SmartStep™ Components & Subsystems

MCE WEINSCHEL

SmartStep™ dc to 26.5 GHz
Components & Subsystems

Streamlines System Designs & Device Integration!

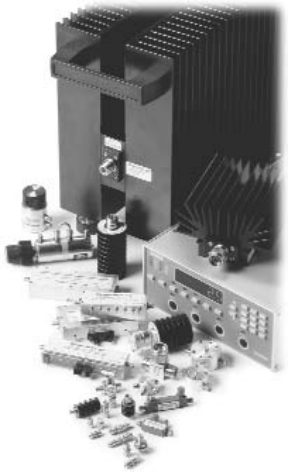
MCE/Weinschel develops, manufactures, markets, and sells high quality microwave and RF components and subsystems for wireless mobile and broadband infrastructure and test applications. Weinschel's mission is to provide superior design capabilities, products of consistent high quality, innovative solutions, and a high level of service to help its customers compete in today's demanding world markets.

Weinschel's subsystem products are employed in standards laboratories, manufacturing and test departments, cable modem head-end sites, cellular telephone networks, engineering development facilities, and quality control positions of communications and aerospace companies, as well as government agencies and private research firms throughout the world. Applications include satellite and ground communications systems, cable modem signal switching, cell telephone testing, telecommunications, radar, OEM, signal analysis, air traffic control, and precision microwave related instruments and system use. Weinschel's subsystems products and capabilities include:

- Cable Modem Testing
- Cellular/PCS Fading Simulation
- Cellular & PCS Subsystems with Low IM Components
- Switch Matrices
- Complex RF Matrices
- Programmable/Switch Controller
- SmartStep Programmable Attenuators
- Plug & Go Switch/Relay Drivers
- Attenuation Modules & Multi-Channel Subsystems

One of the strengths of Weinschel's Subsystem group is the ability to use our other standard catalog as well as in-house developed production products such as:

- Fixed Coaxial Attenuators & Terminations (dc-40 GHz, 2-1,000 Watts)
- Variable Attenuators & Phase Shifters
- Programmable Attenuators (Relay)
- Solid-State Attenuators (GaAs & FET)
- Power Splitters & Dividers
- Coaxial Adapters, Planar Blind-Mate & Planar Crown® Connector Systems
- SmartStep™ Components
- Custom & Other Components



For additional information on the SmartStep Approach, visit our website @ www.weinschel.com/smartstep.htm

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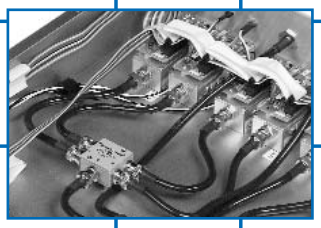
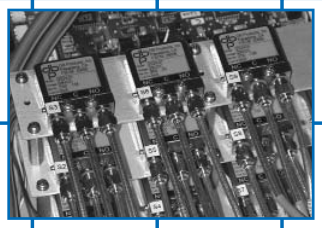
Make Your First Step The SmartStep™...

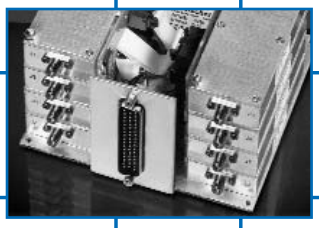


Cable Modem Test Sets



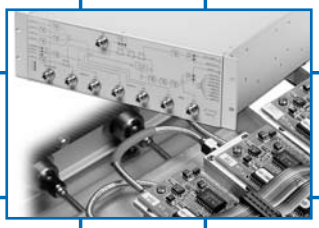
Switch Matrices

Multi-Channel Attenuation Subsystems

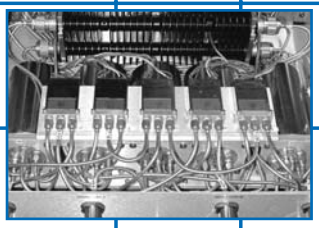


Custom Attenuation Modules

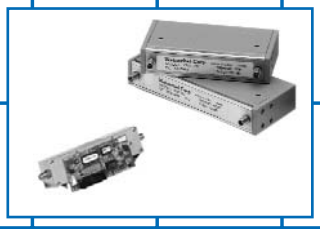
Attenuator Units & Controllers



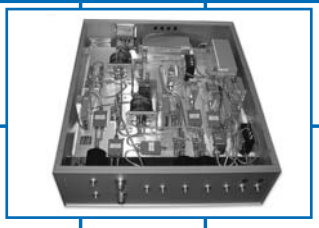
Complex RF Subsystems



Cellular, Wireless, PCS Solutions



SmartStep Attenuators



Customized Mechanical Packaging

Weinschel's new SmartStep technology streamlines system designs and device integration by providing a flexible bus interface as well as components that are simple to configure and control.

Creating Subsystems using Weinschel's Smartstep approach streamlines the design and layout of application specific subsystems that include a wide range of microwave and RF components such as programmable/fixed attenuators, power combiners/dividers/splitters, directional couplers, amplifiers, filters, noise sources and switches which can be controlled using various standard communications interfaces including IEEE-488, RS232, RS422, Ethernet (SNMP option) and RS485. Subsystem design options can also include:

- Turnkey subsystems built to customer specified design & layout.
- Wide dynamic and frequency ranges.
- Front panel and menu controls.
- 50 or 75 Ω configurations.
- Attenuation/switching schemes.
- Customer specified Input/Output parameters.
- Individual to complex matrix/channel configurations.
- Specialized testing and calibration.

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Application Specific Subsystems....

Switch Matrices:

Switch matrices are being modularly designed which allows the end customer to order a variety of 8 x 8 or 8 x 16 configurations with only minor factory board level modifications. The switch matrix has been designed using latching relays so that the signal path integrity can be maintained even during power outages or loss of IEEE-488, RS-232 and/or Ethernet control. These subsystems can be delivered either as a 50 or 75 Ω system.

In Weinschel's standard design approach, our designers use a highly adaptable platform that allows a dense integration of switches. The switch matrix chassis contains:

- Sixteen, 8x1 switch modules and eight, 16x1 modules designs.
- Modular Design allows easily exchange of front and rear panel switches, controllers or power modules.
- IEEE-488, Serial or Ethernet (SNMP option) Interface for computer control.
- Switch Matrix System firmware can be controlled through a 10 Base T TCP/IP software link as well as field level software upgrades or maintenance will be available through a TCP/IP link.
- Customer defined configurations, layout and packaging.

Other microwave switch matrix products and subsystems can be designed for Satellite Earth Stations, Uplink/ Downlink Routing, Cellular Base Stations, Metrology, L-Band Intermediate and Frequency Routing.

Cellular, Wireless, PCS Solutions:

Weinschel has over 25 years of product development experience in satellite and communications systems, test, measurement and simulation of wireless systems. This includes:

- 3G, WCDMA, PCS, & GSM.
- Cable Modem Test Sets.
- Precision RF & Microwave Instrumentation.

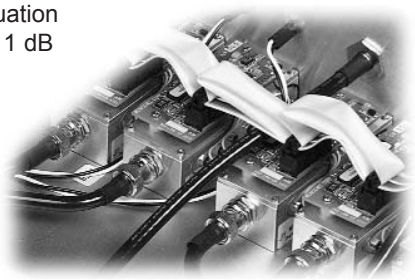
Combining Weinschel's years of experience with our new SmartStep design approach enables our designers to provide the wireless infrastructure market with an almost endless amount of subsystem solutions.

Cable Modem Testing Subsystems:

As cable modems become more readily available so does the need to calibrate and test their operational performance. Weinschel's cable modem testing solution starts with the design and manufacturing of 75 Ω subsystems that offer:

- Multi-channel inputs and outputs with front or rear panel connector mounting options.
- Operation over the dc to 1.2 GHz frequency range.
- IEEE-488, Serial or Ethernet (SNMP option) Interface for computer control.
- Wide dynamic range by employing Weinschel SmartStep Attenuators.
- Custom Mechanical Design & Layout.

For convenience, Weinschel also offers standard 75 Ω attenuator units (8310-1-X) that operates over the dc-1 GHz frequency range and provides an adjustable attenuation range of 0-63 dB in 1 dB steps.



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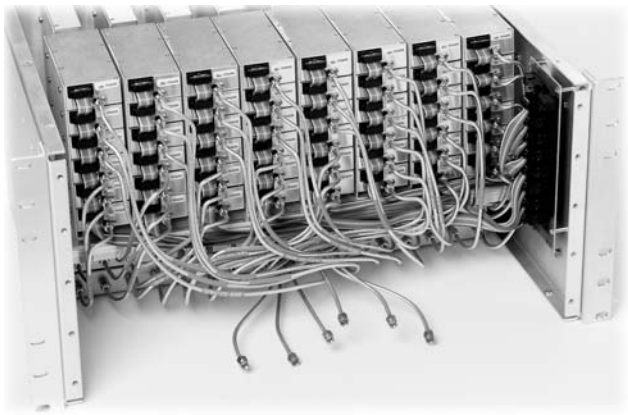
Attenuation Modules & Multi-Channel Subsystems:

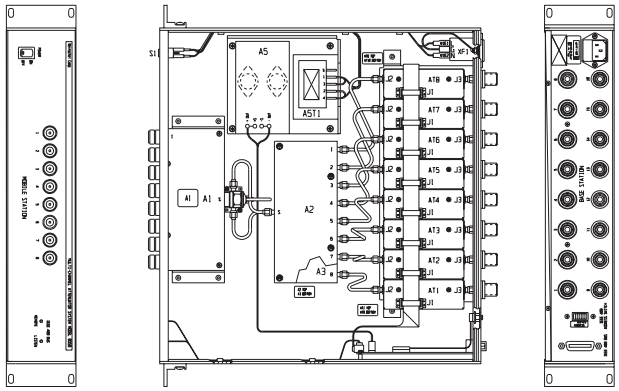
Whether the application is an individual attenuation module for satellites or complex matrix/channel configurations for cellular base station testing and operation, Weinschel's SmartStep design approach offers a versatile but simple method of creating and packaging fixed, solid-state and/or mechanical (relay) attenuators into customer specified modules and subsystems.



Advanced attenuation/switching schemes can be designed using other components such as switches, combiners/dividers/splitters and directional couplers. Our designers use the advanced SmartStep Interface firmware to create virtual devices with attenuation ranges up to 127 dB with resolutions of 0.25 dB that can operate over the dc-26.5 GHz frequency band. Other designs can include:

- Complex Matrix/Channel Configurations.
- Custom Mechanical Design & Layout.
- IEEE-488, Serial or Ethernet (SNMP option) Interface for computer control.
- Wide dynamic range & frequency range options available.
- Solid-State (GaAs FET & PIN) designs available.
- Customer specialized testing and calibration can also be supplied.

Customized Mechanical Packaging & Modular Design:



The strength of Weinschel's SmartStep design approach starts with an experienced engineering design staff. Using today's modern design tools and the latest software allows Weinschel's engineering staff to offer its customers a wide range of customized mechanical packaging & modular design solutions.

Specific PCB and driver configurations can be designed for operating various types of devices or retrofitting an existing device to operate with our SmartStep Approach!

Subsystems are easily configured for mounting into any rack or cabinet designed per EIA RS-310 or MIL-STD-189.

Although Weinschel specializes in the design of customized module and cabinet configurations, most subsystems are designed using off-the-shelf components, devices and cabinet configurations which allows Weinschel to design and manufacture subsystems with reduced lead times as well as lower overall design cost.

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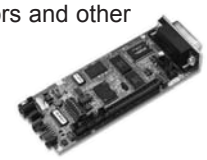
SmartStep Components....

Programmable/Switch Controllers:

(pg 171)

MCE/Weinschel's approach starts with the Model 8210A SmartStep Interface which provides a flexible, low cost solution for the control and operation of electromechanical switches and programmable step attenuators using standard communication interfaces. The 8210A represents a new concept in device control applications for bench test and subsystem designs.

- Designed to interface with Weinschel's new line of SmartStep programmable attenuators and other electromechanical devices.



- Simplifies your bench test setups and subsystem design.
- Available in two standard communication interfaces:
  - Model 8210A-1:GPIB/IEEE-488 (HS-488 ready)
  - Model 8210A-2:RS-232, RS-422, RS-485

Each model contains similar capabilities and provides switch-selectable parameters to tailor the interface's operation.

SmartStep Programmable Attenuators:

Pg 141 (3200T), 144 (3250T) & 157 (150T)

Weinschel's approach also includes a new generation of intelligent programmable step attenuators with a built-in digital interface. These models are designed to simplify the control and integration of these devices into subsystem and bench applications.

The SmartStep attenuators feature a microcontroller-based driver that provides a TTL-level digital interface for control of the attenuator relays or solid-state circuitry. This new feature simplifies operation and interfacing requirements, while at the same time providing for greatly enhanced flexibility over past designs.

These SmartStep Devices contain non-volatile configuration memory used to hold a wide variety of attenuator and driver-dependent parameters, including serial number, attenuator cell dB values, mechanical relay or solid-State (GaAs FET & PIN) configurations, and switching requirements which are all accessible via the Device Interface Bus (DIB).

SmartStep Attenuator Units for Rack or Bench Use:

(Pg 174)

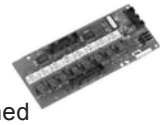
MCE/Weinschel's 8310 & 8311 Series SmartStep Attenuator Units represent Weinschel's newest concept in programmable attenuation for bench test and subsystem applications. Standard 8310 Series designs house and control various Weinschel Programmable Attenuator Models (3200T, 150T, and 4200 Series) via front panel controls or standard communications interfaces including GPIB (IEEE-488) and RS-232/RS-422 /RS485. The standard units combine the features of the Weinschel 8210A Device Controller with a front panel user interface to form a flexible, easy to use solution.

Most 8310 Series are single channel configurations where RF signal is routed through either the front or rear mounted Ports A & B but can be configured for up to four channels of attenuation, RF switching, or other functions and other features such as:

- Multi-Channel attenuation paths (up to 4 input/outputs).
- Relative vs. Nominal attenuation step function.
- Wide choice of Frequency & Attenuation Ranges.
  - dc to 1, 2, 3, 18 & 26.5 GHz
  - up to 127 dB
  - Solid-State (GaAs FET & PIN)
  - Relay Switched
  - 50 & 75 Ω Configurations
- High Accuracy & Repeatability.
- Easily mounted into racks or cabinets designed per EIA RS-310 or MIL-STD-189.

Plug & Go Switch/Relay Drivers:

(Pg 181)



Standard as well as custom designed Switch/Relay Driver Cards are available for controlling a wide variety of electromechanical switches and other TTL devices. For example, one of our standard designs contains eight electromechanical relays for output and control.

The relays are Form C (SPDT) latching type, which along with various jumper configurations, can be used with the 8210A to control a variety of devices such as RF Switches (+28V and latching) and other TTL compatible devices. This card also provides an optional three-pin external power connector which can be used to supply power to the device's under control, to simplify wiring. This external power is not used by the control circuitry on the relay driver, and its use is completely application dependent.

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The Virtual Device....

Sometimes, when constructing a system or subsystem, you cannot find a device that provides quite the functionality that you require. Assume you need a large attenuation range, but a small incremental step size. Typically, one would be forced to use two physical attenuators connected in series to achieve this goal. For example, let's assume there is a requirement for an attenuator with a total attenuation >80 dB, with a resolution of 1dB over the dc-18 GHz frequency range. One could combine a Model 150T-70 0-70/10 dB steps) with a Model 150T-11 0-11/1 dB steps) to meet this goal. Unfortunately, the programming burden has increased dramatically, since you must now not only write the software to control two separate devices, but also develop an algorithm for determining the appropriate settings for each device.

In addition, if your requirements were to change perhaps to a larger attenuation range, or a different step size, these algorithms would have to change accordingly. The 8210A provides a solution to this dilemma with the ability to create and define a virtual device. A virtual device allows the user to construct a device by combining the attributes of several physical devices, and be able to program this combination as if it were one physical device! Revisiting our example above, we can create a virtual attenuator with an attenuation range of 81/1 dB steps, effectively creating a 150T-81. Controlling this new device requires no more programming than controlling a single attenuator.

The 8210A supports up to 32 virtual attenuator devices, each of which allow up to four physical attenuators to be combined into a single device. The virtual attenuator uses the Attn Protocol command set, providing the same programming interface as other attenuator devices.

During the setup process, the user assigns a name to the virtual attenuator, which may be stored in the 8210A's non-volatile EEPROM memory for future use. During the power-up configuration process, the 8210 will automatically recall and assign these virtual devices.

The SmartStep Approach....

Using Weinschel's Smartstep approach a customer can easily design and layout subsystems in minutes that includes a wide range of Plug & Go programmable attenuators and other standard microwave and RF components which can be controlled over various standard communications interfaces. Weinschel offers subsystem design and manufacturing services to help you implement this new approach into your specific program. This approach is ideal for specialized wireless communication test applications for Cellular, PCS, Modem, and CATV equipment and systems.

Subsystem design options can include standard controller interfaces (IEEE-488.1, RS-232, RS-422 and others); attenuation ranges up to 127 dB with resolutions of 0.25 dB; front panel and menu controls; 75 Ω configurations; attenuation/switching schemes; individual to complex matrix/channel configurations; specialized testing and calibration; and custom packages. Refer to page 170 for examples.

Specific driver configurations can also be designed for operating your devices or retrofitting an existing device with the SmartStep Approach!

Conclusion....

Whether you're designing your own switching/combining/attenuation wireless simulation system or require a turnkey solution, contact Weinschel for a wide range of standard products or custom engineered subsystems at 800-638-2048, 301-846-9222 or e-mail us at sales@weinschel.com!

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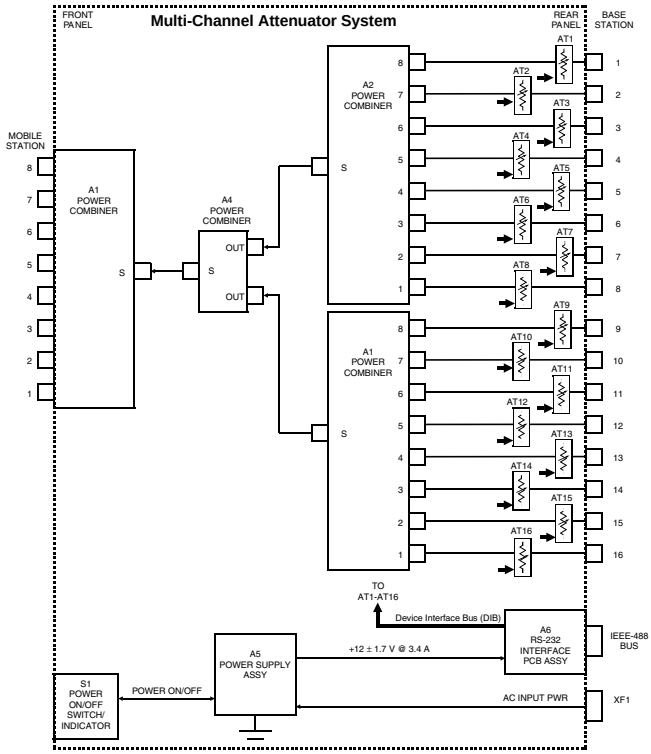
SmartStep Subsystem Design Examples....

Applications for the SmartStep Components & Subsystems range from control of a single SmartStep Attenuator in a bench test/lab environment using a PC and a terminal emulator, to complex system applications where an 8210A style interface is employed to control many devices to create custom and semi-custom subsystems to reduce overall design cost.

Weinschel can provide a variety of custom designed driver interfaces for various devices, such as RF switches, relays, PIN attenuators, displays and other devices, as well as complete subsystem design and integration services. This is the ideal solution for creating multi-path subsystems for use in specialized wireless communication test applications for Cellular, PCS, Modem, and CATV equipment and systems.

APPLICATION 1: CELLULAR/PCS FADING SIMULATION



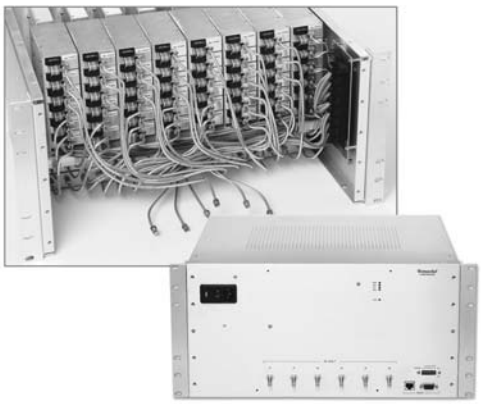
MCE/Weinschel designs and manufactures multi-path attenuation subsystems for fading simulation/emulation of cellular, 3G, GSM, PCS systems, laboratory testing of CATV, cable modem, and wireless components and systems. This subsystem illustrated features:

- 800-1900 MHz frequency range.
- 16 Input Channels to 8 Output Channels.
- RS-232 Serial Interface.
- Wide Dynamic Range: 127/1 dB steps.
- Weinschel 3200T SmartStep Programmable Attenuators.

APPLICATION 2: COMPLEX MULTI-CHANNEL ATTENUATOR MATRIX

This application illustrates Weinschel's ability to house and control a large number of solid-state programmable attenuators and power combiners creating a complex multichannel attenuator subsystems. Other features include:

- 800 - 2,200 MHz frequency range.
- 6 front panel Input channels to 8 rear panel Output Channels.
- Wide Dynamic Range: 95 in 1 dB steps.
- RS-232 Serial Interface.
- Combiner Isolation 20 dB maximum.
- Designed to customer specified packaging requirements.
- 64 Weinschel SmartStep Solid-State Programmable Attenuators.
- Removable mounting brackets that can be located on either end of unit, can be mounted into racks or cabinets designed per EIA RS-310 or MIL-STD-189.



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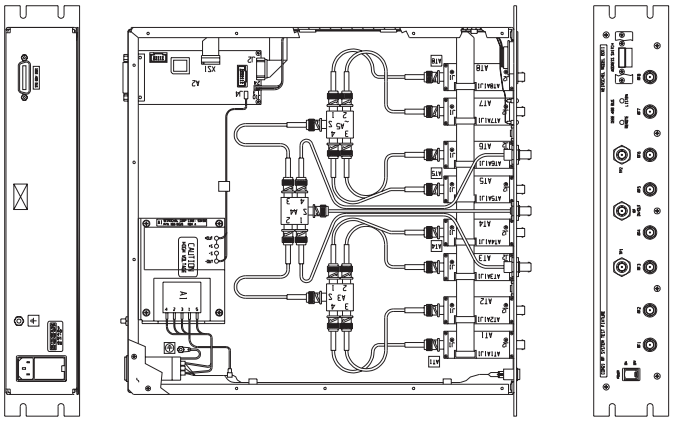
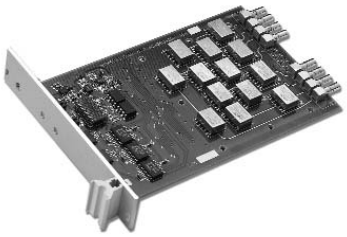
APPLICATION 3: CABLE MODEM TESTING...75 Ω

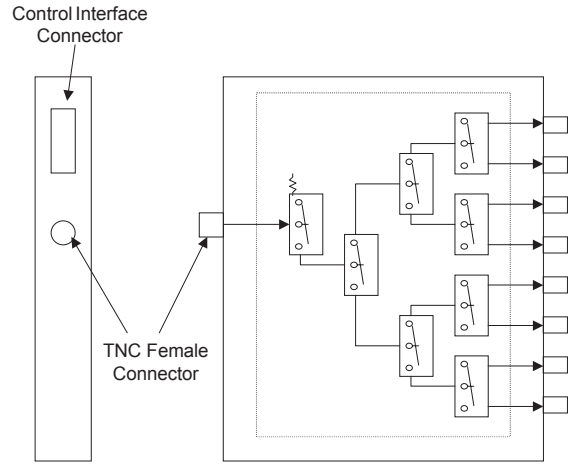


- 800-1900 MHz frequency range
- 8 Input Channels to 1 Output Channel
- IEEE-488 Interface
- Wide Dynamic Range: 63/1 dB steps, 75Ω
- Weinschel 3250T SmartStep Programmable Attenuators

APPLICATION 4: SWITCH MATRICES...8X8 OR 8X16 BLOCKING MATRIX



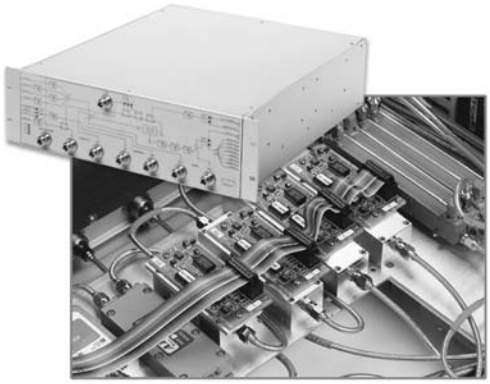
- Operates over the dc-2200 MHz frequency range.
- Ethernet SNMP Control.
- Configuration: 8x8 or 8x16 blocking matrix.
- TNC Female Connectors: 8 Front & 16 Back panel.
- Electromechanical Switch Design.
- 50 and 75 Ω Configurations.
- Modular Design and Layout.



1 X 8 Matrix Board

APPLICATION 5: COMPLEX RF MATRICES

This Subsystem contains a wide variety of high performance mechanical switches, combiners, directional couplers, and other standard microwave components creating a complex multi-function RF matrix that is controlled over various industry standard bus interfaces. Other features include:



- 800 - 3 GHz Frequency Range
- Customized front panel layout and graphics.
- IEEE-488 & RS-232 Serial interfaces.
- Optional rack mounting hardware.
- Standard Stainless Steel Type N Connectors on front & rear panel.
- Weinschel 3200T SmartStep Programmable Attenuators.

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Low Intermodulation Subsystems & Signal Conditioning Networks...

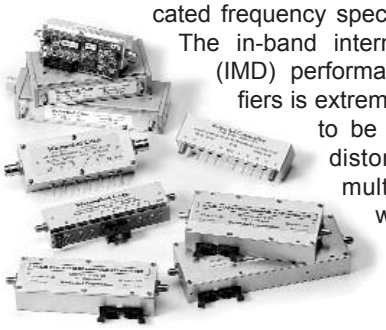
Some custom subsystem designs warrant the use of Low Intermodulation passive components such as programmable attenuators, terminations, fixed attenuators, couplers, cables, connectors and switches. Weinschel is a leading manufacturer of the first three items. The following paragraphs briefly describe the importance of low intermodulation and some design features and comparative test data for the same.

Programmable Attenuators

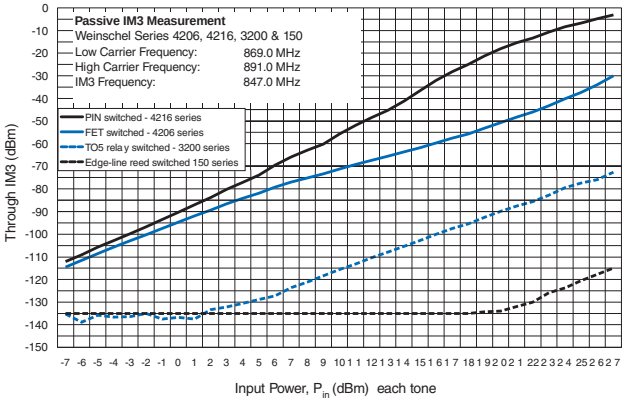
Historically the most demanding specifications for programmable components and subsystems have been low insertion loss and SWR, combined with a reasonable life expectancy of several million switching cycles. This was usually adequate for RF instruments like spectrum analyzers and signal generators, where the attenuator bandwidth rather than the switching speed was of prime concern. To achieve wide bandwidths, the programmable attenuators were mostly of electromechanical design and the linearity of these passive components was only taken for granted. Intermodulation distortion discussions and problems were usually limited to components such as amplifiers, mixers and filters.

In recent years, however, wireless communication systems employing complex digital modulation schemes, increased channel capacity, high transmit power and extremely low receiver sensitivity have put into question the linearity of passive components. Even very low level multi-tone intermodulation products generated by attenuators can seriously degrade the efficiency of a system/instrument if these products fall within the user passband. For two closely spaced tones at frequencies f1 and f2, the third order IM products at 2f1 - f2 and 2f2 - f1 , are the most harmful distortion products. They are harmful because they are close to f1 and f2 and virtually impossible to filter out.

In today's base stations the multi-carrier power amplifier (MCPA) is replacing banks of single-channel amplifiers and their corresponding power combining network. MCPAs have the capability of carrying a number of modulation schemes simultaneously and can also employ schemes such as dynamic channel allocation (DCA) to use the allocated frequency spectrum more efficiently. The in-band intermodulation distortion (IMD) performance of these amplifiers is extremely critical and needs to be measured using low distortion programmable multi-tone generators with superior IMD performance.



IM3 Performance of Electromechanical & Solid State Programmable Attenuators



Electromechanical programmable attenuators obviously provide a far superior IMD performance than their corresponding solid state counterparts employing semiconductor switching elements. However, their slow switch speed, in the order of milli-seconds, and short switch life in the order of 5-10 million cycles make them unattractive in some applications like cell phone testing and other ATE systems. Solid State programmable attenuators do overcome these two problems and are, therefore, included here for IMD performance comparison. The goal is to provide some good basic IMD test data for a variety of commercial programmable attenuators and permit the end user to select the most appropriate type for his system application.

Fixed Attenuators & Terminations

These seemingly linear components generate low levels of IMD which must be considered, especially when incident power levels are high. Some of Weinschel custom subsystem designs include low IM versions of medium and high power fixed attenuators and terminations. These components are supplied with specified 3rd order through and reflected intermodulation levels (IM3) measured with a passive IM analyzer. Typically, the IM3 levels for these components are -110 dBC . Standard Models with this LIM (low IM) option are models 33, 24, 49, 53, 57, 58 and the corresponding terminations, ranging in incident power ratings of 25 to 500 Watts. Features of these components include specifically designed connectors and carefully processed and trimmed thin film resistors for low IM performance.

Couplers, Cables, Switches, Connectors, etc.

Although Weinschel does not manufacture these components we work very closely with our suppliers, providing them pertinent design input to achieve the lowest possible IMD performance on such products.

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MODEL 8210A *SmartStep*™ Programmable Attenuator/Switch Controller

IEEE-488

RS232\RS422/RS485

A Logical Interface for Switchable Devices!

Features

- Provides a flexible, powerful, low cost solution for bus control of programmable step attenuators and other switchable devices under computer control.
- Designed to interface with Weinschel's new line of ***SmartStep*** programmable attenuators and other electromechanical devices.
- Simplifies your bench test setups and subsystem design.
- Available in two standard communication interfaces:
  - Model 8210A-1: GPIB/IEEE-488 (HS-488 ready)
  - Model 8210A-2: RS-232, RS-422, RS-485

Description

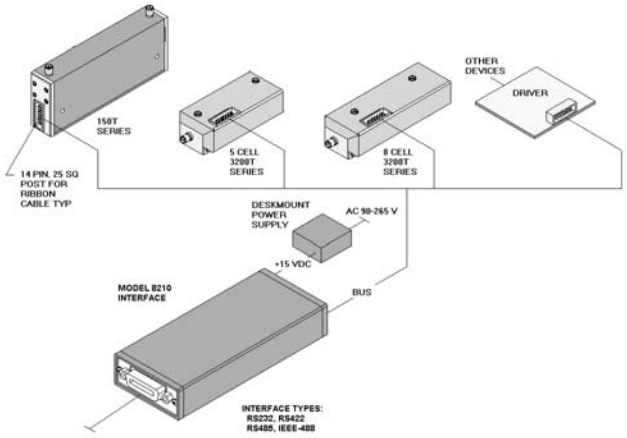
Model 8210A represents a new concept in device control applications and provides a high level interface from various industry standard communications interfaces to the ***SmartStep***'s serial Driver Interface Bus.

The Device Interface Bus (DIB) is a system for connecting a number of relatively low-speed I/O devices to a host, providing a simple, uniform and inexpensive way to control a variety of devices via a single port. The DIB is based on the two-wire I^2C serial bus and several software protocol layers that allow the Model 8210A to address up to 125 peripheral devices with serial data rates of up to 100 KHz. The DIB may also be used to supply DC power to the devices, resulting in a simple, low-cost interconnection system.

The SmartStep Programmable attenuator/switch controller is available in two models, each providing a different type of communications interface to suit user configuration requirements. Each model contains similar capabilities, and provides switch-selectable parameters to the interfaces' operation.

Applications

Applications for the 8210A range from providing control of a single SmartStep Attenuator in a bench test/lab environment using a PC and a terminal emulator, to complex system applications where the 8210A is employed to control many devices to create custom/semi-custom subsystems to reduce overall design cost. Weinschel can provide a variety of custom designed driver interfaces for various devices, such as RF switches, relays, PIN attenuators, displays and other devices, as well as complete subsystem design and integration services. Contact us with your specialized needs.



Typical Capacity: *Control a subsystem consisting of 32 individual 8-cell programmable attenuators plus 16 DPDT switches.*

Accessories:

PART NUMBER	DESCRIPTION
001-378	Deskmount Power Supply, +15 V 95-250 Vac, 47-63 Hz ac input
193-8013	Interconnect Cable
193-8012	Attenuator Mounting Kit: This kit includes all hardware to allow the user to mount one ***SmartStep*** attenuator onto the Model 8210A

For additional information on the Model 8210A, visit our website @ www.weinschel.com/8210A.htm

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Specifications

SPECIFICATION	DESCRIPTION	
DC Input	Connector:	2.5mm barrel style
	Requirements:	+12 to +15 Vdc @ 250 mA
Driver Interface	Connector:	14-pin 0.025" square post header @ 0.1" centers. Mates with AMP 746285-2 or equivalent.
	Signals :	SDA serial data SDC serial clock VDC DC supply voltage GND ground
	VDC Output Current:	2 A maximum
	Maximum Cable Length:	10 Meters (1000 pF maximum capacitance)
	Data Transfer Rate:	100 KHz
Environmental	Operating Temperature:	0 to +50°C
	Storage Temperature:	-55° to +75°C (67° to +167°F)
	Humidity:	95%
	Altitude:	40,000' (12,192M)
IEEE-488 Bus(1)	Connector:	24-pin per IEEE-488.1
	Protocols:	per IEEE-488.2
	Indicators:	Remote, Listen
RS-232 Bus(2)	Connector:	9-pin male D
	Signals:	TXD, RXD, RTS, CTS, DTR, GND
	Baud Rates:	2400, 9600, and 19200, 38400
	Data Bits:	8
	Handshaking:	None, RTS/CTS, XON/XOFF
	Parity:	None, Odd, Even
	Indicators:	Tx (Transmit) and Rx (Receive Active)
RS-422 Bus(3) & RS-485 Bus(4)	Connector:	9-pin male D(Model 8210-2)
	Signals:	TXD+, TDX-, RXD+, RTX-, RTS+, RTS-, CTS+, CTS-, & signal GND
	Baud Rates:	2400, 9600, and 19200, 38400
	Data Bits:	8
	Handshaking:	None, RTS/CTS, XON/XOFF
	Parity:	None, Odd, Even
	Indicators:	Tx (Transmit) and Rx (Receive Active)

Notes:

1. GPIB/IEEE-488 model allows user-selectable addresses.
2. RS-232 can be used with standard PC serial port for short and medium distances (up to approximately 50 ft).
3. RS-422, designed for very long distance communications (4000 ft) & optimized as a single node protocol, typically with one device connected to a single port.
4. RS-485, designed for very long distance communications (4000 ft) & optimized for multi-drop connections that can used to create a low cost network.

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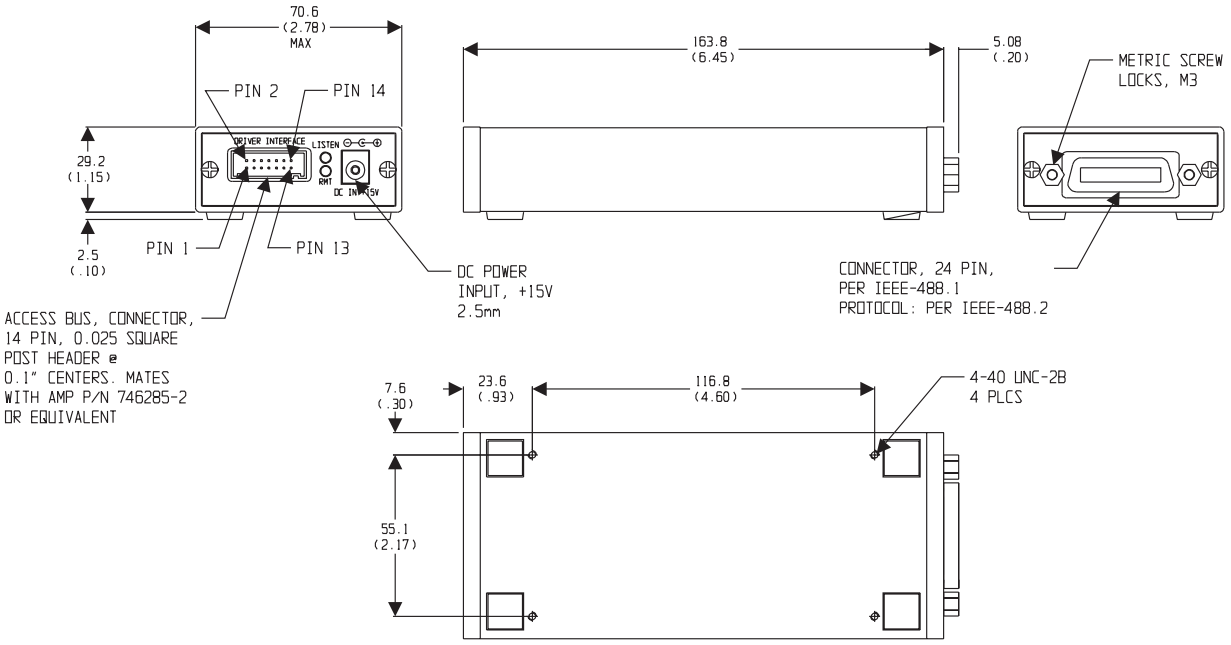
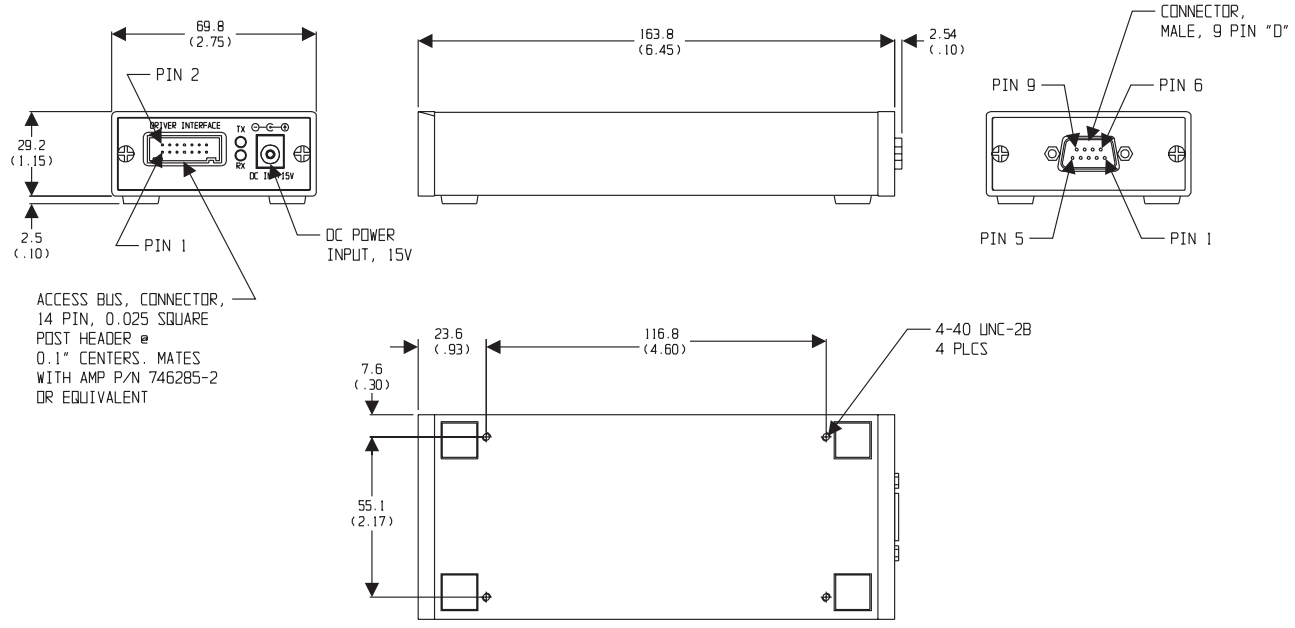
Physical Dimensions

Model 8210A-1 (IEEE-488):



Model 8210A-2 (RS-232/RS-422/RS-485):



NOTE: All dimensions are given in mm (inches) and are maximum, unless otherwise specified.

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MODEL 8310 & 8311
SmartStep™ Programmable Attenuator

IEEE-488

RS232\RS422/RS485

CE

A New Concept in Programmable Attenuation!

Features

- Provides a flexible, easy to program, low cost solution for your bench test/calibration setups and subsystem applications.
- Multi-Channel attenuation paths (up to 6 input/outputs)
- Relative vs. Nominal attenuation step function.
- Wide choice of Frequency & Attenuation Ranges.
  - dc to 1, 2, 3, 18 & 26.5 GHz
  - up to 127 dB
  - Solid-State (GaAs FET *& PIN)
  - Relay Switched
  - 75 Ω Configurations
- Accuracy & Repeatability.
- Designed to interface with Weinschel's new line of ***SmartStep*** programmable attenuators and other electromechanical devices
- Designed to interface with industry standard communication interfaces:

  - GPIB/IEEE-488 (HS-488 ready)
  - RS-232, RS-422, RS-485

- **Rack Configurable:** The Model 8310 or 8311 can be rack mounted either as a single unit using Rack Mounting Kit (P/N 193-8033) or two Model 8310's can be mounted together using Rack Mounting Kit (P/N 193-8033-1). These kits fit into any rack or cabinet that is designed per EIA RS-310 or MIL-STD-189.

Description

MCE / Weinschel's 8310 and 8311(New) Series SmartStep Attenuator Units represent a new concept in programmable attenuation for bench test and subsystem applications. Standard 8310 Series designs house and control various Weinschel Programmable Attenuator Models (3200T, 150T, and 4200 Series) via front panel controls or standard communications interfaces including GPIB (IEEE-488) and RS-232/RS-422 /RS485. This series combines the features of the MCE / Weinschel 8210A Device Controller with a front panel user interface to form a flexible, easy to use solution.

Most 8310 Series are single channel configurations where RF signal is routed through either the front or rear mounted Ports A & B but can be configured for up to four channels of attenuation, RF switching, or other functions. Multiple programmable attenuators can be used inconjuction with other coaxial devices such as switches, power combiners, directional couplers, and filters creating single or multichannel subsystems.

New 6 Channel 19" Rack Size Designs

Applications

Applications for the 8310 and 8311 Series range from providing control of a single SmartStep Attenuator in a bench test/lab environment using a PC and a terminal emulator, to complex system applications where the 8310/8311 Series are employed to control many devices to create custom/semi-custom subsystems to reduce overall design cost. Weinschel can provide a variety of custom designed driver interfaces for various devices, such as RF switches, relays, pin attenuators, motorized step attenuators, displays, and other devices, as well as complete subsystem design and integration services. Contact us with your specialized needs.

For additional information on the Model 8310, visit our website @ www.weinschel.com/8310.htm

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Specifications

SPECIFICATION	DESCRIPTION	
Input Power Requirements	ac	100 to 240 Vac, 50/60 Hz, 50 Watts
Environmental	Operating Temperature Storage Temperature: Humidity: Altitude:	0 to +50°C 67° to +167 °F (-55° to +75°C) 96% 40,000' (12,192M)
IEEE-488 Bus	Connector: Protocols: Indicators:	24-pin per IEEE-488.1 per IEEE-488.2 Remote (RMT), Listen (LSN), Talk (TLK), SRQ (SRQ)
RS-232 Bus	Connector: Signals: Baud Rates: Data Bits: Handshaking: Parity: Indicators:	9-pin male D TXD, RXD, RTS, CTS, DTR, GND 2400, 9600, 19200, and 38400 8 None, RTS/CTS, XON/XOFF None, Odd, Even Tx (Transmit) and Rx (Receive)
RS-422 BUS(3) **RS-485 Bus(4)**	Connector: Signals: Baud Rates: Data Bits: Handshaking: Parity: Indicators:	9-pin male D TXD+, TDX-, RXD+, RTX-, RTS+, RTS-, CTS+, CTS-, and signal GND 2400, 9600, 19200, and 38400 8 None, RTS/CTS, XON/XOFF None, Odd, Even Tx (Transmit) and Rx (Receive)
RF Characteristics(5)	See ordering guide (pg175 through 177)	

1. GPIB/IEEE-488 model allows user-selectable addresses.
2. RS-232 can be used with standard PC serial port for short and medium distances (up to approximately 50 ft).
3. RS-422, designed for very long distance communications (4000 ft) and & optimized as a single node protocol, typically with one device connected to a single port.
4. RS-485, designed for very long distance communications (4000 ft) & optimized for multi-drop connections that can used to create a low cost network.
5. Refer to Individual data sheet for detailed specifications on internal programmables.

Ordering Guide...8310 Series with 150 Programmables

Model No	Attenuation Value (dB)	Frequency Range (GHz)	Insertion Loss (maximum)	SWR (Maximum)	No of Channels	Attenuator Model No.*	Connector Type	Conn Location
8310-201-F	70/10	dc-18.0	3.25 dB	1.75	1	150T-70	SMA/F	Front
8310-201-R	70/10	dc-18.0	3.25 dB	1.75	1	150T-70	SMA/F	Rear
8310-201-2-F	70/10	dc-18.0	3.25 dB	1.75	2	150T-70	SMA/F	Front
8310-201-2-R	70/10	dc-18.0	3.25 dB	1.75	2	150T-70	SMA/F	Rear
8310-202-F	121/1	dc-18.0	5.25 dB	1.95	1	150T-11+150T-110	SMA/F	Front
8310-202-R	121/1	dc-18.0	5.25 dB	1.95	1	150T-11+150T-110	SMA/F	Rear
8310-204-F	62/2	dc-18.0	3.70 dB	1.95	1	150T-62	SMA/F	Front
8310-204-R	62/2	dc-18.0	3.70 dB	1.95	1	150T-62	SMA/F	Rear
8310-204-F	62/2	dc-18.0	3.70 dB	1.95	2	150T-62	SMA/F	Front
8310-204-R	62/2	dc-18.0	3.70 dB	1.95	2	150T-62	SMA/F	Rear

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Ordering Guide...8310 Series with 3200 Programmables

Model No	Attenuation Value (dB)	Frequency Range (GHz)	Insertion Loss (maximum)	SWR (Maximum)	No of Channels	Attenuator Model No.*	Connector Type	Conn Location
8310-1-F	63/1	dc-1.0 (75Ω)	6.0 dB	1.6	1	3250T-63	BNC/F	Front
8310-1-R	63/1	dc-1.0 (75Ω)	6.0 dB	1.6	1	3250T-63	BNC/F	Rear
8310-1-2-F	63/1	dc-1.0 (75Ω)	6.0 dB	1.6	2	3250T-63	BNC/F	Front
8310-1-2-R	63/1	dc-1.0 (75Ω)	6.0 dB	1.6	2	3250T-63	BNC/F	Rear
8310-2-F	63/1	dc-1.0 (75Ω)	6.75 dB	2.0	1	3250T-63	F/F	Front
8310-2-R	63/1	dc-1.0 (75Ω)	6.75 dB	2.0	1	3250T-63	F/F	Rear
8310-2-2-F	63/1	dc-1.0 (75Ω)	6.75 dB	2.0	2	3250T-63	F/F	Front
8310-2-2-R	63/1	dc-1.0 (75Ω)	6.75 dB	2.0	2	3250T-63	F/F	Rear
8310-35-F	127/1	dc-2.0	6.0 dB	1.4	1	3200T-1	N/F	Front
8310-35-F-E	127/1	dc-3.0	6.0 dB	1.4	1	3200T-1E	N/F	Front
8310-35-R	127/1	dc-2.0	6.0 dB	1.4	1	3200T-1	N/F	Rear
8310-35-R-E	127/1	dc-3.0	6.0 dB	1.4	1	3200T-1E	N/F	Rear
8310-35-2-F	127/1	dc-2.0	6.0 dB	1.4	2	3200T-1	N/F	Front
8310-35-2-R	127/1	dc-2.0	6.0 dB	1.4	2	3200T-1	N/F	Rear
8310-35-3-T	127/1	dc-2.0	6.0 dB	1.4	3	3200T-1	N/F	Front to Rear
8310-35-4-T	127/1	dc-2.0	6.0 dB	1.4	4	3200T-1	N/F	Front to Rear
8310-35-4-T-E	127/1	dc-3.0	6.0 dB	1.4	4	3200T-1E	N/F	Front to Rear
8310-36-F	64.5/0.1	dc-2.0	8.0 dB	1.4	1	3209T-1	N/F	Front
8310-36-R	64.5/0.1	dc-2.0	8.0 dB	1.4	1	3209T-1	N/F	Rear
8310-36-2-F	64.5/0.1	dc-2.0	8.0 dB	1.4	2	3209T-1	N/F	Front
8310-36-2-R	64.5/0.1	dc-2.0	8.0 dB	1.4	2	3209T-1	N/F	Rear
8310-36-3-T	64.5/0.1	dc-2.0	8.0 dB	1.4	3	3209T-1	N/F	Front to Rear
8310-37-F	63.75/0.25	dc-2.0	6.0 dB	1.4	1	3200T-2	N/F	Front
8310-37-R	63.75/0.25	dc-2.0	6.0 dB	1.4	1	3200T-2	N/F	Rear
8310-37-2-F	63.75/0.25	dc-2.0	6.0 dB	1.4	2	3200T-2	N/F	Front
8310-37-2-R	63.75/0.25	dc-2.0	6.0 dB	1.4	2	3200T-2	N/F	Rear
8310-37-3-T	63.75/0.25	dc-2.0	6.0 dB	1.4	3	3200T-2	N/F	Front to Rear
8310-37-4-T	63.75/0.25	dc-2.0	6.0 dB	1.4	4	3200T-2	N/F	Front to Rear
8310-38-F	63/1	dc-2.0	5.25 dB	1.4	1	3206T-1	N/F	Front
8310-38-F-E	63/1	dc-3.0	5.25 dB	1.4	1	3206T-1E	N/F	Front
8310-38-R	63/1	dc-2.0	5.25 dB	1.4	1	3206T-1	N/F	Rear
8310-38-2-F	63/1	dc-2.0	5.25 dB	1.4	2	3206T-1	N/F	Front
8310-38-2-R	63/1	dc-2.0	5.25 dB	1.4	2	3206T-1	N/F	Rear
8310-38-3-T	63/1	dc-2.0	5.25 dB	1.4	3	3206T-1	N/F	Front to Rear

Ordering Guide...8310 Series with 4200 Programmables

Model No	Attenuation Value (dB)	Frequency Range (GHz)	Insertion Loss (maximum)	SWR (Maximum)	No of Channels	Attenuator Model No.*	Connector Type	Conn Location
8310-136-F	63.75/0.25	0.8-2.5	6.0	1.6	1	4228-63.75	N/F	Front
8310-136-R	63.75/0.25	0.8-2.5	6.0	1.6	1	4228-63.75	N/F	Rear
8310-136-2-F	63.75/0.25	0.8-2.5	6.0	1.6	2	4228-63.75	N/F	Front
8310-136-2-R	63.75/0.25	0.8-2.5	6.0	1.6	2	4228-63.75	N/F	Rear
8310-137-F	63/1	0.8-3.0	4.7	1.6	1	4226-63	N/F	Front
8310-137-R	63/1	0.8-3.0	4.7	1.6	1	4226-63	N/F	Rear
8310-137-2-F	63/1	0.8-3.0	4.7	1.6	2	4226-63	N/F	Front
8310-137-2-R	63/1	0.8-3.0	4.7	1.6	2	4226-63	N/F	Rear
8310-138-F	103/1	0.8-3.0	6.0	1.6	1	4228-103	N/F	Front
8310-138-R	103/1	0.8-3.0	6.0	1.6	1	4228-103	N/F	Rear
8310-138-2-F	103/1	0.8-3.0	6.0	1.6	2	4228-103	N/F	Front
8310-138-2-R	103/1	0.8-3.0	6.0	1.6	2	4228-103	N/F	Rear

*Refer to Individual data sheet for detailed specifications on internal programmables. See www.weinschel.com for Model 4226 & 4228 Data Sheet.

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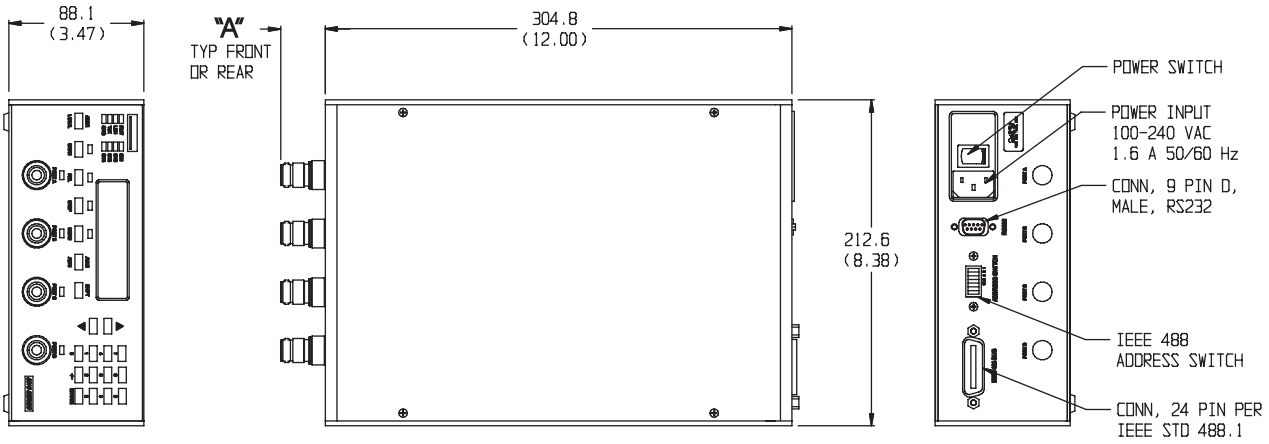
Ordering Guide...8311 Series....New!

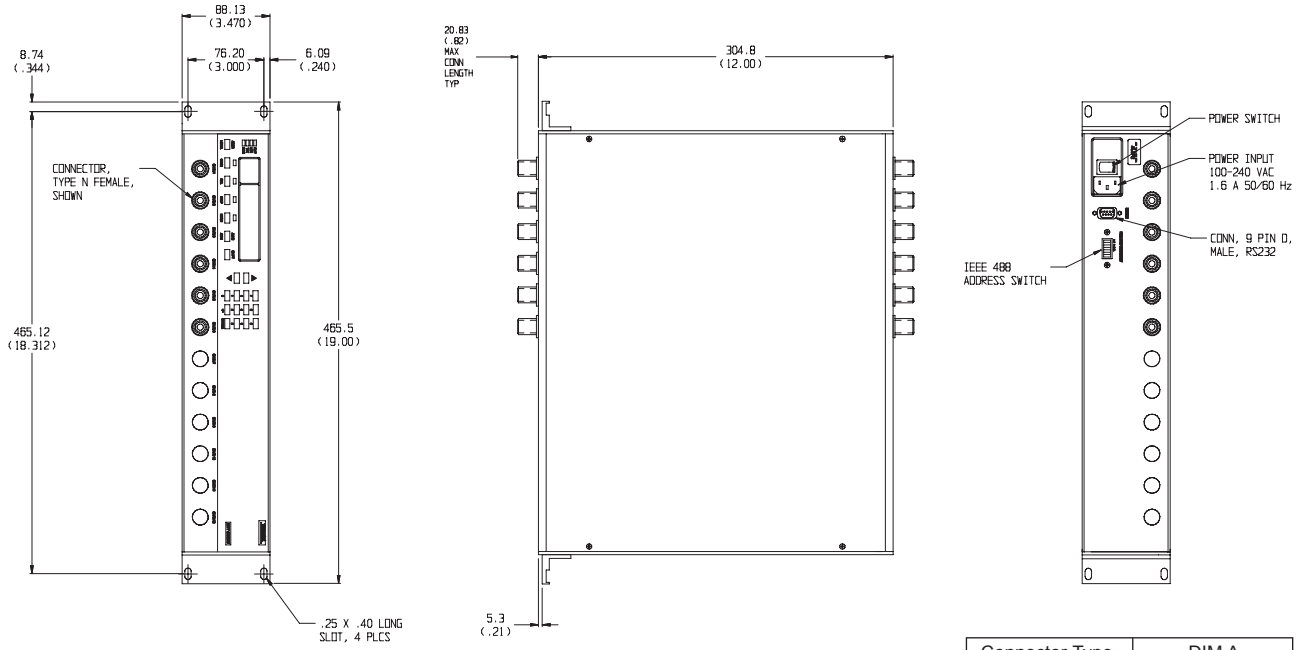
Model No	Attenuation Value (dB)	Frequency Range (GHz)	Insertion Loss (maximum)	SWR (Maximum)	No of Channels	Attenuator Model No.*	Connector Type	Conn Location
8311-1-6-F	63/1	dc-1.0 (75Ω)	6.00 dB	1.60	6	3250T-63	BNC/F	Front
8311-38-6-F	63/1	dc-2.0	5.25 dB	1.40	6	3206T-1	N/F	Front
8311-138-6-F	63/1	0.8-3.0	4.70 dB	1.60	6	4226-63	N/F	Front
8311-204-6-F	62/2	dc-18.0	3.70 dB	1.95	6	150T-62	SMA/F	Front

Physical Dimensions

8310 Series:



8311 Series:



Connector Type	DIM A
N	29.2 (1.15)
SMA	8.6 (0.34)
BNC	18.8 (0.74)
F	9.65 (0.38)

NOTE:

1. All dimensions are given in mm (inches) and are maximum, unless otherwise specified.
2. Connector location (Front/Rear) may vary depending on Model ordered.

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MODEL 8312
SmartStep™ High Power Programmable Attenuator

IEEE-488

RS232\RS422

NEW

100 Watt Hot Switching Capability

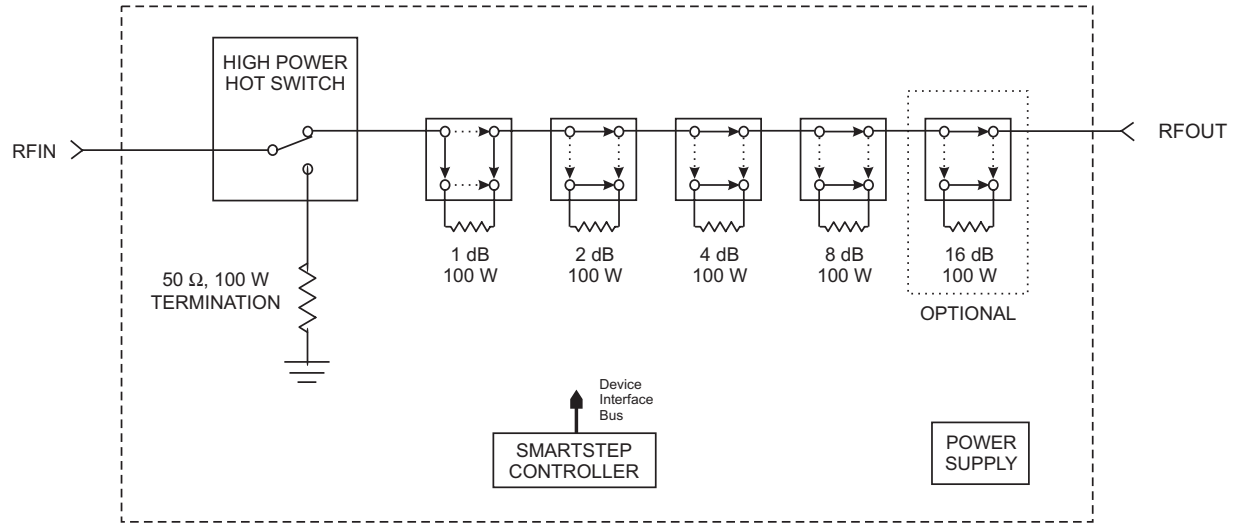
Description

MCE/ Weinschel's design approach uses a highly adaptable platform that allows configuration of the step attenuator to the customers requirements. When the controller requests a new attenuation level the input switch terminates the input signal into a 50 Ohm load. (See Figure 1) This input switch is **hot switchable at 100 Watts** of input power. This will remove the high power signal from the main signal path. With no signal connected to the attenuator path the controller then commands the series of relays to configure the attenuator for the requested attenuation value. Then the input switch re-connects the input signal to the attenuator path. The system can be operated with either a remote controller (IEEE-488 or RS-232) or through front panel control.

Features

- Available in 0-15 dB or 0-31 dB Configurations.
- Provides a flexible, easy to program, low cost solution for your bench test/calibration setups and subsystem applications.
- Relative vs. Nominal attenuation step function.
- DC to 13.0 GHz Operation.
- High Accuracy & Repeatability.
- Power Handling up to 100 Watts average
- Designed to interface with industry standard communication interfaces:

  - GPIB/IEEE-488 (HS-488 ready)
  - RS-232, RS-422
- Built-in monitoring for switching input power into the load in case of fan failure.
- **Rack Configurable:** Using a Rack Mounting Kit allows the Model 8312 to be easily mounted into any rack or cabinet that is designed per EIA RS-310 or MIL-STD-189.



Note: If power failure should occur, the unit will remain in the last selected at tenuation state.

Figure 1. Model 8312 Block Diagram

For additional information on the Model 8312, visit our website @ www.weinschel.com/8312.htm

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Specifications

SPECIFICATION	DESCRIPTION		
Input Power Requirements	AC	100 to 240 Vac, 50/60 Hz, 50 Watts	
Environmental	Operating Temperature	0 to +50°C	
	Storage Temperature:	67° to +167 °F (-55° to +75°C)	
	Humidity:	96%	
	Altitude:	40,000' (12,192M)	
IEEE-488 Bus	Connector:	24-pin per IEEE-488.1	
	Protocols:	per IEEE-488.2	
	Indicators:	Remote (RMT), Listen (LSN), Talk (TLK), SRQ (SRQ)	
RS-232 Bus	Connector:	9-pin male D	
	Signals:	TXD, RXD, RTS, CTS, DTR, GND	
	Baud Rates:	2400, 9600, 19200, and 38400	
	Data Bits:	8	
	Handshaking:	None, RTS/CTS, XON/XOFF	
	Parity:	None, Odd, Even	
	Indicators:	Tx (Transmit) and Rx (Receive)	
RS-422 BUS(3)	Connector:	9-pin male D	
	Signals:	TXD+, TDX-, RXD+, RTX-, RTS+, RTS-, CTS+, CTS-, and signal GND	
	Baud Rates:	2400, 9600, 19200, and 38400	
	Data Bits:	8	
	Handshaking:	None, RTS/CTS, XON/XOFF	
	Parity:	None, Odd, Even	
	Indicators:	Tx (Transmit) and Rx (Receive)	
RF Characteristics(4)	Connectors:	Type N, Female	
	Frequency Range:	dc - 13 GHz	
	Impedance:	50 Ω	
	SWR:	50 MHz - 5 GHz:	1.60 (Maximum)
		5 GHz - 13 GHz:	1.95 (Typical)
	Attenuation Range:	15 dB/1 dB steps (8312-15-F)	
		31 dB/1 dB steps (8312031-F)	
	RF Power Rating:	50 MHz - 5 GHz:	100 Watts (Maximum)
		5 GHz - 13 GHz:	50 Watts (Maximum)
	Attenuation Settings:	100, 000 selections (minimum)	
	Attenuation Update Rate:	1 second (Typical)	
	Incremental Accuracy:	Frequency	1-15 dB / 16-31 dB
		50 MHz - 3 GHz:	±0.5 dB / ±0.8 dB
		3 GHz - 5 GHz:	±0.5 dB / ±0.8 dB
		5 GHz - 13 GHz:	±2.0 dB / ±3.0 dB
	Insertion Loss (dB):	Frequency Range	8312-15-F / 8312-31-F
		50 MHz - 3 GHz:	3.0 / 3.5
		3 GHz - 5 GHz:	4.0 / 4.5
		5 GHz - 13 GHz:	7.0 / 8.0

1. GPIB/IEEE-488 model allows user-selectable addresses.
2. RS-232 can be used with standard PC serial port for short and medium distances (up to approximately 50 ft).
3. RS-422, designed for very long distance communications (4000 ft) and & optimized as a single node protocol, typically with one device connected to a single port.
4. Refer to Individual data sheet for detailed specifications on internal programmables.
5. Specifications subject to change without notice.

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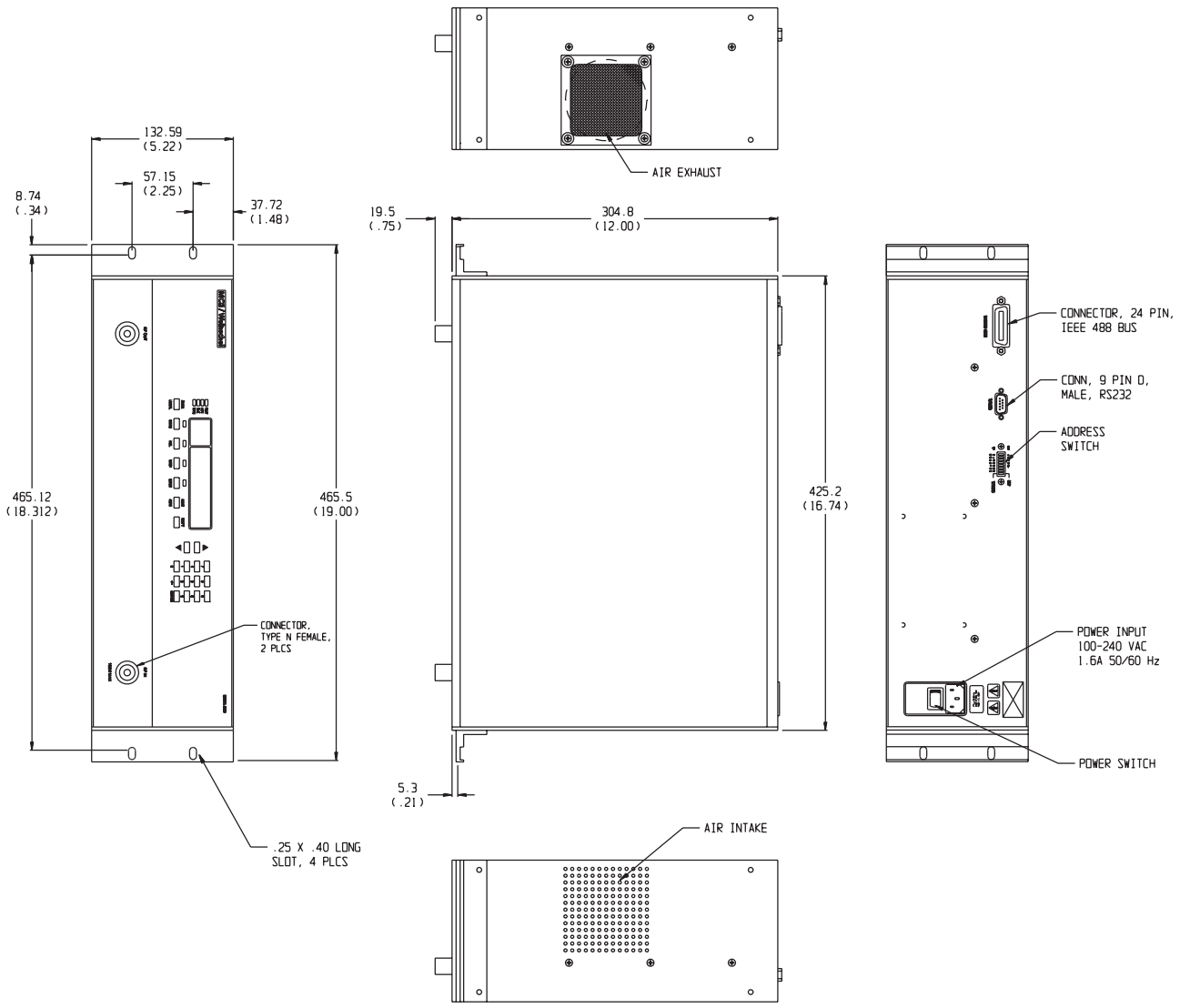
Physical Dimensions



NOTE: All dimensions are given in mm (inches) and are maximum, unless otherwise specified.

MODEL NUMBER DESCRIPTION:

Example:

8312 - XX - F

Basic Model Number	Attenuation Value (dB)*	Connector Options (Type N, Female Only!)

* Available in 0-15 dB and 0-31 dB configurations only!

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MODEL 8501
SmartStep™ High Power Programmable Switch

IEEE-488

RS232\RS422

NEW

100 Watt Hot Switching Capability

Description

MCE / Weinschel's 8501 Series provides front-panel and computer control for up to two channels of high power RF switching (Figure 1), where RF signals are routed through either the front or rear mounted switch port connectors labeled 1, C, 2.

Special configurations designed to specific customer requirements may contain other coaxial devices such as power combiners, directional couplers, and filters to create single or multi-channel subsystems. The 8501 can also contain and control a separate programmable attenuator channel.

Features

- Provides a flexible, easy to program, low cost solution for your bench test/calibration setups and subsystem applications.
- Single or Dual Switch Configurations
- DC to 13.0 GHz Operation.
- Power Hot switching up to 100 Watts average
- Designed to interface with industry standard communication interfaces:

  - GPIB/IEEE-488 (HS-488 ready)
  - RS-232, RS-422

- **Rack Configurable:** Using a Rack Mounting Kit allows the Model 8501 to be easily mounted into any rack or cabinet that is designed per EIA RS-310 or MIL-STD-189.

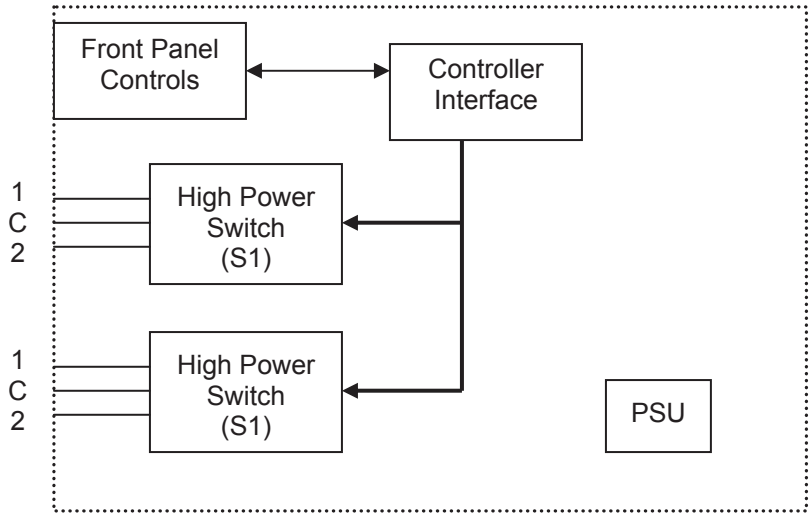

Figure 1. Model 8501 Block Diagram

For additional information on the Model 8501, visit our website @ www.weinschel.com/8501.htm

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Specifications

SPECIFICATION	DESCRIPTION
Input Power Requirements	AC 100 to 240 Vac, 50/60 Hz, 50 Watts
Environmental	Operating Temperature 0 to +50°C Storage Temperature: 67° to +167 °F (-55° to +75°C) Humidity: 96% Altitude: 40,000' (12,192M)
IEEE-488 Bus	Connector: 24-pin per IEEE-488.1 Protocols: per IEEE-488.2 Indicators: Remote (RMT), Listen (LSN), Talk (TLK), SRQ (SRQ)
RS-232 Bus	Connector: 9-pin male D Signals: TXD, RXD, RTS, CTS, DTR, GND Baud Rates: 2400, 9600, 19200, and 38400 Data Bits: 8 Handshaking: None, RTS/CTS, XON/XOFF Parity: None, Odd, Even Indicators: Tx (Transmit) and Rx (Receive)
RS-422 BUS(3)	Connector: 9-pin male D Signals: TXD+, TDX-, RXD+, RTX-, RTS+, RTS-, CTS+, CTS-, and signal GND Baud Rates: 2400, 9600, 19200, and 38400 Data Bits: 8 Handshaking: None, RTS/CTS, XON/XOFF Parity: None, Odd, Even Indicators: Tx (Transmit) and Rx (Receive)
RF Characteristics	Port Connectors: Type N, Female Frequency Range: dc - 13 GHz Impedance: 50 Ω

	DC to 3	3 to 5	5 to 11	11 to 13
SWR (maximum):	1.25	1.45	1.70	1.70
Insertion Loss (dB maximum):	0.25	0.30	0.50	0.65
Isolation (dB maximum):	70	60	50	50
RF Average Power Handling (CW):	100 W to 3 GHz 50 W to 13 GHz			
Hot Switch Cycling:	100K @ 100 Watts CW @ 2 GHz			

1. GPIB/IEEE-488 model allows user-selectable addresses
2. RS-232 can be used with standard PC serial port for short and medium distances (up to approximately 50 ft).
3. RS-422, designed for very long distance communications (4000 ft) and & optimized as a single node protocol, typically with one device connected to a single port.
4. Specifications subject to change without notice.

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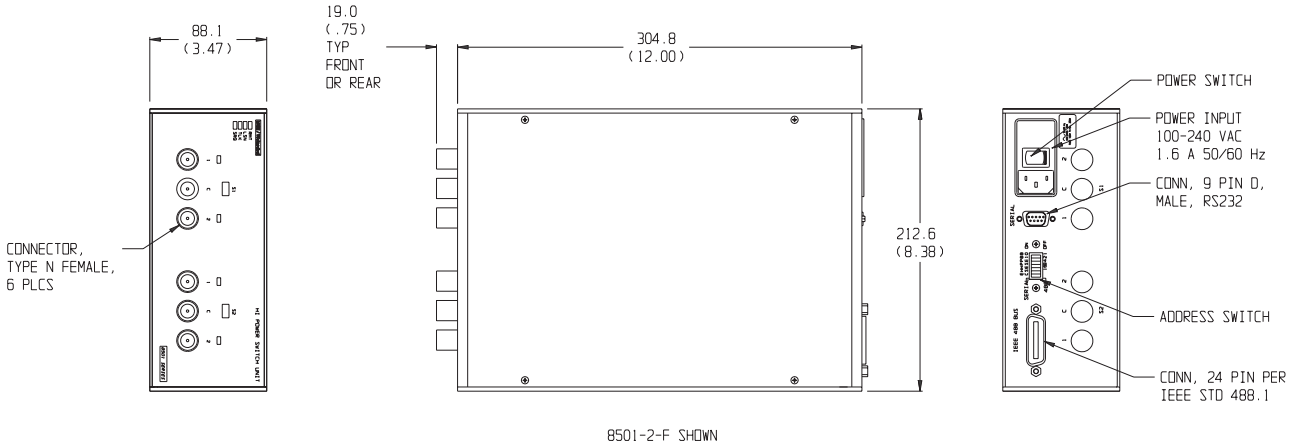
Physical Dimensions



8501-2-F SHOWN

NOTE: All dimensions are given in mm (inches) and are maximum, unless otherwise specified.

MODEL NUMBER DESCRIPTION:

Example:

8501 - X - F

Basic Model Number	Number of Switches	Connector Location F = Front, R = Rear (Type N, Female Only!)

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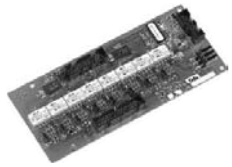
SmartStep™ Switch/Relay Driver
(P/N 193-8015-000)



Simplifies Device Control & Subsystem Design!

Description

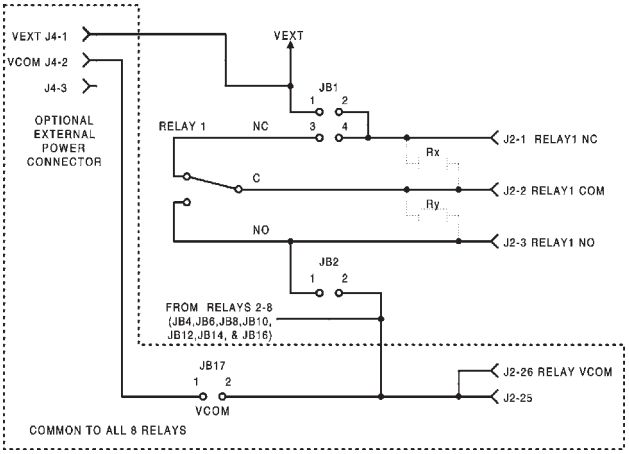
MCE / Weinschel's SmartStep™ Switch/Relay Drivers (P/N 193-8015-000) were specifically designed for controlling a wide variety of electromechanical switches and other TTL devices. For example this standard design contains eight electromechanical relays for output and control.

The relays are Form C (SPDT) latching type which along with various jumper configurations, can be used with the 8210A to control a variety of devices such as RF Switches (+28V and latching) and other TTL compatible devices. This card also provides an optional three-pin External Power connector which can be used to supply power to the device's) under control, to simplify wiring.

The Relay Driver Card provides eight electromechanical relays for output and control. The relays are Form C (SPDT) latching type which, along with various jumper configurations, can be used with the 8210A controller interface to control a variety of devices.

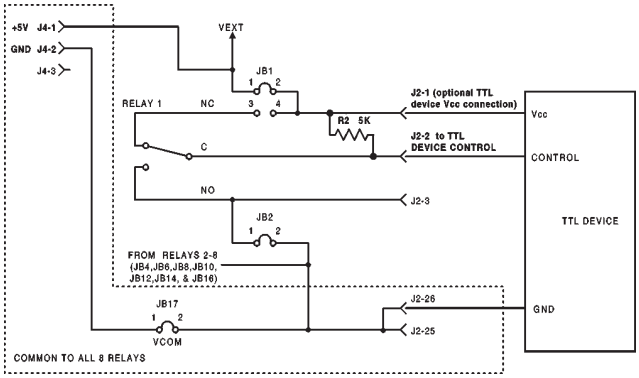
The Relay Card interfaces to the Weinschel Model 8210A via the Device Interface Bus (J1), a 14-pin ribbon cable which provides communications and power to the Relay Driver Card from the Model 8210A. This card also provides an optional three-pin External Power connector (J4) which can be used to supply power to the device(s) under control, to simplify wiring. This External Power is not used by the control circuitry on the Relay Driver, and its use is completely application dependent.

Each relay (shown below) contains a number of user-configurable jumpers which allow the output connections to supply power and/or ground to the devices under control. There are provisions for the user to install their own components on the outputs, which may include pull-up/pull-down resistors, filter caps, EMF suppression diodes, etc.

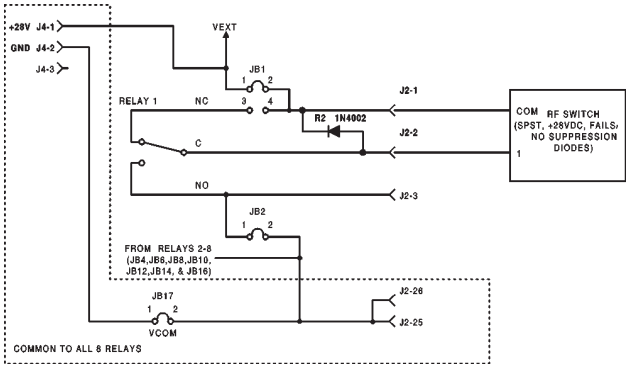


Applications

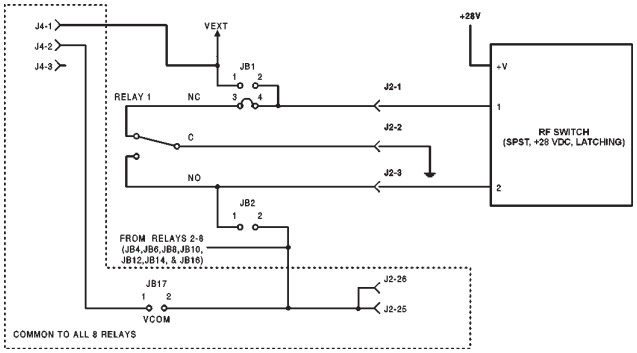
Samples 1-3 below illustrate a few of the configurations possible with the Model 8015.



Sample 1: TTL Device Control



Sample 2: +28 V RF Switch



Sample 3: Latching RF Switch

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Specifications

DRIVER INTERFACE:

Input Supply Voltage:	+12 to +15 Vdc Control Signals
Control Signals:	TTL/CMOS compatible
Interface Modes	Access.Bus protocols

DC Characteristics:

Driver Interface (D0-D7, /I2C, /RST):

Signals (Description)	Minimum	Maximum
V_{IL} (Input Low Voltage):	-0.5 V	0.8 V
V_{IH} (Input High Voltage):	2.0 V	5.25 V
I_{pu} (Input Pullup Current):	50 µA	400 µA

Power Supply:

V_{IN} (Supply Voltage):	11.0 V	16.0 V
I_{IN} (Supply Current, digital section):		25 mA
I_{CELL} (Supply Current per relay):		15 mA

RELAY CHARACTERISTICS:
(Typical for 25°C unless otherwise noted)

Number of Relays:	8	
Relay Type:	SPDT (Form C), Latching	
Maximum Switching Voltage:	AC	125 Vac
	DC	220 Vdc
Maximum Switching Capacity:	AC	0.5 A @ 125 Vac
	DC	2.0 A @ 30 Vdc
Minimum Switching Capacity:	10 mA @ 10 mVdc	
Initial Contact Resistance:	75 mW	
Contact Material:	Gold-clad Silver Alloy	
Expected Life:		
Mechanical	10^8 operations	
Electrical	10^5 operation @ 2A, 30 Vdc	
	$2x10^5$ operations @ 1A, 30 Vdc	
Relay Release Time:	4 msec	

OPERATING TEMPERATURE:	-20 to +70°C
STORAGE TEMPERATURE:	67° to +167 °F (-55° to +75 °C)

CONNECTORS:

Device Interface Bus (DIB), J1: 14-pin 0.025" square post header @ 0.1" centers. Mates with AMP 746285-2 or equivalent.

Relay Output Connector, J2: 26-pin 0.025" square post header @ 0.1" centers.

Expansion Connector, J3: 20-pin 0.025" square post header @ 0.1" centers.

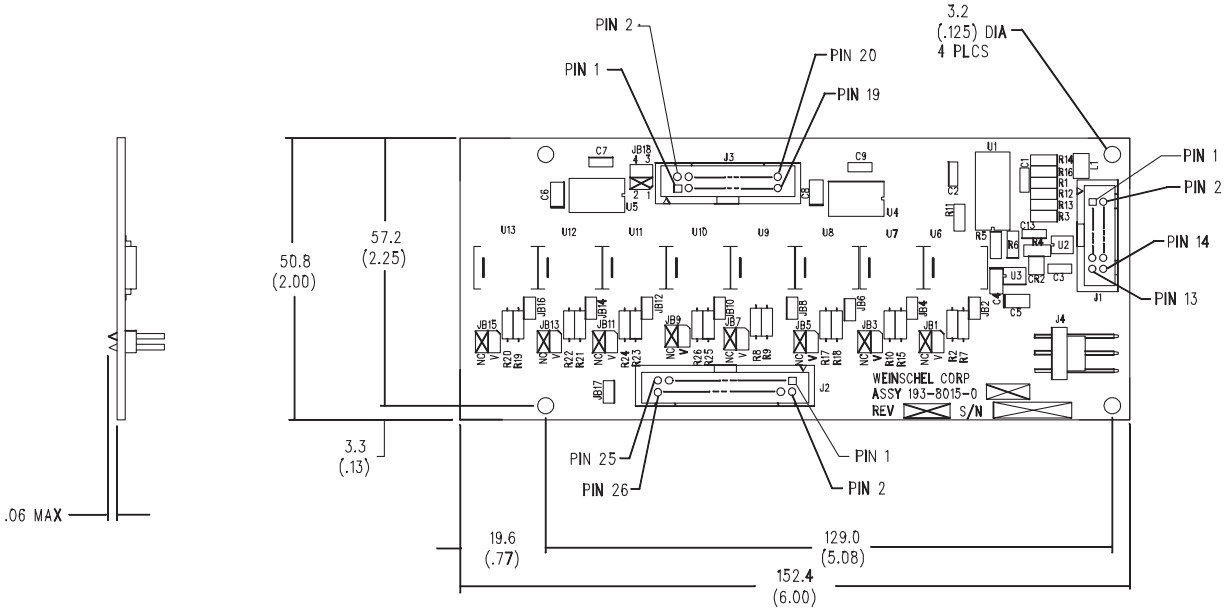
External Power (3-pin), J4: 3-pin 0.025" square post right angle header @ 0.156" centers.

Accessories

SmartStep Interface: The Model 8210A SmartStep Interface provides a flexible, low cost solution for the operation of programmable step attenuators and other electromechanical devices under computer control. Designed to interface to Weinschel's new line of SmartStep programmable attenuators, the 8210A represents a new concept in device control applications for bench test and subsystem designs. The 8210A provides a high-level interface from various industry standard communications interfaces, including IEEE-488 and RS232/RS422/RS485, to the SmartStep's serial Driver Interface Bus.

SmartStep Programmable Attenuators: Weinschel offers a wide range of programmable attenuators and other components that can be easily interfaced with the Model 8015 and 8210A to create subsystems in minutes and greatly simplify computer control applications. Refer to the Model 3200T Series or and 150T Series data sheets for more information.

Physical Dimensions



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