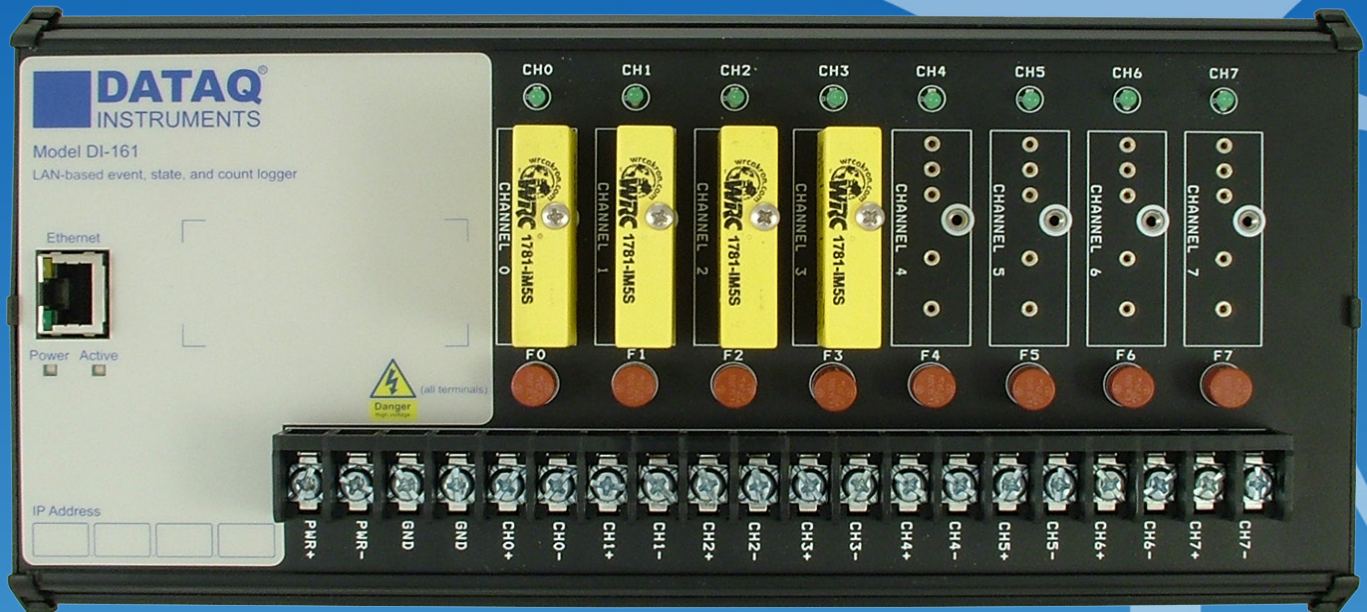


# DI-161 LAN-based Event Data Logger



- ✓ Measures how long, how many, and when events occur
- ✓ Perfect as an OEE (Overall Equipment Effectiveness) data logger
- ✓ Adapts to a wide range of signal types
- ✓ LAN-based for easy deployment, singularly or in groups
- ✓ Includes server-side software to aggregate and report results

## DI-161 Event Data Logger Description

Model DI-161 is a data logging device that records accurate information about electromechanical-based operation and performance. The instrument applies one of three modes to automate the measurement of process activity:

- Events – when something happened
- States – how long something happened
- Counts – how many happened

In general applications the DI-161 acts as a state change and on/off data logger. Examples include the reporting of activity involving motors, pumps, fans, refrigeration units, flow sensors, and more.

In a more narrow sense the DI-161 can develop a complete picture that describes all the variables needed to quantify overall equipment effectiveness (OEE):

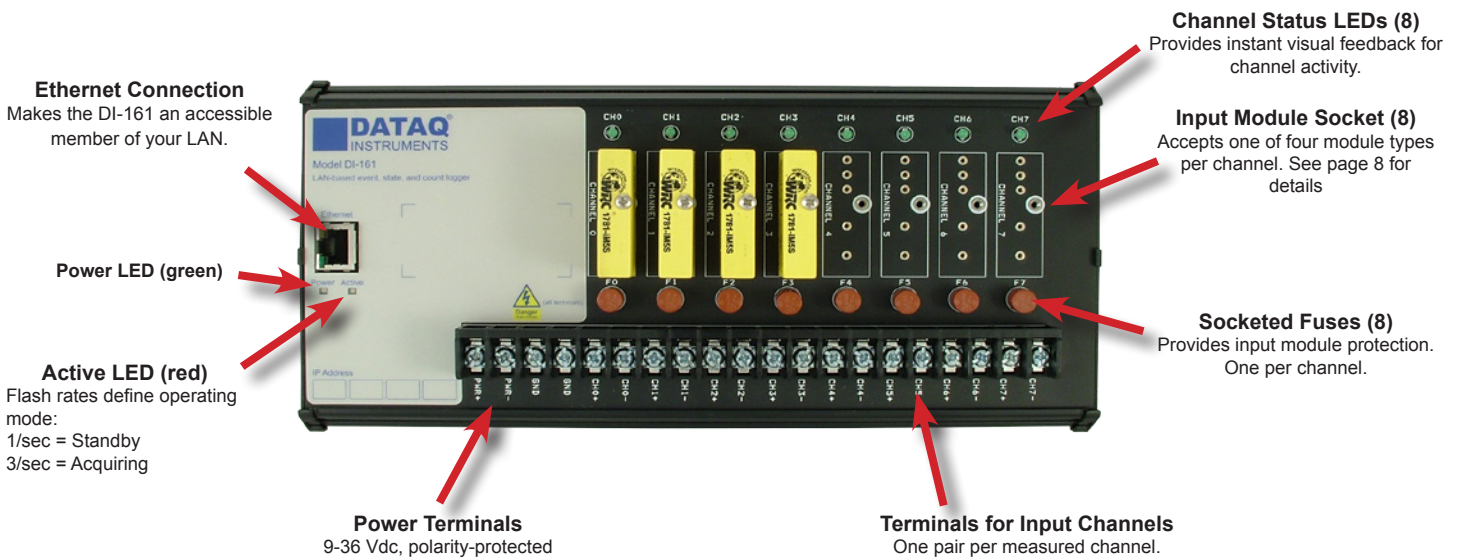
- Actual operating time
- Actual production rate
- Total units produced
- Defective units produced

In many applications a range of existing control signals may be paralleled with the DI-161 to derive desired OEE metrics. For example, if power is applied to a machine whenever it is available for production, that same signal can be applied to a DI-161 channel and configured for the State mode to allow the DI-161 to report Actual Operating Time. Likewise, a sensor that produces a pulse when a completed part is ejected by a machine can be applied to a channel configured for the Count mode to derive Total Units Produced and Actual Production Rate. The flexibility of the DI-161 allows an almost endless range and combination of measured metrics.

The DI-161 is an Ethernet-based, eight-channel, DIN rail-mounted device that can be easily configured without programming to monitor any process. Its eight channels accommodate signal isolators (not included) that allow you to connect the DI-161 to virtually any process signal type with complete safety, from 24- to 280-Vrms/VDC control signals.

Each DI-161 channel can be independently enabled or disabled. Channels may also be configured to detect an event, state, or count on either the rising or falling edge, so the DI-161 adapts to your process requirements and not the other way around. Results from all enabled channels are reported continuously, each with a time and date stamp, at a configurable report interval that ranges from once every 100 mS to once every 198 days in 4 mS increments. And expansion is easy with the DI-161. A built-in Ethernet interface allows the DI-161 to easily integrate with existing LAN access points, and permits multiple DI-161s in any number to be deployed wherever and whenever they are needed.

## DI-161 Event Data Logger Close-up



## DI-161 Event Data Logger Features

### Built-in Ethernet Interface

The DI-161 supports DHCP and fixed IP address configurations, so it adapts easily to any existing or proposed LAN. Network support also provides the ability to easily expand your deployment to multiple DI-161s and the potential to store data files to any server, local or remote.

### Configurable for event, state, and count functions per channel

All bases are covered with the flexibility offered not only by an eight-channel device, but also with the ability to configure each channel independently for the range of metrics your application demands.

### Active rising- or falling-edge selections per channel

Does a count increment when a signal transitions from low to high, or high to low? Is a machine or process considered to be active when the defining signal is high or low? Leading or falling edge-triggering allows you to configure the correct true and false states for each channel independently.

### Flexible report interval of once every 100 mS to 198 days in 4 mS increments

The report interval defines how often the DI-161 reports states, events, and counts, and it defines the granularity of the results. Very rapid processes, characterized by fast cycle times and part ejections may benefit from a faster report interval. The opposite is true for slower processes. The DI-161 can adapt to both extremes, and everything in between.

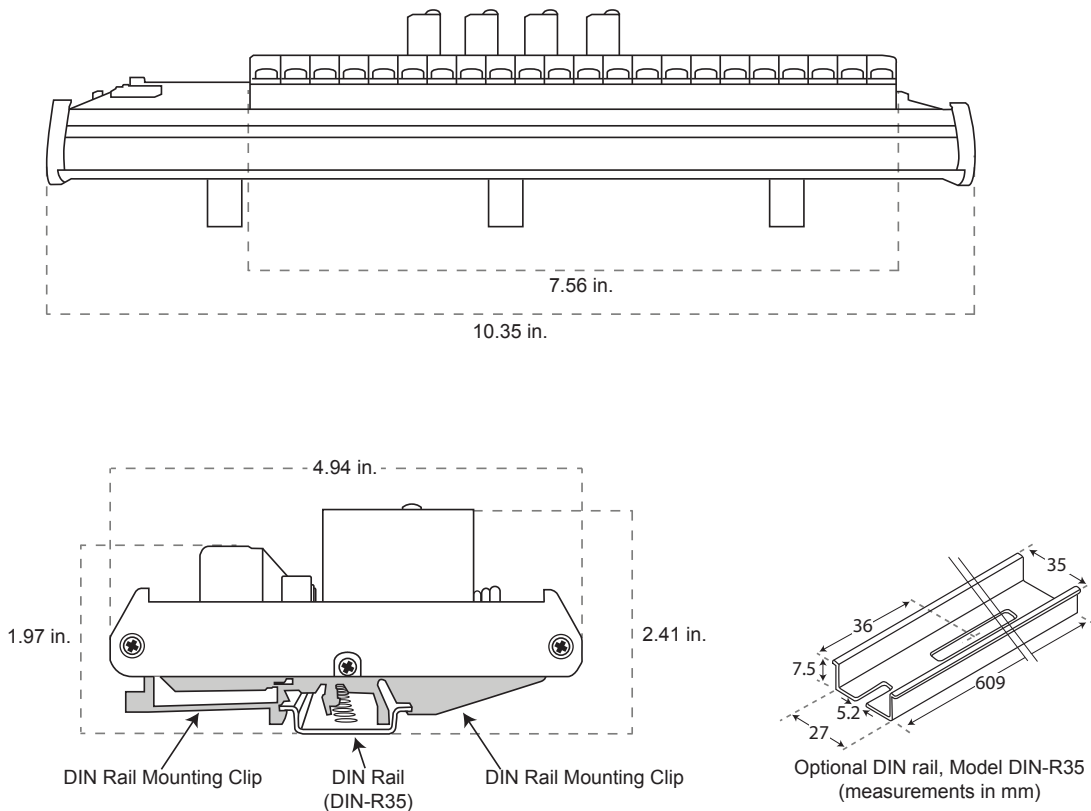
### Reports a date and time stamp with each interval

The date and time associated with any given report interval is critical to the process of forming a complete process picture. For example, results may be correlated with scheduled and unscheduled down time, re-tooling, and even differing efficiencies of personnel.

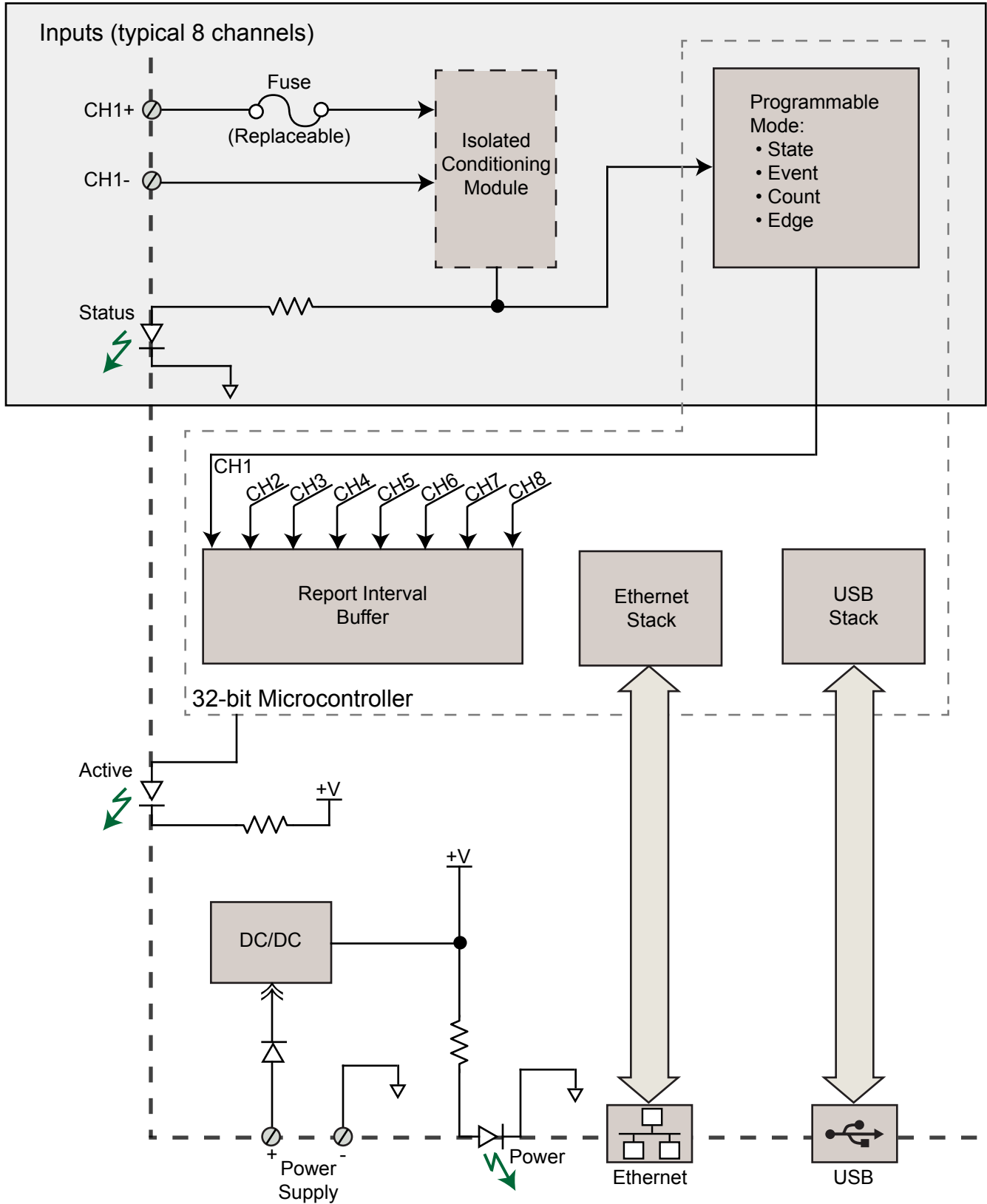
### Connects to any signal type from 10 to 280 Vrms/DC

Any given process is controlled by an array of signal types of various amplitudes and frequencies, each describing a vital component of the overall activity. The DI-161 adapts to virtually any signal source to keep customization minimal and enhance the speed of deployment.

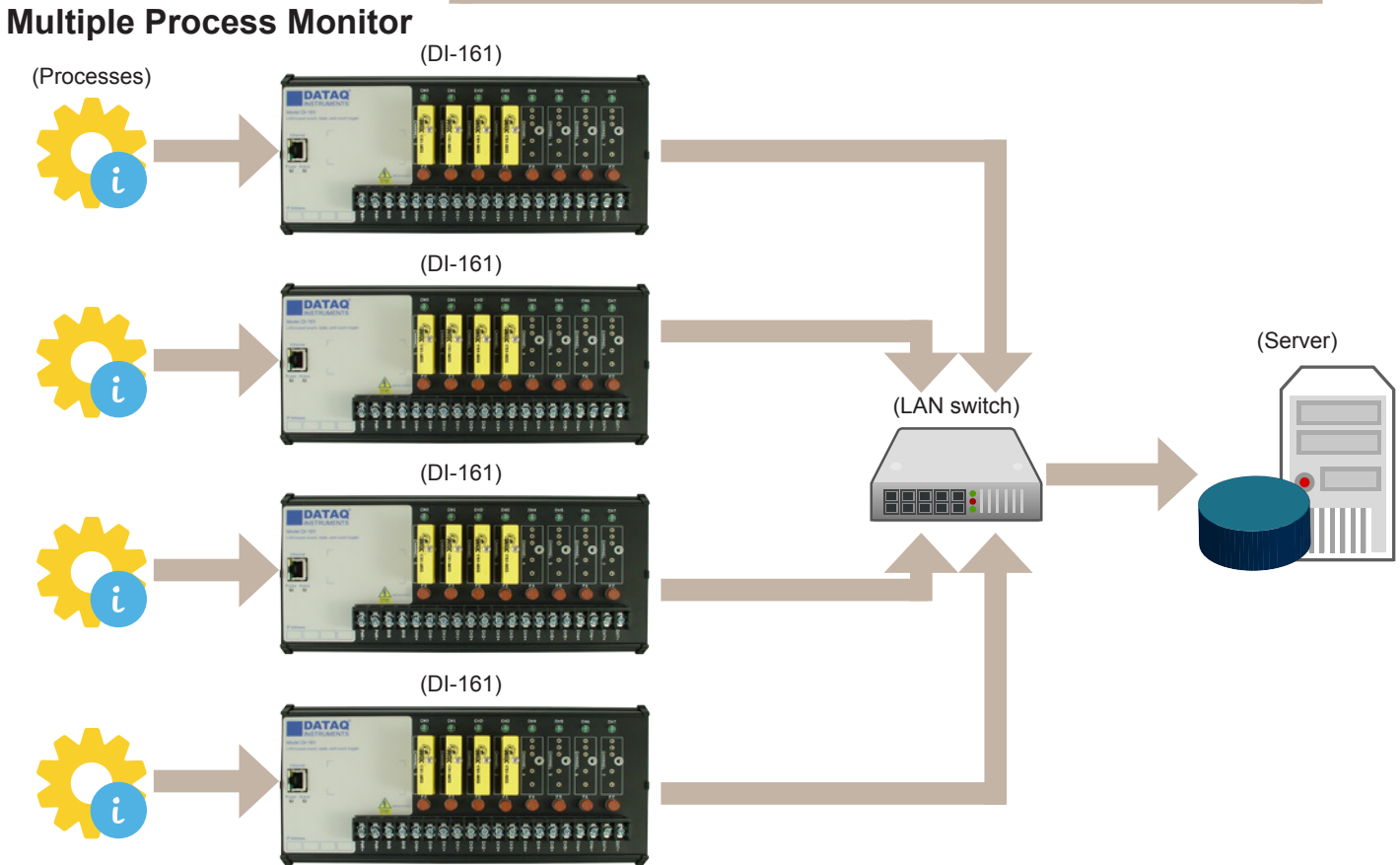
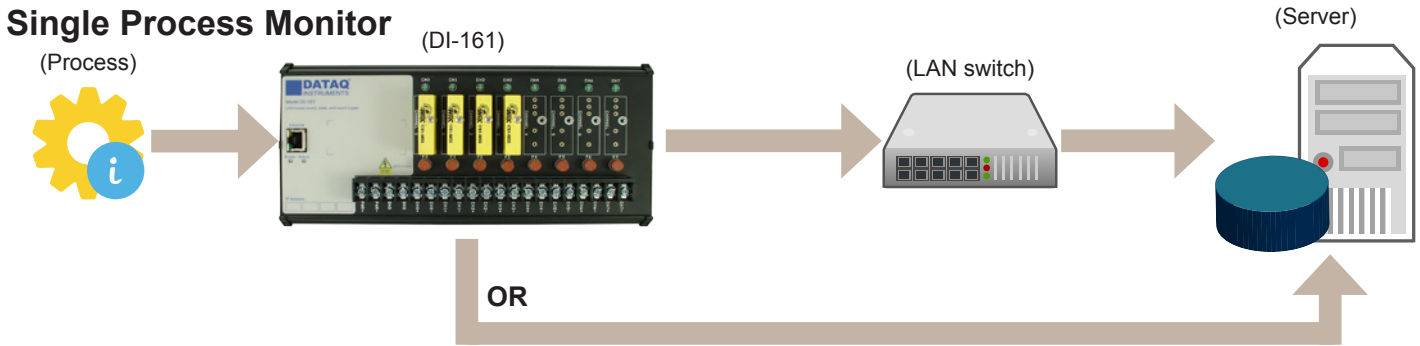
## DI-161 Event Data Logger Dimensions



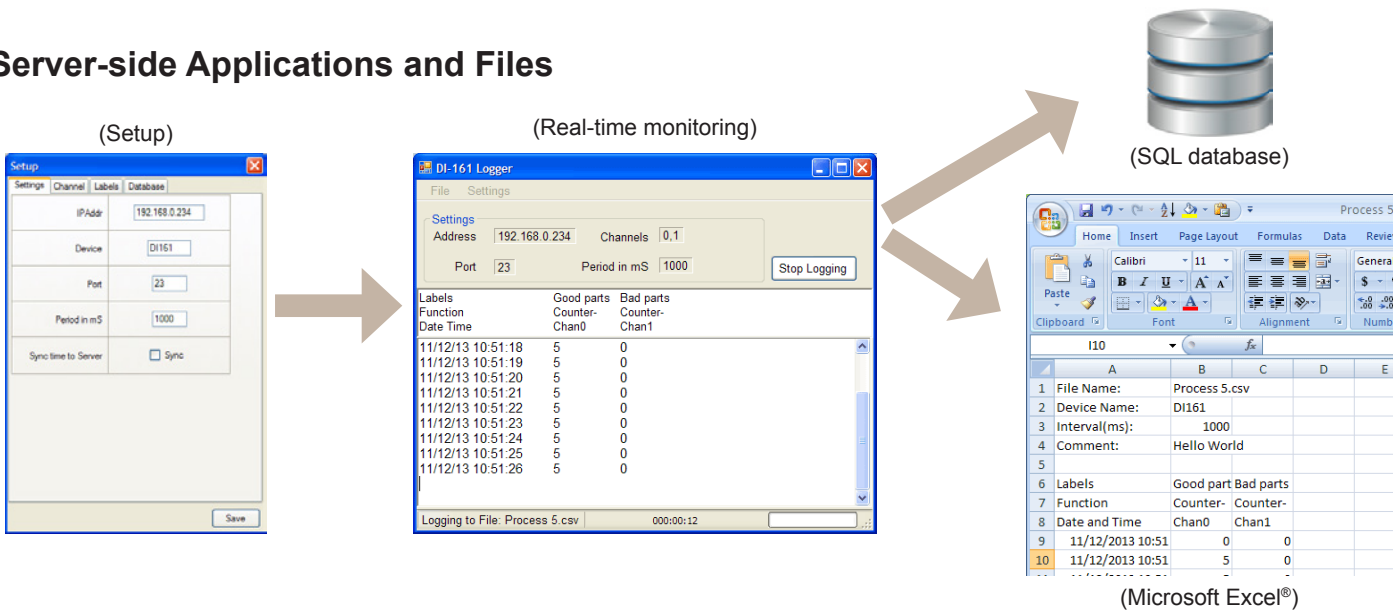
# DI-161 Event Data Logger Block Diagram



# Typical DI-161 Deployments



## Server-side Applications and Files



DI-161 hardware provides everything you need for reliable OEE and state-change measurements from any source. From signal conditioning to final results, the DI-161 forms a complete solution to return a reliable measurement of process variables over any required time period. Reported data points are time and date-stamped for clarity and easy correlation.

## Programmable Report Interval

The DI-161 allows a wide range of report resolutions to be configured per board, ranging from very granular to very coarse. Report updates may be delivered as often as once every 100 mS and as infrequently as once every 198 days. Complete flexibility and precision is supported by allowing you to program the interval anywhere within this range with 4 mS resolution. Reports for up to eight enabled channels per instrument are delivered continuously at the programmed interval until the DI-161 is instructed to stop. When a channel is used as a counter it is noteworthy that transitions are accumulated for the entire report interval, whereupon they are reported, the count is reset to zero, and accumulation resumes for the next report interval. In this manner, and for all three modes, the configured interval should not be interpreted as a sample rate, but rather as a timeframe that defines how often values are reported, which determines the granularity of results.

## Configurable Modes Adapt To Any Recorded Metric

The DI-161 allows three primary measurement modes, and each may be configured per channel. You choose the mode depending upon the required metric, and each is recorded continuously at the configured report rate.

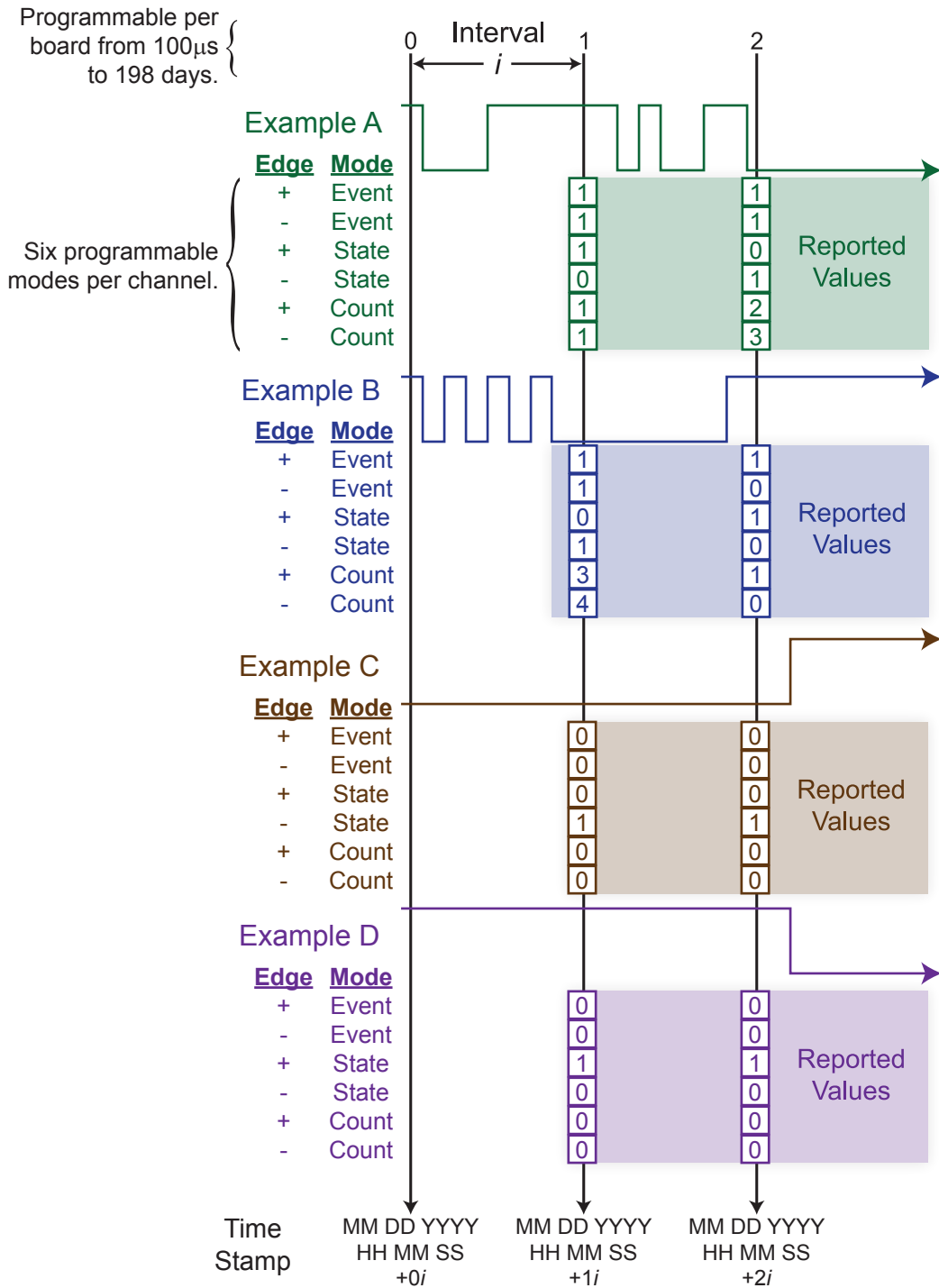
Mode*	Description	Possible Metrics	Examples**
<b>Event</b>	A single occurrence within the programmed report interval. Although multiple events may occur within a report interval, only one will be reported per interval.	<ul style="list-style-type: none"> <li>•Categorized production losses</li> <li>•Adjustments</li> <li>•Changeover</li> <li>•Breakdowns</li> </ul>	<ul style="list-style-type: none"> <li>•A process adjustment was made at 10:40 am</li> <li>•A breakdown occurred at 02:03 am</li> <li>•The door opened at 1:01 am</li> <li>•The motor turned off at 5:27 pm</li> </ul>
<b>State</b>	How long an event lasts. Sampled only at the end of a report interval.	<ul style="list-style-type: none"> <li>•Actual operating time</li> <li>•Actual down time</li> <li>•Actual cycle time</li> <li>•Changeover time</li> </ul>	<ul style="list-style-type: none"> <li>•The process began at 8:20 am and continued until 12:30 pm.</li> <li>•Changeover time was 3 hrs, 11 min</li> <li>•The pump turned on at 1:34 am and turned off at 3:45 am</li> <li>•The refrigerator turned off at 2:29 pm and back on at 3:45 pm</li> </ul>
<b>Count</b>	Totalizes the number of events that occurred during each report interval.	<ul style="list-style-type: none"> <li>•Actual run rate</li> <li>•Actual total units produced</li> <li>•Actual defective units produced</li> <li>•Speed loss</li> <li>•Startup rejection</li> <li>•Flow/volume</li> </ul>	<ul style="list-style-type: none"> <li>•The process produced an average of 120 parts per minute over 420 total minutes of operating time</li> <li>•Maximum and minimum run rates were 135 and 99 parts per minute respectively.</li> <li>•Total volume pumped was 102.45 gallons at 7:45 pm</li> </ul>

\* Each mode may be programmed for either leading- or falling-edge detection.

\*\*Date stamps are omitted from these examples for simplicity.

# DI-161 Hardware Operation (continued)

The following examples show the interpretation applied by each of the three modes. Including edge selections, the DI-161 allows a choice of six configurable methods per channel.



# Signal Conditioning Module Overview

The DI-161's design leverages reliable isolated semiconductor switch modules for both AC and DC signal types to ensure proper operation under any electrical situation. The modules allow detection of any signal amplitude, from 10 to 280 Vrms or Vdc depending upon the specific model, and provide a unique latch-up feature that allows them to cleanly detect the absence or presence of applied AC waveforms. Modules are selected and installed, mixed and matched, on a channel-by-channel basis in a manner that directly accommodates the need of any particular deployment.

## Module Quick Selection Guide (see Specifications section for more details).

Measurement	Module Type
DC state <sup>1</sup>	AC/DC discrete input modules
DC event <sup>1</sup>	
DC pulse count (50 Hz max) <sup>1</sup>	
AC state <sup>2</sup>	
AC event <sup>2</sup>	
AC pulse count (25 Hz max) <sup>2</sup>	DC discrete input module
High-speed DC pulse count (100 Hz Max) <sup>1</sup>	



<sup>1</sup> Unipolar signals only

<sup>2</sup> AC line frequencies only (50-60 Hz, sine)

### AC/DC Discrete Input module Quick Reference Guide

Specification	Model			Units
	IN5S	IA5S	IM5S	
Type	AC/DC			-
Nominal input voltage	24	120	240	Vrms/Vdc
Minimum input voltage	12	90	180	
Maximum input voltage	60	140	280	
Maximum input current	30	10	8	mA rms
Line frequency range	50-60			Hz
Isolation	600			Vdc or peak AC

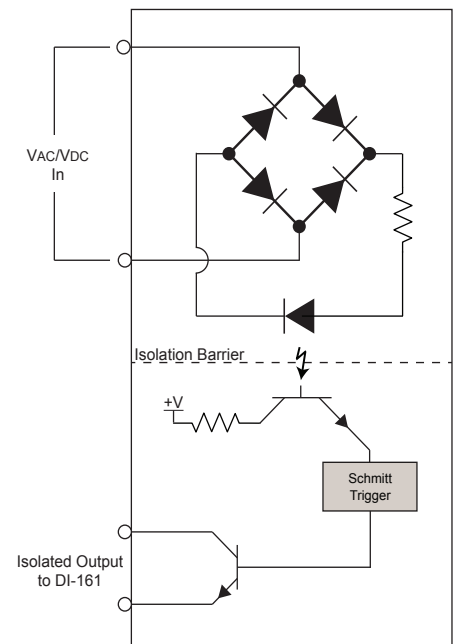
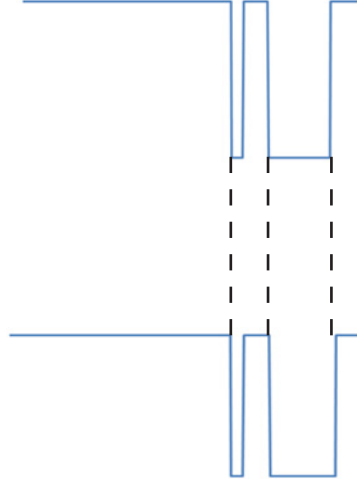
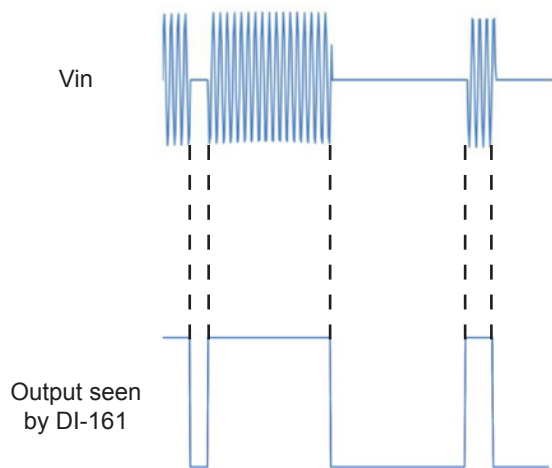
### DC Discrete Input module Quick Reference Guide

Specification	Model	
	IB5S	Units
Type	DC	-
Nominal input voltage	24	Vdc
Minimum input voltage	3.3	
Maximum input voltage	32	
Maximum input current	32	mA dc
Isolation	600	Vdc or peak AC

## Module Block Diagram and VIN vs. Output Timing

AC (50-60 Hz)

DC





## Software Overview

Initial configuration of the DI-161 is achieved through a provided Windows application that discovers all DI-161s on the host PC's subnet, and allows each to be selectively configured. Another supplied Windows application takes over from there to manage each DI-161, facilitating both board measurement configuration and data storage. One instance of the application software is run per board, either on the same PC or across multiple platforms as needed.

### DI-161 Configuration Application

DI161 Setup

Mac Address	00:1B:81:00:00:03
Host Name	
IP Addr	192.168.0.53
Gateway	192.168.0.1
Subnet Mask	255.255.255.0
Primary DNS	0.0.0.0
Secondary DNS	0.0.0.0
User ID	admin
Password	admin
Manufacture Date	08/22/2006
Serial Number	AF0467AC
Version	1.04
DHCP Enable	<input checked="" type="checkbox"/>
Device Selector	2

Reconnect Program

A supplied Windows application allows any number of DI-161 instruments on the host PC's IP range to be discovered and configured. Configurable parameters include assignments for IP address and subnet mask, a unique host name (if a DNS server is available), password protection for web configuration, and more.

### Windows-based Real-time Recording Software

This is the primary screen for DI-161 software. It features a real time display window that shows the status of all enabled channels as they're acquired, as well as the current configuration for the board's network settings. It also allows you to stop and start recording of DI-161-acquired data.

DI-161 Logger

File Settings

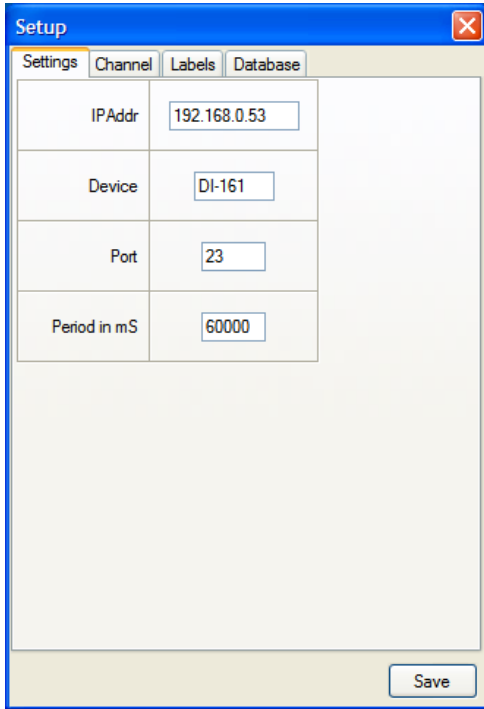
Settings

Address 192.168.0.53 Channels 0

Port 23 Period in ms 60000 Stop Logging

Labels	Function	Date Time	Pieces	Counter-Chan0
08/02/13	11:40:40		335	
08/02/13	11:41:40		336	
08/02/13	11:42:40		335	
08/02/13	11:43:40		329	
08/02/13	11:44:40		326	
08/02/13	11:45:40		327	
08/02/13	11:46:40		327	
08/02/13	11:47:40		326	
08/02/13	11:48:40		327	
08/02/13	11:49:40		327	

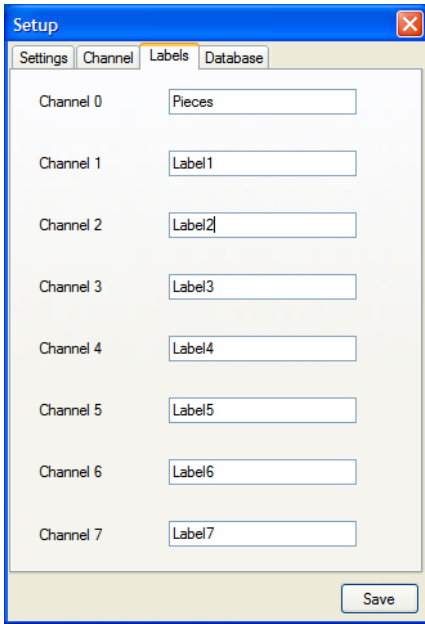
Logging to File: scrap.csv 000:15:00



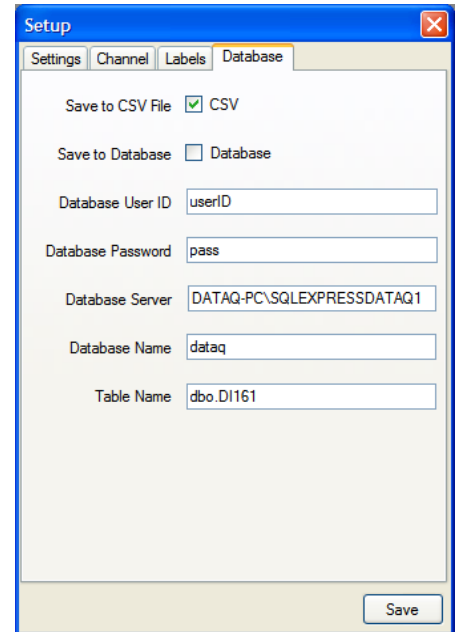
Accessible from the main screen is a tabbed group of setup screens. “Settings” informs the application of the networks settings of the DI-161 hardware that will be used with it. Here also the overall sample throughput rate of the hardware is configured in milliseconds, from once every 100 mS to once every 198 days in 4 mS increments

The “Channel” tab allows each of the DI-161’s eight channels to be disabled, or configured for one of six settings if enabled. Supported measurement modes per channel are count, event, or state with positive or negative edge triggering.





The “Labels” tab allows each DI-161 channel to be uniquely identified, both on the real time display and when data is exported to a file. The feature allows you to associate data with specific sources both now in the the future.



“Database” setup allows you to define the format of the file the software creates. You can store files in either a CSV (comma seperated value) format, which is compatible with almost any analysis package (most notably, Microsoft Excel®). Another option allows the software to log onto an SQL database server with a user name and password , and then to write data directly to a specific database and table.

**Schedule**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
03:23	00:00	00:00	13:30	00:00	08:00	01:03
03:27	07:59	02:37	13:59	07:59	09:20	02:05
10:34	08:00	04:23	14:15	08:00	10:20	03:07
10:57	13:01	07:59	14:30	15:59	11:47	04:17
13:13	14:00	08:30	16:00	16:00	13:01	05:13
17:17	15:27	09:00	16:57	23:59	13:23	06:11
23:23	18:03	12:23	17:00	00:00	17:00	09:23
23:59	00:00	15:29	23:59	00:00	22:31	20:13

Buttons: Clear, Default, Exit No Save, Exit Save

**Built-in Scheduler Automates Recording Sessions**

Do you want data recording to begin and end at precise times during the week? Use DI-161 software to define any repeating schedule of start and stop times on a weekly basis for complete unattended operation.

# DI-161 Specifications

## Signal Inputs

Number of input channels: 8

Input channel range: (Refer to module specs)

Channel-to-channel isolation: 600 VDC or peak AC

Input-to-output isolation: 600 VDC or peak AC

## AC/DC module detailed specifications

Input:	Model			Units
	IN5S	IA5S	IM5S	
Nominal Input Voltage <sup>1</sup>	24	120	240	Vrms/Vdc
Minimum Input Voltage <sup>1</sup>	10	80	90	
Maximum Input Voltage <sup>1</sup>	60	140	280	
Maximum Input Current	30	10	8	
Drop Out Current	1.0	2.5	1.5	
Allowable Off-state Current	1.0	3.0	2.0	
Allowable Off-state Voltage	2.0	50	120	
<b>Output:</b>				
Maximum Turn-on Time (Vac)	20			msec
Maximum Turn-off Time (Vac)	30			
Maximum Turn-on Time (Vdc)	1			
Maximum Turn-off Time (Vdc)	1			
Line Frequency Range	50-60			Hz
Maximum DC Pulse Count Frequency	50			
Maximum AC Line Pulse Count Frequency	25			

<sup>1</sup> Unipolar only for DC input signals. AC input signals support line frequencies (50-60 Hz)

## DC module detailed specifications

Input:	Model	Units
	IB5S	
Nominal Input Voltage <sup>2</sup>	24	Vdc
Minimum Input Voltage <sup>2</sup>	3.3	
Maximum Input Voltage <sup>2</sup>	32	
Maximum Input Current	32	mA dc
Nominal Input Resistance	1K	Ohm
Drop Out Current	1.0	mA dc
Allowable Off-state Current	1.0	
Allowable Off-state Voltage	2.0	
<b>Output:</b>		
Maximum Turn-on Time	5	msec
Maximum Turn-off Time	5	
Maximum DC Pulse Count Frequency	100	Hz

<sup>2</sup> Unipolar signals only

## Internal Clock

Accuracy: 20 ppm

Sync method: Via connected PC during setup

## System Configuration

Method: Using PC-based program and web server via Ethernet interface

Parameters: Measurement configuration,; sampling interval; network settings; channel labels

Programmable network settings: DHCP/fixed/DNS IP address; subnet mask

## Measurement Operation

Programmable functions (per channel): Event, State, Count; positive- or negative-edge triggering

### Counter operation

Counts the number of events occurring over a sample interval.

Reset condition: Programmable interval timeout

Maximum count: 8,640,000

Maximum frequency: (See module specifications)

Minimum pulse width: (See module specifications)

### State operation

Determines the DURATION of an event. Records the state that exists upon termination of a sample interval.

### Event operation

Determines WHEN an event occurred, but does not yield the duration of the event. Records a single time-stamped data point when one or more events occur within a definable interval.

Minimum pulse width: 5 mSec

Programmable Intervals (applies to all channels): .1 to 86,400.0 seconds(.1 sec to 1 day).

## Controls, Indicators and Connections

Interfaces: Ethernet (operation); USB (firmware upgrades)

Channel Indicators (LED): Channel state (true/false), one per channel

Active Indicator (LED): Indicates activity: Flashes 3 times per second when program running; once per second otherwise.

Power Indicator (LED): Indicates power.

Signal input connections: Screw terminals, four per channel: ± signal input and (2) no-connect.

Power connector: 2-position screw terminal

Signal module backplane: Eight positions (one per channel)

Fuse socket: Eight positions (one per channel)

## Power

Voltage range: 9 to 36 Vdc

Power consumption: 2.25 watts (excluding modules)

Power consumption per module: 0.10 watts

## Optional Power Supply (DIN-P24)

Rated input voltage: 100-240 Vac

Input frequency: 47-63 Hz

Inrush current (115/230 Vac): 15/30 A

Efficiency: >80%

Voltage out: 24 Vdc

Nominal current out: 420 mA

Input-to-output isolation: 500 Vdc

Minimum required free space: 25 mm on all sides

Operating temp: -25 to +71 °C

Approval: CE, UL508

Weight: 60g

## Environmental

Operating Temperature: 0°C to 35°C (32°F to 95°F)

Operating Humidity: 0 to 90% non-condensing

Storage Temperature: -20°C to 45°C (-4°F to 113°F)

Storage Humidity: 0 to 90% non-condensing

## Physical Characteristics

Mounting and type: DIN rail, EN 50022, top hat rail

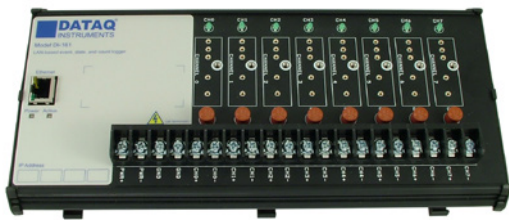
Dimensions (with modules): 10.35 × 2.41 × 4.94 inches

Weight (with modules): 1.35 lbs

# DI-161 Ordering Guide

Description			Order No.
<b>DI-161</b> Event, State, and Count Data Logger hardware including controller software for Windows, eight input fuses (one per channel), a DIN-mountable tray with mounting feet. <i>Please Note: The DI-161 does not include discrete input modules or power supply.</i>			DI-161
<b>Optional Accessories</b>			
<b>IN5S</b> 24-V isolated AC/DC discrete input module	IN5S	<b>DIN-P24</b> Isolated DC power supply for DI-161	DIN-P24
<b>IA5S</b> 120-V isolated AC/DC discrete input module	IA5S	<b>DIN-R35</b> 35mm × 609mm top hat-style DIN rail.	DIN-R35
<b>IM5S</b> 240-V isolated AC/DC discrete input module	IM5S	<b>2000182</b> One (1) spare fuse (8 included with device).	2000182
<b>IB5S</b> 24-V isolated, high speed DC discrete module	IB5S	<b>DIN-M</b> One (1) spare mounting foot (3 included with device).	DIN-M

## Included



DI-161 with case and mounting feet



7-foot CAT-5 Cable

## Optional Accessories



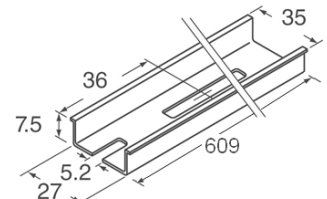
Discrete isolator modules



DIN-P24 24 Vdc DIN power supply



DIN-M mounting feet  
(3 included with the DI-161)



DIN-R35 EN50022 DIN rail



241 Springside Drive  
Akron, Ohio 44333  
Phone: 330-668-1444  
Fax: 330-666-5434

### Data Acquisition Product Links

(click on text to jump to page)

[Data Acquisition](#) | [Data Logger](#) | [Chart Recorder](#)

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