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Find the *Pickering 20-750-711* at our website: ***Click HERE***

20-750/750A
GHz RF Matrix Module



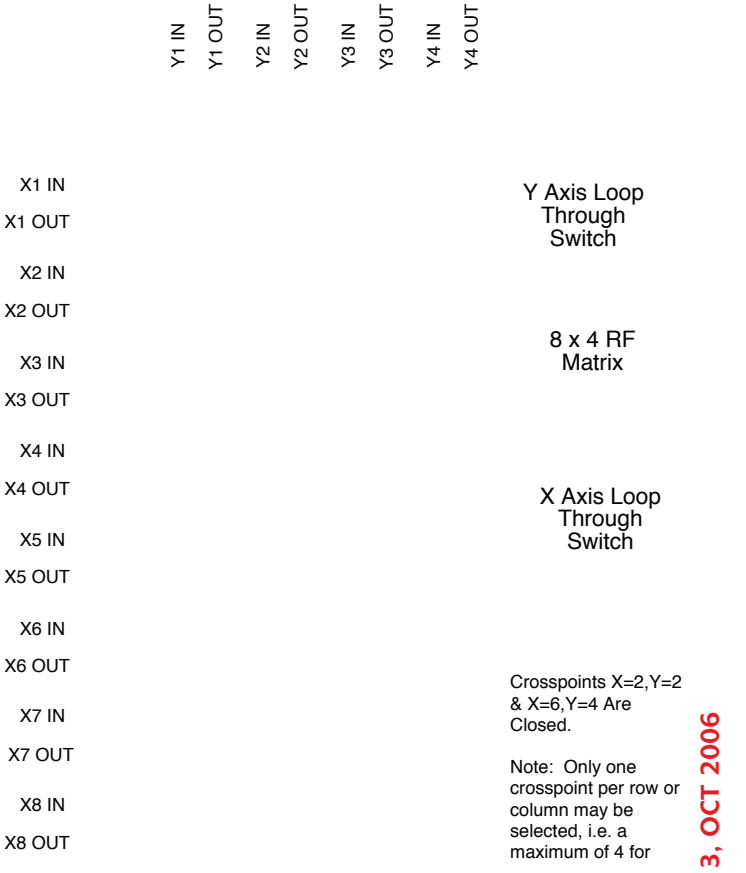
- 8 x 4 Blocking R.F. Matrix Expandible to Over 300 Crosspoints
- Bandwidths to Beyond 1300MHz
- Built-in Automatic "Loop Through" Simplifies Construction of Large High Performance RF Matrices (With Minimal Signal Degradation)
- 50Ω or 75Ω Versions with a Choice of BNC, SMB, SMA, 1.0/2.3 or BT Type 43 Connectors
- Built-In Self Test
- Very High RF Isolation

The Pickering Interfaces 20-750 and 20-750A series provides a range of high performance 8 x 4 RF Matrix Modules with a bandwidth to over 1300MHz with built-in expansion capability to beyond 300 crosspoints. Providing a sophisticated RF matrix offering high quality switching with versatile expansion capabilities together with a choice of connectors types in both 50Ω and 75Ω versions.

Applications include routing high frequency signals to and from oscilloscopes, network/spectrum analysers, signal generators and synthesizers, switching high frequency logic and many other situations involving coaxial switching. 75Ω versions are suitable for telecommunications and high quality video switching applications.

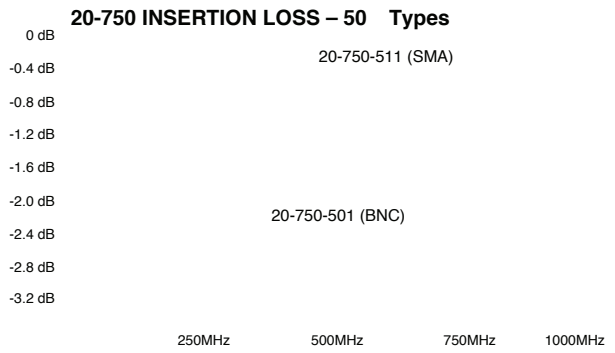
Easy Expansion with Automatic "Loop Through"

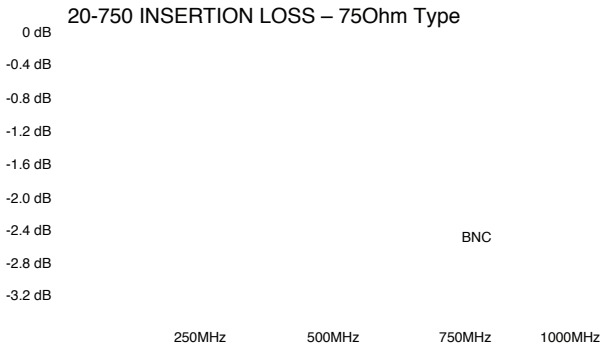
Each X and Y input channel has an associated output channel, all unused input channels will automatically be switched to the corresponding output channel, this allows for simple expansion (with little performance loss) and permits the user to place matched terminations on all output channels if required.

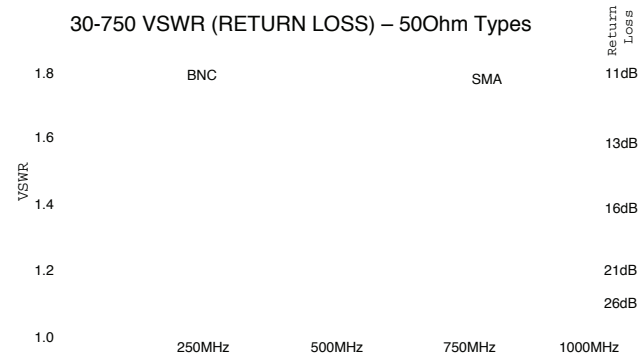


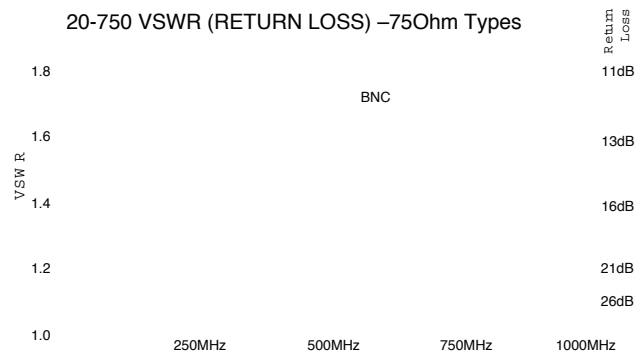
Switching Diagram for the 20-750 RF Matrix Module

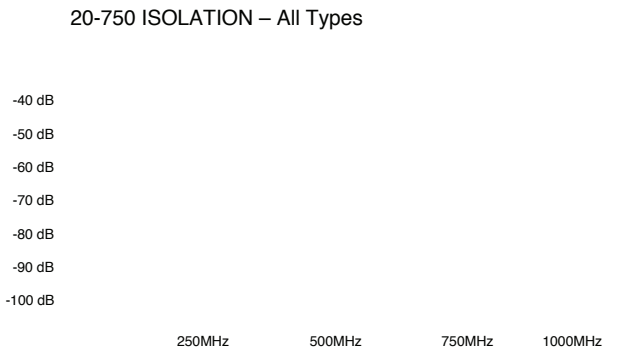
ISSUE 3, OCT 2006

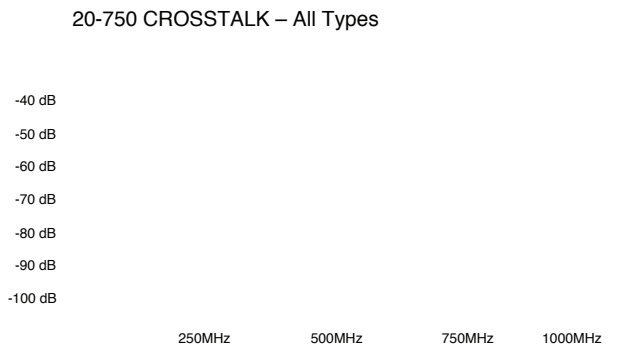




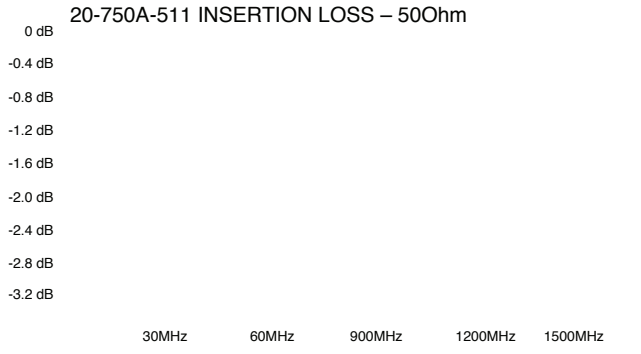


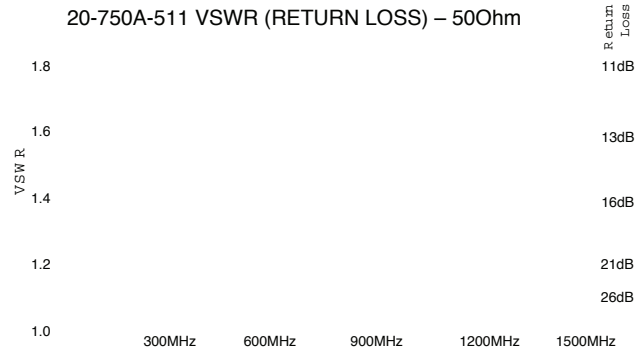




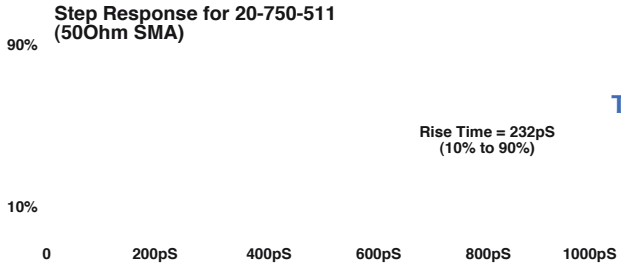


Typical RF Performance Plots for 20-750





Typical RF Performance Plots for 20-750A-511



Typical Step Response Plot for 20-750

Matrix Construction

This matrix is constructed using electromechanical coaxial relays giving consistent reliable performance from DC to beyond 1.3GHz.

Programming

The 20-750/750A Matrix module is simple to program using the following commands:-

ARESET a	Open all switches on device **a**
DIAGNOSTIC?	Report any Self Test errors
DELAY t	Force a minimum delay of **t** milliseconds between two instructions
MCLOSE a,x,y	Close switch at coordinates **x,y** on matrix **a**
MOPEN a,x,y	Open switch at coordinates **x,y** on matrix **a**
RESET	Open all switches on all modules
VIEW? a	View status of device **a**

Self Test

Self-Test is invoked at power on and may also be operated under software (*TST?) or via a recessed push button. Self-Test pass is indicated on a front panel LED with a full pass/fail description available using the DIAGNOSTIC? command. Self-Test comprises 3 levels:-

1. **Logic Test.**
2. **Relay Coil Test** .
3. **Full Switch Contact Test.**

Width and Dimensions

All modules conform to the 6U height (262mm) Eurocard standard with dimensions: 160mm deep and 2.4 inches wide (12HP).

Connectors

The 20-750 RF Matrix Module is available with BNC, SMA, SMB, Type 43/SMZ or 1.0/2.3 connectors. Other connector types are available to order, please contact the sales office for details.

Product Order Codes

800MHz RF Matrix, 50Ω, BNC	**20-750-501**
1300MHz RF Matrix, 50Ω, SMA	**20-750A-511**
1300MHz RF Matrix, 50Ω, SMB	**20-750A-521**
800MHz RF Matrix, 75Ω, BNC	**20-750-701**
1000MHz RF Matrix, 75Ω, Type 43/SMZ	**20-750-711**
1000MHz RF Matrix, 75Ω, 1.0/2.3	**20-750-741**

Optimised Matrix Modules are available to special order which are tailored to a specific frequency range.

Mating Connectors & Cabling

50Ω SMB to SMB Lead, 1m length	**10-987-510**
50Ω SMA to SMA Lead, 1m length	**10-981-510**
50Ω BNC to BNC Lead, 1m length	**10-980-510**
75Ω BNC to BNC Lead, 1m length	**10-980-710**
75Ω 1.0/2.3 to 1.0/2.3 Lead, 1m length	**40-977-731**
75Ω SMZ to SMZ Lead, 0.5m length	**10-988-705**

Other lead lengths are available, please contact sales office

Latest Details

Please refer to our Web Site for Latest Product Details.
www.pickeringtest.com

Specification (All Versions)

Characteristic Impedance:	50Ω or 75Ω
Isolation (at 2000MHz):	>60dB
Crosstalk (at 2000MHz):	>50dB
Maximum Voltage:	100V DC
Maximum Power:	10W
Maximum Carry Power (900MHz):	15W
Maximum Switch Current:	0.1A
On Path Resistance:	<500mΩ
Off Path Resistance:	$>10^8$Ω
Differential Thermal Offset:	<20µV
Switching Time:	20ms
Expected Life (Low power):	$>2x10^7$ operations
Expected Life (Full power):	$>3x10^5$ operations

Specification (50Ω BNC Version)

Rise Time:	<0.5ns
Max Insertion Loss (0 to 1000MHz):	<3dB
Max V.S.W.R. (0 to 800MHz):	1:1.8

Specification (50Ω SMA Version)

Rise Time:	<0.5ns
Max Insertion Loss (0 to 1000MHz):	<3dB
Max V.S.W.R. (0 to 1000MHz):	1:1.8

Specification (75Ω BNC Version)

Rise Time:	<0.5ns
Max Insertion Loss (0 to 1000MHz):	<3dB
Max V.S.W.R. (0 to 800MHz):	1:1.8

Expanded Matrix Typical Performance (50Ω SMA)

Typical performance figures are given below for expanded matrix modules (SMA versions) with both 2 and 4 modules chained together (losses due to coaxial cabling were small).

	2 Modules	4 Modules
Typ Insertion Loss (0 to 1000MHz):	<2dB	<3.5dB
Typ V.S.W.R. (0 to 1000MHz):	<1:1.8	<1:2.0

Please contact factory if more detailed information on expanded matrix performance is required.

Please refer to separate Application Sheet for further information on large matrix construction.

Operating/Storage Conditions

Operating Conditions

Operating Temperature:	0°C to 55°C
Humidity:	Up to 95% non-condensing
Altitude:	5000m

Storage and Transport Conditions

Storage Temperature:	-20°C to +75°C
Humidity:	Up to 95% non-condensing
Altitude:	15000m

RF Matrix Construction Using Model 20-750

Brief Description

A full blocking matrix like the one shown in the illustration (16 x 8) is very easy to construct. The 20-750 has been designed with expansion in mind, each module has a “loop through” switch on each coordinate axis, thus matrix modules may be daisy-chained with little performance loss. Other types of RF matrix units leave interconnection problems for the user to solve.

Simple Expansion

RF matrix systems may be expanded by simply adding more matrix modules and daisy chaining the additional modules onto your current matrix, performance will not be greatly reduced, furthermore existing software will need very minimal update (see below).

Automatic Termination of Unselected Lines

The “Loop Through” Switch capability on each matrix module means that if termination of all unused signals is required, then all the user must do is add a terminator to the “loop though” connector at the end of the coaxial daisy-chain. This terminator will then be automatically selected without any further software intervention.

Choice of Impedance and Connector Type

The 20-750 is available in either 50Ω or 75Ω versions with a choice of connector types. BNC versions are very popular, however BNC limitations reduce matrix performance, so for applications requiring maximum performance and reliability the SMA versions are usually preferred.

Very Straightforward Software Control

Programming the RF Matrix is very simple, to operate a crosspoint only the x and y coordinates within the whole matrix need be known, the exact location of matrix modules and switches is not required. To program an RF Matrix only three commands need be used:-

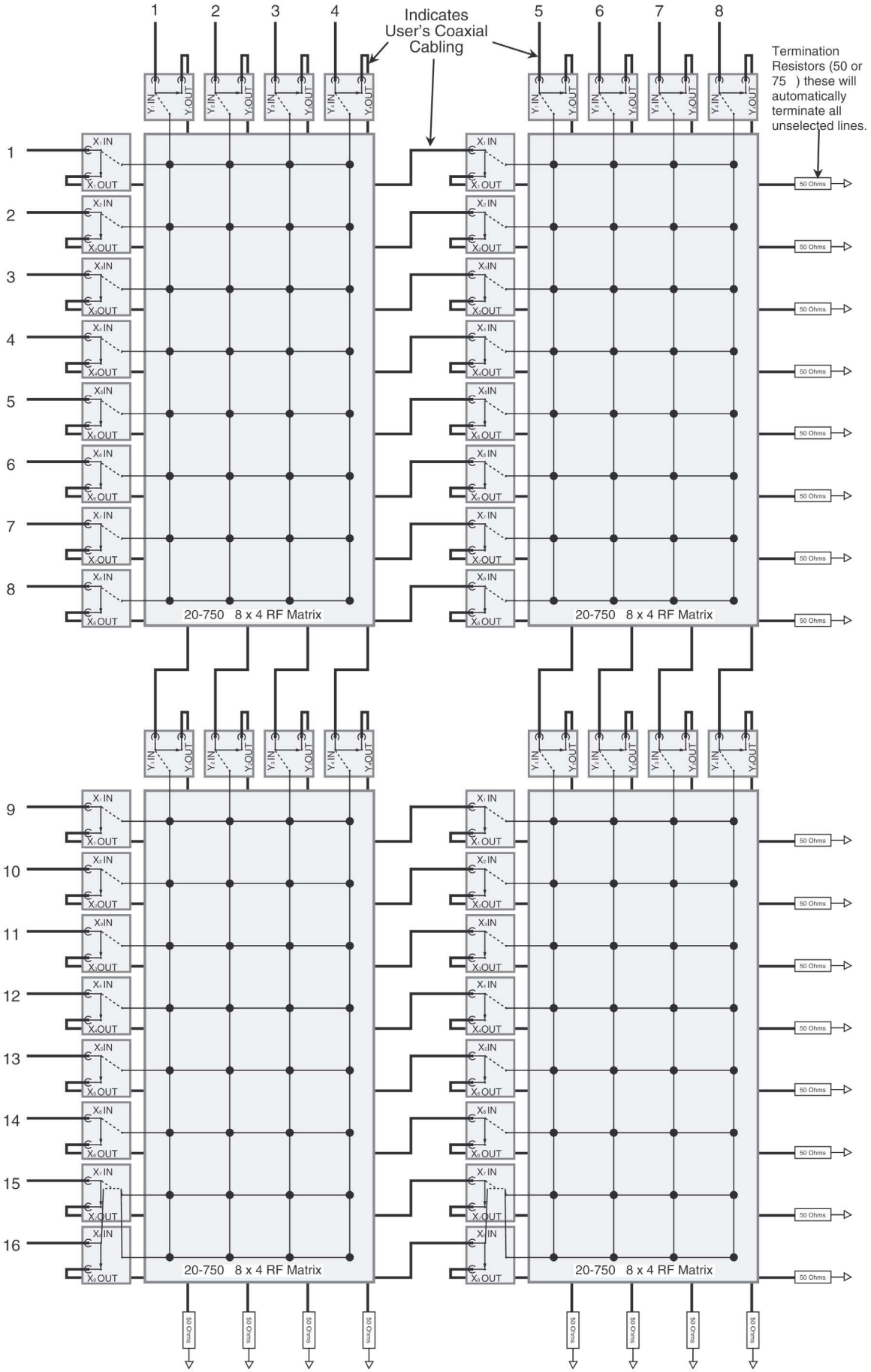
`MCLOSE a,x,y`	This closes the crosspoint at coordinate **`x,y`**.
`MOPEN a,x,y`	This opens the crosspoint at coordinate **`x,y`**.
`RESET a`	Clears all crosspoints on the addressed matrix.

Each matrix comprises of up to 30 matrix modules (e.g. from 8 x 4 up to 64 x 16), the location of each matrix module within the whole matrix is determined by DIP switches set on each module.

Thus the complex nature of programming the RF matrix is completely shielded from the user!

RF Matrix Example Application:

16 x 8 RF Matrix with 1GHz Bandwidth, Constructed Using Four 8 x 4 Matrix Modules – *See Notes Overleaf.*



The following notes may be of interest for RF switching applications:-

- When setting up large RF switching systems (e.g. multiplexers and matrices) it is often preferable to use SMA or SMB connectors for improved return loss performance. BNC connectors have poorer and much less consistent return loss characteristics particularly at frequencies above 1GHz.
- Many RF switching modules feature automatic matched termination of all unused channels, this ensures that an unused channel will be correctly terminated to minimise unwanted reflections.

  Pickering may be able to build RF switching systems for non-standard impedances, e.g. 93Ω , please contact sales office to discuss your requirement.
- RF Matrices may be constructed in a variety of ways depending upon the versatility, size, performance, software complexity and cost constraints of the application. Few RF matrix applications are alike, choice of construction includes:-

  1. Full access matrix constructed using interconnected 20-750 matrix modules. Here any combination of crosspoints may be selected simultaneously, please refer to 20-750 application note for further details.

  2. Single crosspoint matrix constructed using back to back multiplexers, easy to construct and low cost, but can only switch one channel at a time.

  3. A hybrid of a core matrix fed by multiplexer modules. This technique is a mixture of the above two, several crosspoints may be simultaneously switched, however it still does not have as much versatility as the first method. If a very large matrix is to be constructed (e.g. 100 x 100) then the first method will usually prove too unwieldy, therefore a hybrid is the most likely choice.
- RF switching modules may also be used for very high isolation low frequency applications – also look at our 20-520 matrix modules.
- Binary tree construction: It is very important when constructing RF switching networks to eliminate stubs (e.g. using coaxial T junction connectors), a binary tree construction (using changeover relays) is the most popular method.
- Pickering Interfaces can supply highly detailed plots and information for specialised areas that may be of interest for a particular application.

Further information:

The above notes may be of some help, but please feel free to contact our technical sales office to discuss your RF/Microwave application in further detail.

Return Loss to VSWR Converter

VSWR	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.3
Return Loss/dB		26	21	18	16	14	13	12	11	10	9	8

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