



**Your digital solution for wireless TV production  
and terrestrial news gathering.**

# **CARRY-CODER II**

## **User Manual**

**Manual P/N Rev. 2004-06-28  
(Applicable to the CARRY-CODER II, version 2.01)**

*Please note that this document contains preliminary information.  
Specifications are subject to change without prior notice.  
This document contains confidential information and is intended for customer use only.  
It cannot be duplicated without prior authorization from BMS.*

## GLOSSARY

|       |                                               |
|-------|-----------------------------------------------|
| 16QAM | Quadrature Amplitude Modulation (16 states)   |
| 64QAM | Quadrature Amplitude Modulation (64 states)   |
| ATSC  | Advanced Television Standard Committee        |
| COFDM | Coded Orthogonal Frequency Division Multiplex |
| CVBS  | Composite Video Baseband Signal               |
| DCE   | Data Communication Equipment                  |
| DVB   | Digital Video Broadcasting                    |
| DVB-T | Digital Video Broadcasting for Terrestrial TV |
| EMC   | Electro-Magnetic Compatibility                |
| EU    | European Union                                |
| GOP   | Group Of Pictures                             |
| MPEG  | Moving Pictures Engineering Group             |
| PIN   | Personal Identification Number                |
| QPSK  | Quad Phase Shift Keying                       |
| US    | United States of America                      |

## LEGEND



= Idea (Highlighted operator Information)



= Warning (indicates a critical or hazardous point)

## CONTENTS

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| 1. OVERVIEW .....                                                           | 4  |
| 1.1 Overview.....                                                           | 4  |
| 1.2 Overview.....                                                           | 5  |
| 2. GETTING STARTED .....                                                    | 5  |
| 2.1 Installing the transmitter on the camera: .....                         | 6  |
| 2.2 Installing the transmitter in the backpack:.....                        | 6  |
| GETTING STARTED .....                                                       | 7  |
| 2.3 Controlling the CARRY-CODER II transmitter: .....                       | 7  |
| 2.4 Transmitter operating configuration:.....                               | 7  |
| 2.5 CARRY-CODER II Transmitter <EXPERT> Operating mode configuration: ..... | 8  |
| 3. OPERATING INSTRUCTIONS .....                                             | 9  |
| 3.1 Start-up indications.....                                               | 9  |
| 3.2 Operator Menu summary .....                                             | 9  |
| 3.2 Operator Menu summary .....                                             | 10 |
| 3.3 Changing Operator Menu parameter values .....                           | 11 |
| 3.5 Setting Transmitter Output Power .....                                  | 13 |
| 3.6 Setting Transmission Mode and Robustness .....                          | 13 |
| 3.7 Recalling and Saving Operating Configurations .....                     | 14 |
| 3.8 Setting Video Input Parameters and Video Mode .....                     | 15 |
| 3.9 Setting Audio Input Parameters and Audio Level .....                    | 16 |
| 3.10 Configuring Data Input (RS232) .....                                   | 16 |
| 3.11 Configuring Transmission privacy .....                                 | 16 |
| 4. USING EXPERT MODE .....                                                  | 18 |
| 4.1 Expert audio-video parameters .....                                     | 18 |
| 4.2 Expert COFDM parameters.....                                            | 19 |
| 5. INPUT/OUTPUT CHARACTERISTICS .....                                       | 20 |
| 5.1 Composite video (CVBS).....                                             | 20 |
| 5.2 Component video (YUV) .....                                             | 20 |
| 5.3 Analog audio.....                                                       | 20 |
| 5.4 Data input.....                                                         | 20 |
| 5.5 Remote control port .....                                               | 20 |
| 5. RF output .....                                                          | 21 |
| 5.9 Power supply input .....                                                | 21 |
| 6. WARRANTY AND RETURN TO FACTORY .....                                     | 22 |
| 7. CONTACT INFORMATION .....                                                | 23 |
| ANNEX A : COFDM modes characteristics.....                                  | 24 |

## 1. OVERVIEW

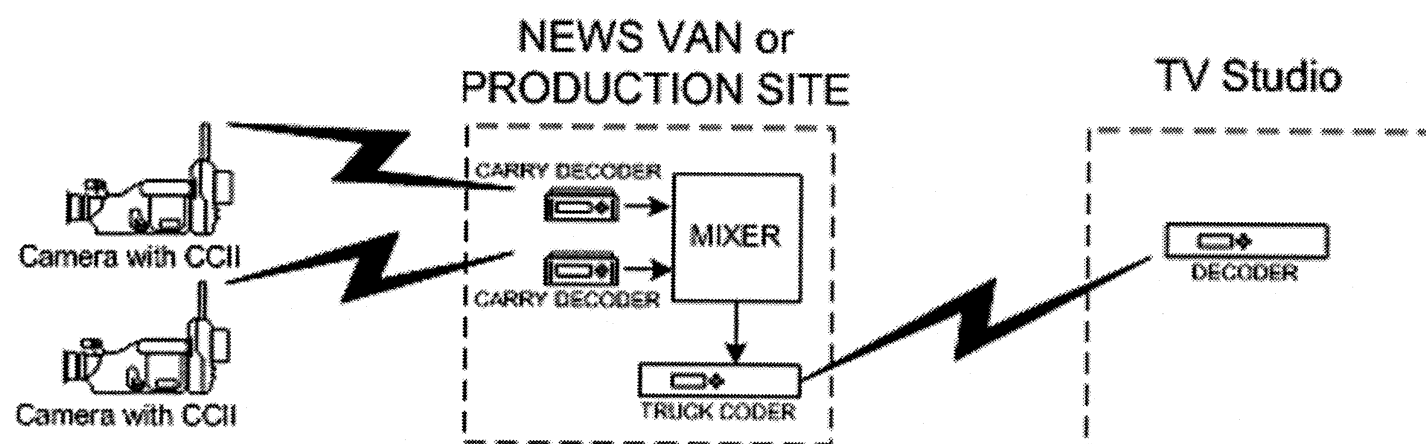
### 1.1 Overview

Wireless digital communications is increasingly used across the teleproduction community, especially by organization covering news and sports. The technology of DVB-T is generally adopted because of interoperability and reliable performance provided by MPEG-2 compression and COFDM.

BMS offers its expertise in the Carry-Coder product family with the high-power Carry-Coder II portable transmitter and companion COFDM integrated receiver-decoder.

The Carry-Coder product family includes:

- **CARRY-CODER II:** Portable transmitter, dockable to a camera or carried in a custom backpack.
- **NEWS-CODER II:** Rack-mounted COFDM transmitter for ENG mobile applications.
- **HELI-CODER II:** Transmitter system for aircraft applications.
- **DE-CODER II:** Rack-mounted COFDM integrated receiver-decoder.
- **CARRY DE-CODER II:** Portable COFDM integrated receiver-decoder.



Blue products are not  
supplied by BMS

Key features for these products are:

- Robustness
- DVB-T transmission for portable and mobile operation in a multi-path environment.
- High quality, reliable transmission of video and audio in portable and mobile use.
- Flexible audio, video and data interfaces.
- Compact size.
- Low-power consumption.

## 1.2 Overview

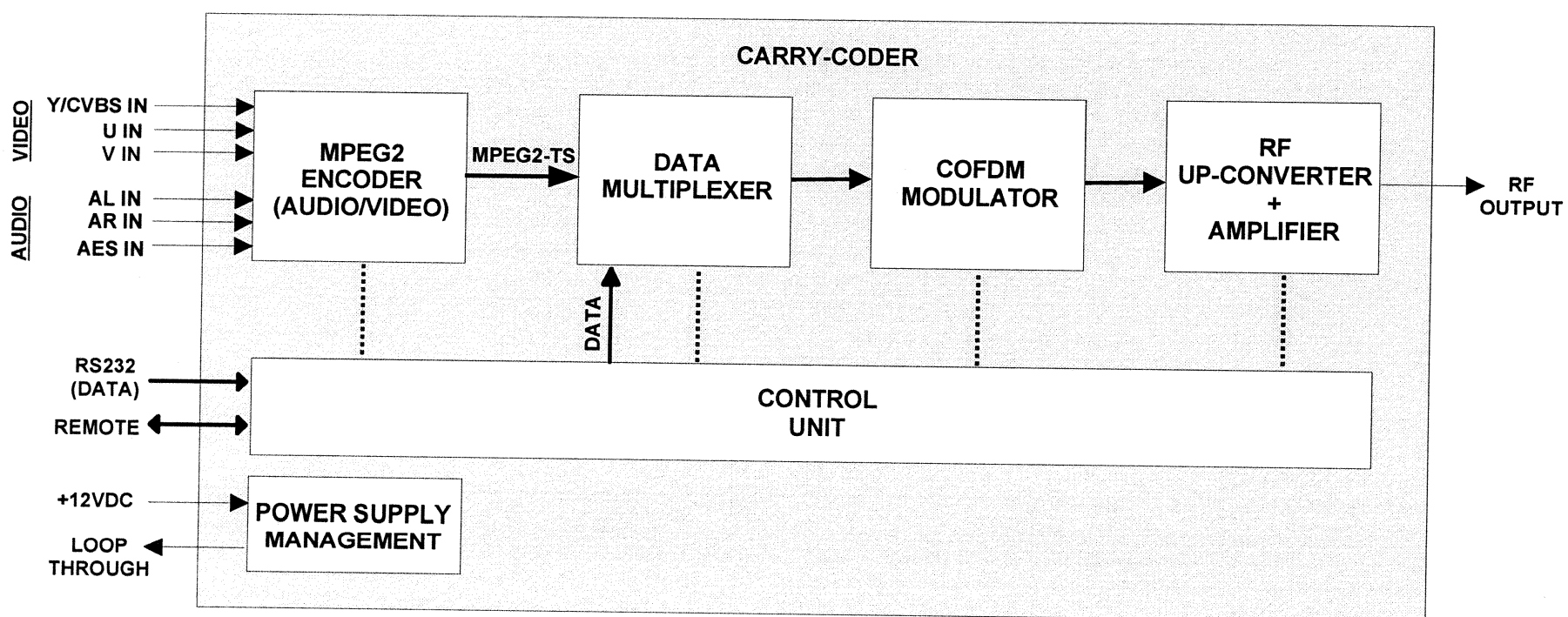
The CARRY-CODER II is a portable device that performs wireless digital transmission of audio, video and data.

It can be mechanically docked to the rear of a video camera equipped with a battery socket (Anton/Bauer or Sony).

It can be carried comfortably in a matching BMS backpack.

The Carry-Coder II interface consists of video and audio cables.

The following block diagram gives an overview of CARRY-CODER architecture:



The CARRY-CODER II is comprised of the following sub-systems:

- An MPEG-2 Encoder (1 video channel + 2 audio channels) compliant to ISO/IEC 13818 (MP@ML).
- A Data Multiplexer.
- A COFDM Digital Modulator ("2K" sub-carriers) compliant to ETS 300 744 (the DVB-T standard).
- An RF Up-Converter and RF Amplifier (providing up to 1W transmitter output power).
- A detachable control panel offering a user-friendly displayed interface for control and system status.

The CARRY-CODER II includes the following input/output connections:

- Composite video input (CVBS)
- SDI input
- Component video input (YUV)
- Analog audio line inputs (L+R)
- ASI Input
- Digital audio input (AES)
- 1 RS232 data interface (for user applications)
- 1 remote control port
- 1 RF output port
- 1 power supply input (11-32VDC nominal)
- 1 battery docking connector with "loop-through" power output.

 Changes or modifications not expressly approved BMS, Inc. could void the user's authority to operate the equipment.

## 2. GETTING STARTED

### 2.1 Installing the transmitter on the camera:

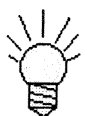
- Remove the battery from the camera battery connector socket; attach the transmitter onto the camera in its place.
- Connect the interface cables to the appropriate camera and CARRY-CODER II connectors.
- Carefully attach the BMS supplied transmitter antenna with integrated shielded extender to the connector on the top of the CARRY-CODER II. This antenna extension shaft ensures that the transmitted signal is sent out into unobstructed space for propagation of the COFDM signal. In addition this shaft ensures the safety of the operator in accordance to FCC and CE safe emissions requirements.
- 
- Attach the battery onto the CARRY-CODER II battery connector socket.
- Switch on the power for the camera and the CARRY-CODER II.

### 2.2 Installing the transmitter in the backpack:

- Open the backpack compartment flaps by “unzipping” the (hook and loop) closure seam tape.
- Place the CARRY-CODER into the backpack, inserting the docking tabs on (back side of unit) into the mating docking slots on the inside wall of the backpack. This ensures that the transmitter is safely retained and in position for proper ventilation.
- Close the backpack compartment flaps, securing the closure seam tape.
- Snap the external belt in place over the upper portion of the transmitter.
- Lift and open the hood that surrounds the CARRY-CODER II interface connectors.
- Connect the power cable coming from the backpack battery connector socket to the CARRY-CODER II.
- Connect the interface cables to the appropriate camera and CARRY-CODER II connectors.
- Carefully attach the BMS supplied antenna with integrated extension shaft to the antenna connector on the top of the CARRY-CODER II. This antenna extension shaft ensures that the transmitted signal is sent out into unobstructed space for propagation of the COFDM signal. In addition this shaft ensures the safety of the operator in accordance to FCC and CE safe emissions requirements.
- Attach the battery onto the CARRY-CODER II battery connector socket.
- Switch on the power for the camera and the CARRY-CODER II.



When the CARRY-CODER II is used in the camera mount or the backpack configuration the system must be used with the BMS supplied antenna that has an integrated shielded antenna extender in order to meet FCC and CE safe emissions requirements.



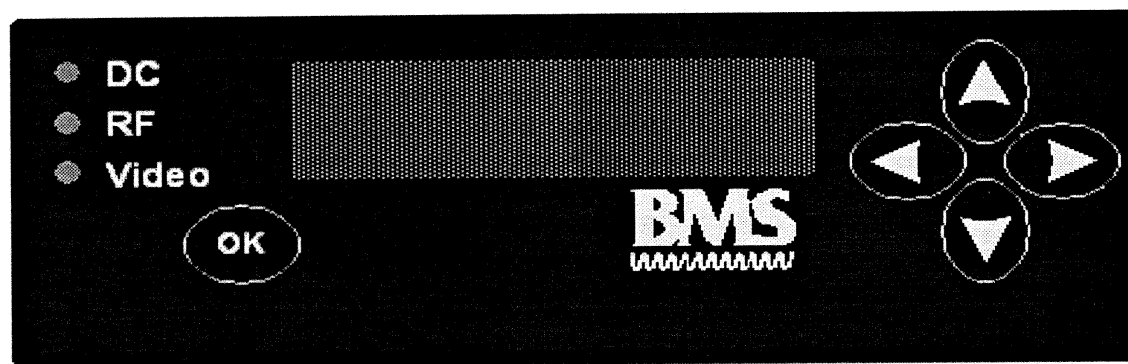
Please note that the CARRY-CODER II can be powered from an external supply source (i.e., a battery belt or the backpack battery) instead of an attached battery. For this purpose, the CARRY-CODER II provides a separate power connector and a switch to select the docked battery or a separate DC power source. The benefit provided by using the backpack is the efficient use of individual batteries, obtaining optimal battery life.

## GETTING STARTED

### 2.3 Controlling the CARRY-CODER II transmitter:

#### Control Unit features:

- The CARRY-CODER II control unit is designed for the convenience of the user.
- The control unit can be attached or disconnected at any time.
- Easily readable four line EL display.
- Operator navigation of menu with four intuitive directional buttons.
- Operational command entry using the <OK> button.
- Display includes status icons at right portion of top line.
- Text menu line one displays operating frequency.
- Text menu lines two and three are for system control functions.
- Text menu line four displays system status.



### 2.4 Transmitter operating configuration:

When the CARRY-CODER II is powered up for the first time, the operator can easily review the operating parameters using the control unit. Here is a listing of the parameters, in operating menu sequence.

- RF Output Operating Frequency (.25 MHz Steps or BAS Band Channel with Operating Frequency).
- RF Output Power (OFF LOW MID HIGH MAX).
- Transmission mode robustness (LOW MID HIGH).
- Recall Configuration (Presets 1 to 9).
- Save Configuration (Presets 1 to 9).
- Video Input (CVBS, YUV, ASI, SDI).
- Video Mode (PAL, NTSC).
- Audio Input (analog, AES, SDI).
- Audio Level Left
- Audio Level Right
- Data port Baud Rate (1.2, 4.8, 9.6 Kbps)
- Encryption (OFF or PIN code entry).
- User Mode (NORMAL, EXPERT)

CAUTION : PLEASE THOROUGHLY REVIEW SECTION 2.5 BEFORE USING <EXPERT> Mode.

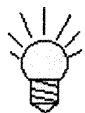
## 2.5 CARRY-CODER II Transmitter <EXPERT> Operating mode configuration:

NOTE: MOST USERS WILL OPERATE THE SYSTEM IN <NORMAL> MODE. THE <EXPERT> MODE PROVIDES USER CONTROL OF CERTAIN DVB-T PARAMETER SETTINGS. Here is a listing of those parameters, in operating menu sequence:

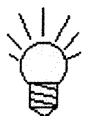
- Resolution (1/1,  $\frac{3}{4}$ ,  $\frac{2}{3}$ ,  $\frac{1}{2}$ )
- GOP Structure (I, IP, IBP, IBBP)
- GOP Length (6, 12, 18, 24)
- Constellation (QPSK, 16QAM, 64QAM)
- Guard Interval (1/32, 1/16, 1/8,  $\frac{1}{4}$ )
- Code Rate (1/2,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$ ,  $\frac{7}{8}$ )

Please refer to Section 3.8 for a table describing how these DVB-T parameters are applied to the three factory presets for signal robustness.

Section 4 contains operating instructions for using the EXPERT mode.



Certain operating parameters are used on a repeated basis. This involves combinations of settings as described in Section 2.4. These settings should be stored in memory as Configuration Presets 2 through 9. This provides fast restoration of parameter settings that are used most often..



A good backup plan is to maintain commonly used parameter settings (i.e., high robustness and maximum power) in a known configuration preset memory. If a problem occurs that won't go away, a known good parameter setting can be recalled from memory. This should help to resolve a problem. Another method is to adjust each parameter one by one, beginning with changing the operating frequency, to ensure that the link is not being affected by another signal on your selected operating frequency.

## 3. OPERATING INSTRUCTIONS

### 3.1 Start-up indications

The CARRY-CODER starts with display showing the status of the system. During system initialization, the CARRY-CODER II goes through self-test of its MPEG-2 encoder, COFDM modulator and RF sections. Due to the complexity of the system initialization process, this sequence lasts for a duration of approximately 30 seconds and looks like this:

```
BMS Inc. CarryCoder 2
Freq Agile 1990-2500
Software Ver. 2.01
Resetting
```

At the completion of the initialization process, the display should look like this:

```
2454.25 MHz
FREQUENCY
2454.25 MHz
```

If the self-test finds that a sub-system does not respond correctly, a status message is displayed on the fourth line of the display. For example, if the camera is not sending video to the transmitter, the display will include the appropriate message:

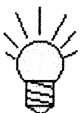
```
2454.25 MHz
FREQUENCY
2454.25 MHz
NO VIDEO
```



When the CARRY-CODER starts up, it is in the same condition as when it was powered down. This allows the user to replace the battery with no need to touch the controls.

### 3.2 Operator Menu summary

When the control panel display shows normal system status (no Error or Warning status message) and if there is no operator use of the control panel, the display goes dark to save battery life. Pressing any key on the control unit restores the display to show the status of the system.



**If there is a status message, the display will remain lit (will not go dark) until the problem is resolved.**

The user menus can be accessed from the status screen by pressing any key. Then, the user can scroll the menus by pressing the « ↑ » and « ↓ » keys.

After 30 seconds of keypad inactivity, the display automatically returns to the status screen.



Pressing the « ↑ » and « ↓ » keys simultaneously will cause the display to go to the status screen without having to wait 30 seconds.

### 3.2 Operator Menu summary

#### Carry-Coder II Operating Menu structure

|                      |
|----------------------|
| FREQUENCY            |
| 2454.25 MHz          |
| RF OUTPUT POWER      |
| OFF LOW MID HIGH MAX |
| ROBUSTNESS           |
| LOW MID HIGH         |
| RECALL CONFIGURATION |
| 1 2 3 4 5 6 7 8 9    |
| SAVE CONFIGURATION   |
| 1 2 3 4 5 6 7 8 9    |
| VIDEO INPUT          |
| CVBS YUV SDI ASI     |
| VIDEO MODE           |
| PAL NTSC             |
| AUDIO INPUT          |
| ANALOG AES SDI       |
| AUDIO LEVEL LEFT     |
| -9-----0+++4         |
| AUDIO LEVEL RIGHT    |
| -9-----0++++4        |
| DATA PORT BAUD RATE  |
| 1.2 4.8 9.6          |
| ENCRYPTION           |
| OFF ENTER PIN        |
| USER MODE            |
| NORMAL EXPERT        |

#### Carry-Coder II EXPERT Operating Menu structure

|                     |
|---------------------|
| RESOLUTION          |
| 1/1 3/4 2/3 ½       |
| GOP STRUCTURE       |
| I IP IBP IBBP       |
| GOP LENGTH          |
| 6 12 18 24          |
| CONSTELLATION       |
| QPSK 16QAM 64QAM    |
| GUARD INTERVAL      |
| 1/32 1/16 1/8 ¼     |
| CODE RATE           |
| 1/2 2/3 3/4 5/6 7/8 |