Installation and Operations Manual

Field-Coder II (FCII)

And Field-Coder II With Power Amplifier (FCII-MAX)

DOC# 6051420300 REV -

February 2007

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INTRODUCTION

The Field-Coder II (FCII) microwave transmitter is portable COFDM transmitter designed for applications that require temporary microwave link. Based on the field proven technology of the BMS Carry-Coder II, the FCII is weather resistant, sturdy, robust, easy to set-up and simple to use. The FCII is a digital transmitter and encoder compliant with COFDM DVB-T specifications. However The FCII by itself is only a 1W transmitter, covering a short range. FCII-MAX, an external 5W PA is necessary to provide enough range for the transmission. The FCII-MAX will operate by the FCII-AC, a powerful external power supply. Similar to FCII-transmitter, both FCII-MAX and FCII-AC are weatherproof units.

Features:

- Digital Transmission
- 6 MHz Occupied Bandwidth Feature
- Simple Set-up and Operation
- 9 Presets
- Field-Proven Design
- Intuitive Operator Controls
- DVB-T Standard-Compliant

This document provides instructions for the installation, operation and maintenance of the Field-Coder II.

Broadcast Microwave Services (BMS) is a leader in wireless digital microwave technology providing innovative products for the television broadcast, video, telemetry and surveillance industries. A wholly owned subsidiary of Cohu, Inc., BMS designs and manufactures a comprehensive line of microwave communications equipment for broadcasting sports venues, law enforcement and military applications. BMS also builds and integrates command and control centers to provide fully functioning, complex, end to end digital systems.

For the latest product and system information please visit www.bms-inc.com.

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Table of Contents

List of Figures

List of Tables

WARNING!
RF RADIATION EXPOSURE HAZARD

This warning is provided by Broadcast Microwave Services (BMS) Inc. for safety purpose. The following information help to reduce the risk of RF exposure hazard.

FCC Limit of RF Exposure

According to Federal Communication Commission (FCC), the Maximum Permissible Exposure (MPE) for FR radiation has been set to 1.0 mW/cm^2 for the Field-Coder II equipment (OET Bulletin 65).

The Field-Coder II with Power Amplifier is a non-broadcast transmitter and without an antenna it will not create RF exposure (power density) exceeding the 1.0 W/cm^2 FCC limit.

However a high-gain antenna such as a parabolic dish will greatly enhance the Field-Coder II output power density beyond the MPE limit of 1.0 mW/cm^2.

In this situation a minimum distance from the antenna needs to be calculated in order to keep the MPE always below the safety limit. The calculation has been done for Field-Coder II based on the formula mentioned in OET Bulletin 56.

The calculations have been done for different commonly used antenna in Electronic New Gathering (ENG) systems.

Digital Transmission

Figure 1 shows the plot of the minimum exposure distance for 0dBi, 5dBi, 16dBi, and 30dBi antennas. The 2 GHz Field-Coder II with Power Amp transmits the maximum power of 5 Watts. The minimum exposure distances are found from the cross points of the exposure graphs (for various antennas) with the line of maximum permissible exposure (i.e. 1 W/cm^2). Notice that the numbers in Figure 1 predict the worse case scenario, which is straight in front of the antenna (exposing to the antenna main-lobe). Obviously the side-lobe exposures are well below these numbers as the radiation intensity dramatically reduces on the side lobes.

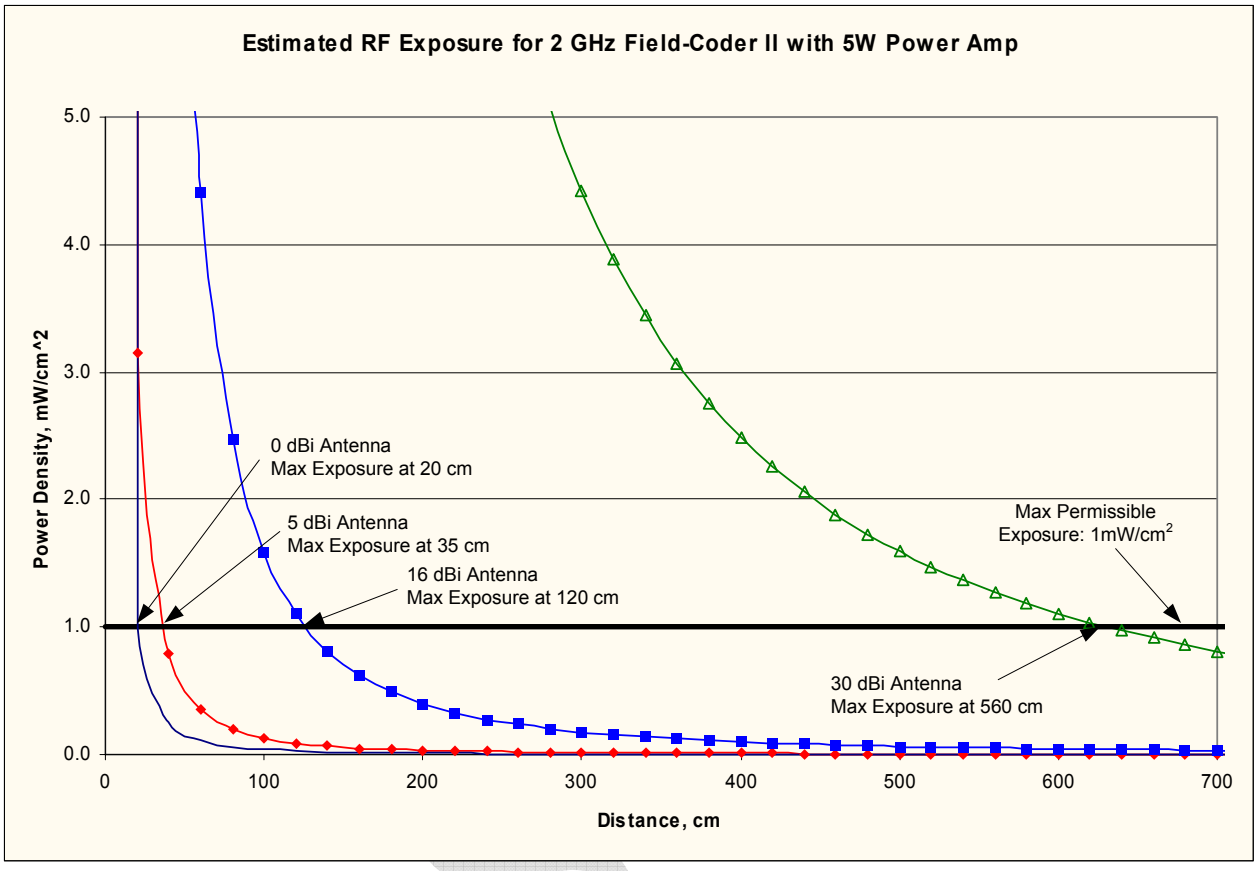


Figure 1

Summary

In order the keep the RF exposure within the FCC limit, it is necessary to maintain the safe distance from the antenna. The results shown in Figures 1 can be summarized in the following table:

Antenna Gain (dBi)	Minimum permissible distance from antenna (cm)
0	25
5	40
16	130
30	620

Notice the above table indicates worst-case situation (straight in front of the antenna).

SYSTEM DESCRIPTION

The Field-Coder II system is a portable 1W digital transmitter for wireless transmission of video, audio, and user defined private data. Built on the same platform as the field proven Carry-Coder II, the FCII has many of the same features and capabilities.

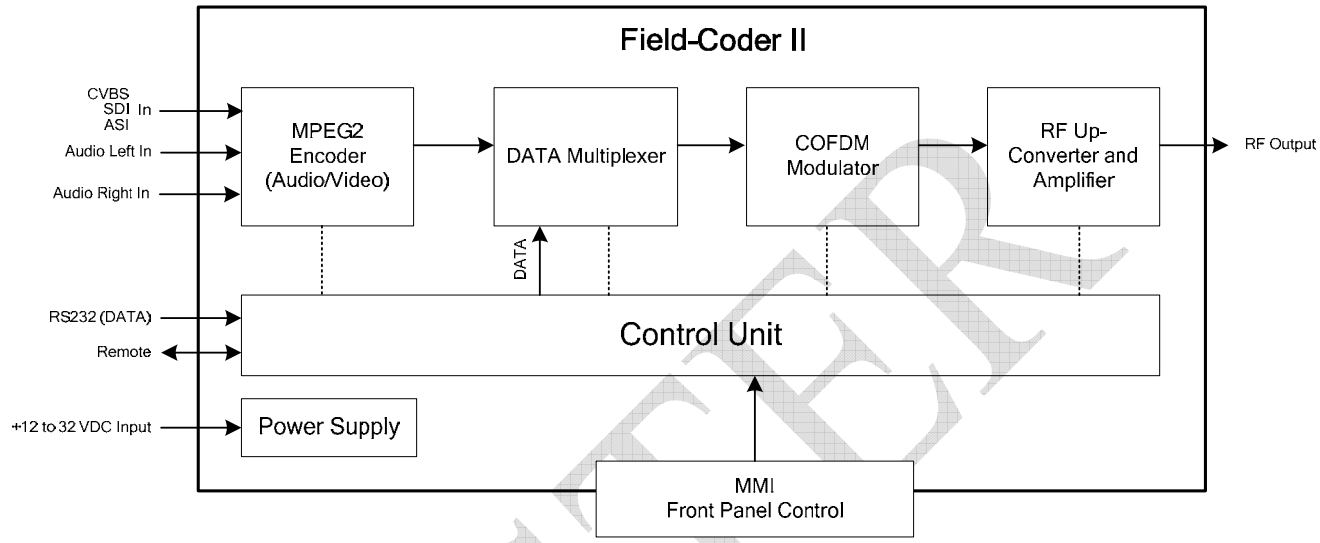


Figure 1 FCII Architecture Block Diagram

The FCII supports 2 audio (analog) inputs and one video (CVBS, SDI or ASI) input. The FCII includes an MPEG2 encoder and a DVB-T compliant COFDM modulator. Both MPEG and COFDM parameters are fully configurable by the system controller in support of optimum performance and compatibility with other equipment. For those users less familiar with detailed COFDM and MPEG settings, there are 3 preset robustness settings (low, mid and high) that each optimize video performance at the expense of modulation complexity. High robustness provides the lowest quality video but is able to operate in severely compromised locations. Low robustness provides the best quality video but may require a clear line of sight shot.

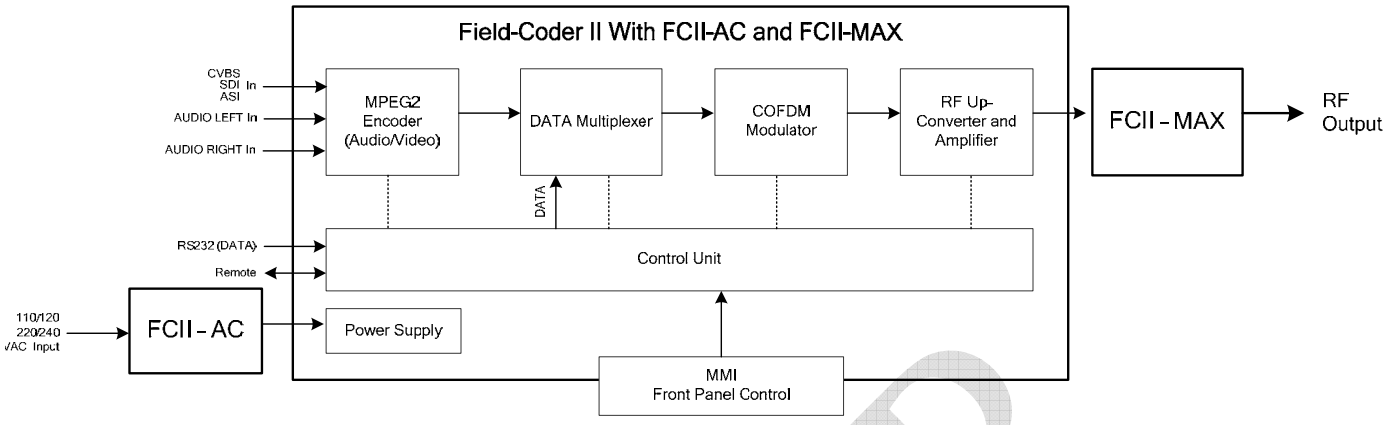
An auxiliary data channel is provided that can be configured to transmit data (GPS, etc.) at baud rates up to 9600 bps.

The FCII can be controlled directly through the Front Panel or remotely.

Configurations of the FCII

The FCII can be used:

- Independently – when supplied with +12 to + 32 VDC
- With the FCII-AC (AC to DC Power Converter) – to power the FCII from AC source
- With Both the FCII-MAX and FCII-AC – FCII-AC powers both the FCII and FCII-MAX



The FCII-AC is a weatherproof AC/DC power supply that can be used to power both the FCII and the FCII-Max from 110/220 VAC.

As a stand alone unit, the FCII is a 1 W digital transmitter. The FCII – MAX will increase the power output to 5W, significantly increasing the transmission range and robustness. Conveniently, the FCII-MAX can also be powered by the FCII-AC.

FCII Family Components and Accessories

The FCII Family consists of the following components and accessories:

Component	BMS Part Number
FCII	8014203XXX
FCII Accessory Kit	7614203020
Audio Cables,	7314203000
DC Power Cord,	7313444060
System DC Power Cord	7314204009
Tripod Bracket Assy	7614203040
FCII Side Brackets (4)	4414203001
10-32 x 3/8 FH Screws (20)	281006800
Installation and Operation Manual	6051420300
FCII – MAX	8014205XXX
FCII – MAX Accessory Kit	7614205000
N to N RG213 Cable	7310111009
System DC Power Cord	7314204012
FCII Side Brackets (4)	4414203001
10-32 x 3/8 FH Screws (20)	281006800
FCII – AC	8014204000
AC Power Cord	7313444040

Accessory Components	BMS Part Number
BTA-100 Tripod w/ Quick Disconnect head (optional)	8001285903
Mount for Tripod use (included with FCII Accessory Kit) (used on FCII or FCII-AC for Tripod w/ Quick Disconnect head) 3/8 - 16 x 5/8" FH Screw ¼ - 20 x 5/8" FH Screw Mounting Plate	7614203040 290133858 281007105 4414203051
Tripod Transit Case (optional)	250000050
Antenna Options	**BMS Part Number**
Horn Antenna (16 dBi Vertical Horn) w/Field-Lock Bracket (quick-disconnect)	8014203005
Horn Antenna (16 dBi RHC) w/Field-Lock Bracket (quick-disconnect)	8014203015
Field-Lock Bracket Mount (used on FCII or FCII-MAX, required to use Horn Antenna quick-disconnect) 1/4-20 X 1" SH Cap Screw SS 1/4" .78" THK High Collar S/L Washer SS	7614203010 290191410 290301400
Field-Lock Bracket (required to convert existing Horn Antenna to quick disconnect mount)	7614203000

Technical Specifications

Table 1 Physical Characteristics

	FCII	FCII – MAX	FCII – AC
Size	10.5"W x 11.25"D x 2.15" H	~ 9" W x 11" D x 2.5" H	9" W x 11" D x 2.5" H
Weight	~ 9.5 lbs.	~ 9.5 lbs.	~ 9.5 lbs.
Voltage Required	+11 to +32 VDC	+11 to +32 VDC	90-240 VAC
Power	56 Watts Max. with 1 Watt RF Output	95 Watts Max. with 4 Watts RF Output	150 Watts @ 28 VDC
Fuse	N/A	N/A	AC – 4A Fuse BMS p/n 514000404 DC – 6.3A Fuse BMS p/n 514000463
Temperature Range	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C
Relative Humidity	Up to 98% NC	Up to 98% NC	Up to 98% NC
Altitude	15,000' ASL	15,000' ASL	15,000' ASL

Table 2 RF Output

S-Band	
Frequency Range	1990 MHz - 2.5 GHz

Frequency Step	250 kHz
Channel Plan	Programmable
Modulation	COFDM (2K carriers)
Output Power	50 mW, 100 mW, 250 mW and 1W (selectable)
Shoulders at +/- 4.2 MHz	> 30 dB for 1W > 35 dB for 250 mW or less
Harmonic and Spurious	< -60 dBc (DC to 6 GHz)
Return Loss	18 dB (typical)

Table 3 COFDM Parameters

COFDM Parameter	Specification
Guard Interval of Symbol	1/4 , 1/8, 1/16 or 1/32
Modulation of Sub-Carriers	QPSK, 16QAM, 64QAM
Error Correction	Viterbi (code rate : 1/2, 2/3, 3/4, 5/6 or 7/8) Reed-Solomon (204, 188)
Channel Bandwidth	8/7/6 MHz
Standard	ETS 300 744 (DVB-T)

Table 4 Video Inputs

Video Input Parameter	Specification		
Video Input	CVBS Composite Video Baseband Signal	SDI Serial Digital Interface	ASI Asynchronous Serial Interface
Encoding Standard	MPEG2 ISO/IEC 13818-2	SMPTE 259M CCIR601	DVB-ASI TR 101 891
Format			
PAL	625 lines / 50 Hz / Fsc = 4.43 MHz		
NTSC	525 lines / 60 Hz / Fsc = 3.58 MHz		
Impedance	75 Ohms		
Connector	BNC - Female		

Table 5 Audio Input

Audio Input Parameter	Specification
Audio Input	Analog (Line – Symmetrical)
Channels	2 separate channels (Left and Right)
Nominal Level	Adjustable from –9 dBu to +4 dBu (0 dBu = 775 mV)
Headroom	12 dB (analog) – 18 dBFs (digital)
Sampling Frequency	48 kHz – 20 bits
Frequency Response	30 Hz – 20 kHz (+/- 0.5 dB)
Signal-To-Noise Ratio	75 dB
Total Harmonic Distortion	< 0.5 % @ 1kHz
Impedance	< 100 Ohms

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FCII SET-UP with FCII-AC and FCII-MAX

The FCII can also be used with the FCII-AC and the FCII-MAX together. Using the brackets (BMS p/n 4414203001) to join the three components, and installing the quick disconnect tripod mounting plate to the bottom of the FCII-AC will speed up field set-up. The FCII-AC should be placed on the bottom of the stack, with the FCII in the middle and the FCII-MAX on the top. The preparation for quick field set-up is as follows:

- Tripod Quick Disconnect Mound Installation to the FCII-AC (if applicable)
- Installing Antenna bracket quick disconnect Mount to the FCII-MAX
- Attaching the FCII, FCII-AC and the FCII-MAX together
- Cable Interconnections

Installing the Tripod Quick-Disconnect Mount to FCII-AC

Please follow the procedures in section **Error! Reference source not found. Error! Reference source not found.** to install the tripod quick disconnect mounting plate to the FCII-AC.

Attaching the FCII, FCII-AC and FCII-MAX together

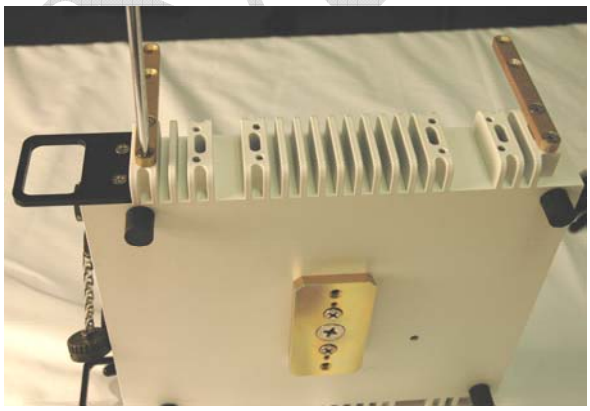
When using the FCII with the FCII-AC and the FCII-MAX it is convenient to stack them all together. The stack order is as follows; FCII-AC on the bottom, FCII in the middle, and the FCII-MAX on top. This allows for proper access and adequate cooling for each component.

The FCII components are designed to be stacked on top of each other and secured by simple brackets on either side. There are 6 sets of threaded holes, 3 pair forward, 3 pair toward the back, on either side of the components. There is no real requirement for which sets are used provided the load is distributed both front and back and the components are stacked flush with each other.

Tools Needed:

#2 Phillips Head screwdriver

The design of the FCII-AC requires that it is placed on the bottom of the stack. Use 4 #10-32 screws to secure, but do not tighten, two brackets, one forward, one back to one side of the FCII-AC.

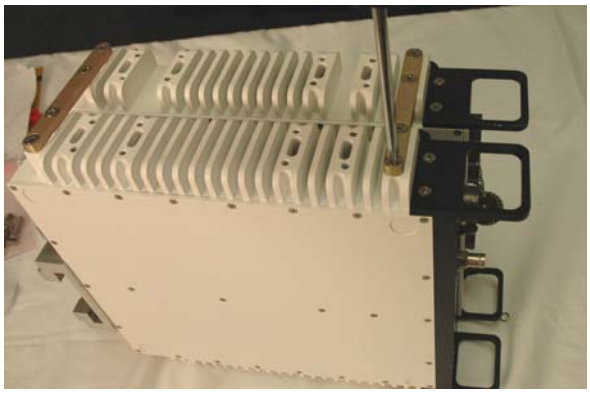


Use 4 #10-32 screws to secure, but do not tighten, the two brackets on the opposite side of the FCII-AC.

Align the FCII so that it is facing the same way as the FCII-AC.

Slip the FCII in between the brackets.

Secure the FCII to the brackets using the matching hole set used on the FCII-AC. The FCII should be stacked directly on top of the FCII-AC, not staggered.



Tighten all screws.

The FCII-MAX power amplifier requires proper heat transfer. The FCII-MAX needs to be on the top of the stack.

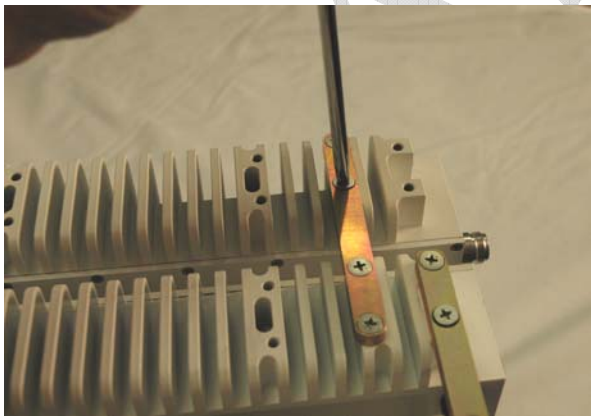
Use 4 #10-32 screws to secure, but do not tighten, two brackets, one forward, one back to one side of the FCII.

Use 4 #10-32 screws to secure, but do not tighten, the two brackets on the opposite side of the FCII.

Align the FCII-MAX so that it is facing the same way as the FCII-AC and FCII.

Slip the FCII-MAX in between the brackets.

Secure the FCII-MAX to the brackets using the matching hole set used on the FCII. The FCII-MAX should be stacked directly on top of the FCII, not staggered.



Tighten all screws.

Figure 2 is an example of one way to install the brackets used to attach the FCII-AC, FCII and FCII-MAX together.

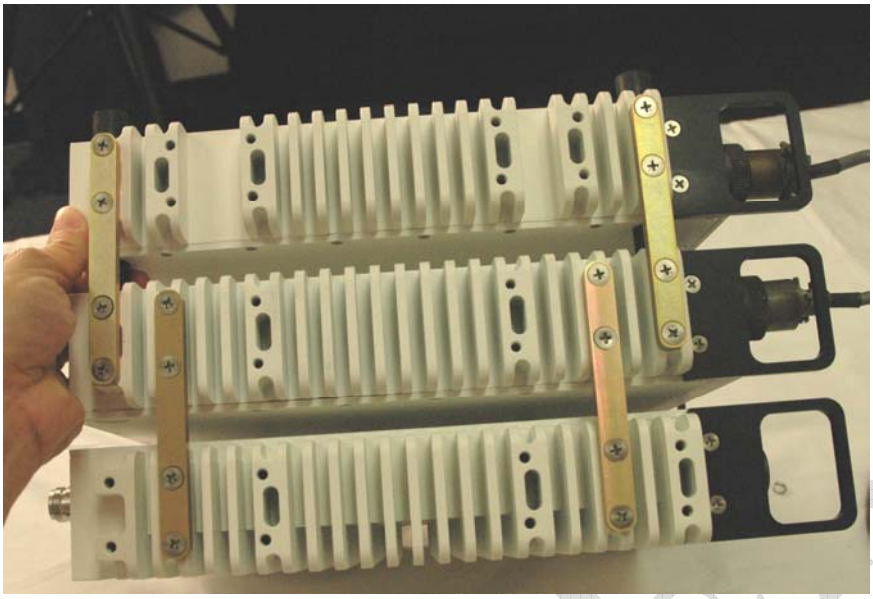


Figure 2 FCII-AC, FCII, and FCII-MAX Bracket Attachment

Cable Interconnections

To hasten field set-up time, it is advantageous to have some of the interconnect cables already connected. The cable connections between the three components are as follows:

The power cable from the FCII-AC to the FCII

The power cable from the FCII-AC to the FCII-MAX

The RF cable from the FCII to the FCII-MAX, this cable is connected in the field after the Horn Antenna is mounted.

The power connection DC to FCII on the FCII-AC to the power input connector on the FCII located right below the ON OFF switch.

To connect the power connection from the FCII-AC to the FCII, align the connector, matching the keys on one side to the grooves on the other.

Slide the connector into place and twist connector housing to secure.

Repeat for connecting the cable to the FCII.

To connect the power cable from the FCII-AC to the FCII-MAX, remove the attached connector cover.

Align the proper connector on cable BMS p/n 7314204012 , matching the keys on one side to the grooves on the other.

Push the connector in place and twist the connector housing to lock the connector down.

Repeat with connecting the other end of the cable to the FCII-MAX.

Figure 3 demonstrates how the cables should look when all three components are attached.

Figure 3 FCII-AC, FCII and FCII-MAX Attached Cable Connections

This completes the FCII preparation for quick field set-up for this configuration. Please proceed to Sections 0 and **Error! Reference source not found.** to continue with the initial set-up for the FCII.

USER INTERFACE

All the transmission parameters are configured through the control panel.

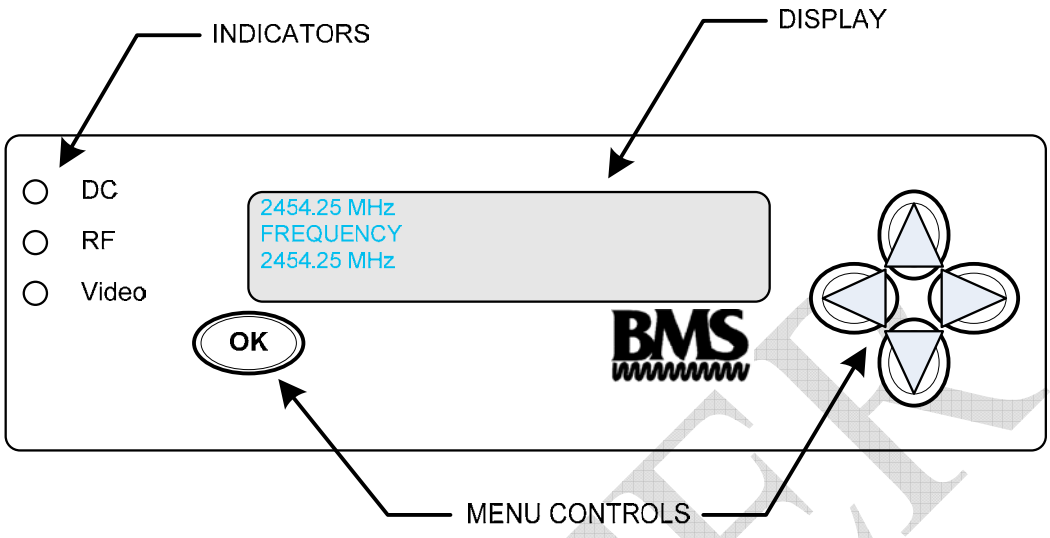


Figure 4 FCII Control Panel

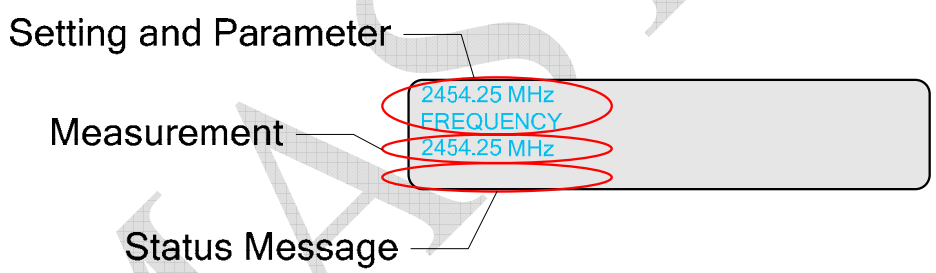


Figure 5 FCII Status Screen

Pressing any of the menu controls will bring up the menu screens. Use the ↑ and ↓ buttons to scroll through the menus. Pressing OK on a menu screen will allow changes to that menu's parameters. The → and ← buttons move the cursor. The FCII display will return to the status screen after 30 seconds of no-input, or when the ↑ and ↓ buttons are pressed simultaneously.

The FCII has two tiers of menus, Normal and Expert. The Normal menus provide control of system functions that are needed in routine portable transmission situations. The Normal menus are the more frequently used menus. The Expert Menus are used for advanced configuration of the FCII. The Expert menus enable the operator to selectively adjust key (audio and video) compression and COFDM transmission parameters. The Expert menus should be reserved to advanced users. Improper configuration of the Expert menu parameter settings could result in transmission failure.

What follows is a list of all the FCII menus, with brief description and instructions for use.

Table 6 Normal Mode User Menus

Normal Menu	Description	How to Use
2454.25 MHz FREQUENCY 2454.25 MHz	RF Frequency Displays RF Transmit Frequency.	To set the RF Frequency press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz RF OUTPUT POWER off low <u>mid</u> high max	RF Output Power Boost or Reduce Signal Strength	To set the RF Output Power, press OK. Use the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to when finished.
2454.25 MHz ROBUSTNESS low <u>mid</u> high expert	Transmission Robustness Choose from 3 predefined settings, or operate in Expert Mode	Change the Robustness by using the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to set. Low – Studio, Mid – News, Sports, Entertainment High – Mobile/Airborne Expert – Custom Configuration
2454.25 MHz RECALL CONFIGURATION 1 2 3 4 5 6 7 8 9 default	Recall Configuration	Recall a saved configuration. Press OK to change. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished. Default is set by the factory
2454.25 MHz SAVE CONFIGURATION 1 2 3 4 5 6 7 8 9	Save Configuration Allows a set of parameters to be recalled at a later time.	To save a configuration after all parameters have been set, use the → and ← buttons to select where to save. The current choice is <u>underlined</u>. Press OK to save.
2454.25 MHz VIDEO INPUT <u>CVBS</u> YUV SDI ASI	Video Input Mode YUV is not an option for the FCII. The FCII will default to CVBS	To change the Video Input Mode,, use the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to set.
2454.25 MHz VIDEO MODE PAL <u>NTSC</u>	Video Mode Current Video Mode is <u>underlined</u>	Change the Video Mode from PAL to NTSC. Use the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to set.
2454.25 MHz AUDIO INPUT <u>analog</u> SDI	Audio Input	Change the Audio Input from analog to SDI. Use the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to set.
2454.25 MHz AUDIO LEVEL LEFT -9--------<u>0</u>+++4	Audio Output Level Left Channel Displays Audio Output level for the left channel	Set the Audio Output Level. Use e the → and ← buttons to move the cursor. Press OK when finished.
2454.25 MHz AUDIO LEVEL RIGHT -9--------<u>0</u>++++4	Audio Output Level Right Channel Displays Audio Output level for the right channel	Set the Audio Output Level. Use e the → and ← buttons to move the cursor. Press OK when finished.
2454.25 MHz DATA PORT BAUD RATE 1.2 4.8 <u>9.6</u>	Auxiliary Data Rate Configure the Aux. RS232 Port Baud Rate	To change the baud rate, use the → and ← buttons to navigate choices. The current choice is <u>underlined</u>. Press OK to set.

Normal Menu	Description	How to Use
2454.25 MHz DATA PORT MODE CCII CCI	Auxiliary Data Port Mode Configure the Aux. RS232 Port	To change the data port mode, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to set.
2454.25 MHz Scrambling off enter PIN	Scrambler Privacy Identification Number Enable transmission privacy scrambling. Current selection is in underlined	To set the Privacy Identification Number for transmission privacy, use the → button to select "enter PIN". Press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished. Note that the PIN only shows when it is being set. This PIN must match the reciever PIN. When operating with a DCI, the first two digits must be set to zero and rest must be from0 to 9. <00####>
2454.25 MHz Channelized System OFF ON	Use Channelized Frequencies	Use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to set.
2454.25 MHz USER MODE normal expert	User Mode Allows access to EXPERT Level Menus	Normal mode provides operation simplicity for routine use. Expert mode allows the user to selectively adjust key compression and COFDM settings. Specific parameters are required to ensure proper operation. For this reason, EXPERT mode is reserved for trained "Expert" users. Use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to set.

NOTE:

The Expert Menus should only be configured by advanced users. Improper configuration can result in transmission failure.

Table 7 Expert Mode User Menus

Expert Menu	Description	How to Use
2454.25 MHz Video bitrate 4.35 Mbps	Video Bitrate Controls Picture Resolution. Larger values increase the resolution and increases the time between picture updates. Smaller values decrease resolution and decreases the time between picture updates.	This is an EXPERT Level parameter To change the video bitrate, press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz GOP STRUCTURE I IP IBP IBBP 422IBBP	GOP Structure Controls the structure of picture groups. Affects video encoding delay	This is an EXPERT Level parameter To set the GOP structure, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz GOP LENGTH 6 12 18 24	GOP Length Set the length of picture groups. High value, longer group, better quality, more chance for errors.	This is an EXPERT Level parameter To set the GOP length, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz CONSTELLATION QPSK 16QAM 64QAM	Constellation Individually modulates each sub-carrier of the COFDM signal. QPSK most robust, low data rate, 64QAM least robust, fastest data rate	This is an EXPERT Level parameter To set the constellation, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz GUARD INTERVAL 1/32 1/16 1/8 1/4	Guard Interval Guards both ends of a symbol. Higher ratios more robust than lower ratios	This is an EXPERT Level parameter To set the Guard Interval use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz CODE RATE 1/2 2/3 3/4 5/6 7/8	Code Rate Ratio of signal to error correction. Higher values, faster rate, but more errors the slower, lower ratios.	This is an EXPERT Level parameter To set the coder rate, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz Channel Bandwidth 8 7 6 MHz	Channel Bandwidth	This is an EXPERT Level parameter To set the Channel Bandwidth, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz Serial Address 0123456789ABCDEF	Serial Address Set to 6 in all cases except when the CCII is being controlled by something other than the Remote.	This is an EXPERT Level parameter Set the Serial Address, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK when finished.

Expert Menu	Description	How to Use
2454.25 MHz Scrambling Type A B	Scrambler Type Type A – Most Common Type B – Rare	This is an EXPERT Level parameter To set the Scrambler Type, use the → and ← buttons to navigate choices. The current choice is underlined. Press OK to when finished.
2454.25 MHz Video PID 300	Video Packet Identifier BMS default is 0300	This is an EXPERT Level parameter To set the Video PID, press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz Audio PID 301	Audio Packet Identifier BMS default is 0301	This is an EXPERT Level parameter To set the Audio PID, press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz PCR PID 101	Program Clock Recovery BMS default is 0101	This is an EXPERT Level parameter To set the PCR PID, press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz PMT PID 200	Program Map Table BMS default is 0200	This is an EXPERT Level parameter To set the PMT PID press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.
2454.25 MHz SDT String BMS Camera 01	Stream Description Table String Provides a unique identifier to a transmission stream. When using ASI, the FCII will employ the SDT String specified with the ASI Signal.	This is an EXPERT Level parameter To set the SDT, press OK. Use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.

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OPERATION

Field Set-up

These instructions are for setting up FCII systems that have been prepared and configured for quick field set-up. If the FCII system is not being used with a tripod, be sure to set the FCII on a stable surface before installing the antenna, connecting power, or operating.

For Tripod Use

Set the tripod up so that it is stable.

Mounting on the Tripod

Seat the FCII Tripod Mounting Plate into the Tripod Mount. Fully extend the lever and angle the unit to maneuver the mounting plate in on one side, then the other. When it is seated, the mounting plate will be just barely visible.

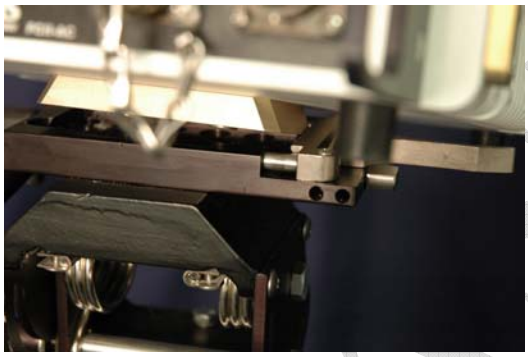

Figure 6 Not Seated

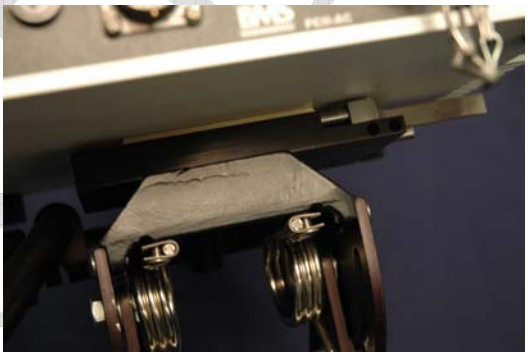

Figure 7 FCII Seated in Tripod Mount

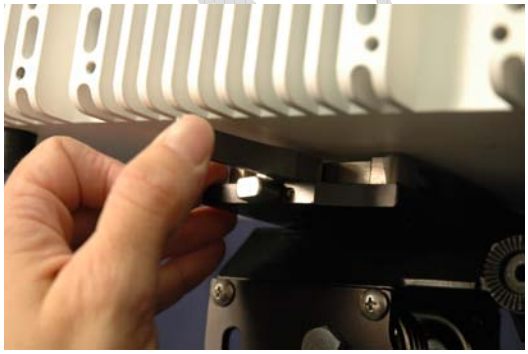

Figure 8 Close the Clamp

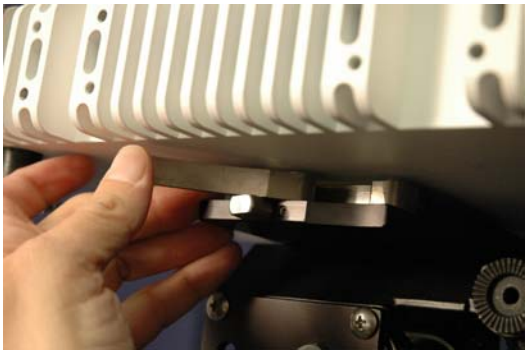

Figure 9 Fold the lever flush

Lock the Clamp.

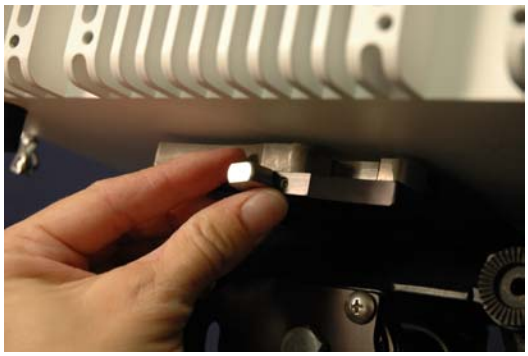

Figure 10 Not Locked

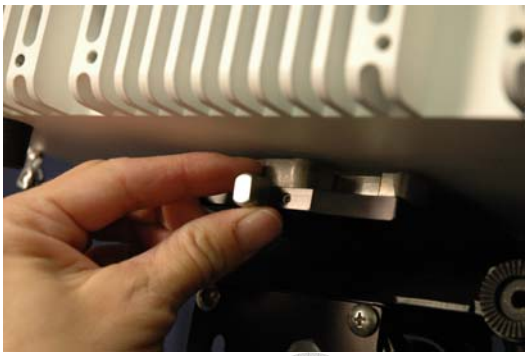

Figure 11 Locked

Attaching the Horn Antenna

Align the antenna bracket on the horn antenna perpendicular to the bracket mount on the back of the FCII or FCII-MAX unit.

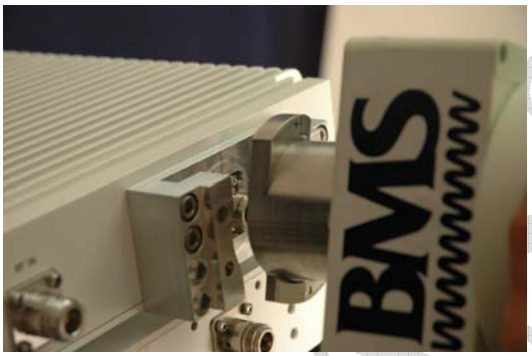

Figure 12 Align Antenna Mount with Bracket

Figure 13 Insert Antenna Mount into Bracket

Figure 14 Rotate Antenna to Lock

Figure 15 Antenna Locked to Mount

Cable Connections

If using the FCII-MAX, connect the RF cable from the FCII to the RF In connection on the FCII-MAX after installing the Horn Antenna.

Figure 16 Connect the RF Cable to the FCII

Turn the knurled sleeve to tighten

Figure 17 Connect the RF Cable to the RF In Connector on the FCII-MAX

Turn the knurled sleeve to tighten

Connect the video input to the VIDEO IN connector on the FCII front panel.

Connect the audio input to the AUDIO IN connector on the FCII front panel.

Supply the FCII with power either 28VDC direct to the FCII via the terminal under the ON/OFF switch, or AC (120 or 240) through the FCII-AC via the AC-INPUT connector on the front panel.

Operation

Verify all cable connections are secure.

Turn video source on. FCII will not transmit without a valid video source.

Turn on the FCII-AC power (if applicable).

Turn on the FCII.

Note:

The FCII stores the operating settings upon shut down. When it is restarted, the FCII starts in the same state it was shut down in. If the FCII was shut down during transmission, it will start in transmission, with the same settings it had when it was last operated.

Manually Configure FCII for Broadcast

Select Frequency

Press the any of the menu keys to bring up the frequency menu.

2454.25 MHz
RF Input Freq
2454.25 MHz

Press OK to enter the menu, use the ↑ and ↓ buttons to change the value. The → and ← buttons move the cursor. Press OK when finished.

Select Transmission Power

Use the ↑ and ↓ buttons to navigate to the RF OUTPUT POWER menu.

Use the ➔ and ➔ buttons to select the output power and start transmission. Press OK.

Select Robustness

Optimize the transmission by changing the robustness setting. Use the ↑ and ↓ buttons to navigate to the ROBUSTNESS menu

Use the ➔ and ➔ buttons to select the desired robustness setting. Press OK.

Using a Preset Configuration

To use a preset configuration, use the ↑ and ↓ buttons to navigate to the RECALL CONFIGURATION menu.

Use the ➔ and ➔ buttons to select the desired numbered configuration. Press OK.

Select Transmission Power

Use the ↑ and ↓ buttons to navigate to the RF OUTPUT POWER menu.

Use the ➔ and ➔ buttons to select the output power and start transmission. Press OK.

Shut Down

Stopping Transmission

Use the ↑ and ↓ buttons to navigate to the RF OUTPUT POWER menu.

Use the ➔ and ← buttons to select off to stop transmission. Press OK.

Power Down the FCII

Flip the FCII ON/OFF switch to the OFF position.

Flip the FCII-AC to POWER switch to the OFF position.(if applicable).

Disconnect the power chord from the FCII-AC (if no FCII-AC in use, then disconnect power from the FCII.)

Disconnect the RF cable from the FCII to the FCII-MAX (if applicable).

Remove the antenna. Twist to align the flanges with the opening. Pull straight out.

Remove the FCII components from the tripod. Unlock the clamp lever. Release the clamp and lift the FCII off the tripod.

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PREVENTATIVE MAINTENANCE

In order to ensure system longevity it is highly recommended that the following preventative maintenance procedures be done at the appropriate time.

Maintenance Schedule

Procedure	Yearly	Quarterly	Monthly	Prior to Each Use
Inspect Mounting Hardware on Tripod, FCII and FCII-AC units				■
Inspect All Cables (connection, chafing)				■

Suggested Spare Parts List

The FCII-AC has two fuses located on the front panel. These are a 4A AC Fuse BMS p/n 514000404 and a 6.3A DC Fuse BMS p/n 514000463.

There are no other serviceable parts. Any attempts to service any other individual components may void the warranty.

Fuse Replacement Procedure

Tools Needed

Standard Screwdriver

1. Remove the old fuse by using the screwdriver to unscrew the fuse cap on the front panel of the control panel (see Figure 18 and Figure 19)
2. Remove the old fuse & dispose.
3. Insert new fuse into the fuse holder.
4. Replace the fuse cap using a screwdriver to secure it in place.

Unscrewing the AC Fuse Cap

Removing the AC Fuse Holder

AC Fuse in Holder

Figure 18 Replacing the AC Fuse

Unscrewing the DC Fuse Cap

Removing the DC Fuse Holder

Figure 19 Replacing the DC Fuse

WARRANTY

BMS warrants that, at time of delivery, the product will be free from defects in materials and workmanship provided the equipment or system is installed, operated and maintained in accordance with the Operation and Maintenance manual or such other BMS documentation as may be applicable. Any such defect reported to BMS within two years, BMS will take reasonable and prompt action to repair or replace such equipment.

Should any of the components be defective, please contact BMS immediately. Please have the following information available so we can best serve you.

- Customer Name
- Contract Number
- BMS Model Number
- Serial Number
- Detailed Description of Problem
- Name of Contact Person.
- Contact Information such as phone number and/or email address.
- Return Information

Much of this information can be found on the product label found on the component.

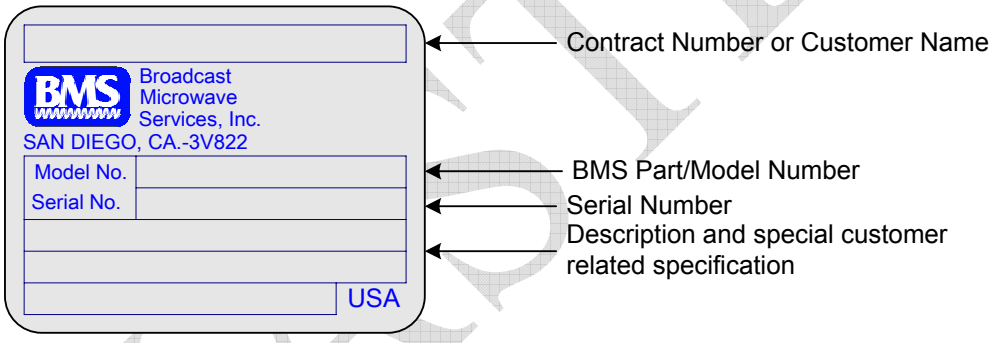

Figure 20 Product Label

Defective components under BMS warranty will be repaired/replaced promptly at the discretion of BMS. Items no longer under warranty will require a PO before repairs can proceed.

NOTE:
All goods returned for service require an RMA #. Any goods received without an RMA# may not be processed in a timely manner. Please contact BMS for an RMA#.

Customer Service Information

Broadcast Microwave Services, Inc.
12367 Crosthwaite Circle
Poway, CA 92064

Toll free (US): 800-669-9667
Fax: +1 (858) 391-3049
Email:support@bms-inc.com
Web: www.bms-inc.com

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Additional References

US Broadcast Frequency Assignments

Coded Orthogonal Frequency Division Multiplex (COFDM) Modulation

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US Broadcast Frequency Assignments

Old BAS Channel Plan 2 GHz (S) Band 1990-2110 MHz			17 MHz CW
1	1994.75	1999.00	2003.25
2	2012.25	2016.50	2020.75
3	2029.25	2033.50	2037.75
4	2046.25	2050.50	2054.75
5	2063.25	2067.50	2071.75
6	2080.25	2084.50	2088.75
7	2097.25	2101.50	2105.75

New BAS Channel Plan 2 GHz (S) Band 1990-2110 MHz			12 MHz CW 12 MHz CS
A1r	2028.50	2031.50	2034.50
A2r	2040.50	2043.50	2046.50
A3r	2052.50	2055.50	2058.50
A4r	2064.50	2067.50	2070.50
A5r	2076.50	2079.50	2082.50
A6r	2088.50	2091.50	2094.50
A7r	2100.50	2103.50	2106.50

2.5 GHz (S) Band 2450-2500 MHz			17 MHz CW 17 MHz CS
8	2454.25	2458.50	2462.75
9	2471.25	2475.50	2479.75
10	2487.75	2492.00	2496.25

6 GHz (C) Low Band			25 MHz CW 25 MHz CS
1	6431.00	6437.50	6444.00
2	6456.00	6462.50	6469.00
3	6481.00	6487.50	6494.00
4	6506.00	6512.50	6519.00

6425-6525 MHz			

7 GHz (C) High Band 6875-7125 MHz			25 MHz CW 25 MHz CS
1	6881.00	6887.50	6894.00
2	6906.00	6912.50	6919.00
3	6931.00	6937.50	6944.00
4	6956.00	6962.50	6969.00
5	6981.00	6987.50	6994.00

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6	7006.00	7012.50	7019.00
7	7031.00	7037.50	7044.00
8	7056.00	7062.50	7069.00
9	7081.00	7087.50	7094.00
10	7106.00	7112.50	7119.00

13 GHz Band 12700-13250 MHz			25 MHz CW 25 MHz CS
1	12706.25	12712.50	12718.75
2	12731.25	12737.50	12743.75
3	12756.25	12762.50	12768.75
4	12781.25	12787.50	12793.75
5	12806.25	12812.50	12818.75
6	12831.25	12837.50	12843.75
7	12856.25	12862.50	12868.75
8	12881.25	12887.50	12893.75
9	12906.25	12912.50	12918.75
10	12931.25	12937.50	12943.75
11	12956.25	12962.50	12968.75
12	12981.25	12987.50	12993.75
13	13006.25	13012.50	13018.75
14	13031.25	13037.50	13043.75
15	13056.25	13062.50	13068.75
16	13081.25	13087.50	13093.75
17	13106.25	13112.50	13118.75
18	13131.25	13137.50	13143.75
19	13156.25	13162.50	13168.75
20	13181.25	13187.50	13193.75
21	13206.25	13212.50	13218.75
22	13231.25	13237.50	13243.75

Coded Orthogonal Frequency Division Multiplex (COFDM) Modulation

COFDM is used for microwave applications like wireless cameras and mobile video links because of its tolerance to multipath transmission errors. In addition COFDM offers more than twice the spectral efficiency of comparable FM analog microwave transmission.

COFDM does not rely on the vulnerability of a single carrier but spreads the digital information over many narrow band carriers using Frequency Division Multiplex (FDM). The bandwidth and the data rate on each of these carriers are reduced and therefore the RF robustness is increased. The carriers are accurately spaced and orthogonal, which means they can be generated and recovered without carrier specific filtering. Even though the spectra of adjacent carriers significantly overlap, each carrier can be demodulated without crosstalk from its neighbors.

The main COFDM parameters are:

- Number Of Sub-Carriers (About 2,000 In Our Case)
- The Symbol
- Individual Sub-Carrier Modulation
- Guard Interval (GI) Duration Between COFDM Symbols
- Data Redundancy Code Rate Used For Error Correction

Symbols

The active symbol is the period that digital information is sampled. The number of bits carried in each symbol depends on the choice of modulation.

Modulation

Modulation is the process of varying a carrier signal in order to use that signal to convey information. Quadrature amplitude modulation (QAM) is a modulation scheme which conveys data by changing (modulating) the amplitude and phase of two carrier waves. BMS uses the forms QPSK, 16QAM, and 64QAM.

QPSK	2 bits/symbol
16 QAM	4 bits/symbol
64 QAM	6 bits/symbol

The higher-order QAM has a higher susceptibly to noise and other corruption. 64QAM will transmit more bits per symbol but with higher bit error rate. It is a less robust signal, but over an easy transmission path (studio setting) it probably won't matter. More difficult transmission paths (mobile or aerial over long ranges with lots of interference from trees and buildings) will require a more robust signal.

Guard Interval (GI)

The guard interval acts as a buffer to protect the active symbol from echoes. A guard interval is added to the beginning of each symbol to allow time for echoes to settle before beginning the active symbol period. A wide range of guard interval options are available from $\frac{1}{32}$ to $\frac{1}{4}$. This fraction represents the ratio between the guard interval to the active symbol period.

Code Rate

The code rate represents the amount of Forward Error Correction (FEC) used for each active symbol. FEC is a method of obtaining error control in data transmission. A code rate of ½ means that for two bits of information received, 1 bit is the real data. The other bit tells how intact the first bit is. A code rate of 7/8 means that out of the 8 bits sent, there are 7 bits of real data and only 1 bit that is to catch any errors in those 7.

Transmission Rates

Finding the best transmission mode to suit a given situation means selecting the best compromise between modulation, guard interval and code rate. What follows are the ETSI EN 300 744 V1.4.1 (2001-01) standards for the useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems for 6, 7, and 8 MHz channels respectively.

Modulation	Code Rate	Transport Rate (Mb/s) at each Guard Interval for 6 MHz BW				Transport Rate (Mb/s) at each Guard Interval for 7 MHz BW				Transport Rate (Mb/s) at each Guard Interval for 8 MHz BW			
		1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
QPSK	1/2	***3,732***[1]	***4,147***	***4,391***	***4,524***	4,354	4,838	5,123	5,278	***4,98***	***5,53***	***5,85***	***6,03***
	2/3	***4,976***	***5,529***	***5,855***	***6,032***	5,806	6,451	6,830	7,037	***6,64***	***7,37***	***7,81***	***8,04***
	3/4	***5,599***	***6,221***	***6,587***	***6,786***	6,532	7,257	7,684	7,917	***7,46***	***8,29***	***8,78***	***9,05***
	5/6	***6,221***	***6,912***	***7,318***	***7,540***	7,257	8,064	8,538	8,797	***8,29***	***9,22***	***9,76***	***10,05***
	7/8	***6,532***	***7,257***	***7,684***	***7,917***	7,620	8,467	8,965	9,237	***8,71***	***9,68***	***10,25***	***10,56***
16QAM	1/2	***7,465***	***8,294***	***8,782***	***9,048***	8,709	9,676	10,246	10,556	***9,95***	***11,06***	***11,71***	***12,06***
	2/3	***9,953***	***11,059***	***11,709***	***12,064***	11,612	12,902	13,661	14,075	***13,27***	***14,75***	***15,61***	***16,09***
	3/4	***11,197***	***12,441***	***13,173***	***13,572***	13,063	14,515	15,369	15,834	***14,93***	***16,59***	***17,56***	***18,10***
	5/6	***12,441***	***13,824***	***14,637***	***15,080***	14,515	16,127	17,076	17,594	***16,59***	***18,43***	***19,52***	***20,11***
	7/8	***13,063***	***14,515***	***15,369***	***15,834***	15,240	16,934	17,930	18,473	***17,42***	***19,35***	***20,49***	***21,11***
64QAM	1/2	***11,197***	***12,441***	***13,173***	***13,572***	13,063	14,515	15,369	15,834	***14,93***	***16,59***	***17,56***	***18,10***
	2/3	***14,929***	***16,588***	***17,564***	***18,096***	17,418	19,353	20,491	21,112	***19,91***	***22,12***	***23,42***	***24,13***
	3/4	***16,796***	***18,662***	***19,760***	***20,358***	19,595	21,772	23,053	23,751	***22,39***	***24,88***	***26,35***	***27,14***
	5/6	***18,662***	***20,735***	***21,955***	***22,620***	21,772	24,191	25,614	26,390	***24,88***	***27,65***	***29,27***	***30,16***
	7/8	***19,595***	***21,772***	***23,053***	***23,751***	22,861	25,401	26,895	27,710	***26,13***	***29,03***	***30,74***	***31,67***

[1] Figures in ***italics*** are approximate values.

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GLOSSARY

Analog Transmission	Frequency Modulated (FM) method of sending information with radio waves. An older, dependable method of transmission. (See Digital Transmission)
Antenna Actuator	The mechanism which deploys or retracts the antenna radio operation or for landing and take-off.
ASI: Asynchronous Serial Interface	Transmission standard used to connect video delivery equipment within a cable, satellite or terrestrial plant.
BNC Connector	The Bayonet Neill-Concelman connector is a type of RF connector used for terminating coaxial cable. (See TNC connector)
COFDM: Coded Orthogonal Frequency Division Multiplex	A digital modulation method that divides a single digital signal across multiple (1000+) signal carriers simultaneously. BMS Coder II family products use COFDM digital modulation.
Composite Video	The format of an analog television (picture only) signal before it is combined with a sound signal and modulated onto an RF carrier.
dB: Decibel	A unit for expressing the ratio of two amounts of electric or acoustic signal power equal to 10 times the common logarithm of this ratio.
dBd	Gain referenced to a perfect dipole
dBi	Gain referenced to a perfect isotropic point source
dBm	A unit for expressing the power ratio in decibel (dB) of the measured power referenced to one milliwatt (mW).
Digital Transmission	Digitally Modulated (COFDM and others) method of sending information with radio waves. Newer more reliable method of transmission. (See Analog Transmission)
Directional Antenna	The final transmit element of a microwave system that radiates the signal one direction, in a directed or focused narrow beam. This requires aiming of the antenna toward the receive site.
DTV: Digital Television	Digital Television uses digital modulation and compression to broadcast video, audio and data signals.
DVB-T: Digital Video Broadcasting-Terrestrial	An international digital television (DTV) standard that defines digital COFDM modulation using MPEG2 compression.
GPS: Global Positioning System	A navigational system using satellite signals to fix the location of a receiver on or above the earth surface.
MPEG-2	A compression standard for digital video and audio data.

Multipath	The radio wave propagation phenomenon that results in the transmitted signals. reaching the receiving antenna by two or more paths. This condition is not desirable and usually results in signal fading and interference.
MUX Multiplex	The combining of multiple signals into a single transmission.
NIT	Network Information Table
Omni-Directional Antenna	The final transmit element of the microwave system that radiates the signal approximately equally throughout a 360 degree circle. Does not require aiming of the antenna.
PAL phase-alternating line	A color encoding used in broadcast television systems in large parts of the world.
PAT Program Association Table	Indicates which PID the PMT is to be found
PID	Packet Identifier
PMT-PID Program Map Table	Yields information about the Program, Video PID, Audio PID, and PCR PID. The PMT-PID default is 200 for BMS systems.
PCR-PID Program Clock Reference	A time stamp indicating the system time clock value when the stamped packet leaves the encoder buffer and enters the decoder buffer used to Synchronize the receiver System Time Clock (STC) with the transmitter STC. Default is 101 for BMS systems.
RF: Radio Frequency	That portion of the Electromagnetic Spectrum that is used for radio and television transmission.
SDI: Serial Digital Interface	A digitized video format used for broadcast grade video.
SDT	Service Description Table
Stand-by	The condition of an RF system where all but the transmit circuits are energized. In this status the system may be switched into transmit mode instantaneously. (See Transmit)
TNC Connector	Threaded version of the BNC connector (See BNC connector)
Transmit	The condition of an RF system where it is sending out signal. (See Stand-by)
YUV	The YUV model defines a color space in terms of one luminance and two chrominance components. YUV is used in the PAL system of television broadcasting, which is the standard in much of the world.