

LIBRA VSAT – Seismic and Environmental Data Acquisition by Satellite

When disaster happens and cellular networks fail, Libra continues to deliver mission critical service.



Libra is the only fully integrated satellite communications system in the world specifically designed for seismic and environmental data acquisition.

Libra has a proven track record for reliable operation in some of the harshest environments the world has to offer. The Libra VSAT system takes private data networking to a new level with exceptional data availability.



nanometrics.ca



SATELLITE COMMUNICATIONS NETWORK FOR SEISMIC AND ENVIRONMENTAL DATA ACQUISITION

The Libra system is a proven, reliable data communications solution, effective in any terrain or environment. Satellite telemetry provides the highest possible data integrity and is not restricted by limitations such as line-of-sight terrestrial requirements or the proximity of established communications infrastructure.

VERSATILE CYGNUS TRANSCEIVER FOR THE REMOTE SITE

Each Libra remote site is equipped with a Cygnus 210 transceiver. Designed for acquisition of seismic and environmental data, Cygnus can also acquire a wide range of IP and serial data types.

The newest model, Cygnus 210 transceiver, is designed to work with Nanometrics' Centaur digital recorder, and features a 10/100Base-T Ethernet interface and a serial port for data inputs, as well as an antenna connector for TDMA timing and a 9-36 VDC power input. Cygnus can be deployed for general IP data communication or customers can benefit from the embedded Apollo data acquisition and communications software. This software combines UDP/IP multicast communications with application level retransmission error correction to deliver >99.99% data availability.

CONTINUOUS, RELIABLE TELEMETRY

Libra is an IP communications system that collects continuous data, which it transmits in near real-time from the remote station directly to the central hub on customer premises via geostationary satellites. It is a simple system consisting of remote and central site location, without the complexity of repeater stations or multiple communication links and technologies.

As a private network, Libra is extremely robust, well suited for mission critical applications. Unlike Internet, cellular and public VSAT networks, Libra does not share bandwidth with other users, nor is it subject to surprise configuration changes made by third party network operators. These factors combine to significantly reduce the workload for your technical support and IT staff and improve data availability.

BENEFITS

- Freedom of station placement regardless of terrain or infrastructure
- Ultra-low total station power consumption dramatically improves reliability and significantly minimizes power system cost and station footprint for easier environmental permitting where required
- Operations' network security streamlined with private IP data network resulting in outstanding data availability
- GPS timed TDMA scheme allows several remote stations to share a single low-bandwidth satellite carrier segment for lowest monthly cost per station

ECONOMICAL NETWORKS OF ANY SIZE

Libra is cost effective to operate in either small or large networks. Satellite space segment operating costs for a typical 10-12 station network acquiring continuous seismic data are minimal because several stations share a single low-bandwidth segment.

Data can be transmitted from any number of remote Libra sites simultaneously to more than one receiving Carina hub with no additional satellite lease cost. Furthermore, one Libra network can share data with an adjacent network without incurring additional space segment costs.

EASY IMPLEMENTATION AND EXPANSION

Libra network installation and expansions are quick and easy. VSAT eliminates the detailed planning and expense involved in accommodating topography, terrestrial line-of-site requirements or access to ground-based communications infrastructure. No repeater stations or connections to existing communications infrastructure means fewer permits or contracts to negotiate and higher availability.

Most solar powered remote stations can be installed and commissioned within a day. Whether installing one station or 100, each deployment follows the same standard procedure and uses a uniform set of equipment.

COMPLETE FREEDOM OF STATION PLACEMENT

Libra opens up a wide range of options for remote site placement, including hostile or isolated terrain unsuitable for cellular, telephone or radio communications.

Libra remote stations can be installed anywhere there is a clear view of the satellite. The cost of communications does not vary with the location or with distance from the central site.

With its minimal power requirements, Cygnus remote stations can be solar powered and completely independent of any established ground infrastructure.

POWERFUL NETWORK MANAGEMENT TOOLS

Libra systems are simple to operate and maintain, with provided training. Comprehensive state-of-health and diagnostic information are continuously acquired, monitored and presented to the user via a series of web pages.

REAL-WORLD EXPERIENCE

Libra is a well-established product with over 1200 remote sites and 60 hubs operating in more than 30 countries around the world.



Remote Libra stations have a small footprint, with an easily installed modem in a highly reliable weatherproof outdoor package supporting antenna sizes as small as 0.6 m. Libra supports economic networks of any size with low cost central hub configurations and centrally managed remote stations.

Cygnus VSAT Transceiver (model 210)

ANTENNA (REMOTE STATIONS)

Antenna size: 1.2 m diameter antenna typical Note: 1.8 m and 2.4 m are also available Mount options: Penetrating kingpost mount or non-penetrating mount with ballast trays. Pedestal mount.

SATELLITE MODEM

Operating frequency: Transmit: 950 to 1550 MHz Receive: 950 to 1750 MHz

Transmit frequency: 14.0 to 14.5 GHz (Ku-band) 13.75 to 14.25 GHz (Ext. Ku-band) 5.925 to 6.425 GHz (C-band)

Receive frequency: 10.95 to 11.45 GHz (Ku-band) 11.7 to 12.2 GHz (Ku-band)

12.25 to 12.75 GHz (Ku-band)

Other options available. Please contact Nanometrics. **Transmit power:** -40 dBm to -4 dBm

Operational band: All standard satellite bands supported: Ku-band, extended Ku-band, C-band, and extended C-band **Occupied bandwidth:** 90 KHz typical, -26 dB

at $f_0 \pm 50$ kHz

TRANSCEIVER

Data rate (modulation): 112 kbps (QPSK rate 7/8 FEC)

- 64 kbps (QPSK rate 1/2 FEC)
 66 kbps (RPSK rate 7/8 FEC)
- 56 kbps (BPSK rate 7/8 FEC)
 32 kbps (BPSK rate 1/2 FEC)

Note: The appropriate inbound and outbound modulation will depend on the satellite link budget. **Remote station retransmission buffer:** 8 GB **E_b/N_o threshold:** FEC rate 1/2: 3 dB (BER \leq 10⁻⁵) FEC rate 7/8: 5 dB (BER \leq 10⁻⁵)

Carina Hub (model 110)

SATELLITE MODEM

Transmit power: -40 to -4 dBm

Transceiver: Complies with INTELSAT GX standard. Compatible with standard and extended Ku-band as well as C-band and extended C-band satellites Data rate (modulation): 112 kbps (QPSK rate 7/8 FEC)

64 kbps (QPSK rate 1/2 FEC) 56 kbps (BPSK rate 7/8 FEC)

32 kbps (BPSK rate 1/2 FEC)

Note: The appropriate inbound and outbound modulation will depend on the satellite link budget. Local data output: 10/100 Base-T Ethernet port

Equipment mounting: 1U 19-inch rack mount chassis

 ${\rm E_b/N_o}$ threshold: FEC rate 1/2: 3 dB (BER $\le 10^{-5})$ FEC rate 7/8: 5 dB (BER $\le 10^{-5})$

Network Management and Control

CONFIGURATION AND REAL-TIME MONITORING (CYGNUS 210, CARINA 110)

Software: Upgradeable locally or over satellite.. Firmware: Upgradeable locally or over satellite. Firmware load may be deployed to multiple units concurrently via Antares network management software.

ENVIRONMENTAL

Operating temperature: -20 to +60°C Humidity: 0 to 100% Environment: Self-contained, all-weather outdoor unit. IP67 rated

CONFIGURATION

Web-based interface: Configured using a Web browser via HTTP connection either remotely via satellite or locally via Ethernet Timing system: Internal DCXO clock disciplined to GPS Time accuracy:< 100 µs GPS receiver: Internal 12 channel receiver

GPS antenna: External active antenna supplied with cable

Ethernet: 10/100 Base-T with auto MDIX

POWER

Supply voltage: 9 – 36 VDC Modem power consumption: 2.5 W System Power consumption: Based on 12 V operation. Power consumption varies with data rate, duty cycle and BUC and CNB selection information. Please contact Nanometrics for more information. Examples:

3-channel, 100 sps, 100% ReTX Margin; Ku-Band: (CYGNUS 210+3 W BUC+LNB) 11.9 W typical
3-channel, 100 sps, 100% ReTX Margin; Ku-Band (CYGNUS 210+1.5 W BUC+LNB) 10.7 W typical
3-channel, 100 sps, 100% ReTX Margin; C-Band (CYGNUS 210+2 W BUC+LNB) 16.7 W typical

LIBRA TRANSMISSION PROTOCOL

Satellite: Compatible with standard and extended Ku-band satellites as well as C-band and extended C-band satellites. Complies with INTELSAT GX standard

Remotes per carrier: Configurable via the TDMA table. Typically up to 16 stations per 100 kHz carrier. **Hub redundancy:** Supports multiple central hub configuration with automatic backup transition capability

Carrier access: Centrally configured, fixed assignment TDMA

Remote transmission: Transmission slots referenced to UTC and independently configurable for each station within TDMA frame

Remote transmission modulation: Independently configurable for each station

Outbound traffic: Transmitted within allocated TDMA time slot

TDMA frame duration: 1 to 10 seconds **Error correction:** LDPC FEC for reduced power and antenna size. Selective retransmission requests: Missing data packets are requested until received or are no longer available in the remote buffer.

PHYSICAL

All measurements to outer unit boundaries (tallest connector faces) Width: 241 mm (9.5 in.) Depth: 51 mm (2.0 in.) Height: 318 mm (12.50 in.)

ANTENNA

Antenna size: 2.4 or 3.8 m standard Note: 1.2m, 1.8 m, 4.5 m and other sizes are also available.

Mount options: King post, pedestal, non-penetrating, tripod roof mount IFL cables: 35 m transmit and receive cable set Note: 60 m and 80 m are also available

ENVIRONMENTAL

Operating temperature: -20°C to +60°C **Electromagnetic compatibility:** Complies with Class A FCC Part 15, EN55022, and EN55024

SPLITTER/COMBINER

Modems supported: Supports 2 to 4 Carina 110 modems operating with a single BUC Mounting: 2U 19-inch rack mount chassis

DATA ACQUISITION (CYGNUS 210, CARINA 110)

WAVEGUIDE COMBINER

NOTE: Used in larger networks where more than four carriers are implemented

BUCs supported: Supports 2 to 4 BUCs sharing a single antenna

Port options: 2 or 4 port

PHYSICAL

Note: all measurements to outer unit boundaries (tallest connector face); 1 U rackmount chassis Width: 486 mm (19.2 in.) Depth: 292 mm (11.5 in.) Height: 45 mm (1.75 in.)

Software: Modem includes Apollo data acquisition software with multicast communications and

application level error correction. Requires central site ApolloServer software.

Protocols: UDP/IP unicast and multicast with application level retransmission error correction.



Strategic intelligence fueled by science

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