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# ASA100 / ASA101A / ASA200 / ASA240 / ASA280 User Manual

Analog Signature Analyser

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# 1 Notices

## 1.1 Copyright



Electron Plus is a trading style of Electron Plus Instruments Limited.

## 1.2 Part Number

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## 1.4 Location

The latest version of this document can be found on our website:

www.electron.plus/pages/manuals

## 1.5 Published By

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Hereafter referred to as **Electron Plus**.

## 1.6 Notes

- We frequently update our manuals and add new features and improvements as they become available, please ensure that you check our website for an updated version of this document, especially if updating your **Electron Plus** software.
- We make every effort to ensure the accuracy of this manual's contents. If you find any errors, have suggestions for expanding on a feature, or feel that we can improve its contents then please contact us at `support@electron.plus`
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## 1.7 Trademark Acknowledgement

Electron Plus fully recognises and acknowledges any trademark(s) of the respective trademark holder.

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## 1.8 Purpose of Manual

The purpose of this manual is to enable you to safely setup, configure and operate your **Electron Plus** instrument, associated software and/or accessories.

Please pay particular attention to any section with a warning symbol.

## 1.9 Safety Warnings

Warnings, cautions and notes are colour coded through-out this manual. These are divided into several categories and are described below:

**WARNING - Pay special attention to anything written here - this is for your safety and continued protection and is critical information!**

**CAUTION - Damage may occur to your equipment or any DUT (device under test).**

**NOTE - General text, with useful information or tips.**

# 2 Introduction

## 2.1 What is the ASA?

The **ASA** (Analog Signature Analyser) is a diagnostic instrument designed for PCB-level fault finding using **analog signature analysis** (also known as **V-I curve testing**). It applies a test signal across two points of a circuit and displays the resulting voltage-current relationship as a characteristic **signature** (Lissajous pattern) on an oscilloscope-style display.

By comparing the signature of a known-good component or circuit node against the device under test (DUT), faults such as short circuits, open circuits, leaky components, and incorrect component values can be quickly identified - often without needing to know the circuit schematic.

## 2.2 Supported Instruments

| Model | Description |
|---|---|
| **ASA100** | Single-channel Analog Signature Analyser |
| **ASA101A** | Single-channel Analog Signature Analyser (updated) |
| **ASA200** | Dual-channel Analog Signature Analyser |
| **ASA240** | Quad-channel Analog Signature Analyser |
| **ASA280** | Eight-channel Analog Signature Analyser |

## 2.3 Key Features

- Real-time V-I signature display
- Adjustable test voltage (200 mV to 10 V peak)
- Adjustable series resistance (50 ohm to 10k ohm, model dependent)
- Multiple test frequencies
- Automatic frequency optimisation (Auto Frequency), which finds the frequency that most opens the V-I signature for the part you are probing
- Logic-safe probe limit (5 V / 10 mA) for protecting sensitive circuits
- **Basic mode** for quick, no-setup component identification: clip onto a single part and read its live R / C / L estimate against a library of reference signatures, with no test plan required
- **Comet** direction marker that tells a capacitor from an inductor at a glance
- **Compare** and **Recent Compares**: latch a golden reference and overlay live DUT signatures, keeping a thumbnail history of each comparison
- Signature comparison (overlay of reference and live traces)
- Automated test plans with pass/fail thresholds
- PCB image overlay with component location markers
- Euclidean distance matching for automated pass/fail
- DMM (digital multimeter) integration (ASA200/ASA240/ASA280)
- MUX (multiplexer) channel selection (ASA200/ASA240/ASA280)
- USB connection via FTDI

# 3 Getting Started

## 3.1 Installation

1. Install the **ASA26** software from the provided installer or download from www.electron.plus
2. Connect your ASA instrument to the PC via USB
3. Install the FTDI USB drivers if prompted (the installer includes these)
4. Launch ASA26

## 3.2 Selecting the Model

The ASA software runs in dedicated ASA mode. The connected model (ASA100, ASA101A, ASA200, ASA240, or ASA280) is identified from the instrument itself and shown in the **Connected Units** indicator once you connect. If the connected instrument does not match the configured model, the software reports error **ASA #0060** (see Troubleshooting).

## 3.3 Connecting

1. Ensure your ASA instrument is powered on and connected via USB
2. Click the **Connect** pill on the action strip
3. ASA26 will verify the USB connection and read calibration data from the instrument
4. When connected, the **Connect** pill shows the connected state and the **Connected Units** indicator shows your model

**If connection fails, check the USB cable and that the FTDI USB drivers are installed. If the connected instrument is not the expected model, the software reports error ASA #0060.**

# 4 The ASA Workspace

The ASA software presents a single configurable **workspace**. You arrange the panels you want (V-I scope, PCB image, test-point list, signal controls and so on), and the software remembers your layout. The panels are called **pills** and are described under *Controls* below.

For quick component identification without building a test plan, the workspace also offers a dedicated **Basic mode** (see *Basic Mode*), reached from the **Basic** button on the action strip.

The workspace has three regions:

- **Action strip** (top): the buttons that drive the instrument, namely Connect, **Basic**, the **Mode** selector, the document actions (New / Open Plan, New / Open Test) and **Compare**. Settings, Help and the logo sit at the top-right, with a four-line readout box (open plan, test document, serial, and pin progress) just to their left.
- **Display area** (centre): a grid where you place the panels you want to see, such as the V-I scope, PCB image and test lists.
- **Info strip** (bottom): read-only status, namely the open plan name, comms activity, connected unit, and calibration status.

### 4.1 Workspace Modes

The **Mode** selector on the action strip switches the workspace between the plan-based modes:

| Mode | Purpose |
|---|---|
| **Auto Test** | Compare a board against the stored references automatically, advancing from point to point. |
| **Manual Test** | Compare a board against the stored references one point at a time. |
| **Edit** | Build and edit a test plan: place pins on the PCB image, create components, set test parameters. |
| **Capture** | Build the golden-signature library: probe known-good points and store their reference signatures. |

The mode buttons sit together with the test modes (Auto Test, Manual Test) first, then the authoring modes (Edit, Capture). In **Capture** and **Auto Test** modes a **Previous Pin** button steps back to the previous test point to re-capture or re-test it; in the other modes it greys out.

Separately, the **Basic** button on the action strip enters **Basic mode**, a no-plan workspace for identifying a single component on the bench (see *Basic Mode*). It is independent of the plan-based modes above.

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## 5 Controls

The workspace is built from **pills**, self-contained panels you place in the display area, or that live on the action and info strips. The main ASA pills are:

### 5.1 Display-area pills

| Pill | What it shows |
|---|---|
| **VI Scope** | The live V-I signature for the probed point, with the stored golden trace and the device-under-test trace overlaid. |
| **PCB Image** | The board photo with a coloured marker on every test point. Pan, zoom and rotate; this is also where you place and move pins when editing a plan. |
| **PCB Zoom** | A second board view that stays centred on the currently selected point (read-only). |
| **PCB Navigator** | A whole-board overview with a box showing the region the PCB Image pill is currently zoomed into. |
| **Test Points** | The test plan as a list, grouped by component, with each point coloured by its status. Click a point to select it everywhere. |
| **Failed Tests** | The same list, filtered to show only points that failed. |
| **Mini Scopes** | A pair of small BEFORE / AFTER scope panes for side-by-side signature comparison. |
| **Signature Generator** | The **Voltage**, **Resistance** and **Frequency** controls for the test signal (see below). |
| **Test Point** | The details of the selected point: label, component, pin number, status and position. |
| **Edit Test Points** | The form for creating components and renaming, deleting or moving pins. |
| **Reference Signatures** | (Basic mode) A gallery of example V-I signatures (resistors, capacitors, inductors, diodes, logic rails and more) to compare the live trace against. |
| **Component Parameters** | (Basic mode) The live R / C / L estimate and component type for whatever you are probing. |
| **Recent Compares** | (Basic mode) A strip of thumbnail snapshots of your recent comparisons, newest on the right, each stamped with its capture time. |

## 5.2 Action-strip pills

All buttons stay visible at all times; a button greys out when it is not relevant to the current mode.

| Pill | Function | Active in |
|---|---|---|
| **Connect** | Connect to or disconnect from the instrument. | always |
| **Basic** | Enter Basic mode for quick, no-plan component identification (see *Basic Mode*). | always |
| **New Plan** | Start a new master test plan (`.ept`). You give the board a reference name and name the file immediately; every edit then saves automatically. | Edit |

| Pill | Function | Active in |
|---|---|---|
| **Open Plan** | Open an existing master test plan. | Edit, Capture |
| **New Test** | Start testing a physical board. If a plan or test document is open you are offered the current plan, otherwise you pick one; then you enter the board's **serial number** (required). A fresh per-board test document is created, named `boardname_serial_timestamp.uut` (the timestamp is UTC). | Auto Test, Manual Test |
| **Open Test** | Open an existing board's test document. You choose **Continue** (resume where it left off) or **Retest** (the board was repaired, so results are archived to history and every pin starts untested). If the master plan has changed since the test document was created, you are first asked to **Update** (adopt the new plan, where new points arrive untested and removed points keep their results) or **Keep** (carry on against the original plan). | Auto Test, Manual Test |
| **Compare** | Latch a stable live signature as the yellow golden reference, then probe other points to overlay them against it for a quick A/B comparison (see *Basic Mode*). | Basic |
| **Mode** | Switch between Auto Test, Manual Test, Edit and Capture (see *Workspace Modes*). With a test document open, Edit and Capture are greyed, because a board's reference cannot be edited. | always |

There is no Save button, and there is no Clear Results button: every test run creates its own fresh, dated test document, so there is nothing to clear. Plans and test documents save automatically on every change.

## 5.3 Info-strip pills

| Pill | Shows |
|---|---|
| **Plan Name** | The filename of the open plan or test document. |
| **Serial** | The serial number of the board under test (bold white when a test document is open). |
| **Comms** | Live transmit / receive activity with the instrument. |
| **Connected Units** | The connected ASA model and its connection state. |
| **Cal Status** | The instrument's calibration status. |

## 5.4 Signal Controls (Signature Generator pill)

### 5.4.1 Voltage

Controls the peak test voltage applied to the DUT. Available values depend on the instrument model.

- Click **+** / **-** to step through voltage values
- Range: 200 mV to 10 V peak
- **Limit 5V/10mA**: a logic-safe toggle below the voltage value. When engaged it caps the test voltage at 5 V and raises the series resistance so the probe current can never exceed 10 mA, which protects sensitive logic and low-power parts. Toggle it off to use the full range.

### 5.4.2 Resistance

Controls the series resistance in the test circuit. Higher resistance provides better sensitivity for low-impedance components; lower resistance is better for high-impedance components.

- Click **+** / **-** to step through resistance values
- ASA100 / ASA101A: 100 Ω, 1k Ω, 10k Ω
- ASA200 / ASA240 / ASA280: 50, 100, 200, 500, 1k, 2k, 5k, 10k Ω

### 5.4.3 Frequency

Controls the test signal frequency.

- Click **+** / **-** to step through frequency values
- Different frequencies reveal different component characteristics (for example, capacitance is more visible at higher frequencies)
- **Auto Frequency**: a toggle below the frequency value. While engaged, the software automatically searches for the frequency that most opens the V-I "eye" of the part you are probing. It starts at 100 Hz, tries the neighbouring frequencies, and keeps moving toward a wider signature. When you lift the probe it resets to 100 Hz, ready for the next part. Toggle it off to hold a fixed frequency.
- **Comet**: a toggle next to Auto Frequency (off by default). When on, a small moving dot rides the live V-I trace to show which way the loop is travelled. A capacitor and an inductor draw the same ellipse, so the spin direction is the only thing that tells them apart at a glance.

The Signature Generator banner carries a small layout button that flips the Voltage / Resistance / Frequency controls between a stacked column and a side-by-side row, useful depending on where you dock the panel.

# 6 Test Plans

## 6.1 Overview

Test plans allow you to define a sequence of test points on a PCB, each with its own test parameters and reference signature. In a Test mode (Auto Test or Manual Test) you step through the test plan, comparing each point against its stored reference.

Test plans are saved as `.ept` files (Electron Plus Test plan).

## 6.2 Creating a Test Plan

1. Use **New Plan** on the action strip to start a plan (you name its file immediately), then use **Edit** mode to place test points on the PCB image
2. Switch to **Capture** mode and set the voltage, resistance and frequency (Signature Generator pill) for the first test point
3. Touch the probes to the first component and capture its reference signature
4. Move to the next test point and repeat; every change saves automatically

### 6.2.1 Ordering the test sequence

Components are added in the order you create them, which can make the test walk jump around the board. In **Edit** mode the **Re-sort** button (under the Create / Move / Delete buttons) renumbers the whole sequence to follow the board geometry, so Auto Test and the Test Points list step across the board in a smooth path.

The dropdown beside it sets the order. The default, **Left to Right priority then Top to Bottom**, divides the board into vertical columns and walks them left to right, each column top to bottom; a component is positioned by its Pin 1 and its pins stay together in pin-number order. The other seven options cover every primary sweep (left to right, right to left, top to bottom, bottom to top) paired with each secondary direction. The column width is set in **Settings** (below). Non-testable points keep their place in the sequence but are skipped during testing.

## 6.3 Testing a Board

Each physical board you test gets its own **test document** (`.uut`), a copy of the plan that records that board's serial number and every result. New Test names it `boardname_serial_timestamp.uut` (the timestamp is UTC), so every run is its own dated file.

1. Switch to **Auto Test** or **Manual Test** mode
2. Click **New Test**: confirm or pick the plan, then enter the board's serial number (required); or click **Open Test** to resume or retest an existing board
3. Each probed point is compared against its stored reference using Euclidean distance matching; every result is recorded against the board's serial with a date and time
4. Results are shown as **Good** (green), **Bad** (red), **Untested** (yellow), **No Signature** (pink), or **No Test** (grey)
5. For a repaired board, **Open Test** → **Retest** archives the previous results into the board's history and starts a fresh pass; the master plan is never altered
6. If the master plan was edited after a board's test document was created, **Open Test** asks whether to **Update** the document to the new plan or **Keep** the original. Plan changes never reach a board's document silently, and every update is recorded in the document's audit trail. The update report includes how many locally-amended references were kept (see below)

### 6.3.1 Modified boards: amending a reference for one board

If one board legitimately deviates from the master plan (a reworked pad, a substituted part), right-click its test point in the **Test Points** tree and choose **Amend golden (this UUT only)…**:

1. Type the reason for the deviation (required, as it becomes part of the board's audit record, together with who and when)
2. The next probe touch on that point captures the new reference **into this board's test document only**; the master plan is untouched
3. The point is marked with a **cyan ring** on the PCB and an **[amended]** tag in the trees; the replaced reference is archived in the point's history
4. A later plan **Update** keeps an amended reference (the deviation is deliberate); the popup reports how many were kept

Selecting a different test point, pressing Stop, or arming a mode cancels a pending amend; the capture only ever lands on the point you armed it for.

If a one-off modification becomes a standing variant (several boards built the same modified way), author a fresh master plan for it in Capture mode (**New Plan**), and test those boards against the new plan.

### 6.3.2 Badge markers

| Marker | Meaning |
|---|---|
| **Orange ring** / `[orphaned]` | The point was removed from the master plan by an update; this board keeps its results as evidence. Orphaned points are skipped by the automatic walk (manual probing still works). |
| **Cyan ring** / `[amended]` | The point's reference was deliberately re-captured for this board only (see above). |

A point that is both shows the orange orphaned marker (the more alarming state).

## 6.4 PCB Image Overlay

You can load a photograph of your PCB and mark the location of each test point:

1. In Edit mode, load a PCB image for the plan
2. Each test point can be assigned X/Y coordinates on the PCB image
3. The PCB image is displayed alongside the scope, with crosshairs showing the current test point location
4. This helps operators quickly locate the correct probe position on the physical board

### 6.4.1 PCB Image controls

A toolbar above the PCB image gives you these view controls:

| Button | Action |
|---|---|
| **Zoom** | Toggle. ON, left-drag draws a rubber-band box and releasing zooms to that region. OFF, left-drag pans the image. |
| ← (Back) | Returns to the previous view. Each zoom, pan, rotate, or 1:1 reset pushes the prior view onto an undo stack; this button pops it. Greyed out when there's no history to go back to (e.g. immediately after loading a new PCB image). |
| **+** | Zoom in 1.25× around the current view centre. |
| **–** | Zoom out (×0.8) around the current view centre. |
| **1:1** | Reset to fit-to-window, rotation 0. |
| **0° / 90° / 180° / 270°** | Cycle rotation by 90°. The label shows the current angle. |
| **Save View to Pin** | With a test point selected, persists the current zoom + rotation onto that pin. Recalled when the pin is selected later. |
| **Save View to Component** | The same, saved onto the whole component, so clicking any of its pins recalls that view. |
| **Transparency 0% / 50% / 75%** | Fades the pin numbering and markers so you can see the PCB underneath. 0% is fully opaque. |
| **Clear Golden** | (Capture and Edit modes only) Resets the selected pin's stored golden signature, so its marker returns to pink, ready to re-capture. A "Captured signature" label sits to its left. |

The Back button is the safest way to recover from an accidental zoom. For example, if you drag a box that overshoots the IC you wanted, just press ← and you are back where you started.

# 7 Signature Interpretation

## 7.1 Basic Signatures

| Component | V-I Signature |
|---|---|
| **Short circuit** | Vertical line (high current, low voltage) |
| **Open circuit** | Horizontal line (low current, high voltage) |
| **Resistor** | Straight diagonal line (slope depends on resistance value) |
| **Diode** | L-shaped curve (forward conduction in one direction) |
| **Capacitor** | Ellipse or circle (size depends on capacitance and frequency) |
| **Inductor** | Narrow ellipse, nearly a line |
| **Zener diode** | L-shape with reverse breakdown visible |

## 7.2 Comparison Testing

The most powerful use of analog signature analysis is **comparison**:

1. Capture a reference signature from a known-good board
2. Compare the same test point on the suspect board
3. Any difference in the signature shape indicates a fault

**Signature analysis does not require power to be applied to the board under test. The ASA provides its own low-voltage test signal, making it safe for unpowered testing.**

# 8 Basic Mode

Basic mode is for quickly identifying a single component on the bench, with no test plan and no PCB image needed. Click **Basic** on the action strip to enter it, and click a plan-based mode (or **Basic** again) to leave.

In Basic mode the workspace shows the **V-I Scope**, the **Signature Generator** (Voltage / Resistance / Frequency, with Auto Frequency and Comet), the **Reference Signatures** gallery, the **Component Parameters** reader, and the **Recent Compares** strip.

### 8.1 Reading a component (Component Parameters)

The **Component Parameters** panel shows a live estimate of the part you are probing: its resistance (R), capacitance (C) and inductance (L), and the dominant component type (RESISTOR, CAPACITOR, INDUCTOR, OPEN CIRCUIT or SHORT). The estimate is indicative, derived from the shape of the V-I loop, and is best for telling one class of part from another rather than as a precise meter.

A capacitor and an inductor draw the same ellipse on the scope, and only the direction the loop is travelled tells them apart. Turn on **Comet** (Signature Generator) to see that direction as a moving dot riding the live trace.

### 8.2 Reference Signatures

The **Reference Signatures** panel is a gallery of example V-I signatures, each a small picture with a one-line description: faults (open, short, partial short), resistors of various values, capacitors and inductors, diodes (silicon, Schottky, LED, Zener), transistor junctions, and combinations such as a logic power rail with decoupling or a logic input pin with its ESD clamps. Compare the shape on the live scope to these to identify the part in front of you. The cards can be laid out in one, two or more columns to suit the panel size.

### 8.3 Compare and Recent Compares

**Compare** checks one point against another, for example a suspect part against a known-good one:

1. Probe a known-good point and click **Compare** on the action strip. When the live signature settles it is latched as the yellow **golden** reference.
2. Probe the next point. Its signature is overlaid in blue (the **DUT** trace) against the golden, so any difference is obvious.
3. While comparing, the Voltage / Resistance / Frequency controls are held fixed, so the golden and the DUT are always compared at identical test conditions.
4. Click **Compare** again to release the golden.

Each comparison is saved as a snapshot in the **Recent Compares** strip: a square thumbnail of the scope (golden plus DUT, with the test conditions and the estimated R / C / L) stamped with its capture time, newest on the right. Use the single-arrow buttons to page through older comparisons and the double-arrow buttons to jump to the oldest or newest.

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## 9 Calibration

The ASA stores calibration data in the FTDI EEPROM on the instrument. Calibration is performed at the factory and should not normally need adjustment.

Calibration data includes: - DAC gain and offset values for voltage output accuracy - ADC gain and offset values for measurement accuracy - DC bias calibration values

**Do not modify calibration data unless you have the appropriate calibration equipment and procedures. Incorrect calibration can result in inaccurate measurements.**

## 10 Settings

Open the **Settings** dialog from the gear icon at the top-right. It carries:

- **Colours**: opens the colour editor, where you can recolour any named element of the app (ribbon and panel backgrounds, traces, banners, buttons and so on). Changes apply live and persist. Icon colours are baked at launch, so restart to apply those.
- **Mini-scopes**: how the Mini Scopes panel chooses which pins to show (Previous + Next, or one per pin of the selected component), and a cap on how many.
- **Auto Frequency**: the change threshold the Auto Frequency search uses.
- **Test Sequence Sort**: the strip (column) width for the Edit-mode **Re-sort** button, as a percent of the board. 10% gives 10 columns; smaller gives more, narrower columns.
- **Time Zone**: a display-only offset from UTC. A live "Local time now" readout updates every second, so you can set the offset until it matches your wall clock. Files are always stored in UTC; this only shifts on-screen timestamps, such as those in Recent Compares.
- **Calibrate ASA100**: opens the voltage-calibration window (the instrument must be connected).

## 11 Troubleshooting

| Problem | Solution |
|---|---|
| **Cannot connect** | Check USB cable, verify FTDI drivers installed, check correct instrument model selected in Settings |
| **No signature displayed** | Verify the probes are connected, check the voltage and resistance settings |
| **Flat line (open circuit) on all components** | Check probe connections, ensure test leads are not broken |
| **Noisy signature** | Try a lower test frequency, check for loose probe connections, ensure DUT is powered off |
| **ASA #0056 - No USB detected** | No FTDI device found - check USB connection and drivers |

| Problem | Solution |
|---|---|
| **ASA #0059 - USB descriptor incorrect** | The connected device is not an Electron Plus instrument - check you have the correct device plugged in |
| **ASA #0060 - Wrong instrument selected** | The connected instrument does not match the selected model - change the instrument in Settings |

## 12 Specifications

Refer to the datasheet for your specific ASA model for detailed electrical specifications. Datasheets are available at:

www.electron.plus/pages/datasheets

## 13 Contact and Support

For technical support, please contact:

**Electron Plus Instruments Limited**
Email: support@electron.plus
Web: www.electron.plus