Technical Operations Manual

The most important thing we build is trust.

VETA Receiver – Briefcase

(VR-B)

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Cobham Surveillance
GMS Products
1916 Palomar Oaks Way Ste 100
Carlsbad, CA 92008
T: 760-496-0055
F: 760-496-0057
www.cobham.com/gms

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Revision History

Version	Date	Main Changes from Previous version	Edited by
X1	11-04-2009	Initial Release	RM

1 Acronyms

This section lists and describes the various acronyms used in this document.

Name	Meaning
16QAM	16-state Quadrature Amplitude Modulation
A/V	Audio/Video
AES	Advanced Encryption System
ABS	Basic Encryption System (8 bit)
C-OFDM	Coded Orthogonal Frequency Division Multiplexing
CVBS	Composite Video
BDC	Block-Down Converter
FEC	Forward Error Correction
GUI	Graphical User Interface
I/O	Input/ Output
KBaud	Kilobaud per second
Kbps	Kilobits per second
Mbps	Megabits per second
MER	Modulation Error Rate
MPEG	Moving Picture Experts Group
NTSC	National Television System Committee
PAL	Phase Alternation Line
QPSK	Quadrature Phase Shift Keying
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RX	Receiver
S/N	Signal-to-Noise Ratio
THD	Total Harmonic Distortion
TX	Transmitter
VDC	Volts (Direct Current)
VDL	VETA Digital Link
VR	VETA Receiver
VT	VETA Transmitter
VDR	VETA Digital Repeater
CSM	Compact Surveillance Modem
UDP	User Datagram Protocol
VNA	VETA Network Adapter

2 Introduction

2.1 About the Manual

This manual describes the operation of the GMS VETA Briefcase Receiver. The manual is divided into three main sections:

Getting started and basic operation
This section describes to users how to deploy and use a VR-B unit.

Advanced operation
This section describes the operation of the system in more detail, concentrating particularly on advanced use of the GUI and Streaming operations.

Technical reference
This section provides technical specification and control protocol data and will be of interest to those integrating the VR-B into larger systems or using unusual configurations.

2.2 VETA Product Line

The VR-B is a tactical digital video receiver and is part of the GMS' Very Efficient Transmission Apparatus (VETA) product family. The VETA product range enables the user to build wireless digital microwave video systems. The VETA products have been designed to provide rugged point-to-point links for high quality full frame rate video, and audio, even in non line of sight and urban environments.

Existing analogue systems suffer from impairments such as video noise, loss of color information and poor image quality when line of sight cannot be maintained, and solutions based on wireless internet standards and PC platforms deliver poor quality video.
The VETA product line allows law enforcement, surveillance and emergency service communities to now receive the highest quality video images, in real time, direct from personnel, buildings and vehicles.

GMS' VETA product line provides several key features that enable high-quality and low-latency wireless Audio/Video (A/V) transmission for the most demanding short or long distance point to point or point to multipoint transmission applications. VETA uses a robust digital modulation system known as Coded Orthogonal Frequency Division (COFDM) that provides a robust link that is immune to multipath interference and provides crisp, clear pictures in the most difficult of terrains.

This manual provides information on how to operate the VR-B (VETA Briefcase Receiver) as well as pertinent technical information related to the overall system.

2.3 Key System Features

- COFDM Demodulation 400[(1)] or 2K Carriers
- Bandwidths 6/7/8 MHz and 1.25 or 2.5MHz[(2)]
- Input Frequency: 0.174 to 8.5 GHz (In-Bands)

- Low End to End System Latency (down to ~44mS)
- Internal Down-Converters
- Maximum Ratio Combining antenna diversity for fade and multipath elimination
- Secure – ABS / AES 128 or 256 Encryption[3]
- Daylight Readable 8" monitor
- AC/DC operation
- LAN IP Streaming Interface

[1], [2] 400 carriers is optional with the 1.25 or 2.5MHz RF bandwidths
[3] AES 128 or 256 bit optional

3 General System Information

The VR-B (VETA Briefcase Receiver) receives and demodulates DVB-T 2k carriers' signals with bandwidths of 6, 7 or 8 MHz; additionally, optional 1.25 or 2.5 MHz RF bandwidths with 400 carriers allow both increased reception range and larger quantity of simultaneous A/V links to operate in the same frequency band. The wider bandwidths provide greater throughput that allow the system to transfer the highest quality video.

The standard VR-B is supplied with dual Diversity inputs and internal RF Block-Down Converters (BDCs) with a user selected (at time of purchase) frequency band. The VR's Maximal Ratio Diversity Combiner provides optimum reception in difficult fading and multipath environments. Additionally, the Diversity combining can provide up to 2.5 dB in link performance, increasing the receiver's sensitivity to -97.5 dBm at 8 MHz bandwidth.

One of the biggest problems encountered in the transition from analog to digital A/V systems has been the inherent digital coding/decoding delays that in some digital systems are 400ms or more. The VETA Transmitters & Receivers employ internal MPEG-2 or MPEG-4[(4)] (User Selectable) Encoders and Decoders with specially designed 'low-delay' coding technology, which provides an end to end latency down to 44ms *without* the introduction of any further MPEG encoding artifacts. This ensures that the picture you see is what is happening *now* - crucial for applications such as surveillance, and law enforcement, where personnel are reacting to real-time events.

The VR-B also includes internal low-latency Audio/Video Decoder (MPEG-2 or MPEG-4[(4)]) and output circuits that provide video, two audio and data channels. Security of transmission is ensured by the use of Standard ABS encryption or, for greater security, the optional AES 128 or 256 bit scrambling algorithms.

VR-B has a built-in 8" daylight readable monitor that is used for viewing the video. The received Audio and Video can be displayed on external monitor.
The built-in VETA IP Network Adapter (VNA) provides the VR-B with a video streaming capability for network interfacing. An optional M.S. Windows software Decoder and Recording application is also available.
Control and status monitoring can be accomplished via the VR Front Panel or via an external IBM PC and GMS' M.S. Windows application control software. Critical performance parameters like Signal to Noise Ratio (SNR), Pre and Post FEC Bit Error Rate (BER) and Packet Errors are provided both on the on the On-Screen Display and M.S. Windows control program.

[(4)] Option Dependant

3.1 Warranty

GMS offers a 12 month standard product warranty. During this period, should the customer encounter a fault with the equipment we recommend the following course of action:

- Check the support section of the website for information on that product and any software/firmware upgrades.
- If fault persists call our support line and report the fault. If fault persists and you are informed to return the product, please obtain an RMA number from the GMS support department or website and ship the equipment with the RMA number displayed and a description of the

fault. Please email the support section the airway bill/consignment number for tracking purposes.

Depending on the nature of the fault GMS endeavor to repair the equipment and return it to the customer within 14 days of the item arriving at our workshops. Obviously it is impossible to cater for all types of faults and to manage 100% replacement part availability, and delays are sometimes inevitable.
Please contact GMS for details of packages that can be tailored to meet your individual needs, whether they are service availability, technical training, local geographic support or dedicated spares holdings.

3.2 Safe Operating Procedures

- Ensure that the power supply arrangements are adequate to meet the requirements of VETA product.
- Operate within the environmental limits specified for the product.
- Only authorized, trained personnel should open the product. There are no functions that required the User to gain access to the interior of the product.
- The unit is designed only to be operated with the Lid open to ensure adequate airflow.
- The VR-B with the lid up, should not be exposed to prolonged rain fall, this will cause damage.

4 Getting Started

The VR-B is pre-configured by GMS prior to shipment (based on customer requirements), thus is ready to work "right out of the box".

NOTE: Additional cables and antennas may be delivered by GMS based on customer application. Contact GMS for further information.

4.1 Deploying and Operating the VR-B

The VR-B is a tactical digital video receiver, and the following guidelines should be employed when using the equipment.

- The VR-B can be operated with the lid up or down.
- An open unit with the lid up should not be exposed to rain fall, as this will cause damage.
- Depending on the RF environment (line of sight or non line of sight) and the power of the transmitter (100mW or 1W), the VR-B will operate at a range typically 300m to 1km from the target transmitter in an urban environment.
- If the VR-B is being operated inside a building or vehicle, better results may be achieved by using the external antenna function and deploying the antennas to the outside of the building or vehicle.
- To prevent damage to the VR-B, it should not be operated too close to the transmitter (within 5m typically, further if the transmitter is greater than 1W in power).

Figure 1 – VR-B, Front View

4.2 Components

The GMS' VR-B is a tactical microwave receiver case incorporating the following principle components.

- Diversity antenna inputs
- 8" LCD viewing screen
- COFDM digital video receiver
- External Connector Panel
- Integral AC / DC power supply
- Network Adapter for Video Streaming

These principle components are highlighted in the photographs below.

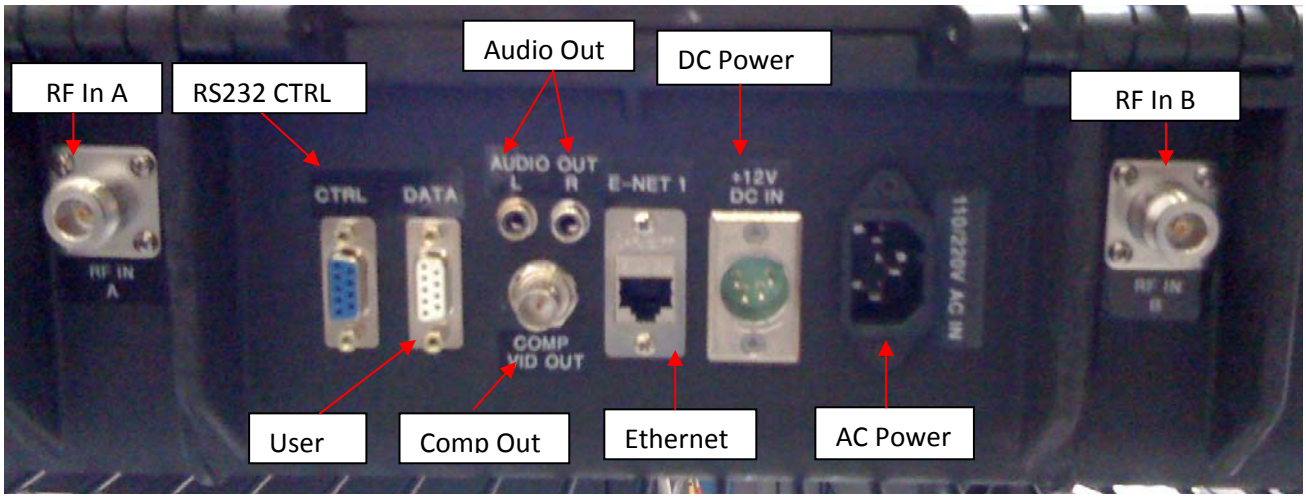

Figure 2 – VR-B, Rear Panel

4.2.1 Power Supply

VR-B has two power supply options: External DC Input and External AC Input.
VR-B can be powered from an external DC by connecting the DC connector in the Rear Panel to a DC source with the following characteristics:

Voltage: 10 to 16V
Typical Power: 42 Watts

The VR-B can be powered from an external AC source by connecting the AC connector in the Rear Panel an AC source with the following characteristics:

Voltage: 90 to 264VAC

The position of the switch *AC/DC In* determines the supply option. The unit is powered on by switching the master power switch (marked PWR) into the ON position. The Power status LED built in the switch will light Green if the power is on.

4.2.2 LCD Monitor

The LCD monitor automatically turns on when power is applied to the briefcase. The user has an option of turning it off (it will turn back on when power is cycled to the briefcase). The monitor also has a control panel for changing LCD parameters like brightness, contrast, etc. The *Video Source* of the monitor should be always set to S-video.

4.2.3 External Connections on the VR-B

The Rear Panel of the VR-B incorporates a number of external connections, as shown in Figure 2.

- Video Out, for external viewing of receiver video. Connect the video output lead to the BNC connector labeled *Composite Video Out* on Rear Panel to the chosen video display device. Typically the video display device will be a high quality monitor.
- Audio Out, for connecting external speakers. Connect the audio output lead to the connectors labeled *Audio Out L* and *Audio Out R* on the Rear Panel to the chosen audio monitoring device, typically speakers.
- RS232 Control, for connecting to an external control device (PC), allowing the user to remotely control the VR-B with the current Control Application. Contact GMS for cable information.
- User Data, for user data output.
- Ethernet, for connecting to LAN for control and streaming video.
- RF In A and B, for connecting external antennas located at back of the VR-B, outside of actual rear Panel.

4.2.4 Understanding Config's

VR-B equipment features eight user selectable and programmable configurations. These allow the user to store the most commonly used channels for quick selection. The *Current Config* is defined as the number of the currently selected configuration 1 to 8. The *Current Config* can be changed by loading one of the 8 Config's in the Main Window of Control Software or by toggling the Config button on the front panel of VR-B. The parameters in Current Config-s can be edited in the VR-B menu using the PC Control application. Any modifications made to system settings will be saved in the current Config. All changes are therefore saved permanently.

4.3 Front Panel Indicators

VR-B features a front panel for easy access to controls. The detailed description of the LED's and buttons is in following sections.

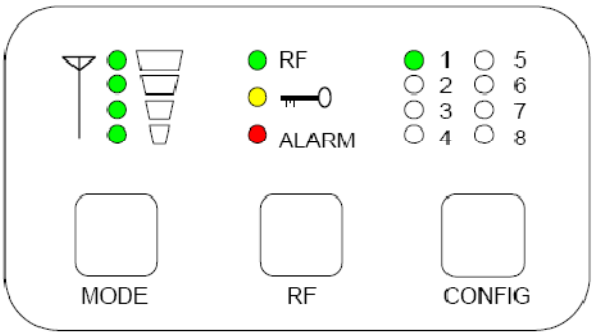

Figure 3 – VR-B front panel

4.3.1 Received Signal Strength Green LED's

The green LED's (located above the MODE button) when ON indicate the signal strength (the RF input power level) from the minimum (no LEDs light) to the maximum strength (all four LEDs light).

4.3.2 RF Green LED

The RF green LED indicator (located above RF button) when ON indicates that the Receiver is locked to the incoming signal; system is operating normally.

4.3.3 Lock Yellow LED

The LOCK (key icon) yellow LED indicator (located above the RF button) when is ON indicates that incoming signal is encrypted.

4.3.4 Alarm Red LED

The Alarm red LED indicator (located above the RF button) indicates a fault condition or an alarm when ON. This can be an indication that there is no RF lock; no video in the Transport Stream or non matching Encryption Key.

4.3.5 Green Config LEDS 1 to 8

The 8 green LEDs (located above the CONFIG button) indicate which one of the eight stored configurations is currently selected. Stored configurations are discussed in Section 6 of this manual and in section 5.1.8 below. If Config LED is flashing, the BDC power is OFF, and the RX will not be able to receive a signal through the BDC.

4.3.6 Config Button

The Config button, when pressed, selects the next configuration from memory. The 8 configurations in memory define all potential variables including center frequency, modulation bandwidth, Guard Interval and OFDM polarity. See section 6 for a full discussion on setting the parameters for each configuration.

☞ *Note that this configuration selection (1 through 8) must match the transmitter's OFDM modulation parameters selection for the link to work.*

4.3.7 RF Button

Pressing the RF button toggles (ON/OFF) DC power to the Block-Down Converters.
Flashing Config LED indicates OFF state, and solid green – ON state. When using the internal BDCC, the DC power must be on.

4.3.8 Mode Button

Pressing the Mode button toggles the diagnostic On Screen Display (OSD). Pressing the mode button will toggle the OSD on with the spectrum display showing input A from the Composite Video output port. Pressing the mode button a second time will change the spectrum display to input B. Pressing a third time will turn the OSD off. The diagnostic data (displayed on top of the current video) includes, signal to noise data, input power level, frequency as well as some captured parameters from the incoming RF signal, as shown in
Figure 4. The OSD is explained in detail in section 6.

4.4 Initial Checkout

Prior to installing a VR-B unit into the desired target environment, an initial checkout should be performed to ensure proper operation of the unit. The initial checkout consists of configuring a basic VDL (VETA Digital LINK) wireless link, shown in
Figure 4. To run the initial checkout the following is needed:

- VETA Transmitter in the same band as VR-B.
- Power supply for VETA TX, must be able to source 1 AMP at 12VDC.
- Power Source for VR-B. Ensure power supply can supply at least 3A at +12VDC.
- RS232 Control connection to a PC operating the controller GUI.
- Video Source.

All external connection to the VETA products should be made, as described in the relevant sections of corresponding manuals, before proceeding to power on the system.

- Connect VR-B and VETA Transmitter to separate Power Supplies.
- Install Omni-directional antennas (or ones best suited for the application) onto the RF IN A and RF IN B ports on the VR-B and one on the SMA RF connector on the VETA transmitter.
- Attach a Composite Video source to the BNC Video Input cable that is located on the VT breakout cable.
- Attach the CTRL DB-9 connector of the same cable to the RS232 Port of the PC operating the VT GUI for changing of VT parameters.
- It is assumed that the frequency selected for the transmitter is matched with the frequency specified on the VR-B. If both VR-B and VT have default settings, then all the parameters in corresponding Config should match. If the frequencies do not match or the user is unsure, then consult the Software Manuals (100-M0131*) on how to set frequency on the VR-B and the transmitter.
- Apply Power to VT and VR-B.
- Turn on the VR-B with the PWR switch on the top panel.
- Press the RF button on the VT to insure that RF signal is *On*.
- Turn on the video source and video monitor equipment.
- After approximately 5 seconds, the link should be established and video provided by the source should be displayed on the monitor (Figure 5).

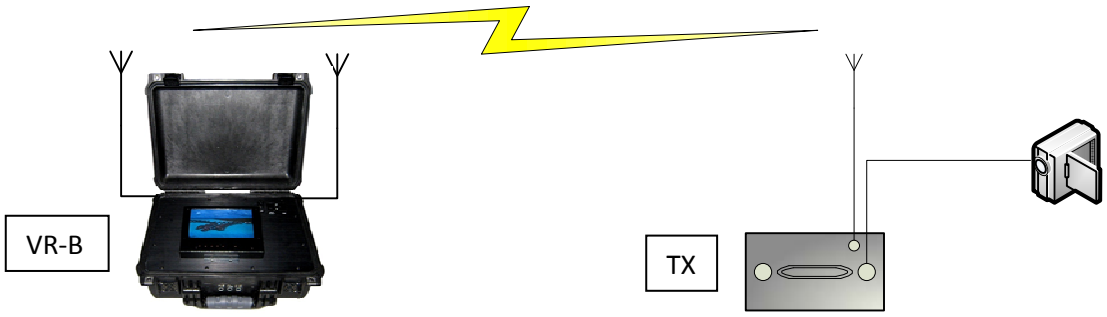

Figure 4 – Basic VDL Setup

The initial checkout described above is simply to check the basic video operation of the VR-B unit. For further details on the connectors, monitoring and controlling the VR-B read thoroughly through this manual.

Figure 5 – VR-B OSD

4.4.1 Using of the On Screen Display

On Screen Display (OSD) tool is an extremely useful tool for system set-up and diagnostic. The displayed diagnostic data includes a spectrum display, signal to noise data, input power level and frequency. The received spectrum display is useful when checking for interference and signal quality. When setting a VETA system up, the OSD should be used in the following way.

- Channel is clear. With the transmitter OFF, check that the channel is empty of interference signals, this is confirmed by ensuring that the reported power in the channel is at –95dBm or lower and that the spectrum is shown as a rounded dome with no obvious spikes or tones.
- Check Quality of Link. Switch on the transmitter and confirm that SNR is 6 or greater and that power level is at least –92dBm or greater. This represents approximately a 5dB margin. Failure of the link will occur when the power level reaches –97dBm or the SNR reaches 3dB.

5 Advanced Operations

5.1 Streaming Video

The VR-B can be connected to IP networks and translate the receiver signal into a streaming video service. Figure 6 shows an example of wireless IP link using VETA Transmitter.

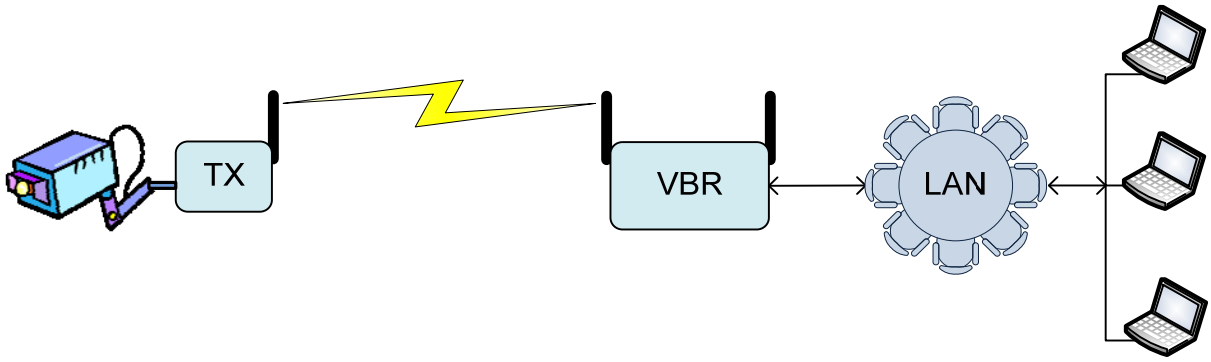

Figure 6 – Streaming Mode

5.1.1 Web Browser Control

The VR-B features a web Browser control interface allowing configuration setup using the LAN (Ethernet) interface. To view the web page, connect a PC to the LAN interface of VR-B, open a browser and type the following default address:
http://192.168.0.71
The URL of the configuration page is:
http://192.168.0.71/index.htm.
To access the control page, the user is required to follow a login procedure. When prompted, enter the following login details:

User Name: admin
Password: ipradio

Figure 7 – Login Screen

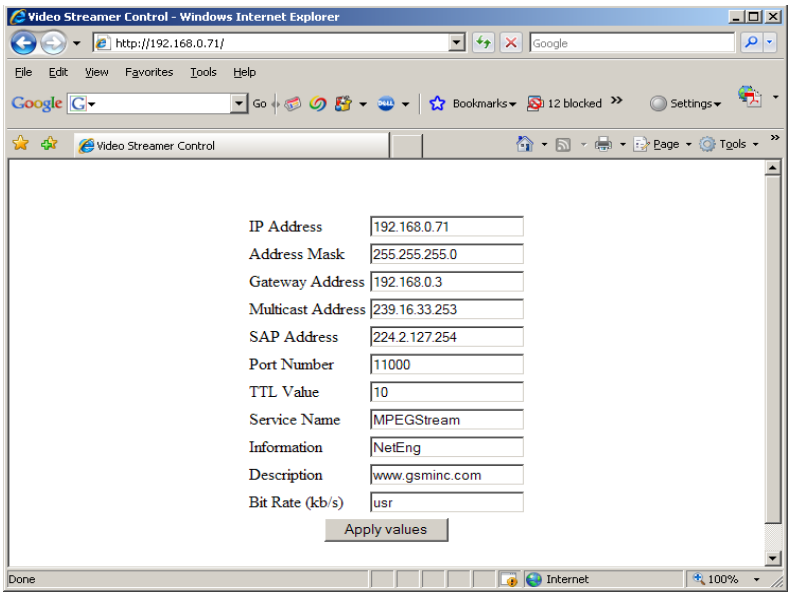

Figure 8 – Web Browser Page

The browser will display the page shown in Figure 8.
The following sections describe the Streamer Configuration parameters.

5.1.2 IP Address

This control allows the user to change the IP address of the unit. The user should make a note of the unit's new IP address when changing it.

☞*Failure to do so will result in an inability to use the web browser interface until the unit's new IP address is recovered.*

5.1.3 Multicast Address

This control allows the user to change the multicast address used by the unit. The default value is 239.16.33.254.

5.1.4 Port Number

This control allows the user to change the multicast port used by the unit. The default value is 11000.

5.1.5 TTL

This control allows the user to change the value of the IP TTL (Time to Live) set by the unit.

5.1.6 SAP Address

This control allows the user to change the value SAP/ SDP multicast address used by the unit. The default value is 224.2.127.254 and the port used is 9875. These are standard multicast values for such parameters, and it is recommended they are not changed unless specifically required due to routing restrictions.

5.1.7 SAP / SDP Data

• Service Name – textual information naming the multicast stream as delivered in the SAP/SDP packets from the unit. Default is “MPEG Stream”.
• Info – further textual information about the multicast stream as delivered in the SAP/SDP packets from the unit. Default is “NetEng”.
• Description - Optional URI (Universal Resource Identifier) pointing to a web page on the network containing additional information about the multicast.
Default is www.cobham.com/gms
• Bitrate - textual information indicating the bitrate in kbits/s of the stream. Default is usr kbit/s.

The default values are:

- IP address 192.168.0.71.
- Multicast address 239.16.33.254
- Multicast port 10000
- SAP/SDP multicast address 224.2.127.254
- SAP/SDP port 9875

6 Hardware Overview

All interface connectors of VR-B are located on the *Rear Panel* of the unit. The following sections describe all VR-B connectors.

6.1 VR-B Rear Panel

The rear panel contains the connectors necessary for interfacing to the VR-B. Detailed descriptions of all the VR-B connectors and components are included in the following sections.

6.1.1 RF In

Table 1 – RF IN

Connector Name	Connector Type	Comments
RF IN A	N(M)	To internal down converter
RF IN B	N (M)	To internal down converter

6.1.2 Video

One composite video out 75 ohm impedance, PAL/NTSC is selectable.

Table 2 – Video Connector

Connector Name	Connector Type	Comments
COMP VID OUT	BNC (F)	Composite video out

6.1.3 Audio

Two RCA connectors are provided for audio outputs Left and Right. The output level is nominal line level with output impedance of 50 ohm. Audio is single ended. There are no audio gain adjustments.

Table 3 – Audio Connections

Connector Name	Connector Type	PIN	Function
AUD L	RCA (F)	Tip Terminal	LEFT AUDIO
AUD L	RCA (F)	Body terminal	GND
AUD R	RCA (F)	Tip Terminal	RIGHT AUDIO
AUD R	RCA (F)	Body terminal	GND

6.1.4 RS232 CTRL DB-9 (M) Connector

The DB-9 connector provides RS232 TX & RX control.

The receiver can be controlled remotely with GMS PC control software. This is done by connecting the PC RS232 transmit and receive lines to the RS232 TX CTRL and RS232 RX CTRL, pins 2 and 3.

The remaining pins do not carry any function.

Table 4 – RS232 CTRL

Connector Name	Connector Type	Pin	Function
RS232 CTRL	DB - 9(M)	1	NC
RS232 CTRL	DB - 9(M)	2	RS232 TX CTRL
RS232 CTRL	DB - 9(M)	3	RS232 RX CTRL
RS232 CTRL	DB - 9(M)	4	NC
RS232 CTRL	DB - 9(M)	5	GND
RS232 CTRL	DB - 9(M)	6	NC
RS232 CTRL	DB - 9(M)	7	NC
RS232 CTRL	DB - 9(M)	8	NC
RS232 CTRL	DB - 9(M)	9	NC

6.1.5 RS232 User Data DB-9 (M) Connector

The DB-9 connector provides RS232 TX & RX control for User Data.

Table 5 – RS232 User Data

Connector Name	Connector Type	Pin	Function
RS232 CTRL	DB - 9(M)	1	NC
RS232 CTRL	DB - 9(M)	2	RS232 TX CTRL
RS232 CTRL	DB - 9(M)	3	RS232 RX CTRL
RS232 CTRL	DB - 9(M)	4	NC
RS232 CTRL	DB - 9(M)	5	GND
RS232 CTRL	DB - 9(M)	6	NC
RS232 CTRL	DB - 9(M)	7	NC
RS232 CTRL	DB - 9(M)	8	NC
RS232 CTRL	DB - 9(M)	9	NC

6.1.6 Ethernet

Table 6 – Ethernet Connector

Connector Name	Connector Type	Pin	Function
Ethernet	RJ45	1	Transmit+
Ethernet	RJ45	2	Transmit-
Ethernet	RJ45	3	Receive +
Ethernet	RJ45	4	NC
Ethernet	RJ45	5	NC
Ethernet	RJ45	6	Receive-
Ethernet	RJ45	7	NC
Ethernet	RJ45	8	NC

6.2 VR-B Top Shelf

The Top Shelf contains Monitor, Power switches and 4 connectors. This section describes these components.

6.2.1 Power Select and Power Switch

Both switches are recessed. Refer to Section 4.2.1 for detailed description of the switches. Select the position of the switch *AC/DC In* depending on the supply option. Then switch the master power switch (marked PWR) to ON position to power up the unit. The Power status LED will light Green when the power is ON.

6.2.2 Fuse

For the circuit protection VR-B has user serviceable fuse, located above the power switch. The fuse is for AC Input and has 6A rating.

7 Serial Control Protocols

The following section describes the Serial control protocol employed on the RS232 link for controlling the VETA receivers. Normally, this interface is only used when the VR is incorporated into a system that contains an integrated System Controller.

7.1 RS232 Control

The physical interface is RS232. Normal operation involves sending a packet from the control device (normally a PC) to the device being controlled. If the packet satisfies an address integrity check, then the controlled device will action the command and send a reply.

For compatibility with modems an ASCII style protocol is used.

Ports are set for 8 bits, No parity, 1 stop

7.2 Packet Structure Sending (from PC)

ASCII	Value	Description
STX	02h	Start byte
0-9	30h-39h	4 byte unit address. In range 0-9999
R	20h-7Eh	1 byte command type. r read, w write or m misc
I	20h-7E	1 byte indicator of internal data block
ABC	20h-7Eh	Command –three byte mnemonic
;	3Bh	Separator
PQR	20h-7Eh	Data –Optional, variable length
;	3Bh	Separator
X	20h-7Eh	Sum Check
ETX	03h	End byte

7.3 Packet Structure Reply (from controlled device)

ASCII	Value	Description
STX	02h	Start byte
0-9	30h-39h	4 byte unit address. In range 0-9999
Z	20h-7Eh	Status Byte
PQR	20h-7E	Data –Optional, variable length
;	20h-7Eh	Separator
X	3Bh	Sum Check
ETX	20h-7Eh	End byte

The Sum check byte is the summation of all bytes in the packet, not including the start and end bytes. Higher order bytes are ignored and the final byte result is modified to prevent ASCII control characters being sent. Bit 7 (highest) is forced high.

Status byte will indicate command performed OK, or indicate an error.

ASCII	Meaning
1	All OK
E	General error, Command could not be actioned.

Typically E will be returned if the message is formatted incorrectly (separators in wrong place) or if commands are in upper case, or if commands do not match against the allowed list of commands, or if the checksum is wrong.

Addresses in the range 0001 to 9998 are for general use. Address 0000 is reserved and 9999 is a broadcast address. i.e. any device will reply to this address. Its reply will contain its own specific address.

All data in the transmitter and receiver is stored as one of 5 data types: Double, String, List, Integer or HexInteger. The data type dictates the contents of the data section of the reply.

List – 1 byte for sending. Value is hexadecimal coded as ASCII. 2 byte reply. Reply represents index into original choice list. e.g. Reply 02 indicates entry 2 in original list.

- Double - variable length. Reply always contains decimal point and 4 decimal places, can have 1 to 3 digits before decimal.
- Integer – 6 Byte reply. Integer value with stuffed with preceding zeros. e.g. GOP reply 000012 = GOP length 12
- String - Variable length. Reply is string excluding null terminator
- HexInteger – 8byte Hex reply

7.4 Receiver Command List

Table 7 - Type 'd' messages for Memory configuration commands

Function	R/W	Block	Command	DATA	Type
Store Current Configuration to Memory	r/w	d	sto	Configuration Address (1-8)	Integer
Load Configuration from Memory into Current	r/w	d	loa	Configuration Address (1-8)	Integer
Read number of last Configuration Loaded	r	d	las	Configuration Address	Integer

Table 8 - Type '1' messages for Tuner / Demod

Function	R/W	Block	Command	DATA	Type
Input Frequency	r/w	1	ipf	Frequency received MHz. Decimal point allowed	Double
Down Converter LO	r/w	1	dco	MHz. Decimal point allowed	Double
Down Converter LO Side	r/w	1	los	0 = Low 1 = High	List
OFDM Bandwidth	r/w	1	wid	DVB-T Mode 0 = 8 MHz 1 = 7 MHz 2 = 6 MHz Narrow Band Mode 3 = 2.5 MHz 4 = 1.25 MHz	List
OFDM Modulation Mode	r	1	mod	DVB-T/Narrow Band Mode 0 = QPSK 1 = 16QAM DVB-T Mode 2 = 64QAM	List
OFDM FEC	r	1	fec	DVB-T Mode 0 = ½ 1 = 2/3 2 = ¾ 3 = 5/6 4 = 7/8 Narrow Band Mode 1 = 2/3 2 = 1/3	List
OFDM Guard Interval	r/w	1	gua	DVB-T Mode 0 = 1/32 1 = 1/16 2 = 1/8 3 = ¼ Narrow Band Mode 1 = 1/16 2 = 1/8	List
OFDM Polarity	r/w	1	pol	0 = Normal 1 = Inverted	List
Input SNR A	r	1	snr	Input SNR in dB	Double
Input SNR B	r	1	mer	Input SNR in dB	Double
BER Pre Viterbi	r	1	pre	Pre Virterbi x 10-6	Int
BER Post Viterbi	r	1	pos	Post Viterbi x 10-6	Int
Packet Errors	r	1	pkt		Int
Lock Status	r	1	loc	0 = Not Locked 1 = Locked	List
Input Level A	r	1	ina	Input Level in dBm	Double
Input Level B	r	1	inb	Input Level in dBm	Double

Table 9 - Type 'g' messages for Unit Level commands

Function	R/W	Block	Command	DATA	Type
Unit Mode	r/w	g	udm	0 = Narrow Band 1 = DVB-T	List
Input Mode	r/w		mod	0 = RF Input 8 = Chaining Input	List
BDC Power	r/w	g	lnb	0 = Off 1 = On	List
Unit RS232 Address	r/w	g	add	Unit Adress 0000-9999	Interger
Software Version	r	g	sof	Software Version Number	String
FPGA Version	r	g	fpg	FPGA Version Number	String
Serial Number	r	g	ser	Hex Based Serial Number	String
License Code	w	g	lco	License number to enable certain features	List
On Screen Display	r/w	r/w	osd	0 = Off 1 = Channel A 2 = Channel B	List
Auto Spectrum Detection (Narrow Band)	r/w	g	asd	0 = Off 1 = On	List
Chaining Output Mode 1	r/w	g	cha	0 = Demod 1 = Chaining In	List
Chaining Output Mode 2	r/w	g	ch2	0 = Pre-Descrambling 1 = Post-Descrambling	List
License Mask	r	g	lma	Bit Mask of Licensed Features	Interger
Down Converter Gain Offset	r/w	g	dcg	Range: -30.0 – 30.0 Decimal Point Allowed	Double
Board Type	r	g	bty	PCB Type	String

Table 10 - Type 't' messages for RS232 data pipe commands

Function	R/W	Block	Command	DATA	Type
Data On/Off	r/w	t	dat	0 = Off 1 = On	int
Input Data Baudrate	r	t	bau	2 = 1200 baud 3 = 2400 baud 4 = 4800 baud 5 = 9600 baud 6 = 19200 baud 7 = 38400 baud 8 = 57600 baud 9 = 115200 baud	int
Data Parity	r/w	t	par	0 = none 1 = even 2 = odd	List

Table 11 - Type 'e' messages for Decoder configuration commands

Function	R/W	Block	Command	DATA	Type
Unit Number	r/w	e	ser	Index into List of Programs	Integer
Preferred Unit Name	r/w	e	def	Preferred Unit Name	String
525 Video Format	r/w	e	525	1 = NTSC 2 = NTSC no Pedestal	List
625 Video Format	r/w	e	625	1 = PAL	List
Locked	r	e	loc	0 = No 1 = Yes	List
Decoded Video Line Standard	r	e	lin	0 = 625 1 = 525	Interger
Fail Mode	r/w	e	fai	0 = Freeze 1 = Blue	List
Line Standard at Power Up	r/w	e	pwr	0 = 625 1 = 525	List
Service Scrambling Status	r	e	scr	0 = Clear 1 = Scrambled	List
MPEG4 Deblocking Filter	r/w	e	deb	0 = Enable 1 = Disable	List
Received Video Type	r	e	vid	0 = MPEG2 1 = MPEG4	List
Transmitter Video Input Lock	r	e	txv	0 = Unlocked 1 = Locked	List
Default Service Name Match	r	e	dsm	0 = No Match 1 = Match	List
Video PID	r	e	vpi	13-bit PID	Integer
Audio PID	r	e	api	13-bit PID	Integer
Data PID	r	e	dpi	13-bit PID	Integer

Table 12 - Type 'z' messages for Descrambling commands

Function	R/W	Block	Command	DATA	Type
Descrambling	r/w	z	des	0 = Off 1 = ABS 4 = AES128 5 = AES128+ 6 = AES256 7 = AES256+	List
ABS Scrambling Key	w	z	ebs	VETA Link basic Scrambling Key	8-digit Hex String
AES Scrambling Key – lower 128 bits	w	z	aes	Advanced Encryption Standard – lower 128 bits	32-digit hex String
AES Scrambling Key – upper 128 bits, used in AES256 only	w	z	a25	Advanced Encryption Standard – upper 128 bits	32-digit hex String

7.5 Network Adapter Command List

Table 13 - Command List

Description	Type	Block	Command	Data Sent	Data Type
Unit Mode	R/W	i	ipm	0 – Streamer 1 – IP Radio	List
IP Address	R/W	i	Ipa	xxx.yyy.zzz.kkk	String
Gateway Address	R/W	i	Gwa	xxx.yyy.zzz.kkk	String
Address Mask	R/W	i	Msk	xxx.yyy.zzz.kkk	String
SW version	R	i	Ver	SW version number	String
Router Mode	R/W	i	Rte	0 – IP layer 1 – MAC layer	List
Chaining Bit rate	R/W	i	ebr	10kb/s – 32Mb/s	String

Table 14 Streamer Mode Commands

Description	Type	Block	Command	Data Sent	Data Type
Multicast Address	R/W	i	mca	xxx.yyy.zzz.kkk	String
SAP Address	R/W	i	Sap	xxx.yyy.zzz.kkk	String
Port Number	R/W	i	prn	0 - 65535	String
Time to live	R/W	i	ttl	1 - 255	String

8 Specifications

8.1 C-OFDM RF INPUT

Input Ports: 2
Connectors: N-Female
Input Impedance: 50 Ohms, <1.5:1 VSWR
Input Frequency: 0.9 to 8.5 GHz (In-Bands)
Frequency Accuracy: +/-10 ppm

8.2 DEMODULATION

DVB-T # of Carriers: 2k
DVB-T Bandwidth: 8/ 7/ 6 MHz
DVB-T Guard Interval: 1/32, 1/16, 1/8, 1/4
DVB-T FEC 1/2, 2/3, 3/4, 5/6, 7/8
DVB-T Modulation QPSK, 16-QAM, 64-QAM
Optional VETA Narrow BW Modes
VETA # of Carriers: 400
VETA Bandwidth: 2.5 MHz or 1.25 MHz
VETA Guard 1/16, 1/8
VETA FEC 1/3, 2/3
VETA Modulation QPSK, 16QAM
Threshold: (6,7, & 8 MHz BW)
QPSK ½: <-95 dBm
16-QAM ½: <-89 dBm
64-QAM ½: <-83dBm
(Optional Diversity can improve threshold by 2.5 dB)
VETA BW Threshold: -100 dBm to -105dBm

8.3 VIDEO DECODING

Compression Type: MPEG-2 (Field or Frame Encoding, Selectable) Auto Detect Desired.
Compression Standard: ISO/IEC 13818-2 with Intra-Refresh update mode for low Latency operation
Video format standards: NTSC or PAL
Profiles: SP@ML or MP@ML
Chroma Format: 4:2:0
Line Standard: 525 and 625 (NTSC/PAL)
Horizontal Resolution: 704, 528, 480, 352 pixels
VETA Systems Latency end to end delay: Down to ˜44ms for 6, 7, or 8 MHz
Narrow BW to ˜120mS (w/VETA TX Only, mode dependant)

Video Outputs
1- Composite w/OSD, 1-S-Video
Standards: NTSC (with and without pedestal) or PAL
Video Connectors: Composite – BNC-F,
Output Impedance: 75 Ohms
Output Level: 1V p-p
Frequency Response: 10 Hz to 4 MHz, +/- 1.5 dB

8.4 AUDIO DECODING

Number of Channels: 2
Decompression Type: MPEG Layer I & II (Musicam) or NICAM (User Selectable)
Musicam
Compression Standard: ISO/IEC 13818-3(Musicam)
Bit rates: 256 kbit/s/ch (Musicam), All bitrates supported
Sampling Frequency: 32 kHz, or 48 kHz (Musicam)
Nicam (Ultra-Low Latency)
Bits per Sample: 12 or 8
Sampling Frequency: 32 KHz, 16 KHz or 8 KHz
Frequency Response: 200 Hz to 10 KHz, +/- 1.0 dB Analogue
Audio Outputs: Un-balanced outputs, Line or MIC Level
Output Impedance: <100 Ohms Unbalanced
Connector: RCA

8.5 POWER

DC Voltage Range: 10 - 16 V
Reverse Voltage Protection
Power Consumption: 42 Watts
AC Voltage: 90-264 VAC @ 45-440 Hz

8.6 Physical

Dimensions: 16.0" W x 13.0" D x 6.87" H
Weight: 18.4 lbs (8.4 kg)
Packaged in a Pelican 1450 case

8.7 Environmental

Operational Temperature: -10 to +70 deg C

8.8 LAN/USB Interface

Refer to GMS' VETA IP Network Adapter (VNA) Data Sheet.
LAN module provides 10/100 Base-T LAN (RJ-45) Interface that can be used for audio/video/user-data streaming
USB - Standard

8.9 RS232 DATA OUTPUT

Baud Rate: Up to 115 k baud.
Connector: DB-9M

8.10 REMOTE CONTROL

RS232 Control from PC GUI: All receiver options and functions are controlled via the remote interface.

8.11 LOCAL MONITORING

On Screen Display: Signal To Noise Ratio (SNR), Pre and Post FEC Bit Error Rate (BER) and invalid Encryption Key are provided both on the On-Screen Display and the M.S. Control Application.

8.12 SECURITY OPTION

ABS is standard. The VR-B can optionally be provided with Advanced Encryption System (AES) 128 or 256 for protecting the signal in sensitive applications

Appendix A – Default Settings

PARAMETER	CONFIGURATIONS							
Config #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Unit Mode	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T
BDC LO	5200	5200	5200	5200	5200	5200	5200	5200
BDC Side	High	High	High	High	High	High	High	High
BDC Gain	0	0	0	0	0	0	0	0
COFDM BW	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz
RF Frequency	4908	4928	4908	4928	4908	4928	4908	4928
Modulation GI	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
OFDM Polarity	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
NTSC Format	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
Blue Screen on no Video	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MPEG4 deblocking Filter	No	No	No	No	No	No	No	No
On screen Display	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Auto Spect Detect	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Descrambling	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LNB Power	ON	ON	ON	ON	ON	ON	ON	ON
Power up Video Format	525	525	525	525	525	525	525	525

Appendix B – Troubleshooting Section

Symptom	Possible Reason	Action
Switch is On, Power LED is Off	**Blown Fuse**	Replace the Fuse
No RF Link	**Frequency mismatch**	Ensure that TX is active & on correct frequency
	BDC-s have incorrect LO	Ensure BDC's power is On, LO is set correctly
Poor Link performance	**Interference.**	Remove interfering signal or switch to alternative frequency.
	Receive antenna positioning	Where possible mount antennas unobstructed, away from other objects and as high as possible.
	Poor alignment of directional antennas	Ensure a proper alignment.
	Unsuitable Antennas.	Ensure that antennas are in a right band.
	Reduced Transmit Power.	Ensure that attenuation setting is appropriate for direct output or amplifiers connected.
Reduced image quality	**Horizontal Resolution.**	Select horizontal resolution that matches the resolution of the source.
	Video Bit Rate.	Ensure appropriate Audio mode is selected or fully disabled if not required.
SNR Reading: 0.0 but, other RF parameters locked	**OFDM Polarity Mismatch**	Either on the TX or RX (whichever is more accessible) switch the OFDM polarity
Blue Screen at VR-B	**No Video at TX**	Turn the OSD on & insure that Demod Lock is OK, Packet errors=0.
	Scrambling key mismatch	Ensure that scrambling keys at RX & TX are matching
No Audio	**Audio Disabled at TX**	Turn Audio On at TX (disabled by default)

Appendix C – References

For more detailed information on GMS products described in this manual, download the manuals below from GMS' WEB site (www.cobham.com/gms) of contact GMS customer Service department.

- Operations Manual, VETA Receiver 100-M0087
- Operations Manual, VETA Receiver SW 100-M0131
- Operations Manual, VETA Transmitter 100-M0089