



Deployable Laboratory Precision

Technical Specification & Operational Briefing: Dome Scratcher Test Set

Part No.: 1513C029-01(V2026)

Target System: AH-64 Apache PAWS MWS Sensor

Compliance: MIL-PRF-13830B

The PAWS Optical Mandate

The Passive Air Warning System (PAWS) requires flawless optical surface integrity to ensure missile threat detection. Assessing this in the field requires adhering to strict laboratory standards (MIL-PRF-13830B) without a laboratory environment.

1. Field-Deployable

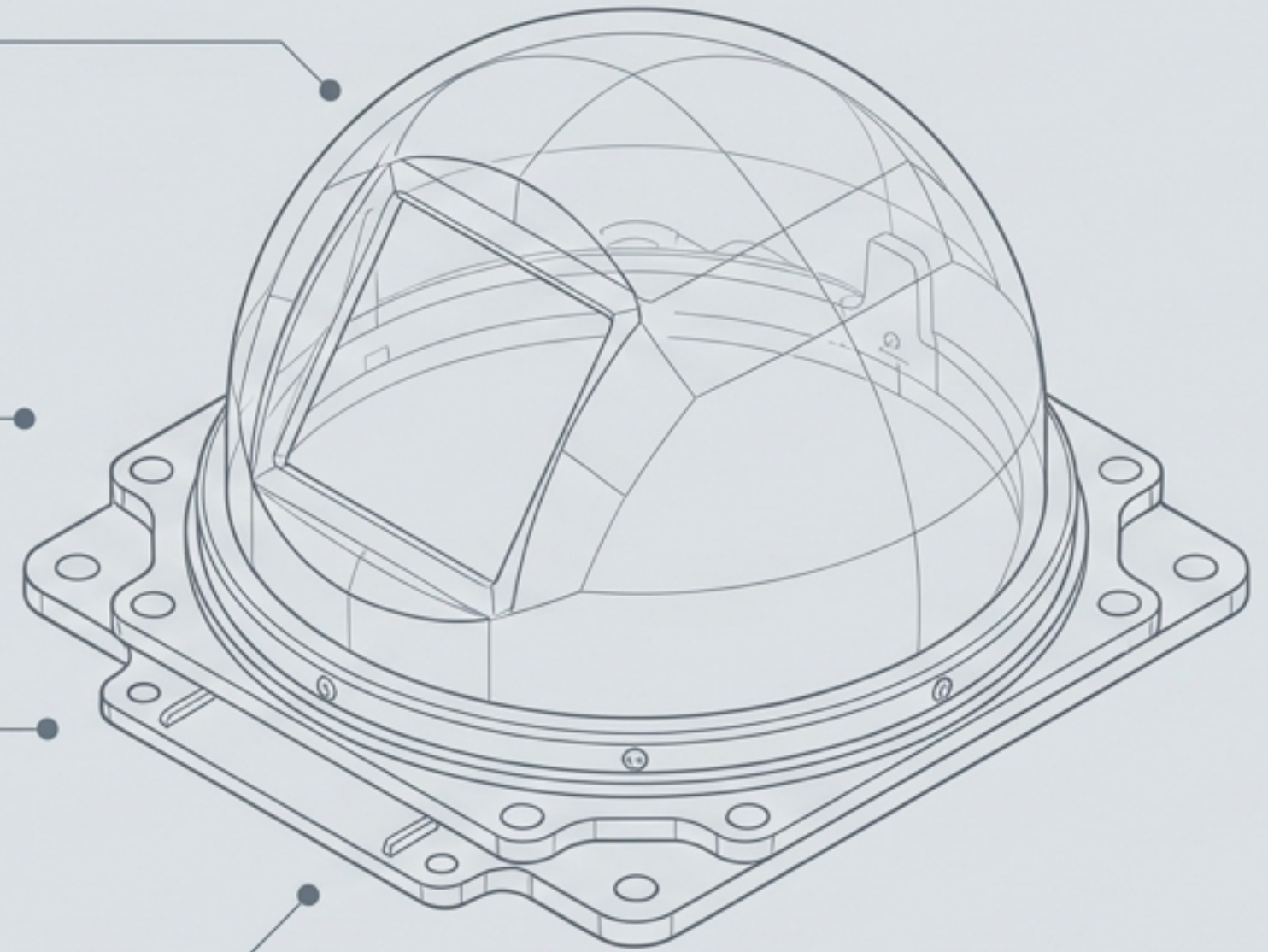
Must operate on the tarmac with aircraft on the ground, engines off.

2. Traceable Precision

Measurements must yield definitive Scratch-Dig metrics to determine continued airworthiness.

3. Non-Destructive

Zero tolerance for introduced contamination or secondary abrasion during the inspection process.



Unyielding Exterior Shell

Enclosure

Pelican Storm iM2500
polycarbonate shell (IP67
dust-tight, waterproof to 1m).

Atmospheric Control

Dual automatic pressure-
equalisation purge valves
(safe up to 12,000m MSL).

Mobility

Retractable telescopic
handle and twin inline
wheels for tarmac transit.

Environmental Resilience

MIL-STD-810H vibration
rated; operating range 0°C
to +45°C.



Dual-Layer System Architecture

Design Philosophy

Custom CNC-machined Ethylene Vinyl Acetate (EVA) foam engineered to prevent misplacement and isolate delicate optics from transit shock.

Layer 1 (Operational Kit)

The uppermost layer housing day-to-day inspection tools, including the Primary Kit (L1-1), Reference Kit (L1-2), and core accessories.

Layer 2 (Sustainment Spares)

The submerged layer containing the 65+ piece spare inventory to sustain operations throughout the kit's service life without returning to base.

Internal Climate

Integrated humidity indicator and silica desiccant packs maintain $\leq 85\%$ RH.



L1-1: The Primary Field Kit

The core diagnostic tools for routine scratch-dig evaluation.

Instrument Profile ●

10X Scale Loupes. Features ≥ 32 mm FOV, ≥ 20 mm effective aperture, and integral LED illumination.

Reticle #3 (Linear) ●

Calibrated linear metric scale specifically for determining maximum scratch width.

Reticle #7 (Circular) ●

Concentric circular reference markings engineered for isolating and measuring Dig/Pit diameters.

Design Note

The 10 mm contact ring sits flush against the dome to guarantee exact focal distance without applying structural pressure.



L1-2: The Reference Arsenal

Illumination Array

10X White/UV LED Rechargeable Magnifier and 100-Lumen Super Bright Pen Light.

Expanded Optics

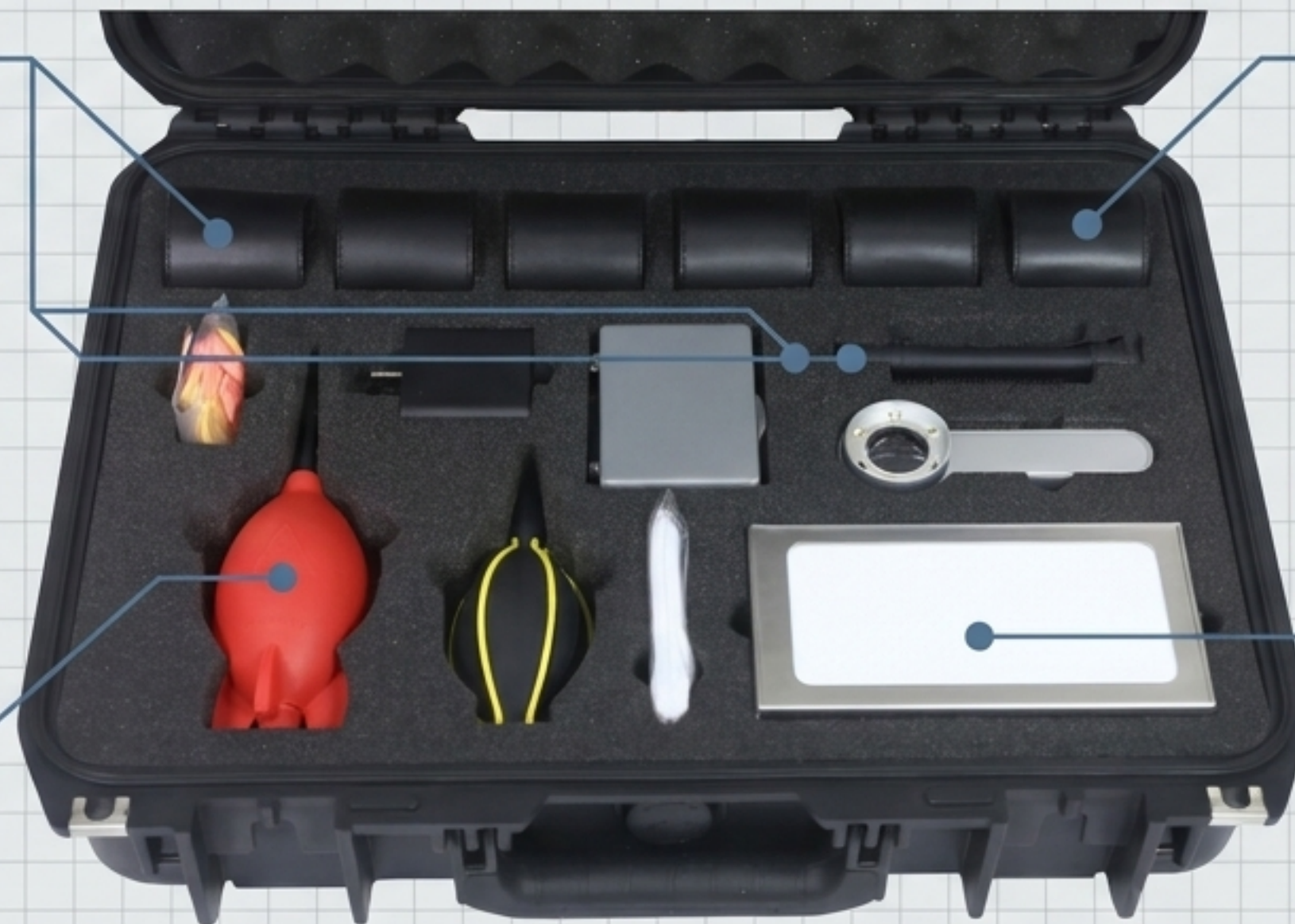
A suite of 6 additional 10X Loupes pre-fitted with specialized reticles (#STD, #4, and high-contrast white variants).

Contamination Control

Large (400mL) and Medium (250mL) non-contact Air Blasters.

Calibration Reference

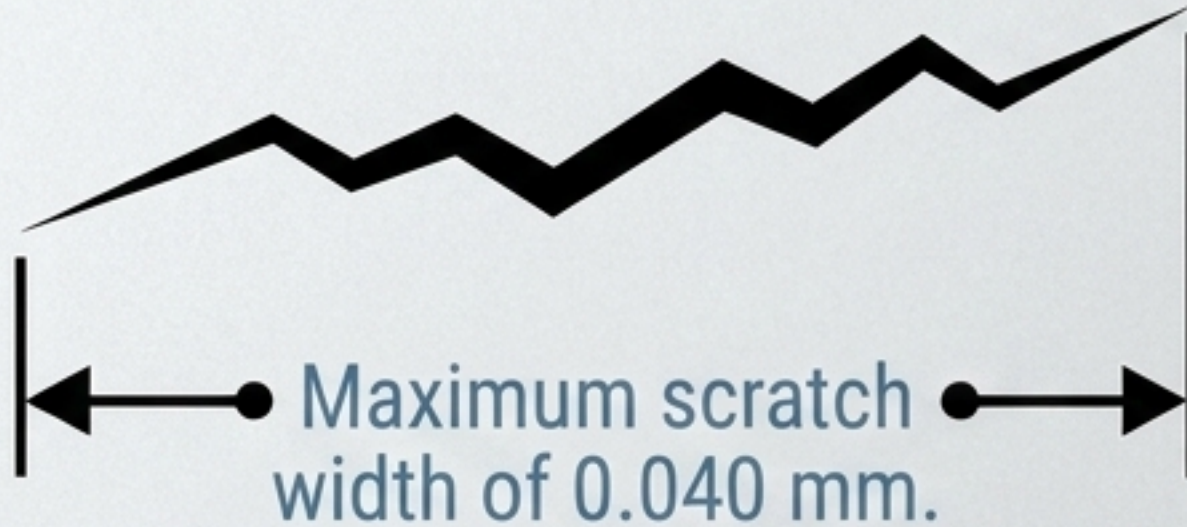
Moulded Acrylic Scratch Dig Comparator plate with physical reference standards (Scratches 10-160, Digs 5-100).



MIL-PRF-13830B: The 40-20 Standard

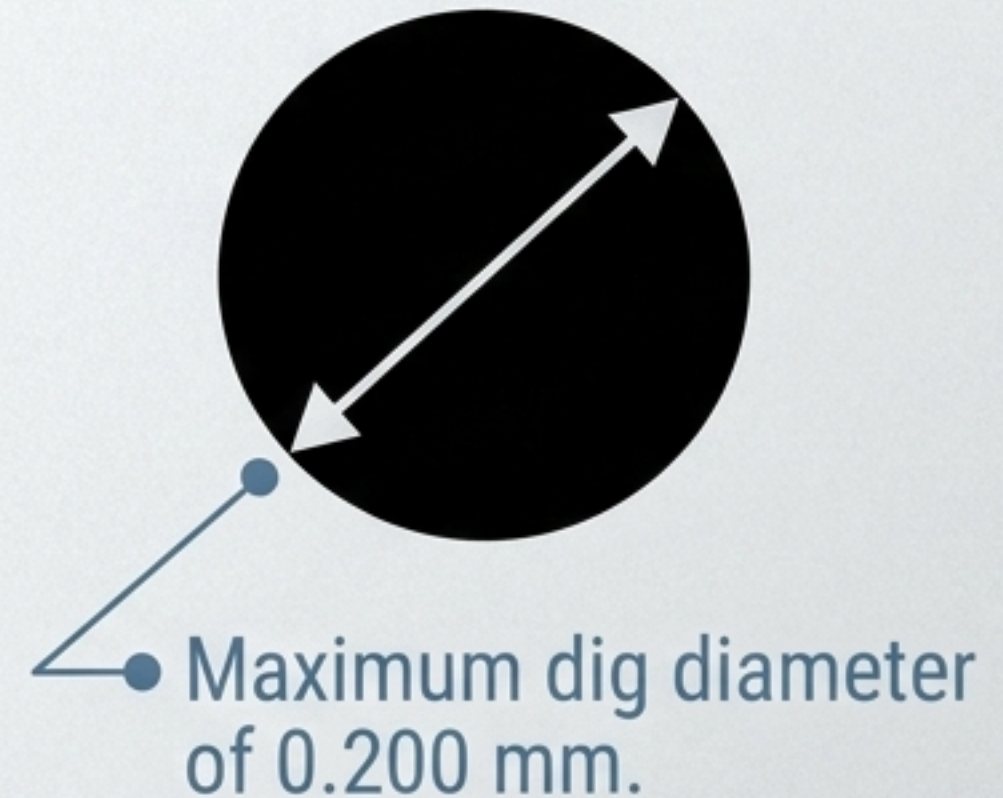
Lower numbers mandate a more pristine surface. The AH-64 PAWS dome demands 40-20.

A. The Scratch (40)



(Length is evaluated separately)

B. The Dig (20)



Reticle Diagnostic Matrix

Reticle ID	Visual Pattern	Target Defect	Primary Application
#3 Black	Linear scale	Scratch Width	Critical PAWS pass/fail compliance
#7 Black	Concentric rings	Dig Diameter	Localized void sizing
#STD Black	Grid scale	General spacing	Rapid wide-area survey
#4 Black	Fine linear	Fine length	Secondary dimensional verification

Key Insight: White-suffix reticles (e.g., #STDW) provide inverted high-contrast markings specifically engineered for low-reflectivity or anti-reflection coated dome surfaces.

Standard Operating Procedure

1. ESD & Clean (Non-Contact First)

Don ISO 5 Class 100
anti-static finger cots.

Execute 3-5 blasts
with the 400mL Air
Blaster at 50-100mm.

 **Warning:** Never dry
wipe a dusty dome.

2. Scratch Traverse (#3 Loupe)

Traverse the optical
aperture in
overlapping parallel
rows. **Orient
linear reticle scale**
perpendicular to
defect to capture
maximum width.

3. Dig Isolation (#7 Loupe)

Position circular
reticle concentrically
over pits/inclusions.

Identify the smallest
circle that fully
encompasses the
void.

4. UV Sub- Surface Scan (365nm LED)

Dim ambient light.
Sweep surface with
365nm UV LED
magnifier to identify
coating cracks
or hidden
delamination.

Airworthiness Acceptance Thresholds

Connecting 10x optical measurement directly to Boeing MRO flight readiness.

Condition	Threshold Value	Consequence
Max Scratch Width	> 0.040 mm	FAIL: Ground Aircraft
Total Scratch Length	> 1/4 aperture diameter	FAIL: Ground Aircraft
Max Dig Diameter	> 0.200 mm	FAIL: Ground Aircraft
Total Dig Diameters (Sum)	> 0.400 mm	FAIL: Ground Aircraft
UV Coating Anomaly	Any fluorescence	FAIL: Refer to SRM

PROTOCOL: Borderline cases ($\pm 10\%$ of limit) require triplicate measurement via Reference Kit and verification against the Dig Comparator plate before assigning a 'CONDITIONAL PASS'.

Sustainment & Calibration Control

Calibration Baseline	Layer 2 Self-Sustainment
- 10x Scale Loupes are factory-calibrated. - Mandatory annual verification against a traceable reference rule ($\pm 5\%$ tolerance). - Zero-field-repair policy: Failed loupes are immediately quarantined and replaced from Layer 2.	- The kit carries an embedded 65+ piece consumable and spare inventory beneath Layer 1. - Includes a complete secondary Spare Kit (L2-1), 6 spare batteries, 50+ fresh ESD cots, replacement reticles, and backup comparator. - Desiccant packs dictate environmental health: replace every 12 months or when indicator exceeds 40% RH.