Technical Operations Manual

COBHAM

The most important thing we build is trust.

VETA Receiver

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Revision History

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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)
CSM	Compact Surveillance Modem
COFDM	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
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RX	Receiver
S/N	Signal-to-Noise Ratio
THD	Total Harmonic Distortion
TX	Transmitter
UDP	User Datagram Protocol
VDC	Volts (Direct Current)
VDL	VETA Digital Link
VDR	VETA Digital Repeater
VMT	VETA Miniature Transmitter
VNA	VETA Network Adapter
VR	VETA Receiver
VT	VETA Transmitter

2. Introduction

GMS' Very Efficient Transmission Apparatus (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 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 (VETA Receiver) as well as pertinent technical information related to the overall system.

2.1 Key System Features

- COFDM Demodulation 2K Carriers or 400[(1)]
- Bandwidths from 1.25[(2)]MHz to 8 MHz
- Input Frequency: 0.174 to 8.5 GHz (In-Bands)
- Internal or External Down-Converters
- Low End to End System Latency (down to ~44mS)
- Secure – ABS / BCRYPT 128 or 256 Encryption[(3)]
- Optional LAN IP Streaming Interface
- Optional Video Server

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

3. General System Information

The VR (VETA 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 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! Optional external GMS BDCs are available that can support other frequency bands and optimize reception when mounted directly to remote Antennas. These remote BDC can be powered from the IF line of the VR or, their own power supply. The VR can also be optional supplied with internal LNAs for operation below 860 MHz or no internal Down-Converter or LNA. The latter option is used when the BDC is remotely mounted, usually with an Antenna.

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.

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-Screen Display and M.S. Windows control program.

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

The optional VETA IP Network Adapter (VNA) provides the VR with a video streaming capability for network interfacing. An optional M.S. Windows software Decoder and Recording application is also available. See Section 7 on VETA 'Chaining' feature. Alternatively the VR can have an integrated video server installed for web streaming applications.

The VR's versatile housing can be optionally mounted in a suitcase, can sit on a desktop, or be configured to mount in a 19-inch instrumentation rack.

[(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.

4. Getting Started

The VR 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 Initial Checkout

Prior to installing a VR 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. In the case outlined, we will assume a VETA Miniature Transmitter (VMT) is used to transmit to the VR. Note, that any MPEG-2, DVB-T compliant transmitter can be employed instead if the VR is set-up in standard DVB-T Mode (RF BW 6, 7, or 8 MHz) and not in ultra-low delay mode.

Figure 1 shows a basic VDL configuration wireless link. The following setup can be done, either wirelessly with antennas, or through hard line connection with 50Ω cable. In either case, make sure there is enough attenuation from the Tx to the Rx to avoid overdriving the receiver. In most DVB-T receivers, their optimal input power ranges from -30 to -70 dBm. The VR shown has internal BDCC installed locally within unit, which is our standard VR configuration. The steps necessary to setup the configuration shown are stated below:

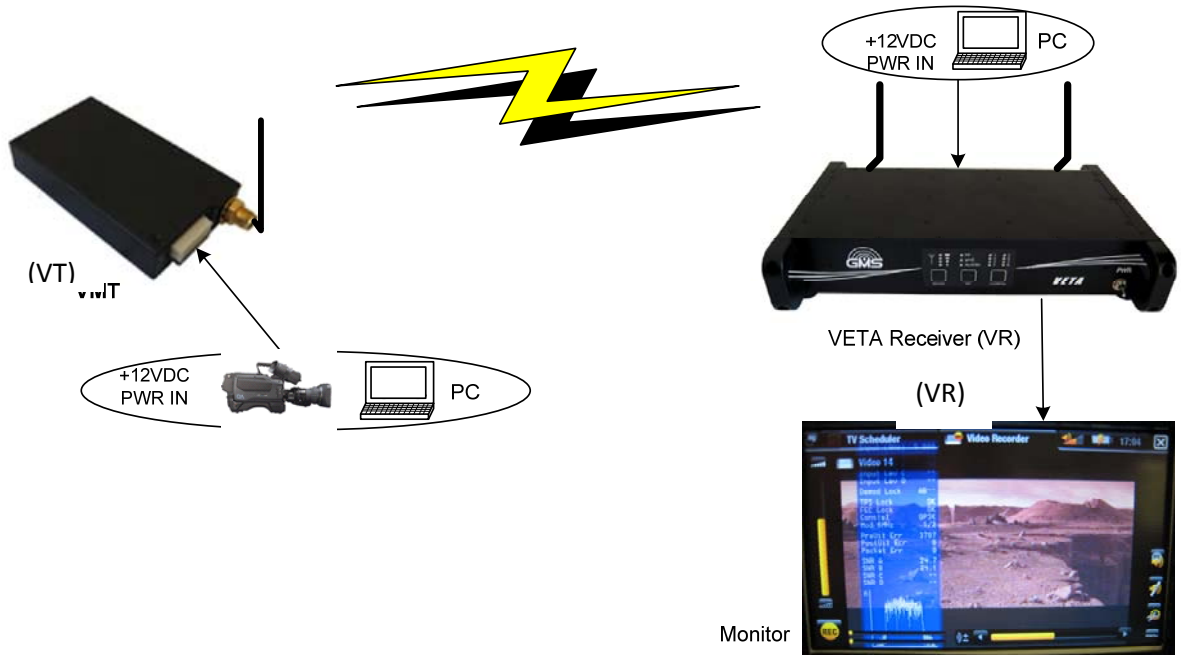


Figure 1 – Basic VDL Setup

- Install omni-directional antennas (or ones best suited for the application) onto the RF IN A and RF IN B ports on the Veta Receiver and one on the SMA RF connector on the VMT. (Hard lined connection can be made instead, make sure enough attenuation is present when performing a hard line checkout)
- Attach the VMT breakout cable (780-C0449 or equivalent) and apply **+12VDC** to the red pigtail and GND to the black pigtail. Ensure power supply can supply at least 0.5A at +12VDC.
- Attach a composite video source to the BNC video input cable that is located on the VMT breakout cable.
- Note which VMT Configuration 1 through 16 is shown (rotary switch or through control software); this number must match the receiver.
- Attach a video cable from BNC VID output port on the VR (VETA Receiver) to the composite Video input port of a video monitor.
- Apply +12Vdc to the VR, pins 1, 2, +12V and 3, 4 ground to the J2 dB connector (if using provided cable use the red (+12V) and black (GND) pigtails. *Power supply must be able to source 2 AMP at 12VDC.*
- Turn on the video source and video monitor equipment.
- Turn on the VR with the **PWR switch** on the front panel (up is ON). The VR will output a 'blue' screen to your video monitor when no video is present to the VR.
- Once the VR has powered-up, ensure the selected green LED1 through 16 (above the **CONF button**) matches the same configuration LED as the transmitter. If not use the **CONF button** to select the correct configuration, select the same number as the transmitter. (See section 5.1.6 for explanation of binary representation of configs).
- If the configuration LED is flashing green press the **RF button** on the front keypad (this action provides power to the internal down converters) and the LED will stay solid green.
- After approximately 5 seconds, the link should be established and video provided by the source should be displayed on the monitor. The RF green LED should light as well as the signal strength green LED indicators.
- Press the **MODE button to** turn on the diagnostic OSD (on screen display).
- If the red Alarm LED lights it may be an indication that the receiver is unable to lock to a signal. Check the following:
    - Ensure the receiver and transmitter lit configuration green LED (1 through 16) located above the **CONFIG button** is the same. If not press the **CONFIG** button on either the transmitter or receiver so they match.
    - Ensure the PWR switch for the VR is **ON** and that the **RF button** has been pressed after apply +12VDC.
    - If the TX and RX are physically too close to each other, the RX may overload causing distorted Video. You may reduce the power of the TX (low power mode through VMT GUI) or move the TX & RX further apart. 50 Ohm RF attenuators can also be used to attenuate power from the Tx.

4.2 Key RF Settings For COFDM Transmission

The RF settings shown in Figure 2 show the key COFDM configurations for setting up any COFDM link. The settings underlined in RED must be matched specifically to the VETA Transmitter for proper RF lock and demodulation (the other COFDM parameters are auto-

detected). In general, when troubleshooting a RF link, the operator should make sure that the following RF parameters are matched at both the Transmitter and Receiver.

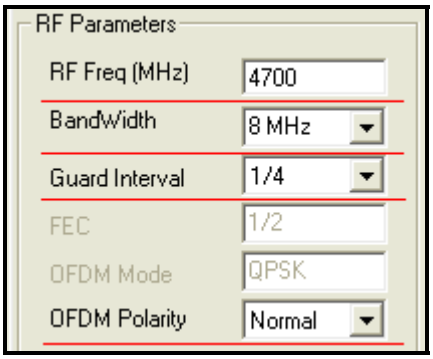


Figure 2 – VR RF Essentials

The initial checkout described above is simply to check the basic video operation of the VR unit. For further details on the connectors, monitoring and controlling the VR read thoroughly through this manual starting with section 5, hardware overview, and section 6. For a full explanation of the control software see Manual: 100-M0131.

5. Hardware Overview

The VR versatile housing can be optionally mounted in a suitcase, sit on a desktop or be configured to mount in a 19 inch instrumentation rack.

All interface connectors are located in the back of the unit. The front consists of a standard push button panel, LED indicators and a toggle power switch. The front and back panels of the VR unit are illustrated in Figure 3, 4 and 6 and discussed in detailed in this section.

Figure 3 – VR Front View

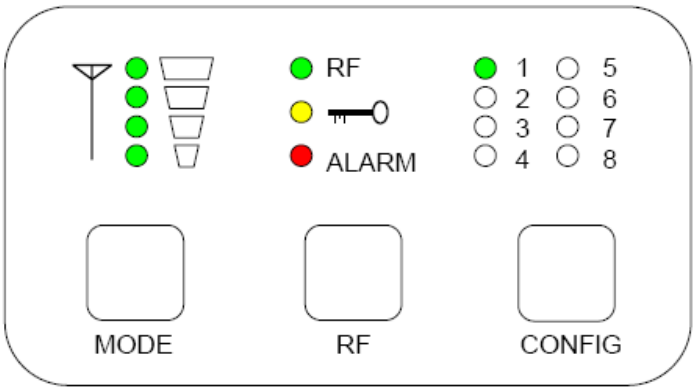


Figure 4 – VR front panel

5.1 VR Front Panel

The front button panel, LED indicators and power switch are explained in this section.

5.1.1 Power Switch

The Power Switch located on the far right side of the panel enables +VDC to the system; up position is **ON**, down position is **OFF**. On powering the VR, the eight green configuration LED-s (see section 5.1.6) will light up indicating the current configuration (the one that was active

when the VR power was turned off). In addition the red Alarm LED (see section 5.15) may light if the VR is unable to lock or decode the incoming signal.

5.1.2 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).

5.1.3 RF Green LED

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

5.1.4 Lock Yellow LED

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

5.1.5 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.

5.1.6 Green Config LEDS 1 to 8

The 8 green LEDs (located above the CONFIG button) indicate which one of the sixteen 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**.

The sixteen configurations are represented in binary format with LED-4 being the most significant bit, and LED-1 being the least significant. (Note: LED-5 will always be light, which indicates receiver is in 16-configuration mode). When LEDs 1-4 are all light, this represents config group 16, while when LEDs 1-4 are off, this represent config group 1.

5.1.7 Config Button

The Config button, when pressed, selects the next configuration from memory. The user will see the LEDs on the front panel increment in a binary fashion. The 16 configurations in memory define all potential variables including center frequency, modulation bandwidth, Guard Interval and OFDM polarity. See section 6 and software manual 100-M0131 for a full discussion on setting the parameters for each configuration.

☞Note that this configuration selection (1 through 16) must match the transmitter's OFDM modulation parameters selection for the link to work.

5.1.8 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.

5.1.9 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 5. The OSD is explained in detail in Manual 100-M0131.

Figure 5 – VR OSD

5.2 VR REAR PANEL

The rear panel contains the connectors necessary for interfacing to the VR. Detailed descriptions of all the VR connectors and components (see Figure 6) are included in the following sections.

Figure 6 – VR Rear View

5.2.1 RF AND IF CONNECTIONS

The VR can be configured with internal down converters, which is the normal default hardware setup, or with external down converters.

When using internal down converters the antennas are connected to the diversity RF input, RF IN A and RF IN B. Internal down converters take the microwave RF signal and down convert it to the UHF intermediate frequency (IF) which comes out on IF OUT A and IF OUT B BNC connectors. The IF OUT A and IF OUT B are then connected with external cables to the IF IN A and IF IN B BNC connectors respectively.

If using external down converters the IF outputs from the external down converters are connected to the IF IN A and IF IN B (in this scenario the RF IN A / B and IF OUT A /B are not used). See section 5.3 below on using external down converters.

> ☞ ***WARNING:*** ***external down converters can be supplied with +12VDC through the IF IN A or IF IN B ports (from the VR). Ensure the external DC can handle the +12VDC through the IF port before activating power (or for that matter ensure the power is off before connecting) otherwise damage could occur to the down converters. The +12V power can be activated using GMS control software or the RF button on the front panel.***

Table 1 – RF Connections

Connector Name	Connector Type	Comments
RF IN A	SMA (F)	To internal down converter
RF IN B	SMA (F)	To internal down converter
IF OUT A	BNC(F)	From internal down converter
IF OUT B	BNC(F)	From internal down converter
IF IN A	BNC(F)	To demodulator/decoder
IF IN B	BNC(F)	To demodulator/decoder

5.2.2 ASI OUT

One ASI (asynchronous serial interface) connector is provided. This is a 75 ohm AC coupled output. The ASI can be used if external decoders are preferred, or to a ASI recorder or Multiplexer.

Table 2 – ASI Connector

Connector Name	Connector Type	Comments
ASI	BNC (F)	ASI out stream

5.2.3 Video

One composite video out 75 ohm impedance, PAL/NTSC standard is provided. S-Video output is also provided but is located on the multifunction J1 dB-15 (F) connector which is described under section 5.2.5.

Table 3 – Video Connector

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

5.2.4 Audio

A Lemo 5 pin connector is provided for audio output. The output level is nominal line level with output impedance of 50 ohm. Audio is single ended. There are no audio gain adjustments.

Table 4 – Audio Connections

Connector Name	Connector Type	PIN	Function
AUD	Lemo 5-PIN (F)	1	NC
AUD	Lemo 5-PIN (F)	2	NC
AUD	Lemo 5-PIN (F)	3	GND
AUD	Lemo 5-PIN (F)	4	LEFT AUDIO
AUD	Lemo 5-PIN (F)	5	RIGHT AUDIO

5.2.5 J1 Multifunction DB-15 (F) Connector

The multifunction DB-15 connector provides for DC power out, received signal strength indicator, A & B, S-Video output and the necessary clocks, data and grounds for the optional chaining interface (an interface which allows multiple services to be sent via one RF link).

The DC power out is basically a loop through from the DC power in and should reflect the input DC level (see section 5.2.6). It is used to provide power for optional equipment and setups.

S-Video provides a step up in terms of video quality from composite video out (as described in section 5.2.3) and be taken from pins 14 and 15.

The remaining pins and their functions are described in the table below.

Table 5 – J1 Multifunction Connector

Connector Name	Connector Type	Pin	Function	Comments
J1	DB - 15 (F)	1	PWR OUT	9VDC-18VDC
J1	DB - 15 (F)	2	PWR OUT	
J1	DB - 15 (F)	3	GND	
J1	DB - 15 (F)	4	GND	
J1	DB - 15 (F)	5	RSSI A	0 - 4.5V
J1	DB - 15 (F)	6	RSSI B	0 - 4.5V
J1	DB - 15 (F)	7	Chain CLK OUT	
J1	DB - 15 (F)	8	GND	
J1	DB - 15 (F)	9	Chain DATA OUT	
J1	DB - 15 (F)	10	Chain CLK IN	
J1	DB - 15 (F)	11	GND	
J1	DB - 15 (F)	12	Chain DATA IN	
J1	DB - 15 (F)	13	GND	
J1	DB - 15 (F)	14	S-LUMA OUT	
J1	DB - 15 (F)	15	S-CHROMA OUT	

5.2.6 J2 Multifunction DB-9 (M) Connector

The multifunction DB-9 connector provides for DC power in, RS232 TX & RX control and RS232 TX & RX data.

The DC nominal voltage is 12VDC, minimum is 9VDC and maximum should not exceed 18VDC. Reverse polarity protection is provided *but* ***no protection for over voltage***. Power pins 1 & 2 are internally connected as well as ground pins 3 &4.

The receiver can be controlled remotely with GMS PC control software (which is explained in more detail in Manual 100-M0131). This is done by connecting the PC RS232 transmit and receive lines to the RS232 TX CTRL and RS232 RX CTRL, pins 5 and 6.

In addition serial RS232 data, sent from the transmitter, can be received on pins 8 & 9, RS232 TX DATA and RS232 RX DATA using a PC RS232 port or another appropriate device.

The remaining pins and their functions are described in the table below.

Table 6 – J2 Multifunction Connector

Connector Name	Connector Type	Pin	Function	Comments
J2	DB - 9(M)	1	PWR IN	9VDC -18VDC
J2	DB - 9(M)	2	PWR IN	
J2	DB - 9(M)	3	GND	
J2	DB - 9(M)	4	GND	
J2	DB - 9(M)	5	RS232 TX CTRL	
J2	DB - 9(M)	6	RS232 RX CTRL	
J2	DB - 9(M)	7	GND	
J2	DB - 9(M)	8	RS232 TX DATA	
J2	DB - 9(M)	9	RS232 RX DATA	

5.2.7 RJ-45, VIDEO SERVER (Optional Video Server)

A VETA Receiver can optionally be configured to have an integrated video server installed. The video output from the VR will now show an overlay generated via the video server. When connected to a valid network the Video server will show its' IP address on the video output as an overlay. If no Ethernet is connected, an icon of a RJ-45 with an 'X' through it will show in the upper right corner of the video output to indicate no network connection was made.

When a valid network has been attached, the user can open their internet browser and enter the IP address shown on the video overlay. The video shown at the video output of the VR should now be simultaneously streaming to the web browser. In order to make changes to the video server, the user will need the username and password:

The default user name is: admin

The default password is: 9999

To turn off the video overlay:

Suppose, for example that the IP address of the device is 192.168.1.168. The user would type in: http://192.168.1.168/tailpage.htm. (After login) The user would select "ON" or "OFF" in the OSD column.

Warning: Please write down the IP address of the device before turning off the OSD.

For more details on the video server, see the Video Server Manual.

5.3 Using External Down-Converters

Down converters have an LO (local oscillator) which is mixed with the DVB-T transmitter frequency and it then converts it to the IF - intermediate frequency. The VR (VETA receiver) locks on to the IF frequency in order to be able to receive the C-OFDM signal. The VR calculates

the IF frequency based on the LO (in MHz) of the down converter as well as the DVB-T transmitter frequency (in MHz) and whether the LO is using high or low side injection (relative to the band of transmission). These parameters must be entered into the GMS control software setup screens (see Figure 7 and also refer to manual 100-M0131) regardless if the VR is configured with internal or external down converters. However when the unit leaves the factory, these parameters are pre-configured when using internal down converters. When using external down converters it is up to the user to enter these parameters. If necessary contact the manufacturer of the BDC (block down converter) to find the **LO**, if it's using '**high**' **or** '**low**' side injection and the **gain** of the unit. Although the BDC gain setting is not needed for the operation of the system it is used in calculating of input levels displayed by OSD (on screen display).

The **OFDM polarity** of 'normal' or 'invert' is usually selected based on the polarity of the transmitter.

The VR can source +VDC through the 'IF IN B' and 'IF IN A' ports so that the external BDC-s can be powered through the IF cable (referred to as 'remote power') instead of using a 'local' power source at the BDC. This feature makes powering the BDC-s convenient and less messy than dealing with additional power supplies. It also makes it easier to install the BDC-s in places where it may be difficult to have a local power source. The **BDC Power** with options 'yes' or 'no' turns ON or OFF the +VDC on the IF line. The DC voltage up the IF line is equal to the voltage supplied to the VR. If using long cable runs to external BDC the DC drop across the IF line may be such that the BDC are not able to power. In this case, one work around (besides using higher quality coax, with less DC loss/ft) is to increase the supply voltage to the VR. *As mentioned above in section 5.2.1, before selecting 'yes' ensure the external BDC has the capability of being powered up through the IF line. If not it could cause damage to the unit.*

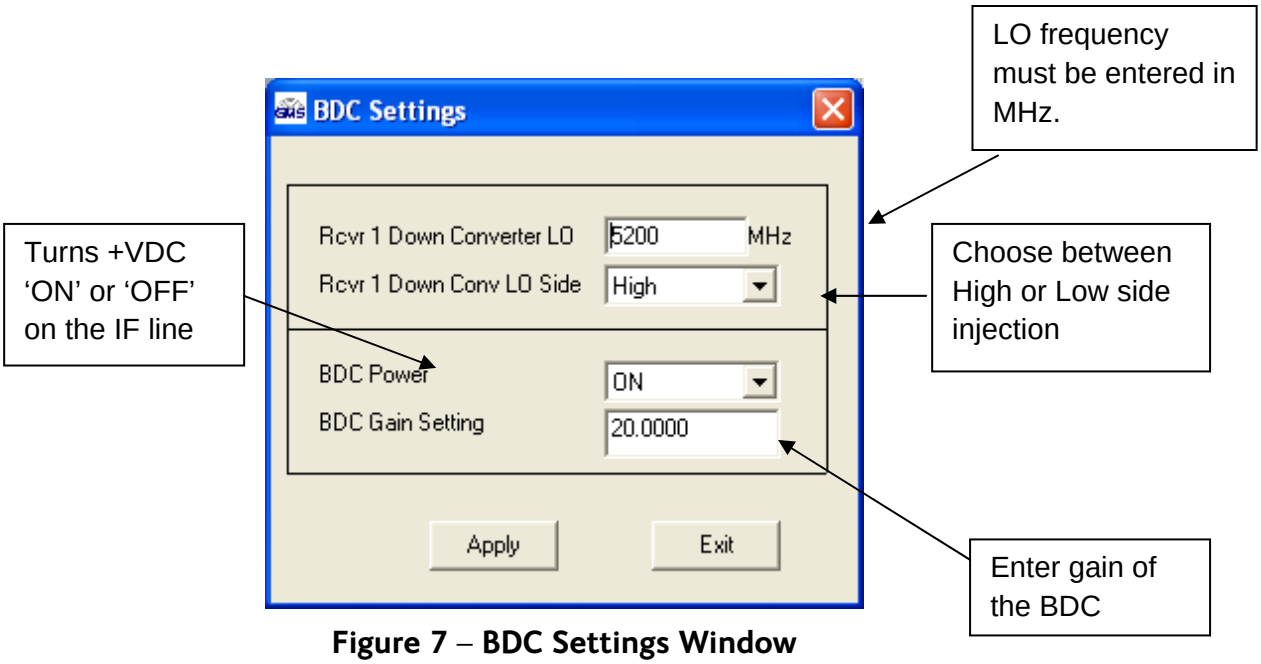


Figure 7 – BDC Settings Window

External BDC-s are connected as shown in Figure 8. Ensure to use high quality 75 ohm impedance RF cable which can handle VHF to UHF frequencies from approximately 45 MHz to 1000 MHz. When using external BDC-s keep in mind that there is a limit to the length of the IF cable (cable between the BDC and the VR) which is based on:

- **Excessive DC voltage drop**: BDC-s usually have a specification calling out a minimum DC voltage for their units to work. Excessive cable length can cause the DC voltage to drop below this minimum causing the system to fail. This voltage drop can usually be calculated based on the manufacturer's cable properties. Or you can simply measure the DC voltage at the BDC (remember to keep a load on when making this measurement). The bottom line is that when using 'remote' power the user needs to ensure the DC voltage from the VR to the BDC is above the required minimum.
- The work-around to excessive DC voltage drop is to power up the BDC-s using 'local' power. Hence if the IF cable length is causing too much of a voltage drop, use a local power supply to power up the BDC.
- **Excessive IF signal loss**: Excessive cable length can also cause too much signal loss (noted in dB) before it gets to the VR. Once again the manufacturer's cable specifications can be used to calculate the dB loss based on frequency and cable length. It can also be measured using a Spectrum Analyzer if one is available. Signal loss results in system degradation noted usually in poor SNR readings and low input levels as seen on the OSD. Remember that a 3 dB loss corresponds to half power loss!
- One possible work-around to excessive signal loss (when running long IF cable lengths) is to use a good quality in-line amplifier. Make sure to follow manufacturer's instructions very closely because improper installation of an inline-amplifier could introduce other problems.

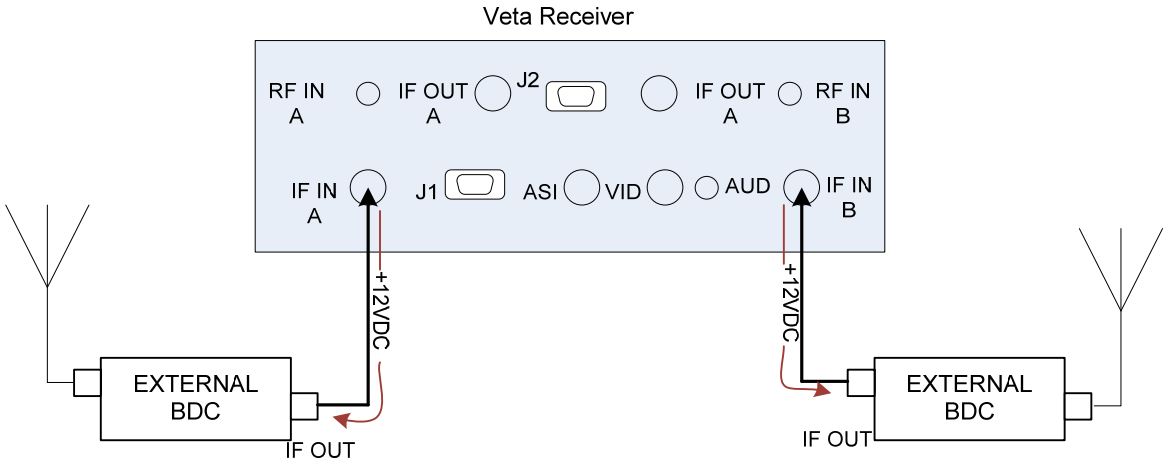


Figure 8 – External BDC Setup

6. Software Control Overview

Configuration, control and monitoring of the VR units are enabled through the use of GMS' optional (sold separately) MS Windows-based VR Configurator software program. This Graphical User Interface (GUI) program provides the end user with a straightforward way to interface with the VR unit. During normal operation, once a VDL link is established, the VR Configurator GUI can be used to monitor the link statistics as well as control the receiver. Monitoring the link statistics is an optional operation therefore, if desired, the VR Configurator GUI does not need to be active and can be disconnected from the VR unit.

6.1 System Requirements

The VR Configurator program has been developed and tested on Windows 2000, Windows XP and Windows NT. Although the VR Configurator program may work properly on other operating systems, no GMS support or assistance can be provided concerning other operating systems.

6.2 Software Installation

The following instructions outline the installation process for the VR Configurator program:

Insert provided CD-ROM into computer.

Click on 'setup.exe' file. This will launch the GMS_VR Setup program and several initial setup files will begin to be copied onto the computer.

After the initial setup files are copied over, the GMS_VR Setup program will prompt the user to close any applications that are running. Once all other programs are exited, click on the 'OK' button.

The GMS_VR Setup program will prompt the user to click on the 'computer icon' button to begin installation. If desired, the user can change the destination directory from the default. Click on the 'computer icon' button.

The GMS_VR Setup program will then prompt the user to 'Choose Program Group'. If desired, the user can change the program group from the default. Click on the 'Continue' button.

After installing the VR Configurator program, the GMS_VR Setup program will put up a window indicating that setup was completed successfully. Click 'OK'.

6.3 VR Configurator Functions

The VR Configurator program provides the user access to many different configuration, control and monitoring options. When the VR Configurator program is launched, the screen shown in Figure 9 is displayed. The user should first select the serial port their computer is connected to via the Serial Port Selector and Status region. If the selected serial port is valid, the gray-colored status box will show 'Ready'. The Device Selector region allows the end user to choose to interface to a VR (receiver) unit. To configure a VR, select the 'VR' box in the Device Selector region. Once the 'VR' box is selected, the screen shown in Figure 10 is displayed. The VR

Configurator program contains function buttons and all the configurable settings available on a VETA Rx.

For more detail see the Software Manual: 100-M0131.

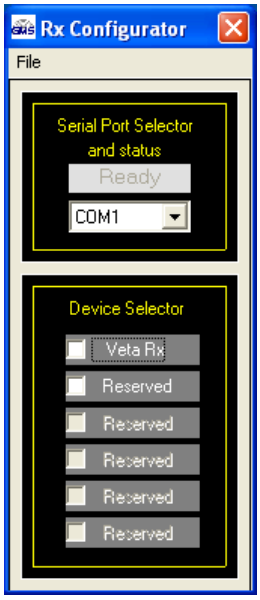


Figure 9 – VR Configurator COM Port Selector

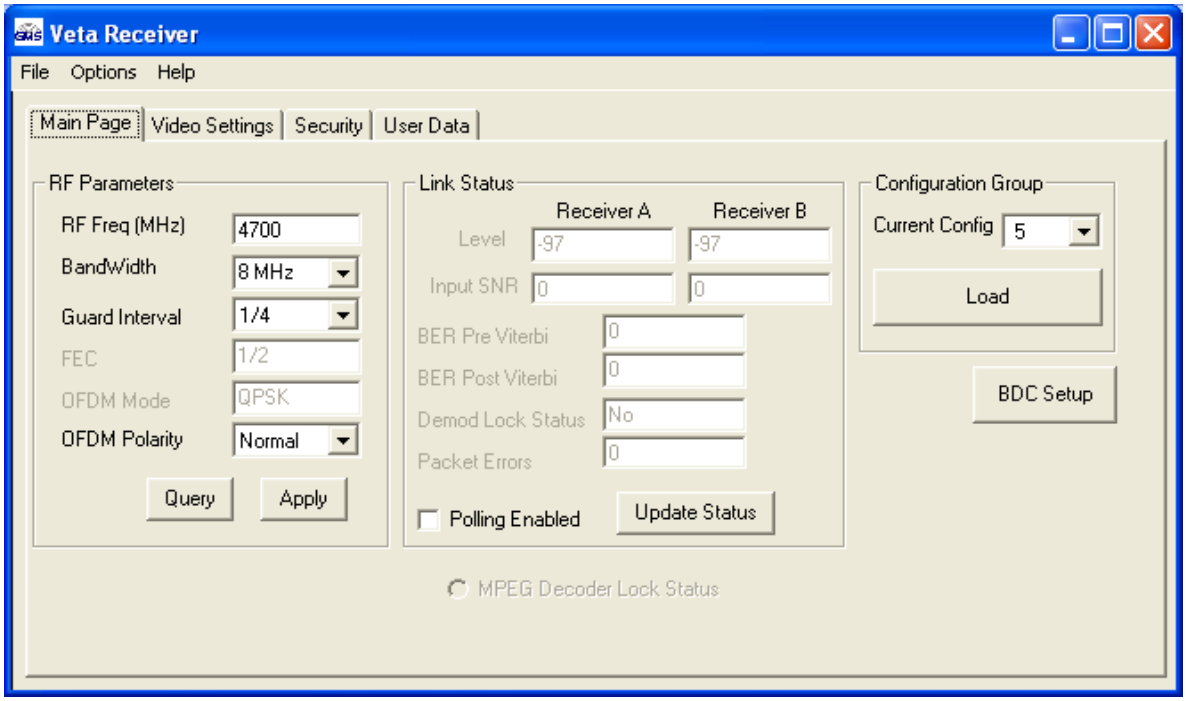


Figure 10 – VR Configurator Main Screen

7. VETA Chaining Feature

The VETA series of products use a Proprietary Transport stream protocol called 'Chaining' to create the VDR (VETA Digital Repeater), the CSM (Compact Surveillance Modem) or a UDP Tx. This is all available by utilizing the chaining feature which comes standard on all VETA Tx, VR and VNA. Contact factory for more information about the Chaining feature and the variety of applications it can be employed with.

7.1 VETA Digital Repeater (VDR)

An In band or cross band repeater can be made very simply with the VETA series Transmitter (VT-2W, VT-C, or VT-L) in conjunction with a VETA Receiver. The user simply has to connect the 'Chaining Out' of the VR into the 'Chaining In' of a VETA Tx.

7.2 Compact Surveillance Modem (CSM)

The VETA Compact Surveillance Modem is much like the VDR with the addition of the VETA NETWORK ADAPTOR (VNA). The VNA allows for IP streaming of video, or with a complement CSM a LAN Bridge (CSB) can be created across the link.

7.3 UDP Transmitter

A UDP transmitter can easily be employed using the Chaining Out of a VNA into the Chaining In of a VETA TX. UDP can be sent to the VNA via the RJ45 connector which is converted to Chaining within the VNA and delivered to the VETA TX through the Chaining interface. On the receiver Side, a VR will send its Chaining Out to the Chaining In of a VNA. The VNA can be connected to a router or simply another computer to distribute the UDP data.

8. Specifications

8.1 C-OFDM RF INPUT

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

8.2 C-OFDM IF INPUT

Input Ports: 2
Input Connector: BNC-F
Input Impedance: 75 Ohms, <1.5:1 VSWR
Input Frequency: 0.174 to 849 MHz
Frequency Accuracy: +/-2 ppm
Final IF Bandwidth: 10 MHz @-3dB
LO Radiation: <-25 dBm
DC Output: 12V @ 500 mA

External Down-Converters (optional)
Frequencies >845 MHz

8.3 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

8.4 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 or 4:2:2
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,
S-Video – p/o J-1, DB-15F
Output Impedance: 75 Ohms
Output Level: 1V p-p
Frequency Response: 10 Hz to 4 MHz, +/- 1.5 dB

8.5 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: 48 kHz only (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 Level
Output Impedance: <100 Ohms Unbalanced
Connector: LEMO 5 pin

8.6 POWER

DC Voltage Range: 9 - 18 V
Reverse Voltage Protection
Power Consumption: 12 Watts
W/ Optional AC to DC Adapter
AC Voltage: 90-264 VAC @ 45-440 Hz
AC Power Consumption: 13 Watts
Circuit Breaker Protector

8.7 Physical

Less Handles
Dimensions: 9.752” W x 4.8” D x 1.754” H
24.77 cm W x 12.19 cm D x 4.45 cm H
With Handles
Dimensions: 9.752” W x 6.8” D x 1.754” H
24.77 cm W x 17.27 cm D x 4.45 cm H
Weight: 3.69 lbs (1.67 kg)

8.8 Environmental

Operational Temperature: -10 to +70 deg C

8.9 Optional LAN/USB Interface

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

8.10 RS232 DATA OUTPUT

Baud Rate: Up to 115 k baud.
Connector: p/o J1, DB-9M

8.11 CONTROL

Local Control: Front Panel with 16 channel/mode select,
Preset key selection (1-16).

8.12 REMOTE CONTROL

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

8.13 LOCAL MONITORING

Control Panel: Signal Strength (Bar Graph), Channel & Mode, and Rx Lock, invalid Encryption Key

OSD: Signal to Noise Ratio (SNR), Pre and Post FEC Bit Error Rate (BER) and Packet Errors.

8.14 REMOTE MONITORING

All RX measurements and controls

8.15 SECURITY OPTION

ABS is standard. The VR can optionally be provided with BCRYPT 128 or 256 for protecting the signal in sensitive applications.

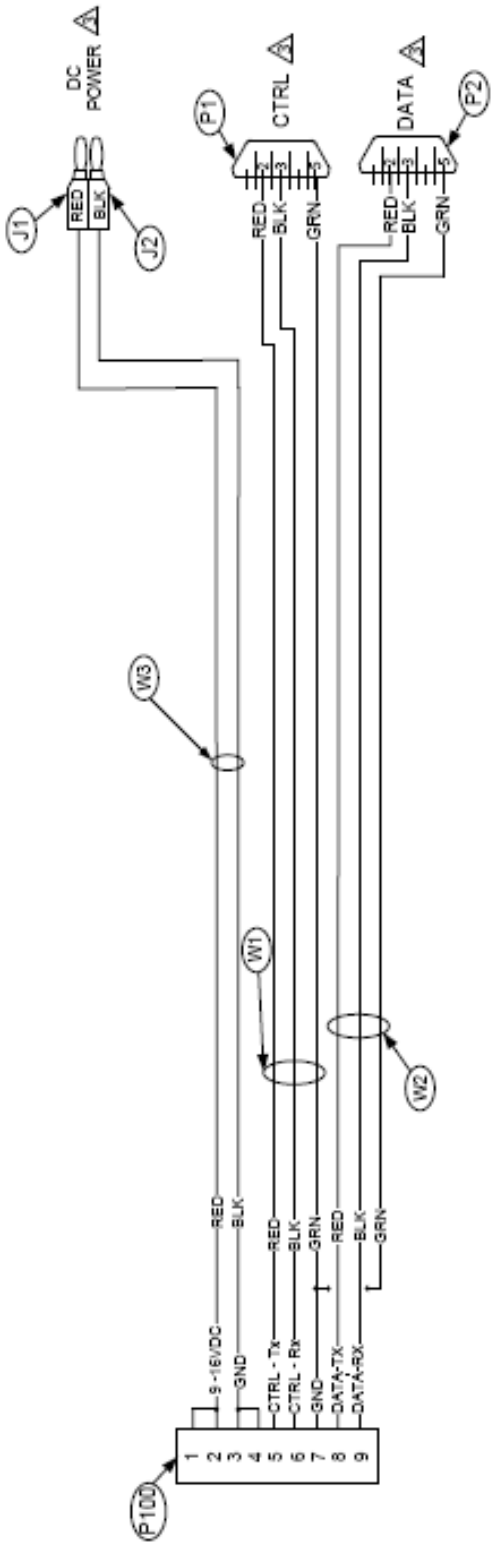
Appendix A – LED Indictors

LED condition	Meaning	Action
No Config LED-s lit	Unit is OFF	Turn the unit On
Config LED is flashing	Indicates that BDC power is off	Push the *Mode* button to turn BDC-s On.
Red Alarm Lit **RF LED Off**	No RF Signal Lock	Ensure that RF source is active and has correct frequency. Ensure that BDC-s are turned on. Ensure there is no interfering signal
Red Alarm Lit **RF LED On**	Has RF Signal Lock, but no decoder Lock	Ensure that Video is enabled at the Transmitter. Ensure that scrambling keys matched
Signal strength LED-s off	No incoming RF signal	Ensure that RF source is active.

Appendix B – Troubleshooting Section

Symptom	Possible Reason	Action
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 (which ever is more accessible) switch the OFDM polarity

Appendix C – Control Cable



Appendix D – VR DEFAULTS, LS BAND

PARAMETER	CONFIGURATIONS															
Config #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Unit Mode	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	Narrow Band	Narrow Band	Narrow Band
BDC LO	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550
BDC Side	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
BDC Gain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COFDM BW	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	2.5Mhz	2.5Mhz	2.5Mhz
RF Frequency	1755	1802	1850	1755	1802	1850	2200	2300	2400	2200	2300	2400	2345	1802	2300	1802
Modulation GI	1/4	1/4	1/4	1/8	1/8	1/8	1/8	1/8	1/8	1/32	1/32	1/32	1/4	1/16	1/16	1/16
OFDM Polarity	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Inverted	Inverted	Inverted
NTSC Format	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
Blue Screen on no Video	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MPEG4 deblocking Filter	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
On screen Display	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Auto Spect Detect	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Descrambling	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LNB Power	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Power up Video Format	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
Store Config	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Appendix E – VR DEFAULTS, S1 BAND

PARAMETER	CONFIGURATIONS															
Config #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Unit Mode	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	Narrow Band	Narrow Band	Narrow Band
BDC LO	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
BDC Side	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
BDC Gain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COFDM BW	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	2.5Mhz	2.5Mhz	2.5Mhz
RF Frequency	2200	2300	2400	2200	2300	2400	2200	2300	2400	2200	2300	2400	2345	2300	2300	2300
Modulation GI	1/8	1/8	1/8	1/32	1/32	1/32	1/8	1/8	1/8	1/32	1/32	1/32	1/4	1/16	1/16	1/16
OFDM Polarity	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Inverted	Inverted	Inverted
NTSC Format	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
Blue Screen on no Video	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MPEG4 deblocking Filter	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
On screen Display	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Auto Spect Detect	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Descrambling	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LNB Power	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Power up Video Format	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
Store Config	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Appendix F – VR DEFAULTS, C2 BAND

PARAMETER	CONFIGURATIONS															
Config #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Unit Mode	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	DVB-T	Narrow Band	Narrow Band	Narrow Band
BDC LO	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200
BDC Side	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
BDC Gain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COFDM BW	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	8Mhz	7Mhz	2.5Mhz	2.5Mhz	2.5Mhz
RF Frequency	4400	4700	5000	4400	4700	5000	4400	4700	5000	4400	4700	5000	4400	4700	5000	4400
Modulation GI	1/4	1/4	1/4	1/8	1/8	1/8	1/8	1/8	1/8	1/32	1/32	1/32	1/16	1/16	1/16	1/16
OFDM Polarity	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
NTSC Format	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
Blue Screen on no Video	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MPEG4 deblocking Filter	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
On screen Display	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Auto Spect Detect	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Descrambling	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LNB Power	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Power up Video Format	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
Store Config	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16