

## SafetyNet IO Modules

SafetyNet IO Modules interface to safety system field wiring via Field Terminals. The IO Modules and the Field Terminals mount on Carriers that provide mechanical support, but also connect the internal communication bus and power supply connections to the Modules. The IO Modules are certified as suitable for use in SIL 2 safety-related applications.

- **Certification**

The SafetyNet IO Modules are certified for use in safety-related applications up to and including SIL 2. The SafetyNet System achieves this certification with a 1oo1D architecture. The SafetyNet IO Modules have been designed specifically for safety-related applications and are certified on the basis of the excellence of their design. The certification does not depend on "proven in use" data.

- **Diagnostics**

The IO Modules perform comprehensive internal diagnostic tests as an essential part of ensuring that the IO can carry out the required safety function. If the SafetyNet IO Module's internal diagnostics detect a fault that would prevent the SafetyNet System from carrying out its safety function,

then it will initiate a controlled shutdown. A controlled shutdown has two objectives – firstly, to ensure that the IO Module enters its failsafe mode; and secondly, to record sufficient data to allow the reason for the shutdown to be determined. If a SafetyNet Module enters a controlled shutdown, then all IO channels are deactivated: input channels are not scanned; and output channels are de-energized.

- **Bussed Field Power**

The Bussed Field Power (BFP) connectors on the rear of IO Module Carriers provide the power connections for field instruments wired to the IO Modules. For the SafetyNet System, BFP must be 24 VDC and supplied by MTL's 8914-PS-AC units. These power supplies may be used in redundant pairs, if required.

- **Live Maintenance**

SafetyNet IO Modules can be removed and replaced in a Class 1, Division 2 or Zone 2 hazardous area - once the relevant Bussed Field Power (BFP) connection has been isolated using an appropriate hazardous area switch (such as the MTL951). Removing and replacing the Modules does not interrupt the operation of the other parts of the node. If a Module is replaced by another Module of identically the same type, then no intervention is required for the System to begin operating normally once the Bussed Field Power is restored.

- **Line Fault Monitoring**

In addition to the comprehensive internal diagnostics the SafetyNet IO Modules can monitor field wiring for line faults.

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- **Event Logging**

Data from SafetyNet IO Modules can be time stamped and stored by the SafetyNet Controller before being downloaded to the PAC8000 SOE Data Retrieval Client or a 3rd party historian package. SafetyNet IO Module data is time stamped with a resolution of better than 200ms.

- **Failsafe Mode**

IO Modules will enter Failsafe Mode from the Running State either due to loss of communications with the Controller or because the module has received an instruction from the Controller to enter the Failsafe State. In this state:

- The Red Fault LED is lit
- The IO Module is flagged as unhealthy to the Controller
- All Railbus Write requests are rejected, except instructions to Reset or to exit the Failsafe State
- Inputs and HART data are read
- Outputs are de-energized
- Background diagnostics continue and if a failure is detected, the module will enter Controlled Shutdown

- **Controlled Shutdown**

A Controlled Shutdown is carried out if a fault is detected in the Module. In this state it can communicate the reason for shutdown.

- **LEDs**

A number of LEDs are provided on each IO Module to provide visual indication of the status of the Module, its channels and its power supply.

- **Module 'Fault' LED (red)**

- On - Failsafe
- Off - Normal operation Flashing (equal:mark space ratio) - Cold start in process, will flash until communication is established with SafetyNet Controller.
- Blinking (On for a short period, then On for a longer period - morse code 'a') - Fault state after controlled shutdown

- **Module 'Power' LED (green)**

- On - Power OK
- Off - BFP or Railbus Power Failure

- **Module 'Channel' LED's (yellow)**

- See Individual Module Specifications.

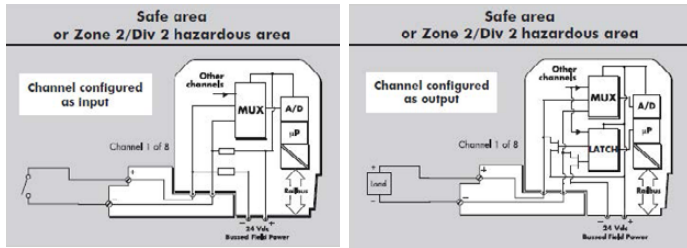
## Publication Reference Chart

GFA-1779	PAC8000 2/x Series Modular I/O
GFA-1769	PAC8000 Carriers and Field Terminals

**SafetyNet Discrete Input/Output Module**

SafetyNet Discrete Input/Output Module features:

- 8 inputs - any combination of inputs and outputs
- Certified for use in SIL 2 safety applications
- Non-arcing inputs and outputs
- Output channels rated up to 2A continuous
- Inputs for dry contact switches
- 24Vdc Bussed Field Power required from 8914-PS-AC



**8811-IO-DC**

<b>Product Name</b>	<b>24Vdc, Non-isolated Discrete Input/Output Module</b>
<b>Lifecycle Status</b>	Active
<b>Number of Channels (independently configured as inputs or outputs)</b>	8
<b>Inputs</b>	
<b>ON/OFF Threshold Current</b>	0.9mA (typ.)
<b>O/C Voltage</b>	24 VDC (typ.) - depends on BFP Supply
<b>Wetting Current</b>	1.2mA (typ.)
<b>Minimum Pulse Width Detected</b>	5ms
<b>Max Input Frequency in Pulse Counting Mode (no debounce)</b>	30Hz
<b>Isolation (any channel to Railbus)</b>	250 VAC
<b>Outputs</b>	
<b>Maximum Output Current per Channel</b>	2A
<b>Maximum Output Current per Module - Continuous</b>	6A
<b>Maximum Output Current per Module - Non-continuous (&lt;10 seconds)</b>	8A
<b>Input Configurable Parameters</b>	
<b>Filter Time Interval</b>	0 to 8s (in 1ms steps)
<b>Earth Leakage Detection Channel</b>	ON/OFF
<b>Latch Inputs</b>	enable /disable
<b>Latch Polarity</b>	latch on high/latch on low
<b>Pulse Counting</b>	up transition/down transition/disable
<b>Line Fault Detection</b>	none/open circuit/open & short circuit
<b>Output Configurable Parameters</b>	
<b>Output Type</b>	pulse/discrete/pattern
<b>Pulse Width</b>	1ms to 60s
<b>Line Fault Detection<sup>†</sup></b>	open line & short circuit detect /disable
<b>Resistance Measurement Accuracy</b>	
<b>For Normally De-energized Output Open and Short-circuit Detection.</b>	
<b>With forward biased test current</b>	$\pm(3.4\%+5.3\text{ohm})$ for line resistance $\delta$ 220ohm greater of: $\pm 7\%$ or $\pm(3.1\%+27\text{ohm})$ for line resistance $>220\text{ohm}$ , $<1\text{kohm}$
<b>With reverse biased test current</b>	greater of: $\pm 7\%$ or $\pm(3.1\%+430\text{ohm})$
<b>Response Time</b>	
<b>Input Signal Change to Availability on Railbus</b>	5ms (max.)
<b>Railbus Command to Output Change</b>	1ms (max.)
<b>Hazardous Area Specification</b>	
<b>Protection Technique</b>	EEx nA nL IIC T4
<b>Location (FM and CSA)</b>	Class 1, Div.2, Grps A,B,C,D T4
<b>Power Supplies</b>	
<b>System Power Supply</b>	50mA (typ.), 70mA (max.)
<b>Bussed Field Power Supply</b>	
<b>All Channels Configured as Inputs</b>	50mA (max)
<b>Any Channels Configured as Output Currents</b>	50mA + output load
<b>Module key code</b>	B6
<b>Module Width (mm)</b>	42
<b>Weight (g)</b>	210