Description
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 test systems in production. It also offers a flexible, low cost interconnection solution for automating experiments on the bench and for development testing in the lab. The HP 3488A is designed to hold any combination of up to 5 of the following optional switch and control modules:

- 10 Channel Relay Multiplexer
- 10 Channel General Purpose Relay
- Dual 4 Channel VHF Switch
- 4 x 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 ohm Multiplexers

Flexible Switching
The HP 3488A offers an economical approach to switching flexibility through plug-in modules. The user can select the right combination of switching functions to meet both performance and budget requirements. 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 with multiple relay closures or with selectable channels in a break-before-make mode. Break-before-make closures and recallable complete switch configurations can be combined in a programmable scan list. The HP 3488A uses removable screw terminal connectors that provide easily interchangeable wiring configurations for each test. Built-in self-test capability assures proper operation.

Multiplexer (Opt. 010/HP 44470A)
Option 010 is a 10 channel multiplexer for scanning or multiple signal connections. Channels switch 2 wires (Hi & Lo) with 2PST relays for DVM inputs and other signals up to 250 V and 2A. This module can also be used to multiplex signals to other switching functions such as the matrix module.

General Purpose Relay (Opt. 011/HP 44471A)
This module consists of 10 SPST independent relays for general signal switching and control of external devices. The quality connections provided make this module ideal for switching signals when multiplexing isn't required or for supplying switchable power to the device under test.

VHF Switch (Opt. 012/HP 44472A)
The VHF module provides broadband switching capability for high frequency and pulse signals. The 2 independent groups of bidirectional 1 x 4 switches can be used for signals from dc to 300 MHz. All channels have 50 ohm characteristic impedance and are break-before-make within a group of 4 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 (Opt. 013/HP 44473A)
Option 013 offers highly flexible switching with a 4 x 4, 2 wire matrix. Any combination of 4 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 2 lines (Hi & Lo) at a time. Multiple 4 x 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 (Opt. 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 of coaxial switches.

Breadboard (Opt. 015/HP 44475A)
The breadboard module provides a convenient way to implement custom circuits and special functions that interface directly with the HP 3488A's backplane control signals.

Microwave Switch (Opt. 016/HP 44476A)
This microwave switch furnishes three independent SPST 50-ohm coaxial switches with excellent performance from DC to 18 GHz. The 3-mm SMA connector allows the user to easily connect cables for multiple system configurations.

Form-C Relay (Opt. 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 (Opt 018/HP 44476B)
The module brings multi-port 50-ohm coaxial switching to your test system. The module can mount any two HP 3331XX Coaxial Switches. The HP coaxial relays come in three-, four-, and five-port configurations, different switches for a variety of applications. HP Coaxial Switches that can be used are listed on the following table.

### HP Coaxial Switch

<table>
<thead>
<tr>
<th>Model</th>
<th>Port</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 33311B</td>
<td>3</td>
<td>dc - 18 GHz</td>
</tr>
<tr>
<td>HP 33311C</td>
<td>4</td>
<td>dc - 26.5 GHz</td>
</tr>
<tr>
<td>HP 33312B</td>
<td>4</td>
<td>dc - 18 GHz</td>
</tr>
<tr>
<td>HP 33313B</td>
<td>5</td>
<td>dc - 26.5 GHz</td>
</tr>
<tr>
<td>HP 33313C</td>
<td>5</td>
<td>dc - 26.5 GHz</td>
</tr>
</tbody>
</table>

**1.3 GHz 50 ohm Multiplexer (Opt. 44478A)**

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 1x4 multiplexers. All test connections are made to BNC's on the module's edge. Off-channels can be resistively terminated.

### Specifications for Opt. 010/HP 44470A

**Multiplexer, Opt. 011/HP 44471A General Purpose Relay, and Opt. 013/HP 44473A Matrix Switch and Opt. 017/HP 44477A Form-C Relay Switch**

**Modules**

**Input Characteristics**

- **Maximum Voltage:** 250 V dc, 250 Vac rms, 350 Vac peak
- **Max Current:** 2A dc, 2A ac rms
- **Max AC RMS:** 250 V
- **Thermal Offset:** < 15 µV
- **Impedance:** 50 ohms
- **SWR:** 1.40
- **Insertion Loss:** < 0.05 dB
- **Isolation:** > 90 dB
- **Frequency Range:** 30 MHz - 300 MHz

### Specifications for Opt. 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
- **Max Current (per channel):** 30 mA dc, 300 mA ac rms
- **Thermal Offset:** < 15 µV per channel
- **Characteristics Impedance:** 50

### AC Isolation/Performance

<table>
<thead>
<tr>
<th>(50 Ω termination)</th>
<th>1 kHz</th>
<th>1 Mhz</th>
<th>10 Mhz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss (dB)</td>
<td>&lt; 0.3</td>
<td>&lt; 0.35</td>
<td>&lt; 0.90</td>
</tr>
<tr>
<td>Crosstalk (dB)</td>
<td>&lt; 73</td>
<td>&lt; 53</td>
<td>&lt; 33</td>
</tr>
</tbody>
</table>

### Specifications for Opt. 016/HP 44476A Microwave Switch Module

**Frequency Range:** dc to 18 GHz

**Isolation:** > 90 dB

**Impedance:** 50 Ohms

**Insertion Loss:** < 0.05 dB

**SWR:** 1.40

### Specifications for Opt. 018/HP 44476B Microwave Switch Module

Refer to HP 3331XX specifications.

### Specifications for Opt. 019/HP 44478A and Opt. 020/HP 44478B 1.3 GHz Multiplexers

**Input Characteristics**

- **Maximum Voltage:** 42V DC, AC Peak
- **Maximum Current per channel:** 1 A DC or AC RMS
- **Maximum Power per channel:** 24W, 24VA, or 44 dBm
- **Impedance:** 50 ohms (Opt. 019/HP 44478A)

### General Specifications

**Environmental**

- **Temperature:** 0 to 55°C; humidity: 95%, 0 to 40°C
- **Power:** 86-132 V/195-250 V, switch selectable; 48 - 440 Hz; 18 VA.
- **Interface:** SH1 AH 1T6TE0L4LEOSR1PPODC1DT1E2
- **Size:** 89 mm H (without feet) x 425 mm W x 292 mm D (3.5 “ x 16.75” x 11.5”). Allow 76 mm (3”) additional depth for wiring.
- **Weight:** 8.5 kg (18.5 lb). Shipping: 16 kg (36.5 lb).

### Ordering and Configuration Information

- **Price**: HP 3488A Switch/Control Unit $3,625
- **Switch Modules-Includes Terminal Connectors**
  - **Opt. 010/HP 44470A:** 10 Channel Relay Multiplexer Module $455
  - **Opt. 011/HP 44471A:** 10 Channel General Purpose Relay Module $455
  - **Opt. 012/HP 44472A:** Dual 4 Channel VHF Switch Module $600
  - **Opt. 013/HP 44473A:** 4x4 Matrix Switch Module $560
  - **Opt. 014/HP 44474A:** 16 Bit Digital Input/Output Module $455
  - **Opt. 015/HP 44475A:** Breadboard Module $191
  - **Opt. 016/HP 44476A:** Microwave Switch Module $2,110
  - **Opt. 017/HP 44477A:** Form-C Relay Module $455
  - **Opt. 018/HP 44478B:** Microwave Switch Module $455
  - **Opt. 019/HP 44478A:** 1.3 GHz 50 ohm Mux $825
  - **Opt. 020/HP 44478B:** 1.3 GHz 75 ohm Mux $900
- **Rack Mounting and Manuals**
  - **Opt. 401:** Side Handle Kit (HP P/N 5061-1171) $43
  - **Opt. 907:** Front Handle Kit (HP P/N 5061-1170) $55
  - **Opt. 908:** Rack Flange Kit (HP P/N 5061-1168) $35
  - **Opt. 909:** Rack Flange Kit (HP P/N 5061-1169) $79
  - **Opt. 910:** Extra Operating & Service Manuals $84
  - **Opt. W30 Three Year Hardware Support $50**