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ASA100
ASA101A
ASA200
ASA240
ASA280

User Manual

Analog Signature Analyser

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1 Notices

1.1 Copyright

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1.2 Part Number

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1.4 Location

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

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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`
- Copying or reproducing this document or any part of this document without written permission of **Electron Plus** is strictly prohibited.

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	Analog Signature Analyser
ASA101A	Analog Signature Analyser - Handheld
ASA200	Analog Signature Analyser (8 resistance ranges, bias generator)
ASA240	Analog Signature Analyser (8 resistance ranges, 2x40 MUX, bias generator)
ASA280	Analog Signature Analyser (8 resistance ranges, 80x1 MUX, bias generator)

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 Quick Start: Your First Signature

This chapter walks you from a cold start to reading your first live V-I signature on the bench, using **Basic mode**. Basic mode needs no test plan, no PCB photo and no setup: you clip the probes onto a single part and read its signature straight away. It is the fastest way to learn how the ASA behaves, and it is the mode you will reach for whenever you just want to identify a component or sanity-check a part.

Work through the steps in order with a few loose components to hand: an ordinary resistor (say 1k ohm), a capacitor (say 100 nF or larger) and, if you have one, an inductor.

4.1 Step 1: Launch and connect

1. Make sure your ASA instrument is powered on and plugged into the PC over USB.
2. Launch **ASA26**.
3. Click the **Connect** pill on the action strip (top-left).
4. ASA26 verifies the USB connection and reads the calibration data stored on the instrument. When it succeeds, the **Connect** pill shows the connected state and the **Connected Units** indicator on the info strip shows your model (ASA100, ASA101A, ASA200, ASA240 or ASA280).

The Connect pill changes appearance as it moves through its states, so you always know where you stand:

The ASA connects over FTDI USB. If connection fails, check the USB cable and confirm the FTDI USB drivers are installed (the installer includes them). The ASA26 software is 64-bit only.

Signature analysis is done on a completely powered-off board or component. The ASA provides its own low-voltage test signal, so never apply power to the part you are probing.

4.2 Step 2: Enter Basic mode

Click the **Basic** button on the action strip. The workspace switches to the Basic-mode layout, which shows the panels you need to identify a single part:

- the **VI Scope** (the live signature),
- the **Signature Generator** (the Voltage, Resistance and Frequency controls),
- the **Reference Signatures** gallery (example shapes to compare against),
- the **Component Parameters** reader (the live R / C / L estimate), and
- the **Recent Compares** strip (a thumbnail history of your A/B comparisons).

To leave Basic mode later, click a plan-based mode on the **Mode** selector, or click **Basic** again.

4.3 Step 3: Set Voltage, Resistance and Frequency

The three controls in the **Signature Generator** pill shape the test signal. Each has a **+** and a **-** button; you step through the available values rather than typing a number. The output is always on once you are connected, so the moment you touch the probes you will see a trace.

1. **Voltage** sets the peak test voltage applied across the probes. Click **+** / **-** to step it. The range is **200 mV to 10 V peak** (available values depend on your model). For a first look at a resistor, a few volts is fine.
2. **Resistance** sets the series resistance in the test circuit. Higher resistance gives better sensitivity for low-impedance parts; lower resistance suits high-impedance parts. ASA100 / ASA101A offer **100, 1k and 10k ohm**; ASA200 and above offer **50, 100, 200, 500, 1k, 2k, 5k and 10k ohm**. Start at **1k ohm**.
3. **Frequency** sets the test signal frequency. Different frequencies bring out different behaviour (capacitance shows up more at higher frequencies). Step it with **+** / **-**.

The Limit 5V/10mA toggle sits 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. Leave it on when probing anything you are not sure about; toggle it off only when you need the full voltage range.

4.4 Step 4: Read a known resistor (the diagonal line)

1. Touch the two probes across the leads of your resistor.
2. Watch the **VI Scope**. A resistor draws a **straight diagonal line** through the centre of the display. The angle of the line tells you the value: a shallower (more horizontal) slope is a higher resistance, a steeper (more vertical) slope is a lower resistance.
3. Glance at the **Component Parameters** reader. It should report the dominant type as **RESISTOR** and give a live resistance estimate.

If you instead see a **vertical line**, the probes are reading a near-short; a **horizontal line** means a near-open (or the probes are not making contact). Press a little harder and check your contact.

The estimate in Component Parameters is derived from the shape of the V-I loop. It is excellent for telling one class of part from another, but treat it as indicative rather than as a precision meter reading.

4.5 Step 5: Try a capacitor (the ellipse) and turn on Comet

1. Touch the probes across your capacitor. Instead of a line you will see an **ellipse** (or, with the right frequency, close to a circle). The size of the ellipse depends on the capacitance and the test frequency.
2. If the ellipse is very thin, step the **Frequency** up a few times: capacitance opens up more at higher frequencies, and a fuller ellipse is easier to read.
3. Now switch on **Comet**, the toggle next to Auto Frequency in the Signature Generator (it is off by default). A small dot now rides the live trace, showing **which way round the loop is travelled**.

Comet matters because a **capacitor and an inductor draw the same ellipse**. The only thing that distinguishes them at a glance is the direction of travel, and Comet makes that direction visible. If you have an inductor, probe it now and watch the dot spin the opposite way to the capacitor.

4.6 Step 6: Turn on Auto Frequency

Rather than hunting for the best frequency by hand, let the instrument find it.

1. Engage the **Auto Frequency** toggle, below the Frequency value.
2. While it is on, the software 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 the widest, most informative signature.
3. When you lift the probes it resets to 100 Hz, ready for the next part.

Toggle Auto Frequency off when you want to hold one fixed frequency, for example when you are about to compare two parts and need identical conditions.

4.7 Step 7: A/B a suspect part with Compare and Recent Compares

The most powerful thing the ASA does is **comparison**: hold the signature of a known-good part and overlay a suspect one on top, so any difference jumps out. In Basic mode this is the **Compare** workflow.

1. Probe a **known-good** part and let the trace settle.
2. Click **Compare** on the action strip. When the live signature settles, it is **latched as the yellow golden reference**.
3. Probe the **suspect** part. Its signature is overlaid in **blue** (the DUT trace) on top of the yellow golden. Any difference in shape, size or angle is now obvious.
4. While you are comparing, the Voltage, Resistance and Frequency controls are **held fixed**, so the golden and the suspect are always measured under identical conditions. This is why you switch Auto Frequency off before comparing.
5. Click **Compare** again to release the golden.

By default each comparison is saved automatically 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. If you would rather not keep these snapshots, turn **Save compare snapshots** off in Settings (the on-screen comparison still works, nothing is written to disk).

4.7.1 Auto Freeze

Auto Freeze (the button just to the right of Compare, Basic mode only) is a separate, faster way to hold a reference when you are walking quickly from part to part. Where Compare latches one golden and keeps it until you release, Auto Freeze keeps the **blue** trace pinned to the **last stable signature** you touched: probe a part and, the moment its trace settles, it is frozen in blue; lift the probe and the frozen trace stays on screen; touch the next part and the frozen trace jumps to that one. The **red** live trace keeps running the whole time, so you always see what is under the probe right now against the part you saw a moment ago.

Press the button again to turn it off. Auto Freeze and Compare are mutually exclusive: turning one on turns the other off.

Throughout the ASA the golden reference is always yellow and the live or DUT overlay is always blue, so you can read any scope or thumbnail at a glance: yellow is the standard you are testing against, blue is the thing under test. In Auto Freeze the held trace is the same blue, and red is always the live probe.

4.8 What the live readout is telling you

The **Component Parameters** panel is your running commentary on whatever sits between the probes. It shows:

- a live **resistance (R)**, **capacitance (C)** and **inductance (L)** estimate, and
- the **dominant component type**: RESISTOR, CAPACITOR, INDUCTOR, OPEN CIRCUIT or SHORT.

Read it alongside the scope, not instead of it. The scope shows you the **shape** (line, ellipse, L-bend) and Comet shows you the **direction** that separates a capacitor from an inductor; the Component Parameters reader puts a number and a name to what you are seeing. Together they let you identify a loose part in seconds, and they are the same primitives you will use later when you build a full test plan.

To compare your live shape against a labelled library, open the **Reference Signatures** gallery in the Basic-mode workspace. It holds example signatures for 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. Match the shape on your live scope to the closest card to confirm what you are holding.

There is no Save button and nothing to clear. Your comparison snapshots are kept automatically in Recent Compares, and when you move on to test plans every test run is written to its own dated document. You can simply work.

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5 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.

5.1 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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6 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:

6.1 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.

Pill	What it shows
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.

6.2 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
Open Plan	Open an existing master test plan.	Edit, Capture

Pill	Function	Active in
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
Auto Freeze	Hold the blue trace at the last stable signature you touched (red stays live), re-freezing on each new stable contact, so you can walk part to part without pressing Compare. A separate mode from Compare (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.

6.3 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.

6.4 Signal Controls (Signature Generator pill)

6.4.1 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.

6.4.2 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

6.4.3 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 stacked (vertical) and side-by-side (horizontal). This orientation is remembered **per workspace mode**: Basic and Edit keep the controls stacked, while Auto Test and Capture lay them side-by-side so the VI Scope gets more height. Flip it in any mode and that mode keeps your choice (across restarts too).

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7 Working with the PCB Image

The **PCB Image** pill turns a photograph of your board into a guided map. Once you have placed your test points on it, every point you select, in the trees, in Auto Test, or with the navigation arrows, brings the matching marker into view, so you always know where to land the probe. This chapter covers loading an image, the view toolbar, saving per-pin and per-component views, and the two companion pills that work alongside it.

7.1 What the PCB Image pill is for

The PCB Image pill does double duty:

- In **Edit** mode it is the surface you place and move pins onto when authoring a plan.
- In **Capture**, **Manual Test** and **Auto Test** it is the location surface: a coloured marker sits on every test point, telling you both where the point is and how it last tested.

Each marker is drawn as a square for pin 1 of a component and a circle for the remaining pins, and is coloured by status:

Marker colour	Meaning
Green	Good, passed the last test
Red	Bad, failed the last test
Yellow	Untested, golden captured but not yet tested against a board
Pink	No golden captured yet (Auto Test skips it)
Teal	No Test, flagged to be ignored during the automatic walk
Dark grey	Automatically-detected short, skipped by Auto Test

A hollow **orange ring** marks an orphaned point (removed from the master plan but kept on this board as evidence); a hollow **cyan ring** marks a point whose reference was amended for this board only. A point that is both shows the orange ring.

7.2 Loading a PCB image

1. Switch to **Edit** mode.
2. Load a PCB photograph for the plan. A clear, square-on, well-lit photo of the populated side works best.
3. Place your test points on the image (see *Test Plans*). As you create a component, the view you are looking at is captured automatically as that component's recall view, so when you later land on any of its pins the image returns to the spot where you placed it.

The image is stored alongside the plan, so the markers and saved views travel with the `.ept` master plan and with every `.uut` test document made from it.

7.3 The view toolbar

A toolbar above the image gives you the view controls. They behave the same in every mode (apart from Clear Golden, noted below).

Button	Action
Zoom	A toggle. When ON, left-drag draws a rubber-band box and releasing zooms to that region. When OFF, left-drag pans the image.
Back (left arrow)	Returns to the previous view. Every zoom, pan, rotate or 1:1 reset pushes the prior view onto an undo stack, and Back pops it. Greyed out when there is no history to return to, such as immediately after loading a new image.
+	Zoom in around the current view centre.
–	Zoom out around the current view centre.
1:1	Reset to fit-to-window at rotation 0.
0° / 90° / 180° / 270°	Cycle the image rotation by 90°. The label shows the current angle.
Rotate Labels	A button that shows "Aa" with a rotate arrow. It cycles the pin number labels between clockwise and counter-clockwise, for legibility on dense boards.
Aa	Step the pin number label size (small, medium, large).
Crosshair	A toggle that draws an alignment cross at the selected point. On by default.
Auto Centre	A toggle. When ON, selecting a pin or component recalls its saved view (pan and zoom). When OFF, selecting a point highlights its marker but does not move the image, useful when you want to study one area while clicking around the trees.

Button	Action
Save View to Pin	With a test point selected, stores the current view (pan, zoom and rotation) onto that single pin, recalled whenever that pin is later selected.
Save View to Component	The same, stored onto the whole component, so selecting any of its pins recalls that view (unless a pin has its own Save View to Pin override).
Transparency 0% / 50% / 75%	Fades the pin numbering and markers so you can see the board underneath. 0% is fully opaque.
Clear Golden	Capture and Edit modes only. With a **pin** selected, resets that pin's stored golden so its marker returns to pink, ready to re-capture. With a whole **component** selected (no single pin), clears the golden on **every pin** of that component at once. A **Captured signature** label sits to its left.

Back is the safest way to recover from an accidental zoom. If you rubber-band a box that overshoots the part you wanted, press Back once and you are exactly where you started.

7.4 Recalled views: pin overrides component

When Auto Centre is on, the view a point recalls is resolved in a fixed order:

1. If the pin has its **own** saved view (set with **Save View to Pin**), that wins.
2. Otherwise the parent **component's** saved view is used (captured at part creation, or re-set with **Save View to Component**).
3. Otherwise the image falls back to a sensible fit around the component.

So **Save View to Pin** tunes a single awkward pin without disturbing the rest, and **Save View to Component** resets the shared view for every pin of a part that has no override of its own. Re-saving the component view does not erase existing per-pin overrides.

7.5 Rotating to match the bench

If the board is sitting in front of you at a different orientation from the photo, cycle the rotation button (0° / 90° / 180° / 270°) until the image on screen matches what your eyes see on the bench. There is then no mental rotation between screen and probe tip. The rotation is remembered with the plan.

7.6 The companion pills: PCB Zoom and PCB Navigator

Two further pills work alongside the main PCB Image pill. Place them in the display grid like any other pill.

- **PCB Zoom** is a second, read-only board view that always stays centred on the currently selected point, regardless of the main image's Auto Centre setting. Dock it next to the main image to keep a tight close-up of the active pin while the main view stays zoomed out as a map.
- **PCB Navigator** is a whole-board overview with a box drawn around the region the main PCB Image pill is currently showing. It tells you at a glance where on the board your current zoom is sitting, and is the quickest way to confirm you have not lost yourself in a corner of a large image.

7.7 Practical tips for finding a probe point

1. Keep **PCB Navigator** docked so you always know which part of the board the main view is showing.
2. Use **PCB Zoom** for the tight close-up of the active pin and leave the main image zoomed out as your map. You then read both at once without touching a control.
3. Turn **Auto Centre** on while stepping through Auto Test or the Test Points tree, so each point brings its own view up automatically.
4. When two pins of one part need different close-ups, frame each and press **Save View to Pin** so the right view returns every time.
5. Raise **Transparency** to 50% or 75% when a marker is hiding the pad or track you actually need to probe.
6. Rotate the image to match the board on the bench before you start, so left on screen is left under your hand.

Clear Golden discards the selected pin's stored reference signature and is available only in Capture and Edit modes. Use it deliberately: the marker returns to pink and the point is skipped by Auto Test until you re-capture a new golden for it. It follows your selection: select a single pin and it clears just that pin; select a whole component (with no pin chosen) and it clears the golden on all of that component's pins in one go.

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8 Walkthrough: Building a Test Plan

This chapter walks you through authoring a complete golden test plan from a blank start: naming the board, loading its photo, placing the test points, grouping them into components, and capturing a known-good signature for every point. By the end you will have a master plan (`.ept`) that any operator can run against suspect boards.

Have a known-good "golden" board on the bench, a clear photo of it, and your ASA instrument connected before you begin. Calibration is read from the instrument automatically when you connect.

> **NOTE - Authoring is split across two modes. You build the geometry of the plan (pins and components) in Edit mode, then fill in the test signal and capture each reference in Capture mode. The plan saves automatically at every step, so there is no Save button to remember.**

8.1 Step 1: Switch to Edit mode and start a new plan

1. On the action strip, use the **Mode** selector and choose **Edit**.
2. Click **New Plan**. You are asked for a board reference name (for example `ACME-Widget-MkII`) and you name the plan file immediately.
3. The plan is created as a `.ept` file. From this point every change you make is written to that file automatically, so you never need to save by hand.

> **NOTE - New Plan is only available in Edit mode. If the button is greyed, check the Mode selector: a board's test document cannot be edited, so Edit and Capture grey out whenever a `.uut` test document is open.**

8.2 Step 2: Load the PCB image

The PCB photo is the surface you place pins onto, and later the map an operator uses to find each probe point.

1. In Edit mode, load a PCB image for the plan using the load control on the **PCB Image** pill.
2. Use the toolbar above the image to frame the board: **Zoom** (toggle on to rubber-band a region, off to pan), **+** and **–** to zoom around the centre, **1:1** to fit-to-window, and the rotation button to cycle **0° / 90° / 180° / 270°** so the on-screen board matches the one in front of you.
3. If you over-zoom, press the ← (Back) button to return to the previous view. Each zoom, pan and rotate is pushed onto an undo stack.

8.3 Step 3: Place test-point pins

Placing pins one click at a time would take an age on a dense board, so the placement modes let you describe the geometry of a group with a few clicks. Pick the mode that matches the part, then click to place.

The available placement modes include:

- **1 pin / 2 pin / 3 pin / 4 pin / Custom**: place a single evenly spaced row of pins.
- **Pin-to-pin**: click a start and an end point and number the run from pin X to pin Y.
- **1 row**: click the pin-1 and pin-N locations and give the pin count; the rest are interpolated evenly.

- **2 row (DIP / SOIC)**: four clicks (each row's first and last pin) for two parallel rows.
- **4 row (QFP)**: eight clicks, one per corner pin, around a square package.
- **Preset DIP / SOIC and Preset QFP**: pick the factory pin count from a menu, then click the corners; the count is filled in for you.

Every pin you place is born **pink** (no signature captured yet) with status **Untested**. Pin 1 of a group is drawn as a square and the rest as circles, matching the universal pin-1 marker convention.

NOTE - As you build a part, each anchor click draws its pin marker on the image straight away, so you watch the component grow rather than waiting for the end.

8.4 Step 4: Create components and number the pins

Pins are grouped into named **components** (for example `U7`, `R12`, `J3`), which is how the **Test Points** tree organises the plan and how an operator finds their place on the board.

1. Use the **Edit Test Points** pill (the Create / Move / Delete form) to create a component as you place its pins, giving it a reference name.
2. The pins within a component carry their own pin numbers, so a click on `U7` pin 4 selects exactly that point everywhere in the workspace.
3. When you finish one component the wizard re-arms automatically for another of the same shape, so you can lay down a row of identical parts quickly. To stop the auto-repeat, click the component-shape button in the menu (for example "2 pin"), or press **Esc**. Esc also cancels a placement part-way (before you have placed pin 1), so you can pause to zoom in for a closer look at where pin 1 goes, then re-arm. While a placement is armed, a grey **Press [Esc] to cancel** hint shows under the Create Component button.
4. If you leave the reference name blank, the component is auto-named `unknown_01`, `unknown_02`, and so on. That is a keepable name: some boards legitimately leave parts unidentified, so it never needs changing.

CAUTION - Deleting a component cascade-deletes all of its pins and their captured signatures. The delete dialog names the pin count first (for example "Delete U7 and its 16 pins?"). If you only mislabelled a part, rename the component instead: the pins and their goldens stay attached.

8.5 Step 5: Switch to Capture mode and store each golden

With the geometry placed, switch to building the reference library. Use the **Mode** selector and choose **Capture**.

For each test point in turn:

1. Select the point in the **Test Points** tree or on the PCB image. The PCB view recalls the zoom and rotation you placed the part at, so the point is already framed.
2. On the **Signature Generator** pill, set the **Voltage**, **Resistance** and **Frequency** for that point using the **+** / **-** steppers. Adjust them until the live V-I signature on the **VI Scope** is clean and informative. These V/R/F values are stored in the plan row for the point.

3. Touch the probes to the physical point on the golden board and watch the live trace settle.
4. When you are happy, capture the reference. The point's marker switches from **pink to yellow** (golden captured, untested) and the captured V/R/F is stored alongside the 64-sample signature.
5. Move to the next point and repeat. Every capture is written to the `.ept` automatically.

NOTE - Some pins will not settle to a stable signature. This happens when a point has enough power behind it to run a microcontroller, or sits in some sort of oscillating loop, so the live trace keeps moving and never holds still. On those pins, reducing the test voltage for that particular point is useful: with less drive the circuit often stops running or oscillating, which gives a stable signature you can capture. Lower the Voltage on the Signature Generator before you capture that point.

NOTE - To re-capture a point, use Clear Golden on the PCB image toolbar (available in Capture and Edit modes). This resets the selected pin's stored signature and returns its marker to pink, ready to probe again.

As you work through the board, the **Test Points** tree fills in: each captured point turns yellow, and a component's roll-up icon shows the worst status of its children, so a glance at the top level tells you which parts still hold pink (uncaptured) pins.

8.6 Step 6: Re-sort so the walk follows the board

Components are numbered in the order you created them, which can make Auto Test and the Test Points list jump around the board. Re-sorting renumbers the whole sequence to follow the board geometry, so the test walks across the board in a smooth path.

1. In **Edit** mode, click **Re-sort** (under the Create / Move / Delete buttons).
2. Choose the sweep order from the dropdown beside it. 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.
3. The other seven options pair each primary sweep (left to right, right to left, top to bottom, bottom to top) with a secondary direction, so you can match whatever path suits the board.

NOTE - The column width used by Re-sort is set under Settings → Test Sequence Sort as a percentage of the board: 10% gives ten columns, smaller values give more, narrower columns. Non-testable points keep their place in the sequence but are skipped during testing.

8.7 Step 7: You are done; the plan is already saved

There is nothing left to save. Every pin you placed, every component you named, every captured golden and the sort order are all written to the `.ept` master plan as you went. The plan is the reusable template: with it open, switch to **Auto Test** or **Manual Test** and click **New Test** to begin checking real boards against your goldens, each board recorded in its own dated `.uut` test document.

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9 Walkthrough: Testing a Board

This chapter takes you from a finished test plan to a tested physical board. You will run a board against its plan in Auto Test, read the result colours, step a single point at a time in Manual Test, resume or retest a repaired board, handle the prompt that appears when the master plan has changed, and amend a golden reference for one board that legitimately deviates from the plan. By the end you will understand what the per-board test document records and why every run produces its own dated file.

Before you start you need two things: a master plan (`.ept`) with golden signatures already captured, and the physical board on its bench, unpowered. If you still need to build the plan, see *Test Plans*.

Analog signature analysis needs no power on the board. The ASA provides its own low-voltage test signal, so testing is safe on a completely unpowered unit. Leave the board powered off throughout.

9.1 Per-board test documents (.uut)

Every physical board you test gets its own **test document**, saved as a `.uut` file. A test document is a copy of the master plan plus two things the plan does not have: the board's **serial number**, and the actual **good/bad result for every test point**. There is one test document per physical board.

The file is named `boardname_serial_timestamp.uut`, where the timestamp is in UTC. Because each run creates its own dated file, there is no Save button and no Clear Results button: every change auto-saves, and every test run is already its own separate, dated record. You never overwrite an earlier board's results.

Results written during testing land in the test document only. The master plan is never altered by a test run, so the goldens you captured stay exactly as you left them.

9.2 Running a board in Auto Test

Auto Test walks the plan for you, advancing from point to point and recording a result at each one.

1. Connect to the instrument (click the **Connect** pill on the action strip). The test signal is on once connected.
2. Set the **Mode** selector on the action strip to **Auto Test**.

3. Click **New Test**. If a plan or test document is already open you are offered the current plan; otherwise you pick the plan to test against.
4. Enter the board's **serial number**. This is required: it identifies the specific physical unit and names the test document. A fresh `boardname_serial_timestamp.uut` is created.
5. Touch the probes to each point as the software advances through the plan. For each testable point the instrument reconfigures to that point's stored Voltage, Resistance and Frequency, waits for the live signature to stabilise, then compares it to the stored golden.
6. Watch the result colours appear on the **Test Points** tree and on the **PCB Image** as the walk proceeds.

The comparison is done by **Euclidean distance**: the live signature is measured against the golden, and if it falls within the configured tolerance the point passes. The **Previous Pin** button steps back to re-test a point if you want to repeat it.

Points with no golden captured (pink), points flagged **No Test** (teal), and automatically-detected shorts (dark grey) are skipped by the automatic walk. So are orphaned points (see below). Manual probing of any point still works at any time.

9.3 Reading the result colours

Each test point carries one of six statuses, shown both in the trees and as a marker on the PCB image:

Status	Colour	Meaning
Good	Green	The point passed its last test (live signature matched the golden within tolerance).
Bad	Red	The point failed: the live signature diverged from the golden beyond tolerance.
Untested	Yellow	A golden is captured but this board has not yet been tested at this point.
No Signature	Pink	No golden has been captured for this point. Auto Test skips it.
No Test	Teal	The point is flagged to be ignored during automatic testing.
Short	Dark grey	An automatically-detected short. Auto Test skips it.

After an Auto Test pass, the **Failed Tests** pill lists only the red points, so you can dig straight into the failures. Click any failed point to select it everywhere: the V-I scope shows its golden and live traces overlaid, and the PCB image jumps to it so you can re-probe by hand and investigate.

9.4 Testing one point at a time (Manual Test)

When you want full control, set the **Mode** selector to **Manual Test**. This compares the board against the stored references one point at a time, with no automatic advance.

1. Set **Mode** to **Manual Test**.
2. Select a point in the **Test Points** tree (or use the navigation to land on one). The instrument reconfigures to that point's stored Voltage, Resistance and Frequency, and the PCB image highlights its marker.
3. Touch the probes to the physical point and read the golden (yellow) and live (blue) traces on the V-I scope.
4. Move to the next point and repeat.

Manual Test is the right choice for re-probing the red points from a failed Auto Test run, for awkward points that take longer to settle, and for any point you simply want to study without the walk moving on.

With a test document open, the Edit and Capture modes are greyed out. A board's reference cannot be edited from a test document: the golden library belongs to the master plan, which the test workflow never touches. The exception is amending a single golden for one board, covered below.

9.5 Resuming or retesting a board (Open Test)

To return to a board you have tested before, click **Open Test** and choose its test document. Its **master plan loads automatically** alongside it (the test remembers which plan it came from, and the ASA finds it by that reference or by a matching plan sitting next to the test file), so you do not have to Open Plan separately. You are then offered two choices:

- **Continue** resumes the board where it left off. Existing results are preserved and you carry on testing the points that still need it.
- **Retest** is for a board that has been repaired. The board's current results are archived into its history and every point resets to Untested, so you run a fresh, clean pass. The serial number is kept, and the master plan is never altered.

Choose **Retest** after rework so the new pass is recorded as its own clean result while the previous outcome stays in the board's history as evidence of what the board looked like before the repair.

9.6 When the master plan has changed: Update or Keep

If the master plan was edited after a board's test document was created (a point added, removed, or re-captured in the plan), **Open Test** asks you to decide what to do before it opens the document. Plan changes never reach a board's document silently.

- **Update** adopts the new plan into this board's document. New points arrive **Untested**; points the plan removed are kept on the board (you do not lose their results), but they are flagged as orphaned. The change is recorded in the document's audit trail.

- **Keep** carries on against the original plan the board was tested against, leaving the document unchanged.

When you choose **Update**, the update report tells you exactly what happened, including how many locally-amended references were preserved (see the next section). If you also chose **Retest**, the plan-change prompt is resolved first, so the retest then runs against the updated plan.

Update changes which points this board is tested against and resets new points to Untested. Use Keep if you specifically need to reproduce the board's original test against the plan as it was. The decision is recorded either way.

9.7 Amending a golden for one board

Sometimes a single board legitimately deviates from the master plan: a reworked pad, or a substituted part of a different value. Rather than corrupt the master golden for every board, you can amend the reference for **this board only**.

1. Right-click the board's test point in the **Test Points** tree and choose **Amend golden (this UUT only)...**.
2. Type the **reason** for the deviation. This is required: it becomes part of the board's audit record, stored together with who made the change and when.
3. The next probe touch on that point captures the new reference into this board's test document only. The master plan is untouched.
4. The point is marked with a **cyan ring** on the PCB image and an **[amended]** tag in the trees. The reference it replaced is archived in the point's history.

A later plan **Update** keeps an amended reference, because the deviation was deliberate, and the update report tells you how many amended goldens were kept.

Selecting a different test point, pressing Stop, or arming a mode cancels a pending amend. The new capture only ever lands on the point you armed it for, so a pending amend can never spill onto the wrong point or the wrong board.

If a one-off modification becomes a standing variant (several boards built the same modified way), do not keep amending each one. Author a fresh master plan for that variant in Capture mode using **New Plan**, and test those boards against the new plan.

9.8 Orphaned points

When a plan **Update** removes a point that this board already has results for, the board keeps those results as evidence and marks the point as **orphaned**:

Marker	Meaning
Orange ring / `[orphaned]`	The point was removed from the master plan by an update. This board retains its old results, but the automatic walk skips the point (it is no longer in the master's coverage, so there is no current golden to test it against). Manual probing still works.
Cyan ring / `[amended]`	The point's reference was deliberately re-captured for this board only (see above).

If a point is both orphaned and amended, it shows the orange orphaned marker, because that is the more alarming state and the one you want to notice first.

9.9 The board's history

Each test document keeps a running history per point. Every time a point is tested, its result is recorded with a date and time against the board's serial. The newest entry is the point's current status; the older entries are its history. Retesting a repaired board, and amending a golden, both archive the previous state into that history rather than discarding it.

The result is a complete, dated, per-board record: which physical unit (by serial) was tested, against which plan, with what outcome at every point, including any deliberate deviations and the reasons given for them. Because every run is its own dated `.uut` file and nothing is ever silently overwritten, the test record is the deliverable, exactly what production-line, field-repair and regulated-industry work need it to be.

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10 Reading Signatures in Depth

The V-I signature is the heart of the ASA. Once you can read the shape on the scope, you can identify most parts and spot most faults without a schematic and without ever powering the board. This chapter explains what the scope axes mean, walks through the common signature shapes one by one, shows how the Voltage, Resistance and Frequency controls change what you see, and gives you a fault-by-symptom table to work from at the bench.

10.1 What the axes mean

The VI Scope plots **voltage on the horizontal (X) axis** and **current on the vertical (Y) axis**. The ASA drives a low-voltage sine across the two probe points and measures the current that flows back. As the test signal swings through its cycle, the (voltage, current) point traces out a closed loop, a Lissajous figure, and the shape of that loop is the component's signature.

The axes are fixed, never autoranging:

- The horizontal scale runs to plus and minus the test **Voltage** you have set.
- The vertical scale runs to plus and minus the test Voltage divided by the series **Resistance** you have set (that is the largest current the circuit can pass at that setting).
- The origin sits in the centre of the display.

Because the scale is anchored to your V/R settings rather than to the trace, a signature does not jump around as you probe, and two signatures captured at the same V/R/F are always directly comparable.

On the scope the **golden** reference trace is drawn in **yellow** and the live **DUT** trace is overlaid in **blue**, so any divergence between a known-good reference and the part in front of you is obvious at a glance.

> **NOTE - Signature analysis needs no power on the board under test. The ASA supplies its own test signal, so every measurement in this chapter is taken on a completely unpowered board.**

10.2 The common shapes

Each class of part draws a characteristic loop. Learn these seven and you can read most of what you meet on a board.

Open circuit (horizontal line). No current flows however hard the voltage is driven, so the point only moves left and right along the X axis: a flat horizontal line through the origin. This is what you see on a broken track, a lifted pad, a cracked joint, or simply probing across nothing.

Short circuit (vertical line). Current flows freely with almost no voltage developed across the gap, so the point only moves up and down the Y axis: a vertical line through the origin. This is a dead short, a solder bridge, or a track shorted to a plane.

Resistor (diagonal line). A resistor passes current in proportion to voltage, so the signature is a straight diagonal line through the origin. The **slope** tells you the value: a low-value resistor passes a lot of current and gives a line tilted toward the vertical, a high-value resistor passes little current and gives a line tilted toward the horizontal. A pure resistor draws a clean line with no width to the loop.

Capacitor (ellipse). A capacitor makes the current lead the voltage, so the loop opens out into an **ellipse or circle**. The size of the ellipse depends on the capacitance and the test frequency: a larger capacitor or a higher frequency passes more current and opens the loop wider. A small capacitor at a low frequency may look almost like an open circuit until you raise the frequency.

Inductor (narrow ellipse). An inductor also produces a phase shift but resists changing current, so it draws a **narrow ellipse, nearly a line**, usually with some resistive tilt from the winding resistance. Low inductances at low frequency can look much like a resistor.

> **NOTE - A capacitor and an inductor can draw the same ellipse on the scope. The only thing that separates them by eye is the direction the loop is travelled. Turn on Comet (see below) to see that direction.**

Diode (L-shape). A diode conducts in one direction only. Below its forward voltage almost no current flows (a near-horizontal segment), then once it conducts the current rises steeply (a near-vertical segment): the two meet in a characteristic **L** or knee. The corner sits at roughly the forward voltage, so a silicon diode, a Schottky, and an LED each show the knee at a different place along the X axis.

Zener diode (double L-shape). A Zener behaves like an ordinary diode forwards but conducts again in reverse once the voltage reaches its breakdown value. You see the forward L plus a **second bend on the reverse side**, giving a stepped, roughly Z-shaped or back-to-back shape. The reverse bend only appears if your test Voltage is high enough to reach the Zener's breakdown voltage.

10.2.1 Partial and combination signatures

Real circuit nodes rarely show a textbook shape, because the probes see everything connected to that node at once. The signature is the sum of the parts in parallel:

- A **leaky capacitor** shows the capacitor ellipse with a resistive tilt: the loop is open (capacitance) but slanted (the leakage resistance in parallel). The worse the leak, the more the ellipse tips toward a diagonal line.
- A **partial short** shows a steep, near-vertical line that has not quite collapsed onto the Y axis: there is still a small voltage developed, so it is a low resistance rather than a dead short.
- A **logic pin** shows a complex shape built from the chip's internal protection diodes and leakage paths, often two diode knees back to back (the input clamps to the supply and to ground). A **logic power rail with decoupling** shows a capacitor-like loop with the rail's clamp diodes adding bends at the edges.

The **Reference Signatures** gallery in Basic mode shows worked examples of all of these (resistors of various values, capacitors and inductors, silicon and Schottky and LED and Zener diodes, transistor junctions, and combinations such as a decoupled logic rail or a clamped logic input). Compare the live trace against the gallery cards to identify the part in front of you.

10.3 How the controls change the shape

The same component can look very different depending on how you have set the three controls. Use them deliberately to bring out what you are trying to see. All three are stepped with **+** / **-** on the Signature Generator pill; there is no type-a-value entry.

Frequency mainly affects reactive parts:

- Raising the frequency opens a capacitor's ellipse wider (a small cap that looked open at 100 Hz becomes a clear ellipse higher up) and widens an inductor's narrow ellipse.
- A pure resistor's diagonal line does not change with frequency, which is itself a useful test: if the shape stays put as you step the frequency, the part is resistive.

Resistance (the series resistor) sets the current sensitivity, which is the vertical scale:

- A higher series resistance limits current and suits **high-impedance** parts (it stops a low-value resistor or a large capacitor from slamming the trace flat against the vertical limits).
- A lower series resistance allows more current and suits **low-impedance** parts (it opens up the signature of a small resistor or an inductor that would otherwise look like a short).

Voltage sets how hard the part is driven, which is the horizontal scale:

- A higher test voltage is needed to reach the knee of a diode or the breakdown of a Zener. If a diode looks like a flat line, you may not be driving it past its forward voltage.

- A lower test voltage keeps you below the turn-on of semiconductor junctions, which is useful when you want to see only the passive parts on a node.

CAUTION - Engage Limit 5V/10mA when probing sensitive logic and low-power parts. It caps the test voltage at 5 V and raises the series resistance so the probe current can never exceed 10 mA. Toggle it off only when you need the full range on rugged parts.

10.3.1 Letting the instrument find the frequency

If you are not sure which frequency best reveals a part, turn on **Auto Frequency** (the toggle below the Frequency value). It starts at 100 Hz, tries the neighbouring frequencies, and keeps moving toward whichever setting most opens the V-I loop of the part you are probing. Lift the probe and it resets to 100 Hz, ready for the next part. Toggle it off to hold a fixed frequency, which you should do whenever you are comparing two parts, so that both are measured under identical conditions.

10.4 Using Comet to tell an inductor from a capacitor

A capacitor and an inductor draw the same ellipse. The difference is which way round the loop is travelled, because in a capacitor the current leads the voltage and in an inductor it lags. **Comet** makes that direction visible:

1. Probe the part and get a clean ellipse on the scope.
2. Turn on **Comet** (the toggle next to Auto Frequency on the Signature Generator pill; it is off by default).
3. A small moving dot now rides the live trace, showing the direction the loop is being travelled.
4. Note the direction. A capacitor and an inductor spin opposite ways round the same ellipse, so the spin is the one thing that separates them at a glance.

In Basic mode you can cross-check the result against the **Component Parameters** reader, which shows a live R / C / L estimate and the dominant component type (RESISTOR, CAPACITOR, INDUCTOR, OPEN CIRCUIT or SHORT) derived from the loop shape. Treat that estimate as indicative for telling one class of part from another, not as a precision meter.

10.5 Diagnose by signature

When you are comparing a suspect board against a golden, the **difference** between the two traces is the diagnosis. The table below maps what you see to the most likely cause.

What you see on the suspect	Likely cause
Flat **horizontal line** where the golden showed a real signature	Open circuit: broken track, cracked joint, lifted pad, dry solder, missing part
Vertical line where the golden showed a slope or loop	Dead short: solder bridge, shorted decoupling cap, track to plane

What you see on the suspect	Likely cause
Steep near-vertical line, not quite on the axis	Partial short or a part that has dropped to a much lower value
Resistor **slope tilted differently** from the golden	Wrong-value or drifted resistor (steeper toward vertical = lower value, flatter = higher value)
Capacitor **ellipse smaller** than the golden, or collapsed to a line	Open or much-reduced capacitor, broken connection to the cap
Capacitor ellipse **tilted toward a diagonal**	Leaky capacitor (leakage resistance in parallel)
Diode **L-knee missing** (flat line)	Open diode, or test Voltage too low to reach its forward voltage
Diode conducts **both ways** (loop instead of an L)	Shorted or failed diode junction
Zener **reverse bend missing**	Open Zener, wrong part fitted, or Voltage below its breakdown
Logic-pin shape **simpler** than the golden (a clamp diode missing)	Damaged input protection, blown ESD clamp, or the IC removed or open
Live trace **matches the golden**	The node is healthy; move to the next point

NOTE - Before you call a difference a fault, confirm both traces were taken at the same Voltage, Resistance and Frequency. A mismatch in test conditions changes the shape on its own. In a Test mode each point is reconfigured automatically to its captured settings, and during a Compare the controls are held fixed for exactly this reason.

CAUTION - A noisy or unstable signature is usually a probe-contact problem, not a fault. Reseat the probes, try a lower frequency, and make sure the board is unpowered before you read anything into the shape.

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11 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.

11.1 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.

11.2 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.

11.3 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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12 Calibration, Settings and Troubleshooting

This chapter covers the factory calibration that lives inside your ASA, the Calibrate window used to renew it, every item in the Settings dialog, and a troubleshooting reference for connection and signature problems, including the ASA #0056, #0059 and #0060 error codes.

12.1 Calibration

Your ASA is calibrated at the factory and stores its calibration data inside the FTDI EEPROM on the instrument itself, not in a file on your PC. Because the calibration travels with the hardware, any PC you connect the instrument to reads the same calibration the moment you connect.

Calibration data includes:

- DAC gain and offset values, for test-voltage output accuracy
- ADC gain and offset values, for measurement accuracy
- DC bias calibration values

The instrument's calibration state is shown in the **Cal Status** pill on the info strip at the bottom of the workspace, and the calibration details are read from the instrument when you connect.

Calibration is performed at the factory and should not normally need adjustment. For day-to-day fault finding you never need to open the Calibrate window. It exists for service and recalibration only.

Do not modify calibration data unless you have the appropriate reference equipment and you are following a calibration procedure. Incorrect calibration produces inaccurate measurements that look perfectly normal on screen, so a bad calibration can mislead you into passing or failing boards wrongly.

12.1.1 The Calibrate window

The Calibrate window is opened from **Settings**, using the **Calibrate ASA100** button (see *Settings* below). The instrument must be connected before you open it.

Calibration works by driving the instrument's DAC to known codes, measuring the actual voltage produced with a reference meter, and recalculating the calibration so the output matches the requested value. You can either type the measured voltages in by hand or let the window read them automatically from a connected Keysight 34465A bench multimeter over the network.

The window is laid out top to bottom in the order you work through it:

1. Enter the unit's **Serial #**. A **Cal Cert ID** is generated automatically for the new certificate; there is no control to set it by hand.
2. If you are reading voltages automatically, enter the **34465A** network address (a default address is shown ready to edit) and click **Connect**. The status text next to it shows whether the meter connected.
3. Work down each per-scale block, or click **AUTO (run all)** to walk every point in sequence. For each voltage scale the window sets a known DAC code, you (or the meter) measure the actual output, it sets the second code, measures again, recalculates, then drives the calibrated code and reports the residual error as a percentage.
4. The **LIVE DAC** readout near the top shows the exact code being driven and the voltage it is producing, updated on every set and read, so you can watch the trim settle.
5. Once the points are taken, complete the four numbered steps along the bottom in order: **Create file + report**, **Program (upload)** the calibration into the instrument's EEPROM, **Download** it back, and **Verify**. Each step lights a tick when it succeeds, so there is visible evidence that every stage completed.

The **LOG** panel records each action as you go, which is useful evidence to keep with a calibration certificate. Click **Close** when finished.

The calibration the window writes is stored in the instrument, so the next time you connect the renewed calibration is used. Keep the generated report and certificate with your instrument's records.

12.2 Settings

Open the **Settings** dialog from the gear icon at the top-right of the action strip. The instrument parameters (Voltage, Resistance, Frequency) are not here; they live on the Signature Generator panel. Settings carries the following sections.

12.2.1 General

Read-only information about the installation: the application version, the settings folder location, and the colour-overrides file location. Use these when reporting a problem to support so you can quote exactly which version you are running.

12.2.2 Colours (Appearance)

The **Colours** button opens the colour editor, where you can recolour any named element of the app: the top and bottom ribbon backgrounds, the panel background, the signature traces, the cell banners, the buttons and so on. Changes apply live and persist between sessions.

Icon colours are baked when the app launches, so a colour change that affects an icon only takes effect after you restart ASA26.

12.2.3 Mini-scopes

Controls how the **Mini Scopes** panel chooses which pins to display:

- **Mode**: *Previous + Next* shows the two pins either side of the selected one; *Dynamic* shows one small scope per pin of the selected component.
- **Max mini-scopes**: a cap (8, 16 or 32) on how many scopes Dynamic mode will show. A component with more pins than the cap windows down to this many, anchored so the count does not shrink as you near the end of the component.

12.2.4 Auto Frequency

Change threshold sets how much a neighbouring frequency must open the V-I "eye" before the Auto Frequency search will move to it. Below the threshold the search stays at its 100 Hz starting point. A higher value makes Auto Frequency stickier, so it changes frequency less readily.

12.2.5 Test Sequence Sort

Strip width sets the default column width used by the **Re-sort** button in Edit mode, expressed as a percent of the board width. At 10% the board is divided into 10 vertical columns; a smaller percent gives more columns, each narrower. See *Test Plans* for how Re-sort uses these columns to order the test walk.

12.2.6 Time Zone

Local offset from UTC is a display-only setting. It shifts the timestamps you see on screen, such as those in the Recent Compares strip, from UTC to your local time. A live **Local time now** readout updates every second, so you can adjust the offset until it matches the clock on your wall.

At startup the ASA checks this offset against your computer's current local time. If they disagree (for example after a daylight-saving change, or moving the machine to another region), an amber notification badge appears on the **Electron Plus logo**. Click the badge to open a short prompt: choose **Yes** to set the offset to match your computer, **No** to leave it for now, **Don't ask again** to stop the check, or **Cancel** to decide later.

Files are always stored in UTC. The Time Zone setting only changes how timestamps are displayed; it never changes what is written to disk. This is why a `.uut` test document's filename timestamp is always UTC regardless of this setting.

12.2.7 Compare snapshots

Save compare snapshots controls whether each Basic-mode Compare is saved to the **Recent Compares** strip. On (the default) keeps the running thumbnail history; off lets you compare on screen without writing anything to disk, which is handy when you are just probing around and do not want to fill the history with throwaway comparisons.

Recent Compares sets whether the Recent Compares strip is shown in Basic mode. Shown is the default; choose Hidden to remove the strip and give the VI Scope the extra height. The change applies immediately.

12.2.8 Calibration

The **Calibrate ASA100** button opens the Calibrate window described above. The instrument must be connected. See *Calibration* for the full procedure.

Click **Close** to dismiss the Settings dialog.

12.3 Troubleshooting

12.3.1 Connection problems

If the **Connect** pill will not reach the connected state, or it drops out during use, work through these checks:

1. Confirm the instrument is powered on and the USB cable is fully seated at both ends. Try a different USB cable and a different port; a marginal cable is a common cause of intermittent drops.
2. Confirm the **FTDI USB drivers** are installed. The ASA connects over FTDI USB, so the FTDI drivers must be present. The installer includes them.
3. Confirm you are running the 64-bit ASA26 software.
4. If you have more than one FTDI device attached, disconnect the others and try again so the software is not seeing the wrong device.

If the connected instrument is not the model the software expects, you will see error **ASA #0060** (see the error-code table below).

12.3.2 No signature, flat line, or noisy signature

A poor or absent signature is almost always a probe-contact issue, since the test signal is on continuously once you are connected and the trace responds the instant the probes make contact.

Symptom	What to check
No signature at all	Confirm both probes are touching the component or test points. Check the Voltage and Resistance settings on the Signature Generator panel are sensible for the part. A very high series resistance against a low-impedance part can leave the trace almost flat.
Flat horizontal line (open circuit) on everything	This is the open-circuit signature, so the instrument is seeing no connection. Check the probe leads are not broken and the tips are making clean metal-to-metal contact. Clean oxidised or fluxed pads.
Flat vertical line (short) where you do not expect one	Confirm you are probing the two points you intend, and that the probe tips are not bridging adjacent pins.
Noisy or jumping signature	Make sure the board under test is fully powered off; the ASA supplies its own test signal and external power corrupts the trace. Try a lower test frequency. Check for an intermittent probe connection.

The board under test must be unpowered. The ASA provides its own low-voltage test signal, and applying external power to the board while probing can give misleading signatures and may damage the instrument or the board.

If you cannot tell a capacitor from an inductor, both draw the same ellipse. Turn on Comet on the Signature Generator panel to see the direction the loop is travelled, which is what distinguishes the two. See *Signature Interpretation* for the common signature shapes.

12.3.3 Error codes

The software reports startup and connection faults with a numbered ASA error code:

Code	Meaning	What to do
ASA #0056 - No USB detected	No FTDI device was found on the USB bus.	Check the USB cable and that the instrument is powered on. Confirm the FTDI USB drivers are installed.
ASA #0059 - USB descriptor incorrect	A USB device was found, but its descriptor shows it is not an Electron Plus instrument.	Confirm you have the correct device plugged in, and that you are not connecting to an unrelated FTDI adaptor.
ASA #0060 - Wrong instrument selected	The connected instrument does not match the model the software expects.	Check that the instrument you have connected is the model you intend to use; the software identifies the model from the instrument itself.

If a fault persists after these checks, quote the error code and the application version (from Settings, General) when you contact support at support@electron.plus.

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13 Specifications

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

www.electron.plus/pages/datasheets

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14 Contact and Support

For technical support, please contact:

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