

# Aeroflex / Weinschel Subsystems

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## Common Highway 4 x 4 Switch Matrix Design Concept

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## 1 Introduction

Aeroflex / Weinschel is pleased to present this technical paper describing a 4 x 4 Switch Matrix. Weinschel develops and manufactures high-quality, high-reliability microwave and RF components and Subsystems. Aeroflex / Weinschel has over 25 years of product development experience in satellite and communications systems, test, measurement and simulation of wireless systems, including 3G, WCDMA, PCS, and GSM; cable modem test sets and precision microwave and RF instrumentation. Aeroflex / Weinschel is well positioned to deliver designs based upon this 4 x 4 Switch Matrix.

Switch Matrix features:

- Common Highway Design
- 4 inputs to any one of 4 outputs
- GaAs MMIC switches
- IEEE-488 Control

## 2 Scope

Aeroflex / Weinschel's design approach is to use GaAs MMIC switches to assemble the 1x4. The switch components need only a fraction of the space inside the 3U chassis therefore there is room for increased functionality such as the addition of power splitters or the insertion of a variable attenuator. (Each bid as options to this design) Each matrix will be controllable through separate GPIB ports, yet both can be controlled manually through the front panel.

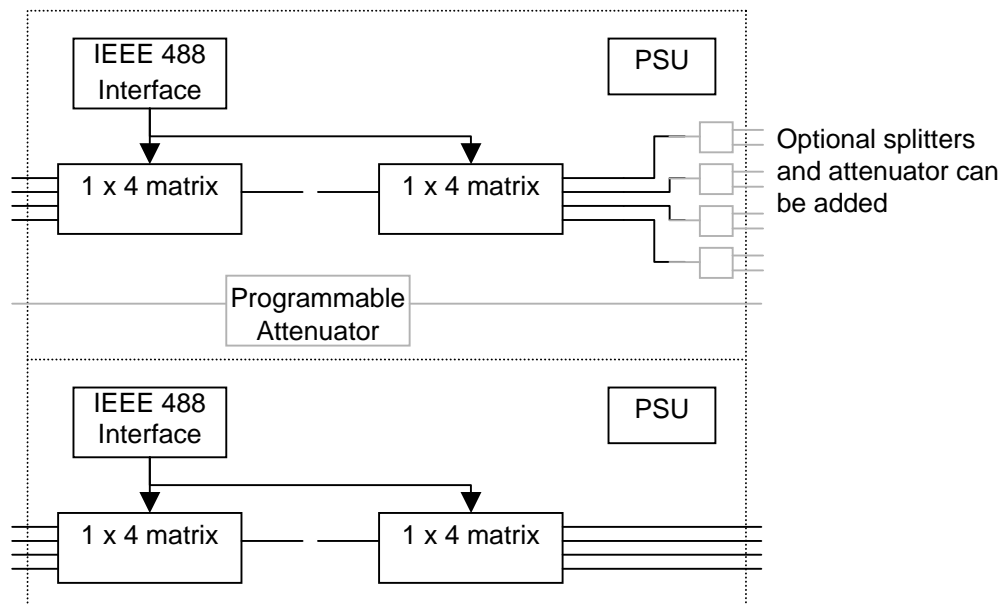


Figure 1. System Diagram.

### 3 General specifications

#### 3.1 RF Specifications – GaAs MMIC Switch Design

Specifications:	Typical	Firm
Switch	GaAs MMIC	GaAs MMIC
Frequency:	DC – 3GHz	DC – 3GHz, (usable to 3.5GHz)
Configuration:	4 x 4 input terminated	4 x 4 input terminated
Impedance:	50 ohm	50 ohm
Insertion Loss:	7.5 dB	8.0 dB
RF Input Power (P1dB):	28 dBm	25 dBm
Isolation:	50 dB	40 dB
RF connector:	SMA Female*	SMA Female*
Size:	5.25 h x 19 w x 10 d	5.25 h x 19 w x 10 d (2 ½ rack units)
Return Loss:		
Selected port	20dB	20 dB
Terminated port	> 10dB above 500MHz	> 10dB above 500MHz
Control:	IEEE 488	IEEE 488

\* Alternate RF connectors available.

#### 3.2 Design

The 4 x 4 Switch Matrix design will be delivered in a chassis with a power supply and dual IEEE 488 ports. There will be two 4x4 switch matrices installed in the chassis. Each matrix will be a common highway design shown in figure 2. The switches are GaAs MMIC devices that are mounted on a RF PCB. Each side of the matrix will be a 4 x 1 non-reflective switch that is connected together with cable. The input to the matrix will be terminating when not selected into the through path.

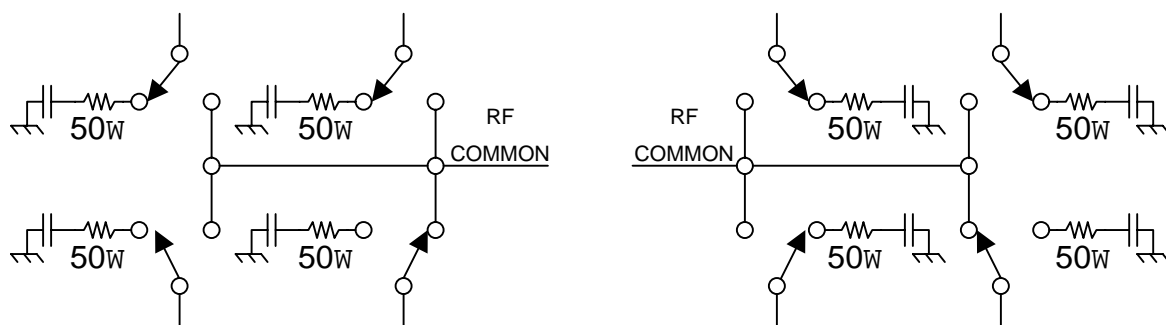


Figure 2. Functional Diagram of RF Network.

### **3-2.1 Controller**

The controllers will be Aeroflex / Weinschel Model 8210A-1. Each controller will independently control a 4x4 matrix using a GPIB interface.

### **3-2.2 Front Panel**

The front panel will allow the manual control of each switch path.

### **3-2.3 Microwave Switches**

The multi-throw switch design will be based on the use of high quality GaAs MMIC non-reflective switches mounted on a RF PCB. Each RF PCB also contains control electronics to interface with the controller.

#### **Repeatability:**

With the use of solid state switches there will be no repeatability degradation through the use of the switch as can normally be seen on electromechanical relays.

### **3-2.4 System Options**

#### **Power Dividers**

Power dividers can be added to the system at the outputs of the 4x4 switch matrix. These dividers will operate over the 800 MHz to 3 GHz frequency range. Adding the dividers will increase the signal path insertion loss by 4 dB. The power dividers will have 20 dB of port to port isolation.

#### **Step Attenuator**

A variety of Weinschel pin switched programmable step attenuators can be added to this subsystem. The step attenuator can be controlled using the existing 8210A-1 controller already installed. All attenuators are 800 MHz to 3 GHz, RF Pwr 1Watt max,

The attenuators which are available for installation are:

- (a) 63 dB attenuation range in 1 dB steps
- (b) 95 dB attenuation range in 1 dB steps
- (c) 127 dB attenuation range in 1 dB steps

## **4 Certification**

The Common Highway 4x4 Switch Matrix can have a CE certification if required.

## **5 Quality Assurance**

Aeroflex / Weinschel will implement its standard quality assurance program for development, fabrication, assembly, alignment and test of the deliverable items. This program supports compliance with the inspection requirements of ISO 9001.

## **6 Design Rights**

Aeroflex / Weinschel will retain all proprietary rights to the will retain all proprietary rights to the Multi-Channel 4 x 4 Switch Matrix. Weinschel will assign special model number to this item at the time of order.