WTC4

Head End System

Channelized Bi-Directional Amplifier

User's Manual

rev 6

Applied Micro Design Inc.

19516 Amaranth Drive Germantown MD 20874 ph 301.540.9506 | info@appliedmicrodesign.com | www.appliedmicrodesign.com

Table of Contents

Notes, Cautions, and Warnings

This is a Class B Booster.

Part 90 (Class B) Signal Boosters
WARNING. This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express consent of an FCC Licensee to operate this device. You **MUST** register Class B signal boosters (as defined in 47 CFR 90.219) online at **www.fcc.gov/signal-booster/registration**. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

Connect RF Output to existing Distributed Antenna System (DAS) cable only.

DO NOT operate equipment with unauthorized antennas, cables, and/or coupling devices.

DO NOT operate equipment unless all RF connectors are secure.

DO NOT operate equipment unless it has been installed and inspected by a qualified radio technician.

Contact Information

For more information contact the FCC at:

https://signalboosters.fcc.gov/signal-boosters/

F.2 PART 90 CLASS B SIGNAL BOOSTERS Licensees and signal booster operators are required to register existing Class B signal booster installations with the FCC by November 1, 2014. After November 1, 2014, operation of an existing, unregistered Class B signal booster will be unauthorized and subject to enforcement action. Any new Class B signal booster installed after November 1, 2014 must be registered prior to operation. To encourage compliance with this new requirement, registration will be free of cost to the operator and/or licensee.[R11], [R9]

FCC Part 90 Class B Signal Booster Registration & Discovery website:

https://signalboosters.fcc.gov/signal-boosters/

Introduction

There are three major components to the Tower-4 system; the Head-End hardware, the Distributed Antenna System (DAS) hardware, and the Site-Wide Network (SWN).

Signals from the SWN are input to the Downlink (DL) Head-End (HE) hardware. These signals are filtered and amplified by the HE DL, and fed into the DAS.

Signals from the DAS are input to the Uplink (UL) HE hardware. These signals are filtered and amplified by the HE UL, and fed into the SWN.

There are two equipment rooms in Tower-4, and each equipment room has an Uplink and Downlink rack. One each of these racks (one UL and one DL) will be tested.

The Downlink Rack contains three DSP Card Cages, two Dual Amplifiers, one Single Amplifier, and one CBC chassis. The signals are combined in the CBC chassis and fed to the DAS.

The Uplink Rack contains three DSP Card Cages and one CBC chassis. Signals from the DAS are input to the CBC chassis.

The UL and DL Channel Cards are the same design. They are FPGA-based designs, programmed essentially as active digital filters. The cards have a standard line-up; Analog-to-Digital Conversion, Digital Demodulation to baseband, digital filtering in the FPGA, Digital Modulation back to the original carrier frequency, and Digital-to-Analog conversion. The DSP Channel Cards can be programmed for multiple filters to process multi-carrier signals.

Head-End Downlink Group

There are eleven SWN windows (seven 400 MHz and four 800 MHz) input to the HE channel cards. Each window is input to a separate card; each card is set for one wide-band filter to pass multi-carrier signals, and is set for a specified gain. Wide-band filters for the DL are specified to achieve the required Group or Propagation Delay of 10 μs.
The Site Wide Network (SDN Demarc) provides a constant level of -10 dBm per carrier into each Downlink Channel Card. The outputs of the Downlink Channel Cards are input to power amplifiers, either directly or via a combiner. Window groupings to the power amplifiers are shown on the system block diagrams.
The gain of the Downlink Channel Cards are set to have an output of +20 dBm per carrier (100 mW) at the output of the power amplifiers, with -10 dBm per carrier at the input of the Downlink Channel Cards. The 800 MHz Downlink Channel Cards are set to have an output of +22 dBm at the output of the power amplifiers.
The power amplifiers are very linear and can handle multiple carriers. The ALC (Automatic Level Control) of each amplifier is set to provide a maximum of +37 dBm (5W).
The outputs of the 400 MHz and 800 MHz power amplifiers are combined through combiners and low-loss CBC (Cross-Band Couplers). The output of the CBC is the connection into the DAS.

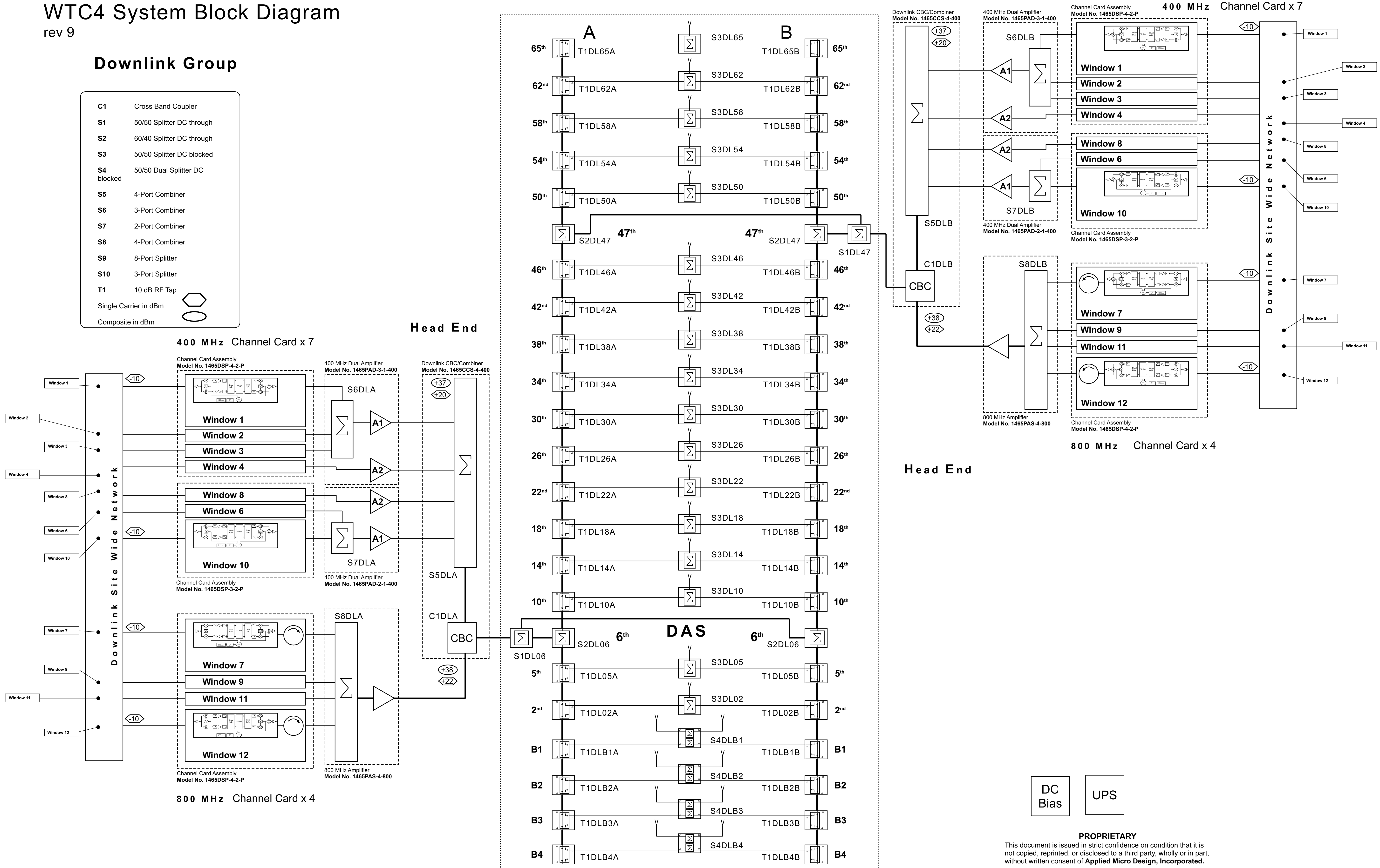
Head-End Uplink Group

There are eleven windows (seven 400 MHz and four 800 MHz) input to the UL channel cards from the DAS. Each window is input to a separate card; each card is set for one or more narrow-band filter to pass multi-carrier signals. Narrow-band filters for the UL are specified to achieve the required Group or Propagation Delay of 25 μs.

A group of frequencies (window grouping) is assigned to one Uplink Channel Card. The signals coming from the DAS are amplified with an LNA (low-noise amplifier) and distributed to the Uplink Channel Cards using a CBC and splitters.

The Uplink Channel Cards will receive multi-carrier signals in the range of -83 dBm to -33 dBm per carrier. Each Uplink Channel Card uses AGC (Automatic Gain Control) to maintain an output level of -33 dBm. The Site Wide Network or SDN Demarc requires no more than -33 dBm per carrier.

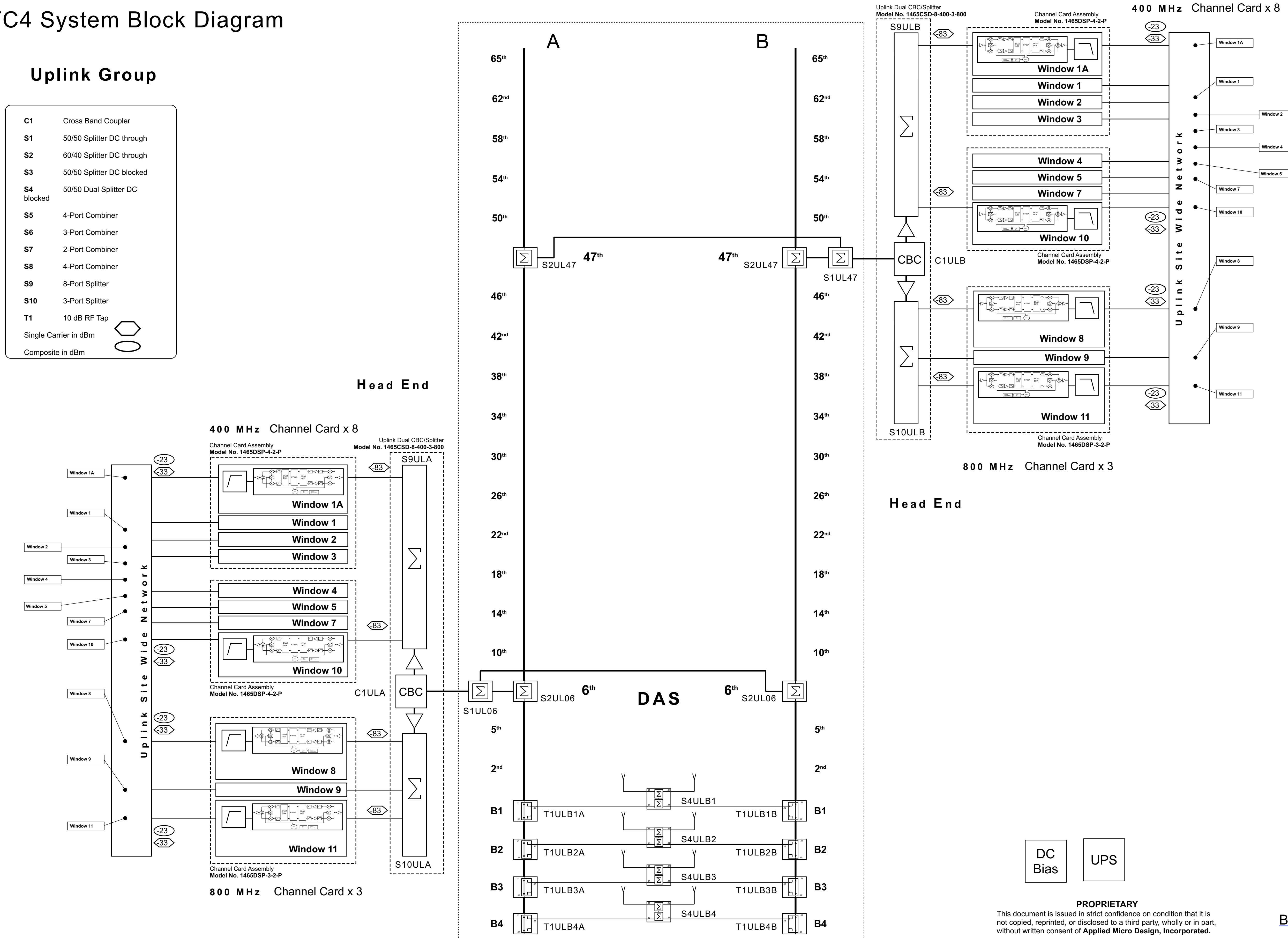
WTC4 System Block Diagram
rev 9



WTC4 System Block Diagram
rev 9

Uplink Group

C1	Cross Band Coupler
S1	50/50 Splitter DC through
S2	60/40 Splitter DC through
S3	50/50 Splitter DC blocked
S4 blocked	50/50 Dual Splitter DC
S5	4-Port Combiner
S6	3-Port Combiner
S7	2-Port Combiner
S8	4-Port Combiner
S9	8-Port Splitter
S10	3-Port Splitter
T1	10 dB RF Tap
Single Carrier in dBm	
Composite in dBm	



PROPRIETARY

Back to Index

System Specification

DSP Section

Frequency Range:	Downlink	Uplink
	453 - 454 MHz	458 - 459 MHz
	460 - 461 MHz	455 - 456 MHz
	464 - 465 MHz	469 - 470 MHz
	470 - 471 MHz	473 - 474 MHz
	851 - 854 MHz	806 - 807 MHz
		807 - 808 MHz
		808 - 809 MHz
Number of Channels:	2 (standard); optional 4, 8, 16 available	
Channel Bandwidth:	12.5 kHz or 25 kHz	
Channel Spacing:	12.5 kHz or 25 kHz	
RF Frequency Accuracy:	tracks input signal exactly	
Adjacent Channel Selectivity:	50 dB @ +/- 17.5 kHz	
Time Delay:	< 60 microseconds	
Variation of Output Power with Input Level:	+0, -1.0 dB in either direction	
AGC Time Constant:	< 100 microseconds	
AGC Control Range:	+ 80 dB	
Maximum passband Ripple (Full Band):	2 dB (across full band)	
Maximum Passband Ripple (Segment):	0.1 dB (across any 100 kHz segment)	
Input / Output Impedance:	50 Ohms	
Input / Output VSWR:	1.35:1, worst-case	
IP3:	+20 dBm	
Input / Output Connectors:	SMA	
Keying:	PL, DPL, Carrier-Detect (computer control)	
Duty Cycle:	Continuous	
Power Supply:	95 - 132 VAC, 45 - 64 Hz	
Current:	< 2A	
Operating Temperature Range:	-20 °C to +60 °C	

Power Amplifier Section

Power Output:	+ 20 dBm / carrier for 453 - 488 MHz
	+ 22 dBm / carrier for 851 - 854 MHz
Gain:	35 - 45 dB
Gain Adjust:	10 dB
OIP3:	+55 dBm for 453 - 488 MHz
	+60 dBm for 851 - 854 MHz
Impedance:	50 Ohms
Load VSWR:	Infinite, no damage
N.F.:	7 dB
Power Supply:	95 - 132 VAC, 45 - 64 Hz
Current:	< 2A
Operating Temp:	-30° to +60° C
Size:	19” x 5.22” x 16”

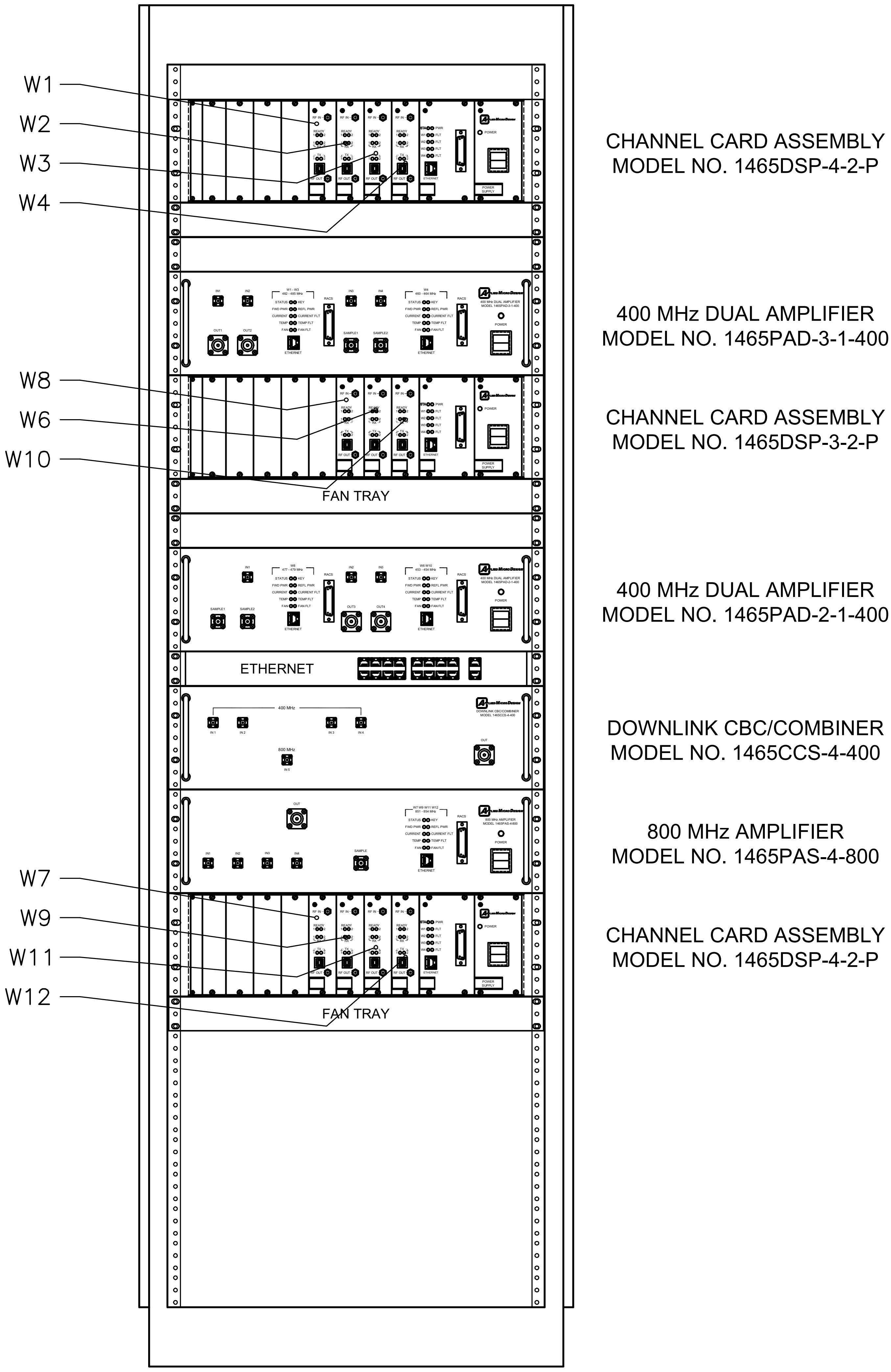
DWG. NO. ED01465-0014 SH 1 REV. 5

APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

PROPRIETARY

This document is issued in strict confidence on condition that it is not copied, reprinted, or disclosed to a third party, wholly or in part, without written consent of Applied Micro Design, Inc.



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .XX ± .XXX ± ANGULAR ±
DO NOT SCALE DRAWING

MATERIAL:

FINISH:

FILE: ED01465–0006R5

CONTRACT NO.	
DRAWN RWC	DATE 7/23/14
CHECKED	DATE
ENGINEER	DATE
APPROVED	DATE
APPROVED	DATE

APPLIED MICRO DESIGN — GERMANTOWN, MD.

ENVELOPE DRAWING DOWNLINK CABINET

SIZE	CAGE CODE	DRAWING NO.	REV
B		ED01465–0014	5

SCALE NONE — SHEET 1 OF 1

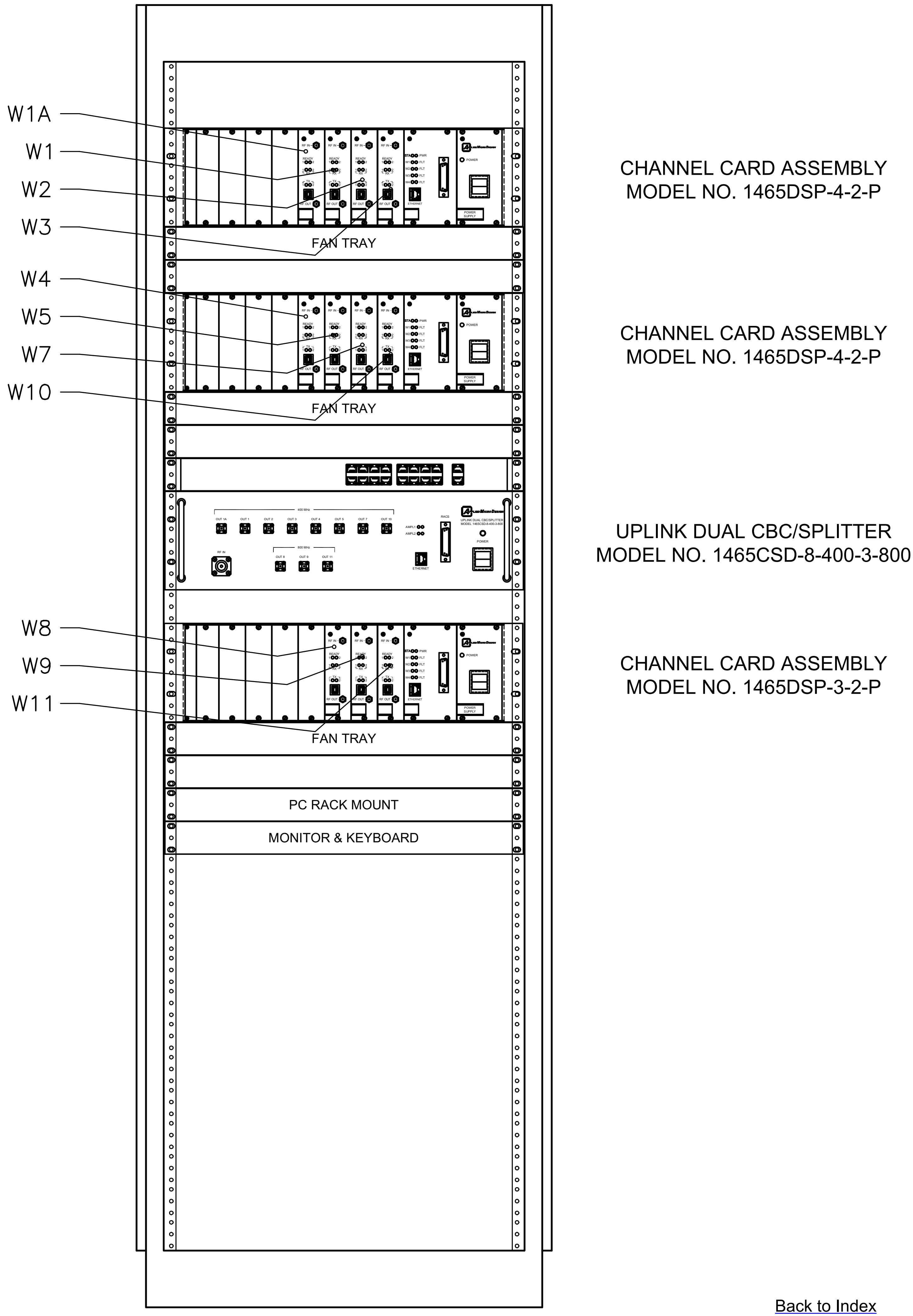
DWG. NO. ED01465-0013 SH 1 REV. 5

APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

PROPRIETARY

This document is issued in strict confidence on condition that it is not copied, reprinted, or disclosed to a third party, wholly or in part, without written consent of Applied Micro Design, Inc.



Back to Index

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .XX ± .XXX ± ANGULAR ±
DO NOT SCALE DRAWING

MATERIAL:

FINISH:

FILE: ED01465-0013R5

CONTRACT NO.	
DRAWN RWC	DATE 7/23/14
CHECKED	DATE
ENGINEER	DATE
APPROVED	DATE
APPROVED	DATE

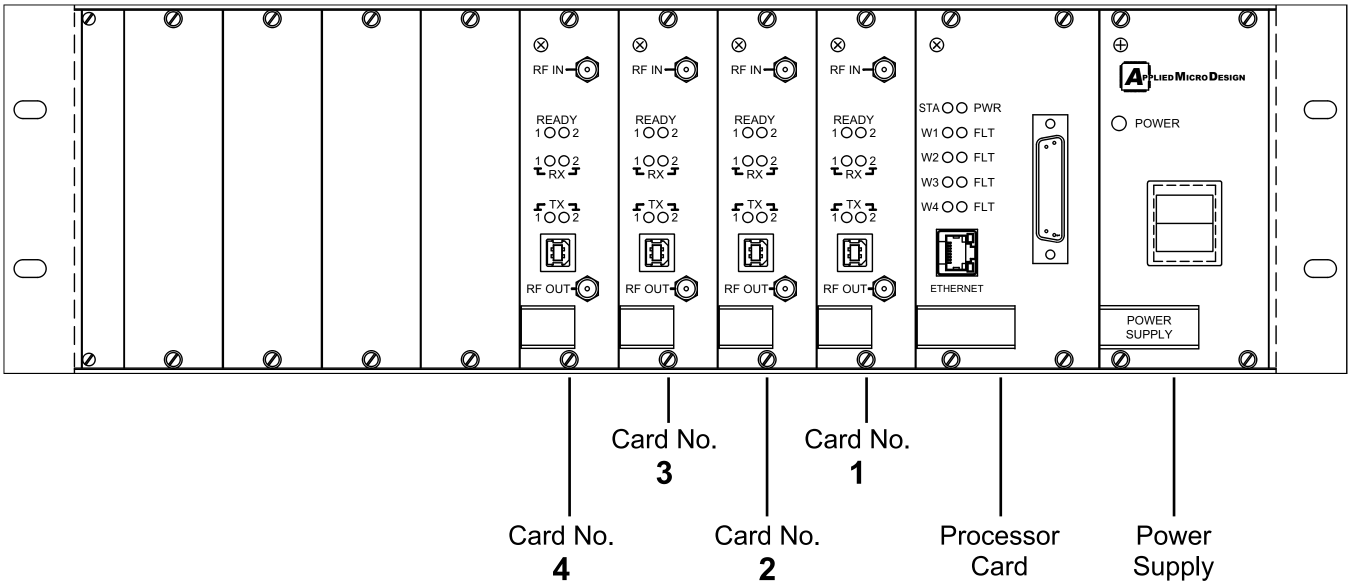
APPLIED MICRO DESIGN — GERMANTOWN, MD.

ENVELOPE DRAWING UPLINK CABINET

SIZE	CAGE CODE	DRAWING NO.	REV
B		ED01465-0013	5
SCALE NONE		SHEET 1 OF 1	

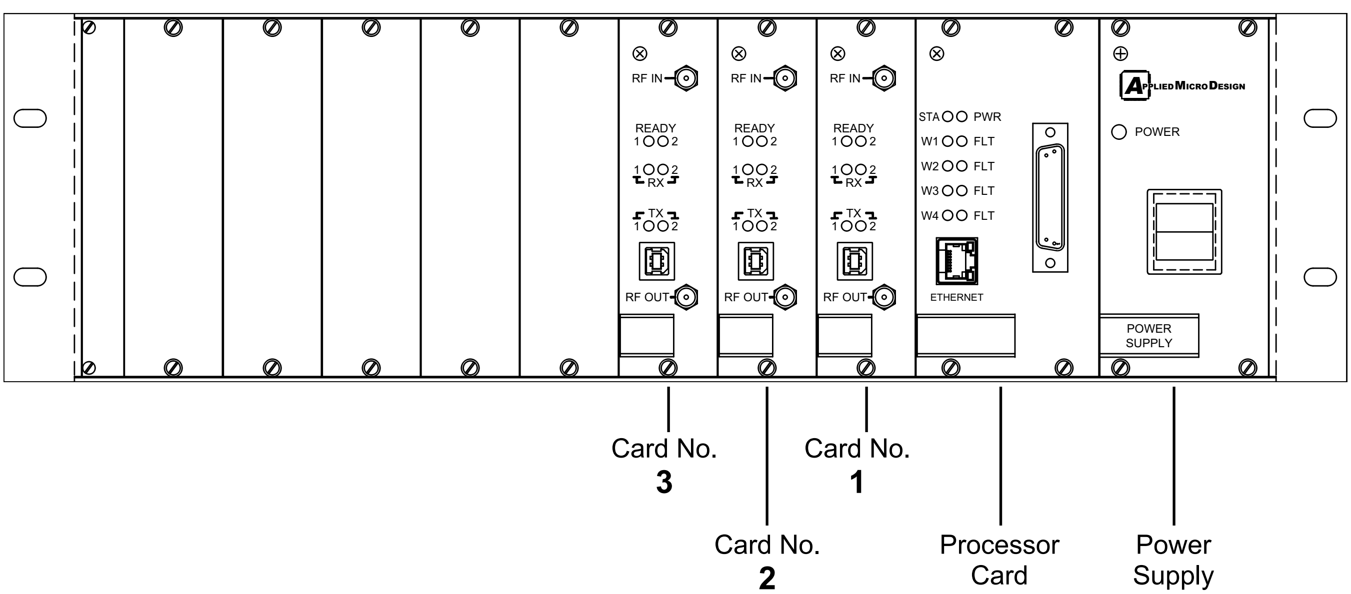
DSP Card Cage - 4 Cards

Model No. 1465DSP-4-2-P

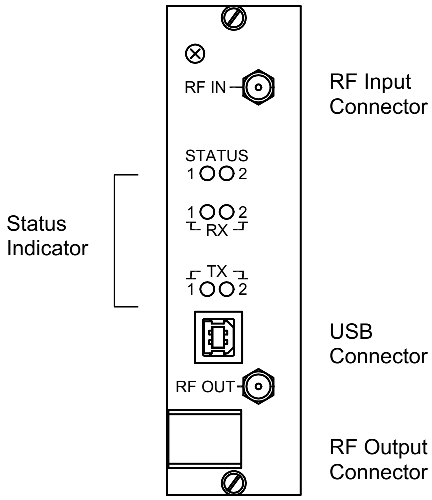


DSP Card Cage - 3 Cards

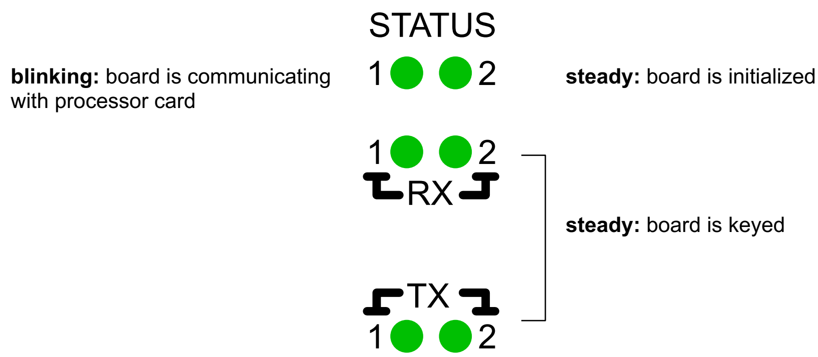
Model No. 1465DSP-3-2-P

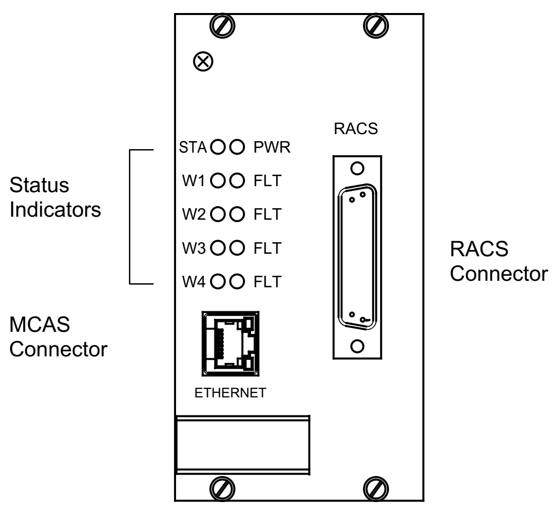


DSP Front Panel and Indicators



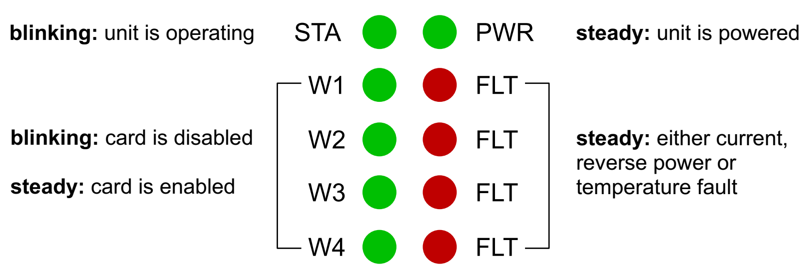
DSP Card



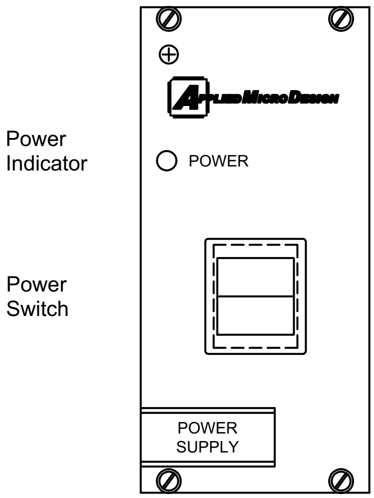


Processor Card

L.E.D. columns blink alternately until processor card establishes communication with DSP cards.



DSP Front Panel and Indicators



Power Supply

steady: unit is powered POWER

The Channel Card is a Software Defined Radio (SDR) that can process up to sixteen channels.

The filter parameters of each channel can be independently selected to optimize the Adjacent Channel Time Delay Interference (TDI).

The FPGA-based design allows for the implementation of a number of Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, including Cauer, Butterworth, and Tchbecheff. All filters can be configured with the number of poles required to provide optimum rejection, within the constraints of bandwidth and filter roll-off, to reduce or eliminate TDI.

Model 1465DSP is a two slot solution to channelized filtering for DAS systems. Two slot receptions enable the filtering, AGC and Key Line control in two 12.5 kHz channels on one channel card. TDMA and FDMA formats can be supported.

Parameters are adjustable using a Graphical User Interface (GUI) that runs on a laptop tied to the USB front panel connector. The GUI enables the setting of center frequency, bandwidth, threshold of operation, and Keying (CD, PL, or DPL). All channel parameters are stored in non-volatile memory and the board will power up in the last programmed configuration. The GUI will run on any laptop under Windows XP or later versions.

DSP Specifications

(all parameters are software defined)

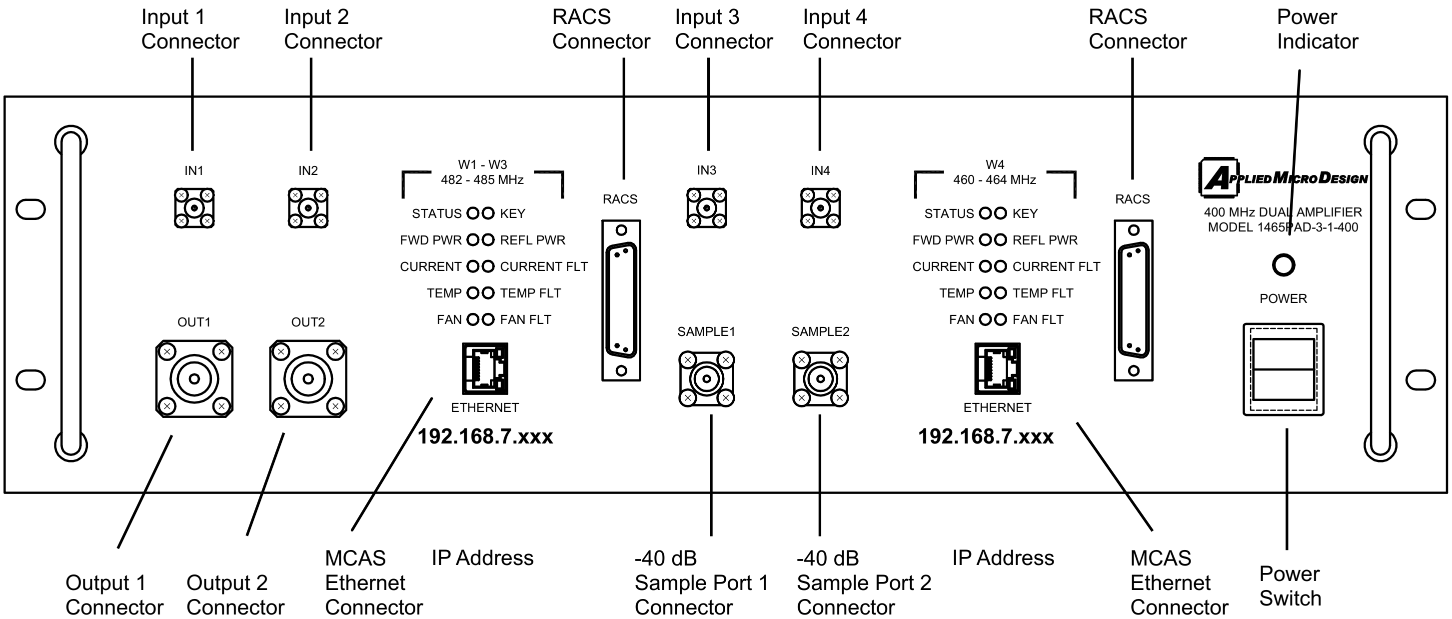
Frequency Range**	Downlink	Uplink
	453 - 454 MHz	458 - 459 MHz
	460 - 461 MHz	455 - 456 MHz
	464 - 465 MHz	469 - 470 MHz
	470 - 471 MHz	473 - 474 MHz
Number of Channels	2 (standard); optional 4, 8, 16 available	
Channel Bandwidth	12.5 kHz or 25 kHz	
Channel Spacing	12.5 kHz or 25 kHz	
RF Frequency Accuracy	tracks input signal exactly	
Adjacent Channel Selectivity	50 dB @ +/- 17.5 kHz	
Time Delay	< 60 microseconds	
Variation of Output Power with Input Level	+0, -1.0 dB in either direction	
AGC Time Constant	< 100 microseconds	
AGC Control Range	+ 80 dB	
Maximum passband Ripple (Full Band)	2 dB (across full band)	
Maximum Passband Ripple (Segment)	0.1 dB (across any 100 kHz segment)	
IP3	+20 dBm	
Keying	PL, DPL, Carrier-Detect (computer control)	
Duty Cycle	Continuous	
Operating Temperature Range	-20 °C to +60 °C	
Input / Output Impedance	50 Ohms	
Input / Output VSWR	1.35:1, worst-case	
Input / Output Connectors	SMA	
Input Power	95 - 132 VAC, 45 - 64 Hz	

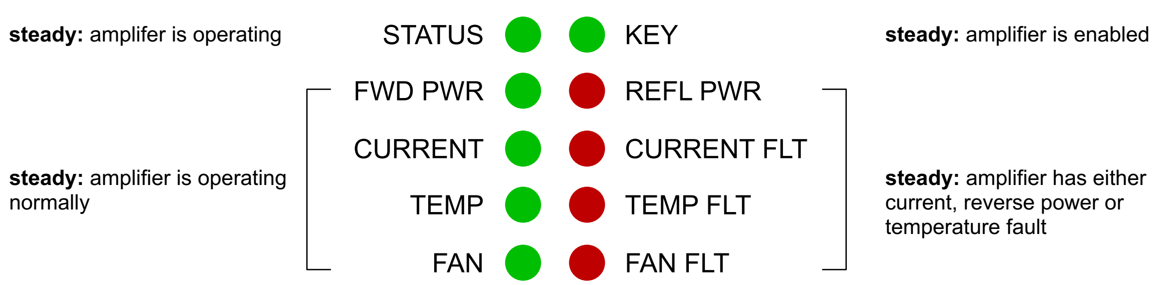
** - VHF, 800 MHz, and 900 MHz also available

Back to Index

Dual Power Amplifier - Front Panel and Indicators

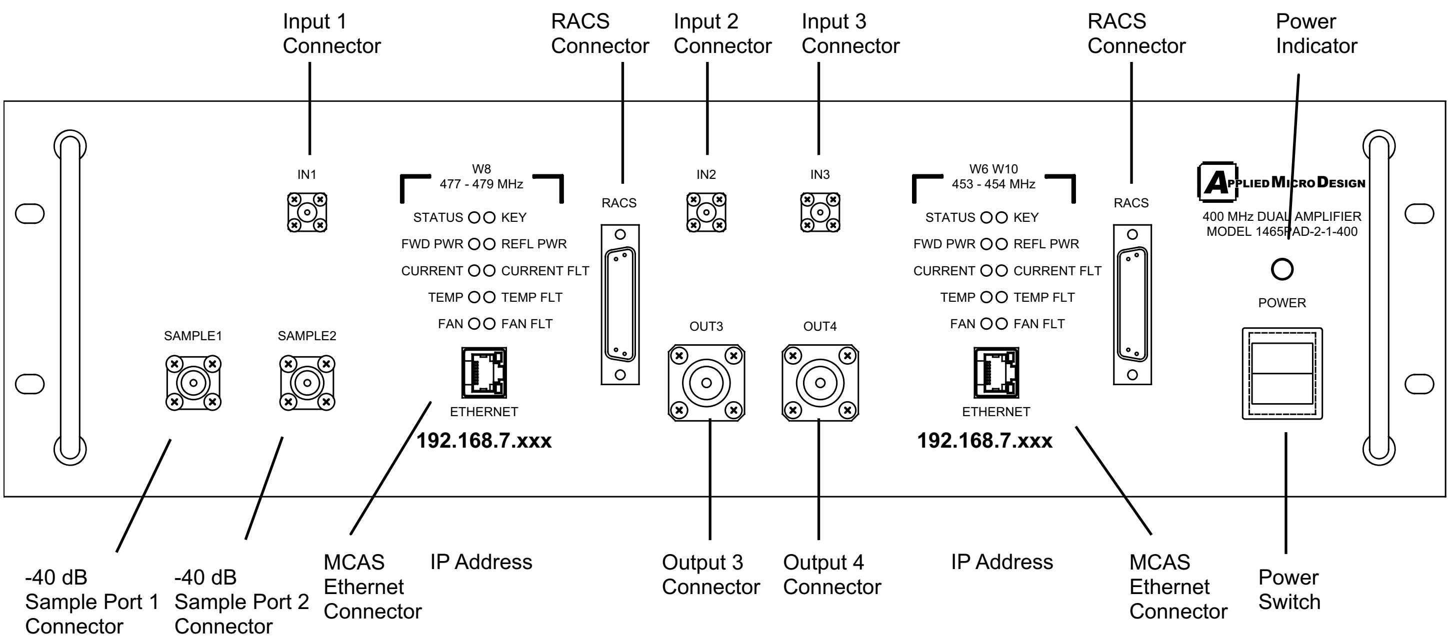
Model No. 1465PAD-3-1-400





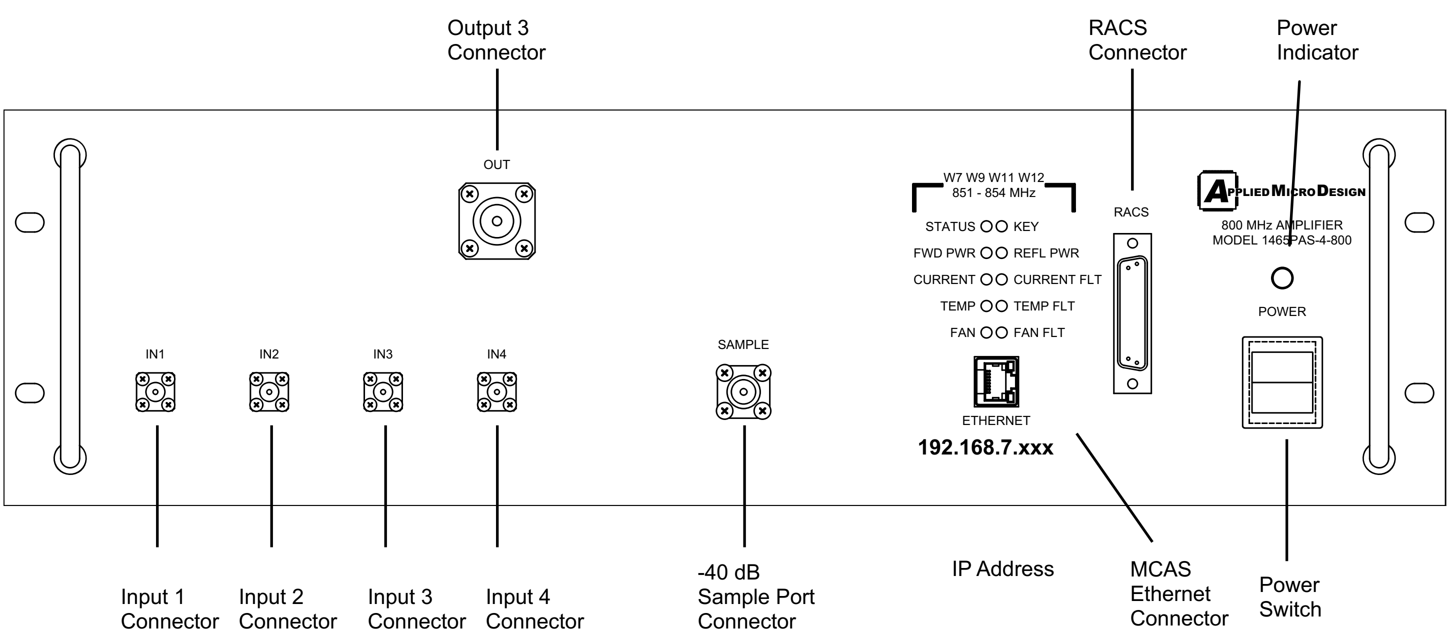
Dual Power Amplifier - Front Panel and Indicators

Model No. 1465PAD-2-1-400



Single Power Amplifier - Front Panel and Indicators

Model No. 1465PAS-4-800



The 1465PA channel amplifier is a high-linearity, multi-carrier amplifier for DAS (Distributed Antenna System) applications. The unit is a single or dual-amplifier configuration. Each amplifier has its own processor board, alarms, panel indicators and power supply. The processor board controls the enable signal to the amplifier and monitors forward power, reverse power, current, fan status and heat sink temperature.

The processor board features remote monitoring capability via Ethernet. A computer running the Graphical User Interface (GUI) can display the status of the amplifier and provide control.

A front panel Look Port for each amplifier allows the user to sample the signal at the front panel. Look port enables measurement without interrupting main line communications. The Look Port sample is 40 dB below the main RF output port.

The processor board contains six NO/NC relay lines that interface to any alarm system and control.

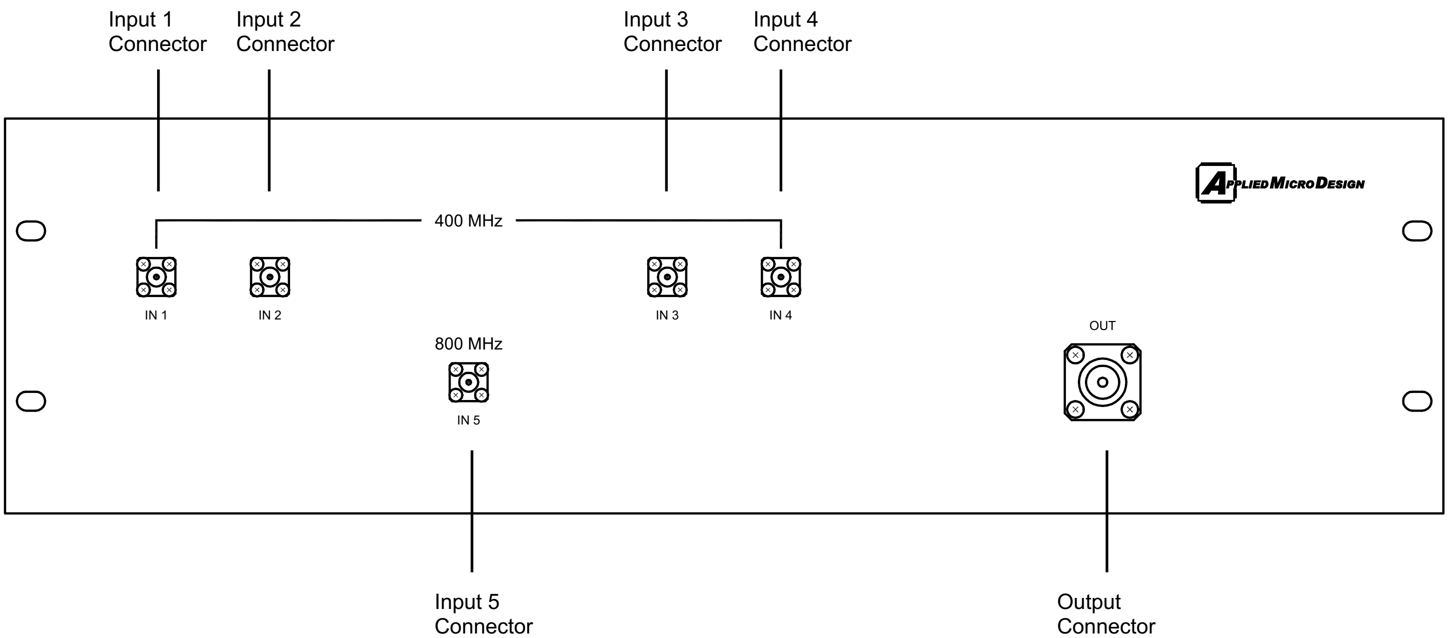
Power Amplifier Specifications

Frequency:	453 - 488 MHz	Frequency:	851 - 854 MHz
Power Output:	5 W (+37 dBm) Composite	Power Output:	6.5 W (+38 dBm) Composite
Power Output:	+ 20 dBm / carrier	Power Output:	+ 22 dBm / carrier
Gain:	35 - 45 dB	Gain:	35 - 45 dB
Gain Adjust:	10 dB	Gain Adjust:	10 dB
ALC:	5 Watts	ALC:	5 Watts
OIP3:	+55 dBm	OIP3:	+60 dBm
Impedance:	50 Ohms	Impedance:	50 Ohms
Load VSWR:	Infinite, no damage	Load VSWR:	Infinite, no damage
N.F.:	7 dB	N.F.:	7 dB
Power Supply:	110V AC	Power Supply:	110V AC
Current:	< 2A	Current:	< 2A
Operating Temp:	-30° to +60° C	Operating Temp:	-30° to +60° C
Size:	19” x 5.22” x 16”	Size:	19” x 5.22” x 16”

Back to Index

CBC/Combiner - Front Panel

Model No. 1465CCS-4-400



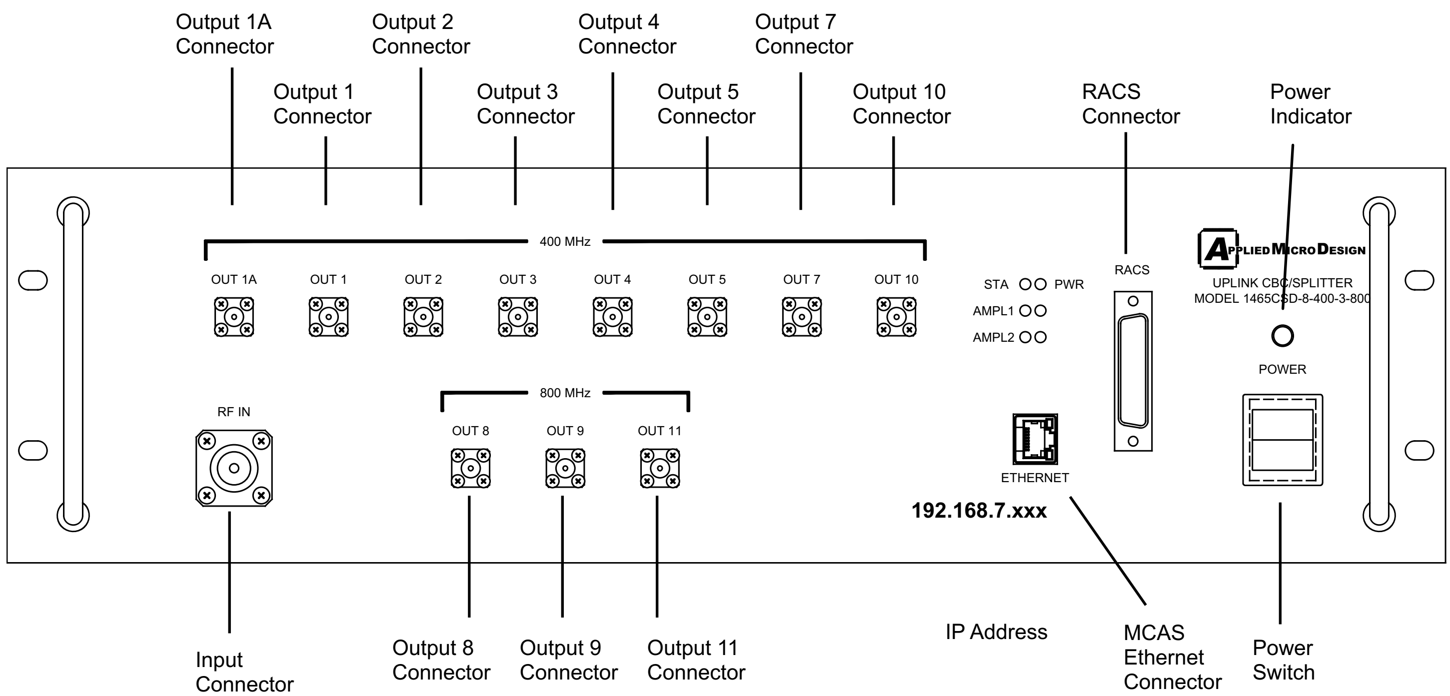
The 1465CCS-4-400 is a Cross Band Coupler (CBC) and Combiner in one chassis; it is designed for DAS (Distributed Antenna System) applications. The low-insertion loss CBC combines signals from two paths; 400 MHz and 800 MHz bands. The 400 MHz band path has a combiner prior to the CBC for multi-channel combining of multi-carrier signals.

CBC/Combiner Specifications

Frequency:	453 - 488 MHz; 851 - 854 MHz
Input Power:	40 dBm (10W) each port maximum
Insertion Loss:	< 2 dB
Isolation:	40 dB minimum between ports
Impedance:	50 Ohms
Operating Temp:	-30 to +60 °C
Input Connectors:	SMA female
Output Connector:	N-type female
Size:	19” x 5.22” x 12”

CBC/Splitter - Front Panel and Indicators

Model No. 1465CSD-8-400-3-800



blinking: LNAs are operating — STA — PWR — **steady:** LNAs are powered

steady: LNAs are operating normally — AMPL1 / AMPL2 — **steady:** LNA has current fault

The 1465CSD-8-400-3-800 is a Cross Band Coupler and Splitter housed in one chassis; it is designed for DAS (Distributed Antenna System) applications. The CBC/Splitter separates signals from the 400 MHz and 800 MHz bands into two paths. Each path has a splitter for multi-channel distribution of multi-carrier signals for downstream processing.

A Low-Noise Amplifier (LNA) in front of each splitter provides improved signal-to-noise ratio (SNR) at the splitter outputs. The LNAs are tied to a processor board that functions as a current monitor. The processor board provides status via front-panel LEDs and also features a remote monitoring capability via Ethernet. A computer running the Graphical User Interface (GUI) can display the status of the amplifiers.

CBC/Splitter Specifications

Frequency:	458 - 488 MHz; 806 - 809 MHz
Input Power:	40 dBm (10W) maximum
Gain:	10 dB
Noise Figure:	< 2 dB
Isolation:	60 dB minimum between ports
Impedance:	50 Ohms
Input Connector:	N-type female
Output Connector:	SMA female
Power Supply:	110V AC
Current:	< 1 A
Operating Temp:	-30 to +60 °C
Size:	19” x 5.22” x 16”

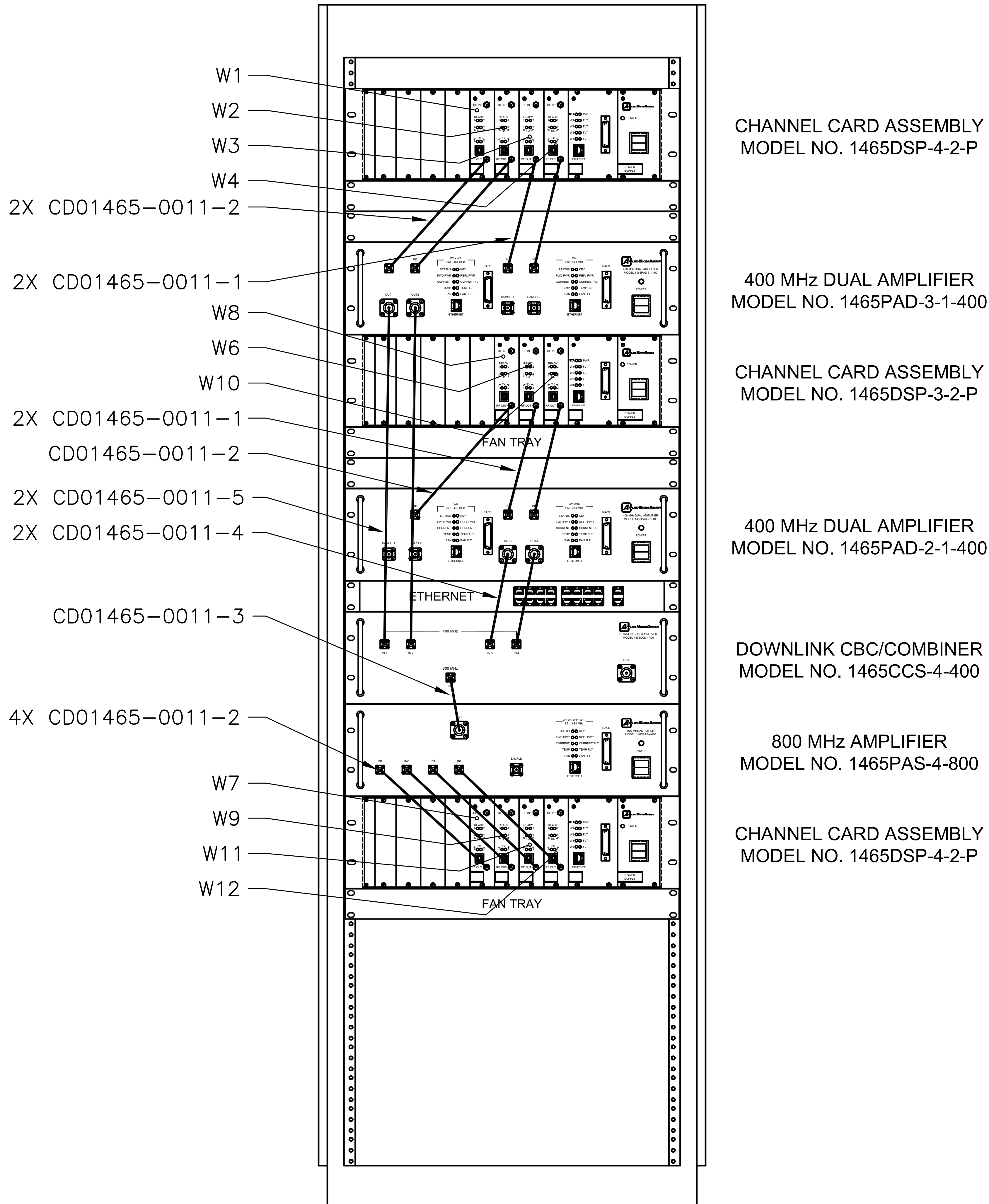
Back to Index

DWG. NO. ED01465-0006 SH 1 REV. 2

APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
2	ADDED CABLE ID	5/14/15	

PROPRIETARY



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ± .XXX ± ANGULAR ± DO NOT SCALE DRAWING	CONTRACT NO.		APPLIED MICRO DESIGN	GERMANTOWN, MD.	
	DRAWN RWC	DATE 3/27/15			
MATERIAL:	CHECKED	DATE	ENVELOPE DRAWING DOWNLINK RF CABLES		
FINISH:	ENGINEER	DATE			
	APPROVED	DATE	SIZE B	CAGE CODE	DRAWING NO. ED01465-0006 / REV 2
FILE: ED01465-0006R2	APPROVED	DATE	SCALE NONE		SHEET 1 OF 1

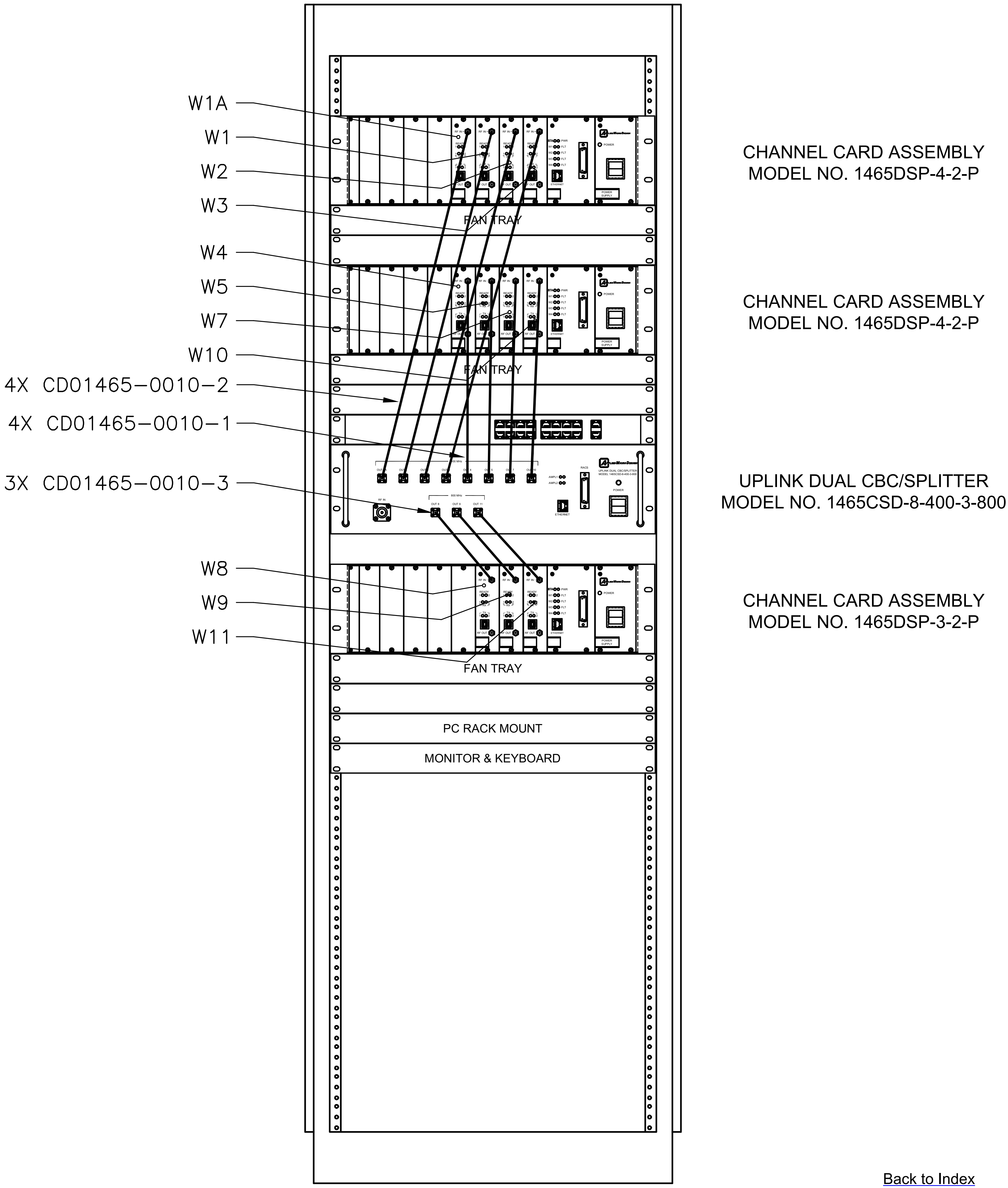
APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
2	ADDED CABLE ID	5/14/15	

DWG. NO. ED01465-0008 SH 1 REV. 2

PROPRIETARY

This document is issued in strict confidence on condition that it is not copied, reprinted, or disclosed to a third party, wholly or in part, without written consent of Applied Micro Design, Inc.



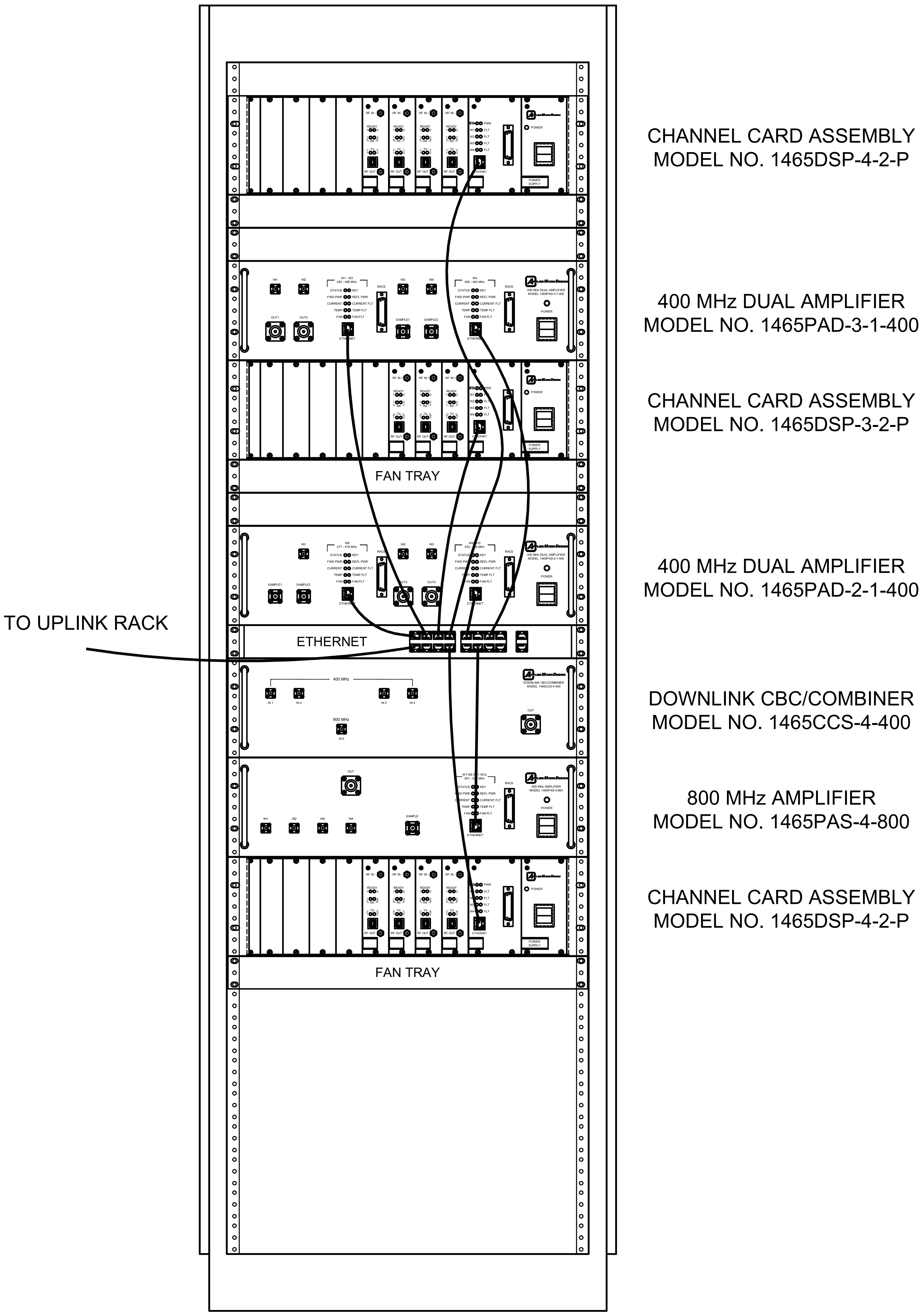
Back to Index

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES	CONTRACT NO.		APPLIED MICRO DESIGN — GERMANTOWN, MD.
DECIMALS .XX ± .XXX ± ANGULAR ±	DRAWN RWC	DATE 3/27/15	
DO NOT SCALE DRAWING	CHECKED	DATE	ENVELOPE DRAWING UPLINK RF CABLES
MATERIAL:	ENGINEER	DATE	
FINISH:	APPROVED	DATE	SIZE B — CAGE CODE — DRAWING NO. ED01465-0008 — REV 2
FILE: ED01465-0008R2	APPROVED	DATE	SCALE NONE — SHEET 1 OF 1

DWG. NO. ED01465-0007 SH 1 REV. 1

APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ± .XXX ± ANGULAR ± DO NOT SCALE DRAWING	CONTRACT NO.		APPLIED MICRO DESIGN GERMANTOWN, MD.
MATERIAL:	DRAWN RWC	DATE 3/27/15	ENVELOPE DRAWING DOWNLINK ETHERNET CABLES
FINISH:	CHECKED	DATE	
	ENGINEER	DATE	
	APPROVED	DATE	SIZE B · CAGE CODE · DRAWING NO. ED01465-0007 · REV 1
FILE: ED01465-0007R1	APPROVED	DATE	SCALE NONE · SHEET 1 OF 1

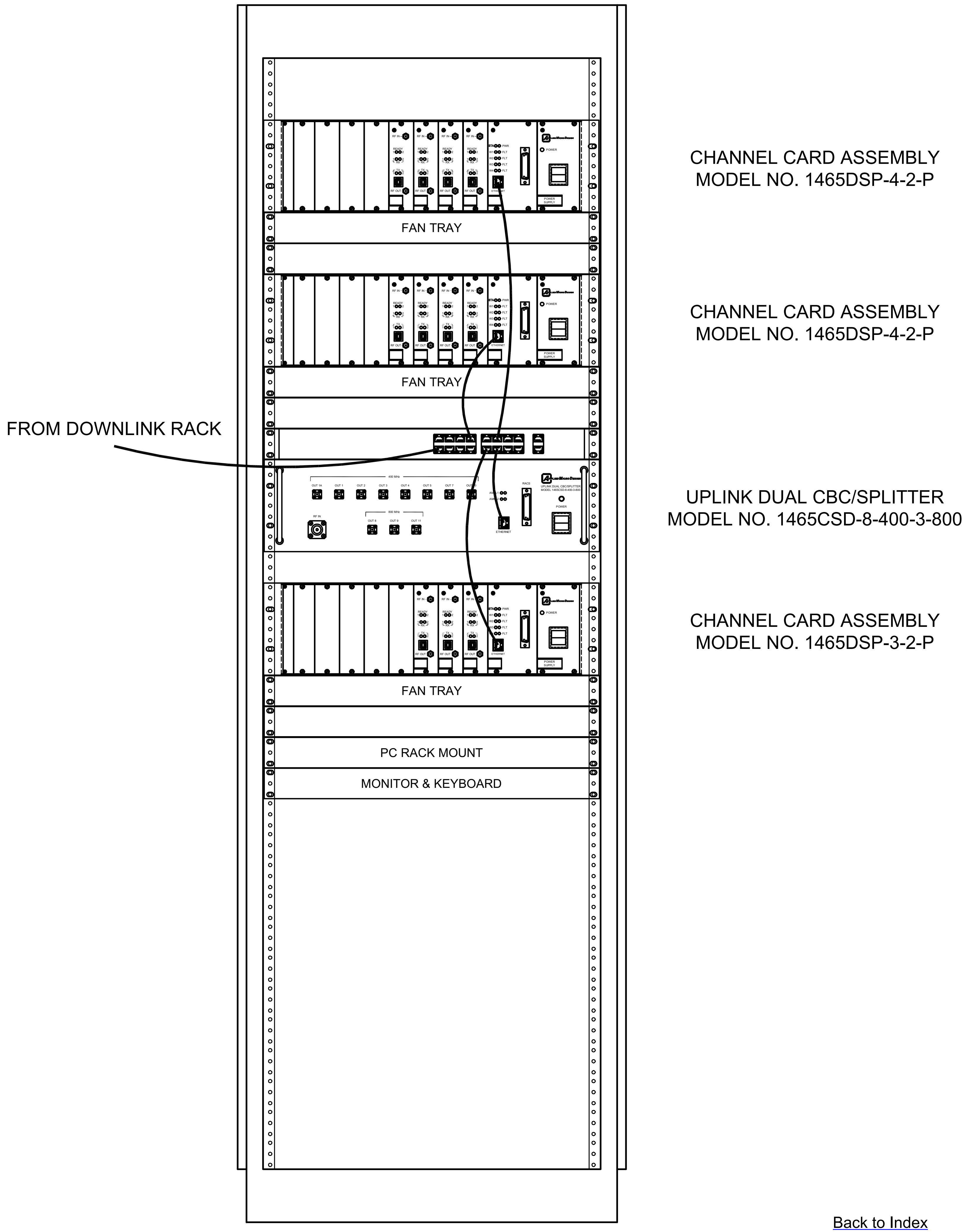
DWG. NO. ED01465-0009 SH 1 REV. 1

APPLICATION	
NEXT ASSY	USED ON
	WTC T4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

PROPRIETARY

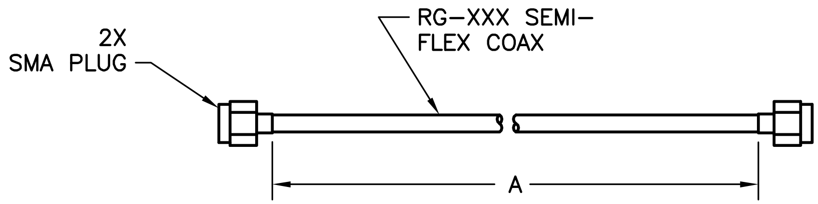
This document is issued in strict confidence on condition that it is not copied, reprinted, or disclosed to a third party, wholly or in part, without written consent of Applied Micro Design, Inc.



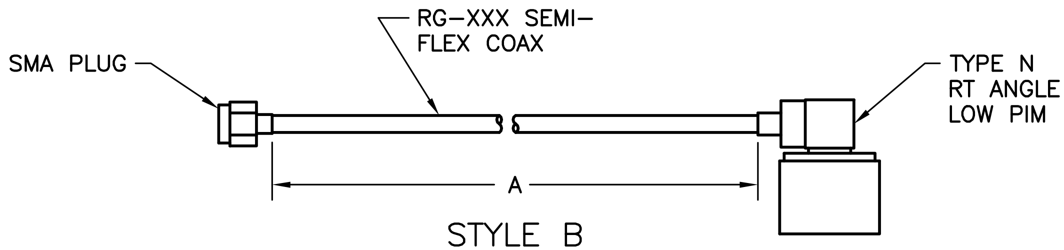
Back to Index

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ± .XXX ± ANGULAR ± DO NOT SCALE DRAWING	CONTRACT NO.		APPLIED MICRO DESIGN — GERMANTOWN, MD.
	DRAWN RWC	DATE 3/27/15	
MATERIAL:	CHECKED	DATE	ENVELOPE DRAWING UPLINK ETHERNET CABLES
	ENGINEER	DATE	
FINISH:	APPROVED	DATE	SIZE B — CAGE CODE — DRAWING NO. ED01465-0009 — REV 1
FILE: ED01465-0009R1	APPROVED	DATE	SCALE NONE — SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



STYLE A



STYLE B

PART NO.	STYLE	RG-XXX	DIM A	QTY
-1	A	RG-405	9.5	4
-2	A	RG-405	11.5	7
-3	B	RG-405	5.0	1
-4	B	RG-405	9.0	2
-5	B	RG-402	22.0	2

NOTES:
1. INTERPRET DRAWING IAW STANDARDS PRESCRIBED BY DOD-STD-100.
2. SOLDERING SHALL CONFORM TO THE REQUIREMENTS OF MIL-STD-2000.

-1 QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL/SPECIFICATION	ITEM NO.

PARTS LIST

NEXT ASSY	USED ON
ED01465-0006	WTC 4

APPLICATION

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .XX ±.12 .XXX ± ANGULAR ±
DO NOT SCALE DRAWING
MATERIAL:
FINISH:
FILE: CD01465-0011R1

CONTRACT NO.	
DRAWN RWC	DATE 4/9/15
CHECKED	DATE
ENGINEER	DATE
APPROVED	DATE
APPROVED	DATE

APPLIED MICRO DESIGN GERMANTOWN, MD.

SPECIFICATION CONTROL DWG
DOWNLINK CABINET CABLES

SIZE	CAGE CODE	DRAWING NO.	REV
B		CD01465-0011	1

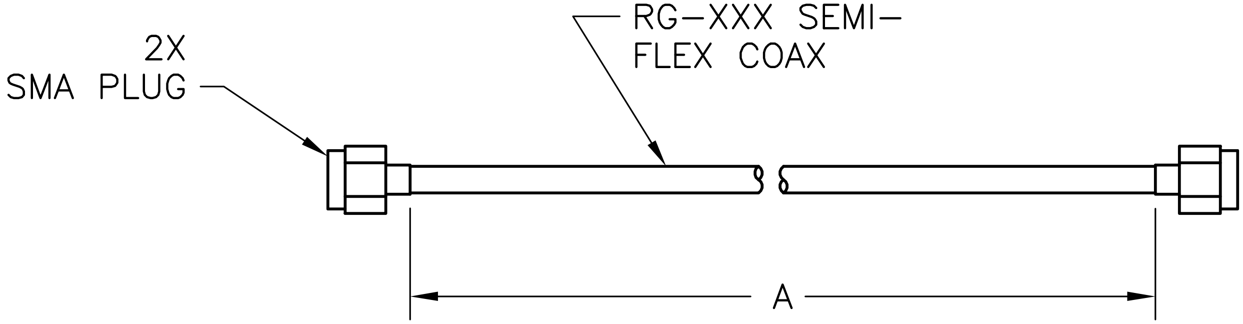
SCALE NONE SHEET 1 OF 1

PROPRIETARY

APPLICATION	
NEXT ASSY	USED ON
ED01465-0008	WTC T4

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED



PART NO.	RG-XXX	DIM A	QTY
-1	RG-402	14.5	4
-2	RG-402	24.0	4
-3	RG-405	8.0	3

NOTES:
1. INTERPRET DRAWING IAW STANDARDS PRESCRIBED BY DOD-STD-100.
2. SOLDERING SHALL CONFORM TO THE REQUIREMENTS OF MIL-STD-2000.

Back to Index

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .XX ±.12 .XXX ± ANGULAR ±
DO NOT SCALE DRAWING

MATERIAL:

FINISH:

FILE: CD01465-0010R1

CONTRACT NO.	
DRAWN RWC	DATE 4/9/15
CHECKED	DATE
ENGINEER	DATE
APPROVED	DATE
APPROVED	DATE

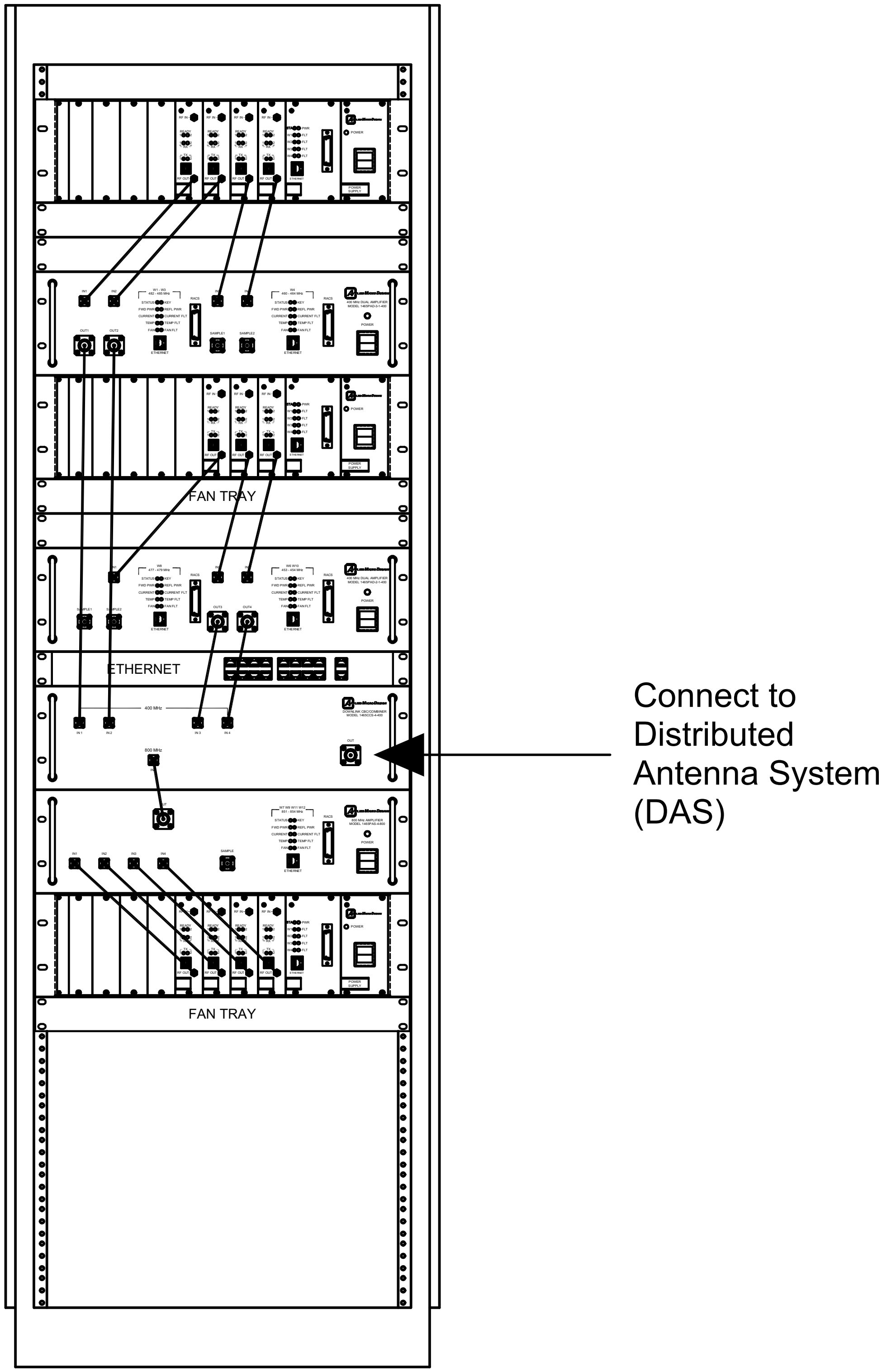
APPLIED MICRO DESIGN — GERMANTOWN, MD.

SPECIFICATION CONTROL DWG
UPLINK CABINET CABLES

SIZE	CAGE CODE	DRAWING NO.	REV
A		CD01465-0010	1
SCALE NONE		SHEET 1 OF 1	

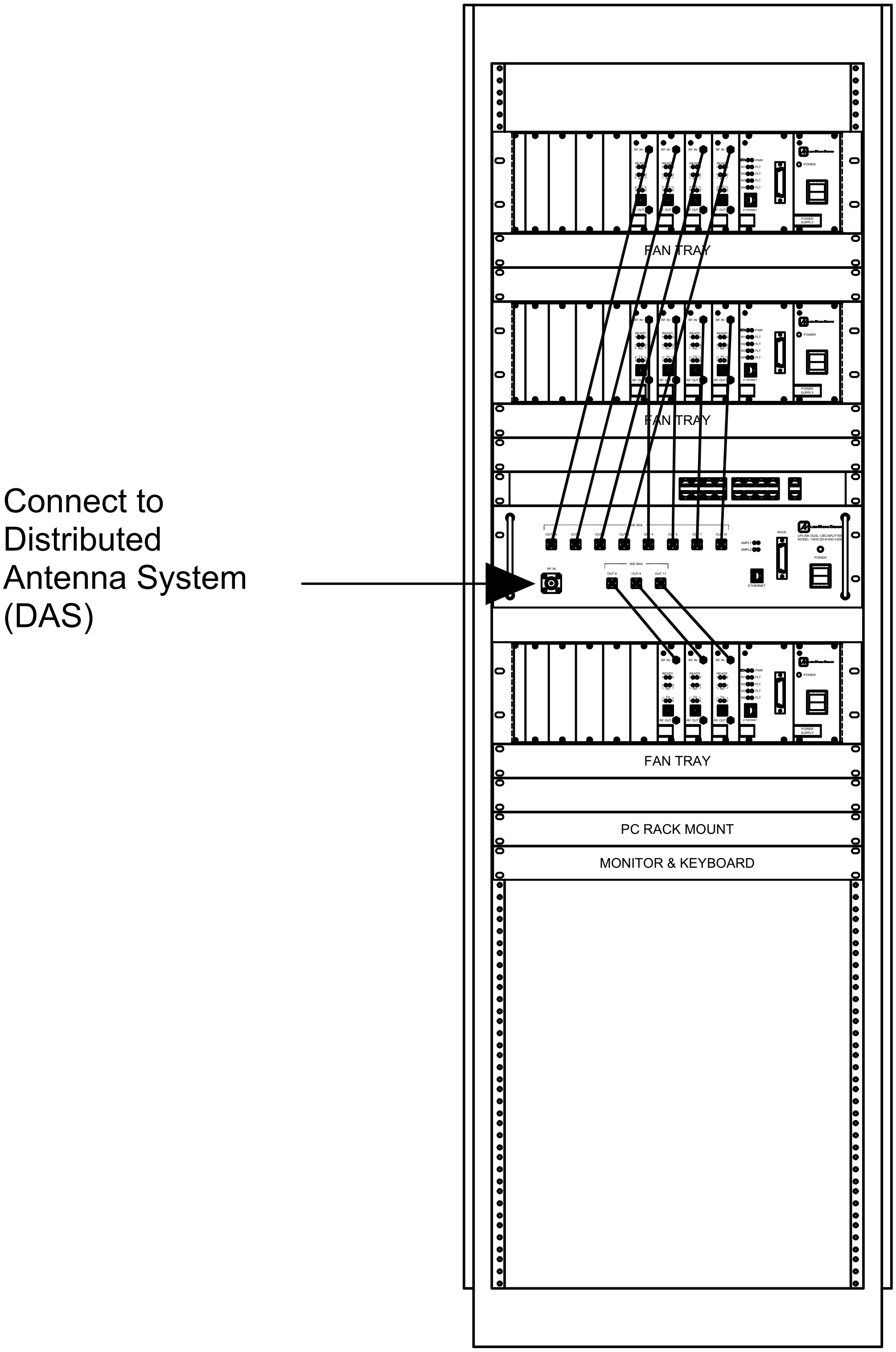
Downlink Installation

No antennas, cables, and/or coupling devices are shipped with this equipment.



Uplink Installation

No antennas, cables, and/or coupling devices are shipped with this equipment.



Appendix A

NMS GUI Manual

USER'S

MANUAL

Network Monitoring and Control System 1.0 – AMDI (NMS)

Applied Micro Design Inc.

May, 2015

Revision Sheet

Release No.	Date	Revision Description
1.0	5/25/15	User’s Manual Created

USER'S MANUAL

TABLE OF CONTENTS

Page #

1.0 PRODUCT DESCRIPTION

1.0 PRODUCT DESCRIPTION

1.1 Overview

The WTC NMS is a graphical user interface, GUI, program that notifies WTC personnel if a specific component fails or if a condition exists that can cause a failure. The GUI continuously polls each component and displays the current status on the GUI screen. If a failure or adverse condition is detected, an icon on the WTC NMS flashes red.

The WTC NMS consists of layered maps which provide different levels of detail. The user can double click on a node, to see a more detailed view of the equipment or to identify a failed or about to fail component.

1.2 Key Features

The important NMS features include the following:

This system indicates the device status whether normal, alarming, connected or disconnected.

- Continuous polling updating status
- Component management through Ethernet Interface
- High-level view
- Drill down windows to view more detailed information
- Configurable Alarm Thresholds
- Device enable/disable

1.3 Acronyms and Abbreviations

WTC – World Trade Center. This is the site for the system installation.

GUI – Graphical User Interface

NMS – Network Management and Control System

AMDI – Applied Micro Design Inc.

DSP – Digital Signal Processing

RF – Radio Frequency

CBC – Cross Band Coupler

UI – User Interface

LNA – Low Noise Amplifier

PWR – Power

UL – Up Link

DL – Down Link

2.0 GETTING STARTED

2.0 GETTING STARTED

2.1 Startup

The system comes with the NMS pre-installed.

Start NMS server:

1. Double-click the Intermapper® icon on the Desktop.

Figure 2: InterMapper® Desktop Shortcut

2. The Map List window will appear.

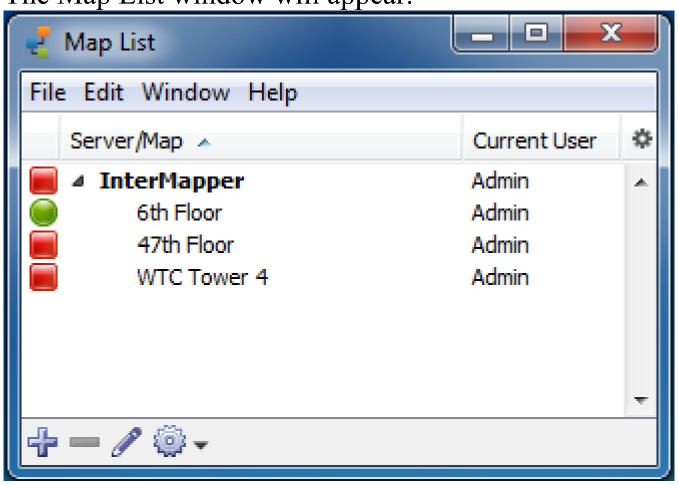


Figure 3: Map List

2.2 System Requirements

To use NMS, ensure the following minimum software and Hardware requirements are available:

- Hardware Requirements
  - Windows 7 Operating System or greater.
  - Ethernet RJ-45 interface
- Software Requirements – Intermapper® with a minimum license to monitor 50 devices.

2.3 Opening the Map

Double-click the 'WTC Tower 4' map. This will open the overview window which displays a high level view of the entire system.

2.4 Exit NMS

Close all map windows, Intermapper® application, and component GUI windows.

3.0 MAPS

3.0 MAPS

The WTC NMS consists of layered maps which provide different levels of detail. The user can double click on a node, to see a more detailed view of the equipment or to identify a failed or about to fail component.

3.1 Overview Map

The Overview Map provides a high level view of the entire WTC system. Each icon on the Overview Map represents an individual equipment room. The color of the icon, representing an equipment room, indicates the most serious condition. If a failure condition is detected on any component in an equipment room, the room's icon will flash red.

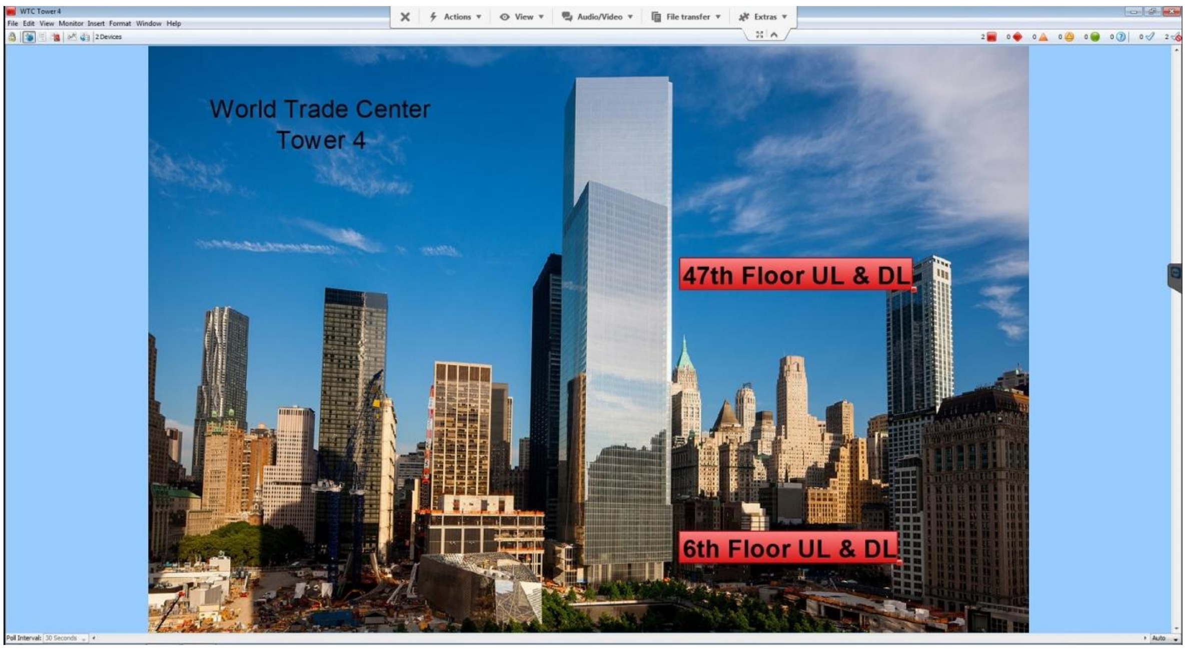


Figure 1: NMS Overview Map

3.2 Node View Map

The Node View Map provides a detailed view of the equipment room which includes the Uplink and Downlink racks. Devices in alarm mode flash red. The user can drill down into the device to view detailed status of the hardware, set alarm thresholds, enable/disable the device, and update device firmware.

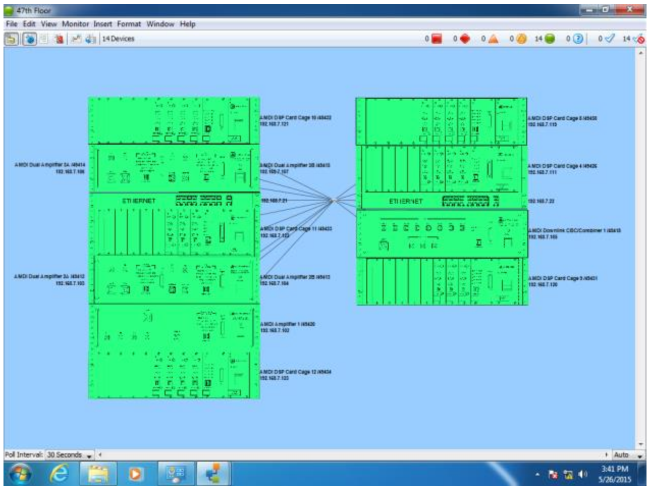


Figure 2: Node View Map SYSTEM OK

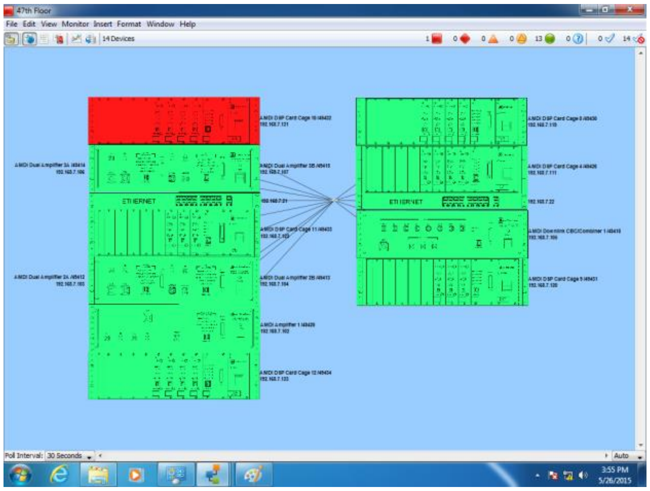


Figure 3: Node View Map COMPONENT FAILED

4.0 COMPONENT LEVEL GUI

4.0 COMPONENT LEVEL GUI

By double clicking the component icon the user can view detailed status of the hardware, set alarm thresholds, enable/disable the device, and update device firmware. Each component GUI includes 3 tab pages Status, Thresholds, and Update.

4.1 AMDI DSP Processor Board Control

4.1.1 Status/Control

The status tab displays the current status for the individual DSP Channel Cards installed in the chassis. The current measured Forward and Reverse power readings, in dBm, are displayed. If the Forward/Reverse PWR readings display ‘OFF’ there is no signal present. The current board temperature is displayed in degrees C. The instantaneous current draw is displayed in milliamps, mA. The Status column displays the current board status which can be DISABLED, ENABLED, TEMP FAULT, CURRENT FAULT, FORWARD PWR FUALT, REVERSE PWR FUALT, and COMMS Error.

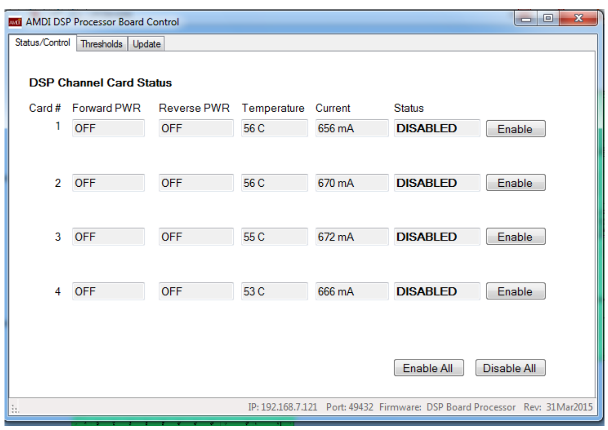


Figure 4. DSP Status/Control tab

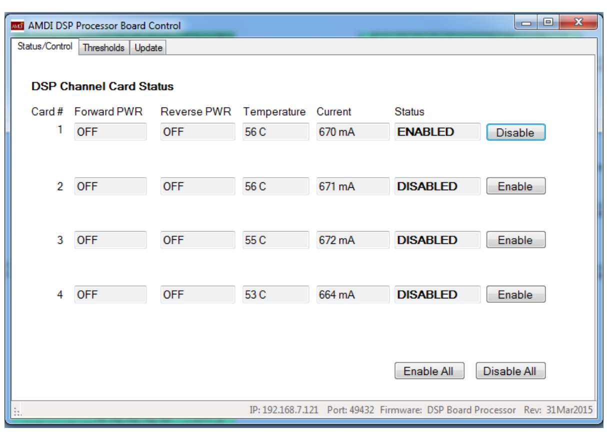


Figure 5. DSP Status/Control tab with channel Enabled.

To enable the RF output on a channel card click ‘Enable’.

To disable the RF output on an individual card click ‘Disable’.

To enable all cards in a Channel Card Cage click ‘Enable All’.

To disable all cards in a Channel Card Cage click ‘Disable All’.

4.1.2 Thresholds

The Thresholds tab displays the alarm thresholds for the DSP Processor board. The below table outlines each threshold:

Name	**Description**
Card Count	The number of DSP channel cards installed in the corresponding card cage.
Forward Power	Number representing the minimum RF output power value in – dBm.
Reverse Power	Number representing the maximum reflected power reading in – dBm.
Current	Number representing the maximum allowable current draw value in mA.
Temperature	Number representing the maximum allowable temperature in degrees C.

Table 1. DSP Channel Card Threshold Values

To edit thresholds, click the ‘Thresholds’ tab, then click ‘Edit’, when prompted for a username/password use the following:

Username: AMDI
Password: admin

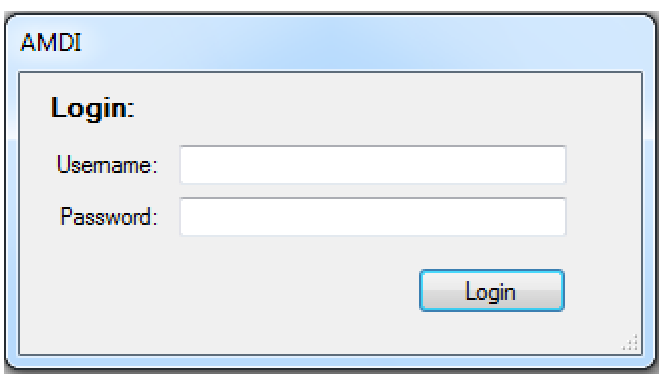


Figure 5. Login Prompt to edit thresholds

This will allow the user to make changes to the threshold values.

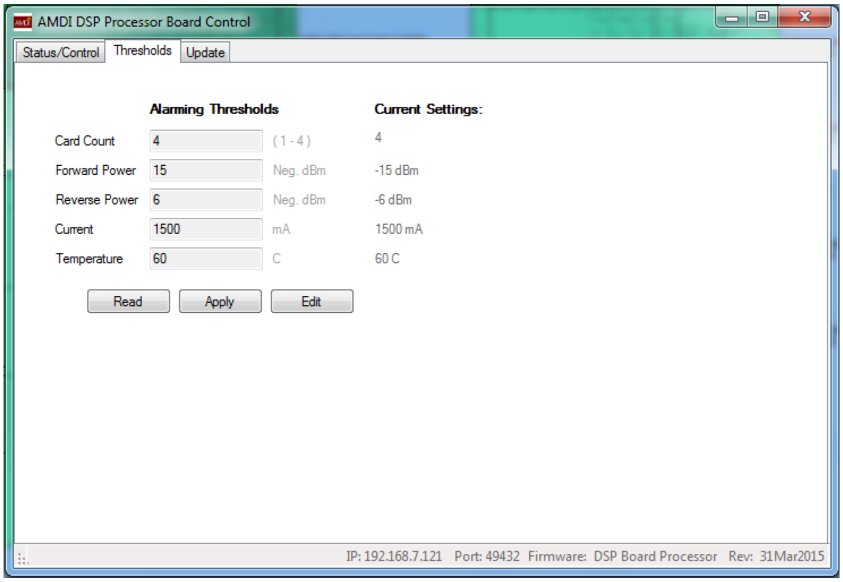


Figure 6. DSP Thresholds tab

4.1.3 Update

<u>Update Processor Firmware:</u>

To update the firmware running inside the processor, click ‘Open HEX’ and navigate to the coorisponding .hex file. Once the file has been selected, click update. There will be a label that says “Programming Complete” next to the Update button, and the button will be disabled.

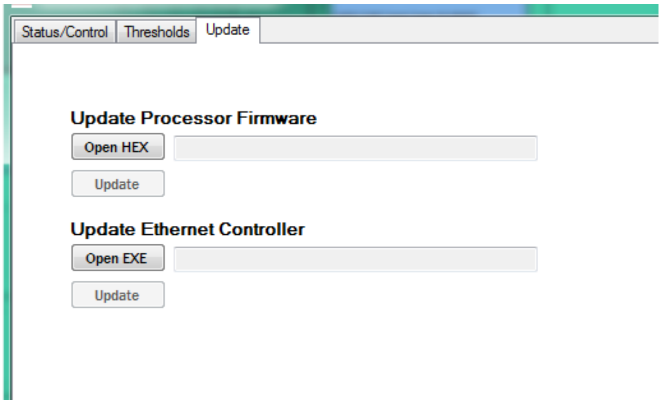


Figure 7. DSP Channel Card Update Tab

<u>Update Ethernet Controller:</u>

To update the firmware running inside the Ethernet Interface, click ‘Open EXE’ and navigate to the coorisponding .exe file. Once the file has been selected, click update. There will be a label that says “Programming Complete” next to the Update button, and the button will be disabled.

4.1.4 Faults

The table below describes the different fault messages displayed in the Status column on the 'Status/Control' tab page. The alarms are generated whenever a measured value exceeds the threshold.

Fault Name	Description	Troubleshooting
TEMP FAULT	The temperature value is greater that the threshold.	Verify fans are running. Verify temperature threshold is correct.
CURRENT FAULT	The current draw for the board is greater than the current threshold value.	Verify the board is connected properly.
FORWARD POWER FAULT	The measured forward power value is less than the forward power threshold.	Verify DSP board RF output and AGC settings using the AMDI UI application.
REVERSE POWER FAULT	The measure reverse power value is greater than the reverse power threshold.	Verify RF cables are connected properly.
COMMS ERROR	The number of detected channel cards is less than the programmed card count threshold.	Verify the cards are properl y seated in card cage. Verify the threshold value represents the number of channel card present in the card cage.

Table 2. DSP Channel Cards Fault Messages

4.2 AMDI Power Amplifier Control

4.2.1 Status/Control

The status tab displays the current status for the power amplifier. The current measured Forward and Reverse power readings, in dBm, are displayed. There are 2 progress bars that provide a visual representation of the forward and reverse power. The current amplifier temperature is displayed in degrees C. The instantaneous current draw is displayed in amps, A. The Status column displays the current amplifier status which can be DISABLED, ENABLED, TEMP FAULT, CURRENT FAULT, FORWARD PWR FUALT, and REVERSE PWR FUALT.

.

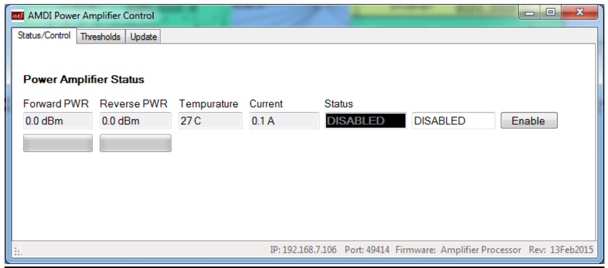


Figure 8. Power Amplifier Status/Control Tab disabled

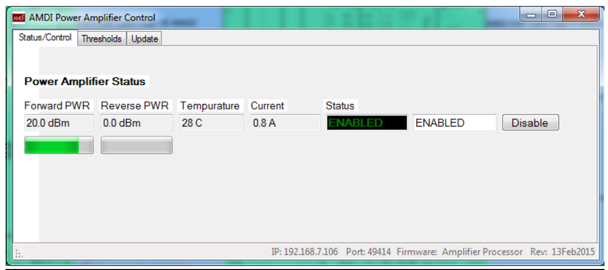


Figure 9. Power Amplifier Status/Control Tab Enabled

4.2.2 Thresholds

The Thresholds tab displays the alarm thresholds for power amplifier. The below table outlines each threshold:

Name	**Description**
ALC	The value for Automatic Level Control
Forward Power	Number representing the minimum RF output power value in dBm.
Reverse Power	Number representing the maximum reflected power reading in dBm.
Current	Number representing the maximum allowable current draw value in A.
Temperature	Number representing the maximum allowable temperature in degrees C.

Table 3. Power Amplifier Threshold Values

To edit thresholds, click the ‘Thresholds’ tab, then click ‘Edit’, when prompted for a username/password use the following:

Username: AMDI
Password: admin

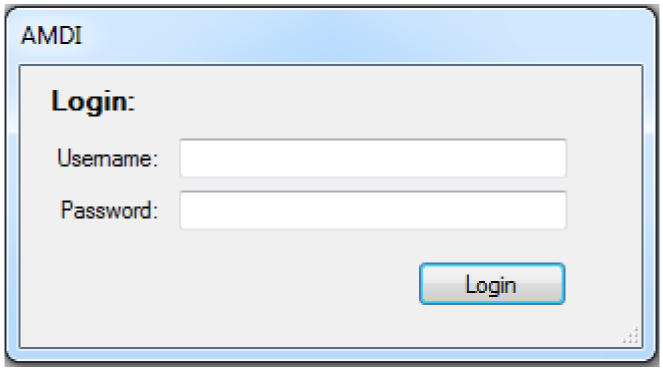


Figure 10. Login Prompt to edit thresholds

This will allow the user to make changes to the threshold values.

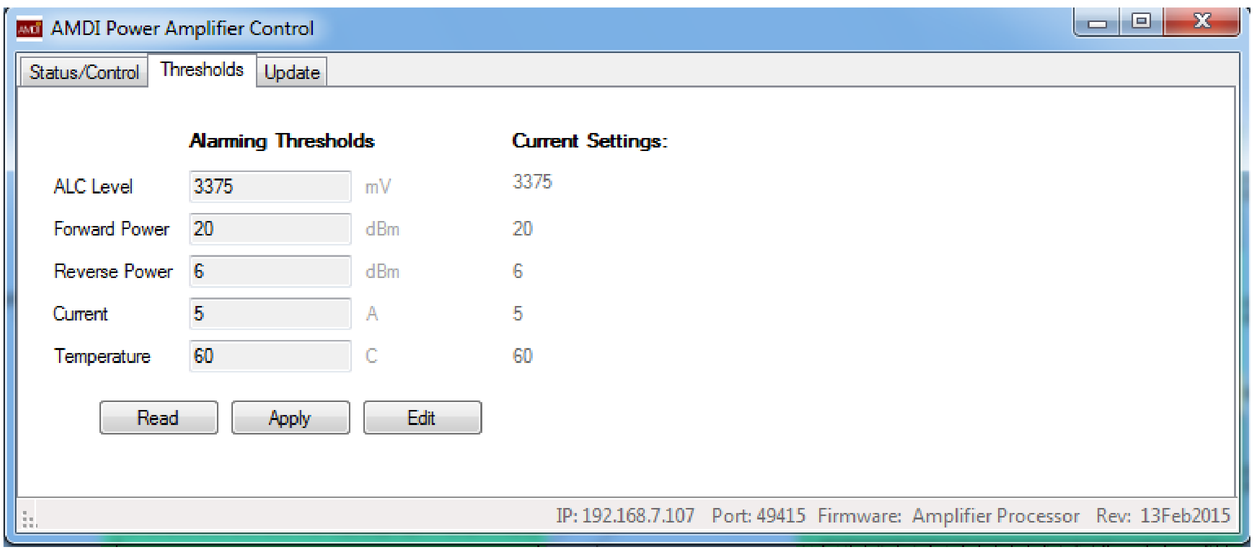


Figure 11. Power Amplifier Thresholds Tab

4.2.3 Update

Update Processor Firmware:

To update the firmware running inside the processor, click ‘Open HEX’ and navigate to the coorisponding .hex file. Once the file has been selected, click update. There will be a label that says “Programming Complete” next to the Update button, and the button will be disabled.

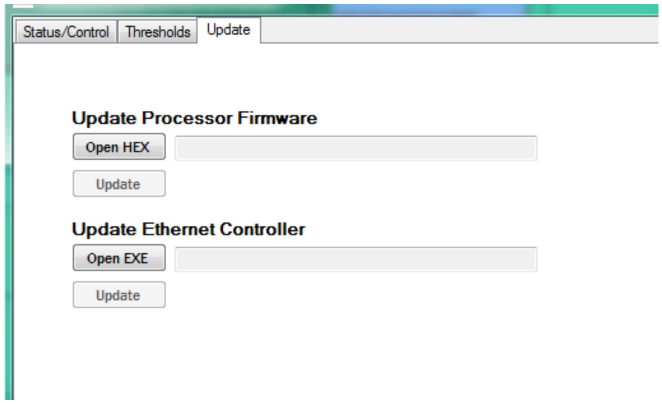


Figure 12 Power Amplifier Update Tab

Update Ethernet Controller:

To update the firmware running inside the Ethernet Interface, click 'Open EXE' and navigate to the coorisponding .exe file. Once the file has been selected, click update. There will be a label that says "Programming Complete" next to the Update button, and the button will be disabled.

4.2.4 Faults

The table below describes the different fault messages displayed in the Status column on the 'Status/Control' tab page. The alarms are generated whenever a measured value exceeds the threshold.

Fault Name	Description	Troubleshooting
TEMP FAULT	The temperature value is greater that the threshold.	Verify fans are running. Verify temperature threshold is correct.
CURRENT FAULT	The current draw f or the amplifier is greater than the current threshold value.	Verify the amplifier is connected and operating properly.
FORWARD POWER FAULT	The measured forward power value is less than the forward power threshold.	Verify the ALC threshold value is configure properly.
REVERSE POWER FAULT	The measure reverse power value is greater than the reverse power threshold.	Verify RF cables are connected properly.

Table 4. Power Amplifier Fault Messages

4.3 AMDI Cross Band Coupler

4.3.1 Status

The status tab displays the current draw in millamps, mA, for the LNAs in the chassis. The status column will display OK or CURRENT FAULT.

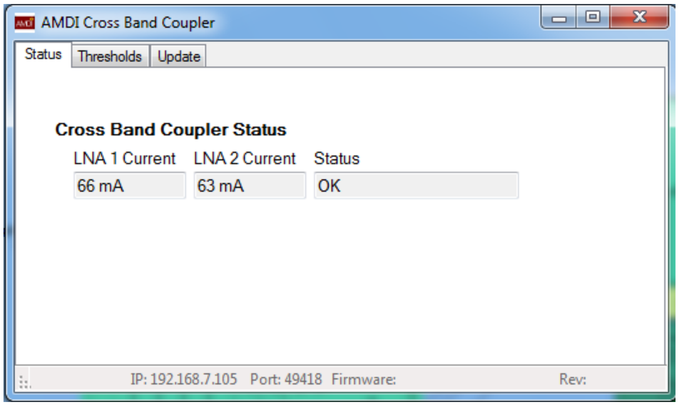


Figure 13 CBC Status tab

4.3.2 Thresholds

The thresholds tab allows the user to set the current draw threshold for the LNAs.

To edit thresholds, click the ‘Thresholds’ tab, then click ‘Edit’, when prompted for a username/password use the following:

Username: AMDI
Password: admin

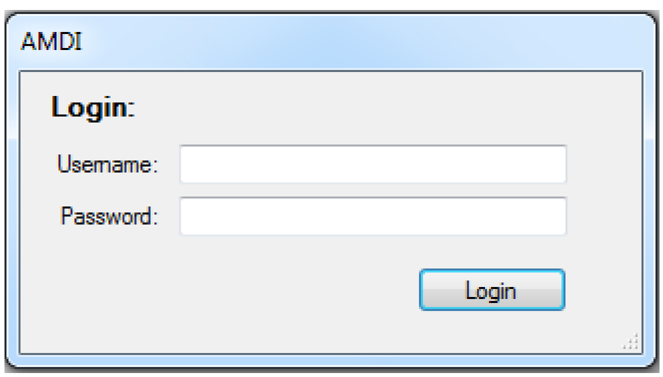


Figure 14 Login Prompt to edit thresholds

This will allow the user to make changes to the threshold values.

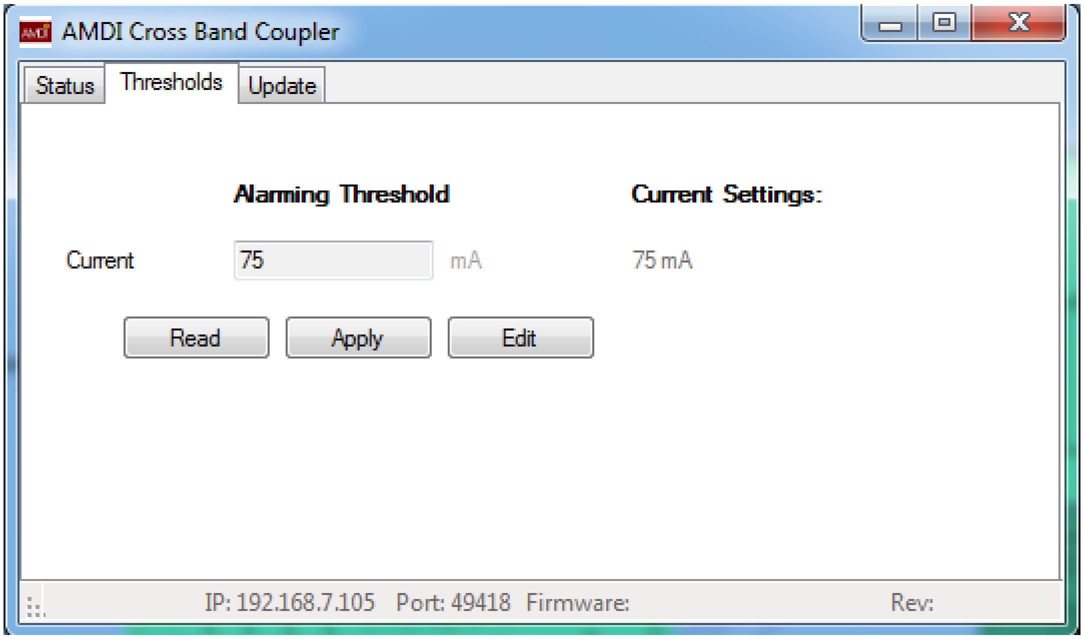


Figure 15 CBC Thresholds Tab

4.3.3 Update

<u>Update Processor Firmware:</u>

To update the firmware running inside the processor, click 'Open HEX' and navigate to the coorisponding .hex file. Once the file has been selected, click update. There will be a label that says "Programming Complete" next to the Update button, and the button will be disabled.

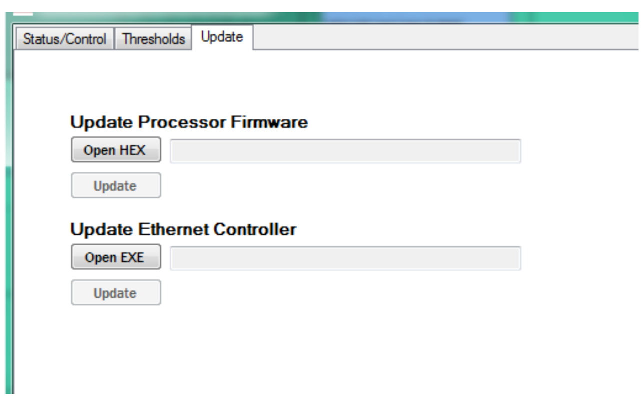


Figure 12 CBC Update Tab

<u>Update Ethernet Controller:</u>

To update the firmware running inside the Ethernet Interface, click 'Open EXE' and navigate to the coorisponding .exe file. Once the file has been selected, click update. There will be a label that says "Programming Complete" next to the Update button, and the button will be disabled.

4.3.4 Fault

The table below describes the fault message displayed in the Status column on the ‘Status’ tab page. The alarm is generated whenever a measured value exceeds the threshold.

Fault Name	Description	Troubleshooting
CURRENT FAULT	The current draw for the LNA is greater than the current threshold value.	Verify the CBC is connected and operating properly.

Table 5 CBC Fault Message

Back to Index

Appendix B

RACS (*Radio Access Control System*) **Description**

There are two equipment rooms in Tower-4, and each equipment room has an Uplink and Downlink rack.

The Downlink Rack contains three DSP Card Cages, two Dual Amplifiers, one Single Amplifier, and one CBC chassis. There are a total of eight processor boards in the Downlink rack; one board in each Card Cage, two boards in each Dual Amplifier, and one board in the single amplifier. The CBC chassis is passive and does not have a processor board.

The Uplink Rack contains three DSP Card Cages and one CBC chassis. There are a total of four processor boards in the Uplink rack; one board in each Card Cage and one board in the CBC chassis.

Each processor board has an Ethernet interface and is connected to an Ethernet Switch in the associated rack. Each processor board also has six relays that are the interface to the RACS system.

There are three wires associated with each relay; Common (COM), Normally Open (NO), and Normally Closed (NC). There is a DB-25F connector on each front panel that brings out the eighteen lines; three lines per each of the six relays.

A relay changes state from NO to NC if a corresponding fault is detected by the processor board. The threshold for each fault function is programmable via the Graphic User Interface (GUI) program provided with the system.

Five block diagrams are attached:

Figures 1 and 2 are high-level block diagrams showing the components of the system that implement the RACS function for the DL and UL racks respectively. Each of the components described above is listed along with the corresponding AMDI model number.

Figures 3, 4, and 5 show the RACS section of a typical Card Cage, DL Power Amplifier, and UL CBC in more detail.

DSP Window Card RACS Interface

The Card Cage chassis has a backplane board that runs across the back of the chassis. The DSP cards and the processor board plug into the backplane, which provides the signal path for an RS-422 interface between the processor board and each of the DSP Window cards.

The processor board sends command to, and receives status from, each of the DSP Window Cards.

Status messages from the Window card to the processor board include; Forward Power, Reflected Power, Current, Temperature, Mode (narrow-band or broadband), and number of active channels.

Since there is one processor board per chassis, there is one set of six RACS relays per chassis. The relays represent the composite status for the (three or four) DSP cards in the chassis. Any one of the following faults on a channel card will result in the relay corresponding to that card changing state: Forward Power Fault, Reflected Power Fault, Current Fault, Temperature Fault.

The following is a list of relay fault assignments:

DSP Channel Card #1 Fault
DSP Channel Card #2 Fault
DSP Channel Card #3 Fault
DSP Channel Card #4 Fault
Spare #1
Spare #2

Figure 3 shows the Card Cage block diagram and the RACS relay lines.

Power Amplifier RACS Interface

The Power Amplifier chassis contains either one or two power amplifier modules. A power amplifier module consists of a power supply, power amplifier, optional combiner, and processor board.

Figure 4 shows the lines between the amplifier module and the processor board. Voltages proportional to amplifier forward and reflected power are input to the processor board. ALC level, ALC enable, and amplifier enable (key line, to turn the amplifier on and off) are output from the processor board to the amplifier.

In addition to these signals, the processor board monitors amplifier current (via a sense resistor in series with the power supply) and amplifier temperature (via a thermistor mounted to the amplifier heat sink). A tachometer signal on the fan is monitored to ensure the fan is rotating.

The processor board sends command to, and receives status from, the amplifier and peripherals (current, temperature, and fan status).

The following is a list of relay fault assignments:

Forward Power Fault
Reflected Power Fault
Over-Current Fault
Temperature Fault
Fan Fault
Spare

Uplink CBC RACS Interface

The Uplink CBC chassis contains a Cross-Band Coupler, two Splitters, and two LNA’s. There is one processor board in the chassis that measures power supply current into each LNA.

The following is a list of relay fault assignments:

LNA #1 Over-Current Fault
LNA #2 Over-Current Fault
Spare #1
Spare #2
Spare #3
Spare #4

Notes:

1.RACS fault thresholds are the same as for the chassis front-panel LED's. Thresholds are set using the AMDI GUI.
2.The "Forward Power" fault is not defined at this time.
3.All faults are generated under firmware control of the processor board in the corresponding chassis. These can be re-defined in later firmware versions.

Back to Index

WTC4 HE Alarms Diagram

rev 3

Downlink Group

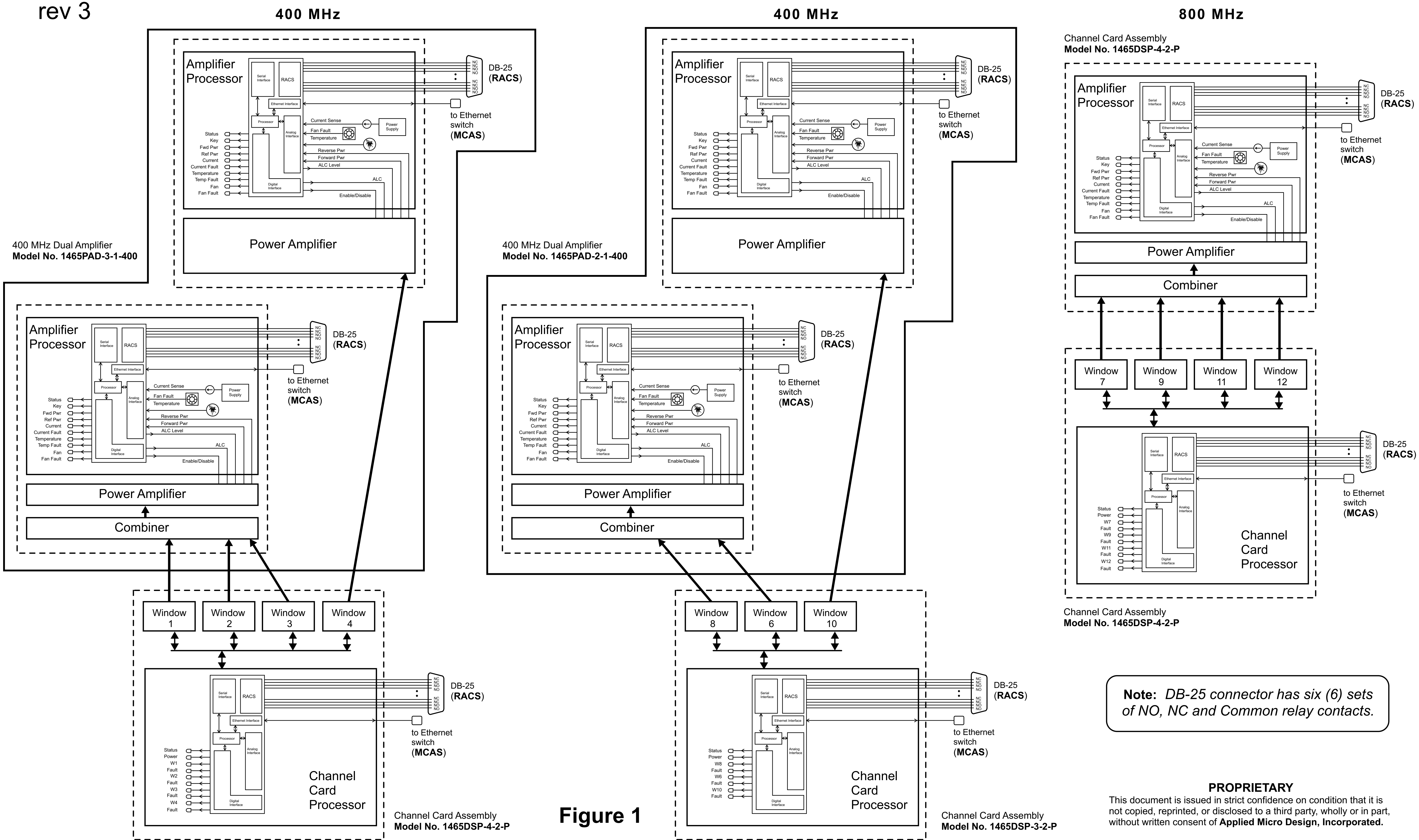


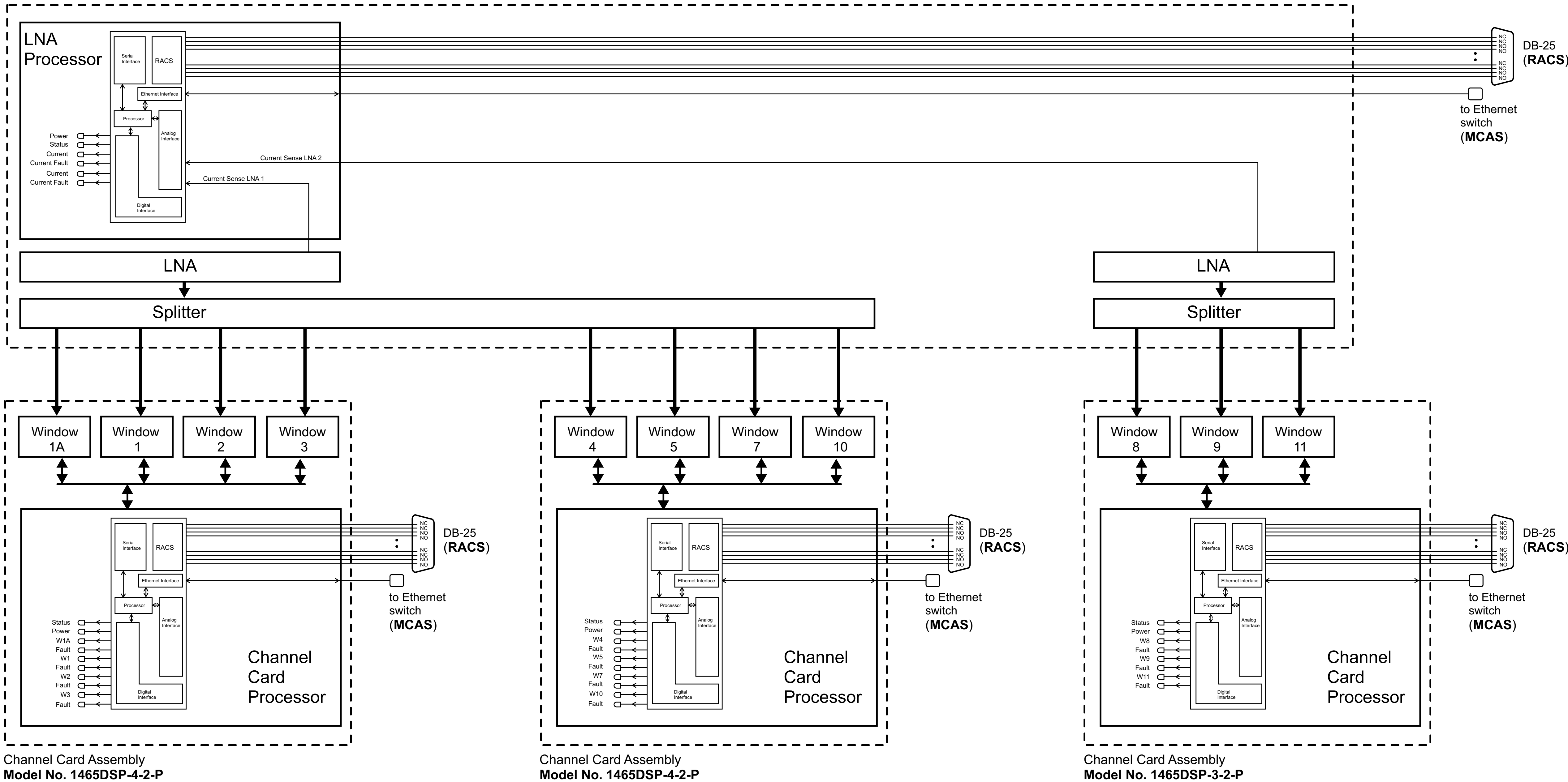
Figure 1

Note: *DB-25 connector has six (6) sets of NO, NC and Common relay contacts.*

WTC4 HE Alarms Diagram

rev 3

Uplink Group



400 MHz **400 MHz** **800 MHz**

Note: *DB-25 connector has six (6) sets of NO, NC and Common relay contacts.*

Figure 2

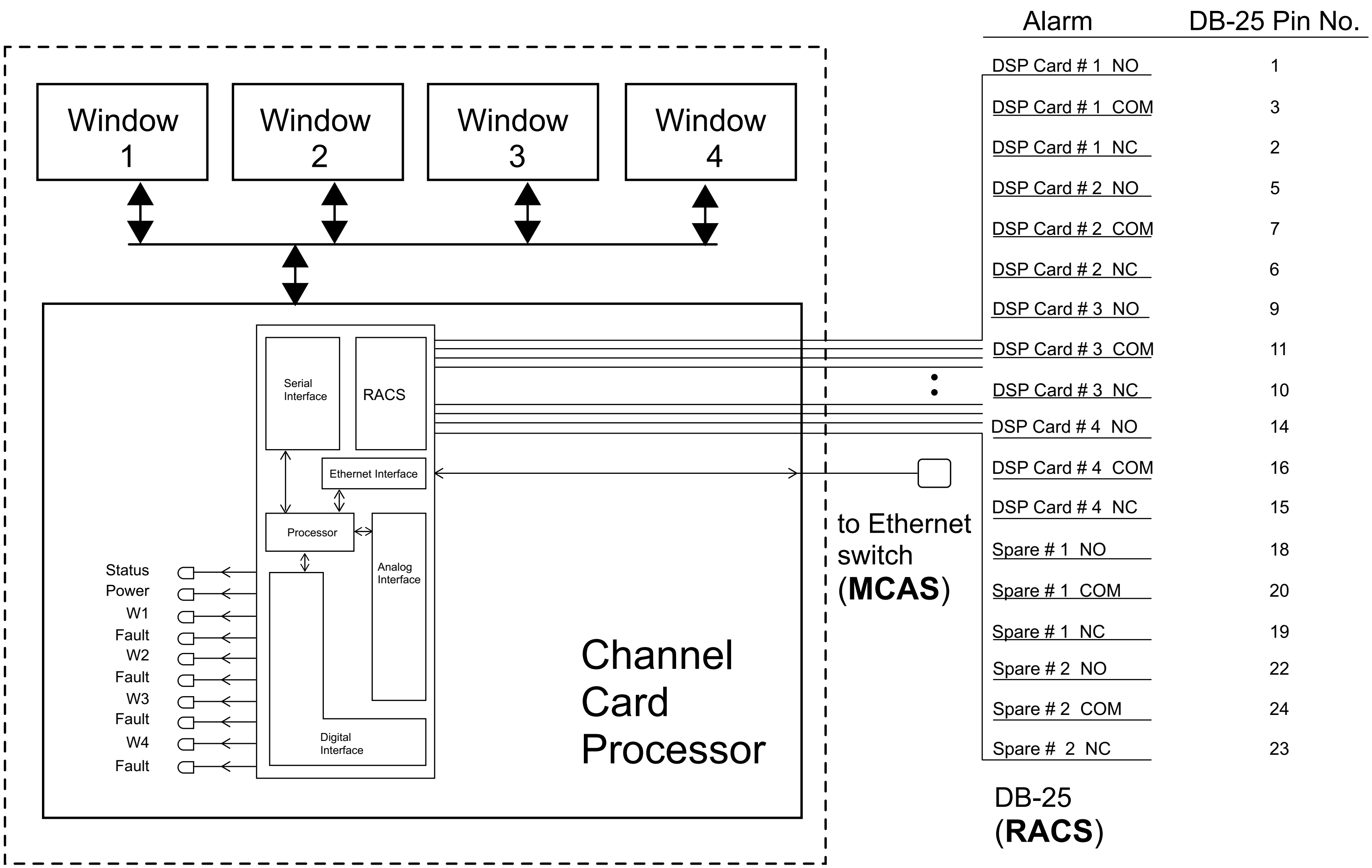
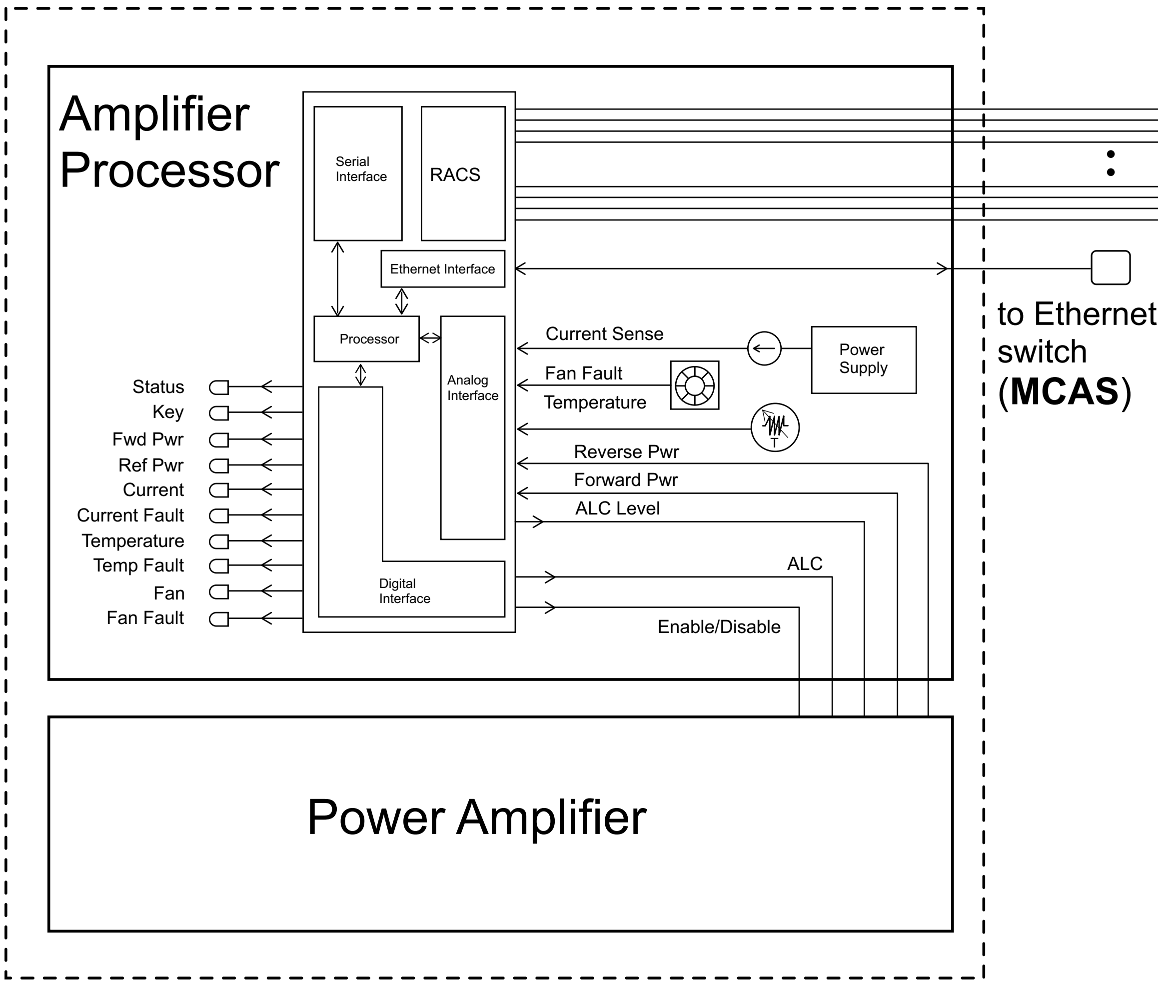

Alarm
DB-25 Pin No.
DSP Card # 1 NO 1
DSP Card # 1 COM 3
DSP Card # 1 NC 2
DSP Card # 2 NO 5
DSP Card # 2 COM 7
DSP Card # 2 NC 6
DSP Card # 3 NO 9
DSP Card # 3 COM 11
DSP Card # 3 NC 10
DSP Card # 4 NO 14
DSP Card # 4 COM 16
DSP Card # 4 NC 15
Spare # 1 NO 18
Spare # 1 COM 20
Spare # 1 NC 19
Spare # 2 NO 22
Spare # 2 COM 24
Spare # 2 NC 23
DB-25 (RACS)
Window 1
Window 2
Window 3
Window 4
Serial Interface
RACS
Ethernet Interface
Processor
Analog Interface
Digital Interface
Status
Power
W1
Fault
W2
Fault
W3
Fault
W4
Fault
Channel Card Processor
to Ethernet switch (MCAS)

Figure 3

400 MHz



Alarm	DB-25 Pin No.
Fwd Pwr NO	1
Fwd Pwr COM	3
Fwd Pwr NC	2
Ref Pwr NO	5
Ref Pwr COM	7
Ref Pwr NC	6
Current Fault NO	9
Current Fault COM	11
Current Fault NC	10
Temp Fault NO	14
Temp Fault COM	16
Temp Fault NC	15
Fan Fault NO	18
Fan Fault COM	20
Fan Fault NC	19
Spare NO	22
Spare COM	24
Spare NC	23

DB-25
(**RACS**)

Figure 4

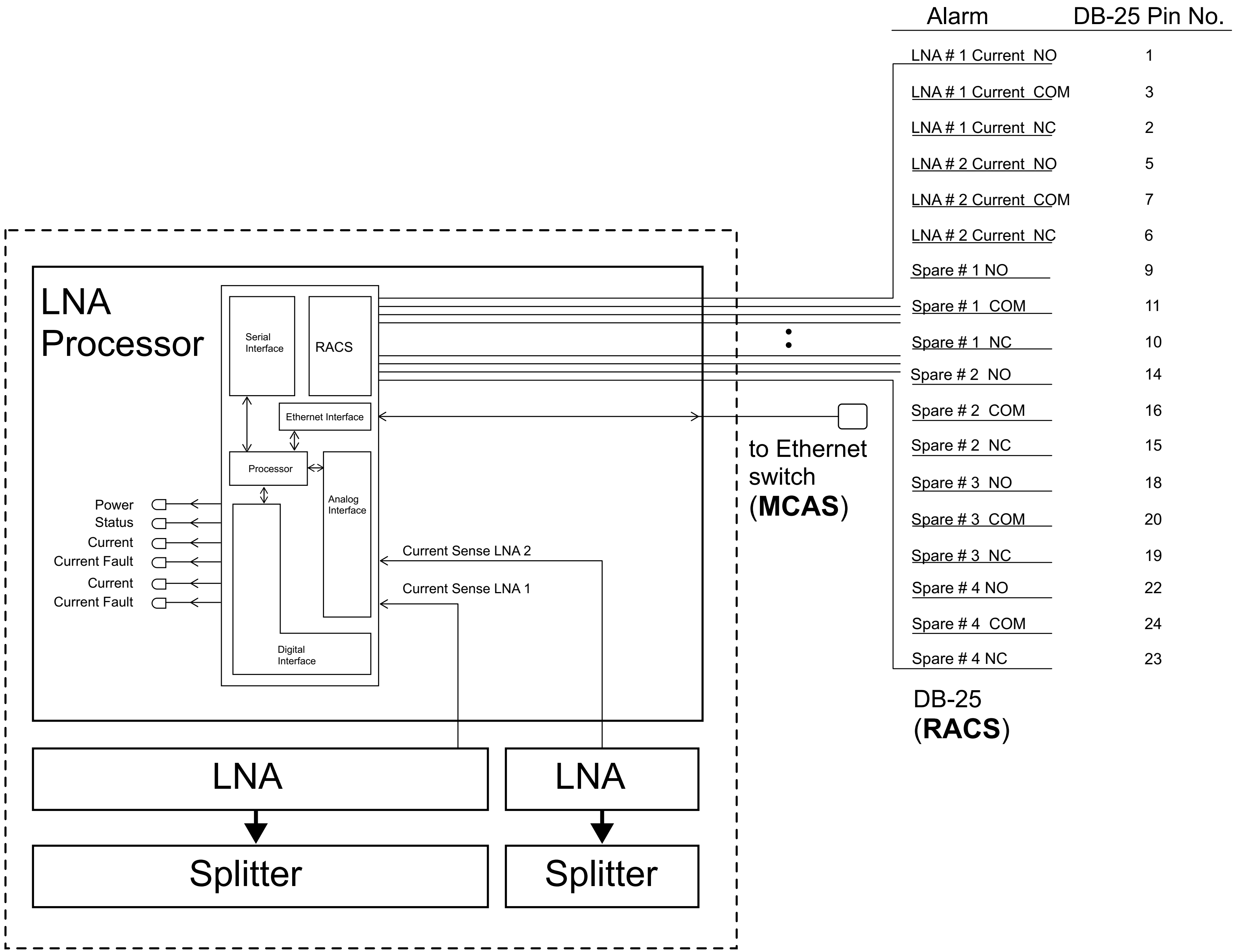


Figure 5

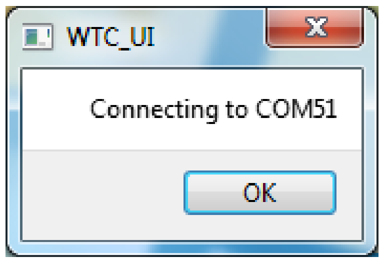
Back to Index

Appendix C

DSP User GUI Operation

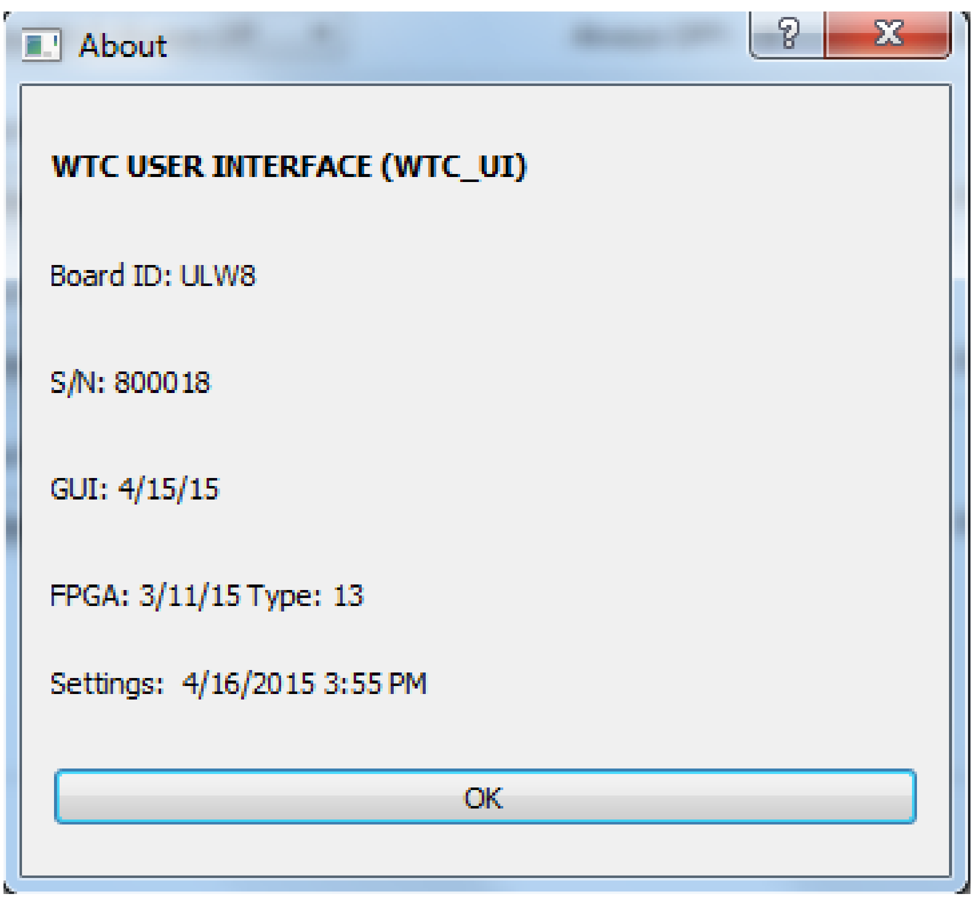
This document describes the operation of the WTC GUI, the graphical user interface program that is used to configure each of the DSP modules. To use the WTC GUI connect a USB cable from the PC to a DSP module and start the program by double-clicking on the desktop shortcut that looks like this:

When the WTC GUI program starts it looks for DSP modules on the USB interface. If it finds only one module on the USB port, it displays a dialog box like the following one to announce on which USB COM port it has found a DSP module on. Clicking the OK button dismisses the COM port dialog box.

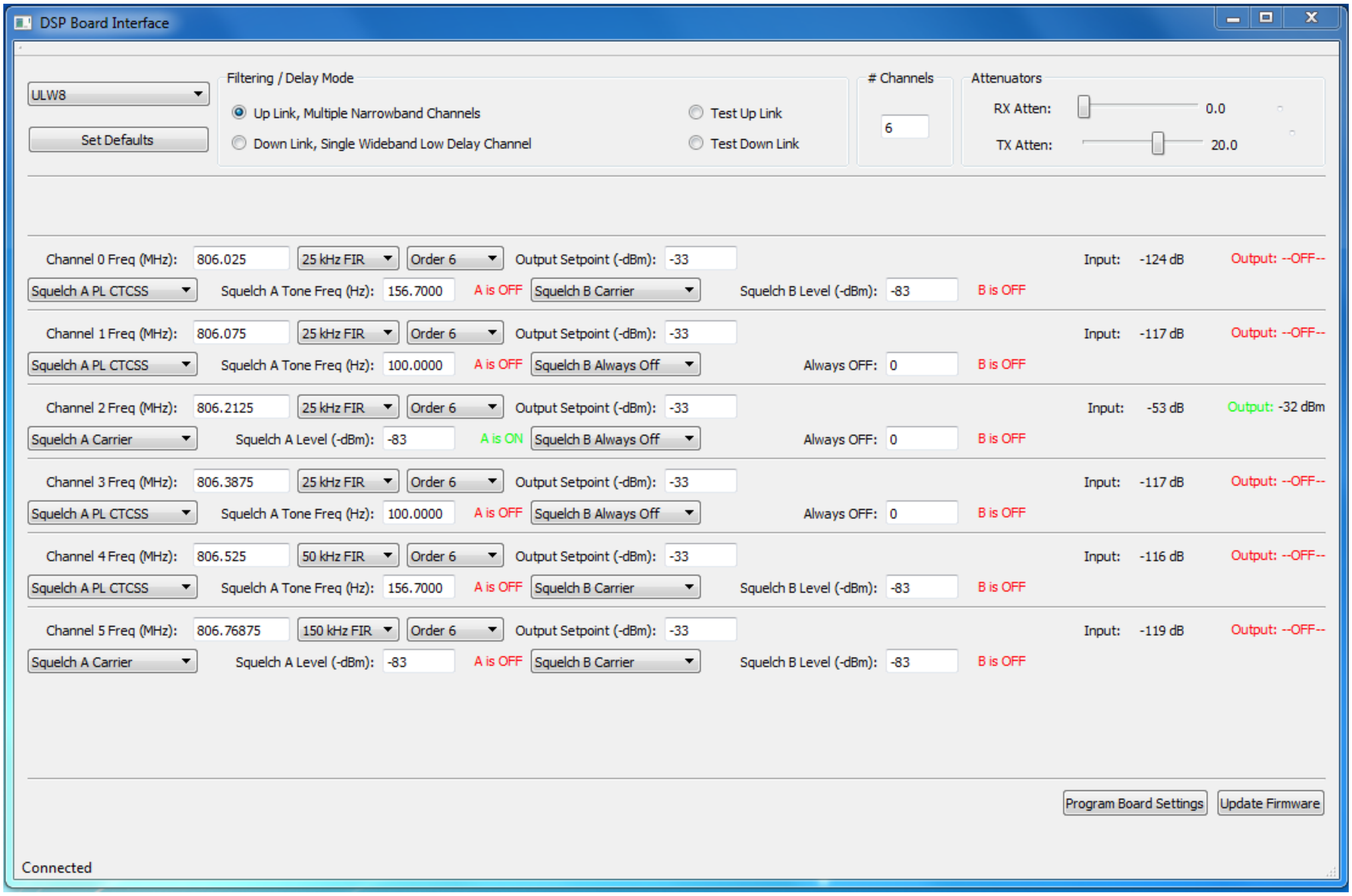


On the other hand if it finds more than one the program lets the user select which module to work with.

Next the WTC GUI program reads the current settings from the DSP module and also the module board ID, serial number, and the revision dates of the GUI, firmware and settings. It displays that information in an About dialog box like this:



The About dialog, is displayed on top of the main GUI window. Here is an example of the Main window for one of the WTC uplink modules, namely ULW8 (Up Link Window 8):



The settings that were read from the non-volatile memory on the DSP module allow the GUI program to configure the GUI controls so they match the DSP module. The settings include the selected mode which may be either “single channel low delay mode” which is normally used for the downlink or “multiple channel narrowband mode” which is usually used for uplink.

The WTC firmware allows up to eight channels in uplink mode but other firmware is available from AMDI that allows up to sixteen channels per DSP module. The ULW8 has six channels.

The GUI hides the GUI controls for the channels beyond those six since the settings read from the board tell the GUI program that for the “Up Link Window 8” module only six channels are used. To use a different number of channels the user only needs to change the number in the edit box labeled “# of Channels”.

As you can see in the figure above, for each channel the GUI provides controls that specify these values:

Channel Frequency (MHz)

Channel filter bandwidth

Channel filter order

Output AGC setpoint (dBm)

Squelch A and B types

Squelch A and B values

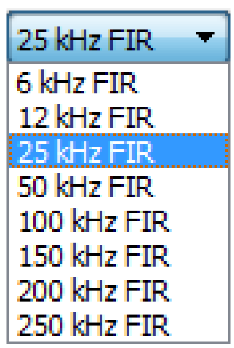
The GUI also provides the following outputs:

Squelch A and B ON or OFF indicators

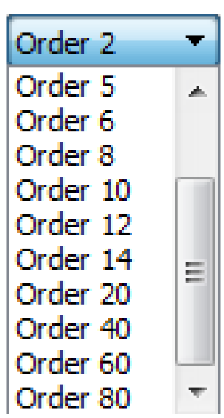
Channel Input signal level (dBm)

Channel Output signal level (dBm)

Here is an explanation of some of these settings. Each channel uses Digital Signal Processing to implement very flexible filters. The user can control both the filter bandwidth and the filter sharpness and time delay. The filter bandwidth is selected using this control:

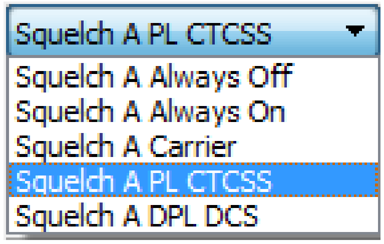


The filter sharpness and time delay are related. Sharper filters have a longer time delay. Time delay is important in applications in which a receiver may receive both the signal that has passed through the re-broadcast equipment and the signal directly from the transmitter. The following control lets the user select the filter order which is a measure of the filter's sharpness. For each channel this control lets the user select the filter order:



A filter with an order of 6 provides an input to output delay of about 24 microseconds but the filter transitions from its passband to its stop bands slowly. A filter with an order of 80, on the other hand has sharp edges but a longer delay.

Each channel has two squelch circuits because in some applications two different services share the same frequency channel. In other cases more than one service are so close in frequency that a single re-broadcast channel is used to handle both. For both Squelch A and Squelch B the user can select using one of the two “Squelch Type” controls like these:



As the user changes the “Squelch Type” the prompt for the “Squelch Value” edit box changes. For Carrier squelch type it reads “Squelch A Level (dBm):” as shown for ULW8 channel 2. For “PL CTCSS” squelch type it reads “Squelch A Tone Freq (Hz):” as shown for ULW8 channel 0. For “DPL DCS” squelch type the prompt is “Squelch A DPL Code:”

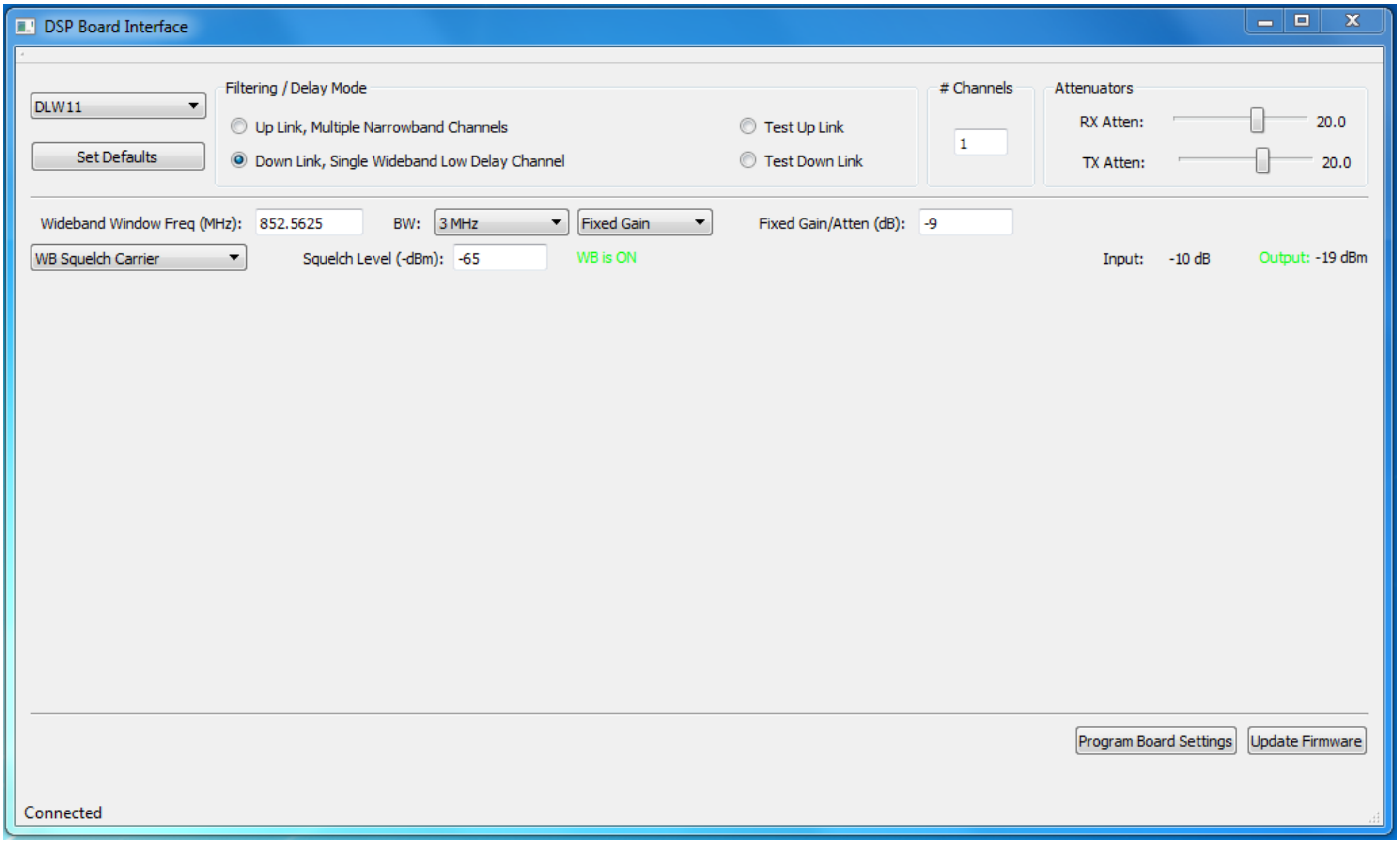
Notice, in the ULW8 figure above, that for channel 2 there is green text that reads “A is ON” and red text that reads “B is OFF”. That text lets the user see the current output of each of the channel’s two squelch circuits. When either Squelch A or Squelch B is ON then the channel is keyed on. When it is keyed on the output level text for the channel indicates the output level in dBm.

The input level text for each channel shows the level of the signal that has passed through the channel’s filter. The ULW8 screen capture was done while there was a signal within that channel at about -53 dBm.

The edit box just to the right of the “Output Setpoint (-dBm):” text lets the user specify the desired output signal level (at the DSP module’s output) for each channel that is “Keyed ON” by the squelch circuits.

The description so far has been focused on “Up Link, Multiple Narrowband Channels” mode. In that mode the time delay is less critical. The signal path is from the portable radio in the building to the distributed antennas through the DSP modules, combiners and amplifiers through fiber optic links to the communication HUB. So there is very little chance that the receiver located distant from the portable at the hub will receive both the signal directly from the portable and through the channelized re-broadcast system. In this case the filters can be selective so they pass only one or two radio channels each even though this higher selectivity comes at the price of increased time delay. The filter order control described above lets the user trade off filter selectivity for time delay for each channel.

For downlink the signal path is from transmitters at the communication hub is via fiber optic cables through the DSP modules to 5 watt amplifiers to transmit on the distributed antenna system that runs up both stairwells. Since some of that transmitted signal and a signal directly from the transmitter may be received by a portable radio inside or near the building, the time delay for the downlink is more critical. The DSP module provides “Down Link, Single Wideband Low Delay Channel” mode to achieve a delay less than 10 microseconds for this case. The screen shot that follows shows a typical module in this mode. Many of the GUI controls are the same as those described above. The following screen shot shows a typical Down Link module in this case Down Link Window 11 (DLW11).



Notice that the BW: is set to 3 MHz. The BW control lets the user select from 50kHz, 100 kHz, 150 kHz, 200 kHz, 250 kHz, 500 kHz, 1 MHz, 1.5 MHz, 2 MHz, 2.5 MHz, 3 MHz, 3.5 MHz, 4 MHz, 5 MHz or 5.5 MHz. There are two gain modes available Fixed Gain and AGC. In fixed gain mode there is an edit box labeled “Fixed Gain/Atten (dB):”. In the case shown above the fixed gain is set to -9 dB. For downlink the signals are relatively strong. They arrive from the communication hub via the fiber at a level of -10 dBm. For DLW11 the signal will pass through a 4:1 combiner and then a 5 watt amplifier to the Distributed antenna system. The value of -9 dB has been chosen to make the level at the DAS after the loss in the combiner and the gain of the amplifier the specified level. Some down link module outputs pass through either no combiners or combiners with different losses so the values in the fixed gain box vary to compensate for the signal path.

If AGC mode had been chosen then the prompt text would read “Output Setpoint (-dBm):” and the DSP circuitry would adjust the gain to make the output equal to the value in the edit box. The WB Squelch choices are WB Squelch Always OFF, WB Squelch Always ON and WB Squelch Carrier. The latter is the usual choice with the others used mostly for testing. There is red or green text that indicates whether the squelch is off or on. As you can see there is also a measure of the input and output signal level displayed.

Notice the slider control labeled RX Attenuator in the upper right corner of the screen. For the downlink mode it is set to 20 dB of attenuation. That is because the input is relatively strong at -10 dBm. For the uplink mode the signals may be quite weak, as low as -83 dBm, when they arrive at the DSP module so for uplink the RX attenuator is set to 0 dB of attenuation.

At the bottom of the GUI are two pushbuttons. The “Program Board Settings” pushbutton causes the changes currently on the GUI controls to be saved to the DSP module’s non-volatile memory. The settings are loaded into the Digital Signal Processing hardware when the power to the module is turned on.

The pushbutton labeled “Update Firmware” is used to write new firmware into the DSP module. It lets the user select a “.BIT” file to load. This should only be done when AMDI sends a new firmware file and the new file has been loaded onto the PC. The present firmware file is on the PC named AmdiDspWtc.bit.

AMDI
Applied Micro Design Inc.
19516 Amaranth Drive Germantown MD 20874
ph 301.540.9506
info@appliedmicrodesign.com
www.appliedmicrodesign.com

Back to Index