



### IS40 Bypass Switch

#### Silicom 40G/10G Intelligent Bypass Switch

##### Product Description

Silicom 40G Intelligent Bypass switch (IS40) is Silicom second generation of an active external Bypass switch that protects network integrity from network failures and network maintenance. The Silicom intelligent Bypass switch (IS40) is a self-generating heartbeat and controls the network switch mode of operation.



The Silicom IS401U is a 1U host system which supports up to three modules. The 1U host system can support mix of 40G Bypass module and dual rate 10G/1G Bypass modules. A 40G module supports one Bypass segment per module. A dual rate 10G/1G Bypass module supports two Bypass segment in a module.

The Silicom IS40 supports 40 Gigabit Ethernet Multimode Fiber (40GBase-SR4) and 40 Gigabit Single mode fiber (40GBase-LR4) network standards. Each 40G Bypass module includes two MPO / LC ports for network ports, and two QSFP+ ports for the attached in-line network system.

The Silicom IS40 supports dual rate 10/1 Gigabit Ethernet Multimode Fiber (10GBase-SR , 1000Base-SX) and 10/1 Gigabit Single mode fiber (10GBase-LR, 1000Base-LX) network standards. Each 10G Bypass module Network includes four LC Duplex Monitor ports and four SFP+ ports for the attached in-line network system.

The Silicom Intelligent Bypass switch (IS40) supports three modes of operations: Inline, Bypass, Tap and Linkdrop. In Inline mode, the IS40 diverts inline network traffic to attached in-line network system. In Bypass mode, the IS40 does not divert the traffic to the attached in-line network system and diverts it to other network link. In Tap mode, incoming traffic in port NET0 is mirrored to port MON0 and incoming traffic in port NET1 is mirrored to port MON1. In Linkdrop mode the IS40 disables the links on the network ports (NET0, NET1). The IS40 simulates switch / router cable disconnection.

The IS40 generates the heartbeat packets and transmits the heartbeat packet to the in-line Monitor / Network appliance port, the Monitor Network appliance receives the heartbeat packets and transmits is to its other port (bridges the heartbeat packet). The IBS40 detects back the heartbeat packet and maintains the Inline mode.

The IS40 sets to Bypass, Tap or Linkdrop when it does not receive back the heartbeat packet from the Network / Monitor appliance. When the Network / Monitor appliance recovers, it transmits back the heartbeat packet and the Intelligent switch sets to Inline. The IS40 bypasses its Ethernet Monitor ports on event of power failure, Link failure, in-line software application system hang or user request.

The IS40 includes Double Bypass Safe architecture. The Silicom Double Bypass safe architecture is based on two Bypass routing circuitry: An Active Bypass circuitry and Passive Bypass circuitry. If the internal active bypass routing circuitry fails, the passive

Bypass routing circuitry is activated.

The IS40 can be configured using:

- Simple CLI configuration management via a serial communication console port, Ethernet port using Telnet or SSH.
- Web interface management interface.
- SNMP

The Silicom IS40 Bypass switch includes centralized management to all Bypass segments in the box.

The IS40G includes two redundant 90 – 240 V AC power supply or two redundant -48 DC power supply.

**Figure: 1 – Front panel view of IS40**

2X10 Gigabit Bypass Modules and 1X40 Gigabit Module



## Key Features

- Self generating heartbeat pulses – No driver or management port is required to generate pulses
- Sets to Bypass when it detects in-line system failure
- Sets to Bypass when it detects in-line system link failure
- Sets to Bypass when it detects in-line software application system hang
- Sets to Bypass on Power failure
- Sets to Normal when it detects in-line system recovery
- Double Safe Bypass architecture with two routing circuitries
- Centralized managements
- Two on Board Watch Dog Timer (WDT) Controllers
- Software programmable time out interval
- Software Programmable WDT Enable / Disable
- Independent Bypass / Normal / Tap operation in every module
- Supports up to three 40G Bypass segment in a 1U chassis
- Supports TAP mode of operation
- Simple CLI configuration management via serial port
- Telnet management interface via network management port
- SSH management interface via network management port

- Supports SNMP version 1, 2c, 3 (SHA, AES)
  - Supports remote log
  - Supports TACACS+
  - Support RADIUS
  - Supports NTP
  - Supports time zone
  - Supports multi configuration backup
  - Support Two ports link feature – if one of the network ports link fails it will drop the link on the other network port as well
  - Two redundant power supplies
  - Optional -48V DC power supplies
- IS40M40G4BP-QS4
- Supports Short Range Fiber 40 Gigabit Ethernet (40GBase-SR4 50um)
- IS40M40G4BP-QB4
- • Supports Short Range Fiber 40 Gigabit Ethernet (40GBase-SR BiDi)
- IS40M40G4BP-QL4
- Supports Long Reach Fiber 40 Gigabit Ethernet (40GBase-LR4)
- IS40M108BP-SRD
- Supports Short Range Fiber 10 Gigabit Ethernet (10GBase-SR)
  - Supports Short Range Fiber Gigabit Ethernet (1000Base-SX)
- IS40M108BP-LRD
- Supports Long Reach Fiber 10 Gigabit Ethernet (10GBase-LR)
  - Supports Long Range Fiber Gigabit Ethernet (1000Base-LX)

## Technical Specifications

| Bypass Specifications   |   |
|---|---|
| <b>WDT Interval (Software Programmable):</b>                            | <b>Routing</b><br>Transmit heart beat packet every 3mS – 10Sec. Default 5mS<br>Verification packets received every 10mS – 50Sec. Default 20mSec<br><b>Double Bypass</b><br>Transmit heart beat packet every 300mS – 60Sec. Default 7Sec<br>Verification packets received every 1S – 253Sec. Default 20Sec |
| Production Default configuration  |   |
| <b>Mode at Power up:</b>  | Bypass  |
| <b>Heartbeat:</b>   | Activated   |
| <b>Bypass Switch is ready and in-line device responds to heartbeat:</b> | Change to Normal  |

|  |                              |
|--|------------------------------|
| In-line device responds to heartbeat:      | Normal                       |
| In-line device does not respond heartbeat: | Bypass                       |
| Mode at Power Off:                         | Bypass                       |
| Heartbeat Packet:                          | Internetwork Packet Exchange |

#### IS401U: Bypass Switch 1U Host System Technical Specifications

|                        |  |
|------------------------|--|
| Dockings:              | Front holders  |
| Voltage Input:         | AC: 90-240 VAC Auto-Select<br>-48 (-75 – -36) VDC  |
| Power Consumption:     | 180W   |
| Size:                  | 438mm x 586 mm x 44 mm ( 17.24" x 23.07" x 1.73")<br>Wide x Depth X Height   |
| Operating Humidity:    | 0%–90%, non-condensing   |
| Operating Temperature: | 0°C – 40°C (32°F – 104°F)  |
| Storage Temperature:   | -20°C–65°C (-4°F–149°F)  |
| Fans                   | 4 hot swap Fans<br>4 wires connections on each fan (12V,GND,TACH and PWM)<br>Specifications (maximum operation condition) of one Fan<br>SPL- 61dB(A)<br>Current – 0.92A<br>Air flow – 28.6 CFM |
| EMC Certifications:    | Class A FCC / CE / BSMI  |
| Safety:                | CB / UL  |
| MTBF*:                 | 48 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C   |

#### IS401U: Bypass Switch 1U Host System LEDs Specifications

|       |  |
|-------|--|
| LEDs: | <p><b>FRONT</b></p> <p><b>Two Power LEDs: PS1, PS2</b><br/> <b>PS1:</b> Green LED will light when power is on and off if there is a failer in power supply module or when extracrting the power supply module from the system.<br/> <b>PS2:</b> Green LED will light when power is on and off if there is a failer in power supply module or when extracrting the power supply module from the system.</p> <p><b>System Status LEDs: 3 LEDs</b><br/> <b>Sys OK:</b> System Normal Operation – Light Green.<br/> Who l'm: in rack identification – Blinking Green.<br/> <b>Sys UP:</b> System Init during power up and during shutdown – Light Yellow.<br/> <b>ALM:</b> System Alarm – Light Red.</p> <p><b>Module Power LEDs:</b><br/> 1. <b>M1:</b> module1 power on – Light Green. <b>M2:</b> module2 power on – Light Green.<br/> 2. <b>M3:</b> module3 power on – Light Green.</p> <p>BACK</p> <p><b>One bi-color LED indication that integrated on each power supply module:</b><br/> <b>Power Switch On</b> – Geern color.<br/> <b>Standby(AC/DC In,Only +5VSB output)</b> – Blinking Green color.<br/> <b>Power Fail</b> – Red color.</p> |
|-------|--|

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|  | <b>Internal Fan Fail</b> – Blinking Red.  |
| <b>Switches</b>  | <p>Push button to power the system (PWR).<br/> From ON to OFF –<br/> Press and hold this push button during 4 second will perform firmware shutdown<br/> press and hold this push button during 8second will perform power shoutdown.<br/> From OFF to ON – simple push will turn system on.<br/> Reset (RST):<br/> Small micro-switch stand behind hidden hole :<br/> Press and hold for more than 1 sec will perform restart to the system.</p> |
| <b>Connectors:</b>   | Management Ports:<br>RJ-45 Ethernet (MGNT ETH)<br>RJ-45 serial port (RS-232)<br>USB port (RS-232)   |
| <b>IS40M40G4BP-QS4 (50um)</b>  |   |
| <b>Fiber Gigabit Ethernet Technical Specifications – (40GBase-SR4) Adapters:</b> |   |
| <b>IEEE Standard / Network topology:</b>   | Fiber Gigabit Ethernet, 40GBase-SR4 (850nM)   |
| <b>Data Transfer Rate:</b>   | 40G per port  |
| <b>Cables and Operating distance:</b>  | Multimode fiber:50um<br>*50m maximum on OM3 MMF<br>*75m maximum on OM4 MMF<br>Theoretical Distance – Defined as half a distance   |
| <b>Output Transmit Power:</b>  | Typical: -2 dBm<br>Minimum: – 7.6 dBm   |
| <b>Optical Receive Sensitivity:</b>  | Typical: -13 dBm<br>Maximum: -12. dBm   |
| <b>Insertion Loss ( Passive: Normal Mode)</b>                                    | Typical: 1.2 dB<br>Maximum: 1.8 dB  |
| <b>Insertion Loss ( Passive: Bypass Mode)</b>                                    | Typical: 1.2 dB<br>Maximum: 2.1 dB  |
| <b>Power Consumption:</b>  | 18.5W   |
| <b>Size:</b>   | 102.2mm x161.9 mm x 40.5 mm (4.02" x 6.37" x 2")<br>Wide x Depth x Height   |
| <b>Operating Humidity:</b>   | 0%–90%, non-condensing  |
| <b>Operating Temperature:</b>  | 0°C – 40°C (32°F – 104°F)   |
| <b>Storage Temperature:</b>  | -20°C–65°C (-4°F–149°F)   |
| <b>EMC Certifications:</b>   | Class A FCC / CE / BSMI   |
| <b>Safety:</b>   | UL  |
| <b>MTBF*:</b>  | 75 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C  |
| <b>IS40M40G4BP-QS4 and : LED and Connector Specifications</b>                    |   |
| <b>LEDs:</b>   | Green LED per port (Network / Monitor)<br>Activity : LED will blink.  |

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|   | <p>Link : LED will turn on.</p> <p>Two LED:<br/>         Inline Mode – Green LED.<br/>         Non Inline Mode :Bypass, TAP, Disconnect – Yellow (Orange) LED.</p> <p>HB Status LED<br/>         Blinking Green LED – HB is active.<br/>         LED is off – HB not active</p> |
| <b>Connectors:</b>  | <p>Network: 2 MPO<br/>         Monitor: 2 QSFP+</p>   |
| <b>IS40M40G4BP-QBD (850um/900nm)</b>  |   |
| <b>Fiber Gigabit Ethernet Technical Specifications – (40GBase-BD) Adapters:</b> |   |
| <b>IEEE Standard / Network topology:</b>  | Fiber Gigabit Ethernet, 40GBASE-SR-BiDi (850nm / 900nm)   |
| <b>Data Transfer Rate:</b>  | 40G per port  |
| <b>Cables and Operating distance:</b>   | <p>Multimode fiber:50um<br/>         *50m maximum on OM3 MMF<br/>         *75m maximum on OM4 MMF<br/>         Theoretical Distance – Defined as half a distance</p>  |
| <b>Output Transmit Power:</b>   | <p>Typical: 0 dBm<br/>         Minimum: -4 dBm</p>  |
| <b>Optical Receive Sensitivity:</b>   | <p>Maximum: -7.1. dBm at 850nm<br/>         Maximum: -7.7. dBm at 900nm</p>   |
| <b>Insertion Loss (Passive: Normal Mode)</b>                                    | <p>Typical: 1.2 dB<br/>         Maximum: 2 dB</p>   |
| <b>Insertion Loss (Passive: Bypass Mode)</b>                                    | <p>Typical: 1.2 dB<br/>         Maximum: 2 dB</p>   |
| <b>Power Consumption:</b>   | 19W   |
| <b>Size:</b>  | 102.2mm x161.9 mm x 40.5 mm (4.02" x 6.37" x 2")<br>Wide x Depth x Height   |
| <b>Operating Humidity:</b>  | 0%–90%, non-condensing  |
| <b>Operating Temperature:</b>   | 0°C – 40°C (32°F – 104°F)   |
| <b>Storage Temperature:</b>   | -20°C–65°C (-4°F–149°F)   |
| <b>EMC Certifications:</b>  | Class A / FCC / CE / BSMI   |
| <b>Safety:</b>  | UL  |
| <b>MTBF*:</b>   | 75 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C  |
| <b>IS40M40G4BP-QBD and : LED and Connector Specifications</b>                   |   |
| <b>LEDs:</b>  | <p>Green LED per port (Network / Monitor)<br/>         Activity : LED will blink.<br/>         Link : LED will turn on.</p> <p>Two LED:<br/>         Inline Mode – Green LED.<br/>         Non Inline Mode :Bypass, TAP, Disconnect – Yellow (Orange) LED.</p>                  |

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|  | HB Status LED<br>Blinking Green LED – HB is active.<br>LED is off – HB not active.   |
| <b>Connectors:</b>   | Network: 2 LC<br>Monitor: 2 QSFP+  |
| <b>IS40M40G4BP-QL4</b>   |  |
| <b>Fiber 40Gigabit Ethernet Technical Specifications – (40GBase-LR4) Adapters:</b> |  |
| <b>IEEE Standard / Network topology:</b>   | Fiber Gigabit Ethernet, 40GBase-LR4 (1310nm)   |
| <b>Data Transfer Rate:</b>   | 40Gbit/s per port  |
| <b>Network ports Cables and Operating distance:</b>                                | Single mode fiber:<br>5000m maximum at 9 um **<br>**Theoretical Distance – Defined as half a distance  |
| <b>Output Transmit Power:</b>  | Typical: 2 dBm<br>Minimum: – 4 dBm   |
| <b>Optical Receive Sensitivity:</b>  | Typical: -11 dBm<br>Maximum: -3.83. dBm  |
| <b>Insertion Loss ( Passive: Normal Mode)</b>                                      | Typical: 1 dB<br>Maximum: 1.8dB  |
| <b>Insertion Loss ( Passive: Bypass Mode)</b>                                      | Typical: 1 dB<br>Maximum: 1.8 dB   |
| <b>Voltage:</b>  | 12V +/-5%, 5VSB+/-5%, 5V +/-5%   |
| <b>Size:</b>   | 102.2mm x161.9 mm x 40.5 mm (4.02" x 6.37" x 2")<br>Wide x Depth x Height  |
| <b>Operating Humidity:</b>   | 0%–90%, non-condensing   |
| <b>Operating Temperature:</b>  | 0°C – 40°C (32°F – 104°F)  |
| <b>Storage Temperature:</b>  | -20°C–65°C (-4°F–149°F)  |
| <b>EMC Certifications:</b>   | Class B FCC / CE / VCCI  |
| <b>Safety:</b>   | UL   |
| <b>MTBF*:</b>  | 75 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C   |
| <b>IS40M40G4BP-QL4: LED and Connector Specifications</b>                           |  |
| <b>LEDs:</b>   | Green LED per port (Network / Monitor)<br>Activity : LED will blink.<br>Link : LED will turn on.<br>Two LED:<br>Inline Mode – Green LED.<br>Non Inline Mode :Bypass, TAP, Disconnect – Yellow (Orange) LED.<br>HB Status LED<br>Blinking Green LED – HB is active.<br>LED is off – HB not active |
| <b>Connectors:</b>   | Network: 2 LC  |

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|  | Monitor: 2 QSFP+  |
| <b>IS40M10G8BP-SRD</b>   |   |
| <b>Dual rate Fiber 10G/1G Ethernet Technical Specifications – (10GBase-SR / 1000Base-SX) Adapters:</b> |   |
| <b>IEEE Standard / Network topology:</b>   | 1000Base-SX, 10GBase-SR (850nm)   |
| <b>Data Transfer Rate:</b>   | 20Gbit/s in full duplex mode per port   |
| <b>Cables and Operating distance:</b>  | Multimode fiber:62.5um<br>16.5m maximum at 62.5 um **<br>Theoretical Distance – Defined as half a distance as stated by the IEEE 802.3 standard |
| <b>Output Transmit Power:</b>  | Typical: -2.5 dBm<br>Minimum: – 7.3 dBm   |
| <b>Optical Receive Sensitivity:</b>  | Typical: -14 dBm<br>Maximum: -11. dBm   |
| <b>Insertion Loss ( Passive: Normal Mode)</b>  | Typical: 0.8 dB<br>Maximum: 1.8 dB  |
| <b>Insertion Loss ( Passive: Bypass Mode)</b>  | Typical: 0.8 dB<br>Maximum: 1.8 dB  |
| <b>Voltage:</b>  | 12V +/-5%, 5VSB+/-5%, 5V +/-5%  |
| <b>Power Consumption:</b>  | 10.5W   |
| <b>Size:</b>   | 102.2mm x161.9 mm x 40.5 mm (4.02" x 6.37" x 2")<br>Wide x Depth x Height   |
| <b>Operating Humidity:</b>   | 0%–90%, non-condensing  |
| <b>Operating Temperature:</b>  | 0°C – 40°C (32°F – 104°F)   |
| <b>Storage Temperature:</b>  | -20°C–65°C (-4°F–149°F)   |
| <b>EMC Certifications:</b>   | Class A / FCC / CE / BSMI   |
| <b>Safety:</b>   | CB / UL   |
| <b>MTBF*:</b>  | 48 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C  |
| <b>IS40M10G8BP-LRD</b>   |   |
| <b>Dual rate Fiber 10G/1G Ethernet Technical Specifications – (10G Base-LR / 100BaseLX) Adapters:</b>  |   |
| <b>IEEE Standard / Network topology:</b>   | 1000Base-LX, 10GBase-LR (1310nm)  |
| <b>Data Transfer Rate:</b>   | 20Gbit/s in full duplex mode per port   |
| <b>Netowrk ports Cables and Operating distance:</b>  | Single mode fiber:<br>5000m maximum at 9 um **  |
| <b>Insertion Loss ( Passive: Normal Mode)</b>  | Typical: 0.8 dB<br>Maximum: 1.8 dB  |



|   |  |
|---|--|
| <b>Insertion Loss ( Passive: Bypass Mode)</b> | Typical: 0.8 dB<br>Maximum: 1.8 dB   |
| <b>Voltage:</b>                               | 12V +/-5%, 5VSB+/-5%, 5V +/-5%   |
| <b>Power Consumption:</b>                     | 11W  |
| <b>Size:</b>                                  | 102.2mm x161.9 mm x 40.5 mm (4.02" x 6.37" x 2")<br>Wide x Depth x Height            |
| <b>Operating Humidity:</b>                    | 0%–90%, non-condensing   |
| <b>Operating Temperature:</b>                 | 0°C – 40°C (32°F – 104°F)  |
| <b>Storage Temperature:</b>                   | -20°C–65°C (-4°F–149°F)  |
| <b>EMC Certifications:</b>                    | Class A / FCC / CE / BSMI  |
| <b>Safety:</b>                                | CB / UL  |
| <b>MTBF*:</b>                                 | 48 years<br>According to Telcordia SR-332 issue 3, environment GB, temperature 40 °C |

| <b>IS40M10G8BP-LRd/SRd: LED and Connector Specifications</b> |  |
|--|--|
| <b>LEDs:</b>   | Green LED per port (Network / Monitor)<br>Activity : LED will blink.<br>Link : LED will turn on.<br><br>Bi-color LED:<br>Inline Mode – Green color<br>Non Inline Mode :Bypass, TAP, Disconnect – Yellow (Orange) color.<br><br>HB Status LED<br>Blinking Green LED – HB is active.<br>LED is off – HB not active |
| <b>Connectors:</b>   | Network: 4 LC Duplex<br>Monitor: 4 SFP+  |

**Figure: 1 – Normal Mode Functional Block Diagram**

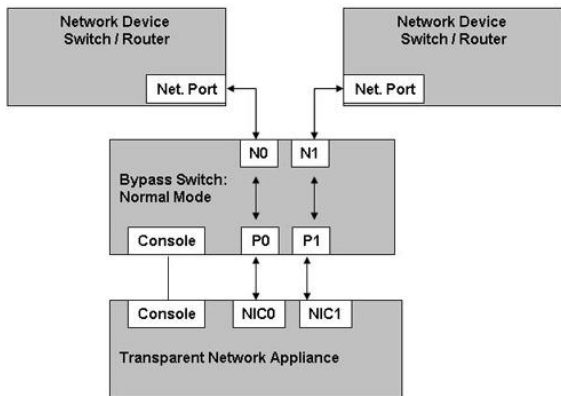


Figure: 2 – Bypass Mode Functional Block Diagram

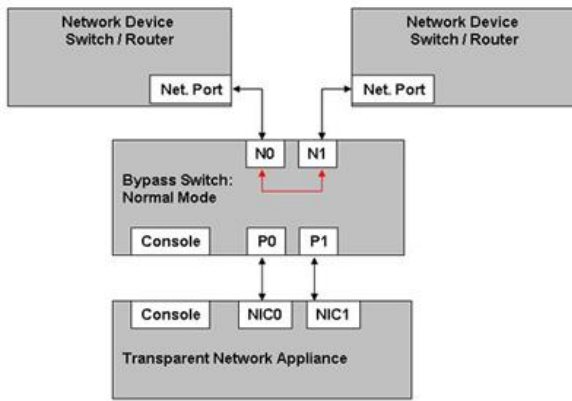


Figure: 3 – Tap Mode Functional Block Diagram

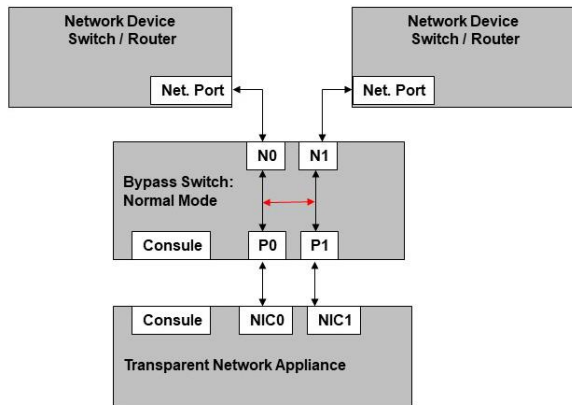
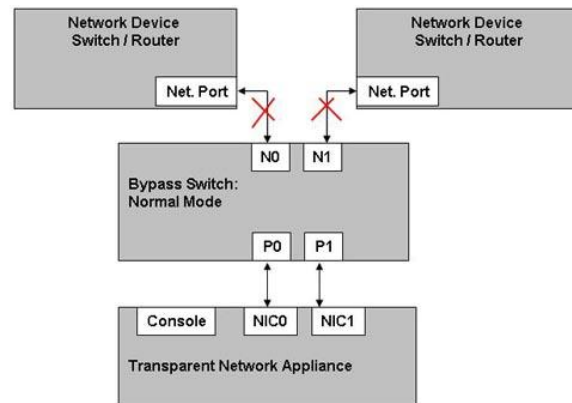


Figure: 4 – Tap Mode Functional Block Diagram



## Order Information

| P/N                    | Description  | Notes   |
|------------------------|--|---|
| <b>IS401U-US</b>       | Bypass Switch 1U Host System   | 90-240 VAC Auto-Select, US cable  |
| <b>IS401U-EU</b>       | Bypass Switch 1U Host System   | 90-240 VAC Auto-Select, EU cable  |
| <b>IS401U-48V</b>      | Bypass Switch 1U Host System   | Power supply -48VDC   |
| <b>IS40M40G4BP-QS4</b> | 40G Gigabit (SR4) fiber Intelligent Bypass Switch module                   | SR4 MMF Single Segment Bypass 40G – (SR4 on the Network and Monitor ports)                |
| <b>IS40M40G4BP-QBD</b> | 40G Gigabit (SR-BiDi) fiber Intelligent Bypass Switch module               | SR-BiDi MMF Single Segment Bypass 40G – (SR-BiDi on the Network and Monitor ports)        |
| <b>IS40M40G4BP-QL4</b> | 40G Gigabit (LR4) fiber Intelligent Bypass Switch module                   | LR4 SMF Single Segment Bypass 40G – (LR4 on the Network and Monitor ports)                |
| <b>IS40M10G8BP-SRD</b> | Dual segment 10G/1G Gigabit (SR/SX) fiber Intelligent Bypass Switch        | SR/SX MM Dual Segment Bypass, Dual rate 10G/1G – (SR/SX on the Network and Monitor ports) |
| <b>IS40M10G8BP-LRD</b> | Dual segment 10G/1G Gigabit (LR/LX) fiber Intelligent Bypass Switch module | LR/LX SM Dual Segment Bypass, Dual rate 10G/1G – (LR/LX on the Network and Monitor ports) |

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