ROC800-Series Advanced Pulse Module

The Advanced Pulse Module (APM) for the ROC800-Series Remote Operations Controller (ROC800) provides advanced functionality commonly found in liquid and gas measurement applications. The DL8000, ROC809, and Series 2 ROC827 allow installation of APM modules in any module slot.

The APM supports different field devices based on various hardware switch settings. In some cases, you can "pair" pulse inputs for use with API 5.5 compliant Pulsed Data Fidelity and Integrity algorithms. All configurations support high-speed interrupt-driven detector switch inputs for use in proving applications.

Fuses have been eliminated on all input/output (I/O) modules through the extensive use of current-limiting short-circuit protection and surge protection techniques. This results in less maintenance for remote locations. The I/O modules are self-resetting after the fault clears.

You configure I/O points using ROCLINK™ 800 Configuration Software. Light-emitting diodes (LEDs) indicate the current status for each channel of the module.

All modules have removable terminal blocks for convenient wiring and servicing. The terminal blocks can accommodate a wide range of wire sizes up to 12 American Wire Gauge (AWG).

Each module provides 2500 volts dc of isolation from other modules and the backplane, including power and signal isolation. Each module has its own isolated power supply, protected from short circuits. This completely isolates the field circuitry from the backplane and the CPU while limiting current during a short-circuit. The module automatically recovers after the fault clears.

Densitometer Inputs

You can interface any pulse input channel to densitometer models with open-collector outputs, including Micro Motion 7835/7845, ITT Barton 668, UGC 278, and Sarasota FD960 densitometers. User-selectable hardware filtering is provided on channel 3 for use with the Micro Motion 7835/7845 densitometer.

Detector Inputs

During a meter proving operation, detector inputs start and stop the accumulated pulse counts. A positive-to-negative transition on either detector input generates a time-stamped interrupt with the 30-megahertz on-board processor. This interrupt is used in the pulse accumulation between the detectors as well as the pulse interpolation calculations. Pulse interpolation is calculated in compliance with API MPMS Chapter 4.6 recommendations for double chronometry measurement for pulse interpolation to achieve the accuracy required for small volume provers.

The module's detector input channels can be used with individually wired detector switches or detector switches that are wired in series from the prover on the same cable. The detector inputs can be used with relays, open-collector/open-drain type solid-state switches, and other two-state devices.

Examples of various APM configurations are given in the table below:

	Ch 1	Ch 2	Ch 3	Ch 4
Config 1	PI	PI	PI	PI
Config 2	PI	PI	PI	PO
Config 3	PI	PI	Densitometer Freq Input	PI
Config 4	PI	PI	Densitometer Freq Input	PO
Config 5	PI	PI	API Pair 2	
Config 6	API Pair 1		PI	PI
Config 7	API Pair 1		Densitometer Freq Input	PI
Config 8	API Pair 1		Densitometer Freq Input	PO
Config 9	API Pair 1		API Pair 2	

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Pulse Inputs

The four pulse input (PI) channels can be used for a number of applications. When used with dual pulse turbine meters, the APM can be used to create two API 5.5/ISO 6551, level B, C, D, and E compliant pairs or one API 5.5/ISO 6551 Level A compliant pair. Channel 3 can provide the hardware filtering to support the frequency input from a Micro Motion 7835/7845 densitometer. This hardware filtering is engaged into channel 3 by a hardware switch located on the module. Channel 4 can be designated as either a pulse input or a pulse output.

PI channels support up to 9 kHz inputs. The APM module processes the PI signals from pulse-generating devices and provides a calculated rate and an accumulated pulse total. PI channels are most commonly used to interface to relays or open-collector/open-drain type solid-state devices.

PI channels can interface to either self-powered or externally powered devices with signals up to 9 kHz. You can use a DIP switch setting on the module to place an optional 10 kΩ pull-up resistor in circuit per channel. If the pull-up resistor is engaged, then the PI channel supports externally powered open-collector and open-drain devices, as well as contact-closure devices. If the pull-up resistor is disengaged, then the PI channel supports 0 to 3 volt dc through 0 to 12 volt dc sourced square-wave input signals.

Pulse Frequencies

These values assume the API level is set the same for both pairs under the 4-Pulse Inputs column.

	2-Pulse Inputs	4-Pulse Inputs
Level A	2000 Hz	N/A
Level B	4000 Hz	2000 Hz
Level C	8000 Hz	4500 Hz
Level D/E	9000 Hz	5500 Hz

Pulse Output

The pulse output has been designed to provide a user-configurable output pulse based on either an input rate or an accumulation. The output signal occurs by switching a NPN transistor. The transistor output is an open-collector. You can use a DIP switch setting on the module to place an optional 10 k kΩ pull-up resistor in circuit. The 10 k kΩ pull-up resistor pulls the output to 12 V. Pull-up to 24 V requires an external resistor to +T. The maximum output frequency is 12000 Hz. You can designate channel 4 either as a pulse input or a solid-state pulse output.

Advanced Pulse Module (ROC800)

Field Wiring Terminals
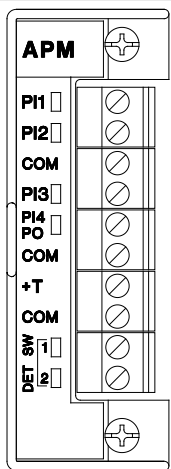
DOC0887A

Terminal	Label	Definition
1	PI1	Ch 1, Pulse 1, API PR 1
2	PI2	Ch 2, Pulse 2, API PR 1
3	COM	Module Common
4	PI3	Ch 3, Pulse 3, API PR 2
5	PI4/PO	Ch 4, Pulse 4, API PR 2
6	COM	Module Common
7	+T	Loop Power
8	COM	Module Common
9	DET SW 1	Detector Switch 1
10	DET SW 2	Detector Switch 2

Inputs

Pulse Inputs	Quantity	4 channels (channel 3 can provide the hardware filtering to support densitometer frequency input and channel 4 may be designated as pulse output)		
	Type	Common voltage source		
	Scan Period	Configurable (50 milliseconds to 60 seconds)		
	High Speed Input	2-Pulse Inputs	Level A	2000 Hz
			Level B	4000 Hz
			Level C	8000 Hz
			Level D/E	9000 Hz
		4-Pulse Inputs	Level B	2000 Hz
			Level C	4500 Hz
			Level D/E	5500 Hz
	Input Impedance	2 KΩ typical		
	Minimum On-State Input Voltage	2.4 Vdc		
	Maximum Off-State Input Voltage	0.4 Vdc		
	Pulse Count Accuracy	0.001%		
Densitometer Inputs	Minimum Frequency	100 Hz		
	Maximum Frequency	5 kHz		

	Frequency Accuracy	0.001%
Detector Switch Inputs	Quantity	2 channels
	Type	Interrupt triggered, common voltage source
	Maximum Input Overload Voltage	±24 Vdc, continuous

Outputs

Pulse Outputs	Quantity	1 channel (shares channel 4)
	Type	Open-collector switched, NPN transistor output
	Maximum Current	30 mA
	Maximum Frequency	12000 Hz

Isolation

Field to Logic	2500 Vdc, 1 minute minimum
Field to Power	2500 Vdc, 1 minute minimum
Module to Module	2500 Vdc, 1 minute minimum

Power

Consumption	Main power supply loading at the battery terminals:	
	12.0 Vdc	110 mA maximum over operating temperature range
Loop Power	+T Sensor Supply Current	35 mA nominal at 24 Vdc

Physical

Dimensions	26 mm W by 76 mm H by 133 mm D (1.02 in. W by 2.99 in. H by 5.24 in. D)
LEDs	Six green LEDs indicate the status of the I/O channels
Weight	79.3 g (2.8 oz)
Wiring	Up to 12 AWG (American Wire Gauge) at the removable terminal block

Environmental

Same as the unit in which it is installed

Approvals

Same as the unit in which it is installed

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