Switches

Drivers and Interface Modules

and up to an additional 217 switches via seven additional HP 84940A driver cards. A distribution board, HP 84941A (see opposite), is available to facilitate the interconnection of the HP 87130A to switches or attenuators.

HP E1368A, E1369A and E1370A VXI Attenuator and Switch Drivers

HP's VXI family of instrumentation includes modules for microwave switching and attenuation control up to 18.0 GHz. HP E1368A contains three factory-installed SPDT switches such as the HP 8762B which feature all-port termination, dc to 18.0 GHz. HP E1369A is identical to the HP E1368A except that the switches are not included. This allows user-substitution of HP 8763/64 series transfer switches. HP E1370A allows the user to customize the internal configuration for HP 8766 series multiport switches or HP 8494/95/96/97 series step attenuators.

For more information, request a copy of the HP VXI Catalog, Pub. no. 5964-3970E, 5964-6898E (CD format).

HP 84940A Switch Driver and HP 84941A Distribution Card

The HP 84940A is an expansion driver card for the HP 70611/12/13 family of MMS attenuator/switch drivers and the HP 87130A attenuator/switch driver. The HP 84940A has been designed for incorporation into large interfaces located remotely from their controller. A single HP 84940A can control up to 31 switches and can be located up to 150 feet (45 m) from an HP 70611/12/13 or HP 87130A. The physical interconnection to the switches or attenuators is realized via 31 four-pin output connectors which permit quick connection and disconnection of the switches or attenuators. The HP 84941A is a signal distribution card designed to simplify the interconnection of the drive cable from an HP 70611A, Option 001, or HP 87130A to the 31 components directly driven by these controllers. The HP 84941A also provides 31 four-pin connectors for convenient interconnection to switches or attenuators. Included with the HP 84941A is a pack of 31 cables, to connect as many as 31 switches or attenuator sections to the HP 84941A.

Custom Switch Matrixes (dc to 40 GHz)

HP designs and manufactures custom microwave switch matrixes for applications in ATE systems and bench test stands. Switch matrixes provide multiple path routing of stimulus and measurement signals under computer control. HP's custom design team is also able to include many of the other signal conditioning components, such as: step attenuators, detectors, power sensors, noise sources, mixers, power splitters and others that may be required to build a high performance solution. HP broadband amplifiers, described in this catalog, can be used to augment path losses and increase test signals for input to other measuring instruments. In addition, it is often possible to include extra logic and switching functions which add calibration paths for running confidence tests on the system.

With years of experience in custom matrix design, HP test solutions reduce test time, provide measurement confidence and enhance reliability. Each HP matrix is fully documented with a general description, RF and dc component schematics, parts identifier drawings, parts list, drive logic and verification data.

The simplest custom matrix is a collection of switches, with their RF connectors routed to the front or rear panel of the equipment rack. The customer can then use external cabling to configure their own system. Next in complexity is the "common highway" matrix configuration, whereby any one of the inputs may be routed to any one of the outputs, but only one path at a time. A full-access matrix is the most flexible switching solution, allowing simultaneous routing of signals from any input port to any unused output port.

Depending on the desired configuration of the matrix, HP designers will use SPDT switches, transfer switches, and/or SP4T and SP6T switches to achieve the required function. Each switch has its own design tradeoffs. The SPDT switches are more versatile in allowing complex, full-access configurations, while use of multiport switches are more economical, and provide higher performance in terms of insertion loss, isolation and phase shift.

Switches

Custom Switch Matrixes (dc to 40 GHz)

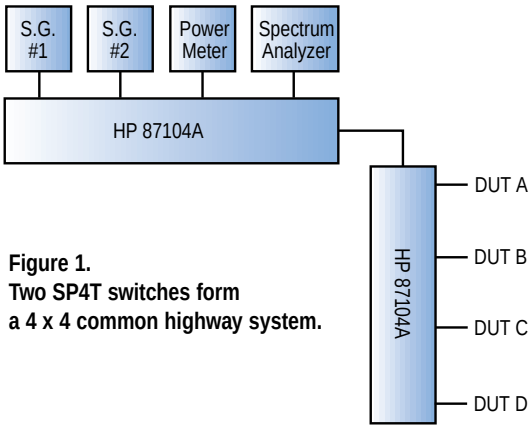

Figure 1.
Two SP4T switches form a 4 x 4 common highway system.

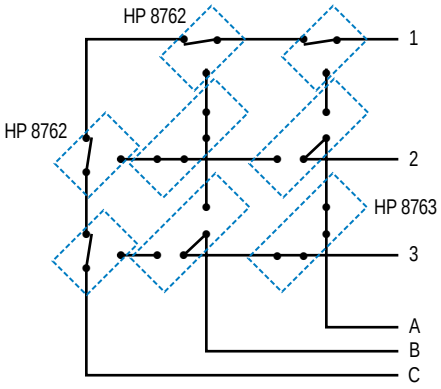

Figure 3.
Full access, crosspoint matrix.

Figure 1 shows a typical switch matrix configured for four devices under test (DUT). In this case, two different signal generators route signals to the DUT, while allowing the DUT to output its signal back to a power meter or spectrum analyzer. Because of the single (common highway) signal path, only a single DUT can be tested at a time.

The highest level of complexity is the "full-access" matrix shown in Figure 2. In this case, four input signals A, B, C, and D can be simultaneously connected to any one of the unused output lines from 1 to 6. A full-access matrix reduces an ATE system's operational expense and run time, since concurrent multipath testing allows all equipment to be used to maximum capability.

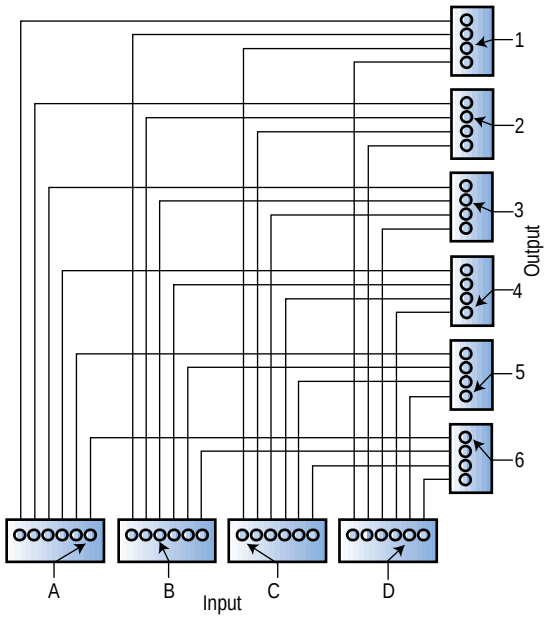

Figure 2. Typical full-access application.

Another example of a full-access matrix is shown in Figure 3. This "crosspoint" matrix is made up of HP SPDT and transfer switch models. Traditionally, crosspoint technology has been used for large matrixes. However, in large matrixes, the path losses increase. Therefore, this configuration is recommended for matrixes up to 3 x 3 only.

Configuring a Custom Matrix

In order to specify a matrix to meet a particular application, several requirements must be understood:

- How much isolation is required for each signal path.
- Whether some or all signal paths need equal electrical length.
- Selection of connectors on the front and rear test panel. It is important to estimate the number of connect/disconnect cycles the test connectors will see in typical operation. While 3.5 mm and 2.4 mm HP connectors are very rugged, it still may be necessary to use "connector savers" to extend a test connector's useful life.
- Isolation, SWR and insertion loss requirements for each different path will influence both matrix layout and switch selection.
- Switch control may be provided by standard HP drivers such as the HP 11713A, 87130A, 3488A, or the 70611A MMS attenuator/switch driver. The HP 11713A and HP 3488A provide manual push-button control. Some users may wish to provide their own solenoid drivers.

Switches

Custom Switch Matrixes (dc to 40 GHz)

Additional Literature

Your HP sales representative can provide more information on HP's capabilities in automated RF and microwave matrixes and test sets. Custom matrixes are priced based on content and non-recurring engineering (NRE) for each new design. Several publications are available with general background and technical data that may assist you.

Product Note 8760-1, *Custom Microwave Switch Matrixes*, Pub. no. 5959-7860.

Application Note 332, *Microwave Switching from SPDT to Matrix*, Pub. no. 5953-6466.

Application Note 332-1, *Switching, Novel Combinations of Microwave Switches*, Pub. no. 5954-8892.

HP 70611A, HP 87130A and HP 11713A Switch Attenuator Driver Configuration Guide, Pub. no. 5963-2038E.