DRAFT FOR REVIEW pink boxes = facts still needed before publishing

TinyScan TS402 User Guide

For TS402 software version 02.04.02 (build 4) and later. This guide covers the handheld scan tool, its screen and buttons, and the web pages you can open on a phone or tablet.

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1. What the TS402 does

The TS402 is a pocket-size scan tool for **small-engine electronic fuel injection (EFI) controllers**, the engine's computer, called the *ECU*. It's built for mowers, generators, pumps, utility vehicles and similar equipment. It is **not** a car OBD-II scanner.

With it you can:

- find the engine's ECU automatically, on either of the two connection types small engines use: **K-line** and **CAN**;
- read the stored **trouble codes** (also called DTCs, diagnostic trouble codes) and clear them after a repair;
- watch **live data**, such as RPM, temperatures, battery voltage and throttle;
- read the ECU's identification;
- use a phone, tablet or laptop over the TS402's own Wi-Fi for bigger screens: gauges, graphs, data capture and more;
- update its own software from the TinyScan server, but only when you say Yes.

2. Getting started and power

In the box

The TS402 unit, the engine interface cable and a carrying case. **Confirm the kit contents and the cable part number(s)**

Power

The TS402 runs on **5 V USB-C power**. **Confirm how a customer powers it in the field: a USB-C supply or power bank, the engine cable, or both**

Turning it on

1. Connect power. The screen shows the `TinyScan` logo while it starts.
2. Next, a `NETWORK INFO` screen shows the Wi-Fi mode and address for about 10 seconds. Press `ENTER` or `ESC` to skip it.
3. The **Main Menu** appears. The unit is ready.

From power-on to the main menu takes up to about a minute.

Turning it off

When you're finished, back out to the Main Menu and disconnect power. The TS402's main software is stored read-only, which protects it from damage when power is removed.

> **Never remove power while the screen says `UPDATING` or `Do not power off.`** See Software update.

To confirm: Is it OK to tell customers that unplugging at the Main Menu is the normal way to turn the TS402 off? The shop plug-pull test is still to be done.



Start-up logo



Main Menu

3. The buttons

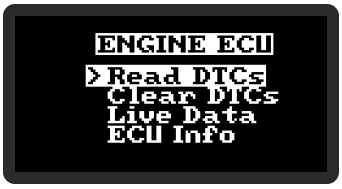
Button	What it does
`UP` `DOWN`	Move the **>** pointer through a menu, scroll through codes and pages, and switch between **NO** and **YES** on a question screen.
`ENTER`	Choose the highlighted item, or confirm.
`ESC`	Go back one screen, or cancel.
`DTC`	Shortcut: **read trouble codes now**, from any screen. If the TS402 isn't connected yet, it finds the engine first and then reads the codes.
`I/M`	Shortcut: switch between **Imperial** (°F, PSI) and **Metric** (°C, kPa). A banner at the top of the screen confirms the change.
`LEFT` `RIGHT`	Not used yet. A coming update will let RIGHT pick **YES** and LEFT pick **NO** on question screens. For now, use `UP` / `DOWN`.

Most screens show their own key hints on the bottom line, for example `ENTER=Retry ESC=Back`.

To confirm: the exact key labels printed on the production keypad (this guide uses UP, DOWN, LEFT, RIGHT, ENTER, ESC, DTC and I/M, the names in the software).

4. The menus

Menu	Items
Main Menu	**Read Codes**: find the engine and open the Engine menu **Quick Status**: a short summary screen (RPM, coolant and speed show `---` for now; it doesn't show live values yet) **Setup**: settings and software update **About**: model, software version (FW), serial number (SN) and hardware revision
Engine menu (after connecting)	**Read DTCs** · **Clear DTCs** · **Live Data** · **ECU Info**
Setup	**Network Status** · **Units** · **Reset Defaults** · **Software Update**



Engine menu



Setup menu



About (your serial number appears where the Xs are)

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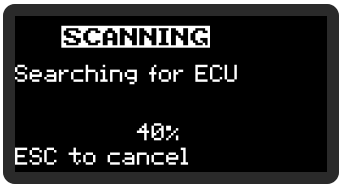
5. Connecting to an engine

The TS402 talks to two kinds of engine computers, and it figures out which one you have by itself:

- **K-line**: a single-wire connection used by many small-engine EFI systems, including the Delphi MT05 ECU.
- **CAN**: a two-wire network (J1939) used by newer engines.

1. With the key **OFF**, plug the TS402 cable into the engine's diagnostic connector. Push it in all the way. **Add a photo or drawing of the connector and where to find it on common engines**
2. Turn the ignition key **ON**. The engine can be stopped or running.
3. On the TS402, choose **Read Codes** from the Main Menu and press `ENTER`.
4. The `SCANNING` screen counts up to 100 % while it searches, for up to 30 seconds. Press `ESC` to cancel.
5. When it finds the ECU, it shows `K-LINE` or `CAN`, then `Connected to Engine ECU`. After about 3 seconds, the **Engine menu** opens.

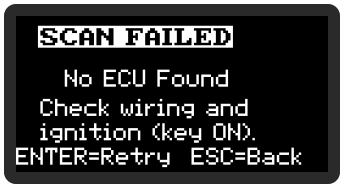
If nothing answers within 30 seconds, you'll see `SCAN FAILED · No ECU Found`. Check the cable and that the key is ON, then press `ENTER` to try again or `ESC` to go back.



Searching for the ECU



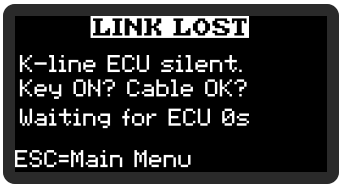
Connected (K-line example)



No engine found

If the connection drops

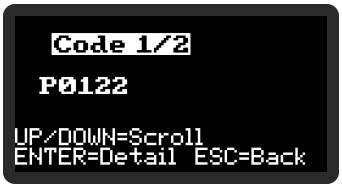
If the engine stops answering while you're connected, for example because the key was turned off or the cable was bumped, the screen shows `LINK LOST` and counts the seconds. Fix the cause and the TS402 **picks up where it left off by itself**. Press `ESC` to give up and return to the Main Menu.



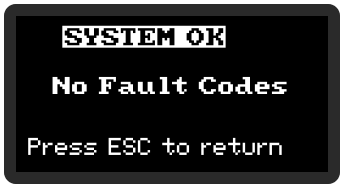
Connection lost, waiting for the ECU

6. Reading trouble codes

1. Connect to the engine (section 5), then choose **Read DTCs**. Or press `DTC` at any time.
2. If there are no codes, you'll see `SYSTEM OK · No Fault Codes`.
3. If there are codes, the screen says how many it found, then shows them one at a time: `Code 1/2` and so on. Use `UP` / `DOWN` to move between codes.
4. Press `ENTER` on a code for its detail pages, and use `UP` / `DOWN` to page through them:
   - page 1: the code (CAN codes also show their SPN and FMI numbers);
   - page 2: description (not built in yet; look the code up in the engine maker's service manual);
   - page 3: occurrence count.
5. Press `ESC` to go back.



Code list (example code)



No codes stored

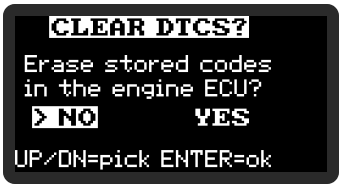
> **Tip:** Write the codes down, or take a photo of the screen, **before** you clear them.

7. Clearing trouble codes

Clear the codes after the problem has been repaired. Clearing erases the stored codes in the engine's ECU.

1. Key **ON**, engine **stopped**, TS402 connected.
2. Choose **Clear DTCs** from the Engine menu.
3. The screen asks `CLEAR DTCS? Erase stored codes in the engine ECU?` **NO** is selected first, so nothing happens by accident.
4. Press `UP` or `DOWN` to move to **YES**, then press `ENTER`.
5. The screen shows `CLEARING FAULT CODES… Please wait…` The TS402 then reads the codes again to make sure.

Result on screen	What it means
`SUCCESS! Codes cleared` "Verified: re-read shows no codes."	Done. The ECU confirms there are no codes left.
`FAILED! Not cleared` "ECU refused" / "Engine off, key ON?"	The ECU said no. Stop the engine, leave the key ON and try again.
`FAILED!` "ECU still has N codes" / "Fault may be active"	The fault is still there, so the ECU set the code again right away. Repair the cause first.
`FAILED!` "No reply from ECU" / "Check key ON/cable"	Check the key and the cable.



Clear question (NO is selected first)

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8. Live data and ECU info

Live Data

Choose **Live Data** from the Engine menu. The screen refreshes about four times a second. Use **UP** / **DOWN** to change pages, and **ESC** to go back.

Engine type	Page 1	Page 2	Page 3
K-line	RPM, Coolant, Battery	Intake, MAP, Throttle	–
CAN	RPM, Oil Temp, Fuel Rate	Battery, Intake, Baro	Throttle

A value shows `----` when the ECU doesn't send it. If an ECU can't send live data at all, the screen says `Live data is not supported by this K-line ECU.` Press **I/M** to switch units.



Live Data, page 1 (shown with no engine connected)

ECU Info

Choose **ECU Info** to read the ECU's identification, such as its part and software numbers. It takes a moment (`Reading ECU… please wait`). There are 4 pages; use **UP** / **DOWN**. Anything the ECU doesn't report shows as *not supported*.

For many more parameters, gauges and graphs, use the web pages (section 9).

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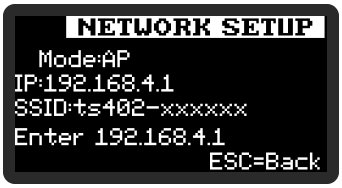
9. Wi-Fi and the web pages

The TS402 makes its own Wi-Fi network (a "hotspot"), so you can use a phone, tablet or laptop as a big screen. No internet is needed for this.

1. On the TS402, open **Setup** → **Network Status**. It should say `Mode:AP`. AP is hotspot mode. The **SSID** line shows the network name, which looks like `ts402-xxxxxx` and matches the serial number on the About screen.
2. On your phone or tablet, open Wi-Fi settings and join that network.
3. Open a web browser and go to **`http://192.168.4.1`**. Type `http://`, not `https://`.

To confirm: Will shipped units' hotspot be open, or will it have a password printed on a label? This guide doesn't mention a password.



Network Status in hotspot (AP) mode

What's on the web pages

Page	What you can do
Settings	Pick your engine: Manufacturer, then Series, then Model. This opens the matching K-line or CAN pages.
Engine pages	**Device Trouble Codes** (read and clear) · **Parameters** (all live values in a table) · **Gauges** · **Graphs** · **Capture Data** · **Live Stream**
Connections	See the network details, add a Wi-Fi network (name and password) so the TS402 can reach the internet, or switch back to hotspot mode.
About	Unit name, model, software version and build date, the **Technical Manual**, and the **Check For Update** button (section 11).

The web pages and the TS402 screen work at the same time.

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10. Setup: network, units, reset

Network Status

Shows the Wi-Fi mode, address (IP) and network name. Each press of **ENTER** switches to the next mode: **AP** (hotspot) → **Client** (joins your shop Wi-Fi) → **Off** → AP again. In AP mode the hint line reads `Enter 192.168.4.1`, the address to type in your browser. Pressing ENTER in AP mode still switches to Client and turns the hotspot off.

- **AP (hotspot):** for the web pages, no internet. Address `192.168.4.1`.
- **Client:** the TS402 joins a Wi-Fi network you saved before on the **Connections** web page. The screen shows the address your network gave it. Software updates need this mode, because they need the internet.
- **Off:** Wi-Fi turned off.

> In Client mode the hotspot is turned off, so `192.168.4.1` won't open. To get the hotspot back, go to **Setup** → **Network Status** and press **ENTER** until it says AP.

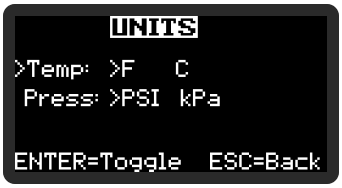
To confirm: the exact customer steps for saving a shop Wi-Fi network: the Connections page, the Android app, or both.

Units

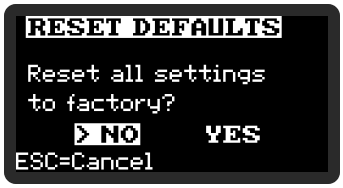
Choose temperature (°F or °C) and pressure (PSI or kPa). Use `UP` / `DOWN` to pick the row, `ENTER` to switch it, and `ESC` to go back. The `I/M` button switches Imperial/Metric from any screen. Unit choices go back to °F/PSI when the TS402 restarts.

Reset Defaults

Asks `Reset all settings to factory?` with **NO** selected. Use `UP` / `DOWN` and `ENTER`. Today this puts the display units back to °F and PSI.



Units



Reset Defaults

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11. Software update

The TS402 can download new software from the TinyScan update server. **It never updates by itself:** it only checks when you ask, and it only installs if you choose **YES**.

> **Built-in safety:** every update is digitally signed by TinyScan and checked before anything is installed. The new software is installed *next to* the old software and tested. If the test fails, the TS402 **goes back to the old software automatically**.

What you need

- The TS402 connected to a Wi-Fi network with internet (**Client** mode; see section 10).
- Steady power for about 2 minutes. A typical update takes about 1½ minutes.
- Don't use the TS402 on an engine during the update.

Step by step, on the TS402 screen

1. Main Menu → **Setup** → **Software Update** → `ENTER`.
2. The screen says `Checking for updates…` (`ESC` cancels).
3. If there's new software you'll see `UPDATE AVAILABLE`, the **New** and **Now** versions and the download size, and `Install?` with **NO** selected.
4. Press `UP` or `DOWN` to move to **YES**, then press `ENTER`. (LEFT/RIGHT don't work here yet.) To skip the update, leave it on NO and press ENTER, or press `ESC`.

5. The screen shows `UPDATING` with each step: *Downloading* and *Verifying* (with a progress bar), then *Unpacking*, *Restarting* and *Testing*. **The buttons don't respond during the update. This is normal.**
6. The screen goes blank and restarts once. This is normal, and the update continues. It then shows `UPDATING · Testing…`.
7. When it's finished: `UPDATE DONE · Installed: 02.04.xx · Software is up to date.` Press **ESC** to return to Setup.

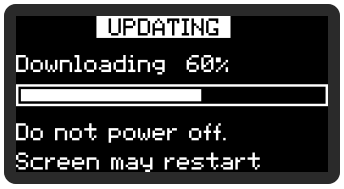
> **While the screen says `Do not power off.`, keep the power connected.** The TS402 is designed to protect itself even if power is lost: it starts on the old software, or retries. But don't unplug it on purpose.



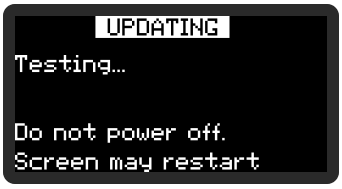
Update available: NO is selected first



After pressing UP or DOWN: YES selected



Downloading



Testing the new software, after the screen restart



Finished



Nothing new to install

Screen pictures come from the TS402 software running in a simulator. Version numbers are examples.

Other messages you might see

Screen	What it means / what to do
`UP TO DATE` "Software is up to date."	You already have the newest software. Press ESC.
`UPDATE` "Can't reach the update server. Check the Wi-Fi internet link."	The TS402 isn't on the internet. Put it in Client mode on a network with internet, then try again.
`UPDATE` "Update check failed: Another update is already running"	An update is still finishing. Wait a minute, press ESC, and open Software Update again.
`UPDATE UNDONE` "The update failed its self-test and was undone. Old software kept."	The safety check worked, and your TS402 is on its previous software and works normally. TinyScan won't offer that same update again. Contact support if you like.
`NOT INSTALLED` "Nothing changed."	The download or the check stopped (for example, the Wi-Fi dropped). Nothing was changed, so try again later.

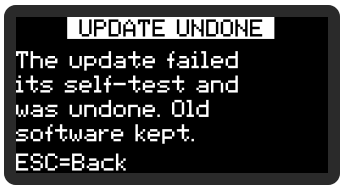
Message screens stay up until you press **ESC** or **ENTER**.



No internet



An update is still finishing



Automatic undo (rollback)

Updating from the web page instead

Open the **About** web page and press **Check For Update**. If an update is offered, press **Yes, install**, or **No** to skip it. The page shows the progress. It loses its connection for a moment while the TS402 restarts its programs, then reconnects and shows **Update installed**.

12. Troubleshooting

Problem	Try this
`SCAN FAILED · No ECU Found`	Key ON? Cable pushed all the way in at both ends? Check the engine fuse and battery. Press ENTER to retry.
`LINK LOST`	Key turned off, or the cable moved. Fix it and the TS402 reconnects by itself, or press ESC.
`COMM ERROR` "Unsupported protocol or ECU."	This engine's ECU isn't supported. Press ENTER for the menu.
Live values show `----`	The ECU isn't sending that value, or the link just dropped. Check that the key is ON.
Clear codes failed	See the table in section 7. Usually the engine is running, or the fault is still present.
Can't find the TS402 Wi-Fi	Setup → Network Status must say Mode:AP. If it says Client or Off, press ENTER until it says AP, wait a moment, then look for the network again.
Browser won't open 192.168.4.1	Make sure your phone is joined to the TS402 network, not your shop Wi-Fi. Some phones switch back to mobile data when a network has no internet, so turn mobile data off for a moment. Type `http://192.168.4.1`.
Software update: "Can't reach the update server"	The TS402 must be in Client mode on a network with internet (section 10).
Screen stuck on a message	Message screens wait for you. Press ESC or ENTER.
Screen blank or not responding (not during an update)	Disconnect power, wait 10 seconds, and reconnect.

13. Specifications and support

Item	TS402
Engine connections	K-line (ISO 14230 / KWP2000, 10,400 baud), including the Delphi MT05 ECU; CAN (SAE J1939, 250/500 kbit/s)
Display	128 × 64 monochrome LCD
Wi-Fi	Built-in hotspot (192.168.4.1) or joins your network; Bluetooth LE for setup
Power	5 V USB-C, about 400 mA typical
Computer	Raspberry Pi Zero 2 W
Software updates	Signed updates you approve, with automatic rollback

Support and warranty, needed from Timothy: support phone and email, website, warranty terms, and the list of supported engine makes and models for customers. The TS402's own Settings web page currently says *"Design Technology, Inc. · Home of the Tiny Tach · www.tinytach.com · 630-920-1300"*. Confirm that's the support contact to print here.