THALES
BROADCAST & MULTIMEDIA

Affinity®

200-Watt

LBD-200C-N1

L-Band Digital Transmitter

PRELIMINARY DRAFT

Product Manual

Safety Notice

In compliance with Federal Regulations, 29 CFR 1910.1200, Material Data Sheets (MSDS) are provided for each potentially hazardous material supplied. Please review this information thoroughly.

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For technical support call 1-800-345-9295 or log on to our web site at www.thales-bm.com.

Manufactured in the United States of America

1 Preface

Congratulations on purchasing a Thales Affinity® Transmitter. We would like to welcome you to the future of digital broadcasting and especially to the Thales Broadcast & Multimedia family.

Your Affinity® is a state-of-the-art low power digital L-Band transmitter. In addition to the sophisticated on-board diagnostic test and measurement features, major assemblies within the Affinity® are housed in a convenient modular plug-in package. This modular design philosophy allows for “Hot Swap” module replacement without the necessity of shutting down the entire transmitter for long periods. The “Hot Swap” plug-in module feature virtually eliminates costly downtime.

Before receiving your Affinity®, the transmitter was subjected to a battery of quality assurance inspections and functional tests to assure years of dependable and reliable on-air broadcasting. In addition to ensuring that the appropriate support materials are supplied with the transmitter, it should be comforting to know that Thales Customer Service representatives are only a click http://csg.us.thales-bm.com or phone call (800-345-9295) away. Check out the volumes of Thales product support literature, service bulletins, and other related information on our service web site, and be sure to visit us at our upcoming trade-shows and forums.

Again, thanks for choosing Thales Broadcast & Multimedia as your digital broadcasting partner.

Affinity® LBD-200C-N1 Transmitter

2 Introduction

The intention of this Affinity® *Product Manual* is to familiarize an operator with the setup, basic operation, and functions of the Thales Affinity® LBD-200C-N1 L-Band Transmitter.

Non-technical personnel should avoid performing any operations and/or procedures contained within this manual without obtaining the proper training. Semi-technical personnel may perform the operations and/or procedures appropriate to their skill-level and training.

It is highly recommended that the normal operation, maintenance, and servicing of this transmitter be performed only by qualified and trained technicians or personnel.

CAUTION: Observe caution while at the transmitter site or while engaged in any transmitter maintenance. Refer to the Safety section of this manual for additional information on the dangers and hazardous conditions that are present in and around the transmitter site, and on the precautions the operator must observe while working within the transmitter area.

3 Safety Information

3.1 Introduction

The Thales Broadcast & Multimedia Affinity® transmitter conforms to the safety information contained in the International Electrotechnical Commission (IEC) publication 60215 (1987-06) (www.iec.ch). The design and manufacturing approach of the transmitter will protect the operator from dangerous voltages, heat, radiation, and other hazards if operated within the confines of the specification. Thales has attached warning labels to the enclosures and/or various assemblies to identify potentially dangerous conditions to the operator. Operators must adhere to these warning labels.

Thales recommends that only skilled personnel, as defined by the IEC 60215 publication, be permitted to operate the transmitter. Proper training and correct equipment operation will remove the risk of hazardous conditions and dangers to the operator.

3.2 Warnings, Cautions, and Notes

This manual contains **WARNING** and **CAUTION** notices that identify procedures, conditions, and materials that could potentially cause death, injury, or damage to equipment.

A **WARNING** notice will appear before a procedure or instruction if injury or death could result from performing the procedure or instruction incorrectly.

A **CAUTION** notice will appear before a procedure or instruction if equipment damage could occur from performing the procedure or instruction incorrectly.

A **NOTE** appears after a paragraph to highlight important information.

WARNING
This equipment uses dangerous voltages that can cause injury or death. Observe applicable safety precautions.

CAUTION
Do not operate the transmitter with the antenna and station-load disconnected. Doing so may damage the transmitter.

Warning and Caution Samples

NOTE: The RF Sample contains pre-distortion and is not representative of output signal. The RF sample is a reference point for testing only.

Note Sample

3.3 Safety Symbols

Assemblies within the transmitter system that contain high voltage conditions have safety symbols attached to them.

HIGH VOLTAGE

This symbol identifies the presence of high voltage that can cause injury or death.

3.4 Electrical Shock and the Human Body

Electrical shock or electrocution occurs when the body becomes part of an energized electrical path and this electrical energy passes through the body.

The body subjected to a difference of potential, or stored electrical charge causing current to flow through the body, will be shocked or electrocuted. Effects of electrical shock may include severe burns to the skin and/or internal organs and respiratory or cardiac arrest. Any electrical current that flows through the central nervous system of the human body has the potential to cause serious injury or death.

Severity of electrical shock depends upon the source and duration of exposure. Use the following information in conjunction with a vigilant and on-going safety program. This information is in general terms and does not include unknown variables that may increase susceptibility to electrical shock. Always exercise **Awareness and Caution**.

Direct Current (DC): Low voltage (up to 72 VDC) usually does not present a hazard to human life, but a severe burn is possible under some conditions. Medium and high voltage (greater than 72 VDC) can cause severe shocks, burns, and even death.

Alternating Current (AC): At commercial frequencies (50-60 Hz) and intermediate voltages (72 to 600 VAC), lethal current can flow through the body. Even low AC voltages (24 VAC or less) under certain circumstances can be dangerous and lethal. The danger of shock is less at high frequencies, but radio-frequency (RF) burns are possible.

Body Resistance: The resistance of the body and the amount of insulation between the body and electrical earth-ground determine the amount of electrical current that passes through the body. The skin presents the greatest resistance of the human body to impede current flow. Please note that s*kin resistance decreases with increased voltage*.

Time of Contact: The length of time the body remains in contact with electrical current determines the severity of possible injury. Burns break down the skin and thus lowers the body's ability to resist electrical current. The more extensive the burn, the less resistance the skin provides. As current flow increases, so does the severity of the shock. The duration of contact is critical. Current flowing through the body causes loss of muscle control, chest contractions (breathing is impaired) and ventricular fibrillation of the heart. During fibrillation, the heart cannot pump sufficient quantities of blood.

Magnitude: The magnitude of the electrical current determines the extent of muscle-control loss, effects on the heart, and severity of burns.

Path: The path of the electrical current through the body is critical. When current passes from hand to hand, or hand to foot, the brain, heart, lungs, and spinal cord, which become part of the electrical path, are affected.

Age and Condition of Victim: The age and physical condition of the victim affects the severity of electrical shock. Elderly victims, young children, or those with existing medical conditions, are more susceptible to injury caused by electrical shock.

3.5 Emergency Procedures for Electrical Shock

Anyone engaged in electrical or electronic work should be aware of the proper safeguards and emergency procedures related to hazardous electrical conditions. An understanding and knowledgebase regarding electrical hazards will reduce the risks and dangers of electrocution. Obtaining safety related training courses such as First Aid and CPR, and applying them during emergencies, might greatly reduce the effects of electrically induced injuries.

Promptly report to the appropriate personnel any electrical “popping” or sparking, and any noticeable defects or hazardous conditions that can cause injury, property damage, or interference to the electrical equipment.

Immediately report any electric shock received to the appropriate supervisor or safety personnel.

In the event that an individual comes into contact with a live electrical circuit:

- **Cut off the power**. Learn how to remove power anywhere within the work area.
- **Free a victim from a live circuit**. If a person is “frozen” to a live electrical contact, turn off the power if possible. If you cannot turn off power, use wooden boards, poles, sticks, a belt, dry rope, articles of clothing or some other **nonconductive material** of sufficient strength to pull the affected person from electrical contact.
- **Contact emergency personnel.** Immediately contact emergency medical personnel. *Only qualified and trained personnel should perform First Aid procedures*.

WARNING
Under no circumstances touch a victim exposed to a live circuit. Doing so will place you in the live circuit, and may result in injury or death due to electrocution.

Victim in live circuit Warning

3.6 Transmitter Electrical Hazards

WARNING
Use appropriate practices when working near high voltage. The removal of panels identified with warning symbols can expose the mains voltages. These voltages can cause injury or death.

Transmitter Electrical Hazards Warning

The transmitter uses lethal voltages that can cause injury or death. The transmitter assemblies fully enclose these voltages to prevent accidental contact.

Thales recommends these safe-working practices:

- Operate and maintain the transmitter according to the instruction manuals.
- Do not allow personnel to work alone on the transmitter.
- Permit only skilled personnel to operate the transmitter. See IEC 60215.
- Ensure personnel know the location of circuit breakers and mains disconnect switches.
- Ensure the transmitter is OFF, disconnected from the AC mains voltage, and secured via a lock-out/tag-out process before working in any areas identified with warning symbols.
- Ensure all personnel have training in First Aid and CPR procedures.

4 Features

4.1 Overview

The Thales Broadcast & Multimedia Affinity® is an advanced low power solid-state Coded Orthogonal Frequency Division Multiplexing (COFDM) Digital Video Broadcast-Terrestrial (DVB-T/DVB-H) transmitter. The Affinity® is fully compliant with European Telecommunications Standards Institute (ETSI) EN 300744 DVB-T, EN 302304 DVB-H specification requirements, and complies with all FCC requirements. The design goal of the Affinity® family of transmitters was to allow broadcasters to cost effectively begin broadcasting in DVB-T/DVB-H formats while accomplishing the following objectives:

- Optimum signal performance in all operating modes
- Maximum redundancy for 100% power output
- Ease of initial setup and operation
- Ease of monitoring and diagnostics
- Flexible solutions for all site layouts and installations

The Affinity® L-Band solid-state low power transmitter is available in several models providing output powers ranging from 50 to 400 Watts average (rms). The transmitter brand can house up to sixteen high-gain full-band GaAs FET amplifier modules operating in parallel. The quantity of amplifiers installed for a system is determined by the desired output power.

Each Affinity® transmitter is provided with a DVB-H RF Sirius Exciter containing linearization circuits to compensate for both linear and non-linear distortions. The correction can be operated in an adaptive mode allowing automatic compensation and signal optimization.

The Affinity® family of solid-state low power transmitters includes an advanced control system providing enhanced monitoring and diagnostic capability. The single or dual drive configuration determines the operating interface for the system.

For single drive (SD) configurations, the front panel of the DVB-H RF Sirius Exciter includes a Local Control & Monitoring Panel (LCMP) with a man-machine interface (MMI). The MMI consists of a front panel Liquid Crystal Display (LCD) and a soft-key activated menu that provides transmitter controls, power readings and alarm indicators.

For dual drive (DD) operation, each of the DVB-H RF Sirius Exciter units are controlled by an external Central Processing Unit (CPU) that includes switchover management for a Web server or SNMP agent. The LCMP for dual drive operation consists of a color touch screen with menus and bar graph.

Remote operation for both configurations can be made by either an embedded Web server through a standard browser, or through a SNMP agent by means of an SNMP manager.

4.2 Affinity® Low Power Transmitter Configurations

There are three basic transmitter configurations available:

Single Drive – One exciter/driver chain drives the power amplifiers in parallel. This configuration includes options for N+1 power supply.

Dual Drive – Two exciter/driver(s) operating in a main/standby automatic switching mode drives the power amplifiers in parallel. This configuration includes options for N+1 power supply.

Diversity Transmitter – This configuration can feed four antennas in 90° sectors. There are two independent single drive transmit chains fed by a common exciter with embedded time delays on each output. The exciter time delay function is defined in the DVB-H standard, EN 300744. The delay must be within the guard interval defined in the network, and should add a few microseconds of delay in relation to the other transmitter in the site. The timing information can be sent to the transmitter via the Megaframe Information Protocol (MIP) or can be adjusted locally in the modulator.

4.3 Affinity® Family Construction

The Affinity® family of low power solid-state DTV transmitters is designed to provide maximum flexibility for site layout and installation. All of the transmitter chassis are designed to fit in EIA standard 19” wide equipment cabinets. Outdoor installations are equipped with high quality front and rear access enclosures. These enclosures maintain security and protection against external elements. Transmitter systems are available in several configurations based on output power, redundancy options, and site system requirements.

Single channel, non-redundant transmitter configurations (SD) are sized as follows:

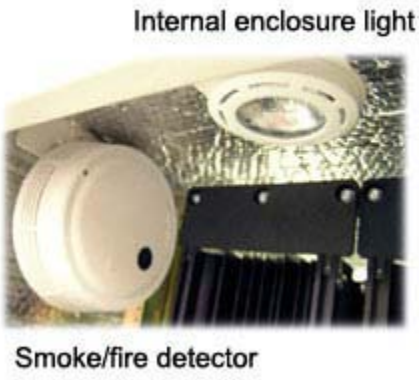
- For 50 to 125 watt average output power levels, the upconverter and amplifier are self-contained in a single 6 rack unit (RU) chassis. The N+1 capable power supply is housed in a 3RU chassis, and the Thales DVB- T/H RF exciter is contained in a 2RU chassis. This 11RU transmitter is the most compact Thales Affinity system.
- For 200 watts average output power levels, three chassis are used (14RU total). The upconverter assembly is self-contained in a single 3RU chassis. The power amplifiers are housed in a 6RU chassis. The N+ 1 capable power supply is housed in a 3RU chassis and the Thales DVB- T/H RF exciter is housed in a 2RU chassis.
- For 400 watts average output power levels, four chassis are used (20RU total). The upconverter assembly is self-contained in a single 3RU chassis. The power amplifiers are housed in two 6RU chassis. The N+1 capable power supply is housed in a 3RU chassis and the Thales DVB- T/H RF exciter is housed in a 2RU chassis.

A dual drive transmitter operating in main/standby configuration (DD) is sized as follows:

The Thales DVB-H RF exciter is contained in a19” 9RU chassis that includes: 2RU chassis for the DVB-H RF exciters, 3RU chassis that house the CPU board with PSU, the DVB-H RF Exciter/Up Converter, and the amplifiers interface board. 1RU is used for the fan unit and air inlet, and 1RU for the dedicated front panel that supports the touch screen and bar graph.

The transmitter uses self-contained ambient forced air-cooling (front to back airflow). All fans are internal to the chassis. Refer to the Cabinet Air Conditioning section of this manual for additional details of the LBD-200C-N1 transmitter cooling and environmental control systems.

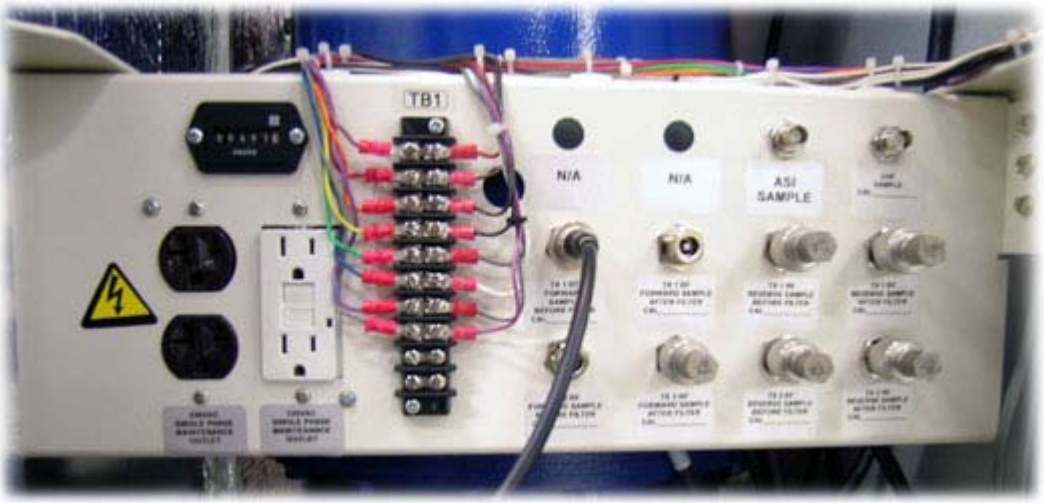
The transmitter system including all ancillary equipment is housed in a Nema 3R rated enclosure with approximate dimensions: 74” H x 44” W x 44” D. This self-contained unit features eyelets for lifting the entire assembly during installation. The base has mounting provisions for mechanical and electrical attachments to building structures. Equipment access is achieved through front and rear opening doors fitted with locks and intrusion alarms with remote signaling. Internal enclosure lights illuminate when any door is opened during maintenance. A smoke/fire detector with remote signaling is utilized to provide the earliest warning of catastrophic failure caused by a natural occurrence or other means.



Located inside the enclosure is an EIA standard 19” rail structure system used for rack mounting each sub system contained in the Affinity® configuration.

The AC distribution system is comprised of: 120/230VAC surge suppression with alarms, two 230VAC outlets, and two 120VAC outlets with separate circuit protection. Four 230VAC utility outlets are provided along with four UPS protected outlets located along the rear corner of the enclosure. These outlets are intended to connect transmitter ancillary equipment. An external disconnect box allows connection of a portable generator. An AC hour-meter will record the operational hours of the equipment.

A UPS is employed to keep critical subsystems running in instances of temporary AC power loss. The 230VAC UPS output is capable of 700VA/490W. Storage for the UPS is via two 24VDC extended battery modules capable of providing an output of approximately 210 Watts for 400 Minutes (6.9 Hrs). This power is intentionally distributed to the site management system, satellite receiver, and DVB-T/H RF exciter to enable status communications from the site, back to the operations center, to continue while normal operating site power is absent. Having the exciter and satellite receiver powered up also minimizes transmitter restart times once normal site power has been restored.



AC Distribution System Panel with AC Hour Meter and IF and RF Sample points

UPS System

UPS & Utility outlets
(rear side of cabinet)

Bandpass filter

A bandpass filter with integrated RF probes provides the filtering required to comply with FCC specifications and to achieve high-level out-of-band emission compliance. A circulator, with load, also an integral part of the RF system, is mounted internally to the cabinet.

A two side-mounted air conditioner unit will provide environmental stabilization for the transmitting system. A temperature sensor with remote signaling monitors and reports out of tolerance internal operating temperatures. Weatherproof coax and AC entry ports located on the side of the cabinet provide for easy access during installation. Critical IF and RF sample points

used for monitoring and troubleshooting are accessible internally from the front-side of the cabinet. All service and external interface points are easily accessible through the front, rear and left side of the cabinet. The right side of the cabinet is intentionally left blank for installation near a build wall or similar structure. Most field replacement units are front-loaded. Each cabinet assembly is designed to fit through typical building service entries requiring no major structural changes for installation. An optional rain shield can be provided to aid in protection against a sudden change of weather during maintenance; however for safety reasons maintenance in poor weather is not suggested nor recommended by Thales. Refer to the cabinet layout diagrams in the Block Diagram and Schematics section of this manual for further detail.

The modulator supports 2k, 4k & 8k operating modes, and is well suited for Multi Frequency Networks (MFN), Single Frequency Networks (SFN), and Hierarchical operation. The modulator has been seamlessly integrated as part of the Affinity® transmitter

Each Affinity® L-Band transmitter incorporates GaAs amplifier architecture. The Affinity® transmitter is integrated with the most advanced heat sink technology, and the integral forced air-cooling system of the Affinity® virtually eliminates the need for external blower units. The Affinity® line of transmitters are fully compatible with DVB-H standards and feature advanced embedded software for alignment and system management.

4.4 Additional Affinity® Features:

- Advanced embedded microcontroller design; all transmitter performance adjustments are programmable and password controlled.
- No mechanical tuning required.
- Software setup and control via front panel RS-232 communication ports and/or Local MMI.
- Built-in RS-485 network hardware used to interface control and monitor systems.
- SNMP, Web Server, etc.
- Built-in diagnostics with front panel Liquid Crystal Display (LCD) status display.
- Controlled fold-back VSWR protection. Fast shutdown under extreme reflections.
- Soft fold-back of output power under Power Amplifier Segment (PAS) fault conditions.
- Modular front panel plug-in design for easy maintenance and repair.
- Field Replaceable Unit (FRU) modules are common among the different power levels.
- Incorporated “Hot Swap” solid-state final power amplifier architecture

The Affinity® includes an advanced control system that provides for enhanced monitoring and diagnostic capability. The control system includes a screen-display for detecting and locating equipment malfunctions and faulty subassemblies. The control system interface consists of a front panel LCD and a soft-key activated menu. Alarm indicators and normal controls, as well as power readouts, are available via the display assembly.

The Affinity® transmitter incorporates the Omnitronix SL81 Status Control and Monitoring Systems (SCMS). (See SCMS section of this manual for operational details.)

5 Specifications

5.1 Affinity® LBD-200C-N1 Transmitter Specifications

Parameter	Specification	Test Conditions/ Notes
Transmitter Output		
Average Output Power at the transmitter output (using RF probe to sample main output; N-connector)	54.5 dBm in application with channel filter	1. Thermal power sensor is recommended to verify average output power. 2. Modulated carrier 3. UHF input frequency 670 – 675 MHz 4. UHF input power –18dBm ±3dB 5. UHF input waveform COFDM DVB-H 6. ALC – ON, AGC – ON 7. Linearization – ON
Average Output Power at the channel filter output (using RF probe to sample main output; N-connector)	53 dBm assuming 1.5 dB insertion loss of the circulator, channel filter, RF probes and jumper cables	1. Thermal power sensor is recommended to verify average output power. 2. Modulated carrier 3. UHF input frequency 670 – 675 MHz 4. UHF input power –18dBm ±3dB 5. UHF input waveform COFDM DVB-H 6. ALC – ON, AGC – ON 7. Linearization – ON
Out of band Intermodulation Products / Adjacent Channel Interference	FCC spectral mask definition for the 1670-1675MHz band per FCC Document 47, Telecommunications: Part 27, Miscellaneous Wireless Communications Services: Section 53, Emissions Limits. Subparts (i), (a) (4) Sidelobe power spectral density (PSD) across 1MHz shall be attenuated below the TX (PSD) power (P) by 43+10log (P)	Spectral Mask must be measured at the output of the channel filter. TX input has to exceed FCC spectral mask definition if OEM exciter is used. For TX compliance shoulder level typically should be better than 50dB at breakpoint w/ minimum of 8db non-linear correction capability. 1. Thermal power sensor is recommended to verify average output power. Emissions measured with spectrum analyzer or VSA RBW=30kHz VBW= 100Hz 2. Modulated carrier 3. UHF input frequency 670 – 675

Parameter	Specification	Test Conditions/ Notes
		MHz 4. UHF input power –18dBm ±3dB 5. UHF input waveform COFDM DVB-H 6. ALC – ON, AGC – ON 7. 7. Linearization – ON
Out of band Intermodulation prior to channel filter	Per spectral mask defined as: Lower Channel edge falls between 1670-1670.122875 MHz Shoulder at 1669.822975 MHz and lower must be≤ -32 dBc Upper Channel edge falls between 1674.877125-1675 MHz Shoulder at 1675.177125 MHz and above must be≤ -32 dBc	TX input has to exceed FCC spectral mask definition, if OEM exciter used, in order for TX compliance shoulder level typically should be better than 50dB at breakpoint w/ minimum of 8db non-linear correction capability. 1. Thermal power sensor is recommended to verify average output power. Emissions measured with spectrum analyzer or VSA RBW=30kHz VBW= 100Hz 2. One modulated carrier 3. UHF input frequency 670 – 675 MHz 4. UHF input power –18dBm ±3dB 5. UHF input waveform COFDM DVB-H 6. ALC – ON, AGC – ON 7. Linearization – ON
Inband Intermodulation	Intermodulation products shall not exceed –30dB when comparing portion of the mean power spectral density of the wanted COFDM signal relative to the same portion when “n”-number of carriers are switched off. Sampled bandwidth not to exceed bandwidth of carriers removed.	Modulator must have facility to switch off a block of carriers within the COFDM signal and have better than –33dB IM when same test is conducted at input. 1. Thermal power sensor is recommended to verify average output power. 2. One modulated carrier 3. UHF input frequency 670 – 675 MHz 4. UHF input power –18dBm ±3dB 5. UHF input waveform COFDM DVB-H 6. ALC – ON, AGC – ON 7. Linearization – ON
Transmitter Frequency Response, fixed 5 MHz channel	Relative to the level at $f$center shall not deviate by more than +/-0.5dB across the frequency range $f$center –2.4MHz to $f$center +2.4MHz.	Frequency response is measured at the output of the channel filter. Test is done using spectrum analyzer with modulated input waveform and: 1. UHF input frequency 670 – 675 MHz

Parameter	Specification	Test Conditions/ Notes
		MHz 2. UHF input power –18dBm ±3dB 3. UHF input waveform COFDM DVB-H 4. ALC – ON, AGC – ON (if spectrum analyzer or VSA is used; both OFF if network analyzer method is used) 5. Linearization – ON
Transmitter Group Delay, fixed channel, 5 MHz wide	Over the frequency range $f$center – 2.4MHz to $f$center +2.4MHz shall not exceed +/-200nS relative to the delay at $f$center	Group Delay is measured at the output of the channel filter. Test is done using network analyzer broadband detection from UHF input to channel filter output. Modulator must compensate +/-100 ns of delay and: 1. UHF input frequency 670 – 675 MHz 2. UHF input power –18dBm ±3dB 3. IF input waveform COFDM DVB-H 4. ALC – OFF, AGC – OFF 5. Linearization – ON
Transmitter Carrier to Noise (C/N)	≥ 55 dB	C/N is measured at the transmitter output (no channel filter). RF Output power, 5 MHz channel, measurement conditions 1. UHF input frequency 670 – 675 MHz 2. UHF input power –18dBm ±3dB 3. IF input waveform COFDM DVB-H 4. ALC – OFF, AGC – OFF 5. Linearization – ON Thermal Noise Power is measured at 5MHz BW at the channel center frequency. Measurement is done with Spectrum Analyzer or VSA using PSD.
Spurious Products (Undesired signal power 2 dB higher than the nominal PSD of the adjacent spectral regions that is harmonically related to unmodulated carrier)	≤ -60 dBc	Relative to nominal modulated power measured @ 100 kHz RBW at the channel filter output.

Parameter	Specification	Test Conditions/ Notes
Harmonics (Undesired signal power 2 dB higher than the nominal PSD of the adjacent spectral regions that is harmonically related to unmodulated carrier)	≤ -60 dBc	Relative to nominal modulated power measured @ 100 kHz RBW at the channel filter output.
Output Frequency	Single channel, factory selected at 1670-1675MHz, 5 MHz wide	
Output Spectrum Orientation	Non-Inverted	
Output Impedance Output Return Loss	50 Ω 15 dB	Measurement of the output return loss at the N connector of transmitter with all amplifiers connected and turned on. From 1670-1675MHz
RF Output Regulation	≤ ± 0.3 dB	Measured at transmitter output at nominal output power and: 1. UHF input frequency 670 – 675 MHz 2. UHF input power –18dBm ±3dB 3. UHF input waveform COFDM DVB-H 4. ALC – ON, AGC – ON 5. Linearization – ON RF output regulation is defined as regulation vs. temperature.
Hum and Noise	≤ -60 dBc	Test of power supply DC output under full load measurement by ratio of RMS hum or noise to the corresponding DC voltage
MER	≥ 30 dB	Measurement at nominal output power COFDM DVB-H, Measured at channel filter output MER = 20 log (EVM/100)
Error Vector Magnitude (EVM)	≤ 3.16%	Measurement at nominal output power COFDM DVB-H, Measured at channel filter output
Transmitter Output MUTE	Loss of lock of the local oscillator Loss of input signal User force to standby condition Transmission shutdown when the SFN timing is out of limits Transmission shutdown when wrong region program is applied to the Modulator. Transmission shutdown when	Transmission start-up when any of the conditions are cleared

Parameter	Specification	Test Conditions/ Notes
	equipment temperature or RF reverse power limits are severely exceeded	
Transmitter start up time From Cold or long AC absence From Standby From Reset	 < 10 seconds < 7 seconds < 7 seconds	Time measure; from AC application to RF output enabled and at nominal output power.
Single frequency network timing	The transmission timing of each Transmitter site with respect to all others in the network controlled to within a tolerance of 300nS	

Parameter	Specification	Notes / Test Conditions
Exciter		
Transmission Characteristics	Emission standard: DVB-H Modulation scheme: COFDM Bandwidth: 5, 6, 7, or 8 MHz	
Environmental and Safety	Guaranteed performance: 0^{o} to 45^{o} up to 3000m Safety: IEC215, IEC1010 Acoustic noise: IEC 179: <65dBa	
General Mechanical	Rack: 19” 2U, depth 450mm Cooling: 4 internal fans, front to rear	
Input Power	Voltage: 230V/105V ±15% Frequency: 47-63 Hz Consumption: <200VA	
Transport Stream Input	Dual A and B ASI inputs	
RF Output	Standard: DVB-H Power: 0 dBm Output connector: 50ohm, BNC Frequency: agile between 40-862 MHz	
Intrinsic Signal Quality	Global MER: $\geq$38dB MER per carrier: $\geq$38dB EVM on each carrier: < 1% BER before Viterbi: $\leq 1x10^{-6}$ END: $\leq$0.1 dB In band frequency response: $\leq \pm$ 0.2dB Group delay ripple: $\leq \pm$ 10ns	
Intrinsic Out of band Emissions	Shoulders at ± 500kHz: $\geq$ 46dB Shoulders at ± 10 MHz: > 50dB Spurious < 1GHz: >50dB	
Transmission Characteristics	Emission standard: DVB-H	

	Modulation scheme: COFDM Bandwidth: 5, 6, 7, or 8 MHz	
LO Frequency	1000MHz	Main LO used to convert UHF to Microwave channel
LO Frequency Stability All conditions	Without GPS drift correction: $\leq \pm 1$ part in 10^{10} over any one-year period without adjustment. With GPS drift correction: $\leq \pm 5$ parts in 10^{7} over any one-year period without adjustment.	
LO power	+5dBm, ± 3 dB	Direct measurement of microwave LO
LO Harmonics	-20 dBc	Measured at the LO TP
Non-Harmonic Spurious	100Hz < f_{offset} < 10KHz, -70dBc 10KHz < f_{offset} < 20MHz, -60dBc Other < –65dBc	Measured at the LO TP
LO Warm-up time	5min for frequency accuracy of $\leq \pm 5$ parts in 10^{8}	
Aging	1 day ± 1 parts in 10^{9} 1year ± 2 parts in 10^{7}	
SSB Phase Noise	≤55 dBc/Hz @ 10Hz offset ≤85 dBc/Hz @ 100Hz offset ≤85 dBc/Hz @ 1 KHz offset ≤105 dBc/Hz @ 10 KHz offset ≤112 dBc/Hz @ 100 KHz offset ≤130 dBc/Hz @ 1MHz offset	Direct measurement of microwave carrier set to CW tone.
Frequency Reference input	0 dBm ± 5 dB (+48 dBmV) ± 5 dB	
Input Return Loss	18dB	Measure at the IF input connector
Frequency Reference Connector	BNC-female	
Frequency Reference Impedance	50Ω	

Parameter	Specification	Notes / Test Conditions
Upconverter Amplifier INPUT		
UHF Input Frequency	670.000-675.000 MHz (5 MHz BW)	If OEM exciter used, Input frequency has to be within acceptable tolerance to fulfill output frequency stability requirements prescribed by FCC.
UHF Input Frequency stability	With GPS drift correction: $\leq \pm 1$ part in 10^{10} over any one-year period without adjustment. Without GPS drift correction: $\leq \pm 5$ parts in 10^{7} over any one-year period without adjustment.	Input frequency has to be within ±1kHz window to fulfill output frequency stability requirements prescribed by FCC Section 2.1055 (a) (1) / 73.687 / 21.101 (a)

Nominal Input Power, Average	-18dBm	188 Thermal power sensor is recommended to verify average input power. Or PSD method 2. UHF waveform COFDM DVB-H
Input Power variation All conditions	± 3 dB from nominal input power	
IF input Survivable Power, NO DAMAGE	10 dBm	AGC and ALC on; input level at 0dBm
Spectral Mask of the input signal	Exceed FCC spectral mask definition for the 1670-1675MHz band	
Input Return Loss	10dB	Measure at the IF input connector
Input Impedance	50 Ω	
UHF Input Connector	BNC-female	

Parameter	Specification	Notes / Test Conditions
Front Panel Alarms/Indicators/Adjustments/Controls		
Front panel display, System forward output power	Relative output power (%) calibrated against absolute output power (dBm)	Max. error 0.2 dB within 1.5 dB window from nominal output power; LCD display
Front panel display, reflected output power	Relative reverse power (%) calibrated against absolute output power (dBm)	100% at TX set to nominal output power and SHORTED output (N connector) 0% at nominal output power and 50 Ohm (16 dB return loss) load at the transmitter output (N connector); LCD display
Front panel display, upconverter forward output power	Relative output power (%) calibrated against absolute output power (dBm)	Max. error 1.0 dB within 1.5 dB window from nominal output power; LCD display
Front panel Diagnostics	LCD Displays with menu keys LED display for power supplies	
Module Control Interface RS232 serial communications protocol Interface Connector	Front Panel RS232 port(s) TNET Thales proprietary RJ11 connector	Connector located on each plug-in front panel Parameters defined in plug-in level specs Refer to document # 47267228-306 Upconverter plug-in spec Refer to document # 47266099.00-306 Power Supply plug-in spec

Rear Panel Diagnostics Interface		
Electrical Interface	Logic 0 for fault signals, 12V at 100mA, Reset and stand-by Amplifiers	
Diagnostics Interface connector	Terminal block	J1 connector of rear panel

Rear Panel Remote Serial Monitoring and Control Interface		
Serial Network Communications Protocol	TNET Thales proprietary	
Electrical Interface	RS485 4-wire full duplex (remote bus)	Daisy chain connection, last device in chain requires termination
Interface Connectors	(2) RJ11 connectors	NET interface on rear panel

Rear Panel Local Serial Monitoring and Control Interface		
Serial Network Communications Protocol	TNET Thales proprietary	
Electrical Interface	RS485 4-wire full duplex (local bus)	
Interface Connector	RJ11 connector	J3 connector of rear panel

Rear Panel Agile controller interface		
Electrical Interface	TTL logic	Provides critical TX status and controls for use with Thales agile back-up and control system (ABCS), for N+1 system configurations
Interface Connector	RJ11 connector	J2 connector of rear panel

Rear Panel ABCS interface		
Electrical Interface	TTL logic	
Interface Connector	Male 15-pin D-sub connector	J4 connector of rear panel; used for ABCS command of the designated Agile UCA unit.

Rear Panel modulator interface		
Serial Network Communications Protocol	OPT 1 Thales proprietary OPT 2 UBS/ProTel proprietary	Used to interface TX to Thales or OEM (UBS/Protel) Modulator; offers limited command and status of OEM modulator.
Electrical Interface	RS232 2-wire full duplex	
Interface Connector	Male 9-pin D-sub connector	J6 connector of rear panel

Rear Panel PAS Command		
Serial Network Communications Protocol	TNET Thales proprietary	
Electrical Interface	RS485 4-wire full duplex (local bus) + PAS standby & reset	
Interface Connector	Female 9-pin D-sub connector	J7 connector of rear panel

Rear Panel LAN interface (Optional)		
Serial Network Communications Protocol	SNMP / TCIP	
Electrical Interface	Ethernet	
Interface Connector	RJ45 connector	J5 connector of rear panel

Parameter	Specification	Notes / Test Conditions
General		
Power Requirement Supply Voltage (VAC) Consumption (kW) Power factor (kW/kVA) Cos Ø	220 V_{AC} +10% -15%; 50/60 Hz; <8.4kW .9	
AC connector Cabinet Internal	Terminal Block IEC 320 with locking clamp or terminal block	
Acoustic Noise Outside cabinet Inside cabinet		Measured at 1 m from cabinet al directions with air conditioner at noisiest operation cycle Measured?

Environmental		
System Operating Temperature	-15°C to +40°C	Transmitter enclosed in environmentally controlled shelter. Frequency stability and equipment functionality guaranteed
System Specified Temperature Range	+5° to +40°C	Transmitter enclosed in environmentally controlled shelter. All Specified parameters guaranteed.
Transmitter Specified Temperature Range	+13° to +33°C	No environmental controls
Relative Humidity	98% non-condensing	No environmental controls

Physical		
Dimensions	74” H x 44” W x 44” D 188 cm H x 111.8 cm W x 111.8 cm D	
Approximate Shipping Weight		Fully loaded

Agency Compliance		
Regulatory	Title 47 Part 27.53 of the FCC rules	
FCC ID	CHPLBD-25200	Pending
Standards	ETSI EN 300 744 V1.5.2: DVB-T/DVB-H specification, 21 Jan 2004(draft specification) TS 101 191 V1.3.1: SFN Synchronization EN 300 468: SI Specification ETR 211(SI Guidelines), ETR 162, ISO/IEC 13818, ETR 154, EN 301 192, TR 101 202: documents concerning the Services and data signalization for DVB-T/DVB-H. DVB A010: Interface for CATV/SMATV Head End and Similar Professional Equipment. TM1449 ETR 190: Guide Line for DVB-T/DVB-H networks	
Safety	Meets UL1950/CSA950C22.2-M95 listed specifications	Official certification at Thales discretion

Power Consumption			
Element	Power consumption (All stated values assume full rated transmitter output and air conditioner operating)	Power factor	Load current analysis (Showing the amplitude of the fundamental and harmonic currents)
Satellite RX	≤100 VA	>.9	
Remultiplexer	≤100 VA	>.9	
DVB-H Exciter w/GPS	≤200 VA	>.9	
Upconverter Amplifier 200W	≤3800 VA	.95 typical	
Site management system	≤100 VA		
AC unit (Air Conditioners) 200W	≤4025 VA		
Total system 200W	≤8325 VA	.95 typical	

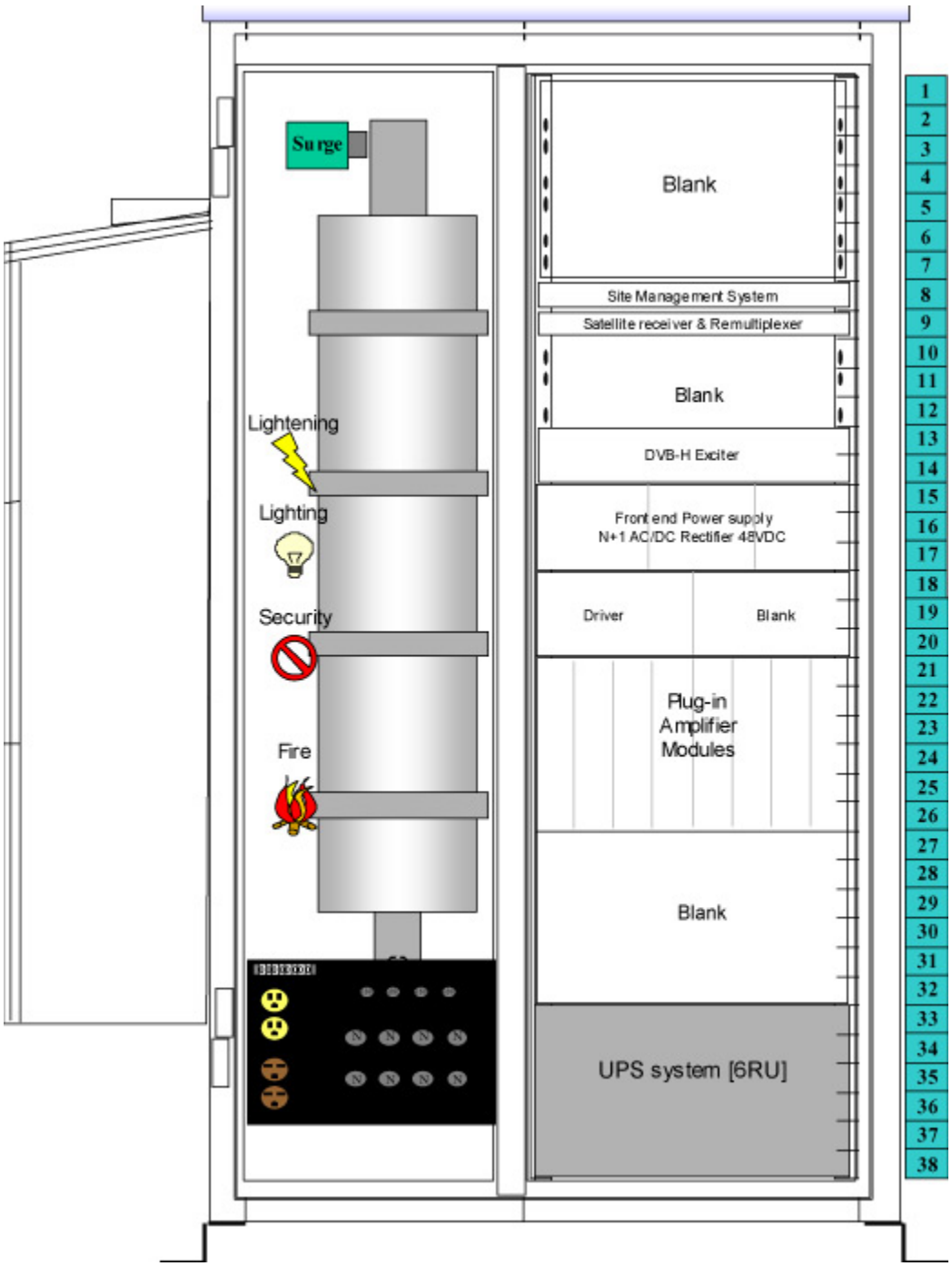
RF Performance:	
Modulation Standard	DVB-T/DVB-H
Average Output Power	50, 100, 200, & 400 Watts
Output Frequency	1670-1675 MHz
Input Interface	MPEG2 Dual ASI, 75 Ohms BNC female Connector
Output Connector	50, 100, and 200 watts – N female 400 watts – 7/16 DIN female User interface 7/16DIN female (all cases)
Output Impedance	50 Ohms
Frequency Response	≤ ±0.5 dB
Frequency Stability	±150 Hz 30 days (internal reference) ≤ ±1 Hz (Optional External GPS)
Carrier to Noise (C/N)	≥ 55 dB
Hum and Noise	≤ -60 dBc
Group Delay	≤ ±200 ns
Out-of-band Emissions	Compliant with FCC Document 47, Telecommunications: Part 27, Miscellaneous Wireless Communications Services: Section 53, Emissions Limits. Subparts (i), (a) (4)
Harmonics	≤ -60 dBc
MER	≥ 30 dB
RF Output Regulation	≤ ± .2 dB

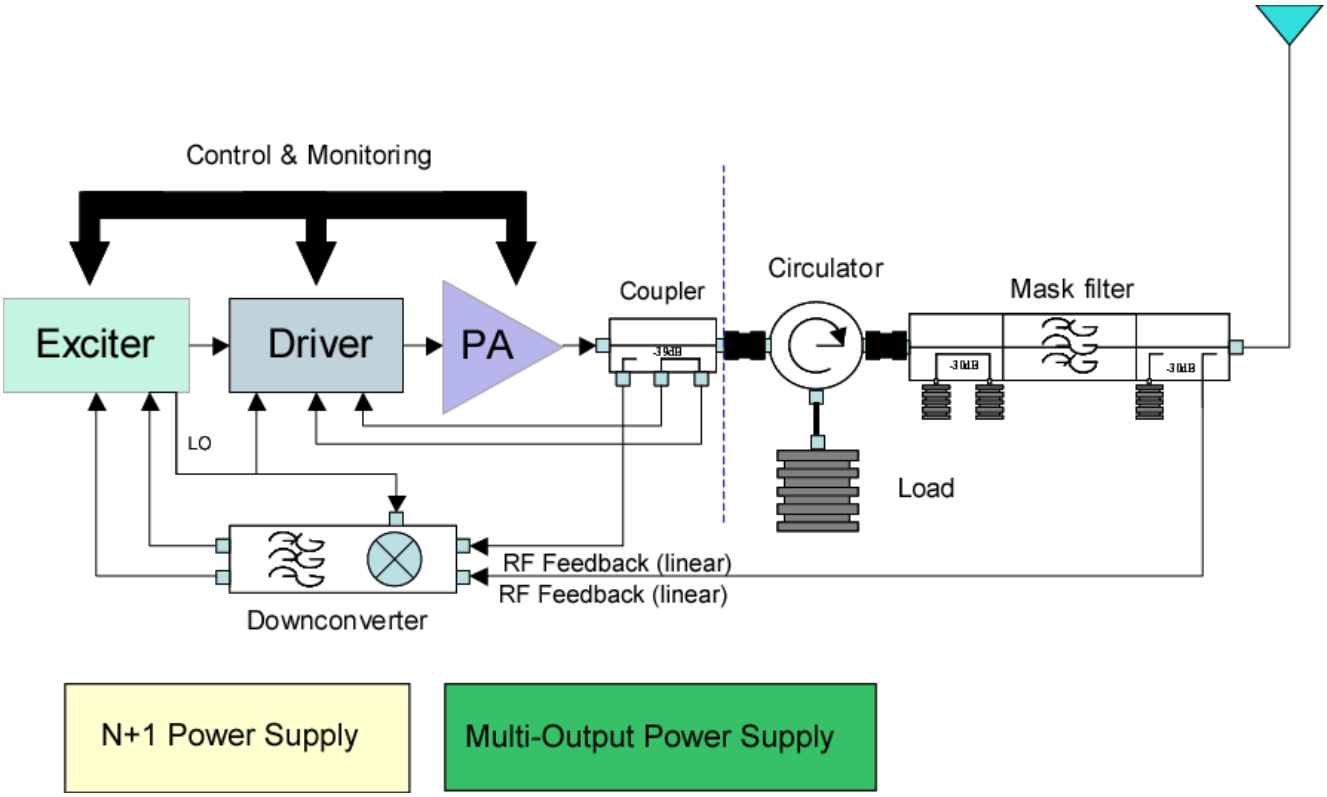
Electrical Requirements:	
Power Requirement (200 watts)	Single Phase, 220 VAC +10% -15%;
Frequency	50/60 Hz
Consumption including ADAPT™ exciter (does not include encoding / multiplexing equipment, Starter PAK listed below for reference)	200 watts ≤4350 VA
Heat loading including ADAPT™ exciter (does not include encoding / multiplexing equipment, Starter PAK listed below for reference)	200 watts ≤3.42 kW
“ancillaries” consumption / heat loading	500 VA / 550 watts
Power Factor Correction	Typical 0.95, minimum 0.9

Ambient Environment:	
Operating Temperature	+32°F to +122°F (0°C to +50°C)
Specified Temperature Range	+55°F to +91°F (+13° to +33°C)
Relative Humidity	95% non-condensing
Power Amplifier Cooling	Forced ambient air, front to back flow using integral high volume fans

Mechanical:	
Cabinet Dimensions	74.0” H x 44” W x 44” D 188 cm H x 111.8 cm W x 111.8 cm D
Weight	Dependent on transmitter configuration, consult factory
Color	Customer specified
Transmitter Service	Rear and Front
Access	Rear and Front

5.2 Affinity® LBD-200C-N1 Cabinet Layout





Simplified Transmitter Block Diagram

5.3 Affinity® LBD-200C-N1 FRU Part Numbers

This section lists the modular Field Replacement Units (FRU) of the Affinity® unit. Complete parts lists are included at the end of this manual.

453313-01 Affinity® LBD-200C-N1 Transmitter

Item Part Number	Qty	Description
754578-01	1	Receiver, Satellite
754580-01	1	Site Management System, SNMP Link
47267295	1	Chassis Assembly, 3RU Driver L-Band
47267352	1	Chassis Assembly, 6RU 6-Amp L-Band
754573-01	1	Filter, Spectral Mask
47267381.01	1	Sirius DVB-H Modulator w/Keypad, GPS
754568-01*	2	Front-End Power Supply Assembly ***Assembly 47266865.07 includes a rack and two Front-End Power Supplies**
47267228.01	1	Upconverter L-Band (Driver Component)
47266099.04	1	Power Supply Plug-In (Driver Component)
47267227.01	6	Amplifier Assembly, L-Band
47267339	1	Downconverter, L-Band UHF
751338-01	2	Attenuator, 17dB 50 Ohm SMA
752732-01	2	Attenuator, DC to 2GHz 3dB 2W
754572-01	1	Circulator, 500W “N”
607270-01	2	Load, 500W Air Cooled
400279-08-48	4 Required	Cable Assembly, Coax
400279-09-48	1 Required	Cable Assembly, Coax
400279-10-48	4 Required	Cable Assembly, Coax
400279-28-48	1 Required	Cable Assembly, Coax
400279-35-48	2 Required	Cable Assembly, Coax
410920-01-48	2 Required	Cable Assembly, Video
609125-01	2	Cable, LMR600 5’L 7/16Din-“N”
609124-01	2	Cable, LMR600 3’L 7/16Din M
609123-01	1	Cable, Flat Mod RJ11/Spade Lug
607618-01	4	Cable, Ethernet CAT5
607883-01	2	Cable Assembly, DB9-M to F STR 2’
47267403	1	Cable Assy, Alarm DB9M-Open End
47267404	1	Harness Assy, 6P Molex to Ring

5.4 Fusing and Protection

Fusing:

Location	Reference	Value	Thales P/N
Power Supply Rear Panel	AC Fuse	4-Amp fuse	752785-01
	PA Power Switch Circuit Breakers (magnetic) Qty-4	40-Amp	754253-01
	PA Fan Circuit Breakers (thermal) Qty-2	1-Amp	754383-01

Sub-Chassis fuse locations

Controls and Indicators:

The OEM Front-End Power Supply contains the following indicators:

Description	Signal	LED Indicator
AC Good	A lit LED indicates AC is present	Amber
Temp OK	A lit LED indicates DC output is operating within tolerance	Green
DC Good	A lit LED indicates temperature inside the power supply is within the operating temperature range	Green

Thermal Protection:

Certain plug-in modules are thermally protected with over-temperature sensors. If temperatures exceed 122º Fahrenheit (45º Celsius), the plug-in module is shut down by the microprocessor until the temperature is below the trip-point level.

Interlocks:

Interlocks are performed through the software applications.

VSWR Protection:

The Voltage Standing Wave Ratio (VSWR) protection system will lower the transmitter output power by 6dB if the reflected power exceeds 16%, of the transmitter output power (calibrated on a 100% scale). If the reflected power reaches 25% of the transmitter output power, the VSWR protection system shuts the transmitter down. To bring the transmitter back into operation after a VSWR protection shutdown requires an operator to perform a transmitter reset through the Omnitronix SL-81 Site Management system, local reset via MMI on front panel, or by cycling the Upconverter Module power.

5.5 Equipment Packaging

The transmitter is packaged at the factory on a single skid. Assemblies to be mounted in the transmitter are packed in crates. The skid and crates may contain one or more precaution labels or markings. These markings provide information regarding the various precautions that should be observed during the handling, unpacking, and storage of the equipment crate. Examples of these precautions may include positioning, fragility, and weather constraint labels.

NOTE: Acceptable storage climate for the equipment crate is between -30ºC to +60ºC.

5.5.1 Unpacking and Inspection

Before taking delivery, and prior to removing the contents of the crates, examine the exterior of the crates for evidence of shipping damage. If any damage is visible to the crate or the contents, do not continue to unpack the equipment. Protect the goods from further damage and contact the freight carrier and Thales immediately for further instructions.

If the crate is free from damage, the equipment may be carefully removed. The following tools are recommended for the unpacking process:

- Cutter
- Screwdriver

Remove the packing slip from the cover of the crate. Using the screwdriver, remove the top cover and one of the sides of the shipping crate. With the cutter, carefully cut through the cover material. Be careful not to damage any equipment during this process.

Once the equipment has been removed from the crate and verified against the packing slip, inspect the equipment for any signs of damage. If any damage is visible, contact Thales immediately for further instructions. While unpacking, carefully compare packing list with the equipment, checking for in-transit damage at the same time. Should any damage be noted, notify the freight carrier at once to file a freight claim. Do not discard any packing material until told to do so by the carrier. Also, notify Thales Broadcast & Multimedia of any damages or missing materials from the shipment. Retain original boxes and internal packing materials to adequately protect equipment to be returned to the factory for repairs, upgrades, or modifications.

5.6 Environment Considerations

The equipment housed in outdoor enclosures can be safely operated in ambient temperatures of -15º to +45º Celsius (5º to +113º Fahrenheit) The RF power regulation and frequency determining devices are qualified to operate across -30 to +50º Celsius (-22º to +122º Fahrenheit) However, the channel filter will tolerate much less temperature variation. Therefore, if not installed in a qualified outdoor enclosure with HVAC system, Thales recommends that the transmitter be operated within ±10° Celsius from room ambient. Moderate temperatures generally extend equipment life. Although the equipment may be operated with relative humidity

of up to 95%, the equipment must be protected from conditions that cause condensation within the equipment. The transmitter chassis requires a rack with a minimum of 24” vertical front-to-rear rail separation. If a rear door must be used to secure the rack cabinet, the rack must be at least 40” deep to accommodate transmitter cabling, and the door must open fully or be removed to allow transmitter maintenance. If a rear door is placed on the rack, forced ventilation through the cabinet is required (600 cfm minimum per transmitter is recommended) and an air or temperature interlock should be incorporated for protection against interruption of ventilation (contact Thales Broadcast & Multimedia Customer Service department for assistance). In case of indoor installations, the area should be kept dry and clean. There should be sufficient space in front of the transmitter cabinet for service personnel and test equipment. A minimum of 44” behind the cabinet should be free for rear cabinet access and air movement. Also, ample room must be available at the cabinet rear for cable placement.

5.7 System Grounding

For proper system operation, it is imperative that the system be adequately grounded. Each individual equipment-rack requires grounding to the main building ground. The basic grounding scheme is provided below:

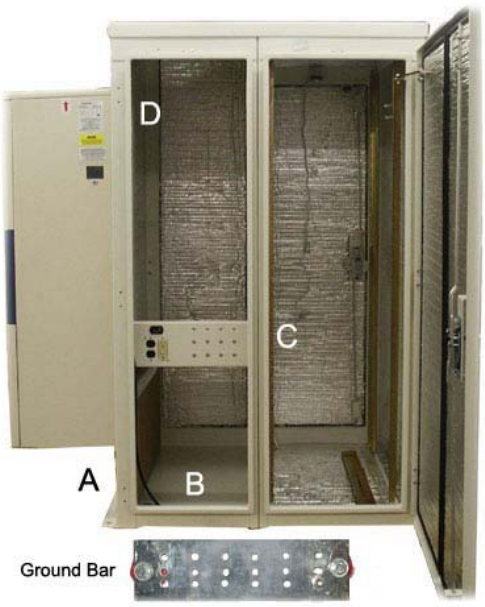
A: User Ground: Tie to building ground

B: Internal Ground Bar: Phone line Interface

C: Internal Equipment Ground Bar: Wired to all Chassis.

D: RF Surge Arrestor Ground Bar

Front View



Earth Grounding Scheme

6 General System Description

The Thales Affinity® LBD-200C-N1 low power solid-state DVB-H transmitter is intended to provide maximum flexibility for site layout and installation. The Affinity® transmitter contains integrated modular assemblies that were designed to fit into EIA standard 19" rack units. The transmitter consists of several of these rack units that house, with the exception of the Downconverter Module, RF filter and HVAC unit, the major components that make up the transmitter system. This module design allows operators of the transmitter to easily install, operate and maintain the equipment.

The basic topology of the Affinity® LBD-200C-N1 transmitter configuration is as follows:

- Site Management System
- Satellite Receiver and Remultiplexer
- Sirius DVB-H Exciter
- Front-End Power Supply
- Driver Section
  - Power Supply Module
  - Upconverter Module
  - Downconverter Module
- Power Amplifier (PA) Segments
- UPS system
- RF Filter
- Phone System Interface
- HVAC Unit

The low power microwave transmission system transmits a digitally modulated average power signal on a single 1670-1675MHz channel. The LBD-200C-N1 generates 200 watts average power using a COFDM modulation scheme.

Digital transmission techniques provide superior performance over analog methods with reduced susceptibility to noise and co-channel interference. COFDM modulation provides exceptional throughput and spectral efficiency, while meeting the needs of mobility. The system architecture is based on: advanced transistor technology, low-loss power combining, and distributed control and power conversion. Some unique advantages of this new design are: flexibility/scalability, lower downtime, and lower operating costs. The modular structure of this

system allows for quick and easy replacement of malfunctioning plug-in modules resulting in less downtime and convenient scalability. The high efficiency design and small size decreases operating expenses. Each of the plug-in modules is self-managing. When a fault occurs within a module, the application software detects and automatically signals and/or records the fault. If a catastrophic failure occurs within any of the plug-in modules, the Master Support Interface (MSI) system will detect the failure and perform an automatic controlled shutdown.

One key benefit of this series of transmitters is the “Hot Swap” replacement capability. The hot swap feature allows the transmitter to continue functioning while a faulty power amplifier segment is replaced. During replacement the transmitter will continue operating with only slight power loss and with little to no change in the noise floor. Full transmitter power will be restored when the replacement amplifier is plugged into the amplifier chassis.

Should any of the other plug-in modules contained in the transmitter require replacement, a brief transmission interruption will occur when the faulty plug-in is removed. Transmission is restored when the replacement module is plugged in.

7 Installation

(Reference *L-Band XMTR Enclosure Planning* document **38-0019-040** located in Section 25)

WARNING
This equipment utilizes a grounding plug on all power cords. For personal safety, do not defeat this feature. As with all similar types of equipment, high voltage can be accessed when the chassis cover is removed. Special care should be given in areas of fuses, line switches, and power supplies. Modern high power solid-state equipment contains low output voltage power supplies with very high current capability. To prevent severe burns, avoid contacting these circuits with conductive jewelry such as rings, watches etc. When servicing the transmission line and antenna, care must be taken to avoid exposure to high-energy microwave.

7.1 Installation of Transmitter Sub-Chassis

The transmitter modules require twelve rack units of vertical rack space (not including the exciter).

Install the LBD-200C-N1 support rails within the equipment rack as shown in the site-specific cabinet layout diagram. Failure to use the support rails will result in damage to the transmitter chassis. Install rack clips to secure the transmitter front panel. Slide the chassis onto the support rails and secure to the rack clips. The rear door of the transmitter opens for maintenance access. Nothing should be mounted to the rear of the rack that will interfere with this access.

Ensure AC power outlets and other brackets are appropriately located so as not to block the rear of the transmitter. To ensure that no electrical arcing occurs, perform the installation of the individual module segments of the transmitter in the order discussed below:

7.1.1 Installation of Site Management System

Pending

7.1.2 Installation of Satellite Receiver and Remultiplexer

Pending

7.1.3 Installation of Sirius DVB-H Exciter

Pending

7.1.4 Installation of Driver Plug-In Modules

The Driver Plug-in Modules slide into the sub-chassis on nylon slides and connect to the Driver Backplane board via floating connectors. The driver section of the transmitter occupies the left quadrant of rack space directly below the Sirius Exciter and adjacent to the Power Amplifier Segments. Within the driver section, the **Power Supply Module** occupies the left slot, while the **Upconverter Module** occupies the right slot. To install the driver plug-ins, slide the module into its proper location until fully seated. There is a disconnect switch on the backplane board to ensure that there is no arcing between connections before the segment is fully engaged. Once the plug-in is in place, tighten the front panel thumbscrews to ensure that the plug-in remains securely in place.

Driver Assembly

Power Supply Module

Upconverter Module

7.1.5 Installation of Power Amplifier Segments

The Power Amplifier Segments (PAS) slide into the sub-chassis amplifier bay on nylon slides and connect to the PA Backplane via floating connectors. The key-lock switch, located on the amplifier front panel, must be in the OFF/UNLOCKED position to plug the segment in. This removes the potential for arcing between connections before the segment is fully engaged. Once the segment is slid into place, thumbscrews on the front panel secure the segment to the sub-chassis. The key-lock switch may be turned to the ON/LOCKED position to apply power to the amplifier segment. Once the key-lock switch is turned on, the segment will automatically set the gain and currents of the amplifier.

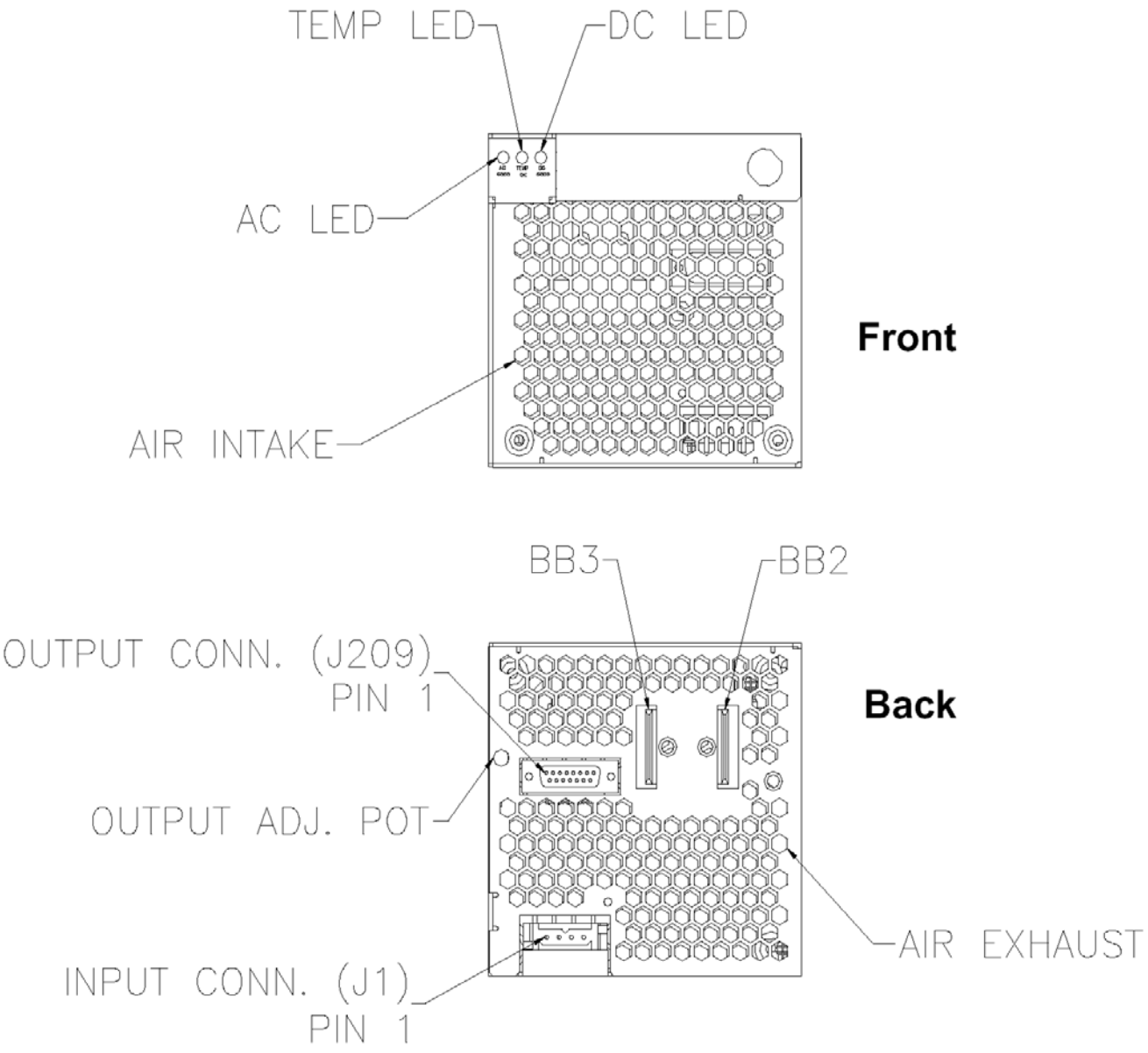
Amplifier positions within the Affinity® LBD-200C-N1 transmitter sub-chassis

7.1.6 Installation of Front-End Power Supplies

The two 48V Front-End Power Supplies occupy 3RU of chassis rack space and are installed left justified in the bay located above the Driver and Power Amplifier Segments. Each Front-End Power Supply slides into the sub-chassis on nylon slides and connects to the Front-End Power Supply Backplane via floating connectors.

Front-End Power Supply

Front-End Power Supply LED Indicators


TEMP LED
DC LED
AC LED
AIR INTAKE
Front
BB3
BB2
OUTPUT CONN. (J209)
PIN 1
OUTPUT ADJ. POT
INPUT CONN. (J1)
PIN 1
AIR EXHAUST
Back

7.1.7 Installation of UPS System

Pending

UPS System Front view

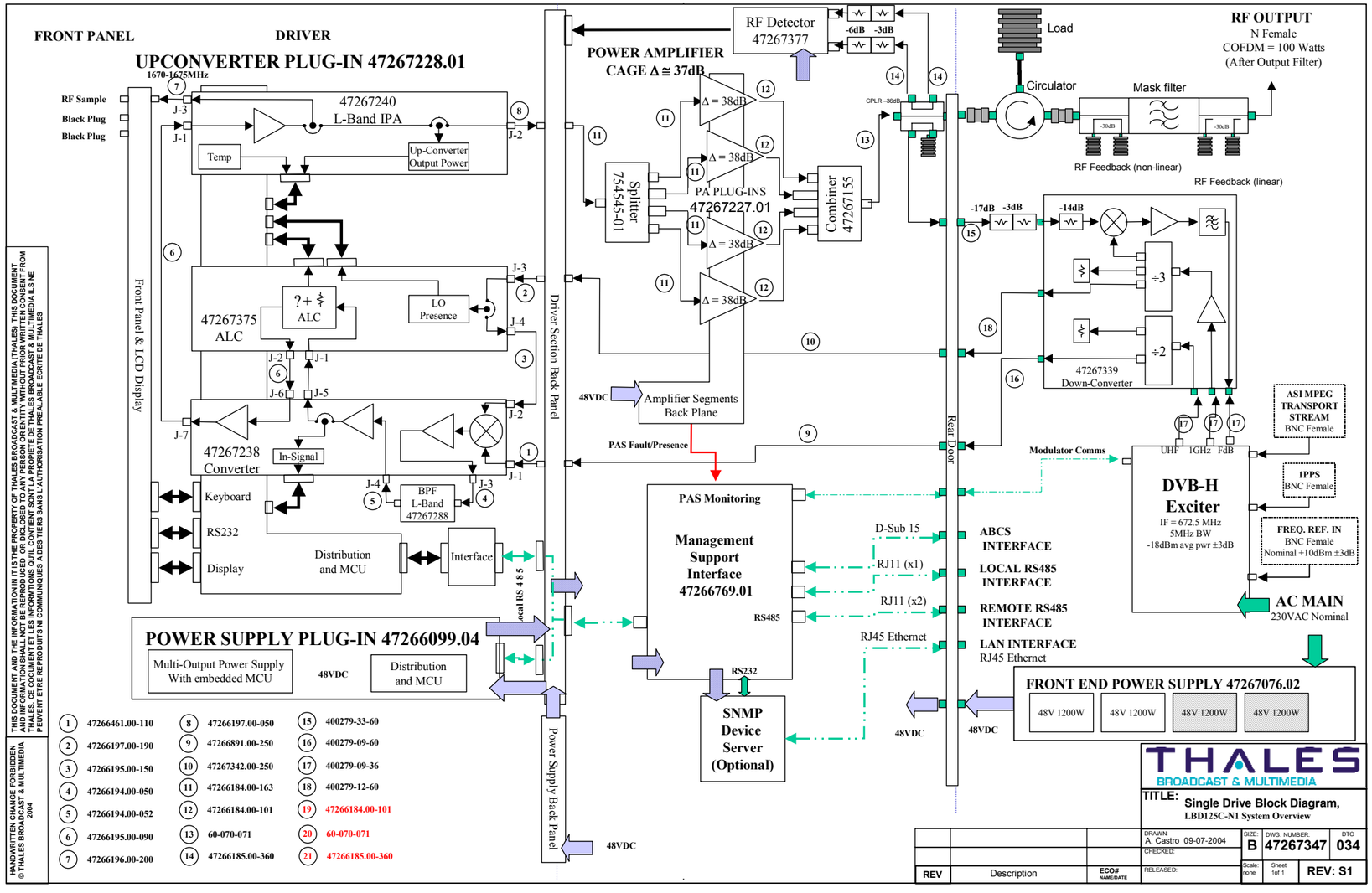
UPS System Rear view

7.1.8 Installation of Downconverter

Pending

Block Diagram System Overview

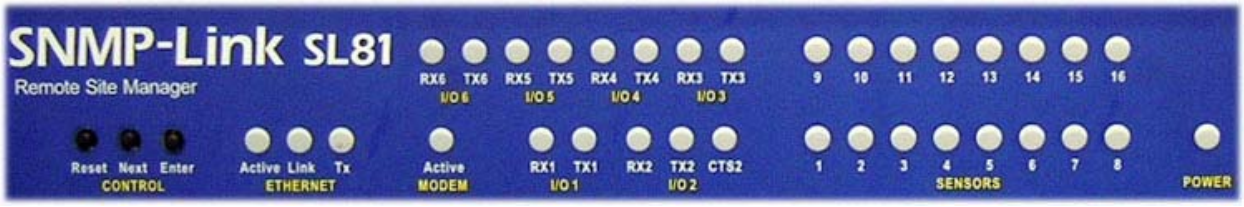
Need LBD200 version of block diagram



8 Site Management System Description

8.1 Status Monitoring and Control System

The Omnitronix SL81 Status Monitoring and Control System (SMCS) is provided for use with Affinity® transmitters. The SMCS is a rack-mounted unit located within the transmitter cabinet. It provides a web interface and an SNMP agent for remote control. Remote access to the SNMP agent is available through a GSM connection or via dial-up modem and a PSTN line. All events and faults are stored in a logbook with date and timestamps.



9 Satellite Receiver and Remultiplexer Description

Pending

10 Sirius DVB-H Exciter Description

Exciter front-view

Exciter rear-view

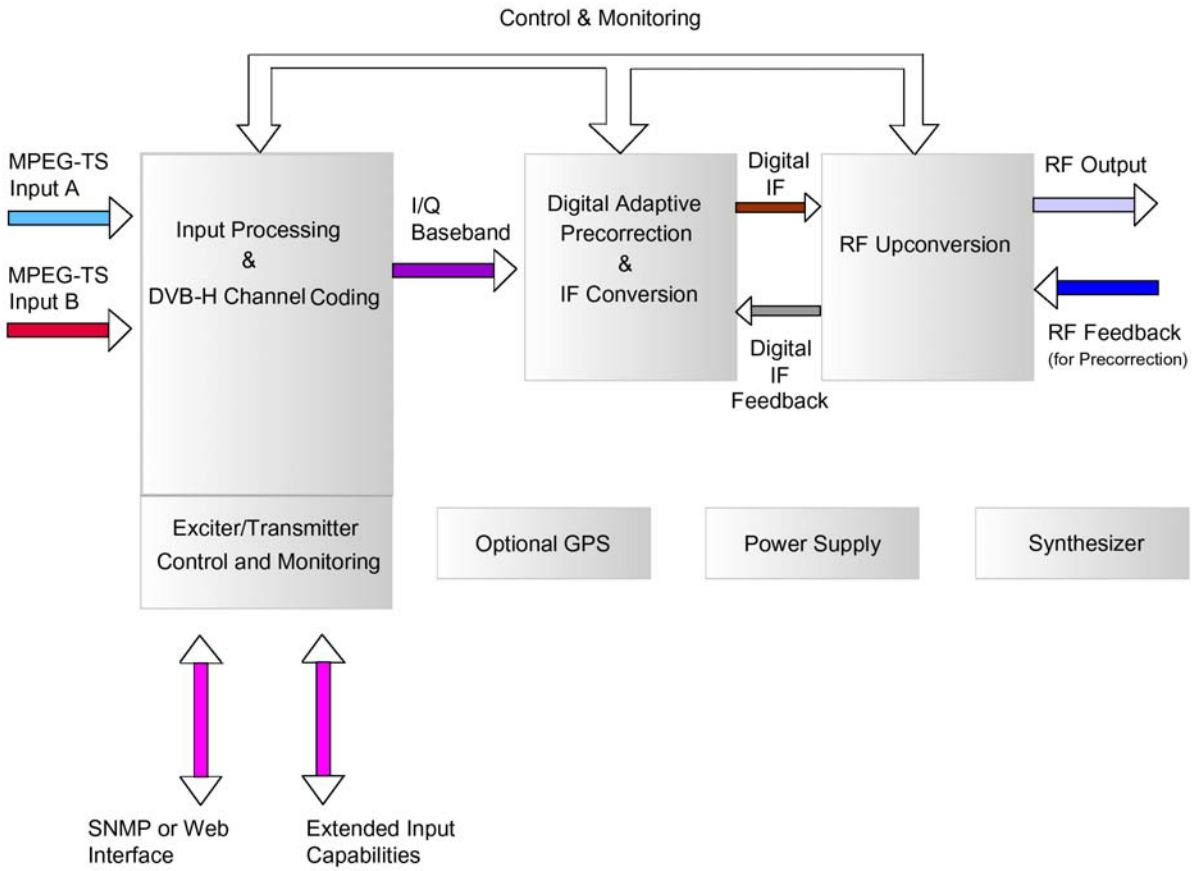
10.1 Introduction

The Thales Sirius DVB-H Digital RF Exciter, which is integrated in the Affinity® LBD-200C-N1 transmitter, is part of the family of state-of-the-art Digital Modulator/RF Exciters based on a unique hardware platform capable of delivering the proper pre-corrected RF low power DVB-H, ATSC, DRM or other processing waveform signal to an amplifying chain. The Exciter is contained in an independent 19” 2RU unit and includes all necessary power supplies and interfaces. This very powerful platform is based on open standard technologies, and the latest generation of FPGA processing.

For single drive configuration, the front panel of the RF exciter includes a LCMP (Local Control & Monitoring Panel) made of a 2 RU front panel including a display and dedicated control knobs.

Extended or remote operation can be achieved by using an embedded Web server from a standard browser, or through the Omnitronix SNMP manager.

The block diagram below provides a functional view of the Sirius DVB-H Digital RF Exciter.



Thales DVB-H Digital Exciter Block Diagram

Single Drive Operation

In the Single Drive (SD) configuration, the Thales Sirius DVB-H Digital RF Exciter is equipped with a dedicated LCMP (Local Control & Monitoring Panel) located on the front of the unit. This dedicated LCMP includes a display and control buttons.

The selection of the various menus is made by means of button-switches located on the front panel of the Exciter.

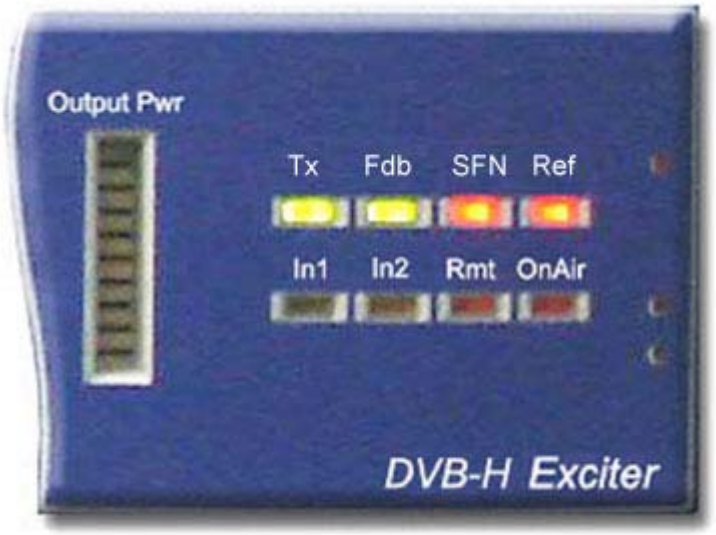
Sirius Exciter LCMP

The menus are as follows:

- **Overview:** provides complete access to the main parameters (status of the input, modulation, clock reference, QoS summary and operating frequency)
- **Input settings:** provides an overall view of the parameters selected for the two inputs
- **Threshold settings:** displays the parameters selected for MER, ripple and shoulder
- **Modulation settings:** displays the selected reference clock, bandwidth, mode, type of modulation and associated protection ratio for each input
- **Transmitter settings:** displays frequency, output power, signal attenuation, selected linear equalization, non linear pre-correction, clipping, operating mode
- The last menu provides a direct manual access to fast switch to the mute position

The Local Control and Monitoring Panel (LCMP) of the Exciter provides a readout for output power and the following alarm indicators:

- TX fault / Hardware fault synthesis
- RF feedback
- SFN mode
- Reference status
- ASI input 1
- ASI input 2
- Remote or local control mode
- On-Air indication



Sample Exciter Display Screens

Sample Exciter Display Screens

Sample Exciter Display Screens

Sample Exciter Display Screens

10.1.1 Remote Operation

(Optional)

For SD configuration the remote operation is enabled by either the SNMP agent or the Web server, both of which are embedded in the Sirius DVB-H RF Exciter.

10.1.2 SNMP Agent and Web Server

The objective of the SNMP agent is to ensure remote operation of the equipment by using the SNMP protocol by means of the IP protocol supported by an Ethernet interface.

The SNMP agent is responsible for:

- Communication with the equipment by means of SNMP protocol
- Communication with the equipment by sending e-mail
- Implementation of FTP and TELNET protocols

The control of the equipment in this manner is only enabled when remote operation is selected. The SNMP agent in both local and remote modes of operation always accepts monitoring requests.

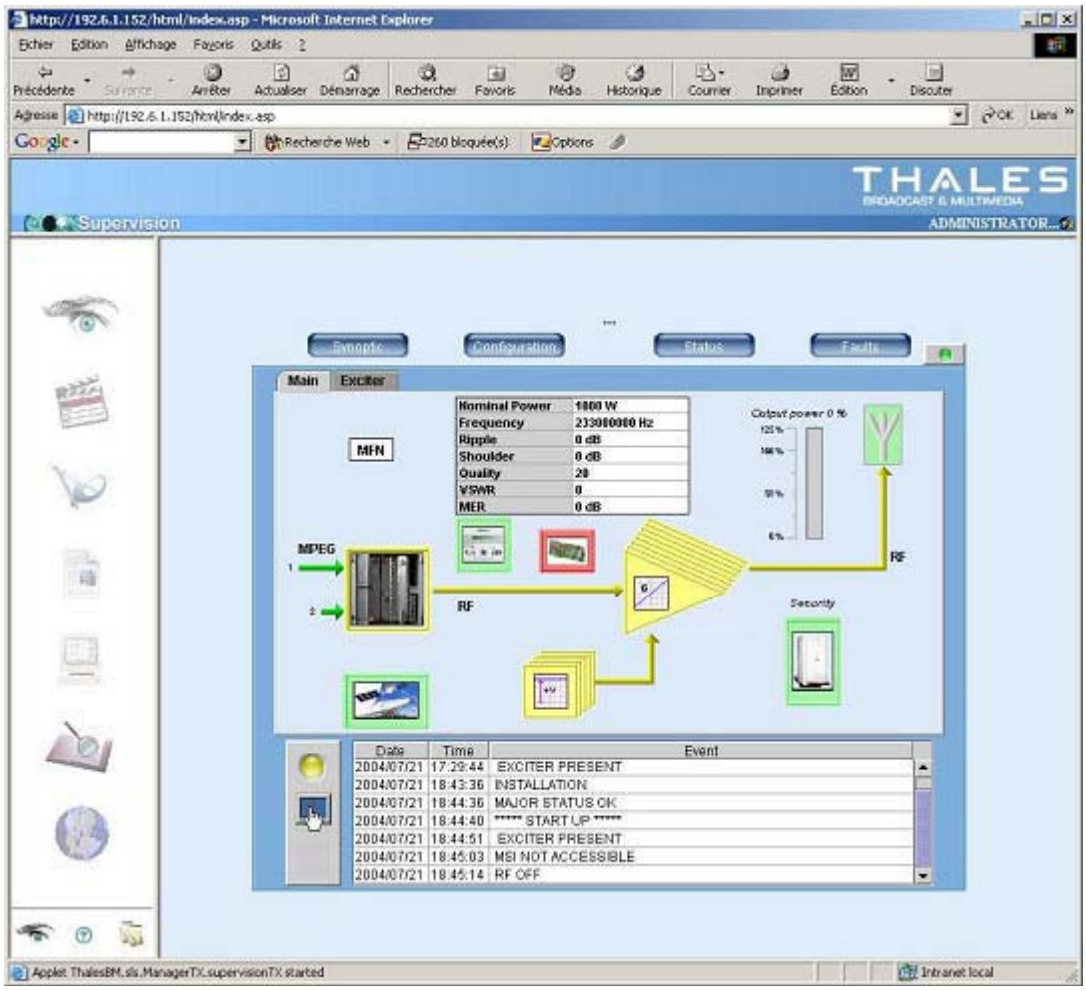
Access to the SNMP agent for either writing and/or reading is organized by means of user profiles defining individual rights and conditions for access. The SNMP agent integrates SMTP protocol allowing events to be sent via e-mail. Important events will automatically generate “traps”. The links between events and traps are configurable by the operator.

A web server allows the equipment to be controlled from any standard browser by means of the HTTP protocol. The control of the equipment in this manner is only enabled when remote operation is selected. The web server, in both local and remote modes, always accepts monitoring requests.

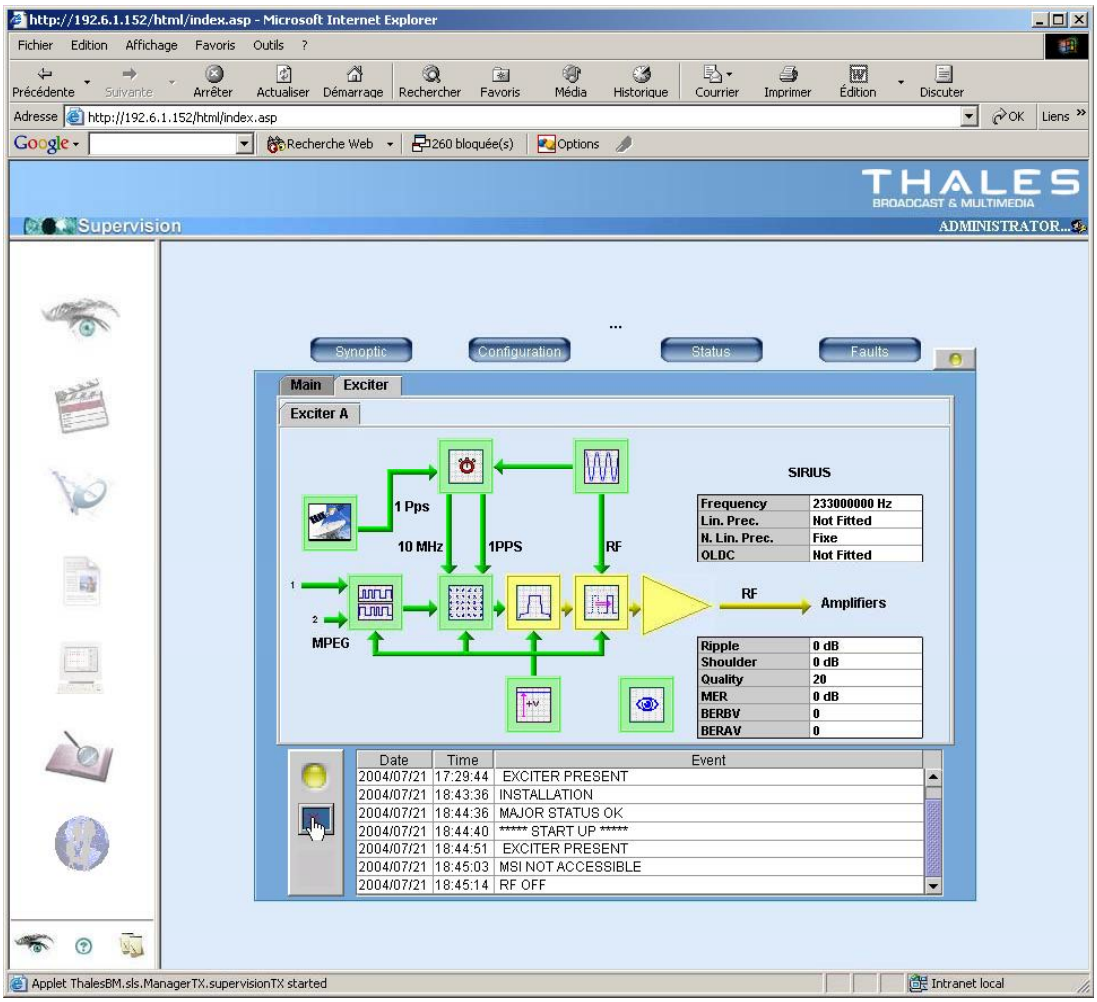
The web server provides:

- Static information such as leaflet and user manual of the equipment
- Dynamic information including displays of all status alarms and faults, and operating parameters
- Operating or configuration control protected by means of user profiles and passwords
- Access to equipment logbook

The following screen shots represent the main page and the page dedicated to the Sirius DVB-H RF Exciter. These should provide an accurate representation of the capability of the embedded web server.


http://192.6.1.152/html/index.asp - Microsoft Internet Explorer
THALES
BROADCAST & MULTIMEDIA
Supervision
ADMINISTRATOR...
Synoptic
Configuration
Status
Faults
Main
Exciter
Nominal Power 1000 W
Frequency 233000000 Hz
Ripple 0 dB
Shoulder 0 dB
Quality 20
VSWR 0
MER 0 dB
MFN
Output power 0 %
MPEG
RF
RF
Security
Date Time Event
2004/07/21 17:29:44 EXCITER PRESENT
2004/07/21 18:43:36 INSTALLATION
2004/07/21 18:44:36 MAJOR STATUS OK
2004/07/21 18:44:40 ***** START UP *****
2004/07/21 18:44:51 EXCITER PRESENT
2004/07/21 18:45:03 MSI NOT ACCESSIBLE
2004/07/21 18:45:14 RF OFF
Applet ThalesBM.sls.ManagerTX.supervisionTX started
Intranet local

Main page



Sirius DVB-H Exciter page