Hardware for dynamic quantum computing experiments: Part II[1] DIEGO RISTÈ, COLM RYAN, MARCUS DA SILVA, BRIAN DONOVAN, THOMAS OHKI, BLAKE JOHNSON, Raytheon BBN Technologies — In fault-tolerant quantum computing, non-transversal gates will require ancillary qubits to interact with the logical register. Measurements of these ancillas must then determine subsequent logical operations in real time. Here we use the in-house developed BBN APS2 control system and X6 QDSP readout platform to test efficient feedback and feed-forward protocols on small registers of physical transmon qubits. By comparing closed- and (postselected) open-loop experiments, we observe no significant error added by feedback other than decoherence during its latency ($< 0.02 \, T_2^{\star}$). Demonstrations include the simultaneous reset of a three-qubit register, deterministic entanglement by measurement, and teleportation.

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