**Two Independent Channels with Full Isolation**

- **Zero and Span for Each Output**
- **Input and Output LoopTracker™ LEDs**
- **Output Test/Manual Override for Each Channel**
- **Built-In I/O Power Supplies**

### Applications

- Monitor and Control Motor or Line Speed
- Convert Speed and Frequency Signals

### Channel 1 Frequency Input Range

- Factory configured, specify input range
- **Frequency:** 0-25 Hz to 0-20 kHz
- Any waveform with 5 microsecond min. pulse, 100 mV min.
- amplitude change, 100 mV to 150 Vrms amplitude

### Channel 1 Sensor Power Supply

- 15 VDC ±10%, regulated, 25 mA, ±10 mVrms max. ripple

### Channel 1 Characteristics

- **Impedance at max. sensitivity:** 10 kΩ norm.
- **Impedance at min. sensitivity:** 100 kΩ norm.
- **Sensitivity/hysteresis adjustment:** Multi-turn potentiometer
- **Sensitivity/hysteresis range:** ±25 mV to ±2.5 V typical
- **Normal mode protection:** 200% of input rating
- **Common mode protection:** 600 V input to ground

### Channel 2 Frequency Input Range

- Factory configured, specify input range
- **Frequency:** 0-25 Hz to 0-20 kHz
- Any waveform with 5 microsecond min. pulse, 100 mV min.
- amplitude change, 100 mV to 150 Vrms amplitude

### Channel 2 Sensor Power Supply

- 15 VDC ±10%, regulated, 25 mA, ±10 mVrms max. ripple

### Channel 2 Characteristics

- **Impedance at max. sensitivity:** 10 kΩ norm.
- **Impedance at min. sensitivity:** 100 kΩ norm.
- **Sensitivity/hysteresis adjustment:** Multi-turn potentiometer
- **Sensitivity/hysteresis range:** ±25 mV to ±2.5 V typical
- **Normal mode protection:** 200% of input rating
- **Common mode protection:** 600 V input to ground

### LoopTracker

- Variable brightness LEDs indicate I/O levels for each channel

### Channel 1 and Channel 2 Output Ranges

- Factory configured, specify for each output channel
- **Voltage:** 0-1 VDC to 0.10 VDC, 10 mA max.
- **Bipolar voltage:** ±1 VDC to ±10 VDC

### Output Calibration

- Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

### Output Characteristics

- **Linearity:** ±0.1% of span
- **Temperature stability:** Better than ±0.04% span/°C
- **Output ripple and noise:** Less than 10 mV RMS

### Isolation

- Full 5-way, 1200 Vrms minimum

### Output Loop Power Supplies

- 20 VDC nominal, regulated, 25 mA for each output channel
- May be selectively wired for sinking or sourcing mA output

### Output Test

- Front buttons set each output to test level when pressed
- Each test level potentiometer adjustable 0-100% of span

### Installation Environment

- Mount vertically to a 35 mm DIN rail
- For use in Pollution Degree 2 Environment
- IP 40 housing, requires installation inside an enclosure
- −10°C to +60°C operating ambient

### Connectors

- Eight 4-terminal removable connectors, 14 AWG max wire size

### Power

- 85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum
- D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum

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### Description

The APD 2077 DuoPak accepts two frequency inputs and provides two optically isolated DC voltage or current analog outputs that are linearly proportional to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

### Output Sink/Source Versatility

Standard on the APD 2077 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sourcing or sinking allowing use with any combination of powered or unpowered milliamp I/O devices.

### How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order.

### Channel 1 Output range

- **Channel 1 input range**
- **Channel 2 input range**
- **Channel 1 output range**
- **Channel 2 output range**

### LoopTracker

- API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a quick visual picture of your process loop at all times and can greatly aid in saving time during initial startup and troubleshooting.

### Output Test/Manual Override

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

### Options and Accessories

#### Options

- **Options—add to end of model number**
  - **R1** Channel 1 I/O reversal (i.e. 20-4 mA out)
  - **R2** Channel 2 I/O reversal (i.e. 20-4 mA out)
  - **R3** Channel 1 and channel 2 I/O reversal
  - **M19** Channel 1 high voltage output >10 V up to 20 V
  - **M29** Channel 2 high voltage output >10 V up to 20 V
  - **M39** Channel 1 and channel 2 high voltage output
  - **U** Conformal coating for moisture resistance

#### Accessory—order as separate line item

- **API BP4** Spare removable 4 terminal plug, black

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**Duolink Two Channel Signal Converter/Isolator/Transmitter, Factory Ranged**

**APD 2077**

- **85-265 VAC, 60-300 VDC model only**
- **85-265 VAC, 50/60 Hz or 60-300 VDC**
- **9-30 VDC or 10-32 VAC**

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**Absolute Process Instruments**

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Precautions
WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See diagram for terminal designations and wiring examples. Consult factory for assistance. WARNING! Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.

Precautions
ATTENTION! Tout le câblage doit être effectué par un électricien ou ingénieur en instrumentation qualifié. Voir le diagramme pour désignations des bornes et des exemplaires de câblage. Consulter l’usine pour assistance. ATTENTION! Eviter les risques de choc! Fermez le signal d’entrée, le signal de sortie et l’alimentation électrique avant de connecter ou de déconnecter le câblage, ou de retirer ou d’installer le module. API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. See api-usa.com for latest product information. Consult factory for your specific requirements.

WARNING! This product can expose you to chemicals including nickel, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Electrical Connections
Polarity must be observed for signal wiring connections. If the input and/or output do not function, check wiring and polarity. Each product is factory configured to your exact input and output ranges as indicated on the serial number label.

Outputs
For milliamp ranges determine if your devices provide power to the current loop or if the loop must be powered by the APD module. Typical voltage may be 8–24 VDC at your device’s terminals if it provides power to the loop.

Mounting to a DIN Rail
Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1” (25 mm) above and below housing vents for air circulation.

1. Tilt front of module down and position the lower spring clips against the bottom edge of DIN rail.
2. Push front of module upward until upper mount snaps into place.

Removal
Avoid shock hazards! Turn signal input, output, and power off.
1. Push up on bottom back of module.
2. Tilt front of module down to release upper mount from top edge of DIN rail.
3. The module can now be removed from the DIN rail.

Output Calibration
Input and output ranges are factory pre-configured (at 24°C ±1°C). Zero and Span potentiometers are used to calibrate the output to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time. An accurate frequency calibration source such as a signal generator may be required for calibration.
2. Provide an input to the module equal to the minimum input required for the application. In the most cases this will be 0 Hz.
3. Using an accurate measurement device for the output, adjust the Zero screwdriver for the exact minimum output desired. The Zero control should only be adjusted when the signal input is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4–20 mA output or –10 V for a ±10 V output.
4. Set the frequency to the maximum required input for the application.
5. Using an accurate measurement device for the output, adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
6. Repeat adjustments for each channel for maximum accuracy.

Sensitivity Adjustment
This multi-turn potentiometer provides an adjustable threshold level that the incoming signal must exceed before an output can be produced. This is used to limit noise and minimize false input signals that may cause erroneous readings.

Fully clockwise: (max. sensitivity) input threshold is ±25 mV.
Fully counterclockwise: (min. sensitivity) input threshold is ±2.5 volts.

Output Test Function
When a Test button is depressed it will drive the output with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal. They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

Each Test Cal. potentiometer can be adjusted to set the test output from 0 to 100% of the output span. Press and hold the Test button and adjust the corresponding Test Cal. potentiometer for the desired output level.

Operation
The APD 2077 accepts two input frequencies and provides two optically isolated DC voltage or current analog outputs that are linearly proportional to the inputs.

Each input frequency is capacitively coupled (to remove any DC component at the input) to a comparator whose threshold is determined by the setting of the sensitivity control. The output from the comparator passes through an opto-coupler to the output stage. Green LoopTracker® input LEDs provide a visual indication that a signal is being sensed by the input circuitry of each channel. The LEDs illuminate when the input is sufficiently large to trigger the input comparator depending on the input sensitivity adjustment.

They also indicate the input signal range by changing in intensity as the frequency changes from minimum to maximum. If an LED fails to illuminate or change in intensity as the frequency changes, it may indicate a problem with module power, signal input, or wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

Red LoopTracker output LEDs provide a visual indication that the output signals are functioning. Each becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

Inputs, Frequency
The input ranges are pre-configured at the factory. No input calibration is necessary. The frequency input is compatible with most types of sensors that produce a minimum 100 mV amplitude change and a minimum 0.5 microsecond pulse width. A 15 VDC supply is available to power the sensor if required. Always refer to the sensor manufacturer’s data sheet to determine supply voltage compatibility and proper wiring.

Sensor Load
The frequency signal input is capacitively coupled to prevent any DC in the input. Some sensors, typically those without an internal load resistor, require a resistive load in order to function. The resistor value may be specified by the sensor manufacturer as the “minimum resistive load” or calculated from the sensor manufacturer’s specified “load current range”.

The 15 VDC power supply is capable of providing 25 mA. A load current range of 3 mA to 25 mA would typically use a 5 kΩ to 500 Ω resistor.

Module Power Terminals
Check label for module operating voltage to make sure it matches available power. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

When using DC power, either polarity is acceptable, but for consistency, wire positive (+) to terminal 25 and negative (–) to terminal 28.