99 — Reference & Troubleshooting

> **TraxProbe & Traxcope User Manual** · Version 1.0.0 · Updated 2026-08-25
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Quick-lookup appendix: the full configuration table, the TID range map, file formats, and a consolidated troubleshooting guide.

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1. `TRAX_CFG_*` configuration reference

All settings go in your `trax_config.h` (any folder on the include path). **Bold** entries are mandatory (or mandatory in the stated mode).

Hardware & timestamps

Setting	Default	Meaning
`TRAX_CFG_HW_PORT`	— (error if unset)	`TRAX_HW_PORT_ARM_CORTE` `_GENERIC` , `_LINUX`
`TRAX_CFG_TIMER_FREQ_HZ`	— (error if unset)	Timestamp timer frequenc sent to the host
`TRAX_CFG_TIMER_FREQ_DIV`	`1`	Rational frequency: actual FREQ_HZ / FREQ_DIV
`TRAX_CFG_TIMESTAMP_MODE`	`TRAX_TIMESTAMP_TICK_TIMER`	Or `TRAX_TIMESTAMP_FREE` (DWT/mcycle)
`TRAX_CFG_TIMESTAMP_TIMER_VAL`	— (TICK_TIMER mode)	Fine-timer register expres e.g. `(SysTick->VAL)`
`TRAX_CFG_TIMESTAMP_TIMER_DIR`	`TRAX_TIMER_DIR_DOWN`	`_UP` for up-counting timer
`TRAX_CFG_TICK_COUNTER_PERIOD`	— (TICK_TIMER mode)	Fine cycles per tick (`SysT` `>LOAD + 1`); auto-derived FREERUN mode
`TRAX_CFG_TICK_BITS`	`8`	Timestamp split `[tick:N]` `[fine:32-N]`
`TRAX_CFG_TICK_RATE_HZ`	auto-derived	Tick ISR rate; override onl exotic tick sources
`TRAX_CFG_CORE_COUNT`	`1`	SMP: cores running one image (1–63)

Transport, RTOS, buffers

Setting	Default	Meaning
`TRAX_CFG_TRANSPORT`	`TRAX_TRANSPORT_RTT`	Or `TRAX_TRANSPORT_CUST` implement four `trax_tra` functions in your transport `write`, `read`, `clear_tx` reporting, capacity and oc optional `TRAX_CFG_TRANSP` See Chapter 02 §3.2
`TRAX_CFG_RTOS_TYPE`	`TRAX_RTOS_NONE`	Or `TRAX_RTOS_FREERTOS`
`TRAX_CFG_FREERTOS_VERSION`	— (error if RTOS is set)	`TRAX_FREERTOS_VERSION( patch)` — mandatory wh is selected. Use `tskKERNEL_VERSION_NUMB`
`TRAX_CFG_OS_VER_MAJOR` / `_MINOR` / `_PATCH`	`0` / `0` / `0`	START_TRACE OS versi FreeRTOS only — FreeR these from `TRAX_CFG_FRE`
`TRAX_CFG_MAX_RTOS_TASKS`	`16`	FreeRTOS task-table size
`TRAX_CFG_MAX_RTOS_OBJECTS`	`16`	FreeRTOS sync-object tab semaphores, mutexes, tim
`TRAX_CFG_RTOS_TASK_NAME_MAX`	`16`	Stored task-name length (NUL). Set to `configMAX_T`
`TRAX_CFG_CTRL_TASK_PRIORITY`	`1`	TraxCtrl drain task priority
`TRAX_CFG_CTRL_TASK_STACK_SIZE`	`256` words	TraxCtrl stack
`TRAX_CFG_CTRL_TASK_PERIOD_MS`	`10`	Drain period
`TRAX_CFG_ISR_YIELD_TO_SCHEDULER`	`1`	`1` = omit `ISR_EXIT` when yields to the scheduler; `0` `ISR_EXIT` and show the 2 resume of the preempted
`TRAX_CFG_OWN_FREERTOS_TICK_HOOK`	`1`	`1` = TraxProbe owns `vApplicationTickHook` (goes in `trax_app_tick_h` own the hook and must ca `trax_freertos_on_tick(`
`TRAX_CFG_FREERTOS_TICK_ISR_PRIORITY`	lowest NVIC	Priority shown on the auto ISR lane
`TRAX_CFG_HEAP_HAS_STATS`	`1` from FreeRTOS V10.3.0	`vPortGetHeapStats()` av (heap_4/5). Set `0` on hea

Setting	Default	Meaning
`TRAX_CFG_BASEPRI`	unset (PRIMASK)	Cortex-M3+ only: BASEPR TraxProbe critical sections bit value, typically `configMAX_SYSCALL_INTE`
`TRAX_CFG_OUT_BUFFER_SIZE32`	`2048`	Output ring size in 32-bit v bytes)
`TRAX_CFG_IN_BUFFER_SIZE32`	`16`	Host-command RX buffer
`TRAX_CFG_FRAME_MAX_SIZE32`	`65535`	Max frame words (16-bit h ceiling)
`TRAX_CFG_TX_BATCH_MAX_BYTES`	`4096`	Max bytes drained from th `trax_process()` pass
`TRAX_CFG_TRANSPORT_TX_FREE`	`SIZE_MAX` (unknown)	CUSTOM only, recommen `size_t(void)` function re space. Lets the core size to it before collecting fram falling back to try-and-retr
`TRAX_CFG_TRANSPORT_BUF_SIZE`	`0` (unknown)	CUSTOM transport TX-bu for the diagnostics panel (
`TRAX_CFG_TRANSPORT_BYTES_USED`	derived (`BUF_SIZE - TX_FREE`)	CUSTOM only: name of a function returning exact T Diagnostics only — define derivation does not match
`TRAX_CFG_START_RUNDOWN_POLL_LIMIT`	`100`	Restart: max `trax_proce` waiting for ring quiescence the reset
`TRAX_RTT_UP_CHANNEL` / `_DOWN_CHANNEL`	`1` / `1`	SEGGER RTT channel nu
`TRAX_RTT_BUFFER_SIZE_UP` / `_DOWN`	`16384` / `64`	RTT up/down buffer sizes

Logging

Setting	Default	Meaning
`TRAX_LOG_COMPILE_LEVEL`	`TRAX_LOG_LEVEL_TRACE`	Global compile-time strip threshold. **No `TRAX_CFG_` prefix**
`TRAX_FILE_LOG_LEVEL`	= global	Per-file override (define in the `.c` before includes). **No `TRAX_CFG_` prefix**
`TRAX_CFG_LOG_MAX_ARGS`	`24`	Max log arguments (even, 1–24)

Metadata

Setting	Default	Meaning
`TRAX_CFG_META_STORAGE`	`TRAX_META_IN_FLASH`	Or `TRAX_META_ELF_ONLY` (zero flash; host needs ELF)
`TRAX_CFG_META_NAME_LEN`	`32`	Var/marker/ISR/SM name length (multiple of 4)
`TRAX_CFG_META_TAG_LEN`	`32`	Log tag length
`TRAX_CFG_META_FORMAT_LEN`	`64`	Log format string length
`TRAX_CFG_META_UNIT_LEN`	`8`	Unit string length
`TRAX_CFG_META_DESC_LEN`	`32`	Stream description length
`TRAX_CFG_META_PROJECT_LEN`	`32`	Project-name field length
`TRAX_CFG_META_VERSION_LEN`	`16`	Build-version field length
`TRAX_CFG_META_BUILD_ID_LEN`	`24`	Build-id field length
`TRAX_CFG_FILTER_MAX_ORDER`	`12`	Max order for `TRAX_VAR_FILTER` coefficients. Wire contract — changing it requires a Traxcope build with a matching `FILTER_MAX_ORDER`
`TRAX_CFG_FORMULA_EXPR_LEN`	`48`	Var-formula expression string length
`TRAX_CFG_PROJECT_NAME`	`"Unknown"`	Shown in Traxcope firmware info
`TRAX_CFG_BUILD_VERSION`	`""`	Firmware version string
`TRAX_CFG_BUILD_ID`	`__DATE__ "T" __TIME__`	Build fingerprint (git hash, CI id, ...)

Streams, state machines, sync, diagnostics, memory, master switch

Setting	Default	Meaning
`TRAX_CFG_STREAM_CNT`	`0`	Number of variable stream instantiated. Must be a pla integer literal
`TRAX_CFG_SM_CNT`	`0`	Number of `TRAX_SM_DEFI` state machines. Sizes the current-state shadow table for session start / `STREAM_GAP`

Setting	Default	Meaning
`TRAX_CFG_SYNC_ROLE`	`TRAX_SYNC_ROLE_NONE`	`_MASTER` / `_SLAVE` for mu probe sync
`TRAX_CFG_SYNC_GPIO_SET_LOW()` / `_HIGH()`	no-op	Master's sync-line drive macros (ISR-safe)
`TRAX_CFG_SYNC_FILTER_DELAY_NUM` / `_DEN`	`0` / `1`	Sync input-filter delay (rational, seconds)
`TRAX_CFG_DIAG_REPORT_PERIOD_MS`	`1000`	Period of on-wire diagnost snapshots
`TRAX_CFG_DIAG_MAX_SUBSCRIBERS`	`2`	Concurrent diagnostic-subscriber table size (≥ 1)
`TRAX_CFG_DIAG_DEFAULT_LOGS`	`1`	Library emits ERROR/WARNING log lin on overflow / corrupt / backpressure
`TRAX_CFG_STACK_MONITOR_INTERVAL_MS`	`500`	Per-task stack high-water poll period
`TRAX_CFG_HEAP_WARN_BYTES`	`2048`	Heap-free warning thresh
`TRAX_CFG_HEAP_CRITICAL_BYTES`	`512`	Heap-free critical threshol
`TRAX_CFG_STACK_WARN_PERCENT`	`20`	Warn at N% stack remaini (`0` = disabled)
`TRAX_CFG_STACK_CRITICAL_PERCENT`	`10`	Critical at N% stack remaining (`0` = disabled)
`TRAX_CFG_FAULT_ENABLE`	`0`	Crash capture & post-mortem across resets (opt in — see 20)
`TRAX_CFG_FAULT_HANDLERS`	`1`	Let TraxProbe define the Cortex-M fault handlers (= call `trax_fault_capture()` from your own)
`TRAX_CFG_FAULT_SECTION`	`".trax_noinit"`	Linker section holding the persistent fault record (NOLOAD, outside `.bss`)
`TRAX_CFG_FAULT_STACK_SNAPSHOT`	`512`	Bytes of the faulting stack captured into the record (disables)
`TRAX_CFG_FAULT_RAM_END`	`0` (auto)	Exclusive end of stack RA for the snapshot clamp

Setting	Default	Meaning
		(auto-detects from vector-table slot 0)
`TRAX_CFG_FAULT_TRACE_SNAPSHOT`	`1024`	Flight recorder: bytes of pr crash trace history preserved across the rese (0 disables)
`TRAX_CFG_FAULT_FLIGHT_CHUNK`	`512`	Flight recorder: payload bytes per replay chunk (paced one per `trax_process()`)
`TRAX_CFG_FAULT_DYNMETA_TASKS`	`16` (RTOS) / `0` (bare metal)	Crash-time task-table entries preserved across t reset (40 B each); Traxcop warns when the live table was larger and this cap truncated the snapshot
`TRAX_CFG_FAULT_DYNMETA_OBJECTS`	`16` (RTOS) / `0` (bare metal)	Crash-time kernel-object-table entries preserved (32 B each); same truncation warning
`TRAX_CFG_FAULT_NOINIT_MAX`	`0` (unchecked)	Hard budget for the crash-dump RAM: set to your reserved region's byte size and the build fails when th configured snapshots outgrow it (`TRAX_FAULT_NOINIT_TOT` gives the current footprint 2884 B with all defaults)
`TRAX_ENABLE`	`1`	Master switch — `0` strips the entire probe from the build

2. TID range map

Range	Use	User enums anchor
`0x0000–0x00FF`	Reserved (protocol/system) — never use	—
`0x0100–0x010F`	Library logs (diagnostics, tag `diag`)	—

Range	Use	User enums anchor
`0x0110–0x1FFF`	**User logs**	`TRAX_TID_RANGE_LOG_USER_START`
`0x2000–0x2FFF`	**Variables**	`TRAX_TID_RANGE_VAR_USER_START`
`0x3000–0x3FFF`	**Variable streams**	`TRAX_TID_RANGE_STREAM_USER_START`
`0x4000–0x400F`	Port ISRs (kernel tick = `TRAX_TID_ISR_TICK` 0x4000)	—
`0x4010–0x4FFF`	**User ISRs**	`TRAX_TID_RANGE_ISR_USER_START`
`0x5000–0x5FFF`	**Markers** (stop = TID | 0x8000)	`TRAX_TID_RANGE_MARKER_USER_START`
`0x6000–0x6FFF`	Kernel events (tasks, queues, heap, ...) — library-owned	—
`0x7000–0x70FF`	**State machines**	`TRAX_TID_RANGE_SM_USER_START`
`0x7100–0x71FF`	Fault analysis (reset reason 0x7100, crash record 0x7110, flight recorder 0x7130–0x7132, crash-time task/object tables 0x7140–0x7141) — library-owned	—
`0x7200–0x7FFF`	Reserved	—
`0x8000–0xFFFE`	Dynamic (runtime allocated)	—

Always let enums auto-increment from the anchor; never assign explicit values.

3. File formats & on-disk layout

Extension / file	What it is
`.traxcfg`	Probe configuration (JSON): identity, transport settings, schema info. Shareable, version-controllable; imported via Probes → Import
`.traxws`	Workspace (JSON): probe configs/references, dock layout, open views and their settings, window geometry. Auto-saved on exit
Recording folder	One per recorded session: `recording.json` / `session.json` manifest (probe identity, time range, sync anchors, chunk index) + `chunk_*.traxdb` raw data + `lod/LN/*.traxrec` multi-resolution level-of-detail files

Extension / file	What it is
`.elf`	Your firmware image — Traxcope reads `.trax_*` metadata sections from it (names, format strings, units, deadlines, SM tables)

Default recording location is under the application data directory; override per probe in its General tab.

4. Rotary Motor Monitor

A dashboard view in the Toolbox that complements the Scope for rotating machinery: bound to a single position variable, it derives shaft angle, RPM, angular velocity, acceleration, and direction, with a live dial and trend plots. See Chapter 19.

5. Troubleshooting

Connection

Symptom	Check
Test Connection fails (RTT)	J-Link attached and not held by another debugger; correct serial selected; telnet-only vs managed mode matches your J-Link session
Test Connection fails (UART)	COM port free (close terminal programs); baud/parity match the firmware transport; TX/RX not swapped
Connects but no session start	Firmware never reached `trax_init()`; transport `write` failing silently; wrong port (debug console vs trace UART)
Session starts, then immediate backpressure / ring overflow	Custom transport with a software TX ring left stale bytes in front of `SESSION_START` — implement `trax_transport_clear_tx()` to empty that ring (leave RX alone). A blocking UART with nothing queued uses an empty body

No / wrong data

Symptom	Check
Connected, streaming, but views empty	Firmware blocked before emitting (e.g. waiting in `trax_wait_stream_started()` deadlock with your own logic); on bare metal, `trax_process()` not being called
Names missing, raw TIDs everywhere	ELF path unset/stale in probe config; firmware built `TRAX_META_ELF_ONLY` but no ELF given; compare build ID in firmware info card against your ELF

Symptom	Check
Timestamps nonsensical / events out of order	`TRAX_CFG_TIMER_FREQ_HZ` / `TICK_COUNTER_PERIOD` don't match real hardware; `trax_timestamp_tick()` not called from the tick ISR (bare metal)
Amber `STREAM_GAP` entries in the Event View	The ring overflowed and the stream paused/resumed — expected behavior, but each episode means lost frames; the diagnostics card shows episode/drop totals — if it happens often, raise `TRAX_CFG_OUT_BUFFER_SIZE32`, reduce traffic, or use a faster transport

View-specific

Symptom	Check
View won't sync with others	Sync only works in **Review** mode; check each view's Sync toggle
Multi-probe timelines misaligned	Hardware sync not wired/enabled (Chapter 18); or apply manual offset/scale
Scope channel missing	Probe filter in that view instance excludes the probe; variable never sent a sample yet
Trigger never fires	Master enable off; trigger in Idle (mode None); condition scoped to the wrong probe

Build errors (firmware)

Error	Fix
`TRAX_CFG_HW_PORT must be defined`	Set it in `trax_config.h`
`TRAX_CFG_TIMER_FREQ_HZ must be defined`	Set it (and `TIMER_VAL` / `TICK_COUNTER_PERIOD` in TICK_TIMER mode)
`TID is outside the ... range`	Anchor the enum at the right `TRAX_TID_RANGE_*_USER_START`
`Stream TID index >= TRAX_CFG_STREAM_CNT`	Increase `TRAX_CFG_STREAM_CNT`
`SM TID index >= TRAX_CFG_SM_CNT`	Increase `TRAX_CFG_SM_CNT`
Duplicate symbol `__trax_log_fmt_...`	Same log TID used at two call sites in one file — one TID per call site
Undefined references to `.trax_*` sections at link	`linker/trax_meta.ld` not added to the linker script list

6. Where the examples live

Worked firmware walkthroughs live in the **online tutorials**. This manual is the reference; the tutorials are the step-by-step builds.