

Mill Zero (MIL_ZER)

Troubleshooting Guide

Arconic Lancaster — BLISS II Rolling Mill

ControlLogix conversion of the KS2100 CO_ZERO_STATES sequence

Document	PWS-ARC-BLISS-MILZER-TSG-001
Program	MIL_ZER (10 ms periodic task)
Audience	Maintenance technician & controls engineer
Author	R. David Megee IV — ProcessWise Solutions LLC

1. What Mill Zero does

Mill Zero is the calibration sequence the operator runs at every roll change. It strokes the screwdn cylinders to a repeatable kiss-point, samples the cylinder / load-cell / bend loads at zero force, and captures the tare offsets and stretch datum the AGC, BENDCTRL, RLCREG and SETUP programs rely on for the production pass. A bad zero affects every coil rolled until the next zero. The sequence runs once, takes 1–5 minutes, and only runs with the mill stopped.

The sequence is a state machine. **The single most useful troubleshooting tag is** MZ_CURRENT_PHASE (which phase, 0–10) and MZ_EVENT_CODE (which sub-step event). Watch them live, or on the HMI Mill Zero page, to see exactly where the sequence is sitting.

2. Phase sequence — what each phase waits on to advance

If the sequence is stuck, find the current phase below; the **Advances when** bit is what is not getting set. That is what to chase.

Ph	Phase	What happens	Advances when	Goes to
0	INIT	First-scan init	(automatic)	1 IDLE
1	IDLE	Wait for operator request	REQUEST_MZ + stopped	8 PREP
8	PREPARE	Set conds / tare / setpt	PREP_COMP	2 LEVEL
2	LEVEL_MILL	Stroke + level cylinders	CO_IN_POSN	5 CYL_LD
5	CYL_TO_LOAD	Cylinders to strike load	STRK_LOAD_COMP	7 SAMPLE
	(if tilt needed)	Level error too large	TILT_REQUIRED	4 TILT
4	TILT_MILL	Apply auto-tilt, retry	GO_TO_LOAD	5 CYL_LD
7	SAMPLE_LOADS	Average loads, record tare	SAMPL_COMP	6 END
6	END_ZERO	Commit zero, write roll data	STAT_MZ_COMP	1 IDLE
3	ABORT	Operator / interlock abort	ABORT_COMP	1 IDLE

Abort: from any active phase, STS.MZER_PERMIT_ABORT diverts to phase 3 (handled by PHASE3_DRIVER). Interrupt (INTERRUPT_MZ) snaps straight back to IDLE.

3. Common stuck-points

Symptom	Likely cause	Check
Won't start from IDLE	Mill not stopped / no request	Zero speed; REQUEST_MZ pulse; MZ_PERMIT
Stuck in PREPARE	A sub-step not completing	MZ_EVENT_CODE; SET_CONDS_COMP
Stuck in LEVEL_MILL	Cylinders not in window	CYL_POS_ACT vs CYL_P_REF; ENGD_CYL_WNDW
Stuck in CYL_TO_LOAD	Strike load not reached	PIN_CYL_LOD vs target; STRK timeout cnt
Tilt loop never ends	Retry / tilt limit	AUTO_TILT_RETRY_COUNT; TILT_LIMIT_EXCEEDED
Stuck in SAMPLE_LOADS	Sample count not reached	SUM_AVE_CNT; MZ_SAMPLE_COUNT_LOW
Sequence times out	Phase exceeded timeout	MZER_TIMEOUT; per-phase TMO_CNT_*
Aborts immediately	Abort / interrupt asserted	MZER_PERMIT_ABORT; INTERRUPT_MZ
Zero wrong afterward	Bad tare / low sample	MZ_SAMPLE_COUNT_LOW; tare deltas

4. Timeouts, watchdog & safety interlocks

Item	Meaning / what to check
STS.MZER_TIMEOUT	A phase exceeded its ENGD timeout. Per-phase TMO_CNT_* shows which.
WATCHDOG	Scan/health counter (BENDCTRL dual-loop pattern). Should keep toggling.
LZN-017 strip interlock	ABORT will not crash cylinders onto a strip: gated by STAT_IN/OUT_TEN_EST.
LZN-002 timeout clamp	ST_POS timeout clamped on first scan (legacy value was negative).
LZN-011 sample-count alarm	MZ_SAMPLE_COUNT_LOW blocks committing a zero on too few samples.
LZN-021 safe mill speed	MILL_SPEED clamped before divide (no /0 fault in BROLL cycle calc).

5. MZ_EVENT_CODE legend (sub-step events)

MZ_EVENT_CODE holds the legacy KS2100 event number of the active sub-step. Trend it with MZ_CURRENT_PHASE for full phase + sub-phase resolution.

Code	Sub-step event	Code	Sub-step event
1054	Idle	1018	Prepare: set conditions
1036	Prepare: cyl tare position	1082	Prepare: cyl setpoint
1005	Prepare: monitor speed/screws	1022	Acquire tare: sum
1050	Acquire tare	1015	Level mill
1004	Cylinder to load	1010	Tilt mill
1025	Sample: init sums	1045	Sample: set cycle
1066	Sample: cyl sums	1042	End zero: cyl open gap
1028	End zero: finalize		

6. Key tags / test points

Tag	Use
MZ_CURRENT_PHASE	Current phase 0–10 — first thing to watch
MZ_EVENT_CODE	Current sub-step event (legend §5)
MZ_PHASE_ELAPSED	Seconds in the current phase
CYL_POS_ACT_DS / _NDS	Live cylinder positions
CYL_P_REF_DSMZ / _NDSMZ	Commanded cylinder references (set by CYL_REF_DISPATCH)
PIN_CYL_LOD_DS / _NDS	Cylinder loads
STS.* completion bits	Phase 'advances when' bits (§2)

Routine map: state machine = SCAN_PHASE_ROOT (root) + SCAN_PHASE_SUB (sub-states) + PHASE3_DRIVER (abort). Permits/aborts = ZERO_LOGIC. Cylinder refs = CYL_REF_DISPATCH. Shared flags = MZ_FLAG_CONSOL (single-writer). Per-phase actions = U_xxx (entry) / C_xxx (continuous). Each routine's rung-0 header states what it does, what it waits on, and what to check if stuck.