

With compliments

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1295

SECTION I

1.0 GENERAL DESCRIPTION

This section provides an introductory functional description of the 1295 Precision Attenuation Measurement Receiver and its specifications.

1.1 INTRODUCTION

The Micro-Tel Model 1295 Precision Attenuation Measurement Receiver is a completely self-contained receiver designed for manual and semi-automatic, NBS-traceable, attenuation measurements covering the frequency range from 10 MHz to 18 GHz. Frequency range expansion to 26.5, 40 or 54 GHz is optional. Refer to the Option Section of this manual. It includes provisions for operating under IEEE-488 Bus control and with the FS-1000 Frequency Synthesizer.

The 1295 receiver provides fundamental mixing over its entire frequency range, digital averaging of the received signal level, automatic calculation of attenuation level and a precision IF attenuator. The IF attenuator is adjustable over a small range and is calibrated against a 30 MHz reference attenuator. A 30 MHz reference source is an integral part of the receiver.

The 1295 Receiver has the capability to calibrate fixed or variable attenuators using an external signal source, calibrate the output attenuators of signal generators and to calibrate standard noise sources using an external standard noise source and associated components. The instrument also operates as a 30 MHz IF receiver.

1.2 PRINCIPLES OF OPERATION

For a general understanding of the 1295 Receiver, refer to the Simplified Block Diagram, Figure 1.2. Individual functions are described in later sections.

The RF input covers 10 MHz to 18 GHz and is converted down to the 30 MHz IF by the RF tuner. The 30 MHz input is used to calibrate noise sources and allows the instrument to be utilized as an IF receiver. The PIN switch modulates the noise input with a 1000 Hz square wave.

The 30 MHz signal connects through the precision step attenuator to the IF Amplifier. The step attenuator has eleven 10 dB steps for a total range of 110 dB. Each 10 dB step is adjustable through the receiver front panel so that it may be set precisely to 10 dB by reference to an external reference attenuator.

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1.3 SPECIFICATIONS

- Frequency01 to 18 GHz (Standard)
18 to 54 GHz (Optional)
- Frequency Bands03 IF, .01-2, 2-4, 4-8, 8-12, 12-18 GHz
(Standard)
18-26.5, 26.5-40, 40-54 GHz (Optional)
- Inputs (1)01-18, 30 MHz
Connections for external 18-40 GHz mixers
- Input SWR (2) 2:1 maximum (.01-18 GHz)
1.5:1 maximum (30 MHz)
- Input Connectors 30 MHz Type "N"
.01-18 GHz Type "N"
- Sensitivity (3) -103 dBm in 100 kHz bandwidth
- Input Signal CW, -2 dBm maximum for measurement
(.01-18 GHz) +20 dBm maximum without damage
- Input Signal CW, -15 dBm maximum for measurement
(30 MHz) +20 dBm maximum without damage
- Measurement Range 100 dB minimum (.01 to 18 GHz)
- Measurement Resolution ... 0.001 dB (Low Sens); 0.01 dB (Hi Sens)
- Measurement Accuracy As listed in the following chart

.01 - 18 GHz

Range	Accuracy	Max Error	RF Level	Sens
0- 70 dB	± (0.02 dB + 0.02 dB/10dB)	±0.16 dB	-10 to -80 dBm	LO
0- 85 dB	± (0.05 dB + 0.02 dB/10dB)	±0.21 dB	-10 to -95 dBm	HI
0- 95 dB	± (0.10 dB + 0.02 dB/10dB)	±0.28 dB	-10 to -105 dBm	HI
0-100 dB	± (0.20 dB + 0.02 dB/10dB)	±0.40 dB	-5 to -105 dBm	HI
0-110 dB		± 0.6 dB (typ)	-2 to 112 dBm	HI

NOTE: the above accuracies are for slow averaging and 100 kHz BW.
accuracy for 0-110 dB measurement is for slow avg. and 15 kHz BW.

- Frequency01-2 GHz ±1% of frequency ± 20 MHz
2-54 GHz ±1% of frequency
- Frequency Display 5-digit LED, 1 MHz resolution
- IF Attenuator 0-110 dB in 10 dB steps. Automatic or
manual operation. Each step adjustable to
± .01 dB of external reference attenuator.

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IF Input	30 MHz, -15 dBm max. for measurement +10 dBm max.
IF Bandwidth	15, 100 and 500 kHz nominal
IF Linear Range	30 dB nominal
Measurement Stability	± 0.010 dB/minute @ IF after 1 hour warm-up, LO Sensitivity, Slow Averaging
Level Display	4 1/2 digit - HI Sensitivity 5 1/2 digit - LO Sensitivity .00 to 123.00 dB
Digital Averaging	1 or 4 seconds per reading, selectable
Reference Signal	30 MHz ± 7.5 kHz 0-50 degrees C +17 dBm minimum at rear panel Stability: ± 0.005 dB per 10 minutes
LO Sample (4)	-10 dBm minimum, 2 to 18 GHz
Phase Lock Input	1.7 MHz per volt nominal
CRT Display	Displays 1 kHz swept IF output signal
AFC	Electro-mechanical; operates to minimum measurement level
FM Tolerance	Approximates selected IF bandwidth
IEEE-488 Bus (5)	Rear panel input. Controls all measurement functions plus tuning and data readout.
Frequency Acquisition	Automatic; capture range programmable
Power Required	115/230 Vac $\pm 10\%$. 50-400 Hz, 50 watts maximum
Temperature (6)	Operating +15 degrees to +35 degrees C Storage -15 degrees to 85 degrees C
Construction	Solid state except for CRT
Size	5 1/4 x 17 x 18 inches Rack mount optional
Weight	38 pounds, nominal

NOTES:

- (1) The 30 MHz input can be switched at a 1000 Hz rate for measurement of noise sources.

- (2) A 4 dB pad is internally connected to the 2-18 GHz mixer. This may be removed for increased sensitivity but higher SWR.
- (3) Sensitivity is the signal level at which the "low level" light goes off. Sensitivity for S/N = 3 dB is about 5 dB better when driving an SWR meter when connected internally to the bolometer output. Sensitivity in the 15 kHz bandwidth is about 6 dB better. Sensitivity in the 500 kHz bandwidth is about 6 dB worse.
- (4) In the .01-2 GHz band, the LO sample is 2330 MHz above the input signal frequency. The 2300 MHz second local oscillator may be phase locked to a 5 MHz reference having 0 dBm level.
- (5) Refer to Section 3 for interface functions.
- (6) Operable from 0 to +50 degrees C with accuracy.

OPTIONS:

- Option 1: External mixer 18-26.5 GHz
- Option 2: External mixer 26.5-40 GHz
- Option 4: 30 MHz IF output
- Option 5: External mixer 40-54 GHz

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