Firmware Adaptation for the TEN-TEC Paragon 585

Version ZB V1.1

By Rolf Heine, DL6ZB

> **For the Paragon 585 only.** This firmware is intended exclusively for the Ten-Tec Paragon 585 (unofficially also called “Paragon I”), not for the Paragon 586. Ten-Tec made changes in the 586, among others to the VCOs.

With firmware ZB V1.1, the Ten-Tec Paragon 585 can be controlled through its COM port by today’s amateur radio software just like an Icom IC-718. The COM port requires the TEN-TEC MODEL 258 “RS232 INTERFACE BOARD” plug-in card. Loggers, Hamlib, DXLab Commander and N1MM+ talk to the radio without a special driver. In addition there is a direct TAG display, the 60 m band, band registers, a version display on the radio and a more sensible default setup after RESET.

The basis is the original Ten-Tec firmware V3.9. CW still has priority: the timer ISR, the CW loop, the PLL output and the TX enable are unchanged. Keypad, encoder, memory, Scan/RATE, Split/RIT, clock and band keys work as before.

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1. Changes Compared with the Original Firmware

CI-V as an Icom IC-718

Setting	Value
Radio model in the software	Icom IC-718 (Hamlib model 3013)
CI-V address	5E (IC-718 default)
Interface	4800 baud, 8N1
Echo / Transceive	off (point-to-point RS-232, query or poll)
PTT	via RTS (hardware), not via CI-V

The controller address is usually E0. If a program sends 00 as its own address (DXLab, for example), the reply is addressed to 00. Hamlib 4.0 and later detects the missing echo by itself. Example: `rigctl -m 3013 -r COM3 -s 4800 f`

Supported commands:

Command	Function
`03`	Read frequency (5-byte BCD, 10 Hz resolution)
`05`	Set frequency (`FB`, from 30 MHz up `FA`)
`04` / `06`	Read / set mode (LSB, USB, AM, CW, RTTY, FM)
`07`	VFO state; `07 00` / `07 01` selects VFO A / B; `07 A0` is A = B; `07 B0` swaps A and B
`0F`	Read split state; `0F 00` / `0F 01` turns split off / on (the SPLIT LED follows)
`7E 00`	Status byte: bit 0 TAG LED, bit 1 SPLIT LED, bit 3 VFO A LED
`7E 01`	Set or clear the TAG (0 to 7 ASCII characters, see below)
others	`FA` (cleanly rejected)

Frames to another address, broadcast frames, frames of the wrong length or without `FD` are silently discarded. No commands are processed while transmitting. The radio sends no unsolicited messages. Additional functions use the vendor command `7E`.

Known differences from the IC-718: `07 01` with an active RX offset answers `FB` but – like the F key – only switches the offset off and stays on VFO A. `19 00` (ID) and `1C 00` (TX status) are not supported. Setting split (`0F 01`) requires the same mode on VFO A and B, as on the radio itself.

Setting the TAG Directly

`7E 01` writes the callsign into the TAG line without the detour via "MEM 00". The radio stays in VFO mode and the display is redrawn immediately. Missing positions are filled with spaces; `7E 01` without text clears the TAG. The command is accepted only when the AUX display is set to TAG, otherwise `FA`. The field has 7 positions. A frame with 8 or more characters is silently discarded. Use capital letters and digits. Text entry on the front panel (`X ;` … `@nn`) remains as in the original; `@` on the main level no longer starts TAG editing (use `X ;`).

60 m Band and Band Registers

HAM UP/DOWN now steps 80 m → 60 m → 40 m and back. On the first visit and after RESET the radio lands on 5351.5 kHz in CW. On 60 m, transmit is enabled for 5350.00–5369.99 kHz. With the "HAM" jumper installed, the Paragon 585 transmits only on the classic amateur bands; reception covers all of HF anyway. To transmit on 60 m, remove the jumper (see Installation). In Germany, 60 m is available to Class A licensees only, with at most 15 W ERP/EIRP – reduce power accordingly. Check your own country's rules.

Each of the 10 bands remembers the last used frequency in 100 Hz steps. A band change returns there, no longer to the same distance from the band edge as on the previous band. The mode is kept on a band change (exception 60 m: CW).

Frequency Storage

The frequencies of the VFOs, memory channels and band registers are kept in the battery-backed SRAM. With the backup battery installed they are retained through power off and on (warm start). The band registers store the last used frequency of each band in this SRAM. As in the original, RESET erases all memory channels, including the TAG in channel 00.

Defaults After RESET

	Original	ZB V1.1
Start frequency / mode	7335 kHz LSB	7025.00 kHz CW (VFO A and B)
10 Hz digit of the frequency display	off	on
AUX display	Clock (TIME LED)	TAG (TAG LED)

Switching off and on with the backup battery is a warm start, not a RESET: the last selected AUX display, the state of the 10 Hz digit and the frequencies stored in SRAM are retained. The new values for start frequency, mode, TAG display and 10 Hz digit take effect only after RESET or without a battery.

Version Display on the Radio

Press and release SHIFT, then ENTER: the AUX field shows `ZB V1.1`. The display stays until the next key is pressed. That key only ends the display and is not executed; the previous AUX display then returns (TAG, date, clock or memory text). Pressing both keys at the same time does not work – SHIFT and ENTER are in the same column of the keypad matrix. The CW key does not key while the version is shown.

Bug Fixes

- PC queries no longer disturb the transmitter. In the original, a status query could interrupt CW keying; CI-V works byte by byte without waiting and processes nothing while transmitting.
- Characters from the PC control no longer pass through the keypad handler as key codes. This eliminates swallowed characters, accidental operating commands and hanging input dialogs.
- The split lockout after a TAG entry has been fixed.

Removed Functions

- The former Paragon protocol (remote) of the Model 258 plug-in card is gone. The card itself (RS232 Interface Board) is still required for the COM port. Programs that speak the old protocol no longer work – select Icom IC-718 instead.
- The voice output (Model 257 voice board) is no longer addressed. The announce key no longer announces anything. If you need the voice output, keep the original EPROM.
- There is no PTT via CI-V. Transmit is keyed by hardware as before: PTT via RTS, or key or keyer at KEY.

Also unchanged: control of the two MC145158 PLL chips, Scan/RATE, the memory layout, clock and date, RIT/XIT and the split rules on the radio.

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2. Installation

The CPU remains the original MC146805E2. The program memory is an AT28C64B (8 KB EEPROM, DIP-28) instead of the original 27C64 UV EPROM. On the board, /WE is tied to VCC; the chip cannot be written by accident inside the radio.

- Keep the original EPROM so the original state can be restored.
- Take ESD precautions when working on the open radio.
- Remove the 27C64 from its socket and insert the AT28C64B. The orientation of pin 1 (notch or dot on the package) must match the marking on the socket.
- The firmware requires the original CDP6853 ACIA, connected directly to the MAX232 of the RS-232 board.
- After the first power-up, perform a RESET so the new defaults (7025.00 kHz CW, TAG, 10 Hz digit) take effect.
- With the jumper labeled “HAM” installed on the Logic Board, the Paragon 585 transmits only on the classic amateur bands; reception covers all of HF anyway. To transmit on 60 m, remove the jumper. It is located at U7 (MC146823P), pin 38 to ground, and is marked “HAM” on the board.

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3. Programming

A suitable programmer for the AT28C64B is the XGecu T48, a universal USB programmer (also called TL866-3G). It is the successor of the TL866II Plus. The device is available from electronics distributors and online marketplaces. The manufacturer provides information and the software on its website www.xgecu.com (Download section).

The accompanying software is called Xgpro and runs on Windows.

How to program the chip:

1. Download the current Xgpro software from the manufacturer's site and install it on Windows. Install the USB driver as well, or follow the installer's prompts.
2. Connect the T48 via USB.
3. In Xgpro, select the device AT28C64B (DIP-28).
4. Insert the chip into the ZIF socket. The orientation of pin 1 must match the picture in Xgpro and the marking on the socket.
5. Load the HEX file `paragon585_ZB_V1.1.hex` (Intel HEX); alternatively the binary file `paragon585_ZB_V1.1.bin` (8192 bytes, start address 0).
6. Check the Xgpro checksum: it must be **0x000A2850**.
7. Program the chip and check it with Verify.

Both files are included in the download ZIP.

SHA-256 of the HEX file `paragon585_ZB_V1.1.hex`:

```
cc4cf3f49fe3cfec3e3a927b9a5fa0704f3490d7c801def71d3984542dfa1c07
```

SHA-256 of the binary file `paragon585_ZB_V1.1.bin`:

```
c3865f681d42b4d42034d80d5edf1752d772673f4b56345cd40d09912e36fc55
```

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4. EEPROMs from the Author

The author can provide programmed EEPROMs in limited quantities within the European Economic Area for reimbursement of costs. If interested, please ask at dl6zb@dl6zb.de

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5. Legal Notes

Firmware ZB V1.1 is provided free of charge as freeware for private use and amateur radio. The purpose of this work is to adapt a historic amateur radio device to the requirements of a modern environment. It is a voluntary effort without any intention of making a profit.

The changes to the original firmware are Copyright © 2026 Rolf Heine, DL6ZB. The original Ten-Tec firmware remains the basis. The rights of Ten-Tec and other rights holders remain unaffected. All names and trademarks mentioned are the property of their respective owners.

The firmware is provided without warranty. Any liability for damage resulting from its use or installation is excluded. Use is at your own risk. Modifications to the radio and compliance with the legal operating rules of the amateur radio license are the responsibility of the user.

Responsible:

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