Portable High-Powered Transmitter (RFX-PHT)

OPERATORS MANUAL

CONTENTS

1 GENERAL SAFETY INFORMATION

The information that follows, together with local site regulations, should be studied by personnel concerned with the operation or maintenance of the equipment, to ensure awareness of potential hazards.

WARNING- RF Power Hazard: High levels of RF power are present in the unit. Exposure to RF or microwave power can cause burns and may be harmful to health.

Switch off supplies before removing covers or disconnecting any RF cables, and before inspecting damaged cables or antennas.

Avoid standing in front of high gain antennas (such as a dish) and never look into the open end of a waveguide or cable where RF power may be present.

Users are strongly recommended to return any equipment that requires RF servicing to RF Central.

WARNING- GaAs / BeO Hazard: Certain components inside the equipment contain Gallium Arsenide and Beryllium Oxide that are **toxic substances.** Whilst safe to handle under normal circumstances, individual components **must not** be cut, broken apart, incinerated or chemically processed. In the case of Beryllium Oxide, a white ceramic material, the principal hazard is from the dust or fumes, which are carcinogenic if ingested, inhaled or entering damaged skin.

Please consult your local authority before disposing of these components.

CAUTION- Tantalum Capacitors: When subjected to reverse or excess forward voltage, ripple current or temperature these components may rupture and could potentially cause personal injury.

CAUTION: This system contains MOS devices. Electro-Static Discharge (ESD) precautions should be employed to prevent accidental damage.

1.1 Health & Safety

Exposure to Non Ionizing (RF) Radiation/Safe Working Distances

The safe working distance from a transmitting antenna may be calculated from the relationship:

$$D = \sqrt{\frac{P_T . G_R}{4\pi . w}}$$

In which D = safe working distance (meters)
PT = transmitter or combiner power output (watts)
GR = antenna gain ratio = anti log (gain dBi ÷10)
w = power density (watts/square meter)

The RF power density value is determined by reference to safety guidelines for exposure of the human body to non-ionizing radiation. It is important to note that the guidelines adopted differ throughout the world and are from time-to-time re-issued with revised guidelines. For RF Central use, a maximum power density limit of 1w/m² is to be applied when calculating minimum safe working distances. Appendix A refers.

Important Note: It must be remembered that any transmitting equipment radiating power at frequencies of 100 KHz and higher, has the potential to produce thermal and athermal effects upon the human body.

To be safe:

a) Operators should not stand or walk in front of any antenna, nor should they allow anyone else to do so.

b) Operators should not operate any RF transmitter or power amplifier with any of its covers removed, nor should they allow anyone else to do so.

Worked examples

Antenna			Transmitter Power			
Type	**Gain (dBi)**	**Gain Ratio**	**2W**	**4W**	**10W**	**30W**
OMNI	4	2.5	1	1	1.5	2.5
HELIX	20	100	4	5.6	9	15.5
PARABOLIC DISH	35	3,162	22.5	32	50	87
			MINIMUM SAFE DISTANCE (METERS)			

1.2 Maximum RF Power Density Limits

The RF Radiation Power Density limit figure recommended by RF Central is based upon guideline levels published in:

a. IEEE standard C95.1 1999 - IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

b. Guidelines for Limiting Exposure to Time-varying Electric, Magnetic & Electromagnetic Fields (up to 300 GHz) published in 1998 by the Secretariat of the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Both documents define guideline RF power density limits for "Controlled" and "Uncontrolled" environments. An uncontrolled environment is defined as one in which the person subjected to the RF radiation may be unaware of and has no control over the radiation energy received. The uncontrolled environment conditions can arise, even in the best regulated operations and for this reason the limits defined for the uncontrolled environment have been assumed for the RF Central recommended limit.

Documents a) and b) also show the RF power density guidelines to be frequency dependent. Different power density / frequency characteristics are presented in the two documents. To avoid complexity and to avoid areas of uncertainty, RF Central recommends the use of a single power density limit across the frequency range 100 kHz to 300 GHz. The $1 w/m^2$ power density limit we recommend satisfies the most stringent of the guidelines published to date.

Footnote: The IICNIRP document may be freely downloaded from the internet at www.icnirp.de/documents/emfgdl.pdf (PDF file)

2 INTRODUCTION

2.1 GENERAL DESCRIPTION

Designed to utilize the RFX-CMT, the RFX-PHT portable 2 GHz digital transmitter comes with either 5 or 10 watt max. power output. It provides a means to make any “news car” into a “live car”. “Run and shoot” vehicles now become “run and transmit” The PHT can also be used in a standalone mode for temporary transmit application. RF Central warranties the PHT for 3 Years.

This manual is to be used in conjunction with the RFX-PHT unit, which is composed of two major components; the RFX-CMT and the Amplifier case.

Various optional accessories are available for the PHT described in detail in paragraph 2.3.

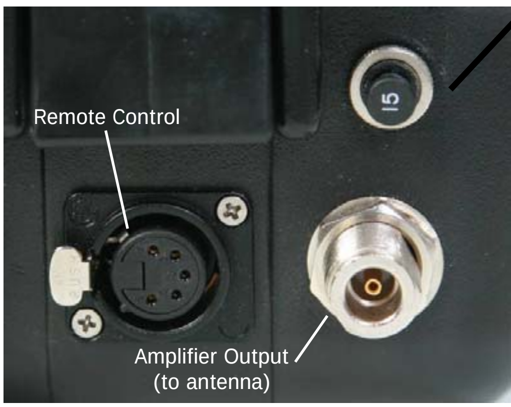
(fig. 2-1) – PHT Case (top view)

(fig. 2-2) – PHT Case (standing)

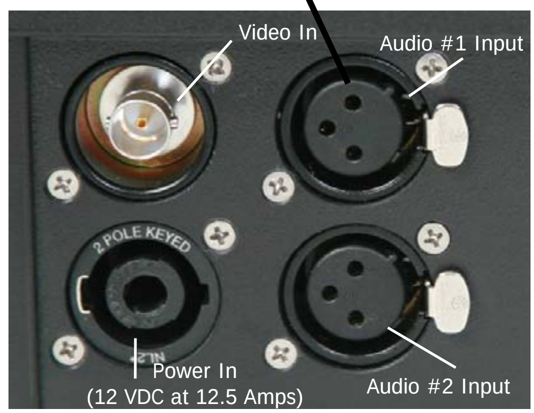
(fig. 2-3) – PHT Case (opened with CMT installed)

(fig. 2-4) – PHT Case (opened with CMT unclipped)

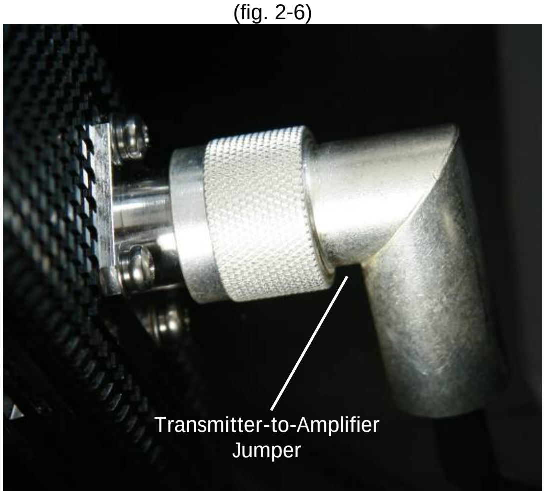
(fig. 2-5)



(fig. 2-6)



(fig. 2-7)



(fig. 2-8)

(fig. 2-9)

RFX-PHT
Control Panel

2.2 RFX-CMT DESCRIPTION

The core transmission component of the RFX-PHT is the RFX-CMT.

The RFX-CMT Wireless Camera system is designed for all applications, both indoor and outdoor, in which a mobile camera is essential to the televised program production. The RFX-CMT simply clips onto the battery adapter plate, transforming a standard news gathering camera into a wireless camera.

The CMT system is comprised of the transmitter that contains an audio encoder, video encoder, COFDM modulator, power supplies and an RF power amplifier. In its CMT configuration, it is attached directly to a camera with an omni-directional antenna (see diagram 2-1 & 2-2).

CMT Inputs

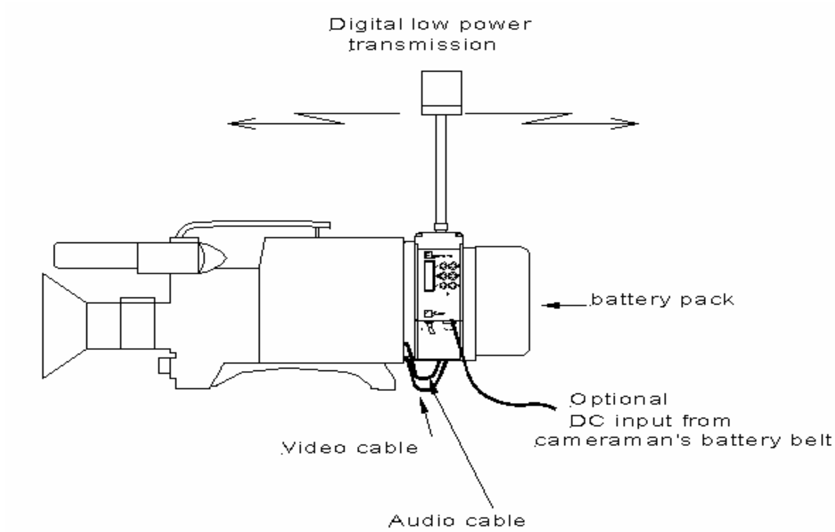
(fig. 2-10)

(fig. 2-11)

(fig. 2-12)

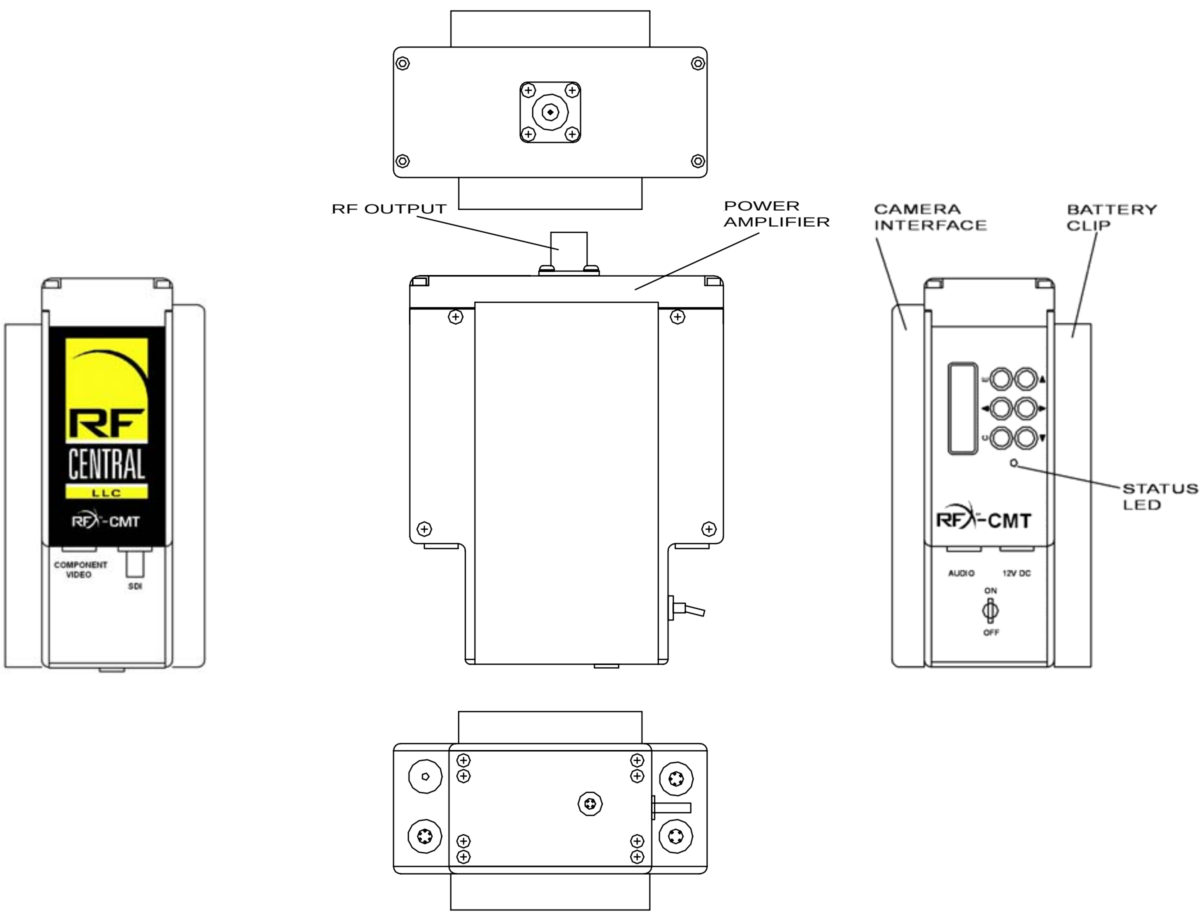
(fig. 2-13)

Typical RFX-CMT mounting configuration



(diagram 2-1)

External Views of the RFX-CMT



(diagram 2-2)

3 ACCESSORIES / OPTIONS

3.1 Vehicle Installation Kit

The RFX-PHT Vehicle Installation Kit includes a mounting plate which secures the RFX-PHT carry case in place, a magnetic mounted rooftop omni-directional antenna, and DC power cable for vehicle battery power. Additional options are shown in table 2-1, below.

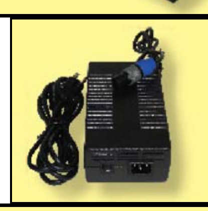
RFX-PHTMT **PHT Vehicle Mounting Plate**	
RFX-MAM **Magnetic Antenna Mount** 3 strong 5-inch diameter magnets	
RFX-RRM **Roof Rack Antenna Mount** Quickly & easily clamps to standard roof rack	
RFX-OMNI-4.5 **4.5 dBi Omni Antenna** 9" long, 1 ¾" diameter, N-type male connector	
RFX-AT8 **8 dBi Omni Antenna** 24" long, ¾" diameter, N-type male connector	
RFX-WCM **POV Camera Suction Cup Windshield Mount**	
RFX-PHTPS **PHT Power Supply** 110 VAC input, 12 VDC output	
RFX-CCK **Complete PHT Vehicle Wiring Kit** Power, Video, Audio, Remote switch, & Antenna Cables	

Table 2-1

RFX-PHT unit mounted in vehicle

3.2 Antenna Options

Antenna options for the RFX-PHT system vary based on a number of considerations. The transmit and receive ends of the link can be considered separately, since each application is unique.

Omni-directional antennas are typically used with the RFX-PHT link. However, some applications allow for more directional solutions, providing more robust transmission to the receiver. Directional antennas are typically used when higher gain is required and can be utilized in a variety of ways, from GPS auto-tracking to human control, or simple directional pointing.

Receive antennas used with the RFX-PHT can be either Omni or Directional. For improved receive system performance, diversity reception can be used with an array of multiple antennas. RF Central's diversity receiver technology uses maximum ratio combining to pull together the output of all the antennas providing extremely robust / exceptional / exponentially more reception.

Contact RF Central for more specific antenna information.

4 SPECIFICATIONS

Frequency Band	1.990 - 2.500 GHz
Tuning Range / Frequency Selection	To accommodate FCC channel plans; up to 16 pre-set channels, tuning in 0.5 MHz steps, selectable via control panel
Transmit Power	Adjustable to 5 Watts (higher power available – contact RFC)
Skirts	-30 db typical at 5 Watts
Modulation	COFDM DVB-T (2k carrier)
Modulation Modes	QPSK, 16 QAM, 64 QAM FEC: 1/2 2/3 3/4 5/6 7/8 Guard interval: 1/4 1/8 1/16 1/32
Data Rate	4.98 to 31.7 Mbit/s
Bandwidth	8MHZ, 7MHz, and 6MHz
Encoding Options	MPEG 2: 4:2:0/4:2:2 (DVB standard)
Video Input	Digital: SDI 270 Mbit/s Analog: NTSC/PAL composite or component
Audio Input	2 x analog inputs, mic/line selectable
Power Requirements	12VDC (12 Amps) 110VAC Power Supply available
Size	14 x 10.5 x 6.5 inches
Weight	15.5 lbs
Environment	Temperature: -4° to +122° degrees F Altitude: 14,500 ft Humidity: 95% long term

5 SYSTEM OPERATION

The following operation detail is specific to the RFX-CMT transmitter module of the RFX-PHT.

5.1 Camera Interfaces

The RFX-CMT transmission module of the RFX-PHT can be supplied with one of two battery and camera interfaces:

- Sony 'V' Block / IDX
- Anton Bauer Gold Mount

These provide a flexible and versatile mounting system suitable for a wide range of cameras and battery options.

The RFX-CMT is first mounted onto the camera rear battery interface. If required, an appropriate battery can then be docked onto the rear of the RFX-CMT transmitter. The video and audio cables must then be connected between the camera and the RFX-CMT, see 5.11.3 and 5.11.4 for details of the hardware configuration via the Control Panel.

If a battery is docked onto the rear of the RFX-CMT, no external DC power lead is required. A separate lead is only required if a battery belt or external power supply is used.
Care should be taken to prevent damage to an external power supply if a battery is docked, since current can be taken FROM the Power Connector.

5.2 Operator Controls / Menus

The RFX-CMT is configured using an LCD display and six push buttons. These are arranged as four navigation buttons (▲▼◄►), Enter and Clear.
The Enter button is used to store the modified parameter in non-volatile memory; this parameter will then be used to configure the RFX-CMT and will also become the default value when next powered on.
The Cancel button can be used to exit a menu without storing the parameter in memory.
Various menu levels are provided to allow the operator to access the different hardware and operating parameters:

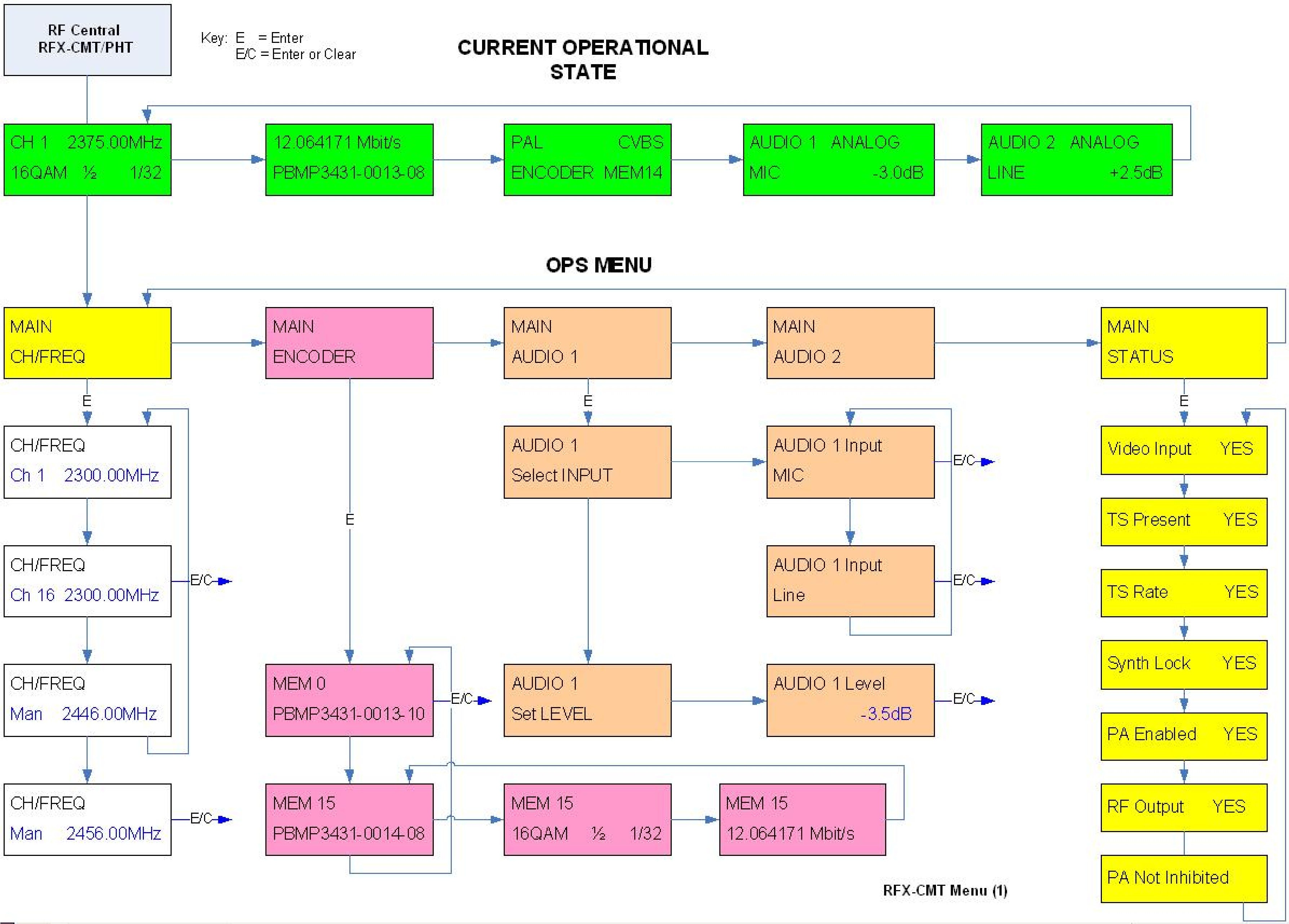
5.3 Initialization Menu

At switch on the status of the initialization is displayed. If any errors are found with the initialization of the major functions; Video, Audio, Encoder and Modulator; an error message will be displayed. During initialization the Status LED will be off.

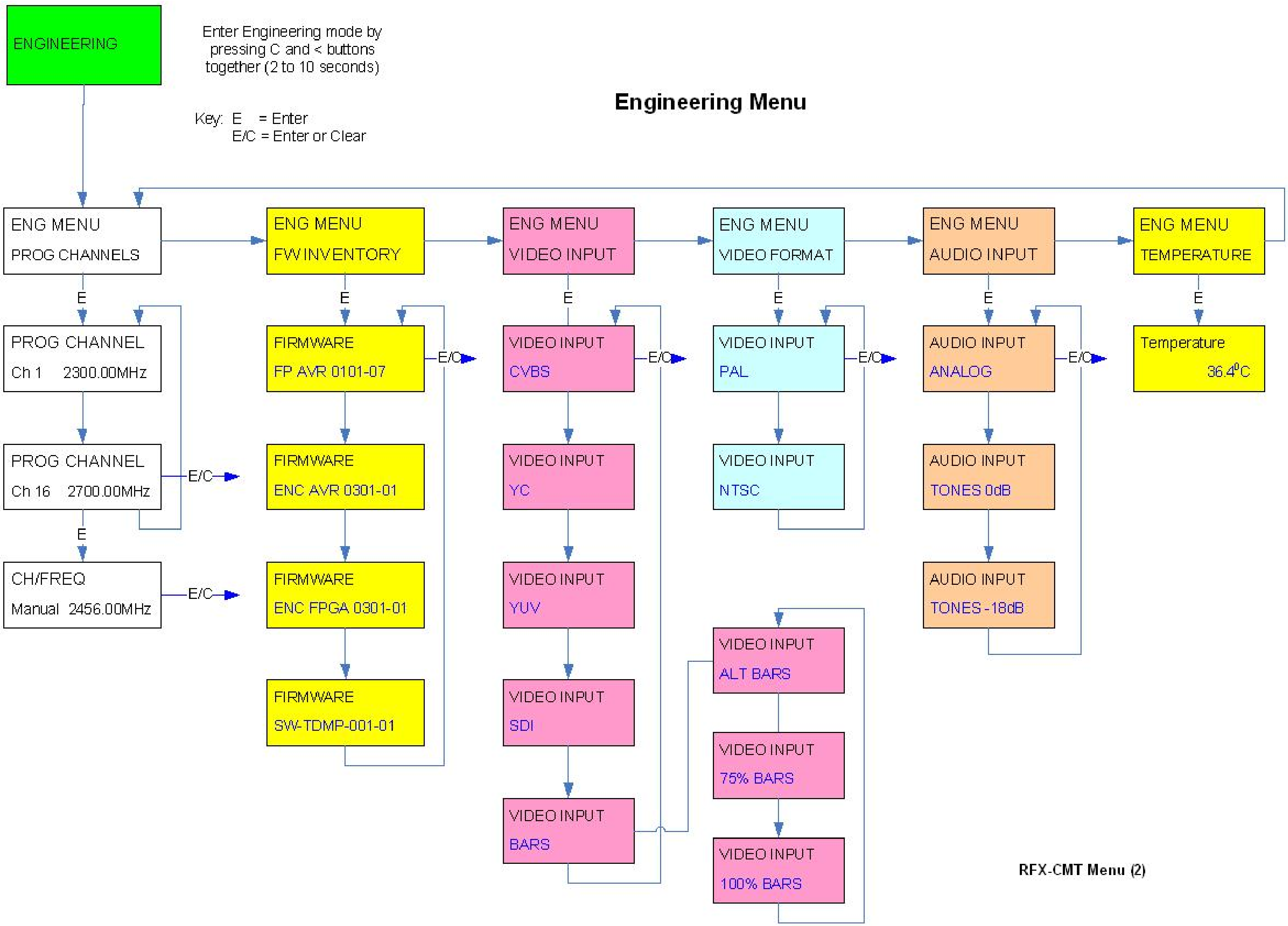
5.4 Main Menu

This is the display screen during normal operation of the RFX-CMT and indicates the TX frequency, Channel number (or Manual frequency) and the current Encoder memory settings. The ▲▼ buttons are used to select the required sub-menus; Ch/Freq, Encoder, Audio1, Audio2 and Status, the Enter button is then used to select. The ◄► buttons are used to display the current operational state.

During normal operation the Status LED will be green indicating 'healthy' state of the RFX-CMT.


RF Central
RFX-CMT/PHT
Key: E = Enter
E/C = Enter or Clear
CURRENT OPERATIONAL STATE
CH 1 2375.00MHz
16QAM ½ 1/32
12.064171 Mbit/s
PBMP3431-0013-08
PAL CVBS
ENCODER MEM14
AUDIO 1 ANALOG
MIC -3.0dB
AUDIO 2 ANALOG
LINE +2.5dB
OPS MENU
MAIN
CH/FREQ
MAIN
ENCODER
MAIN
AUDIO 1
MAIN
AUDIO 2
MAIN
STATUS
E
CH/FREQ
Ch 1 2300.00MHz
CH/FREQ
Ch 16 2300.00MHz
E/C
CH/FREQ
Man 2446.00MHz
CH/FREQ
Man 2456.00MHz
E/C
E
MEM 0
PBMP3431-0013-10
E/C
MEM 15
PBMP3431-0014-08
MEM 15
16QAM ½ 1/32
MEM 15
12.064171 Mbit/s
E
AUDIO 1
Select INPUT
AUDIO 1
Set LEVEL
AUDIO 1 Input
MIC
E/C
AUDIO 1 Input
Line
E/C
AUDIO 1 Level
-3.5dB
E/C
E
Video Input YES
TS Present YES
TS Rate YES
Synth Lock YES
PA Enabled YES
RF Output YES
PA Not Inhibited
RFX-CMT Menu (1)

Engineering Menu



5.5 Ch / Frequency Menu

This menu is used to select one of the sixteen pre-programmed channels (CH1 – Ch16) or 'manual' frequency selection. The 'Man' setting allows control of the transmit frequency in 0.5MHz steps within preset limits (0.5MHz steps are applicable to this version of the transmitter; earlier versions have 1MHz steps).

The Enter button allows the ◄► buttons to select the required digit, the ▲▼ buttons then select the required value. The Enter button then stores the value and returns to the Main menu.

5.6 Encoder Menu

Using the ▲▼ buttons, this menu is used to select the required MPEG encoder operating parameters. These are held in sixteen non-volatile memories (0 – 15). The ◄► buttons are used to display for the selected memory:-

Modulation mode	- QPSK, 16QAM, 64QAM
Code rate	- 1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	- 1/32, 1/16, 1/8, ¼
Data rate	- 4.976471 to 31.668449 Mbit/s

The encoder menu also selects the MPEG profile; 4.2.2, 4.2.0 and SP@ML (low delay)

Pre-programmed encoder parameter sets can vary according to individual customer requirements; a separate sheet is included in the documentation accompanying the equipment when shipped from the factory. As a guide, a typical set of 16 pre-set parameters is included in Appendix A – Section 9

5.7 Audio 1 Menu

The Audio menus are split into two levels: Select Input and Set Level. The ▲▼ buttons and Enter are used to select the required audio sub menu. The audio input can be set for either Line or Mic input; selecting Mic gives a fixed +20dB gain.

There is also a level adjustment providing a +/- 20dB adjustment in 0.5dB steps. This level adjustment is intended to cater for variations in camera audio output levels; it is NOT intended to use these adjustments to set microphone sound level. It is assumed that the mic pre-amp and limiter within the camera is used for this purpose.

5.8 Audio 2 Menu

As 5.7 above but for setting the Audio 2 input and level.

5.9 Status Menu

The status menu is used to confirm the condition of the RFX-CMT. If the Status LED is red indicating a fault or warning, the Status menu will indicate the nature of the problem.
The ▲▼ buttons are used to scroll through the various functions:

Video Input	- a valid video input is present
TS Present	- the MPEG encoder is generating Transport Stream
TS Rate	- TS data rate matches the modulator data rate
Synth Locked	- the RF synthesizer is locked to correct frequency
PA Enabled/Disabled	- the RF PA is powered or disabled
RF Output	- greater than +14dBm is present on the output

5.10 Status Monitoring

There is a red/green 'status' LED indicating the condition of the RFX-CMT , if a fault or warning exists the LED will indicate Red and the Status menu will indicate the nature of the fault / warning. During initialization of the unit the Status LED will be off.

The Status LED is capable of flashing RED to indicate a warning, or flashing GREEN to indicate no video input. This is due to:

GREEN	No Video Input.	Check the camera is switched on and the video lead is correctly connected
RED	The PA is turned off.	To disable the RF Power Amplifier the **C** and ◄ are pressed as the RFX-CMT is switched on. This allows the transmit frequency to be checked before the PA is switched on. The PA can be re-enabled by re-cycling the power.

5.11 System Configuration – Engineering Menu

The Engineering menu provides the method of hardware configuration. No user adjustments or setup is provided internally.

The engineering menu is entered by pressing the ◄ and 'C' buttons simultaneously for ~10seconds, then releasing the 'C' button.

5.11.1 Prog Channels

Each of the sixteen frequency channels can be independently allocated the required frequency with 0.5MHz resolution.

The ▲▼ buttons are used to select the Channel to be assigned. The Enter button then allows the four ▲▼◄► to edit the required frequency. The Enter button then stores the value and returns to the Main menu.

5.11.2 FW Inventory

The firmware version for the encoder and main unit controller can be obtained from this menu

5.11.3 Video Input/Video Format

The RFX-CMT can accept either CVBS, YC, YUV inputs in either PAL (625) or NTSC (525) via the six pin LEMO Video input connector or can be set to generate internal test bar patterns of 75%, 100% or alternating between these two.

SDI digital video can also be input via the BNC 75Ω connector if required this can also be used to input CVBS analog video.

Note: The CVBS LEMO input (Pin 1 & 2) is paralleled with the BNC input when CVBS is selected; only connect to either one of these inputs or an incorrect signal level may result.

Signal routing is managed by the controller according to the selected options.

The ▲▼ buttons are used to select the required video input type. The Enter button then stores the value and returns to the Main menu.

5.11.4 Audio Input

The RFX-CMT can accept two mono/one stereo analog input(s) via the five pin LEMO Audio input connector or can be set to generate internal test tones of either 0dBFS or –18dBFS.

Signal routing is managed by the controller according to the selected options.

The ▲▼ buttons are used to select the required audio input type. The Enter button then stores the value and returns to the Main menu.

5.11.5 Temperature

Provides a display of the internal temperature of the RFX-CMT controller in degrees Celsius

6 PREPARING FOR OPERATION

6.1 EQUIPMENT PREPARATION

6.1.1 Preparing Portable High Power Kit (PHT)

Before leaving to undertake an operation it is recommended that the following equipment checks be made.

Check that the CMT is securely fastened to the PHT unit.

Confirm that the vehicle-mounted bracket is secured properly to the vehicle.

Confirm that the PHT is properly secured in the vehicle-mounting bracket.

Confirm that all wiring is in good condition with no sharp bends or kinks.

Confirm antenna is mounted correctly and that antenna cable is properly connected.

Confirm external power cables are connected and secure.

Confirm the correct frequency is selected 5.5.

Confirm the correct preset mode of operation is selected. 5.6

Confirm the correct Audio level is selected 5.7

Confirm the correct Video input type is selected. 5.11.3

6.1.2 Preparing Camera-Mount Configuration (CMT)

Check that the Camera Adapter is securely fastened to the camera.

Check that the batteries to be used are fully charged and that an emergency spare battery is available and fully charged.

Confirm the correct frequency is selected 5.5.

Confirm the correct Encoder mode of operation is selected. 5.6

Confirm the correct Audio level is selected 5.7

Confirm the correct Video input type is selected. 5.11.3

If the camera is to be used with a cable-connected antenna, ensure that the cable is in good condition, paying particular attention to the quality of the end connectors and their assembly status. If extension cables are required, make sure that the cable connectors are compatible or that the necessary back-back connectors are to hand.

To enable the frequency to be checked without transmitting RF power the RFX-CMT can be powered up with the Power Amplifier disabled. To disable the RF Power Amplifier the **C** and ◄ are pressed and held as the RFX-CMT is switched on.

6.1.3 The Receiving Equipment

The transmitter may operate in conjunction with a variety of RF Central receivers, including the RFX-PMR, RFX-RMR, and the RFX-MVRX. Contact RF Central for additional receiver options.

When used with the RFX-CMT transmitter the receiving equipment produces two audio channels, analog (mono), and one (stereo) AES3; - the third and fourth audios are non-functioning when used with either the RFX-CMT or the RFX-PHT. Video outputs include SDI, composite video, and ASI output. If extension cables are necessary, ensure that the connectors are compatible and of good quality to avoid problems at site.

Check that the receiving antenna/Receiver interfaces are clean and free from dust and other unwanted materials.

If tripods are to be used to mount the equipment, make sure that some means of securing the tripod or of weighting it down is provided. Gusty wind conditions may put installations at risk, particularly when parabolic antenna dishes are to be used.

Make sure that all batteries, if used, are fully charged and whenever possible, provide a spare with the cable to connect it to the Receiver.

Check that the Receiver channel frequencies are compatible with those of the RFX-CMT Transmitter and set the channel selector switch to the channel number required. The Receiver is labeled with channel number and frequency information. As a precaution, set the manually selectable frequency of the Receiver to the working frequency.

Whenever practical, set up the system and trial it before leaving for site to ensure that all components of the system are working. Checking at base, where adjustments and corrective actions can be made, will pay off when setting up at site.

7 Connector Pin Outs

7.1 SDI / CVBS Video BNC

SDI or composite video, blanking & sync (CVBS) input. Switched via controller dependant upon Video Input Selection. See 5.11.3

75Ω BNC connector

7.2 Video Connector

Composite (CVBS) / YC / YUV

6Pin Lemo Plug FGG.1B.306.CLAD62Z

Pin	CVBS	YC	YUV
1	0V	Y(0v)	Y(0v)
2	CVBS	Y	Y
3		C(0v)	U(0v)
4		C	U
5			V(0v)
6			V

7.3 Audio Connector

Line / Mic Hi Z

5-Pin Lemo Plug FGG.1B.305.CLAD62Z

Pin	Function
1	0V (Screen)
2	Ch1 +
3	Ch1 -
4	Ch2 +
5	Ch2 -

7.4 Power Connector

9-18V DC 18W (power only)

This connector can be used to take power from the docked battery (5A Max) to power external cameras if the RFX-CMT is not docked directly to the camera, or feed power into the RFX-CMT and then forward into the camera.

Note: A diode is fitted to prevent the external power supply from ‘back feeding’ into the battery.

The power switch is used to control the RFX-CMT only. The power supply to the camera is always available from the battery interface or external power connector. The camera on/off switch should therefore be used to control the camera independently.

4 Pin Lemo Plug FGG.1B.304.CLAD62Z

Pin	Function
1	0V
2	0V
3	+12V
4	+12V

7.5 Remote Connector

RS232.   19200 Baud, 8 bit, 1 stop, No parity
4 Pin Lemo Plug FGG.0B.304.CLAD62Z

Pin	Function
1	0V
2	Tx (Data out from unit)
3	Rx (Data into unit)
4	0V

8 Module Descriptions

The RFX-CMT is based upon the highly successful dock-able Wireless Camera system. Internally, it is very different!

Factory engineers have completely redesigned the RFX-CMT to compress all the circuitry from five circuit boards onto two. This greatly reduces space and weight compared with the original wireless product.

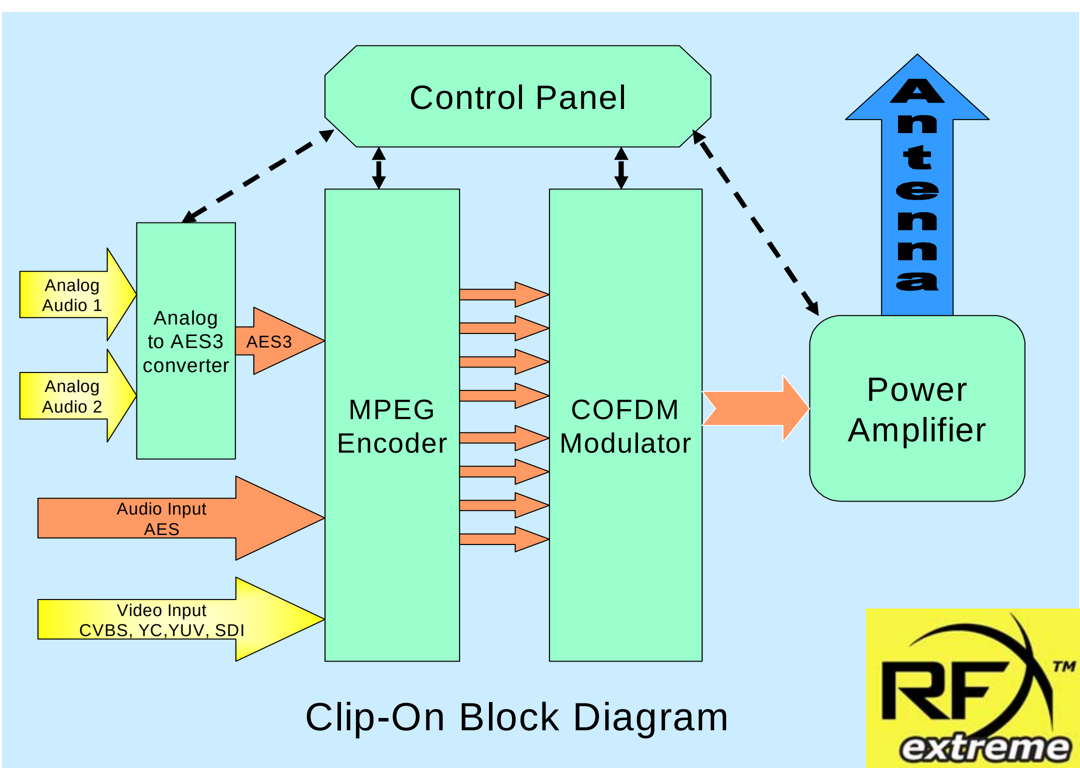
The result is a Digital Wireless Camera system, which has exceptional RF performance, is well-balanced and easy to use.

The RFX-CMT contains four circuit board assemblies:

- Audio / Video Encoder PBAB-TDAV-0301
- COFDM Modulator PBAB-TDVM-0303
- RF Power Amplifier PBAB-TDPA-0801
- Display / System Controller PBAB-TDDB-0101

The superior RF performance of the RFX-CMT when combined with an RF Central receiver is such that it typically requires only a single receive point with Fan beam antenna for most normal OB locations, including sports stadiums.

8.1 Block diagram



8.2 Audio / Video Encoder

The Encoder board consists of the following main functions:

- SDI to Digital deserializer. Converts the SMPTE-259M-C serial digital video input to an 8 bit parallel digital video bus.

- Analog to Digital Video Converter, 10-bit over sampling ADC. Takes either Composite Video (75 Ω, 1v p-p) (CVBS); YC or YUV inputs in either PAL / NTSC format or converts to an 8-bit parallel digital video bus.

- Analog to Digital Audio Converter, 48kHz, 24 bit
  Two high impedance analog inputs. Audio 1 (or left channel). Audio 2 (or right channel). The two channels are first buffered by a variable gain stage to cater for either Mic or Line level inputs. A switchable 20dB stage is also included to cater for low level Mic inputs. The two audio channels are then converted into an I^2S serial data stream.

- FPGA. Selects the required 8 bit-parallel digital video bus from either the SDI deserializer or the video ADC for input to the MPEG2 encoder. A relay is used to route the input from the BNC (either SDI or CVBS) to either the deserializer or ADC. Selects the I^2S from the ASE/EBU receiver or the audio ADC for input to the MPEG2 encoder. Generates the video test bars and audio test tones.

- Microcontroller. Writes control data and reads status data to/from the MPEG2 Encoder.

- MPEG2 Encoder

  A suite of MPEG2 compliant compression techniques, where the data bit rate is reduced by processing over multiple picture frames. The absolute picture (**I**ntra frame) is interleaved with pictures that are created using difference data (Predicted frame) with Bi-directionally predicted frames (4:2:2 Only) in conjunction with motion compensation; thus low data rates down to 6 Mbps, can be achieved.

  A set of encoding parameters is loaded into the encoder at power up. These are selected from one of the 'preset' encoder memories. See 5.6

- DC Power Supplies
  Switching DC/DC converters are used to generate the various supplies from the incoming 9-18V battery supply. These include 2.5, 3.3V, 5V, 8V and +/-5V supplies.

There are no field replaceable parts on the Encoder board. If a fault occurs with the board, contact RF Central for technical assistance.

8.3 COFDM Modulator

The acronym COFDM stands for “Coded Orthogonal Frequency Division Multiplexing – a modulation scheme which is used by the DVB digital television system.”

The COFDM modulator has been designed to take its input from the MPEG2 encoder. This Transport stream is then modulated directly to the 2/2.5/3.5/4.5GHz band as appropriate. This method reduces the occurrence of intermodulated harmonic frequencies and requires less up-converters to reduce microphony.

The COFDM modulator RF output is via the SMB connector. This output is then fed into the power amplifier, via the short RF cable. The nominal RF output level is –9dBm of the Modulator.

The modulator is automatically configured to match the data rate of the MPEG2 Encoder.

The modulator can support modulation schemes and data rates according to the chart in Appendix B – section 10; operationally the modulator is configured according to preset parameter sets as described in 5.6

There are no field replaceable parts on the COFDM modulator. If a fault occurs with the board please contact RF Central for technical assistance.

Power Amplifier

The function of the power amplifier is to amplify the signal from the COFDM modulator to a suitable level for transmission via the N-type connector into the antenna. The amplifier is required to be highly linear to accommodate the multiple carrier signal formats employed for digital system operation, with very low distortion (low intermodulation between carriers). The nominal output power is +20dBm (100mW) across the 2/2.5/3.5GHz band (as appropriate). Nominal overall gain is 29dB, thus the nominal RF input level is –9dBm. The amplifier operates from a single +8 Volt supply. Nominal operational supply current is 700mA.

The status of the PA is provided by LEDs to monitor RF output level (green) and DC present (red) and also monitored by the main controller and displayed as the status monitoring menu. See 5.10.

To ensure good RF practice when power is applied to the RFX-CMT Camera back, always make sure that there is a suitable load or antenna connected to the RF output.

8.4 Front Panel

The Front Panel consists of a micro-controller, 16-character by 2-line LCD display, operator switches and interface circuits (see fig. 7:1).

The Front Panel is the main system controller for the unit. All configuration of the unit hardware is from this board. An I^{2}C two-wire interface is used to communicate with all other intelligent devices within the unit. This carries the command data and reads back status data from all boards within the unit. At power-up this board initializes all the other boards and during normal operation monitors all the major functions and reports any problems as part of the unit status.

All configuration parameters, video settings, audio settings, MPEG encoder parameters, frequencies etc are held on this board. The MPEG parameter set required (one of sixteen) is selected via the Front Panel by the operator. These parameter sets are held in the non-volatile memory of the front panel unit and can only be upgraded by the factory.

(fig. 7:1)

9 Appendix A: MPEG Encoder Parameter Sets

Note: The following parameters are typical for the transmitter and are issued for guidance only. Some transmitters may have different configurations according to individual customer requirements.

Set	**Part Number**	**Rate (Mbit/s)**	**COFDM Mode**	**MPEG**	**Video Rate (Mbit/)**	**Video LPF**	**Low Delay Mode**	**Audio Rate (kbit/)**
0	PBSW-TDVP-0303-05-00	18.096257	64-QAM, 1/2, 1/32	422P@ML, GOP4	16.59	No	No	192
1	PBSW-TDVP-0303-05-01	18.096257	64-QAM, 1/2, 1/32	SP@ML, Infinite GOP	11.81	No	Yes	192
2	PBSW-TDVP-0303-05-02	12.06417	64-QAM, 1/2, 1/32	MP@ML, GOP4	10.00	Yes	No	192
3	PBSW-TDVP-0303-05-03	12.06417	64-QAM, 1/2, 1/32	SP@ML, Infinite GOP, Intra-slice	8.00	Yes	Yes	160
4	PBSW-TDVP-0303-05-04	9.048128	QPSK 3/4, 1/32	422P@ML, GOP4	7.79	Yes	No	192
5	PBSW-TDVP-0303-05-05	9.048128	QPSK 3/4, 1/32	SP@ML, Infinite GOP, Intra-slice	6.00	Yes	Yes	192
6	PBSW-TDVP-0303-05-06	6.032086	QPSK 1/2, 1/32	SP@ML, Infinite GOP	4.94	Yes	No	128
7	PBSW-TDVP-0303-05-07	6.032086	QPSK 1/2, 1/32	MP@ML, GOP4	4.94	Yes	No	192

10 Appendix B: Table of DVB-T non-hierarchical bit rates

Modulation	Code rate	Bit rate (Mbit/s) at each guard interval (symbol fraction)			
QPSK		1/32	1/16	1/8	1/4
	1/2	6.03	5.85	5.53	4.98
	2/3	8.04	7.81	7.37	6.64
	3/4	9.05	8.78	8.29	7.46
	5/6	10.1	9.76	9.22	8.29
	7/8	10.6	10.2	9.68	8.71
16-QAM		1/32	1/16	1/8	1/4
	1/2	12.1	11.7	11.1	9.95
	2/3	16.1	15.6	14.7	13.3
	3/4	18.1	17.6	16.6	14.9
	5/6	20.1	19.5	18.4	16.6
	7/8	21.1	20.5	19.4	17.4
64-QAM		1/32	1/16	1/8	1/4
	1/2	18.1	17.6	16.6	14.9
	2/3	24.1	23.4	22.1	19.9
	3/4	27.1	26.3	24.9	22.4
	5/6	30.2	29.3	27.6	24.9
	7/8	31.7	30.7	29.0	26.1