

Jet Engine Balancing: Laser Tachometer.....Friend or Foe?

Introduction

When an aircraft engine has a vibration problem you want to diagnose it quickly and on-wing to save time and the expense of an engine removal. If trim balancing is required to reduce vibration levels, a clean, consistent, once/revolution signal is needed from the engine to provide critical vibration phase information. This paper briefly outlines the differences between the two most commonly available methods of obtaining this signal; the laser tachometer and odd tooth detection.



The Problem

Testing jet engines on-wing requires access to vibration and speed signals from the engine. Getting to these signals can often be challenging due to the design of aircraft wiring harnesses and mechanical constraints under engine cowls. Auxiliary equipment and wiring must be positioned and routed in a manner that eliminates any possibility of them becoming FOD. Easy and safe to acquire once-per-revolution signals are generally available from standard AVM/EVM connections; however, several commercially available systems utilize an externally mounted laser tachometer to provide this signal. These laser tachometers require mounting of reflective tape onto the spinner, which produces a high contrast reflectance each time the tape passes beneath the laser. Unfortunately, this method requires extensive setup and alignment and historically has been troublesome, unreliable, susceptible to unfavorable weather conditions, and unsafe for operators and aircraft. Additionally, vibration during engine testing often creates misalignments between the laser and tape rendering the test useless.

The Solution



Figure 1: PBS-4100 Plus

The PBS-4100 Plus (Figure 1) combined with aircraft-specific accessory kits provides reliable and safe vibration testing and trim balancing on virtually any jet engine. MTI engineers have studied wiring configurations of hundreds of engine and airframe combinations and developed cable sets that couple directly to the aircraft's equipment connections. The powerful software program within the PBS-4100 Plus system features circuitry that automatically detects and "locks on" to the special odd-tooth signal provided by the engine's speed sensor. This eliminates the need for externally mounted laser tachometer systems along with their operational problems and alignment issues.

Figure 2 (next page) illustrates just how quick and easy it can be to set up your next vibration analysis/trim balance.

MTII appnote: lasertachometer.pdf - Page 1 of 2

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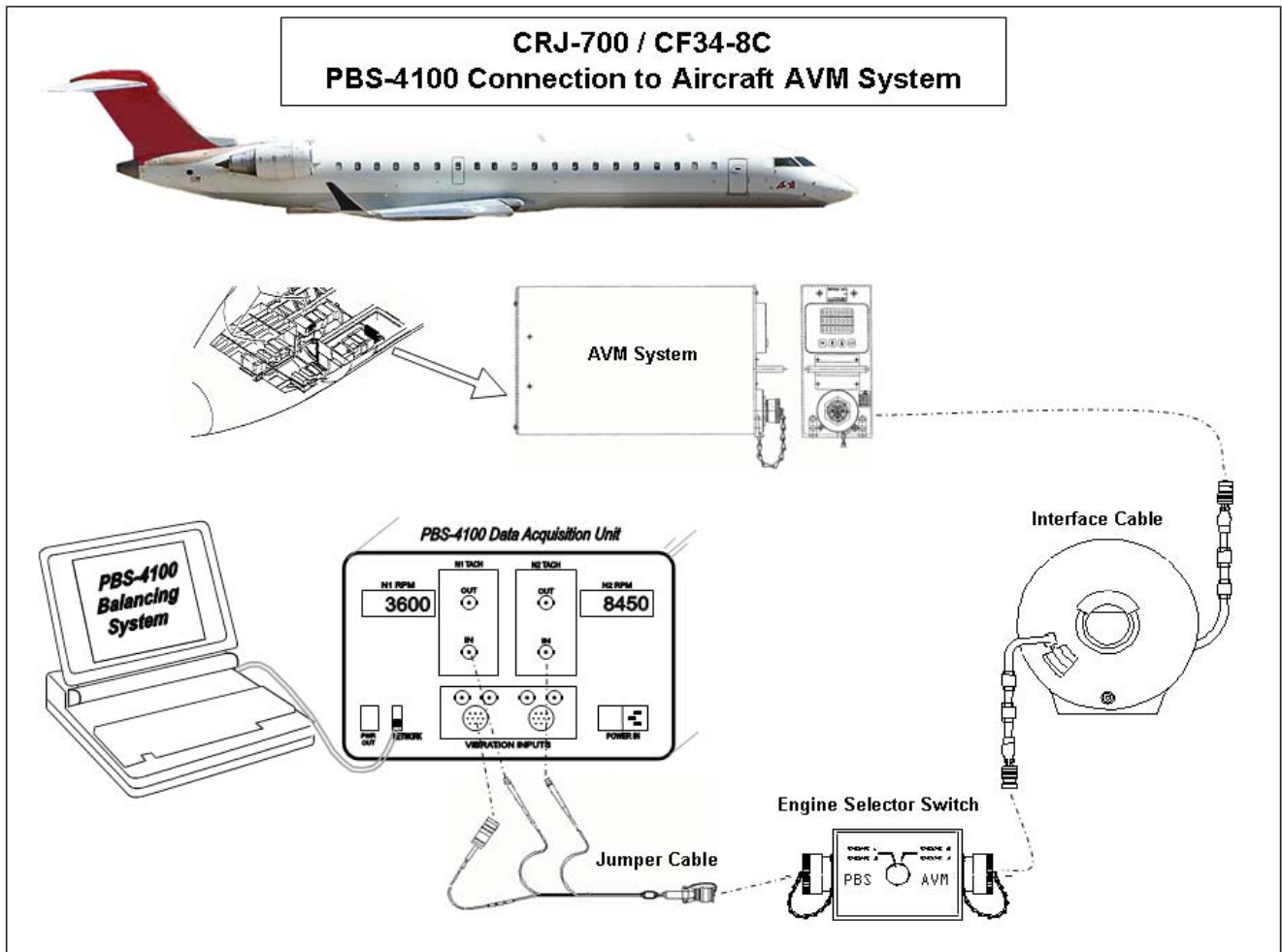


Figure 2: PBS-4100 Connection Diagram