

## Precision Impedance Analyzers



**6505B 5 MHz**

**6515B 15 MHz**

**6530B 30 MHz**

**65120B 120 MHz**

**6510B 10 MHz**

**6520B 20 MHz**

**6550B 50 MHz**

- Precise high frequency impedance measurements
- Characterize components to 120 MHz (65120B)
- 0.05% basic measurement accuracy
- Easy to use with large TFT 8.4" touch screen
- Clear graphic displays
- Fully programmable over GPIB or LAN
- Competitively priced
- Equivalent Circuit Analysis function (/E option)
- Calculate Permittivity and Permeability (/K option)
- Test programs in Multi Measurement Mode (/M)
- Polar/Complex Plots (/Y option)
- Unipolar (/D1) and bipolar (/D2) DC Bias options

The 6500B series of Precision Impedance Analyzers provide precise and fast testing of devices at frequencies up to 120 MHz. Basic measurement accuracy is  $\pm 0.05\%$  making the instruments the best in their class.

The accuracy and versatility makes these precision instruments the ideal choice for many different tasks and applications including passive component design, dielectric material testing and resonant frequency characterisation.

Engineers need to evaluate component characteristics at high frequencies with very high levels of accuracy. The 65120B 120MHz Precision Impedance Analyzer is therefore ideal for many demanding tasks, combining accuracy and ease of use at an affordable price. If a maximum frequency less than 120MHz is required, other models are available in this range.

### AC Measurement parameters

- Impedance (Z)
- Phase Angle ( $\theta$ )
- Capacitance (C)
- Dissipation Factor (D)
- Inductance (L)
- Quality Factor (Q)
- Resistance (R)
- Reactance (X)
- Conductance (G)
- Susceptance (B)
- Admittance (Y)

### High measurement accuracy

Capacitance, inductance and impedance basic accuracy are all an excellent  $\pm 0.05\%$ . Dissipation factor accuracy is  $\pm 0.0005$  and the quality factor accuracy is  $\pm 0.05\%$ .

## Graphical sweep of components

The 6500B series of Precision Impedance Analyzers are highly accurate high frequency component analyzers with a host of useful features.

Graphical sweep of two measured parameters is available and displayed on the large clear colour display. Swept parameters are frequency, drive level and DC bias (option).

Display formats available include series or parallel equivalent circuit. Polar and Complex plots can also be displayed when the /Y firmware option is installed.

An Equivalent Circuit Analysis function is available as the /E firmware option. This allows modelling and curve fitting to various models of equivalent circuits. 4 types of 3-component model and 1 type of 4-component model can be selected. The instrument will calculate the nearest equivalent circuit parameters for the measurement traces and revise the results for the different models instantly. Alternatively the parameters can be entered by the user and the instrument will plot the resulting frequency characteristics and revise the plot between the various models instantly.

For single frequency measurements a meter mode is available.

## Variable drive and bias levels

AC drive levels up to 1V or 20 mA can be selected to evaluate components in realistic operating environments. /D1 DC bias option provides 0 to +40V dc bias voltage and 0 to +100mA dc bias current. /D2 option provides -40V to +40V dc bias voltage.

## External control

The GPIB interface is used to control the instrument and read back measured values for applications such as quality control or for archiving purposes.

An Ethernet interface similarly allows the instrument to be controlled and to send out data, allowing it to be integrated into many test environments.

## Wide range of interfaces

An external monitor or projector may be connected to the instrument's VGA output. The ability to provide a large screen display of measurement results is invaluable in production environments or for teaching and training.

Instrument control from both a keyboard and mouse is available. Any keyboard or mouse, with either a PS/2 or USB interface, can simply be connected to provide an alternative method of instrument control and operation.

## Data storage and retrieval

All measurement and setup data can be stored using the Ethernet interface or a USB memory (supplied as standard).

## Setup Data

Up to 20 instrument setups may be locally stored for each mode. Additional setups can be stored to the USB memory stick which is supplied with each unit as standard.

## Bin handling option

/B1 option (non-isolated 5V) or /B2 option (isolated 24V) signals are available through a 25-way D-type connector. 10 bins can be set using absolute or percentage limits.

## Printer outputs

Hard copy printouts can be obtained using an HP-PCL compatible graphics printer. A networked HP-PCL compatible printer may also be used via the Ethernet connection.

## Component connections

Four front panel BNC connectors permit three or four terminal connections with the screens at ground potential.

The 1J1011 Component Fixture, supplied as standard, ensures optimum performance when measuring a wide range of leaded components and devices.

1J1012 (2-terminal), 1J1014 (4-terminal) and 1J1024 (2-terminal small body DUT) SMD Fixtures allow connection to surface mount devices.

## Protection against charged capacitors

High precision measuring instruments can be damaged by All the models in the range incorporate protection against charged capacitors.



*Simultaneous plot of impedance and phase displayed against frequency on a clear colour display*

## Technical specifications

### Measurement parameters

Any two of the following parameters can be measured and displayed at the same time:

#### AC functions

Impedance (Z)	Phase Angle ( $\theta$ )
Capacitance (C)	Dissipation Factor (D)
Inductance (L)	Quality Factor (Q)
Resistance (R)	Reactance (X)
Conductance (G)	Susceptance (B)
Admittance (Y)	

#### Display format

Series or parallel equivalent circuit – all parameters  
3 and 4-element models (/E option)

### Test conditions

#### Frequency range

6505B	20 Hz to 5 MHz
6510B	20 Hz to 10 MHz
6515B	20 Hz to 15 MHz
6520B	20 Hz to 20 MHz
6530B	20 Hz to 30 MHz
6550B	20 Hz to 50 MHz
65120B	20 Hz to 120 MHz

Frequency step size: 1 mHz

Accuracy of set frequency  $\pm 0.005\%$

#### AC drive level

10mV to 1Vrms\*

200 $\mu$ A to 20mArms\*

\*Varies with frequency

Signal source impedance: 50 $\Omega$  nominal

#### DC bias

##### D1 option

0 to +100 mAdc bias current; 0 to +40 V dc bias voltage

##### D2 option

-40 V to +40 V dc bias voltage

#### Binning (optional)

10 bins with absolute and percentage limits.

25 way D-type interface connector.

#### Option /B1 (non-isolated)

Common 0 V. Bin outputs 0 to 5 V(nominal) with >10 mA current sink capability.

#### Option /B2 (isolated)

Common 24 V input. Outputs 0 to 24 V with >10 mA current source capability.

### Mode of operation

#### Analysis Mode (Graphical Sweep)

Allows graphical sweep of any two measurement parameters

Swept parameters: frequency, drive level or DC bias

#### Materials Test (/K option)

Calculates Complex Relative Permittivity,  $\epsilon^*r$  when using 1020 Material Test Fixture and Complex Permeability,  $\mu^*$

#### Setup Data

Up to 20 instrument setups can be locally stored for each mode. Additional setups can be stored on USB memory.

#### Equivalent Circuit Analysis (/E option)

4 types of 3-component model and 1 type of 4-component model.

#### Polar/Complex Plots (/Y option)

Polar Plots:

1. Z (Impedance & Angle)
2. Y (Admittance & Angle)

Complex Plots:

1. Rs/Xs (Series Resistance against Series Reactance)
2. Gp/Bp (Parallel Conductance against Parallel Susceptance)
3. Z'/Z" (Real Impedance against Imaginary Impedance)

### Measurement connections

Four front panel BNC connectors in 4-terminal pair configuration permits three or four terminal connections with the screens at ground potential.

### Measurement accuracy

#### Dissipation factor

$\pm 0.0005 (1+D^2)^*$

#### Quality factor

$\pm 0.05\% (Q+1/Q)^*$

#### Capacitance / Inductance / Impedance

$\pm 0.05\%*$

\*Varies with frequency, drive level and measured impedance

### General

#### Power Supply

Input voltage 90 VAC to 264 VAC (Autoranging)

#### Mains frequency

47 Hz to 63 Hz

#### Display

8.4" VGA (640 x 480) colour TFT with touch screen

## Local Printer

HP-PCL compatible graphics printing  
Centronics / parallel printer port, Epson compatible text / ticket printing

## Network Printer

HP-PCL compatible graphics printing

## GPIO interface

External instrument control. 24 pin IEEE 488 connector

## Remote trigger

Rear panel BNC with internal pull-up, operates on logic low or contact closure

## USB interface

Two Universal Serial Bus Interfaces  
USB 1.1 compliant

## VGA interface

15-way D-type connector to drive an external monitor in addition to the instrument display

## LAN interface

10/100-BASE-TX Ethernet controller. RJ45 connector

## Keyboard interface

Standard USB or PS/2 keyboard port. Instrument front panel remains active with keyboard plugged in

## Mouse interface

Standard USB or PS/2 mouse port. Touch screen remains enabled when the mouse is connected.

## Bin handler (option)

/B1 option (non-isolated 5V) or /B2 option (isolated 24V).  
25-way D-type connector

## Environmental conditions

This equipment is intended for indoor use only in a non-explosive and non-corrosive atmosphere

## Temperature range

Storage -20°C to 60°C  
Operating 0°C to 40°C  
Full Accuracy 18°C to 28°C

## Relative humidity

Up to 80% non-condensing

## Altitude

Up to 2000 m

## Installation category

II in accordance with IEC664

## Safety

Complies with the requirements of EN61010-1

## EMC

Complies with EN61326 for emissions and immunity

## Mechanical

Height 190 mm (7.5")      Depth 525 mm (20.5")  
Width 440 mm (17.37")      Weight 14.5 kg (32 lb)

## Order codes

Description	Order code
<b>6505B</b> 5 MHz Precision Impedance Analyzer	<b>1J6505B</b>
<b>6510B</b> 10 MHz Precision Impedance Analyzer	<b>1J6510B</b>
<b>6515B</b> 15 MHz Precision Impedance Analyzer	<b>1J6515B</b>
<b>6520B</b> 20 MHz Precision Impedance Analyzer	<b>1J6520B</b>
<b>6530B</b> 30 MHz Precision Impedance Analyzer	<b>1J6530B</b>
<b>6550B</b> 50 MHz Precision Impedance Analyzer	<b>1J6550B</b>
<b>65120B</b> 120 MHz Precision Impedance Analyzer with any two firmware options and either /D1 or /D2 option as standard	<b>1J65120B</b>

All models supplied with:-

User manual      AC power cable  
2-terminal component fixture (1J1011)      USB memory

## Hardware Options

Description	Order code
Bin handler (non-isolated)	/B1
Bin handler (isolated 24V)	/B2
DC Bias (0 to +40V, 0 to +100mA)	/D1
DC Bias (-40V to +40V)	/D2

## Firmware Options

Description	Order code
Equivalent Circuit Analysis	/E
Material Test	/K
Multi-Measurement Mode	/M
Polar Complex Plots	/Y

Wayne Kerr's policy is one of continuous development and consequently the product may vary in detail from the description and specification in this publication.

Issue E