging iteration
201	Traditional to PPL Pressure Difference	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Error in PPL expressed in percent
202	Traditional to Recovery Pressure Difference	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Error in PRR expressed in percent
203	Recovery to PPL Pressure Difference	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Error in RPR expressed in recovery percent
204	Diagnostic Attempt Counter	RO	System	U32	4	0 to 4294967295	0	1.00	Number of times a diagnostic has been attempted
205	Diagnostic Completion Counter	RO	System	U32	4	0 to 4294967295	0	1.00	Number of times a diagnostic has completed successfully
206	Last Diagnostic Completion Timestamp	RO	System	U32	4	0 to 4294967295	0	1.00	Date/time of the last completed diagnostic [number of seconds since 01/01/1970]
207	Seconds Until Next Scheduled Diagnostic Run	RO	System	U32	4	0-4294967295	0	1.00	Countdown timer for scheduled execution of diagnostics
208	Program Status Code	RO	System	U16	2	0-65535	0.0	1.00	Numeric code indicating status of the program
209	Tap Type	RO	System	U8	1	0,1,2,10	0	1.00	Copy of (46,#,88). Valid values are: **0** = Orifice with flange taps **1** = Orifice with corner taps **2** = Orifice with D – D/2 taps **10** = Venturi
210	Average Count	RO	System	U8	1	0-9	0	1.00	Counter used for averaging of x and y output values

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
211	Alarm Byte	RO	System	U8	1	0 to 127	0	1.00	Packed representation of the alarm status of the four diagnostic points. bit0 indicates x1 Alarm bit1 indicates y1 Alarm bit2 indicates x2 Alarm bit3 indicates y2 Alarm bit4 indicates x3 Alarm bit5 indicates y3 Alarm bit6 indicates x4 Alarm bit7 is always 0 If the indicated diagnostic is greater than 1.0, the associated bit will be of value 1, otherwise, the bit will be zero. Example: Y1, X2, and x4 are greater than 1.0 but all others are less than 1.0 Value = binary 01000110 or decimal 70
212	Pattern Alarm Code	RO	User	UINT8	1	0-25, 255	255	1.00	A code indicating which pattern was matched to the diagnostic results
213	x1 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the x1 diagnostic
214	x2 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the x2 diagnostic
215	x3 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the x3 diagnostic
216	x4 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the x4 diagnostic
217	y1 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the y1 diagnostic
218	y2 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the y2 diagnostic
219	y3 Exception Byte	RO	System	UINT8	1	0,1	0	1.00	A value of 1 indicates an exception for the y3 diagnostic

Point Type 220: DPMD Configuration Parameters

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
220	L over D	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Actual distance to PPL tap made dimensionless by dividing it by the meter inlet diameter
221	Suggested Z	RO	System	FL	4	Any positive, non-zero IEEE floating point value	0.0	1.00	Value of PLR offset (Z) which will “zero” the meter for Prognosis FC
222	Meter UOM System	RO	System	UINT8	1	0,1,2	0	1.00	Copy of the units of measure system for the station (in ROC800 gas meter station structure) associated with the meter. Valid values are: **0** = U.S. units **1** = KPa **2** = Bar
223	Low Traditional DP Cutoff	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	0.00	If the traditional DP [in Pa] is below this value, DP diagnostic calculations will be suspended
224	Low Recovery DP Cutoff	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	0.00	If the recovery DP [in Pa] is below this value, DP diagnostic calculations will be suspended
225	Low Permanent DP Cutoff	R/W	User	FL	4	Any positive, non-zero IEEE floating point value	0.0	0.00	If the permanent DP [in Pa] is below this value, DP diagnostic calculations will be suspended

4.2 Program Status Codes and Messages

The following table describes program status codes and messages.

Code	Message	Suggested Corrective Action
0	OK	None required
1	SQRTof Neg, Rec Flow	Check recovery DP input
2	SQRTof Neg, PPL Flow	Check permanent DP input
3	Unsupported Mtr Type	Meter type must be orifice, Venturi, or cone
4	Allow Err Pct 0 PPL	Check allowable error percentages – they must be greater than zero
5	Flow Zero Traditnl	Check traditional DP input and meter configuration in the ROC meter
6	Allow Err Pct 0 REC	Check allowable error percentages – they must be greater than zero
7	Allow Err Pct 0 PPL3	Check allowable error percentages – they must be greater than zero
8	Flow Zero PPL	Check permanent DP input
9	Trad Dp Zero	Check traditional DP input
10	PPL Dp Zero,Y1	Check permanent DP input
11	Meter Area Error	Check meter size configuration in ROC meter
12	Trad Dp Zero,Ratios	Check traditional and permanent DP inputs
13	PlrCalprimeZ zero	Check PLR calculation method (advanced configuration)
14	PrrCalPrimeZ zero	Check PRR calculation method (advanced configuration)
15	RprcalPrimeZ zero	Check RPR calculation method (advanced configuration)
16	Max Accept a zero	Check allowable error percentages – they must be greater than zero
17	Max Accept b zero	Check allowable error percentages – they must be greater than zero
18	Max Accept c zero	Check allowable error percentages – they must be greater than zero
19	Tradnl Dp Source Err	Check meter DP input configuration in ROC meter
20	Must have two DPs	Check configuration of recovery and permanent DP inputs
21	No License	Obtain and install a license key for the softwarer
22	Kr Polynoml Coef Err	Check curve fit coefficients for Kr method (advanced configuration)
23	Kppl Polynml Coef Er	Check curve fit coefficients for Kppl method (advanced configuration)
24	Cd Polynoml Coef Err	Check curve fit coefficients for Cd method (advanced configuration)
25	Invalid Cd Method	Check Cd Method (advanced configuration)
26	Invalid Kr Method	Check Kr Method (advanced configuration)
27	Invalid Kppl Method	Check Kppl Method (advanced configuration)

Code	Message	Suggested Corrective Action
28	Invalid PLR Method	Check PLR Method (advanced configuration)
29	PLR Polynoml Coef Er	Check curve fit coefficients for PLR method (advanced configuration)
30	PRR Polynoml Coef Er	Check curve fit coefficients for PRR method (advanced configuration)
31	RPR Polynoml Coef Er	Check curve fit coefficients for RPR method (advanced configuration)
32	Ival PRatio Mtd Comb	Check Cd, Kr, Kppl, PLR, PRR, and RPR methods
33	DP too low for a run	Wait until flow through the meter increases or decrease meter restriction size to increase Dp values

4.3 Pattern Match Codes and Messages

The following table describes pattern match codes and messages.

Code	Message	Description
0	Within Acceptable Limits	Meter is performing correctly
1	Traditional DP is reading high	Error in the traditional DP reading. Sensor calibration, manifold valve, impulse line
2	Traditional DP is reading low	Error in the traditional DP reading. Sensor calibration, manifold valve, impulse line
3	PPL DP is reading high	Error in the permanent DP reading. Sensor calibration, manifold valve, impulse line
4	PPL DP is reading low	Error in the permanent DP reading. Sensor calibration, manifold valve, impulse line
5	One or more DP is in Error	Comparison of the three measured DPs is out of acceptable range
6	Recovery DP is reading low	Error in the recovery DP reading. Sensor calibration, manifold valve, impulse line
7	Recovery DP is reading high	Error in the recovery DP reading. Sensor calibration, manifold valve, impulse line
8	Condition 8	One or more of the following might be the cause: ▪ Disturbed Flow, may be over-reading or under-reading ▪ Unseated orifice meter (dual chamber, plate not fully wound down, leak under plate), under-reading or, any of the below that all cause an over-reading ▪ Partial blockage of orifice (relatively steady pattern for relatively steady flow, if blockage does not move) ▪ Inlet diameter entered too small (relatively steady pattern for relatively steady flow) ▪ Orifice diameter entered too large (relatively steady pattern for relatively steady flow) ▪ Wet gas flow (highly unstable DPs and associated diagnostic points)
9	Condition 9	One or more of the following might be the cause: Disturbed Flow, may be over-reading or under-reading or, any of the below that all cause an under-reading: ▪ Inlet diameter entered too large (relatively steady pattern for relatively steady flow) ▪ Orifice diameter entered too small (relatively steady pattern for relatively steady flow) ▪ Contamination (relatively steady pattern in the short term for relatively steady flow – can change over time as contamination increases or decreases) ▪ Buckled plate (relatively steady pattern for relatively steady flow) ▪ Worn edge plate (relatively steady pattern in the short term for relatively steady flow– change over time as wear increases) ▪ Backwards plate (steady pattern for relatively steady flow – extreme coordinates, points well outside box, more extreme than worn edge).

Code	Message	Description
10	Condition 10	One or more of the following might be the cause: ▪ the entered inlet diameter is too large ▪ the entered cone diameter is too small ▪ the entered kppl is too small
11	Condition 11	One or more of the following might be the cause: ▪ the entered inlet diameter is too small ▪ the entered cone diameter is too large ▪ the entered kppl is too high
12	Entry Cd Too High	Meter restriction size is incorrectly configured in the flow computer or Curve fit calculation for Cd is producing invalid values. Check coefficients.
13	Entry Cd Too Low	Meter restriction size is incorrectly configured in the flow computer or Curve fit calculation for Cd is producing invalid values. Check coefficients.
14	Entry Kr Too High	Curve fit calculation for Kr is producing invalid values. Check coefficients.
15	Entry Kr Too Low	Curve fit calculation for Kr is producing invalid values. Check coefficients.
16	Entry PLR Too Low	Curve fit calculation for PLR is producing invalid values. Check coefficients.
17	Entry PLR Too High	Curve fit calculation for PLR is producing invalid values. Check coefficients.
18	Entry PRR Too Low	Curve fit calculation for PRR is producing invalid values. Check coefficients.
19	Entry PRR Too High	Curve fit calculation for PRR is producing invalid values. Check coefficients.
20	Entry RPR Too Low	Curve fit calculation for RPR is producing invalid values. Check coefficients.
21	Entry RPR Too High	Curve fit calculation for RPR is producing invalid values. Check coefficients.
22	Condition 22	One or more of the following might be the cause: ▪ wet gas ▪ obstructed cone ▪ damaged cone
23	Condition 23	One or more of the following might be the cause: ▪ the entered inlet diameter is too small ▪ the entered throat diameter is too large ▪ the entered kppl is too small

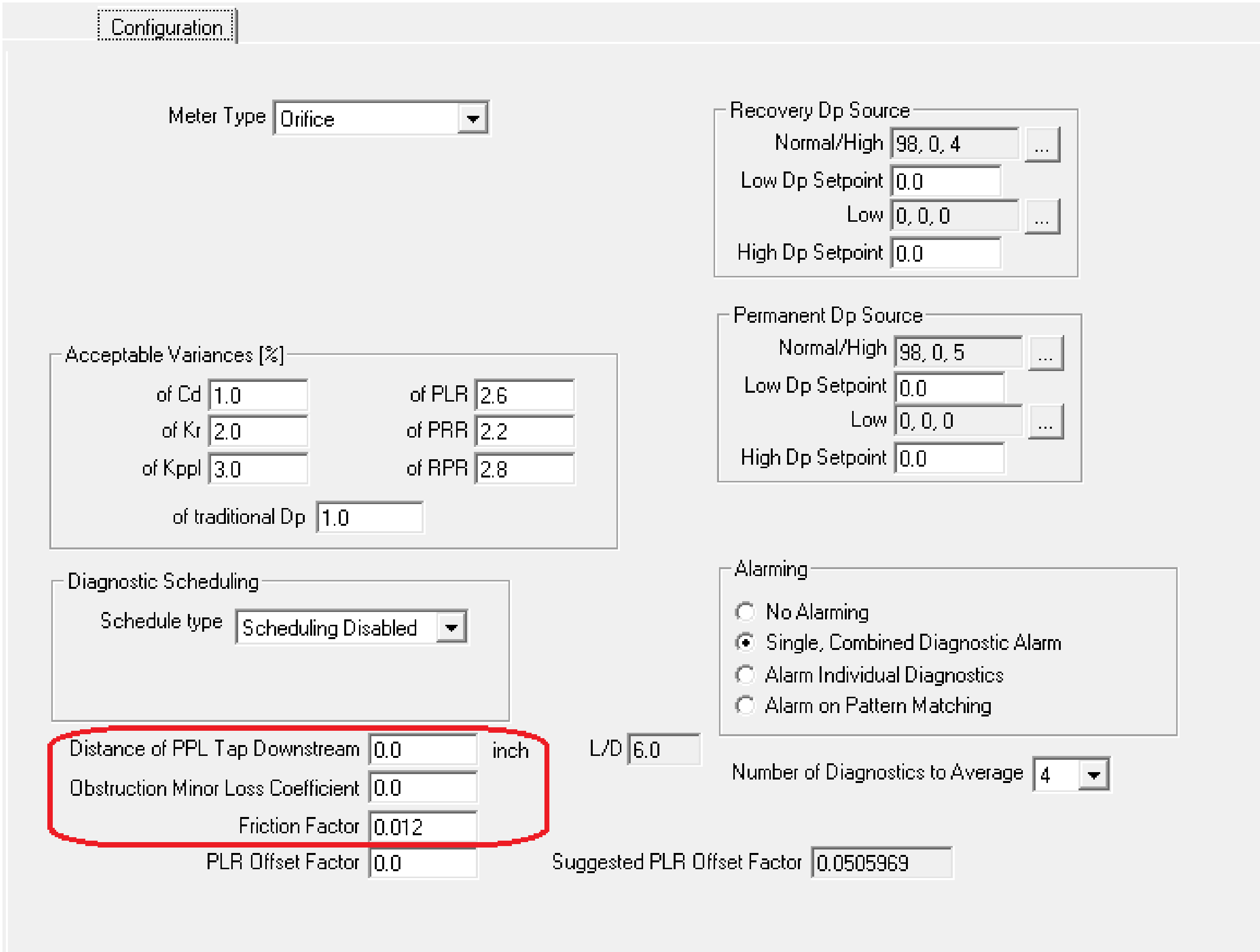
Code	Message	Description
24	Condition 24	One or more of the following might be the cause: ▪ the entered inlet diameter is too large ▪ the entered throat diameter is too small ▪ the entered kppl is too large
25	Possible Wet Gas	Wet gas induces “noise” in Prognosis FC signals. If the “number to average” parameter is configured high enough, this “noise” will be reduced by the averaging process. The values from the individual “runs” can be viewed via the values displayed on the “detail” tab (parameters 138 through 173) and the degree of variation can be observed.

4.4 Zeroing the meter for Prognosis FC

Certain characteristics of the meter run configuration and the gas can cause the pressure loss ratio of a DP meter to shift. Among these conditions are:

- Far downstream (permanent) pressure tap is more than the idea distance downstream
- A thermowell or other obstruction is installed upstream of the far downstream (permanent) pressure tap
- Wet gas

One way to account for the tap location and/or obstruction is to use knowledge of the meter configuration along with the configuration parameters provided.



Another option is to "zero the meter". This is done as follows:

- Insure (via inspection and calibration) that the meter is performing to specification
- Observe the **Suggested PLR Offset Factor** value displayed in the DP Diagnostic Program's **Configuration** tab
- Enter the suggested value into the **PLR Offset Factor** parameter on the DP Diagnostic Program's **Configuration** tab
- Apply changes

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visit *www.EmersonProcess.com/Remote/Support*.

Global Headquarters,
North America, and Latin America:
Emerson Automation Solutions
Remote Automation Solutions
6005 Rogerdale Road
Houston, TX 77072 U.S.A.
T +1 281 879 2699 | F +1 281 988 4445
www.EmersonProcess.com/Remote

Europe:
Emerson Automation Solutions
Remote Automation Solutions
Unit 8, Waterfront Business Park
Dudley Road, Brierley Hill
Dudley UK DY5 1LX
T +44 1384 487200 | F +44 1384 487258

Middle East/Africa:
Emerson Automation Solutions
Remote Automation Solutions
Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone – South 2
Dubai U.A.E.
T +971 4 8118100 | F +971 4 8865465

Asia-Pacific:
Emerson Automation Solutions
Remote Automation Solutions
1 Pandan Crescent
Singapore 128461
T +65 6777 8211 | F +65 6777 0947