TTi

THURLBY THANDAR INSTRUMENTS

PSA-T Series   PSA1301T & PSA2701T

1.3GHz & 2.7GHz RF Spectrum Analyzers

INSTRUCTION MANUAL

Aim TTi

Table of Contents

1. Supplied Items

The PSA1301T or PSA2701T portable spectrum analyzer is made up of four main items:

The PSA1301/PSA2701 spectrum analyzer unit manufactured by TTi.
The Palm T|X handheld computer manufactured by Palm, Inc.
The PSAnalyzer software application created by TTi to run on the Palm T|X.
An SD (or MMC) Memory Card for storing and transferring data

The following support items are also provided by TTi:
"Read This First" leaflet.
Universal mains adaptor/charger.
USB lead (mini B plug to standard A plug).
SD/MMC USB Card Reader (NOT supplied if SanDisk Gemini SD card is fitted - see 23.3.2
USB extension lead.
Printed instruction manual (English only).
Support CD containing multi-language manual and backup software.
M2.5 security screws to prevent easy removal of the Palm T|X (if required).
Transparent storage case for memory card.

The spectrum analyzer is supplied with the Palm T|X mounted into it, and the PSAnalyzer software application pre-installed. The memory card is fitted into the Palm T|X.

All of the software and accessories provided by Palm for the T|X are contained within the Palm T|X shipping box.

Note: The SD/MMC USB Card Reader and other small items may be packed inside the Palm T|X shipping box.

2. Using This Manual & Meaning of Terms

Cross References within this Manual

This manual is also provided as multi-language PDF files. The manual includes many cross references which are shown as follows - see section X.X.

Within a PDF file, the boxed number is a hyperlink to that section number, thus enabling the user to jump rapidly the section referred to and then jump back to continue reading the text.

TTi
TTi is used throughout this manual as the abbreviation for Thurlby Thandar Instruments Ltd.

Palm and palmOne
The Palm T|X is manufactured by Palm, Inc. The company was previously using the name palmOne, but has now reverted to its original name of Palm. Hardware and support software items may be branded either Palm or palmOne. The name Palm is used throughout this manual, but may refer to items branded palmOne. Palm and palmOne are registered trademarks of Palm, Inc.

Handheld Computer and PDA
Devices such as the Palm T|X are commonly described as handheld computers, palmtop computers or PDAs (personal digital assistants). The term 'handheld computer' is used throughout this manual.

PSA1301/2701
This is used to describe the spectrum analyzer unit excluding the Palm T|X handheld computer.

PSA1301/2701T
This is used to describe the complete spectrum analyzer unit including the Palm T|X handheld computer.

3. Warranty and Support

The warranty for the PSA1301 or PSA2701 spectrum analyzer unit is provided by TTi. The warranty for the Palm T|X handheld computer is provided by Palm - details of the warranty are contained within the Palm T|X shipping box or on the Palm website.

TTi (or its agents and distributors) will provide technical support for the PSA1301/2701T spectrum analyzer based around use of the PSAnalyzer software application.

TTi (or its agents and distributors) will NOT provide technical support for any other functions of the Palm T|X outside of the PSAnalyzer software application. Technical support for all other functions must be obtained from Palm or from associated support websites. **See section 27.1**.

4. Initial Operations

4.1. Charging the Batteries

It is probable that the batteries will be discharged when the product is received. Consequently the first action should be to charge the unit using the supplied mains adaptor. To fully charge the batteries it should be left charging for 4 hours.

4.2. Initialising the Palm T|X

If the battery has been <u>fully</u> discharged, the Palm T|X handheld computer will have to be re-initialised before the spectrum analyzer can be used. **Details of how to re-initialise it are given in section 15**.

Note: The PSA1301/2701 spectrum analyzer adaptor does not require any manual initialisation.

4.3. Software provided by Palm on CD

The software and support information provided by Palm assumes that you will want to link your Palm T|X to a personal computer on a regular basis. The Palm "Read this First" manual instructs you to load the CD software immediately as part of the initial set up.

Users of the PSA1301/2701T do not need to do this unless they choose to. TTi recommends that users read the relevant sections of the Palm documentation and consider their own use of the product before deciding whether to install to Palm software. **Also read Appendix B, section 29 of this manual.**

! Note: Do **NOT** make a USB connection between the PSA1301/2701T (or the Palm T|X) and a PC unless the Palm software has already been installed.

4.4. Linking to a Personal Computer

It is NOT necessary ever to link the PSA1301/2701T to a personal computer. It is a self contained instrument which can perform its primary function of RF spectrum analysis without linkage to other devices. TTi provides a USB linked memory card reader in order that PSAnalyzer files can be transferred to a PC where this is required.

However some of the additional features of the Palm T|X do require linking to a personal computer in order to share information, load new software applications and transfer files.

See section 28.3 for information on this subject.

5. First Use of the Spectrum Analyzer

After charging the battery and initialising the Palm T|X, it will then be possible to use the Spectrum Analyzer by launching the PSAnalyzer application.

❗ TTi recommends that you should read this manual in full before using the PSA1301/2701T.

However, if immediate use of the spectrum analyzer is required, the following procedure can be used to start making measurements quickly.

5.1. Quick Start Guide

❗ Before commencing - the batteries must have been charged and the Palm T|X initialised as described in sections 4.1 and 15 respectively.

1. **Connect the signal to be measured** - connect signal to the SMA connector at the top of the spectrum analyzer. The maximum allowable signal without damage is +20dBm (+127dBuV or 2.2 V rms). The maximum measurable signal is 0dBm (+ 107dBuV or 223 mV rms). If there is a possibility of the signal exceeding these levels, add suitable in-line attenuation.

2. **Launch the PSAnalyzer application** - enter the Applications screen (by pressing the Home key once or twice). Press the PSAnalyzer icon on the touch screen of the Palm T|X, (the touch screen can be operated with a finger tip or the stylus of the Palm T|X).

PSAnalyzer

3. **Select the Mode Menu** - press the on-screen Mode key.

Mode

4. **Select Preset** – press the Preset key.
This sets Quick Menu mode, Span maximum, Attenuation on, Highest RBW, Sweep mode normal, Marker M1 on at the centre of the sweep.

Preset

5. **Observe the Sweep** - the sweep time will be slow because of the wide span.

6. **Adjust the Attenuator** – If the peak signal is below the –20dBm graticule line, press the Attenuator On/Off key to toggle the attenuator to Off thus increasing the sensitivity.

Atten. On/Off

7. **Move the Marker** – use the 5-way navigator to move the marker to the area of interest and position it at the centre of the signals to be observed.

8. **Centre the Sweep** -.press the Set C=M1 key to re-centre the sweep around the new marker position (Note: the span will be reduced to the maximum that can be achieved with the new centre frequency)

Set C=M1
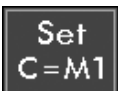
9. **Zoom the Span** – Press the Zoom-In key successively to create a narrower span that shows more detail of the signals of interest.

Zoom In

The above procedure should be sufficient to get started. Thereafter adjustments can be made to sweep parameters, attenuator, resolution bandwidth, etc. as may be appropriate to the signals being observed.

Basic on-screen help information for every menu is available by pressing the Help hard key. Some general information regarding the capabilities of the unit is available from the Info key on the Exit menu.

5.2.   Detailed Operating Guide

To fully understand the operation of the PSA1301/2701T and PSAnalyzer, it is necessary to read this manual.

From an operating point of view, the key sections are "Using the PSAnalyzer Application" section 19, "The PSAnalyzer Menu System" section 20, and "PSAnalyzer Operating Techniques" section 21.

6.   Product Description and Capabilities

Brief Summary

The PSA-T series (PSA1301T and PSA2701T) are fully portable spectrum analyzers incorporating a handheld computer (a Palm T|X). They are sufficiently small and lightweight to be operated as a handheld instrument and has a typical battery life of four hours from each charge. Alternatively they can be used as bench instruments using the supplied mains adaptor/charger. They can be set horizontally or vertically, or at an angle of about 25 degrees using the built-in tilt stand.

The spectrum analyzer has a frequency range of 0.15 MHz to 1300 MHz (PSA1301T) or 1MHz to 2700MHz (PSA2701T). The span can be set anywhere between 0.320 MHz and 1299.850 MHz (PSA1301T) or 2699.000 MHz (PSA2701T) with a resolution of 1kHz. Start, stop or centre frequencies can be set to the same resolution. The resolution bandwidth is selectable as 280 kHz or 15 kHz (PSA1301T) or 1 MHz, 280 kHz or 15 kHz (PSA2701T).

The on-screen amplitude range is 80 dB with a reference level of -20dBm or 0dBm. Amplitudes can alternatively be displayed in dBµV. Vertical magnification to 5dB/div can be selected. Average noise floor is better than -90dBm at -20dBm reference level and 15 kHz RBW.

Sweeps can be continuous, single shot, peak hold or average (2 to 256 sweeps). Sweep time is defined by the span and resolution bandwidth, and varies between 0.1 sec and 30 sec. A zero span mode is available with AM or FM audio demodulation.

Twin vertical marker lines are available giving a readout of frequency and amplitude to a resolution of 0.1 kHz and 0.1 dB. Markers can be manually positioned or automatically peak finding and tracking.

A reference trace can be displayed in addition to the live trace. Limit lines can also be created and displayed.

The graticule is fully controllable. Any number of traces can be stored to permanent memory for recall to the screen or for data export. Limit lines, instrument set-ups and complete screen bitmaps can also be stored.

Battery life depends upon screen brightness, but is around four hours of continuous operation from a charge. To conserve the battery, auto-sleep mode can be selected whereby the unit turns off automatically after a defined period from the last key press. All data is retained when off.

Pressing the Help hard key brings up a help screen relevant to the current menu position.

Full details of the product capabilities are given with the Specification section 7 and Using the PSAnalyzer Application section 19 onwards.

7. Specification

7.1. Frequency Measurement

Frequency Span

Frequency Range:	150 kHz to 1300 MHz in one range (PSA1301) 1 MHz to 2700 MHz in one range (PSA2701)
Setting Modes:	Centre frequency plus Span, or Start frequency plus Stop frequency
Maximum Span:	1299.85 MHz [150 kHz to 1300 MHz] (PSA1301) 2699 MHz [1 MHz to 2700 MHz] (PSA2701)
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°C
Stability:	Better than ± 10 ppm over 10°C to 30°C
Ageing:	Better than ± 3 ppm per year

Phase Noise

Phase Noise:	Typically -100dBc/Hz at 100kHz offset at 500MHz (PSA1301) Typically -90dBc/Hz at 100kHz offset at 500MHz (PSA2701)

Resolution Bandwidth

RBW:	Selectable as 280 kHz or 15 kHz (PSA1301) Selectable as 1 MHz, 280 kHz or 15 kHz (PSA2701)
Video Filtering:	Selectable independently of RBW setting

Frequency Markers

Number of Markers:	One, Two, or None
Marker Resolution:	0.1 kHz at all frequencies
Marker Accuracy:	1/320th of Frequency Span ± 0.1kHz + Reference Frequency Accuracy
Frequency Readout:	Display of absolute and difference frequencies for both markers

7.2. Amplitude Measurement

Amplitude Range

Display Range:	80 dB
Measurement Units:	dBm or dBµV (dB milliwatts or dB micro volts)
Reference Level:	Selectable as -20 dBm or 0dBm (87 dBµV or 107 dBµV)

Amplitude Accuracy

Ref. Level Accuracy: Better than ± 1 dB at 50MHz at 10dB below reference level (20°C ± 5°C)

Level Flatness: Better than ± 1.5 dB relative to 50MHz over 500kHz to 1300MHz (PSA1301)
Better than ± 1.5 dB relative to 50MHz over 1MHz to 2700MHz (PSA2701)

Amplitude Linearity: Better than ± 1 dB over 50dB range down from reference level

Noise Floor

Noise Floor: Better than -93 dBm average displayed noise floor (PSA1301)
(reference level = –20 dBm, RBW = 15 kHz)
Better than -93 dBm average displayed noise floor for F > 3MHz (PSA2701)
(reference level = –20 dBm, RBW = 15 kHz)

Distortion and Spurii

3rd Order Intermod.: < –60dBc for two signals (500MHz and 501MHz) at 10dB below reference level
(PSA1301)
< –60dBc for two signals (500MHz and 502MHz) at 10dB below reference level
(PSA2701)

Harmonic: < –60dBc at 10dB below reference level (100MHz)

1st & 2nd Image: <– 55dBc, typically <– 60dBc

Residual Spurii: Below noise floor (PSA1301)
<3dB above noise floor (PSA2701)

Amplitude Markers

Number of Markers: One, Two, or None

Marker Resolution: 0.1 dB

Amplitude Readout: Display of absolute and difference amplitudes for both markers

Limit Lines

Limit lines are created from lists of amplitude & frequency points. Straight lines are
drawn between these points.

Displayed Lines: One, two (or none) differentiated by colour.

Line Storage Any number of limit lines can be stored.

7.3. Sweep

Sweep Method: Peak detection for 320 points per sweep. The amplitude of the peak level found
within each sub-span is stored (sub-span = span/320).

Sweep Time: Set automatically by Span and RBW.
Typically 200ms + 2ms/MHz of span for RBW = 1MHz (PSA2701 only)
Typically 200ms + 7ms/MHz of span for RBW = 280kHz
Typically 200ms + 75ms/MHz of span for RBW = 15kHz

Sweep Modes: Normal (continuous), Single, Peak Hold, or Average (2 to 256 sweeps)

Sweep Control: Separate buttons for Run and Stop. Peak Hold and Average are reset whenever
Run is pressed.

7.4. Signal Input

Input Connector: SMA connector, 50 Ohms

VSWR: 1.5:1 typical

⚠ Absolute
Maximum   + 20 dBm or +127 dBµV (2.2V rms) or 15V dc
Input Level:

7.5. Demodulation (Zero Span mode)

Demod. Modes: AM or FM

Display: Carrier amplitude only (horizontal line).

Audio Out: 30 mW into 32 Ohms mono or stereo headphones, adjustable volume, 3.5mm
                       jack socket (marked ⌒) adjacent to the Signal Input.

Audio Filter   Selectable low-pass filter to attenuate high frequency interference.
                       2 pole filter with turnover point at approximately 3 kHz.

7.6. Display

Display Type: 3.7 inch (9.4 cm) transflective 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. Selectable as fully on, horizontal lines
                       only, or off).

Displayed Points: 320 points per sweep (peak detected).

Live Trace: Dot-joined trace from current or held sweep. 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 cannot be viewed at an optimum distance.

7.7. Memory Storage

Memory Type: Non volatile Flash memory using removable SD or MMC memory cards.

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 "Media" application of the Palm T|X, or transferred to a PC for printing.
Store/Recall Limit Lines	Any number of limit lines can be stored under either default file names or user entered file names, and recalled as required.

7.8. Connectors

RF Input Connector:	Standard SMA connector.
Power Connector:	1.3 mm dc power socket (centre positive) for 5.2V/1A external AC power adaptor/charger as supplied by TTi.
USB Connector:	Mini USB connector (5 pin mini B) which provides direct access to the USB port of the Palm T|X.
Audio Connector:	3.5 mm jack socket for demodulated audio out (accepts mono or stereo plugs).

7.9. Power Sources

AC Line Operation/Charging

The PSA1301/2701T can be operated from mains power using the AC power adaptor provided by TTi. This powers and recharges both the Spectrum Analyzer and the Palm T|X simultaneously.

AC Adaptor/Charger

Input Voltage Range:	100V to 240V nominal 50Hz/60Hz. Interchangeable plus for UK, Euro, USA and Australia are supplied.

Battery Operation

The PSA1301/2701 and the Palm T|X contain their own internal rechargeable battery packs. The PSA1301/2701 is turned off automatically whenever the PSAnalyzer program is exited, or when the Palm T|X is turned off.

PSA1301/2701 Spectrum Analyzer

Battery Type:	Ni-Mh 3.6V 700mA-hr (3 x AAA cell)
Battery Life:	> 5 hours continuous operation (PSA1301) > 4 hours continuous operation (PSA2701)
Recharge Time:	< 3 hours from fully discharged

Palm T|X

Battery Type:	Li-ion 3V 1050mA-hr
Battery Life:	Typically 4 hours continuous operation (depending on backlight brightness)
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).

7.10. Mechanical

Size: 170mm high x 97mm wide x 47mm deep (including feet)

Weight: 495 grms total including Palm T|X.

Tilt Stand: Built-in tilt stand for bench use which angles the unit at approximately 25 degrees to the horizontal and can alternatively be used as a hook mount.

7.11. 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.

8. Declaration of Conformity

EC Declaration of Conformity

We   Thurlby Thandar Instruments Ltd
Glebe Road
Huntingdon
Cambridgeshire PE29 7DR
England

declare that the

PSA1301T and PSA2701T Portable RF Spectrum Analyzers

meet the intent of the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC. Compliance was demonstrated by conformance to the following specifications which have been listed in the Official Journal of the European Communities.

EMC

Emissions: a)   EN61326 (2006) Radiated, Class B

Immunity: EN61326 (2006) Immunity Table 1, referring to:

        a)   EN61000-4-2 (1995) Electrostatic Discharge

        b)   EN61000-4-3 (2006) Electromagnetic Field

        c)   EN61000-4-4 (2004) Fast Transient

        Performance levels achieved are detailed in the user manual.

Safety

EN61010-1 Pollution Degree 2.

Chris Wilding

CHRIS WILDING
TECHNICAL DIRECTOR
1 May 2009

9. EMC

Spectrum Analyzer

This instrument has been designed to meet the requirements of the EMC Directive 2004/108/EC. Compliance was demonstrated by meeting the test limits of the following standards:

Emissions

EN61326 (2006) EMC product standard for Electrical Equipment for Measurement, Control and Laboratory Use. Test limits used were:

a)   Radiated: Class B

Immunity

EN61326 (2006) EMC product standard for Electrical Equipment for Measurement, Control and Laboratory Use.

Test methods, limits and performance achieved are shown below (requirement shown in brackets):

a)   EN61000-4-2 (1995) Electrostatic Discharge : 4kV air, 4kV contact, Performance A (B).

b)   EN61000-4-3 (2006) Electromagnetic Field:
3V/m, 80% AM at 1kHz, 80MHz – 1GHz: Performance B (A) and 1.4GHz to 2GHz: Performance B (A); 1V/m, 2.0GHz to 2.7GHz: Performance B (A).

Note: The PSA-T Series spectrum analyzers are extremely sensitive instruments and, as a result, show some susceptibility to high electromagnetic fields throughout their measurement range. In general, the instrument will operate correctly but may show the interfering frequencies on the measurement trace if the levels are very high.

c)   EN61000-4-4 (2004) Fast Transient, 0.5kV peak (signal input), Performance B (B).

Performance Definitions

The definitions of performance criteria are:

Performance criterion A: 'During test normal performance within the specification limits.'

Performance criterion B: 'During test, temporary degradation, or loss of function or performance which is self-recovering'.

Adaptor/Charger

This AC adaptor/charger has been designed to meet the requirements of the EMC Directive 2004/108/EC.

Compliance was demonstrated by meeting the test limits of the following standards:

Emissions

EN55022, radiated and conducted Class B.

Immunity

EN55024:1998/A1:2001/A2:2003, referring to:

a)   IEC 61000-4-2 (2001) Electrostatic Discharge.

b)   IEC 61000-4-3 (2002) Electromagnetic Field.

c)   IEC 61000-4-11 (2004) Voltage Interrupt.

d)   IEC 61000-4-4 (2004) Fast Transient.

e)   IEC 61000-4-5 (2001) Surge.

f)   IEC 61000-4-6 (2003) Conducted RF.

10. Safety

Spectrum Analyzer

This instrument is Safety Class III according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use).

This instrument has been tested in accordance with EN61010-1 and has been supplied in a safe condition. This instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in a safe condition.

This instrument has been designed for indoor use in a Pollution Degree 2 environment in the temperature range 5°C to 40°C, 20% - 80% RH (non-condensing). It may occasionally be subjected to temperatures between +5° and -10°C without degradation of its safety. Do not operate while condensation is present.

Use of this instrument in a manner not specified by these instructions may impair the safety protection provided.

<div align="center">

WARNING!

</div>

All accessible parts will be at the same voltage as the outer body of the SMA input socket. In particular, note that the shell of the mini-USB connector is galvanically connected to the body of the SMA input which will therefore be at earth ground potential when the USB port is connected to a desktop PC. To maintain user safety under all other circumstances it is essential that the input is not connected to a voltage above 30Vdc or 30Vrms with respect to earth ground which is the limit of Safe Extra Low Voltage (SELV) by IEC definition.

The instrument shall be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair.

Any adjustment, maintenance and repair of the opened instrument under voltage shall be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.

Do not wet the instrument when cleaning it.

The following symbols are used on the instrument and in this manual.

⎓   Direct Current

⚠   CAUTION – refer to accompanying documentation.
Damage to the instrument may occur if these precautions are ignored.

Adaptor/Charger

The adaptor/charger supplied has a universal input voltage rating of 100-240VAC, 50/60Hz. It is a Class II (double insulated) device, fully approved to EN 60950-1 (2001), UL 60950 (UL listing E138754) and AS/NZS CISPR:2002 (C-Tick).

11. Connections

11.1. RF Signal Input

The signal to be measured is connected via a standard (non reverse) SMA connector mounted at the top of the instrument. The input impedance is 50 Ohms. The maximum allowable input is +20dBm or +127dBuV of RF power (approximately 2.2 volts RMS), or 15V DC.

⚠ Applying a signal above these levels could damage the unit and such damage would not be covered by the product warranty.

It should be noted that SMA connectors have a limited mechanical life and that, where frequent connection and disconnection is expected, a sacrificial intermediate connector should be used.

11.2. DC Power Input

DC power to operate and/or recharge the instrument is connected via a 1.3mm power socket mounted on the side of the instrument.

⚠ Use ONLY the mains adaptor provided by TTi with the unit. Use of any other power source will void the warranty.

The batteries of the spectrum analyzer unit and of the Palm T|X are automatically charged whenever dc power is connected.

An LED adjacent to the socket shows that the batteries of the PSA1301/2701 are recharging. When they are fully charged this LED will go off. The charging state and charge level of the Palm T|X batteries is shown on the display of the T|X, see section 18.1

11.3. Demodulated Audio Output

Demodulated audio (when in Zero Span Mode) is provided via a 3.5mm stereo jack socket (marked 🎧) mounted at the top of the instrument adjacent to the RF Signal Input. Maximum power output is 32 milliwatts into 32 Ohms with the volume level adjustable from within the application.

The signal is mono but connection can be made using either a mono or stereo plug. In the latter case the signal will be present on both channels.

11.4. USB 'through' Connector

The USB port of the Palm T|X can be accessed via a mini USB connector (mini type B) mounted on the side of the instrument. A cable is provided to connect this to a standard computer USB port.

Note that the USB interface has no function within the PSAnalyzer application, the cable is supplied in order that Palm Desktop software can be used with the Palm T|X in situ within the PSA1301/2701T.

Note: The USB cable should be disconnected at the PSA1301/2701T end when using the PSAnalyzer application.

❗ **Important** - Do NOT try to make a USB connection to a PC which has not had the appropriate software loaded onto it. See section 28.2

12. Stylus

Handheld computers such as the Palm T|X are normally operated using the supplied stylus. The PSAnalyzer application has been written so that use of a stylus is not a requirement, see section 19.2 . Nevertheless some users may prefer to operate it using a stylus.

The stylus provided with the Palm T|X clips into a slot on its right hand edge. When the T|X is fitted into the PSA1301/2701, the stylus fits into the same slot but is prevented from sliding as far down as normal by a stop incorporated within the top cover. This ensures that the stylus remains easily accessible.

Note: If access to the stylus is not required, it can be pushed past the stop. If this is done, however, it will not be possible to access it without removing the Palm T|X from the PSA1301/2701T.

13. Memory Card

The PSA1301/2701T is supplied complete with a Flash memory card (type SD or MMC). This card is necessary for storing and recalling traces, screens and set-ups in PSAnalyzer. A backup of the original PSAnalyzer program is also stored on the card.

The memory card can be used in many other Palm applications, both as additional memory and as a convenient way of sharing data with other devices. Note: Palm documentation refers to a memory card as an expansion card.

PSAnalyzer can be used without any card in place, but storing or recall of traces, screens or set-ups will not be available.

The memory card can be used as a means of transferring data to and from a PC using the USB card reader supplied or, in the case of a SanDisk Ultra II Gemini card, the card itself. See section 23.3 for details.

13.1. Removing and Inserting the Card

The card fits into a slot on the top left hand edge of the Palm T|X and is slightly recessed relative to the top edge of the PSA1301/2701.

To remove the card, press it down and then release it (a confirmation tone may be heard). The card becomes free and can be slid out. To insert the card, slide it into the slot and press it down firmly until a click is felt and the confirmation tone is heard.

Note: When a card is inserted, the Applications screen is automatically switched to show the applications which are on the card. In the case of the card supplied with the PSA1301/2701T this will be the utility PSAInstaller. To return to the normal Applications screen, select the drop down menu at the top right and select "All" in place of "Card".

13.2. Using an Alternative Card

Any SD (secure digital) or MMC (multi media) card that is compatible with the Palm T|X can be used in place of the one supplied. When PSAnalyzer stores a file it automatically creates the required folder structure. Multiple cards could be used increase total capacity or to separate files related to different projects. Note that the maximum card size useable with the Palm T|X is 2GB.

Note: The original card should be retained as it contains an important utility and a backup of the PSAnalyzer application. This card is labelled with the TTi logo and with the version number of the supplied PSAnalyzer software.

13.3. Card Storage Capacity

The size of the memory card supplied by TTi may vary from time to time, but will be in the range 64MB to 2GB.

The size if the files stored by PSAnalyzer are very small in comparison. Set-up files are a few hundred bytes each, trace files are around six kilobytes each, and screen bitmap files are 120 kilobytes each. Note, however, that the FAT16 format of the card creates a minimum file allocation size of 16 kilobytes (or possibly greater) for any file stored.

As a rough guide, a 64MB card can store 450 traces, 450 set-ups and 450 screens simultaneously, while a 128MB card would be able to store over 1,000 of each.

14. Removing and Re-fitting the Palm T|X

All of the functionality of the Palm T|X is available when it is mounted within the PSA1301/2701 spectrum analyzer. However, users may wish to remove it in order to carry it in their pocket as a personal organiser or to use for other purposes. Removing and re-fitting is quick and simple.

Removing
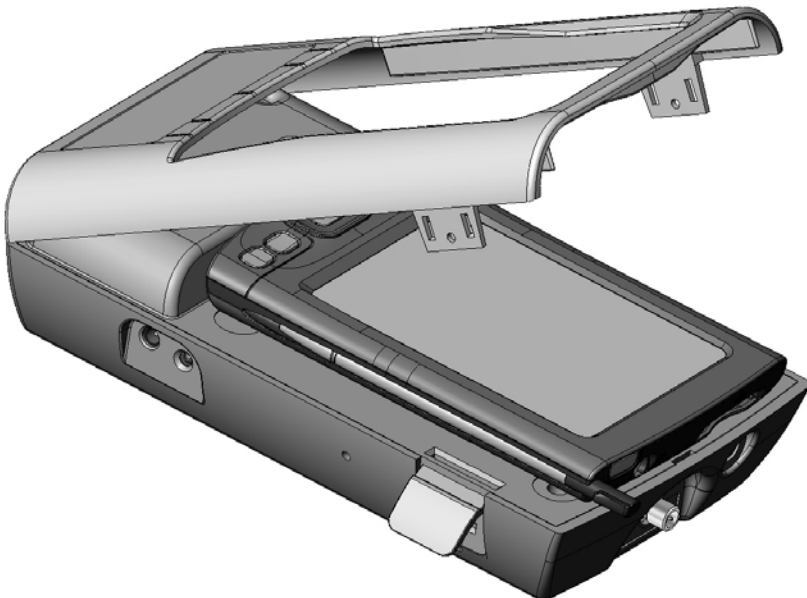
Lift the two latches close to the top of the unit and remove the silver top cover (see drawing). Remove the Palm T|X by gripping its sides and pulling it towards the top edge of the spectrum analyzer. (Note that the connector is a tight fit and that a hard pull may be needed).

Note: the top cover could be secured by screws under the latches which must be removed first (see section Preventing Unauthorised Removal below).

Re-fitting

Remove the Stylus from the Palm T|X. Push the Palm T|X onto the connector by pushing it firmly in the line of the instrument.

Ensure that the two fixing latches are open. Locate the top cover onto the rear of the instrument and lower it down, then operate the two fixing latches to secure it. Refit the Stylus.

Preventing Unauthorised Removal

In circumstances where removal of the Palm T|X is regarded as undesirable, the top cover can be secured using screws which fit underneath the two latches. TTi provides Torx head screws for this purpose (M2.5 size) although they are not fitted.

15. Re-initialising the Palm T|X

Whenever the battery of the Palm T|X has been allowed to completely discharge (as is normally the case when it is first received) it will be necessary to re-initialise it.

15.1. Procedure for Re-Initialising

Charge the Palm T|X in the normal way. After a short period (normally less then 10 minutes) the battery voltage will recover to a point where normal operation is possible. The T|X may then switch itself on automatically, or it may be necessary to turn it on manually (using the green button on the top edge).

At this point a Palm logo will appear on the screen and the unit will reboot (i.e. the operating system will reload) as indicated by moving black bars on the screen. When this is complete the user will be prompted to confirm or re-enter the real-time clock information (date, time, location) and confirm user preferences.

When this has been completed the Palm T|X is ready for use, however it should be left charging for several more hours before disconnecting it from the ac power adaptor/charger.

In exceptional circumstances, the Palm T|X may fail to re-initialise after being re-charged. Should this happen it will be necessary to operate the "Reset" button on the back of the T|X. To do this, remove the T|X from the PSA1301/2701 (see "Removing and Re-fitting the Palm T|X" above), and use the Palm stylus to press the reset button, see section 26.2. It should then re-initialise.

15.2. Technical Note about the OFF state

Handheld computers operate on the principle of being 'always on'. When they are turned 'off', they merely go into a low power consumption mode with the display and other functions disabled - this is often referred to as Sleep mode. When turned back on, they restart instantly without the delay that would be caused if the operating system had to be reloaded.

Consequently when 'off', a small amount of power is still being taken from the battery. It is assumed that the user will keep the unit charged and never let the battery fully discharge.

In most handheld computers, allowing the battery to fully discharge would cause all of the user's data to be lost. However, the Palm T|X uses permanent Flash memory which prevents user data from being lost if the battery is fully discharged. The real-time clock, however, cannot continue to run with a fully discharged battery.

If the unit is left unused and unconnected to its charger for an extended period (typically several weeks) the battery will discharge to a point where re-initialisation is needed.

The batteries of the PSA1301/2701 will also discharge over an extended period of time, but no re-initialisation should be required.

16. Language Choice for the Palm T|X

As supplied with the PSA1301/2701T, the operating language of the Palm T|X has been set to English. It is possible to change this to French, German or Spanish, but the change should be made before the product is first used. Note that the Spectrum Analyzer software remains in English.

See the Read This First leaflet for instruction on changing the language.

17. Turning On and Turning Off

17.1. Palm T|X On/Off

General

The Palm T|X can be turned ON in either of two ways: by pressing the green button on the top edge, or by pressing any of the four keys below the display. Using the green button returns to the application in use when it was turned off. Using one of the four keys below the display will go to the application assigned to that key.

Note: When turning the unit back on, it may be necessary to press a key several times before it responds. This is because, in sleep mode, the keys are being polled very slowly as part of the power saving system.

The Palm T|X can be turned OFF by pressing the green button on the top edge. When operating on its battery and running standard Palm applications, it will turn off automatically after a short delay from the last action (settable between 30 seconds to 3 minutes). This automatic switch off is disabled whenever the mains adaptor/charger is connected (unless preferences are changed).

Within the PSAnalyzer Application

The PSA1301/2701T is most easily switched on or off using the hard key marked Back. When using the PSAnalyzer application, pressing and holding this key for more than one second turns it off (sleep mode). Pressing it again turns it back on.

Note: It may be necessary to press the key more than once to turn on because of slow key polling in sleep mode.

The PSAnalyzer application suppresses automatic switch off of the Palm T|X and replaces it with its own battery saving system. Using the Auto Sleep function from the System menu, the unit can be set to turn off automatically at a user set delay between 5 minutes and 60 minutes from the last button press.

Any of the four main hard keys can be used to turn the unit on, though the Back (Home) key is preferable - because the other keys will also perform the function assigned to them. Alternatively the green button on the top edge can be used for on or off.

17.2. PSA1301/2701 On/Off Control

The on/off state of the PSA1301/2701 spectrum analyzer unit is controlled from the Palm T|X.
If the T|X is 'on' and the PSAnalyzer application is running, then the PSA1301/2701 will be on. If the T|X is 'off', or if the T|X is on but an application other than PSAnalyzer is running, the PSA1301/2701 will be off.

17.3. Operation Delay after Turning On

When the PSAnalyzer application is brought out of Sleep mode (by pressing a hard key or the green power key), the PSA1301/2701 goes through a brief initialisation sequence. This can create a delay of up to two seconds during which the Run/Stop indicator turns red and shows Wait. It is also possible that the first sweep may be corrupted.

18. Battery and AC Power

The PSA1301/2701T can operate using its internal rechargeable batteries, or from AC line using the adaptor provided by TTi.

18.1. Battery Operation

The Palm T|X and the PSA1301/2701 incorporate their own rechargeable batteries. The AC adaptor/ charger provided by TTi recharges both batteries simultaneously. Charge control circuitry ensures that the batteries will not be over charged.

The PSAnalyzer application provides battery condition indicators for both batteries, the left hand one is for the PSA1301/2701 (providing only a low battery warning), while the right hand one is for the Palm T|X and incorporates a multi-stage 'fuel gauge' type battery indication.

In normal operation within the PSA1301/2701T, the Palm T|X battery will discharge more quickly than the PSA1301/2701 battery. The PSA1301/2701 battery also has a shorter recharge time.

However, should the PSA1301/2701 battery become fully discharged, communications between it and the Palm T|X will stop and the red "WAIT" symbol will become permanently on, and the left hand battery symbol will indicate "empty".

Battery life depends upon screen brightness, but should be between three and five hours of continuous operation from a charge. Recharge time is typically less than four hours.

To conserve the battery the PSAnalyzer application can be put into sleep mode when not in use by pressing and holding the Home/Back key. Also auto-sleep mode can be selected whereby the unit turns off automatically after a defined period from the last key press. All data is retained when off.

Checking the Palm T|X battery condition

The precise condition of the T|X battery can be checked from within PSAnalyzer by accessing the Task Bar.
To display the task bar, press the Help key.
The task bar is displayed below the help screen text.

To check the battery condition select the "System Info" icon from the Task Bar. Press the Home key to exit.
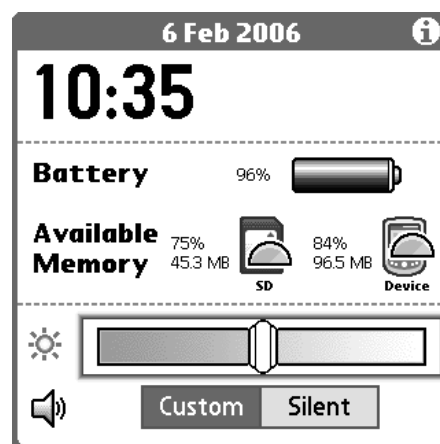
18.2. AC Power Operation

The AC adaptor/charger provided by TTi can be used as the permanent power source for the PSA1301/2701T. If the batteries require re-charging, this will be done automatically and charging terminated at the appropriate point.

Use only the AC power adaptor provided by TTi. Use of any other power source could cause damage and will void the warranty.

When connected to the external power source, the right hand battery indicator will show a lightning symbol.

Auto-sleep switch-off is disabled when external power is connected.

An LED next to the DC power input will illuminate while the PSA1301/2701 batteries are charging.

18.3. Extended Periods Without Use

If the unit is left unused for extended periods, the batteries of both the Palm T|X and PSA1301/2701 will gradually discharge. If the internal battery of the Palm T|X discharges beyond a certain point, re-initialisation will be necessary, see section 15 .

The discharge time for either battery is typically several weeks, but could be considerably less if the batteries were already partly discharged when it was turned off.

If an extended period without use is envisaged, it is advisable to leave the unit connected to its charger in order to maintain the battery charge level.

19. Using the PSAnalyzer Application

19.1. Initial Conditions

The signal to be measured should be connected using the SMA connector at the top of the unit see section 11.1 .

⚠ Signals that could exceed +20dBm (+127dBuV or 2.2V rms) or 15V DC, should be connected via a suitable attenuator. Signals exceeding this level could cause damage.

! Bluetooth or WiFi on the Palm T|X should be set to Off. (The very close proximity to the spectrum analyzer of a UHF source could cause spurious signals to be displayed).

To check that both wireless sources are off, press Help and observe the task bar at the bottom of the screen. The Bluetooth symbol should both be grey (rather than white). The WiFi symbol should show the word Wi-Fi rather than signal level bars. If not, select them from the task bar and turn the function off.

! The USB lead should be unplugged at the spectrum analyzer end. (The USB cable could induce interference into the spectrum analyzer that could cause spurious signals to be displayed).

19.2. Selecting and Leaving the Application

To launch the PSAnalyzer application, enter the Applications screen (by pressing the Home key once or twice). Press the PSAnalyzer icon (using the touch screen), or select it by pressing the centre button of the 5-way navigator twice.

To leave the application in order to use other Palm applications, select Exit from the main (home) menu and then use Exit Application.

19.3. Touch Screen or Hard Key operation

Handheld computer applications are normally operated using the touch screen. Most commonly they require the use of the supplied stylus because they involve selecting tiny icons or characters, or positioning a cursor precisely within a document.

The PSAnalyzer application has been written to give the user a choice - touch screen operation using a stylus or a finger tip, or hard key operation without ever touching the screen. These options are always present ** allowing the user to change operation method whenever they choose.

Touch Screen Operation

PSAnalyzer creates soft keys on the screen which are large enough to be operated using a finger tip as well as a stylus. Most functions are controlled directly using these soft keys, but some functions (such as scrolling digits or moving markers) are performed using the hard keys of the 5-way navigator. The basic functions of Run, Stop, Help and Back (Home) are also assigned to hard keys.

Hard Key Only Operation

Some users may prefer never to use the touch screen. PSAnalyzer allows all functions ** to be operated using only the hard keys. Each function is selected from the on-screen menus by scrolling through the keys using the 5-way navigator and pressing the central button. The currently selected key is shown by either a darker colour, or by a coloured outline. All menus including numeric entry screens can be operated in this way.

** Quick Menu mode can not be operated using hard keys only. Also it is not possible to enter user-defined file names using hard keys, default file names must be accepted instead. User-defined names require the use of the Palm on-screen keyboard which can only practicably be operated using a stylus.

19.4. The PSAnalyzer Screen
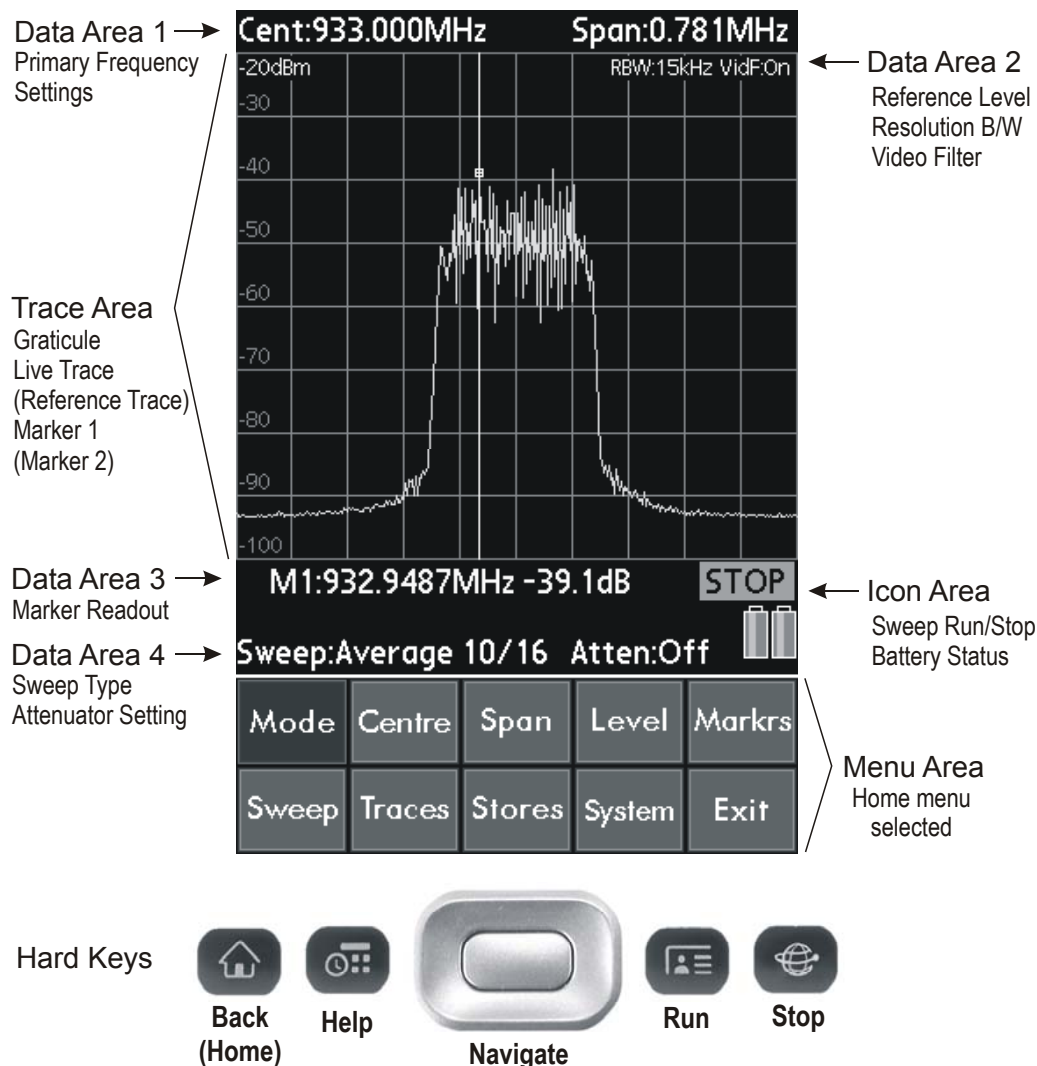
19.5. Operation and Navigation

The Palm T|X has nine hard keys (four dedicated keys plus the five way navigator). The PSAnalyzer application creates soft keys within a menu structure. Soft keys can be pressed directly (using a finger tip or stylus) or they can be operated using the five way navigator ** (left/right/up/down to select, centre to "press" the key). This latter mode avoids ever having to touch the screen.

The four dedicated keys are used to start or stop the sweep (Run and Stop), select context sensitive Help, and exit a sub menu and return to the home menu (Back / Home).

** Quick Menu mode can not be operated in this way.

19.6. Turning Off / Power Saving

When operating from batteries the unit should be turned off when not in use. Press and hold the Back (Home) key. The display will go off, the status of the instrument is not lost and all data is retained apart from any running sweep. To turn back on, press the Back (Home) key again *. Alternatively use the recessed green on/off key on the top edge of the Palm T|X.

Note: an Auto Sleep function that automatically turns the unit off after a delay is available - see System menu, section 20.15. Auto Sleep is disabled whenever external power is connected.

* Note: When turning the unit back on, it may be necessary to press the key several times before it responds. This is because, in sleep mode, the keys are being polled very slowly as part of the power saving system.

20. The PSAnalyzer Menu System

20.1. Home Menu

All functions are operated from one of ten sub-menus selected from the Home Menu. To exit a sub menu and return to the home menu, press the Back (Home) hard key.

Alternatively pressing the dark grey area on the left hand side directly above the key row of a sub menu duplicates the action of the Back (Home) key.

When using a stylus or finger tip this may be more convenient than using the hard key.

This "hidden" key exists in all menus apart from the Home menu.

Dark grey key duplicates Back/Home hard key
press in the top left hand section of the menu area
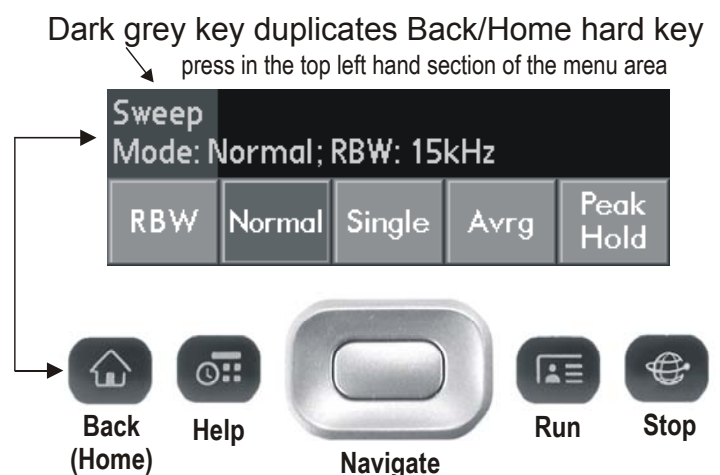
20.2. Menus Summary

Mode: set the control mode to Centre plus Span, or Start plus Stop, centre plus demodulation (Zero Span) or Quick Menu. Also provides a function called Preset which sets defined conditions from a single key press. Note that the labels of the next two keys depend upon the mode setting.

  Centre: set the centre frequency of the sweep (not available when mode = Start/Stop). A further sub menu of Set Step Value can be selected from the Centre menu.

  Span: set the span of the sweep (not available when mode = Start/Stop).

  Start or Stop: set the start or stop frequency of the sweep (not available when mode = Centre/Span, Zero Span or Quick Menu).

  AM/FM: set the type of audio demodulation for Zero Span mode (not available when mode = Centre/Span or Start/Stop).

  Quick Menu: select the Quick Menu mode of operation which opens a new menu with dark green keys in place of blue. See section 20.17 for detailed information on Quick Menu operation.

Level: set reference level (by turning attenuator on or off); select display units (dBm or dBµV); select vertical zoom and pan.

Markrs: set marker(s) on/off and position markers manually or automatically.

Sweep: select sweep mode (Single, Normal (continuous), Peak Hold or Average), set RBW (resolution bandwidth).

Traces: select Live and Reference traces, copy Live to Reference, select Limit Lines, set Video Filter, choose Hi or Lo resolution.

Stores: store or recall a trace or a set-up, copy a whole screen to an image file, open the Limit Lines editor.

System: set auto sleep mode, set sweep averaging number, turn graticule on or off.

Exit: exit from the PSAnalyzer application or suspend the application (sleep mode); view information about the application.

20.3. Mode Menu

This menu allows the selection of four different modes: Centre/Span, Start/Stop, Zero Span and Quick Menu. The current mode is shown within the menu area. To change mode press the appropriate key after which the unit returns automatically to the home menu.

(Note that the two keys of the home menu to the right of the Mode key change depending upon the mode selected).

Centre/Span and Start/Stop are essentially the same mode, but with different options of control over the sweep parameters. When the mode is changed the sweep will remain the same and the values of start and stop or centre and span will be calculated from the existing sweep parameters.

Zero Span mode disables the sweep and shows a horizontal line representing the level at the centre frequency. AM or FM audio modulation is selectable with the audio available from a 3.5mm jack socket (marked 🎧) adjacent to the RF Signal Input. Demodulation mode and audio level are selected from the AM/FM menu.

Quick Menu is a different mode of operation which provides direct access to some of the most commonly used functions without selecting a sub-menu and allocates the navigator keys permanently to marker control. See section 20.17 for detailed information on Quick Menu operation.

Preset is used to set a defined set of conditions from a single key press. It is particularly useful when the frequency location and level of the signal to be measured is unknown. Pressing Preset sets the following conditions:
Mode = Quick Menu, Frequency span = Minimum to Maximum, Sweep = Normal (and running), RBW = Maximum, Live Trace = On, Ref Trace = Off, Video Filter = On, Level zoom = Off (10dB/div), Attenuator = On, Graticule = On, Markers = M1 at centre of frequency span .

20.4. Centre Menu

This menu allows the centre frequency of the sweep to be set. Values are always in MHz with a maximum resolution of 0.001 (1kHz). The range is 0.310 to 1299.840 MHz or 1.160 to 2699.840 MHz. The current centre frequency is displayed within the menu area.

There are four ways to set the centre frequency:

Step Up/Step Down: allows the centre frequency to be increased or decreased in fixed steps as set by the Set Step Value sub menu which is accessed from this menu.

Set C = M1: sets the centre frequency equal to the frequency at the position of Marker One, and moves the marker to the centre of the graticule.

Set by Keybd: this opens a 0 to 9 numeric entry keypad. Keys can be pressed directly (with finger tip or stylus) or operated with the five way navigator. Press OK to activate the new frequency and return to the Home menu, or Cancel to escape.

Note: If Set by Keybd was the last function used within a menu, then it will be automatically selected the next time that the menu is entered.

Set by Tab/Jog: selects a numeric entry mode whereby the digits of the current centre frequency can be selected and incremented/decremented using the five way navigator. The changed frequency is activated automatically after a short delay. To exit this entry mode press the Back (Home) hard key, or the grey area at the top left of the menu.

(Note that when using a stylus, the digit to be "jogged" can be directly selected by pressing it).

Note: If Set by Tab/Jog was the last function used within a menu, then it will be automatically selected the next time that the menu is entered.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.5. Step Value Sub Menu

This is a sub-menu of the centre menu. It sets the step value that will be used in the Step Up/Step Down function of the centre frequency menu Values are always in MHz with a maximum resolution of 0.001 (1kHz). The range is 0.001 MHz to 100.000 MHz. The current step value is displayed within the menu area.

There are four ways to set the step value:

Set Step = M delta: sets the step value equal to the absolute value of frequency difference between the two marker positions.

Set Step = Span/10: sets the step value equal to one tenth of the current frequency span (i.e. one graticule division).

Set by Keyboard:
Set by Tab/Jog:
These two keys operate in the same manner as described for the Centre menu, see section 20.4.

To exit this sub menu and return to the centre frequency menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.6. Span Menu

This menu allows the span of the sweep to be set. Values are always in MHz with a maximum resolution of 0.001 (1kHz). The range is 0.320 to 1299.850 MHz or 0.320 to 2699.000 MHz. The current span is displayed within the menu area.

There are four ways to set the span:

Zoom In/Zoom Out: decreases or increases the span in binary steps.

Span = M delta: sets the span equal to the absolute value of frequency difference between the two marker positions..

Set by Keyboard:
Set by Tab/Jog:
These two keys operate in the same manner as described for the Centre menu, see section 20.4.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.7. Start Frequency Menu

This menu allows the start frequency of the sweep to be set. Values are always in MHz with a maximum resolution of 0.001 (1kHz). The range is 0.150 to 1299.680 MHz or 1.000 to 2699.680 MHz. The current start frequency is displayed within the menu area.

There are four ways to set the start frequency:

Start = M1: sets the start frequency equal to the frequency at the position of Marker One.

Start = M1/Stop = M2: sets the start frequency equal to the frequency at the position of Marker One and the stop frequency equal to the frequency at the position of Marker Two (both markers must be active for this function to operate)

Set by Keyboard:
Set by Tab/Jog:
These two keys operate in the same manner as described for the Centre menu, see section 20.4.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.8. Stop Frequency Menu

This menu allows the stop frequency of the sweep to be set. Values are always in MHz with a maximum resolution of 0.001 (1kHz). The range is 0.470 to 1300.000 MHz or 1.320 to 2700.000 MHz. The current stop frequency is displayed within the menu area.

There are three ways to set the stop frequency:

Stop = M1: sets the stop frequency equal to the frequency at the position of Marker One.

Start = M1/Stop = M2: sets the start frequency equal to the frequency at the position of Marker One and the stop frequency equal to the frequency at the position of Marker Two (both markers must be active for this function to operate*)*
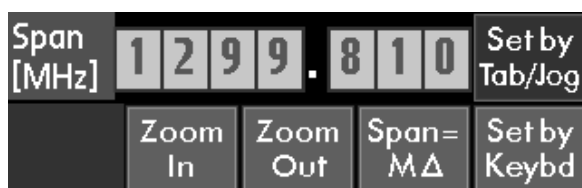
Set by Keyboard:
Set by Tab/Jog:
These two keys operate in the same manner as described for the Centre menu, see section 20.4.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.9. AM/FM Menu

This menu controls the settings for demodulated audio in Zero Span mode, which can be Off, AM, or FM. The demodulated audio is outputted from the 3.5mm stereo/mono jack socket.

Audio Volume: to change the volume press the Audio Volume key and use the up and down keys of the five way navigator to change the volume level (range 1 to 16).

Audio Filter: toggles the low-pass audio filter on or off. The filter has a turnover point of around 3 kHz and is useful for attenuating high frequency interference.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.10.   Level Menu

This menu allows the reference level (the level represented by the top of the graticule) to be changed by means of a switchable attenuator. It also allows the display to be vertically zoomed. The current status is shown within the menu area.

Atten. On/Off: toggles the input attenuator between On and Off and sets the reference level to -20dBm (On) or 0dBm (Off). N.B. in dBµV mode these reference levels become 87dBµV and 107dBµV.

dBm/dBµV: toggles the display of levels between dBm (power relative to 1mW into 50 Ohms) and dBµV (power relative to 1 microvolt into 50 Ohms).

Normal: the normal level display is 10dB/div allowing the full 80dB display range to be shown. Use this key to cancel zoom mode.

Zoom/Pan: this key increases the vertical scale to 5dB/div. Use the up/down keys of the five way navigator to pan the 40dB window through the 80dB range.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.11.   Markers Menu

This is not truly a menu as it has no soft keys. Two markers are available shown by yellow and blue vertical lines. The frequency and amplitude at each marker point is displayed below the trace area, along with difference values. The five way navigator is used to control the markers as follows:

Turn Markers On - press the centre of the 5-way navigator to turn on each marker. (Note that only M1 or M1+M2 can be displayed - not M2 alone).

Select Marker to be Controlled - once both markers are displayed, subsequent presses of the centre key toggles the marker under control.

Note that when both markers are on, only the values for the "marker under control" are displayed, along with the difference values for the two markers.

Move Markers Left or Right - press the left and right navigator keys to scroll the selected marker. Auto speed-up is provided. Alternatively press the screen at the point that you want the selected marker to move to.

Find next Peak - press the up or down navigator keys to move the selected marker to the next higher or next lower amplitude peak.

Note: This function is peak tracking and will therefore follow the peak if the frequency is changing. To cancel peak tracking press the left or right navigator keys once.

Turn Markers Off - press and hold the navigator centre key to turn off each marker (M2 will turn off first).

To exit this function and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

Note: Markers maintain a fixed position on the screen. Changing any sweep parameter (Start, Stop, Centre, Span) will change the frequency at the marker position. The exception to this is the C = M1 function which also repositions the marker at the new centre frequency, see section 20.4.
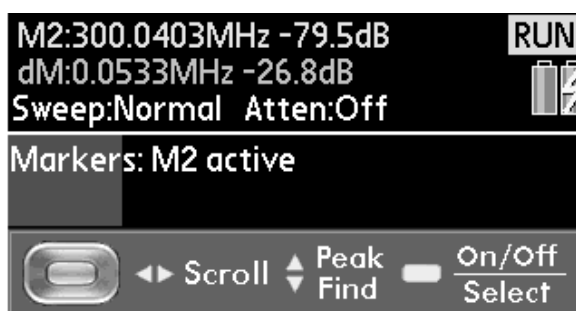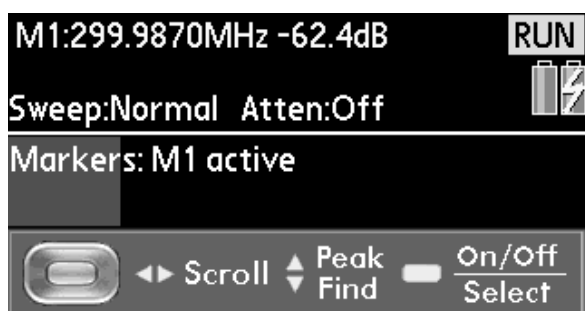
20.12.   Sweep Menu
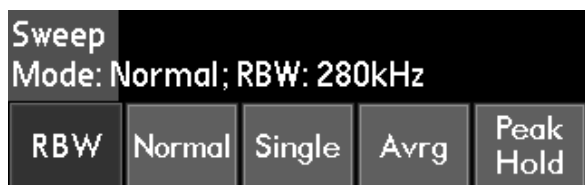
This menu allows the selection of four different sweep modes, and the setting of the resolution bandwidth (RBW). The current sweep mode and RBW are displayed within the menu area.

RBW: Toggles between the two resolution bandwidths of 280 kHz and 15 kHz (PSA1301) or between the three resolution bandwidths of 1 MHz, 280 kHz and 15 kHz (PSA2701).

Normal : sets a continuous sweep mode where a new sweep is commenced automatically after the previous sweep is completed. Press the Stop hard key to terminate the sweep and hold the trace on the screen. Press the Run hard key to restart sweeping.

Single: sets a single sweep mode whereby a sweep is initiated by pressing the Run hard key. When the sweep is completed the sweep stops and the trace is held on the screen.

Avrg: sets sweep averaging mode whereby the trace shows the average of a number of sweeps (selectable in binary steps 2 to 256). The most recent N sweeps are averaged, pressing Run restarts averaging from zero. Pressing Stop holds the trace. The averaging number is set in the System menu.

Peak Hold: in peak hold mode the trace shows the highest level detected at each frequency since sweeping was commenced. Pressing Run resets Peak Hold. Pressing Stop holds the trace.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.13.   Traces Menu

This menu allows the live trace and the reference trace to be turned on and off and the live trace to be copied to the reference trace. It also allows the screen resolution for the trace area to be changed, and the video filter function to be turned on or off. The current status is shown within the menu area.

Live Trace: toggles the live trace on and off - the live trace (green) is updated by the sweep function.

Ref. Trace: toggles the reference trace on or off - the reference trace (purple) can be either recalled from memory or copied from the live trace. If no reference trace has been created or recalled, the key will have no function.

Note: If the sweep parameters (start/stop or centre/span) are different from their values when the reference trace was captured, the trace is automatically shifted and scaled so as to correctly represent the stored trace for the new frequency span. The trace may therefore occupy only a part of the screen or may be off the screen altogether. An off-screen trace is indicated by a purple arrow at the appropriate edge of the graticule.

Live > Ref.: copies the live trace, as currently displayed on the screen, onto the reference trace.

Hi Res/Lo Res: toggles the screen resolution of the trace area. Hi Res uses 320 x 300 pixels, Lo Res uses 160 x 150 points where each point is 4 pixels; this provides thicker lines but less resolution.

Video Filter: toggles the video filter function on or off. When on, an analogue filter is applied to the trace which attenuates sudden transitions and noise.

Limit Lines: toggles the limit lines (L1 and L2) on or off. Successive presses step through a sequence: Both Off > L1 On > L2 On > L1 + L2 On > Both Off. If no limit lines have been created or recalled, the key will have no function. The colour of Limit Line 1 is red. Limit line 2 is blue.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.14.   Stores Menu

Traces can be stored to memory as files of amplitude and frequency (comma-separated-variable format). These files can be recalled to the reference trace. The complete set-up of the instrument can be to saved to files for recall later. The whole screen (traces, graticule, annotation) can be stored to a bit-map image file for viewing or printing outside of the application.

Each key brings up a dialogue box which includes a scrollable window of existing files, a line for the currently selected file name, and three keys - OK, Cancel and Delete.

When a file is being stored, a default filename is allocated. This can be overwritten using the on-screen keyboard. Existing files can be overwritten by selecting them from the files window and pressing OK (a warning message is displayed).

Existing files can also be deleted by selecting them from the files window and pressing Delete (a warning message is displayed).

Note: The store, recall and copy functions are only available when the memory card is inserted.

Store Trace: press this key to store the live trace, as currently displayed on the screen, into a memory location. Opens a window showing existing stored traces and a default file name (e.g. trce001). Over-write file name, if preferred, using on-screen keyboard. Press OK to store.

Recall Trace: press this key to recall a stored trace to the reference trace. Opens a window showing existing stored traces which can be selected directly on-screen or via the 5-way navigator . Press OK to confirm recall.

Store Setup: press this key to store the complete set-up of the instrument into a memory location. Opens a window showing existing stored set-ups and a default file name (e.g. sett001). Over-write file name, if preferred, using on-screen keyboard. Press OK to store.

Recall Setup: press this key to recall a stored setup. Opens a window showing existing stored setups which can be selected directly on-screen or via the 5-way navigator . Press OK to confirm recall.

Copy Screen: copies the whole visible screen (from above the menu area) to a bit-map image file. Opens a window showing existing stored screens and a default file name (e.g. scrn001). Over-write file name, if preferred, using on-screen keyboard. Press OK to store.

Lim. Line Editor: enters the Limit Line Editor sub menu which enables values to be entered to create limit lines for the display, and to save and recall limit lines from memory (see section 21.9).

To exit this menu and return to the home menu press the Back (Home) key or the grey area at the top left of the menu..

20.15.   System Menu
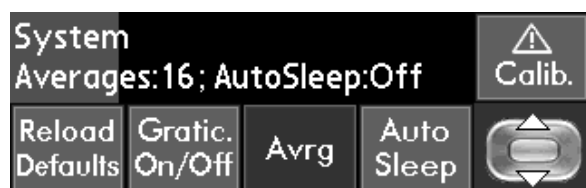
This menu is used to set the graticule display, set the averaging number for sweep averaging, and to set the delay time for auto sleep. The factory default set-up status can also be reloaded. The current status is shown within the menu area.

Avrg: press to set the number of sweeps that will be averaged when averaging mode is selected in the sweep menu. Use the up/down keys of the five way navigator to set the number (2 to 256 in binary steps).

Auto Sleep: press to set whether the unit goes into sleep mode (off) after a delay from the last key press. Use the up/down keys of the five way navigator to set either Off, or a time between 5 mins and 60 mins.

Auto-sleep is disabled when external power is connected.

Gratic. On/Off: press to cycle the graticule through three states: full on, horizontal lines only, off.

Reload Defaults: press to reload the instrument set-up status as shipped from the factory. (See section 24.1 - for list of factory defaults.

! **Calib.:** press to enter instrument calibration mode. Re-calibration can only be undertaken with specialised equipment and in conjunction with the Service Manual which is available from TTi.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.16.   Exit Menu

This menu allows you to exit from the PSAnalyzer application or suspend the application (sleep mode); and to view information about the application

Info.: Read a summary of the capabilities and specifications of the spectrum analyzer.

About: view information about this application (e.g. version number)

Sleep: turn off the application to save power - all current settings and data are retained. Press any of the four main hard keys, or the green button at the top of the unit to resume the application.

The unit can also be turned off (Sleep mode) by pressing and holding the Home hard key for > 1 second.

Note that the unit can be set to enter Sleep mode automatically after a fixed time - see System menu.

Exit Applic.: exit the application and go to the home menu of the Palm PDA. To re-launch the application find PSAnalyzer in the Palm T|X applications screen.

To exit this menu and return to the home menu press the Back (Home) hard key, or the grey area at the top left of the menu.

20.17.   Quick Menu

Quick Menu mode is selected using the Mode menu. Once selected, the two keys to the right of the Mode key change to become a single key marked Quick Menu.

Selecting Quick Menu produces a new operating menu screen using dark green keys in place of blue. Operation using this menu is different from the other menus within PSAnalyzer.

Quick Menu can only be operated using the touch screen - users who wish to operate PSAnalyzer functions using the Navigator hard keys alone can not use Quick Menu mode. This is because the Navigator keys are allocated to Marker control and no longer operate the key highlighting.

The purpose of Quick Menu is to provide direct access to some of the more commonly used functions without having to select sub-menus. Frequency setting is only available as centre/span.

Markers (Navigator keys): when the quick menu is displayed (green keys), the keys of the five way navigator are assigned to marker control.

Press the centre key of the navigator to turn on a marker or, if both are already on, to toggle control between the two markers. Press and hold the centre key to turn a marker off.

Press left or right to move the currently selected marker (the marker can also be moved by touching the screen). Press up or down to move the selected marker to the next higher or next lower amplitude peak.

See section 20.11 for more information.

Main Menu: return to the main (home) menu in order to access functions that are not available from Quick Menu, or to select a different mode.

Centre: enter the Centre frequency menu for selecting the centre frequency of the sweep or setting the step size. See section 20.4.

Span: enter the Span menu for setting the frequency span of the sweep. See section 20.6.

RBW: toggle the resolution bandwidth between 280 kHz and 15 kHz (PSA1301T) or between 1 MHz, 280 kHz and 15 kHz (PSA2701T). The value is displayed at the top right of the graticule area.

Atten. On/Off: toggle the attenuator between On (reference level = 0dBm) and Off (reference level = -20dBm). The reference level is displayed at the top left of the graticule area.

Set C = M1: set the centre frequency equal to the frequency at the position of Marker One, and move the cursor to the centre of screen.

Step Up/Step Down: increase or decrease the centre frequency in fixed steps as set by the Set Step Value sub menu which is accessed from the Centre menu

Zoom In/Zoom Out: decrease or increase the span in binary steps.

21. PSAnalyzer Operating Techniques

The following section contains some tips and hints regarding the operation of the PSA1301/2701T. Each individual menu function is detailed within section 20 "The PSAnalyzer Menu System". Information is also provided in the context sensitive Help on the instrument.

21.1. Menu Navigation

The Hidden Key: PSAnalyzer is controlled via the ten operating menus, see section 20. Moving between menus requires a return to the Home menu by pressing the Back (Home) hard key. When using the touch screen for control (rather than the 5-way navigator), it is also possible to use the "hidden" key which is the dark grey area at the top LH side of each menu. This duplicates the action of the Back (Home) hard key.

The Menu Highlight Position: When using the 5-way navigator for control, pressing the select button operates the currently highlighted key. On leaving a menu, this position is remembered and is recalled when the menu is next entered. Thus, if Start = M1 was the last function used within the Start menu, it can be operated again by highlighting Start in the Home menu and pressing the selector button twice.

Note that using the 5-way navigator for key control can not be done in Quick Menu mode.

21.2. Frequency Setting

21.2.1. Centre/Span and Start/Stop modes

PSAnalyzer has four "modes" of operation selected from the Mode menu: Centre/Span, Start/Stop, Zero Span and Quick Menu.

Centre/Span and Start/Stop are not actually different sweep modes. Rather, they are different modes for setting and displaying the sweep parameters. The user can change between these two modes at any time without altering the sweep (apart from causing it to restart). The only effect will be to change the information directly above the graticule area, and the two menu keys to the right of the Mode key.

Quick Menu is a variant of centre/span mode which gives direct access to some commonly used functions without the need to enter sub-menus. It also allocates navigator keys permanently to marker control. See section 20.17 for details.

21.2.2. Centre Menu Shortcuts

Set Centre to Marker: To re-centre the sweep to a new position within the currently visible sweep, move the marker (M1) to the desired position and press Set C = M1.

Step Up / Step Down: The centre frequency can be moved in fixed steps (settable between 1kHz and 100MHz) by these two keys. The Set Step Val. key accesses the menu for setting the step size.

Step Value Shortcuts: The Step Value sub menu provides two shortcut keys. Step = MΔ sets the step size to the difference between the two marker positions M1 and M2. Step = Span/10 sets the step size equal to one tenth of the current span i.e. one graticule division.

21.2.3. Span Menu Shortcuts

Zoom In / Zoom Out: The span can be increased or decreased in binary steps by these keys.

Set Span equal to Marker Difference: The Spn = MΔ key sets the span equal to the difference between the two marker positions M1 and M2 while moving the centre frequency to the markers mid-point.

21.2.4. Start and Stop Menu Shortcuts

Set Start and/or Stop to Markers: The Start = M1 key moves the start frequency to the current position of marker M1. An equivalent functions is available from the Stop menu. The Strt=M1/Stp=M2 key sets the start and stop frequencies to the current marker positions.

21.2.5. Setting by Direct Numeric Entry

Each frequency related menu has a Set by Keybd key. This creates a 0 to 9 numeric entry keypad of large keys which can be pressed directly with the finger tip. (Alternatively they can operated with the five way navigator). The entered value appears at the top.

The space below the keys contains the standard Palm input area. If required, this can be used to edit the number after it is entered and before it is confirmed using standard Palm cursor-based editing. See section 21.11 for details of how to change the input area type.

Press OK to activate the new frequency and return to the menu, or Cancel to abort and return to the menu. Note that the Back (Home) hard key does not operate within this screen.

If Set by Keybd was the last function used within a menu, then it will be automatically selected the next time that the menu is entered. This reduces the number of key presses required when entering new frequencies repetitively.

21.2.6. Setting by Tab and Jog

Setting by Tab/Jog provides an alternative to settings frequencies by the Keyboard. It is particularly relevant to users who wish to operate the PSA1301/2701T without using the touch screen, but it is potentially relevant to all users.

Within any frequency menu, the current set frequency is displayed above the keys in a set of boxes. The Set by Tab/Jog function allows the frequency to be changed .using the 5-way navigator (left/right to select digit, up/down to change digit). It is also possible to select the digit to be changed simply by using the stylus or finger tip to press it.

This also provides a quick and convenient way of stepping frequencies (although the step size is limited to decade values).

New frequencies do not have to be confirmed. A delay of about half a second is included between a digit being altered and the sweep parameters being changed to match. This allows digits to be scrolled without the sweep continually restarting.

If Set by Tab/Jog was the last function used within a menu, then it will be automatically selected the next time that the menu is entered. This reduces the number of key presses required when entering new frequencies repetitively.

21.3. Performing Sweeps

Frequency sweeps are started and stopped using the hard keys Run and Stop. The Sweep menu permits four different sweep types to be selected, and allows the resolution bandwidth to be changed, see section 20.12.

The Stop key halts the sweep at any time and holds the trace. The Run key initiates a new sweep and also resets Averaging and Peak Hold sweep modes. (Note that the averaging value is selected from the System menu rather than the Sweep menu).

When the sweep is in Stop, any change to the sweep frequency settings or to the attenuator setting will initiate a new single sweep. This is done to ensure that the live trace remains correct relative to the graticule markings.

Sweep Rate and Update Mode

There is no user control of the sweep rate. The speed of sweeping is determined by the frequency span and the resolution bandwidth; the analyzer sweeps at the fastest rate possible for the Span and RBW selected, subject to a maximum rate of approximately 5Hz.

The approximate sweep time can be calculated from the following formulae (span in MHz):
For RBW = 1MHz (PSA2701 only), sweep time = 200ms + (span x 2ms)
For RBW = 280kHz, sweep time = 200ms + (span x 7ms)
For RBW = 15kHz, sweep time = 200ms + (span x 75ms)

Thus, for example, a sweep of 10MHz span at 15kHz RBW will take about 1 second; whilst a sweep of 1GHz span will take around 8 seconds at 280kHz RBW, or 2 seconds at 1MHz RBW.

Note that for fast sweeps (less than 0.67 seconds) the display is updated at the end of the sweep with all points re-written simultaneously. For slower sweeps, the display is updated synchronously with the sweep and the old sweep values are sequentially over-written with the new values. In this mode the progress of the sweep is indicated by a moving yellow line at the bottom of the graticule.

Video Filter

The video filter has only two settings, on or off. The setting has no effect on the sweep rate.

By default the video filter is turned On. At 280kHz/1MHz RBW this reduces the effects of system noise within the PSA1301/2701 and improves the identification of low level signals just above the noise floor. The filter attenuates noise signals above about 10kHz. It has a negligible effect on peak amplitude measurements for signals at -60dB below the reference level or higher.

Where users wish to evaluate the noise performance of the system under test, they may wish to turn the video filter Off.

At 15kHz RBW the effect of the video filter is small.

21.4. Level Measurements

The normal display has a range of 80 dBs down from the top of the graticule (the reference level). The reference level is set from the Level menu, see section 20.10. With the attenuator off, the reference level is -20dBm, with the attenuator on it is 0dBm.

Although RF signal measurements are most commonly made in dBm (power relative to 1 milliwatt into 50 Ohms), EMC measurements are normally made in dBµV (power relative to 1 microvolt into 50 Ohms). The dBm/dBµV key toggles between these two measurement modes.

Note that, in dBµV mode, the top-of graticule reference becomes 87dBµV (-20dBm) with the attenuator off, and 107dBµV (0dBm) with the attenuator on. The graticule lines are shifted so that subsequent lines are in multiples of 10dBµV.

Note that any signal levels above the reference level can cause non-linearity in the detectors which could affect the amplitude accuracy of other signals which are below the reference level.

An overload indicator is provided to show this condition. The indicator is a red upwards pointing arrow near the top of the graticule.

> **!** The absolute maximum signal level that can be applied without damage is specified as +20dBm or 127dBµV (approx. 2.2V rms).

The display can be vertically expanded using the Zoom/Pan function. Zoom has a single level of x2, and the 40dB window can be panned over the full range using the 5-way navigator. Note that this function is for viewing purposes only and provides no improvement in accuracy or resolution, the latter being fixed at 0.1dB.

21.5. The PRESET Key

The Preset key is found within the Mode menu, see section 20.3. It has a yellow outline to signify that it changes several things simultaneously.

Preset is used to set a defined set of conditions from a single key press. It is particularly useful when the frequency and amplitude of the signal is unknown, or when the existing status of the unit is unknown as might be the case when the PSA1301/2701T is being shared between several users.

Pressing Preset sets the following conditions: Mode = Quick Menu, Frequency span = Minimum to Maximum, Sweep = Normal (and running), RBW = Maximum, Live Trace = On, Ref Trace = Off, Video Filter = On, Level zoom = Off (10dB/div), Attenuator = On, Graticule = On, Markers = M1 on at centre of the span .

An alternative to using the Preset key is to reload factory defaults (from the system menu). This resets all of the settings to a known state including system settings such as screen resolution. See section 24.1.

21.6. Using Markers

Markers provide a numeric readout of amplitude and frequency. Activation and control of markers using the Markers menu is described in section 20.11.

Markers are vertical lines with a box that highlights the intersection point of the marker with the trace. The readout shows the frequency and level at the intersection point. When both markers are displayed, the frequency and amplitude difference is also displayed. Markers provide an amplitude readout for the live trace only.

Markers also provide a quick and accurate method of resetting centre, span, start or stop frequencies to examine an area of interest. See section 21.2.

Although the frequency readout has a resolution of 0.1kHz, the uncertainty of the frequency at any sweep point is related to the span, being approximately 0.3% of the span width (span/320).

Note that markers retain their position relative to the graticule. When the sweep range is changed, the marker frequencies change with them.

Peak Find and Track: The Peak Find function (5-way navigator up/down) will automatically move the selected marker to the position of the highest amplitude peak. Thereafter pressing navigator down will move the marker to the next amplitude peak (regardless of is position on the screen), and so on downwards in amplitude. Pressing navigator up will move it through peaks of increasing amplitude.

The function will automatically track the signal. For each new sweep, the marker moves to follow its current peak position. If it is currently marking the third highest amplitude level, it will move to the position of the new third highest amplitude level when the signal changes. Only the currently selected marker will peak track.

Peak find/track is cancelled when the marker is moved manually, the selected marker is changed, or when any sweep parameter is changed.

Marker Movement Shortcut: When the Markers menu is selected (or when in Quick Menu mode), the active marker can be moved by touching the screen at the desired position.

21.7. Reference Trace

A reference trace (in purple) is available in addition to the live trace. See Traces menu, section 20.13. The reference trace can be copied directly from the live trace, or recalled from a memory store.

Both the reference trace and the live trace can be toggled on or off from within the traces menu.

Note: If the sweep parameters (start/stop or centre/span) are different from their values when the reference trace was captured, the trace is automatically shifted and scaled so as to correctly represent the stored trace for the new frequency span. The trace may therefore occupy only a part of the screen or may be off the screen altogether. An off-screen reference trace is indicated by a purple arrow at the appropriate edge of the graticule.

The reference trace is also shifted and scaled to match changes in the attenuator setting or the vertical zoom and pan.

21.8. Store, Recall and Copy

PSAnalyzer provides the facility to store traces and complete instrument set-ups to a memory card and recall them as required. See Stores menu, section 20.14.

Each key within the Stores menu brings up a dialogue box which includes a scrollable window of existing files, a line for the currently selected file name, and three keys - OK, Cancel and Delete.

When a file is being stored, a default filename is allocated. This can be overwritten using the on-screen keyboard. The maximum length of the file name is, in practical terms, limited to the length of file name entry line. However longer name will be accepted although the last characters will not be visible while they are being entered.

Existing files can be overwritten by selecting them from the files window and pressing OK (a warning message is displayed).

Existing files can also be deleted by selecting them from the files window and pressing Delete (a warning message is displayed).

The Copy Screen key copies the whole screen to the memory card as a bitmap image.

There is no Recall function for screen images. Screens are viewed outside of the PSAnalyzer application using the Media application of the Palm T|X, see section 23.1.
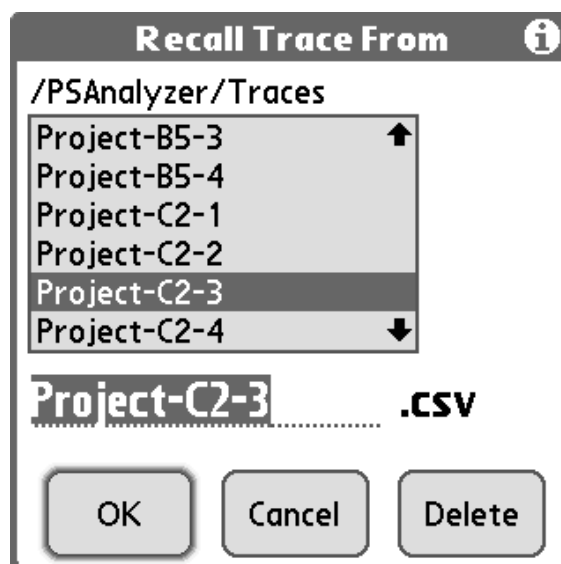
21.9. Creating and Displaying Limit Lines

Limit Line Editor (ⓘ)

Line 1	Line 2		Recall

Freq [MHz]	dBm		
1100.000	-45.0		Store
1120.000	-38.0		
1150.000	-32.0		
1170.000	-40.0		Finish
1200.000	-55.0		

1100.000	-45.0		Cancel

Add	Mod	Del	New

$	€	£	¥	1	2	3	-	+	←
[	]	{	}	4	5	6	/	*	:	→
<	>	\	=	7	8	9	.	,	↵
@	~	&	#	(	0	)	␣	%

Limit lines are created by defining a list of frequency & amplitude points (minimum 2). Straight lines are drawn between these points. Where a frequency is repeated with different amplitudes, the line becomes vertical representing a step change.

Two limit lines can be displayed simultaneously. The limit line editor controls the current lists for these two lines. Limit line lists can be created, modified, stored and recalled from this screen.

Note that the display of the Limit Lines is controlled from the Traces menu.

Creating or Editing Limit Lines

The editor is accessed using the Lim. Line Editor key within the Stores menu.

Values are entered using the Palm numeric keyboard - - see section 21.11. Because of its small size, it is likely to require the use of the Palm stylus or similar pointing device.

The two current lists are selected by pressing Line1 or Line 2 at the top of the screen (the blue highlight shows which is selected). The window shows up to six points within the current list. Use the scroll arrows to move through the list.

The two dotted lines below the window are the two numeric editing areas (frequency and amplitude). The editing cursor can be moved between the two using the Navigator hard keys (or by touching the screen). The Palm keyboard is used to enter or modify numbers, the cursor can be moved using the Navigator keys or by touching the screen at the desired position.

Note that amplitudes are entered in dBm or dBμV depending upon the setting chosen in the Level menu. Existing values are automatically converted when the dBm/dBμV mode is changed.

Once a new frequency/amplitude point has been created in the editing area, it can be added to the current list by pressing the Add key below. The maximum number of frequency/amplitude points in a limit line list is 400.

To modify or delete an existing point, it can be brought into the editing area by selecting it from within the list window. To delete the point press the Del key. To modify the point, edit it with the Palm keyboard and then press the Mod key.

To start a completely new list, press the New key. This deletes all points in the current list. To exit the editor screen while saving all of the changes, press the Finish key. To exit without saving any changes press the Cancel key.

Note that frequency/amplitude points are automatically placed in ascending frequency order. However where two identical frequency points are included to create a step change, the "from" amplitude point must appear above the "to" amplitude point in the list.

Limit lines can be stored and recalled to and from the memory card in a similar way to traces. The store and recall procedures are similar to those described in section 21.8 . Note that a limit line will be stored from (or recalled to) either Line 1 or Line 2 depending upon which is currently selected.

Displaying Limit Lines

To turn a limit line on or off on the display, go to the Traces menu. The Limit Lines key in the traces menu cycles though four states: Off > L1 > L2 > L1+L2 > Off. If no limit lines have been defined, the key will have no effect.

Note that a limit line terminates at the highest and lowest frequencies from which it is defined. If the current span is outside of these frequencies, no line will appear.

21.10.   Screen Resolution and Trace Thickness

The high resolution of the Palm T|X screen (pixel spacing = 0.165mm) provides an excellent level of trace detail. However, because it is drawn one pixel wide, the trace is thin and may be difficult to view from a distance away.

If a thicker trace is required, the screen resolution can be changed from within the Traces menu, see section 20.13. In Lo Res. mode, the graticule area is modified to have only 160 x 150 points, where each point is made up of four pixels.

This lower resolution mode provides a thicker trace that halves the number of sweep points displayed while retaining peak detection. Pairs of points are combined into single points using the higher of the two amplitudes. Note that the maximum frequency resolution of the marker is halved. Greater measurement accuracy will be achieved using Hi Res. Mode.

21.11.   Changing the Palm Input Area type

The Set by Keyboard function for frequency setting, and all Store/Recall functions brings up the standard Palm input area at the bottom of the screen.

This input area can be alpha, numeric or graffiti.

To change the type, use the stylus to press one of the small graphics below it:

ABC = upper case letters, abc = lower case letters, 123 = numerics, the right-hand graphic = graffiti area.

21.12.   Adjusting the Display Brightness

The display brightness can be adjusted from within PSAnalyzer by accessing the Task Bar.
To display the task bar, press the Help key. The task bar is displayed below the help screen text.

To change the brightness select the "System Info" icon from the Task Bar (the icon which shows the time).
Set the brightness and then press the Home key to exit.

22. Help Screens

PSAnalyzer provides many pages of context sensitive Help screens. Each menu has its own associated help screen which may contain several pages of scrollable text.

Some general information about the specification and capabilities of the product is also available from the Info key under the Exit menu.

Help screens also provide access to the standard Palm Taskbar which allows the screen brightness to be changed and Palm system information to be checked (time, date, battery status, memory status, Wireless status and alerts). See sections 21.12 and 28.8.4.

For some sub-menus (Set by Keyboard, Store/Recall, Limit Line Editor), the help screen is accessed from the $\boxed{i}$ symbol at the top right of the screen and <u>not</u> by using the Help hard key.

Note: Help screens should be closed by pressing Done as soon as they have been read. When a Help screen is open, the PSAnalyzer application will turn off after the standard delay set within the Palm preferences (adjustable 30 secs to 3 mins).

23. Functions outside of PSAnalyzer

23.1. Viewing a Stored Screen Image

Screen images are stored from within the PSAnalyzer application, see section $\boxed{20.14}$. However, to view or print a stored screen image, it is necessary to exit the PSAnalyzer application and use the native applications of the Palm T|X.

The following assumes that screens have been saved to the default position on the plug-in memory card (the folder DCIM \ PSAnalyzer).

Open the Media application from the Application screen, or use the Photos and Videos shortcut from the Favourites screen.

Ensure that the Card icon is selected (top right hand side) and set the drop down menu to either PSAnalyzer or All Albums. Thumbnails of available images will appear - this can be set (at the bottom left of the screen) to be thumbnails only or thumbnails plus file details.

Select the image to be viewed from the file list by pressing its thumbnail or its name (e.g. scrn001). After a few seconds the image will appear. Pressing anywhere on the screen will return to the thumbnails view. Press the home key to exit the Media application.

23.1.1. Adding Annotation to Screens

The Media application menu option "Draw on Picture" allows images to be annotated (using sketching and/or text) and then saved as a new image.

See the Palm T|X documentation for full information on the Media application.

23.2. Printing a Stored Screen Image (using a printer connected to a PC)

Screen image files are stored on the memory card in the DCIM \ PSAnalyzer folder and have the extension .bmp. See section $\boxed{24.3}$ for more details.

To transfer a screen image to a PC for printing it is necessary to use the USB linked card reader supplied with the PSA1301/2701T.

When transferred to a personal computer, screen image files can be opened in any image editing program, and by the Picture and Fax Viewer application of Windows XP from which printing can be initiated.

23.3. Transferring PSAnalyzer Files to a Personal Computer

PSAnalyzer uses a plug-in memory card to store screen images, traces and set-ups. There are three types of file; trace files, set-up files, and screen image files. All of these might be transferred onto a PC for backup purposes. In addition, screen image files may need to be transferred for printing, and trace files may be required for import into other programs such as Excel.

Trace files are stored on the card in the folder PSAnalyzer\Traces. Set-up files are stored on the card in the folder PSAnalyzer\Setups. Screen image files are stored on the card in the folder DCIM\PSAnalyzer. See section $\boxed{24.3}$ for details of the file types and structures.

To transfer any file to a PC it is necessary to use the USB linked card reader supplied with the PSA1301/2701T. Alternatively, any type of card reader that the user may already have can be used provided that it supports SD/MMC type cards.

> ! **Important** - Do <u>NOT</u> try to make a direct USB connection from the PSA1301/2701T to a PC which has not had the Palm software loaded onto it in advance.

23.3.1. Using the Memory Card Reader (If Supplied)

TTi provides a USB linked memory card reader to allow PSAnalyzer user files to be transferred to and from a personal computer.

The type of card reader supplied may vary from time to time. It may be a single card type (SD and MMC cards only) or a multi-card type. A USB extension lead may also be provided for card readers which do not have their own flexible connection lead.

Installation

No driver files should be required for installation under Windows Vista, Windows XP, Windows 2000, Windows ME, or Mac OS9 or OS10 or later. Installation under Windows 98 SE should also be possible, but it may be necessary to download drivers from the manufacturer's website.

Plugging the card reader into an unused USB port (USB 2 or USB 1) should cause the operating system to recognise the device and to load suitable drivers. This may take some time as more than one driver has to be installed. When installation is complete, the operating system may request a reboot.

The card reader is seen as a removable disk drive, and the operating system should automatically allocate it an unused drive letter. The device should be visible under Windows in My Computer.

In the event of difficulties see section 26.4.

Transferring Files

Once the installation procedure has been carried out, it will be possible to plug and unplug the card reader as required with the operating system automatically recognising it and allocating it a drive letter.

With the card inserted, open the "disk drive" under its allocated drive either from My Computer or from Explorer. The directory structure of the card will be visible. Trace files are stored in the folder PSAnalyzer\Tr21aces. Set-up files are stored in the folder PSAnalyzer\Setups. Screen image files are stored in the folder DCIM\PSAnalyzer. Files can be transferred between the card and the PC by using the normal drag and drop techniques.

23.3.2. SanDisk Ultra II Gemini combined SD and USB card

The PSA1301/2701T may be supplied with a special type of SD memory card which does not require a separate USB card reader. The SanDisk Ultra II Gemini card performs the function of both a normal SD card and a USB flash drive.

To change the card function to USB, hold the card with the label upwards, and hinge the outer section of the lower half of the card downwards. This exposes a USB connector which can be plugged into a standard USB port on a computer. To return to the normal SD card function, hinge the moveable section upwards until it snaps into place.

PSA-T series units supplied with this type of card will <u>not</u> include a USB SD/MMC card reader. All references to the card reader within the Instruction Manual should be interpreted as applying to the Gemini card operating in USB mode.

23.4. Sending PSAnalyzer Files via Bluetooth or WiFi

The Palm T|X incorporates both Bluetooth and WiFi, allowing wireless connections to be made to a mobile phone, a personal computer, or a WiFi network.

Note: Setting up of WiFi and Bluetooth connections, and setting up Email are covered within the Palm documentation. TTi and their agents/distributors do NOT provide any support advice on these subjects.

23.4.1. Email Attachments

Any files stored on the memory card (as well as any data with the internal memory) can be selected as attachments to an email and sent to a remote or local computer.

23.4.2. Sending Images from the Media application

PSAnalyzer screen image files can be send directly from within the Media application using Bluetooth. Alternatively they can be beamed using IR.

23.4.3. Direct File Transfer using WiFile LT

Palm currently supplies a WiFi file sharing program called WiFile LT on the support CD. This may provide the capability to move files to and from shared folders on a computer within a network.

Note: Both Bluetooth and WiFi must be turned OFF when using the spectrum analyzer in active sweeping mode.

24. PSAnalyzer Files and Defaults

24.1. Factory Default Settings for PSAnalyzer

As initially supplied, the set-up of the PSA1301 is as follows:

Mode = Centre/Span. Centre = 649.925MHz, Span =1299.85MHz, Step = 1MHz
Attenuator = On (reference level = 0 dBm). Mode = dBm. Level zoom = Off (10dB/div)
Markers = M1 set to On at centre frequency (M2 = Off)
Sweep = Normal (and running). RBW (resolution bandwidth) = 280 kHz
Live Trace = On. Ref. Trace = Off. Resolution (of trace area) = High Res. Video Filter = On
Limit Lines = Off. Audio Filter = On. Audio Volume = 10.
Graticule = On, Averages = 16, Auto Sleep = 30 mins

As initially supplied, the set-up of the PSA2701 is as follows:

Mode = Centre/Span. Centre = 1349.5MHz, Span= 2699MHz, Step = 1MHz
Attenuator = On (reference level = 0 dBm). Mode = dBm. Level zoom = Off (10dB/div)
Markers = M1 set to On at centre frequency (M2 = Off)
Sweep = Normal (and running). RBW (resolution bandwidth) = 280 kHz
Live Trace = On. Ref. Trace = Off. Resolution (of trace area) = High Res. Video Filter = On
Limit Lines = Off. Audio Filter = On. Audio Volume = 10.
Graticule = On, Averages = 16, Auto Sleep = 30 mins

These factory defaults can be reloaded at any time from within the System menu.

24.2. File Locations for PSAnalyzer data files

The PSAnalyzer application is stored within the internal program memory of the handheld computer. The initialisation file that stores the "last used" settings when the application is terminated is also stored within the internal memory.   However, files created by the user (stored traces, set-ups and screens) are stored on a plug-in memory card.

Trace files are stored in the folder PSAnalyzer\Traces. Limit line files are stored in the folder PSAnalyzer\Limits. Set-up files are stored in the folder PSAnalyzer\Setups. Screen image files are stored in the folder DCIM\PSAnalyzer.

24.3. File Structures for PSAnalyzer data files

Trace Files

Trace files have the extension .csv and are standard "comma separated variable" files suitable for import into Excel, MathCad or any other program that supports CSV import.

A file consists of 320 data pairs representing each frequency point in the trace. The first number is a frequency in MHz to four decimal places, e.g. 742.6830. The second number is the amplitude in dBm to one decimal place (amplitudes will be within the range 0.0 to -100.0).

Screen Files

Screen files have the extension .bmp and are bitmaps representing the whole of the screen above the menu area. Each file uses 120 kilobytes and is an image of 379 pixels high by 320 pixels wide in 8-bit indexed colour format.

When transferred to a personal computer, screen files can be opened in any image editing program, and by the Picture and Fax Viewer application of Windows XP.

Set-up Files

Set-up files have an encoded structure and have no function outside of the PSAnalyzer application.
The only reason for transferring them onto a personal computer would be for back-up purposes.
The file extension is .ini

A set-up file includes all of the settings within PSAnalyzer including the current reference trace (if any) and the current limit lines (if any).

Limit Line Files

Limit Line files have the extension .csv and are standard "comma separated variable" files consisting of frequency and amplitude pairs. The first number is a frequency in MHz to three decimal places, e.g. 149.863. The second number is the amplitude in dBm to one decimal place (amplitudes will be within the range 0.0 to -99.9). The list is in ascending frequency order.

Limit line files can be created in an external program such as Excel, and imported into PSAnalyzer by copying them to the PSAnalyzer\Limits folder on the card.

25. Maintenance, Calibration and Repair

25.1. Screen Protection

Handheld computers are sometimes used with Screen Protectors - a thin transparent film which covers the touch screen. When used in a clean environment using either a stylus or hard keys only, a Screen Protector is not necessary.

In dirty environments or when using a finger to press the screen, it may be advisable to use a Screen Protector to prevent grease or other contaminants from damaging the screen. A Screen Protector reduces the quality of the display somewhat, although this can be minimised by careful application.

Some people generate a considerable level of grease from their finger tips, and may find that the screen quickly becomes smeared when regularly touched. Other people may experience no difficulties from touching the screen without a Screen Protector in place.

Screen Protectors are available from a variety of sources.

25.2. Cleaning

If the unit requires cleaning, use a cloth that is only lightly dampened with water or a mild detergent. Take particular care in cleaning the touch screen area. Refer to the Palm documentation for further advice.

25.3. Maintaining Battery Condition

If left unused and disconnected for an extended period, the rechargeable batteries will discharge beyond the point where normal operation is possible. See Section 18.3.

If an extended period without use is envisaged, it is advisable to leave the unit connected to its charger in order to maintain the battery charge level.

25.4. Calibration

To ensure that the accuracy of the instrument remains within specification the calibration should be checked (and if necessary adjusted) annually. The calibration adjustment procedure is detailed in the service manual.

25.5. Service & Repair

Palm T|X handheld computer

Warranty and Service is the responsibility of Palm. In the event of a fault occurring, access your local Palm website for details of how to proceed. These websites are country specific, but can be accessed through the route web address of **www.palm.com**

PSA1301 or PSA2701 Spectrum Analyzer Adaptor

TTi or their agents overseas will provide a repair service for any PSA1301/2701 spectrum analyzer adaptor developing a fault.

Where owners wish to undertake their own maintenance work, this should only be done by skilled personnel in conjunction with the service manual which may be purchased directly from the TTi or their agents overseas.

26. Trouble Shooting

26.1. Correcting Unexpected Conditions in PSAnalyzer

If the PSAnalyzer application appears to be performing in an unexpected way, the following solutions should be tried.

1. Exit the PSAnalyzer application and restart it.

2. Recall a previously stored Set-up file from the Stores menu. (Store the current settings first if they are important).

3. Operate the Reset button on the PSA1301/2701. This button is located on the right-hand side of the instrument, and should be operated using a thin non-metallic object such as a pencil tip.

This reset is non-destructive. It restarts the microprocessor in the PSA1301/2701 but all set-up information is retained as this is reloaded from non-volatile memory after the reset.
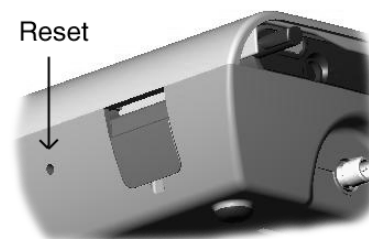
Note that the button is too far recessed to be operated by the stylus tip. The original stylus supplied with the Palm T|X has a suitable thin point concealed within its cap. A replacement stylus may not have this.

4. Operate the Reload Defaults button on the System menu. This will restore the unit to its factory defaults as listed in section 24.1.

5. If none of the above corrects the problem, try resetting the Palm T|X as detailed below.

26.2. Resetting the Palm T|X

Handheld computers, such as the Palm T|X have a complex operating system which can occasionally "crash" or otherwise cease to operate normally. Should this happen, it will be necessary to perform a reset procedure. There are two types of reset, a soft reset and a hard reset.

Performing a Soft Reset

Remove the Palm T|X from the PSA1301/2701T (see section 14). Use the stylus (or a similar object without a sharp tip) to gently press the reset button on the rear.

The screen will go blank briefly and then the operating system will reload as indicated by moving black bars.

It may be necessary to re-enter the time, date and location. However, no other data will be lost.

Performing a Hard Reset (Caution !)

Only do a hard reset if a soft reset doesn't solve your problem, or if you want to clear all of your information from your handheld.

Reset button
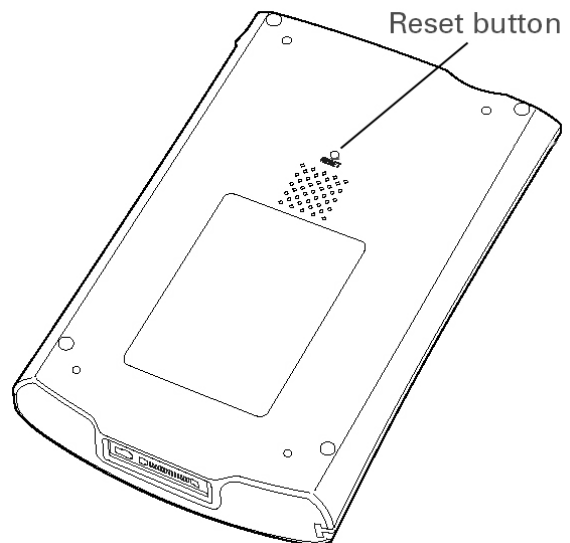
! A hard reset deletes all records and entries stored on your handheld, including the username that identifies the handheld. It will also erase the PSAnalyzer program and any other third party programs that are not incorporated within the permanent ROM memory of the device.

1. Press and hold the power button.

2. While holding the power button, use the tip of the stylus (or a similar object without a sharp tip) to gently press and release the reset button.

3. Wait for the Palm Powered™ logo to appear (not the first Palm logo that appears), and then release the power button.

4. When you see the message that warns you about erasing all of the info on your handheld, do one of the following: • Press Up on the 5-way navigator to finish the reset and show the touchscreen, or • Press any other button to do a soft reset.

26.3. Reinstalling or Updating the PSAnalyzer application

Creating a Duplicate Card

Reinstalling or updating the application may require the original memory card supplied with the PSA1301/2701T by TTi. Should this have been lost or erased, it will be necessary to create a duplicate from the support CD supplied by TTi with the product.

Take a suitable SD or MMC card and insert it into a card reader connected to a PC.

Find or create a folder called Palm, then find or create a sub-folder called Launcher. Open the CD and open the folder Card\Palm\Launcher, then copy the file PSAInstaller.prc to the Launcher sub-folder on the card.

Find or create a folder called PSAnalyzer, then create a sub-folder called Software. Open the CD and open the folder Card\PSAnalyzer\Software, then copy the file PSAnalyzer.prc to the Software sub-folder on the card.

Reinstalling the Application

Should the PSAnalyzer application be erased by performing a Hard Reset or by any other means, it will be necessary to reinstall it. The memory card supplied with the PSA1301/2701T includes a backup copy of the application and an Installer program.

Remove and re-insert the memory card supplied with the PSA1301/2701T by TTi. The Applications screen will appear showing the utility program PSAInstaller. Select this program and follow the on-screen instructions.

When completed, return to the normal Applications screen by selecting the drop down menu at the top right and select "All" in place of "Card".

Updating the Application

From time to time TTi may issue updated versions of the PSAnalyzer application. These are likely to be made available via a web download. The version number of the currently installed PSAnalyzer can be checked from within the application by going to the Exit menu and selecting About.

Take the memory card supplied with the PSA1301/2701T by TTi, and insert it into a card reader connected to the PC onto which the new version has been downloaded.

1.   Locate the backup version of the program (PSAnalyzer.prc) in the folder PSAnalyzer\Software.

2.   Create a new sub-directory called (say) Older, and move the older PSAnalyzer.prc into it.

3.   Copy the new version of PSAnalyzer.prc to the folder PSAnalyzer\Software.

Re-insert the memory card. The Applications screen will appear showing the utility program PSAInstaller. Select this program and follow the on-screen instructions.

When completed, return to the normal Applications screen by selecting the drop down menu at the top right and select "All" in place of "Card".

26.4. Card Reader Installation Problems

Installation instructions are given in section 23.3.1 and may also be included with the device.

Early operating system such as Windows 95, Windows NT and the first version of Windows 98 do not support USB devices. Windows 98 SE does support USB but a driver may be required from the card reader manufacturer's website.

Once installed the card reader is seen as a removable disk drive, and the operating system should automatically allocate it an unused drive letter. The device should be visible under Windows within My Computer.

There are circumstances where installation appears to be perfectly normal, but the device does not become visible through My Computer. This is typically caused by a clash with a Network drive.

Should this occur, insert a card into the reader and open Control Panel > Administrative Tools > Computer Management > Disk Management (Windows Vista/XP/2000 only). Locate the card (disk) which can be identified by its description (removable), its filing system (FAT), and its size in MB. Right click it's disk icon and select "change drive letter and path". Change the drive letter to one that will not clash with any network drives or any removable drives that might be connected to the system at any time.

27. Support Information and Accessories

27.1. Support Information for the Palm T|X

TTi and its agents/distributors do NOT provide support for the Palm T|X other than for its use within the PSA1301/2701T running the PSAnalyzer application.

A considerable amount of support information is provided in PDF form on the CDs included with the product.

The Software Installation CD supplied by Palm includes a Getting Started manual in English, French, German, Italian and Spanish, plus a simplified manual in several other languages.

The CD supplied with the PSA1301/2701T by TTi includes the full Palm T|X manual (in English) within the directory \Palm.

Further support information is available from Palm websites. These websites are country specific, but can be accessed through the route web address of **www.palm.com**

A number of other non official websites and forums exist which may provide useful information. These can be found by using a search engine.

27.2. Standard Accessories supplied for the Palm T|X

A number of accessories for the Palm T|X are supplied by Palm within the shipping box. These include a USB HotSync lead, a universal voltage AC adaptor/charger, and a leather cover.

None of these items are useable with the PSA1301/2701T, but can be used with the Palm T|X if it is removed.

The Palm T|X shipping box also contains the following:

License and Warranty Information
Printed "Read This First" Manual (multi language)
Software Installation and Support CD for Windows and Mac computers (multi language)

27.3. Optional Accessories

Optional Accessories for the PSA1301/2701T

For a list of optional accessories for the PSA1301/2701T, visit our website: **www.tti-test.com** or contact TTi directly.

Optional Accessories for the Palm T|X

A number of optional accessories are available for the Palm T|X, along with software applications. Palm websites are country specific, but can be accessed through the root web address:
www.palm.com

28. Appendix A.
Using other functions of the Palm T|X

NOTE: The following information is an overview of the functionality of the Palm T|X intended for PSA1301/2701T users who are unfamiliar with such devices. It is not intended as a substitute for Palm's own documentation, and its accuracy is not guaranteed.

TTi (and its agents and distributors) do NOT provide technical support for any other functions of the Palm T|X outside of the PSAnalyzer software application. Technical support for all other functions must be obtained from Palm or from associated support websites. See section 27.1.

Users should refer to the full PDF instruction manual (TX_Handbook_en.pdf) which is included on the TTi PSA1301/2701T support CD. A more recent version may be available from the Palm Website.

Multiple language version of a Getting Started manual are included on the Palm T|X Software Installation CD. These can be installed directly onto the Palm T|X itself, see section 28.7.

Useful basic information is also provided by the Quick Tour application on the Palm T|X and the "Discover Your Device" tutorial on the Palm installation CD.

For more detailed information, there are third-party books on the subject, see section 28.12 .

28.1. Handhelds and PDAs - Overview

Devices such as the Palm T|X are described as hand-held computers, palm-top computers or PDAs (personal digital assistants). The origin of these devices lies in the personal organisers of the 1970s. Companies such as Palm (Palm Pilot) and Apple (Apple Newton) then developed much more powerful devices incorporating touch sensitive screens for stylus based operation, and operating systems that could run many types of software application..

Today's hand-held devices have powerful microprocessors, full colour high resolution screens, and application software capable of duplicating many of the functions of a full size personal computer.

28.2. Software provided by Palm on CD

None of the software and applications on the Palm T|X Software Installation CD are necessary for operation of the PSA1301/2701T as a spectrum analyzer.

Palm provides extensive software for both Windows and Mac computers intended for sharing information between the Palm T|X and a PC. Some additional applications for the Palm T|X are also included on the CD.

28.3. Linking to a Personal Computer

It is NOT necessary ever to link the PSA1301/2701T to a personal computer. However, some of the additional features of the Palm T|X do require linking to a personal computer in order to share information, load new software applications and transfer files. This will require the installation of the Palm Desktop software - see Appendix B, section 29.

Note that transferring PSAnalyzer files to a PC can NOT be done using Palm Desktop software. Files must be transferred using the memory card and a card reader. See section 23.3.

! Important - Do <u>NOT</u> try to make a USB connection to a PC which has not had the appropriate software loaded onto it. See next section.

28.3.1. USB connections to a PC

The following applies to both the PSA1301/2701T and the Palm T|X by itself. The mini USB connection on the side of the PSA1301/2701T is a direct through connection to the USB port of the Palm T|X.

As stated previously in this manual and in the Read This First leaflet, a direct USB connection should only be made to a PC if the user intends to use the Palm Desktop software on that computer. In that case, the Palm installation CD must be run on the computer prior to making the USB connection.

! Do <u>NOT</u> attempt to make a USB connection otherwise. The operating system is likely to identify a Palm device and to load a generic driver for it. This driver may be incompatible with the Palm T|X and may prevent correct operation of the Palm Desktop software thereafter.

USB transfer of PSAnalyzer user files can only be done using a memory card reader, see section 23.3. Direct USB file transfers using Palm Desktop software is only relevant to native Palm applications and full system backups.

28.4. Palm Desktop software

Palm Desktop is Palm's companion software application for linking the Palm T|X to a PC. It is a powerful piece of software which enables the user to maintain certain types of data simultaneously on the handheld computer and on the PC. It also provides facilities for document conversion, backup of data, and installation of new programs.

Palm Desktop software has no direct relevance to PSAnalyzer.

Users of the PSA1301/2701T should read Appendix B, section 29 before deciding whether or how to install Palm Desktop.

28.5. Core Capabilities of the Palm T|X

The full functionality of the Palm T|X is defined by the installed Applications. These applications make use of the core capabilities of the product which are as follows.

Screen - High resolution 320x480 transflective TFT colour display, landscape or portrait mode, full area Touch Screen.
Processor - 312 MHz Intel Xscale processor.
Memory - 128MB of Flash memory (100MB available to user). Non-volatile, all data retained if battery is fully discharged.
Audio - Stereo out via 3.5mm 'phones socket, built-in loudspeaker. Note: This is **not** the output for demodulated audio in Zero Span Mode; for this see 11.3 and 20.3.
Control - Touch screen operation from task bar, on-screen menus and drop-downs. Most functions can also be operated using only the 5-way navigator.

Text Input

> **Qwerty Keyboard** - selectable on-screen keyboard for "typing" with the stylus.
> **Handwriting Recognition** - built-in Graffiti-2 character recognition allows text entry by 'writing' on the screen.

Connectivity

> **USB** for easy connection to personal computers.
> **Bluetooth** for wireless connection to computers, mobile phones, and Bluetooth peripherals.
> **WiFi** for wireless connection to computer networks (and wireless internet).
> **Infra Red** for connection to other handheld/PDA devices, mobile phones, IR peripherals.

Expansion - slot for SD, SDIO and MMC cards.

28.6. Standard Applications

Standard applications are included within the permanent memory of the T|X. Note that the following list is illustrative only. Palm may vary the applications provided with the Palm T|X from time to time, and could omit one or more of the listed applications or add others.

Addit - commercial application intended to facilitate purchasing of additional software applications.

Calc - large key calculator suitable for fingertip operation. Standard, mathematical, financial, conversion, logic and statistical functions (press 5-way navigator > to change mode). Up to 14 digits of precision. Scrollable calculation history. Copy and paste results into applications.

Calendar - full appointments/tasks diary system with editable text, durations, reminders and alarms.

Card Info - provides summary details for any card plugged into the SD card slot.

Contacts - easily searchable contacts database with customisable storage for large amounts of information per person including thumbnail photographs.

Dialer - establish a bluetooth or IR connection to a mobile phone for dialling direct from the T|X. Copy and paste phone numbers from Contacts.

Documents - DataViz Documents-To-Go - provides compatibility with Microsoft Office documents in Word, Excel and Powerpoint.

Expense - provides a convenient method for recording and sorting expenses details and receipts.

Favourites - customiseable list of applications, files, folders or web links that can be accessed directly.

HotSync - synchronises information between the T|X and a personal computer. The information to be synchronised can be set by the user. Particularly relevant to maintaining Calendar, Contacts and Expense data.

Media - application for viewing and organising photos and videos.

Memos - simple word processor application for creating text documents that do not require text formatting (otherwise use Documents).

Note Pad - enables drawings (hand writing, diagrams etc.) to be made on screen and saved.

Prefs - accesses the Preferences screen from which many functions of the T|X can be customised.

pTunes - MP3 music player application.

SMS - create SMS text messages to send via a mobile phone linked by Bluetooth or IR.

Solitaire - game application.

Tasks - create and maintain task lists linked to Calendar.

VersaMail - provides an email facility when Bluetooth or IR linked to a mobile phone or WiFi linked to a Network.

Web - opens a web browser (called Blazer) and accesses a WiFi or Bluetooth connection for internet access.

World Clock - provides a time and date display for three world locations chosen by the user.

28.7. Additional Applications

Palm provides some additional applications on the Palm T|X Software Installation CD,. These may include the following:

Getting Started Guide (Manual)- installs the Palm T|X basic operating manual onto the unit as an application.

WiFile LT - the "light" version of WiFile Pro. This is a file sharing program which provides the capability to move files to and from shared folders on any computer within a network using WiFi.

eReader - application for use with electronic books.

Acrobat Reader for Palm OS - allows standard Adobe Acrobat PDF files to be read. (Also installs a converter program onto the PC).

A number of other add-ons are provided on the CD. Some are PC based software to improve integration with Windows. Others are basically web links to enhancements or upgrades.

28.8. Some Palm Basics

28.8.1. Operating System, Memory and Filing System

The Palm T|X uses the Palm OS 5.4 operating system. This operating system uses a propriety database type filing system. Data stored in this filing system can not be viewed or accessed directly by a Windows based PC (or Mac). Transfer of data between the handheld computer and the PC requires Palm Desktop software to be installed.

The Palm operating system can also make use of memory with a conventional filing system. This memory is normally provided via a plug-in SD or MMC Flash memory card. Data on this card will use a conventional folder based filing system and has the potential to be viewed and accessed on a Windows or Mac PC.

Files created by most Palm applications and stored on a memory card will have the extension .prb (palm database). The content of these files can only be viewed on a PC by using Palm Desktop software. However, the Documents application can create files in Microsoft Office format (Word and Excel) that can be directly used on a PC.

The Palm T|X contains 128MB of Flash (non volatile) memory. 100MB of this memory is available to the user. By default this memory uses the Palm database filing system.

28.8.2. Modes of Operation

Palm applications are designed for operation using the touch screen and a stylus. A few applications (such as Calculator) can be operated using a finger tip in place of the stylus. Most applications also support some level of operation using the 5-way navigator thus enabling single handed operation.

Briefly tapping an icon selects it. Some icons have an alternative function that is selected by pressing and holding (though most do not). Editable text items have a cursor position which is selected by touching the screen. Multiple characters can be selected by pressing and dragging. Text can be entered using the on-screen keyboard (or by using hand writing recognition).

To use the 5-way navigator, press the centre button to create a highlight (unless a highlight is already present). Thereafter the navigator can be used to move the highlight and make selections. The operation of the navigator varies in different applications and may have some dedicated functionality.

Some menu options show a character short cut (e.g. ╱C for Copy). This refers to the use of the stylus within the handwriting input area and will only be of relevance to users who have learnt and regularly use handwriting recognition.

28.8.3. Hard Keys

By default, the four main hard keys of the T|X are set to launch the following applications (left to right): Home (Applications/Favourites), Calendar, Contacts, Web Browser. The function of the keys can be changed from within Preferences.

Home Key

The Home key - can be used in any standard Palm application to open either the Favourites screen or the Applications screen, depending upon the settings in Preferences. Further presses alternate between Applications and Favourites. Pressing and holding the home key brings up a menu of the most recently used applications.

The key also exits an application and terminates it (except for background applications such as pTunes).

28.8.4. Task Bar

The task bar is present in all standard Palm applications, occupying the bottom of the screen (or side of the screen in landscape mode). It is suppressed within the PSAnalyzer application in order to maximise screen area, however, it can be temporarily enabled by entering a Help screen.

Find - search for data by name. (The Find function will only find data that is directly related to a standard Palm application).

Menu - displays one or more drop-down menus giving options relevant to the current application.

Note that in most applications the Menu can also be accessed by pressing the identifier tab at the top left hand side of the application screen.

System Info - show time and date, battery condition, and available memory. Control screen brightness and sound on/off.

Alerts - if any alerts have occurred (e.g. a diary appointment) this will flash. Press to view.

Bluetooth - turn Bluetooth on or off, change Bluetooth preferences and set-up.

WiFi - turn WiFi on or off, change WiFi preferences and set-up.

Full-screen Writing - normally Graffiti handwriting recognition is limited to an area at the bottom of the screen. It can alternatively be enabled for the full screen area.

Screen Rotation - change the screen orientation from portrait to landscape or vice versa.

Input - switch between displaying and hiding the text input area, press and hold for input area menu (Palm keyboard or Graffiti area).

28.8.5. Application Help

Most Palm applications provide some level of on-screen help text. There is no standardised method of providing help screens. Some include help text directly within the operating screens, others provide a Help soft key or have Help (or Tips) within the menu options (see below). Others have an "**i**" symbol at the top of the screen which is pressed to bring up help,.

28.8.6. Menu Options

Each application has a set of drop-down menus that can be accessed from the Menu key on the Task Bar (see above) or by pressing the identifier tab at the top left hand side of the application screen.

The menu options vary depending upon the applications - example drop down menus for the Media application are shown below.
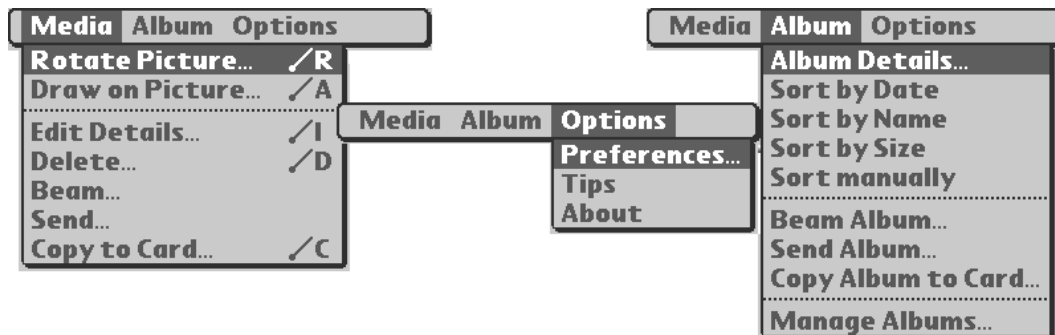
28.8.7. Categories

Most Palm applications include a drop-down menu at the top right of screen which is known as Categories. Initially this will be set to "All", but individual categories can be selected from the drop-down.
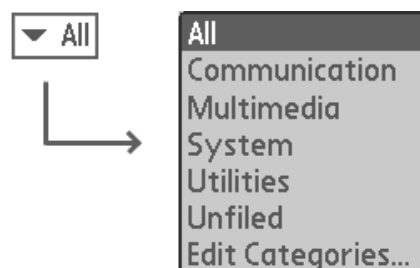
The concept of categories stems from the organisation of the Program Memory area of the device, see section 28.8.1. Most native Palm applications store both the program and the data for that application in the program memory area. This memory area does not have folder-based filing system. Categories can be regarded as Palm's folder system for the program memory area.

Each application (including the application called Applications) defines its own category list. Each category can be regarded as a sub-folder of the application. New categories can be created (and existing ones renamed or deleted) by selecting the Edit Categories function from the drop-down. One category which is always present and can not be deleted is Unfiled, this can be regarded as the root folder. Selecting "All" from the drop-down gives access to the contents of all of the categories including Unfiled.

NOTE The category list for the Media application is called Albums rather than Categories.

For basic applications, a document or file can be moved from one category to another by opening it in the application, changing the category setting, and then closing. More complex applications incorporate their own individual methods for moving data between categories.

28.8.8. Files and Folders on the Memory Card

Some applications, such as Media, Documents and pTunes, can operate with data that is stored both within the internal memory and on a memory card. Unlike the internal memory, the memory card will have a conventional folder structure and files can be directly copied to or from a PC.

Some applications define their own folder names for files on the card (DCIM in the case of Media, Documents in the case of Documents). Data stored from the Palm T|X onto a card, or transferred onto the card from a PC using Palm Desktop software will be automatically placed into the correct folder. However, files copied directly to the card must be manually placed into the correct folder.

Some other applications, such as pTunes, have a built-in folder browser and can access relevant files from anywhere on the card.

Categories

Applications such as Media and Documents retain the concept of categories for files on the memory card as well as files within the internal memory of the handheld.

The category list for the Media application is called Albums, and separate lists are maintained for the internal memory and the card. Creating a new album on the card creates a new sub-folder within the folder DCIM.

The category list for the Documents application combines all relevant files into a single list. An icon shows whether the document is on the card or within the internal memory of the handheld. Creating and changing categories does not affect the folder location. All files saved to the card as native Microsoft Office format will be in the folder Documents, while files saved in the alternative "native" format (e.g. Word to Go format) will be in the folder Palm/programs/DXTG. These latter files have the extension .pdb and can not be used on a PC except by using Palm Desktop software.

28.8.9. Communicating with Other Devices

Palm devices incorporate a variety of methods for communicating with peripherals, personal computers, and other handheld computers.

USB
All current Palm handheld computers incorporate a USB interface. This is intended for communication with a personal computer or another device that can act as a USB host (the handheld computer is defined as a USB peripheral).

❗ NOTE Do <u>NOT</u> try to make a direct USB connection to a PC which has not had the Palm software loaded onto it in advance. See section 28.3.1.

Serial
Some Palm handheld computers, including the Palm T|X, incorporate a UART based serial interface. This is used primarily for interfacing external peripherals such as keyboards. The PSA1301/2701 uses this interface to communicate with the T|X.

Infra Red
Most handheld computers, including the Palm T|X, incorporate an infra red beam interface. This can be used to communicate with peripherals or laptop computers which have IR, but its primary purpose is to communicate with other handheld computers. The "Beam" command from the Palm menu system provides a quick and convenient way to transfer data (and even applications) to another handheld computer.

Bluetooth and WiFi
Many handheld computers, including the Palm T|X, now incorporate a Bluetooth wireless interface that allows them to communicate with other handheld computers, mobile phones, and personal computers. The Palm T|X also incorporate WiFi for wireless connection to a Network.

28.9. HotSync

HotSync® is the Palm method for "synchronising" data between the Palm T|X and a personal computer. Synchronising can encompass loading new files, updating (overwriting) existing files, and backing up files. The actions can be bi-directional. Exactly what is performed during a HotSync operation is defined within the Palm Desktop application on the PC. See Appendix B section 29.3.

HotSync requires that the standard Palm software applications are installed onto a personal computer. Users of the PSA1301/2701T who do not intend to use Palm Desktop and other Palm PC applications should ignore HotSync.

28.10.   Creating a Shortcut to PSAnalyzer

As supplied by TTi, the PSAnalyzer application is installed within the Palm T|X applications so as to occupy the first position within the Applications screen (category All or Unfiled). Other applications (apart from Quick Tour) are listed alphabetically.

It is easy to launch PSAnalyzer from the Applications screen either by pressing the icon directly, or by using the centre button of the 5-way navigator. However, it is also possible to change the settings of the T|X so as to be able to launch PSAnalyzer from a hard key or from Favourites.

Hard Key Shortcut
Open Preferences and select Buttons (under Personal). Choose a button (other than the Home button) and open the drop-down menu. Select PSAnalyzer and press Done.

Favourites Shortcut
Open the favourites screen and press the top left hand tab (which displays the time). Select Rearrange Favourites. Choose a favourite on Page 1 that is of low importance, highlight it and drag it firstly to the page 2 icon and then to an unused position on that page.

Select page 1, then press and hold the newly created unused position - the Edit Favourite dialogue box will appear. Set Type: App, Original: PSAnalyzer (from drop-down), Name: PSAnalyzer. Press OK. Select and drag to the desired position on page 1. Press Done.

28.11.   Additional Software Applications

A very large number of additional software applications are available for the Palm handheld computer. Some come directly from Palm, but the larger number come from third party sources.

Note: TTi does not promote, endorse or provide support for any applications. The following information is provided for guidance only.

Most applications are commercial with typical prices between US$10 and US$50, though some are free of charge. Most applications can be "tried" before purchase. There are three main ways to find software applications:

Addit

Addit is pre-installed onto the Palm T|X. Its primary purpose is to provide a conduit for buying additional software applications. It also offers access to News and to Tips & Tricks.

Addit requires Palm desktop software to be installed onto your PC. The new applications (or News items and Tips & Tricks) are downloaded to the PC and transferred to the handheld during a HotSync operation.

The Palm website

Palm websites are country specific, but can be accessed through the route address of **www.palm.com**

A link can then be found to Software, from which a wide range of software applications can be purchased, normally priced in local currency.

Third Party websites

There are many third part websites that provide access to fully commercial software, shareware, or freeware. These can be found by using a Search Engine. Useful search phrases may be Palm Software, Palm Applications, PDA Software, Handheld Software, etc.

28.11.1.   Installing additional applications without using Palm Desktop

Where the user has installed Palm Desktop software onto their PC, this should be used to install new applications. The sub-application Quick Install is provided for this purpose. However, it is also possible to install some software application using the memory card and card reader, see section 23.3.1 .

Note: Only applications which consist of a single .prc file can be installed in this way. Applications which include an additional file such as a .pdb file, must be installed using Palm Desktop or Quick Install.

Software applications are normally installed in the main memory of the handheld. Some applications can be run directly from the memory card, but others have to be installed in the main memory by copying them from the card.

Having downloaded (or otherwise copied) a software application to a PC, use the card reader to copy the program file (which will have the extension .prc) to the card. The file must be copied to the directory \Palm\Launcher.

When the card is inserted back into the Palm T|X, the Applications screen is automatically switched to show the applications which are on the card. (To return to the normal Applications screen, select the drop down menu at the top right and select "All" in place of "Card").

To copy a program from the card to the main memory, select Menu Options by pressing the time display at the top LH side of the Application screen, then select Copy. Change the "Copy from" drop down from Device to Card, then select the required program from the list and press Copy.

28.12.   Learning more about Palm and the Palm T|X

In addition to the main Palm site (www.palm.com), there are Internet sites that provide useful information on using Palm handhelds.

There are also books on the subject which may prove useful.

An example is "How to Do Everything with your Palm Powered Device" (sixth edition) published by Osborne/McGraw-Hill, ISBN No. 0072263792.

There are similar books from other publishers.
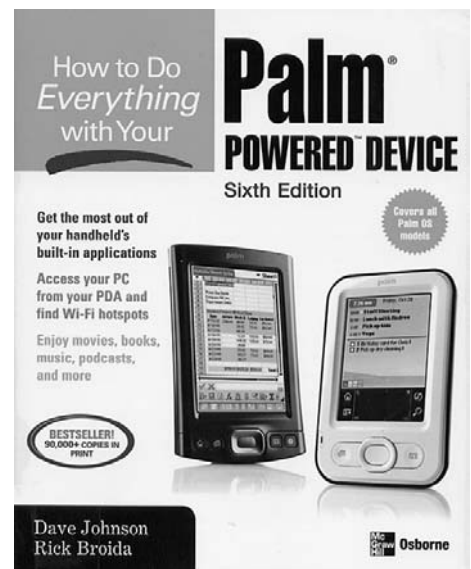
29.   Appendix B.
Palm Desktop Software

The following information is provided as guidance for PSA1301/2701T users.

See the Palm documentation for details of how to use Palm Desktop.

29.1. Deciding whether to install Palm Desktop

The documentation provided by Palm with the T|X instructs the user to install the Palm Desktop software immediately. TTi advises users of the PSA1301/2701T to consider their particular circumstances before deciding whether to install it (and where to install it).

Palm Desktop is NOT needed for any of the functions of PSAnalyzer on the PSA1301/2701T.

However, if it is intended to use the Palm T|X as a personal organizer, Palm Desktop may be very valuable. It also provides a convenient means of converting Microsoft Office documents, and for loading new applications and backing up data.

29.2. The purpose of Palm Desktop software

Palm Desktop is the companion software application for linking the Palm T|X (or other Palm handheld computers) to a PC. It is a powerful piece of software which enables the user to maintain data simultaneously on the handheld computer and on the PC.

Palm Desktop can be installed in any of six languages: English, Deutsch, Français, Español, Italiano, or Português.

Palm Desktop includes modules for managing Calendar, Contacts, Tasks, Memos, Expense, Note Pad, Media, Documents, and VersaMail. The "Documents" module (Documents to Go) is actually a stand-alone module which has the function of converting and transferring Microsoft Office files (Word, Excel and Powerpoint).

29.3. HotSync

The key to Palm Desktop is HotSync. HotSync transfers data between the two devices so as to maintain them in synchronism. So, for example, when a new contact name is added to the contacts list on either device, performing a HotSync operation automatically updates the other device.

HotSync also provides an automatic backup onto the PC both of data, and of programs which are not within the ROM of the Palm T|X. HotSync is normally performed using a USB connection, though it can also be done via a modem or over a network a using a wireless connection.

The USB cable supplied by Palm with the Palm T|X includes a button which automatically initiates HotSync. However, it can also be initiated from the HotSync icon on the Applications screen. This method should be used when the Palm T|X is fitted into the PSA1301/2701T.

29.4. Palm T|X User Name

Palm Desktop creates a "pairing" relationship between a PC and a Palm T|X. It creates a User Name for the Palm T|X which is written into the device firmware and can not subsequently be changed (other than by a hard reset). The User Name must be unique as it identifies a particular device and ensures that if another device is connected to the PC, files will not be accidentally overwritten by a HotSync operation.

The user name can be seen at the top right of the screen by selecting the HotSync application. The Palm T|X supplied with the PSA1301/2701T does not yet have a user name.

A user name is only required if Palm Desktop software is to be used. The user name is created when the first HotSync operation is done.

29.5. Palm Desktop software and Windows PCs

Palm states that for a full installation including Palm Desktop software, the PC must be running Windows 2000 or Windows XP and that admin rights will be required to install. One available USB port is needed. Other operating systems that support USB may be useable, but functionality will be reduced.

Palm Desktop includes modules for managing Calendar, Contacts, Tasks, Memos, Expense, Note Pad, Media, Documents, Quick Install and VersaMail. Quick install is a stand-alone module for installing new applications and files onto the handheld. A background program called HotSync manager is also installed.

29.6. Palm Desktop software and Apple Macintosh computers

Palm states that for a full installation including Palm Desktop software, the Mac must be running OS 10.2.6 or above and that admin rights will be required to install. One available USB port is needed.

The full installation of Palm Desktop includes modules for managing Calendar, Contacts, Tasks, Memos, Expense, Note Pad, Media, Documents, and VersaMail. There is also a Send to Handheld droplet for installing new applications and files.

29.7. Installation Procedure

Palm Desktop is a substantial suite of software for installation onto a PC (Windows or Mac). The installation procedure takes some time, and may require a reboot (depending upon the operating system). Inserting the CD should cause the installation to start automatically.

Once the software is installed, a screen appears showing the current step in the procedure i.e.

1. Install software   **>2. Synchronise device**   3. Register device   4. Install extra software

On pressing Continue, a dialogue box appears for "Enter Your User Name". This step can not be skipped. This user name will be allocated to the Palm T|X at the next stage. The name must be unique, if another Palm handheld device (that might be seen by this computer) had the same user name problems could occur.

After entering a user name, the next screen provides a choice of Synchronise with Palm Desktop or with Microsoft Outlook. This choice can be changed later from within Palm Desktop.

The next screen instructs you to "Sync your Device and Computer". There are two options: initiate a HotSync or Skip. What happens next depends upon which you choose.

Either: Initiate HotSync

> The screen instructs you "press the HotSync button" on the USB cable to begin. If the Palm T|X is mounted within the PSA1301/2701T, it will be connected via the mini USB cable and there will be no HotSync button. In this case, select HotSync from the applications screen and press the HotSync symbol on the screen.

> HotSync commences using the default settings of Palm Desktop to synchronise and backup files. This may take several minutes. The User Name entered earlier in the set-up is written to the firmware of the Palm T|X.

Or: Skip

> The screen warns that "unexpected results can occur". No HotSync takes place, no files are transferred, and no User Name is transferred.

The installation then progresses to the "Register Device" stage, and finally to the "Discover your Device" screen which provides the option of adding extra software.

Note: Once Palm Desktop has been installed on a PC, the "Discover your Device" screen can be returned to at any time by re-inserting the CD.

29.8. Using multiple devices with one PC, or a device with multiple PCs

An instrument such as a PSA1301/2701T is likely to have a different useage pattern from a stand alone handheld computer. One department may have several devices and may wish to use them with more than one PC which has Palm Desktop installed.

Palm Desktop caters for this by maintaining separate accounts and folders for different "users" (i.e. devices with different user names). Each user can have its own custom HotSync settings which defines exactly what happens when a HotSync takes place on that PC.

When a HotSync is initiated on a device which has a user name that Palm Desktop does not recognise, it asks if new user account should be created. On confirmation, HotSync continues using default HotSync settings.

When a HotSync is initiated on a device which does not yet have a user name, a dialogue box appears prompting to select an existing user name, or enter a new user name. That user name is then written to the firmware of the Palm T|X and HotSync continues.

Note that a new user can be set up within Palm Desktop prior to the relevant device being connected (select Edit Users from the drop down at the top right). This has the advantage that custom HotSync settings can be defined prior to the first HotSync being initiated. For example, all actions could be set to "do nothing" except for Backup.

29.9. HotSync transfer of PSAnalyzer Screen Images to a PC

Palm Desktop has no conduits for PSAnalyzer files and therefore can not be used for the general transfer of PSAnalyzer files. However, screen images are recognised by the Media application and are therefore transferred to a PC when a HotSync operation is performed (provided that the custom HotSync action for Media remains suitably set within Palm Desktop).

The folder location on a Windows PC will be as follows:

C:\Program Files\Palm\"user-name"\Photos\offline copy location\"nnnn"\PSAnalyzer

Where "user-name" is the Palm T|X User Name (see section 29.4) and "nnnn" is a four digit hex number assigned by Palm Desktop to the memory card.