AIR TRAFFIC MANAGEMENT

DOPPLER VHF OMNIDIRECTIONAL RANGE

Supplying ATM systems around the world for more than 90 years

indracompany.com
The Indra DVOR is the ultimate choice in Doppler VHF Omnidirectional Range equipment combining quality with exceptional value for money.

The equipment employs state of the art technology ensuring high reliability in order to meet the demands of both civil and military requirements.

Fundamental to the design concept of this unit are integrity, reliability, and maintainability.

The equipment has been tested under the most demanding environmental conditions, allowing equipment operation in any environment.

The Indra DVOR is an easy-to-use system requiring minimal maintenance, that meets or exceeds all requirements of ICAO annex 10, volume I edition 6, and EUROCAE ED-52, enabling interoperability with all currently available radio navigation aids on the market.

This equipment is another exceptional result of Indra’s expertise in radio navigation aids.
## Characteristics

### GENERAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Type</th>
<th>Double side band DVOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Single or Dual</td>
</tr>
<tr>
<td>Output power</td>
<td>25 W to &gt;100 W adjustable in 0.1 W steps</td>
</tr>
<tr>
<td>Frequency range</td>
<td>108 to 117.95 MHz</td>
</tr>
<tr>
<td>Channel spacing</td>
<td>50 KHz channel</td>
</tr>
<tr>
<td>Carrier frequency stability</td>
<td>± 5ppm</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>Digitally programable by Synthezizer</td>
</tr>
<tr>
<td>Bearing accuracy</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>Bearing Adjustment</td>
<td>± 180° in 0.01° steps</td>
</tr>
<tr>
<td>Spurious Radiation</td>
<td>&lt;-70 dBc typically</td>
</tr>
<tr>
<td>Antenna system</td>
<td>1 + 48 alford loops</td>
</tr>
<tr>
<td>Polarization</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Status indication</td>
<td>Full local and remote indication</td>
</tr>
<tr>
<td>Module hot replacement</td>
<td>Yes</td>
</tr>
<tr>
<td>System monitoring (BITE)</td>
<td>Complete system / LRU monitoring</td>
</tr>
<tr>
<td>Local/remote interface</td>
<td>Ethernet / RS-232 and RS-485</td>
</tr>
<tr>
<td>Reliability</td>
<td>MTBF &gt; 10,000 h (single)</td>
</tr>
<tr>
<td></td>
<td>MTBO &gt; 20,000 h (dual)</td>
</tr>
<tr>
<td></td>
<td>MTTR &lt; 30 m (15m typical)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>600 VA (single) 750 VA (warm standby)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>One 19” standard rack (33u): 600 x 600 x 1467 mm (WxDxH)</td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL

| Temperature         | -20°C to +60°C Indoor |
|                     | -50°C to + 70°C Outdoor |
| Relative Humidity   | 95% Indoor             |
|                     | 100% Outdoor           |
| Maximum altitude    | 15,000 ft operating    |
|                     | 45,000 ft inoperative  |
| Wind                | 160 km/h operating     |
|                     | 200 km/h survival      |
| Hail/Ice            | 50 mm                  |
Indra DVOR

The equipment is a state-of-the-art technology product ensuring high reliability and maintainability based on many years of operation in field systems in order to meet the demands of both civil and military requirements.

The system is a low-cost and high performance turn-key solution with high flexibility that can be adapted to customer sites and/or maintenance communications architecture needs.

The system makes use of the experience gained by Indra in developing and installing navaid systems for clients in a wide variety of countries all over the world under the most severe climatic conditions.

Main Characteristics

- Dual transmitters, monitors, power supplies and control
- RF amplifiers modules based on solid state technology
- Multiple interfaces (RS-232, Ethernet, etc.)
- Extensive use of the latest digital technology
- Friendly and intuitive user interface
- Multiple configurations
- Standard and flexible RMM architecture
- High level BITE

Remote Maintenance Monitoring

The equipment can be integrated with a versatile and robust software architecture that allows control and supervision performed locally or remotely, with several security levels.

The software architecture is based on standard protocols which provide intuitive and simple operation.

Different interfaces such as Ethernet, RS-232 and RS-485, thus are available allowing system compatibility and remote control connections by multiple means including dial-up modem, leased-lines, radio, IP-based virtual private network (VPN), Ethernet, and cellular networks.

Technology

The Indra DVOR is based on a modular design architecture, solid state components and auto-diagnosis Built In Test (BIT) concept to provide a superior level of reliability.

Direct digital synthesizer (DDS) techniques are used for timing, frequency and waveform generation circuitry, derived from a single stable temperature-compensated crystal clock circuit which ensures accurate clocking of all critical time-dependent pulse generation and measurement circuits.

Maintenance and Reliability

Includes a Built In Test (BIT) capability designed to detect, isolate and report any malfunction or condition out of tolerance by using automatic and non-interruptive self-tests down to LRU level.

These BIT (Built In Test) system capabilities dramatically reduce routine maintenance tasks and repair times, allowing the prediction of system performance degradation. The results of the BITE process are available both locally and remotely via L/RMM.

The maintenance concept is based on LRU modules, easily accessible and exchangeable.

All components of the Indra DVOR have been selected to provide maximum reliability and minimize maintenance costs.
## Characteristics

### VOICE INPUT FACILITIES
- **Microphone input**: -52 dBm to -9 dBm @ 600 ohm
- **Line input - analog**: -37 dBm to +6 dBm @ Balanced 600 ohm
- **Digital input**: Optical S/PDIF In/Out Toslink
- **Voice compandor**: User selectable

### MODULATION SIGNAL CHARACTERISTICS

#### Reference phase
- **Frequency**: 30 Hz ± 5 ppm
- **Modulation depth**: 28% to 32% digitally adjustable
- **Distortion Factor**: 5%
- **Harmonic Distortion**: <3% of fundamental

#### Ident code
- **Modulation frequency**: International morse up to 5 chars
- **Modulation depth**: 1020 Hz ± 5 ppm
- **Repetition rate**: 0 to 20% digitally adjustable
- **Operation mode**: Independent/Associated

#### Voice Modulation
- **Frequency range**: 300 Hz to 3000 Hz
- **Modulation depth**: 0% to 40% digitally adjustable
- **Noise (due signal conmutation)**: better than 30 dB

#### Variable phase
- **Frequency**: 9960 Hz ± 5 ppm
- **Mean depth**: 28% to 32% digitally adjustable
- **FM modulation index**: 16 ± 1
- **Sideband harmonic levels**: Better than ICAO and ED-52
  - 1st harmonic < -40 dBc
  - 2nd harmonic < -50 dBc
  - 3rd harmonic < -60 dBc
  - 4th and above < -60 dBc

### MONITOR

- **Configuration**: Single/dual
- **Frequency**: 108 MHz to 118 MHz
- **Monitor voting**: AND/OR
- **Alarm thresholds**: Digitally configurable
- **Carrier power**: 3dB ± 1dB, adjustable
- **Bearing information**: ±1° maximum, adjustable
- **Reduction in modulation depth**
  - or 30 Hz AM: 15% ± 1%, adjustable
  - or Sub-carrier 30 Hz FM or Ident: 50% ± 10%, adjustable
- **Ident code**: Continuous / Absence of tone, Incorrect Code
- **Antenna monitoring**
- **Primary Alarm Condition**
  - Individual antenna monitoring
  - Diametrically opposite antenna pairs
  - Three individual antenna failures.
- **Monitor failure**: Yes (failsafe)
- **Antenna sensors**: NFM and FFM (Yagi or dipole antenna)