ILS-TS
Instrument Landing System Test System

- Replacement of the ILS Localizer, Glideslope, and Marker Beacon antenna signals with three signal generators to test airborne receivers
- Real-time simulation for approach and landing operation
- Hardware-in-the-loop architecture
- Compatible with external dynamic flight model simulations (e.g. MATLAB/Simulink®, C/C++, Python)
ILS Overview

The Instrument Landing System (ILS) provides aircraft pilots with landing approach data relative to the ideal landing course. This is especially critical when visibility is poor due to bad weather, night landings, and crosswind approaches. As a method of approach navigation, the ILS includes three functions: Localizer, Glideslope, and Marker Beacons. The Glideslope ensures that the vertical descent path is aligned to the ideal descent path in tandem with the distance from the runway based on the Marker Beacons. The Localizer ensures that the lateral left-right approach is aligned with the center of the runway. The Marker Beacons provide pilot audio alerts along the approach path.

Architecture

The TechSAT Test System provides all three functions of the Instrument Landing System:

- **Localizer (LOC)** – The Localizer Test System simulates the signals of the horizontally aligned antennas. These transmit two intersecting main beams beside one another at carrier frequencies between 108 MHz and 112 MHz as seen from the approaching aircraft coming in for a landing. The left beam is modulated at 90 Hz and the right beam at 150 Hz. The received signal will be modulated equally along the centerline of the runway. The airborne receiver (UUT) uses this modulation to determine the correct descent lateral approach path by demodulating the received Localizer signal and calculating the Difference in Depth of Modulation between the two tones. The Localizer Test System provides also COM/ID signals to identify the current runway.

- **Glideslope (GS)** – The Glideslope Test System simulates the signals of the vertically aligned antennas. These transmit two intersecting main beams on top of one another at carrier frequencies between 329 MHz and 335 MHz. The top beam is usually modulated at 90 Hz and the beam below at 150 Hz. The received signal will be modulated equally along the centerline of the Glideslope elevation angle. The airborne receiver (UUT) uses this modulation to determine the correct descent vertical approach path by demodulating the received Glideslope signal and calculating the Difference in Depth of Modulation between the two tones.

- **Marker Beacons (MB)** – The Marker Beacon Test System simulates the signals of all three MB ground antennas. These transmit a narrow beam width at 75 MHz carrier frequency in a vertical direction. Each beacon has a distinct modulation frequency allowing the airborne receiver (UUT) to identify which one is overflown. The Outer Marker is modulated at 400 Hz, the Middle Marker at 1300 Hz, and the Inner Marker at 3000 Hz. The Marker Beacon Test System provides also COM/ID signals to identify the current runway.

Technical Data

**RF Signal Generator LOC**
- 19”-2U desktop case
- Frequency range: 108 MHz to 112 MHz
- Power level: -85 dBm to +10 dBm
- Provides modulated COM/ID signals to identify runway
- Remote control via Ethernet

**RF Signal Generator GS**
- 19”-2U desktop case
- Frequency range: 329 MHz to 335 MHz
- Remote control via Ethernet

**RF Signal Generator MB**
- 19”-2U desktop case
- Frequency: 75 MHz
- Simulated signals:
  - Outer Marker 400 Hz
  - Middle Marker 1300 Hz
  - Inner Marker 3000 Hz
- Provides modulated COM/ID signals to identify runway
- Remote control via Ethernet

Integration Bench

The Navigation System solution can be integrated in all TechSAT SIB products, which include:

- Real-time PC
- I/O interfaces:
  - Analog
  - Digital
  - ARINC 429
  - AFDX®/ARINC 664
  - CAN/ARINC 825
- Windows® 7 or CentOS RT

Avionics Development System (ADS2)

Part Number

011281

TechSAT ILS Navigation System Solution

UUT

Flight:

Flight

Mockup

Display

Control

Protocol

ADS2

Device Interface

LOC

Test Set

GS

Test Set

MB

Test Set

Interface

Airborne

AIRCRAFT

AIRCRAFT

AIRCRAFT

AIRCRAFT

AIRCRAFT