Camera Mounted Transmitter (RFX-CMT-II SD/HD)

OPERATOR'S MANUAL

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Need help? Contact RF extreme care Technical Support:

866.732.0113
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1 GENERAL SAFETY INFORMATION

The information that follows, together with local site regulations, must 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
			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 1w/m² 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).

Issue Status

Issue	Date	Changes
1	28/03/2007	Initial Issue
2	19/06/2007	Revised SD/HD capable

1.3 **Mandatory Safety Instructions to Installers & Users**

Use only manufacturer or dealer supplied antenna.

Antenna Minimum Safe Distance: 20cm (8 inches)

Antenna Gain: 4.0 dBi referenced to a dipole.

The Federal Communications Commission has adopted a safety standard for human exposure to RF (Radio Frequency) energy which is below the OSHA (Occupational Safety and Health Act) limits.

Antenna Mounting: The antenna supplied by the manufacturer or radio dealer must not be mounted at a location such that during radio transmission, any person or persons can come closer than the above indicated minimum safe distance to the antenna i.e. 20cm (8 inches). To comply with current FCC RF Exposure limits, the antenna must be installed at or exceeding the minimum safe distance shown above and, in accordance with the requirements of the antenna manufacturer or supplier.

Base Station Installation: The antenna should be fixed-mounted on an outdoor permanent structure. RF Exposure compliance must be addressed at the time of installation.

Antenna Substitution: Do not substitute any antenna for the one supplied or recommended by the manufacturer or radio dealer. You may be exposing person or persons to excess radio frequency radiation. You may contact your radio dealer or the manufacturer for further instructions.

Warning: Maintain a separation distance from the antenna to a person(s) of at least 20cm (8 inches). You, as the qualified end-user of this radio device must control the exposure conditions of bystanders to ensure the minimum separation distance (above) is maintained between the antenna and nearby persons for satisfying RF Exposure compliance. The operation of this transmitter must satisfy the requirements of Occupational/Controlled Exposure Environment, for work-related use. Transmit only when person(s) are at least the minimum distance from the properly installed, externally mounted antenna.

2 INTRODUCTION

The RFX-CMT-II Wireless Camera system is specifically designed to support Standard Definition and High Definition Wireless Camera operations, and is derived from RF Central's very successful RFX-CMT Wireless Camera system.

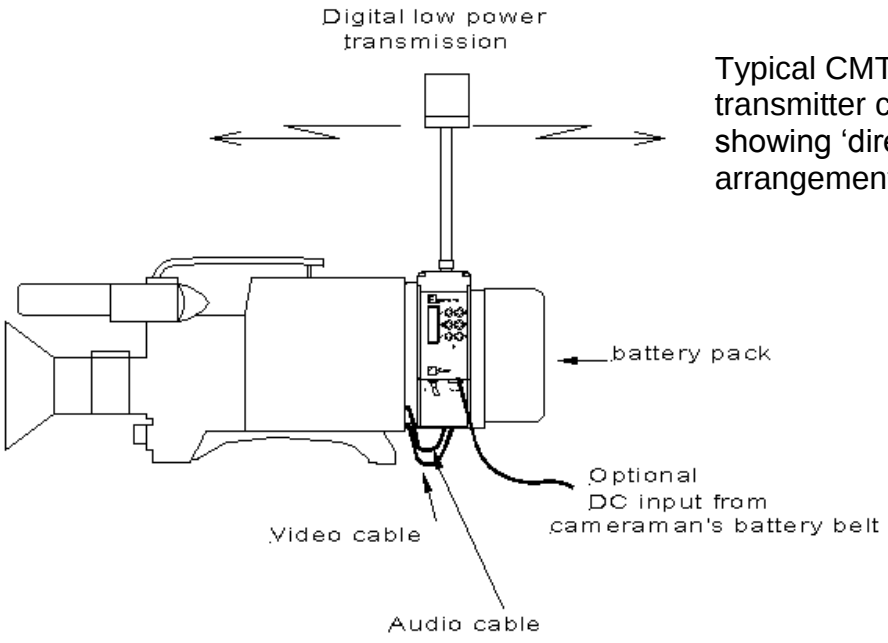
The system is comprised of the transmitter that contains an audio encoder, SD/HD video encoder, COFDM modulator, power supplies and an RF power amplifier. Attached directly to this transmitter is an omni-directional antenna.

The transmitter is switchable between SD and HD encoding modes directly for the front panel. In HD mode the audio is embedded into the SDI input. In SD mode the audio input may be SDI embedded, digital AES, and analog or internal test tones.

The transmitter will also accept an ASI DVB transport stream. The COFDM modulation is selectable between 6, 7, and 8MHz RF bandwidth. Modulation (Constellation), FEC rate and guard interval are also selectable through the front panel menu system.

RF Central's RMR-II, 2-way or 6-way diversity receive terminals are usually used in conjunction with the CMT-II. Please note that these receivers must be equipped with the correct RF Central SD/HD decoder modules to enable decoding of signals from this version of transmitter.

Typical RFX-CMT-II system configurations



Typical CMT-II transmitter configuration showing 'direct docking' arrangement.

3 SPECIFICATIONS

Frequency band	2.0 – 2.5GHz band (1.5, 3.5, 4.5, 6.5 and 7 GHz bands also available)
Tuning range	300MHz standard bandwidth.
Frequency Selection	Up to 16 pre-set channels or tuning in 1 MHz steps via side mounted panel control.
Transmit Power	100mW
Transmit Antenna	Omni Directional 4dBi gain (nom.)
Modulation	COFDM DVB-T 2k
Modulation Modes	QPSK, 16QAM, 64QAM
	FEC: $^{1}/_{2}$ $^{2}/_{3}$ $^{3}/_{4}$ $^{5}/_{6}$ $^{7}/_{8}$
	Guard interval: $^{1}/_{32}$ $^{1}/_{16}$ $^{1}/_{8}$ $^{1}/_{4}$
	Menu selectable via side mounted panel control
Bandwidths	8MHz (selectable 6, 7, 8MHz in some modes)
Encoding Options	MPEG 2 Video (ISO/IEC 13818-2)
	MPEG1 Layer II
	Linear PCM/SMPTE303M (2 ch, 16bit/ch)
Latency	Selectable to less than two frames minimum, Tx to Rx
Video Input	SDI HD SMPTE-292M (299M)
	SDI SD SMPTE-259M (272M)
	Analog Composite and YUV, Y/C Component video
Audio Input	Digital HD: SDI embedded
	Digital SD: SDI embedded
	1 x AES3 stereo
	Analog: 1 x stereo / 2 x mono inputs, mic/line selectable
Internal test signals	75% and 100% Color bars, audio test tones (SD video)
ASI input	DVB ASI transport stream 188/204
Power Requirements	10 - 35VDC
Mechanical Interface	Transmitter normally mounts between battery and battery interface plate
Size	160 x 130 x 54mm
Weight	0.95kg (including antenna)
Environmental	Temperature: -20^{o} to $+50^{o}$C
	Altitude: 4500m
	Humidity: 95% humidity long term

4 CONNECTOR PIN-OUTS

4.1 **Video BNC connector**

75Ω BNC connector

Dependant on transmitter user configuration, used for

- HD SDI
- SD SDI
- Composite NTSC
- ASI

4.2 **Video Multiway Connector**

Dependant on transmitter user configuration, used for

- SD Component video

6 Pin 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

4.3 **Audio Connector**

Analog or AES3 digital

8 Pin Lemo Plug FGG.1B.308.CLAD62Z

Pin	Function	Notes
1	0V (Screen)	Analog balanced. Switchable 50k/600 Ω
2	Ch1 +	
3	Ch1 -	
4	Ch2 +	
5	Ch2 -	
6	0v (screen)	Digital AES/EBU
7	+	
8	-	

4.4 **Power Connector**

10-35V DC 18W (Clip-On power only)

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

The power switch is used to control the CMT-II 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

4.5 **Remote Connector**

RS232. 38400 Baud, 8 bit, 1 stop-bit, 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

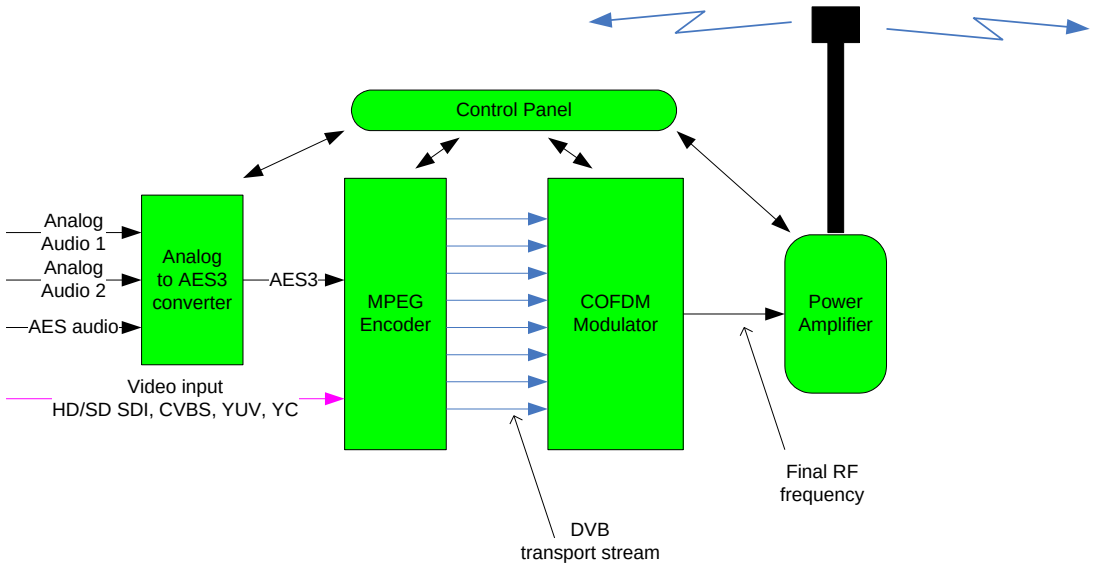
(In the version of CMT-II described in this manual the feature of remote set up is not implemented.)

5 MODULE DESCRIPTIONS

The RFX-CMT-II contains four circuit board assemblies:

- Audio / Video Encoder
- COFDM Modulator
- RF Power Amplifier
- Display / System Controller

Block diagram



RFX-CMT-II block diagram

5.1 **Audio / Video Encoder**

The Encoder board performs the following main functions:

- SDI to Digital de-serializer
  Converts the SDI serial digital video input to an 8 bit parallel digital video bus.

- Analog to Digital Audio Converter, 48kHz, 24 bit
  This is only used when the audio input is selected to analog. 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 30dB 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.

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

- MPEG2 Encoder
  Operates in either SD or HD encoding modes.

  A set of encoding parameters is loaded into the encoder at power up. These are selected from one of the 'preset' encoder memories. See 6.7.5

- ASI input mode
  When ASI input mode is selected the MPEG2 encoder is by-passed and the ASI transport stream passed direct to the CPFDM modulator.

- DC Power Supplies
  Switching DC/DC converters are used to generate the various supplies from the incoming 11-18V 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.

5.2 **COFDM Modulator**

The COFDM modulator has been designed to take its input from the MPEG-2 encoder, or directly from the front panel when ASI input mode is selected. This transport stream is then modulated directly to the final 1.5/2/2.5/3.5/4.5/6.5/7GHz band as appropriate. This method reduces the need for inter-modulation products.

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 of the modulator is –9dBm.

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 which accompanies the customer's equipment when shipped; operationally the modulator is configured according to preset parameter sets as described in Appendix A.

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

5.3 **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 inter-modulation between carriers). The nominal output power is +20dBm (100mW) across the 1.5, 2, 2.5, 3.5, 4.5, 5.8, 6.5, or 7GHz 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 6.3.

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

5.4 **Front Panel PCB**

The Front Panel consists of a micro-controller, 16-character by 2-line LCD display, operator switches and interface circuits.

The Front Panel is the main system controller for the unit. All configuration parameters, video settings, audio settings, MPEG encoder parameters, frequencies etc are held on this board. An I^2C 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.

The chosen MPEG parameter set is selected, from 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 at the factory.

6 SYSTEM OPERATION

6.1 Camera Interfaces

The RFX-CMT-II can be supplied with one of three possible battery and camera interfaces:

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

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

The RFX-CMT-II is first mounted onto the camera rear battery interface. If required, an appropriate battery can then be docked onto the rear of the Clip-On transmitter. The video and audio cables must then be connected between the camera and the RFX-CMT-II,

If a battery is docked onto the rear of the RFX-CMT-II, 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.

6.2 Powering up the Clip-On with the PA disabled

To disable the RF Power Amplifier the front panel buttons **C** and ◄ are both pressed down together as the unit is switched on and initializes. This allows the transmit frequency to be checked before the PA is switched on. In this condition the front panel LED will be flashing RED. PA status can be checked according to section 6.6

The PA can be re-enabled by cycling the power to the CMT-II - off/on; alternatively the PA may be turned on and off through the control menu 6.7.2

6.3 Status Monitoring (front panel LED)

The front panel LED indicates the condition of the D-Cam Clip-On as follows,

GREEN	Normal Operating condition
GREEN FLASHING	CMT-II is functioning but has no video, or ASI, input
RED FLASHING	The Power Amplifier is turned off.
RED	Clip-On internal fault condition, (consult the status menu through the LCD display – see section 6.6).

6.4 **Operator Controls / Menus**

The CMT-II has three control menus, “Operations menu for internal MPEG encoder mode” , “Operations menu for external ASI mode” and “Engineering menu”. To access the Engineering menu press **C** repeatedly to reach the menu summary screen, and then press and hold the **C** and ◄ buttons simultaneously (hold for 2 to 10 seconds). Note: after the Engineering menu has been accessed the CMT-II will revert to the “Ops” menu after 30 secs. if the “Eng” menu is not being navigated.

The RFX-CMT-II is configured using an LCD display and six push buttons. These are arranged as four navigation buttons (▲▼◄►), plus **E**nter and **C**lear.

The **E**nter button is used to store the modified parameter in non-volatile memory; this parameter will then be used to configure the RFX-CMT-II and will also become the default value when next powered on. The **C**ancel 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:

The layouts of the “Operations” and “Engineering” menus can be found at the end of this section. The following paragraphs describe how each of the major functions are monitored and controlled.

6.5 **Initialization screen**

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.

6.6 **Summary, Current Operational State and Status Warning screens**

The display screen during normal operation of the RFX-CMT-II indicates the Tx frequency, Channel number (or Manual frequency), the current modulation mode, FEC rate and guard interval.

Additional screens showing the *current operational state* are accessed via the ► button. These show:-

encoder preset (additional values are further available through the ▲▼ buttons)
DVB PIDs
video set-up
audio set-up

A screen showing *status warnings* is accessed via the ◄ button. These show:-

Video input OK (additional values are further available through the ▲▼ buttons)
PA not inhibited
MOD TS
MOD rate
Synth. locked

6.7 System Configuration – Operations Menu (MPEG mode)

From the summary screen the ▲▼ buttons are used to select the required sub-menus; the **E**nter button is then used to select the required function.

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

.

6.7.2 PA Menu

This menu allows the transmitter output power amplifier to be switched on and off.

6.7.3 Select ASI Menu

This menu is used to switch the unit into ASI input mode. Once ASI mode is selected the menu changes to "OPS MENU - ASI MODE" see the appropriate menu chart and paragraph 0

6.7.4 Select MPEG Menu

The full MPEG set-up menu is shown on Sheet 2, details are as follows:

6.7.5 Encoder Pre-set - SD and HD modes

The unit is programmed with pre-set MPEG and COFDM parameter sets for both Standard and High definition modes modes; the appropriate values are displayed according to Definition setting – see paragraph 6.7.6. Parameter sets are held in eight user selectable preset memories (0 – 7). Details of the pre-sets are shown on a chart which is shipped with the equipment.

The Encoder Pre-set menu selects the MPEG encoder profile; 4.2.2, 4.2.0 and SP@ML (low delay), video data rate, Modulation mode, and FEC rate. After scrolling to the chosen memory pre-set additional information <i> can be accessed though the ◄►buttons.

Pre-programmed encoder parameter sets can vary according to individual customer requirements; a separate chart is included in the documentation accompanying the equipment when shipped from the factory

6.7.6 Definition – SD/HD selection

This function allows the CMT-II to be switched between SD and HD encoding mode

6.7.7 **PID menu**

The PIDs which are inserted into the DVB transport stream as part of the encoding process may be set via this menu.

6.7.8 **Video Input**

In HD encoding mode the video input is automatically selected to SDI and the Video Input selection function is omitted from the menu

In SD encoding mode the CMT-II can accept:-

SDI digital video via BNC connector.
Component, YC, YUV inputs via the six pin LEMO
Composite video via BNC connector
Internal test bar patterns of either 75%, 100% or alternating between these two.

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

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

6.7.9 **Audio Menu**

The Audio menus are split into two levels: Select Input and Set Level. The input can be selected to:

Analog
AES3 digital
SDI embedded
Internal test tones, 0dB FS or –18dB FS

When in analog audio input mode both channels, Ch1 and Ch 2, can be individually set for either Line or Mic input; selecting Mic gives a fixed +30dB gain. There is also a level adjustment providing a +/- 20dB adjustment in 0.5dB steps.

The analog audio input impedance can be set to either 600 Ω or 50K Ω through the Engineering menu paragraph 6.9.5

6.8 System Configuration – Operations Menu (ASI mode)

6.8.1 Ch / Frequency Menu

This menu is identical to that mentioned in paragraph 6.7.1

6.8.2 PA Menu

This menu is identical to that mentioned in paragraph 6.7.2

6.8.3 Select MPEG Menu

This menu is used to switch the unit into internal MPEG encoder mode. Once MPEG mode is selected the menu changes to “OPS MENU - MPEG MODE” see the appropriate menu chart and paragraph 6.7.

6.8.4 Select ASI Menu

This menu allows the modulation parameters to be individually set when the unit is operated in the ASI input mode. Details are as follows:-

6.8.5 Constellation

Allows the modulation to be set QPSK, 16QAM, 64QAM

6.8.6 Code rate

Allows the Viterbi FEC to be set 1/2, 2/3,3/4, 5/6, 7/8

6.8.7 Guard interval

Allows the Guard interval to be set 1/4, 1/8, 1/16, 1/32

6.8.8 Bandwidth

Allows the COFDM modulation bandwidth to be set 6, 7, 8MHz

6.9 System Configuration – Engineering Menu

*The engineering menu is entered by pressing the ◄ and ‘**C**’ buttons simultaneously for ~10seconds, until “select ENGINEERING” appears then press the ‘**E**’ button.*

6.9.1 Prog Channels

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

The ▲▼ buttons are used to select the Channel to be assigned. The **E**nter button then allows the four ▲▼◄► to edit the required frequency. The **E**nter button then stores the value and returns to the top level of the “Engineering” menu.

6.9.2 **Inventory**

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

6.9.3 **Cable equalizer**

This feature allows the selection of an automatic equalizer on the digital SDI or ASI input designed to compensate for long cables, up to 300 meters of high quality SDI cable. The equalizer should be set to *active* for cables longer than 10 meters

The equalizer is not designed for short cables and should be set to *bypass* for cables less than 10 meters (i.e. when the CMT-II is mounted on a camera)

6.9.4 **LCD Contrast**

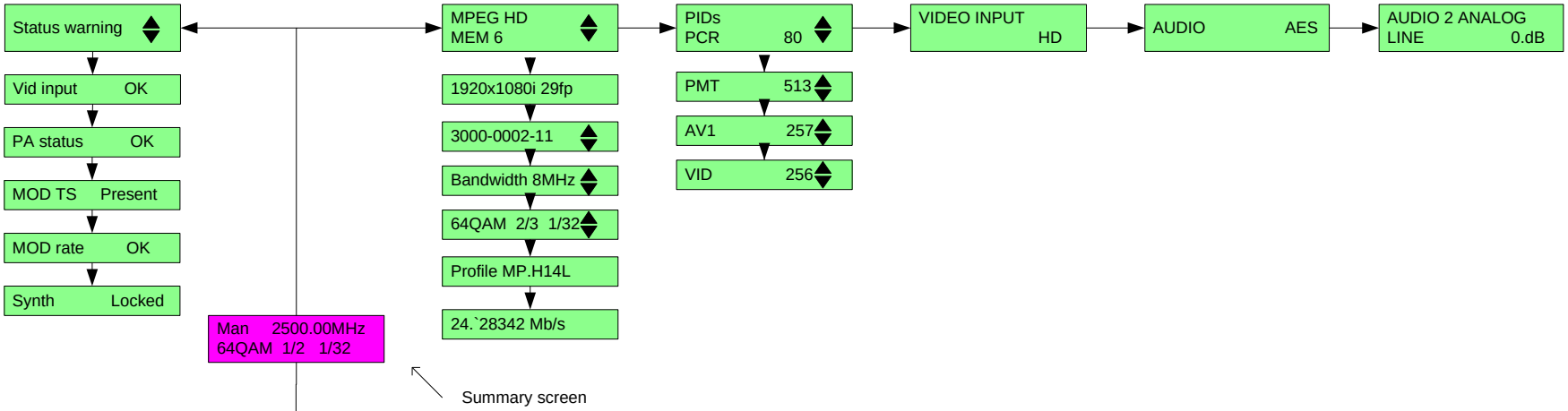
This menu allows the contrast of the LCD display to be adjusted.

The ▲▼ buttons are used to select the required contrast. The **E**nter button then stores the value and returns to the top level of the “Engineering” menu.

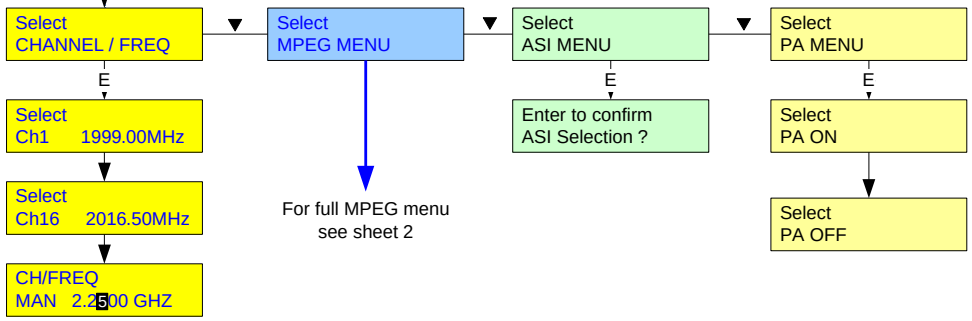
6.9.5 **Audio input impedance (Z)**

The input impedance (Z) of the analog audio inputs can be set to 600Ω or 50KΩ through this menu.

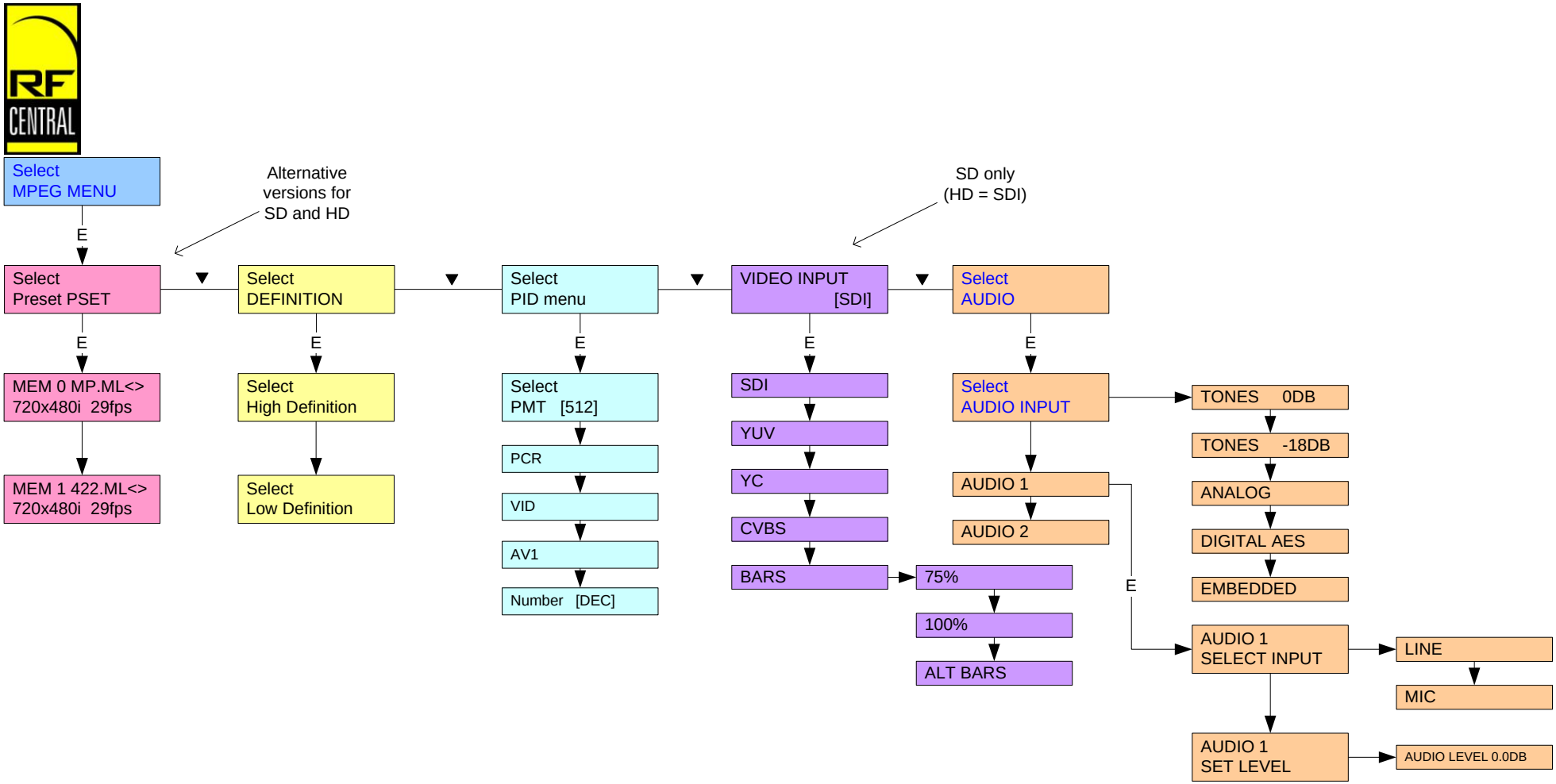
CURRENT OPERATIONAL STATE



CONFIGURATION MENU

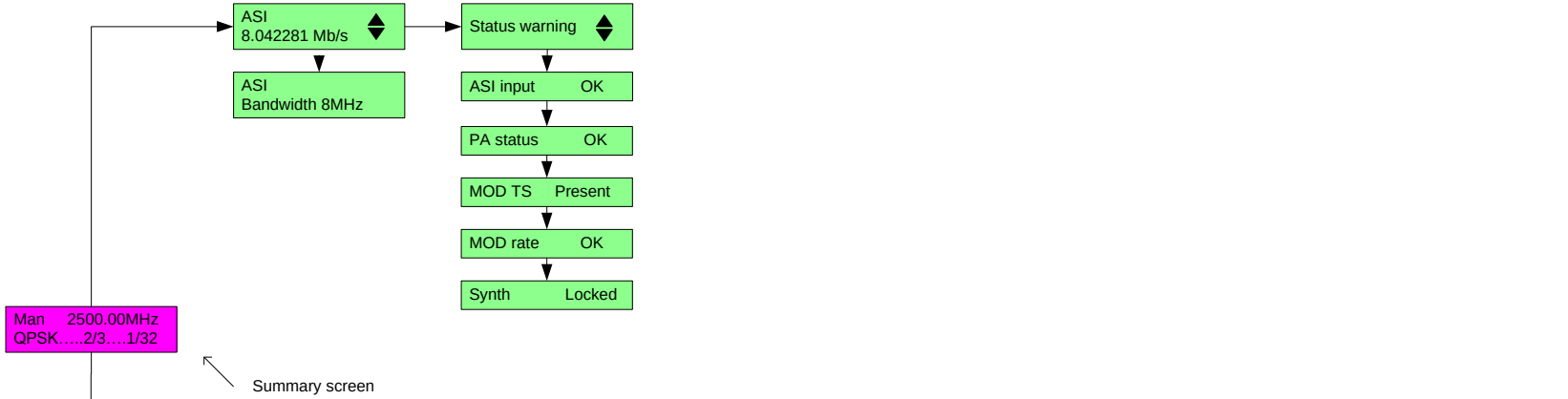


RFX-CMT-II
OPS MENU –
MPEG ENCODER MODE
Sheet 1

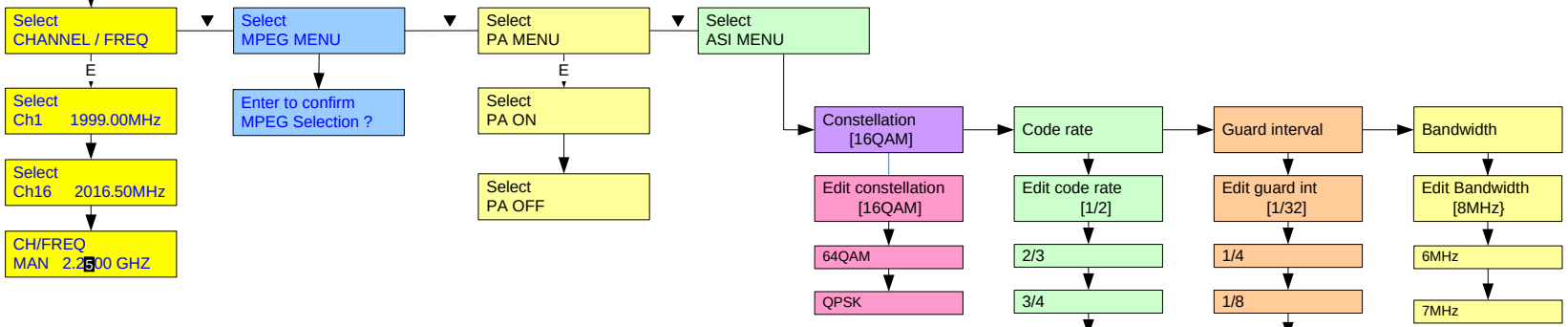


RFX-CMT-II
OPS MENU –
MPEG ENCODER MODE
Sheet 2

CURRENT OPERATIONAL STATE

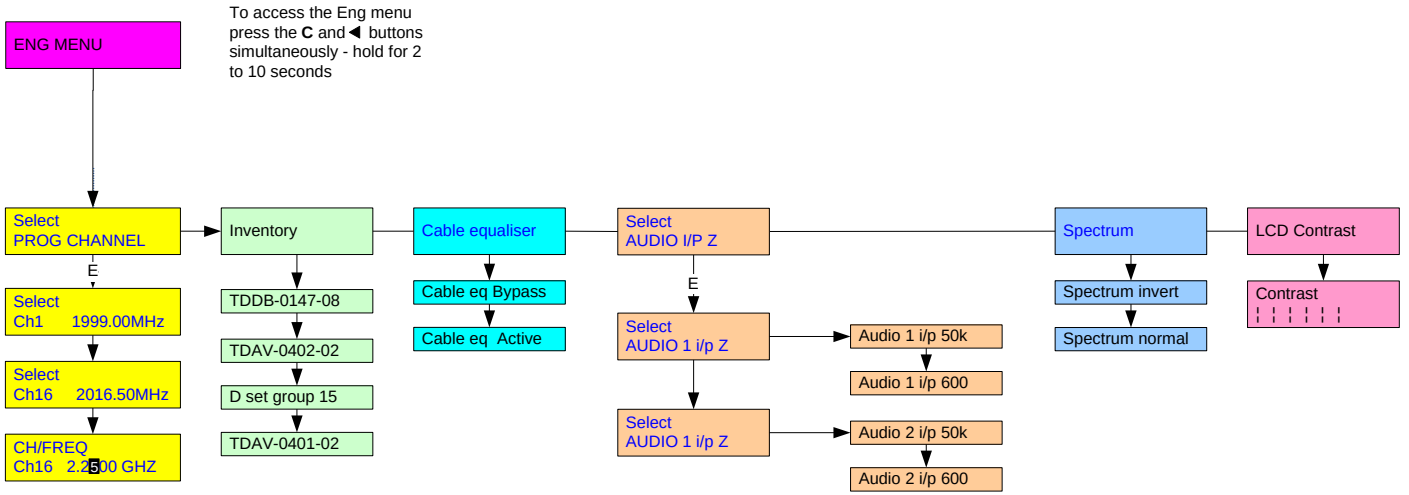


CONFIGURATION MENU



RFX-CMT-II
OPS MENU –
ASI MODE

ENGINEERING MENU



RFX-CMT-II
ENG MENU

7 PREPARING FOR OPERATION

EQUIPMENT PREPARATION

Prior to the start of operations, we recommend that the following equipment checks be made.

7.1 The RFX-CMT-II transmitter

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.

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-II can be powered up with the PA disabled, see paragraph 6.2.

The current operational set-up of the transmitter can be checked according to paragraph 6.6

7.2 The Receiving Equipment

The CMT-II transmitter may operate in conjunction with a variety of RF Central receivers, including the RMR, RMR-II, PMR, PMR-II, RMRT, RMRT-D, and the RMR-X6 six-way diversity system.

When used with the CMT-II transmitter, the RF Central receiving equipment produces two analog audio channels, duplicated as one (stereo) AES3; - the third and fourth audios are non-functioning at the receiver when used with the CMT-II Tx. Video outputs include SDI and composite video outputs, later RF Central receivers also have an ASI output and component video Y/C. 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-II Transmitter and set the channel selector switch to the channel number required. The Receiver is labeled with channel number and frequency information.

With *Two Box receivers* the Receiver Head and Control units may be operated at distances up to 600 meters apart. RF Central triax cable is supplied in standard lengths of 100 and 200 meters and will plug together to create the lengths required. Check that the necessary lengths of triax interconnecting cable are available and that the cable and cable connectors are in serviceable condition.

Whenever practical, set up the system and test it before leaving for the remote site to ensure that all components of the system are working properly. Checking the system, making necessary adjustments, and taking corrective actions ahead of time, will pay off later when setting up at the remote site.

8 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 HD	Part Number	Rate (Mbit/s)	COFDM Mode	MPEG	Video Rate (Mbit/)	Video Format	Encoding Mode	Audio Rate (kbit/)	Delay Setting
1	PBMP-3000-5002-2A	17.564	16-QAM, C3/4, G1/16	MP@H14-L Intraslice	15.00	1080i (25/29 fps)	Field Intraslice	384	Low
2	PBMP-3000-5011-10	18.096	64-QAM, C1/2, G1/32	MP@H14-L Intraslice	16.00	1080i (25/29 fps)	Field Intraslice	384	Low
3	PBMP-3000-5002-31	23.418	64-QAM, C1/2, G1/32	MP@H14-L Intraslice	21.00	1080i (25/29 fps)	Field Intraslice	384	Low
4	PBMP-3000-5012-10	18.096	64-QAM, C1/2, G1/32	MP@H14-L Intraslice	16.00	720p (50/59 fps)	Field Intraslice	384	Low
5	PBMP-3000-5006-0A	18.096	16-QAM, C3/4, G1/32	MP@H14-L Intraslice	16.00	1080i (25/29 fps)	Frame Intraslice	384	Std.
6	PBMP-3000-5013-10	18.096	64-QAM, C1/2, G1/32	MP@H14-L Intraslice	16.00	1080i (25/29 fps)	Frame Intraslice	384	Std.
7	PBMP-3000-5006-11	24.128	64-QAM, C2/3, G1/32	MP@H14-L Intraslice	22.00	1080i (25/29 fps)	Frame Intraslice	384	Std.
8	PBMP-3000-5014-10	18.096	64QAM, C1/2, G1/32	MP@H14-L Intraslice	16.00	720P (50/59 fps)	Frame Intraslice	384	Std.
SD									
1	PBMP-3000-1008-10	18.096	16-QAM, C1/2, G1/32	422 P@ ML Intraslice	16.00	PAL/NTSC	Field Intraslice	256	Low
2	PBMP-3000-1005-69	13.271	16-QAM, C2/3, G1/4	MP @ ML Intraslice	11.5	PAL/NTSC	Field Intraslice	256	Low
3	PBMP-3000-1005-42	8.294	QPSK, C3/4, G1/8	MP @ ML Intraslice	6.50	PAL/NTSC	Field Intraslice	256	Low
4	PBMP-3000-1005-40	5.529	QPSK, C1/2, G1/8	MP@ML, Intraslice	4.00	PAL/NTSC	Field Intraslice	256	Low
5	PBMP-3000-1009-10	18.096	64-QAM, C1/2, G1/32	422 @ ML GOP 12	17.00	PAL/NTSC	GOP 12	256	Std.
6	PBMP-3000-1006-69	13.271	16-QAM, C2/3, G1/4	MP@ML, GOP12	12.00	PAL/NTSC	GOP 12	256	Std.
7	PBMP-3000-1006-42	8.294	QPSK, C3/4, G1/8	MP @ ML GOP 12	7.0	PAL/NTSC	GOP 12	256	Std.
8	PBMP-3000-1006-40	5.529	QPSK, C1/2, G1/8	MP @ ML GOP12	4.5	PAL/NTSC	GOP 12	256	Std.

9 APPENDIX B: Table of DVB-T bit rates

8MHz COFDM RF Bandwidth

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