Rosemount 3051S Advanced HART Diagnostics with a Field Communicator

INTRODUCTION

The purpose of this document is to explain the basics of configuring and using the Rosemount 3051S HART Advanced Diagnostics Pressure Transmitter with a 375 or 475 Field Communicator. The instructions are written around the Advanced Diagnostics DA2 option (3051S HDT Rev. 3). For more detailed information on 3051S Advanced Diagnostics, refer to the product user's manual 00809-0100-4801.

CONFIGURATION OF ADVANCED DIAGNOSTICS

The setup of Advanced Diagnostics is done within the Guided Setup menu of the Field Communicator. Enabling and configuring the Statistical Process Monitoring (SPM) diagnostic and the Power Advisory diagnostic will be explained here.

Configuring the SPM Diagnostic

To start the SPM Guided Setup, from the overview screen, use the menu keys:

Configure (2) > Guided Setup (1) > Diagnostics Setup (2) > Statistical Process Monitoring (1)

TAZ42HHx75E • **B** _ **D** × File Z File Zo ← ♡ 3051S Diag:FIT-140 0 » 🗈 🗙 -» 🗈 🗙 3051S Diag:FIT-140 Configure 1 Overview 1 Guided Setu 2 Manual Set 3 Alert Setup 2 Configure 3 Service Tools SAVE HOME SAVE TAZ42HHx75E • 6 _ C × TAZ42HHx756 * G _ D X File Zoom Tools Help \mathbf{H}^{\prime} ≫ 🗈 🗙 ← \mathbf{H}^{\prime} » 🗈 🗙 -3051S Diag:FIT-140 3051S Diag:FIT-140 Guided Setup Diagnostics Setup 1 Initial Setup 2 Power Advisory 3 Optional Configuration Process Alerts Service Alert SAVE HOME SAVE HOME

Figure 1. Starting SPM Guided Setup

You will be given a warning message that the control loop should be removed from automatic control. Click OK on the message. Note that configuring the Statistical Process Monitoring diagnostic will not affect the pressure measurement or analog output of the transmitter.

Figure 2. Warning Message

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3051S Diag:FIT-140		
WARN-Loop should be re	emoved from	
automatic control		
		1

Next, you will see the following message:

Turn SPM On or Off? Statistical Process Monitoring monitors process conditions to generate HART alerts or analog alarms (On).

Select the option "On" to activate the SPM diagnostic.

Figure 3. Activate SPM Diagnostic

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3051S Diag:FIT-140	
Turn SPM On or Off?	
Statistical Process Monitoring m	onitors 🛛 🔻
Off	
On	
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ABOF	RT ENTER



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Next, you will be asked what SPM variable you want to use for the detection. For most diagnostics applications, it is recommended to use "Stdev & Mean." For plugged impulse line detection in *varying* DP flow applications, it is recommended that you select the option "Coefficient of Variation."

Figure 4. Setting Up SPM Variable



Next, you will need to enter the sample window time for the SPM. This is the length of time over which the statistical values (e.g. mean and standard deviation) are calculated. A longer sample window will give a more stable and consistent value for standard deviation, but it will also take longer for the SPM to respond to an abnormal condition. A shorter window may make the diagnostic more prone to false detections. For many diagnostics applications, you can accept the default of 3 minutes.

Figure 5. Entering Sample Window Time

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30	3051S Diag:FIT-140																	
Sp pre	Specify window of time for SPM to sample pressure signal and calculate process noise (1 💌																	
3																		
<u>*</u>	q	w	е	r	t	y	u	i	0	p	ŧ		*	1	7	8	9	
Lock	а	s	d	f	g	h	j	k	Ι	,	@&	┢	-		4	5	6	FN
shift	z	x	C	۷	b	n	m				áü		+	0	1	2	3	
HELP DEL				AB	OR'	Г		E	N	Ē	ł							

Next, select the detection threshold (alert sensitivity) for Standard Deviation. You can start with a medium threshold, although, this can be adjusted later.

Figure 6. Selecting Detection Threshold for Standard Deviation

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File Zoom Tools Help		
<u>H</u> ///		
3051S Diag:FIT-140	1	
Configure alert sensitiv Deviation (Custom)	ity level for St	andard
Low		
Medium		
High Custom		
	ABORT	ENTER

Set the Detection Action (Alert or Alarm) for a standard deviation change. For most applications, the detection action should be set to Alert. Use "Alert Unlatched" if the HART alerts will be regularly monitored by the host system (e.g. AMS Alert Monitor). Use "Alert Latched" if the host system is likely to miss alerts due to slow HART polling rates.

Figure 7. Setting Detection Action for Standard Deviation Change

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File Zoom Tools Help			
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3051S Diag:FIT-1	40		1. J.
Configure action if S threshold is exceede	itandard Deviatio ed (Alert Unlatche	n aler ed)	4
None			_
Alert Latched			
Alarm Alert Unlatched			
	ABORT	EN	TER

Alternatively, the detection action can be set to "Alarm." This will cause the device to go into the Alarm state (e.g. driving the current to 3.5 mA or 23 mA) if the SPM diagnostic detects an abnormal condition. This option could be used for legacy host systems which cannot read digital HART alerts. However, note that the host system will not be able to determine which device alert has occurred. For example, both a failure in the pressure sensor and an SPM detection may cause the device to drive to alarm. The user will need to use a Field Communicator to determine the cause of the device alarm. Next, select both a Sensitivity Level and an Action for a Mean Change detection. It is recommended that the detection action be set to "Relearn" because if the process conditions (e.g. flow rate) change, this could also cause a change in the process dynamics (standard deviation). To avoid this causing a false detection, the SPM should learn the new process dynamics characteristics.

Figure 8. Selecting Sensitivity Level and Action for a Mean Change Direction

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<u>H</u>	A A	<u>H</u> ///					
3051S Diag:FIT-140		3051S Diag:FIT-140					
Configure alert sensitivity level for I (Custom)	Mean 🔺 👻	Configure action if Mean alert thresh exceeded (Relearn)	old is 🔺				
Low		None					
Medium		Alert Latched					
High		Alarm					
Custom		Relearn					
		Alert Unlatched					
ABORT	ENTER	ABORT	ENTER				

Finally, click OK at the message "Loop may be returned to automatic control" to complete the method.

Figure 9. Completing SPM Setup

TAZ42HHx75E		· · · · · ×
File Zoom Tools Help		
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3051S Diag:FIT-140		
NOTE-Loop may be retur control	ned to autor	natic 🔺
		Y

Configuring the Power Advisory Diagnostic

Configuration of the Power Advisory diagnostic can also be done within the Guided Setup menu. Use the menu keys to enable and configure the Power Advisory diagnostic:

Configure (2) > Guided Setup (1) > Diagnostics Setup (2) > Power Advisory (2)

IMPORTANT:

During the Loop Characterization the current output of the pressure transmitter will momentarily drive to 4 mA and 20 mA. Ensure that all operational procedures (e.g. placing control loop in manual mode) are followed before beginning the Loop Characterization.

Click OK to proceed with the Power Advisory configuration.

Figure 10. Power Advisory Configuration

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← <u>H</u> (\)	>>>		X		<u>H</u> ///		X
3051S Diag:FIT-140				3051S D	iag:FIT-140		
Diagnostics Setup				WARN-Lo	op should be re	emoved from	-
1 Statistical Process Mor	itoring			automatic	control		
2 Power Advisory							
3 Process Alerts							
4 Service Alert							
1							
1							_
L							7
SAVE	HOME					ABORT	ОК

Select "Yes" to perform the Loop Characterization. While the Characterization is in progress, you will see an hour glass icon on the screen.

Figure 11. Performing Loop Characterization

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<u>H</u>				<u>H′</u> \/ _/	
3051S Diag:FIT-140		3051	SD	iag:FIT-140	
Characterization required during fi	rst time 🔺	Char	acter	ization in Progress	s 🔺
installation or when loop has been	altered. 🔻				
1 No				—	
2 Yes				<u> </u>	
				(*)	
		J			7
ABORT	ENTER			ŀ	ABORT

After the Loop Characterization you will be shown the allowable range for the Voltage Deviation Limit, and then be asked to enter a value. You can accept the default of 1.5 V.

Figure 12. Entering Value for the Voltage Deviation Limit

TAZ42HHx75E	• • • X	🔜 TAZ42HHx	:75E		• <u>- </u>	
File Zoom Tools Help		File Zoom T	ools Help			
\mathbf{H}			<u>H</u> ///			
3051S Diag:FIT-140		3051S Dia	g:FIT-140			
Maximum allowable voltage deviat Minimum allowable voltage deviati	ion: 2.698 🔺 on: 1.000	Configure allowable voltage deviation limit (1.50 V) 1.50				
	K→ qwer lock asd f shiftzxcv	tyuio ghjkl bnm	p ← * /@& ← - áü +	/ 7 8 9 . 4 5 6 FN 0 1 2 3		
ABORT	ок	HELP	DEL	ABORT	ENTER	

Finally, set the Detection Action for the Power Advisory Diagnostic. The options are "Alert Latched," "Alert Unlatched," and "Alarm." In this example, we select "Alert Latched," Click OK to complete the method.

Figure 13. Setting the Detection Action for the Power Advisory Diagnostic

TAZ42HHx75E	*ID .ID X	TAZ42HHx75E	• 0 - 0 ×				
File Zoom Tools Help		File Zoom Tools Help					
HW	X	HW	m ×				
3051S Diag:FIT-140		3051S Diag:FIT-140					
Configure action if voltage limit ex (None)	ceeded 👘	NOTE-Loop may be returned t control	o automatic 🔄				
None							
Alert Latched							
Alert Unlatched							
			-				
ABORT	ENTER	AL	BORT OK				

ACCESSING THE ADVANCED DIAGNOSTICS INFORMATION

The following explains how to use the 375 or 475 Field Communicator to look at the details of an abnormal event detected by the 3051S Advanced Diagnostics after an alert or alarm is seen in the host system.

Checking the Device Status

After the Advanced Diagnostics capabilities have been configured, the diagnostic algorithms will operate continuously. If a diagnostic event (e.g. SPM High or Low variation or Power Advisory) is detected, then either a digital HART alert will be generated or the loop current will drive to the High or Low alarm value, depending upon which detection mode was configured. After connecting the Field Communicator, you will see a message indicating the alert that was detected. The Field Communicator continuously polls for device alerts, and whenever a device alert is present, this message will appear. Click "Yes" to ignore the next 50 occurrences of the alert and continue using the Communicator. This message will continue to show up periodically until the device alert condition is cleared.

Figure 14. Device Alert



Viewing the SPM Status and Variables

If an SPM Alert was detected the following steps can be used to view the trend of the SPM data and adjust the detection settings if necessary.

The current device status and alerts can be seen by navigating to:

Overview (1) > Status (1) > Device Status (1).

Figure 15. Locating Device Status



Select the device alert (e.g. High Variation Detected) and then select "Alert Description" to view the detailed information. For "High Variation Detected" the description includes a list of possible abnormal conditions that could cause this event.

Figure 16. Viewing Alert Description

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File Zoom Tools Help			File Zoom	Tools Help			
← <u>H</u> (\/)	>>>						
3051S Diag:FIT-140			3051S Diag:FIT-140				
High Variation Deter	cted		High Vari	ation Detected.		-	
1 Alert Description 2 High Detection Mes 3 Reset			Descriptio The trans the proce Possible - Entraine - Pump/va - Pulsatio	on: mitter has dete ss noise levels. Causes: rd air alve cavitation n	cted an incre	ease in	
SAVE	HOME				ABORT	ок	

Viewing a Trend of Statistical Variable

The following explains how to view a trend of an SPM Variable within a Field Communicator. Navigate to:

Shortcuts (3) > SPM Status (2) > Trends (4)

Figure 17. Viewing a Trend of an SPM Variable • 6 _ 0 × TAZ42 * G _ O X TAZ42HHx75 \mathbf{H}^{\prime} **>>>** 🗈 🗙 --**H**4// **>>> (** 3051S Diag:FIT-140 3051S Diag:FIT-140 Shortcuts Overview 1 Calibration 1 Status 2 Primary Purpose Variable 3 All Variables 4 View Logs 5 Device Information SAVE HOME SAVE HOME TAZ4 • 🖬 💶 🗶 🔳 TAZ421 * 6 _ O X - \mathbf{H}^{1} » 🖻 X \mathbf{H}^{1} » 🗈 🗙 -3051S Diag:FIT-140 3051S Diag:FIT-14 SPM Status Trends <mark>1 Standa</mark> 2 Mean 1 Detection Statu Statistical Values 3 Time Stamp SAVE HOME SAVE HOME

On the trends list, select the SPM variable that you want to view. Note that the Field Communicator does not have any process data storage capability. Once you open up the trend window, it will begin drawing the trend from the current point in time. You will see the trends for the baseline statistical value, current statistical value, and upper and lower limits.

To highlight a specific trend, select that trend from the drop-down menu.

Figure 18. Highlighting a Specific Trend



Setting New Sensitivity for SPM

To set new detection limits for the statistical process monitoring diagnostic, navigate to:

Configure (2) > Alert Setup (3) > Statistical Process Monitoring (1) > Detection Configuration (3) > Standard Deviation Detection Settings (1)

Figure 19. Setting New Detection Limits for the Statistical Process Monitoring Diagnostic

TAZ42HH	x75E		• <u> </u>	TAZ42HHx	75E	•	
File Zoom	Tools Help			File Zoom T	ools Help		
←	<u>H′</u> \/ _/	>>>>		←	\mathbf{H}^{\prime}	>>>	B X
3051S Dia	ag:FIT-140			3051S Dia	g:FIT-140		
Online				Configure			
1 Overview	/			1 Guided S	etup		
2 Configure	e			2 Manual S	etup		
3 Service 1	Fools			3 Alert Setu	ib D		
	SAVE				SAVE	HOME	
TAZ42HH×	:75E			TAZ42HH	x75E		• • • • • • • • • • •
File Zoom T	ools Help	-		File Zoom	Fools Help		
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3051S Dia	a:FIT-140			3051S Dia	ag:FIT-140		
Alert Setu	p			Statistica	I Process N	lonitoring	
1 Statistical	Process Mor	nitoring		1 SPM Stat	us		
2 Power Ad	lvisory Diagn	ostic		2 Baseline	Configuration		
3 Device Di	agnostics			3 Detection	Configuration	n	
4 Process A	lerts			4 Operational values			
J SEIVICE A	iens						
	SAVE	HOME		[SAVE	HOME	
		TAZ42HH	x75E		• B _ D X		
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		Detection	Configura	tion			
		1 Standard	Deviation De	etection Setti	ings		
	2 Mean Detection Settin				iigə		
			SAVE	HOME	1		

Then, select the option "Configure Sensitivity" and set a new sensitivity value as desired.

Figure 20. Setting New Sensitivity Value

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(<u>H (</u>)	>>>		X		<u>H</u>		ľ	×
3051S Diag:FIT-140					3051S Diag:FIT-140				
Standard Deviation Detection Settings					Select the sensitivity level for the Standard Deviation change				
1 Standard Deviation Medium									
2 Configure Se	ensitivity				1 High				
3 Action		Alert U	nlatch	ed	2 Medium	n			
4 Alert Delay 60 (0 to 3600 Sec.)			3 Low						
5 High Detection Mes				4 Custom					
6 Low Detection Mes									
HELP	SAVE	HOME					ABORT	ENT	rer

Viewing the Power Advisory Status

If the Power Advisory condition is active in the device, after connecting the Field Communicator, you will see a message indicating the "Power Advisory Diagnostic." Click "Yes" to ignore the next 50 occurrences of this diagnostics alert and continue using the Field Communicator. This message will continue to show up periodically until the device alert condition is cleared.

Figure 21.	Power Advisory Diagno	ostics Alert.					
	TAZ42HHx75E	• 6 _ O ×					
	File Zoom Tools Help						
	<u>H</u>						
	3051S Diag:FIT-140						
	1 non-zero status code(s) found. Ignore next 🔺 50 occurrences of status?						
	1. Power Advisory Diagnostic						
		~					
	YES	NO					

To see the current device status, use the menu sequence:

Overview (1) > Status (1) > Device Status (1)

Figure 22. Getting Current Device Status

TAZ42000x756						
← H/W	>>>	B	X	+	HVV	» h X
3051S Diag:FIT-14 Status		3051S Diag:FIT-140 Device Status: Maintenance				
1 Device Status: Main 2 Device Status: Advis		1 Refresh Alerts 2 Power Advisory Discussife				
3 Communications: Polled				3 Configuration Changed		
SAVE	HOME	1			SAVE	HOME

On the Device Status screen the current active alerts are listed.

To see the detailed information associated with this detection, select

Power Advisory Diagnostic (2) > Alert Description (1)

Figure 23. Viewing Alert Description

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g:FIT-140			
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ription			
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The alert description for Power Advisory Diagnostic will give a list of various conditions that could cause it to trip.

Figure 24. Alert Description



If the detection mode is set to either "Alert Latched" or "Alarm." after the condition that caused the alarm has cleared, you need to do a "Reset" to clear the alarm from the device. Note that after a Power Advisory detection, if the loop characteristics were changed as part of the remediation (e.g. new power supply or change wiring), it is necessary to repeat the Loop Characterization.

Figure 25. Resetting Alarm

TAZ42HHx75E	X TAZ42HHx75E	• 6 _ O X
File Zoom Tools Help	File Zoom Tools Help	
	<u>H</u> ∕∖/ _/	
3051S Diag:FIT-140	3051S Diag:FIT-140	
Power Advisory Diagnostic	Reset Alert	-
1 Alert Description	-	
2 Reset	1	
	1	
	1	
	1	
	1	-
SAVE HOME	ABORT	ОК

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