

IPC EDUCATIONAL TRAINERS

MICRO STRIP TRAINER (Microwave)

MODEL: - IPC-MS-3000



DESCRIPTION:-

The increase use of microwaves, in application ranging from satellite and terrestrial communication to high speed computing and data transmission, has resulted in short-fall of appropriately trained engineers and technicians.

Over three quarters of all microwave circuits are now non-waveguide. The swing towards micro strip technology must be reflected in the courses offered in engineering education institutes.

BE; recognizing the urgent need for suitable training equipment, have developed a micro strip trainer which will provide the means to investigate the technology and techniques used in this important subject area.

IPC-MS-3000 Micro Strip Trainer comprises 18 passive circuit components, 2 active circuits and all the leads and connectors required to construct a verity of commonly used configurations, many of which incorporate microwave integrated circuits (MICs).

The instruction manual supplied with IPC-MS-3000 provides a comprehensive introduction to the subject in a manner which avoids unnecessary mathematical analysis and provides series of structured practical assignments.

The only items of test equipment required are a digital multi meter and a 0-20VDC power supply.

IPC-MS-3000 covers the training requirements for most courses in microwave engineering at undergraduate level courses.

Note: - we reserve the right to change the shape & design of the trainer without prior notice.

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FEATURES:

- Latest Microwave technology.
- 2.0-3.5 GHz VCO.
- 2.4GHz RF Bridge.
- No costly test equipment required.
- Safe low power output.
- Conveniently packed for inventory control.

THE COMPLETE IPC-MS-3000 MICRO STRIP TRAINER CONSISTS OF:**PASSIVE COMPONENTS:**

- 2 Patch antenna
- 1 DC Biasing unit
- 1 Three-port circulator
- 1 Hybrid ring (rat-race) coupler
- 1 Ring resonator
- 1 RF bridge
- 1 Quadrate coupler
- 1 Unmatched load
- 1 Directional coupler
- 1 Wilkinson power divider
- 3 50 ohms loads
- 1 Short-circuit termination
- 1 20dB attenuator
- 1 Crystal detector
- 1 Low-pass filter
- 1 Matched load

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ACTIVE COMPONENTS:

- 1 Voltage controlled oscillator (VCO)
- 1 S-band MMIC amplifier

MISCELLANEOUS:

- 8 SMA plug-plug connector
- 1 BNC –dual banana pins
- 1 DB(9) circular lead
- 2 4mm banana leads
- 1 Spanner
- VCO and detector calibration curves

Most of the components are packed in bright aluminum enclosures and their interconnection is by standard SMA coupling; providing secure but easily made joints. The trainer is designed to be used with basic test equipment: a DC power supply and a digital multi meter; in conjunction with the calibration curves supplied with each VCO and detector.

Realistic quantitative results can easily be achieved with this simple set-up; however the quality of construction allows IPC-MS-3000 to be used with more sophisticated microwave test instruments if these are available.

THE ASSIGNMENTS:

The manual provides a series of structured and stand alone assignments; using mostly the passive components: introduction to micro strip, microwave integrated circuit (MIC) technology and microwave measurement techniques. Further assignments encourage the student to build up complete systems incorporating the active circuits.

The individual units of both active and passive components are designed for compatibility and easy interconnections, thus ensuring that circuits such as a line-of-sight link or simple frequency modulated continuous wave (FMCW) can be built and tested with minimum difficulty.

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The basic principles and techniques of microwave signal processing using micro strip are simply and comprehensively presented, so that the trainer is ideal for use by engineers and technicians working in a variety of different areas of application, including:

- Satellite communication
- Radar
- Surveillance-Security system
- Instrumentation
- Medical electronics
- Data transmission

The practical work is presented under the following general headings:

- Power source and detector action.
- Action of a 3-port circulator.
- Insertion loss measurement on a low-pass filter.
- Measurement of return loss, reflection coefficient and VSWR of a filter, micro strip and commercial matched loads.
- Matching investigations: reflection coefficient of unknown resistive load and its matching by $\frac{1}{4} \lambda$ transformers and shunt stub.
- Properties of power divider and retrace coupler.
- Measurement of effective dielectric constant and line loss using a ring resonator.
- DC biasing and MMIC amplifier investigations.
- Quadrature coupler investigations.
- RF bridge investigation.
- Microwave radio link and antenna investigations.

IPC-MS-3000 trainer complete experimental workstation is also available comprising the supply and a digital multi meter.

TECHNICAL SPECIFICATION:

Patch Antenna

Two micro strip patch antenna supplied

Centre frequency: 2.7 +0.05GHz

Gain: 6dBi (typical)

Return loss: -17dB

Impedance: 50 ohm

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Bias network

These components consists of three types of bias lines. Two a.c and one d.c all utilization the quarter wavelength transformer.

Bias line type	Insertion loss (dB)	
Butterfly	2.7GHz	Full band (2-4 GHz)
Pad	0.02	0.12
Direct d.c short	0.02	0.11
	0.02	0.08

Three-port circulator

Insertion loss: 0.4dB (max at 3GHz)
Insertion loss: 0.5dB (max 2.5 – 2.9GHz)
Isolation : 16 – 24dB (full band 2.5 -2.9GHz)

Hybrid ring (Rat – race) Filter

This is a standard hybrid-ring (or rat-race) coupler.
Centre Frequency : 2.7 +0.1GHz
Insertion loss (at center frequency): -3.2dB
Bandwidth: 400MHz
Isolation: 25dB (typical)
Impedance: 50

Ring Resonator

A loosely-coupled resonant ring designed to resonate at a fundamental frequency of approximately 2.7GHz in its $n = 2$ mode. This component is used to measure the dielectric constant of the printed board.

Low Pass Filter

A 5-section, L-C type micro strip low pass filter.
Pass band (Nominal): DC- 2.7GHz
Stop Band: 3dB point at 3GHz (approx) rising to 20dB at 20% above cut-off.
Impedance: 50 ohm

Matched Load

A quarter wavelength long termination in a standard, 50, thick film, chip resistance.
Centre frequency
Return loss:
Input impedance:

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Unmatched Load

Three 50 input lines terminated in unknown resistive loads. One incorporate a $\lambda/4$ transformer with a centre frequency = 3GHz, and one uses an open-circulated shunt stub element.

Wilkinson Power Divider

Centre Frequency:	2.7 GHz
Operating band:	2-4GHz
Insertion loss:	3.5 +0.25dB
Tracking:	20dB (typical)
Impedance:	0.15dB (typical over full band 50 ohm)

Voltage Controlled Oscillator

The VCO is supplied with its own calibration curve and amplifier

Frequency range:	2.0 – 3.5 GHz
Tuning voltage:	1 – 20V
Power output:	10dBm (typical into 50 ohm)
Modulation output frequency:	1kHz (variable 900-1100Hz)
Modulation waveform:	square wave
Modulator indicator:	2Hz flashing LED
DC supply voltage:	15V fix (fully protected)
DC supply current:	50mA (maximum)
Supply connector:	4mm sockets

S-band MMIC Amplifier

Gain:	+15dB (typical)
Compression point:	+12dBm (typical)
Frequency range:	1.5 – 4GHz
Input impedance:	50 ohm
Output impedance:	50 ohm
Supply voltage:	15V (fully protected)
Supply current:	40mA (typical)
Supply connector:	4mm sockets

RF Bridge

Frequency range:	2 – 4GHz
Built in diode detector:	
Impedance:	50 ohm

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Ancillary equipment

Power supply: 15V DC
0-20V DC variable
1.5A
Regulated DC power supply PS-3000 is recommended

Power Requirements

Power supplies: 15VDC 1.5A
VCO tuning voltage: 0 – 30VDC 1.2.5A

Dimension & Weight (in protective case)

Width: 430mm (17in)
Height: 310mm (12in)
Depth: 89mm (3.5in)
Weight: 4.5Kg (9.92lbs)

Tender Specification

A microwave integrated circuit trainer using micro strip components and operating in the 2 – 4GHz band. To contain 18 passive components. 3 active components and all necessary connectors and leads. Complete with instruction manual providing at least 11 assignment.

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