T T i

THURLBY THANDAR INSTRUMENTS

PSA1301T

Cent:933.000MHz   Span:0.781MHz
-20dBm   RBW:15kHz VidF:On
-30
-40
-50
-60
-70
-80
-90
-100
M1:932.9487MHz -39.1dB
Sweep:Average 10/16   Atten:Off   RUN

| Mode | Centre | Span | Level | Markrs |
| Sweep | Traces | Stores | System | Exit |

Back   Help   Navigate   Run   Stop

T T i
PSA1301T
1.3GHz RF Spectrum Analyzer

Portable 1.3GHz RF Spectrum Analyzer

Big on performance

Small on size and cost

PSA1301T - 1.3GHz RF Spectrum Analyzer

Big on performance
Small on size and cost

The PSA1301T is an entirely new type of instrument.

It utilises the power of a handheld computer* to provide a level of performance that was previously impossible for an instrument of this small size and low cost.

* The PSA1301T incorporates a model T|X handheld computer from Palm For more details visit www.palm.com

A fully integrated instrument

The PSA1301T incorporates the handheld computer within its housing to create a single integrated instrument.

The unit is very compact and lightweight. It fits easily into the hand and takes up very little room within a toolkit.

Access to the USB port of the handheld is provided within the body of the instrument, and all of the functionality of the handheld computer is retained.

High resolution display

The Palm T|X handheld used with the PSA1301T has a high brightness 3.7" (9.5 cm) TFT screen capable of displaying 65,000 colours.

Despite it's small size it has a resolution of 320 x 480 pixels (half VGA), giving it twice the total pixels of the quarter VGA displays used by many bench-top instruments.

The graticule area of 320 x 300 pixels compares with a figure of 260 x 200 for a typical spectrum analyzer.

This allows the PSA1301T to show more sample points at a higher vertical resolution.

Extended battery operation

The PSA1301T operates from rechargeable batteries that can provide more than four hours of continuous operation.

To conserve battery life, it can be turned on or off by a single key press. The unit can also be set to switch off automatically after a set time from the last action.

For continuous bench top operation it can be operated from its AC adaptor which also recharges the batteries in less than 4 hours.

Unlimited data storage

By its use of interchangeable flash memory cards, the PSA1301T can store thousands of waveforms, instrument set-ups, or complete screen images.

Waveforms, set-ups and screens can be saved with either default file names or with user defined names using the alpha-numeric keypad.

A big feature set in a small instrument

The PSA1301T incorporates the features most needed in a portable spectrum analyzer, along with many additional functions provided within the handheld computer.

- ▶ **150kHz to 1300MHz frequency range**
- ▶ **Resolution bandwidths of 280kHz or 15kHz**
- ▶ **-93dBm typical noise floor at -20dBm reference level**
- ▶ **Fully adjustable centre frequency and span in 1kHz steps**
- ▶ **Choice or centre plus span or start plus stop setting**
- ▶ **Zero span mode with AM and FM audio demodulation**
- ▶ **Sweep modes of normal, single, peak hold and average**
- ▶ **Twin markers with readout of absolute & difference values**
- ▶ **Smart marker movement with selectable peak tracking**
- ▶ **Unlimited storage for waveforms, set-ups and screens**
- ▶ **Data transfer to PC for analysis, documentation & printing**
- ▶ **More than 4 hours continuous operation from a charge**
- ▶ **Smaller and lighter than any other spectrum analyzer**
- ▶ **Handheld computer based facilities including word processing, spreadsheets, appointments, picture and video viewing, MP3, plus Web and Email via Bluetooth and WiFi**
- ▶ **Vast range of third party programs available including many for engineering, science and mathematics**

Measurably better value

The size a hand-held instrument should be !

See more detail

The high resolution display of the PSA1301T shows a full 320 samples across the screen with 300 pixels of vertical resolution.

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

Sweep modes

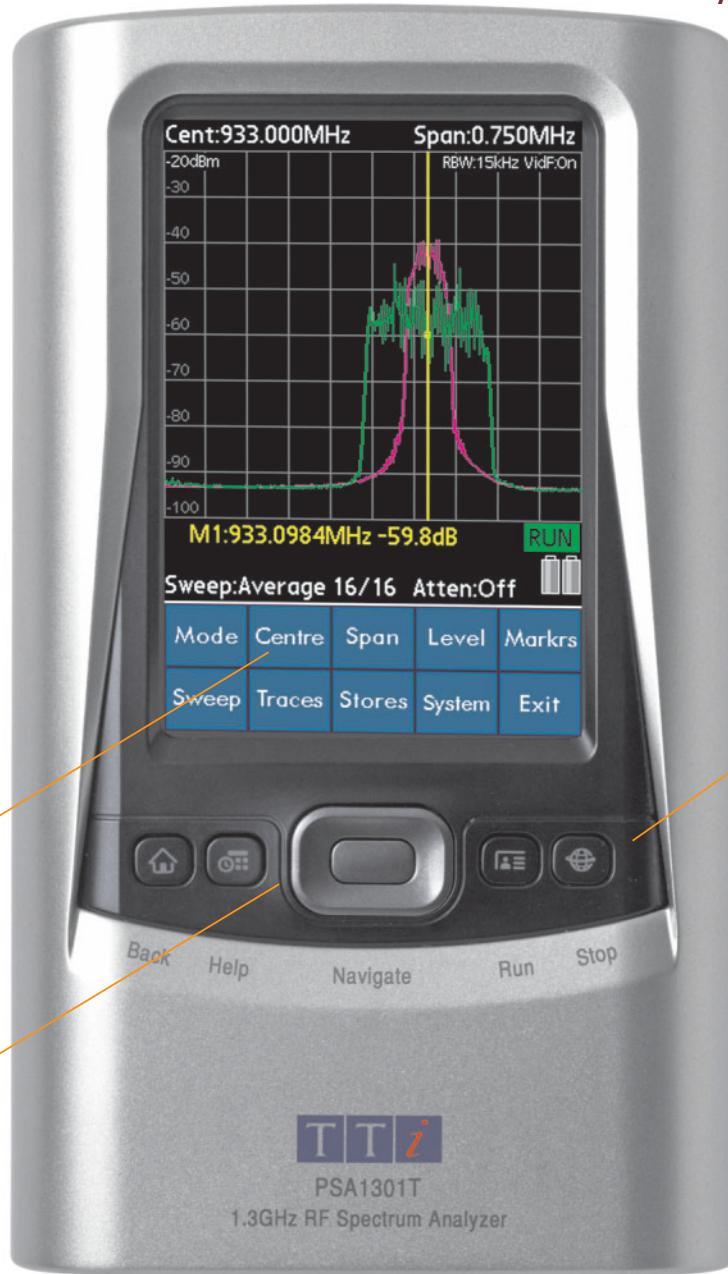As well as continuous and single sweep modes, the user can select peak-hold or multi-sweep averaging.

Touch-screen or hard-key control

The PSA1301T can be operated using the touch screen of the handheld.

Large on-screen buttons enable it to be operated using a finger rather than the handheld stylus.

An intuitive menu system gives rapid access to all facilities with a minimum of button presses.

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

Display readout

Cent:933.000MHz   Span:0.750MHz
-20dBm   RBW:15kHz VidF:On
-30
-40
-50
-60
-70
-80
-90
-100
M1:933.0984MHz -59.8dB   RUN
Sweep:Average 16/16   Atten:Off

| Mode | Centre | Span | Level | Markrs |
| Sweep | Traces | Stores | System | Exit |

Back   Help   Navigate   Run   Stop

TTi
PSA1301T
1.3GHz RF Spectrum Analyzer

Live and reference traces

The display can show a reference trace in addition to the live trace.

Any number of traces can be saved to memory for rapid recall to the screen.

The live trace can be copied to the reference by a single key press.

Dual markers

Single or dual markers can be selected.

Absolute and difference values are displayed for both frequency and amplitude.

The power of a handheld computer

With its built-in Palm handheld, the PSA1301T can perform a host of other functions:

- from word processing and speadsheets, to web and email access.

- from contacts and appointments to mathematical calculations.

- from high resolution photos to diagrams scribbled directly on the screen.

- from SMS text messages to MP3 and video playback.

Equally at home on the bench

The PSA1301T 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.
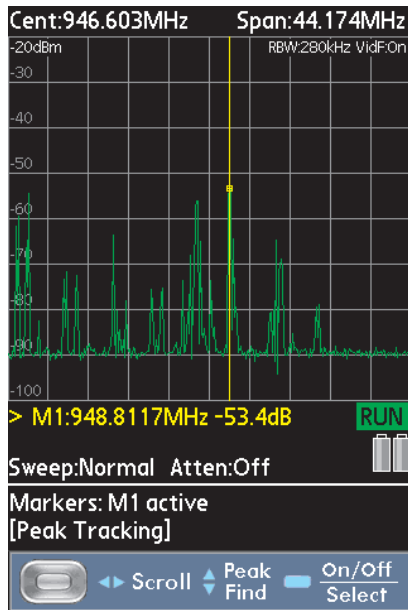
For continuous bench-top operation, the supplied AC line adaptor powers the instrument as well as charging it.

The PSA1301T can be used vertically, as well as horizontally or on its tilt stand.

Smart marker movement

The display can include one or two markers with on-screen readout of frequency and level including difference values.

The markers are moved using the navigator buttons and can be set to automatically track to peaks.

Vertical expansion

The vertical resolution of 10dB per division can be expanded to 5dB with panning over the full dynamic range.
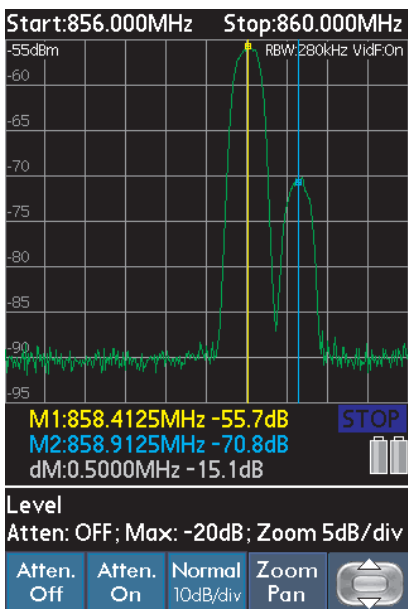
Zero span mode

The PSA1301T includes a zero span mode with both AM or FM audio demodulation.

Instant availability

Unlike some other spectrum analyzers which can take up to a minute to initialise, the PSA1301T starts instantly.

The first sweep can be started in less than two seconds from switching on.

Fast and flexible setting

Ease of use was a major consideration in the design of the PSA1301T.

For example, frequency settings can be changed in several different ways:- by direct numeric entry, by digit increments, or by user defined steps.

Digit increments or direct numeric entry can be used to set frequencies for Centre, Span, Start, Stop, or Step values.
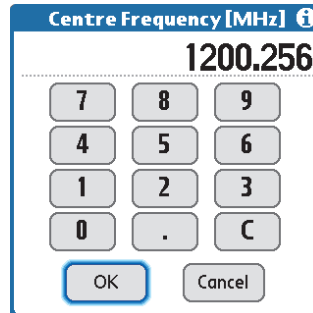
Steps and increments are actioned using the 5-way navigator buttons.

Sweep range can be set as centre plus span or start plus stop. Single press convenience functions are included such as "set centre to marker", "set start and stop to markers" and "set span to marker difference".

The span can be zoomed in binary steps for rapid investigation of a point of interest.
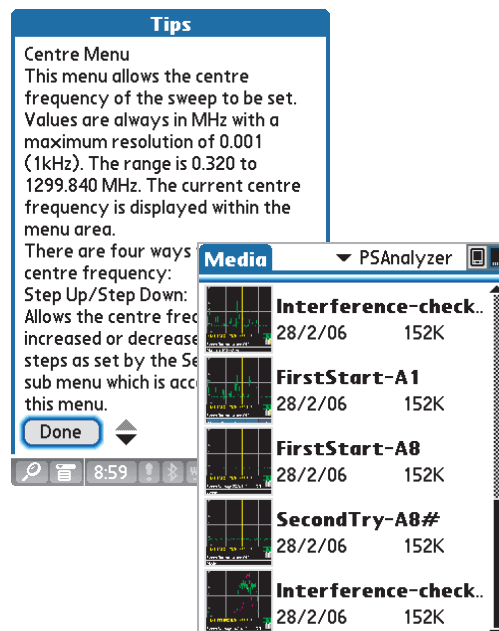
Multiple sweep modes

In addition to the normal continuous update mode, the sweep can be set to Single-shot, Peak-hold, or Multi-sweep Average.

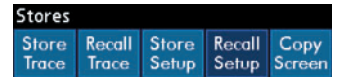The sweep averaging figure can be set in binary steps up to 256.
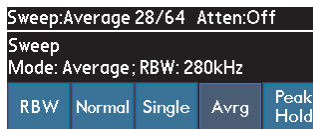
Context sensitive help

Context sensitive help is available for every menu.


Powerful data storage

The PSA1301T can store unlimited amounts of data using removable memory cards. Many hundreds of files can be stored on a single card.

Data can be stored under either default file names, or user file names entered using the Palm keyboard.

The PSA1301T can store three types of data: traces, set-ups and screens.

Trace data is stored as tables of amplitude against frequency in a comma delimited format, which can be recalled to the screen as a reference trace.
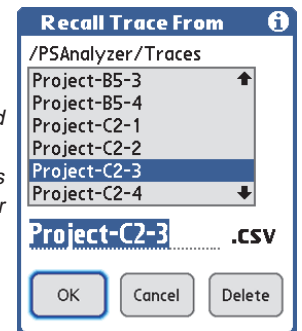
Trace data can also be exported for use with other programs such as Excel or MathCad.

Storage of set-ups allows all of the settings of the instrument to be saved for instant recall to the same instrument, or to another PSA1301T.

Screens are saved as complete bit-map images of everything visible at the time (traces, graticule, markers and all annotation).

These can then be viewed on the Palm T|X itself or transferred to a PC where they can be viewed at expanded sizes and printed in full colour using simple programs such as Picture Viewer.

Data export and transfer

PSA1301T data files are stored on removable flash memory cards.

A USB linked card reader is supplied which allows files to be transferred to or from a PC using simple drag and drop.
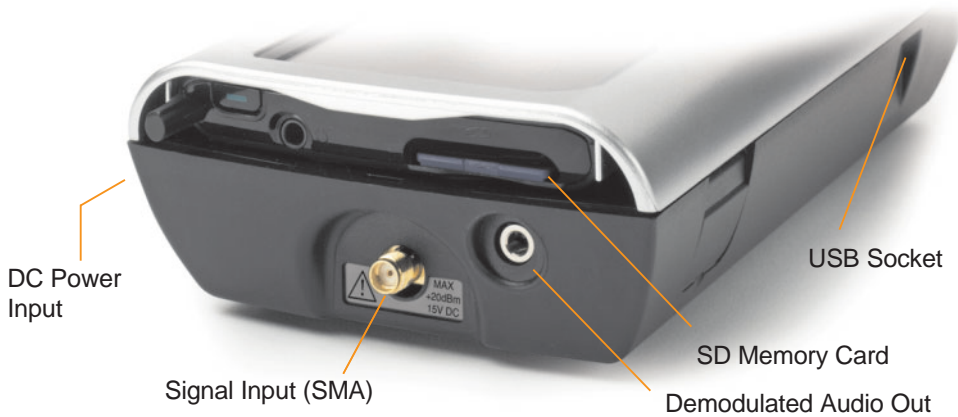

Where a wireless connection is available (Bluetooth or WiFi), files may be transferred using email attachments or via a wireless comms. application.

Transfer of files to a PC is particularly useful for PSAnalyzer screen images where a hard copy print may be required.

PSA1301T trace files have a standard comma seperated value (.csv) format which can be imported into other applications such as Excel or MathCad.

For native Palm applications, Palm Desktop software can be installed on your PC providing not only two way data transfer, but full synchronism with Microsoft Outlook.
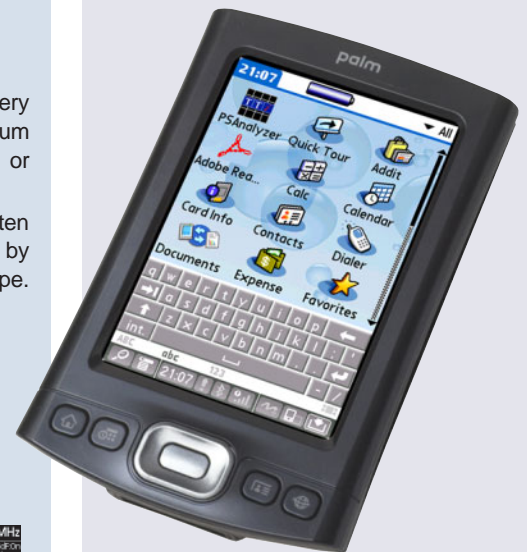
DC Power Input

Signal Input (SMA)

Demodulated Audio Out

SD Memory Card

USB Socket

Product Applications

Traditional RF Field Measurements

The PSA1301T will find many applications within traditional radio communication field environments such as:

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

EMC Evaluations

The wide span of the PSA1301T (150kHz to 1.3GHz) makes it ideal 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 PSA1301T 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 PSA1301T 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

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 PSA1301T.

The small size fits perfectly into the hand and the low weight of less than 0.5 kg allows it to be carried anywhere.

Around one third of the size and one quarter of the weight !
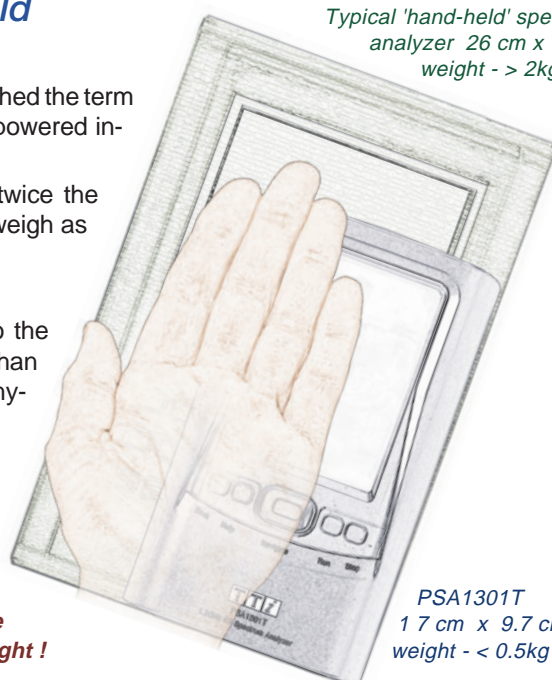
Typical 'hand-held' spectrum analyzer 26 cm x 17 cm, weight - > 2kg

PSA1301T 1 7 cm x 9.7 cm, weight - < 0.5kg

Why the Palm T|X ?

There are two main types of handheld computer: Palm and Pocket PC. Both offer excellent products with extensive features and capabilities.

In looking for the most appropriate host for a portable spectrum analyzer, TTi chose the model T|X from Palm (the world's largest handheld producer) for several important reasons.

A track record

The Palm T|X builds on a long history of expertise from the company that invented the palm top computer.

Palm has a record of future proofing through backwards compatibility.

Permanent Memory

The Palm T|X uses permanent (Flash RAM) memory. Many other handhelds use dynamic memory which can lose both data and programs if the battery becomes fully discharged.

High Resolution Screen

The Palm T|X has a half VGA screen (320 x 480 pixels), providing twice the resolution of the quarter VGA screens used on most Pocket PC models.

Wireless Comms

In addition to USB and IR interfaces, the T|X includes both Bluetooth and WiFi enabling it to communicate with mobile phones and computer networks.

Overall Performance

The T|X is a feature-rich handheld computer incorporating a 312MHz Intel X-scale processor, 128MB flash memory, Bluetooth, WiFi, an SD/SDIO card slot and a half-VGA TFT screen.

The Palm OS 5.4 operating system provides easy file and document exchange with a PC, and compatibility with Word, Excel, Acrobat and other industry-standard applications.

- and Instantly Available

The Palm T|X is fully functional within the PSA1301T. But it can also be removed in a matter of seconds when the spectrum analyzer is not required.

A wealth of handheld computer functions

The handheld used with the PSA1301T retains all of its functionality, giving access to the full power of the Palm operating system.

A few of these facilities are listed below.

Create/edit industry-standard documents

The Palm T|X can work with Word and Excel files that can be transferred to and from your PC. The high resolution display can be switched between portrait and landscape modes as preferred for word processing and speadsheets.

PDF files and even Powerpoint presentations can also be viewed.

View graphics files and photos

The T|X can be used to view a wide range of graphic file types in high resolution colour with zoom and pan.

Circuit and wiring diagrams, connector descriptions, and a host of other important information can be stored in graphical format for instant recall.

Even videos can be viewed.

Communicate using web, email, SMS

The T|X can be connected to a mobile phone, a PC or a Network (using WiFi, Bluetooth, USB or IR) to give access to email and the web.

A built-in emailer program and web browser are provided.

SMS text messages can be sent via a linked phone using the Palm qwerty keyboard.

Play audio files

The T|X can play back MP3 and other digital audio format using the built-in speaker or external phones.

Link using USB, IR, Bluetooth or WiFi

In addition to USB, the T|X has built-in WiFi, Bluetooth and an infra-red port.

As well as linking to a PC or mobile phone, it can communicate with a variety of peripherals such as a wireless keyboard.

Expand functionality with add-ons

A vast number of third part applications are available for the Palm handheld, these include engineering (including electronics), science, medicine, and every sort of business and leisure activity.

The card slots accepts SDIO cards for hardware expansion.

Instant access to a stand-alone handheld

When the spectrum analyzer function is not required, the Palm T|X handheld computer can be quickly removed to be carried in a pocket or briefcase.

It can then be used as a personal organiser or act as the host for other dedicated products such as a Sat-Nav system.

When you need the spectrum analyzer function again, it can be fitted back into the PSA1301T just as quickly.

A powerful tool for today's engineers

The Palm T|X can open, create and edit native Microsoft Word and Excel files.

Even PowerPoint presentations can be viewed.

Font sizes can be changed as required and the screen can be flipped between portrait and landscape format to suit the data being viewed.

For simpler text requirements, the Memo function can be used. Or, if you want to create a sketch, the Notes function allows you to draw directly on the screen and save.

The built in Email program uses the Bluetooth and WiFi connectivity to enable emails to be sent and received via a mobile phone or wireless network.

Notes, sketches, documents and pictures (including PSAnalyzer screens) can all be sent as email attachments.

The built-in web browser gives access to search engines and other information sites when required.

Major sites such as Google and Yahoo automatically adjust their content to suit the smaller screen of a handheld.

The Contacts, Calendar and Tasks applications create a sophisticated personal organiser which offers full integration with Microsoft Outlook if required.

Note: Palm screens on this page are shown at actual size.

The menu option defines 60Hz as Quasi-PAL ON and 50Hz as Quasi-Pal OFF.

Default Video Standard

The switch on the rear sets the default video standard (e.g. for menus) to PAL (switch down), SECAM (centre) or NTSC (switch up). When connected to a PAL TV one would normally set it to PAL, but to get pure NTSC out set it to NTSC.

When set to NTSC, NTSC disks output in NTSC and PAL disks can't be played. When set to PAL, PAL disks output in 50Hz PAL and NTSC disks play output in PAL at 50Hz or 60Hz depending upon the Quasi Pal setting.

Removing the Palm T|X is as simple as raising the two catches, lifting the top cover, and unplugging it.*

* If the user wishes to prevent removal of the Palm T|X, the cover can be retained by Torx head screws behind the catches.

Engineering applications in the palm of your hand

In addition to the mainstream applications described opposite, the Palm T|X includes functions of particular value to engineers.

14 digit calculator

The built-in calculator offers ten different layouts including maths, trigonometry, statistics and logic, plus conversions for weight, temperature, length, area and volume.

The calculation history is displayed and results can be pasted into applications such as speadsheets.

Graphical information

Important information from photographs, sketches and diagrams can be stored and viewed on screen.

Jpeg, Tiff, Gif and Bmp format files are automatically scaled for best-fit to the screen and can be rotated between portrait and landscape.

As well as photos from a camera, many other types of graphical information can be used. For instance sections of a diagram could be scanned to create reference documents.

PDF data

Adobe Acrobat Reader for Palm can be added, enabling component data sheets, equipment handbooks, and other important PDF information to be converted for viewing on the Palm screen
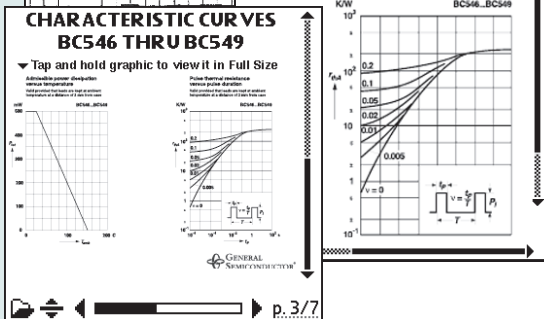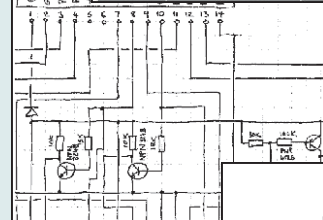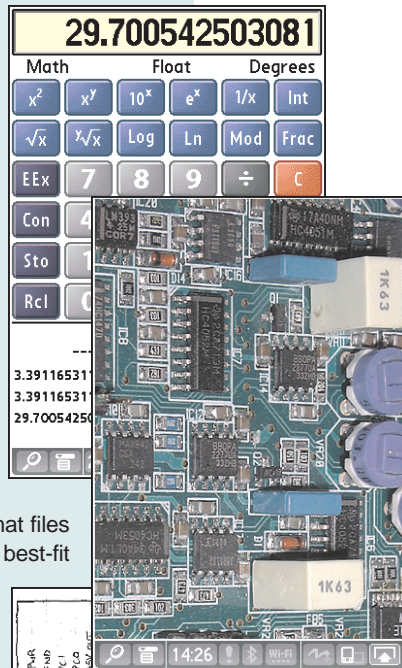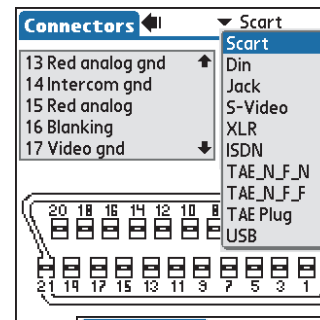
Note: Palm screens on this page are shown at approximately two thirds of actual size.

Expand capabilities further with Shareware and Freeware

Among the large number of add-on applications for the Palm are many for science and engineering.

Some of these are freeware while others are low-cost shareware.

Whatever your interests at work or at home, you are likely to find relevant applications available.

Acknowledgments:
Converter 2.2 by Matt Marsh (Freeware)
Ohm Reader 1.0 by Dennis Yee (Freeware)
Electronics 2.8 by Kim Molgaard (Shareware)
pDraft 1.26/2.0 by Harry Konstas (Freeware)
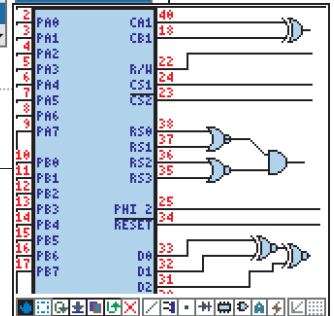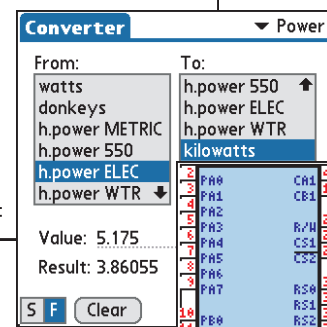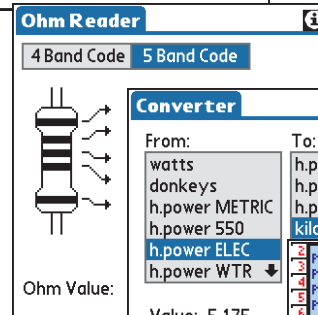
Creating custom applications

Tools are available for creating custom applications in high level languages.

A version of Labview (Labview for PDA) is available from National Instruments Inc.

Technical Specifications

FREQUENCY MEASUREMENT

Frequency Span
Frequency Range:	150kHz to 1300 MHz
Setting Modes:	Centre frequency plus Span, or Start plus Stop frequencies
Maximum Span:	1299.85 MHz
Minimum Span:	320 kHz, or Zero Span with demodulation
Setting 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 ℃
Stability:	Better than ± 10 ppm over 10 ℃ to 30 ℃
Ageing:	Better than ± 3 ppm per year

Phase Noise
Phase Noise:	Typically -100dBc/Hz at 100kHz offset at 500MHz

Resolution Bandwidth
RBW:	Selectable 280 kHz or 15 kHz
Video Filtering:	Selectable independently of RBW setting

Markers
No. of Markers:	One, Two (or None)
Marker Resolution:	0.1 kHz at all frequencies
Marker Accuracy:	1/320th 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
Display Range:	80 dB
Reference Level:	Selectable as -20 dBm or 0dBm

Amplitude Accuracy
Ref. Level Accuracy:	Better than ± 1 dB at 50MHz (20℃ ± 5℃)
Flatness:	Better than ± 1.5 dB over 0.5MHz to 1300MHz
Linearity:	Better than ± 1 dB over 50dB from reference level
Noise Floor:	Better than -90 dBm average displayed noise floor (reference level = -20 dBm, RBW = 15 kHz)

Distortion and Spurii
3rd Order Intermod.:	< –60dBc for two signals at 10dB below reference level (500MHz and 501MHz)
Harmonic:	< –60dBc at 10dB below reference level (100MHz)
1st & 2nd Image:	<– 55dBc, typically <– 60dBc
Residual Spurii:	Below 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.

SWEEP
Sweep Method:	Peak detection for 320 points per sweep. The amplitude and frequency of the peak level found within each sub-span is stored (sub-span = span/320).
Sweep Time:	Set automatically by Span and, RBW.
Sweep Modes:	Normal (continuous), Single, Peak Hold, Average (2 to 256).
Sweep Control:	Run and Stop buttons. Peak-hold and Average are reset whenever Run is pressed.

SIGNAL INPUT
Input Connector:	SMA connector, 50 Ω
VSWR:	1.5 : 1 typical
Maximum Level:	+ 20 dBm

DEMODULATION (Zero Span mode)
Demod. Modes:	AM or FM
Display:	Carrier amplitude only (horizontal line).
Audio Out:	30 mW into 32 Ω mono or stereo headphones, adjustable volume, 3.5mm jack socket

DISPLAY
Display Type:	3.7 inch (9.4 cm) backlit TFT LCD, 480 x 320 pixels total, 16 bit colour, touch screen.
Trace Area:	300 x 320 pixels (high resolution mode).
Graticule:	8 x 10 divisions, light grey graticule with annotation (graticule selectable on or off).
Displayed Points:	320 points per sweep (peak detected).
Live Trace:	Dot-joined trace from current or held sweep using . Selectable on or off.
Reference Trace:	Stored trace either recalled from memory or copied directly from live trace. Selectable on or off.
Resolution Modes:	Selectable as High Resolution or Low Resolution.

(In low resolution mode the trace area becomes 150 x 160 points where each point is a block of 4 pixels. Only 160 sweep points are displayed. This mode is useful in situations where the display could otherwise be difficult to see - e.g. when the instrument can not be viewed at an optimum distance.)

MEMORY STORAGE

Memory Type:
Non volatile Flash memory, using removable SD or MMC cards (one card supplied).

Store Trace:
Any number of 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:
Any number of 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. Any number of screens can be stored under either default file names or user entered file names. Screen bit-maps can be viewed using the handheld picture viewing function, or transferred to a PC for printing.

CONNECTORS
RF Input:	Standard SMA connector.
DC Power:	1.3 mm power socket for 5.2V/1A external power source.
USB:	Mini USB connector which provides direct access to the USB port of the handheld.
Audio Out:	3.5 mm jack socket for demodulated audio out (accepts mono or stereo plugs).

POWER SOURCES

Battery Operation
The spectrum analyzer and the handheld contain their own rechargeable battery packs. The spectrum analyzer is controlled from the handheld and is turned off whenever the spectrum analyzer program is exited, or the handheld is turned off.

Spectrum analyzer
Battery Type:	Ni-Mh 3.6V 700mA-hr (3 x AAA)
Battery Life:	> 5 hours continuous operation
Recharge Time:	< 4 hours from fully discharged

Handheld Computer (Palm TIX)
Battery Type:	Li-ion 3V 1050mA-hr
Battery Life:	Typically 4 hours continuous
Recharge Time:	< 4 hours from fully discharged

Auto Sleep Mode
To conserve battery life, the system can be set to automatically switch into sleep mode after a defined time from the last key press. This can be set between 5 mins and 60 mins (or never).

Battery Status   Indicators for both batteries.

AC Line Operation/Charging
The PSA1301T can be operated from mains power using the AC line adaptor provided. This powers and recharges both the spectrum analyzer and the handheld simultaneously.
Voltage Range:	100V to 240V nominal 50Hz/60Hz

MECHANICAL
Size:	170mm high x 97mm wide x 47mm deep
Weight:	495 grms total inc. Palm TIX.
Tilt Stand:	Built-in tilt stand for bench use which angles the unit at approx. 25 degrees to the horizontal.
Stylus:	Casing incorporates standard Palm stylus.

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

SUPPLIED ITEMS

See previous page

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

Designed and built in Europe by:

T T i

Thurlby Thandar Instruments Ltd.
Glebe Road, Huntingdon. Cambs. PE29 7DR   U.K.
Tel: +44 (0)1480 412451 Fax: +44 (0)1480 450409
Web: www.tti-test.com Email: sales@tti-test.com