AIM & THURLBY THANDAR INSTRUMENTS

PSA1302 & PSA2702



PSA Series II portable RF Spectrum Analyzers, 1.3GHz and 2.7GHz

Big on performance, small on size and cost

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PSA Series II RF Spectrum Analyzers

Big on performance
Small on size and cost



PSA1302 - 1.3GHz
PSA2702 - 2.7GHz

The PSA Series II is unlike any other RF spectrum analyzer.

It builds upon the success of the PSA-T series in offering a lightweight and truly handheld instrument that incorporates an extensive feature set. An improved user interface is combined with many new hardware and software features and a ruggedized casing.

Genuinely hand-held

The PSA Series II is sufficiently small and lightweight to fit comfortably into the hand - unlike most other so-called handheld spectrum analyzers.

A removable screen protector and sun-shield combines with rubberised buffers top and bottom to enhance its use in the field.

High resolution colour display

The 4.3" TFT display provides a wealth of detailed information. Colour is used to clearly distinguish between multiple traces, markers and limit lines.

The touch-screen uses a three row hierarchical menu system to provide fast and intuitive control of the many functions.

Battery operation of more than 8 hours

The PSA Series II operates from a Li-ion rechargeable battery that can provide more than eight hours of continuous operation.

If switched off to conserve power, it returns to normal operation within two seconds of switch-on with all data retained. It can also be set to switch off automatically after a set time from the last action.

For continuous bench top operation it can be powered from its AC adaptor which also recharges the batteries in less than 3 hours.

Unlimited data storage

With nearly 2GB of internal memory, the PSA Series II can store thousands of waveforms, instrument set-ups, or complete screen images.

With option U01 installed, it can also log tens of thousands of results and make use of compensation tables and limit patterns.

All files can be saved with either default file names or with user defined names using the alpha-numeric keypad.

USB Flash drives can be used to copy and backup data, or transfer it to a PC for analysis. Alternatively a USB device interface is included for direct connection to a PC for file transfer.

A big feature set in a small instrument

The PSA Series II incorporates the features most needed in a portable spectrum analyzer.

- **1MHz to 1300MHz or 2700MHz frequency range**
- **Resolution bandwidths of 1MHz, 280kHz or 15kHz**
- **-96dBm typical noise floor at -20dBm reference level**
- **Measurement in dBm or dBµV, mV or µW**
- **Zero span mode with AM and FM audio demodulation**
- **Trace modes of normal, peak hold and trace average**
- **Live, View and Reference traces in contrasting colours**
- **Twin markers with readout of absolute & difference values**
- **Smart marker movement with selectable peak tracking**
- **Frequency presets and independent state storage**
- **Auto-find automatically sets sweep parameters for the highest signal found**
- **Unlimited storage for waveforms, set-ups and screens**
- **User assignable file names, file stamping from real-time clock**
- **USB interfaces for Flash drives and PC connection**
- **Comprehensive status and context sensitive help screens**
- **More than 8 hours continuous operation from a charge**
- **Smaller and lighter than other spectrum analyzers (weight only 0.56 kg)**

Option U01 adds:

- **Limit lines and limit patterns with limits comparator**
- **Data logging of peak values, complete traces or screen images from timer, external trigger or limits comparator**
- **Sweep triggering from external trigger or limits comparator**
- **Compensation tables, fixed offsets and 75Ω compensation**
- **Capability to show screen contents on a PC**

The size a hand-held instrument should be !

Ruggedised casing

The casing of the PSA Series II includes rubberised buffers top and bottom to help resist knocks and scratches.

The tilt stand can be moved to the top of the instrument to act as a screen protector when in transit.

In this mode it can also act as a sun-shield when in the field.

Comfortable to hold

With a width of only 92mm (3.6”) and a weight of only 560 grams (20 oz) the PSA fits comfortably into the hand.

Touch-screen or hard-key control

The instrument is normally operated using its touch screen.

The three-row hierarchical menu system provides rapid intuitive access to all functions .

Additional hard keys are provided for marker movement and for shortcuts to major functions.

Alternatively, all of the functions can be operated with just the hard keys by using the five way navigator in a tab-enter-jog mode.

Instant On

On pressing the power button, the instrument comes to life almost instantly, with the first sweep available in under 2 seconds.



Actual size

See more detail

The large TFT display of the PSA Series II shows a wealth of information.

It makes use of colour to clearly distinguish the traces (live, view and reference) from the markers, limit lines and graticule.

Detailed set-up information is shown above the graticule with marker readout and further status below.

Context-sensitive help

The PSA Series II incorporates extensive on-screen help information.

This can be automatically selected to relate to the current menu hierarchy.

Full status display

Instant access is provided to a multi-page status screen that shows the complete status of the instrument including detailed system information.

Connectivity

In addition to the RF input, the analyzer includes connectors for DC power, USB host, USB device, trigger in/out, and audio out.

Built-in loudspeaker

Audio de-modulation can be accessed via the built-in speaker or external phones.

Transfer files to PC

A USB host connector enables USB Flash drives to be connected for additional storage or for cable-less file transfers.

A USB device connector is also provided which enables direct connection to a PC for bi-directional file transfer.



True portability

A genuinely hand-held instrument

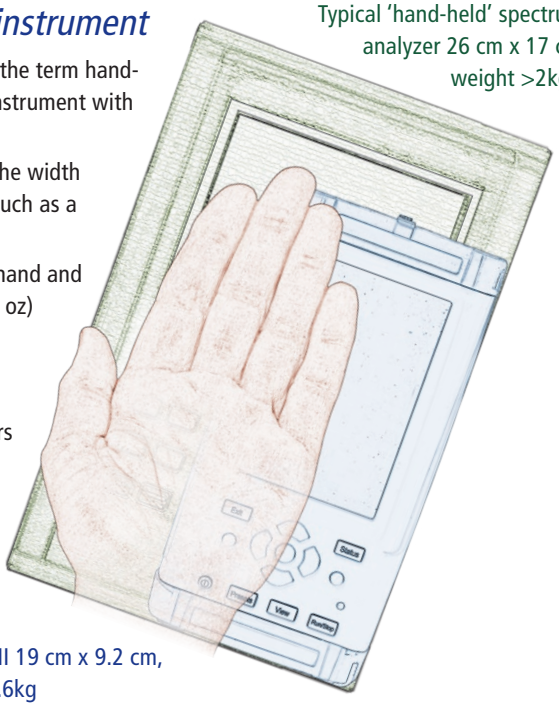
Some manufacturers have stretched the term hand-held to cover any battery powered instrument with a 'flat' format.

Some of these are more than twice the width of an average hand, and weigh as much as a brick. Not so the PSA Series II.

The small size fits perfectly into the hand and the low weight of only 560 grms (20 oz) allows it to be carried anywhere.

Instant availability

Unlike some other spectrum analyzers which can take up to a minute to initialise, the PSA Series II starts instantly, with the first sweep available in less than two seconds from switching on.



Typical 'hand-held' spectrum analyzer 26 cm x 17 cm, weight >2kg

PSA Series II 19 cm x 9.2 cm, weight < 0.6kg

Around one third of the size and one quarter of the weight !

Screen Protector and Sun Shield

When on the move and operating out of doors, the tilt stand can be un-clipped from the back of the instrument and attached at the front.

This protects the screen during transport, and can act as a sun shield when viewing conditions are difficult.

When no longer required it can be re-attached to the rear where it stows out of the way until needed.



Equally at home on the bench

The PSA Series II will find plenty of applications on the bench as well as in the field.

It's low cost enables every engineer to have access to a spectrum analyzer whenever they need one.

For continuous bench-top operation, the supplied AC line adaptor powers the instrument as well as charging it.

The rigid tilt stand angles the instrument at about 40 degrees to the horizontal.



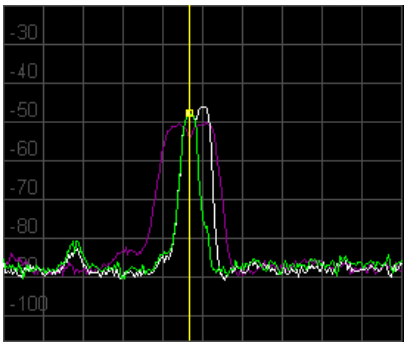


The PSA Series II can be used vertically, as well as horizontally or on its tilt stand.

Packed with features

Live, View and Reference traces

A view trace and reference trace can be displayed in addition to the live trace using contrasting colours for clarity.



Any number of traces can be saved to memory and rapidly recalled to the screen.

Trace states are saved in addition to the traces and can be recalled separately.

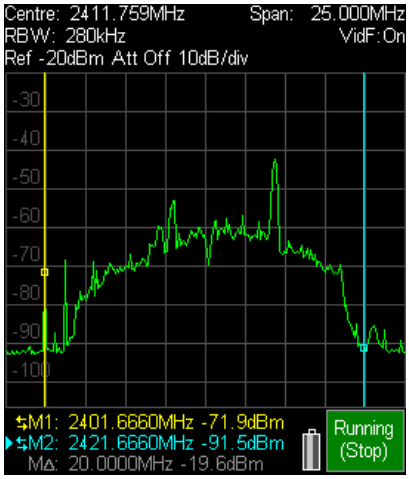
Smart marker movement

Dual markers provide an on-screen readout of frequency and level including difference values.

The markers can be set to specified frequency values, scrolled across the screen, or set to automatically find peaks.

A peak tracking mode is also provided which will track the highest peak in the sweep despite changing frequency.

Marker amplitude readout can be in graticule units (dBm or dBµV) or in linear units (mV or µW).



Vertical expansion

The vertical resolution of 10dB per division can be expanded to 5dB, 2dB or 1dB with panning over the full dynamic range.

Trace write modes

Normal	Average	Peak Hold

In addition to the normal mode, the trace can be set to display Peak-hold, or a Multi-sweep Average.

Zero span audio demodulation

The PSA Series II includes a zero span mode with both AM or FM audio demodulation.

The audio signal, with variable volume and selectable low-pass filter, is available from the built-in loudspeaker or from a standard 3.5mm jack socket.

			FM	Filter On
			AM	Filter Off
			Off	Exit
Exit Z-Span	Demod		Volume Down	Volume Up

Context sensitive help

Context sensitive help is available for every menu, along with a full topics list of help information.

Intuitive menu system

Ease of use was a major consideration in the design of the PSA Series II.

Freq / Span	Sweep / BW	Level / Limits	Traces / Markers	Setup / Functions
Centre	Span	Start / Stop	Step Size	Freq Presets
Set Step	Auto Span/10	Set to MΔ	Set to Centre	Set to M1

The menu system provides rapid access to five menu groups, each of which has up to five sub menus, each with their own function keys.

Function keys perform direct actions or create pop-up menus or dialogue boxes. Frequencies can be set by direct numeric entry, or by a digit increment system.

Centre, Start and Stop can be stepped by any chosen increment. Span can be zoomed in a 1-2-5 sequence.

Single key shortcuts include Set to Peak, Set to Marker and Set between Markers (Start=M1, Stop=M2).

Set Centre Freq (MHz)	2415.364			Toggle Last
1	2	3	←	Exit / Cancel
4	5	6	.	OK
7	8	9	0	OK & Exit

Frequency presets enable fast changes between frequently used sweep ranges.

Extensive data storage

The PSA Series II can store almost unlimited amounts of data using its 1.8GB of internal memory supplemented, if necessary, by USB Flash drives.

The filing system can store trace and state files, screen images, set-up files, logging files*, limit patterns* and compensation tables*.

All-files List: ▸ 0002 of 0055 files			Files
Name	Date	Time	Latest Files
TRACE009	22-06-12	16:02	
▸ FAULT-01	10-07-12	16:50	Find A-Z
FAULT-02	10-07-12	17:02	
TRACE010	16-07-12	14:40	
TRACE011	16-07-12	14:40	

Recall Trace	Trace & State	Trace Only	State Only	Screen Image
Recall Next	Recall Prev.	Recall File		Exit

Files are stored under either default file names, or user-chosen file names entered from an alpha-numeric keypad.

Files are time-stamped from the real-time clock, and can be listed by date or name.

The illustration is a truncated version of the real screen image which can list 20 files simultaneously. Each directory can contain up to 999 files..

*Logging files, limit patterns and compensation tables are only available with Option U01 - see next page.

Data export and transfer

USB device and host connectors are provided enabling the PSA Series II to be linked directly to a PC for file transfer, and for the connection of USB Flash drives for data transfer or storage.

Trace files have a standard comma separated value (.csv) format which can be imported into other applications such as Excel or MathCad.

Screen images are stored as standard bit-maps that can be manipulated and printed using a PC as well as being recalled to the PSA screen.

Full Status display

In addition to the extensive on-screen status information, a single button press reveals the complete set-up of the instrument as a screen listing.

All settings are retained when at power-down, and any number of set-up files can be stored under automatic or user names.

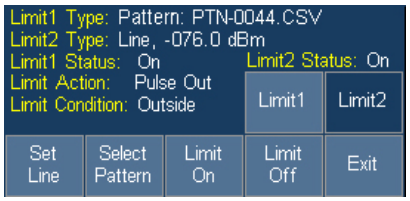
Further features with option U01

Option U01 is a firmware upgrade that increases the capabilities of the PSA1302 or PSA2702 to include the following features (marked with *).

*Triggered sweep**

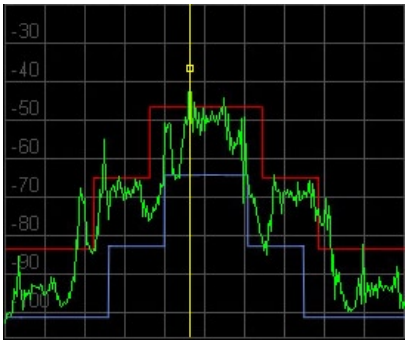
The standard sweep modes of continuous repeat and single shot can be extended to include triggered sweeps from an external signal or internal limits comparison.

*Limit patterns and limits comparator**



Limit lines and patterns can be defined which can be simply visual aids or create automatic actions. Zone restriction can be applied.

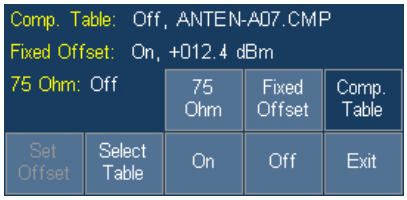
A single or dual line limits comparator can be used to generate audible warnings, output signals, or to freeze or log the trace.



*Offsets and Compensation Tables**

The reference level, graticule and marker readouts can be set to compensate for external attenuation or gain to a resolution of 0.1dB.

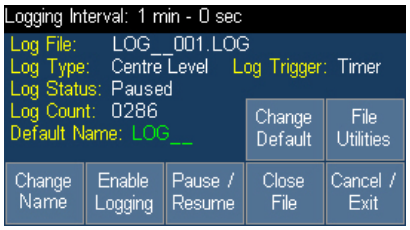
Compensation can also be added for signals emanating from a 75Ω source.



Tables can be loaded that compensate for variations of level with frequency for specific antennae or transducers. The tables can contain up to 100 points and are linearly interpolated between points.

*Data Logging**

The PSA Series II can log results in response to a variety of stimuli. Data is stored as files that can be transferred to a PC for analysis using PSA-Manager software.



The data stored can be the peak level, centre frequency level, the whole trace, or a bitmap screen image. Each file can contain up to 25,000 entries.

The 1.8GB of internal memory enables vast amounts of data to be stored.

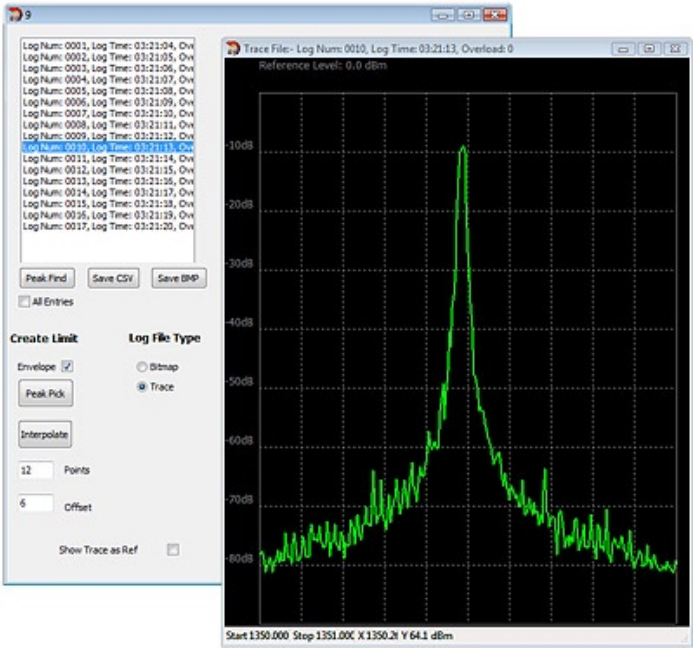
Logging entries can be created by an internal timer (adjustable from seconds up to hours), the manual trigger key, the external trigger input, or the limits comparator.

*View on PC**

View on PC enables the screen of the spectrum analyzer to be sent to a PC by USB. The screen image can be set to a user definable size and is particularly useful for education and training purposes.

PSA-Manager Software

PSA Manager is a Windows* based program that provides additional capabilities for the PSA Series II. It is available free of charge.



It can display trace files, and can back up and manage set-up files and other parameters into project folders.

However, its more sophisticated capabilities are apparent when option U01 is installed within the instrument. It can be used to create limit pattern and compensation table files, using numeric editing, import from .csv files, or its graphical editor. Log files created within the instrument can be viewed and analyzed.

Options & Accessories

A number of options and accessories are available. Further items may be added in future, check the web site for up to date information.

Firmware Upgrade U01

Option U01 is a firmware upgrade that can be purchased and installed by the user at any time. It increases the capabilities of the PSA1302 or PSA2702 to include those detailed earlier on this page and marked *.

Order code: PSA-U01

Note: Option U01 is pre-installed within the PSA1302USC and PSA2702USC products.

Telescopic Antenna

This wideband antenna is intended for general purpose applications where absolute measurements of field strength are not required.

The antenna is a high quality unit with a knuckle joint hinge terminating with an SMA connector suitable for direct connection to the instrument.

The length is adjustable between 7.5cm and 35cm. The useful bandwidth is specified by the manufacturer as 30MHz to 1.8GHz. The resonant frequency as a quarter wave mono-pole is adjustable between approximately 200MHz and 1.0GHz.



Order Code: WB-ANT

Note: The antenna is included within the PSA1302USC and PSA2702USC products.

Vehicle Charger

A vehicle charger operating from either 12V or 24V supplies is available. It is capable of both recharging and operating the spectrum analyzer.

Order Code : PSA-VC

Note: The charger is included within the PSA1302USC and PSA2702USC products.

Travel Case

This soft fitted case is strongly made and offers high impact resilience. It provides protection for the PSA1302 or PSA2702 when in transit, and has storage space for the power adaptor, cables, and other accessories.

Order code: PSA2-SC

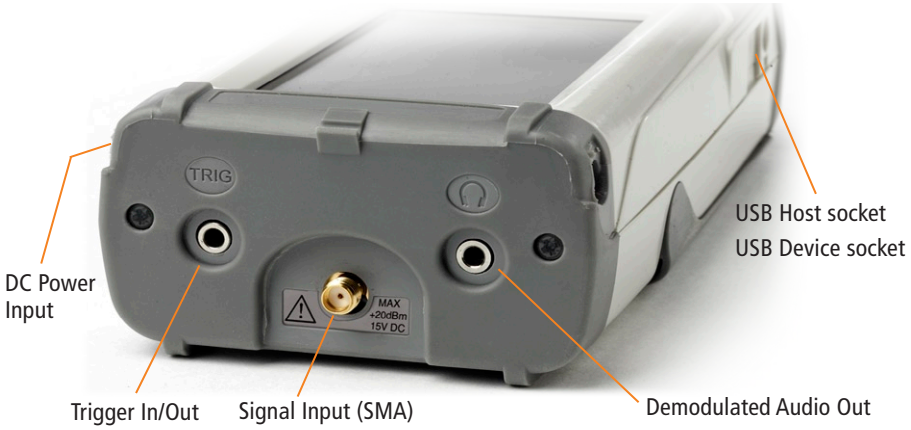
Note: The case is included within the PSA1302USC and PSA2702USC products - see illustration below.

USC versions

The PSA1302USC and PSA2702USC are extended versions of the product that include the firmware upgrade (U01), the travel case, telescopic antenna and car charger.



The firmware upgrade is pre-installed and all of the accessories, including the antenna and car charger, are supplied within the fitted case.



Product Applications

Traditional RF Field Measurements

The PSA Series II will find many applications within traditional radio communication field environments such as:

- Antenna Alignment
- Signal Strength Mapping
- Interference Analysis
- Covert Transmitter Detection
- Spurious Emissions

EMC Evaluations

The wide span of the PSA Series II makes it suitable for investigation of equipment emissions for compliance with EMC requirements relating to CE or FCC approvals.

- Emission Frequency Evaluations
- Comparative Emission Measurements

Product Development & Servicing

The PSA Series II is as suited to bench-top RF work as to field work. Typical uses include:

- RF Amplifier Block Design
- Oscillator and Mixer Design
- Power Measurements
- Impedance Matching Measurement
- IF Section Alignment

RFID Measurements

- Site Evaluations
- Transmitted Power Measurements

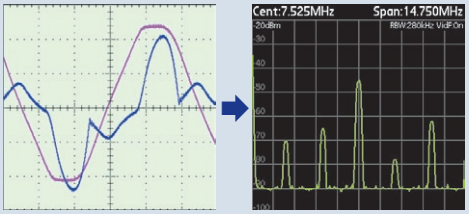
Frequency Domain Evaluation

The low cost of the PSA Series II provides every engineer with the potential to own a spectrum analyzer, whether they work in the RF field or not.

Observing signals in the frequency domain often provides information that can not be seen by looking in the time domain using an oscilloscope.

Typical uses include:

- Harmonic Distortion Measurement
- Filter Evaluations
- Clock Signal Integrity Checks
- Spurious Signal Identification
- HF Stability Analysis



Supplied Items

Standard Product

PSA1302 or PSA2702 spectrum analyzer.
Universal voltage mains adaptor/ charger.
USB connection lead.
Spare stylus.
BNC converter for trigger input.
Multi-language Short Guide.
Full users manual (English only).
Support CD containing PDF versions of manuals and support software.

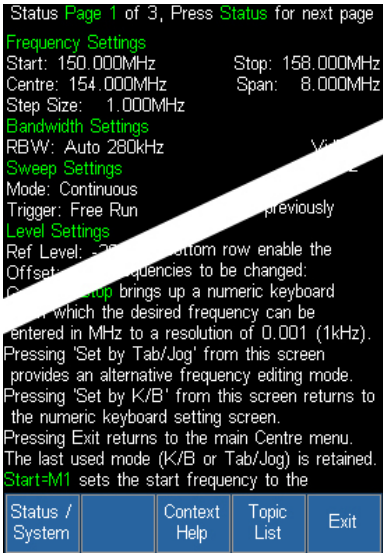
USC Product

All of the 'standard product' items are supplied plus the following:

Firmware Upgrade U01 (installed)
Telescopic Antenna WB-ANT
Vehicle Charger PSA-VC
Travel Case PSA2-SC

The complete status of the instrument can be read using the Status key.

Context Help is instantly available for each menu function from Status/Help.



Technical Specifications - PSA1302 & PSA2702

FREQUENCY MEASUREMENT

Frequency Span

Frequency Range: 1 MHz to 1300 MHz (PSA1302)
1 MHz to 2700 MHz (PSA2702)
Setting Modes: Centre frequency plus Span, or Start plus Stop frequencies
Maximum Span: 1299 MHz (PSA1302)
2699 MHz (PSA2702)
Minimum Span: 270 kHz, or Zero Span with demodulation
Set. Resolution: 1 kHz at any frequency
Setting Accuracy: Reference Frequency Accuracy for Start, Stop & Centre (Zero-Span) frequencies

Reference Frequency Accuracy

Initial Accuracy: Better than ± 10 ppm at 20 °C
Stability: Better than ± 10 ppm over 10 °C to 30 °C
Ageing: Better than ± 3 ppm per year

Phase Noise

Phase Noise: Phase noise at 100kHz offset at 500MHz typically -90dBc/Hz

Resolution Bandwidth

RBW: Selectable 1 MHz, 280 kHz, or 15 kHz
Video Filtering: Selectable independently of RBW setting

Markers

No. of Markers: One, Two (or None)
Resolution: 0.1 kHz at all frequencies
Marker Accuracy: 1/270th of Span ± 0.1kHz plus reference frequency accuracy.
Readout: The frequencies at the marker points and the frequency difference are displayed

AMPLITUDE MEASUREMENT

Amplitude Range

Units: Selectable as dBm or dBµV
Display Range: 85 dB from reference level
Magnification: x2, x5 or x10
Reference Level: Selectable as -20 dBm or 0 dBm (87 dBµV or 107 dBµV)

Amplitude Accuracy

Calibration Level
Accuracy: Better than ± 1 dB at 10dB below ref. level @ 50MHz (20°C ± 5°C)
Flatness: Better than ± 1.5 dB over the range
1 MHz to 1300 MHz (PSA1302)
1 MHz to 2700 MHz (PSA2702)
Linearity: Better than ± 1 dB over 50dB from the reference level
Noise Floor: Better than -93 dBm average displayed noise floor (typically -96 dBm) (reference level = -20 dBm, RBW = 15 kHz)

Distortion and Spurii

3rd Order Intermodulation:
< –60dBc for two signals at 10dB below reference level, (500MHz and 502MHz)
Harmonic:
< –60dBc at 10dB below reference level (100MHz)
1st & 2nd Image:
<– 55dBc, typically <– 60dBc
Residual Spurii:
better than 3dB above noise floor

Markers

No. of Markers: One, Two (or None)
Resolution: 0.1 dB
Readout: The level at the marker points and difference are displayed.

SIGNAL INPUT

Input Connector: SMA connector, 50 Ω
VSWR: 1.5 : 1 typical
Maximum Level: + 20 dBm, (127 dBµV); 15V DC

SWEEP

Sweep Method:
Peak detection for 270 points per sweep. The amplitude and frequency of the peak level found within each sub-span is stored (sub-span = span/270).
Sweep Time:
Set automatically by Span and RBW.
Sweep Modes:
Repeat (continuous) or Single Shot
Trace Writing Modes:
Normal (overwrite), Peak Hold, Average (2 to 48 sweeps).

DEMODULATION (Zero Span mode)

Demod. Modes: AM or FM
Display: Carrier amplitude only (horizontal line).
Audio: Internal loudspeaker.
Audio Out: 30 mW into 32 Ω mono or stereo headphones, adjustable volume, 3.5mm jack socket
Audio Filter: Switchable 3kHz Low Pass Filter.

DISPLAY

Display Type: 4.3 inch (10.9 cm) backlit TFT LCD, 480 x 272 pixels total, 16 colours, touch screen.
Trace Area: 232 x 272 pixels.
Graticule: 8.5 x 10 divisions, light grey graticule.
Displayed Points: 271 points per sweep (peak detected).
Live Trace: Dot-joined trace from current sweep.
View Trace: Buffered "instance" of the live trace.
Reference Trace: Stored trace recalled from a trace file.

MEMORY STORAGE

Internal Disk:
1.8GB of internal memory.
External Storage:
USB host interface for removable USB Flash drives.
Store Trace:
Up to 999 traces can be stored under either default file names or user entered file names. Traces are stored as tables of amplitude versus frequency and can be imported into other programs, as well as being recalled to the screen.
Recall Trace:
Recalls any stored trace to the reference trace of the display.
Store Set-up:
Up to 999 instrument set-ups can be stored under either default file names or user entered file names. All settings of the instrument are saved.
Recall Set-up:
Recalls any stored set-up, overwriting the existing settings of the instrument.
Store Screen:
This function copies the whole screen area to memory as a bit-map. Up to 999 screens can be stored under either default file names or user entered file names.
Recall Screen:
Recalls any stored screen as an image.

CONNECTORS

RF Input: Standard SMA connector.
DC Power: 1.3 mm power socket for external power supply/charger
USB Host: Standard USB type A connector for connection of USB Flash drives.
USB Device: Mini USB connector for connection to a PC.
Audio Out: 3.5 mm jack socket for demodulated audio out (accepts mono or stereo plugs).
Trigger In/Out: For use with option U01 only.

POWER SOURCES

Battery

Battery Type: Li-ion 3.7V 3000mA-hr
Battery Life: Typically greater than 8 hours continuous
Recharge Time: < 3 hours from fully discharged
Auto Off Mode:
To conserve battery life, the system can be set to automatically switch off after a defined time from the last key press. This can be set between 5 mins and 60 mins (or never).
Battery Status: Multi-segment battery status indicator.

AC Line Operation/Charging

The instruments can be operated continuously from mains power using the AC line adaptor provided. This powers and recharges the instrument simultaneously.
Voltage Range: 100V to 240V nominal 50Hz/60Hz

MECHANICAL

Size: 192mm high x 92mm wide x 49mm deep
Weight: 560 grms.
Tilt Stand:
Built-in tilt stand for bench use which angles the unit at approx. 40 degrees to the horizontal.
Stylus: Casing incorporates plug-in stylus.

ENVIRONMENTAL AND SAFETY

Operating Range: +5°C to + 40°C, 20% to 80% RH.
Storage Range: -10°C to +50°C
Environmental: Indoor use at altitudes to 2000m, Pollution Degree 2.
Electrical Safety: Complies with EN61010-1.
EMC: Complies with EN61326.

OPTION U01

Option U01 is a firmware upgrade that provides additional capabilities as follows:

Limit Lines and Patterns

Limits: Up to two limits can be displayed together. Lines are defined by dB value, Patterns are created as files by PSA-Manager and loaded from memory (999 files maximum).
Comparator: Comparison of trace or trace segment with limits (above/below/between/outside) can generate trigger signal, pulse, or audio alert.

Data Logging

Data Types: Peak level, Centre Level, Full Trace or Screen Image.
Data Entries: Up to 25,000 entries per file (2500 for Images).
Trigger Source: Entries can be made in response to Manual Trigger key, External Trigger, Internal Timer (2s to 100m per entry) or Limits Comparator.

Sweep Trigger

Source: External Trigger or Limits Comparator.

Offsets and Compensation Tables

Fixed Offsets: Compensation for external gain or attenuation from -50.0dB to +50.0dB.
75 Ohm: Compensation for signals from a 75Ω source.
Tables: Compensation for variations of level with frequency for antennae or transducers. Tables are created as files by PSA-Manager and loaded from memory (999 files maximum).

View on PC

Enables the screen of the spectrum analyzer to be sent to a PC via USB and displayed at a user-defined size.

OPTIONS

Optional Items

Firmware Upgrade: PSA-U01
Transit Case: PSA2-SC
Telescopic antenna: WB-ANT
Vehicle Charger: PSA-VC

For a full list of optional items available for the PSA Series II, please contact Aim-TTi or visit: **www.aimtti.com/psa**

Thurlby Thandar Instruments Ltd. operates a policy of continuous product development and reserves the right to alter specifications without notice.

Designed and built in Europe by:

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