

MICRO-TEL & REACTION INSTRUMENTS



## FEATURES

- .01-18 GHz Standard
- Expandable to 54 GHz with Options
- IEEE-488 Bus Interface
- 100 dB Dynamic Range
- Signal Generator Calibration
- Expandable
- Turn Key System
- Cost Effective
- Attenuation Measurements
- Gain Measurements
- Return Loss Measurements (VSWR)
- Traceability to NBS

## DESCRIPTION

The AMS-1295 is a computer controlled system ideal for calibration laboratories and for production facilities requiring high accuracy and/or high dynamic range attenuation measurements. It is a modular system affording economical entry into automated attenuation measurements as well as the ability to expand as requirements change.

The key element in the AMS-1295 system is the Model 1295 Precision Attenuation Measurement Receiver. The 1295 system uses fundamental mixing to enable the user to make 100 dB dynamic range measurements from .01-18 GHz. It has .001 dB resolution over 80 dB of the range and .01 dB over the full 100 dB range.

While the 1295 Receiver can operate in conjunction with most signal generators, the stability and wide frequency coverage of the SG-811 Microwave Generator make it the ideal signal source for an automated system. The SG-811 covers the 10 MHz to 18 GHz frequency range in a single instrument. An ME-811 Frequency Extender can be connected to and controlled by the SG-811, thus extending coverage to 54 GHz. This means that coverage from .01 to 54 GHz can be easily controlled by the SG-811. This coverage precisely matches the frequency performance of the 1295 Receiver.

While either a manual or automated system may be implemented using just an SG-811 and 1295, a preferred technique utilizes phase locking synthesizers to precisely control the system operating frequency. Increased system speed and improved dynamic range can be obtained by



phase locking the YIG oscillators in the SG-811 Generator and 1295 Receiver to FS-1000 Frequency Synthesizers. The FS-1000 has 10 KHz tuning resolution standard, an internal 5 MHz crystal oven and an IEEE-488 bus interface. FS-1000 synthesizers may be connected to either the 1295 or SG-811 without modification or special programming. An internal microprocessor recognizes the connection to the companion instrument and provides the appropriate offsets to compensate for the 1295 Receiver IF frequency.

Included in a typical system is a computer/controller which controls the various system instruments via the IEEE-488 bus interface. The computer prompts the operator to insert or remove the necessary elements of the system. It also collects data automatically from the 1295 Receiver, processes the data and presents the data to the user in a standard format.

Software is available for some of the more common desktop computers. Some of the programs which can be supplied for automated system use includes: System Self Test, Step Attenuators, Swept Attenuation (Multi-Point), VSWR, Single Point, Filters and Signal Generator calibration.

Automatic operation entails the characterization of a device at discrete frequencies over the range of interest. This is accomplished by entering F1 (low frequency limit); F2 (high frequency limit) and step size. Under computer control, the source and receiver are directed to each frequency in turn and a reference measurement is stored in the computer memory. Subsequently, the Device Under Test (DUT) is inserted between source and receiver and the measurement sequence is repeated. The computer then uses the measurements to calculate the attenuation values and present the data to the user in the form of a printout or data plot.



**MODEL 1295 RECEIVER**

Further characterization of the device is possible by the use of a high directivity RF Bridge (See Application Note #172) Additional measurements characterize the VSWR values at the test device ports. The computer then uses the measurement data to present not only VSWR values but the possible uncertainty associated with each measurement due to the microwave component limitations as well.

Aside from the selection of the controller, there are three principal system configurations which may be selected. Providing that appropriate options are installed in any lower system configuration, the system may be later upgraded simply by procuring the additional instruments.

#### **AMS-1295 BASIC SYSTEM**

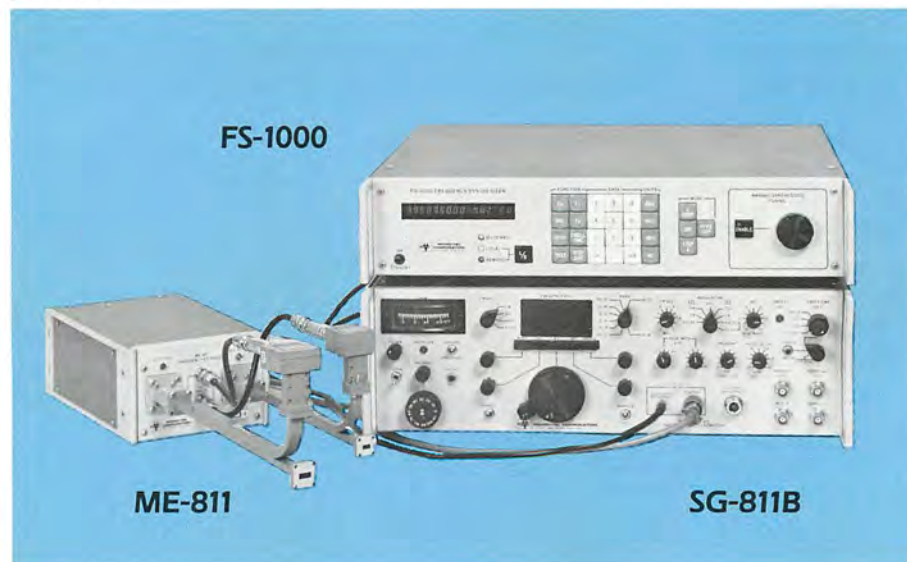
This is the low cost version of the AMS-1295 system. It includes:

- 1295 Precision Attenuation Measurement Receiver
- SG-811B-1A-6A Swept Signal Generator

- Controller (IEEE-488 Compatible)

Frequency accuracy is  $\pm 0.5\%$  (unsynthesized YIG oscillator) and tuning resolution is limited to 10,000 points per band which may affect filter skirt and high Q anomalous propagation measurements. YIG oscillators which are not synthesized prevent the utilization of the receiver's 15 kHz IF bandwidth, so a reduction of about 7 dB in the S/N ratio should be expected.

Because the equipment is unsynthesized, the controller directs the SG-811 generator to the test frequency, and directs the 1295 receiver to a frequency somewhat higher. The frequency of the receiver is dropped via the internal microprocessor until the digital AFC circuitry compensates this difference, thus completing the tuning cycle. This procedure typically requires about 1 second to lock the receiver to the signal source.



**FS-1000**

**ME-811**

**SG-811B**



### AMS-1295A BASIC SYNTHESIZED SYSTEM

This system design eliminates the limitation of the above system. It includes:

- 1295 Precision Attenuation Measurement Receiver
- SG-811B-1A-4 Swept Signal Generator
- FS-1000 Frequency Synthesizer
- Controller (IEEE-488 Compatible)

The signal source is synthesized which places the fundamental frequency accuracy to  $1 \times 10^{-8}$ , tuning resolution is 10 kHz and the 15 kHz IF bandwidth may be utilized to provide the highest S/N ratio.

Tuning of the generator is precise because it is directed to a particular frequency with a search sub-routine similar to the AMS-1295 Basic System. This reduces test time significantly when a large volume of data points are to be taken. It also reduces the amount of programming steps and increases the dynamic range of the receiving system.

### AMS-1295B EXPANDED SYNTHESIZED SYSTEM

This system design is similar to that above, however the receiver is also synthesized. It includes:

- 1295 Precision Attenuation Measurement Receiver
- SG-811B-1A-4 Swept Signal Generator
- Qty. 2 FS-1000 Frequency Synthesizer
- Controller (IEEE-488 Compatible)

The signal source and the receiver are synthesized placing the fundamental frequency accuracy to  $1 \times 10^{-8}$ , tuning resolution is 10 kHz (100 kHz if option 1 is added to the FS-1000) and the 15 kHz IF bandwidth may be utilized

providing the highest S/N ratio.

The receiver and generator are tuned to synthesizer accuracy.

#### 18-40 GHz Coverage

##### Additional Components Required:

#### SG-811 RELATED COMPONENTS

1 ea. ME-811K/Ka-2A-2B Frequency Extender

1 ea. Option 11 (SG-811 Provisions for 18 to 40 GHz Coverage). (SG-811 cannot be field retro-fitted).

#### 1295 RELATED COMPONENTS

1 ea. Option 1 (18 to 26.5 GHz coverage)

1 ea. Option 2 (26.5 to 40 GHz coverage)

#### FS-1000 RELATED COMPONENTS

2 ea. Option 1 (100 Hz resolution).

#### 40 to 54 GHz Coverage

##### Additional Components Required:

#### SG-811 RELATED COMPONENTS

1 ea. ME-811U (40 to 54 GHz coverage).

1 ea. Option 1 (ME-811 External Power Supply)

#### 1295 RELATED COMPONENTS

1 ea. Option 5 (40 to 54 GHz coverage)

#### FS-1000 RELATED COMPONENTS

2 ea. Option 1 (100 Hz resolution).

### AMS-1295C SIGNAL GENERATOR / ATTENUATION MEASUREMENT SYSTEM

This is the top-of-the-line automatic measurement system. It includes:

- 1295 Precision Attenuation Measurement Receiver
- SG-811B-1A-4 Swept Signal Generator
- Qty. 2 FS-1000 Frequency Synthesizer
- Controller (IEEE-488 Compatible)
- Power Meter (IEEE-488 Compatible)
- Modulation Monitor (IEEE-488 Compatible)

In this configuration of the automatic measurement system, the system is expanded to accommodate automatic calibration of signal generators. Option 4 is added to the 1295 Precision Attenuation Measurement Receiver providing a 30 MHz IF output utilized by the modulation monitor. Refer to Application Note #174 for further details.

## SPECIFICATIONS

Frequency Range: .....0.01 to 18GHz.  
18 to 26, 26 to 40 and 40 to 54GHz (Optional)

Frequency Stability: ..... $3 \times 10^{-9}$ /Day Aging Rate (synthesized)

Measurement Range: .....100dB, 0.01 to 18 GHz  
80dB, 18 to 40GHz  
70dB, 40 to 54GHz

Measurement Resolution: .....0.01dB (0 to 80dB)  
.01dB (80 to 100dB)

Measurement Accuracy: .....Refer to the 1295 Data Sheet

System Control: .....Manual or IEEE-488 GPIB Interface

Power Requirements: .....115/230 Vac  $\pm 10\%$ , 50-60Hz

## ORDERING INFORMATION (Please see latest price list.)

(See the individual data sheets for a more detailed description)

AMS-1295 Receiving System—including software to operate on an HP-85 Computer or HP-9825 and necessary control cables

<b>1295</b>	<input type="checkbox"/>	Option R	Rack Mount
<b>Precision Attenuation</b>	<input type="checkbox"/>	Option 1	Adds 18-26 GHz Coverage
<b>Measurement Receiver</b>	<input type="checkbox"/>	Option 2	Adds 26-40 GHz Coverage
.01-18 GHz	<input type="checkbox"/>	Option 4	30 MHz IF Output
	<input type="checkbox"/>	Option 5	Adds 40-54 GHz Coverage
	<input type="checkbox"/>	C-1000	Fiberglass Carrying Case



**SG-811B** See Individual Data Sheet

**Microwave Signal Generator**

.01-18 GHz — 15 mw

<b>FS-1000</b>	<input type="checkbox"/>	Option 1	Required to operate Above 18 GHz
<b>Frequency Synthesizer</b>			
.01 to 18 GHz (to 40 GHz with ME-811 and SG-811 Option 4, 11)			

<b>Signal Generator Calibration System</b>	Composed of:
	1295 Receiver with Option 4,
	FS-1000 Signal Generator Counter,
	Power Meter, Modulation Meter
	System Controller and Software

## WARRANTY

All Micro-Tel products are unconditionally warranted for a period of one year except for physical damage, provided the equipment is returned to the plant in Hunt Valley.

## DISCLAIMER

Micro-Tel produces computer-controlled systems to support the Test and Measurement industry and the surveillance market as well. Demonstration software is produced to support these systems and is provided at no cost to our customers. This software is supplied to assist our customers in developing their own software. Micro-Tel does not warrant the software to meet any specific needs or requirements and is not responsible for improving existing software.