A spectrum analyzer with outstanding performance and a user friendly visual interface simplifying many complex measurements.

- **9 kHz to 2.9 GHz fully synthesized frequency range**

- **Lightweight, portable and rugged construction at 9.4 kg**

- **Excellent TFT color display**

- **Comprehensive marker facility**

- **Wide input signal range +30 dBm to -110 dBm**

- **Optional full range tracking generator**

- **Semi-automated measurements**

- **Low phase noise**

- **Floppy disk drive**

- **Extremely user friendly MMI reduces risk of operator error**

- **Auto Tune facility**

- **AM/FM demodulation**

A Value for Money product

The 2399 is the latest in the range of spectrum analyzers from IFR providing exceptional performance at an exceptional price.

Frequency Accuracy

The local oscillator system in the 2399 is fully synthesized thus providing accurate frequency measurements with 1 Hz resolution.

Portability

With a weight of only 9.4 kg the 2399 is one of the lightest spectrum analyzers available. A truly portable unit!

Color Display

The 6.4 inch TFT colour LCD in the 2399 provides a clear, bright, sharp display with a 640 x 480 pixel active display area viewable in high ambient light conditions.

Comprehensive Marker System
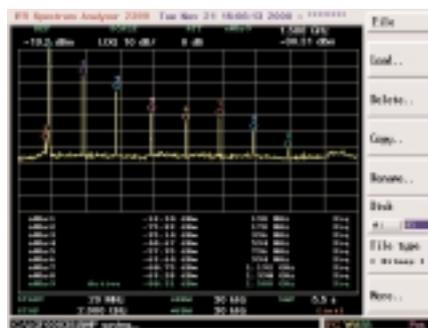
Marker table

The marker system allows up to a maximum of 9 markers to be displayed on the screen at any one time. A marker table shows the frequency and level of each marker selected thus allowing multiple signals to be evaluated simultaneously. In addition to the Normal markers 2399 provides Delta, Peak Search, Peak Track, 1/Delta, Marker Track, Marker to Center and Marker to Reference capabilities.

Measurement Limits

The Limits facility allows an Upper and/or a Lower Limit to be set on the screen of the 2399. Should the signal being displayed fall outside either limit a message will appear on the screen showing which limit has been exceeded and how many times this has happened.

Wide Signal Measurement Range

The 50 ohm input on 2399 can accept signals between +30 dBm and -110 dBm while providing protection up to 50 Vdc.

Semi-Automated Measurements

The MMI on 2399 has been designed to simplify many of the measurements required for the evaluation of today's sophisticated communications systems. These include Adjacent Channel Power, X dB Down, Occupied Bandwidth, Channel Power, Harmonic Distortion.
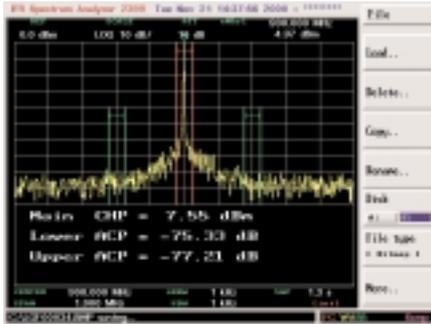
Adjacent Channel Power
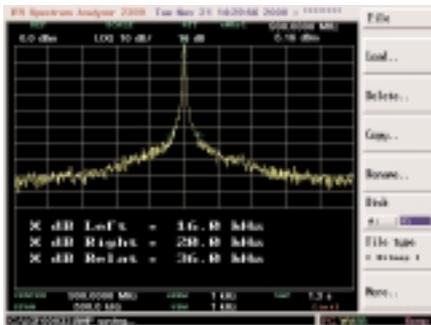
X dB down
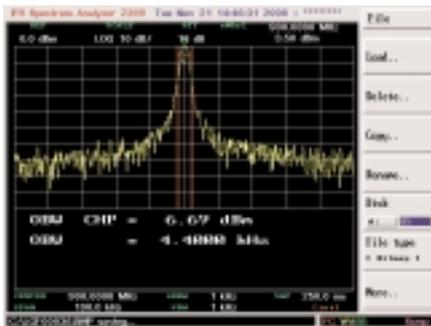
Occupied Bandwidth
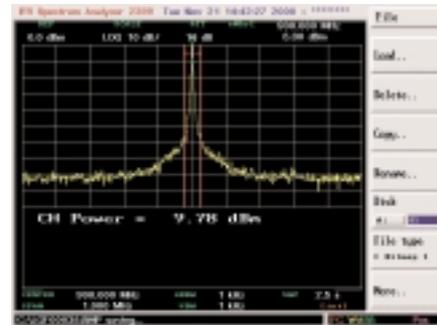
Channel Power
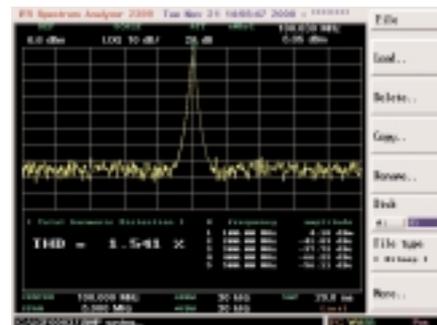
Harmonic Distortion

Auto Tune Function

Use of this function allows an unknown signal to be quickly captured and displayed on the screen. The 2399 will search its complete frequency range for the highest level signal, capture it, display it in the center of the screen with both the span and resolution bandwidths being automatically set to the optimal state for best viewing.

Spectral Purity

The phase noise on 2399 is specified at -90 dBc at 10 kHz offset which allows its use for evaluating the spectral purity and noise performance of systems and sub-systems.

Signal Demodulation

Demodulation of both AM and FM signals allows full testing on a wide range of communications systems. The demodulated signal can be viewed on the screen and is also available on the internal loudspeaker and on headphones via a connector on the front panel. The fm peak deviation and am modulation depth can be measured using the markers provided in 2399.

Information Storage

The 2399 is provided with the capability of internally storing up to 1,000 screen traces and 2,000 operational states. The spectrum analyzer is also fitted with a 3.5 inch FDD for bulk storage.

Interfaces

IEEE 488-2, RS-232 and Printer (PCL5) interfaces are provided as standard on 2399 allowing its integration into automated test systems and the print out of screen displays.

The 2399 has been designed with future flexibility and expansion in mind. The operating system and system memory has the capability to have additional facilities incorporated.

Specification

Frequency

Tuning Range

9 kHz to 2.9 GHz

Resolution

1 Hz

Frequency Span

100 Hz/div to 290 MHz/div in 1, 2, 5 step selections (auto selected)

Zero span and Full span (9 kHz to 2.9 GHz)

Manual selection of Start, Stop and Span

Span Accuracy

±3% of indicated span width

Readout Accuracy

± (Span Accuracy + Frequency Standard Accuracy + 50% of RBW)

Stability

Residual FM <100 Hz p-p at 1 kHz RBW, 1 kHz VBW, (p-p in 20 ms)

Noise Sidebands

-90 dBc/Hz at 10 kHz offset measured at 2.9 GHz

Frequency Counter

Resolution

1 Hz, 10 Hz, 100 Hz and 1 kHz

Accuracy

±(Reference frequency error + frequency readout accuracy + counter resolution ± 1 count)

Sensitivity

-70 dBm from 50 kHz to 2.9 GHz

Amplitude

Measurement Range

+30 dBm to -110 dBm

DANL

50 kHz to 100 kHz ≤ -95 dBm, typically -105 dBm

100 kHz to 2.9 GHz ≤ -105 dBm, typically -115 dBm

300 Hz RBW, 10 Hz VBW

Compression Point

-10 dBm minimum for 1 dB gain compression 100 kHz to 2.9 GHz at 0 dB attenuation

Displayed Range

100 dB in 10 dB/div log scale, 50 dB in 5 dB/div log scale

20 dB in 2 dB/div log scale, 10 dB in 1 dB/div log scale

10 divisions with linear amplitude scale

Amplitude Units

Log scale mode dBm and dBmV.

Linear scale mode V (μV, mV, etc.) or dBV (dBmV only)

Quasi Peak mode dBμV, dBmV or dBm

Display Linearity

5 and 10 dB/div, ±0.15 dB/dB, ≤ ± 1.5 dB over 10 divisions

1 and 2 dB/div, ±0.5 dB over 10 divisions

Linear, ± 10 % of Reference Level over 10 divisions

Frequency Response

±1.5 dB from 10 MHz to 2.9 GHz and ± 2 dB from 9 kHz to 10 MHz with 10 dB RF attenuation

Attenuator

Range

0 dB to 50 dB in 10 dB steps selected manually or automatically coupled to the Reference Level

Accuracy

±0.5 dB/step up to a 1.5 dB maximum

Reference Level

Range

-110 dBm to +30 dBm with 1 kHz filter using 1 dB/div scale

Accuracy

±1.5 dB (50 kHz to 2.9 GHz)

Resolution

0.1 dB steps

Residual Spurious

≤-85 dBm with input terminated and 0 dB attenuation

Harmonic Distortion

≤-60 dBc -40 dBm input at 0 dB attenuation

Intermodulation

≤-60 dBc 100 MHz to 2.9 GHz at -30 dBm input

Other Spurious

≤-60 dBc 10 MHz to 2.9 GHz at -30 dBm

Resolution Bandwith

RBW Selection

300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz

Accuracy

±20%

Selectivity

60 dB/3 dB ratio <15:1

Except 3 MHz filter 50 dB/3 dB ratio <15:1

60 dB/6 dB ratio <12:1 for 9 kHz and 120 kHz Quasi Peak filters

Switching Error

±1.0 dB

Video Selection

10 Hz to 1 MHz in 1-3-10 sequence and Full Bandwidth

Sweep

Rate

50 ms to 1000 s in 1-2-5 sequence, 25 μs to 20 s in Zero Span

Accuracy

20% for <100 ms, 10 % for all other sweep rates

Trigger Source

External, Line, Video, Free run

Trigger Modes

Continuous, Single

TRIGGER LEVEL

Internal Trigger

Adjustable over 10 divisions

External Trigger

TTL Level

Delay

± One sweep time

Display

Type

6.4 inch TFT Colour LCD

Digital Resolution

640 H x 480 V active display area

Markers

Number

Up to 9 colored Markers available with 9 Delta Markers

Modes

Normal, Delta, Peak Search, Peak Track, 1/Delta, Marker Track, Marker to Center, Marker to Reference

All Markers to peak

Marker

Marker track

Marker to center

Marker to reference

Marker to peak

Memory

Trace storage

Up to 1,000 stored traces stored internally

Setup Storage

Up to 2,000 operational states stored internally

External

3.5 inch FDD for bulk storage

Display Traces

2 maximum

Inputs

RF Input

Type "N" 50 ohm female connector

Input VSWR

<1.5:1 from 150 kHz to 2.9 GHz with 10 dB attenuation

Maximum Input

+30 dBm with 30 dB attenuation, 50 Vdc

LO Emissions

≤ -70 dBm with 10 dB attenuation

Outputs

IF Output

10.7 MHz nominal

Video Output

0 to 5 Vdc

VGA output

Printer Drivers

PCL5 compatible via standard 25 pin female D-Sub Parallel Printer

Probe Power

+15 V, -12 V and Ground

Frequency Standard

Frequency

10 MHz

Output Level

+5 dBm nominal

Stability

±1 ppm/year or ± 0.1 ppm/year with High Stability Option

Connector

BNC female

External Input

-5 dBm to +15 dBm

Interfaces

GPIB

Conforms to IEEE 488.1 – 1987, 488.2 – 1992

Subsets

SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, C0, LE0, TE0

RS-232C

Full Duplex

Baud Rate

110 bps, 300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps,

19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps

Parity Check

Odd, Even or None

Data Length

7 bit or 8 bit selectable

Stop Bits

1 bit or 2 bit

Protocol

None, Xon-Xoff, RTS-CTS, DTR-DSR

Environmental

Operating

0 to 40°C

Storage

-20 to +70°C

Temperature & Humidity

Meets MIL-T-28800E for Type 2, Class 5, non-condensing (85 % operating, 90 % storage)

Vibration/Shock

Meets MIL-T-28800E for Type 2, Class 5

Altitude

Operational up to 3,000 metres, non-operational to 12,200 metres

Product Safety

Conforms to EN61010-1 for Class 1 portable equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an Installation Category II

Electromagnetic Compatability

Complies with the limits specified in the following standards:

EN 55011: Class A and EN 50082-1

General Characteristics

DIMENSIONS

Width

350 mm (13.78 in) including handle

Height

185 mm (7.28 in)

Depth

381 mm (15 in)

Weight

9.4 kg

Warm-up Time

15 minutes for specified accuracy

Power Requirements

Voltage

100 to 240 Vac ± 10 %

Frequency

50-60 Hz

Power Consumption

90 W maximum without options fitted

Options

TRACKING GENERATOR

Frequency Range

100 kHz to 2.9 GHz

Output Level

0 dBm to -70 dBm

Output Level resolution

0.1 dB step

Absolute Level Accuracy

≤±1.0 dB at 0 dB

Frequency Flatness

≤2.0 dB @ -10 dBm

Spurious

Harmonic Level	≤-15 dBc
Non-harmonic Level	≤-30 dBc
Sub-harmonics	≤-25 dBc

Leakage

≤-90 dBm

Quasi-Peak (Option)

Quasi-Peak detector and EMC filters

	Band B 9 kHz RBW	Band C 120 kHz RBW
Frequency Range	150 kHz to 30 MHz	30 MHz to 1 GHz
Charge Time (ms)	1 ±20%	1 ±20%
Discharge Time (ms)	160 ±20%	550 ±20%
Display Time (ms)	160 ±20%	100 ±20%

HIGH STABILITY TIMEBASE

Temperature Stability

± 0.2 ppm

Ageing Rate

±0.2 ppm/year

Versions and Accessories

When ordering please quote the full ordering number information.

Ordering Numbers
Versions

2399-00	9 kHz to 2.9 GHz basic spectrum analyzer
2399-01	2399-00 with tracking generator
2399-02	2399-00 with quasi-peak detector and high stability time base

Supplied Accessories

Front cover

Operator's manual

Program manual

AC supply lead

RS-232 cable

2 x 250 V, 3.15 A fuses

Soft carry case

Optional Accessories

	Maintenance manual
AC2621	Rack Mount kit
59999/170	Return loss bridge
AC4250	50 Ω N to 75 Ω BNC
AC5008	DC block N type
AC8700	UHF antenna
AC2601	Soft carry case

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