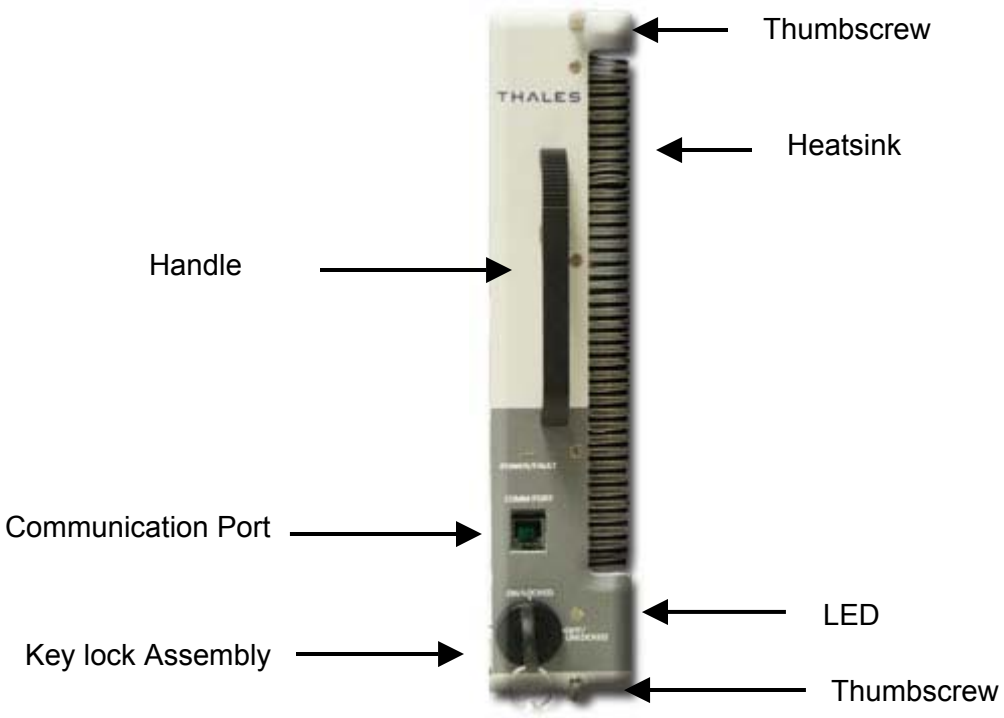


PA Module Rear Panel Assembly

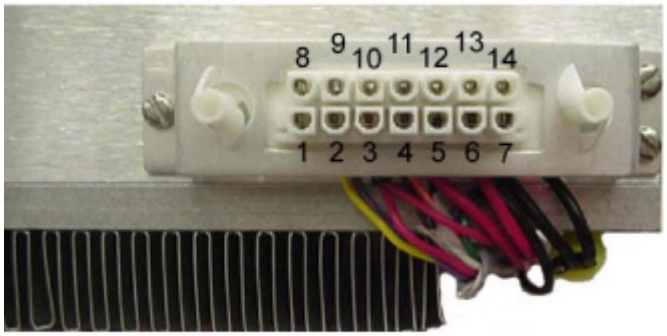
The Rear Panel Assembly of the PA Module consists of a UHF OUTPUT a UHF INPUT and a DC INTERFACE/POWER CONNECTOR.

The **UHF OUTPUT** is the point at which the UHF signal is connected to the RF System

The **UHF INPUT** is the point at which the UHF signal is received from the Driver Section.

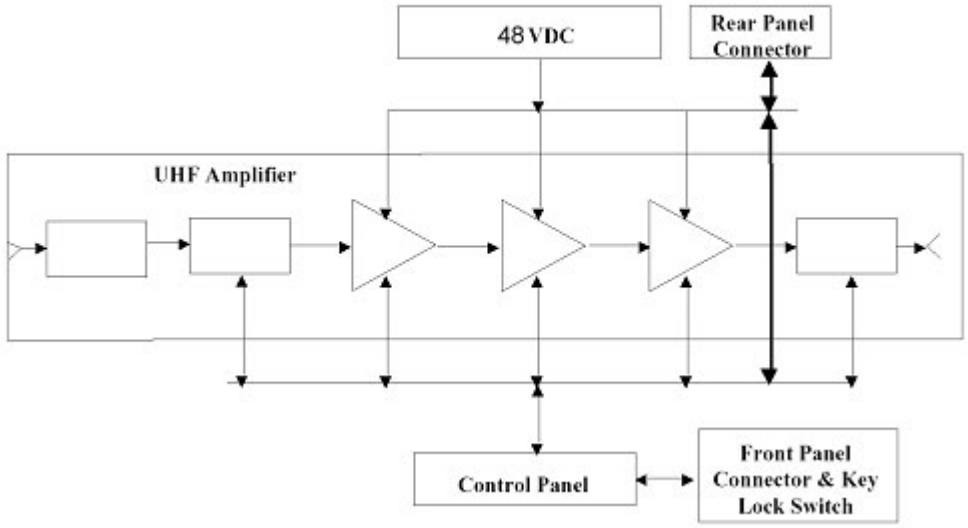
The **DC INTERFACE/POWER CONNECTOR** is the point at which the power supply voltages, control lines and RS-485 communication signals for the PA Module are located.

DC INTERFACE/POWER CONNECTOR PIN LAYOUT

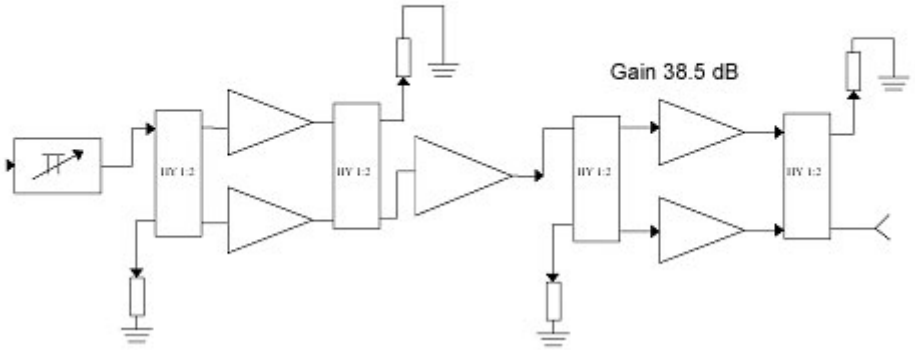


1. TXD RS485 POS
2. TXD RS485 NEG
3. +10VDC
4. +48VDC
5. PAS Presence
6. GND
7. GND
8. RXD RS485 POS
9. RXD RS485 NEG
10. +10VDC
11. +48VDC
12. PAS Fault
13. Cold stand-by
14. Reset

Power Amplifier Segment Block Diagram



Block Diagram, Power Amplifier Board



15 Front-End Power Supply Description

The **Front-End Power Supply Module** provides the **48VDC** level required to power the Driver and PA Modules of the Affinity LBD-200C-N1 transmitter .The Front-End Power Supply Module outputs the 48VDC to the connector boards located within the Sub-Chassis Assembly. The Driver and Amplifiers derive the power from these connector board assemblies.

The Front-End Power Supply Module is a 4000-Watt device containing current limiting, thermal shut down, and fuse protection circuitry. The required input voltage is 208VAC 3-phase @ 50Hz.-60Hz. The nominal output voltage is +48VDC. A potentiometer on the Front-End Power Supply Module is used to adjust the output supply level (factory adjust).

LED indicators located on the supply front panel assembly provide visual feedback of Front-End Power Supply operation.

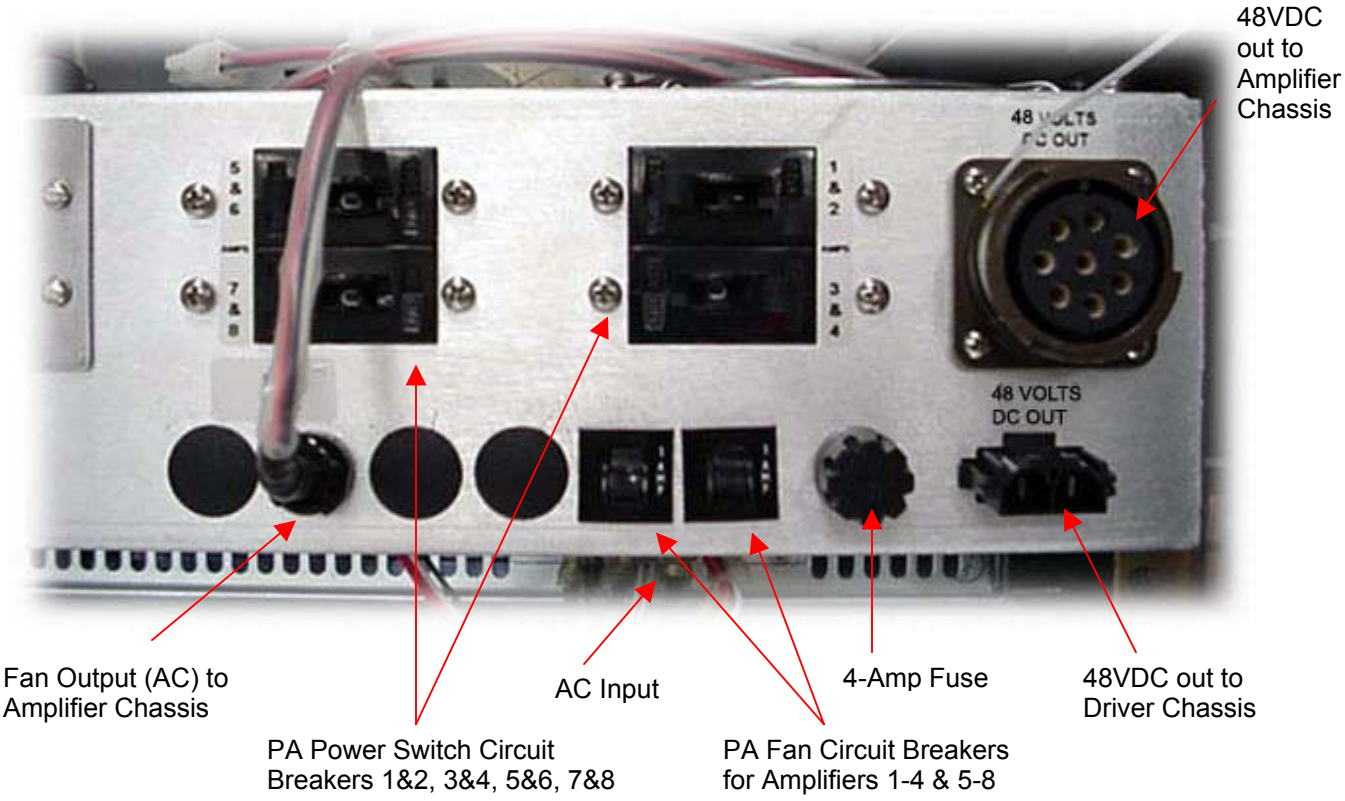
Two internal 600 CFM forced air fans provide convection cooling for the Front-End Power Supply Module.

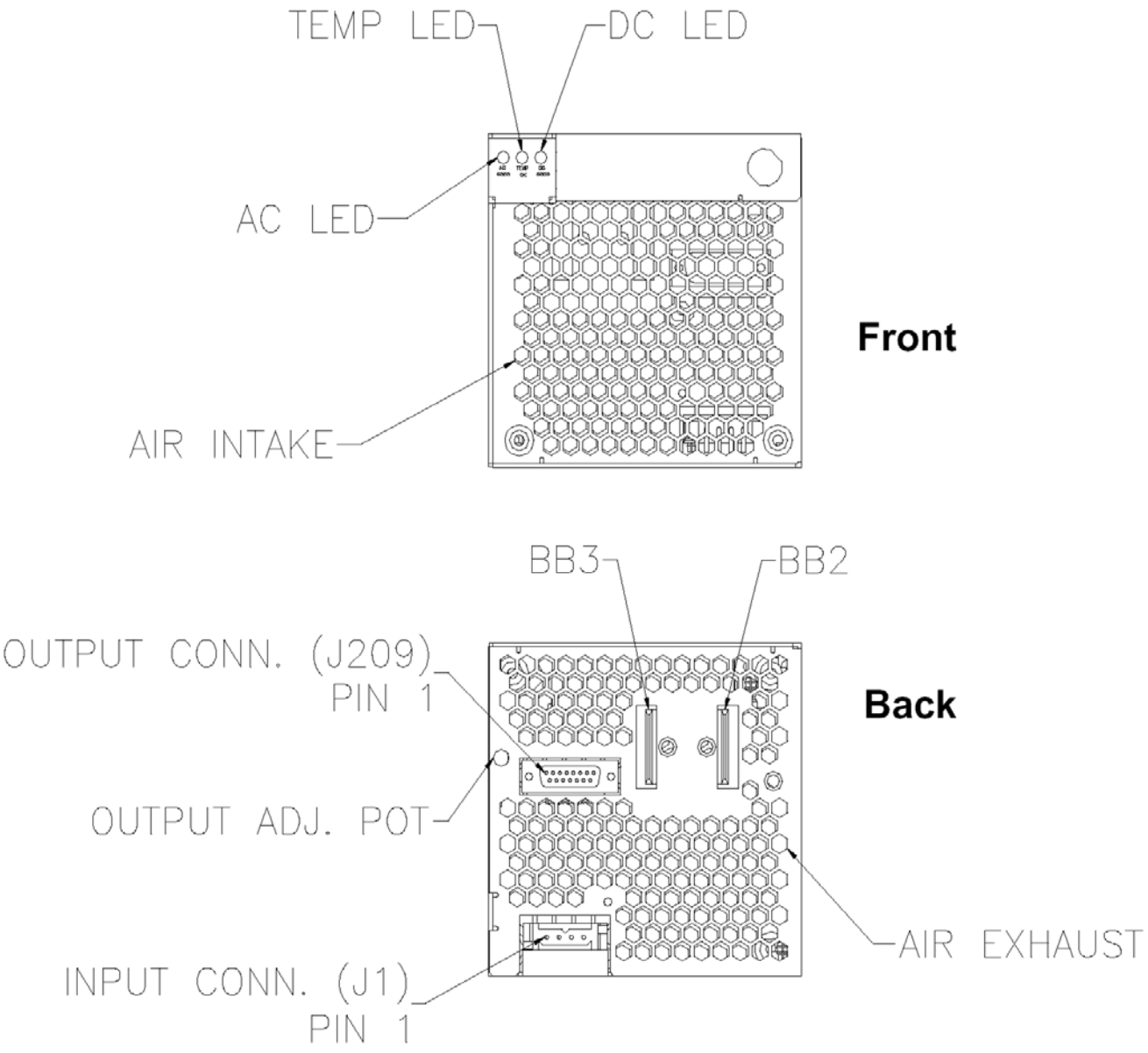
The Front-End Power Supply is plugged into the Power Supply Adapter located in the Chassis assembly.

The 5.25” high, Front-End Power Supply Chassis can contain up to three 48VDC power supplies. The rack is designed to allow the power supply modules to operate in a current sharing mode when more than one module is installed (N+1 applications). The Power Supply Chassis operates off the mains AC power and is fuse protected on TB1.

A circuit breaker assembly is attached to the rear of the chassis to provide DC over-current protection for the PA Modules.

The Front-End Power Supply Modules are “**Hot Swap**” compatible. When operated in N+1 configurations, defective supplies may be removed and replaced without shutting the entire transmitter system down.


48VDC out to Amplifier Chassis
48 VOLTS DC OUT
Fan Output (AC) to Amplifier Chassis
PA Power Switch Circuit Breakers 1&2, 3&4, 5&6, 7&8
AC Input
PA Fan Circuit Breakers for Amplifiers 1-4 & 5-8
4-Amp Fuse
48VDC out to Driver Chassis


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

CHEROKEE INTERNATIONAL

CAR4010T & 4030T

4000 Watt Single Output Rectifier Modules

CAR4010T & 4030T

- **Hot-Swap N+1 Redundancy**
- **Single phase or Three phase Input**
- **Power Factor Correction**
- **Over Voltage, Over Current and Thermal Protection.**
- **Visual LED Indicators**
- **19" 3U high rack available**

Features	Benefits
■ No minimum load requirements	■ Eliminates the need for preload on system backplane
■ Modular design	■ Easy insertion and extraction during hot swap
■ Single phase or three phase inputs	■ One stop shopping, breadth of line for 24V and 48V outputs
■ Constant power characteristic	■ Better suited for battery charging applications

Key Market Segments & Applications

Telecommunications

- Wireless/Cellular
- Central Office Switching
- PCS Installations
- Bulk power front ends for distributed power architecture

Specifications	CAR 4010T & 4030T	
Input Voltage Range	**CAR4010T**: 180-264VAC, 47-63Hz 1Ø / **CAR4030T**: 180-264VAC, 47-63Hz 3Ø	
Input Current (maximum)	25.5A @ Full Load and 180VAC, 1Ø and 15A per phase @ Full Load and 180VAC, 3Ø	
Inrush Current	50A max	
Input Fuse	30A 3AG, Internal Axial Type for 1Ø and 20A 3AG, Internal Axial Type for 3Ø	
Input Transient Protection	MOV and Gas tube	
Power Factor	0.99 (for CAR4010T) and 0.95 (for CAR4030T) at full load and nominal line	
Efficiency	89% typical at 230VAC	
Output Configuration	**V1**	**V2 Standby Output**
CAR4010L1TN/CAR4030L1TN	-54V @ 74A	5V @0.5A
CAR4010K1T/CAR4030K1T	27V @ 148A	5V @ 0.5A
Output Voltage Range	- 40 to -58V (for CAR4010L1T) and 20 to 29V (for CAR4010K1T) with external programming	
Line Regulation	0.5% using remote sense (5% on Stand-by Voltage)	
Load Regulation	0.5% using remote sense (5% on Stand-by Voltage)	
Output Ripple & Noise	<1% (pk-pk)	
Transient Response	3% max deviation 0.50ms recovery time for a 25% load change	
Start-up Time	2 seconds	
Hold-up Time	>20ms at low line	
Overshoot / Undershoot	1% at turn ON / OFF	
Temperature Coefficient	0.02% per °C	
Remote ON / OFF	Logic 1 (TTL High) or open enables unit (ON), Logic 0 (TTL Low) or short shuts unit down (OFF)	
Power Fail Signal	Signal goes low (TTL low) 2ms before loss of output regulation	
Current Limit Protection	110-140% V1, 5VSB <2.5A. Automatic recovery.	
Over Voltage Protection	- 58.5 to -59.5V (for CAR4010L1TN) and 29.5 to 30.5V (for CAR4010K1T). Reset by cycling input power.	
Over Temperature Protection	Automatic shutdown with auto recovery. Thermal shutdown point @ 95°C	
MTBF	300,000 hrs per Bellcore standard	
Output Power Good	TTL High = Power Good, TTL Low = Output out of limits	
LED Indicators	DC Good: Green LED; Temperature OK: Green LED; and AC Good: Amber LED	
Operating Temperature	0°C to 50°C at rated output power. Supply derates linearly from 50°C to 65°C at 2.2% per °C	
Cooling	Self contained ball bearing fan.	
Shock & Vibration	NEBS Compliant to IEC68-2-27 & MIL-STD-810E, Telcordia GR-63-CORE; GR-487-CORE	
EMI/EMC	Meets EN61000-3-2, -3 CISPR22 and FCC Part 15 Class A, Bellcore GR-1089-Core	
Safety Approvals	UL1950, CSA 22.2 No. 650, TUV EN60950 & CE Mark	
Weight	13.5 pounds	

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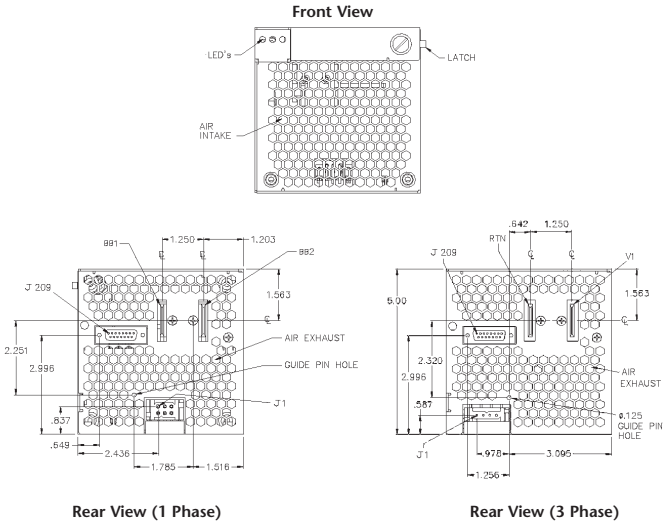
97MS2101
Rev. B - 03.15.04

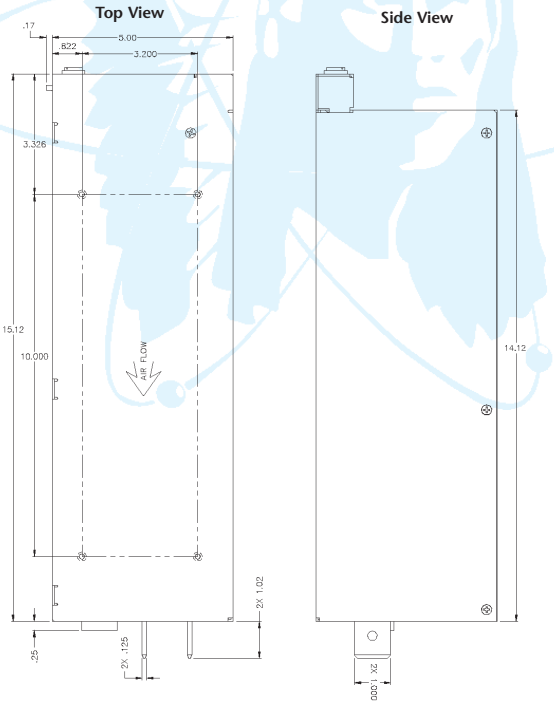
CHEROKEE INTERNATIONAL

CAR4010T & 4030T

4000 Watt Single Output Rectifier Modules

Outline Drawing





Connector Information

Mating Connectors		
Output:	Elcon 538-17-00100	**Input Connector:**
Option Connector:	AMP 205205-2	CAR4010T - Positronics PLB06F0000
Option Pins:	AMP 205090-1	CAR4030T - Positronics PLA04F8000

Model Selection Guide

CAR 40X0 X1T X – 1A

- CAR — Model (CAR Series)
- 40X0 — Output Power & Phase: 4010 - 4000W, Single Phase; 4030 - 4000W, Three Phase
- X1T — Output Voltage: L - 48 Vout; K - 24 Vout
- X — Options: N - Negative Vout; X - Positive Vout

Output (Bus Bar)		
CAR4010L1TN	BB1=V1	BB2=RTN
CAR4010 K1T	BB1=RTN	BB2=V1

Input Connector	CAR4010T		CAR4030T		
Connector Number	**Pin Number**	**Function**	**Connector Number**	**Pin Number**	**Function**
J1	1,4	Chasis Ground	J1	1	Line 1
J1	2,5	Line (L)	J1	2	Line 2
J1	3,6	Neutral (N)	J1	3	Line 3
			J1	4	Chasis Ground

Output Connector	CAR4010T & CAR4030T				
Connector Number	**Pin Number**	**Function**	**Connector Number**	**Pin Number**	**Function**
J209	1	5V Stand By	J209	9	AC Fail
J209	2	5V Stand By RTN	J209	10	V Progammable
J209	3	Module Present	J209	11	V1 Sense
J209	4	Power Good	J209	12	I Monitor
J209	5	ON / OFF	J209	13	Temperature OK
J209	6	I Share	J209	14	RS (Return Sense)
J209	7	Mod-Enable	J209	15	N/C
J209	8	OVP Test Point			

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97MS2101
Rev. B - 03.15.04

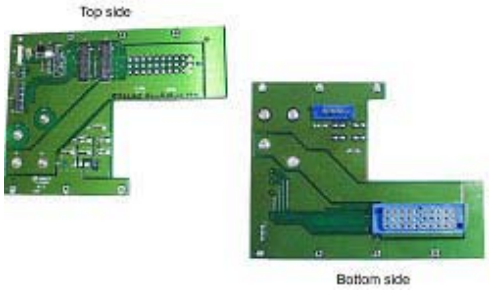
16 Backplane/Interface Board Description

16.1 Front-End Power Supply Backplane

The **Front-End Power Supply Backplane** is the electrical and physical receptacle for the Front-End Power Supply assemblies. The backplane board is mounted to the Affinity® Chassis and provides AC voltage to the Front-End Power Supplies. The DC output voltages from the Front-End Power Supplies are applied to the backplane to be used as a source of power for the Driver section and PA plug-in modules. The Front-End Power Supply Backplane also contains a diagnostic interface that can be used, via the Omnitronix SL81 Status Monitoring and Control System (SMCS), to monitor Front-End Power Supply status.

Front-End Power Supply Backplane board

AC power from the rear panel enters the Front-End Power Supply Backplane board through connectors J3, J4, and J5. The AC source enters the Front-End Power Supplies through backplane connector J11. DC output power from the Front-End Power Supplies is present on J12 of the backplane board where it is distributed to the other modules via backplane connector studs J6 and J7. The 24-position dual row connectors, J1 and J2, are used to communicate and monitor the other modules in the sub-chassis. Three-position single row connector J9 and nine-position single row connector J10 connect to the amplifier motherboard to establish communications between the Driver Backplane board and PA segments.



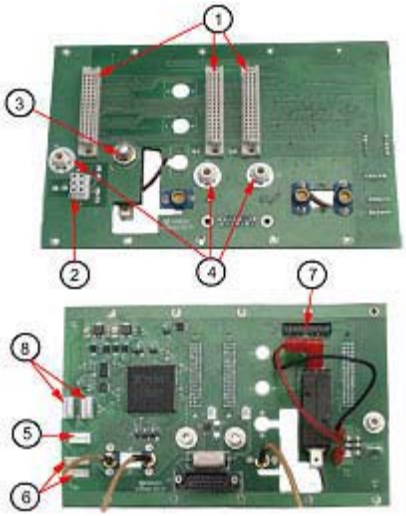
16.2 Driver Backplane

The Driver Section (Power Supply and Upconverter modules) is electrically, and physically connected to the **Driver Backplane** when plugged into the Chassis assembly. The connectivity is established when the push-button switch located on the backplane is depressed. This occurs when the Driver Section Power Supply is plugged into the Chassis. Removing the Driver Section Power Supply Module will also remove power from the Driver Backplane. This is done to prevent arching during a Hot Swap operation.

The Driver Backplane provides +8VDC, +12 VDC, -12 VDC, +24VDC and ground for the Driver Section. The Driver Backplane also contains multidrop communication connectivity used by the Driver Section assemblies.

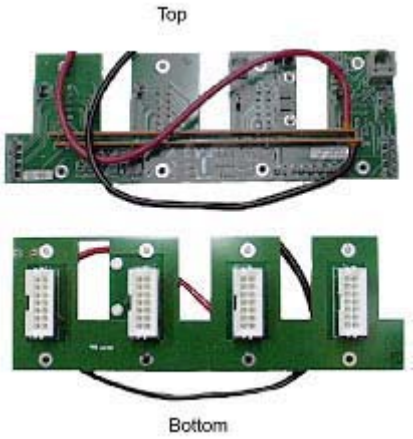
Driver Backplane

The Driver Section Power Supply module supplies the Driver Backplane and Upconverter module with 5VDC, 12 VDC, –12 VDC, and data through 48-pin DIN connections (**1**). The main power to the Driver Section Power Supply plug-in is delivered through a six-position blind mating connector (**2**) that is supplied by a push button switch (**3**) activated by plugging the Power Supply module in. Pins attached to the rear panel of the modules provide module grounding through the grounding sockets (**4**). A five-position single row header (**5**) and a 24-position dual row header (**7**) allow external data exchange. Two six-position single row headers (**6**) supply the RF modules with power and communications. A redundant driver assembly may be achieved by connecting two backplane boards together via the two five-position single row headers (**8**).



16.3 PA Backplane

The PA Modules are electrically and physically connected to the **PA Backplane** when plugged into the Chassis assembly. The PA Backplane contains float-mounted, blind-mating receptacles, and blind-mating headers for module alignment. The PA Backplane provides +48VDC and ground for the PA Module segments. The PA Backplane also contains RS485 multidrop communication connectivity used by the PA Module assemblies. A two-position Dual Inline Package (DIP) switch located on the PA Backplane is used to enable or disable control and diagnostic access via the RJ11 connector located on the front panel of the PA Modules.



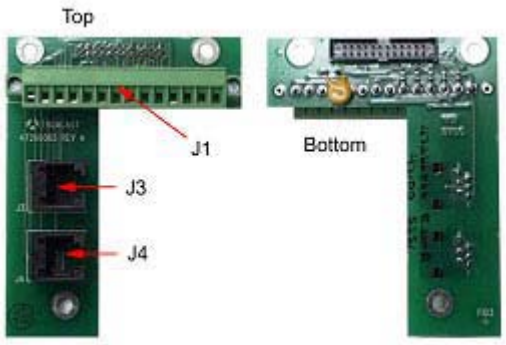
16.4 Rear Panel Interface

Located on the rear panel, the **Rear Panel Interface** board allows access to the control and diagnostic signals within the unit.

J1 is a 14-pin terminal block that allows diagnostic and monitoring pigtail wires to be clamped via the screw lock-downs. This connector provides fault indication status for each sub-assembly within the transmitter system.

J3 - (N/A)

J4 - (N/A)



J1 Control and Diagnostics connector pin-outs

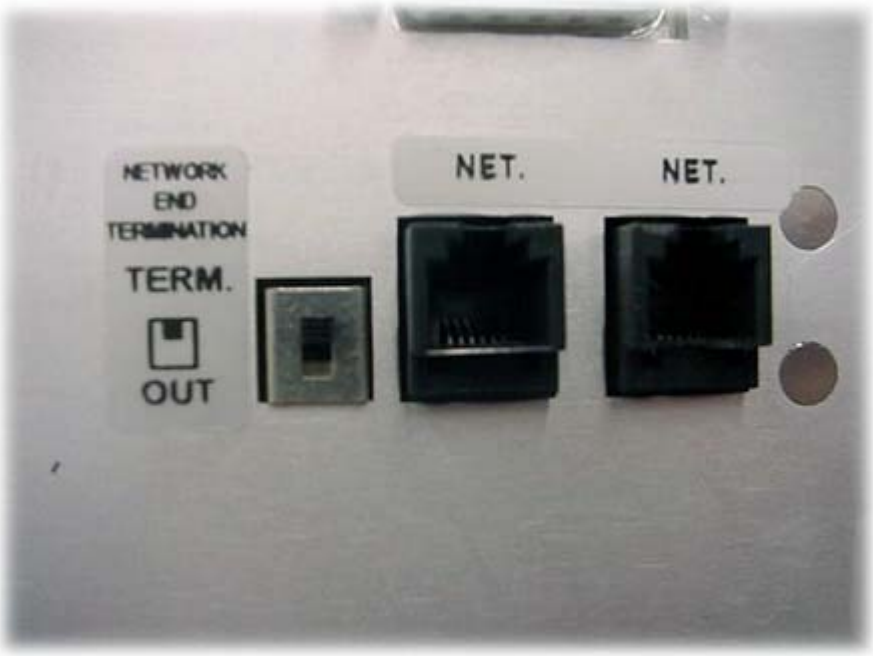
J1 Monitoring Parameters		
Pin	Parameter	Typical Voltage
1	GND	0.0VDC
2	LO/Front-End Fault or Remote ON/OFF	3.7VDC
3	Power Supply Fault	5.0VDC
4	Pre-Amp/Upconverter Fault	3.7VDC
5	System Power Fault or Fwd Power	4.7VDC
6	Reflected Power Fault or +24VDC	+24VDC
7	**+48V** Fault Input	N/A
8	+10V Fault Input	N/A
9	PAS Reset Output	N/A
10	PAS Standby Output	N/A
11	N/A	N/A
12	+12V Output	11.6VDC
13	ALC voltage level	1.7VDC
14	+5V Amp-Cage Fault Input	N/A

16.5 RS-485 Communication Board

An **RS-485 Communication Board** is mounted to the inside rear of the Driver Section. The board monitors the RS-485 communication traffic on the system bus. A common computer/master control station can monitor up to 32 RS-485 devices on the network.

The RS-485 Communication Board is equipped with two RJ11 6-pin telephone type receptacles. The cables used to daisy chain (parallel) the RS-485 devices to the host are shielded double twisted pair.

A mini double-pole double-throw (DPDT) dipswitch labeled NETWORK END TERMINATION is accessible on the RS-485 Communication Board from the back panel of the Driver Section. In an RS-485 network, all RS-485 devices in the daisy chain series, with the exception of the last RS-485 device in the network, have the dipswitch set to OUT. The last RS-485 device in the network has the switch set to TERM. Placing the switch in TERM terminates the communication bus with the required impedance.



RS-485 Communication Board

16.6 Master Support Interface Board

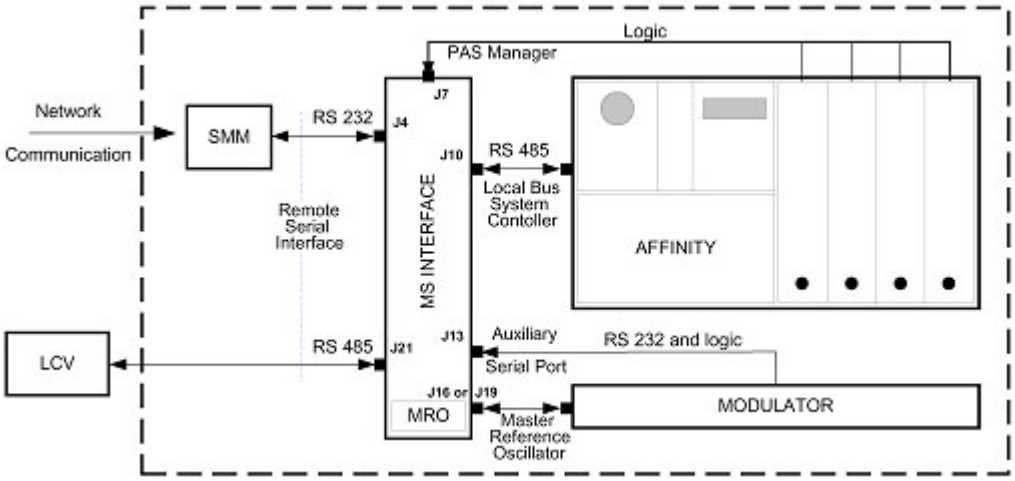
Overview

The **Master Support Interface (MSI) Board** assembly performs several functions within the Affinity transmitter.

- Interface to external management system.
- Control and monitoring of the plug-in modules, via communication and electrical interfaces
- Management (control, fault notification) of modulator
- On-board Master Reference Oscillator (optional, for DVB-H applications)
- Fast response PA module (Amplifier plug-in) protection

Hardware systems

The MSI hardware performs various hardware functions and provides a platform for the management of the internal transmitter components. The circuitry contains a primary microcontroller (Main MCU), a primary programmable logic device, or CPLD (Main CPLD), and an MCU and CPLD dedicated to an auxiliary serial port provided by the transmitter (Port MCU and Port CPLD). Other key circuitry includes a Master Reference Oscillator system, Power Amplifier Segments manager, Fast ALC Reduction circuit, and Remote and Local serial busses.



Remote Serial Interface

External high-level management systems connect to the Affinity® transmitter using the transmitter Remote RS-485 interface. The electrical interface consists of: an RJ-11 jack located on the Affinity® rear panel, a wire harness located inside the Affinity® chassis, and the RS-485 transceiver circuit located on the MSI circuit board assembly. SNMP management is provided through the Omnitronix SNMP Device Server.

Local Bus System Controller

The MSI acts as a master on the Local RS-485 network located inside the Affinity® chassis. As the master on the network, the MSI sends query and command messages to the slave devices on the Local network, and receives responses from the slave devices. The Upconverter plug-in is a slave device.

The Local bus support circuitry consists of:

Auxiliary Serial Port

An RS-232 transceiver, and dedicated MCU and CPLD circuits are provided on the MSI to support an auxiliary RS-232 serial port (aux port). The port system consists of the transceiver and controller circuits on MSI connector J13, and harnessing to the rear panel DB-9 male connector. The auxiliary serial port is typically used to interface a modulator to the Affinity® transmitter.

Master Reference Oscillator

The Master Reference Oscillator (MRO) system on the MSI receives a 10 MHz reference input on MSI SMA connector J17. The MRO phase-locked loop (PLL), which contains an on-board VCO, locks to the reference input. The VCO output signal is fed to two SM connectors, J16 and J19. These are used to feed the Affinity® Local Oscillator and the modulator (optional). A tracking mechanism is provided that follows the control voltage applied to the VCO. Should the 10 MHz reference input be removed, the tracking holds the VCO at the last stable position of the VCO. This helps maintain the transmitter on frequency, even after loss of reference input.

PAS Manager

The Power Amplifier Segments (PAS) are contained in the same chassis as the MSI. This group of amplifiers is called a “quad”.

The PAS Manager of the MSI protects the amplifiers from damage that could occur following failure or removal. When an amplifier fails, the output power of the transmitter is reduced. The transmitter ALC will attempt to correct the reduction in power by increasing the drive level applied to the remaining amplifiers. Since this can result in overdriving the remaining amplifiers and potentially damaging the device(s), the PAS Manager reduces the ALC level to a factory-calibrated level. The transmitter power is reduced predictably (Fast ALC Reduction). The PAS status signals are monitored on connector J7 of the MSI. Failed PAS location numbers are stored in a CPLD register and read by the Main MCU for monitoring and fault notification.

Firmware Systems

The MSI contains four firmware programs: the Main MCU program, the Main CPLD program, the Port MCU program, and the Port CPLD program. Interaction of the various firmware programs is described below.

Main MCU Firmware

The Main MCU program (main firmware) is the most complex of the four programs. This program is responsible for supporting the Local and Remote serial interfaces, MRO, and PAS Manager, as well as passing commands to the Modulator, and receiving fault notifications from the Modulator.

Remote Serial Bus Support

The main firmware receives TNET protocol Remote serial commands and requests. Commands may be issued by using the Omnitronix SNMP Link SL81 management device. The commands may be used to change the values of calibration variables stored in MSI non-volatile memory. For a list of these variables, refer to the SNMP document.

Commands may also be issued to change the settings and behavior of the Modulator. Refer to SNMP document for a list and description of the available Modulator commands. The main firmware is stored in flash memory. The firmware may be updated using a terminal emulator to issue updated commands to the transmitter, and to transfer the updated firmware file to the transmitter.

Status of the Affinity® transmitter is collected by means of status queries sent to the MSI Remote serial port. The MSI responds to these requests with a response message in a predefined format, containing values of monitored variables. In transmitters having an internal SNMP Device Server, the Device Server repeatedly polls the status of the Affinity® transmitter with status queries sent to the MSI.

Local Serial Bus Support

The MSI Main MCU, through firmware, implements a master device on the Affinity® internal Local serial bus. The master device issues requests and commands to the Upconverter on the bus, which is a slave device (i.e. this node cannot issue a request or command, but can only receive requests/commands and respond). Through frequent Local bus queries/responses, the MSI collects the status of the Upconverter. In addition, the MSI can send commands to the plug-in causing changes in operation such as: changing the operating channel, or setting the system to STANDBY or ON AIR.

Master Reference Oscillator Support

The MSI main firmware monitors and controls the on-board Master Reference Oscillator (MRO). The main firmware monitors the MRO PLL VCO control voltage using an A/D converter. The MSI uses the measured voltage to determine a second control voltage to be applied to the PLL that follows the MRO PLL VOC control voltage. A D/A converter on the MSI generates the output. As the VCO control voltage changes slowly with time, the D/A voltage tracks the VCO voltage. If the 10 MHz reference input to the transmitter is removed, the tracking voltage is

frozen by the main firmware thus minimizing disturbance to the transmitter. When the input is reapplied, the tracking resumes.

PAS Manager Support

In the Power Amplifier Segment (PAS) quad system, the MSI monitors two signals, ***PAS_fault*** and ***PAS_presence***, for each PAS. The monitoring is performed in the Main CPLD in a system called the PAS Manager. The failed PAS is detected by the MSI main firmware by reading the registers in the Main CPLD.

The MSI main firmware uses a calibration variable ***QUAD_MASK*** to inform the MSI CPLD of the number of installed PAS modules. This is necessary to set the proper ALC reduction for the given number of PAS.

Auxiliary Port Management

The MSI Auxiliary Serial Port (aux port) is used to monitor and control a device connected to the Affinity® transmitter, such as a modulator. The Port MCU handles port management; however, the commands and requests for status of the modulator originate in the top-level management system and pass through the Main MCU as TNET serial messages. The Main MCU copies the command or status request from the TNET message and passes the request to the Port CPLD, which sends the appropriate control or monitoring message to the managed port device.

Refer to SNMP document for a list and description of the variables managed in the auxiliary equipment connected to the Auxiliary Port.

Port MCU Firmware

The Port MCU is dedicated solely to the management of a device connected to the Auxiliary Serial Port. Equipment such as a modulator may be connected to the aux port. In the factory, the firmware program appropriate to the end-user’s purchased equipment is loaded in the Port MCU.

The Port MCU periodically reads fault alarms for various modulator systems from the modulator and writes the conditions of the systems (pass/fail) to the Port CPLD. The alarm status is available to the Main MCU for fault notification to the top-level management system.

At any time, the top-level management system can issue a command to the modulator. The command is received by the Main MCU and passed through the Port CPLD to the Port MCU. The Port MCU develops the corresponding message with arguments given in the original command, and sends messages to the modulator connected to the aux port.

System Configuration

During factory set-up and test, the various transmitter systems under the control of the MSI are configured, and settings stored, in the MSI non-volatile memory. Some configuration settings are used to enable and set-up optional resources of the MSI. The settings are stored in "personality" variables. In general, users should not change variables, but the user can read back the values of the variables to recall the available MSI resources. The variables are briefly described below. For a more detailed description of the personality variables, refer to the SNMP document.

- On Board Resources Personality (OBR_PERSON) – enables or disables MSI systems such as PAS Manager for quads and MRO.
- Local Serial Bus Personality (LOCAL_PERSON) – enables or disables local serial communications with the plug-in modules.
- Auxiliary Serial Port Personality (PORT_PERSON) – enables or disables the Aux Port system.

16.7 True RMS Detector Module

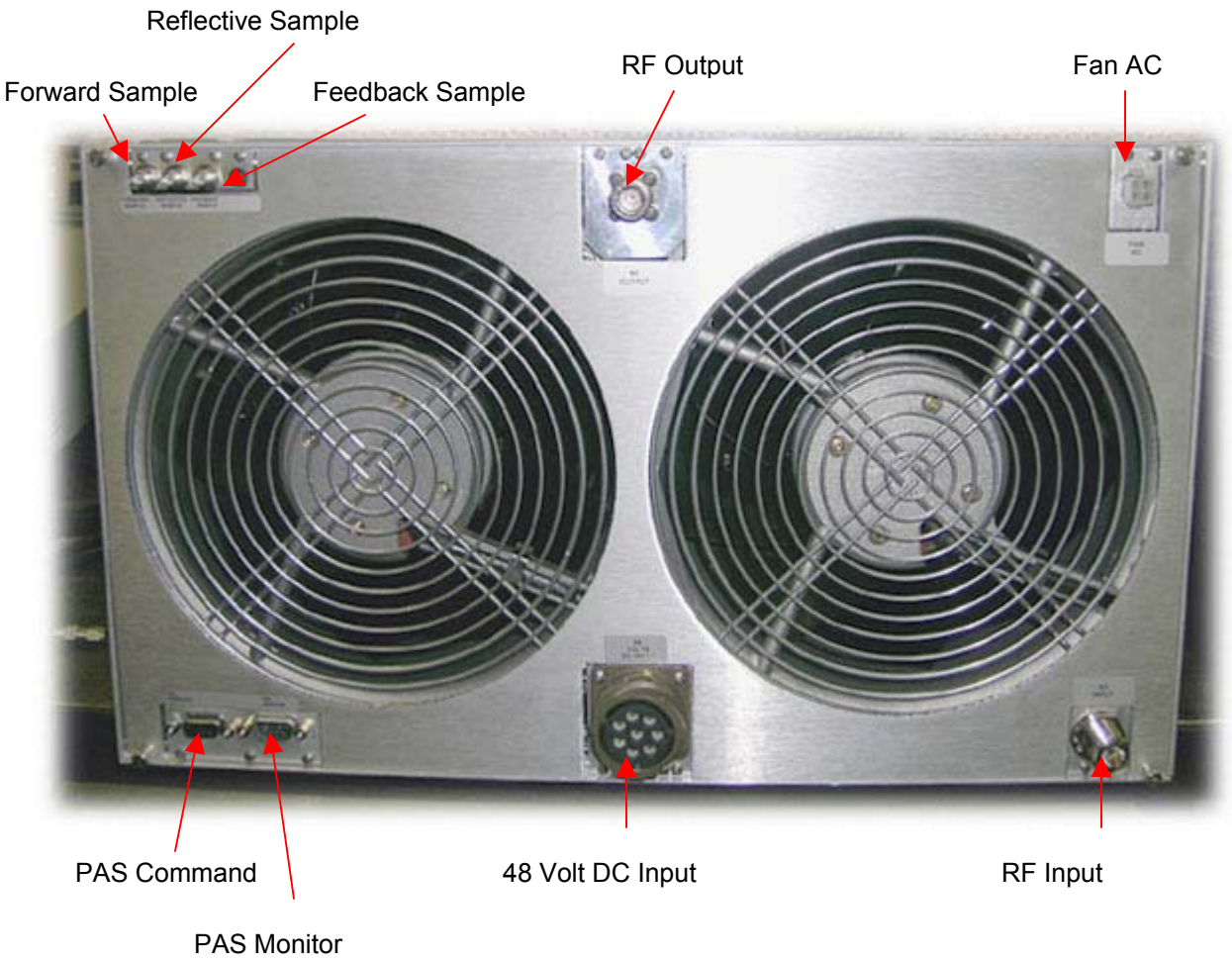
The signals coming from the directional coupler feed the **True RMS Detector Module** with both the forward power and reflected power proportional to the transmitter output. The input attenuator matches the directional coupler port and level to the detector.

The RMS Detector Module is based on a true RMS detector-chip that provides linear RF detection with high sensitivity. The log function of the detector allows for the measurement of the rms power independent of the peak-to-average ratio of the specific waveform of the transmitting signal. Temperature compensation and fault detection are provided with the circuit.

16.8 Sub-Chassis Rear Panel

Rear Panel Connectivity

Amplifier Chassis



48VDC Input: The DC Input provides the power supply requirements for the PA Modules

RF Output: This is the 50-ohm UHF output signal connection to the RF System. (Female N-type connector)

RF Input: Allows RF input from the exciter (-18dBm typical). The connector is 50-ohm BNC.

Fan AC: Provides the AC source to power up the Amplifier Chassis fan assemblies

Forward Sample: This input is for the RF sample feedback from the RF system to drive the local power meter.

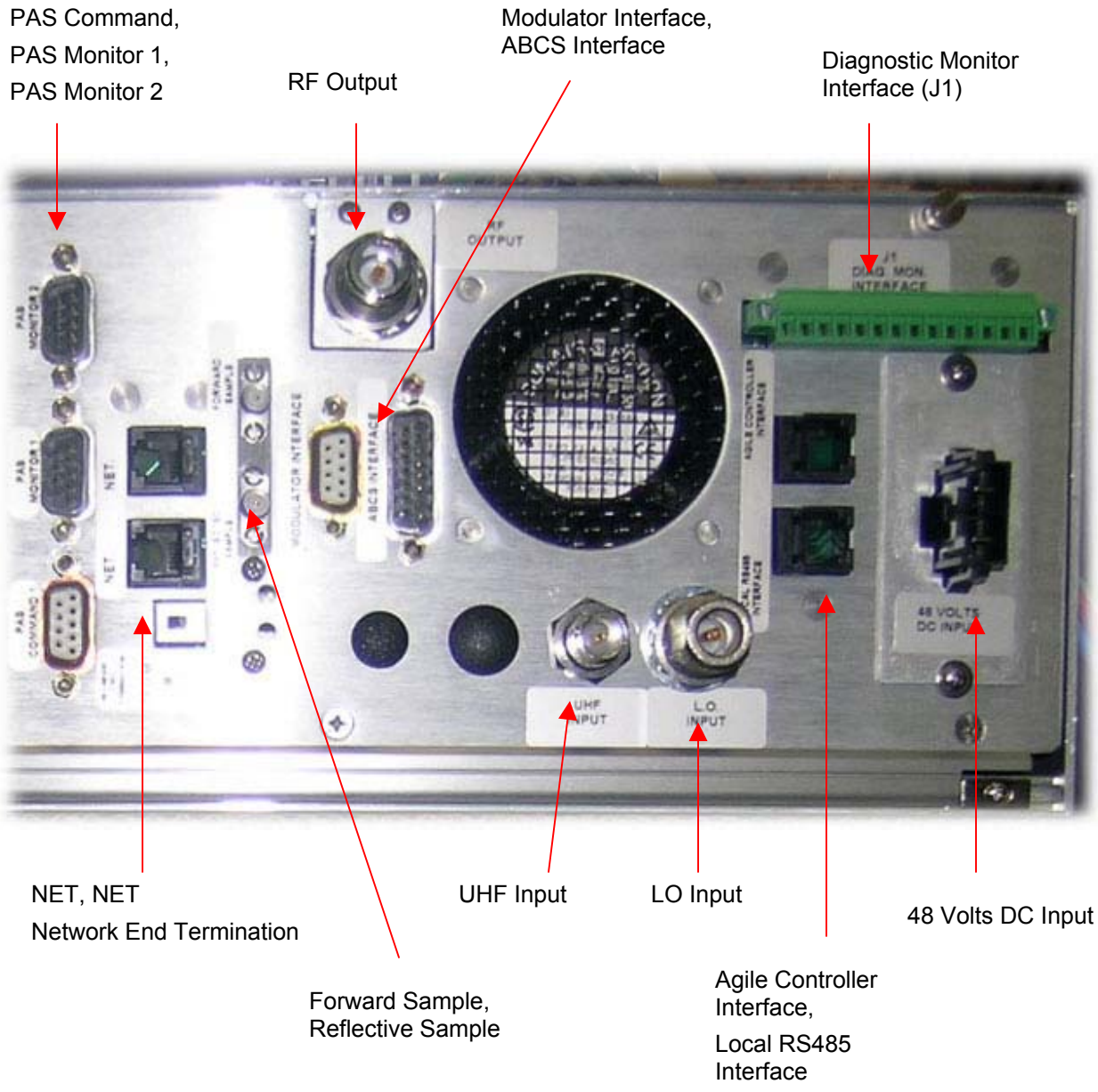
Reflective Sample: This input receives the Reflected RF signal feedback from the RF system to drive the local Reflected power meter.

Feedback Sample: This BNC connector is the output feedback signal of the transmitter. This signal is used to calculate its correction.

PAS Command: This output (9-pin DB female connector) is used to transmit operational commands to the Amplifier Chassis.

PAS Monitor: This output (9-pin DB male connector) transmits operational status data to the Driver Section.

Driver Chassis



16.8.1 Exciter to UCA Cabling and System Interconnects

This section explains cabling and interconnections for the LBD-200C-N1 transmitter. Refer to the Automatic Backup Control System (ABCS) & Site Management Module (SMM) descriptions within the BTS control chassis manual for additional interconnections of the agile transmitter and remote SNMP management systems.

UCA Sub-Chassis Front Panel:

Connect the LO output of the LO Plug-In module to the LO input of the UCA with the SMA male-to-male semi rigid jumper.

Transmitter:

Refer to the cabling diagram, which depicts a photo of the rear panel interconnections.

17 RF Filter Description

RF Filter (Front view)

RF Filter (Rear view)

18 Phone System Description

19 Transmitter Cooling Description

The Affinity® LBD-200C-N1 transmitter incorporates a combination of forced ambient air-cooling and cabinet air conditioning systems. In the ambient system, air enters through the front of each chassis and exits the rear. Amplifiers use folded-fin heatsink technology for increased cooling efficiency. The Upconverter chassis uses a similar cooling arrangement with low volume fans for the lower associated heat dissipation. Accompanying the forced air-cooling systems is the enclosure air conditioning system sized according to the heat load expected by the transmitter and ancillary equipment.

19.1 Cabinet Air Conditioning Systems

ADVANTAGE RP55 SERIES AIR-COOLED PANEL-MOUNTED AIR CONDITIONERS

KOOLTRONIC
COOLING EXCELLENCE FOR ELECTRONICS

K2A3C20RP55R

STANDARD FEATURES

Textured Baked Powder Finish
Built-in Condensate Evaporator
Low ODP Refrigerant
Closed-Loop Cooling
Crankcase Compressor Heater
Digital Temperature Display
EMI/RFI Suppressor
Head Pressure Control Switch
Heavy-duty Steel Enclosure
Low Ambient Kit
Low Temperature Control Thermostat
M/TAB Mounting System
NEMA3R Rating Maintained (UL50)
Permanent Filters
Six Foot [1.8m] (minimum)
SJT 3-wire Cord
UL/CUL Recognized

ACCESSORIES AND OPTIONS*

- Cooling Effect Detector
- Enclosure Heater
- Filter Recoating Adhesive
- Filters for replacement
- Internal corrosion protection
- Power Loss Delayed Compressor Start
- Special paint finishes

*See opposite side for more information.

APPROXIMATE WEIGHT

298 lbs. [135.5 kg]

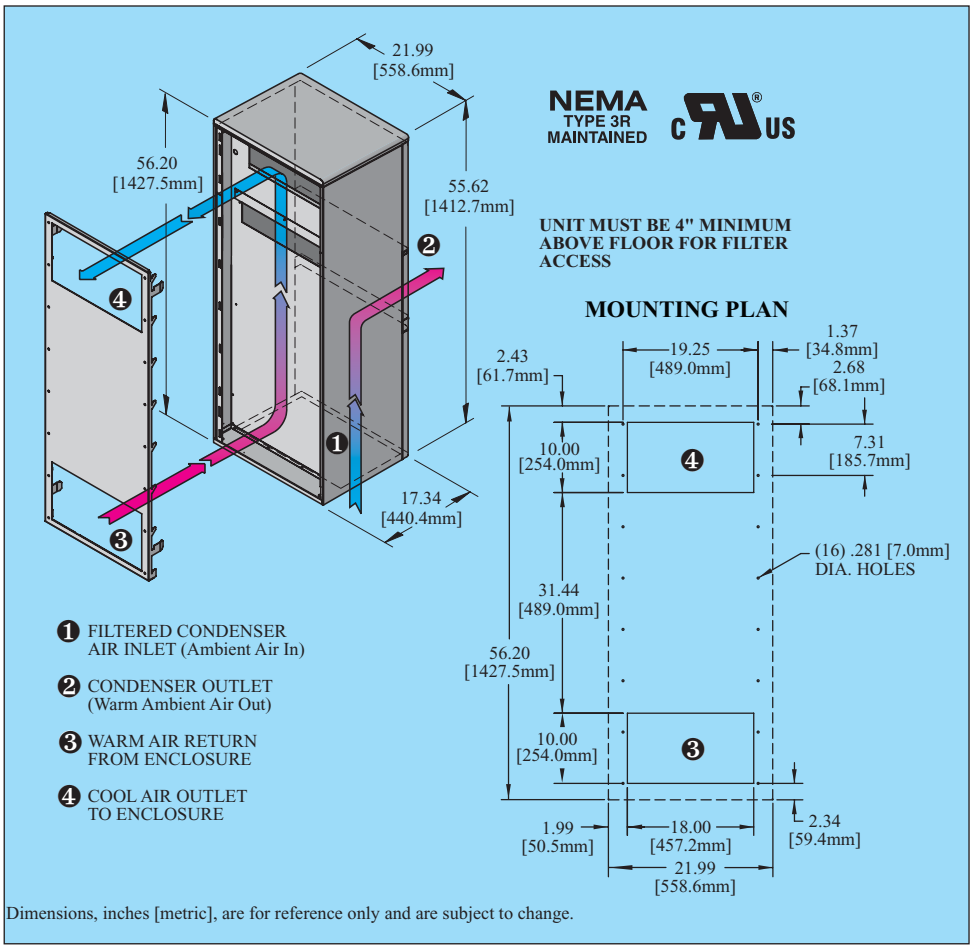
HOW TO ORDER

Specify model number. NOTE: Accessories and Options may affect model number, contact KOOLTRONIC for information.

For assistance in model selection, refer to the Air Conditioner Sizing and Selection Guide, contact KOOLTRONIC, or use one of our design aid software programs, available FREE.

CALL 1-800-321-KOOL (5665)
or FAX 609-466-1114

POPULAR MODELS ARE STOCKED AND READY TO SHIP



Dimensions, inches [metric], are for reference only and are subject to change.

TECHNICAL DATA

Model	Refrigerant	UL/CUL Listed or Recognized	BTU/H Rating	Ambient Temp. °F Max.	Ambient Temp. °F Min.	Ambient Temp. °C Max.	Ambient Temp. °C Min.	Volts	Hz	* Cooling Amps	** Heating Amps
K2A3C18RP55R	R22	Recognized	18000	125	0	51.7	-17.8	230	60	21.6	5.3/8.8
K2A3C20RP55R	R22	Recognized	20000	125	0	51.7	-17.8	230	60	21.6	5.3/8.8
K2A3C22RP55R	R22	Recognized	22000	125	0	51.7	-17.8	230	60	21.6	5.3/8.8

* Rating shown is for operation at maximum ambient temperature.
** Optional Single Enclosure Heater/Double Enclosure Heater

Kooltronic, Inc., 30 Pennington-Hopewell Road, P.O. Box 240, Pennington, NJ 08534-0240
Tel: (609) 466-3400 Fax: (609) 466-1114 Internet: www.kooltronic.com E-Mail: sales@kooltronic.com

DESCRIPTION

At last - air conditioners designed specifically for cooling electronic enclosures that can be used for both indoor and outdoor applications right out of the box!

No more bulky unattractive weather hoods... No more worries over what options to specify for outdoor applications.

Expertly designed and crafted, the ***ADVANTAGE Series*** boasts a stylish appearance with rounded edges, no visible hardware and a textured baked powder finish to blend easily with contemporary enclosure designs.

Servicability has been made easier by incorporating a “knock-down” sheetmetal design which provides quick access to internal components.

Standard features include heavy duty galvanized steel construction with baked-on powder paint, environmentally friendly refrigerants, built-in condensate evaporator, thermostatic low temperature control and EMI/RFI Suppressor. These air conditioners are available in capacities from 1,000 to 22,000 BTU/H in seven heights, all utilizing the exclusive KOOLTRONIC M/TAB integral mounting system.

KOOLTRONIC also designs and manufactures a variety of Air Conditioners to meet *unique* specifications. We invite your inquiries about our modification and custom-design capabilities.

STANDARD FEATURES

CLOSED-LOOP COOLING: The enclosure interior airflow system is isolated from the ambient airflow system. Ambient air can not invade the cool, dehumidified sensitive component compartment.

BALL-BEARING MOTORS: All fan motors are UL/CSA Recognized and include automatic-reset thermal overload protection and double-sealed or double-shielded precision ball bearings. Special permanent lubricants in the tube axial fans perform over a broad temperature range: -20°F [-28.9°C] to 250°F [121.1°C].

RUGGED CONSTRUCTION: Precision-engineered heavy gauge steel construction of all cabinets and blowers insures Air Conditioners will stand up under tough applications.

TEXTURED BAKED POWDER FINISH: Durable, baked-on textured beige powder finish is standard. Other finishes are available.

POWER: Available in 230 VAC, 50 Hz or 60 Hz.

REFRIGERANT: Low Ozone Depleting Potential (ODP) R22 Refrigerant is used in all ***Advantage RP55 Series*** Air Conditioners and are being converted to CFC-free R134a Refrigerant as compressors become available. Consult KOOLTRONIC for status at time of requirement.

PERMANENT FILTERS: Multi-layer grid of sturdy, corrugated aluminum in an aluminum frame. May be reused after washing off accumulations and spraying with A-16 Recoating Adhesive.

CONDENSATE EVAPORATOR: Built-in Condensate Evaporator eliminates need for draining condensate under normal operating conditions. May not be adequate in extremely high humidity with open or leaky enclosure. Overflow condensate drain fitting and hose are included.

LOW AMBIENT KIT: Maintains sufficient operating pressures when ambient temperatures drop below 50°F [10°C]. Includes a compressor heater and pressure actuated condenser blower cycling control.

LOW TEMPERATURE CONTROL: Thermostatic Low Temperature Control prevents over-cooling and provides energy-efficient operation.

EMI/RFI SUPPRESSOR: EMI/RFI Suppressor minimizes transient line spikes during on/off cycling.

CRANKCASE COMPRESSOR HEATER: 240V heater attached to the compressor crankcase to maintain appropriate temperatures during cold operating conditions.

HEAD PRESSURE CONTROL SWITCH: A control device to minimize compressor cycling and prevent evaporator coil icing.

POWER CORD: All models have six foot [1.8m] SJT-type 3-wire power cords with appropriate plugs.

INSULATION: All cold components, lines and the evaporator compartment are insulated with high-performance insulation for maximum efficiency.

GASKETING: All units are fully gasketed for tight, leakproof installation, in compliance with the NEMA 3R Enclosure Rating.

QUALITY ASSURANCE: Refrigeration system components are kept sealed until charged with refrigerant; all brazed joints are thoroughly leak-tested; each unit is functionally tested before shipment.

INSTALLATION: Detailed Installation and Operator's Manual, with drawings, mounting plan and spare parts list is included with each unit.

UL/CUL RECOGNIZED: All ***Advantage RP55*** models are *UL/CUL Recognized*. All ***Recognized*** models are available as ***Listed*** at added cost.

*ACCESSORIES AND OPTIONS***

FACTORY-INSTALLED OPTIONS:

COOLING EFFECT DETECTOR: A thermostat is mounted inside the cabinet and attached to a sensor in the warm air return. When the air temperature increases to the set point, a signal is sent to a terminal block. User-installed wiring from the terminal block to local and/or remote warning devices *(light, bell, siren, etc.)* can be for normally open or closed operation.

Append letter "B" to Part No.

ENCLOSURE HEATER: 240V fin strip heater, installed singly or ganged, used to maintain desired internal enclosure temperature, under cold operating conditions.

Single Heater, append letter "F" to Part No.
Double Heater, append letter “G” to Part No.

****Contact KOOLTRONIC for information.**

*ACCESSORIES AND OPTIONS*** *(continued)*

INTERNAL CORROSION PROTECTION: For corrosive or other hostile environments, special coating material is applied to copper lines, coils and other parts subject to damage.

Append letter "H" to Part No.

POWER LOSS DELAYED COMPRESSOR START: Protects the compressor from possible damage due to harmful short cycling, by initiating an "off" period before resumption of normal operation. Generally air conditioners require several minutes off for compressor protection after power interruptions of any type. These power interruptions can include power failures, opening of interlocked access doors, and cases where a thermostat activates the compressor in less than a few minutes. This option is particularly recommended for applications where frequent, brief power failures occur, interlocked cabinet doors are utilized, or where the cabinet internal loads fluctuate across a wide range.

Append letter "Y" to Part No.

SHORT CYCLE PROTECTOR: Protects the compressor from possible damage due to harmful short cycling, by initiating an "off" period before resumption of normal operation. Generally air conditioners require several minutes off for compressor protection after power interruptions of any type. These power interruptions can include power failures, opening of interlocked access doors, and cases where a thermostat activates the compressor in less than a few minutes. This option is particularly recommended for applications where frequent, brief power failures occur, interlocked cabinet doors are utilized, or where the cabinet internal loads fluctuate across a wide range.

Append letter "Y" to Part No.

SPECIAL PAINT FINISHES**

PAINTED METAL GRILLE**

Append letter "Z" to Part No.

CUSTOMER-INSTALLED OPTIONS:

FILTERS FOR REPLACEMENT: All KOOLTRONIC filters consist of a multi-layer grid of sturdy corrugated aluminum, securely held in a one-piece aluminum frame. Filters are required wherever air is drawn into an electronics enclosure or related cooling equipment to keep internal parts as clean as possible.

A non-drying adhesive coating traps a high percentage of particulate matter. These washable, reusable filters are designed to last the life of the cooling unit. Replacements are available for those which become damaged or otherwise non-serviceable.

Part No. 11631F (11.63 x 21.63 x 0.38 [295mm x 321mm x 10mm])

FILTER RECOATING ADHESIVE: This compound is a superior product for recoating all permanent filters after washing. The adhesives penetrate dirt layers to keep the filter surface tacky for longer effective performance between washings.

Part No. A-16 - one pint container.

****Contact KOOLTRONIC for information.**

20 Affinity Transmitter Control Systems

The upconverter amplifier (UCA) control system (driven by multiple microprocessors) monitors and controls all of the transmitter sub-assemblies, and provides transmitter status information to the operator.

A user-friendly man/machine interface is provided by:

- A front-panel control interface for menu driven commands (select, enter, escape, & exit buttons).
- A front panel LCD screen located on the driver module providing transmitter status information (status of transmitter, output power, power supply, local oscillator, and upconverter).

The transmitter safety system is hard wired, which allows for real-time processing, and is independent of the control system.

20.1 Automatic Control Systems and Monitoring

Automatic control systems protect the transmitter against VSWR problems and excessive air input temperatures by affecting successive restarts---first at the nominal power---then at –3dB while maintaining the transmission quality at the level obtained at nominal power output. Approximately, a 30-second delay will occur between the restarts. The transmitter is automatically shut down if the fault persists.

The transmitter is also protected by a safety system that causes amplifier module shutdown (due to excessive transmitter temperature, etc.). Monitoring of operational parameters, alarms, power output, VSWR, status of amplifiers, drivers and safety loops are available.

20.2 Status Monitoring and Control System (SMCS)

The Omnitronix SL81 Status Monitoring and Control System (SMCS) is provided for use with the Affinity® LBD-200C-N1 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.

20.2.1 SMCS Functions:

Controls

The SMCS has the ability to access the On (transmit), Off (standby), and Reset commands. Other operational commands, monitoring and safety controls, and diagnostic help system are available. The SNMP manager program can be used to browse the MIB of a connected device and select variable(s) to be modified.

Fault Log System

The fault log system within the SMCS records transmitter status changes (using time and date coding) and enables detection and identification of faulty sub-assemblies. This event data is stored in the history log in non-volatile memory.

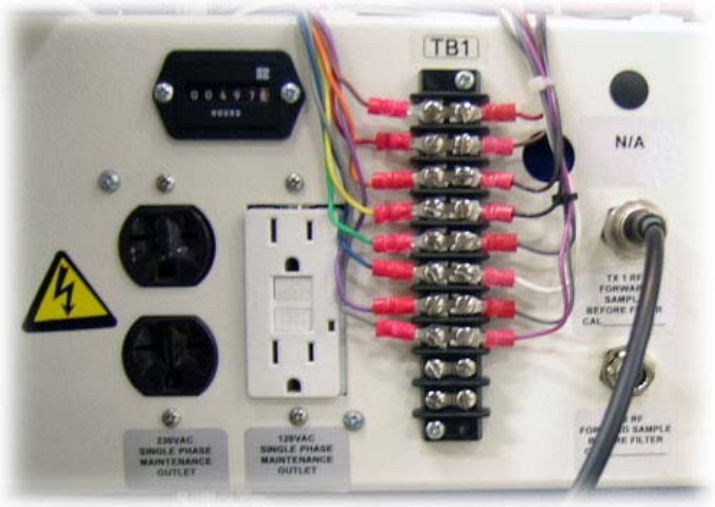
The parameters in the history log can be sorted and viewed several ways including: view by general chronological event and view by parameter. This information can be printed and exported from the SMCS for use with a typical database management system for further analysis.

Remote Control

The SNMP remote control system of the SMCS requires the use of a third-party element management system. It can be configured with either a dial-up modem interface or a GSM connection. All functionality of the local SMCS system is available to a user using the remote version (including control commands). Access to the SNMP agent for either writing and/or reading is organized by means of different user profiles defining the individual access rights. The SNMP TRAP operation is used to asynchronously send event information to the remote manager. The agent generates a TRAP message when one or more of the predefined conditions occur. The link between events and traps are configurable. The SNMP agent also integrates the SMTP protocol, allowing it to send email on events.

External Contact Closure Monitoring

In addition to internal transmitter system monitoring, the SMCS system allows the monitoring of several external contacts and alarm signals. The SMCS system is provided with a peripheral input/output system (PIOS) that provides the station the capability to monitor up to twelve contact closures. The system has three dedicated ports for fire, security, and environment. The user can name the remaining external contact closures through the GUI. This provides the flexibility to monitor anything at the transmitter station that can be interfaced to the contact closures provided in the PIOS (tower lights, generator status, UPS alarm, etc.).



Contact Closure panel

Omnitronix SNMP-Link SL81 Manual here

21 The Affinity® Quick Start Procedure

Each Thales transmitter is factory calibrated, and requires only a minimum start-up procedure to ensure proper operation. The appropriate steps for the installation of the Affinity® transmitter system and its ancillary equipment must have been performed prior to initiating this procedure. Please consult the installation and cabling sections of this manual before powering up any equipment. Verifying that all cables and electrical connections are in place is crucial. Read this section entirely, along with the calibration section, prior to beginning the transmitter power initiation process.

1. Start by ensuring that all of the amplifier modules are turned off via the front panel key switches.
2. Apply AC power to the UPS system; follow the manufacture's turn on guidelines.
3. Apply AC power to the site management system; follow the manufacture's turn on guidelines.
4. Apply AC power to the satellite receiver; follow the manufacture's turn on guidelines. Ensure a proper ASI feed is available to the Sirius DVB-H Exciter.
5. Switch on AC power to the Affinity® Upconverter amplifier chassis(s). Observe that the AC fan has begun to operate (fan noise will be heard).
6. Turn on the 48V Front-End Power Supplies; all plug-in modules should indicate proper DC output via their LED display. Also, observe that the driver sections including the multi-output Power Supply Plug-In and Upconverter have begun their initialization (a small time lag is normal -- under 5 seconds typical).
7. Switch on the Sirius DVB-H Exciter. Using the exciter front panel MMI, turn off adaptive pre-correction if enabled and place in flat response mode (first go to frozen mode then go to flat mode).
8. If available, use a spectrum analyzer to verify the exciter output level -18dBm ± 1dB. Adjust if required. Observe the exciter output, perform cancellation of LO or image rejection via local MMI or SIRUIS setup GUI interface (this is a factory calibration and should not be required).
9. Connect exciter output to the Upconverter amplifier chassis (UCA) UHF input.
10. Ensure 1GHz Local Oscillator connection via exciter and UCA.
11. Connect power meter to output coupler.
12. Ensure that the transmitter output is connected to an appropriate sized 50-ohm station load. Note: the return loss of the load should be greater than 15 dB at minimum.
13. Switch on all power amplifier (PA) front panel key switches while observing the power meter.
14. Using a power meter, ensure proper power output. Also, if available, observe channel spectrum output shoulder performance; shoulder should not exceed -29dBc from flat top, RES BW 30kHz VBW 3kHz. Span 15MHz. marker at 1672.5MHz delta ±2.64MHz.

15. If required, raise or lower power (see calibration sections below for process). Note that some sites may require power to be re-adjusted to compensate for antenna feed line loss. This is normal, and is site specific. The Affinity® system, as calibrated by the factory, will not allow the transmitter rated power output to be exceeded by more than 1dB. This 1dB margin is intended to compensate for transmitter drift with ageing, and serves as the power limiter for transmitter safety and protection against overdrive damage. Thales requires that the transmitter be operated at or below rated output, and that the total effective radiated power at the antenna terminal(s) not exceed the FCC limit of 2kW for this wireless service under part 27 of the commission regulations.
16. Recalibrate meter if required, see calibration process below.
17. Enable adaptive non-linear pre-corrector via front panel MMI. First, place the pre-corrector in frozen mode, then enter adaptive mode. Observe shoulder performance via spectrum analyzer and /or exciter front panel display; shoulder level greater than 34dBc is acceptable, 36 dB is typical.
18. Enable adaptive linear pre-corrector via front panel MMI. First, place the pre-corrector in frozen mode, then enter adaptive mode. Observe frequency response and group delay through appropriate measurement technique.
19. As a safety precaution, place the transmitter into standby; also remove the UHF input to the UCA. Now, connect the transmitter output to the antenna system. Note that the return loss of the antenna should be greater than 15 dB at minimum.
20. Reconnect the UHF input and place transmitter into transmit mode.
21. See that shoulder performance and linear response has not changed with connection to antenna system.
22. Ensure digital transmission quality by the appropriate demodulation and signal analysis techniques.

NOTE: If this is the initial turn on, Thales recommends that the full site proof be conducted in accordance with the provided field proof and handover documentation. All required data should be recorded within that specific documentation. Typically, a Thales field engineer will conduct this site turn-on process test during the site installation and proof. This eliminates the need for any specialized test equipment by the product end-user. Once the system is setup, the customer may maintain and view operating parameters via the onboard control and diagnostic tools, which have been designed for ease-of-use, and to minimize the operator's cost of maintenance.

22 Setup and Detailed Alignment Procedures

The normal start-up procedure for installation and operation of the Thales transmitter is found in the Affinity® Quick Start Procedure outlined in the previous section. In most cases, detailed maintenance calibration may be achieved by running the “Affinity Control GUI” software tool, which is typically loaded on a laptop computer.

NOTE: The user should be familiar with this software prior to attempting any calibrations. Refer to the *Affinity Control User’s Guide* document number # 47267151-108 for a detailed description of software operation.

Manual Alignment Process

22.1 Power Limiter & Manual Gain Calibration

1. Using the front panel key switches, place the PA modules to the OFF/UNLOCKED position.
2. Using EMSET, Set ALC MODE SELECT = 0.
3. Connect a cable to the RF Sample Output located on the preamplifier front panel.
4. Set POWER LIMITER value to zero. At this point, maximum output power should be +9dBm from the preamplifier direct output. Measured at front panel, sample would be -21dBm max.).
5. Set ALC MODE SELECT = 1.
6. Set ALC AUTO REF to 4095.
7. Using the front panel key switches, place the PA modules to the ON/LOCKED position.
8. Raise the POWER LIMITER value until power is 1db above the nominal power.
9. Set ALC MODE SELECT back to 0.
10. Raise ALC MANUAL REF from parameter value of zero until nominal power is achieved.
11. Set HEALTH SNAPSHOT 65535 to clear any faults.

22.2 Forward Power Calibration

1. Using EMSET, Refresh the monitored variables under normal debug mode 1.
2. Under monitored variables frame, read values displayed in the second row. The value in the cell titled LOW is multiplied by 256 and added to the value in the cell titled HIGH. The resulting value from this operation is now entered into the SYSTEM FORWARD POWER REFERENCE parameter.
3. Use EMSET to set ALC AUTO REF until the transmitter output power is 6dB +/- 0.1dB lower than nominal output power. This -6dB setting is critical for the accuracy of the front panel display.

4. Using NORM DEBUG MODE 1, read the values displayed in the second row. Multiply the value in the cell titled LOW by 256 and add this to the value in the cell titled HIGH. Record the total value.
5. Locate the correct setting partition, you should see two fields: one labeled address, and the other labeled Data. Enter 65 into the address field.
6. Enter the recorded value from the step above into data and click send. At this point, the scale factor will be incorporated into the meter system.
7. Confirm that 25% is displayed on the front panel meter under SYSTEM FORWARD POWER.
8. Now close EMSET 4.1, and reopen EMSET 5. Connect as before.
9. Raise ALC AUTO REF until system reaches nominal power and 100% on the front panel meter.
10. This completes the forward power meter calibration.
11. Set HEALTH SNAPSHOT 65535 to clear any faults.

22.3 Automatic Level Control

1. Using EMSET, Place system back to auto ALC mode by setting ALC MODE SELECT = 1.
2. Lower ALC AUTO REF until system reaches nominal power.
3. Perform linear and non-linear pre-correction of transmitter using the front panel menu via the Exciter (see below). After correction, the exciter output level should still be at -18dBm. If not, readjust output back to this nominal level.
4. With the exciter now at -18dBm, If necessary, go back to refine ALC AUTO REFERENCE to nominal power after correction.
5. Set HEALTH SNAPSHOT 65535 to clear any faults.

22.4 Upconverter Power Meter Calibration

1. Refresh the monitored variables under normal debug mode 1.
2. Under the monitored variables frame, read values displayed in the eighth row. The value in the cell titled LOW is first multiplied by 256 then added to the value in the cell titled HIGH. The resulting value from this operation is now entered into UPCONVERTER FORWARD POWER REFERENCE parameter. This completes the preamplifier meter calibration.
3. Set HEALTH SNAPSHOT 65535 to clear any faults

22.5 Reverse Power Calibration

1. Verify the level at the TRU-RMS Detector is +5dBm +/- 2dbm. If not, troubleshoot. (The level is determined by a fixed coupling factor and fixed attenuation values based on transmitter output power rating; if the level is out of tolerance, something is wrong in the RF chain.)

2. In order to calibrate the reflected meter, swap the forward sample and reflected sample cables on detector module.
3. Set NORMAL DEBUG MODE = 1(For a complete explanation of debug modes see DOC#25-0021). The screen will auto refresh. Note, that the variable names no longer represent actual parameter. DOC# 25-0021 explains the function of each parameter under the various debug modes. (Normal debug mode = 1 is used for meter calibration.)
4. Under the monitored variables frame, read values displayed in the third row. The value in the cell titled LOW is first multiplied by 256 then added to the value in the cell titled HIGH. The resulting value from this operation is now entered into SYSTEM REFLECTED POWER REFERENCE parameter. This completes the reflect meter calibration.
5. Return the cables to normal position.
6. Set HEALTH SNAPSHOT 65535 to clear any faults.

22.6 Calibrate Fast Reflected Shut Down

1. Sample the Transmitter output using an inline variable attenuator. Set the level to -5dBm and connect this signal to the reflected port of TRU RMS detector module.
2. Raise level slowly until the preamplifier LCD display of reflected power reads 15%.
3. Lower the FAST REFLECTED THRESHOLD until the power is reduced by approx. 6dB (this power reduction is pre determined) A typical value of fast reflected threshold = 1000. This threshold must be precise. Use smaller calibrations steps when reaching near the value of 1000.
4. Once tripped, it will stay at reduced power. To verify or to recalibrate, lower the sample and reset the module; use the reset button on the EMSET window for this purpose.
5. Verify that you can raise the reflected power percentage to at least 10% without the transmitter tripping into the 6dB protection mode. Also, exceed the 15% mark to activate the protection system. Again, reset the module back into normal operation when this test is completed.
6. Set system reflected power percent limit to = 25.
7. Return all cables to normal position.
8. Set HEALTH SNAPSHOT 65535 to clear any faults.

22.7 Non-linear Precorrection

1. Navigate to the menu for non-linear calibration on the exciter front panel; this is located under the F5 button on the keypad located below the display window [Press F5 once]. The feedback sample should be connected prior to the channel filter (default location).
2. Observe that the feedback level is Normal; see feedback level indicator (typical level is –15dBm).
3. Apply a one-shot or place the correction in adaptive mode; allow a few seconds for automatic correction.
4. Observe the shoulder level; ensure it is within tolerable limits (i.e. ≥34dB).

22.8 Linear Precorrection

1. Navigate to the menu for linear calibration on the front panel of the exciter; this is located under the F5 button on the keypad located below the display window [Press F5 twice]. The feedback sample should be connected after the channel filter.
2. Observe that the feedback level is Normal; see feedback level indicator.
3. Apply a one-shot or place the correction in adaptive mode; allow a few seconds for automatic correction.
4. Observe the frequency response and group delay; ensure they are within tolerable limits.

22.9 Raise & Lower Power

1. Navigate to the menu for POWER & CONTROL on the exciter front panel; this is located under the F3 button on the keypad located below the display window [Press F3 once].
2. Change power by selecting the appropriate output power in a percentage value. An increase or decrease can be achieved, so long as the maximum rating of the transmitter is not exceeded. (Example: to reduce the transmitter to 90% output, select 90% in menu control.)
3. Observe the power adjustment.

NOTE: To succeed in performing this step requires prior transmitter meter calibration or original default factory calibration settings.

23 Maintenance and Servicing

23.1 Maintenance Procedures

This section contains important maintenance information and procedures for the Affinity® transmitter system. It is divided into sections that describe the daily, weekly, monthly, semi-annual, and annual maintenance plans. Use this information in conjunction with the information and/or procedures supplied with vendor components. If information in this manual conflict with information supplied with vendor components, use the vendor-supplied information, or contact Thales Customer Service for subject matter clarification.

23.2 General Principles

The following two recommended general practices will allow for quick and trouble-free transmitter maintenance.

- First, it is imperative that operators and/or maintenance people become familiar with the Affinity® transmitter including operational and safety features. Read the information supplied with the transmitter. Become familiar with the location of major assemblies and components that make up the Affinity® transmitter system.
- The second practice is to keep proper and accurate operating and maintenance records. A good record keeping system should include current as well as historical maintenance and operational data. Using the records as reference, along with adhering to the standard maintenance guidelines, will enable operators to identify and resolve issues before the issues adversely affect system operation.

An example of information that should be contained within a good maintenance record book include:

PROBLEM: Thoroughly describe the problem or failure and record symptom descriptions relevant to the problem.

SOLUTION: Record what was done to resolve the problem. Include any conclusions as to why the problem occurred. Add notes as necessary to prevent the problem from reoccurring. Update applicable procedures and support documentation if warranted.

PARTS REPLACED: Identify all parts that were replaced. Include the part number and assembly reference designation. Use, and if required, update support documentation such as assembly prints, schematic diagrams, and part-lists as necessary.

DATE: Record the date, time, and personnel performing the maintenance or repair.

23.3 Recommended Test Equipment

The following is a recommended list of test equipment required for the operation, test, and troubleshooting of the Affinity® transmitter assemblies and sub-assemblies. The manufacturer's test equipment contained in this list is used only as a guide. Equivalent test equipment by other manufacturers may be used for the testing operations.

Model	Equipment	Typical Uses
Fluke 87	Digital voltmeter, 3½ digits	
Agilent E4418b Power Meter Agilent 8481H Meter Sensor	10MHz to 3 GHz power meter with sensor	Used in conjunction with various attenuators to measure power at various points throughout transmitter.
HP8594E Option 010 Option 301	Spectrum Analyzer (with options) Tracking generator TV Sync trigger	An important instrument for measuring power, troubleshooting, comparing levels, and setting modulation depths. In conjunction with a separate or built-in sweep generator, the analyzer can measure VSWR of antenna/transmission line systems.
HP8713B	Network Analyzer	Useful for measuring frequency response, troubleshooting, comparing gains, and setting frequency bandwidths. In conjunction with an external broadband detector, the analyzer can measure frequency response through frequency conversions.

23.4 Schedules Maintenance

Use this maintenance schedule as a guide for the Affinity® transmitter. Maintenance procedures may be performed more often if environmental conditions are not typical. Variables such as dirt, heat and power-line variations, which may degrade the transmitter operation, should be monitored and accounted for during any maintenance schedule. Keep the transmitter and the surrounding area clean. The transmitter can fail if operated in an overheated and/or dirty environment. Parts with accumulated dirt will not be as efficient and may prematurely fail. Dirty fan assemblies reduce the amount of cooling airflow to the transmitter causing components to overheat. It is important to note that all scheduled maintenance activity should be flexible enough to accommodate any operational variance.

23.4.1 Monthly Maintenance

Perform the following checks on a monthly basis:

Operating Temperatures

During transmitter operation, and using a temperature probe, test the transmission line components, waveguide, and other exposed components for abnormal temperature fluctuations. Unusual hot spots on these components typically indicate a problem.

Visual Inspection

Visually examine the entire transmitter system. Look for loose connections, damaged components, (discolored, charred, melted, broken leads) and dirty areas. Tighten all loose connections; replace all damaged components, and clean dirty areas. Investigate and record the cause for any of these issues.

Cooling System

Verify that all system cooling air displacement fans and air-conditioning units are in working order. Ensure all fans are clean and unobstructed.

Cleaning

It is important to keep the Affinity® transmitter and related support equipment clean. For example, a dirty air filter reduces cooling airflow and can cause a thermal runaway problem inside the transmitter cabinets. Dirt makes a low-resistance path across insulators and wiring.

WARNING
Perform these procedures and checks only when the voltage is removed from the transmitter.

Use a vacuum cleaner, small brushes, or clean lint-free cloths with denatured alcohol or mild-detergent cleaning solutions. **Do not use compressed air**. Compressed air blows dirt around

rather than removing it. Use a small brush to dislodge dirt while using the vacuum to remove it. Where practical, use cloth to wipe dirty surfaces. Clean the fans that pull air through the transmitter. The amount of air that the fan can move is reduced if the impellers are dirty. Clean the motors; dirt may accumulate on the windings and bearings that can increase the operating temperature and decrease the life of the motor.

23.4.2 Semi Annual Maintenance

Perform these checks on a semi-annual schedule:

Plug-In Module Cleaning Procedure

This cleaning procedure is applicable to all the Affinity® plug-in modules.

NOTE: When plug-in modules are removed during the cleaning process there will be an interruption in service. Returning the module to the sub-chassis will restore service.

This note does not apply to the Power Amplifier Segments (PAS). The amplifier segments may be removed one-at-a-time for cleaning with the power attached. Removing an amplifier during this cleaning procedure will cause a reduction in transmitter power until the amplifier is again secured

- Remove the plug-in module by loosening the thumbscrew and sliding the module out of the sub-chassis.
- Remove the side “snap-on” covers if required.
- Gently vacuum or dust inside the plug-in.
- Clean the outside covers and front panel using a damp (NOT WET) non-abrasive cloth, and a mixture of mild detergent and water.
- Ensure that the plug-in module is COMPLETELY dry before plugging it back into the sub-assembly.
- Tighten the thumbscrews

Power and Grounding Audit

The first step to avoiding power quality problems is to check the AC distribution and grounding system for missing, improper, or poor connections. It is important to check the complete grounding system from the source to the load. Checking the grounding system ensures that the voltage drops are within acceptable limits and the ground connections are proper.

Wiring and Grounding Problems

When a neutral-to-ground connection is made at the load side of the equipment, the feeder neutral current will divide and return on both feeder metal raceway and feeder neutral conductor. When an AC current travels on the metal enclosure of the equipment, an electromagnetic field is produced, which is not desirable. Grounding and wiring problems can arise from inconsistencies in equipment installations, such as:

- Different parts of the industrial set-up were built during various time schedules.

- Electronic equipment with control ground and power ground makes the issue of the system grounding more complex.
- In new installations, connections may be left off or may not be properly tightened.
- Loads cycling on-and-off produce heating and cooling that eventually result in poor joints with high impedance
- Periodic additions or modifications to the distribution system can result in missing, improper, and poor quality connections.
- Multiple control or power grounds belonging to different facilities and connected to the same ground will cause loop currents.
- With the introduction of many converter and solid-state power supplies, the steady state neutral current becomes significant, which is not desirable and has to be monitored and corrected.

Acceptance Criteria

A grounding audit must be performed to ensure that acceptance criteria are maintained. Voltage limits, and neutral and ground bonding must be evaluated. Voltage limits: Line-to-ground voltage, and line-to-neutral voltages, must be within 5% of the nominal voltage as per ANSI Standard 84.1. Any voltage deviation above or below the defined limit may affect equipment performance. Voltage drop-in feeders that serve sensitive electronic equipment shall be no more than 2% under the actual load conditions as per IEEE Standard 1100. This is not a requirement, but this practice may help to achieve better equipment performance.

Neutral and ground bonding: A voltage measurement between the neutral and ground will indicate voltage in the milli-volt range under normal operating conditions. A reading of zero volts indicates the presence of a nearby neutral-ground bond. This condition is acceptable.

- Excessive current on equipment ground can indicate the presence of a load-side ground connection. This condition requires careful visual inspection.
- Open or ungrounded equipment has to be identified by visual inspection. This condition must be remedied.

Corrective Measures

The following are some of the typical items that require corrective measures followed by the results of field measurements.

- Missing equipment ground connection. This ground connection must be installed.
- Missing interconnection from the industrial ground to the utility ground has to be connected.
- Reversed connection between the neutral and the ground must be corrected.
- Multiple control grounds from the adjacent facilities connected to the same ground to provide isolated grounding for the facility.
- Rectify loose ground connections. Loose connection in the ground connections produces high impedance connection and has contact resistance.

- It is recommended that all grounding bonds be inspected and tested annually to ensure proper and low impedance connections.

23.4.3 Annual Maintenance

Annual maintenance should consist of verifying that the transmitter is operating in accordance with licensing authority Rules and Regulations. Use the factory tested transmitter data that was initially provided with the transmitter, or any performance data taken after the transmitter was installed. Use this information as a guide for completing the necessary tests, and as a comparison to data recorded during the tests. Thales offers services to conduct these tests. For more information, contact Thales Customer Service Department.

23.5 Troubleshooting

The Affinity® transmitter is equipped with comprehensive diagnostic circuitry that monitors the status of each plug-in module and amplifier segment. The Affinity® front panel contains an LED display that is used in conjunction with the installed Control and Monitoring system to diagnose failure modes.

A 14-pin diagnostic interface connector, labeled **J1** located on the back of the transmitter, is used to assist in troubleshooting. Critical power supply, plug-in module, and motherboard voltage test-points can be accessed from this location. Should a failure occur, the combination of diagnostic status LEDs, the Control and Monitoring system, and the diagnostic interface voltage levels will help identify the failure.

NOTE: Repair of internal modules is not recommended or advised. Contact Thales Customer Service department should a failure occur to any of the plug-in modules or amplifier segments.

Power Supply plug-in module

Power

A lit green LED indicates normal operation. Absence of a lit green LED indicates a missing signal or parameter resulting in an automatic controlled shutdown.

Problem:

No power present from the Front-End Power Supply

Possible Cause	Solution
Fuse F1 blown in plug-in module	Replace fuse with the same rating
No DC input from Front-End Power Supply	Check OEM Power supply for proper operation
Failure in plug-in module	Contact Thales Customer Service Department

Problem:

No output power on the Driver DC Power Supply

Possible Cause	Solution
Short circuit or current overload	Test the 48-pin connector on the backplane assembly for any short circuits.
Short circuit or current overload	Find the plug-in module that is causing the overload by swapping with a known good plug-in module.
Failure in plug-in module	Contact Thales Customer Service Department

Upconverter plug-in module

The Upconverter plug-in module is equipped with a Liquid Crystal Display (LCD) assembly that provides a PASS/FAIL status for each plug-in module, as well as a series of measurements and user adjustments.

To view the status of each plug-in module, perform the following:

- Press the Select key on the Pre-Amplifier keypad assembly. When “STATUS” is displayed press the ENTER key.
- Select the plug-in module to be tested.
- The LCD will display a PASS or FAIL for the plug-in module being tested
- If a FAIL is displayed, contact the Thales Customer Service Department for a replacement.

NOTE: There are no user-level troubleshooting steps for the plug-in modules

If the Reflected Power measurement is high, check the following:

- Output cables between amplifier chassis(s) and output RF filter
- Output RF filter
- High Power Combiner and reject load, if applicable

Connections to the antenna

If these checks have been verified and problems still exist, contact Thales Customer Service.

If the Forward Power measurement is low, check the following:

- Check the LEDs on the Power Amplifier Segment. The LEDs should be lit Green.
- Check the status of each plug-in module via the keypad on the Pre-Amplifier plug-in front panel.
- If no Power Amplifier Segment or plug-in module indicates a FAIL condition, use the keypad and LCD to display the IN-SIGNAL condition.
- If the IN-SIGNAL status indicates a NO IN-SIGNAL condition, check the signal source.

- If any Power Amplifier Segment and/or plug-in module have a FAIL condition, contact Thales Customer Service.

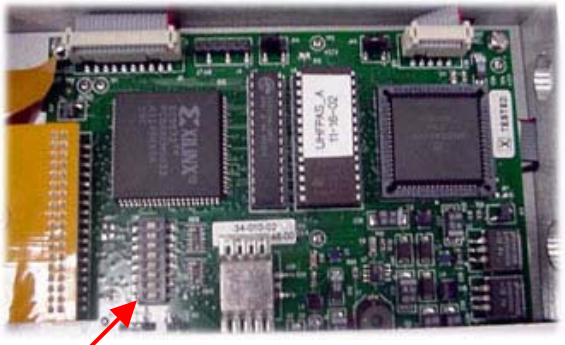
Power Amplifier Segment

"Hot Swap" of the Power Amplifier Segment may be required if a failure occurs. To remove a segment:

- Turn the key-lock switch to the OFF/UNLOCKED position.
- Loosen the thumbscrews on the segment font panel.
- Slide the failed segment out of the Sub-Rack assembly.

Before the replacement segment can be installed, the node address must be set. A set of dual inline package (DIP) switches located on the microcontroller board of the Power Amplifier Segment, are used to set the node address (see the following page).

Set the dipswitches of the replacement segment to the same positions as the dipswitches on the failed segment.

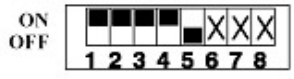


Microcontroller board

Dipswitch

NODE ADDRESSES

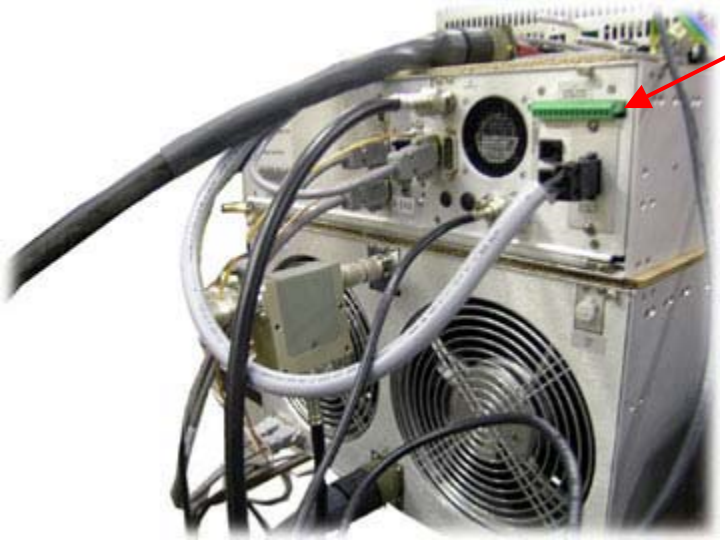
1 to 16 Channels

MODULE POSITION	NODE ADDRESS	NODE SWITCH SETTING
1	2	
2	3	
3	4	
4	5	
5	6	
6	7	
7	8	
8	9	
9	10	
10	11	
11	12	
12	13	
13	14	
14	15	
15	16	
16	17	

NOTE: Do not change node switch Settings 6, 7, and 8. They should remain as set by the factory.

Troubleshooting Worksheet

The troubleshooting worksheet identifies each interface pin. Fill in the Measured Voltage column with the values derived from **J1**.



J1 Monitoring Parameters		
Pin	Parameter	Typical Voltage
1	GND	0.0VDC
2	LO/Front-End Fault or Remote ON/OFF	3.7VDC
3	Power Supply Fault	5.0VDC
4	Pre-Amp/Upconverter Fault	3.7VDC
5	System Power Fault or Fwd Power	4.7VDC
6	Reflected Power Fault or +24VDC	+24VDC
7	+48V Fault Input	N/A
8	+10V Fault Input	N/A
9	PAS Reset Output	N/A
10	PAS Standby Output	N/A
11	N/A	N/A
12	+12V Output	11.6VDC
13	ALC voltage level	1.7VDC
14	+5V Amp-Cage Fault Input	N/A

Sample Worksheet with Typical Voltage Values

Fill in your company information in the space provided on the following page and either mail, email, or phone in the measured voltage results of the troubleshooting worksheet to the Thales Customer Service Department:

Thales Broadcast & Multimedia, Inc.
Customer Service Department
104 Feeding Hills Road
Southwick, MA 01077
1-800-345-9295
csfeedback@us.thales-bm.com

Attention: Customer Service Department

Company Name
Customer Name
Phone Number
Email Address
Address
Transmitter Model Number
Channel
Serial Number

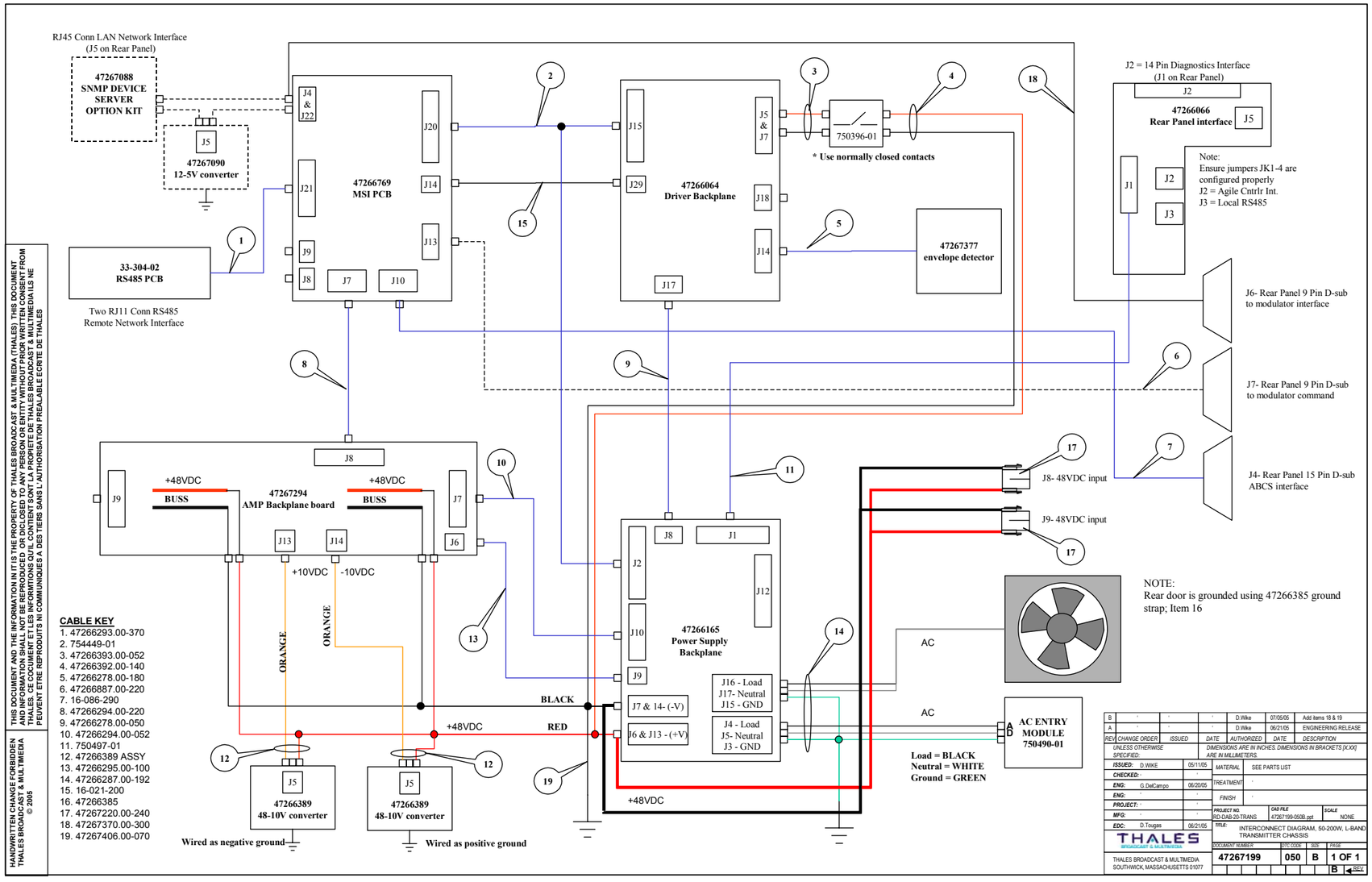
24 Status Control and Monitoring Systems

This is now Omnitronics SL81

24.1 Parallel Interface

UHF Affinity® Remote Control Interface			
Controls	**Cabinet Connector/Pin(s)**	**407755-01 Interconnect Cable Connector/Pin(s)**	**Signal Type**
RF On/Off	J3-1	P3-1 (pair 1 RED)	Latched contact closure to CMD Common (pin 13) for Off
Power Lower	J3-2	P3-2 (pair 1 BLK)	Contact closure to CMD Common (pin 13) to activate
Power Raise	J3-3	P3-3 (pair 2 RED)	Contact closure to DMD Common (pin 13) to activate
Command Common (GND)	J3-13	P3-13 (pair 6 BLK)	Tied to Gnd inside TX
Status			
Transport Stream Input presence	J3-4	P3-4 (pair 2 BLK)	Contact closure between pins 4&5=Fault
	J3-5	P3-5 (pair 3 RED)	
Exciter RF Output Fault	J3-6	P3-6 (pair 3 BLK)	Contact closure between pins 6&7 =Fault
	J3-7	P3-7 (pair 4 RED)	
Power Supply Fault	J3-8	P3-8 (pair 4 BLK)	TTL Low (0V)=Fault (reference to GND)
Pre-Amp Fault	J3-14	P3-14	TTL Low (0V)=Fault (reference to GND)
Power Amp Fault (Not currently active)	J3-10	P3-10 (pair 5 RED)	TTL Low (0V)=Fault (reference to GND)
Metering			
Forward Power	J3-11 (+)	P3-11 (+) (pair 5 BLK)	0-4VDC between pins 11&12
	J3-12 (-)	P3-12 (-) (pair 6 RED)	

25 Block Diagrams and Schematics



CABLE KEY

1. 47266293.00-370
2. 754449-01
3. 47266393.00-052
4. 47266392.00-140
5. 47266278.00-180
6. 47266887.00-220
7. 16-086-290
8. 47266294.00-220
9. 47266278.00-050
10. 47266294.00-052
11. 750497-01
12. 47266389 ASSY
13. 47266295.00-100
14. 47266287.00-192
15. 16-021-200
16. 47266385
17. 47267220.00-240
18. 47267370.00-300
19. 47267406.00-070

REV	CHANGE ORDER	ISSUED	DATE	AUTHORIZED	DATE	DESCRIPTION
B	-	-	-	D.Wike	07/05/05	Add items 18 & 19
A	-	-	-	D.Wike	06/21/05	ENGINEERING RELEASE

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. DIMENSIONS IN BRACKETS [XXX] ARE IN MILLIMETERS.

ISSUED: D.WIKE	05/11/05	MATERIAL	SEE PARTS LIST
CHECKED: -	-	TREATMENT	-
ENG: G.DelCampo	06/20/05	FINISH	-
ENG: -	-	PROJECT NO.	RD-DAB-20-TRANS
PROJECT: -	-	CAD FILE	47267199-050B.prt
MFG: -	-	SCALE	NONE
EDC: D.Tougas	06/21/05	TITLE:	INTERCONNECT DIAGRAM, 50-200W, L-BAND TRANSMITTER CHASSIS

THALES BROADCAST & MULTIMEDIA
SOUTHWICK, MASSACHUSETTS 01077

DOCUMENT NUMBER	SYC CODE	SIZE	PAGE
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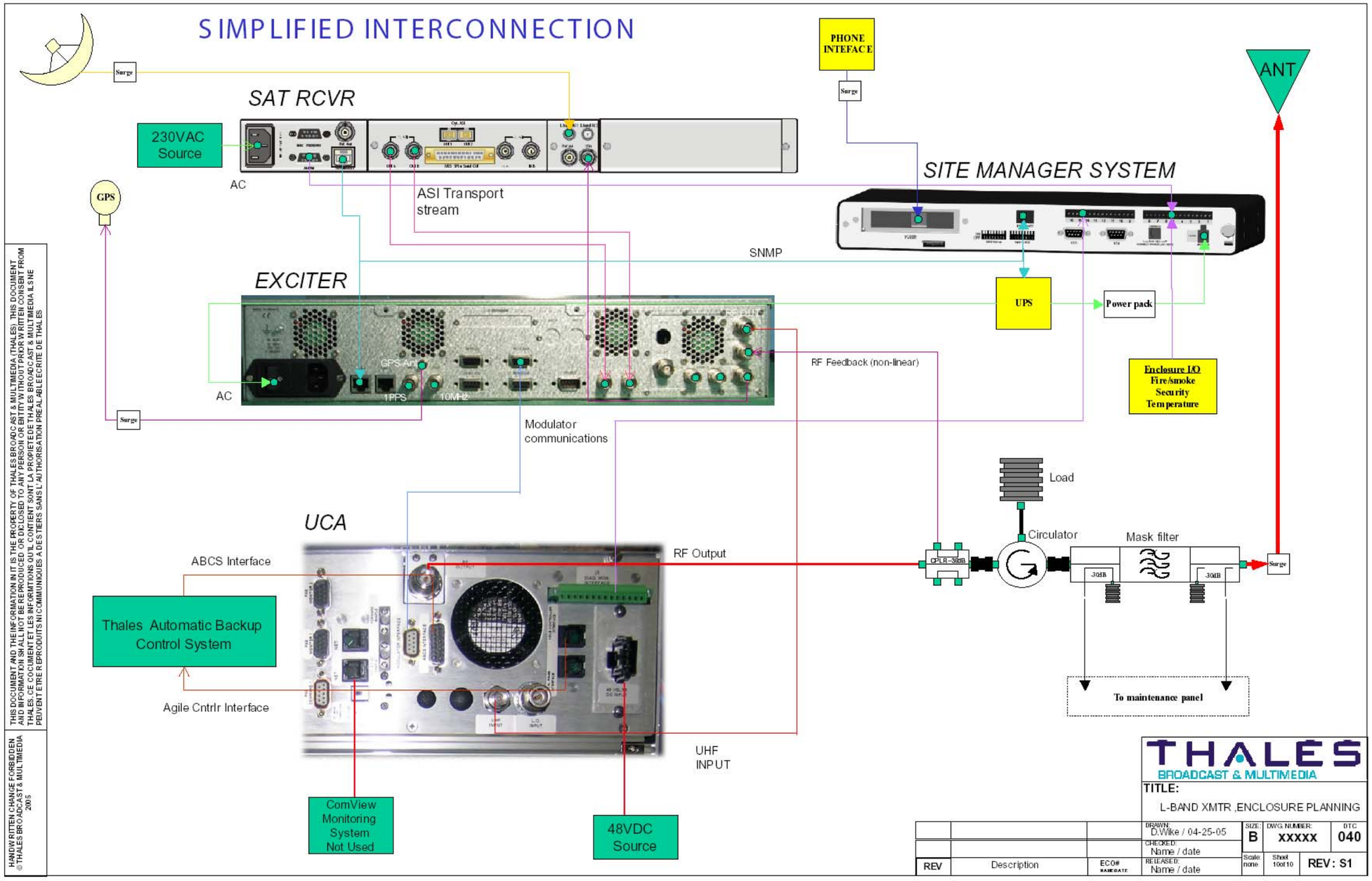
REV B


SIMPLIFIED INTERCONNECTION
PHONE INTEFACE
ANT
Surge
SAT RCVR
230VAC Source
AC
ASI Transport stream
GPS
SITE MANAGER SYSTEM
SNMP
EXCITER
UPS
Power pack
GPS Ant
1PPS
10M Hz
AC
RF Feedback (non-linear)
Enclosure I/O
Fire/smoke
Security
Temperature
Modulator communications
Load
Circulator
Mask filter
CPLR-30dB
30dB
30dB
Surge
To maintenance panel
UCA
ABCS Interface
RF Output
Thales Automatic Backup Control System
Agile Cntrlr Interface
UHF INPUT
ComView Monitoring System Not Used
48VDC Source
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TITLE:
L-BAND XMTR ,ENCLOSURE PLANNING
REV
Description
ECO# DATE/DATE
DRAWN: D.Wike / 04-25-05
CHECKED: Name / date
RELEASED: Name / date
SIZE: B
DWG NUMBER: xxxxx
DTC 040
Scale: none
Sheet 10of10
REV: S1

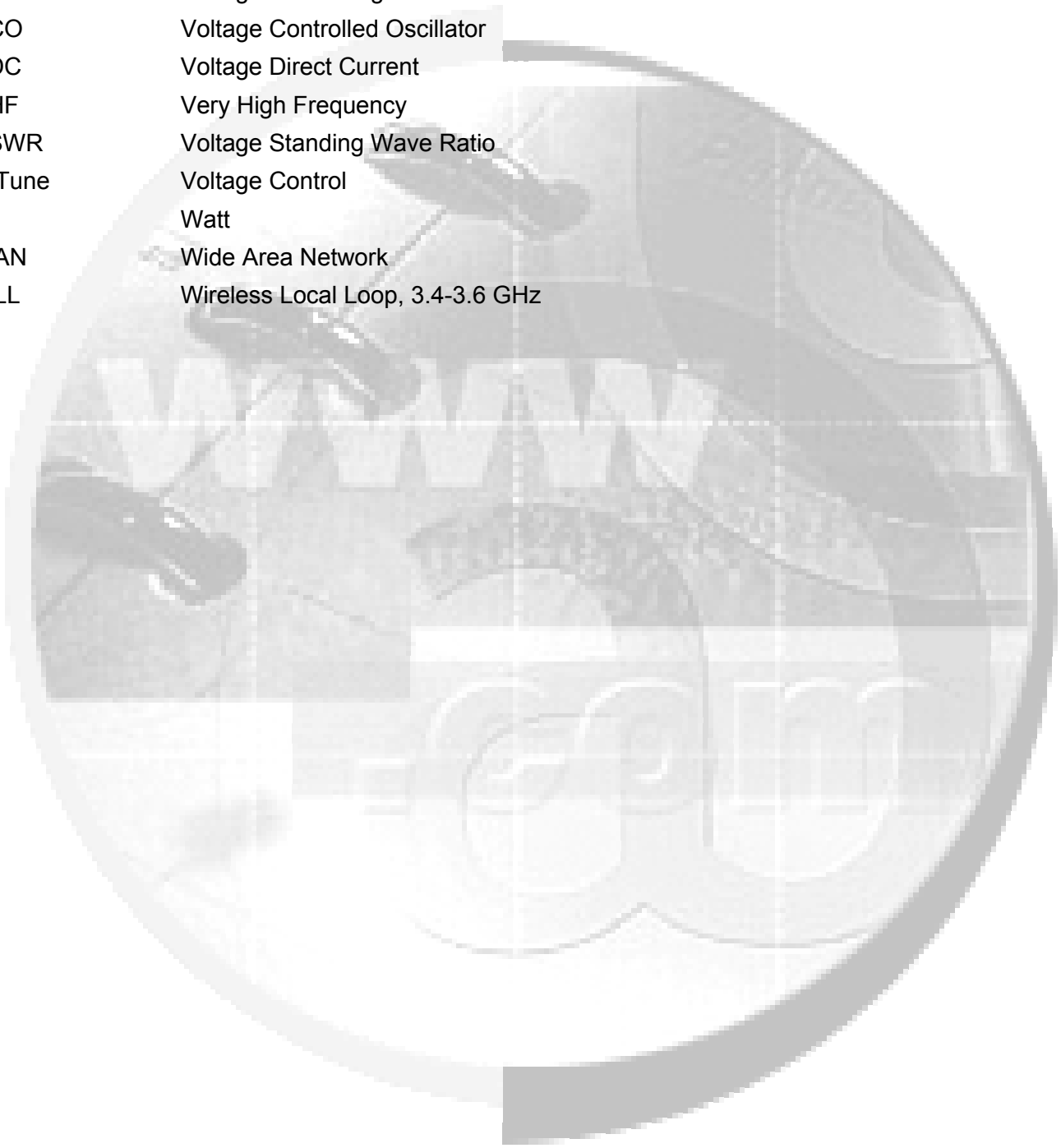
26 List of Acronyms and Abbreviations

8VSB	Trellis Code 8-Level Vestigial Side Band
ABCS	Automatic Back-up Controller System
AC	Alternating Current
AGC	Automatic Gain Control
ALC	Automatic Level Control
ASI	Asynchronous Serial Interface
BW	Bandwidth
CAL	Calibrate
CFM	Cubic feet per minute
COFDM	Coded Orthogonal Frequency Division Multiplexing
CPLD IC	Complex Programmable Logic Device
CPLR	Coupler
CPR	Cardiopulmonary Resuscitation
DAS	Direct Analog Synthesizer
dB	Decibel
DC	Direct Current
DDS	Direct Digital Synthesizer
DHCP	Dynamic Host Configuration Protocol
DIP	Dual-Inline-Package
DPDT	Double Pole Double Throw
DTTB	Digital Terrestrial Television Broadcasting
DTV	Digital Television
DVB-H	Digital Video Broadcasting-Handheld
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMI	Electromagnetic Interference
ETSI	European Telecommunications Standards Institute
FCC	Federal Communication Commission
FET	Field Effect Transistor
FRU	Field Replaceable Unit
FTP	File Transfer Protocol
Fwd	Forward

GPS	Global Positioning Satellite
GUI	Graphical User Interface
HVAC	Heating, Ventilating and Air-Conditioning
Hz	Hertz
I	In-Phase
IC	Integrated Circuit
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IF	Intermediate Frequency
IP	Internet Protocol
KHz	Kilo Hertz
kW	Kilo Watt
LAN	Local Area Network
LCD	Liquid Crystal Display
LDMOS	Laterally Diffused Metal Oxide Silicon
LED	Light Emitting Diode
LO	Local Oscillator
LPF	Low Pass Filter
MAN	Metropolitan Area Network
MCU	Micro Controller Unit
MFN	Multi Frequency Networks
MHz	Mega Hertz
MIB	Management Information Base
MMDS	Multi-Channel Multi-Point Distribution System, 2.5-2.7 GHz
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MPEG	Moving Pictures Expert Group
MRO	Master Reference Oscillator
MSI	Master Control Interface
MTTR	Mean Time to Repair
MUX	Multiplexer
NPN	Negative Positive Negative (transistor)
OCXO	Oven Controlled Crystal Oscillator
OEM	Original Equipment Manufacturer
OID	Object Identifier

OS	Operating System
PA	Power Amplifier
PAS	Power Amplifier Segment
PC	Personal Computer
PCB	Printed Circuit Board
PIN	Positive Intrinsic Negative
PIOS	Peripheral Input/Output System
PLL	Phase Lock Loop
PLO	Phase Locked Oscillator
PNP	Positive Negative Positive (transistor)
PSTN	Public Switched Telephone Network
Pwr	Power
Q	Quadrature
QAM	Quadrature Amplitude Modulation
RAM	Random Access Memory
RF	Radio Frequency
RMS	Root Mean Square
RU	Rack Unit
RX	Receive
SFN	Single Frequency Networks
SMA	Sub-Miniature-A
SMCS	Status Monitor and Control System
SMM	Site Management Module
SNMP	Simple Network Management Protocol
SPI	Serial Peripheral Interface
SSB	Single Side Band
SYS	System
TB	Terminal Barrier Strip
TCP/IP	Transmission Control Protocol/Internet Protocol
Temp	Temperature
TFTP	Trivial File Transfer Protocol
TTL	Transistor-Transistor-Logic
Tx	Transmitter
TX	Transmit

UBS	Unique Broadband Systems, Inc.
UCA	Upconverter Amplifier
UHF	Ultra High Frequency
VAC	Voltage Alternating Current
VCO	Voltage Controlled Oscillator
VDC	Voltage Direct Current
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
V-Tune	Voltage Control
W	Watt
WAN	Wide Area Network
WLL	Wireless Local Loop, 3.4-3.6 GHz



27 Warranty

Thales Broadcast & Multimedia Inc. warrants each product of its manufacture to be free from any defect in material and workmanship for a period of one year after delivery to, and return by, the original purchaser. No returns, however, will be accepted unless accompanied by a written factory return authorization.

The limit of liability under this warranty shall be to repair or replace any product, or part thereof, which proves to be defective after inspection by Thales Broadcast & Multimedia, Inc. With the exception of lamps, fuses or any equipment manufactured by others, which are subject to only such loss adjustments as Thales Broadcast & Multimedia, Inc. may obtain from the suppliers thereof.

This warranty shall not apply to any Thales Broadcast & Multimedia, Inc. product, which has been modified physically or electrically damaged, or to modules which seals have been broken, or any product, which has been subjected to conditions exceeding the applicable specifications or ratings or improper service techniques.

Thales Broadcast & Multimedia, Inc. reserves the right to make design changes to any Thales Broadcast & Multimedia, Inc. product without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of the obligation and liability assumed by Thales Broadcast & Multimedia, Inc. with respect to any and all Thales Broadcast & Multimedia, Inc. products. Thales Broadcast & Multimedia, Inc. neither makes, nor authorizes any person to make, any other guarantee or warranty concerning Thales Broadcast & Multimedia, Inc. products.

28 Parts Lists

29 Appendix

29.1 Section A- Hazardous Materials List

29.2 Section B- Site Drawings

29.3 Section C- List of Modules and Site ID, with Barcode Number

29.4 Section D- Site Acceptance Document

29.5 Section E- Log File

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