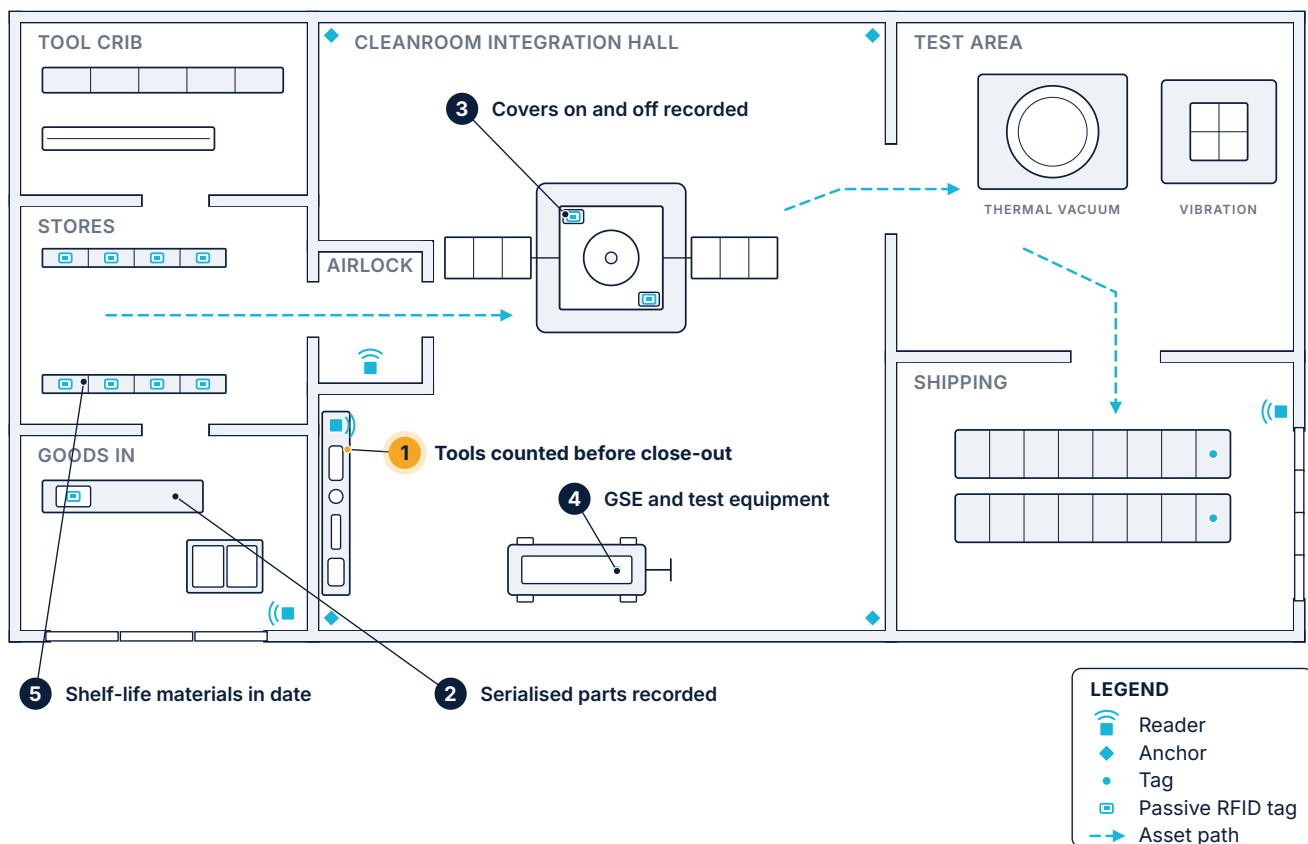


SPACE AND SATELLITE · INTEGRATION HALLS, CLEANROOMS AND TEST

The panel is ready to close. One tool is not on the board.

A plain guide for satellite builders, AIT sites and test houses: tools counted before close-out, serialised parts and the as-built record, covers on and off, GSE and test equipment, and shelf-life materials. AIT means assembly, integration and test. Any tag or reader must first fit your contamination control plan, ESD rules (electrostatic discharge) and test rules.



Callouts match the use cases on page 2. Legend: a **reader** reads passive RFID (radio-frequency identification) tags, which have no battery; a **tag** is an active tag, which has a battery; an **anchor** is a fixed unit that locates UWB (ultra-wideband) tags. Terms used: 2D code: a square barcode.

WHO SHOULD READ WHAT

KPI: key performance indicator, a measure you track. Everyone: your own row and KPI are in the table on page 4.

AIT and programme managers

Page 2 use cases, page 3 payback.

Integration leads and technicians

Page 2: use cases 1 and 3 and the KPIs you would own.

Product assurance and quality

Page 2: use cases 1 and 2.

GSE, test, stores and materials

Page 2: use cases 4 and 5.

IT and OT, finance, procurement, leadership

Page 3: technology, links and payback. OT: operational technology, the systems that run the site.

One next step: book a free 30-minute call to talk through your site and your use case.

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Book a free 30-minute call

What goes wrong today

Tool checks stop work

Gaps on the board mean asking round.

Records copied by hand

Serials typed in from travellers.

Covers on paper lists

A walk round confirms what is fitted.

Status unclear

GSE and materials checked by hand.

USE CASES

Numbered to match the floor plan on page 1. Each card ends with the technology that usually fits.

1 Tools counted before close-out

Pain: Shadow boards show gaps, but tracing who has a tool means stopping work.

What good looks like: Each tool is recorded to a person and task, and open issues are listed before close-out. It supports your FOD programme and inspection.

Usually fits: [passive RFID or barcodes that meet cleanroom rules, confirmed in the survey](#)

2 Serialised parts and the as-built record

Pain: Serials are copied in by hand, and checking the record before shipment takes days.

What good looks like: Each serialised part is read at goods in and linked to its unit, so the as-built record builds as work happens.

Usually fits: [2D codes or RFID on bags and travellers, never on flight hardware unless design data allows, confirmed in the survey](#)

3 Covers recorded on and off

Pain: Caps, covers and remove-before-flight items are listed on paper.

What good looks like: Each item is recorded on and off against the unit and task, so items still fitted are listed before a test or shipment step. Your checklist stays.

Usually fits: [tagged streamers or labels, read with handhelds at the stand, confirmed in the survey](#)

4 GSE and test equipment in configuration

Pain: Shared carts, fixtures and test sets are found by walking the hall.

What good looks like: Each item shows its area, calibration and last user. One used by another programme is flagged for a configuration check.

Usually fits: [zone tags on larger GSE, RFID or barcodes on test equipment, confirmed in the survey](#)

5 Shelf-life materials in date

Pain: Adhesives and tapes are tracked by label, so expired material can be issued.

What good looks like: Each batch carries its expiry, and expired or nearly expired batches are flagged before issue.

Usually fits: [passive RFID or 2D codes on containers, read at the store and issue, confirmed in the survey](#)

ALSO COVERED

- [Build records](#): unit, station and tool in the record.
- [Transport containers](#): contents and returns logged.
- [Restricted areas](#): entries checked against access rights.
- [Units through test](#): where each unit is.
- [Quarantine and bonded stores](#): records match the shelf.
- [AMRs and AGVs](#): choosing the right one first.

A KPI is a number you track, before and during the pilot.

KPI

WHO OWNS IT

Tools not back at close-out

AIT manager, with the FOD focal point

Gaps found in the as-built record at review

Product assurance manager

Protective items not accounted for at a step

AIT manager

GSE used without a current configuration check

GSE or test manager

Expired material issued

Materials and processes lead

We agree how each KPI is measured, and the baseline, in the pilot plan.

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Technology fit

Pick the simplest option that answers the question you have

Technology	Where it fits here	Watch for
Barcode or 2D code (square barcode)	Tools, covers, part bags and travellers where radio is not allowed.	Needs someone to scan. Check label materials for the cleanroom.
Passive RFID (radio-frequency identification, no battery)	Tool boards, stores, goods in and material issue.	Metal affects reads. Tags must meet cleanroom and ESD rules. Reader fields near flight hardware need EMC approval.
BLE (low-energy radio tags with a battery)	GSE (ground support equipment) and test equipment by zone.	Batteries and radio near powered hardware need approval.
UWB (ultra-wideband location tracking)	Live location of large items, where needed.	Needs anchors and a survey. Check test rules on radio use.

The right mix depends on your site. We confirm it in the survey.

Integration

Events go into your build and quality records, under your change control

- **Build records:** tool, part and cover events attach to the work order or build record, once a link is agreed.
- **Quality:** non-conformances and close-out sign-off stay in your QMS (quality management system).
- **Cleanroom rules:** every tag, label and reader is checked against your contamination control plan and ESD rules.
- **People:** Check local privacy and employee-consultation rules, such as works councils or unions, before tracking people, or tools and equipment linked to people.



ROI AND PAYBACK

ROI (return on investment) compares what you gain with what you spend. Payback is the time until the savings cover the cost.

What drives payback here

- Integration time lost to find a tool or confirm a cover
- Checking the as-built record against the hardware before shipment
- Material thrown away because its status is unclear
- Rework or retest after a nonconformance raised at review

If the benefit is not bigger than the running cost, there is no payback.

Bring to the call

- A layout of your cleanroom, integration hall and stores
- Rough counts of board tools, serialised parts per unit and GSE, from your records
- The ERP, MES or build record system you use
- One recent tool, cover or record that took too long to find

We work out payback with you from your own pilot data, not technology provider averages. **Bring rough figures to a free 30-minute call.**

One next step: book a free 30-minute call to talk through your site and your use case.

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Book a free 30-minute call

What it means for you: find your role and your KPI

YOUR ROLE	WHAT IT MEANS FOR YOU	YOUR KPI
AIT manager	Open tools and covers listed before each step.	Tools not back at close-out
Integration lead or technician	Less stopping work to find a tool.	Protective items not accounted for at a step
Product assurance manager	As-built records checked as work happens.	Gaps found in the as-built record at review
GSE or test manager	Configuration checks flagged before use.	GSE used without a current configuration check
Materials and processes lead	Expired batches flagged at issue.	Expired material issued
IT and OT teams	Events into build records, under change control.	Events reaching the build record
Finance, procurement and leadership	Payback from one hall or crib, then a go or no-go.	Payback months, go or no-go

Events reaching the build record: the share of updates that arrive without manual entry.

How a TRACIO project works: five stages

1 Discovery

Your pain points, site, process and KPIs.

2 Assess and shortlist

Site survey, then the options that fit compared.

3 Pilot with KPI baseline

KPIs measured first. Pass marks agreed in writing before set-up.

4 Integrate

If useful, one agreed link into your build record or manufacturing system, under your change control.

5 Multi-site roll-out

After a go decision, one hall or site at a time.

How a pilot runs: set-up, then live weeks in normal use, then a short written report with a go or no-go. Timings are agreed per site.

Questions we hear

"We already have a system."

We give a free second opinion and check how it performs against your KPIs, using your live data and a site visit.

"How do we know it will work here?"

Judge us on method: a pilot, KPIs measured before and during it, and a written go or no-go.

"Can you bid with us, or for us?"

Yes. We team with integrators, or act as the buyer's independent adviser, but never both on the same bid.

"Do you sell or resell hardware?"

Yes, if you choose. Advice comes first; we can then supply, lease and integrate the equipment you pick. We also rent pilot equipment and offer survey and installation support.

Free second opinion

Send us your technology provider's quote or spec for a free second opinion. What to send: the quote or spec, a floor plan or site photos, item counts and your current process. Bring it to the call or send it via tracio.com/contact.

TRACIO consultancy fees

- **UK:** £3k to £30k per project, £1,200 a day
 - **Europe:** €3.5k to €35k per project, €1,400 a day
 - **US and Canada:** \$4k to \$40k per project, \$1,600 a day
 - **Middle East and Australia:** \$4k to \$40k per project, \$1,600 a day
 - **Rest of the world:** \$3.5k to \$35k per project, \$1,400 a day
- Scoped per project, no packages. Fees cover our work only; hardware, software licences and other supplier costs are separate. \$ = US dollars. Travel extra.

Why TRACIO: we work for you, not for the technology providers. We compare the options across the market that fit your site, provide site surveys and installation support, and work worldwide under your change control.

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