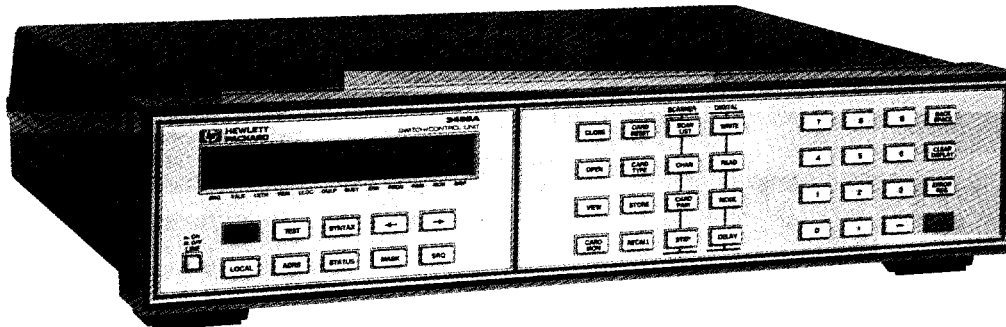


SYSTEM SWITCHES & HP-IB CABLES

Signal Routing and Measurement

HP 3488A

- DC to 26.5 GHz signal switching
- Matrix, multiplexer, and general purpose relays
- Digital I/O control and actuation
- Up to 50 channels
- 40 configuration storage registers
- 11 switch and control modules



HP 3488A



HP 3488A Switch/Control Unit

The HP 3488A switch/control unit brings versatile, HP-IB programmable switching to tests requiring multi-channel measurements. The HP 3488A provides signal switching with the integrity and isolation needed for high-performance production test systems. It also offers a flexible, low-cost interconnection for automating experiments on the bench and for developing tests in the lab. The HP 3488A is designed to hold up to five of the following switch and control modules:

- 10-channel relay multiplexer
- 10-channel general purpose relay
- Dual 4-channel VHF switch
- 4 × 4 matrix switch
- 16-bit digital input/output
- Breadboard
- 3-channel 18 GHz switch
- 7-channel form-C relay
- 2-channel microwave switch
- 1.3 GHz 50 and 75 Ω multiplexers

Flexible Switching

The HP 3488A is an economical approach to flexible switching through plug-in modules. You can select the right combination of switching functions to meet both performance and budget needs. Testing is simplified by having one solution for connections of low-level DVM inputs, high-level dc and ac power, and microwave signals to 26.5 GHz. Additional devices, such as microwave relays and programmable attenuators, are easily controlled with digital I/O functions. Custom circuitry can also be implemented on breadboard modules.

Versatile Performance

The HP 3488A can store up to 40 complete switch configurations for convenient recall in automated test programs. Switch operation can be done with multiple relay closures or with selectable channels in a break-before-make mode. Break-before-make and recallable switch configurations can be combined in a programmable scan list. The HP 3488A uses removable screw terminal connectors that provide easily interchangeable wiring for each test. Built-in self-test assures proper operation.

Multiplexer (Option 010/HP 44470A)

Option 010 is a 10-channel multiplexer for scanning or multiple signal connections. Channels switch 2 wires (Hi and Lo) with 2PST relays for DVM inputs and other signals up to 250V and 2A. This module can also be used to multiplex signals to other switching functions, such as the matrix module.

General Purpose Relay (Option 011/HP 44471A)

This module consists of 10 SPST independent relays for general signal switching and control of external devices. Quality connections make this module ideal for switching signals when multiplexing is not required, or for supplying switchable power to the device under test.

VHF Switch (Option 012/HP 44472A)

The VHF module provides broadband switching for high-frequency and pulse signals. The two independent groups of bidirectional 1 × 4 switches can be used for signals from dc to 300 MHz. All channels have 50-Ω characteristic impedance and are break-before-make within a group of four channels. Each group is isolated from the other and from ground to prevent ground loops. Excellent isolation makes this module ideal for high-frequency signal analyzer measurements requiring a large dynamic range.

Matrix Switch (Option 013/HP 44473A)

Option 013 offers highly flexible switching with a 4 × 4, 2-wire matrix. Any combination of four input channels may be connected to any combination of 4 output channels. Each cross point or node in the matrix uses a 2PST relay to switch two lines (Hi and Lo) at a time. Multiple 4 × 4 modules can be connected to form larger matrices. Multiplexers can be used in conjunction with this module to effectively expand the number of inputs and outputs of the matrix.

Digital I/O (Option 014/HP 44474A)

This module offers 16 very flexible bidirectional I/O lines and 4 TTL-compatible handshake lines for sensing and control of external devices. The digital inputs can be used to sense contact closures to ground. Each channel provides current sinks for remote switching of external relays, such as the HP 33311 series coaxial switches.

Breadboard (Option 015/HP 44475A)

The breadboard module provides a convenient way to implement custom circuits and special functions that interface directly to the HP 3488A's backplane control signals.

Microwave Switch (Option 016/HP 44476A)

This microwave switch furnishes three independent SPST 50-Ω coaxial switches with excellent performance from dc to 18 GHz. The 3 mm SMA connector allows you to easily connect cables for multiple system configurations.

Form-C Relay (Option 017/HP 44477A)

This module provides seven separate SPDT channels for general purpose switching and control of external devices. Using a power supply, the module can drive programmable attenuators and non-HP coaxial switches.

Microwave Switch (Option 018/HP 44476B)

The module brings multi-port 50 Ω coaxial switching to your test system. The module can mount any two HP 3331XX coaxial switches. The HP coaxial relays come in 3-, 4-, and 5-port configurations—different switches for a variety of applications. HP coaxial switches that can be used are:

HP Coaxial Switch	Port	Frequency
HP 33311B/Opt 011	3	dc to 18 GHz
HP 33311C/Opt 011	3	dc to 26.5 GHz
HP 33312B/Opt 011	4	dc to 18 GHz
HP 33312C/Opt 011	4	dc to 26.5 GHz
HP 33313B/Opt 011	5	dc to 18 GHz
HP 33313C/Opt 011	5	dc to 26.5 GHz

1.3 GHz 50 Ω Multiplexer (Option 019/HP 44478A)

1.3 GHz 75 Ω Multiplexer (Option 020/HP 44478B)

These modules bring bi-directional switching of signals from dc to 1.3 GHz, with high-channel isolation (>55 dB @ 1 GHz). Each module consists of two groups of 1×4 multiplexers. All test connections are made to BNCs on the module's edge. Off-channels can be resistively terminated.

Specifications for:

Option 010/HP 44470A Multiplexer

Option 011/HP 44471A General Purpose Relay

Option 013/HP 44473A Matrix Switch and

Option 017/HP 44477A Form-C Relay Switch Modules

Input Characteristics

Maximum Voltage (terminal-terminal or terminal-chassis):

250 V dc, 250 Vac rms, 350 Vac peak

Maximum Current: 2 A dc, 2 A ac rms

Maximum Power: 60 W dc, 500 VA ac

Thermal Offset: < 3 μV

DC Isolation (40°C, 60% RH)

Channel-channel, open channel: > 10¹¹ Ω

AC Isolation/Performance

(50 Ω termination)	100 kHz	1 MHz	10 MHz
Insertion Loss (dB)	< 0.30	< 0.35	< 0.90
Crosstalk (dB)	< -73	< -53	< -33

Specifications for Option 012/HP 44472A VHF Switch Module

Input Characteristics

Maximum Voltage

Center-center, center-low: 250 Vdc, 30 Vac rms, 42 Vac peak

Low-chassis, low-low: 42 V dc

Maximum Current (per channel): 30 mA dc, 300 mA ac rms

Thermal Offset: < 15 μV per channel

Characteristic Impedance: 50 Ω

AC Isolation/Performance

	30 MHz	100 MHz	300 MHz
Crosstalk (dB)			
Channel-Channel	< -100	< -85	< -65
Group-Group	< -85	< -85	< -50
Insertion Loss (dB)	< 0.5	< 0.75	< 1.25
VSWR	< 1.06	< 1.12	< 1.43

All channels break-before-make within a group of 4 channels.

Specifications for Option 014/HP 44474A

Digital I/O Module

I/O Lines

Maximum Voltage: +30 Vdc (line-chassis)

Output Characteristics: V (high) ≥ 2.4 V; V (low) ≤ 0.4 V

I (low) Maximum: 125 mA @ V (low) ≤ 1.25 V; fused at 250 mA

Input Characteristics: V (high) ≥ 2 V; V (low) ≤ 0.8 V

External Increment: Advances HP 3488A to next programmed configuration on falling edge of TTL pulse

Channel Closed: Indicates completion of new configuration;

TTL pulse

Specifications for Option 016/HP 44476A

Microwave Switch Module

Frequency Range: DC to 18 GHz

Isolation: > 90 dB

Impedance: 50 Ω

Insertion Loss: < 0.05 dB

SWR: 1.40

Specifications for Option 018/HP 44476B

Microwave Switch Module

Refer to HP 3331XX product specifications.

Specifications for Option 019/HP 44478A and Option 020/HP 44478B 1.3 GHz Multiplexers

Input Characteristics

Maximum Voltage: 42 Vdc + ac peak

Maximum Current per Channel: 1 A DC or AC rms

Maximum Power per Channel: 24 W, 24 VA, or 44 dBm

Impedance: 50 Ω (Opt 019/HP 44478A)

75 Ω (Opt 020/HP 44478B)

AC Performance

	≤10 MHz	≤100 MHz	≤500 MHz	≤1.3 GHz
Insertion Loss (dB)				
≤ (40° C, 95% RH)	< 0.3	< 0.7	< 1.5	< 3.0
≤ (25° C, 40% RH), (Typ.)	< 0.2	< 0.5	< 1.1	< 1.9
Crosstalk (dB)				
Channel-Channel				
Channel-Common	< -90	< -80	< -65	< -55
Group-Group, Module-Module	< -90	< -80	< -70	< -60
VSWR	< 1.2	< 1.25	< 1.35	< 1.55

General Specifications

Environmental: Temperature: 0° to 55° C (32° to 130° F); humidity: 95%, 0° to 40° C (32° to 105° F)

Power: 86 to 132 V/195 to 250 V, switch-selectable; 48 to 440 Hz; 18 VA

Interface: HP-IB

Size: 89 mm H (without feet) × 425 mm W × 292 mm D (3.5 in × 16.75 in × 11.5 in). Allow 76 mm (3 in) additional depth for wiring.

Weight: Net, 8.5 kg (18.75 lb); shipping, 16 kg (35.25 lb)

Connectors: Removable screw terminal connector. Each terminal accepts 18 to 26 gauge (16 to 40 mils) wire, with strain relief for wiring.

Opt 012/HP 44472A VHF switch: BNC connectors

Opt 016/HP 44476A and Opt 018/HP 44476B microwave switch: SMA connectors

Ordering Information

HP 3488A Switch/Control Unit Price \$2,030

Switch Modules-Includes Terminal Connectors

Opt 010/HP 44470A 10-Channel Relay Multiplexer Module + \$590

Opt 011/HP 44471A 10-Channel General Purpose Relay Module + \$590

Opt 012/HP 44472A Dual 4-Channel VHF Switch Module + \$835

Opt 013/HP 44473A 4 × 4 Matrix Switch Module + \$715

Opt 014/HP 44474A 16-Bit Digital Input/Output Module + \$590

Opt 015/HP 44475A Breadboard Module + \$235

Opt 016/HP 44476A Microwave Switch Module + \$2,725

Opt 017/HP 44477A Form-C Relay Module + \$590

Opt 018/HP 44476B Microwave Switch Module + \$590

Opt 019/HP 44478A 1.3 GHz 50 Ω Mux + \$1,070

Opt 020/HP 44478B 1.3 GHz 75 Ω Mux + \$1,155

Rackmounting and Manuals

Opt 401 Side Handle Kit (HP p/n 5061-1171) + \$51

Opt 907 Front Handle Kit (HP p/n 5061-1170) + \$61

Opt 908 Rack Flange Kit (HP p/n 5061-1168) + \$41

Opt 909 Rack Flange with Handles (HP p/n 5061-1169) + \$92

Opt 910 Extra Operating and Service Manuals + \$122

Opt W30 Three-Year Hardware Support + \$50