



# NETWORK SWITCH SOLUTIONS

## INTRODUCTION

### Welcome To Vigitron's Network Switch Solutions

Dear Security Professional,

Network's designed for security applications have unique requirements resulting from the ever-increasing need for bandwidth and PoE. These extend into many areas resulting in the need to achieve maximum performance for the connected devices. In many cases most network switches are not designed for these applications. They lack the necessary bandwidth, PoE and packet handling. As the industry leader in network education Vigitron's goal is to educate and inform.

Our IP/PoE products group is built on our over 24 years prior as the leader in long distance analog security transmission over twisted pair. Our IP/PoE products are developed working with IP cameras, access control, wireless and LED lighting leading security manufacturers. Our intra-operational testing is designed to provide products to assure the best performance of these products operating on networks. In the 11 years since the inception of our IP products lines we have introduced over 150 IP/PoE products covering all network categories. This gives Vigitron the unique ability to provide complete network solutions avoiding the potential for finger pointing between different manufacturers. Our products are designed, tested and quality controlled in the United States with local design and service support from our skilled network engineers.

Our network switches are not only designed to achieve best performance but also provide unique features to maintain operation, avoid significant downtime, prevent costly service calls and hacking.

Networks designs are as unique as their requirements. Vigitron provides a wide range of network switch solutions. This educational booklet will help you in selecting the right switch for your application. In addition, we invite you to contact our Design Center where our trained staff of engineers can help with network design specific to your application. With the goal of providing you the most reliable and cost effective solution this service is provided free and without obligation.

Please contact us at [support@vigitron.com](mailto:support@vigitron.com) or call us as 1-858-484-5209 with any of your networking IP/PoE requirements. We look forward to working with you.

Regards,



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# NETWORK SWITCH LIMITATIONS

## Packet Size

Standard network switches lock packet size to 1518bytes when the incoming link is 100Mbps. This limitation is within the range of 1-2MP cameras. Higher MP cameras have much larger packet sizes which can be blocked or distorted at the port resulting in dropped or distorted images.



- Virtually all security products transmit data at 100Mbps. When a network switch receives a 100Mbps data stream usually its acceptable Ethernet packet size is limited to 1518 Bytes. The 1G ports can operate at Jumbo frames.

## Packet Size is Important


### IP Video Standard Network Devices:

The smaller 1- 2 MP cameras require a packet size of about 1024 Bytes and higher MP extend beyond 1518 Bytes, which is the limit of RFC 2544. Jumbo Frames can be up to 9600 Bytes or larger.

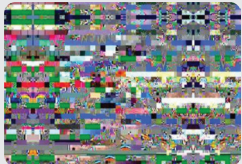
### Standard Network Switches:

At 100Mbps packet sizes are limited to 1518-1538 Bytes. Cameras with MP sizes greater than 2MP will have problems passing through this port limitation. While many switches can be programmed to resolve Jumbo Frames they do so only at 1G speeds. In networking speeds between devices must be matched so the 100Mbps out of an IP camera must be matched to a 100Mbps at the switch port.

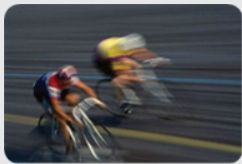
**Problems**



Pixilated



Scrambled



Frozen or Blurred

***Vigitron Managed switches can be programmed to pass Jumbo frames at 100Mbps.***

## NETWORK SWITCH LIMITATIONS

### Switch Fabric

A network switch is its own internal network. The ability to connect a camera to port 1 and view it on the uplink port shows all the ports of a switch are interconnected by the Switch Fabric. There is no standard for determining the bandwidth. At the minimum in order to transmit video on all ports with the least amount of loss the switch bandwidth must be 2X the sum of the maximum bandwidth of all the port.

### Why Switch Fabric is important?

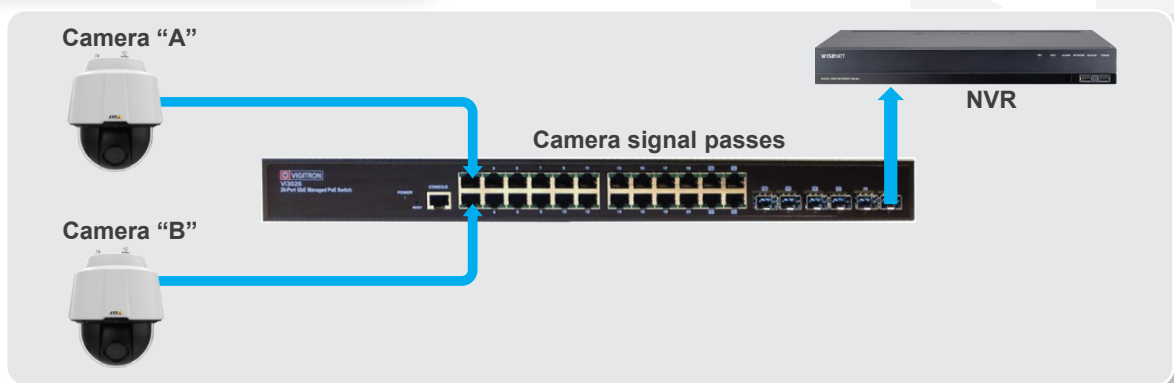
- When all ports are fully loaded, many network switches that have limited bandwidth switch fabric, present poor video transmission.
- To pass IP video, a switch must provide a switch fabric bandwidth equal or greater than 2x the total bandwidth of all ports. This will assure even a fully loaded switch with the highest Mega Pixel cameras will pass IP video without any interruption.



Think about a switch as a highway:

Cars traveling at full speed

- Cars slowing down as more cars enter the highway.
- Some cars stuck in traffic and cannot exit.
- A video security system acts in a similar manner. The VMS or NVR will call to a camera to be recorded and/or viewed. If the camera is stuck on the switch fabric highway it cannot exit the switch.



- Camera "A" enters at a time when the switch fabric bandwidth is available to pass it to the uplink or another port.
- Camera "B" enters at a time when the switch fabric bandwidth is not available and does not pass to the uplink.
- This situation can change at any time due to ports traffic giving it an intermittent appearance.

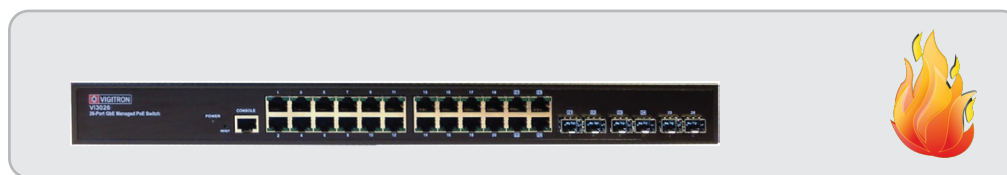
***Vigatron switches maintain a switch fabric 2x the sum of the highest port bandwidth for all ports.***

## NETWORK SWITCH LIMITATIONS

### PoE Supply/PoE Budget

Most PoE switches are not designed to function consistently with all ports operating at their full PoE capacity. Nor does the power supply of a switch represent the total power available PoE. Some power must be allocated to operate the switch. More important, if the load requires the total power supply budget, the switch may heat up and this can damage internal components. For this reason it is recommended the PoE budget be separated from the total power supply by at least 25%, which is standard in all Vigitron switches with internal power supplies.

### Why the difference between Switch Power Supply & PoE Budget is important?



- Network Switches are small environments – only 1.75” high and vary in length up to 17”
- Most Switches do not specify the power needed to operate the switch circuit.
- The power available for PoE is **ALWAYS** less than the Switch power supply specification.
- The closer the total PoE load approaches the total switch power the more potential for:
  - Shortening Switch life due to excessive internal heat.
  - Switch overheating and power shut down if protections exist.
  - Switch can the Switch to completely break down.

***Vigitron Switches maintain at least a 25% separation between total power and PoE budget for safety and reliable long term performance.***

## POE MANAGEMENT

### PoE Automatic checking and restart

Auto checking monitors an individual connected device. In the event a connection is lost, the Switch will re-apply PoE and re-establish the connection.

Port	Ping IP Address	Interval Time(sec)	Retry Time	Failure Log	Failure Action	Reboot Time(sec)	Total Reset
1	192.168.1.101	30	3	error0_notain0	Reboot Remove PO	15	<input type="checkbox"/>
2	0.0.0.0	30	3	error0_notain0	Nothing	15	<input type="checkbox"/>
3	0.0.0.0	30	3	error0_notain0	Reboot Remove PO	15	<input type="checkbox"/>

**Vigatron managed switches can be programmed to continually monitor port connections. In the event a connection is lost PoE is cycled to reboot the device and re-established the connection, reducing down time and service calls**

### Delayed PoE Application

- Large power surges can occur with connected devices such as PTZ cameras that draw large power on start up. This has potential of damaging switch power supply.
- Delayed PoE places less stress on the power supply reducing the potential for damages.
- Programming PoE power delay start up will avoid power surges, particularly when the system involves a PTZ mechanism with start up power surge.

Port	Delay Mode	Delay Time(0-300 sec)
1	Disable	0
2	Disable	10
3	Disable	15
4	Disable	20
5	Disable	25
6	Disable	30
7	Disable	35
8	Disable	40
9	Disable	45
10	Disable	60
11	Disable	120
12	Disable	180
13	Disable	240
14	Disable	300
15	Disable	0
16	Disable	0
17	Disable	0
18	Disable	0
19	Disable	0
20	Disable	0
21	Disable	0
22	Disable	0
23	Disable	0
24	Disable	0

### Intelligent Power limit

- The “Intelligent Power Limit” automatically calculates the amount of PoE required based on the wire resistance and connected device.

PoE Status	
PoE Setting	
Total System PoE Budget(Watt)	550
Power Mode	Just defined Power Limit
Auto Recovery(0:not recovery)	Class defined Power Limit
Intelligent Power Limit	
[Update]	
PoE Status	
System operation status	On
Actual Power Consumption(Watts)	4.5
Remaining PoE Budget(Watts)	545.5

### Maximum Port PoE Power

- Able to provide up to 72W per port to handle PoE power surges.

PoE Setting	
Function	Status Mode Available Power (MAX:16 LSB 1 Watt)
Port No.	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
[Update]	

PoE surges can occur at start up and when functions such as day/night, PTZ start up, auto back focus are applied. The amount of surge can be as much as 20% of the operating PoE. If this power is not available as per the IEEE PoE, the port can shut down. The ability to provide up to 72W helps to prevent this shut down.

**Many security IP devices such as PTZ and multi image cameras require more than maximum 30W per port provided by most switches. Vigatron managed switches can provide up to 72W per port.**

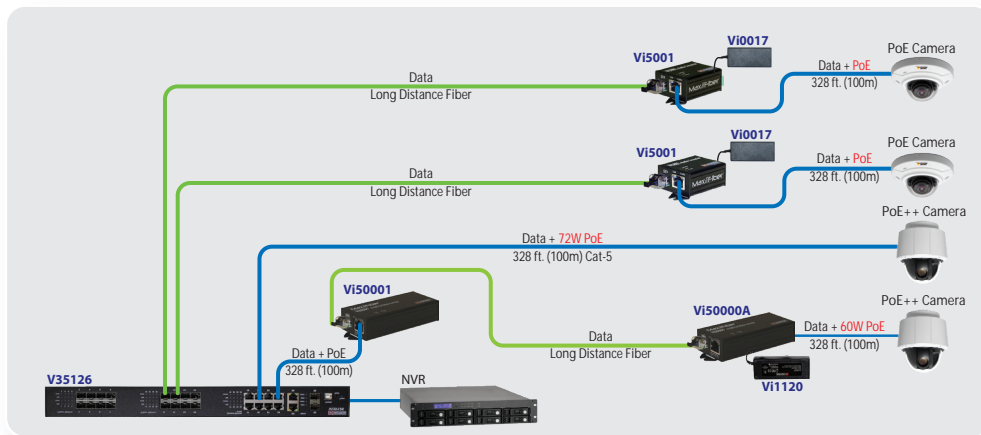
## CORE NETWORK SWITCHES

### What is a Core Switch?

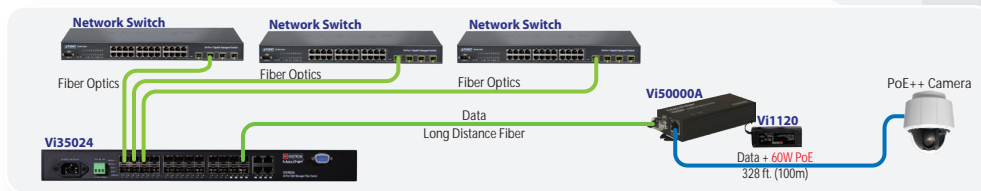
A core switch is a high-capacity switch generally positioned within the backbone or physical core of a network. Core switches serve as the gateway to a wide area network (WAN) or the Internet - they provide the final aggregation point for the network and allow multiple aggregation modules to work together. Its ability to handle data and provide communications to its connected switches is often defined as Layer 2+ and Layer 3 lite providing additional network protection.

### Applications:

A Core Switch is used to connect other switches forming high capacity networks. It allows for individual switches to be routed to individual ports on the Core switch providing status and control. It is a preferred design to daisy chaining switches resulting in reduced bandwidth, high potential for traffic products and reduced reliability.



The Vi35126 Hybrid fiber switch along with Vi5001 media converter transmits IP video over long distance fiber optic cables at long distances while its copper port can provide power to cameras at up to 100m.



The Vi35024 can be used to combine data streams from several Network switches.

Model	Fiber Ports	Managed	1G Uplink Ports	Combo Ports	Total Ports	Power Supply	Backup Supply	Jumbo Frame
Vi35024	24	L2/L3 Lite	4	4	24	110/220VAC	✓	✓

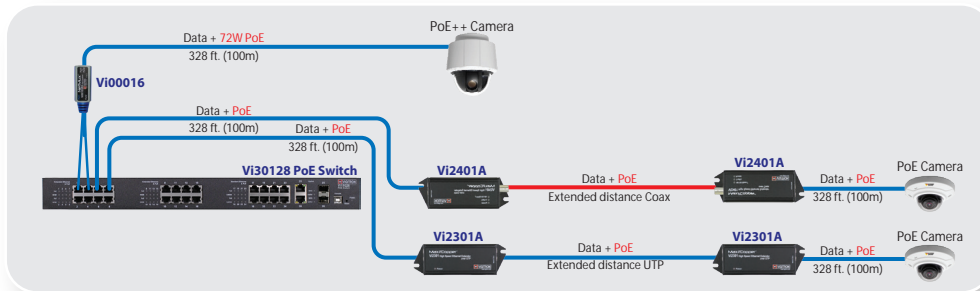
## ENTERPRISE NETWORK SWITCHES

### What is an Enterprise Switch?

An Enterprise switch can also be defined as a high capacity switch having the bandwidth, port packet handling, provide PoE, and receive and process data from its connected devices. Its ability to handle data is also defined as Layer 2+, status communication using SNMP, TCP, UCP, Syslog and uPnP.. Its ability to handle data and provide communications to its connected switches is often defined as Layer 2+ and Layer 3 lite providing additional network protection. Enterprise switches also contain Vigitron unique features such as auto reconnection and PoE application reducing down time and service calls, delayed PoE application and high packet handling even with 100Mbps connections, providing the ability to process Jumbo frames up to 10,000 bytes for high MP cameras.

### Applications:

Enterprise switches are used where the connected devices require high bandwidth, packet size handling and in many cases higher PoE port power with associated high PoE budgets. This is especially true with systems containing high camera counts. In general, this applies to cameras with megapixel counts over 5MP, multiple sensor cameras and where multiple cameras are used within one network.



Model	Managed	Fiber Ports	Combo Ports	1G Ports	10G Ports	Total Ports	Jumbo Frames @100Mbps	Programmable Packet size	PoE Budget	Port PoE	PoE Auto Check /Restart	Programmable PoE Start Delay
VI30128	L2/L3 Lite	4	4	24	4	28	✓	✓	740W	36W	✓	✓
VI30110	L2/L3 Lite	2	2	10	X	10	✓	✓	240W	36W	✓	✓



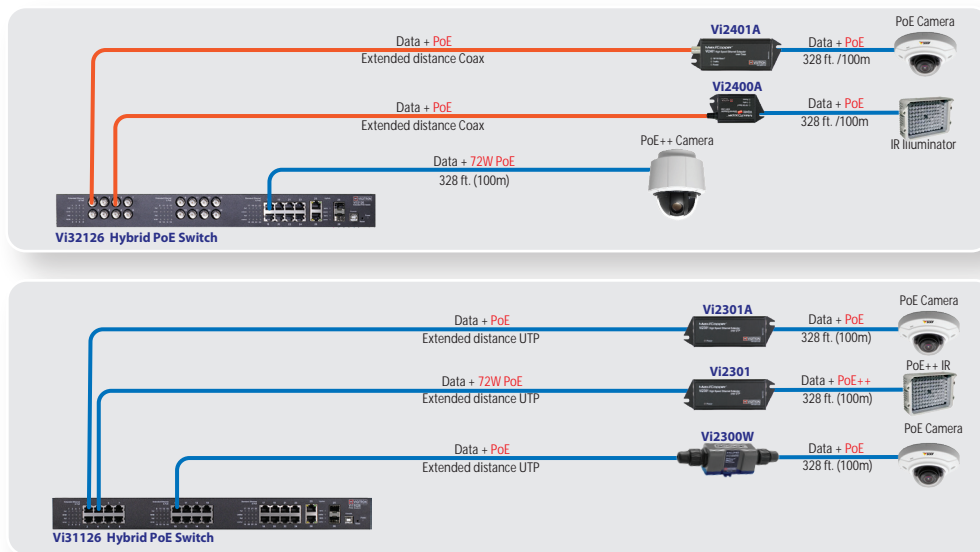
## APPLICATION NETWORK SWITCHES

### What is an Application Switch?

An application switch provides unique features which are specific to certain applications. This can include the ability to power 60watt PTZ cameras from a single port, simple set up and operation, individual hacking port protection and hybrid versions that combine standard ports with extended UTP, Coax and Fiber.

### Applications:

With its ability to combine a network switch with PoE midspan features and extended distance transmission these switches are high performance and low cost when considering all of their features. These features save rack space and help to centralize functions into one simple to use unit. These functions are especially important for applications using 60W PTZ, access control, LED light and Wireless to help in system with high PoE applications and wide range PoE changes.



### Vigtron Application Switch Features:

- 2 Combo Ports
- Managed Layer 2
- PoE Budget 550watts
- Max. Port Power 72W
- 2x Switch Fabric Bandwidth
- Port Frame Size , 1518bytes
- Uplink Frame Size , 1518bytes
- SecurPort™
- Programmable Packet Size
- PoE auto checking and restart
- Programmable PoE Delay

Model	Standard Ports	Extended UTP Ports	Extended Coax Ports	Fiber Ports	1G Uplink Ports	Total Ports	Power Supply	PoE Budget	Max. Port PoE	Programmable Jumbo Frame @ 100/1000Mbps	Programmable PoE Start Delay
Vi30018	16	-	-	-	2	18	685W	550W	72W	✓	✓
Vi30126	24	-	-	-	2	26	685W	550W	72W	-	✓
Vi31026	16	8	-	-	2	26	685W	550W	72W	✓	✓
Vi31126	8	16	-	-	2	26	685W	550W	72W	✓	✓
Vi32026	16	-	8	-	2	26	685W	550W	72W	✓	✓
Vi32126	8	-	16	-	2	26	685W	550W	72W	✓	✓
Vi32226	-	-	24	-	2	26	685W	550W	36W	✓	✓
Vi35126	8	-	-	16	2	26	685W	-	72W	✓	-

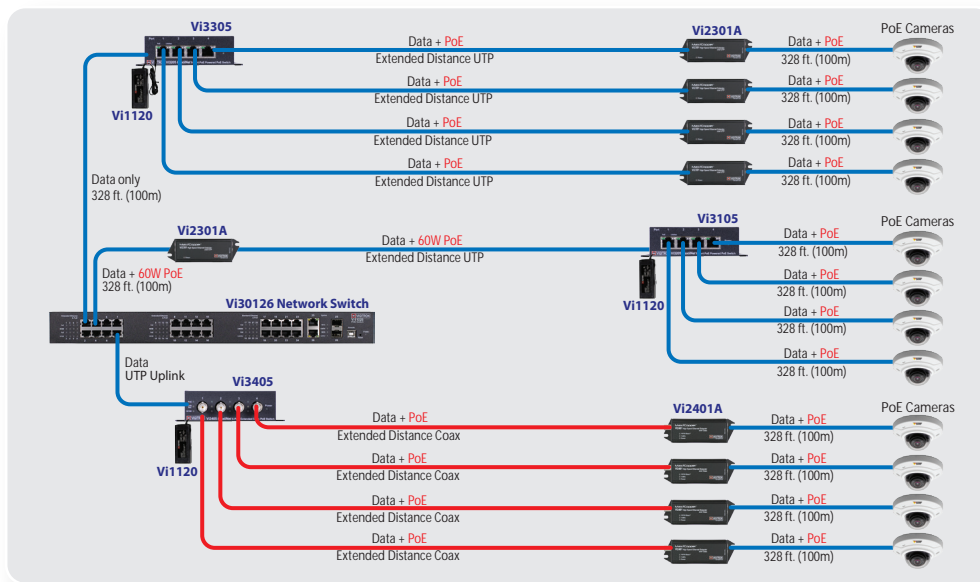
## NODE NETWORK SWITCHES

### What is a Node Switch?

Node switches are usually found in the field connected to other switches transmitting a limited number of cameras to Core or Enterprise level switches. They are mostly hardened having operating temperatures ranging from -40C to +75C. Due to their high range of operating temperatures, Node switches use external power supplies.

### Applications:

Node switches are valuable in reducing the number of cables required to transmit multiple cameras on a single cable. They can also be a source for providing the PoE required for these cameras which are using more than the power that can be sent on a single cable. Node switches can also be found with extended up link and connected device ports. Node switches are available as drop and insert configurations providing for up to 9 individual connection points on a single cable with the ability to resolve 9 IP address eliminating the need to a network switch for smaller applications. Node switches are usually unmanaged and a cost-effective solution for limited field applications, remote gates and alarm panels. They are also available as weatherproof IP67 versions.



Model	Layer 2	1G Ports	Fiber Ports	Extended UTP Ports	Extended UTP Uplink	Extended Coax Ports	Extended Coax Uplink	Fiber Combo Uplink	1G Uplink Ports	Total Ports	Frame Size (Bytes)	Drop & Insert	Max. Input PoE	Max. PoE per Port
Vi3005	√	-	1	-	-	-	-	-	-	5	1518	-	60W	30W
Vi30005	√	5	1	-	-	-	-	-	-	5	9600	-	60W	30W
Vi30005W	√	5	-	-	-	-	-	-	-	5	9600	-	60W	30W
Vi3105	√	-	1	-	1	-	-	-	-	5	1518	-	60W	30W
Vi3205	√	-	1	-	-	-	1	-	-	5	1518	-	60W	30W
Vi3305	√	-	1	4	-	-	-	-	-	5	1518	-	60W	30W
Vi3405	√	-	1	-	-	4	-	-	-	5	1518	-	60W	30W
Vi3103	√	-	-	-	-	-	-	-	-	3	1518	√	30W	30W
Vi30103	√	-	-	-	-	-	-	-	-	3	1518	√	60W	30W
Vi3003	√	3	-	-	-	-	-	-	√	3	9600	√	60W	60W
Vi3003W	√	3	-	-	-	-	-	-	√	3	9600	√	60W	60W

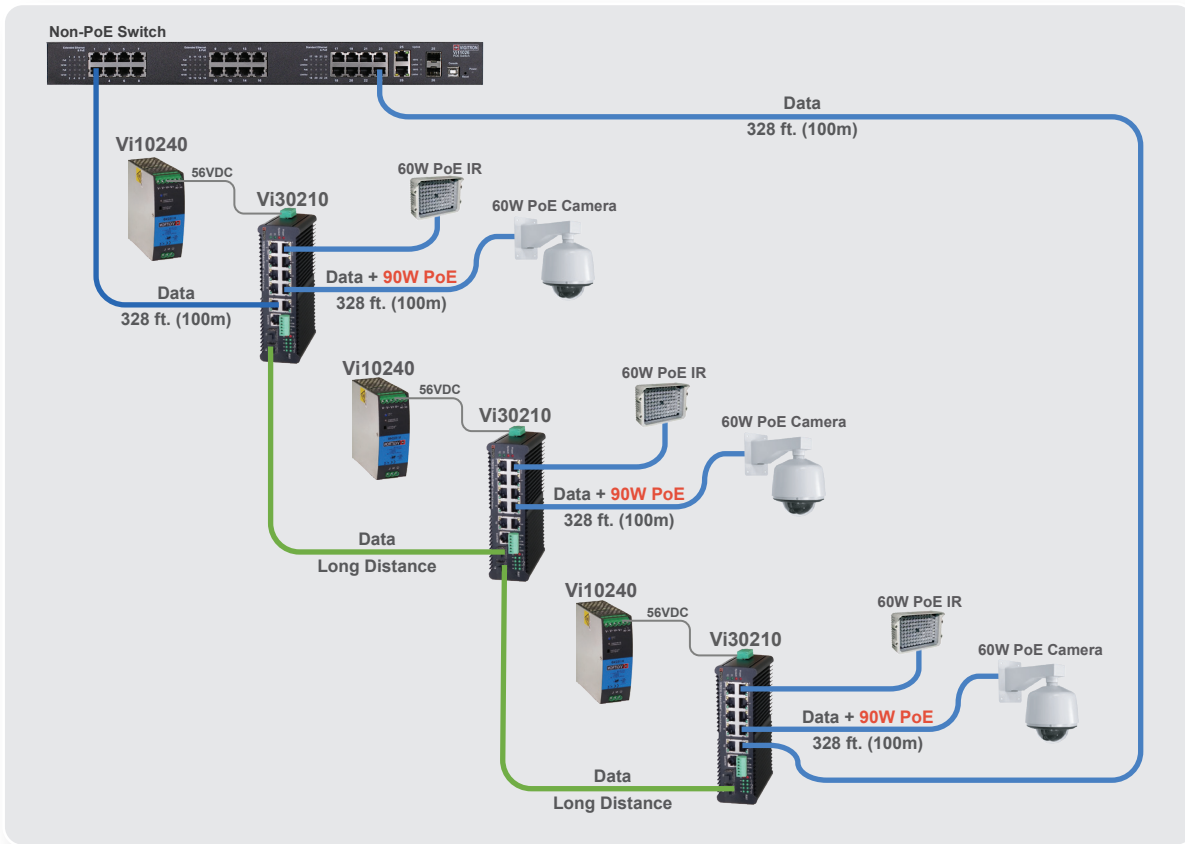
## INDUSTRIAL (INS) NETWORK SWITCHES

### What is an INS Switch?

An Industrial Network Switch (INS) is similar to a Node switch in field position within a network. INS switch generally have operating temperature range between -40C to +75C. The difference is in the INS's ability to provide PoE up to 90W per port, higher Data rate and packet handling than a typical node switch and full Layer 2+ management .

### Applications:

INS Switches are used with higher PoE and management is required for applications using PTZ domes and multiple sensor cameras. Switch management allows resetting of PoE per port. Packet size and traffic handling.



Multiple Vi30210s can be used in a Ring Network configuration to increase the safety of the network.

Model	Layer 2+	1G Ports	Fiber Ports	1G Combo Uplink Ports	Total Ports	Remote Power	Programmable Jumbo Frame @ 100/1000Mbps	Programmable Packet Size	Max. Input Power	Max. PoE per Port	Programmable PoE Delay
Vi30210	✓	8	2	2	10	✓	✓	?	500W	90W	✓

## VIGITRON ADVANTAGES

### Security Features

#### Web Management Filter

Blocks Internet hacking and internal access to social web sites: Blocks Port 80 access.

#### TCP-UDP Filtering

Blocks or allows passage of information from internal and external sources. UDP can be used for device connections to reduce outside web traffic.

#### MAC Address Binding

This feature not only limits the number of devices allowed to connect to a port. But also it gives the user the ability to program communication exclusively with devices that have specific MAC addresses.

#### SecurPort™

The complete anti-ghosting solution:

The unique Vigitron developed feature blocks attempts that copied MAC address to attack networks.

#### Certificate

Requires clients to have a certificate provided by the switch or third party to the switch allowing access and communication between the switch and the client.

***Security is a major concern. Web management filters helps to block communications to public websites, TCP- UDP reduces hacking from ports connected to cameras and many standard security devices . While many switches offer MAC address binding, a process called ghosting can mirror a MAC address to defeat this. Vigitron developed SecurPort™ blocks the ghosting process and issues an alert due to hacking attempts. Finally some models offer the ability to install a certificate which marries the switch to individual clients.***



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## Complete Network Solutions

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COAX ETHERNET EXTENDERS

SINGLE-PAIR EXTENDERS

MANAGED POE SWITCHES

MANAGED FIBER SWITCHES

HARDENED POE SWITCHES

MANAGED POE MIDSPANS

POE SPLITTERS

ACCESSORIES

FIBER MEDIA CONVERTERS

PoE & ETHERNET REPEATERS

IP67 PRODUCTS

HEALTH MONITORING APPS