product

HEWLETT PACKARD

HP 3499A/B Switch/Control Mainframe

Test at the speed of the Revolution

CONFIDENCE

—— It's what switching means to your test system

HP 3499A/B Switch/Control Mainframe

HP 3499 family is a high speed, high density switching solution for automatic test (ATE) applications that provides a 30% cost and space savings over its predecessor-the HP 3488A.

The HP 3499A can scan at rates up to 80 channels per second, or open/close 200 channels in less than 0.1 second. It can accommodate up to 5 plug-in option modules, routing up to 200 channels in a test system. The user can choose from 19 plug-in modules to switch signals from DC to 26 GHz, or 1 mV to 250 V, or 1 mA to 5 A. The HP 3499B is a half-rack-width, 2-slot mainframe, switching up to 80 channels for ATE or desktop operations. Both units have a concise user interface that is extremely useful for manual operation on the manufacturing floor or in desktop applications. High performance switching modules, multi-function modules, built-in relay cycle counters and easy interconnections, all give you confidence in our switching solution for your test system.

Contents

What can you expect from a high-speed and high-density switching system that's this affordable ?

Performance you can trust

While traditional switching mainframes open/close relays in sequence, the HP 3499A/B use innovative parallel driving circuits to open/close switches simultaneously. The HP 3499A can drive up to 50 channels in 25 ms. The parallel operation of the HP 3499A/B significantly increases the test throughput of an automated test system.

HP 3499 family also provides high-density modules with up to 40 channels per module. Two multi-function modules integrate switching and digital I/O in one module and enhance system performance.

Powerful flexibility to get your job done

We put in a lot of effort to make the HP 3499 switching family products as flexible as possible, so that it can be tailored to meet your needs.

HP 3499 family includes two mainframes. HP 3499A is a 5-slot mainframe and HP 3499B, a 2-slot mainframe. These two mainframes will accommodate a full range of 19 different modules, including multiplexer, general purpose relay, matrix, digital I/O, VHF module, RF module, microwave module, Form-C relay, and two special multifunction modules. By combining these mainframes and modules, test engineers can set up their test system with fewer modules in less space and also reduce the cost and complexity of the test system.

Easy to use

Easy-to-use interface means quick test system set-up in an automatic test environment. From the simplified configuration procedures, to the self-guiding front panel interface, to the easy-to-use module connection accessories, we put in extra time and energy to save your time and energy. Simple things, like the built-in relay cycle counters and well-organized user documentation, allow you to operate the HP 3499A/B within 20 minutes after taking it out of the box, resulting in an increased productivity.

Standard RS-232 and GPIB interfaces and SCPI programming language make your test system integration easy.

HP 3499 Family Main Features

High throughput in a small space. You can increase test throughput without adding floor space.

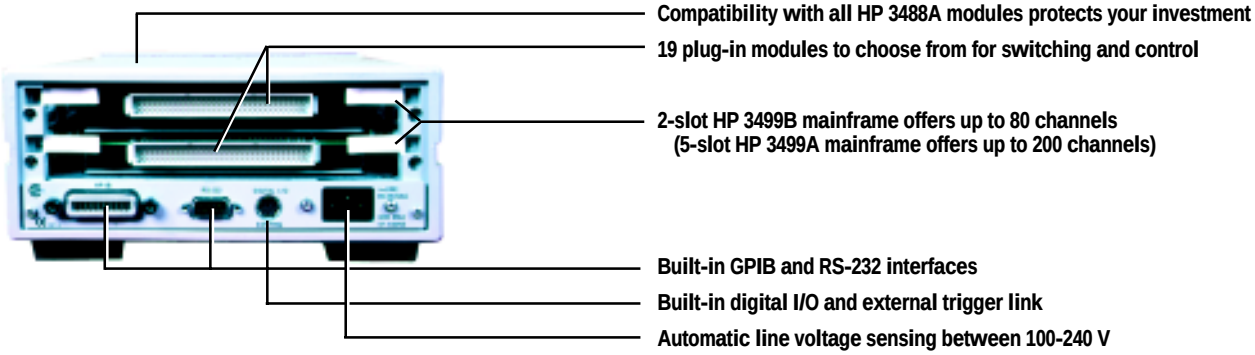
"Just enough" functionality. Wide range of modules to select from.

Multi-function modules integrating switching and digital I/O.

Built-in relay cycle counters for ease of preventative maintenance.

Easy wiring for simplifying cabling and increasing reliability. Users can now have simple, robust interconnections for system set-up and fast module exchange.

Higher density, higher speed and more flexible than you could have ever imagined at this price



HP 3499 Mainframe Specification	
Items	**Specifications**
General	
Display	Vacuum Fluorescent
Rear Panel Connectors	GPIB; RS-232; 8-pin mini DIN Connector (5 pins for Digital I/O, 3 pins for external trigger)
Power Supply	100 to 240 VAC universal input (47 Hz to 63 Hz); 100-127 VAC (400Hz); 40 VA maximum
Operating Environment	0° C to 55° C, <80% RH (0° C to 40° C)
Storage Environment	-40° C to +70° C
Net Weight	HP 3499A: 3.8 kg (8.4bs); HP 3499B: 2.5 kg (5.5bs)
Dimensions	HP 3499A: H 89mm, W 426mm, L 348mm; HP 3499B: H 89mm, W 213mm, L 348mm
Safety	Conforms to CSA, UL-1244, IEC 1010 Cat I
RFI and ESD	CISPR 11, IEC 80 1/2/3/4
Warranty	1 year
System	
Slot Capacity	HP 3499A: 5 slots; HP 3499B: 2 slots.
Memory	Battery backup, 4-year typical life (Temperature over 40°C will decrease battery life) Store States: 10 states in SCPI mode; 40 states in HP3488A mode; Error store: 10 in SCPI mode, 1 in 3488 mode
Relay Setting Time	Automatically selected by the mainframe for each module.
Trigger Source	External trigger (rear panel Mini-DIN connector); GPIB bus (GET,*TRG) or RS232 (*TRG)
External Trigger	Trigger pulse width: >2us, External Trigger Delay: <2ms.
Built-in 4 digital I/O	Input: TTL compatible; Vo (L): <0.8V@Io=-100mA;Vo (H): >2.4V@Io=1mA; Vout (H) ≤ 42V.

High-speed and high-density switching solution ideal for automatic test

Customize your test system with 2 mainframes and 19 modules

Test engineers want "just enough" testing and do not want to pay extra for something they do not plan to use immediately. The 2 mainframes and 19 modules allow you to customize the HP 3499 switch and control system to meet your unique requirements. Buy only what you need - and add more modules later as your application grows.

The HP 3499 family allows the user to select a cost-effective configuration for specific applications. Newly designed high density switch modules reduce cost by compacting a large number of channels on a single module. The HP 3499A contains 5 slots that can accommodate up to 200 channels switching for those large switching applications on the manufacturing floor. The HP 3499B contains 2 slots for switching up to 80 channels, a cost-effective solution for small manufacturing or desktop applications. Both units are designed for easy installation in a standard rack.

Use high-density modules or multifunction modules to save money and space

HP 3499 family provides modules that contain up to 40 switching channels per module. This will greatly reduce the per channel cost and save rack and floor space. Test engineers can set up the test system with fewer modules using less space and also reduce the cost and complexity of the test system. The result is that users spend less money without sacrificing performance and quality.

Two multifunction modules are also introduced along with the HP 3499 family. The N2264A includes 12 general purpose relay channels, 3 high current general purpose relay channels, and 16 bits of digital I/O. The N2265A combines a 4x4 matrix switch with 16 bits of digital I/O on one module. With HP 3499B, users can configure a small but versatile switching/control test system. The 3 power relay channels in N2264A can switch signals up to 5 A. These power relays are very useful in test systems such as cellular phone test, battery test and UPS test where only two or three high current channels are required.

Easy wiring with versatile module connection accessories

We understand that wiring requires a lot of your time and energy, and the HP 3499 switching products have been designed to make it easier for you. The HP 3499 family provides two connection accessories to minimize your wiring time and effort. Both the removable screw terminal blocks and crimp & insert terminal blocks are detachable from the switching modules, eliminating the need for rewiring the connector if a switching module is replaced.

The six high-density modules use industry standard DIN96 connectors for better flexibility. The modules are equipped with DIN96-to-D50(25) cables for easy connection to the DUT and test instruments. Using these cables, you have completely eliminated all wiring.

Screw terminal block

Crimp & Insert terminal block

DIN96-to-D25 cable

Built-in relay cycle counter to facilitate test system maintenance

In a high-speed automatic test equipment (ATE) system, unplanned downtime can be fatal to a high-yield production line. To help test engineers perform preventative maintenance by predicting relay end-of-life, there are built-in relay cycle counters on the 5 high-density switching modules, thereby avoiding costly production line downtime. The relay cycle counter automatically counts every individual relay closure and stores the number in the on-board non-volatile memory. A simple "DIAG: CYC? Chan. xx " command recalls the total number of cycles for individual relays, making scheduled preventative maintenance possible.

Compatibility with HP 3488A

The HP 3499 family is both hardware and software compatible to the world's most popular switch/control unit -the HP 3488A. All 13 of the HP 3488A modules will work in the HP 3499A/B mainframes. The HP 3499A/B can be operated with SCPI (Standard Commands for Programmable Instruments) or the HP 3488A command sets. Upgrading from an HP 3488A to an HP 3499A doubles your channel capacity and lowers your cost per channel with no additional cost in modules.

Take the guesswork out of relay maintenance

The HP 3499A/B use our proprietary relay maintenance systems to help you predict relay end-of-life and avoid costly production line down time. It automatically counts every individual switch closure and stores it in non-volatile memory on each module. You can query the total number of cycles on any individual channel so you can schedule maintenance and avoid random end-of-life failures.

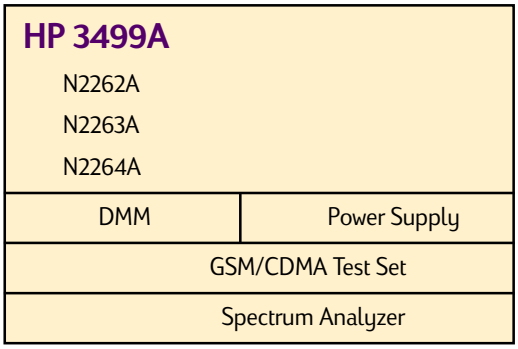
ATE Feature Checklist

- Selection of full-rack-width and half-rack-width mainframes
- Total of 19 modules include multiplexers, general purpose relays, matrix switches, digital input and output, VHF modules, RF modules, and microwave relays
- Switch signals from DC to 26 GHz, or from 1mV to 250 V, or from 1 mA to 5 A
- 2 multifunction plug-in modules integrating switching and digital I/O
- Built-in relay cycle counters for preventative maintenance
- Scan rates up to 80 channels/second
- Parallel open/close operation of 200 channels in 0.1 second
- Removable screw terminal blocks and crimp & insert terminal blocks available
- GPIB and 57.6 Kbaud RS-232 standard instrument interfaces
- One-year warranty for mainframes

Application examples

Cellular phone test

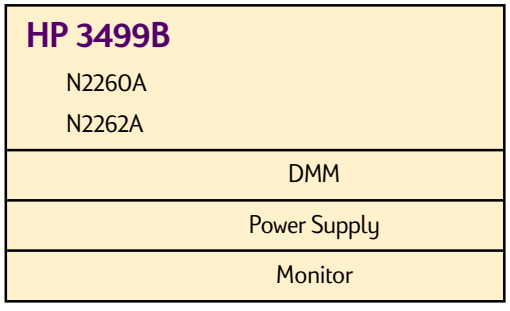
In a typical cellular phone final test system there is a switch system, a GSM/CDMA test set, a DMM (digital multimeter), a power supply, and a spectrum analyzer. An HP 3499A with a multifunction module (N2264A), a digital I/O module (N2263A), and a matrix module (N2262A) provides the switching solution needed in this test system. The 3 general purpose high current relays in the N2264A switch the cellular phone power supplies --- main battery, backup battery, or charger. With the 3 relays on N2264A, the DMM tests the sleeping, standby, and working current - between 0.1 mA and about 4 A. Eight bits of digital I/O drives the external solenoid coils to simulate key pressing. Eight additional bits of digital I/O are used to drive a coaxial relay to route the RF signal coming from the phone antenna to GSM/CDMA test set for camping, call setup, power level, BER test, or to spectrum analyzer for spectrum leakage tests. Three more bits of digital I/O are used to communicate with the cellular phone under test. Working with the DMM, the matrix module switches the voice signals to/from the cellular phone for audio testing.



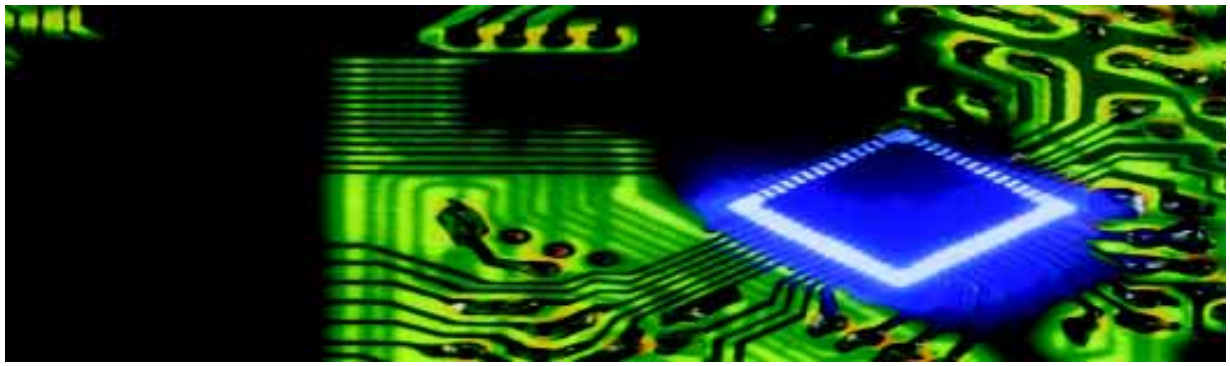
A typical cellular phone test system

Pager Test

A typical test system that tests the pager PC board consists of an HP 3499B equipped with one multiplexer module (N2260A), one matrix module (N2262A), one DMM, and one power supply. This compact test system can test one pager. In this configuration, one 2-meter rack is capable of holding 6-8 test systems. One matrix channel switches the DUT (pager) on/off. Using a multiplexer channel, the DMM tests the bias voltage of the mixer, front-end amplifier, and filters to ensure that the different circuits of the pager are working properly. Using a multiplexer channel, the DMM also tests the working/standby current to ensure the battery operating time specification is met.



A typical pager board test system



Customize your HP 3499A/B with plug-in modules

We invested a lot of time and energy in studying actual switching applications and tailoring the switching modules for different applications. Six high density modules (HP N2260A, N2261A, N2262A, N2263A, N2264A and N2265A) plus the 13 existing modules (HP 44470A/D, 44471A/D, 44472A, 44473A, 44474A, 44475A, 44476A/B, 44477A, and 44478A/B) for the HP 3488A can cover a wide variety of signals with superior flexibility.

Different switching for applications

A general purpose relay is used to turn on/off the DUT (device under test), instruments, motors, pumps and LEDs, or to form an attenuation network with L, C, R components.

A multiplexer is used for switching signal to instrumentation by connecting many test points to an instrument, or a DUT to many instruments. The instruments can include multimeters, oscilloscopes, spectrum analyzers, and counters, etc. There are one-wire, two-wire, three-wire or four-wire multiplexers. A one-wire multiplexer is very useful in high frequency (30 MHz - 26 GHz) applications and common ended signal switching. The two-wire multiplexer is very useful for floating measurements where you need to switch both the "high" and "low" paths. The three-wire multiplexer is mostly used for the guarded measurements that have very high CMRR (Common Mode Rejection Ratio). The four-wire multiplexer is mainly used for 4-wire precision ohm measurements.

A matrix switch is used when one or more instruments are connected to one or more test points at the same time. By using a matrix switch, you can connect any point on a column to any point on a row. A matrix switch offers maximum flexibility, but you need to use more relays and be careful to avoid crosstalk between channels.

A digital I/O module has both input & output bits for digital sensing and is mainly used to control external devices, such as motors, LEDs, and microwave relays. The digital I/O can also be used to send and receive digital patterns to/from the DUT, and to communicate with other devices.

Six high density modules

Now test engineers have a 40-channel 2-wire multiplexer in roughly the same space as only one of the HP 3488A's 10-channel switching modules. The six high density modules reduce cost by compacting a large number of channels on a single module. There are also two multifunction modules for applications a that require variety of functions in limited space. The N2264A includes 12 general purpose relay channels, 3 high current channels and 16-bit digital I/O. The N2265A includes a 4 x 4 matrix switch and 16-bit of digital I/O. With these two modules and HP 3499B, the half-rack-width mainframe, you will have a compact switching unit in a small space and at a low cost!

Flexible channel capacity

The 19 modules in HP 3499 family provide a large variety of channel selections to match your test system application (10-200 channels in one mainframe). The total channel count ranges from 10, 20, to 40 channels per module. You can customize your HP 3499A/B with these modules to match the channel count and switching topologies to meet your individual needs.

There are 19 plug-in modules, including multiplexer, RF multiplexer, general-purpose relay, matrix, digital input/output, Form-C, breadboard, and multifunction modules. Please refer to the following table for plug-in module selection.

Plug-in module selection table

Module	Description	Max. Voltage	Max. Current Per chan.	Initial closed channel resistance	Thermal offset per chan.	Bandwidth	Connection type	Relay Cycle Counter	Page
Multiplexer modules									
N2260A	40-channel	200V	1A	<1 Ω	<3 μV	10MHz	T or C	Yes	10
44470A	10-channel	250V	2A	<1 Ω	<3 μV	10MHz	T		17
44470D	20-channel	250V	2A	<1 Ω	<3μV	10MHz	T		17
General purpose relay modules									
N2261A	40-channel	200V	1A	<0.5 Ω	<3uV	10MHz	T or C	Yes	11
44471A	10-channel	250V	2A	<1 Ω	<3uV	10MHz	T		18
44471D	20-channel	250V	1A	<1 Ω	<3uV	10MHz	T		18
Matrix modules									
N2262A	4 x 8 matrix	200V	1A	<1 Ω	<3uV	10MHz	T or C	Yes	12
44473A	4 x 4 matrix	250V	2A	<1 Ω	<3uV	10MHz	T		19
Digital I/O modules									
N2263A	32-bit TTL	42V	0.6A	NA	NA	NA	T or C		13
44474 A	16-bit TTL	30V	0.125A	NA	NA	NA	T		20
Multi-function modules									
N2264A	12 GP	200V	1A	<0.5 Ω	<3uV	10MHz	T or C	Yes	14
	3 GP	125V	5A	<0.1 Ω	<3uV	10MHz	T or C	Yes	
	16-bit DIO	42V	0.6A	NA	NA	NA	T or C		
N2265A	4 x 4 matrix	200V	1A	<1 Ω	<3uV	10MHz	T or C	Yes	16
	16-bit DIO	42V	0.6A	NA	NA	NA	T or C		
Form-C relay module									
44477A	7-channel	250V	2A	<1 Ω	<3uV	10MHz	T		23

Notes: GP = General Purpose; DIO = Digital I/O; T = Terminal Block; C = Cable.

RF & Microwave modules

Modules	Description	Insertion loss	Crosstalk	SWR	Bandwidth	Impedance	Connector	
44472A	Dual 1 x 4	<0.75dB	<-85dB	<1.12	300 MHz	50 Ω	BNC	19
44478A	Dual 1 x 4	<1.1dB	<-70dB	<1.35	1.3 GHz	50 Ω	BNC	22
44478B	Dual 1 x 4	<1.1dB	<-70dB	<1.35	1.3 GHz	75 Ω	BNC	22
44476A	Triple 1 x 2	<0.25dB	<-90dB	<1.15	18 GHz	50 Ω	SMA	21
44476B	Relay driver can support 2 microwave switches. Technical specs depend on the mounted relays.							21

Module Connection Accessories

Screw Terminal Blocks			
N2290A	Screw terminal block for N2260A	44480A	Screw terminal block for HP44470A
N2291A	Screw terminal block for N2261A	44480B	Screw terminal block for HP44470D
N2292A	Screw terminal block for N2262A	44481A	Screw terminal block for HP44471A
N2293A	Screw terminal block for N2263A	44481B	Screw terminal block for HP44471D
N2294A	Screw terminal block for N2264A	44483A	Screw terminal block for HP44473A
N2295A	Screw terminal block for N2265A	44484A	Screw terminal block for HP44474A
N2296A	Crimp & insert connector for N2260/1/2/3/4/5A	44485A	Screw terminal block for HP44475A
		44487A	Screw terminal block for HP44477A

DIN96-to-D50/25 Cables

N2297A	1.5 m cable for connecting DUT to N2260/1/3/4/5A, terminated with one female DIN96 connector at one end and two male D50 connectors at the other end.
N2298A	1.5 m cable for connecting DUT to N2262A, terminated with one female DIN96 connector at one end and one male D25 connector at the other end.
N2299A	1.5 m cable for connecting DUT to N2260/1/3/4/5A, terminated with one female DIN96 connector at one end and four male D25 connectors at the other end.

2-wire, 40-channel Multiplexer Module

HP N2260A

Description

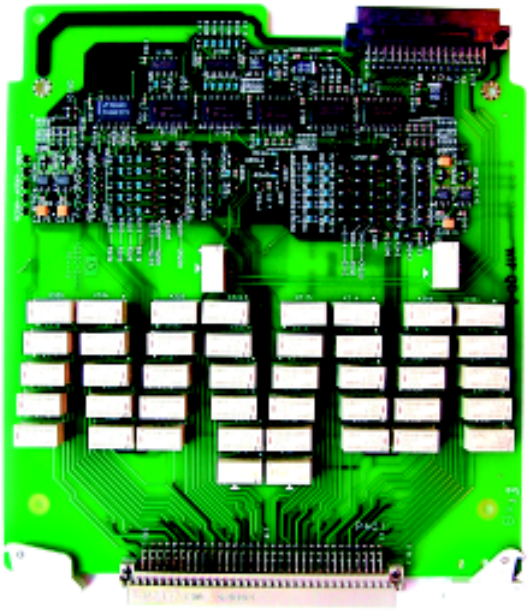
The HP N2260A is a re-configurable multiplexer (MUX) module. The individual relays on this module are rated for switching up to 200 V, 1 A and 60 W or 62.5 VA. Thanks for an innovative driving circuit,10 switching channels can be operated simultaneously, resulting in high throughput of an automatic test system. It can be operated in either SCPI mode or HP 3488A mode. In SCPI mode, it can be reconfigured as either one 80-channel one-wire MUX, or one 40-channel 2-wire MUX, or dual independent 20-channel 2-wire MUXs, or one 20-channel 4-wire MUX topologies. You can use up to five HP N2260As in one HP 3499A mainframe to build a 1-to-200 two-wire MUX. Screw terminal block, crimp & insert terminal block and DIN96-to-D50/25 cables are available for ease of wiring.

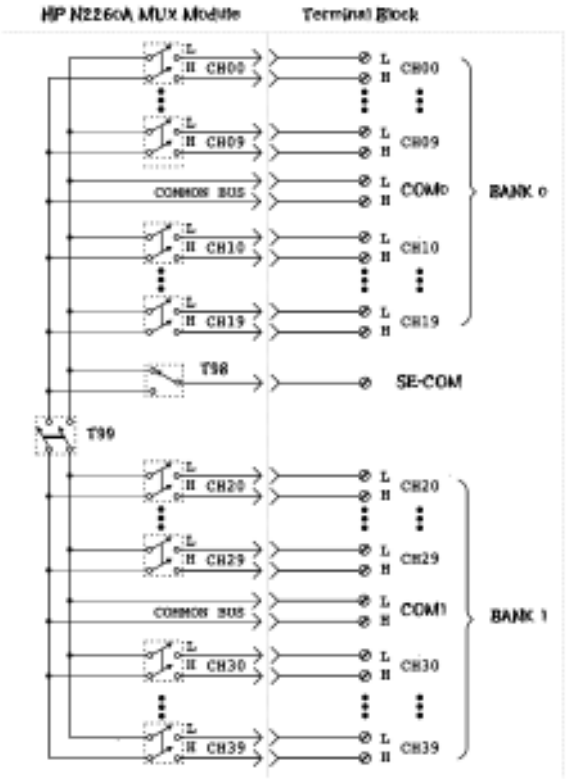
Specifications

General Specifications	
Relays:	Armature latching relay
Thermal Offset:	<3µV
Relay Life Mechanical:	10^8
Electrical:	$5x10^5$ (at 1A load)
Maximum Scan Rate:	80 ch/ sec
Input Characteristics	
Maximum Current:	1A
Maximum Voltage:	200V
Maximum Power:	60W or 62.5VA
Initial Closed Channel Resistance:	<1 Ω
DC Isolation	
Open Channel, Channel-Channel:	
<(40°C, 50% RH)	$>10^{10}$ Ω
HI-LO <(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis <(40°C, 50% RH)	$>10^{10}$ Ω
AC Isolation (2-wire mode)	
Capacitance (with 1 channel closed):	
Open Channel, Channel-Channe	<7pF
HI-LO	<75pF
Channel-Chassis	<150pF
Insertion Loss (with 50 Ohm termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<1.50dB
Crosstalk (with 50 Ohm termination):	
100kHz	<-70dB
1MHz	<-50dB
10MHz	<-30dB
Accessories	
N2290A	Screw Terminal block
N2296A	Crimp & insert terminal block
N2297A	DIN96 -to-Twin-D50 cable
N2299A	DIN96 -to-Quad-D25 cable

Note: All voltage and current are in DC or AC RMS if not specified.

- Re-configurable to 1-, 2- and 4-wire modes
- High speed switching with parallel operation
- Built-in relay cycle counters





40-channel General Purpose Relay Module

HP N2261A

Description

The HP N2261A is a GP relay module, providing 40 independent Single-Pole-Single-Throw (SPST) latching relays. Each channel can switch up to 200 V, 1 A, and 60 W or 62.5 VA. Thanks for an innovative driving circuit,10 switching channels can be operated simultaneously, resulting in high throughput of an automatic test system. It can be operated in either SCPI mode or HP 3488A mode. A pair of signal can be switched together by using a pair of channels on two HP N2261A modules. The HP N2261A can be operated in single channel break-before-make (BBM) or multiple channel open/close mode. Screw terminal block, crimp & insert terminal block and DIN96-to-D25/50 cables are available for ease of wiring.

Specifications

General Specifications

Relays:	Armature latching relay
Thermal Offset:	<3µV
Relay Life Mechanical:	10^8
Electrical:	$5x10^5$ (at 1A load)
Maximum Scan Rate:	80 ch / sec

Input Characteristics

Maximum Voltage:	200V
Maximum Current:	
Per channel	1A
Per module	20A
Maximum Power:	
Per channel	60W or 62.5VA
Per module	1200W or 1250 VA
Initial Closed Channel Resistance:	<0.5 Ω

DC Isolation

Open Channel, Channel-Channel:	
<(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis:	
<(40°C, 50% RH)	$>10^{10}$ Ω

AC Isolation

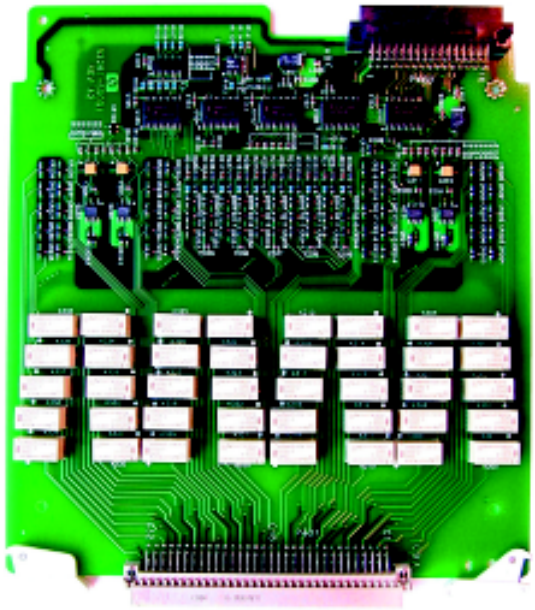
Capacitance (with 1 channel closed):	
Open Channel, Channel-Channel	<10pF
Channel-Chassis	<20pF
Insertion Loss (with 50 Ω termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<0.50dB
Crosstalk (with 50 Ω termination):	
100kHz	<-70dB
1MHz	<-50dB
10MHz	<-30dB

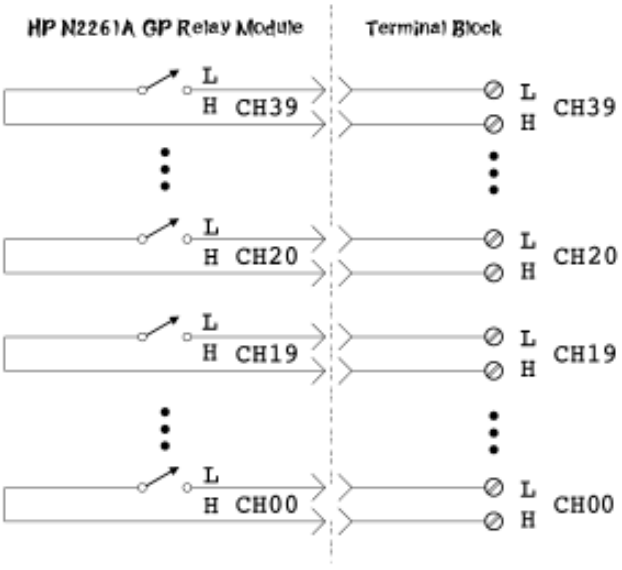
Module accessories

N2291A	Screw terminal block
N2296A	Crimp & insert terminal block
N2297A	DIN-to-Twin-D50 cable
N2299A	DIN-to-Quad-D25 cable

Note: All voltage and current are in DC or AC RMS if not specified

- 40 independent relays in one module
- High speed switching in parallel operation
- Built-in relay cycle counters





Note: Sheet metal covers for all plug-in modules are not shown in the photos.

4 x 8 Matrix Switch Module

HP N2262A

Description

The HP N2262A is a 4 x 8 matrix module, containing 32 cross points organized in a 4-row by 8-column configuration. It provides the most convenient way to connect a group of test instruments to multiple test points on DUTs. Each cross point in the module switches 2 wires for the high and low of a measurement. Multiple matrix modules can be connected together for applications that require large matrixes. For example, four N2262As can be combined as a 16 x 8 matrix. HP N2262As can be used in conjunction with other modules such as multiplexer modules to provide a wide variety of switching combinations. More than one switch can be in closed state, allowing any combination of rows connected to columns. Up to 8 channels can be operated in parallel for high speed switching. There are three accessories for ease of wiring.

Specifications

General Specifications

Relays:		Armature latching relay
Thermal Offset:		<3µV
Relay Life	Mechanical:	10^8
	Electrical:	$5x10^5$ (at 1A load)

Input Characteristics

Maximum Voltage:	200V
Maximum Current:	
Per channel	1A
Per module	4A
Maximum Power:	
Per channel	60W or 62.5VA
Per module	240W or 250 VA
Initial Closed Channel Resistance:	<1Ω

DC Isolation

Open Channel, Channel-Channel:	
<(40°C,50% RH)	$>10^{10}$ Ω
HI-LO:	
<(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis:	
<(40°C, 50% RH)	$>10^{10}$ Ω

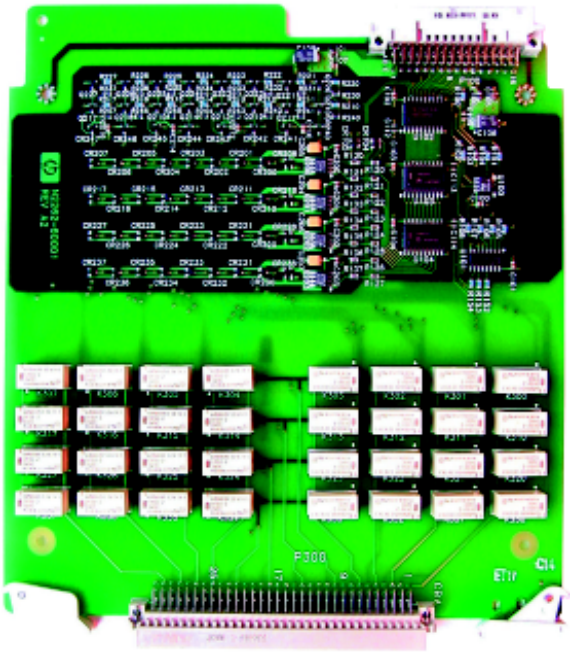
AC Isolation

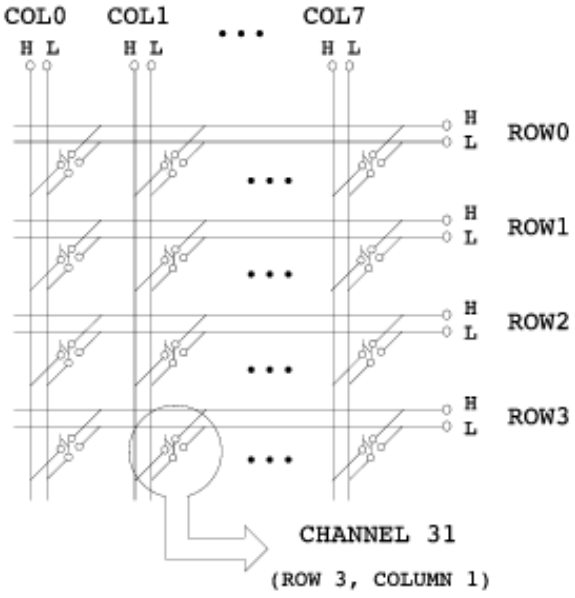
Capacitance (with 1 channel closed):	
Open Channel, Channel-Channel	<7pF
HI-LO	<30pF
Channel-Chassis	<50pF
Insertion Loss (with 50 Ω termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<0.60dB
Crosstalk (with 50 Ω termination):	
100kHz	<-73dB
1MHz	<-53dB
10MHz	<-28dB

Accessories Available

N2292A	Screw terminal block
N2296A	Crimp & insert terminal block
N2298A	DIN96-to-D25 cable

- Multiple inputs connecting to multiple outputs
- High speed switching in parallel operation
- Built-in relay cycle counters





32-Bit Digital Input/Output Module

HP N2263A

Description

The HP N2263A is a 32-bit digital I/O module. It provides 32-bit bi-directional lines and 3 handshake and control lines. The 32-bit I/O lines are TTL compatible input/output, or TTL compatible input and open collector output up to 42 V. The 32-bit I/O lines can be addressed individually, or as four independent 8-bit ports, or as two independent 16-bit ports, or as one 32-bit port. A Zener diode is used in each channel for input voltage-over protection (> 42V DC), including ESD protection. Each I/O line can sink up to 0.6A to control external devices, including:

- High voltage/high current relays;
- Microwave relays and attenuators (HP 8710xx , HP 876xx and HP 849xx);
- Solenoid coils

The polarities of the I/O and handshake lines can be operated in positive or negative logic mode. With the 3 control lines (PCTL, I-#O and PFLG), you can define five handshake modes for communication with peripherals. Screw terminal block, crimp & insert terminal block and DIN96-to-D25/50 cables are available for ease of wiring.

Specifications

I /O Lines

Maximum Voltage(line-chassis):	+42V DC
Maximum sink current(per bit):	0.6A
Output Characteristics:	
V_{out} (high)	≥ 2.4V @I≤10mA output
V_{out} (low)	≤ 0.8V @I≤600mA input
Input Characteristics:	
V_{in} (high)	≥ 2.0V
V_{in} (low)	≤ 0.8V

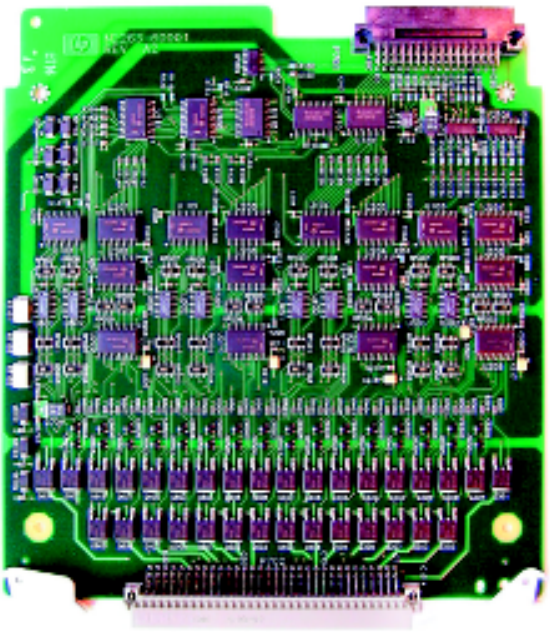
Handshake Lines

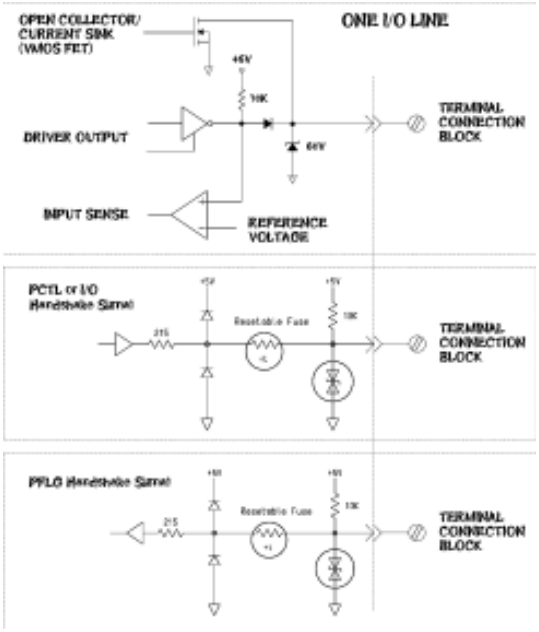
Maximum Voltage(line-chassis):	+5V DC
Output Characteristics:	
V_{out} (high)	≥ 2.4V @I≤400µA output
V_{out} (low)	≤0.5V @ I≤1mA input
I_{out} (low)	<25 mA (when shorted to + 5V)
Input Characteristics:	
V_{in} (high)	≥ 2.0V
V_{in} (low)	≤ 0.8V

Module accessories

N2293A	Screw terminal block
N2296A	Crimp & insert terminal block
N2297A	DIN96-to-Twin-D50 cable
N2299A	DIN96-to-Quad-D25 cable

- TTL compatible, sinking up to 0.6 A
- Input /Output configurable byte-by-byte
- 3 I/O control modes-static, strobe and handshake





Multifunction module

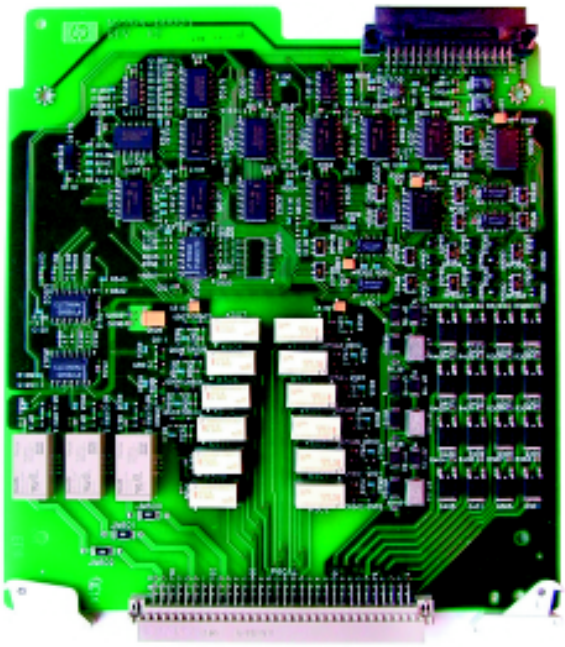
HP N2264A

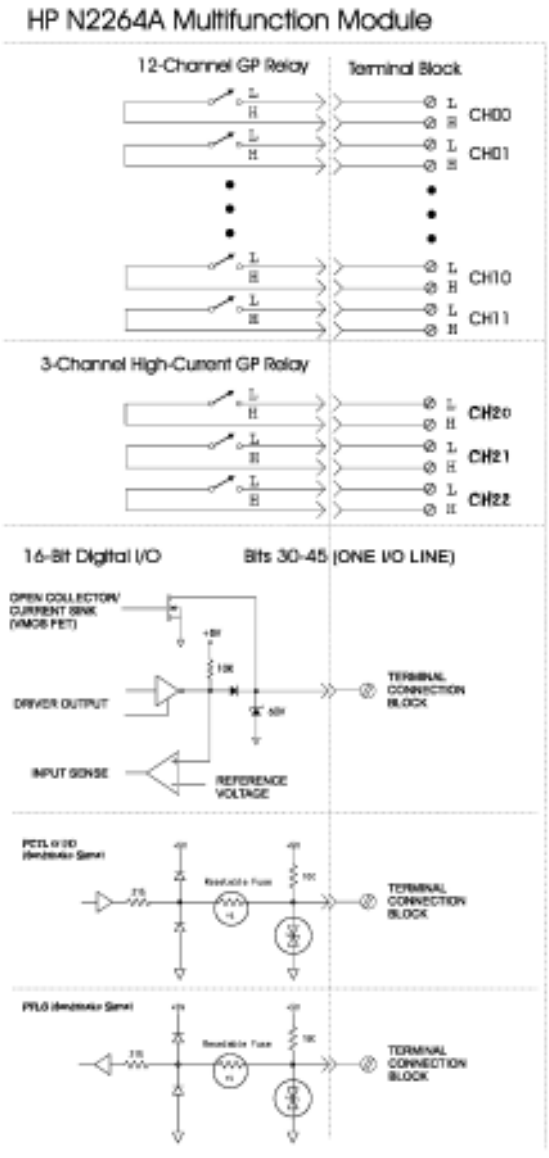
- 12 + 3 GP + 16-bit Digital I/O in one module
- High speed switching in parallel operation
- Built-in relay cycle counters

Description

The HP N2264A multifunction module combines 12 general purpose relays, 3 high current relays and a 16-bit digital input/output in one module. The HP N2264A is designed for applications that require multiple functions in one module for space saving and system cost saving. Its 3 high current channels are especially useful in the automatic test system such as cellular phone test or battery test where only two or three high current channels are needed. There are four connection accessories for ease of wiring.

The 12 general purpose channels are non-latching relays which can switch up to 200 V, 1 A, 60 W or 62.5 VA .The 3 high current channels are non-latching relays, switching up to 5 A, 125 V DC or 200 V AC RMS. The 16-bit digital I/O provides 16 bi-directional data lines (bits) plus 3 lines used for control and handshaking. The 16-bit I/O lines are TTL compatible input/output, or TTL compatible input and open collector output. The 16 I/O bits can be addressed individually, or as two independent 8-bit ports, or as one 16-bit port. A Zener diode is used in each channel for input voltage-over protection (>42V DC), including ESD protection. Each I/O line can sink up to 0.6 A to control external devices.





Specification

12-channel GP Relay

General Specifications

Relays:	Armature non-latching relay
Thermal Offset:	<3μV
Relay Life Mechanical:	10^8
Electrical:	$5x10^5$ (at 1A load)
Maximum Scan Rate:	80 ch/ sec

Input Characteristics

Maximum Voltage:	200V
Maximum Current:	
Per channel	1A

Maximum Power:

Per channel	60W or 62.5VA
Initial Closed Channel Resistance:	<0.5 Ω

DC Isolation

Open Channel, Channel-Channel:	
<(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis:	
<(40°C, 50% RH)	$>10^{10}$ Ω

AC Isolation

Capacitance (with 1 channel closed):	
Open Channel, Channel-Channel	<10pF
Channel-Chassis	<20pF
Insertion Loss (with 50 Ω termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<0.50dB
Crosstalk (with 50 Ω termination):	
100kHz	<-70dB
1MHz	<-50dB
10MHz	<-30dB

Note: All voltage and current are in DC or AC RMS if not specified

3-channel High Current Relay

General Specifications

Relays:	Armature non-latching relay
Relay Life Mechanical:	$5x10^7$
Electrical:	10^5 (at 5A load)
Thermal Offset:	<3μV
Time to close one channel:	16ms

Input Characteristics

Maximum Voltage:	125V DC or 200 V AC
Maximum Current:	5A (per channel)
Maximum Power:	150W or 1250 VA (per channel)
Initial Closed Channel Resistance:	<0.1 Ω

DC Isolation

Open Channel, Channel-Channel:	
<(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis:	
<(40°C, 50% RH)	$>10^{10}$ Ω

AC Isolation

Capacitance (with 1 channel closed):	
Open Channel, Channel-Channe	<10pF
Channel-Chassis	<20pF
Insertion Loss (with 50 Ohm termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<0.50dB
Crosstalk (with 50 Ohm termination):	
100kHz	<-70dB
1MHz	<-50dB
10MHz	<-30dB

Note: All voltage and current are in DC or AC RMS if not specified

16-bit Digital I/O

I /O Lines

Maximum Voltage(line-chassis):	+42V DC
Maximum sink current(per bit):	0.6A
Output Characteristics:	
V_{out} (high)	≥ 2.4V @ I≤ 10mA output
V_{out} (low)	≤ 0.8V @ I≤ 600mA input
Input Characteristics:	
V_{in} (high)	≥ 2.0V
V_{in} (low)	≤ 0.8V

Handshake Lines

Max. Voltage(line-chassis):	+5V
Max. I_{out} (low):	<25 mA (when shorted to +5V)
Output Characteristics:	
V_{out} (high)	≥ 2.4V @ I≤ 400μA output
V_{out} (low)	≤ 0.5V @ I≤ 1mA input
Input Characteristics:	
V_{in} (high)	≥ 2.0V
V_{in} (low)	≤ 0.8V

Accessories

N2294A	Screw Terminal block
N2296A	Crimp & insert terminal block
N2297A	DIN96-to-Twin-D50 Cable
N2299A	DIN96-to-Quad-D25 Cable

Multifunction module

HP N2265A

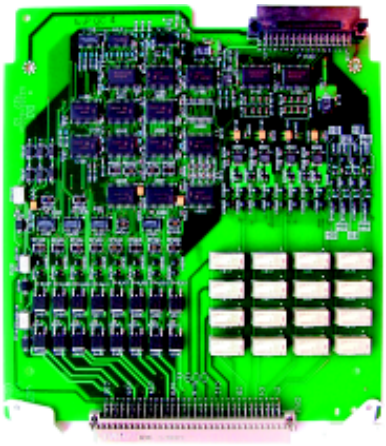
Description

An HP N2265A multifunction module combines a 4 x 4 matrix (2-wire) and 16 bits of digital input/output in one module. The HP N2265A is designed for applications that require multiple functions in one module for space saving and system cost saving. There are 4 connection accessories for ease of wiring.

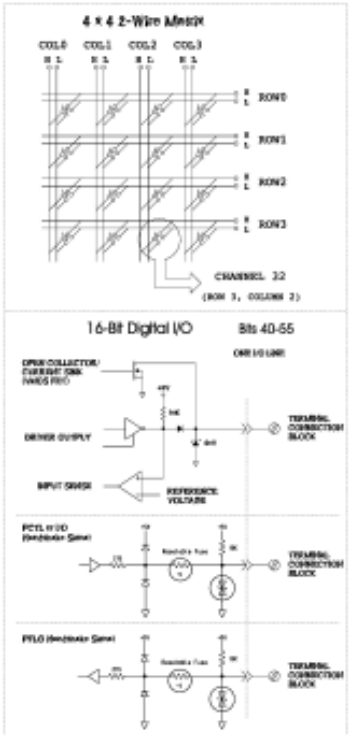
The 4 x 4 Matrix (including 16 crosspoints), provides the most convenient way to connect a group of test instruments to multiple test points on DUTs. Each crosspoint in a module switches 2 wires for the high and low of a test point.

There are 16 bi-directional data lines (bits) plus 3 handshake lines in HP N2265A. The 16-bit I/O lines are TTL compatible input/output, or TTL compatible input and open collector output. The 16 I/O bits can be addressed individually, or as two 8-bit ports, or as one 16-bit port. A Zener diode is used in each channel for input voltage over protection (>42 VDC), and ESD protection. Each I/O line can sink up to 0.6 A to control external devices.

- 4x4 matrix and 16-bit Digital I/O in one module
- High speed switching in parallel operation
- Built-in relay cycle counters



HP N2265A Multifunction Module



Specifications

4 x 4 Matrix

General Specifications

Relays:	Armature latching relay
Relay Life Mechanical:	10^8
Electrical:	$5x10^5$ (at 1A load)
Maximum Scan Rate:	80 ch/ sec

Input Characteristics

Maximum Voltage:	200V
Maximum Current:	
Per channel	1A
Per module	4A
Maximum Power:	
Per channel	60W or 62.5VA
Per module	240W or 250 VA
Initial Closed Channel Resistance:	<1 Ω

DC Isolation

Open Channel, Channel-Channel:	
<(40°C, 50% RH)	$>10^{10}$ Ω
HI-LO: <(40°C, 50% RH)	$>10^{10}$ Ω
Channel-Chassis <(40°C, 50% RH)	$>10^{10}$ Ω

AC Isolation

Capacitance (with 1 channel closed):	
Open Channel, Channel-Channel	<7pF
HI-LO	<25pF
Channel-Chassis	<40pF
Insertion Loss (with 50 Ohm termination):	
100kHz	<0.10dB
1MHz	<0.20dB
10MHz	<0.60dB
Crosstalk (with 50 Ohm termination):	
100kHz	<-76dB
1MHz	<-56dB
10MHz	<-33dB

16-bit Digital I/O

I /O Lines

V_{in}≤+42V DC	I_{sink} ≤0.6A
V_{out}(high)≥2.4V @ I≤10mA output	V_{out}(low)≤0.8V @I≤0.6A input
V_{in}(high)≥2.0V	V_{in}(low)≤0.8V

Handshake Lines

V_{in}≤5V DC	
V_{out}(high)≥2.4V @ I≤400µA output	V_{out}(low)≤0.5V @ I≤1mA input
V_{in}(high)≥2.0V	V_{in}(low)≤0.8V

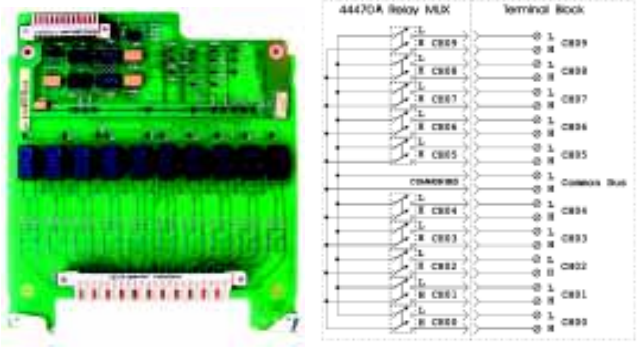
Accessories

N2295A	Screw Terminal block
N2296A	Crimp & insert terminal block
N2297A	DIN96-to-Twin-D50 Cable
N2299A	DIN96-to-Quad-D25 Cable

10-channel Multiplexer Module

HP 44470A

- Designed for low channel count application
- Switching up to 2 A, 250 V



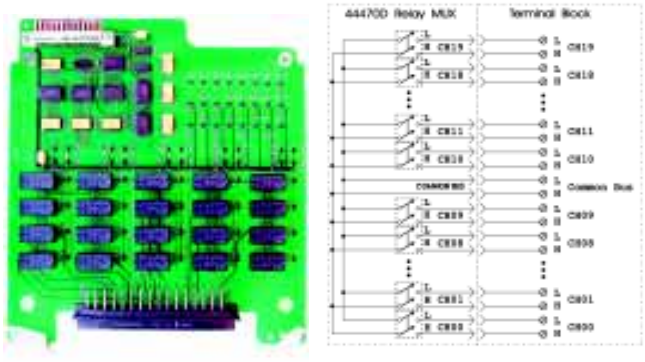
Description

The HP 44470A multiplexer module provides 10-channel to switch both high and low input signals to a common bus. It can switch signals up to 250 V, 2 A, and 60 W, or 125 VA per channel. This module exhibits low thermal offset characteristics which make it ideal for precision low level signal routing. It can be operated in either a break-before-make mode or multiple channel close mode. You can make 4-wire ohm measurements by programming two HP 44470As to open/close in the card pair mode. A screw terminal block is provided for ease of wiring.

20-channel Multiplexer Module

HP 44470D

- Designed for low channel count application
- Switching up to 2 A, 250 V



Description

The HP 44470D multiplexer module provides 20-channel to switch both high and low input signals to a common bus. It can switch signals up to 250 V, 2 A, and 60 W, or 125 VA per channel. This module exhibits low thermal offset characteristics which make it ideal for precision low level signal routing. It can be operated in either a break-before-make mode or multiple channel close mode. You can make 4-wire ohm measurements by programming two HP 44470Ds to open/close in the card pair mode. A screw terminal block is provided for ease of wiring.

Specifications

General Specifications

Relays:	Armature latching relay
Thermal Offset:	<3µV /channel
Relay Life (mechanical):	10^8
Maximum Scan Rate:	43 ch/ sec

Input Characteristics

Maximum Current:		2A
Maximum Voltage:		250V
Maximum Power:	44470A	60W or 125VA
	44470D	60W or 125VA
Initial Closed Channel Resistance:		<1Ω

DC Isolation

Open Channel, Channel-Channel:		
<(40°C, 60% RH)		$>10^{11}$ Ω
HI-LO:		
<(40°C, 60% RH)	44470A	$>10^{10}$ Ω
	44470D	$>5x10^{10}$ Ω
Channel-Chassis:		
<(40°C, 60% RH)	44470A	$>10^{10}$ Ω
	44470D	$>5x10^{10}$ Ω

AC Isolation

Capacitance (with 1 channel closed):		
Open Channel, Channel-Channel		
	44470A	<5pF
	44470D	<7pF
HI-LO:		<27pF
Channel-Chassis:		<80pF
Insertion Loss (with 50 Ω termination):		
100kHz		<0.20dB
1MHz		<0.25dB
10MHz	44470A	<0.50dB
	44470D	<1.20 dB
Crosstalk (with 50 Ω termination):		
100kHz		<-73dB
1MHz		<-53dB
10MHz	44470A	<-33dB
	44470D	<-31dB

Module accessories

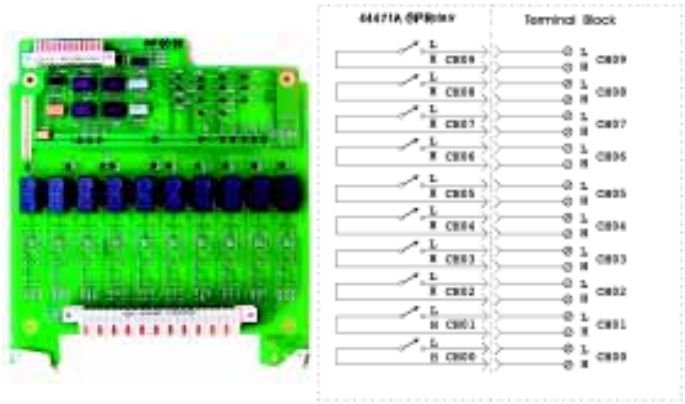
HP 44480A	Screw terminal block for HP 44470A
HP 44480B	Screw terminal block for HP 44470D

Note: All voltage and current are in DC or AC RMS if not specified

10-channel General Purpose Relay Module

HP 44471A

- Switching up to 2 A, 250 V
- High isolation for mV level signal switching



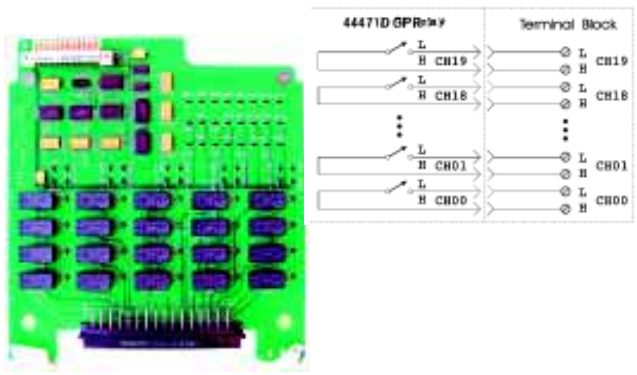
Description

The HP 44471A is a 10-channel 1-wire Form A general purpose relay module. It can be used to control DUT power, to actuate external relay or to form an attenuator. Each relay on the module is rated for switching up to 250 V, 2 A, or up to 60 W or 125 VA. The initial closed channel resistance is lower than 1 Ohm. The HP 44471A exhibits low thermal characteristics, which make it ideal for independent signal switching. A screw terminal block is provided for ease of wiring.

20-channel General Purpose Relay Module

HP 44471D

- Switching up to 1 A, 250 V
- High isolation for mV level signal switching



Description

The HP 44471D is a 20-channel 1-wire Form A general purpose relay module. It can be used to control DUT power, to actuate external relay or to form an attenuator. Each relay on the module is rated for switching up to 250 V, 1 A, or up to 60 W or 125 VA. The initial closed channel resistance is lower than 1 Ohm. The HP 44471D exhibits low thermal characteristics, which make it ideal for independent signal switching. A screw terminal block is provided for ease of wiring.

Specifications

General Specifications

Relays:		Armature latching relay
Thermal Offset:		<3µV /channel
Relay Life (mechanical):		10^8
Maximum Scan Rate:		43 ch/ sec

Input Characteristics

Maximum Current:	44470A	2A
	44471D	1A
Maximum Voltage:		250V
Maximum Power:		
Per channel	44471A	60W or 125VA
	44471D	60W or 125VA
Per module	44471A	600W or 1250 VA
	44471D	1200W or 2500 VA
Initial Closed Channel Resistance:		<1 Ω

DC Isolation

Open Channel, Channel-Channel:		
<(40°C, 60% RH)		$>10^{11}$ Ω
Channel-Chassis:		
<(40°C, 60% RH)	44471A	$>5x10^{11}$ Ω
	44471D	$>5x10^{11}$ Ω

AC Isolation

Capacitance (with 1 channel closed):		
Open Channel, Channel-Channel		<7pF
Channel-chassis		<25pF
Insertion Loss (with 50 Ω termination):		
100kHz		<0.20dB
1MHz		<0.25dB
10MHz	44471A	<0.50dB
	44471D	<1.0 dB
Crosstalk (with 50 Ω termination):		
100kHz		<-73dB
1MHz		<-53dB
10MHz	44471A	<-33dB
	44471D	<-31dB

Module accessories

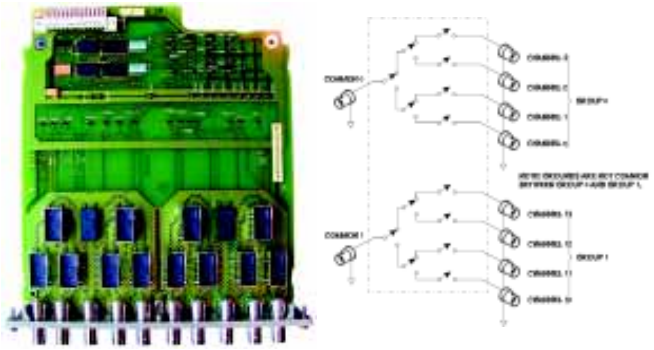
HP 44481A	Screw terminal block for HP 44471A
HP 44481B	Screw terminal block for HP 44471D

Note: All voltage and current are in DC or AC RMS if not specified

Dual 1x4 VHF Multiplexer (300 MHz, 50Ω)

HP 44472A

- DC to 300 MHz
- BNC connectors for ease of wiring



Description

The HP 44472A VHF module offers broadband switching capability for high frequency and pulse signals. Two independent 50 Ω characteristic impedance, bi-directional 1 x 4 switches are provided for signals from DC to 300 MHz. Very low crosstalk makes the VHF module ideal for VHF signal measurements using spectrum, network, or distortion analyzers. You can also use the excellent signal integrity of the VHF module for multiplexing inputs to your GPIB oscilloscope or waveform analyzer. Each group of four channels is isolated from the other and from the chassis to prevent ground loops. BNC connectors provide ease of connection to the module.

Specifications

Input Characteristics

Maximum Voltage	
(center-center, center-low):	250V DC, 30V AC RMS or 42V AC peak
(Low-chassis or low-low):	42V DC
Maximum Current(per chan.):	30mA DC,300mA AC RMS
Thermal Offset:	<15µV
Characteristic Impedance:	50 Ω
Initial Closed Channel Resistance:	<1 Ω
DC isolation <(40°C, 95% RH):	$>10^7$ Ω

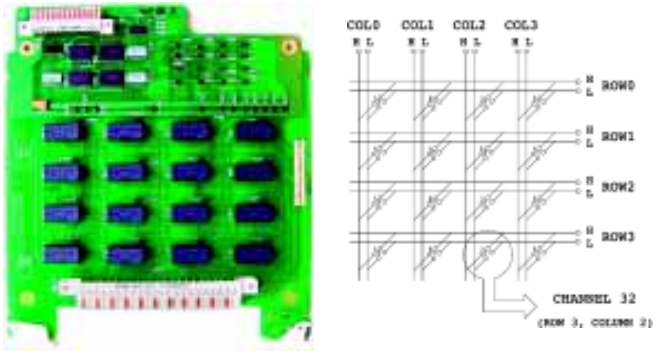
AC Isolation/Performance

	30MHz	100MHz	300MHz
Insertion loss(dB)	<0.5	<0.75	<1.25
Crosstalk(dB)			
Within a Group	<-100	<-85	<-65
Group-Group	<-85	<-85	<-50
VSWR	<1.06	<1.12	<1.43
Capacitance:			
Center-center, center-common	<0.002pF		
Center-low	<70pF		
Low-chassis	<0.20µF		
Rise Time:	<0.7 nsec		
Signal Delay:	<2.5 nsec (channel match <90psec)		

4x4 2-Wire Matrix Switch Module

HP 44473A

- Switching signals up to 250 V, 2 A



Description

The HP 44473A module brings highly flexible matrix switching to your test system. You can use the matrix switch module to conveniently connect a group of instruments to several points on DUT (device under test). Individual module provides a 4 x 4, 2-wire matrix that allows any combination of inputs and outputs to be connected for signals up to 250 V or 2 A .

Specifications

Input Characteristics

Relays:	Armature latching relay
Thermal Offset:	<3µV
Maximum Scan Rate:	43 ch/ sec
Relay life (mechanical):	10^8
Maximum Voltage:	250V
Maximum Current: Per channel	2A
Per module	8A
Maximum Power: Per channel	60W or 125VA
Per module	240W or 500VA
Initial Closed Channel Resistance:	<1 Ω

DC Isolation <(40°C, 60%RH)

Open Channel:	$>10^{11}$ Ω
HI-LO:	$>10^{10}$ Ω
Channel-Chassis:	$>10^{10}$ Ω

AC Isolation

Capacitance (with 1 channel closed):	
Open Channel, Channel-Channel:	<5pF
HI-LO:	<40pF
Channel-Chassis:	<70pF

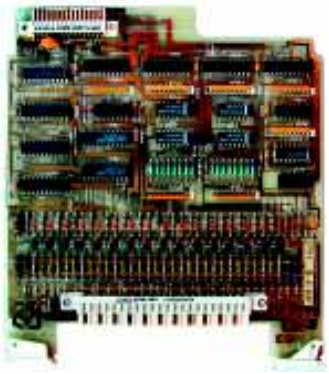
Note: All voltage and current are in DC or AC RMS if not specified

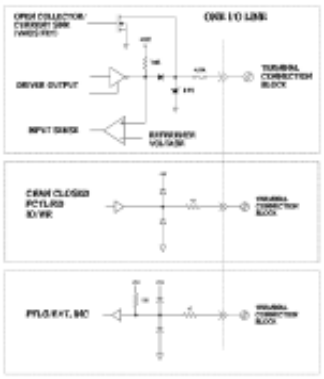
	100kHz	1MHz	10MHz
Insertion Loss	<0.30dB	<0.35dB	<0.90dB
Crosstalk	<-76dB	<-56dB	<-36dB

16-Bit Digital Input/Output Module

HP 44474A

- 16-bit TTL compatible digital I/O
- Input /Output re-configurable byte-by-byte





Description

The HP 44474A is a digital I/O module, providing 16 bi-directional data lines (bits) plus 4 lines used for control and handshaking. All lines are TTL compatible. The 16 data lines offer TTL compatible I/O or inputs and open collector outputs. The 16 I/O lines or bits can be addressed individually, or as two independent 8-bit ports, or as one 16-bit port. For instance, one port can be used for output operations, while the other for input. Each I/O line can sink current up to 0.125 A from external devices.

Specifications

I /O Lines

Maximum Voltage(line-chassis):	+30V DC
Output Characteristics	
V_{out} (high):	≥ 2.4V @ I ≤ 8mA output
V_{out} (low):	≤ 0.4V @ I ≤ 16mA input
I_{out} (low):	125 mA@ V_{out} ≤ 1.25 V
Characteristics	
Vin (high):	≥ 2.0V
Vin (low):	≤ 0.8V

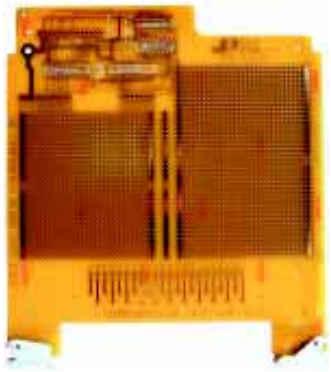
Handshake Lines

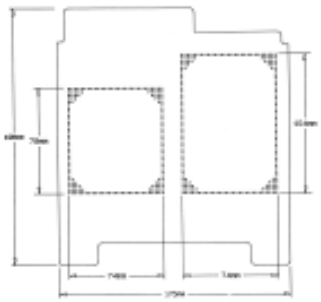
Maximum Voltage(line-chassis):	+5V DC
Output Characteristics	
V_{out} (high):	≥ 2.4V @ I≤ 400µA output
V_{out} (low):	≤ 0.5V @ I≤ 2mA input
Input Characteristics	
V_{in} (high):	≥ 2.0V
V_{in} (low)	≤ 0.8V

Breadboard Module

HP 44475A

- For custom designed special circuitry





Description

The HP 44475A is a breadboard module providing a place for customer mounted circuits for special applications. Occasionally, some desired functions may not be available on a standard plug-in module. In such a case, the HP 44475A provides the ideal solution. The HP 44475A can be used in designing and building special functions for your system. Filters, amplifiers, and other custom circuitry can be implemented on the breadboard's grid of plated holes. The supplied documentation lets you interface your circuit directly to the HP 3499A/B's internal bus control signals.

Specifications

Module Dimensions

Component Areas Available:	104mm x 74mm and 79mm x 74mm
Gird Hole Size (inside diameter):	1.17mm
Grid Hole Spacing(center-center):	2.54mm x 2.54mm
Maximum Component Height: (above Board)	12.7mm (0.5")
Maximum Lead length: (below Board)	3.2mm (0.125")

Input Characteristics

Maximum Voltage:	42V DC, 30V AC RMS
	42V AC Peak
Maximum Power Dissipation: (per Modules)	2W

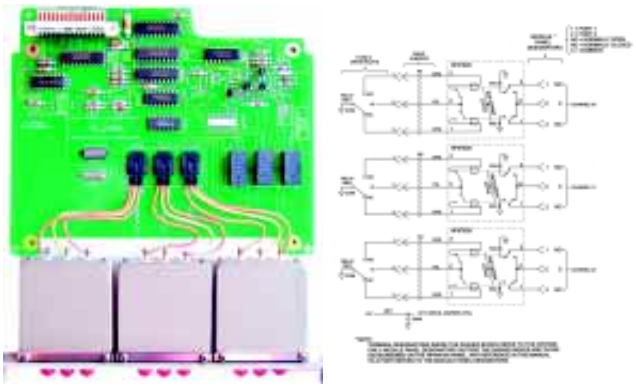
Connection accessory

44485A	Screw terminal block with 22 terminals for field wiring

Microwave Multiplexer Module

HP 44476A

- Switching signals from DC to 18 GHz
- Triple 1-to-2 microwave multiplexers



Description

The HP 44476A is a microwave switch module. There are three independent SPDT 50 Ω coaxial relays with excellent electrical performance from DC to 18 GHz. For general purpose microwave switching applications, the module can be used to switch separate signal sources for a multi-band receiver/transmitter testing application. The 3-mm SMA connectors on the module edge are for ease of wiring.

Specifications

Input Characteristics

Frequency Range:		DC to 18 GHz
Characteristic Impedance:		50 Ω
Input Power Rating:		1 W average
(Also less than ± 7 V DC)		100 W peak
Repeatability (after 10^6 operation):		0.03 dB
Connector:		SMA

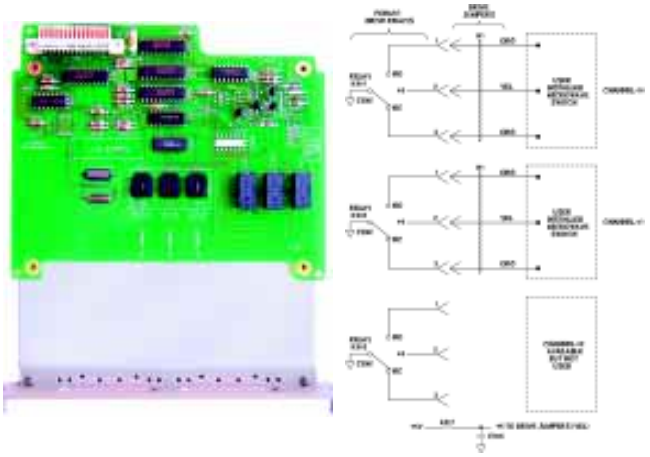
AC Isolation / Performance

Isolation:	DC-18GHz	>90 dB
Insertion Loss:	DC-2 GHz	<0.25 dB
	DC-18GHz	<0.50 dB
VSWR (3 mm SMA):	DC-2GHz	<1.15
	DC-12.4GHz	<1.25
	DC-18.0GHz	<1.40

Microwave Relay Driver Module

HP 44476B

- Supporting varieties of microwave coaxial relays
- Two sets of mounting holes for coaxial relays



Description

The HP 44476B is a microwave relay driver module that brings multi-port 50/75 Ω coaxial switching flexibility to your test system. The HP 44476B panel has two sets of mounting panels, so any two HP 876XX coaxial switches can be mounted on this module. The HP coaxial switches come in three-, four-, and five-port configurations. This flexibility allows you to use the different switches for a variety of applications, constructing transfer switches, switch matrices, etc. Using the HP 876xx in conjunction with the HP 44476B will allow you to extend your automated three-port switching to 26.5 GHz. Coaxial relays must be ordered separately. The HP coaxial switches that can be used are listed below. The Option 011 designates the switches for a coil voltage of 5 V DC.

HP Coaxial Switch	Port	Frequency
HP 8762A/Option 011	3	DC to 4 GHz
HP 8762B/Option 011	3	DC to 18 GHz
HP 8762C/Option 011	3	DC to 26.5 GHz
HP 8762F/Option 011	3	DC to 4 GHz
HP 8763B/Option 011	4	DC to 18 GHz
HP 8763C/Option 011	4	DC to 26.5 GHz
HP 8764B/Option 011	5	DC to 18 GHz
HP 8764C/Option 011	5	DC to 26.5 GHz

For details of HP 876XX specification, please refer to HP p/n 5964-9527E.

Dual 1 x 4 RF Multiplexer (1.3 GHz, 50/75Ω)

HP 44478A/B

Description

The HP 44478A/B multiplexer module is an ideal choice for broadband switching of high frequency or fast pulse signals. Dual 1-to-4 mulitplexers provide bi-directional switching of signals from DC to 1.3 GHz. High channel isolation (>55 dB @ 1 GHz) assures quality dynamic-range measurements using spectrum, network, or distortion analyzers. Each 1-to-4 multiplexer consists of 7 relays in a "tree" structure, which provides high isolation and low VSWR (voltage standing wave ratio). All the connectors on the module's edge are female BNC for ease of wiring. Off-channels can be terminated in resistors to maintain proper operation of DUT circuitry. Simply plug a 50/75 Ω SMB type resistive termination onto the on-board male SMB connector provided for each channel.

Specifications

Input Characteristics

Maximum Scan Rate:	43 ch/ sec
Maximum Voltage:	42V, DC+AC peak
Maximum Current:	1A
Maximum Power: Per channel	24W, 24VA or 44dBm
Characteristic Impedance:	44478A 50 Ω
	44478B 75 Ω

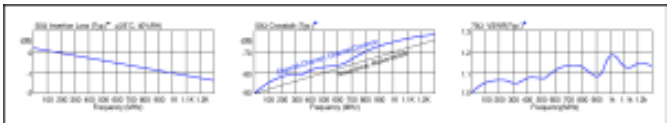
DC Performance

Thermal Offset:	<6µV (<2µV, Typ.)
Initial Closed Channel Resistance:	<1 Ω
Insulation Resistance (between terminals): <(25°C, 40% RH)	$>10^{10}$ Ω

Capacitance:

Center-Center	<0.006pF
Center-Shield	<60pF
Rise Time:	<300psec
Signal Delay:	<3nsec

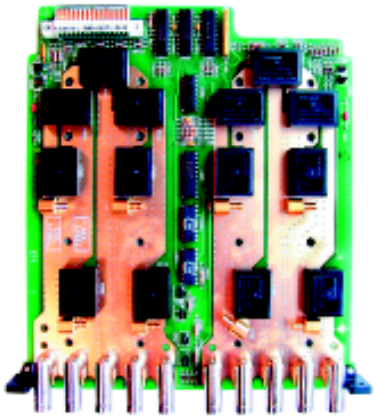
AC Performance	10MHz	100MHz	500 MHz	1.3GHz
Insertion Loss ≤(40°C, 95% RH)	<0.3dB	<0.7dB	<1.5dB	<3.0dB
≤(25°C, 40% RH)	<0.2dB	<0.5dB	<1.1dB	<1.9dB
Crosstalk				
Channel-Channel, Channel-Common	<-90dB	<-80dB	<-65dB	<-55dB
Group-Group, Module-Module	<-90dB	<-80dB	<-70dB	<-60dB
VSWR	<1.20	<1.25	<1.35	<1.55

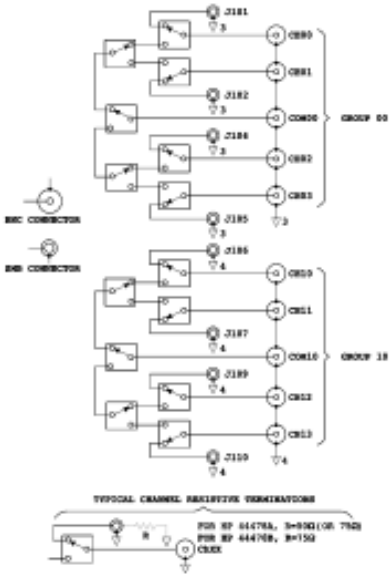


HP 44478B typical performance diagram

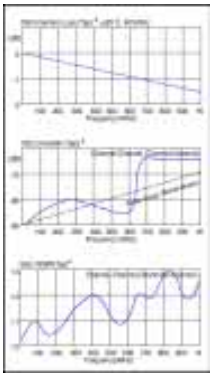
- Switching up to 1 A, 24 W or 24 VA
- Insertion loss less than 1.9 dB @1.3 GHz

HP 44478A/B





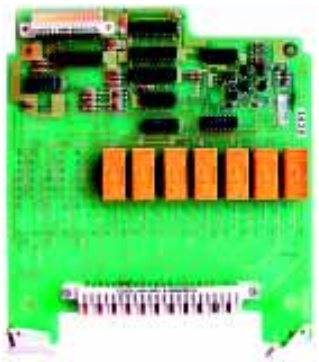
HP 44478A typical performance diagram



Form-C relay Module

HP 44477A

- 7 Single-Pole-Double-Throw relays module
- Switching up to 2 A, 250 V



Description

The HP 44477A is a Form-C relay module providing seven independent Single-Pole-Double-Throw relays for general purpose switching and control of external devices. Using an external power supply, you can use the module to drive remote RF, coaxial, and microwave devices such as the HP 876xx, HP 8710xx series, and mercury relays. This module is normally set up to use an external power supply for voltages up to 250 V DC, and can be easily configured to use the internal 5 V DC power supply. In applications where the module's voltage or current specifications are going to be exceeded, use the module to drive a properly rated external relay to switch those signals.

Specifications

Input Characteristics

Thermal Offset:		<3µV
Maximum Scan Rate:		43 ch/ sec
Relay life (mechanical):		10^8
Maximum Voltage:		250V
Maximum Current:	Per channel	2A
	Per module	14A
Maximum Power:	Per channel	60W or 125VA
	Per module	420W or 875VA
Initial Closed Channel Resistance:		<1Ω

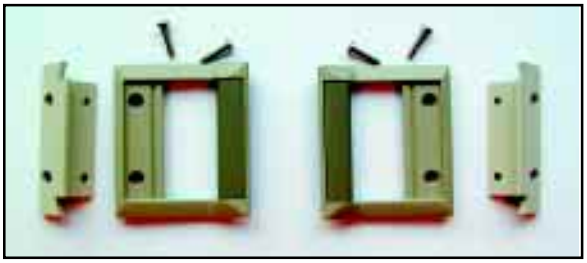
DC Isolation (<40°C, <60%RH)**:**

Open Channel	$>10^{11}$ Ω
Channel-Chassis	$>5x10^{11}$ Ω

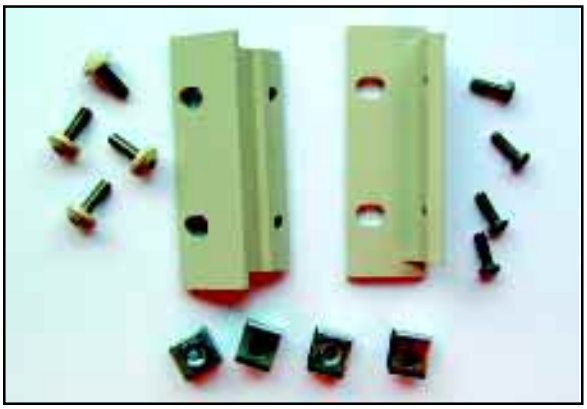
AC Isolation

Capacitance (with 1 channel closed):			
Open Channel, Channel-Channel	<10pF		
Channel-Chassis	<25pF		
	100kHz	1MHz	10MHz
Insertion Loss	<0.20dB	<0.25dB	<0.50dB

Rack Mounting Kits

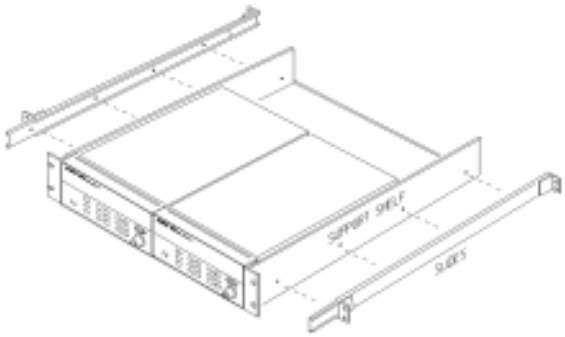


HP 3499A Rack Mount Kit with Handles (Opt. 1CP)



HP 3499A Rack Mount Kit (Opt. 1CM)

To rack mount an HP 3499B with a fill panel, order Option 1CM.



To rack mount two instruments in a sliding support shelf, please order shelf (P/N 5063-9255) and slide kit (P/N 1494-0015), and also use the included tie-down clip (03499-21002).

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Ordering Information

HP 3499A 5-slot full-rack-width Switch/Control mainframe, includes hard copy manual and power cord. Plug-in modules are purchased separately and are required to operate.

Option 0B0 Delete Hard Copy Manual

Option 1CP Rack Mount Kit with Handles

Option 1CM Rack Mount Kit

HP 3499B 2-slot half-rack-width Switch/Control mainframe, includes hard copy manual and power cord. Plug-in modules are purchased separately and are required to operate.

Option 0B0 Delete Hard Copy Manual

Option 1CM Rack Mount Kit with filler panel

HP N2260A 40-channel Multiplexer Module.

HP N2261A 40-channel General Purpose Relay Module

HP N2262A 4 x 8 Matrix Module

HP N2263A 32-bit Digital I/O Module

HP N2264A 12 + 3 GP + 16-bit Digital I/O Module

HP N2265A 4 x 4 Matrix + 16-bit Digital I/O Module

HP N2289A Mini-Din-to-D9 cable for built-in DIO in HP 3499A/B

HP N2290A Screw terminal block for HP N2260A

HP N2291A Screw terminal block for HP N2261A

HP N2292A Screw terminal block for HP N2262A

HP N2293A Screw terminal block for HP N2263A

HP N2294A Screw terminal block for HP N2264A

HP N2295A Screw terminal block for HP N2265A

HP N2296A Crimp & Insert terminal block for HP N2260-5A

HP N2297A DIN96-to-Twin-D50 cable for 6 modules (HP N2260-5A)

HP N2298A DIN96-to-D25 cable for 4x8 matrix (HP N2262A)

HP N2299A DIN96-to-Quad-D25 cable for 6 modules (HP N2260-5A)

All plug-in modules for HP 3488A will work in HP 3499A/B

HP 3488A Switch/Control Unit (Only supports 11 of the 13 4447xx plug-in modules.

Option 023 New version HP 3488A mainframe with firmware upgraded, supporting 44470D and 44471D, or order

HP 44488A used for upgrading existing HP 3488A at later time to support 44470D and 44471D.

Rackmount Kit for HP 3488A

Option 908 Rack Flange Kit (HP p/n 5061-1168)

Option 909 Rack Flange with Handles (HP p/n 5061-1169)

Plug-in modules (work in the HP 3488A and the HP 3499A/B)

Include screw terminal connectors

HP 44470A 10-channel Relay Multiplexer Module

HP 44470D 20-channel Relay Multiplexer Module

HP 44471A 10-channel GP Relay Module

HP 44471D 20-channel GP Relay Module

HP 44472A Dual 4-channel RF Multiplexer Module

HP 44473A 4x4 Matrix Switch Module

HP 44474A 16-bit Digital I/O Module

HP 44475A Breadboard Module

HP 44476A Microwave Multiplexer Module

HP 44476B Microwave Switch Driver Module

HP 44477A Form-C Relay Module

HP 44478A 1.3 GHz 50Ω RF Multiplexer

HP 44478B 1.3 GHz 75Ω RF Multiplexer

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