

Boresight Alignment Equipment System (BAES) 2.0 and Verification Calibration Kit (VCK)

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F-15 TCP World-Wide Review

November 2024

BAES and VCK – BAE Systems Approach

BAES/VCK utilizes industrial / field proven photogrammetric technology

- Provide highly accurate positional / angular measurement capability
- Make aircraft boresight measurement easier for the maintainer
 - Simplified on-aircraft BAES setup
 - BAES/VCK GUI provides maintainer step-by-step instructions
 - BAES software provides automatic, continuous real-time measurements
 - Automatically generates reports for aircraft historical documentation
- VCK provides indigenous calibration capability
 - Calibrate BAES in users PMEL
 - No need to ship any BAES equipment to BAE Systems for calibration

BAES and VCK – **Fielded** for F-16, **Available** for F-15



- **Fielded** since 2011, utilized by 17 FMS F-16 countries
- **Compatible** w/AESA Radar
- **Accurate** to 0.5 milliradians
- **Versatile** Positional & Angular Measurement Capability (6 Degrees of Freedom)
- **Durable** - MIL-STD 810, MIL-STD 461 Qualified
- **Simple/Fast** setup w/no external power requirements
- **Easy to Use** Graphic User Interface guides operator thru all boresight procedures.
- **Lowest Life Cycle Cost** – 100% Field Calibration w/VCK.
- **Selected for USAF/ANG F-16** – Successfully completed testing for USAF/ANG F-16 support in August 2024.

What is **BAES** (Boresight Alignment Equipment System)?

- **Common Equipment**

- Camera with Tripod
- Cabling
- Three LED Pads
- Ruggedized Laptop
- Light Pen for VCK

- **F-16 Adapters**

- Aft & Fwd PBR
- HUD, INS, Radar (not required for AESA)
- Left/Right Hardpoints, M61A1 Gun, AoA Probes

- **F-15 Adapters**

- Aft & Fwd PBR
- HUD, INS, Gun, AoA, Radar (not required for AESA)



BAES – Common Equipment

- SERD 74A30 (BAES Common Equipment), P/N 8587937-1 (BAES 2.0)
 - P/N 8587937-1 integrates new Gbit Ethernet internal communication capability.
 - Organized into three (3) portable cases, can be used with F-16 or F-15



BAES – F-16 Adapters

- SERD 74A29 (BAES F-16 Adapters), P/N 8587938-1 (BAES 2.0)
 - P/N 8587938-1 integrates new Gbit Ethernet internal communication capability.
 - Organized into seven (7) portable cases. Mounts LED Pads to F-16 station interfaces



BAES – F-15 Adapters

- BAES F-15 Adapters
 - Organized into two (2) portable cases. Mounts LED Pads to F-15 station interfaces

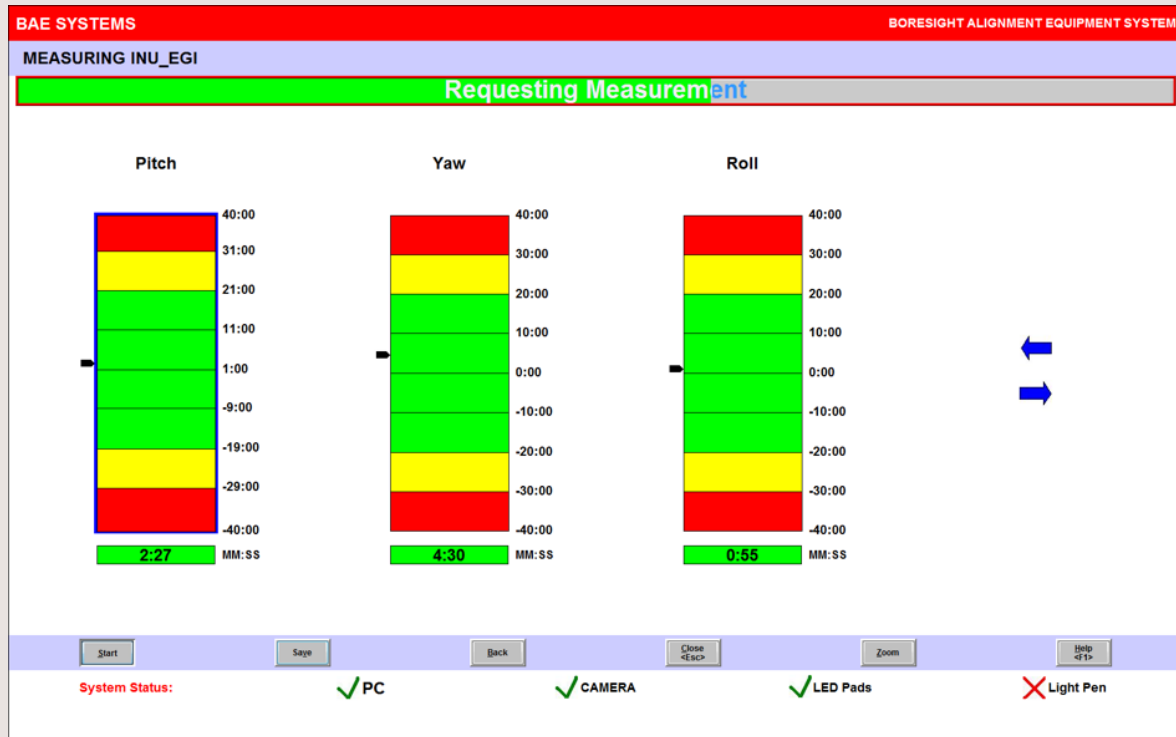
Case 1 FWD / AFT PBR



Case 2 HUD, INS, Radar, Gun, AoA



BAES – Operator Interface



- Simple Graphical User Interface (GUI) for single operator utilization
- GUI provides Users guide
- Menu driven for BAES initialization and avionics boresight selection
- Color-coded GUI feedback during Real-time, Continuous SW execution for real time adjustments

What is **VCK** (Verification Calibration Kit)?

Provides **Indigenous** BAES **Calibration** Capability

- Augments BAES equipment/technology
 - Utilized in user's own PMEL on base
 - Offered as adjunct kit to BAES
- **Verifies** BAES Adapter Calibration integrity
 - **Recalibrates** BAES Adapters if necessary
- Verification (Calibration if necessary) in **< 1 day**
- **Eliminates** the need to ship **ANY** equipment to BAE Systems for 18-month calibration
- Fielded in 2019 for F-16 BAES calibration
 - **25 VCK** Ordered/Delivered to date



BAES and VCK – Summary

- **Next Generation** Photogrammetric Technology utilizing Near Infra-Red LEDs.
 - No lasers / gyros / line of sight requirements
 - BAES fielded in 2011, now used by 17 FMS F-16 Customers
 - VCK fielded in 2019, now used by 16 FMS F-16 Customers
 - USAF/ANG F-16 selected BAES/VCK, passed testing for field use in August 2024.
- **Fast, Easy** to Use
 - Simple to setup and utilize; GUI enables single maintainer operation with integrated user instructions
- **Accurate**, Versatile and Durable
 - 6 Degrees of Freedom - Positional and Angular Measurement Capable
 - Fully Qualified...MIL-STD 810 and MIL-STD 461
- **Cost Effective**
 - Simplicity shortens required maintenance time to confidence check and boresight aircraft
 - VCK is indigenous calibration capability...eliminates expensive / time-consuming shipment of equipment off-base for calibration

Stores System Tester (SST)

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SST – Stores System Tester

- **1 Tester** for Flight-Line (O-Level) and Weapons Shop (I-Level) Armament Test



SST – **Fielded** for all F-16, **Contracted** for FMS F-15 and KF-21

- **Open Architecture / Modular Design**
 - **Upgraded to Windows 10** increasing cybersecurity protection
 - **Integrate** new armament/weapons capabilities seamlessly
 - **Adaptable** to other platforms, **F-15** and **KF-21** on contract
 - **COTS** Instrumentation utilized
- **Utility**
 - **1-Person** Portable for easy Flight-Line maneuverability
 - **Remote Control Unit** (RCU) for cockpit tester control
 - **Easy to Use** Graphic User Interface (GUI)
 - **Full Self-Test** of Tester and Cables
 - **Time Stamped** Test Reports
 - **Rugged / Durable** for Flight-Line utilization
 - Increased **Diagnostics**
 - Electronic Manuals **Capable**



What is SST (Stores System Tester)

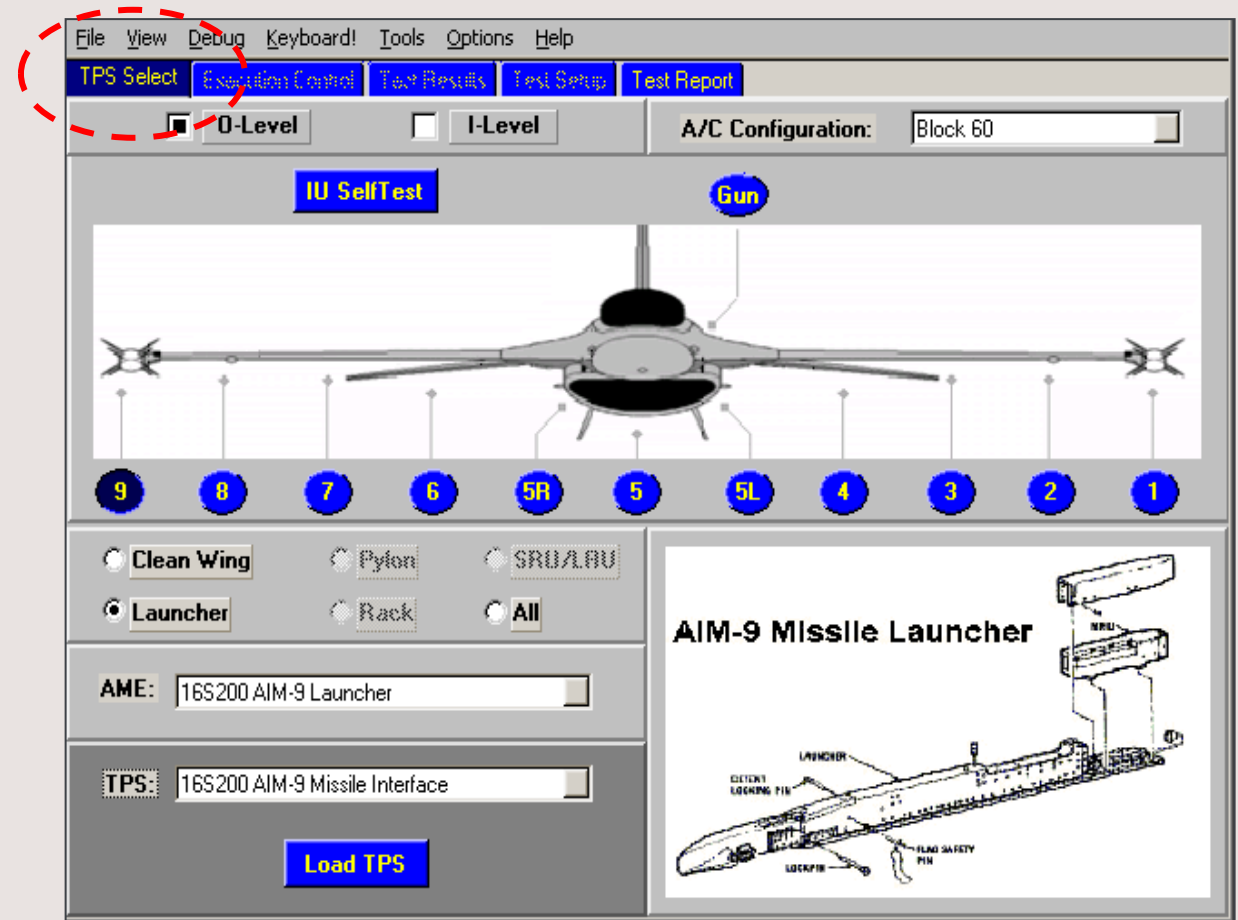
1 Tester for Flight-Line and Armament Backshop

- SST Instrumentation Unit (IU)
 - Same IU utilized for **both** flight-line and backshop maintenance.
- Organizational Level Cable Set
 - Utilized with SST IU for **flight-line** aircraft / AME maintenance.
 - Includes RCU, cables, self-test plugs
- Intermediate Level Cable Set
 - Utilized with SST IU for **backshop** AME maintenance.
 - Includes RCU, cables, self-test plugs



SST – Operator Graphic User Interface (GUI)

- **User Friendly**
- High use of **Pull-down menu** choices
 - Aircraft type / configuration
 - AME selection
 - TPS selection
- **High** use of **graphics**
 - Weapon Stations
 - AME
- **Dynamic** selection
 - Microsoft Access™ database



SST - Designed for the Flight Line Environment

- **Rain**
 - 4 in/hr with 40 mph wind
- **Explosive Atmosphere**
 - Hexane mixture
- **Shock**
 - 30G's for 11ms (Non-Operating)
- **Vibration**
 - 20-2000hz@0.04g²/Hz &
1000-2000hz@0.04g²/Hz-6db/oct.
(Non-Operating)
- **Salt/Fog**
 - 48 Hr Exposure
- **Solar Load**
 - 104 W/ft²

SST – Summary

- 1 Armament Tester for both the flight-line and weapons backshop
 - Fielded for USAF / FMS F-16 since 2003
 - Contracted for FMS F-15 support in 2020
 - Contracted for KF-21 support in 2021
 - Over 700 fielded world-wide, still in Production in 2024 and beyond
- Designed for Weapons Interface Maintenance, by Weapons Maintainers
 - 1-Person Portable
 - Downloadable Time-Stamped Test Reports
 - Full Self-Test Capability
- User Friendly
 - Graphic User Interface with Pull-Down Menus and Graphics for step-by-step guidance
- Durable
 - Designed for the flight-line environment...field proven for over 20 years