

Public Bench Note F2-002

Nikon F2 Slow Shutter Speeds: the Slow-Speed Governor (A23)

Why slow speeds stick, drag or run long. Component reference, mechanism and troubleshooting

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In brief

The slow-speed governor is the small clockwork regulator inside the Nikon F2 that times the slow shutter speeds. Nikon calls it subassembly A23 and lists its parts as a centre wheel, an escape wheel and an anchor, the same family of mechanism that regulates a mechanical watch. When it is clean and free, the slow speeds run evenly and repeat from shot to shot.

Typical symptoms are slow speeds that stick, drag or run long; a shutter that hesitates or stalls partway through a 1 second exposure; slow speeds that vary from one frame to the next; and a governor buzz at 1 s that sounds uneven or stops.

A wrong slow speed is not always the governor. Nikon's own adjustment sequence ties the slow speeds to the change-over mechanism, the slow shaft and brake, and the rear-curtain tension. Symptoms & troubleshooting, below, sorts out which is which.

Not an owner adjustment. The governor is removed for service and its installed position matters, so it is a bench job rather than something to adjust in place. This note explains what is happening and what to look for; it is not a service procedure.

Overview

The Nikon F2 slow-speed governor is a compact mechanical regulator, but it should not be understood, or diagnosed, in isolation. Nikon identifies it as subassembly A23, comprising parts 501 to 536. The wider low-speed system also involves the shutter-speed cam stack, change-over mechanism, slow shaft and the second-curtain/brake mechanism.

A slow-speed error is not automatically a governor error.

Nikon's adjustment sequence makes that distinction explicit in practice. At 1/30 s it calls for a change-over axle/governor relationship; at 1/4 s it calls for the relationship between slow bottom lever 423 and second brake ring 391-1 to be checked; only then does it prescribe adjustment at 1 s and 1/4 s, followed by 1/60 s and a check at every shutter-speed indication. Nikon also warns that rear-curtain tension influences the slow speeds.

Adjustment is not repair.

A contaminated, hesitant or otherwise non-free governor should first be restored to free and consistent operation. Calibration is the adjustment of an otherwise healthy mechanism; it is not a substitute for servicing one that cannot run properly.

What a Public Bench Note is for. It explains what each part does as far as the evidence permits, how the mechanism works to the level presently established, what a fault points to, what Nikon specifies and what Speybench has observed. It should answer more questions than it raises, but it is not a service procedure: full strip-down and reassembly sequences, tooling and the complete Speybench workshop process sit outside it. Every technical claim carries its provenance so the reader can see what is Nikon's, what is read from Nikon's drawings, and what is Speybench's own.

N **Nikon text.** Stated by the manual, or by the part's English/Japanese name in the parts list.

D **Nikon drawings.** Read from position and relationship in Nikon's figures.

B **Bench verified.** Observed and confirmed by Speybench on a physical assembly.

I **Speybench inference.** Derived from name, position or established mechanical relationship; not Nikon text.

S **Speybench practice.** Workshop practice, not Nikon instruction.

About this document. Written by Speybench from bench work and from the Nikon F2 Repair Manual, Revised-1 (30FB-R.2012.B), which is cited by page throughout. Part numbers and names are given for identification. No figures, tables or text from the manual are reproduced; the mechanism diagrams in this revision remain forthcoming pending physical verification. Free to share unaltered with attribution to speybench.com. Nikon, Nikon F and F2 are trademarks of Nikon Corporation. Speybench is independent and not affiliated with or endorsed by Nikon. Supplied as a reference for understanding and diagnosis, not as a service procedure; work on your camera is at your own risk. **Corrections and observations** are welcome at service@speybench.com; anything verified on the bench is recorded in the revision history.

In the component tables every part number, name, subassembly and quantity is Nikon's, and each row describes the part as the manual documents it. In the diagnostic and symptom tables the mark rates how firmly the statement or symptom is tied to the mechanism; where a row draws on two kinds of evidence, both marks are shown. Open matters are expressed in prose (Verify on bench, not established, or open item) rather than by another provenance class.

How the governor fits the low-speed system

Nikon's parts and adjustment material place A23 within a wider chain. The shutter-speed mechanism includes 375 high-speed cam, 376 change-over cam, 377 slow cam, 378 high-speed separator and 379 slow-speed separator. The change-over mechanism includes 425-1 change-over top lever, 446-2 change-over shaft and 447 change-over bottom lever. A21 Slow shaft comprises 403 slow shaft, 423 slow bottom lever and 424 slow top lever. The downstream mechanism includes 391-1 second brake ring and 400-1 second brake lever. **N**

Nikon identifies a centre wheel, escapement and ankle within A23. Taken together with A23's documented role in the low-speed adjustment sequence, these components are consistent with an escapement regulator controlling the progression of the slow-speed mechanism. **N I**

The detailed input → escapement → output → second-curtain release sequence is not completely established in this revision. It is therefore kept open rather than filled in from generic escapement behaviour. **I** Verify on bench.

Diagnostic relationships and drive path

The exact internal drive path is still open, but Nikon's low-speed adjustment sequence establishes several relationships that matter diagnostically. They should be read as a sequence of dependencies, not four unrelated screwdriver operations.

Setting / relationship	What Nikon establishes	Diagnostic significance	Mark
1/30 s	Angle of the change-over axle is adjusted relative to the governor.	The change-over/governor relationship belongs inside low-speed diagnosis. The physical event being aligned is not yet established.	N
1/4 s	With the governor attached, the relationship between slow bottom lever 423 and second brake ring 391-1 is checked.	The governor's installed relationship reaches into the slow-shaft/brake system. Required contact/clearance/timing remains open.	N
1 s and 1/4 s	Large and small eccentrics are used in shutter-speed adjustment.	Nikon documents the adjustments; the individual physical effect of each eccentric is not yet established.	N
1/60 s	Nikon next instructs adjustment of 1/60 s.	The adjustment belongs to the low-speed sequence, but its physical ownership/action remains open.	N

Setting / relationship	What Nikon establishes	Diagnostic significance	Mark
All indications	Nikon requires a final check at every shutter-speed indication.	A successful correction at one setting is not sufficient verification of the complete shutter.	N
Rear curtain	Nikon warns that changing rear-curtain tension influences slow speeds.	A slow-speed error cannot automatically be assigned to A23.	N

Symptoms & troubleshooting

By what can be observed on the assembled camera or on the removed governor. Each entry points to the part of the mechanism worth examining; it is not a repair procedure. Where the correction or causal relationship is not yet established on the bench, the entry says so. The mark rates how firmly the symptom is tied to the mechanism.

Symptom	Likely area	What to inspect	Resolution / finding	
Slow speeds drag or run long	Low-speed system	Governor freedom and repeatability; installed relationships; change-over; curtain condition.	Do not assume governor adjustment. Establish mechanical health first, then widen diagnosis through the low-speed system.	N B
Shutter hesitates at slow speeds	A23 freedom of movement	Contamination; displaced spring; damaged tooth; other obstruction.	Speybench observation: unwanted resistance can produce hesitation. Cause in a given governor: establish on inspection.	B
Shutter sometimes stalls at slow speeds	A23 freedom / mechanical condition	Repeatability after cleaning; springs, teeth and obvious interference.	Do not calibrate an intermittent mechanism. Restore repeatable operation first.	B S
Shutter hangs open at slow speeds	A23	Whether the assembly is free; contamination, obstruction or mechanical defect.	A23 is not operating freely; contamination, obstruction or a mechanical defect remains to be established.	B
Slow speeds vary from shot to shot	Governor or wider low-speed system	A23 repeatability; engagement/installation; wider shutter condition.	Instability must be resolved before calibration. Exact cause: Verify on bench.	B I
Governor buzz at 1 s sounds wrong	Low-speed mechanism	Listen for obviously abnormal cadence, then confirm by observation and measurement.	Useful technician indication, not an objective timing standard or proof of one internal defect.	B
Slow speeds wrong after the governor was refitted	Installed relationship	Witness marks / original A23 position; change-over and brake relationships.	Speybench practice is to preserve the original installed position. Exact causal effect of displacement: Verify on bench.	S I
Slow speeds wrong after curtain adjustment	Curtain / low-speed interaction	Rear-curtain condition and adjustment before blaming A23.	Nikon states that rear-curtain tension influences slow speeds.	N
Cleaned governor still stalls on the bench	A23 mechanical condition	Repeat cleaning if warranted; displaced springs; damaged teeth; other interference.	Closer internal investigation only if a genuine mechanical reason remains.	S
Governor runs freely, but slow speeds still wrong	Installed/wider system	Installation, change-over, slow shaft/brake relationship and curtain condition.	Evidence shifts away from simple internal governor drag. Exact cause: Verify on bench.	I

Adjustment and functional checks

Mechanical health. *Speybench practice:* before calibration, A23 should be clean, completely dry, correctly lubricated and able to complete repeated run-downs freely and consistently. No Nikon free-run time has been established for the removed governor, so none is assigned here. **S**

Installed relationships. Nikon's low-speed sequence establishes the 1/30 s change-over/governor relationship and the 1/4 s relationship between 423 and 391-1 before the timed adjustments are completed. Their precise physical meaning remains open in this revision. **N**

Calibration. Nikon then calls for adjustment at 1 s and 1/4 s using the large and small eccentrics, followed by 1/60 s and a check at every shutter-speed indication. The individual function of each eccentric and the physical 1/60 s adjustment are not yet described because they have not been positively established. **N**

Do not calibrate away friction.

Auditory check. At slow settings such as 1 second the governor is readily audible. Speybench uses obviously abnormal cadence as a diagnostic indication, not as metrology; measurement remains necessary. **B S**

Servicing principles

Removal is not disassembly

Speybench practice: A23 is removed from the camera for proper governor servicing, but internal disassembly is not routine. Before removal, the installed position of the complete governor relative to the camera bottom plate is marked. If the A23 top plate itself must be removed, its position relative to the mechanism beneath is separately scribed. These are two different positional relationships. **S**

If cleaning restores free and repeatable operation and no other mechanical reason for disassembly remains, the internal assembly is left alone. **S**

Cleaning SPEYBENCH PRACTICE

The Nikon material examined for this note gives no A23-specific cleaning prescription. Speybench pre-cleans A23 manually in naphtha, then uses clean naphtha in a sealed jar in an ultrasonic cleaner, followed by ethanol in a separate sealed jar, and dries the assembly promptly and thoroughly with a rocket blower and gentle warm air. The purpose is to remove contamination and leave a completely dry mechanism before its condition or adjustment is judged.

Lubrication SPEYBENCH PRACTICE

The manual's lubricant information does not establish an A23-specific lubrication map. Speybench applies Moebius 9010 in very small controlled quantities with a watchmaker's oiler, restricted to pivots. Gears and gear teeth, springs, lever/contact faces, and the working faces of the escapement and ankle remain dry. The governor is not flooded.

Clean components are lubricated when they are going back into service rather than being left exposed on the bench. After lubrication the governor is again charged and allowed to run down repeatedly to confirm free and consistent operation.

Speybench has encountered caked/dried molybdenum material in this type of mechanism and does not use that treatment. This observation is not presented as a universal claim that dry molybdenum inevitably causes governor failure. **B S**

Components

Each part as Nikon documents it: number, name, subassembly and quantity from the parts list, with the Japanese name where it says more than the English. Every row is N. Where a part's working relationship is still open, it is listed once under Open items rather than repeated row by row.

A. Regulating train

Part	Name	Sub	Qty	Function and why	
501	Segment JP: fan shape (segment)	A23	1	Fan-shaped toothed segment of the governor, carrying pin 502 and turning on axle 503.	N
502	Segment pin	A23	1	Pin fitted to segment 501.	N
503	Segment axle	A23	1	Axle on which segment 501 turns.	N
509	Center wheel JP: No. 2 wheel	A23	1	Toothed wheel of the regulating train, on shaft 510.	N
510	Center wheel shaft JP: No. 2 wheel shaft	A23	1	Shaft carrying centre wheel 509.	N
511	Escapement shaft JP: escape wheel shaft	A23	1	Shaft carrying escape wheel 512.	N
512	Escapement JP: escape wheel	A23	1	The escape wheel of the regulating train, on shaft 511, held by spring 528 and working with anchor 514.	N
513	Ankle shaft JP: anchor shaft	A23	1	Shaft on which anchor 514 pivots.	N
514	Ankle JP: anchor	A23	1	The anchor that works with escape wheel 512, on shaft 513 with washer 533.	N
528	Escapement spring JP: escape-wheel hold-down spring	A23	1	Formed spring holding escape wheel 512.	N
533	Ankle washer	A23	1	Washer on anchor 514.	N

B. Operating levers

Part	Name	Sub	Qty	Function and why	
504	Large lever boss	A23	1	Boss for large lever 506.	N
505	Large lever axle	A23	1	Axle on which large lever 506 pivots.	N
506	Large lever	A23	1	The governor's large operating lever, on axle 505 with boss 504, held by screw 536 and sprung by 532.	N
507	Small lever axle	A23	1	Axle on which small lever 508 pivots.	N
508	Small lever	A23	1	The governor's small operating lever, on axle 507 and sprung by 522.	N
515	L-shaped top lever	A23	1	L-shaped lever at the top of the governor.	N
517	L-shaped lever	A23	1	L-shaped lever.	N
518	F-shaped lever	A23	1	F-shaped lever.	N
529	L-shaped lever axle JP: L-shaped lever pivot shaft	A23	1	Axle for an L-shaped lever.	N
536	Large lever screw 1.4R-2(S)	A23	1	Screw for large lever 506.	N

C. Springs, supports and structure

Part	Name	Sub	Qty	Function and why	
516	Threaded rivet Ø1.2R-1.4(S)	A23	2	Threaded rivets, two off.	N
519	Support screw Ø1.4R-1(S)	A23	1	Screw for long support 524.	N
520	Spring holder JP: spring hook pin	A23	4	Spring hook pins, four off, anchoring the governor's springs.	N
521-1	Spring JP: spring for the segment	A23	1	Wire spring for segment 501.	N
522	Spring JP: small lever spring	A23	1	Wire spring for small lever 508.	N
523	Floor plate JP: base plate	A23	1	The governor's base plate, on which the train is built.	N
524	Long support	A23	1	Long support pillar of the governor frame.	N
525	Support screw Ø1.4R-1.3(S)	A23	2	Screws for long support 524, two off.	N
526	Stopper screw Ø1.2T-4 JP: limit screw	A23	1	Limit screw.	N
527	Spring holder JP: fine-spring stop	A23	1	Stop anchoring one of the governor's fine springs.	N
530	Short support	A23	1	Short support pillar of the governor frame.	N
531	Spring JP: L-shaped lever spring	A23	1	Wire spring for an L-shaped lever.	N
532	Spring JP: large lever spring	A23	1	Wire spring for large lever 506.	N
534	Rivet JP: staked rivet	A23	1	Staked rivet.	N
535	Set screw (1.2U-1.1)	A23	1	Set screw.	N

Open items for bench verification

Item	Bench question
A23 drive path	Trace the detailed input → escapement → output → second-curtain release sequence. This is required before publishing an authoritative internal mechanism diagram.
1/30 s	Establish the physical event aligned by Nikon's change-over axle/governor relationship.
423 / 391-1	Establish the precise relationship between slow bottom lever 423 and second brake ring 391-1 at 1/4 s: contact, clearance, angular position or timing.
Large / small eccentrics	Positively identify both eccentrics and establish what each physically changes before assigning individual functions.
1/60 s	Identify the physical adjustment and establish which subsystem owns it and what it changes.
Governor engagement range	Confirm exactly which shutter-speed settings engage A23 and where the change-over occurs.
Off-camera charging member	Identify positively the A23 member used to charge/run the removed governor before assigning a part number in text or illustration.
Part 431	Confirm the provisional workshop observation that A23 engages with part 431 during installation; positively identify the part and establish the required engagement before describing or illustrating it.
Springs / lever contacts	Where needed for component descriptions or diagrams, confirm spring anchor points and the contacts made by 506, 508, 515, 517 and 518.

These points remain open for physical verification. As they are established on the bench, this note will be revised and the revision history will record what changed.

Mechanism diagrams FORTHCOMING

No detailed mechanism diagram should be published until it has been checked against a physical A23 assembly and, where the diagram extends outside A23, the installed shutter mechanism. A drawing carries more authority than its caveats; an incorrect spring route, lever contact or direction of movement would be trusted over qualifying prose.

Diagram 1: A23 in the low-speed system

Parts / systems: shutter-speed cams and separators; change-over mechanism 425-1 / 446-2 / 447; slow shaft 403 / 423 / 424; A23; second brake ring 391-1 and associated brake mechanism.

To show: only the verified selection/engagement path and the relationship of A23 to the wider low-speed system. Do not imply an exact contact sequence until verified.

Diagram 2: A23 internal regulation

Parts: segment 501, centre wheel 509, escapement 512, ankle 514 and the verified input/output levers.

To show: actual movement directions, spring actions, escapement progression and controlled output only after physical tracing and operational verification.

Each final illustration should carry the caption: Speybench mechanism illustration, traced from a photographed physical assembly and verified against it. Not a Nikon factory drawing.

Sources and provenance

Source	Manual reference	PDF page	Printed page
Front of body / A23	Fig. 5	p.14	12
Sectional view of shutter	Fig. 13	p.22	20
Bottom view	Fig. 16	p.25	23
Top view	Fig. 17	p.26	24
Relative angles	Fig. 19	p.28	26
High- and low-speed adjustments	Sect. 10(1)(i) to (ii)	p.31	29
Shutter cams / slow and change-over parts	Parts list	pp.71 to 77	31 to 37
A23 governor parts 501 to 536	Parts list	pp.81 to 83	41 to 43
A10-2 change-over shaft; A21 slow shaft; A23 governor	Subassembly list	pp.116 to 117	76 to 77
Second-brake components	Subassembly list	p.119	79

The manual's printed folios differ from the PDF page count; both are given. Page references in the text should use PDF pages unless stated otherwise.

Additional source trail. Speybench workshop observations and practice supplied during preparation of this note are retained separately from Nikon evidence. External technician material may be consulted as a research source, but it does not create a separate provenance class: any claim included in the Bench Note is marked according to the evidence actually supporting that claim.

Revision history

Rev	Date	Change
A	Oct 2026	First issue. Nikon F2 slow-speed governor (A23): component reference, mechanism, servicing principles and troubleshooting. Open mechanical relationships retained explicitly for future bench verification; mechanism diagrams reserved until physically verified.