User's Manual

The most important thing we build is trust.

VETA NETWORK ADAPTER (VNA)

100-M0105X1
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Revision History

Version	Date	Main Changes from Previous version	Created by
X1	03-09-2010	Initial Release	

1.0 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)
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
M2D	Messenger Decoder
M2T	Messenger 2 Transmitter
Mbps	Megabits per second
MDL	Messenger Digital Link
MER	Modulation Error Rate
MPEG	Moving Picture Experts Group
MVRD	Messenger VETA Receiver Decoder
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)
VR	VETA Receiver
VT	VETA Transmitter
VDR	VETA Digital Repeater
CSM	Compact Surveillance Modem
UDP	User Datagram Protocol
VNA	VETA Network Adapter

2.0 Introduction

The VETA IP Network Adapter (VNA) is a companion product to GMS' VETA Transmitters and VETA Receiver (VR) that provides either a Simplex or Duplex Link between GMS' VETA product line and a 10/100 Base-T LAN. In order to generate streams suitable for streaming over IP networks, VETA transmitters or receivers are required. These interface to the network engine hardware via their chaining interfaces.
The VNA can be used for following applications:

- IP Streaming Audio/Video/User Data from a GMS VR Receiver
- IP Streaming Audio/Video/User Data from LAN to GMS VETA wireless link
- Wireless LAN Bridging
- Simultaneous wireless Audio/Video Transmission with LAN Bridging
- Monitoring Platforms
- Mobile and portable A/V applications

This manual provides information on how to operate the VNA (VETA Network Adapter) as well as pertinent technical information related to the overall system.

2.1 Warranty Cover

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.

2.2 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.

3.0 Theory of Operations

The transmission of compressed video across an IP network is often called 'streaming video' and can vary from full frame rate high quality to reduced resolution low quality (often called thumbnails) video. Streaming video connections can be point-to-point, going from one source to one receiver (uni-cast) or from one source to multiple receivers (multi-cast).

IP Networks can be either private networks, operated by a single organization (usually described as Private LANs or WANs – Local Area or Wide Area Networks), or public networks, where the capacity is shared between many users (the internet or 3G networks are typical of public networks). In a private network such as those operated by many law enforcement customers, the capacity available on the network is typically 10 to 100Mb/s and the network is rarely operated close to this capacity.

In a public network the capacity is usually purchased by the user on a 'pay per use' scheme, and the capacity is typically very limited and is contended in nature. The capacity on contended networks is both limited and variable. Normally, 200 Kb/s is available on average, but this might vary at times from 0kb/s to 500kb/s. This limited, but variable, capacity makes streaming video of any quality very difficult.

Private networks will often allow multi-cast transmissions, but this may require intervention of the network controller to configure routers and switches to allow multi-cast video streaming. Public networks, on the other hand, rarely allow multi-cast transmissions.

3.1 Applications

- Audio/Video Streaming
- LAN Bridge
- Monitoring Platforms
- Mobile and Portable AV Applications

The VETA IP Network Adapter (VNA) is a companion product to GMS' VETA VT Transmitter & VR Receiver that provides either a Simplex or Duplex link between GMS' VETA product line and a 10/100 Base-T LAN. This enables the user to build wireless digital microwave video systems. The standard VETA Encoder/Transmitter and Receiver/Decoder 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.

VNA is a stand-alone boxed product that can be connected to VETA Receivers or Transmitters and enables streaming video on to public or private networks. When connected to private networks, the VNA generates a high quality multi-cast video stream. When connected to a public network, it produces a reduced frame rate thumbnail stream at a data rate matching that available on the network.

VNA can be used for the following Simplex applications;

- IP Streaming Audio/Video/User Data from a GMS VETA Receiver (VR) or VETA Transmitter (VT-C or VT-2W through Chaining Output).
- IP Streaming Audio/Video/User Data from LAN to a GMS VETA Wireless Link

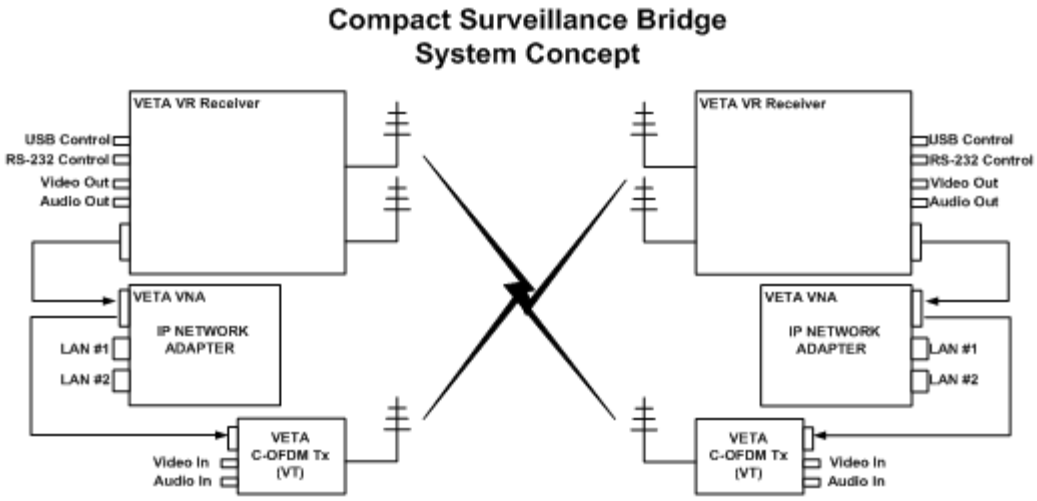

Figure 1 **Compact Surveillance Bridge**

GMS' Compact Surveillance Bridge (CSB) is an example of full Duplex system using VNAs, VTs and VRs. The CSB can provide

- Wireless Long or Short distance LAN Bridging
- Simultaneous Wireless Audio/Video Transmission w/ LAN Bridging

Both the VT and VNA can be mounted on the bottom of the VR receiver. VNA interfaces with RJ-45 connector to IP nodes.

4.0 Hardware Overview

☞Note – it is recommended to make all signal connections before applying power to either the VNA Network Adapter, or associated VETA product.

☞Note - care should be taken when making connections to the card not to damage the headers or connectors. Repeated connection and disconnection is not recommended.

☞Note - that care should be taken to ensure the correct polarity and voltage of the DC supply to avoid damage to the VNA. There is neither reverse polarity nor over voltage protection on the VNA.

4.1 VNA Interfaces

The VNA has connector layout shown in **Figure 2**.

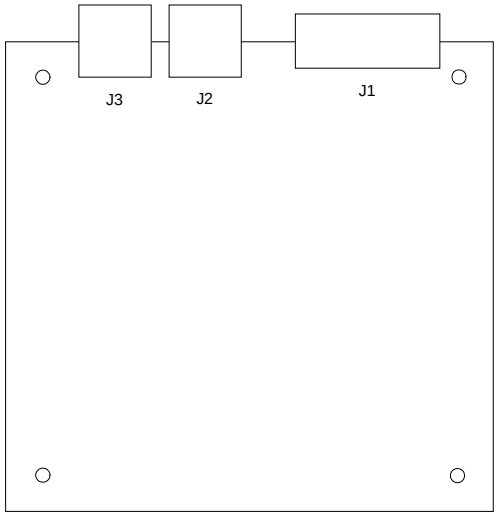

Figure 2 VNA Connectors Layout

The VNA is powered from a 12V DC supply. The power supply employed should be capable of supplying 12V at up to 500mA, with a voltage tolerance +/-0.5V.

The connectors are described in Table 1 and Table 2.

P – Power Pin; I – Input; O – Output; I/O – Bidirectional
All logic is active high unless stated otherwise
All logic levels are 3.3V LVTTL
* indicates analog signal

Table 1 Connector Pin Out J1

CHAINING/CONTROL J1	SIGNAL	Function
J1 PIN 1	Power	P
J1 PIN 2	GND	P
J1 PIN 3	RS232 CTRL TX	O*
J1 PIN 4	RS232 CTRL RX	I*
J1 PIN 5	GND	P
J1 PIN 6	RS232 DATA TX	O*
J1 PIN 7	RS232 DATA RX	I*
J1 PIN 8	GND	P
J1 PIN 9	Chaining Clock Input	I
J1 PIN 10	GND	P
J1 PIN 11	Chaining Data Input	I
J1 PIN 12	GND	P
J1 PIN 13	Chaining Clock Output	O
J1 PIN 14	GND	P
J1 PIN 15	Chaining Data Output	O

Table 2 Connector Pin Out J3

ETHERNET J3	SIGNAL	
J3 PIN 1	TX+	White/Orange
J3 PIN 2	TX-	Orange
J3 PIN 3	RX+	White/Green
J3 PIN 4	Not Connected	Blue
J3 PIN 5	Not Connected	White/Blue
J3 PIN 6	RX-	Green
J3 PIN 7	Not Connected	White/Brown
J3 PIN 8	Not Connected	Brown

Table 3 Connector types

CONNECTOR	Function	PART	NOTES
J1	Control/Chaining	DB-15, M	Standard
J2	Ethernet	RJ45	No Function
J3	Ethernet	RJ45	Standard

4.2 Network

The VNA has two RJ45 sockets for connection to 10 Base T or 100 Base T Ethernet networks J2 and J3, of these two connections only J3 is active. The network interfaces automatically switch between 10 Base T and 100 Base T as required. The network interfaces do not automatically compensate for Ethernet crossovers. The VETA Network Engine network interfaces are wired for straight connection to

a network Hub. If a direct connection to a PC is required, then an Ethernet cross over cable should be used.

4.3 VNA Chaining Interconnection

The VNA features input and output connections for chaining digital bit streams from the Network Engine to other VETA products.
The chaining interface operates at 54MHz, and as such particular care should be taken in the choice of cabling used. It is recommended to individual screened cables for each signal, and that the lengths of the cables should be matched. For reliable system operation the cable length should not exceed 20cm.

4.3.1 IP Radio Configuration

Encapsulated IP data is output to the Transmitter and input from the Receiver via the chaining interface; connections for this configuration are shown in Figure 3 below.

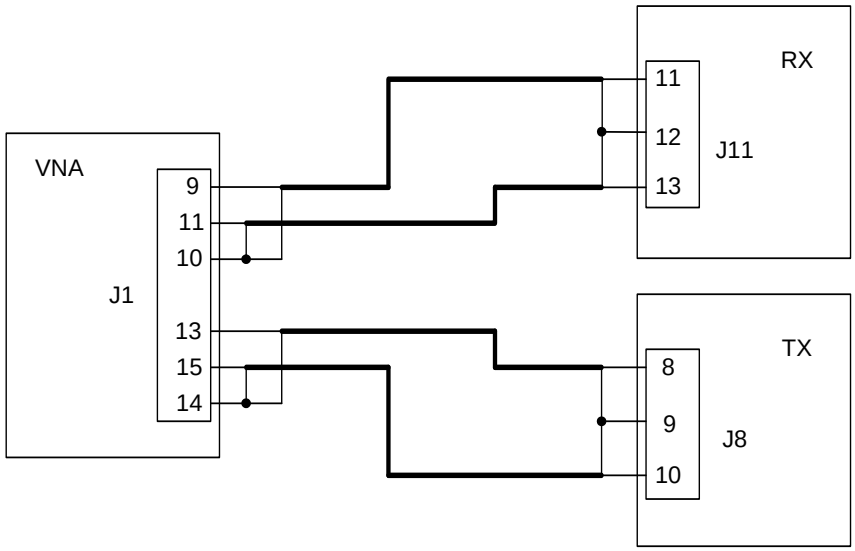

Figure 3 Chaining Interconnections for IP Radio

4.3.2 IP Streaming Configuration

Encoded Video/Audio/Data is sent to the VNA for IP streaming via its Chaining In connections. The encoded Video/Audio/Data can be chained out from a VETA Receiver (Figure 5) or chained in a VETA Transmitter (Figure 4)

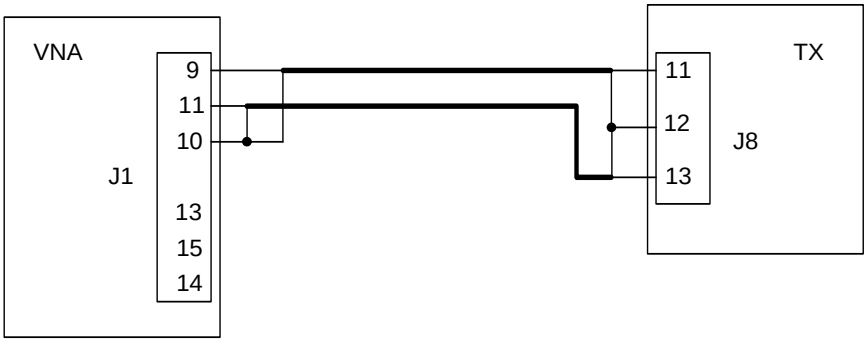

Figure 4 Chaining Out TX to Chaining In VNA

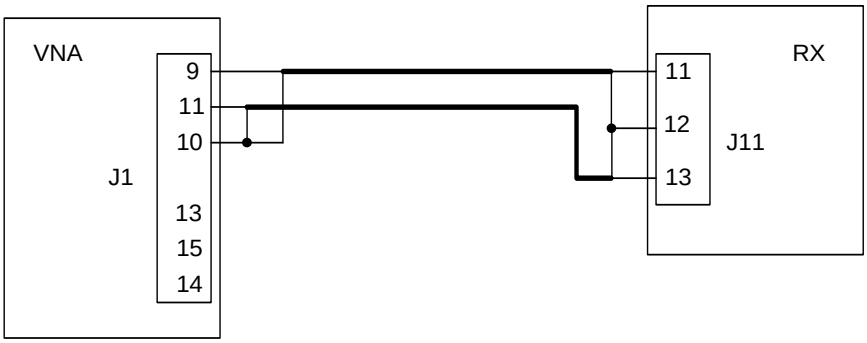

Figure 5 Chaining Out VR to Chaining In VNA

Use individual screened cables (type RG 174 or better) for each signal and connect each screen to the corresponding ground pin as shown in
Figure 6 (RX example). The lengths of the cables should be matched and they should not exceed 20cm in length for reliable system operation.

Figure 6 VNA Connectors Layout

5.0 Control Protocols

5.1 Remote Control

The following section describes the control protocol employed on the RS232 link for controlling VNA. The physical interface is RS232 but this can be converted to RS 485 with an external adapter where multiple units are controlled over one RS 485 bus. 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, and 1 stop bit.

Table 4 Packet Structure from PC

ASCII	Value	
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

Table 5 Packet Structure Reply from controlled device

ASCII	Value	
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 auctioned.

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 Hex Integer. 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 stuffed with preceding zeros, e.g. GOP reply 000012 = GOP length 12

- String - Variable length. Reply is string excluding null terminator
- Hex Integer – 8byte Hex reply

Table 6 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 7 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

5.2 **Web Browser Control**

The VNA 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, 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

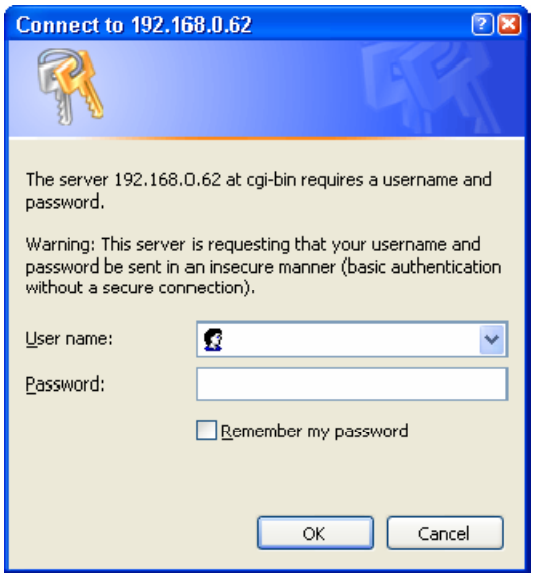

Figure 7 Login Screen

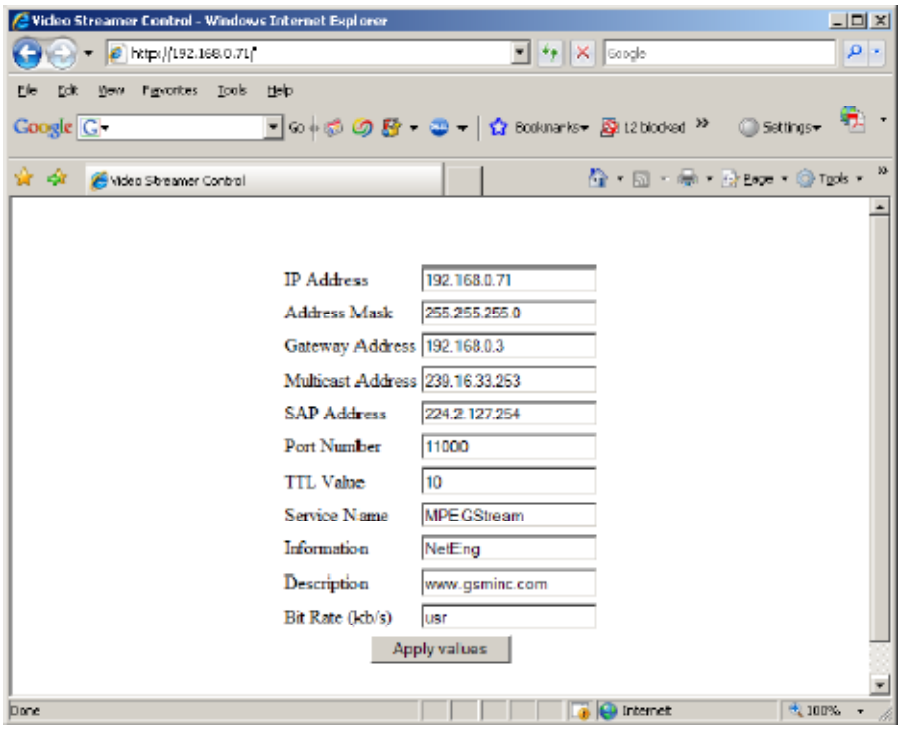

Figure 8 IP Streamer Browser

Figure 8 and Figure 9 show the configuration pages displayed by the browser for IP Streamer and Radio mode

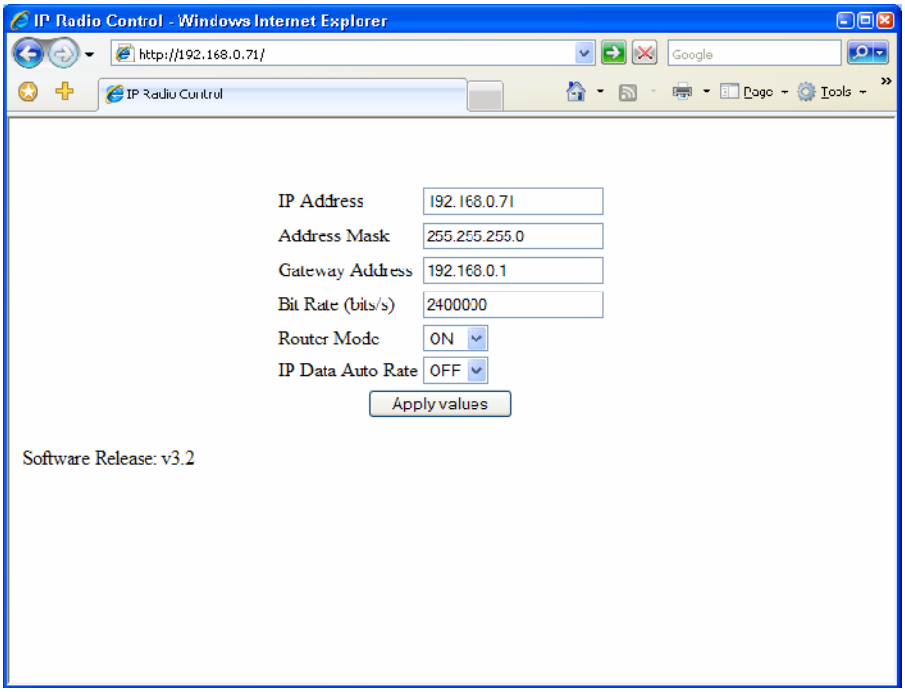

Figure 9 IP Radio Browse

5.3 Streamer Configuration Parameters

5.3.1 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.

5.3.2 Multicast Address

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

5.3.3 Port number

This control allows the user to change the multicast port used by the unit. The default value is 10000

5.3.4 TTL

This control allows the user to change the multicast port used by the unit. The default value is 10000

5.3.5 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.

5.3.6 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 user kbits/s.

The default values :

- 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

6.0 IP Radio Configuration Parameter

6.1.1 Bit Rate

This is the value in bits/s at which the encapsulated IP data is sent to the transmitter via the chaining interface. Depending on the modulation scheme of the transmitter and which data sources (Video, Audio and/or Data) are enabled, the IP radio bitrate must be set to fit within the available bitrate. The table below shows examples of mode versus bitrate and the equivalent approximate end-to-end IP delay (source PC to VNA to VT to VR to destination PC) measured by issuing a ping command (64 bytes) over the link and a direct reply. Video and Audio are disabled; if video is enabled the available bitrate is half the value indicated below.

6.1.2 Router Mode

The router mode selects the mode in which the VNA handles IP packets. When Router mode is OFF, the system transparently passes complete Ethernet packets over the link. Select this mode if the Ethernet MAC address resolution is handled by the IP data packet generator at the transmitter end. When router mode is ON, the Ethernet MAC layer of incoming IP packets is filtered at the transmitter unit and only the IP layer passed. At the receiver end, the Ethernet layer is regenerated and inserted prior to output. Select this mode if automatic address resolution is required at the receiver. Note: when using this mode, it may be necessary to setup appropriate manual routing for each of the external IP data sources/equipment (e.g. PC), to guarantee IP data packets are routed to the D800 Ethernet port.

6.1.3 IP Data Auto Rate (Optional)

This feature is not currently supported and should be left in the "OFF".

Table 7 Bitrates

Transmitter Mode				Available IP Bitrate (Mb/s)	System Delay (ms)
Bandwidth (mhZ)	Modulation Mode	Guard Level	FEC		
1.25	QPSK	1/32	2/3	1.2	50
			1/3	0.6	72
2.5			2/3	2.45	25
			1/3	1.15	37
1.25	16 QAM		2/3	2.4	25
			1/3	1.2	37
2.5			2/3	4.7	14
			1/3	2.4	20
8	QPSK	1/32	2/3	8	5
	16 QAM		¾	18	3.5
	64 QAM		2/3	24.1	3

7.0 Software Decoder

7.1 General Information

The software decoder application (part number 566-021-G) is delivered on CD. The product is installed by following the prompts offered by a comprehensive Install Shield. The product is licensed, and GMS should be contacted to provide a serial number. The license is tied to the target PC, and reinstallation of the product on a different machine will require the purchase of further licenses from GMS. The application is launched by double clicking the application icon.

7.2 Decoding Multicast Streams

The main use for VNA is to allow viewing of the received video/audio signal on a standard PC (or laptop) running the software decoder software. Data is transmitted over the Ethernet network by means of "multicasting" i.e. continuous real-time streaming of packets accessible to any PC connected to the network. It is therefore possible for more than one connected PC to view the streamed data simultaneously. Two types of multicast IP packets are streamed:

- Packets carrying video, audio and data as received by the unit.
- Packets known as SAP (Session Announcement Protocol) and SDP (Sessions Description Protocol) data, which contain information regarding the nature and location of the stream itself.

The application is launched by double clicking the application icon. The software decoder can decode and present MPEG streams that are available from two sources:

- Multicast streams being played out on the connected network by a VNA.
- Files available locally on the target PC or network.

7.3 Player

If the application is started on a PC, which is connected to a network shared by the NETSTREAM, then it will present a view of available streams that can be software decoded and viewed on the PC. If no multicast streams are located by the application, then the stream list window will appear empty. See **Figure 10** and **Figure 11**:

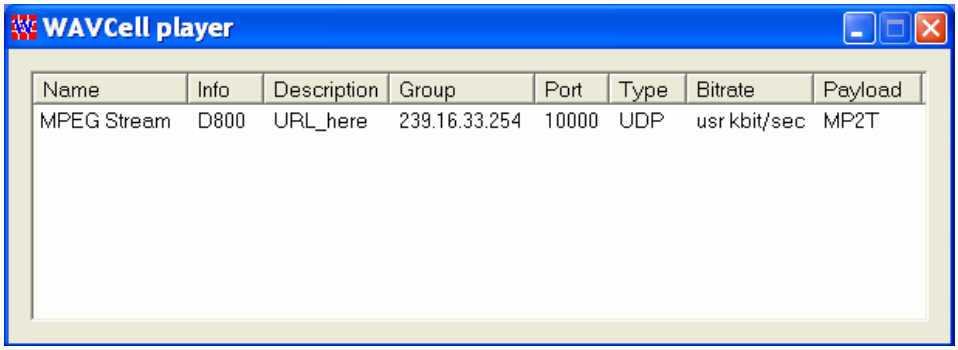

Figure 10 Player with one stream

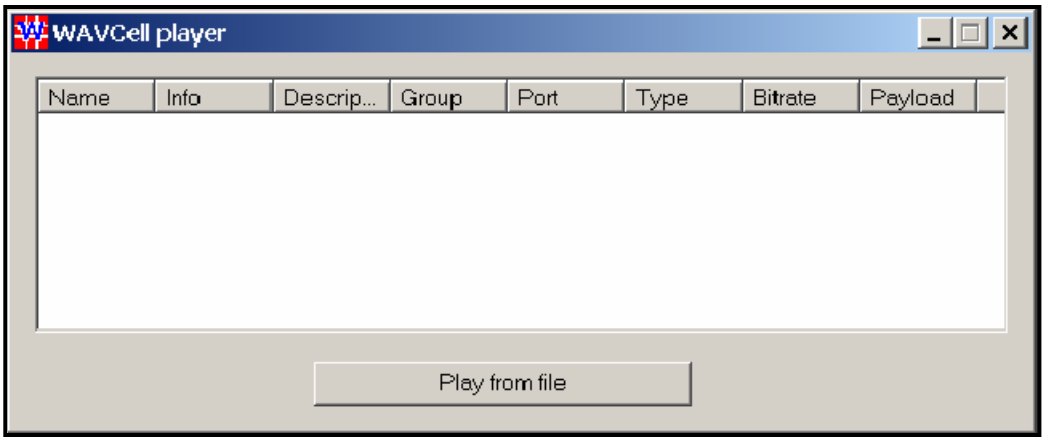

Figure 11 Player with no stream

In simple applications, only one multicast stream will be visible. To start decoding the stream select the stream and then double click it. Details relevant to each stream are presented in a tabular form in the Stream List window.

7.4 AES Encrypted Streams

If the selected stream is AES encrypted by upstream hardware, then the user will be prompted for the reciprocal AES key.

☞AES keys employed are 32 hexadecimal characters long (128 bits).

Once the key is entered, the main software decoder window is launched. The Options menu on the decoder window presents the following choices:

- Quarter Resolution. Selection of this option presents the decoded video at a quarter of its full size.
- Full resolution. Selection of this option presents the decoded video in at its full size. Full resolution and quarter resolution options are mutually exclusive.
- Decode Options. Selection of the decode options presents a further window as depicted in Figure 12. Two options for full and partial decoding of the MPEG video streams are presented.
- Note that as part of our implementation of extremely low delay encoding, GMS VETA products do not employ the use of MPEG B frames. Therefore there is no functional difference between the two options when using GMS encoding product. The option is left in the instance that the GMS software decoder is used to view streams that have been encoded by hardware that employs B frames.
- Record to file. This option gives the user an option of recording the file that is being decoded to disk. The user is prompted with a Windows standard “File Save” dialogue box. When recording is active, this menu option is changed to “Stop Recording” which can be used to stop writing to disk. See Figure 13.

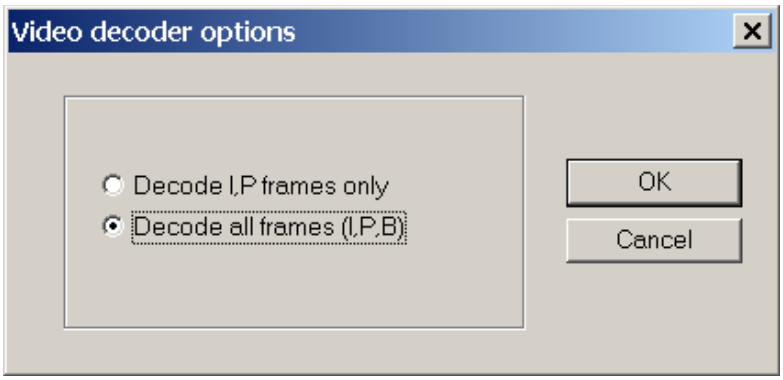

Figure 12 Decoder Options Window

☞Ensure that the PC has adequate disk space to record the files required. Very large file sizes can be generated when recording MPEG steams to disk. Files that are received in encrypted form are recorded to disk with the encryption intact.

- Enable Audio. This control is used to select which software decoders audio outputs should be routed to the host PC audio hardware, when more than once instance of the software decoder is running. As an example, assume that two software decoders required to be running, each decoding a multicast stream that contains audio components. The first stream to be opened will start with audio enabled and being presented to the audio output hardware of the PC. The second will open with the audio disabled, since the hardware is already being used by the first decoding application. The user can manually select the second decoder audio with this option, at which time the first decoder audio will automatically be disabled. Note – this option will also appear grayed out for multicast streams that have no audio components.
- Close Window. This closes the software decoder application.
- Decoding Local Stored Files. If the application is started on a PC, which is connected to a network shared by the NETSTREAM, then it will present a view of available streams that can be software decoded and viewed on the PC. If no multicast streams are located by the application, then the stream list window will appear empty. If the user wishes to play a file from local storage (regardless of whether multicast streams are available or not) then the “Play from File” button should be pressed. This opens a standard Windows “Open File” dialogue box to make the selection. See Figure 14. The default file extension is *.mpg.

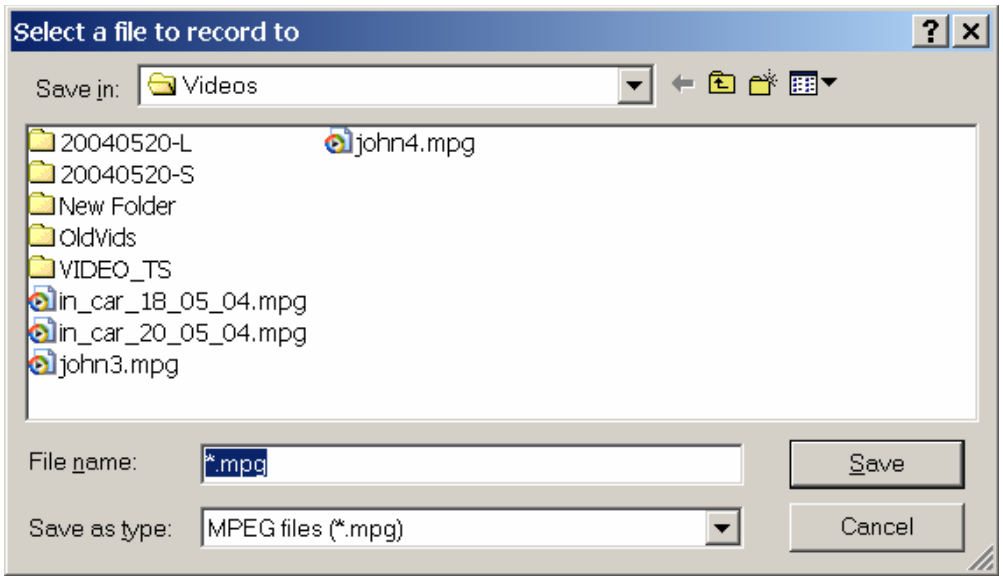

Figure 13 Record File

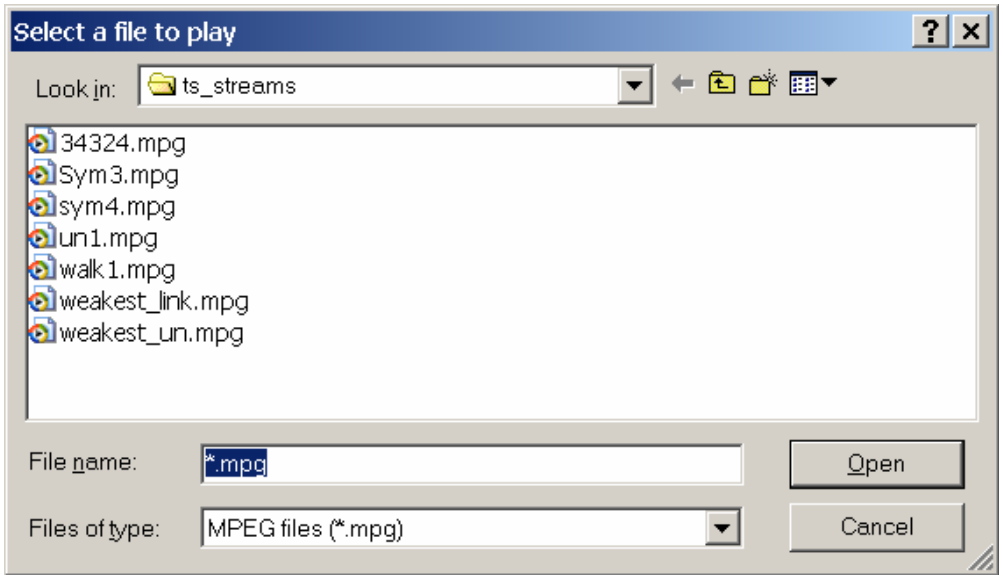

Figure 14 Play File

8.0 Specifications

Network/Modem Ports
Ethernet port 1 RJ45

Network Interfacing
Ethernet 10/100 Mb/s

Thumbnails

Image Standard	Encrypted JPEG
Resolution	User Controllable
Frame rate	0-10 fps, depending on network BW

Security Option
ABS is standard.
AES 128/256 optional

Control

Unit Setup	Ethernet/RS232 via PC application

Physical
Dimensions: 4.15” wide x 4.5” long x 1” high
Weight: 0.666lbs
0.302grams

Environmental
Operational Temperature: -20 to 70 deg C
Humidity: Up to 95% non-condensing

DC Power

DC Voltage Range:	12VDC (+/-0.5V)
Reverse Polarity Protection:	No
Power Consumption:	300mA