BLACK BOX®
NETWORK SERVICES

January 2008

Model Numbers

SW1021A	Complete System with (1) CAT6 path
SW1023A	Complete System with (1) ST Fiber path
SW1025A	Complete System with (1) SC Fiber path
SW1022A	CAT6 upgrade kit – 1 additional path
SW1024A	ST Fiber upgrade kit – 1 additional path
SW1026A	SC Fiber upgrade kit – 1 additional path

2U AUTO-BYPASS SWITCH

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RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le Industrie Canada.

1. Specifications

Connectors:
CAT6 RJ45 A/B SWITCH CARD – (3) CAT6 RJ45 connectors
FIBER OPTIC A/B SWITCH CARDS – (3) Duplex fiber optic SC or (6) ST connectors
CONTROLLER CARD – (1) RJ45, (2) RJ11
POWER CARD – (2) two position male MOLEX connectors

Indicators:
CAT6 RJ45 A/B SWITCH CARDS – (2) LED, one for A, one for B
FIBER OPTIC A/B SWITCH CARDS – (2) LED, one for A, one for B
CONTROLLER CARD – (2) LED, one for power, one for status
POWER CARD – (2) LED, one for PS1 active, one for PS2 active

Switches:
CAT6 RJ45 A/B SWITCH CARDS – (1) momentary toggle switch, (1) 8-position dip-switch
FIBER OPTIC A/B SWITCH CARDS – (1) momentary toggle switch, (1) 8-position dip-switch
CONTROLLER CARD – (1) momentary toggle switch, (1) 8-position dipswitch, (1) momentary push-button switch, and (1) key-lock switch.

Power:
CAT6 RJ45 A/B SWITCH CARD – 12 VDC, 40 mA normal, additional 92 mA max while switching.
FIBER OPTIC A/B SWITCH CARDS – 12 VDC, 40 mA in A position, 120 mA max in B position, additional 18.4 mA max while switching.
CONTROLLER CARD – 12 VDC, 350 mA
The rack may be powered with either one or two (for redundancy) external 100-240VAC 47-63Hz, 12VDC 5A power supply modules. Additional power supply options are also available.

Physical Dimensions:
RACK – 3.5" H x 19" W x 12.5" D (including handles and connectors). The rack chassis has 18 x 0.937" slot positions.
CAT6 RJ45 A/B SWITCH CARD – one slot (0.937 inches wide)
FIBER OPTIC A/B SWITCH CARDS – one slot (0.937 inches wide)
POWER CARD – one slot (0.937 inches wide)
CONTROLLER CARD – one slot (0.937 inches wide)

Environment:

TEMPERATURE	0° to 40° C operating, -20° to 70° C non-operating
HUMIDITY	0 to 95% non-condensing
ALTITUDE	10,000 ft maximum

2. Introduction

The 2U Auto Bypass Switch is a multiple port A/B switch that is designed to automatically switch between a normal network path and a “bypass” or “failover” path for 10/100/1000/10G Ethernet network environments, or multimode fiber based Ethernet environments. It consists of a 2U high, 19 inch rackmount card cage, a power supply card plus external 100-240 VAC power supply module (with an option for a second external power supply module for redundant power), and from 1 to 5 groups of Auto Bypass Switch module cards. Each group of Auto Bypass Switch modules consists of (2) A/B switch cards and a controller card that provides remote access and control, as well as automatic control for its pair of A/B switch cards. There are three types of A/B Switch cards. The CAT6 RJ45 A/B Switch cards support copper based Ethernet environments ranging from 10Base-T up to 10GBase-T. The Fiber Optic A/B Switch cards are designed for multimode fiber applications and come in two versions – an ST version and an SC version. The Fiber Optic A/B Switch cards use precision optical mirror mechanisms to switch connections and are thus completely transparent to rates, protocols, and wavelengths.

Each controller card provides access to user configurable parameters that control an auto-bypass switching function and an auto-recovery switching function, as well as providing remote switching and monitoring capabilities for each independent Auto Bypass Switch module group. These features allow the Auto Bypass Switch to be used in a variety of applications. For example, the Auto Bypass Switch can be used with in-line network monitoring devices, Intrusion Prevention Systems, etc. to automatically remove these devices from the network for maintenance or should they fail, while simultaneously providing basic network connectivity via a “bypass” path through the switch. Other applications include monitoring a “normal” network path and automatically switching to a redundant “backup/failover” path when a problem in the normal network path occurs, thus providing minimal disruption in service to the user(s). To prevent “flapping” when intermittent problems exist in the normal path, the auto recovery function can be disabled to allow the intermittent problem to be corrected while the system continues to use the backup path. Once the intermittent problem is fixed, the user can then send a command or use the front panel toggle switch to cause the 2U Auto Bypass Switch to restore the normal network connections.

In order to be able to perform the auto bypass and auto recovery switching functions, the Auto Bypass Switch issues ICMP echo request (PING) packets from an internal Ethernet node, thru the “normal” network path, to any user specified external Ethernet node on the user’s network. If the normal path connections go down for any reason, the Auto Bypass Switch will detect the failure and automatically switch to the bypass/failover path connections while simultaneously disconnecting the normal path.

The Auto Bypass Switch can automatically switch connection states using its auto bypass and auto recovery switching functions, or the user can remotely issue switching commands via the switch’s remote control Ethernet interface or remote control RS232 serial interface. Manual control of the switch is also provided via momentary contact toggle switches on the front of the unit. These manual toggle switches can be disabled via a front panel keylock switch.

High reliability non-latching telecommunications relays and non-latching optical switching mechanisms are used in the A/B Switch Cards that form the switching elements within the Auto Bypass Switch. When powered OFF, these non-latching relays make a connection between the “A” and the “C” ports on each A/B Switch Card installed in the Auto Bypass Switch chassis. Thus for most applications, the bypass path will use the “A” ports, and the normal path will use the “B” ports. With this configuration, should power to the Auto Bypass Switch fail, the bypass path will automatically be connected (the Auto Bypass Switch connects the A ports to their corresponding C ports) and remain connected until power is restored. Once power is restored, the Auto Bypass Switch can automatically reconnect the normal path (switch back to the B-C connection state) if auto recovery mode is enabled. Or the user can issue a switch command via the RS232 or Ethernet remote control interface. The front panel toggle switch can also be used to restore the normal connection path.

3. Configuration

3.1 A/B Switch Card Configuration

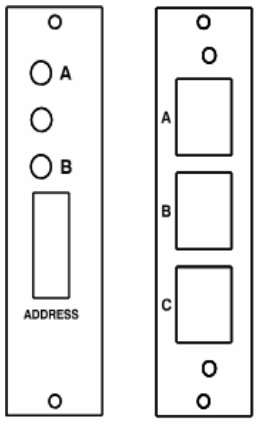


Figure 3.1.1 – Typical A/B Switch Card Front & Rear Panels

Each A/B Switch Card has an 8-position DIP switch, used to set the card's address. Switch position 1 is the least significant bit, and position 8 is the most significant bit. Set each switch position ON (as marked) for a '0', and OFF for a '1'. Card address 1 for example, would be DIP switch position 1 OFF, and positions 2-8 ON. Card addresses within a group must be unique. Card address "00" is reserved and must not be used. A typical approach is to set the card addresses in each group to "01" and "02" from left to right within the group. The Controller Card communicates with the individual switch cards using a multi-drop scheme. If two A/B cards within the same group have the same address, both will try to respond at the same time, causing communication errors.

3.2 Controller Card Rear PC Board Configuration

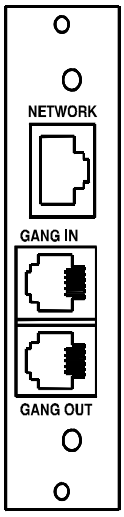


Figure 3.2.1 – Controller Card Rear Panel Outline

The Controller Card rear pc board assembly has two jumpers for shielding and grounding options. The two 3-position jumpers are positioned such that pin 1 is toward the card edge connector, and pin 3 is toward the RJ11 connectors. Each 3-position jumper has a 2-position shunt, used to connect two of the three positions together.

Table 3.2.1 – Controller Card Rear PC Board Jumper Settings

Jumper	**W1**	**W2**
RJ45 Shield		
Connected to Frame Ground *	Pin 1 to Pin 2	
Open	Pin 2 to Pin 3	
Power Supply Ground		
100 Ohm Connection to Frame Ground *		Pin 1 to Pin 2
Direct Connection to Frame Ground		Pin 2 to Pin 3

* Factory Default Positions

Table 3.2.2 – RJ45 10Base-T Ethernet Port Pin Assignment

Pin	Signal Name	Signal Direction
1	Transmit Pair	Output
2	Transmit Pair	Output
3	Receive Pair	Input
6	Receive Pair	Input

Table 3.2.3 – RJ11 GANG-IN Port Pin Assignment

Pin	Signal Name	Signal Direction
5	Signal Ground	Not Applicable
4	Transmit Data / V+	Output / Output
3	Receive Data / V-	Input / Output
2	System Control (OPEN,+12,-12)	Input and Output

Note: The function of pins 3 and 4 on the GANG-IN port, are set using jumpers on the front card (see section 3.3 below). Pins 3 & 4 can be configured as TXD and RXD for serial communication, or as V+ and V- to control the Auto Bypass Switch card group with a remote toggle switch. The connections to V+ and V- are through 1 K ohm resistors. The System Control signal can be used as an input or an output. If used an Input, this pin should normally be open. This input is driven to +V to switch the system to A, and is driven to –V to switch the system to B. Once the system switches connection states, the Input can be returned to open. If used as an Output, this signal is driven to +10 VDC when the user initiates a system switch to A, and is driven to –10 VDC when the user initiates a system switch to B.

Table 3.2.4 – RJ11 GANG-OUT Port Pin Assignment

Pin	Signal Name	Signal Direction
5	No Connection	Not Applicable
4	Transmit Data	Output
3	Receive Data	Input
2	Signal Ground	Not Applicable

Note: The RJ11 Gang Out port is not typically used for Auto Bypass Switch applications.

3.3 Controller Card Front PC Board Configuration

The Controller Card front pc board has an 8-position dipswitch and four jumpers for user configurable options. The four 3-position jumpers are positioned such that pin 1 is toward the front panel, and pin 3 is toward the rear of the card. Each 3-position jumper has a 2-position shunt, used to connect two of the three positions together.

Table 3.3.1 – Controller Card Front PC Board Jumper W1 and W2 Settings

Jumper	W1	W2
Gang-In Pin 3		
Connected to TXD *	Pin 1 to Pin 2	
Connected to V+ through 1K	Pin 2 to Pin 3	
Gang-In Pin 4		
Connected to RXD *		Pin 1 to Pin 2
Connected to V- through 1K		Pin 2 to Pin 3

* Factory Default Setting

The jumpers W1 and W2 function as a pair to configure the gang-in port. Refer to table 3.2.3 for the GANG-IN port pin assignment. Connect to TXD and RXD to support RS-232 serial communications, or connect to V+ and V- through 1 K ohm resistors to control the system control input with a remote toggle switch. Note that the serial port is required for setup of the network parameters.

Table 3.3.2 – Controller Card Front PC Board Jumper W4 and W5 Settings

Jumper	W4	W5
Input Port Source		
no Ethernet capabilities	Pin 1 to Pin 2	
Ethernet version *	Pin 2 to Pin 3	
Input Port Source		
no Ethernet capabilities		Pin 1 to Pin 2
Ethernet version *		Pin 2 to Pin 3

* Factory Default Setting

Jumpers W4 and W5 function as a pair to configure the input port source. It should not be necessary to change these jumpers from their factory set positions. These jumpers configure the source for communications to the internal processor on the Controller Card.

The 8-position dipswitch SW2 on the Controller Card is used to define the Controller Card's address. Switch position 1 is the least significant bit, and position 8 is the most significant bit. Set each switch position ON (as marked) for a '0', and OFF for a '1'. Address 1 for example, would be DIP position 1 OFF, and positions 2-8 ON. Controller Card addresses may be repeated within the Auto Bypass Switch chassis since each controller card has it's own set of interface connectors and unique IP address. However, the user may find that setting each controller card to a unique value helps to eliminate confusion. Address "00" is reserved and must not be used.

3.4 TCP/IP and Auto Bypass Configuration

Once the user configurable jumpers and DIP switch settings inside the 2U Auto Bypass Switch are configured, there are several parameters related to TCP/IP operations and the auto bypass and auto recovery functions that must be initially configured in order to operate the 2U Auto Bypass Switch. These parameters are accessible using either the serial RS232 remote control interface or the Ethernet remote control interface. These parameters include:

- IP address, subnet mask, and gateway address for the Ethernet remote control interface on the 2U Auto Bypass Switch (this interface also functions as the internal Ethernet node that acts as the "PING source" used by the auto bypass and auto recovery switching functions). Note that the default values for these parameters are 192.168.1.30, 255.255.255.0, and 192.168.1.1 respectively.

- IP address and MAC address of the external Ethernet node that the 2U Auto Bypass Switch is to monitor in order to determine when to switch between the normal and the bypass paths. A value of 0.0.0.0 for the monitor IP address disables the auto bypass and auto recovery switching functions.
- Monitor interval – this is the time interval between PINGs issued by the internal Ethernet node in the 2U Auto Bypass Switch, measured in 100 msec increments. For example, if you want the 2U Auto Bypass Switch to issue PINGs every 1.5 seconds then set this value to 15. The valid range is 1 to 255 (0.1 seconds to 25.5 seconds). A value of 0 disables the automatic bypass/recovery functions.
- Monitor fail count – this is the number of successive PING attempts that must fail before the 2U Auto Bypass Switch automatically switches to the bypass path and removes the normal connection path. The valid range is 1 to 255. A value of 0 disables the automatic bypass/recovery functions.
- Monitor ok count – this is the number of successive PING attempts that must succeed before the 2U Auto Bypass Switch automatically switches back to the normal path and removes the bypass connection path. The valid range is 1 to 255. A value of 0 disables only the automatic recovery function – automatic bypass will still operate. If auto recovery is disabled the user must manually switch back to the normal path via the front panel toggle switch or by issuing a “SET SYSTEM B” command to the 2U Auto Bypass Switch.
- The SAVE command saves any changes that are made to the configuration parameters for the next startup. If the Save command is not used, the 2U Auto Bypass Switch will revert back to the prior configuration settings the next time power is cycled, or after receiving a Reset command.
- The RESET command restarts the 2U Auto Bypass Switch. Any configuration changes that were not first saved will be defaulted back to their prior settings when the Auto Bypass Switch restarts.

For additional details regarding the commands used to set these parameters, see Section 7.

4. Installation

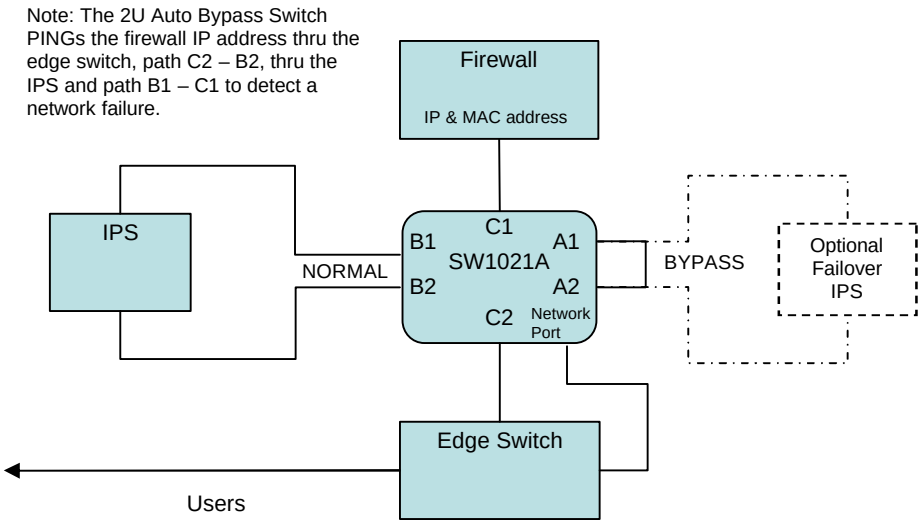
4.1 Find a location suitable for installing the 2U Auto Bypass Switch, with access to AC power outlets and the connections you intend to switch through the unit.

4.2 If you intend to use serial control, connect to the RJ11 Gang In RS232 console port using the supplied DB9 to RJ11 adapter and RJ11 to RJ11 crossover cable. The data rate and format is fixed at 9600 bps, no parity, 8 data bits, and 1 stop bit. See Table 3.2.3 for the RJ11 Gang In port connector pin assignments.

4.3 There are two sets of A/B switch cards per each "path group" within the 2U Auto Bypass Switch. Connect RJ45 cables or multi mode fiber cables between the 2U Auto Bypass Switch and the devices/network connections that you intend to switch. The 2U Auto Bypass Switch connects each C (common) port to either the respective A port or B port for both switching elements. Telecommunications relays and optical switch mechanisms are used to make these connections between ports, which makes the 2U Auto Bypass Switch completely transparent to data formats, rates, protocols, etc. Note that the switch provides straight through RJ45 connections. If your application requires a cross-over cable, use only (1) RJ45 cross-over cable in that path. Use a straight through RJ45 cable on the other side of the switch. And since non-latching relays are used in the 2U Auto Bypass Switch, the A-C connection state is typically used for the bypass or failover path connections, and the B-C connection state is used for the normal path connections.

For example, in Intrusion Prevention System and similar applications, the two "A" ports on the 2U Auto Bypass Switch are typically connected together with a short patch cable. The "B" ports on the 2U Auto Bypass Switch are connected to the IN/OUT ports on the IPS. And the "C" ports on the 2U Auto Bypass Switch are used to provide the connections between the firewall and the 2U Auto Bypass Switch, and between the 2U Auto Bypass Switch and the first edge router/switch on the network. Thus when in the bypass mode, data will flow between the firewall and one of the "C" ports, thru the first "A" port to the second "A" port, and then out the second "C" port to the edge router/switch. And when in the normal mode, the data will flow between the firewall and one of the "C" ports, thru the first "B" port to the IPS and then back from the IPS to the second "B" port, and then out the second "C" port to the edge router/switch.

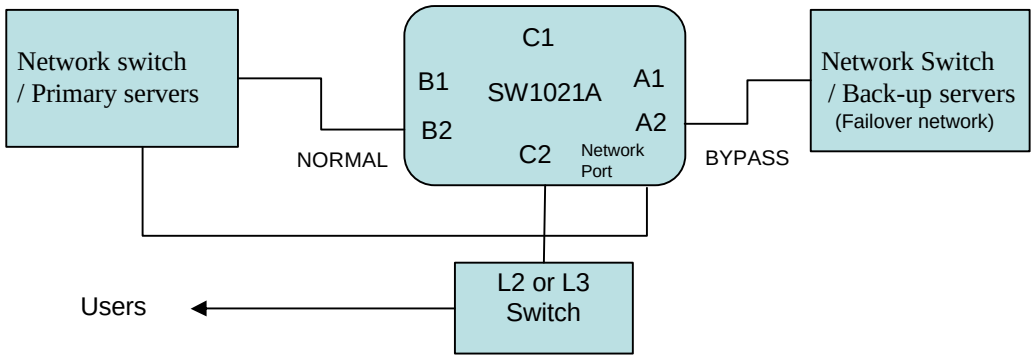
Typical IPS Configuration



A typical failover application where a redundant or backup connection is required would have the host device connected to one of the "C" ports, with the normal network connection to the respective "B" port, and the failover network connection to the respective "A" port. The 2U Auto Bypass Switch provides two separate A/B switching elements, so two separate host devices can be connected to their own "normal" and "failover" network ports. However, if the auto bypass/recovery functions of the 2U Auto Bypass Switch are used, both devices will be simultaneously switched between their normal and failover connections when the auto bypass or the auto recovery switching functions occur.

Typical Failover Configuration

Note: The SW1021A Auto bypass switch PINGs an IP address on the primary network to detect a network path failure.



4.4 Connect a 12VDC power supply to either power supply connector. If you are using redundant power supplies, connect one to each power supply connector. Apply AC power to (each) power supply. The indicators, PS1 and PS2 on the front of the unit will indicate when each power supply is energized. The switch position indicators (A and B) on the front of the unit will light depending on the position of the A/B switching elements within the 2U Auto Bypass Switch. LED A lights when the switching elements in the 2U Auto Bypass Switch are in position A, and LED B lights when the switching elements within the 2U Auto Bypass Switch are in position B.

4.5 Before you connect the 2U Auto Bypass Switch's Ethernet remote control port to your Ethernet network, you must first configure the 2U Auto Bypass Switch TCP/IP related parameters. You should set these parameters before attaching to your network as the default parameters may not work or could interfere with your network. See Section 3 for a list of the TCP/IP parameters that need to be configured.

4.6 Once the TCP/IP parameters have been configured, connect the NETWORK port on the 2U Auto Bypass Switch to your layer 2 switch, HUB, or router. If using the 2U Auto Bypass Switch auto bypass/recovery switching functions, this same layer 2 switch/HUB/router should also be connected to the appropriate switch ports on the 2U Auto Bypass Switch in order to create the required normal and/or bypass paths through the 2U Auto Bypass Switch, and to allow the PING packets from the internal Ethernet node on the 2U Auto Bypass Switch to travel to the desired external Ethernet node on the user's network. If your network is fiber optic based, you will need a media converter to convert the 10Base-T signals of the Auto Bypass Switch NETWORK port to fiber optic Ethernet signals.

In a typical IPS environment, the NETWORK port on the 2U Auto Bypass Switch would be connected to an unused port on the edge router/switch mentioned in the example configuration in section 4.3 above. To provide auto bypass switching, the 2U Auto Bypass Switch should be configured to use the firewall's IP and MAC addresses for the monitor IP address and monitor MAC address parameters. With this configuration, if the 2U Auto Bypass Switch detects a problem thru the normal path and the IPS to the firewall, it will automatically switch to the bypass path. The auto recovery switching function is not valid in this environment and should be disabled. This allows the network security manager to verify that when a problem occurs in the normal path thru the IPS, thus causing the 2U Auto Bypass Switch to switch to the bypass path, that any problems related to the IPS and the normal path are resolved before the IPS is reconnected to the network.

In a typical failover environment, the NETWORK port on the 2U Auto Bypass Switch would be connected to a layer 2 switch or HUB that also connects between the "B" port on the 2U Auto Bypass Switch and the user's "normal" network. To provide auto failover/recovery, the 2U Auto Bypass Switch should be configured to use the IP and MAC addresses of a device on the "normal" network for the monitor IP address and monitor MAC address parameters. With this configuration, the auto bypass switching function will cause the 2U Auto Bypass Switch to automatically switch to the failover network if it detects a problem thru the normal path to the device being monitored. When the auto recovery switching function is enabled, it will cause the 2U Auto Bypass Switch to automatically switch back from the failover network connection to the normal network connection, once the 2U Auto Bypass Switch is able to PING the monitored device again on the normal network path.

The monitorip address and monitormac address parameters can be configured to monitor connectivity to any device within, or outside of the user's network environment. If monitoring connectivity to a device on the same subnet as the 2U Auto Bypass Switch's internal Ethernet node, set the 2U Auto Bypass Switch's monitorip address and monitormac address parameters to the IP address and MAC address of the device being monitored. If monitoring connectivity to a device on a different subnet/network than the 2U Auto Bypass Switch's internal Ethernet node, set the 2U Auto Bypass Switch's monitormac address parameter to the MAC address of the gateway router on the 2U Auto Bypass Switch's subnet, and set the monitorip address parameter to the IP address of the device being monitored. This allows the PING packet issued by the 2U Auto Bypass Switch to be routed through the gateway router to the target device on a different subnet/network. If you don't know the MAC address of the target device or the gateway router on the 2U Auto Bypass Switch's subnet, one method is to open a command prompt window on a P.C. attached to that same subnet and use the "arp -a" command to retrieve this information from the P.C.'s arp cache (you may need to PING the IP address first before the entry will appear in the arp cache).

5. Operation

Whenever the 2U Auto Bypass Switch is powered OFF, or if power fails, the non-latching relays in the 2U Auto Bypass Switch will be in the "A" position, connecting the devices/networks attached to the "A" ports to the "C" ports of both sets of A/B switching elements within the 2U Auto Bypass Switch. When power is applied to the 2U Auto Bypass Switch, the appropriate power supply status indicators (PS1 and/or PS2) will light and LED indicators "A" on the front of the unit will also light to show that the non-latching relays in the 2U Auto Bypass Switch are in the "A" position. Both A/B switching elements in the 2U Auto Bypass Switch will remain in the "A" position until the user manually changes switch states via command or via the front panel toggle switch, or if auto recovery switching is enabled and the 2U Auto Bypass Switch determines that the normal path is available.

5.1 Manual Switching

The 2U Auto Bypass Switch can be switched (both sets of ports simultaneously) from the momentary toggle switch located on the front of the Controller Card. This switching action is enabled by the front panel keylock switch also located on the Controller Card, which must be in the position labeled ENABLE for manual switching to occur. The individual toggle switches on each A/B Switch Card can also be used to switch just that card between the A and B states. This feature may be useful for troubleshooting or during initial installation..

5.2 Serial RS232 Switching

The 2U Auto Bypass Switch can be switched using commands over a serial communications line. The parameters of the RS232 console port are fixed at 9600 baud, no parity, 8 data bits, 1 stop and no flow control (commonly abbreviated as 9600, N, 8, 1, NONE).

When the 2U Auto Bypass Switch powers up, it will send a sign-on message followed by a prompt character ">" to your serial terminal device. After each command is executed, the associated response from the Auto Bypass Switch will be issued, followed by a prompt character. For systems where the console port is being commanded by software, the software should wait for this prompt character before sending each and every command to the 2U Auto Bypass Switch.

It is possible to switch either or both sets of switch ports in that controller card's switch module group to the A or B connection state using the appropriate serial commands. It is also possible to query the position of either or both sets of switch ports using serial commands. The RS232 serial interface is NOT affected by the position of the front panel keylock switch – it will act upon and respond to commands it receives even if the keylock switch is in the DISABLE position.

To display a complete list of the commands available via the serial RS232 interface, type "help" at the command prompt as shown below. For a detailed description of each command, see section 7.

> help

CONSOLE COMMANDS:
GET ALL (display all parameters)
GET VERSION (display software versions)
SET SYSTEM [A/B] (control respective A/B switch card group)
SET RACK N (control respective A/B switch card group)
GET[SET] PORT N [A/B] (control single port)
GET POWER N
GET[SET] IPADDRESS [X.X.X.X]
GET[SET] SUBNETMASK [X.X.X.X]
GET[SET] GATEWAY [X.X.X.X]
GET[SET] READCOMMUNITYNAME [string]
GET[SET] WRITECOMMUNITYNAME [string]

GET[SET] WEBENABLE [ON/OFF]
GET[SET] WEBPASSWORD [string]
GET[SET] WEBTIMEOUT [N] (seconds)
GET[SET] WEBPORT [N]
GET[SET] TELNETENABLE [ON/OFF]
GET[SET] TELNETPASSWORD [string]
GET[SET] TELNETTIMEOUT [N] (seconds)
GET[SET] TELNETPORT [N]
GET[SET] MONITORIP [X.X.X.X] (0.0.0.0 to disable)
GET[SET] MONITORMAC [X X X X X X] (X = HEX CHARS)
GET[SET] MONITORINTERVAL [N] (1/10 seconds, 0 to disable)
GET[SET] MONITORFAILCOUNT [N] (0 to disable)
GET[SET] MONITOROKCOUNT [N] (0 = no auto recover)
GET[SET] AUTHENTICATIONTRAP [ON/OFF]
GET[SET] MANAGER N [X.X.X.X] (0.0.0.0 to disable an entry)
GET MANAGER (display all SNMP managers)
SAVE save settings for next startup
RESET restart (use after SAVE)

>

Notes:

- Commands can be entered in upper or lower case. passwords ARE case sensitive.
- All commands should be terminated with a carriage return (ASCII 13).
- Many of the commands can be abbreviated using just first letters, i.e. “g a” for “get all” or “s p 2 a” for “set port 2 a”.

5.3 Ethernet Switching

In order to use the Ethernet NETWORK port, you must set the IPADDRESS, SUBNETMASK, and GATEWAY address of the 2U Auto Bypass Switch before connecting to your network (see section 6 for more details).

The 2U Auto Bypass Switch can be switched using SNMP commands over a TCP/IP Ethernet network. The NETWORK port on the 2U Auto Bypass Switch is 10base-T only. After setting up the system and powering up for the first time, you may or may not need to change other parameters for your application. These parameters are stored in non-volatile memory, and must be made permanent by using the SAVE command. After saving new parameters, cycle power or use the RESET command to reboot the 2U Auto Bypass Switch to use the newly saved parameters. See the MIB Path Summary for a list of SNMP variables and their functions.

The 2U Auto Bypass Switch also includes a built in http server that allows all of the commands that are available via the RS232 serial port to be accessed via a web browser interface. See section 8 for a detailed description of this feature.

6. Network Setup

To perform the initial setup of the 2U Auto Bypass Switch you can use a serial terminal capable of 9600 baud, no parity, 8 data bits, and 1 stop bit. Connect this terminal to the RS232 console connector on the 2U Auto Bypass Switch using the supplied DB9 to RJ11 adapter and RJ11 to RJ11 crossover cable. Then apply power to the system.

After this process is complete you will see a sign-on message displayed on the serial console, i.e.

```
Network Agent Version 2.9 JUN 2007
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System starting ...
console ready.
>
```

At this point the console is ready for the low level configuration changes necessary before you will be able to communicate with the unit using TCP/IP. You will need to enter an IP address and subnet mask, gateway address, read and write SNMP community names if using SNMP, or a web password for browser access. These parameters then need to be saved into non-volatile memory, and the system will then need to be reset to allow it to reconfigure with the new settings. Any time one or more of these parameters is changed, they must be saved followed by a system reset. The following shows a typical setup session. Change the entered parameters to suit your application requirements. All the console level commands available are described in detail in section 7.

```
>set ipaddress 192.168.1.200
OK
>set subnetmask 255.255.255.0
OK
>set gateway 192.168.1.1
OK
>set readcommunityname public
OK
>set writecommunityname private
OK
>save
OK
>reset
restarting …
```

After the system reinitializes, you will again be greeted by the sign-on message as before. At this time, the unit will respond to SNMP and HTTP messages at the assigned IP address. You can now attach a 10base-T CAT5 cable to the network port and to an available port on your hub/switch/router.

7. Console Commands

The following commands are available from the console prompt of the unit. All commands are case insensitive, although several variable parameters are case sensitive (read/write community names and web password). Many of the command words such as GET, SET, SYSTEM, and PORT can all be abbreviated by the first letter of the command. This allows shorthand entry of switching commands.

GET ALL

Displays all parameters and settings. An example output is shown below.

System Status: X
IP Address: 192.168.1.30
Subnet Mask: 255.255.255.0
Gateway IP Address: 192.168.1.1
Web Enable: Enabled
Web Password: mctech
Web Timeout: 300
Web Port: 80
Telnet Enable: Enabled
Telnet Password: dataman
Telnet Timeout: 80
Telnet Port: 23
Monitor IP Address: 207.155.249.112
Monitor MAC Address: 00 0C 41 3C 98 54
Monitor Interval: 10
Monitor Fail Count: 5
Monitor Ok Count: 5
Read Community Name: public
Write Community Name: private
Authentication Trap: Disabled
2.9 JUN 2007, `V1.1 10/2003`
SNMP Managers:
`1: 192.168.1.113`
`2: 192.168.1.115`
`3: 192.168.1.149`

GET VERSION

Displays the software revision of the system.

2.9 JUN 2007, `V1.1 10/2003`

GET SYSTEM

This command is not supported in the 2U Auto Bypass Switch. If this command is issued to the 2U Auto Bypass Switch it will respond with the following:

`System Status: X`

SET SYSTEM A[B]

Sets both of the A/B switching elements for the connected controller card to position A or B.

GET RACK N

This command is not supported in the 2U Auto Bypass Switch. If this command is issued to the 2U Auto Bypass Switch it will respond with the following:

```
Rack Status: XXXXXXXXXXXXXXXX
```

GET PORT N

Displays the status of A/B switching element N (1-2). The response will be “A” or “B”.

```
Port Status: B
```

SET PORT N A[B]

Sets the addressed A/B switching element N (1-2) to position A or B. Note that the 2U Auto Bypass Switch only uses the first two A/B switching elements. Setting the switch state of any of the other 14 positions is not meaningful.

GET POWER N

This command is not supported in the 2U Auto Bypass Switch. If this command is issued to the 2U Auto Bypass Switch it will respond with the following:

```
Power Status: External Supply
```

SET IPADDRESS X.X.X.X
GET IPADDRESS

Set or display the current IP address of the network module. Any change will not become permanent until a SAVE operation is performed.
SET SUBNETMASK X.X.X.X
GET SUBNETMASK

Set or display the current subnet mask of the network module. Any change will not become permanent until a SAVE operation is performed.

SET GATEWAY X.X.X.X
GET GATEWAY

Set or display the current gateway IP address of the network module. Any change will not become permanent until a SAVE operation is performed.

SET READCOMMUNITYNAME string
GET READCOMMUNITYNAME
SET WRITECOMMUNITYNAME string
GET WRITECOMMUNITYNAME

Set or display the current read or write community name as specified. Note that these are case sensitive fields. Any change will not become permanent until a SAVE operation is performed.

SET WEBENABLE ON[OFF]
GET WEBENABLE

Set or display the current state of web based access. The network module will not accept any HTTP requests when web enable is off. Any change will not become permanent until a SAVE operation is performed.

SET WEBPASSWORD string
GET WEBPASSWORD

Set or display the current web password. Note that this is a case sensitive field. Any change will not become permanent until a SAVE operation is performed.

SET WEBTIMEOUT seconds
GET WEBTIMEOUT

Set or display the current web timeout in seconds. After a period of inactivity of this many seconds, the network module will request a login. Note that the web timeout cannot be disabled. Any change will not become permanent until a SAVE operation is performed.

SET WEBPORT N
GET WEBPORT

Set or display the current web port number. Changing the web port number from the default can be used to provide an additional level of security. Any change will not become permanent until a SAVE operation is performed.

SET TELNETENABLE ON[OFF]
GET TELNETENABLE

Set or display the current state of telnet based access. The network module will not accept any telnet requests when telnet enable is off. Any change will not become permanent until a SAVE operation is performed.

SET TELNETPASSWORD string
GET TELNETPASSWORD

Set or display the current telnet password. Note that this is a case sensitive field. Any change will not become permanent until a SAVE operation is performed.
SET TELNETTIMEOUT seconds
GET TELNETTIMEOUT

Set or display the current telnet timeout in seconds. After a period of inactivity of this many seconds, the network module will disconnect any current telnet session. Note that the telnet timeout cannot be disabled, it can however, be set arbitrarily large. Any change will not become permanent until a SAVE operation is performed.

SET TELNETPORT N
GET TELNETPORT

Set or display the current telnet port number. Changing the telnet port number from the default can be used to provide an additional level of security. Any change will not become permanent until a SAVE operation is performed.

SET MONITORIP [X.X.X.X]
GET MONITORIP

Set or display the IP address of the device that the 2U Auto Bypass Switch is to PING to determine whether or not the normal and/or bypass path is operational. Setting this to 0.0.0.0 disables the auto bypass and the auto recovery functions. Any change will not become permanent until a SAVE operation is performed.

SET MONITORMAC [X X X X X X]
GET MONITORMAC

Set or display the MAC (Ethernet) address of the device that the 2U Auto Bypass Switch is to PING to determine

whether or not the normal and/or bypass path is operational. This value is entered as a series of six HEX characters with spaces between each HEX character. If monitoring connectivity to a device on the same subnet as the 2U Auto Bypass Switch's internal Ethernet node, set the monitormac address parameters to the MAC address of the device being monitored. If monitoring connectivity to a device on a different subnet/network than the 2U Auto Bypass Switch's internal Ethernet node, set the 2U Auto Bypass Switch's monitormac address parameter to the MAC address of the gateway router on the 2U Auto Bypass Switch's subnet. Any change will not become permanent until a SAVE operation is performed.

SET MONITORINTERVAL [N]
GET MONITORINTERVAL

Set or display the time interval between PINGs issued by the internal Ethernet node in the 2U Auto Bypass Switch, measured in 100 msec increments. To issue PINGs every 1.5 seconds, set this value to 15. The valid range is 1 to 255 (0.1 seconds to 25.5 seconds). A value of 0 disables the automatic bypass/recovery functions. Any change will not become permanent until a SAVE operation is performed.

SET MONITORFAILCOUNT [N]
GET MONITORFAILCOUNT

Set or display the number of successive PING attempts that must fail before the 2U Auto Bypass Switch automatically switches to the bypass path and removes the normal path connection path. The valid range is 1 to 255. A value of 0 disables the automatic bypass/recovery functions. Any change will not become permanent until a SAVE operation is performed.

SET MONITOROKCOUNT [N]
GET MONITOROKCOUNT

Set or display the number of successive PING attempts that must succeed before the 2U Auto Bypass Switch automatically switches back to the normal path and removes the bypass connection path. The valid range is 1 to 255. A value of 0 disables only the automatic recovery function – automatic bypass will still operate if enabled. If auto recovery is disabled the user must manually switch back to the normal path via the front panel toggle switch or by issuing a "set system B" command to the 2U Auto Bypass Switch. Any change will not become permanent until a SAVE operation is performed.

SET AUTHENTICATIONTRAP ON[OFF]
GET AUTHENTICATIONTRAP

Set or display the current state of authentication error traps. Authentication traps will be generated when this parameter is set to ON, and not generated when set to OFF. Note that this setting only affects the trap generation, and not how the network module handles an authentication failure. An authentication failure generally means that an SNMP access was attempted with an incorrect community name. Any change will not become permanent until a SAVE operation is performed.

SET MANAGER N X.X.X.X

Set SNMP manager N (1-16) IP address.

Up to 16 SNMP MANAGER IP addresses can be entered for destinations of trap messages. Trap messages will be sent to all enabled MANAGER IP addresses. To remove an entry from the list, set the IP address to 0.0.0.0. Any change will not become permanent until a SAVE operation is performed.

```
SNMP Manager Table:
1: 192.168.1.113
2: 192.168.1.115
3: 192.168.1.149
```

GET MANAGER N

Display SNMP manager N (1-16) IP address.

GET MANAGER

Display all SNMP manager IP addresses.

SAVE

Save settings for next startup. All settings are stored in non-volatile memory and restored upon power on. Changes to parameters will not become permanent unless a SAVE operation is performed. (Save followed by reset command)

RESET

Causes a network system reboot and reloads all parameters from stored settings.

?
HELP

Displays a list of available commands. The help display output is shown below.

>help

CONSOLE COMMANDS:
GET ALL (display all parameters)
GET VERSION (display software versions)
GET[SET] SYSTEM [A/B] (control all system ports)
GET RACK (display all ports)
GET[SET] PORT N [A/B] (control single port)
GET POWER N
GET[SET] IPADDRESS [X.X.X.X]
GET[SET] SUBNETMASK [X.X.X.X]
GET[SET] GATEWAY [X.X.X.X]
GET[SET] READCOMMUNITYNAME [string]
GET[SET] WRITECOMMUNITYNAME [string]
GET[SET] WEBENABLE [ON/OFF]
GET[SET] WEBPASSWORD [string]
GET[SET] WEBTIMEOUT [N] (seconds)
GET[SET] WEBPORT [N]
GET[SET] TELNETENABLE [ON/OFF]
GET[SET] TELNETPASSWORD [string]
GET[SET] TELNETTIMEOUT [N] (seconds)
GET[SET] TELNETPORT [N]
GET[SET] MONITORIP [X.X.X.X] (0.0.0.0 to disable)
GET[SET] MONITORMAC [X X X X X X] (X = HEX CHARS)
GET[SET] MONITORINTERVAL [N] (1/10 seconds, 0 to disable)
GET[SET] MONITORFAILCOUNT [N] (0 to disable)
GET[SET] MONITOROKCOUNT [N] (0 = no auto recover)
GET[SET] AUTHENTICATIONTRAP [ON/OFF]
GET[SET] MANAGER N [X.X.X.X] (0.0.0.0 to disable an entry)
GET MANAGER (display all SNMP managers)
SAVE save settings for next startup
RESET restart (use after SAVE)

>

8. Web Interface

The network module provides access to console commands through a web browser interface. When enabled (see SET WEBENABLE command) accessing the default page on the modules IP address (index.html) will present the following page (or similar).
Note: If using a pop up blocker on your web browser, be sure to allow pop ups from the IP address of the Auto Bypass Switch, otherwise you could experience trouble receiving a response through the interface.

Figure 8.1 Logon Screen

After successfully entering the correct web password (see SET WEBPASSWORD command) you will get the following page (or similar).

Figure 8.2 Initial Command Screen

IMPORTANT: Do **NOT** click on the "submit" button or press the "enter" key on your keyboard multiple times. The web browser interface on the SNMP module typically takes 5 to 10 seconds to process a command and return a response. Clicking on "submit" or hitting "enter" multiple times while the SNMP module is processing a command can cause the SNMP module to decide that the interface is not functioning properly. If this happens, the SNMP module will become non-responsive until it receives a valid login request i.e. you must re-enter the SNMP module's IP address in the address bar of your web browser, and then re-logon when the logon screen appears.
At this point you may enter any valid command into the text box and click "Send Command" to execute. The following is an example result of the GET ALL command.

Web Interface Version 1.0

Command console:
Output from last command...

System Status: X
IP Address: 192.168.1.31
Subnet Mask: 255.255.255.0
Gateway IP Address: 192.168.1.1
Web Enable: Enabled
Web Password: mctech
Web Timeout: 300
Web Port: 80
Telnet Enable: Enabled
Telnet Password: dataman
Telnet Timeout: 80
Telnet Port: 23
Monitor IP Address: 192.168.1.150
Monitor MAC Address: 00 07 62 71 BB 4D
Monitor Interval: 15
Monitor Fail Count: 5
Monitor Ok Count: 5
Read Community Name: public
Write Community Name: private
Authentication Trap: Disabled
2.9 JUN 2007, V1.1 10/2003
SNMP Managers:
1: 192.168.1.109

Enter new command:

Send Command | Logoff

Figure 8.3 Example Command Results Screen

The network controller will allow only 1 web access session. To free up a session without waiting for the web timeout, click “Logoff”. For this reason, the web timeout should be set to a workable time. Resetting the unit will clear any current web session.

9. SNMP MIB Path Summary

The following MIB Path Summary shows the variables available on a 2U A/B switching system.

[internet] – 1.3.6.1
  [private] – 1.3.6.1.4
    [enterprises] – 1.3.6.1.4.1
      [mctech] – 1.3.6.1.4.1.9477

[mctech] – 1.3.6.1.4.1.9477
        private enterprise number

[mcAgent] – 1.3.6.1.4.1.9477.1
        SNMP Agent

[abSwitchSystem] – 1.3.6.1.4.1.9477.1.4
        A/B Switch System

        [abSystemGangPort] – 1.3.6.1.4.1.9477.1.4.1

        [abRackTable] – 1.3.6.1.4.1.9477.1.4.2
                [abRackIndex] – 1.3.6.1.4.1.9477.1.4.2.1.1.RackIndex
                [abRackGangPort] – 1.3.6.1.4.1.9477.1.4.2.1.2.RackIndex
                [abRackKeyStat] – 1.3.6.1.4.1.9477.1.4.2.1.3.RackIndex
                [abRackPowerStat] – 1.3.6.1.4.1.9477.1.4.2.1.4.RackIndex
                [abRackSoftwareVersion] – 1.3.6.1.4.1.9477.1.4.2.1.5.RackIndex
                [abRackName] – 1.3.6.1.4.1.9477.1.4.2.1.6.RackIndex
                [abRackCards] – 1.3.6.1.4.1.9477.1.4.2.1.7.RackIndex

        [abSwitchTable] – 1.3.6.1.4.1.9477.1.4.3
                [abSwitchIndex] – 1.3.6.1.4.1.9477.1.4.3.1.1.SwitchIndex
                [abSwitchPort] – 1.3.6.1.4.1.9477.1.4.3.1.2.SwitchIndex
                [abSwitchSoftwareVersion] – 1.3.6.1.4.1.9477.1.4.3.1.3.SwitchIndex
                [abSwitchName] – 1.3.6.1.4.1.9477.1.4.3.1.4.SwitchIndex

A/B Switch System SNMP Variable Definitions:

[abSystemGangPort] – 1.3.6.1.4.1.9477.1.4.1
A/B Switch System gang port. This variable is used to control all A/B Switch Cards in the system. A system may consist of up to 255 racks, each rack containing up to 16 A/B Switch Cards. It is write only.

[abRackTable] – 1.3.6.1.4.1.9477.1.4.2
A/B Switch Rack variable table. This variable is not directly accessible.

[abRackIndex] – 1.3.6.1.4.1.9477.1.4.2.1.1.RackIndex
A/B Switch Controller "Rack" address. The A/B Switch Controller address is set via an eight position dip switch on the card. Each A/B Switch Controller in the system MUST have a unique address, in the range of 0x01 to 0xFF hex. Address 0x00 is invalid, and must not be used. This is a read only variable.

[abRackGangPort] – 1.3.6.1.4.1.9477.1.4.2.1.2.RackIndex
A/B Switch Rack gang port. This variable is used to control all A/B Switch Cards in a rack. A rack may contain up to 16 A/B Switch Cards. It is write only.

[abRackKeyStat] – 1.3.6.1.4.1.9477.1.4.2.1.3.RackIndex
A/B Switch Rack Key-Lock Switch Status. This is a read only variable. This variable can be used to determine if the Key-Lock Switch is in the OFF or ON position. The front panel switches in the rack are disabled when the Key-Lock Switch is in the OFF position. The A/B Switches will still respond to switch control signals and commands from the GANG-IN and GANG-OUT ports.

[abRackPowerStat] – 1.3.6.1.4.1.9477.1.4.2.1.4.RackIndex
A/B Switch Rack Power Status. This is a read only variable.
The 2U A/B Switch controller rack may contain one or two power supplies. If one power supply is installed and operating, the Power Status will report "OneSupply". If two power supplies are installed and both are operating, the Power Status will report "TwoSupplies". If two power supplies are installed and one is off line, the Power Status will report "One Supply Down".

[abRackSoftwareVersion] – 1.3.6.1.4.1.9477.1.4.2.1.5.RackIndex
A/B Switch Controller Software Version. This is a read only variable, and is limited to a maximum of 14 characters.

[abRackName] – 1.3.6.1.4.1.9477.1.4.2.1.6.RackIndex
A/B Switch Controller Identification String. The string is limited to a maximum of 14 characters.

[abRackCards] – 1.3.6.1.4.1.9477.1.4.2.1.7.RackIndex
A/B Switch Rack Card Status, One character for each of the sixteen cards in the rack. This variable is present for compatibility with other A/B switching systems. It is read only and will respond "NA".

[abSwitchTable] – 1.3.6.1.4.1.9477.1.4.3
A/B Switch Rack variable table. This variable is not directly accessible.

[abSwitchIndex] – 1.3.6.1.4.1.9477.1.4.3.1.1.SwitchIndex
A/B Switch "Card" address.
On a 2U A/B Switch System, the switch card address is set via an eight position dip switch on

the card. Each 2U A/B Switch cards in the system MUST have a unique address, in the range of 0x01 to 0xFF hex. Address 0x00 is invalid, and must not be used. This is a read only variable.

[abSwitchPort] – 1.3.6.1.4.1.9477.1.4.3.1.2.SwitchIndex
A/B Switch Card port. This variable is used to control the A/B Switch Card selected port. When set to A, the switch will connect port A to port C. When set to B, the switch will connect port B to port C. If the addressed A/B Switch Card is not present, you will not get a response.

[abSwitchSoftwareVersion] – 1.3.6.1.4.1.9477.1.4.3.1.3.SwitchIndex
A/B Switch Card Software Version. This is a read only variable, and is limited to a maximum of 14 characters.
On a 2U A/B Switch System, the A/B Switch cards have software. Therefore, this variable may be different, depending on the software version on each card.

[abSwitchName] – 1.3.6.1.4.1.9477.1.4.3.1.4.SwitchIndex
A/B Switch Card Identification String. The string is limited to a maximum of 14 characters.

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