



# CAMPAC2

COFDM Camera-Back Transmitter,



## User Manual

M13-0003-00A; Rev 1p0a

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## **CAUTION!**

### **RISK OF ELECTRICAL SHOCK. DO NOT REMOVE COVERS.**

- Do not remove any covers.
- Refer servicing to qualified technicians only.
- Disconnect all power before servicing.
- Read and perform all instructions carefully.
- Failure to follow suggested instructions and guidelines may void all warranties.

### **FCC STATEMENT**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

### **FCC CAUTION**

Any change or modification not approved by the party responsible for compliance could void the user's authority to operate this device.

This device requires professional installation.

For operation within 5.725 - 5.850 GHz frequency range, the maximum EIRP must be less than 36 dBm. The qualified antenna types to be used with this device include:

Low Gain Collinear Omni Antenna (4.5dBi or 6 dBi)

Collinear Omni Antenna (8dBi).

For operation within 6,425 to 6,525 MHz and 6,875 to 7,125 MHz range, user(s) must obtain a license from FCC.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In order to maintain compliance with the FCC RF exposure guidelines, this device should be installed and operated with a minimum distance of 20cm between the radiator, and the body of the operator and/or nearby persons.

## **Proprietary Information and Disclaimer Notice**

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We have made every effort to ensure the accuracy of this material at the time of printing. However, as the specifications, equipment, and this manual are subject to change without notice, the company assumes no responsibility or liability whatsoever for any errors or inaccuracies that may appear in this manual, or for any decisions based on its use. This manual is supplied for informational purposes only and should not be construed as a commitment by the company.

## **Warranty**

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Nucomm brand equipment is warranted to meet all published specifications and to be free from defects in material and workmanship within a period of two years from date of original shipment. The company's liability under this warranty is limited to:

- Servicing or adjusting equipment.
- Replacement of defective parts.

Any equipment returned to the factory shall have the freight paid for by the buyer.

Equipment showing damage by misuse, abnormal conditions of operation, or attempts to repair by other than authorized service personnel shall be excluded from this warranty. We shall in no event be responsible for incidental injury or property damage. Since we have no control over conditions of use, no warranty is made or implied as to suitability for the customer's intended use, beyond such performance specifications as are made part of the purchase order. There are no warranties expressed or implied, except as stated herein. This limitation on warranties shall not be modified by verbal representations.

## **Shipping Damage**

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Equipment shipped shall become the property of buyer upon delivery and receipt from carrier. Any damage in shipment should be handled by the buyer directly with the carrier. Immediately request the carrier's inspection upon evidence of damage in shipment.

## **Field Service**

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Nucomm brand products are typically designed with easy access to components to facilitate service.

However, some products or modules cannot be serviced in the field. To prevent voiding the warranty, always contact us before servicing or making any repairs. The user is cautioned to read any module descriptions in this manual, and heed any warnings in the manual or on the modules themselves.

## **Replacement Modules**

Troubleshooting to the component level is often not cost-effective and frequently impossible. Often the practical method of effecting repairs is to substitute known good spare modules for suspect units.

Replacement modules for the standard product line are usually available.

Technical Support Information

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Technical Support personnel are available to extend technical assistance to customers while installing, operating, or troubleshooting Nucomm brand equipment. Please have your model number and serial number available.

**Telephone**

During business hours, 8:30am – 5:30pm EST (-5 Hours, GMT), call:

US .....908-852-3700

International.....001-1-908-852-3700

After hours, call:

US or International .....888-531-3892

**Email**

Email address.....[service@nucomm.com](mailto:service@nucomm.com)

**Internet**

Web address.....[www.imt-solutions.com](http://www.imt-solutions.com)

**Equipment Returns**

If equipment cannot be successfully restored through telephone consultation, return to the factory may be required. Loaner items may be available until the repaired items are returned.

For out-of-warranty equipment only: We evaluate all returned units, and then confer with the client on corrective action. If no fault is found, or no corrective action is authorized, a diagnostic fee may be charged.

Prior to returning a product to the factory, please obtain a return material authorization (RMA) number and shipping instructions.

When returning equipment, it is very helpful to enclose a note containing the following:

RMA number.

Serial number.

A detailed description of the problem.

Name of an engineer or technician we may contact regarding problems encountered.

A “ship to” and “bill to” address.

Ship all returns to:

**Nucomm / IMT, LLC**  
**Attn: RMA# (your RMA number)**  
**101 Bilby Rd**  
**Hackettstown, NJ 07840, USA**  
**(908) 852-3700**

**For International returns:**

In addition to the instructions above, when shipping internationally we recommend the use of a courier such as Federal Express, UPS, etc, and that the goods be shipped DOOR-TO-DOOR PRE-PAID. This will reduce Customs costs, handling charges and delays. Enclose all the information above, plus a statement that the equipment was manufactured in the United States (*the latter is needed to expedite customs processing*).

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## Document Revision

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January 4, 2007	Draft 0.0	J. Mattos	Initial Release
May 2007	Draft 1.0	A. Sangiovanni	Updated Release
July 2007	Draft 1.1	L. Ramirez	Added Steps, Formatted.
July 2008	Draft 1.2	L. Ramirez	Updated Audio pin-outs. Edits, etc. New Steps in Operations New Screens. Added information on Pro/News versions. IQ/IF.
September 2009	Draft 1.3	J. Bellott	Corrected first data rate entry in 16 MHz BW table, Table 5
May 20, 2010	1p0	Mike Hardy	<ul style="list-style-type: none"> <li>- Added 5.8GHz</li> <li>- Changed to IMT</li> <li>- Edited Sec 1-5 for clarity and consistency (except menu tree).</li> </ul>
June 2, 2010	1p0a	Mike Hardy	<ul style="list-style-type: none"> <li>- Modified 5.8 plan</li> <li>- changed to 100mW max</li> <li>- modified FCC info</li> </ul>
Pending			Update Menu Tree





## 1.0 DESCRIPTION

The CamPac2 is a small lightweight HD/SD COFDM microwave transmitter intended for wireless camera applications including sports coverage and electronic news gathering (ENG). Its stylish, rugged machined housing provides durability and excellent thermal characteristics for operation in the harshest of conditions. The transmitter can be mounted on video cameras using integrated battery adapter plates. Anton Bauer style plates are standard, though IDX/Sony "V" clip may also be used.

The CamPac2 transmitter includes an integrated MPEG2 encoder and variable bandwidth COFDM modulator. This next generation, high quality MPEG2 encoder can be configured for HD and SD operation -or- for SD operation only, while both versions have an ultra-low latency mode for sports coverage.

The encoder has the ability to be upgraded to MPEG4/H.264. The variable bandwidth modulator offers very high data rates through efficient use of available bandwidth. Data rates in the 20 to 50 Mbps rate can be achieved in the robust QPSK, 16-QAM or 64-QAM formats.

While the CP2 can be configured to utilize COFDM bandwidths from 5-16MHz, the 6/7/8 MHz bandwidth modes are DVB-T compliant to ensure compatibility with any DVB-T standard system.

The CamPac2 accepts HD/SD SDI, ASI, Analog Component and Composite video input formats. The dual audio inputs can be configured for mic or line input.

CamPac2 will also accept SDI Embedded audio. The audio gains are easily set using the programmable gain and the digital VU meters displayed on the color TFT display. The

control panel uses a unique rotary dial that senses the position of the user's finger when pressure is applied and rotated around the disk. By dialing around the wheel and using the (Esc) ▲ and (Ent) ▼ buttons, you can navigate through the menu system.

The CP2 can be controlled remotely via RS 232/RS485 using a PDA or PC, and the control panel may be removed and remoted up to 100 feet away with an optional extender.

An N-type RF connector allows the CamPac2 to be used for applications where connection to a remote antenna is required. For wireless camera applications, an Omni-directional antenna attaches directly to the RF output connector, ensuring maximum EIRP (Effective Isotropic Radiated Power).

The CP2 unit consists of a Base and a Power Amplifier Module (PAM). The first generation CP2 used an "IF" style interface between the Base and PAM. The second generation CP2 uses an "IQ" style interface.

**Note:** *Earlier CamPac2 "IF" based units do not support swapping PAM's. "IQ" based units do support interchangeable PAM's.*

The RF function of the unit is determined by the upconverter and amplifier installed in the PAM. The unit is programmed with operating frequencies and frequency ranges per customer specification, allowing users to customize their RF selections. The currently available operating bands are (check with Nucomm for availability of other bands and PAM's):

2GHz PAM:	1.990 - 2.700 GHz
7GHz PAM:	5.725 - 5.850 GHz
	6.425 - 6.525 GHz
	6.875 - 7.125 GHz

The “IQ” based CP2 can be factory configured for either **News** or **Professional** use, depending on the encoder style installed in the Base. This configuration is not field selectable or swappable, and the customer must specify either the “N” or the “P” style when ordering.

The News (N) style CP2 supports very low latency operation as required by broadcasters for live shots, with superb fidelity. The Professional (P) style CP2 favors exquisite fidelity over low latency, as desired for non-live applications.

In an IQ based unit, the Base outputs a digital IQ modulated signal. The PAM receives the IQ signal and converts it to the final RF output frequency

## 2.0 FEATURES

The CamPac2 was specifically designed for portable use as a camera back transmitter or in helicopters applications.

The CamPac2 features a fully adjustable software modulator that can be re-configured with multiple modulation formats in the field. This is extremely important since, as new modulation schemes emerge, the CamPac2 can be upgraded to meet customer requirements as the customer's needs change.

The CamPac2 has also been designed with an integrated 4:2:2/4:2:0 MPEG-2 encoder, and a COFDM modulator for multi-path tolerant transmission/reception. Depending on the video output or camera type, the CamPac2 accepts NTSC or PAL composite, component, or SDI video.

Two physical audio inputs for a total of four channels are selectable between standard analog audio, and AES/EBU digital audio. An embedded digital audio can be selected, if it is present within the input SDI video signal.

Optional BISS encryption is available.

### 2.1 RF POWER OUTPUT

Depending on which mode the unit has been set to, (in the **System** menu, under the **Power Control** option), either **TXPower Auto OFF** – or – **TXPower Auto ON**, users can choose from the fixed Power Control settings, (25mW or 100mW) – or – for special circumstances, users can scroll through the rotary dial for a flexible, variable output that runs between 0 and 51 (depending on the unit). For more information regarding the set up of TX Power Modes and Power Control Outputs, refer to the **Operation** section.

### 2.2 PROGRAMMABLE OUTPUTS

The CamPac2 utilizes four programmable presets to allow rapid selection of different transmitter parameters. These are fully configurable and can be modified via the Front Panel sensor wheel and LCD menu selections. For more information on Presets, see the section in this document entitled, *Presets*.

### 2.3 POWER SOURCES

The CamPac2 normally receives its primary power from a “clip-on” battery. However, located on the bottom panel of the CamPac2 is a four-pin XLR connector for use with an external DC power supply.

This connection is designed to add flexibility in certain system configurations, such as installation in vehicles or aircraft.

### 2.4 STANDBY OPTION

In the default state, the unit will output an RF signal immediately upon powering up. It is recommended that an antenna or terminating load is connected to the RF connector.

The CamPac2's RF output can be muted, via the MAIN MENU/STANDBY selection. By placing the unit in standby mode, the user may safely replace antennas or tune the unit without radiating any emissions.

When the unit is in standby mode, the LCD will display “STBY” in the upper left corner. When the unit is taken out of standby mode, the LCD will display “TX” and the CamPac2 will output RF at the selected power.



## 3.0 SPECIFICATIONS

### 3.1 IF VERSION (1<sup>st</sup> Generation)

#### ***RF Performance***

Frequency band: .....	1.99 GHz – 2.70 GHz
.....	6.40 GHz – 7.10 GHz
Frequency Stability: .....	+ 2.5ppm
Tuning Step Size: .....	250 kHz (US), 100 kHz ( <i>International</i> )

RF Power output ( <i>programmable steps</i> ):.....	10mW to 100mW (Menu Setting 0~51)
TX Standby: .....	No RF Output (Menu Selectable)

#### ***Modulation:***

COFDM: .....	EN300-744 DVB-T
Single Pedestal Mode:.....	DVB-T 2K:5MHz, 6MHz, 7MHz 8MHz
Dual Pedestal Mode .....	Variable Bandwidth from 10MHz to16MHz
Constellation: .....	QPSK, 16QAM, 64QAM
Code Rate (FEC):.....	1/2, 2/3, 3/4, 5/6, 7/8
Guard Interval .....	1/32, 1/16, 1/8, 1/4

#### **Video Section**

Video Input Formats .....	NTSC, PAL,480P,576P,720P 1080i (4:2:2, 4:2:0)
Video Frame Rates.....	23.98, 24, 25, 29.97, 30, 59.97 Hz
Video Input Signals.....	HD-SDI, SD-SDI, ASI, Y Pr Pb, Composite
Test Mode .....	SMPTE Bars, Zone Plate, Lip-sync, Two- Tone
Output Source .....	Selectable between Modulator and Encoder
Composite Input.....	75 ohm, 1V p-p, NTSC, PAL
HD/SD-SDI Input .....	SMPTE 292/259M Level C (1.5 GB/s – 270Mb/s)

#### ***MPEG Encoder / Options***

Video Profiles .....	MP@ML (4:2:2), 422@ML (4:2:2), HP@ML (4:2:0/4:2:2)
GOP Selections .....	I Only, IP 5, IP6, IP10, IP 15
B Frame Mode .....	Use B Mode, No B Mode
Latency.....	Normal Mode -200mS, Low Mode 57mS (720P mode)
Frequency Response .....	0.25 dB (10Hz to 5MHz)
Signal to Noise Ratio .....	>70dB
Frame Size .....	NTSC: 720x480, PAL 720x576 HD 1440x720(P) or 1920x1080(i)

#### ***Audio Section***

Audio Channels:.....	2 Stereo Pairs – Menu Selectable Combinations MIC/Line, MIC/AES, AES/AES, Embedded
Audio Range .....	-60 to +14dBm continually variable by 1dB steps
Audio Coding:.....	MPEG1 layer 2 audio ISO/IEC 13818-3
Audio Bit Rate .....	96 kb/s to 384 kb/s per channel

Audio Sampling Rate:	48 KHz
Analog Audio Inputs	MIC / Line, Gain selectable -60 to +14dBm (In 1 dB steps)
Digital Audio Inputs	AES/EBU, Embedded SDI (Four Channels)
Frequency Response	20Hz – 20KHz +/- 0.5dB
Audio THD	0.25% @1KHz, + 8dB
Signal to Noise	>60dB

**Control**

RS-232 / RS-485	9600, 19200, 38400, 115,000 Baud
IRDA	115.000 PC or PDA Compatible
Side Panel	can be remotod up to 100 feet, with optional control panel extender.
User Data Channel	Transparent data pipe, up to 1 Mb/s

**Control Panel**

Display	High Resolution 1.5" Color TFT LCD
LCD Brightness	Selectable "Day" or "Night" Mode
Backlight	Menu Selectable
Panel Indicators	RF Power, Input DC Voltage & Current Digital VU Meters, Video Lock, PA Enable Voltage and Temperature Indication
Menu Selector	Rotary sensor wheel w/ audible click
Presets	Four Preset Programmable
Menu	Interactive menu tree

**Power**

Input Range	+12 to +28 VDC Under Voltage & Reverse Polarity Protected
Power Consumption	27 Watts average

**Connectors**

RF Output Connector:	Type "N" (Female) (50 Ohms)
Video Input Connectors	BNC (SDI, ASI, Composite), LEMO (Component)
HD/SD-SDI, ASI, Composite	BNC (75 ohms)
Analog Component/ASI Out	12 Pin LEMO, Size 2B
Analog/AES Audio	2x5 Pin XLR, Size 1B
DC Power	4 Pin XLR, Size 1B, or Anton Bauer, V Clip

**Physical**

Dimensions:	7.5" H x 4.3" W x 1.7" D (19.05 cm x 10.9 cm x 4.3 cm)
Weight	Weight: 2 lbs (0.9 kg)
Environmental:	-13F / -10°C to +113F / +45°C (operational)
Humidity	95%

**3.2 IQ VERSION (2<sup>nd</sup> Generation)****RF Section (per installed PAM):**

Frequency Ranges.....	2GHz PAM:	1.990- 2.700 GHz
.....	7GHz PAM	5.725 - 5.850 GHz
.....	7GHz PAM	6.425 - 6.525 GHz
.....	7GHz PAM	6.875 - 7.125 GHz
Frequency Stability: .....	± 2.5ppm	
Tuning Step Size: .....	250 kHz (US), 100 kHz ( <i>International</i> )	
RF Power output ( <i>programmable steps</i> ):.....	10mW to 100mW (Menu Setting 0~51)	
RF Power output (Power Levels):.....	Medium 3dB Reduction from Hi Power Low 6dB Reduction from Hi Power	
TX Standby: .....	No RF Output (Menu Selectable)	

**Modulation:**

COFDM: .....	EN300-744 DVB-T	
Single Pedestal Mode:.....	DVB-T 2K:5MHz, 6MHz, 7MHz 8MHz	
Dual Pedestal Mode .....	Variable Bandwidth from 10MHz to16MHz	
Constellation: .....	QPSK, 16QAM, 64QAM	
Code Rate (FEC):.....	1/2, 2/3, 3/4, 5/6, 7/8	
Guard Interval .....	1/32, 1/16, 1/8, 1/4	
Encryption:.....	AES 128 Bit	
Spectrum Inversion: .....	Programmable	

**Video Section:**

Video Input Formats: .....	NTSC, PAL, 720p, 1080i (4:2:2, 4:2:0)	
Video Frame Rates:.....	23.98, 24, 25, 29.97, 30, 59.97Hz	
Video Input Signals: .....	HD-SDI, SD-SDI, Y Pr Pb, S-Video, Test	
Video Return Loss: .....	≥27dB	
Test Mode: .....	SMPTE Color Bars, Zone Plate, Lip-sync, 2 Tone	
Output Source .....	Selectable between Modulator and Encoder	
Composite Input:.....	75Ohm, IVp-p, NTSC/PAL	
HD/SD-SDI Input: .....	SMPTE 292/259M Level C (1.5Gb/s – 270Mb/s)	

**MPEG Encoder/Options:**

Video Profiles: .....	MP @ ML (4:2:0) 1-15Mb/s	
.....	422 @ ML (4:2:2) 3-5Mb/s	
GOP Settings: (News).....	I Only, IP5, IP6, IP10, IP15	
(Pro).....	IP15, IP45, IPB15, IPB45, IPBB16	
Delay: .....	Normal and Low Delay Modes	
Latency: (News).....	Normal (GOP:1-5) -250mS,	
.....	Low (intra-slice, GOP:0) Interlaced: 45-52mS	
Latency: (Pro) .....	Normal (GOP: 1-5) -250mS	
.....	Low Delay (intra-slice, GOP: 0) 80mS	

Frequency Response: .....0.25dB (10Hz to 5MHz)  
 Signal to Noise Ratio .....>70dB

Frame Size: (News).....NTSC: 720x480, PAL: 720x576 (4:2:0)  
 NTSC: 720x525, PAL: 720x625 (4:2:2)  
 HD:1280x720p, 1440x1080i, 1920x1080i (4:2:0)  
 Frame Size: (Pro) .....NTSC: 720x480, PAL: 720x576 (4:2:2 or 4:2:0)  
 HD: 1280x720p, 1920x080i (4:2:2 or 4:2:0)

### **Audio Section:**

Audio Channels: (News).....1 Stereo Pair  
 (Pro) .....2 Stereo Pairs

Menu Selectable Combinations .....MIC/Line, MIC/AES, AES/AES, Embedded

Analog Mode: (Pro Only) .....Selectable Compression 1:1 to 10:1  
 Selectable Soft Limiter for levels greater +10dBm  
 AGC ON/OFF

Audio Range: .....-60dBm to 18dBm max input level

### Audio Gain Control:

Ch 1 & 2:.....0dB – 72dB gain, variable by 3dB steps.  
 Ch 3 & 4: (Pro Only) .....0dB – 18dB gain, variable by 3dB steps.

Audio Coding: (News).....MPEG 1 Layer 2 Audio, Linear PCM  
 (Pro) .....MPEG 1 Layer 2 Audio, ISO/IEC 13818-3

Audio Bit Rate: .....96kbps to 384kbps/channel (MPEG Layer 1 or 2)  
 Audio Sample Rate: .....48kHz  
 Analog Audio Inputs:.....MIC/Line, gain from -60 to +14dBm (1dB steps)  
 Digital Audio Inputs: .....AES/EBU, Embedded SDI  
 (P) Professional Model: .....Four channels  
 (N) News Model: .....Two channels

Frequency Response: .....60Hz – 20KHz:  $\pm 0.5$ dB (-3dB @ 20Hz)  
 Audio THD: .....0.25% @ 1KHz +8dBm  
 Signal to Noise:.....>60dB  
 Input Impedance: .....1000 Ohms Balanced

### **Control:**

RS-232/RS485: .....9600, 19200, 38400 Baud, using NU protocol.  
 Side Panel can be remotod up to 100 feet, with optional control panel extender.  
 User Data Channel: .....Transparent data pipe, up to 1 Mb/s, RS-422  
 input.



**Control Panel:**

Display: .....	Hi Res. 1.5 inch Color TFT
Backlight: .....	Adjustable time out None, 10 sec, 20 sec, 30 sec
Panel Indicators: .....	RF output Power, Input DC Voltage and Current, Digital VU Meters, Video Lock and PA Enable, Alarms Voltage and Temperature.
Input .....	Sensor Wheel Encoder with audible click feedback.
Presets: .....	10 User Defined.
Menu: .....	Interactive basic/advanced menu tree

**Power:**

Input Range: .....	+12 to +28 VDC – Under Voltage and Reverse Polarity Protected.
Consumption: (News) .....	10W No RF Head
(Pro) .....	18W No RF Head

**Connectors:**

RF Connector: .....	“N” (F)
HD/SD-SDI, Composite: .....	BNC @ 75 Ohm
Video Input Connectors: .....	BNC (Composite/SDI) LEMO (Component)
ASI Input: .....	BNC @ 75 Ohm
Analog Component: .....	12 Pin LEMO, Size 2B
Analog/AES Audio:	
(P) Professional Model: .....	2 x 5 Pin XLR
(N) News Model: .....	2 x 5 Pin XLR
DC Power .....	1 x 4 Pin XLR
Battery Clips .....	Anton Bauer or IDC V-Clip

**Physical:**

Dimensions: .....	7.5” H x 4.3” W x 1.7” D (19.05 cm x 10.9 cm x 4.3 cm)
Weight: .....	7 lbs. (1.8kg)
Operating Temperature: .....	+13F (-10C) to + 113F (+45C)
Humidity: .....	95%

**Options:**

Camera Control: .....	Support for integrated camera control, using power & data from CP2.
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## 3.1 STANDARD FREQUENCY PLANS

Channel	Offset	2GHz (17MHz)	2GHz (12MHz)	5.8GHz	6.4GHz	6.8GHz
1	-	1,994.75	2,028.50	—	6,431.25	6,881.25
1	0	1,999.00	2,031.50	5737.50	6,437.50	6,887.50
1	+	2,003.25	2,034.50	—	6,443.75	6,893.75
2	-	2,012.25	2,040.50	—	6,456.25	6,906.25
2	0	2,016.50	2,043.50	5762.50	6,462.50	6,912.50
2	+	2,020.75	2,046.50	—	6,468.75	6,918.75
3	-	2,029.25	2,052.50	—	6,481.25	6,931.25
3	0	2,033.50	2,055.50	5787.50	6,487.50	6,937.50
3	+	2,037.75	2,058.50	—	6,493.75	6,943.75
4	-	2,046.25	2,064.50	—	6,506.25	6,956.25
4	0	2,050.50	2,067.50	5812.50	6,512.50	6,962.50
4	+	2,054.75	2,070.50	—	6,518.75	6,968.75
5	-	2,063.25	2,076.50	—	—	6,981.25
5	0	2,067.50	2,079.50	5837.50	—	6,987.50
5	+	2,071.75	2,082.50	—	—	6,993.75
6	-	2,080.25	2,088.50	—	—	7,006.25
6	0	2,084.50	2,091.50	—	—	7,012.50
6	+	2,088.75	2,094.50	—	—	7,018.75
7	-	2,097.25	2,100.50	—	—	7,031.25
7	0	2,101.50	2,103.50	—	—	7,037.50
7	+	2,105.75	2,106.50	—	—	7,043.75
8	-	2,454.25	2,454.25	—	—	7,056.25
8	0	2,458.50	2,458.50	—	—	7,062.50
8	+	2,462.75	2,462.75	—	—	7,068.75
9	-	2,471.00	2,471.00	—	—	7,081.25
9	0	2,475.25	2,475.25	—	—	7,087.50
9	+	2,479.50	2,479.50	—	—	7,093.75
10	-	2,487.50	2,487.50	—	—	7,106.25
10	0	2,491.75	2,491.75	—	—	7,112.50
10	+	2,496.00	2,496.00	—	—	7,118.75
11	-	—	—	—	—	—
11	0	—	—	—	—	—
11	+	—	—	—	—	—
12	-	—	—	—	—	—
12	0	—	—	—	—	—
12	+	—	—	—	—	—
13	-	—	—	—	—	—
13	0	—	—	—	—	—
13	+	—	—	—	—	—

Table 1: Frequency Plans

## 4.0 INSTALLATION

### 4.1 UNPACKING AND INSPECTION

Unpack and visually inspect the unit for LCD, connector, or surface area damage. All claims should be filed with the carrier. Save all shipping and packing materials for possible re-use.

### 4.2 PRE-INSTALLATION CHECK

Connect the CamPac2 output through a 2-watt, 20-dB attenuator to a spectrum analyzer to observe the output frequency on the analyzer display. After connecting a suitable power source to the unit, turn the unit on. Set the spectrum analyzer frequency to the frequency of the channel being observed on the CamPac2.

### 4.3 MECHANICAL INSTALLATION

The CamPac2 comes standard with an Anton Bauer Mounting Bracket Assembly. This allows the CamPac2 and battery to be quickly attached or removed from a portable video camera. This design is ideal for field use.

#### *Mounting the Camera*

To mount the CamPac2 unit to a camera, *do the following*:

1. Orient the CamPac2 Guide Pins (Figure 2 and 3) so that the antenna connector is positioned to the top of the CamPac2.
2. Next, place the CamPac2 Guide Pins into the corresponding camera mounting slots. (See Figure 2).

3. Slide the CamPac2 onto the mounting bracket until you hear the thumb-catch lock. Ensure that there is no play between the CamPac2 and the camera.
4. Screw the antenna onto the CamPac2. Ensure that the antenna is secure.
5. Orient the Battery Guide Pins to the CamPac2.
6. Slide the battery onto the CamPac2 until you hear the thumb-lock catch. Ensure that there is no play between the battery and the CamPac2, (See Figure 3).
7. Connect the desired camera outputs to the CamPac2.

**NOTE:** *When setting up the CamPac2, ensure that the Main Menu selections match the physical connections.*

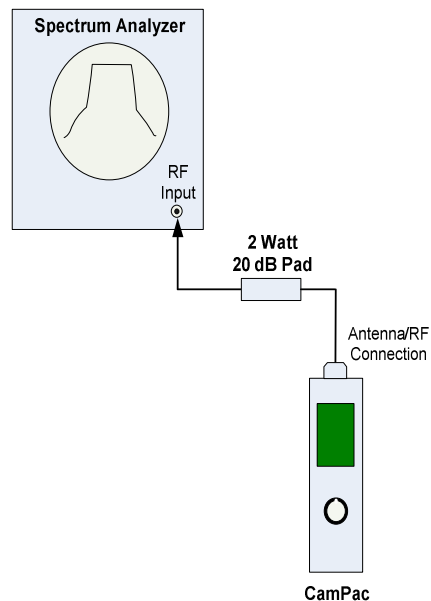


Figure 1: System Check

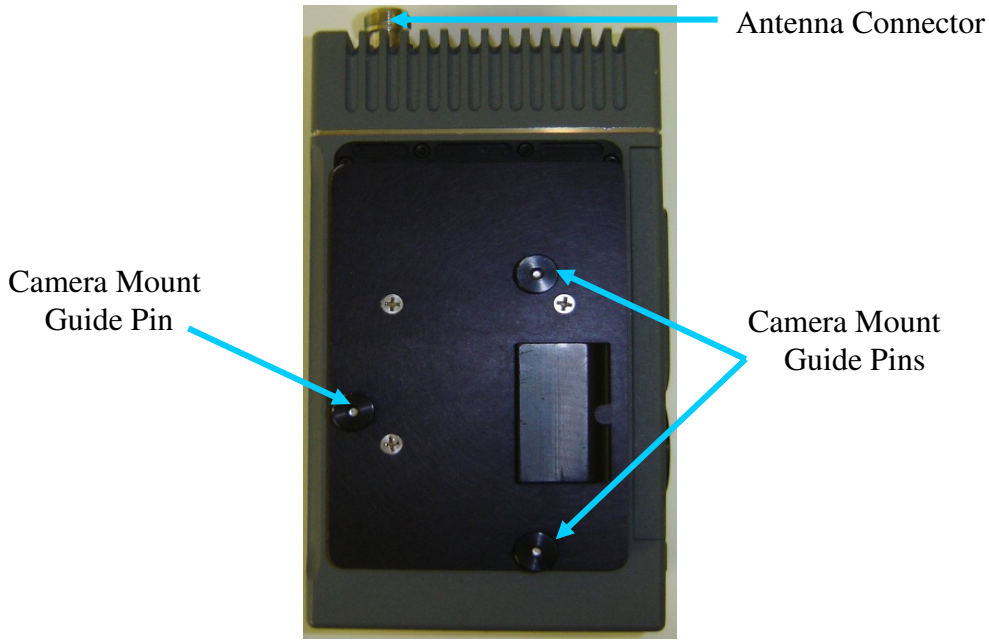


Figure 2: Camera Guide Pins

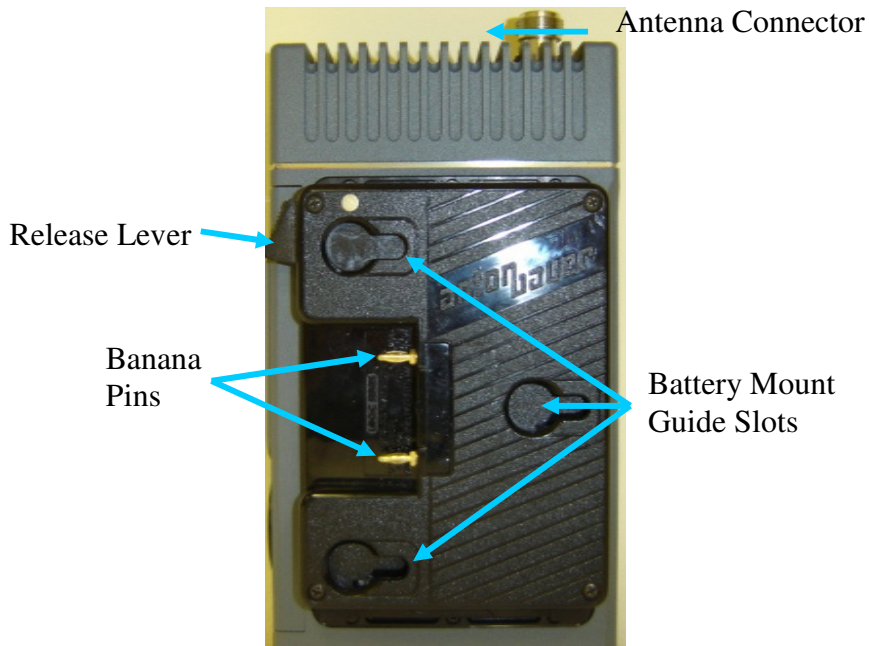


Figure 3: Battery Guide Slots

## 4.4 CONNECTIONS

### Video:

The video inputs to the CamPac2 are either through the 12 pin LEMO connector or a 75-Ohm coaxial cable with BNC connectors (See Figure 6). Connect the video source to the appropriate video input:

HD/SD-SDI – For Serial Digital Interface.  
ASI or Composite, Analog Component.

### Audio:

The CamPac2 supports three audio types, which are connected similarly. Analog and AES audio connections to the CamPac2 are through the two 5-pin XLR audio connections (Figure 9) directly next to the video connections. They are:

5 Pin XLR Audio 1 connector - Channel 1/  
Channel 2 = MIC or line level.

5 Pin XLR Audio 2 connector - Channel 3/  
Channel 4 = line level or AES

Embedded digital audio is input through the BNC connector. This requires that whenever Embedded is selected as the audio source, SDI *must be selected* as the video source.

### Power:

The CamPac2 normally receives power from an external “clip-on” battery. In addition, there is an alternate power input port available on the bottom panel of the CamPac2 via a 4-pin XLR *external* power connection (Figure 9).

### Remote:

A micro USB Remote connector is provided next to the bottom plate. This is used to interface between the CamPac2 and a PC or a PDA.

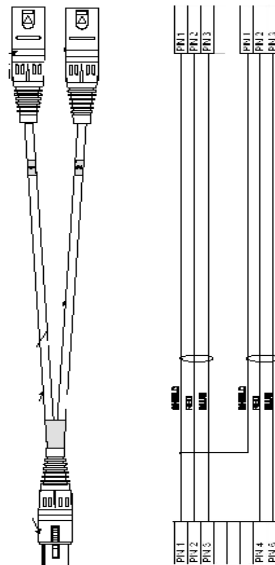


Figure 4: 5 Pin Female XLR to Two 3 Pin Male XLR

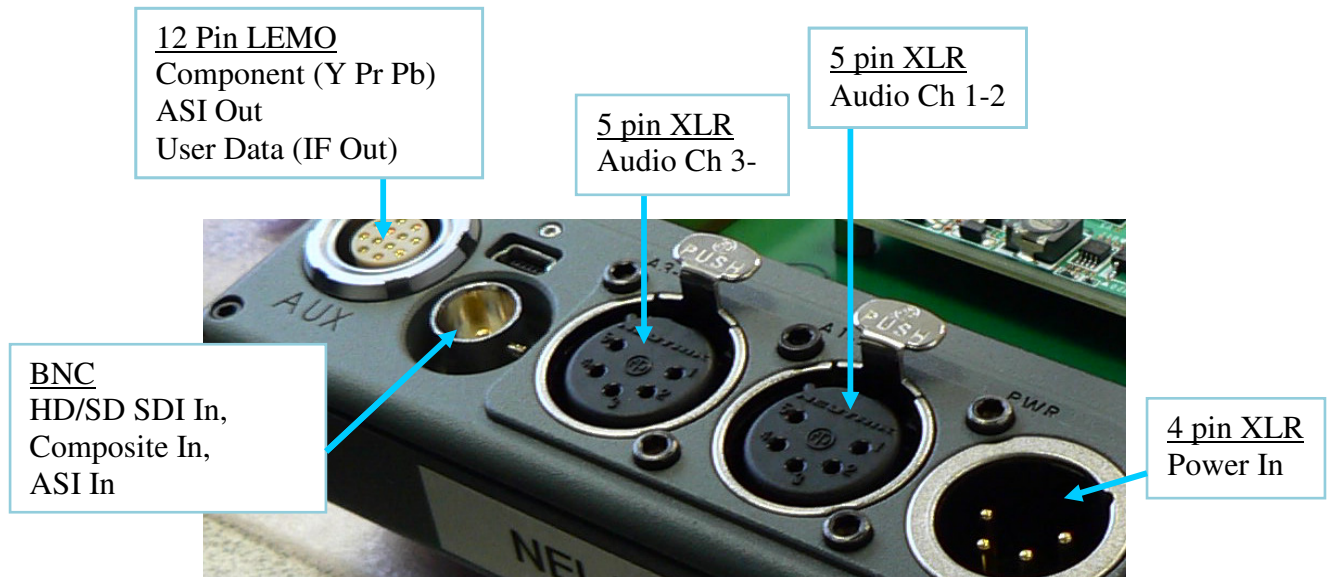


Figure 5: Rear Panel

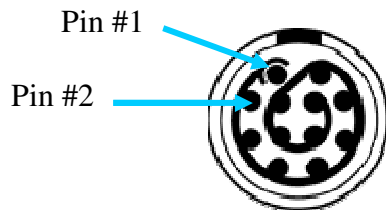


Figure 6: 12 pin LEMO Connector Pin-Out

Pin 1:	Component Y GND (ground)
Pin 2:	Component Y signal
Pin 3:	Component Pb GND (ground)
Pin 4:	Component Pb
Pin 5:	Component Pr GND (ground)
Pin 6:	Component Pr
Pin 7:	User Data RS422+
Pin 8:	User Data RS422-
Pin 9:	IF GND (ground)
Pin 10:	IF Out (IF Base Units Only)
Pin 11:	ASI GND (ground)
Pin 12:	ASI output

Table 2: 12 pin LEMO Connector Pin -Out (p/n FGG.2B.312.CLAD62)



Figure 7: 5 Pin-XLR Connector Pin-Out

1:	Audio Ground	
2:	Audio 1 (Left)	+ / Hot
3:	Audio 1 (Left)	- / Cold
4:	Audio 2 (Right)	+ / Hot
5:	Audio 2 (Right)	- / Cold

Table 3: 5 pin XLR Connector Pin -Out (p/n FGG.1B.305.CLAD52)



Figure 8: 4 Pin XLR Power Connector Pin-Out

DC Power Out	
1:	GND
2	NC
3	NC
4	+12VDC to 28VDC

Table 4: DC 4 pin Connector Pin -Out





## 5. OPERATION

### 5.1 POWER UP

The CamPac2 is turned on by connecting the unit to the battery. The unit will boot-up and go through a self-check mode for several seconds until the system displays the **Default Screen**.

RF Off/On (Standby):

Transmissions can be powered On and/or Off without disconnecting the battery and shutting off the entire unit, by selecting the RF ON/OFF option from the Default menu and toggling the power on and/or off.

### 5.2 DEFAULT SCREEN

Once the unit has initialized, a **Default Screen** resembling the following, is displayed:

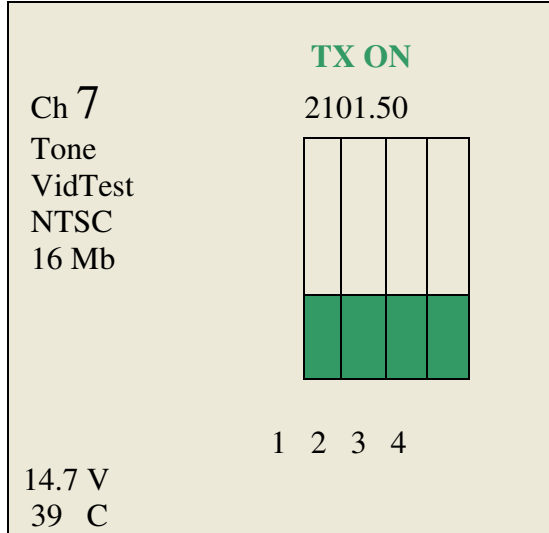


Figure 9: Default Screen

The **Default Screen** displays the following information:

- Channel
- Frequency
- Power Capability
- Data Rate MB
- Battery Voltage
- 1 - 4 bars of Transmit Signal Strength

### 5.3 GETTING AROUND THE SYSTEM

#### Menu Navigation

Sensor Wheel/Rotary Dial:

All the CamPac2 operations and functions are controlled by the Rotary Dial/Sensor Wheel located on the bottom of the front panel is used to set, change, update, input and check different values, rates, options and functionalities throughout the system.

The Rotary Dial allows you to set values higher and lower by circling the dial with your finger, clock-or-counter-clockwise. It is also used to move from field to field in some cases depending on where you are in the system.

After powering up the CamPac2 unit and getting to the **Default** screen, press the Enter ▼ (Ent) directional arrow button, located on the Rotary Dial to get to other screens within the system.



Figure 10: Rotary Dial

To Go to Previous Screen or Default, press the Escape ▲ (Esc) directional arrow on the Rotary Dial to go to the previous screen, and/or back to **Default**.

Menu Timeout:

LCD menu displays will stay on the screen depending on the time limit set from the *Menu Timeout*. The time limit ranges from None (will never revert to default screen) to 30 seconds.

### Changing Settings:

To *change, view, input, select* or *update settings, values, rates, levels* or *options* throughout *most* of the system, do the following

1. Select the desired menu or option by using the Rotary Dial and ENT button to reach the desired screen.

**Note:** *See the CamPac2 Menu Tree diagram at the end of this document for placement and location of all options.*

2. Press ▼ (Ent) to view *that* menu's options.
4. Continue to press ▼ (Ent), and drill down the menus until the value fields that need to be changed are displayed.
5. Click on the Value field until it becomes *Active*, (turns green).
6. Press the rotary dial, clockwise or counter-clockwise to select value fields up or down respectively –**or**– use the rotary dial to scroll up or down an options list to your choice with an \*asterisk.

The settings have been saved to the system.

**Note:** *If you are not choosing from an options list, then you will be setting the value from circulating the rotary wheel. These value fields need to be pressed until they turn green and become “active”, before they can be manipulated and data can be changed. When you reach the correct value, press [Enter] to save.*

## 5.4 TOP MENU

The Top Menu is reached by pressing ENT at the DEFAULT screen, once the unit is booted.



Figure 11: Top Menu

## 5.6 MAIN MENU



Figure 12: Main Menu

## 5.7 RF SETUP

(MAIN>RF SETUP)

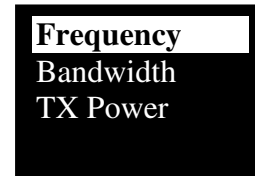


Figure 13: RF Setup Menu

### 5.7.1 Frequency Menu

(MAIN>RF SETUP>FREQUENCY)



Figure 14: Frequency Menu

**Note:** About Frequency Direct, if Frequency Direct Mode is enabled, the frequency may be changed without limitation to channels. Move the Rotary Dial to highlight the frequency, and circulate the Rotary Dial until you reach the correct value(s). Press ▼ (Ent) to register changes within the system.

### 5.7.2 Bandwidth

(MAIN>RF SETUP>BANDWIDTH)

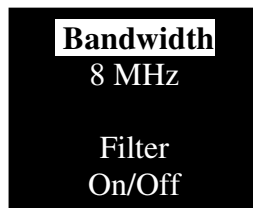


Figure 15: Bandwidth and Filter

### 5.7.3 TX Power

(MAIN>RF SETUP>TX POWER)

IF the TXPwr Auto OFF option has been selected (from the Power Control menu), the screen with a variable flexible rate (0 through to 51 on most units) will be displayed.

IF the TXPwr Auto ON option has been selected (from the Power Control menu), the TX Power screen with the fixed Power Control settings will be displayed; 25mW, 100mW.

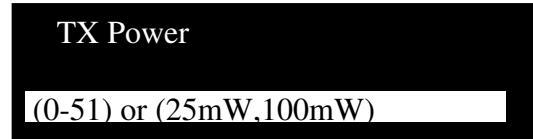


Figure 16: TX Power screen

#### IMPORTANT:

The TX Power value field will display a Variable setting that can be adjusted from 0-51 if Power Control TXPwr Auto OFF is selected. If TX Pwr Auto ON is selected, then use the rotary dial to choose one of the standard settings:

25mW  
100mW

*(the standard settings are recommended)*

#### 5.7.3.1 How to set the TX Power Settings:

The following procedure instructs the user how to set the TX Power Setting from beginning to end. To set the CamPac2 TX Power Output settings, do the following:

1. Power up the Campac2 unit.
2. From the **Default** screen, click ▼ (Ent). The **Top** screen is displayed.
3. Press ▼ (Ent). The **Main Menu** is displayed.
4. Use the rotary dial to select the **System** option and press ▼ (Ent).
5. Using the rotary dial, select the **Power Control** option and press ▼ (Ent). The **Power Control** option list is displayed.
6. Toggle to the correct option and press ▼ (Ent). Your option has been registered and the screen will automatically shut off and start up on its, own, regardless of the option choice.

**Choose your Settings**

7. After the Campac2 unit powers back on, the **Default** screen is displayed.
8. Press ▼ (Ent) to bring up the **Top Menu** and press the **RF Setup** option from that menu. The **RF Setup** menu is displayed.
9. Scroll down to the **TX Power** option and press ▼ (Ent). The TX Power screen is displayed. The field will display either the **Fixed Settings** –or – the **Standard Fixed Settings** depending on what was chosen under the System►Power Control option.
- 10 Press ▼ (Ent) on the **Number Field** until it becomes active (turns green) and use the rotary dial to scroll around the dial and make your number selection. Press ▼ (Ent) when you found the correct value.

**5.8 MODULATION**

(MAIN&gt;MODULATION)

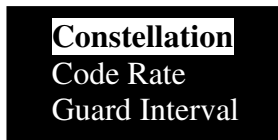


Figure 17: Modulation Options

**5.8.1 Constellation**

(MAIN&gt;MODULATION&gt;CONSTELLATION)

- QPSK
- 16QAM
- 64QAM

**5.8.2 Code Rate**

(MAIN&gt;MODULATION&gt;CODE RATE)

- 1/2
- 2/3
- 3/4
- 5/6
- 7/8

**5.8.3 Guard Interval**

(MAIN&gt;MODULATION&gt;GUARD INTERV)

- 1/32
- 1/16
- 1/8
- 1/4

**5.9 VIDEO SETUP**

(MAIN&gt;VIDEO)

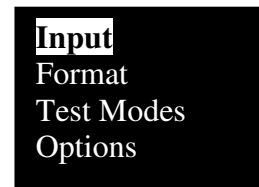


Figure 18: Video Setup Options

**5.9.1 Input**

(MAIN&gt;VIDEO&gt;INPUT)

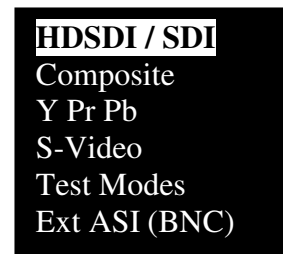


Figure 19: Video Input Options

**5.9.2 Format**

(MAIN&gt;VIDEO&gt;FORMAT)

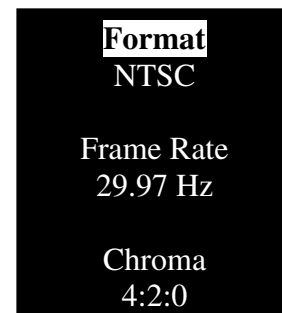


Figure 20: Video Format Options

**5.9.3 Test Modes**

(MAIN>VIDEO>TEST MODES)



Figure 21: Test Modes Options

**5.9.4 Options (Video)**

(MAIN>VIDEO>OPTIONS)



Figure 22: Video Options List

**5.9.4.1 I/P GOP**

(MAIN>VIDEO>OPTIONS>I/P GOP)

- I Frames only
- IP GOP 15
- IP GOP 10
- IP GOP 6
- IP GOP 5

**5.9.4.2 Delay**

(MAIN>VIDEO>OPTIONS>DELAY)

- Normal Delay
- Low Delay
- Lowest Delay

**5.9.4.3 Pedestal**

(MAIN>VIDEO>OPTIONS>PEDESTAL)

- On
- Off

**5.9.4.4 ASI Out Sel**

(MAIN>VIDEO>OPTIONS>ASI Out Sel)

- Modulator
- Encoder

**5.9.4.5 Video Loss**

(MAIN>VIDEO>OPTIONS>Video Loss)

- No Change
- Go To Bars

The selection is registered to the system and marked with an \*asterisk.

**5.9.4.6 PTS Edit**

(MAIN>VIDEO>OPTIONS>PTS Edit)

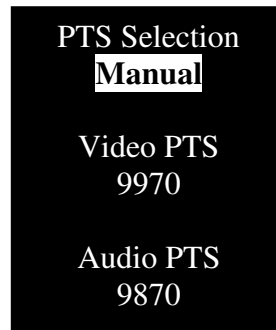


Figure 23: PTS Screen

**5.9.4.7 PID Edit**

(MAIN>VIDEO>OPTIONS>PID Edit)

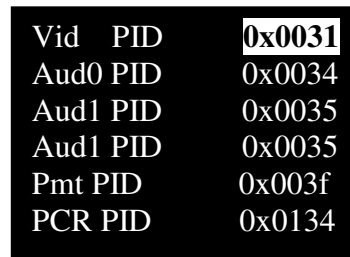


Figure 24: PID Edit Screen

## 5.10 AUDIO SETUP

(MAIN>AUDIO)



Figure 25: AUDIO Setup

### 5.10.1 Inputs

(MAIN>AUDIO>INPUTS)



Figure 26: Audio Inputs List

### 5.10.2 Audio Level dB

(MAIN>AUDIO>Audio Level dB)

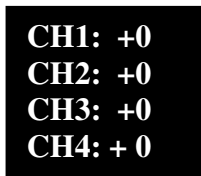


Figure 27: Audio Level dB

## 5.11 PRESETS

### 5.11.1 Storing Presets

(MAIN>EDIT PRESETS>PRESET 1-4)

1. Make your preferred settings.
2. From the MAIN Menu, select Edit Presets.



Figure 28: Presets Options

3. Select the Preset to be saved, press ▼ (Ent).



Figure 29: Preset Menu Options

4. Select Store, then press ▼ (Ent) to save your new preset to the system.

The **Store** screen is displayed, and reads:

**[Preset Stored].**

### 5.11.2 Naming (Labeling) Presets

(MAIN>EDIT PRESETS>PRESET 1-4)

1. Using the rotary dial, scroll to the *Name* option and press ▼ (Ent).

The Preset name (originally 1 through 4) appears on the screen.

2. Press ▼ (Ent) to activate the **Preset** name field (*it will turn green*).

The cursor appears on the first alphanumeric character of the current name.

3. Press the rotary dial, clock –or– counter-clockwise to change the first character in the new label.

4. When you have reached the desired value (number or letter), press ▼ (Ent) –or– ► on the rotary dial to go to the next character in your label. Use the ◀ directional arrow on the rotary dial to backup if needed.

5. Repeat the procedure for the rest of the characters on this preset until the title has been created.

6. Press ▼ (Ent) and ▲ (Esc) to register your label in the system.

The label is displayed on the screen.

### 5.11.3 Recalling Presets

(MAIN>EDIT PRESETS>PRESET 1-4)

1. Using the rotary dial, scroll to the *Recall* option and press ▼ (Ent). The Preset name (originally 1 through 4) appears on the screen.
2. Press ▼ (Ent) to recall the preset and return to the **Default** screen.

## 5.12 SYSTEM

(MAIN>SYSTEM)

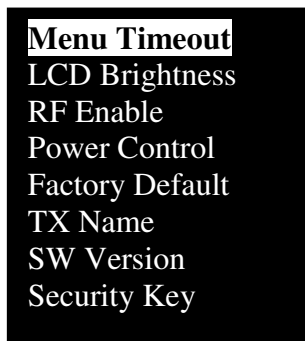


Figure 30: System Setup

### 5.12.1 Menu Timeout

(MAIN>SYSTEM>Menu Timeout)

- None
- 10 Seconds
- 20 Seconds
- 30 Seconds

The selection is marked by an \*asterisk.

### 5.12.2 LCD Brightness

(MAIN>SYSTEM>LCD Brightness)

- Day mode
- Night mode

The selection is marked by an \*asterisk.

### 5.12.3 RF Enable

(MAIN>SYSTEM>RF Enable)

- Disable
- Enable

### 5.12.4 Power Control

(MAIN>SYSTEM>Power Control)

### 5.12.5 Factory Default

(MAIN>SYSTEM>Factory Default)

Allows the user to restore factory defaults.

**WARNING: Any user settings will be overwritten.**

- No – resume ops
- Yes – defaults

### 5.12.6 TX Name

(MAIN>SYSTEM>TX Name)

The default transmitter name is “**CAMPAC2**”. To change the **TX Name**:

1. MAIN>SYSTEM>TX Name

The current *TX Name* is displayed:

**[CAMPAC 2 ]**

2. Click ▼ (Ent) to activate the “name” field. (Field turns green when ready for input).

The cursor appears on the first character.

3. Use the rotary dial to scroll alpha-numeric characters, press ▼ (Ent) to select.
4. Use the ◀▶ arrows to select the next character, repeat until the name is updated.
5. Press ▼ (Ent) to save it to the system.

**5.12.7 SW Version**

(MAIN&gt;SYSTEM&gt;SW Version)

Displays version numbers of the unit's Side Panel, Baseband, Up Converter, and FPGA.

**5.12.7 Security Key**

(MAIN&gt;SYSTEM&gt;Security Key)

To set the system's security key code (**for HD/SD Enable/Disable**), do the following:

1. To activate the screen, click ▼ (Ent).

The field becomes active (turns green).

2. Using the rotary dial, set the correct code by scrolling the alpha-numeric characters until you reach the desired setting.
3. Use the ◀▶ arrows to move on to the next character of the Security Key code until the code has been set.
5. Press ▼ (Ent) to save the changes.

**5.13 ALARMS**

(MAIN&gt;ALARMS)

This screen can provide information regarding some system errors if they should occur, and indicates the reason for any alarms.

1. To activate the screen, click ▼ (Ent). The field becomes active (turns green).
2. The **Alarms** indication list is displayed. If there were no **Alarms** indicated, there will be no alarms displayed on the screen.

**5.14 POWER ON/RF OFF (Standby)**

(TOP&gt;PWR ON)

Allows the user to toggle the CamPac2 transmitter on and off (standby).

**Note:** Depending on whether or not the unit is transmitting or on standby, POWER ON or RF OFF will be displayed, and a TX ON or RF SBY indicator will be displayed on the screen's upper right hand corner.

**5.15 SLEEP/RF OFF**

(TOP&gt;RF OFF)

To set the CamPac2 unit to SLEEP mode, or to set it to RF OFF mode if already in sleep mode, use the rotary dial to scroll down to the **SLEEP –or– RF OFF** option.

**Note:** Depending on whether or not the unit is transmitting or on standby, the SLEEP or RF OFF indicator will be displayed on the screen's upper right hand corner.

**5.16 LOCK**

(TOP&gt;LOCK)

To lock the Campac2 unit so that settings remain "on hold" until you are ready to begin using it again:

1. Scroll down to the "Lock" option and press ▼ (Ent).
2. Hold the ▼ (Ent) button to lock the unit. The screen displays the message:

[HOLD BUTTON TO UNLOCK].

3. When you are ready to unlock the unit, hold down the ▼ (Ent) button until the "Top" First Menu re-appears.
4. The system is unlocked. The settings are the same as when the system was locked.



### 5.17 SETTING DATA RATE

The following tables are to be used in setting up the Data Rate. The Data Rate is based on *Bandwidth*, *Type of Modulation*, *Code Rate*, and *Guard Interval*.

Modulation System	Code Rate	Guard Interval			
		1/32	1/16	1/8	1/4
Bandwidth = 6 MHz Data Rate (Mbit/s)					
QPSK	1/2	4.5240645	4.48248248	4.2334561	3.81011061
	2/3	6.03208575	5.854671	5.5294118	4.9764705
	3/4	6.786096	6.58650525	6.2205885	5.5985295
	5/6	7.540107	7.31833875	6.9117645	6.2205885
	7/8	7.9171125	7.68425625	7.2573533	6.531618
16QAM	1/2	9.048129	8.7820065	8.294118	7.4647065
	2/3	12.0641715	11.709342	11.058824	9.952941
	3/4	13.572192	13.1730105	12.441177	11.197059
	5/6	15.080214	14.6366775	13.823529	12.441177
	7/8	15.834225	15.3685125	14.514707	13.063236
64QAM	1/2	13.5721935	13.1730098	12.441177	11.1970598
	2/3	18.0962573	17.564013	16.588235	14.9294115
	3/4	20.358288	19.7595158	18.661766	16.7955885
	5/6	22.620321	21.9550163	20.735294	18.6617655
	7/8	23.7513375	23.0527688	21.77206	19.594854

**Table 2: Data Rates for 6 MHz Bandwidth**

Modulation System	Code Rate	Guard Interval			
		1/32	1/16	1/8	1/4
Bandwidth = 7 MHz Data Rate (Mbit/s)					
QPSK	1/2	5.27807525	5.12283713	4.8382355	4.35441213
	2/3	7.037433375	6.8304495	6.45098038	5.80588225
	3/4	7.917112	7.68425613	7.25735325	6.53161775
	5/6	8.7967915	8.53806188	8.06372525	6.2205885
	7/8	9.23663125	8.96496563	8.46691213	7.620221
16QAM	1/2	10.5561505	10.2456743	8.294118	8.70882425
	2/3	14.07486675	13.660899	9.676471	11.6117645
	3/4	15.834224	15.3685123	12.9019608	13.0632355
	5/6	17.593583	17.0761238	16.1274505	12.441177
	7/8	18.4732625	17.9299313	16.9338243	15.240442
64QAM	1/2	15.83422575	15.3685114	14.5147065	13.0632364
	2/3	21.11230013	20.4913485	19.3529411	17.4176468
	3/4	23.751336	23.0527684	21.7720598	19.5948533
	5/6	26.3903745	25.6141856	24.1911758	21.7720598
	7/8	27.70989375	26.8948969	25.4007364	22.860663

**Table 3: Data Rates for 7 MHz Bandwidth**

Modulation System	Code Rate	Guard Interval			
		1/32	1/16	1/8	1/4
Bandwidth = 8 MHz Data Rate (Mbit/s)					
QPSK	1/2	6.032086	5.854671	5.529412	4.976471
	2/3	8.042781	7.806228	7.372549	6.65294
	3/4	9.048128	8.782007	8.294118	7.464706
	5/6	10.053476	9.757785	9.215686	8.294118
	7/8	10.55615	10.245675	9.676471	8.708824
16QAM	1/2	12.064172	11.709342	11.058824	9.952942
	2/3	16.085562	15.612456	9.676471	11.6117645
	3/4	18.096256	17.564014	16.588236	14.929412
	5/6	20.106952	19.51557	18.431372	16.588236
	7/8	21.1123	20.49135	19.352942	17.417648
64QAM	1/2	18.096258	17.564013	16.588236	14.929413
	2/3	24.128343	23.418684	22.117647	19.905882
	3/4	27.144384	26.346021	24.882354	22.394118
	5/6	30.160428	29.273355	27.647058	24.882354
	7/8	31.66845	30.737025	29.029413	26.126472

**Table 4: Data Rates for 8 MHz Bandwidth**

Modulation System	Code Rate	Guard Interval			
		1/32	1/16	1/8	1/4
Bandwidth = 16 MHz Data Rate (Mbit/s)					
QPSK	1/2	12.064172	11.709342	11.058824	9.952942
	2/3	16.085562	15.612456	14.745098	13.270588
	3/4	18.096256	17.564014	16.588236	14.929412
	5/6	20.106952	19.51557	18.431372	16.588236
	7/8	21.1123	20.49135	19.352942	17.417648
16QAM	1/2	24.128344	23.418684	22.117648	19.905884
	2/3	32.171124	31.224912	29.490196	26.541176
	3/4	36.192512	35.128028	33.176472	29.858824
	5/6	40.213904	39.03114	36.882774	33.176472
	7/8	42.2246	40.9827	38.705884	34.835296
64QAM	1/2	39.192516	35.128026	33.176472	29.858826
	2/3	48.256686	46.837368	44.235294	39.811764
	3/4	54.288766	52.692042	49.764708	44.788236
	5/6	60.320856	58.54671	55.294116	49.764708
	7/8	63.3369	61.47405	58.058826	52.252944

**Table 5: Data Rates for 16 MHz Bandwidth**

Modulation System	Code Rate	Guard Interval			
		1/32	1/16	1/8	1/4
Bandwidth = 20 MHz Data Rate (Mbit/s)					
QPSK	1/2	15.080215	14.6366775	11.058824	9.952942
	2/3	20.1069525	19.51557	14.745098	13.270588
	3/4	22.62032	21.9550175	16.588236	14.929412
	5/6	25.13369	24.3944625	18.431372	16.588236
	7/8	26.390375	25.6141875	19.352942	17.417648
16QAM	1/2	30.16043	29.273355		
	2/3	40.213905	39.03114	29.490196	26.541176
	3/4	45.24064	43.910035	33.176472	29.858824
	5/6	50.26738	48.788925	36.882774	33.176472
	7/8	52.78075	51.228375	38.705884	34.835296
64QAM	1/2	45.240645	43.9100325	33.176472	29.858826
	2/3	60.3208575	58.54671	44.235294	39.811764
	3/4	67.86096	65.8650525	49.764708	44.788236
	5/6	75.40107	73.1833875	55.294116	49.764708
	7/8	79.171125	76.8425625	58.058826	52.252944

**Table 6: Data Rates for 20 MHz Bandwidth**

### CAMPAC2 - IF Functional Block Diagram

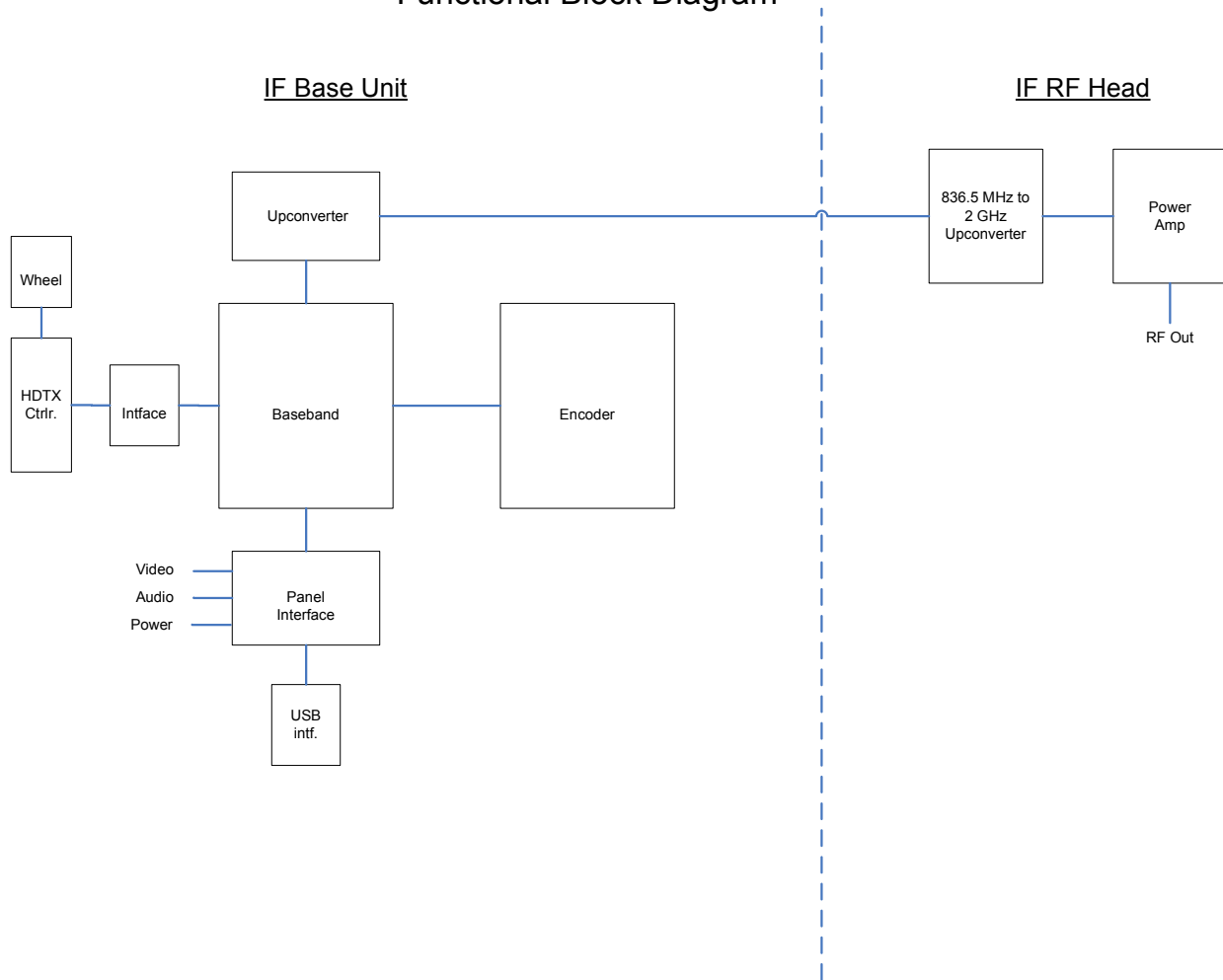


Figure 31: Block Diagram of the CP2 IF Cameraback Transmitter

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### CAMPAC2 PRO/NEWS Functional Block Diagram

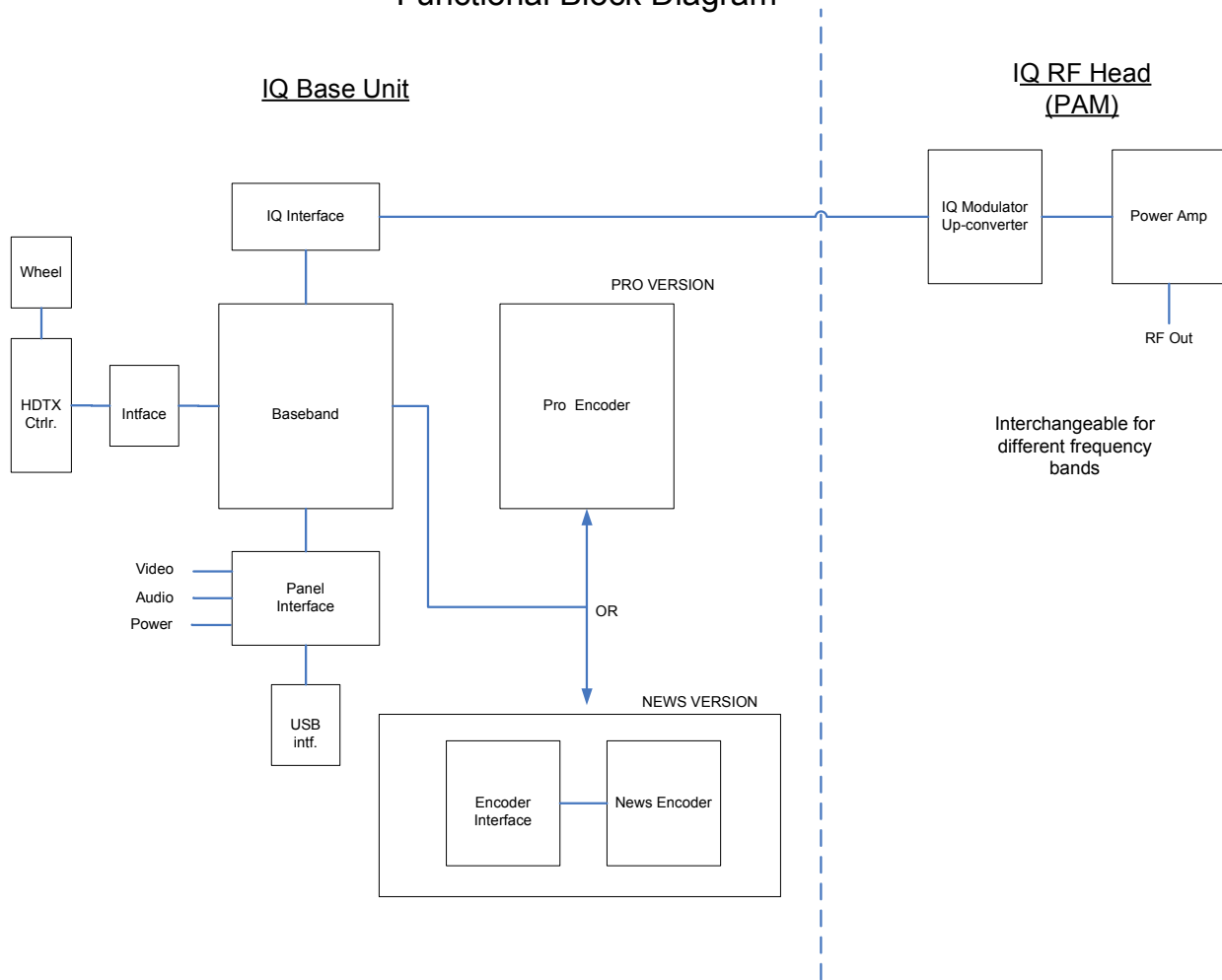


Figure 32: Block Diagram of the CP2 Pro/News Cameraback Transmitter

# Terms & Definitions

<b>16QAM</b>	<i>(16 phase Quadrature Amplitude Modulation) A digital modulation technique that combines amplitude modulation and phase shift keying (16-phase-states) in sending data. This type of modulation supports a transfer rate up to 14 Mbps.</i>
<b>64QAM</b>	<i>(64 phase Quadrature Amplitude Modulation) A digital modulation technique that combines amplitude modulation and phase shift keying (64-phase-states) in sending data. This type of modulation supports a transfer rate up to 28 Mbps.</i>
<b>AES/EBU</b>	<i>(Audio Engineering Society/European Broadcasting Union) is an older standard developed for transferal of digital audio signals. The AES/EBU specifies a single cable in carrying audio data for both digital left- and right-channels to a receiving device. Normally, a 3 pin XLR cable is used.</i>
<b>Composite Video</b>	<i>A single analog video signal encoded with luminance (brightness), chrominance (color), horizontal, and vertical synchronization information, is preset within the signal.</i>
<b>COFDM</b>	<i>(Coded Orthogonal Frequency Division Multiplexing) A type of modulation scheme where more than a 1000 signals are generated from a single signal, and transmitted at right angles to each other. This is to reduce signal loss by a receiver due to obstructions and reflections.</i>
<b>DVB-T</b>	<i>(Digital Video Broadcasting -Terrestrial) An international digital broadcast standard developed in Europe. DVB-T specifies a bandwidth of 6 to 8 MHz per channel, while utilizing MPEG-2 video compression and MPEG audio compression.</i>
<b>EIRP</b>	<i>Effective Isotropic Radiated Power.</i>
<b>FEC</b>	<i>(Forward Error Correction) A transmission technique that utilizes error correction data being sent with the carrier signal for possible signal re-generation by the receiver should errors be detected.</i>
<b>GOP</b>	<i>(Group Of Pictures) A sequence of frames within an MPEG-2 stream to allow video editing and splicing from different signal sources.</i>
<b>IDX</b>	<i>Anton-Bauer Battery Clip</i>

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<b>MPEG</b>	<i>(Moving Picture Expert Group) A family of standards that utilizes complex compression techniques to encode audio-video information into a signal.</i>
<b>NTSC</b>	<i>(National Television Systems Committee) A United States based organization, which develops technical standards for broadcasting.</i>
<b>PAL</b>	<i>(Phase Alternating Line) The European standard for video broadcast.</i>
<b>PAM</b>	<i>Removable, frequency determining module called the RF Power Amplifier Module of the CamPac2.</i>
<b>PID</b>	<i>(Package Identifier) Information located at the beginning of a transmitted packet that tells the receiver what to do with the packet.</i>
<b>QPSK</b>	<i>(Quadrature Phase Shift Keying) A digital frequency modulation technique where a single phase carrier is modulated into a four phase signal, with each quadrant represented by a two digit binary number. The signal is then transmitted and demodulated by the receiver into frequency independent voltage levels.</i>
<b>SDI</b>	<i>(Serial Digital Interface) A digital video format utilizing a 270 Mbps (for Standard Definition) or 1.5Gbps (for High Definition) data rate. The signal consists of a 10-bit, serial interface for both digital video and four channels of embedded digital audio. SDI requires a standard 75-ohm BNC connector and coax cable for connection to a device.</i>
<b>Symbol</b>	<i>A single Symbol can be considered one phase-state of a QPSK signal. All four Symbols used together can be considered the baud rate of the signal.</i>
<b>Transport Stream</b>	<i>When several video and analog inputs are multiplexed into a single data stream for transmission.</i>

5.18 MENU TREE

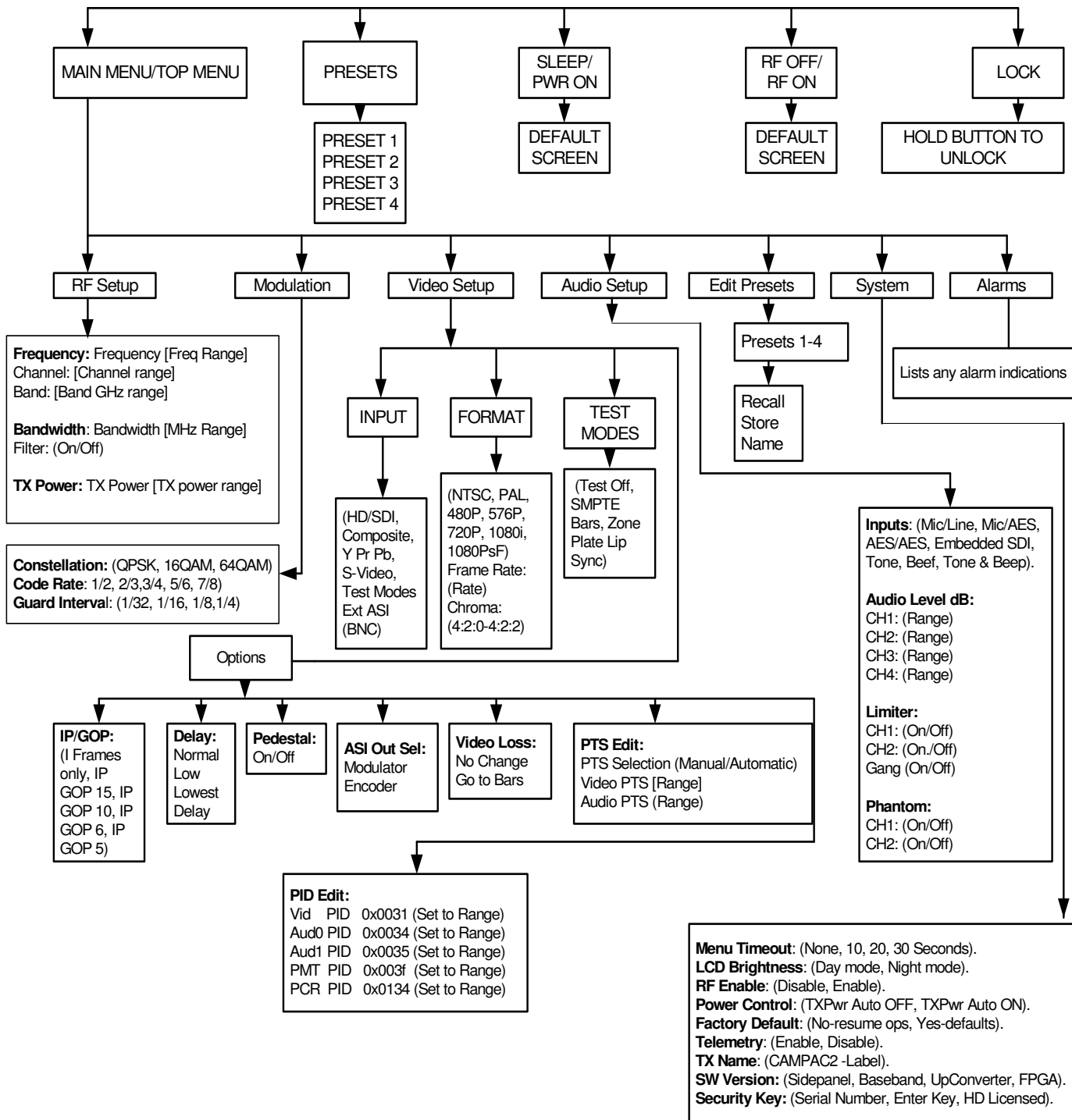


Figure 33: Menu Tree







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