



IN-SNEC

O/Ref. COU 108803

Alain DE MURAT

☎ 33 169827839

Email : ademurat@zodiac.com

EUROPEAN COMMISSION

5 avenue de Beaulieu / Beaulieuilaan 5
1160 Bruxelles
Belgique

For the attention of Mrs Anna PASSERA

Les Ulis, 8 Octobre 2007

Dear Mrs Passera,

Please find enclosed a request for an exemption from requirements of European Directive 2002/195 for specific application of lead.

If the Commission needs further information, we would be happy to provide additional details by mail or e-mail.

Bests regards.

Alain DE MURAT
Cortex Series Quality

IN-SNEC Aquitaine
Aerodrome d'Arcachon
33260 La Teste
Tél. 05.57.52.76.30
Fax. 05.57.52.76.40

IN-SNEC Paris
5, avenue des Andes - BP 101
91943 Les Ulis cedex A
Tél. 01.69.82.78.00
Fax. 01.69.07.39.50
<http://www.in-snec.fr>

IN-SNEC Normandie (Siège Social)
2, me de Caen - BP 7
14740 Bretteville l'Orgueilleuse
Tél. 02.31.29.49.49
Fax. 02.31.80.65.49



IN-SNEC

**Proposal for exemption from requirements of European directive
2002/95 for specific application of lead – Article 4(1)**

Subject : Request a derogation for use of lead in solders in a third party component of Cortex family equipment.

Company background : In-Snec company manufactures and distributes Cortex systems with communicate with Satellite Control Centre for telemetry, remote control, monitoring and control data. Certified ISO9001 and EN9100 and concerned from the respect of the environment, In-Snec has obtained ISO 14001 certification in 2006 and is in accordance with 2002/96/EC Directive with regard to waste of electrical and electronic equipment.

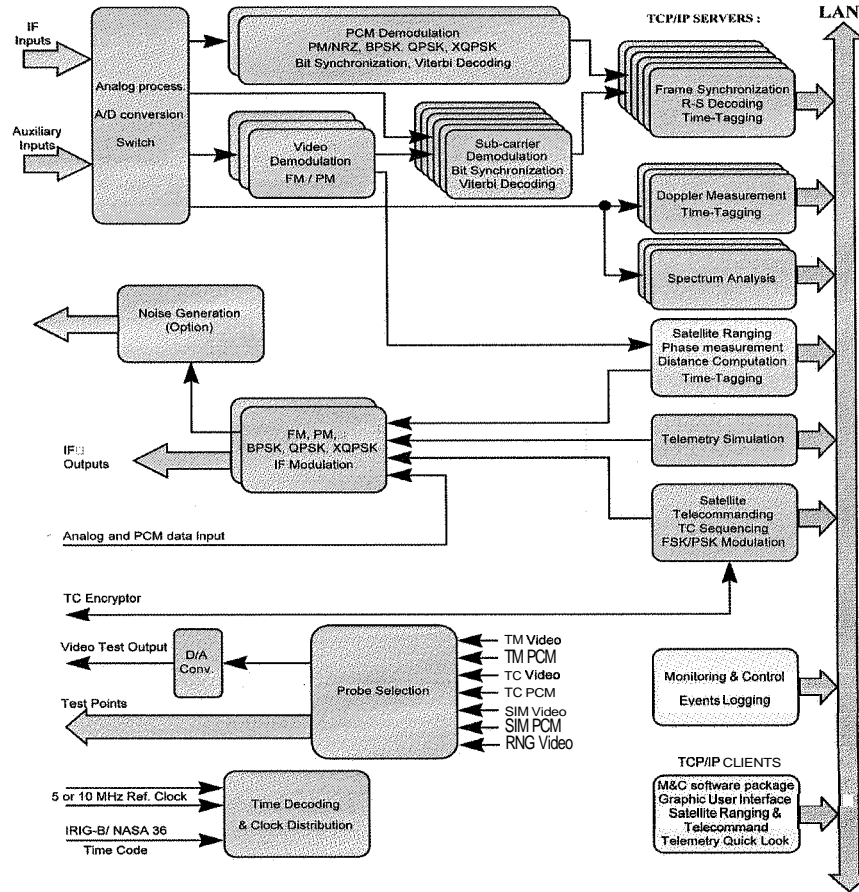
Exemption request : since the beginning of the conception of the Cortex family, an Intel motherboard has been used as the central processor unit of the system.

Intel does not intend to develop a RoHS compliant version of this motherboard, declaring that this product is dedicated to servers and is allowed according to the compliance restriction list of the RoHS Directive.

At this time, In-Snec has not found a similar RoHS compliant product on the market and this product is not replaceable without a complete re-design and re-qualification of the concerned equipment.

Conclusion : In view of these considerations, and without a derogation, In-Snec has no solution to carry on manufacturing these products and requests a exemption from the requirements of article 4(1) of 2002/95/EC Directive for the specific use of lead in solders in our Cortex products.

However In-Snec keep a vigilant watch to improve 2002/95/EC Directive compliance.



U The Cortex CRT communicates with the Control Center via an Ethernet port using TCP-IP protocol. This port is used for exchanging telemetry, telecommand, ranging, monitoring and control, Doppler, logging, ... data as well as file transfer for software upgrade and remote maintenance operations in a multi-clients environment. The built-in Graphic User Interface uses the same communication interface as the control center allowing full control of any Cortex CRT from any PC workstation connected to the network.

Ordering information

• Model reference **CRT**



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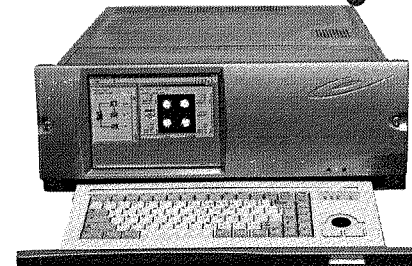
IN-SNEC Normandie : 2, rue de Caen - 14740 Bretteville l'Orgueilleuse - France
 (Headquarters) Ph. +33 (0)2 31 29 49 49 - Fax. +33 (0)2 31 29 49 25

IN-SNEC Paris : 5, avenue des Andes - BP 101 - 91943 Les Ulis Ceder A - France
 Ph. +33 (0)1 69 82 78 00 - Fax. +33 (0)1 69 07 39 50

IN-SNEC Aquitaine : Aérodrome d'Arcachon - 33260 La Teste - France
 Ph. +33 (0)5 57 32 76 30 - Fax. +33 (0)5 57 52 76 40

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CRT

Command Ranging & Telemetry Unit



IN-SNEC

CORTEX Series

CORTEX CRT is the third generation of integrated COMMAND RANGING & TELEMETRY baseband systems designed and manufactured by IN-SNEC since 1990, and based on nearly 20 years experience in equipment and systems for satellite ground control stations

IN-SNEC's products have been selected by the following satellite operators

APSTAR, ARABSAT, ASTROLINK, BSAT, DEUTSCHE Telerom, DLR, ECHOSTAR, ETRI, EUMETSAT, ESA, ESOC, EURASIASAT, FRENCH DOD, GASCOM, INMARSAT, INSAT, KONGSBERG, LSTAR, MCI, MEASAT, MTSAT, MBT / IAI, HISPASAT, NAHUEL, NEWSKIES, NOAA, OPTUS, PANAMSAT, SKYNET, SES AMERICOM, TELESAT, TELESPAZIO, THAICOM, USN

We fly ALCATEL, ASTRIUM, BOEING, LOCKHEED MARTIN, ORBITAL SCIENCES, SPACE SYSTEMS LORAL

CORTEX CRT Main Features

- PC-based architecture with Windows operating system
- User-friendly and intuitive Graphic User Interface
- High integration with drastically reduced hardware For Increased availability
- Enhanced performances, upgradability and flexibility due to extensive use of digital signal processing techniques
- No tuning, no preventive maintenance
- ESA/SLE interface available

CORTEX CRT Missions

- Station keeping, LEDP factory and pre-launch testing
- GEO/LEO, three axis or spin stabilized satellites

CRT

Command Ranging & Telemetry Unit

Telemetry Processing

General

Input frequency	66.0 to 74.0 MHz
AGC range	-25 to -90 dBm 0 to -90 dBm
AGC time constant	1, 10 or 100 ms 0.1 or 1000 ms
Acquisition range	± 10 to ± 500 kHz
Polarization	Diversity combining

PM demodulation

PLL bandwidth	30 Hz to 3000 Hz
Number of receivers	Up to 3 Up to 4
Carrier acquisition	Automatic (FFT analysis ASB)
Acquisition threshold	$C/N_0 < 25$ dB Hz
Acquisition time	< 2 seconds
Maximum Doppler rate	5 kHz/s 10 kHz/s
Doppler measurement	TCP-IP data server integrated Doppler

FM demodulation available

Sub-carrier demodulation & bit synchronization

BPSK SCF	Up to 1.2 MHz Up to 2 MHz
Number of sub-carriers	Up to 6
Bit rate	10 to 250 000 bps
PCM coding	NRZ-L/M/S, BP-LMIS
Acquisition threshold	$E/N_0 = -3$ dB
BER degradation	0.5 dB (typical)

Direct PCM demodulation at IF

Number of receivers	Up to 2
Demodulation	PM/PCM, BPSK, QPSK, OQPSK, SQPSK, AQPSK IM/PCM
Bit rate	1 kbps to 10 Mbps 1 kbps to 40 Mbps
Acquisition threshold	$E/N_0 = -3$ dB
BER degradation	0.5 dB (typical)

Frame processing

Frame synchronization	Fully programmable
CCSDS decoding	PCM decoding, de-scrambling, Viterbi, Reed Solomon, Turbo code
Time-tagging accuracy	± 50 μ s
Real-time data	Up to 32 parameters decommutation
Telemetry storage	On hard disk

IF Modulation

Number of modulators	1 or 2
Modulation	PM, FM, BPSK, QPSK, PMIPCM, OQPSK, SQPSK, AQPSK FM/PCM
Carrier frequency	66.0 to 74.0 MHz
Modulating signals	Up to 3 simultaneously Up to 4
External inputs	Analog or PCM + clock
Frequency deviation	0 to ± 500 kHz
Modulation index	0 to 2.5 radians
Output level	0 to -40 dBm 0 to -60 dBm
Output level accuracy	± 0.5 dBm
IF spurious	< -60 dBc (0 to -20 dBm)
Phase noise	$< 0.5^\circ$ RMS in 1 MHz BW
Frequency sweeping	Range ± 1 kHz to ± 1 MHz Rate 0 to 175 kHz/s Offset 0 to 1 MHz
Viterbi encoding	Yes

Satellite Telecommanding

TC protocol	instructions Pause, Wait & Verify, Wait for absolute time, Group Execute, Idle pattern and Preamble
Modulation	FSK, FSK-HBB, BPSK, FSK + Vail tone, BPSK+AM, SGLS
PCM coding	NRZ-L/M/S, BP-L/M/S
Bit rate	10 to 10 000 bps 10 bps to 1 Mbps
Tone frequencies	100 Hz to 100 kHz

Satellite Ranging

Tone standards	INMARSAT, ESA, ESA-like, USB
Code standards	ESA, SGLS
Tone bandwidth	± 500 kHz
Tone demodulation	2nd order digital PLL
PLL bandwidth	0.1 to 5 Hz
Doppler rate aid available	
Measurement resolution	1 ns
Degradation vs noise	< 0.5 dB from theory
Time-tagging	± 50 μ s accuracy

Simulation and Testing

Telemetry simulation

Modulation	PCM/BPSK or PCM
Simulated TM source	Pseudo, File, TM replay or remote TCP-IP server
BER test	Automatic BER calculation
PCM coding	NRZ-L/M/S, BP-L/M/S
Bit rate & SCF	As per downlink capabilities

Noise generation

Noise channels	2
C/N ₀ dynamic range	50 dB

Time and Frequency

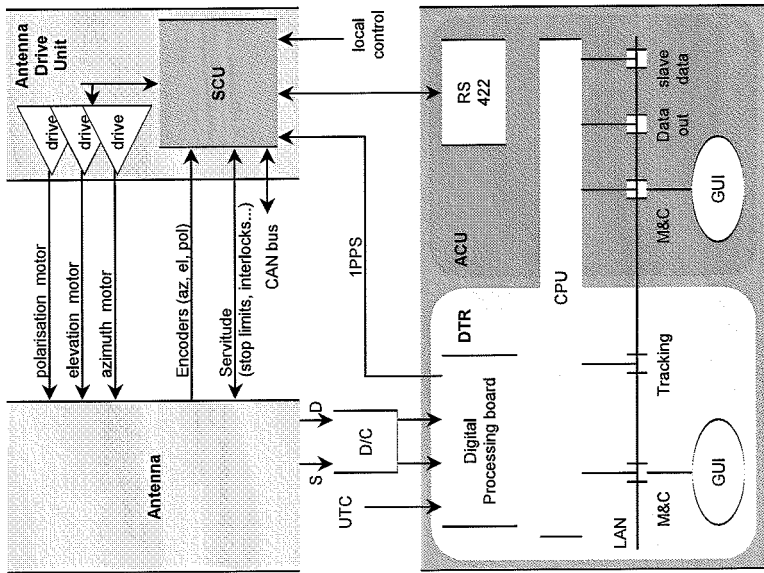
Time	Built-in decoder/generator IRIG-B or NASA-36
Reference clock	Internal or external (5 or 10 MHz)
External clock	2 input ports, in active redundancy
Clock selection	Auto-switching Priority to external clock

Mechanical / Environment

PC chassis	Height 7 inches Width 19 inches Depth 550 mm
Power supply	90-265 VAC - 47-63 Hz
Maximum consumption	1.5 A peak, 220 V
Operating temperature	+10°C to +40°C
Storage temperature	-20°C to +60°C
Relative humidity	40% to 90% RH



ARCHITECTURE



The ACU-DTR CORTEX^{MT} communicates with the Control Center via an Ethernet port using TCP-IP protocol. This port is used for exchanging monitoring and control, tracking, Doppler and logging ... data as well as file transfer (for software upgrade and remote maintenance operations), in a multi-clients environment.

The built-in Graphic User Interface uses the same communication interface as the Control Center, allowing full control of any ACU-DTR CORTEX^{MT} from any other ACU-DTR CORTEX^{MT} or PC workstation connected to the network.

Ordering information

Model reference ACU/DTR



IN-SNEC

IN-SNEC Normandie : 2, rue de Caen - 14740 Breteville l'Ouailleuse - France
(Head Quarters) Ph. +33 (0)2 31 29 49 49 - Fax. +33 (0)2 31 29 49 25
IN-SNEC Paris : 5, avenue des Andes - BP 101 - 91943 Les Ulis Cedex A - France
Ph. +33 (0)1 69 82 76 00 - Fax. +33 (0)1 69 07 39 50
IN-SNEC Aquitaine : Aérodrome d'Anagnin - 33260 La Teste - France
Ph. +33 (0)5 57 52 76 30 - Fax. +33 (0)5 57 52 76 40

<http://www.in-snec.com>

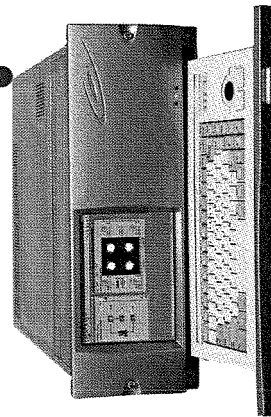


ACU-DTR

Antenna Control Unit
Digital Tracking Receiver



IN SNEC



Functions

■ ACU-DTR CORTEX^{MT} is the first combined equipment, based on nearly 20 years of experience in Antenna Control Unit and Tracking Receiver.

Main Features & Benefits

- PC-based architecture with Windows NT Operating System
- User-friendly and intuitive graphic user interface
- Wide range of configuration parameters and status
- Extensive use of digital signal processing and predictive servo-control techniques for enhanced performances, upgradability and flexibility
- High integration with drastically reduced hardware for increased availability
- No tuning, no preventive maintenance
- Tracking receiver operating modes : true-monopulse, single channel monopulse and step-track, in coherent or non-coherent mode
- Antenna control unit operating modes : auto-track and step-track, for GEO and LEO satellites, or other targets
- Easy connection of the ACU to the Customer's antenna through the SCU electronics providing multiple I/O
- Possible combination with the TTC CORTEX^{MT} product

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ACU Antenna Control Unit

DTR Digital Tracking Receiver

ACU Characteristics

Axis management

- ◆ Programmable axis range (soft limits)
- ◆ Encoders acquisition : up to 20 bits resolution
- ◆ Position resolution : 0.001"
- ◆ Axis velocity : acceleration configurable
- ◆ Specific algorithm for control of single or dual speed motors

Servo-control

- ◆ Full digital servo-control split in ACU and SCU
- ◆ GPC predictive position loops
- ◆ Kalman estimator for monopulse auto-tracking
- ◆ Alternative PID monopulse auto-tracking

Options

- ◆ Extended servo-control pack for GEO application
 - c NORAD track
 - Orbit predictive track
- ◆ Extended servo-control pack for LEO application :
 - Memory tracking (2nd order trajectory extrapolation for LEO tracking)
 - Auto-diversity for dual channel tracking antennas
 - Ephemeris. Slave data table (AZ, EL, UTC) is loaded to the ACU before the satellite tracking.
- ◆ Coordinates conversion (for antenna with tilt axis, or ship-borne)
- g RS232 bus for slave data input
- ◆ Positions readouts made with resolver or synchro
- ◆ Portable control box

Operating modes

- ◆ **Stand-by mode**
 - Axis is braked, drive is inhibited
- ◆ **Manual positioning mode**
 - The antenna is moved to the position provided by a keypad entry
- ◆ **Manual rate mode**
 - ◆ The antenna is moved in CW or CCW by operator action, with configurable velocity
- ◆ **Pre-set mode**
 - Recall of parameters: name of target or satellite, azimuth position, elevation position, polarization position, signal frequency, satellite orbit parameters
- ◆ **Scan mode**
 - The antenna scans around the current position in rectangular mode.
 - Amplitude and velocity are programmable
- ◆ **Slave mode**
 - The antenna is servo-controlled on the angular positions received at a constant rate on a TCP/IP port (azimuth, elevation, polarization)
- ◆ **Auto-track mode**
 - The antenna is servo-controlled on the target with the tracking errors.
 - Transfer to auto-track mode may be done manually or automatically (programmable RF level thresholds)
- ◆ **Step-track mode**
 - Step track parameters are fully configurable
- g **Stow mode**
 - The antenna is moved to a pre-programmed position.
 - The ACU is able to control a stow-pin mechanism if any

DTR Characteristics

Overall functionality

- ◆ Tracking processing from IF (70 MHz) to Ethernet
- g Outputs : AZ/EL errors and IF input level

Tracking outputs

- ◆ Tracking data interface Ethernet / TCP-IP
- ◆ Tracking message contents AZ + EL errors and IF level
- ◆ Message transmission rate 0.02 to 30 seconds
- ◆ Tracking receiver calibration by the ACU via Ethernet / TCP-IP

True monopulse

- ◆ Dual IF inputs : sum channel + multiplexed I&Q error channel)
- ◆ Programmable polarization angle compensation
- ◆ Σ/Δ phase compensation 0 to 360 degrees
- g Σ/Δ phase calibration automatic or manual
- ◆ Calibration data storage (including system configuration) 1024 max

Single channel monopulse

- ◆ Scanning modes Continuous or stepped
- ◆ IF inputs 1 (or 2 for diversity combining)
- ◆ Synchronization input 1, TTL level
- ◆ Scanning frequency 20 Hz to 5 kHz
- ◆ IF inputs (or 2 for diversity combining)

IF reception

- ◆ Input frequency 66 to 74 MHz
- ◆ AGC range -25 to -90 dBm
- ◆ AGC time constant 1, 10 or 100 nis
- ◆ PLL bandwidth 30 Hz to 3000 Hz
- ◆ Acquisition range ± 10 to ± 250 kHz

Operating modes

- ◆ **Non-coherent**
 - IF input Wideband signals
 - Detection filter bandwidth 100 kHz, 1 MHz or 10 MHz
 - Automatic frequency control ON/OFF
- ◆ **Carrier coherent**
 - c IF input Remnant carrier required
 - c Acquisition mode automatic (FFT analysis, ASB)
 - Acquisition threshold C/No c 27 dB, Hz
 - Acquisition time ≤ 2 s

ACU-DTR Characteristics

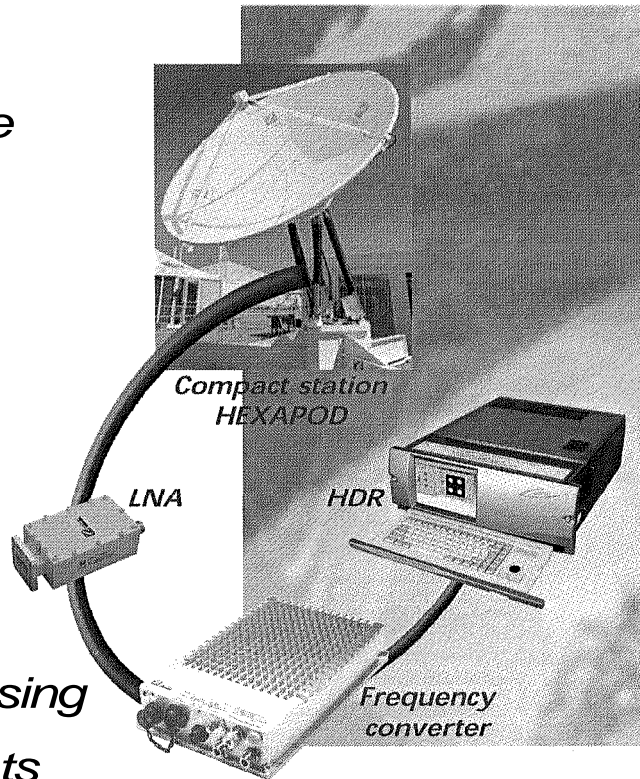
Time and frequency

- ◆ Time Built-in decoder/generator IRIG-B or NASA-36
- ◆ Reference clock Internal or external (5 or 10 MHz)
- ◆ External clock input 2 ports, in active redundancy
- ◆ Clock selection Auto switching
Priority to external clock

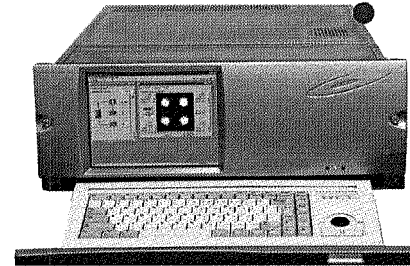
Mechanical / Environment

- ◆ Chassis 19-inch, 4 or 6-Unit rack mountable
- ◆ Supply 90-265 VAC - 47-63 Hz
- ◆ Consumption ≤ 200 VA
- ◆ Operating temperature +10° to +40°C
- ◆ Storage temperature -20° to +60°C
- ◆ Humidity Up to 90% RH non-condensing

A complete
IN-SNEC
 turnkey
 solution
 for YOUR
 remote sensing
 requirements



For more information, refer to the IN-SNEC data sheets :
 ♦ FTP.000103 - X-band compact station
 ♦ FTPOOOIOI - X-band Low Noise Amplifier
 ♦ FTP.000111 - X-band frequency converters



HDR^{XXL}

Multi-Mission
 High Data Rate Receiver



IN SNEC

CORTEX Series

Missions

- Software Defined Radio
- Reception and demodulation for high data rate scientific, remote sensing and telecommunication applications.
- Data acquisition through the Network
 - ♦ Gb/ethernet
 - ♦ Storage Area Network

Examples of missions

(supported without hardware redesign)

ERS SERIES	OFEK	ENVISAT	ICESAT	SDO
AQUA/TERRA	SPOT 4/5	Radarsat 1/2	METOP	IRS
CORIOLIS	Landsat7	NPOESS	EROS-A	LKO
IKONOS	ILEIADES	GOES-R	ORVIEW-3/5	

Main Benefits & Features

- Flawless mission versatility
 - ♦ Perform all current and future missions without hardware redesign
- High data rate payload reception and demodulation
 - 4 Continuously tunable from 500kbps to 2Gbps
- 81 Digital down conversion capabilities
 - ♦ Cost effective from a system point of view
 - ♦ Multiple demods on a single HDR board
- Highly scalable demod
 - ♦ Software upgrade

- DSP based technology with direct analog-to-digital conversion of the received signal
- Full FPGA design
- BPSK, QPSK, O/S QPSK, A/U QPSK, 8PSK, GMSK
- Front end processing
- Less hardware for reliability improvement
- Software based on standard Pentium PC server
- Built-in test & simulation facilities
- Adaptive filtering

Ordering information

■ Model references	HDR without test modulator	SM271002
	HDR with test modulator	SM271003



IN-SNEC

INSNEC Normandie : 2, rue de Caen - 14740 Bretteville l'Orgueilleuse - France
 (Head Quarters) Ph. +33 (0)2 31 29 49 49 - Fax. +33 (0)2 31 29 49 25

INSNEC Paris : 5, avenue des Andes - BP 101 - 91343 Les Ulis Cedex A - France
 Ph. +33 (0)1 69 82 78 00 - Fax. +33 (0)1 69 07 39 50

IN-SNEC Aquitaine : Aérodrome d'Arcachon - 33260 La Teste - France
 Ph. +33 (0)5 57 52 76 30 - Fax. +33 (0)5 57 52 76 40

<http://www.in-snec.com>

HDR

Multi-Mission High Data Rate Receiver

IF Reception

- Dual IF input
- Input Frequency 2x 720 MHz \pm 2.00 MHz & 1.2GHz \pm 330MHz
- I Input impedance 50 Ω
- B AGC time constant 1 ms
- I IF level variation \leq 15 dB/sec
- Carrier acquisition range \pm 10 kHz to \pm 1MHz
- IF bandwidth Automatically adjusted from the symbol rate

Demodulation

- Demodulation BPSK, QPSK, O/S QPSK, A/U QPSK, 8PSK, GMSK
- Continuously tunable from 500 kbps to 2 Gbps
- FEC decoder Viterbi (1/2, 1/3, 3/4, 5/6) Trellis LDPC 7/8
- Synchronization threshold \leq 1 dB (Eb/No)
- Acquisition time \leq 0.25 second
- Real time status IF level, Doppler level, Eb/No level, BER level

Bit synchronization

- Acquisition range \pm 0.3% of the symbol rate
- B BER degradation 0.3 dB @300Mbps and BER 10^{-6} < 2 dB @1Gbps and BER 10^{-6}
- Matched filter I & D, Root Raised, Root Raised cosin, GMSK, Auto-adaptive
- Symbol clock display
- Output ports Separate or merged I & Q channels (Data & Clock)
- Output (electrical) ECL

Front End processing

- Optional software licence
- Real time data storage
- I TCP/IP data interface 1 Gbits Ethernet
- Frame synchronization
- Telemetry Quick Lock
- Data decoding Viterbi single, dual, parallel, RS-CCSDS, RS-DVB, LDPC 7/8
- Derandomizing

Test Modulator board (optional)

IF carrier

- Carrier Frequency 720 MHz, 1-2 GHz
- Output level 0 to -40 dBm (1 dB step)

Noise Source

- B Noise density -105 to 135 dBm/Hz (1 dB step)
- Noise bandwidth

Modulation

- I Modulation B PSK, QPSK, O/S QPSK, A/U QPSK, 8PSK, GMSK
- Continuously tunable from 500 kbps to 2Gbps

PCM simulation

- Operating mode ASCII coded file on hard disk or pseudo-random pattern
 - ◆ Pseudo-random pattern length $2^{10}, 2^{11}, 2^{15}, 2^{23}$
- I BER test capability

Mechanical specifications

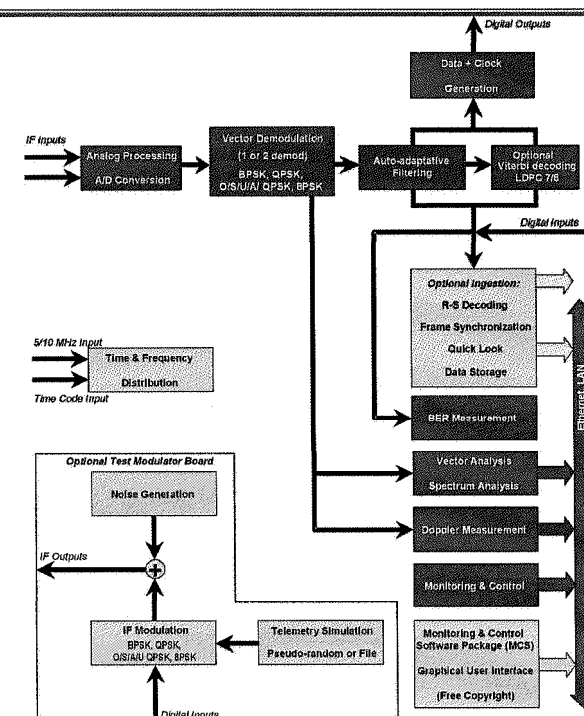
- PC chassis
 - ◆ Height 7"
 - ◆ Width 19"
 - ◆ Depth 550mm

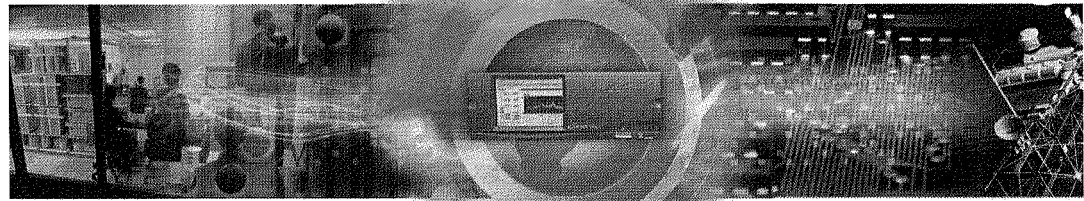
Power supply

- I Power supply Auto range 90265 VAC, 47 to 63 MHz
- Maximum consumption 1.5 A peak, 220V

Architecture

- The HDR is monitored and controlled via an Ethernet port using TCP/IP protocol. The built-in Graphic User Interface uses the same TCP/IP communication interface allowing full control of any HDR from any PC workstation connected to the network.



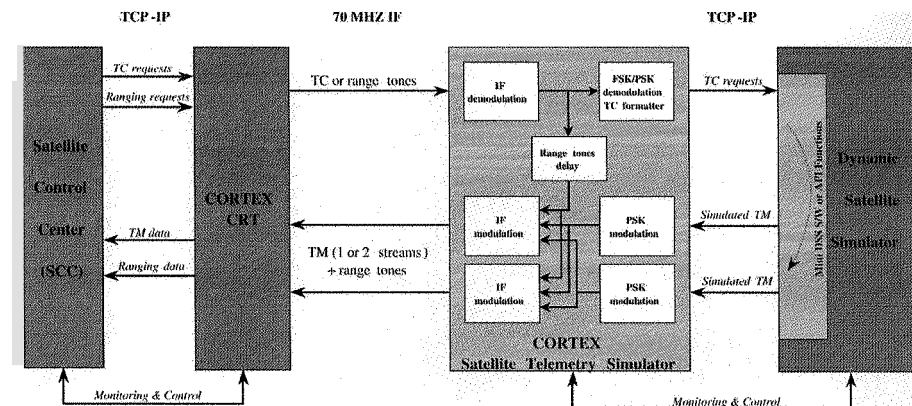


Architecture

The CORTEX STS communicates with the Control Center via an Ethernet port using TCP-IP protocol. This port is used for exchanging telemetry, telecommand, ranging, monitoring and control, Doppler, logging, ... data as well as file transfer (for software upgrade and remote maintenance

operations), in a multi-clients environment.

The built-in Graphic User Interface uses the same communication interface as the Control Center, allowing full control of any CORTEX STS from any PC workstation connected to the network.



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CORTEX STS Satellite Telemetry Simulator

Cortex STS missions

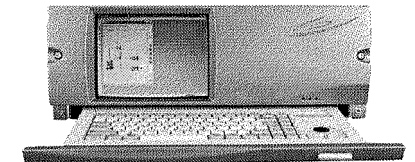
- 4 CORTEX STS is a software package which, in conjunction to a dynamic satellite simulator (DSS), allows for functional testing of the TT&C ground segment (Satellite Control Center, CORTEX CRT and communication network) in operational conditions.

Options

- ◆ Customer-specific API functions for easy interface with the DSS software.
- 4 MINI DSS software for standalone TC/TM loops with TC data dynamically inserted into a pseudo telemetry stream.
- 4 DSS software package : satellite - specific design from detailed specifications.

Cortex STS Main Features

- 4 CORTEX STS requires the same hardware than CORTEX CRT :
 - one Main Signal Processing board
 - one or two IF Modulator board(s).
- ◆ Quick and easy switch from a CORTEX STS machine to a CORTEX CRT machine and vice versa.
- ◆ Both the CORTEX STS and CRT software packages can be mounted in the same chassis with a boot-up menu allowing to operate the unit either as an STS or a CRT.
- ◆ CORTEX STS supports most TT&C modulation and demodulation schemes.



CORTEX Series



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IN-SNEC Normandie : 2, rue de Caen - 14740 Bretteville l'Orgueilleuse - France
(Head Quarters) Ph. +33 (0)2 31 29 49 49 - Fax. +33 (0)2 31 29 49 25

IN-SNEC Paris : 5, avenue des Andes - BP 101 - 91943 Les Ulis Cedex A - France
Ph. +33 (0)1 69 82 78 00 - Fax. +33 (0)1 69 07 39 50

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Ph. +33 (0)5 57 52 76 30 - Fax. +33 (0)5 57 52 76 40

Email contactinsnec@zodiac.com

<http://www.in-snec.com>



Specifications

IF Demodulation

Number of IF Receivers	1 or 2
IF frequency	66 to 74 MHz
Demodulation	FM or PM
Other characteristics	Refer to the CORTEX CRT User's Manual

Demodulation at Baseband

Demodulation	FSK, FSK-HBB, FSK + Validation Tone, BPSK
FSK tone frequency	≤ 100 kHz (" 0 ", " 1 ", Execute)
BPSK SCF	5 128 kHz
Bit Rate	≤ 10 kbps
PCM code	NRZ-L/M/S, BPL/M/S

TC Formatter and TCP-IP Data Server

TC formatter output	TC requests, Execute and Pause instructions Idle and Preamble detection
TCP-IP format	CORTEX CRT Ethernet ICD (STI 100013_CRT)

Range Tone Processing

Tone delay	0 to 1 second in 1/312500 second steps
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Telemetry Simulation

Number of TM Simulators	1 or 2
Modulation	PCM/BPSK
BPSK SCF	≤ 128 kHz
Bit Rate	≤ 19 kbps
PCM code	NRZ-L/M/S, BPL/M/S
Operating mode	LAN (data received from the DSS) or FILE (files on hard disk)

IF Modulation

Number of IF Modulators	1 or 2
IF frequency	66 to 74 MHz
Modulation	FM or PM
Modulating signal	Simulated telemetry (from TMS-1 or TMS-2 or TMS-1 & 2), or/and delayed range tones
Other characteristics	Refer to the CORTEX CRT User's Manual

Options

Optional MINI DSS Software

- ◆ Acquisition of reconstructed TC requests and TC instructions from the CORTEX STS.
- + TC data extraction and insertion in a simulated telemetry data stream.
- ◆ Transmission of simulated data packets to the CORTEX CRT;
- ◆ The MINI DSS software can be installed in the CORTEX CRT machine or any remote PC workstation on the LAN.

Optional API Functions

- ◆ Contact IN-SNEC for more information (detailed DSS interface specifications required)...

