

# Abstract

This supplementary specification details six telemetry integrations that extend TraceLoop's autonomous critical-care platform: Anti-Xa-guided heparin/protamine control, head-of-bed-angle enforcement, passive-leg-raise (PLR) fluid-responsiveness detection, train-of-four-driven neuromuscular-blockade titration, proning-session scheduling, and spontaneous-breathing-trial (SBT) readiness assessment. Each module defines: (i) data feed interface—HL7, MQTT, BLE, or serial—normalized to TraceLoop's fifteen-column factor schema; (ii) Full build logic enabling closed-loop actuation of pumps, ventilators, or bed motors under conflict-graph arbitration; and (iii) Lite build logic providing decision-support alerts without autonomous actuation. Cross-channel safety is enforced through `priority_over`, `requires_ok`, and `mutually_exclusive` edges, while guard-rails, timers, and watchdogs guarantee fail-safe fallback. Newly introduced FIGS. 12–17 illustrate sensor embodiments and workflow graphs; existing FIGS. 3, 4, and 11 are referenced for database and arbitration context. Implementation lifts range from 1-day HL7 parsing (Anti-Xa) to 5-day ventilator mode control (SBT). These integrations collectively advance TraceLoop toward comprehensive, multi-organ, closed-loop critical-care automation.