Document Number DS000034

User Manual

NETNode

Phase 1 and 2 Units

Cobham Surveillance

Unclassified

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0. Preface

0.1. About this Document

This manual describes the operation of **domo** IP radio MESH systems. The manual is divided into three main sections.

- **Getting started and basic operation**

This section describes to users how to deploy and use a domo IP Radio MESH system with its associated NETNode units in typical operational scenarios.

- **Advanced operation**

This section describes the operation of the system in more detail, concentrating particularly on secondary functions such as importing mapping information and working with configurations.

- **Technical reference**

This section provides technical specification and control protocol data and will be of interest to those integrating the MESH system into larger systems.

0.2. Who Should Read this Book

This document is meant for anyone interested in how the system can best be used, but it is of most benefit to:

- **Operators**, who are in charge of the daily operation of the systems and infrastructure.

0.3. Assumed Knowledge

Throughout this book it is assumed that the reader has a thorough knowledge of:

- Web Navigation and Browsers
- TCP/IP Network configuration

0.4. Typographic Conventions

This document uses these typographic conventions to identify text that has a special meaning:

Typographic Conventions Convention	**Examples**
TEXT in small capitals represents a specific key press on the console **keyboard** or hardware **panel**.	ESC, F1, SHIFT
The + sign means "hold down the first key while pressing the second key".	Press CTRL+C to abort
<Text> Serves as a placeholder for variable text that you will replace as appropriate to its context.	Use the filename <systemname>.sys for…
Text in **bold** emphasises a new word or term of significance.	We call this a **protocol** and its function is…
[-a] Text in these brackets indicates an optional component that can be left out.	Ls [-a]
NN This indicates a value entered on a **numeric keypad**.	45 on the numeric keypad
Successive menu selections are shown using **arrows** to indicate a sub-menu. In this example this would mean: Select the **Insert** menu, then select **picture**, then select **from file**.	**Insert→picture→from file**

0.5. Symbols

This document uses these symbols to highlight important information:

WARNING: A written notice given to a reader when a situation might result in personal injury or loss of life.

CAUTION: A written notice given when a situation might result in damage to or destruction of equipment or systems.

NOTE: A written notice given to draw the reader's attention to something or to supply additional information.

0.6. Trademarks

All trademarks or registered trademarks that appear in this document are the property of their respective owners.

0.7. Related Documents

You may also need to read:

Document	Source
None	

0.8. Document History

This document was written and produced by Cobham Technical Communications Team.

This is a change controlled document. Each main page of this document displays a file name at the bottom left corner of the page. This is followed by a release number ('V1.0' is the original). The revision date is also indicated in the table below.

Changes to any page will raise the revision status of the whole document.

Revision	Date	Authors	Summary of Changes
V1.4	2009-12-18	NMcS / RC	New format

Contents

1. Introduction

Cobham Surveillance domo has been supplying point to point high data rate digital video links for many years to security users. These links exhibit exceptional performance, enabling users to reliably exchange video data in extreme RF environments such as mobile and urban. More recently domo has seen an increasing requirement to use the rugged transmission capabilities of COFDM to carry general purpose IP traffic.

There is now also a growing demand from domo customers to incorporate bi-directional capability in its solution, and also a MESH capability.

The traditional two frequency approach (Frequency Division Duplex or FDD) to enable bi-directionality is not convenient or appropriate in many applications; the use of separate frequencies makes frequency management difficult. Also FDD adds complexity, cost and weight with additional antennas, amps and circuitry.

The solution to this problem is a single frequency approach (Time Division Duplex or TDD) where all communicating nodes share the same frequency. This simplifies frequency management and circuitry implementation.

1.1. MESH Applications

- Mini and Micro UAV communications.
- Radios to connect surveillance team vehicles.
- Special Forces data radios.
- Military vehicle radios.
- True real time surveillance / pursuit where an ad-hoc network is used relay imagery in a fluid environment. This would apply equally to manned surveillance as to vehicle pursuit.
- Next generation Unmanned Ground Vehicles (UGVs) where vehicles operate co-operatively.
- FIST battlefield communication applications.
- Perimeter security applications.

Each MESH NETNode has two Ethernet interfaces to allow flexibility of connection. This, in conjunction with the radio link, provides the same functionality as a switched Ethernet hub.

The radio technology is based on the fundamentals of the acclaimed **domo** Solo4 rugged, robust and reliable transmission system giving an extremely secure and easily deployable bi-directional communication system.

AES BCRYPT1 encryption/decryption (AES128 & 256) is also supported on both forward and reverse paths of the MESH system. AES support is an optional software feature and may require an export license.

1.2. domo MESH Features

- Single frequency IP MESH Network
  - Reduces antennas, amplifiers, filters in a bi-directional unit
- No central Node (genuine Mesh)
  - No single point of failure
  - Makes a very adaptable
- Rapid connection and disconnection
  - Nodes are able to connect into the network within 2 seconds without user intervention
- 8 Nodes Maximum
  - 8 nodes provides a good balance between capacity and latency
- Very rugged RF link
  - Proven to be 5 to 10 times better than Wi-Fi per link

IMPORTANT NOTE:

The MESH IP Radio product range has been specifically designed for government security and law enforcement users, the equipment will tune across frequencies that are only available to licensed government users. Non-government users should employ the equipment restricted to the license exempt bands only typically 1.389 to 1.399GHz, 2.400 to 2.483GHz and 5.725 to 5.875GHz.

2. Warranty and Support

2.1. Warranty Cover

domo 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 domo support department, 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.
- If you have extended warranty provisions then **domo** will send an immediate advance replacement to you. Under most circumstances this must be returned once the fault item is repaired.

Depending on the nature of the fault **domo** endeavour 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. This is why **domo** recommends that its customers take out an extended warranty (which includes advanced replacement of faulty items), and/or hold a basic level of spare parts, which can be held by **domo** on the customer's behalf.

Please contact **domo** 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. Safety, Compliance and Approvals

3.1. Safe Operating Procedures

- Ensure that the power supply arrangements are adequate to meet the stated requirements of each MESH NETNode enclosure.
- Operate within the environmental limits specified for the product.
- Do not subject the indoor equipment to splashing or dripping liquids.
- 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.

3.2. EMC / Safety and Radio Approvals

The equipment has been designed to meet and has been tested against the following harmonized EMC and safety standards:

- EN 301 489-1 & EN 301 489-5
- EN 61000-3-2:2000
- EN 61000-3-3:1995
- EN 55022:1998, Class B for Weatherproof Units
- EN 55022:1998, Class A for Plain box Units
- EN 61000-4-2:1995
- EN 61000-4-3:1996
- EN 61000-4-4:1995
- EN 61000-4-5:1995
- EN 61000-4-6:1996
- EN 61000-4-11:1994
- EN 60950:2000

3.3. CE marking

The CE mark is affixed to all SOLO4 and SOLO2 products, and the CE Declaration of Conformity, as well as the technical file is available on request.

4. Getting Started and Basic Operation

4.1. Which Model do I Have?

Each unit in the **domo** product range is marked with two panels.

- Product Code Panel. Give product code and manufacturers information.
- CE and Serial Number Panel. Gives CE mark and product serial number.

domo
NETNode1W-217250
Made in the UK

Mesh systems are available in 3 different product enclosures. These enclosures are targeted to different user applications.

Phase 1 units are sold in waterproof milled aluminium boxes suitable for outdoor mounting.

Phase 2 units supersede the Phase 1 units. These are made in two variants; a plain box variant and a waterproof robust box variant. The plain box variant uses standard cable and connectors where possible. The robust variant is a milled aluminium enclosure and uses Amphenol connectors and bespoke Amphenol cables. These bespoke cables are supplied with the unit.

4.2. Phase 1 Unit

The domo product code can be referenced in the table below.

Product Code	Product	Accompanying items
NETNode1W-217250 (2.17 to 2.50GHz)	1W RF output MESH link (1 node)	Cables: 1-off Control 2m (CA288) 1-off DC Power 5m (CA285) 1-off Ethernet 5m (CA284) CD with operating software and manual
NETNode1W-550600 (5.5 to 6.0GHz)	1W RF output MESH link (1 node)	Cables: 1-off Control 2m (CA288) 1-off DC Power 5m (CA285) 1-off Ethernet 5m (CA284) CD with operating software and manual
NETNode-AVI-UP	Audio/Video Input option Fitted inside the NETNode	Cables: 1-off A/V cable 2m (CA286)

Note: Antennas are not included with this product.

4.3. Phase 2 Products

4.3.1. Plain Box Variant

The **domo** product code can be referenced in the table below.

Product Code	Product	Accompanying items
NETNode-P-217250 (2.17 to 2.50GHz)	1W RF output MESH link (1 node)	Cables: 1-off Control 2m (CA0001) 1-off DC Power brick (CA0023) 1-off Auxiliary cable(CA0474)
NETNode-AVI-UP2	Audio/Video Input option for Phase 2 Fitted inside the NETNode	Cables: 1-off A/V cable 2m (CA0122)

Note: Antennas are not included with this product.

4.3.2. Robust Product

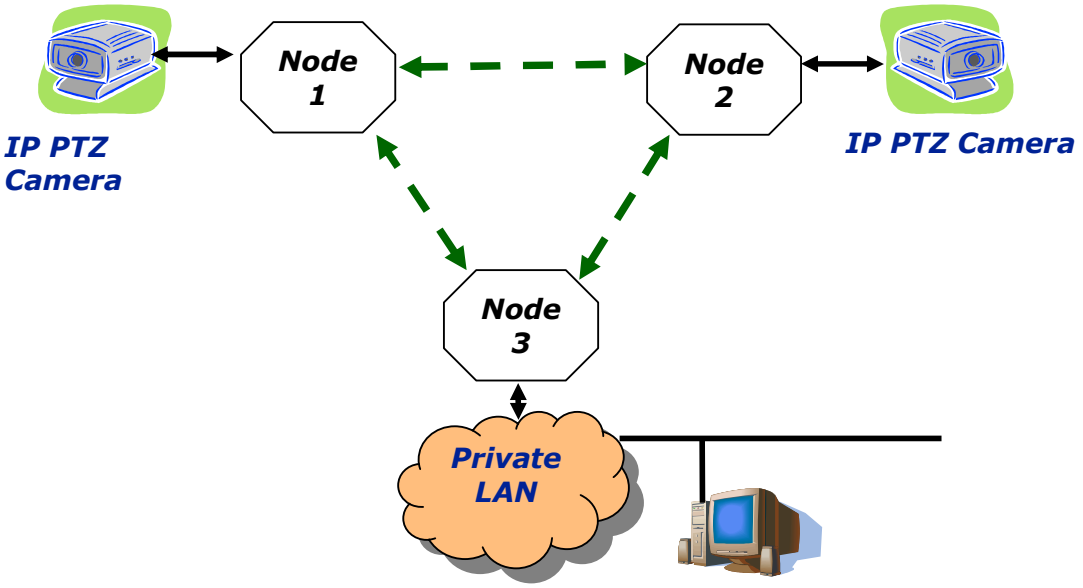
The **domo** product code can be referenced in the table below.

Product Code	Product	Accompanying items
NETNode-R-217250 (2.17 to 2.50GHz)	1W RF output MESH link (1 node)	Cables: 1-off Control/Data 2m (CA406) 1-off DC/Ethernet 5m (CA403)
NETNode-AVI-UP2	Audio/Video Input option for Phase 2 Fitted inside the NETNode	Cables: 1-off A/V cable 2m (CA0477)

Note: Antennas are not included with this product.

4.4. Basic Operating Principles

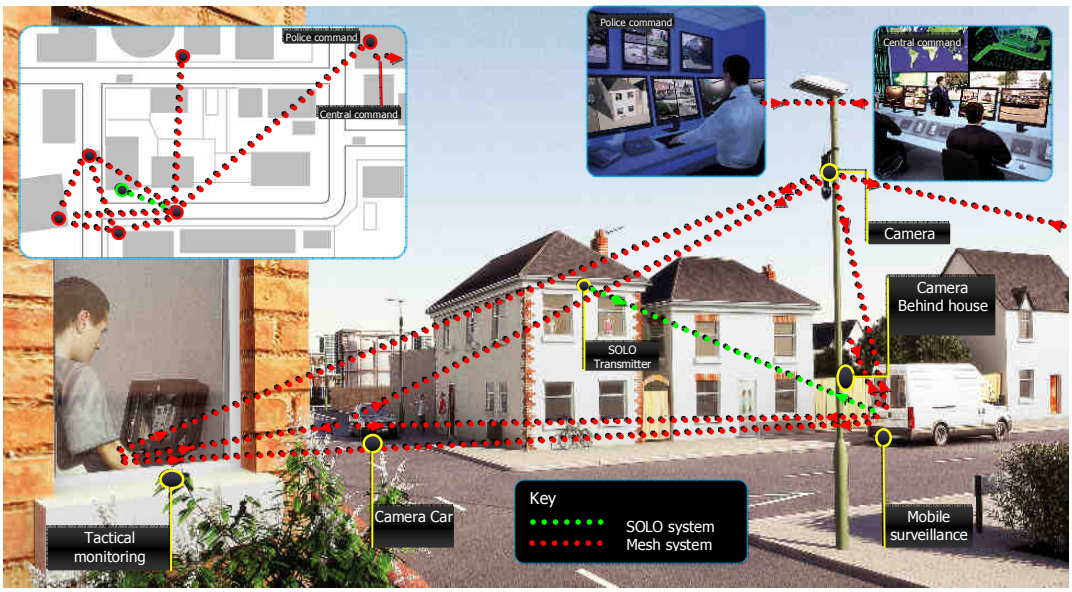
As an example a basic system is illustrated with two IP cameras contributing into a Private LAN using the MESH system. Each MESH NETNode behaves as a switched hub providing two physical Ethernet ports, and a connection onto the mesh radio link.



All NETNode units are connected to each other as a wireless IP network. The Mesh system arbitrates which node transmits at any given time avoiding any conflict.

The nodes are able to seamlessly connect into the network without user intervention. The only key parameters that need to be preloaded into the units are the encryption keys and the frequency.

Mesh could also be used to quickly deploy a multiple node surveillance system around an area of interest. The NETNode units could be used to contribute Video or IP data such as stills photography or sensor data.

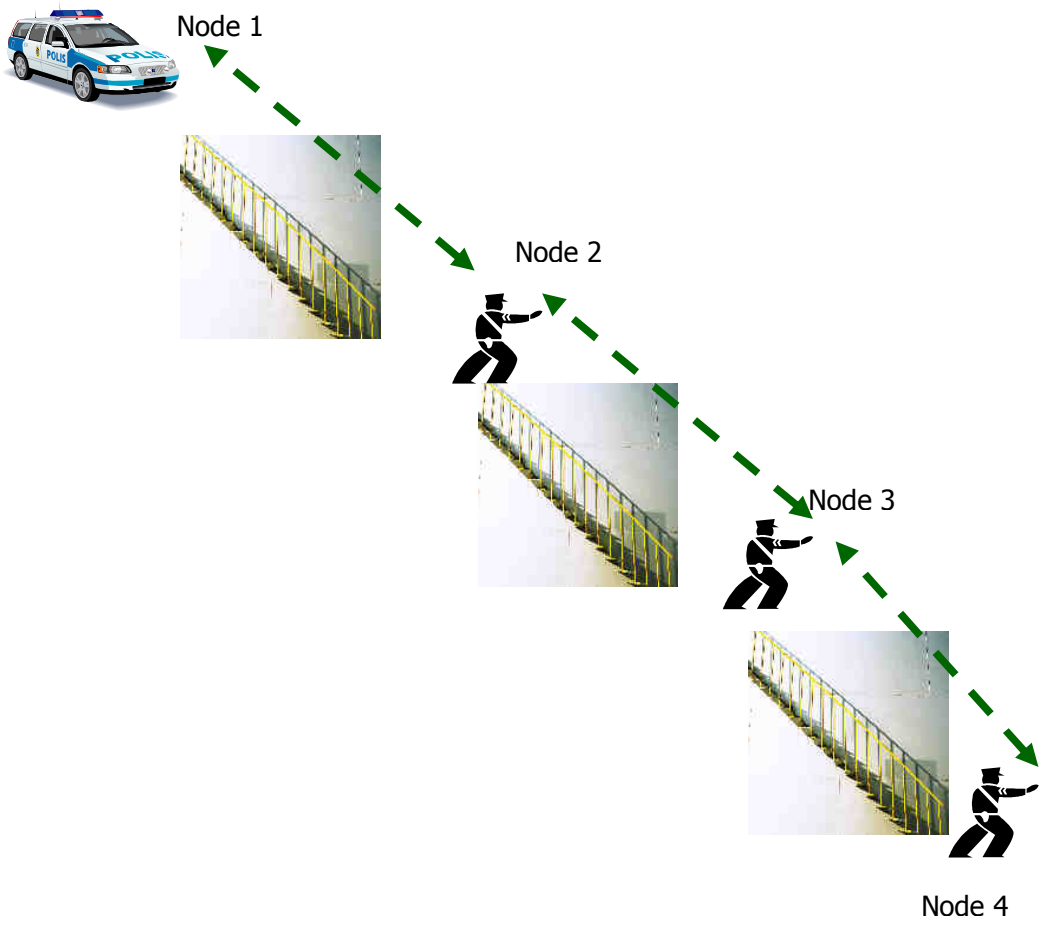


The NETNode can accept video from a standard composite (PAL/NTSC) camera or an IP camera can be connected through the MESH Network. To connect a standard composite video signal into a MESH NETNode the NETNode-AVI-UP option must be fitted into the NETNode.

The MESH is able to support 3 or 4 full quality video links through the one frequency – if 3 nodes were to contribute video simultaneously then the bit-rate for each link would have to be adjusted to roughly 700kbps per video service. Full frame rate video can be supported at 700kbps but at reduced resolution – typically ½ resolution or SIF resolution would be selected. Higher resolutions could also be supported – even up to full resolution but typically not at full frame rate.

A 4 or 5 Node Mesh network can have up to 3Mbps of data capacity available for transmission of information between the Nodes IF every Node can see every other Node and the link quality between all the nodes is good. Note that if information needs to be transmitted through a chain of Nodes or if the link quality is not good then the useful information rate available in the Mesh reduces.

The MESH can also be used to facilitate range extension. Nodes can communicate through a chain.



In this example the MESH system is used to provide a video link back through a chain to a command vehicle. Using VOIP all the operatives could also be listening and communicating over the network.

4.5. Getting Started on the Bench (Phase 1 Unit)

4.5.1. Cables and Connections

This section describes how to connect the following **domo** model numbers.

- NETNodeIP1W-217250 (2.17 to 2.50GHz)
- NETNode-AVI-UP (option)

The pictures below show the Phase1 **domo** NETNode product.

A **domo** MESH Phase 1 NETNode and a Phase 2 Plain box NETNode is supplied with the following cables:

- IP via Ethernet x 1
- Control 2m x1
- DC Power 5m x1
- AV 2m x1 (if the NET-AVI-UP option is ordered)

A **domo** MESH Phase 2 Weatherproof NETNode is supplied with the following cables:

- IP via Ethernet x 1 and DC Power is combined — Part Number CA0403
- Control 2m x1 — Part Number CA0406
- AV 2m x1 (if the NET-AVI-UP2R option is ordered) — Part Number CA0477

A **domo** MESH Phase 2 Plain NETNode is supplied with the following cables:

- Standard 12V Power Block — Part Number CA0023
- Control cable 2m x1 — Part Number CA0001
- Special Control / Data Cable — Part number CA0474
- AV 2m x1 (if the NET-AVI-UP2P option is ordered) — Part Number CA0122

Before deploying **domo** MESH NETNode units in the field it is strongly advised to test the products in a bench environment in order to gain familiarity with the product.

BEFORE SWITCHING ON THE UNIT PLEASE NOTE:

The DC power supply must be set to 12.5V and assume up to 2.5A of current draw.

4.6. Procedure for Establishing Connection to a Node

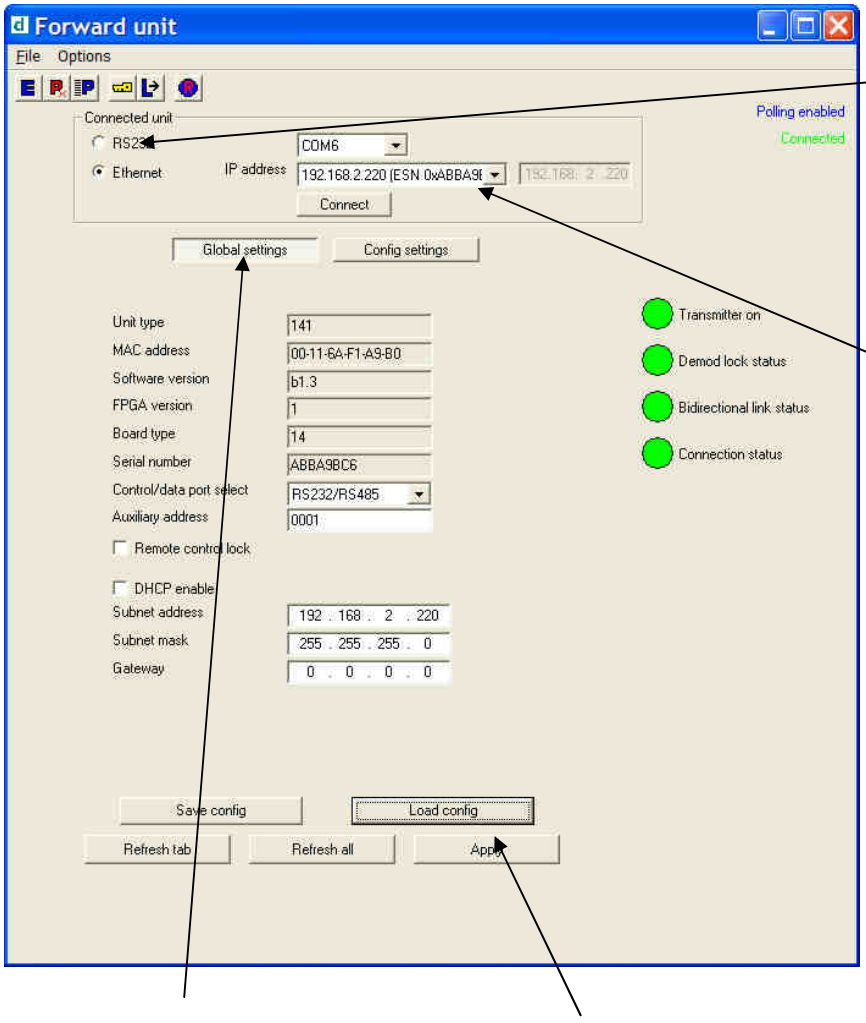
Once a user has connected to a unit and established a NETNode on their network operating the system is easy.

The procedure to establish communication with a node varies depending on whether the User wishes to connect the MESH to a network running DHCP or whether the user wishes to run with static IP addresses.

The user must start by testing one MESH node at a time connected to the Users Network. This example assumes that the User network supports DHCP. Connect a Windows PC to the DUO CTRL/DATA port using the CRTL/DATA cable (CA288 (Phase1) or CA0406 (Phase 2 Robust)). On a Phase2 Plain box Mesh connect the PC to the AUX port using the CA0474 cable. Run the MESH PC Control application. This application will identify the IP address of any mesh nodes on the Network. Tick the Ethernet Radio box and read the IP addresses.

If the User's Network does not support DHCP then a PC running the MESH PC control application must be connected using the CA288 cable to connect from the RS232 port on the PC to the Control port on the MESH node. The RS232 control 9-way D-type must be used.

Fit the two antennas onto the two TNC connectors prior to powering the unit.



Select Ethernet or RS232

IP address of any unit on the Network

Select the **'Global Settings'** tab.

Apply

If the NETNode unit is connected to a network that supports DHCP then leave the DHCP option box checked. If the network does not support DHCP then a valid static IP address must be entered and the DHCP box unchecked.

Note: Click 'Apply' after changing any configuration setting

Once the IP address is established the web-server should be used to configure frequency and output power. Once the node is on the User network any Web-browser can be used to browse to the Mesh NETNode to configure and control the node or to browse network status. The unit can be browsed by entering the relevant IP address in the web-browser.

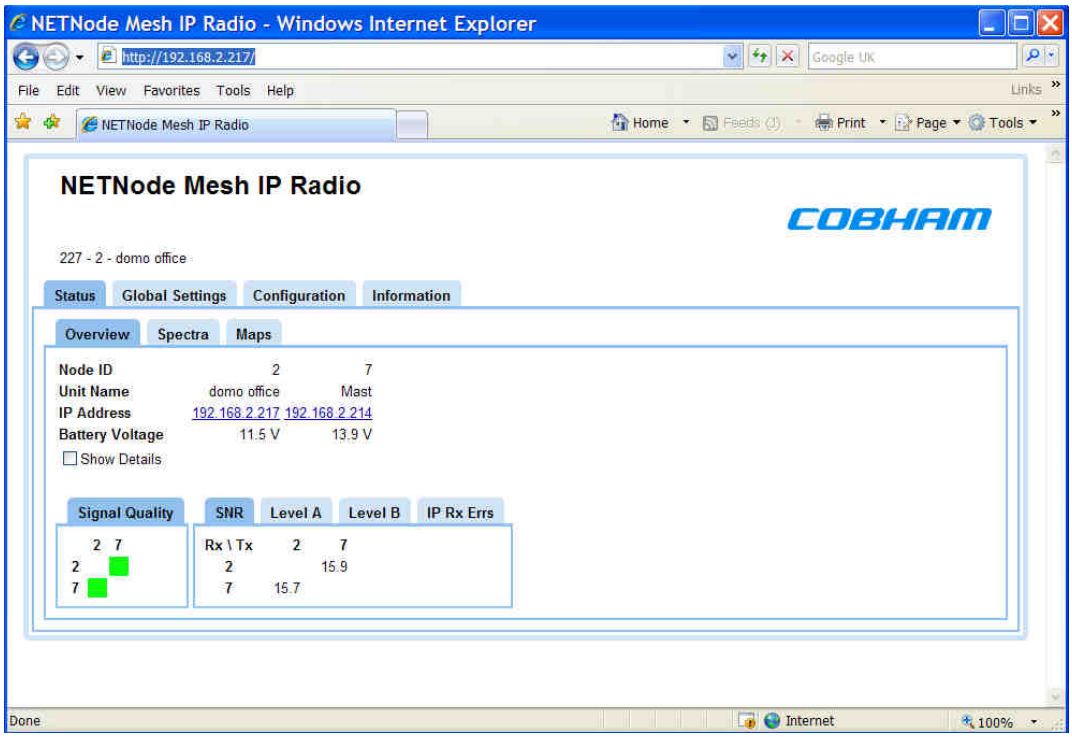
4.7. Web-browser Username and Password

The web-browser will prompt for a Username and Password on the first connection.

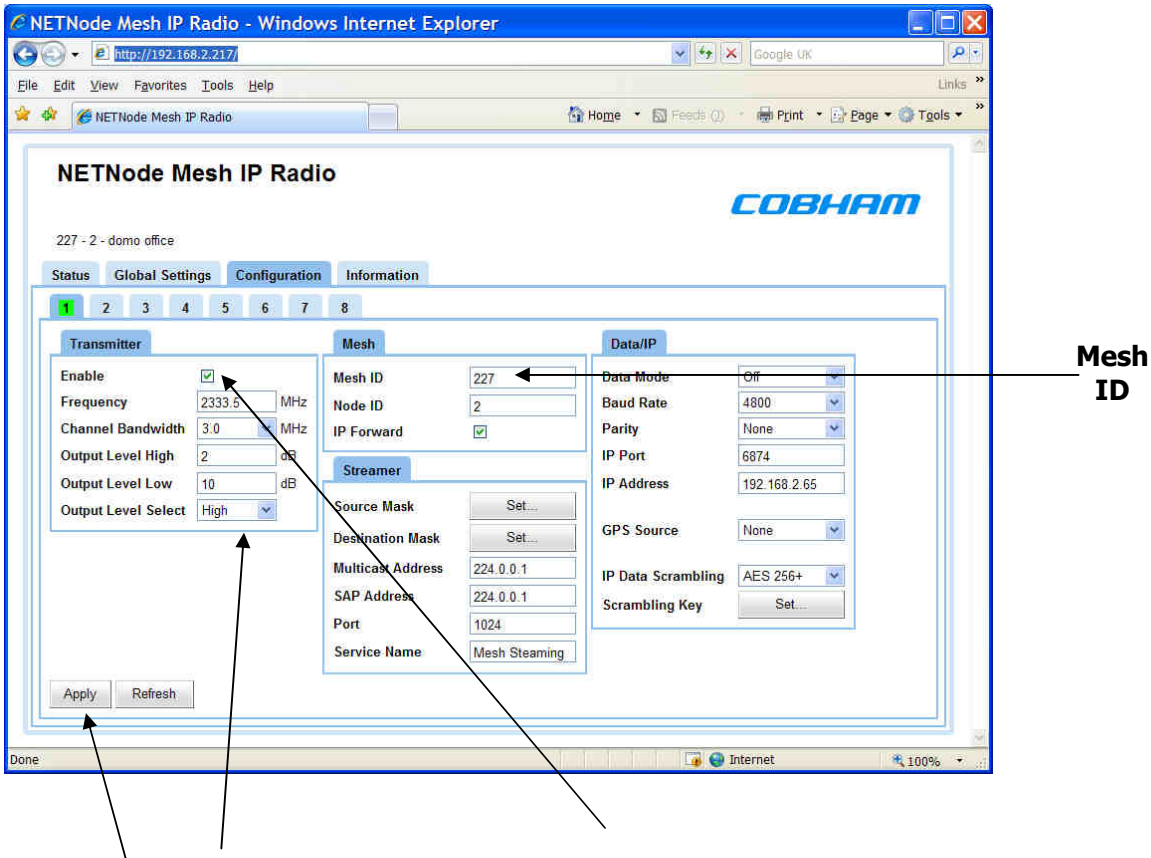
Username should be left blank

Password is 'meshweb'

The status page will be displayed upon successfully entering the Username and Password.



Navigate to the Configuration page by clicking the Configuration Tab.



Set **Output level select** to 'Low' and set **Enable** 'ON' by 'ticking' the check box.

Note: Click 'Apply' after changing any configuration setting

Check that the Frequency is valid for the operation of the unit – specific country regulations will determine the frequencies available for operation. Note that 2400 to 2480MHz is licence exempt in most of the world.

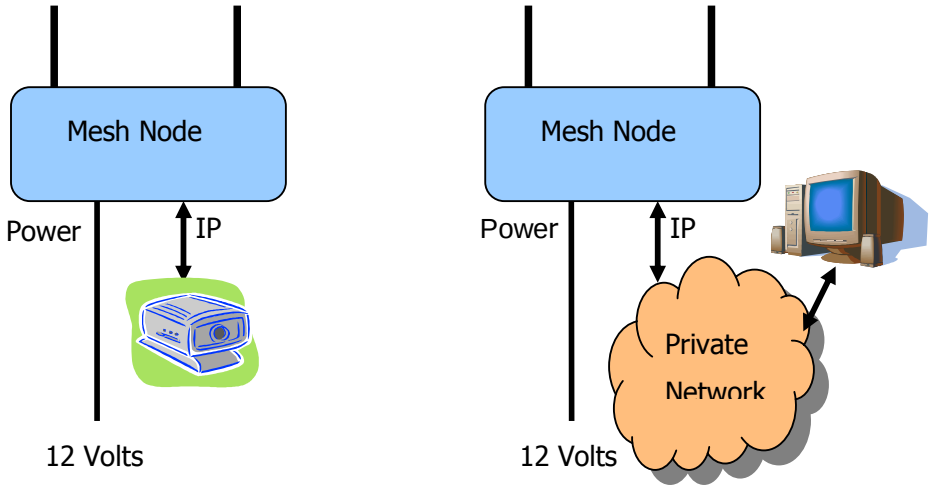
For the units to function in s single network the following must be set correctly:

1. All units are on the same frequency
2. All units have the same channel bandwidth set
3. All units have their Transmit enabled
4. All units must have the same mesh ID
5. Each unit must be assigned a different node ID (0-7). This is most important for the network to function correctly.
6. If encryption is enabled then the encryption type and keys must match.

Power down the Unit.

Repeat the procedure for a second node – making sure that the frequency is always set to be identical.

Domo suggests configuring the system on the bench as outlined below.



BEFORE SWITCHING ON THE WHOLE SYSTEM PLEASE NOTE:

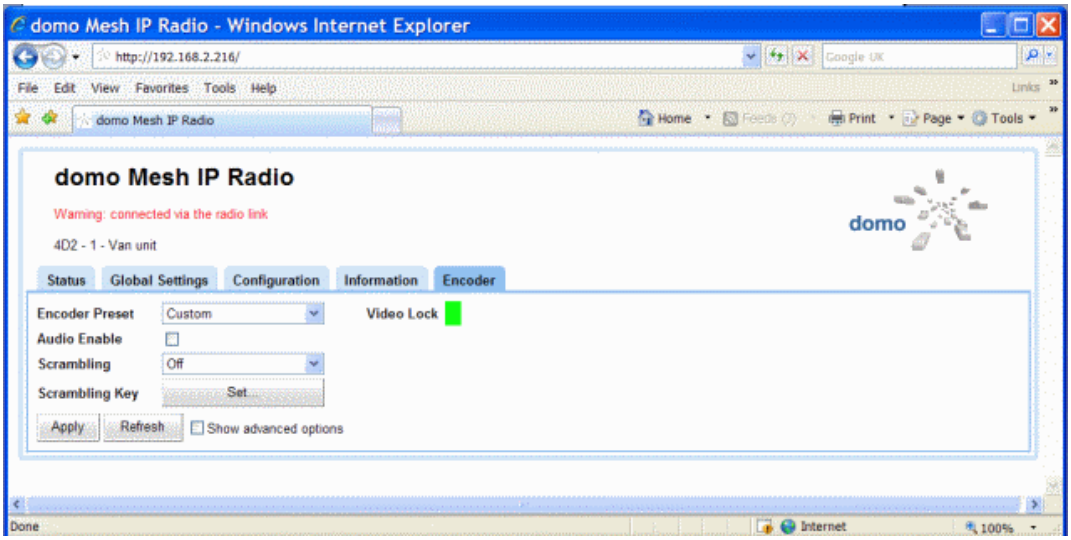
The DC power must be set to 12.5V and assume up to 2.5A current draw.

Don't connect the Ethernet ports of both units simultaneously to your network when they are both operating as you will create a loop in and out of your IP network. This may affect your network performance.

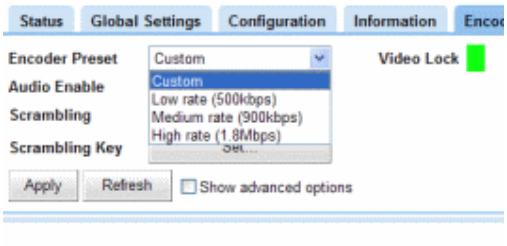
Connect one MESH node unit to your network and the other MESH node to an IP camera or a standalone PC. The IP Camera or the standalone PC will then be connected to your network through the MESH network.

4.8. Integrated Video Encoding AVI option fitted (Composite Input)

The user must enable the video transmission. If the MESH node has an AVI option fitted then it will accept standard composite video (NTSC or PAL) and it will encode and stream the video over the Network. An Encoder Tab appears on the Web-browser if an internal video encoder is fitted.



The user can select from a number of preset Encoder options



Using the advanced options the user can more precisely customise the encoder settings.

Note: Click 'Apply' after changing any configuration setting

4.9. DC Power

The NETNode can be powered from a nominal 12V DC supply or an AC to DC adapted supply.

Locate, push and twist to lock the Amphenol connector on the Power cable into the socket labelled POWER, taking care to align the connectors. Connect the banana connectors on the other end of the cable to a suitable DC source.

The 12V DC input has the following characteristics.

- Input Voltage Range – 12V to 15V, **not** reverse voltage protected
- Current draw – 1.2A to 2A at 12V (capacity dependant)

CAUTION: The Input is **NOT** reverse voltage protected. Take extreme care when connecting power to this unit. DO NOT OVER VOLTAGE THE UNIT (Use 15V absolute MAX)

4.10. Ethernet

Locate, push and twist to lock the Amphenol connector into the socket labelled 'IP', taking care to align the connectors. When using a plain box Mesh Node simply insert a RJ45 network cable into one of the 2 RJ45 Ethernet sockets.

4.11. Video and Audio Input (if Option is Present)

Locate, push and twist to lock the Amphenol connector into the socket labelled 'AV', taking care to align the connectors. If using a plain box Mesh unit simply push fit the Lemo connector. Connect the video and audio sources.

Connector	Signal
Video BNC	75 ohm composite video source, PAL or NTSC software selectable
Audio Plugs	Line / Microphone level audio, switchable. Line level -2dBu clip level low impedance source (< 600 ohm) Microphone level 12, 24, 36 and 48dB preamp stages software switchable

Microphone power is provided on the audio connectors at approximately 3V (suitable for Electret microphones)

Typically the video source should be a small colour or black and white CCD camera.

Typically the audio source should be an Electret microphone.

4.12. Antennas

Note: It is important only to power up the NETNode unit with the Antennas fitted.

Both antennas must be connected for normal operation. The units are supplied with different types of panel mounted connectors. The phase 1 units are supplied with panel mounted TNC connectors which carries the RF input and output. The antenna should be connected by screwing it onto the TNC, but care should be taken to not over tighten the connector.

The phase 2 plain box mesh units are supplied with panel mounted SMA connectors which carry the RF input and output. The antenna should be connected by screwing it onto the TNC, but care should be taken to not over tighten the connector.

The phase 2 robust box mesh units are supplied with panel mounted N-Type connectors which carry the RF input and output. The antenna should be connected by screwing it onto the TNC, but care should be taken to not over tighten the connector.

The units have the following RF output characteristics.

RF Spec	Model Number ending - 217250	Model Number ending - 550600
Output Frequency	2.170 to 2.50GHz	5.6 to 5.9GHz
Output Bandwidth	2.5/3/3.5MHz	2.5/3/3.5MHz
Output Power	1W or 100mW (nominal)	1W or 100mW (nominal)
Output Impedance	50 ohm	50 ohm

Note: It is recommended that the antennas be connected directly to the transmitter unit. The use of RF cables at this point will degrade the performance of the system.

The optimum choice of antenna will vary according to application. The following table gives some suggestions for suitable transmit antennas with the associated **domo** part number.

Application	**Antenna model number**
Mobile body worn application	1.00 to 1.40GHz - ANTBCL 2.28 to 2.50GHz - ANTBCS
Mobile vehicle application	1.00 to 1.40GHz – ANT4L 2.20 to 2.50GHz - ANT4S 5.60 to 5.90GHz – ANT4-560590
Long range point to point link	1.00 to 1.40GHz – ANT12L 2.28 to 2.50GHz – ANT12S 5.60 to 5.90GHz – ANT14-560590

Other antennas for more specialist applications, such as aircraft use or covert surveillance use are available on request from domo.

Some of the antennas will require connector adaptors (Inter series RF adaptors) to connect the antennas directly to the product.

4.13. Deploying the System

All external connection to the MESH products should be made, as described in the previous sections, before proceeding to power on the system.

4.13.1. Installation Notes

This section gives guidelines for how to install the MESH node in the following applications.

4.13.2. Fixed position Applications

The MESH NETNode unit is designed to be waterproof allowing it to be installed outdoors.

4.13.3. Vehicle Applications

Interconnection between the unit and any antenna should be kept as short as possible, but where this is not possible, special attention should be taken to use only low loss cables. An appropriate cable might be RG213C/U. It is essential to minimise the distance between the unit and the antenna. Mounting holes are provided.

Power conversion will be required for 24V vehicles.

The video input can be connected across long video cable lengths so remotely mounted cameras should pose no problem.

The unit is self-cooling; however it should be mounted in a ventilated environment. Forced air cooling is not required.

4.13.4. Diversity and Antenna Positioning

The **domo** MESH NETNode product uses an advanced diversity technique called maximum ratio combining to construct a good spectrum from two potentially damaged received signals. This requires a small separation of the antennas.

Sometimes better results can be achieved by separating the antennas further, or by positioning them of different corners of a building. The optimum antenna placement depends on the environment in which the equipment is used and the signal path, and is often limited by physical factors (accessibility for example).

Note: Any cable run between the Node and the antenna **MUST** be **LOW LOSS** cable.

Contact domo for details of suitable cable.

4.14. Battery / DC Power Considerations

The 1W output power MESH Node units can consume over 2amps of current at 12V.

They are designed to trip off at 10.5V and reset on at 11.5V. The DC cable supplied as standard with the MESH node is 5m long to allow a customer to mount the Duo on a mast. This suffers about 0.5V drop through the cable.

Therefore 1W MESH nodes need to be connected to a large capacity battery which in nominally 12V or to a 12V power supply. AC to 12V power supplies are not supplied as standard with the product.

Users can order a suitable universal AC to 12V power supply from domo as a cost option.

Note: Product code SOL4CLC-PSU is used for the Phase 1 unit

Phase 2 Plain Box Mesh units are supplied with an AC to 12V power block as standard

4.15. NETNode Specification

RF	Frequency Bands	2170 to 2500MHz
	Power	1W
	Power Control	30dB
	Tuning Steps	125kHz
Modulation	Bandwidth	2.5 or 3 or 3.5 MHz (selectable)
	FEC	1/2
	Modulation Forward Link	QPSK/16QAM Adaptive
	Sensitivity	-92 to -98dBm (mode)
Ethernet	Physical	100 BaseT
	Data Rate	Network Toplogy dependent (Up to 2.2Mbps capacity in a 2.5MHz system. Up to 3Mbps capacity in a 3.5MHz system.) Internal packet compression will increase the data rate capacity for some types of packet considerably.
	Protocols	ARP, UDP control, Ping, TFTP upgrade IP and ICMP protocols between the radios MPEG over IP Encapsulation (UDP multicast + SAP)

Video In (option)	Line Standard Resolution Coding Mode Delay Frame Rate	PAL/NTSC 704, 528, 480, 352 MPEG2 or MPEG4 60ms to 0.5 sec depending on mode Full / Half / Quarter / Eigth (optional)
Audio In (option)	Input Sample Rate Bits per Sample	Line Level or Microphone 32KHz, 16KHz, 8KHz switchable 12 or 8bit switchable
Data Interface	RS485 Data I/O	1K2 to 115K6 baud switchable
Encryption	Format	AES128 / 256 Selectable (optional)
Control	RS232 Local Control Remote Control Ethernet	9K6 Control Port Ethernet control with comprehensive diagnostic capability
Power	D.C input Power Consumption	11 to 14V only (No reverse power protection) 14W to 24W (Unit and mode dependant)

	Phase 1 Box	**Phase 2 Robust Box**	**Phase 2 Plain Box**
Weight	2.5kg	1.75kg	1.25kg
Dimensions	260 x 194 x 57mm	180 x 180 x 70mm	185 x 155 x 55mm
Temperature Spec	-10 to +50°C	-10 to +50°C	-5 to +45°C
Sealing	Waterproof	Waterproof	Indoor use only

5. Normal Procedures

This chapter covers normal day to day operations of a fully configured NETNode system. If you are working with a new system or you need to change any of the configurations, look at the Advanced Procedures later in this guide.

5.1. Connecting Up the NETNode

5.1.1. Connecting the Antennas

You'll need a NETNode and two antennas.

1. Connect **both** antennas to the RF connectors on the rear of the unit.

Caution: Antennas should be connected **directly** to the unit. If you have to use cables (in a mobile application for example) keep them short.

Note: There are many types of antenna that can be fitted to the NETNode unit. Your antennas may look different from those in this guide.

5.1.2. Connecting to AC Supply

You'll need a NETNode and an AC Adaptor.

1. Connect the Amphenol 2-way plug (m) from the AC adaptor to the Amphenol 2-way jack (f) on the Robust NETNode. On the plain box unit the connector is a 4-way Lemo.
2. Now connect the IEC mains cable to your local AC supply and switch on.
3. On the front panel, the Power LED will show solid green.

5.1.3. Connection to DC Supply – Mesh Phase 1 & Phase 2 Robust Unit

You'll need a NETNode and the CA0285 cable assembly.

1. On a Phase 1 unit connect the Amphenol 2-way plug (m) from CA0285 cable to the Amphenol 2-way jack (f) on the NETNode.
2. On a Phase 2 Robust unit the CA0403 provides both the DC supply cable and an Ethernet connection cable. This 5m long cable is designed to allow a user to mount the unit on a tripod or small mast and run the power and Ethernet into a command or control point.
3. Connect the banana plugs to a suitable 12VDC supply
4. On the front panel, the Power LED will show solid green.

5.2. Starting Up and Shutting Down the NETNodes

5.2.1. Starting up the NETNodes

You'll need at least **two** fully configured NETNodes. (If they are not, then see advanced procedures).

1. Switch on the NETNodes using the procedure above.
2. On the front panel, the Power LED will show solid green.
3. Do Nothing! - Leave the system to form a mesh automatically.
4. On the front panel, the RF Connected LED will show solid green on each NETNode.
5. The mesh is now ready for operation.

5.2.2. Shutting Down the NETNodes

1. Disconnect the power cable from each of the NETNodes.
2. On the front panel, both green LEDs will show dark.
3. The system will shutdown safely.

5.3. Connecting an IP Device to a NETNode

Now you can attach an IP device to any of the NETNodes. There are several types of IP device you can attach:

- Computers
- IP Cameras
- IP Microphones
- IP Loudspeakers

Let's take the example of attaching a laptop computer to a NETNode. You might use this at an observation post to look at all the assets you have deployed on other NETNodes like cameras and microphones.

You'll need a fully powered mesh system which has completed forming a mesh automatically and is showing a solid green RF Connected LED on each NETNode.

You'll also need a Laptop computer with an RJ45 Jack and a CA0284-5 cable.

On a Phase 1 unit

1. Connect the Amphenol 4-way plug (m) from CA0284-5 cable to the Amphenol 4-way jack (f) on the NETNode labelled **IP.**
2. Now connect the RJ45 8-way plug (m) to your laptop's RJ45 8-way jack (f).
3. Ensure you know the IP address of the computer you have attached.

Note: Attach all the IP devices you need on each NETNode of your mesh network in the same way.

On a Phase 2 Robust unit

1. Connect the Amphenol plug (m) from CA0403cable to the Amphenol jack (f) on the NETNode labelled **Power/IP. (**This cable also includes the DC power banana plugs.)
2. Now connect the RJ45 8-way plug (m) to your laptop's RJ45 8-way jack (f).
3. Ensure you know the IP address of the computer you have attached.

On a Phase 2 Plain box unit simply connect to one of the RJ45 panel mount sockets labelled **1** or **2** on the NETNode unit. It does not matter which socket you use.

Note: Attach all the IP devices you need on each NETNode of your mesh network in the same way.

5.4. Connecting a Second IP Device to a NETNode

We have seen how to connect IP devices to the NETNodes using the Amphenol 4-way jack on the NETNodes labelled IP.

In fact, you can equipment via a second IP interface to the same NETNode at the same time. Here's how:

You'll need a fully powered mesh system which has completed forming a mesh automatically and is showing a solid green RF Connected LED on each NETNode.

On a Phase 1 Unit

You'll also need an IP device (an IP camera for example) and a CA0288-5 cable.

1. Connect the Amphenol 19-way plug (m) from CA0288-5 cable to the Amphenol 19-way jack (f) on the NETNode labelled **CTRL/DATA.**
2. Now connect the RJ45 8-way plug (m) to your IP device's RJ45 8-way jack (f).
3. Ensure you know the IP address of the IP device you have attached.

On a Phase 2 Robust Unit

You'll also need an IP device (an IP camera for example) and a CA0406 cable.

1. Connect the Amphenol plug (m) from CA0406 cable to the Amphenol jack (f) on the NETNode labelled **CTRL/DATA.**
2. Now connect the RJ45 8-way plug (m) to your IP device's RJ45 8-way jack (f).
3. Ensure you know the IP address of the IP device you have attached.

On a Phase 2 Plain box Unit

On a Phase 2 Plain box unit simply connect to one of the RJ45 panel mount sockets labelled **1** or **2** on the NETNode unit. It does not matter which socket you use.

5.5. Viewing a Network Camera

As an example of using an asset, let's try viewing a Network Camera attached to the mesh.

You'll need a fully powered mesh system which has completed forming a mesh automatically and is showing a solid green RF Connected LED on each NETNode.

You'll also need an IP network camera attached to one of the NETNodes and a computer attached to another NETNode. You need to know the IP address of the network camera you want to view.

The network camera will come with setup software to configure the camera before first operation. Ensure you have configured you camera.

1. On the computer open your web browser
2. Type in the IP address of the camera in the address bar. (http://10.10.10.30/ for example).
3. You may be prompted for a username and password, depending on the features of the connected camera.
4. An image from the camera will be displayed.
5. If your network camera has PTZ capability, you'll be able to control it using the software on the computer.

Note: You will view or listen to *most* assets in a similar way depending on the device being used. Each IP device will have its own control software but is usually accessed by using a web browser.

5.6. Connecting a Composite Camera to a NETNode

If you have an **AVI version** of the NETNode you can attach a **composite** camera to the unit. The composite camera can be **PAL** or **NTSC**.

You'll need a fully powered mesh system which has completed forming a mesh automatically and is showing a solid green RF Connected LED on each NETNode.

The NETNode must be configured for composite camera operation. Check that **Global Settings** → **Auxiliary Address** is set to 1.

On a Phase 1 Unit

You'll also need a composite camera with a BNC Jack and a CA0286-3 cable.

1. Connect the Amphenol 10-way plug (m) from CA0286-3 cable to the Amphenol 10-way jack (f) on the NETNode labelled **AV**.
2. Now connect the BNC 2-way plug (m) to your camera's BNC 2-way jack (f).

On a Phase 2 Robust Unit

You'll also need a composite camera with a BNC Jack and a CA0477 cable.

1. Connect the Amphenol plug (m) from CA0477 cable to the Amphenol jack (f) on the NETNode labelled **AV**.
2. Now connect the BNC 2-way plug (m) to your camera's BNC 2-way jack (f).
3. The CA0477 cable also provides a DB-9 socket that carries RS232 data from the NETNode that can be used to control a Pan Tilt Zoom (PTZ) camera PTZ control is required.

On a Phase 2 Plain box Unit

You'll also need a composite camera with a BNC Jack and a CA0122 cable.

1. Connect the 5-pin Lemo plug (m) from CA0122 cable to the Lemo 5-way jack (f) on the NETNode labelled **A/V**.
2. Now connect the BNC 2-way plug (m) to your camera's BNC 2-way jack (f).
3. The **AUX** connector can provide RS232 or RS485 data to control PTZ functions, if required.

6. Configuring a NETNode for the first time

You'll need to **configure** each of your NETNodes before they can be used for the **first time**.

You'll need a NETNode connected to a power supply and showing a solid green Power LED.

You'll also need an appropriate cable (see details below for each of the unit types), and a computer with d830_ctrl software loaded.

6.1.1. Connecting the NETNode to your Computer using Serial (RS232)

The first time you set up a NETNode you'll be connecting using a serial RS232 interface.

You'll only have to do this once – every other time you'll hook up to the NETNode using an IP interface using a web browser.

On a Phase 1 Unit

1. Connect the Amphenol 19-way plug (m) from CA0288-5 cable to the Amphenol 19-way jack (f) on the NETNode labelled CTRL/DATA.
2. Now, connect the RS232 D-Type 9-way plug (f) to your computer's RS232 9-way jack (m).

Caution: There are two D-Type 9-way plugs on the CA0288-5 cable – ensure you select the RS232 version by checking the label attached to the shell of the plug. The other is RS485.

On a Phase 2 Robust Unit

1. Connect the Amphenol plug (m) from CA0406 cable to the Amphenol jack (f) on the NETNode labelled CTRL/DATA.
2. Now, connect the RS232 D-Type 9-way plug (f) to your computer's RS232 9-way jack (m).

Caution: There are two D-Type 9-way plugs on the CA0406 cable – ensure you select the RS232 version by checking the label attached to the shell of the plug. The other is RS485.

On a Phase 2 Plain box Unit

1. Connect the 15-way HD D-Type plug (m) from CA0474 cable to the 15-way D-Type jack (f) on the NETNode labelled AUX.
2. Now, connect the RS232 D-Type 9-way plug (f) to your computer's RS232 9-way jack (m).

Caution: There are two D-Type 9-way plugs on the CA0474 cable – ensure you select the RS232 version by checking the label attached to the shell of the plug. The other is RS485.

6.1.2. Starting the Control Software

3. On the desktop double click the **d830_ctrl** icon.

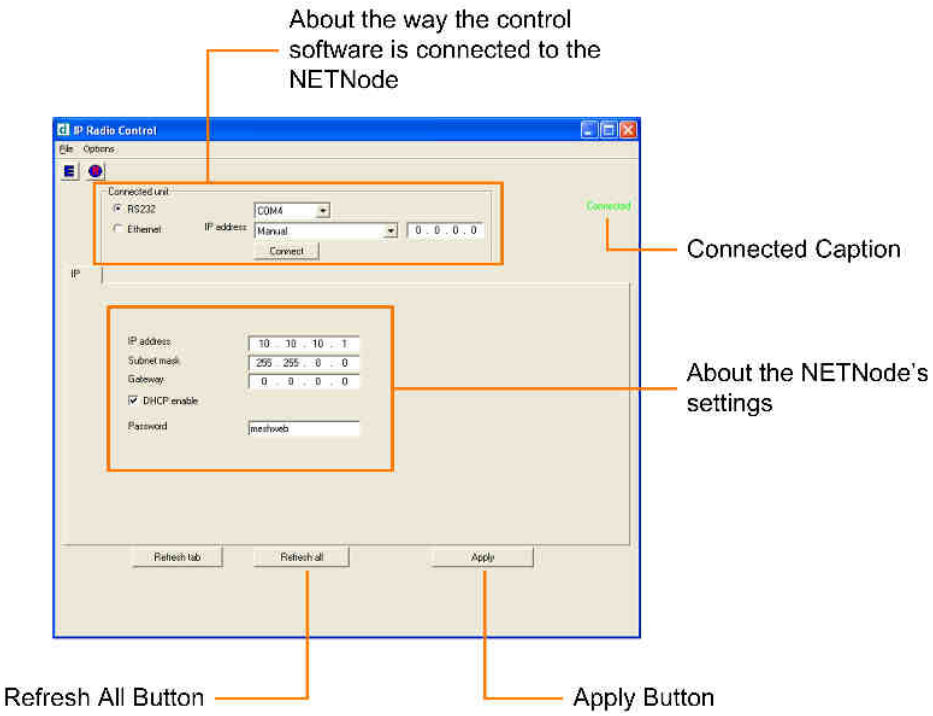
4. The **IP Radio Control** Dialog will open on the control software.

The IP Radio Control dialog is divided into **two** main panes. The **top half** tells you all about how the control software is **connected** to the NETNode device.

You can see we have made a serial connection using the computer's **RS232** port. We're using the computer's **COM 4** port but this may be different on your machine.

The green **Connected** caption tells you the software has successfully hooked up to the NETNode.

Here's how it should look:



6.1.3. Configuring the IP Address

Take a look at the screen above and you see that the **DCHP checkbox** is checked. In some situations this may be appropriate for advanced users of the system but in most cases it's better if each NETNode has its own fixed address. It'll make life much easier:

1. Uncheck the **DHCP** enable check box.
2. Enter an **IP address** for this NETNode in the IP address text box.
3. Enter a **subnet mask** in the Subnet mask text box.
4. Leave the **gateway** at zero for now.
5. Leave the **password** as **meshweb** for now.
6. Click the **Apply** button (this sends all your changes to the NETNode unit).
7. Click the **Refresh All** button and check that your settings have been recovered from the NETNode unit.

Now you have an **IP address** loaded into the unit you'll be able connect to it using a **web browser** from a remote location.

Note: The only time you'll need to use a serial (RS232) connection again would be if you forgot the password or the IP Address that is set on this page.

Caution: It's important to click the **Apply** button after any configuration change.

6.1.4. About IP addresses

In the example we have shown we're using a **class B** IP address and subnet mask but you can use **any** IP address that suits your operations.

6.1.5. Connecting the NETNode to your Computer using IP

For the rest of the set up of the NETNode you'll be connecting using an IP interface and a web browser.

On a Phase 1 Unit

1. Connect the Amphenol 19-way plug (m) from CA0288-5 cable to the Amphenol 19-way jack (f) on the NETNode labelled **CTRL/DATA**.
2. Now, connect the RJ45 8-way plug (m) to your computer's RJ45 8-way jack (f).

On a Phase 2 Robust unit

3. Connect the Amphenol plug (m) from CA0403cable to the Amphenol jack (f) on the NETNode labelled **Power/IP. (**This cable also includes the DC power banana plugs.)
4. Now connect the RJ45 8-way plug (m) to your laptop's RJ45 8-way jack (f).
5. Ensure you know the IP address of the computer you have attached.

On a Phase 2 Plain box unit

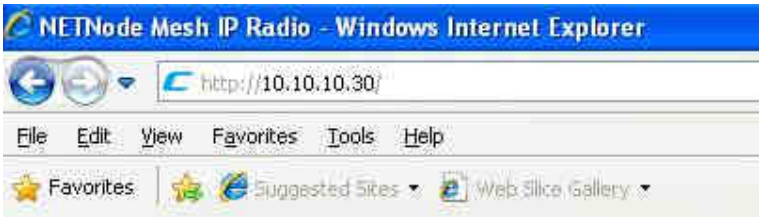
On a Phase 2 Plain box unit simply connect to one of the RJ45 panel mount sockets labelled **1** or **2** on the NETNode unit. It does not matter which socket you use.

6.1.6. Starting the Web Browser

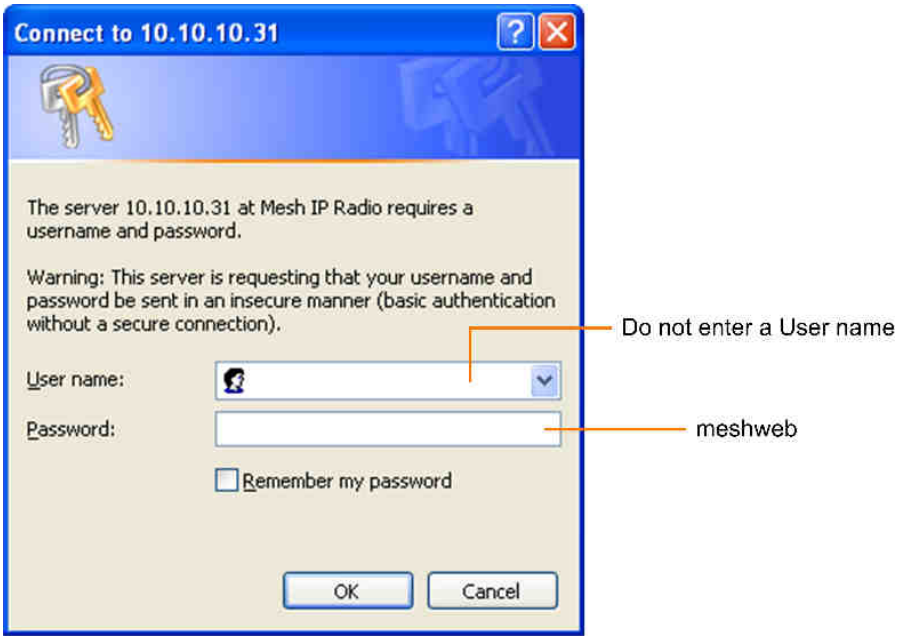
1. Start your **web browser** (normally: **start → internet**).

Note: You can use many different types of web browser with our products like Firefox for example. These web browsers start in slightly different ways.

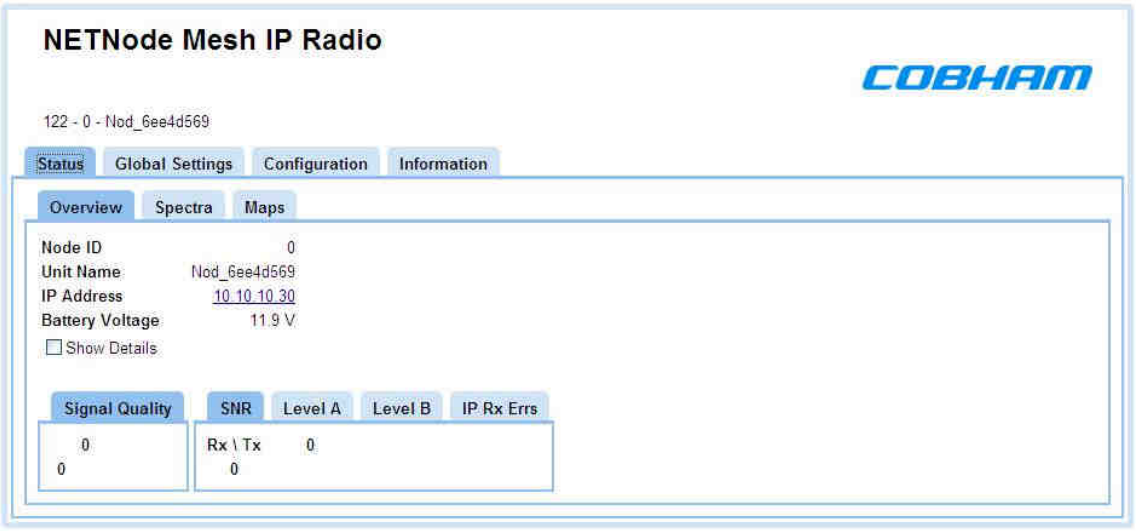
2. Type the **IP address** of the NETNode you are connected to in the **address bar**.



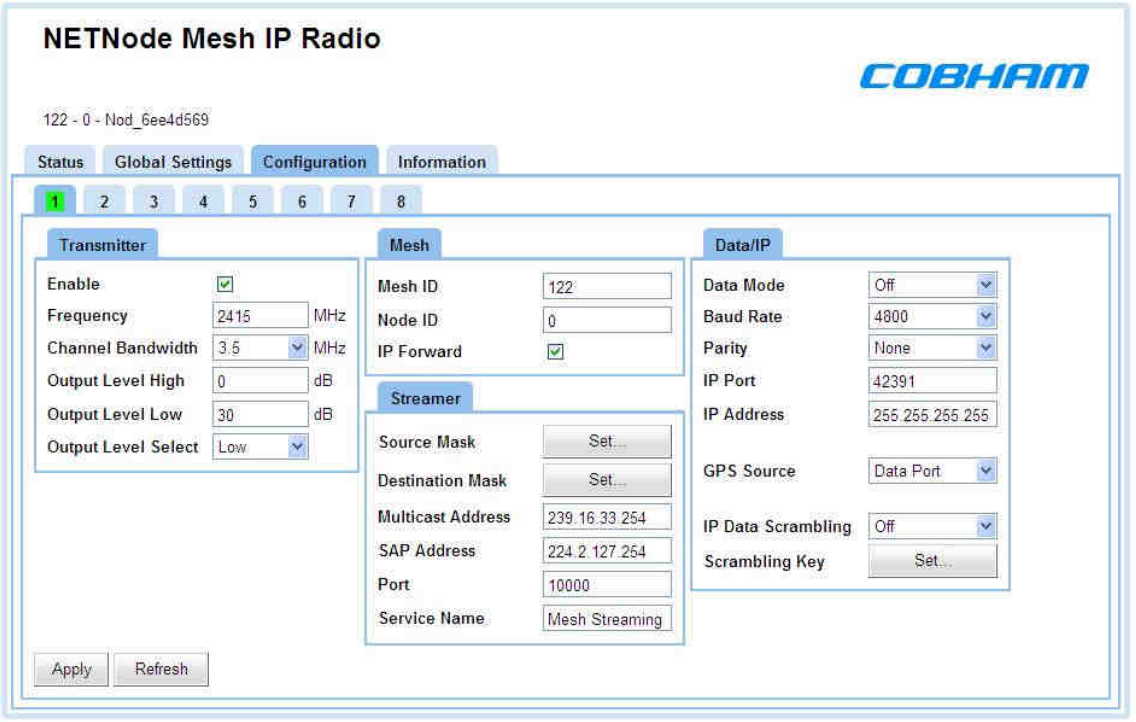
3. Press **ENTER** on your keyboard
4. The **Connect to** dialog will open



5. Do **not** type a **User Name**
6. In the **Password** text box type **meshweb**
7. The web browser window will open and the **Status** tab is displayed



8. Click on the **Configuration** tab
9. Click on configuration **1** (it will show **green** when selected, like below)



10. In the **Transmitter** pane check the **Enable** check box.
11. In the **Transmitter** pane type in the **frequency** you want.
12. In the **Mesh** pane type in a **Mesh ID** (001 to 999)
13. In the **Mesh** Pane type the **Node ID** (0 to 7)
14. Click the **Apply** button.

You'll see the **Configuration** dialog appear. The NETNode is now configured and ready to form a part of a mesh.

6.1.7. About Enable Check Box

This simply turns on the transmitter when checked. The transmitter only sends when it has data ready to move. For a unit to function in a mesh the transmitter must be enabled.

6.1.8. About Frequency

All the units in a mesh must be on the same frequency. Check that the Frequency is valid for the operation of the unit – specific country regulations will determine the frequencies available for operation.

6.1.9. About Channel Bandwidth

All units in a mesh must have the same bandwidth set.

6.1.10. About Mesh ID

The **Mesh ID** tells the unit which **mesh** it belongs to. All NETNodes on Mesh ID 122 for example will communicate with each other.

This means you could set up **another mesh** with Mesh ID 125 for example on the **same frequency** which would run independently of Mesh 122 (though you *would* have to be careful about interference).

You can choose any numbers from **001 to 999** for your **Mesh ID**.

6.1.11. About Node ID

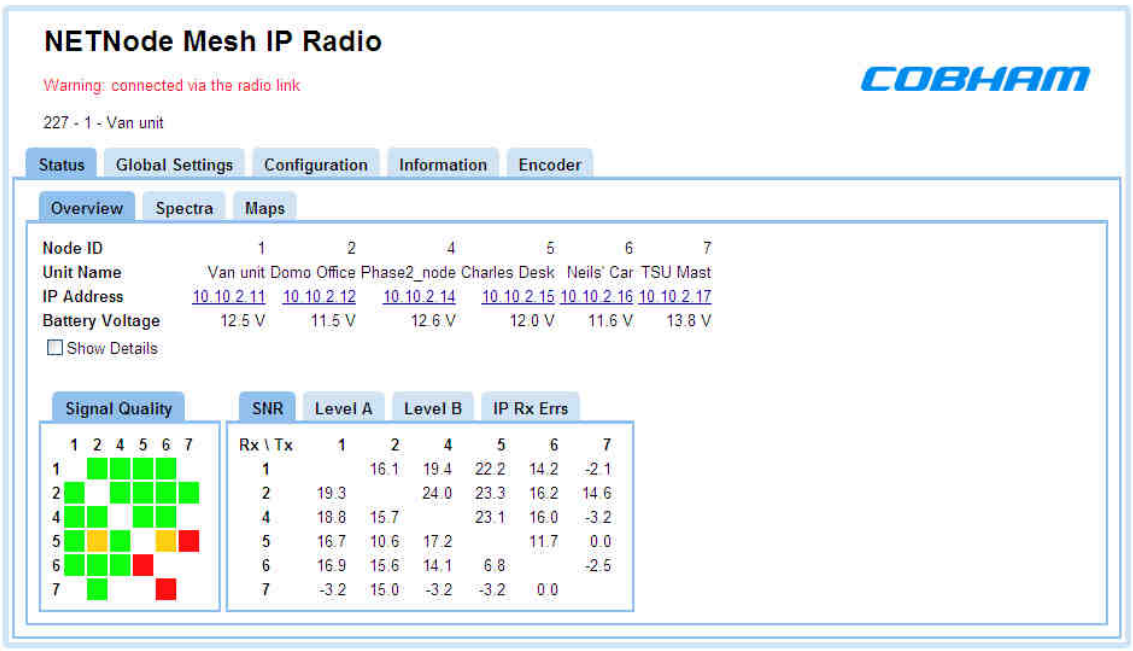
The **Node ID** gives the unit a **unique** ID within the mesh. You can have up to **eight** NETNodes in a mesh and they each must carry a unique Node ID.

You can choose any numbers from **0 to 7** for your **Node ID**.

7. Advanced Procedures

7.1. Status Tab – Overview Pane

Now you have got the NETNodes configured, let's take a look at the rest of the configuration possibilities. We'll begin with the Status tab.



Here is the **Status tab** with the focus on the **Overview** pane.

7.1.1. Node ID

We are showing **six** NETNodes with **Node IDs** of 1, 2, 4, 5, 6 and 7. There could be up to eight NETNodes in a mesh with Node IDs numbered 0 to 7.

7.1.2. Unit Name

The unit name is a 'friendly' name to make it easier for you to know which NETNode we are talking about. This name is assigned in the **Global Settings** Tab.

7.1.3. IP Address

This shows the IP address of the unit that we set up in our initial configuration. Notice that it is shown as a hyperlink. If you click on one of these hyperlinks the browser will switch to that NETNode.

7.1.4. Battery Voltage

This returns the current battery voltage of the NETNode. Not so exciting when we are on mains in the lab but vital when you are looking at a node located on a high building several miles away which is running on batteries.

7.1.5. Show Details Check Box

If you check this box you'll see a whole bunch of data about Tx IP Packets etc. This can give you vital information about the running of the network.

7.1.6. Signal Quality

This gives you a simple picture of the signal quality around the mesh system. Ideally, we'd like to see steady green boxes for all links. Naturally, mobile units will go out of range or interference will cause a unit to degrade for a while. The clever thing is the mesh will find a new routing and heal itself thus keeping your network on air.

Here's what the colours mean:

Colour	Means…
Green	16 QAM mode – most robust
Amber	QPSK mode – less robust
Red	Basic link only – lowest data rate passing between nodes
White	Link broken or not configured

7.1.7. SNR

This pane shows the Signal to Noise Ratios for each of the NETNodes.

7.1.8. Level A

This pane shows the dBm value for antenna A on the NETNode unit.

7.1.9. Level B

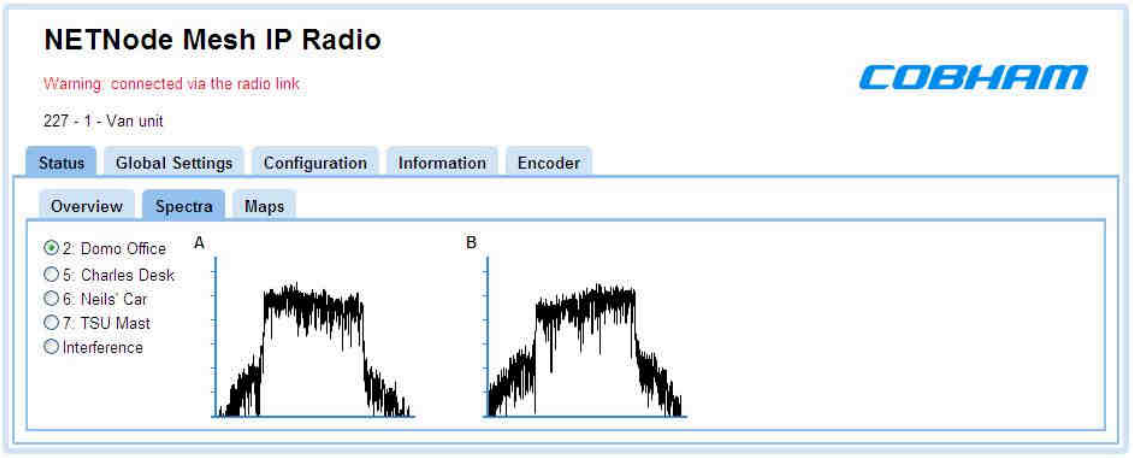
This pane shows the dBm value for antenna B on the NETNode unit.

7.1.10. IP Rx Errs

This pane shows the number of IP receive errors for each NETNode.

7.2. Status Tab – Spectra Pane

Now let's look at the **Status tab** with the focus on the **Spectra** pane.



7.2.1. About the Spectra Displays

There are **two** displays labelled A and B which show the spectra being **received** on the two diversity antennas of the NETNode you are attached to.

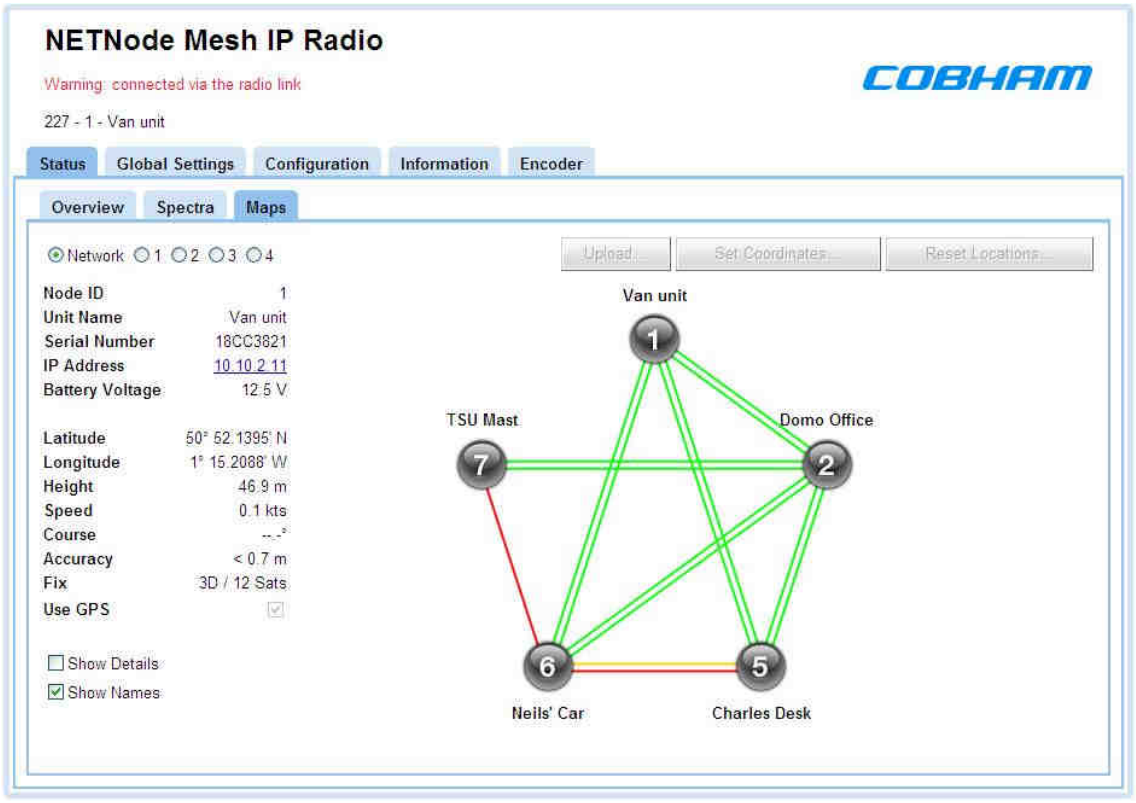
But, there could be **several** NETNodes transmitting on the mesh so we need to define **which** unit we are looking at.

This is done with the radio buttons on the left side of the spectra display. In our example, the radio button for **Domo Office** is selected. This means the two displays are showing spectra for the **Domo Office NETNode** transmissions as received on our node's two antennas.

7.2.2. Interference

The last radio button is called interference. When you select this, the displays show the spectra when none of the NETNodes in the mesh are transmitting. This enables us to look for interference on the frequency we are planning to use for our mesh.

7.3. Status Tab – Maps Pane



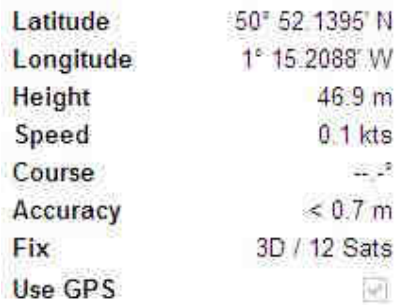
7.3.1. Radio Buttons

The radio buttons enable you to choose between **Network** and one of **four** map displays for the mesh. Leave it on Network for now.

7.3.2. Node Information

Under the radio buttons you'll see some node information about the NETNode you are currently attached to. We talked about this information in the Overview Pane above.

7.3.3. GPS Information



The NETNode we have selected has a GPS unit connected and the Use GPS check box is checked. This means that the NETNode can broadcast precise information about its location to other nodes or fixed assets on the mesh.

7.3.4. Show Details Check Box

When the **Show Details** check box is checked the node information shown above is expanded to show things like Tx IP Packets which are useful when diagnosing network problems.

7.3.5. Network Display

In the example above you can see the network display is selected. This gives a simple graphical view of the NETNodes in the mesh and the links between them.

Note: The buttons above the display are greyed out as they have no function when the Network radio button is selected.

Each NETNode is shown as a circle with a white number. (If the number turns red, then the node is temporarily congested).

If you have the **Show Names** check box checked, you'll also see the node **name** displayed.

The links between the nodes are shown as **coloured lines**. As each NETNode supports bidirectional operation there are normally **two** lines for each link.

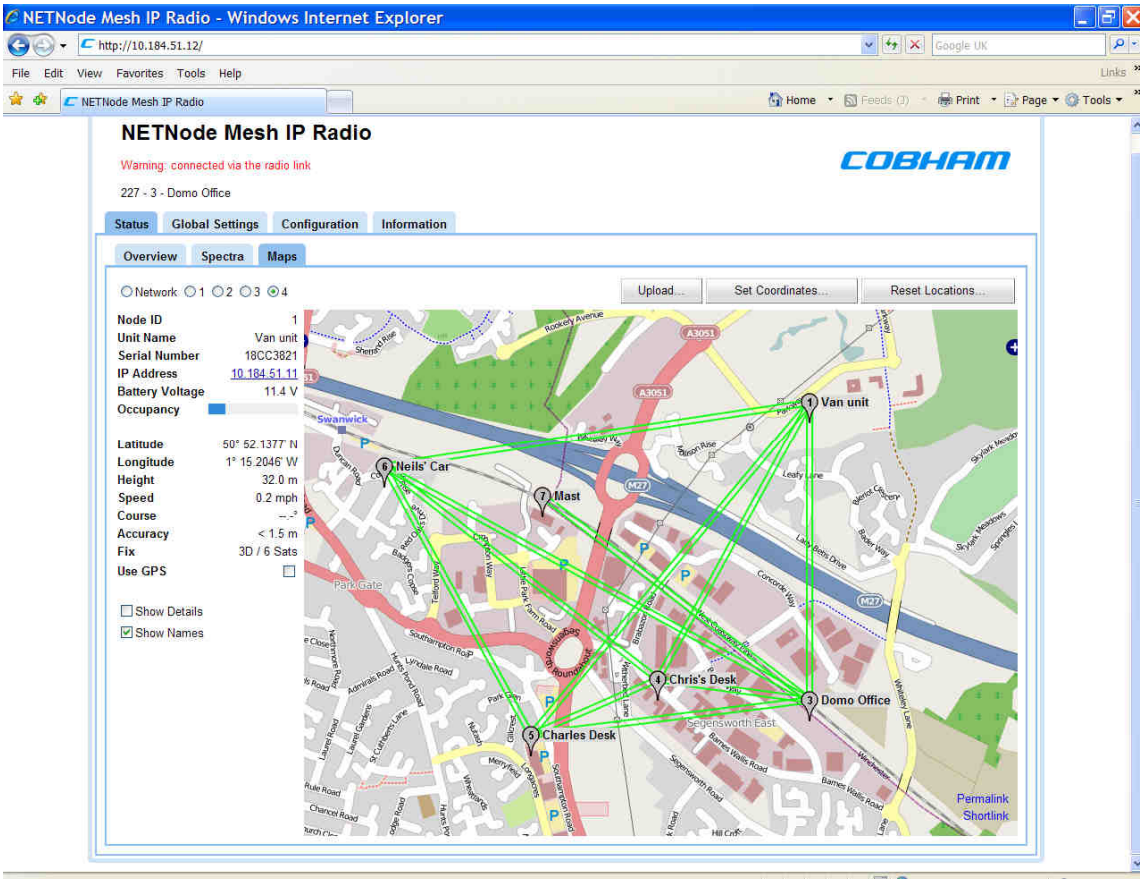
Here's what the colours mean:

Colour	Means…
Green	16 QAM mode – most robust
Amber	QPSK mode – less robust
Red	Basic link only – lowest amount of data passing
White	Link broken or not configured

In the example above you are seeing static lines but when you are connected to a live system, you'll see these lines changing state and the RF environment changes or NETNodes move about.

7.3.6. Map Display

Now select one of the **numbered radio buttons**. This changes the display to the **map display**. There are **four** possible map displays each selected by a radio button.



You'll see the mesh network diagram overlaid onto a map of the area showing the nodes and the links between them.

There are **two** ways you can place the nodes onto the map:

- Manual Placement
- GPS Placement

7.3.7. Manual Placement

Position the mouse pointer over the node symbol. The pointer will change to a four-headed arrow. Left click and drag the node to the position on the map where the node should be displayed.

Note: You can drag a node symbol to **anywhere** on the map. Normally, you would place the symbol where the node is actually located, but there is nothing to stop you just randomly placing the symbol in Portsmouth when the physical NETNode is in Southampton for example.

7.3.8. GPS Placement

If a NETNode has a GPS unit connected it can report its position which can then be displayed on the map.

1. Ensure you are connected to a NETNode with **GPS attached**.
2. Ensure the **Use GPS** check box is checked.
3. The symbol for that node will now snap to the correct location on the map where the actual NETNode is currently located. If it moves, it will move on the map, showing heading speed and height.

7.3.9. Upload Map Data

Each of the four map radio buttons can contain a different map. These maps need to be uploaded before you can use them.

7.3.9.1. Upload Map Image File

To upload a map you'll need an internal drive which has been formatted. (Information Tab).

You'll also need an image file containing the map for the area you are interested in. The system supports four file types for maps:

- .JPG
- .PNG
- .GIF
- .BMP

We recommend using JPEGs as they are good quality but small files. Bitmaps on the other hand are excellent quality but very large. There is a limited amount of memory available in each NETNode for maps.

1. Click the **Upload...** button
2. The **Upload Map Data** dialog opens

3. Click the **Browse** button and navigate to your image file.
4. Click the **Upload File** button to place the image in the NETNode's flash memory.

7.3.9.2. Set Coordinates

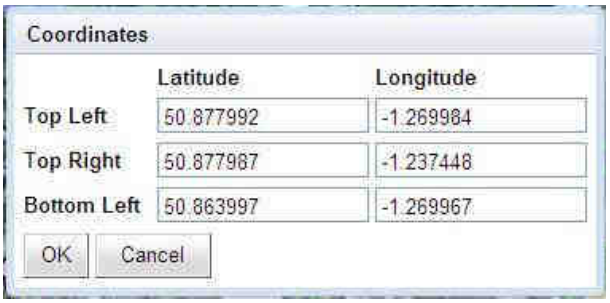
When you have loaded your map, you'll need to find out the **coordinates** of **three** of the corners of the map image to enable the GPS feature to work.

You'll need to know the Top Left, Top Right and Bottom Left coordinates of your image.

These coordinates must be in **decimal** form and accurate to six places. (You may be more familiar with Latitude and Longitude being expressed in hours minutes and seconds).

You can get the coordinates from your map data source for example.

1. Click the **Set Coordinates** button.
2. The **Coordinates** dialog box opens.



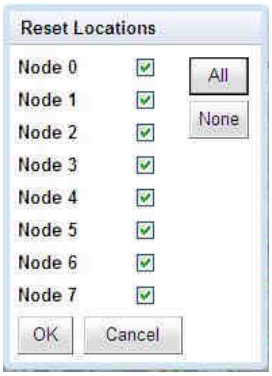
3. Type in the coordinates of each of the corners of the image.
4. Click **OK.**

7.3.9.3. Reset Locations…

When you have loaded a new map or you have been moving nodes on an existing map you may need to reset their locations. This can be useful if you lose nodes off the edge of the map.

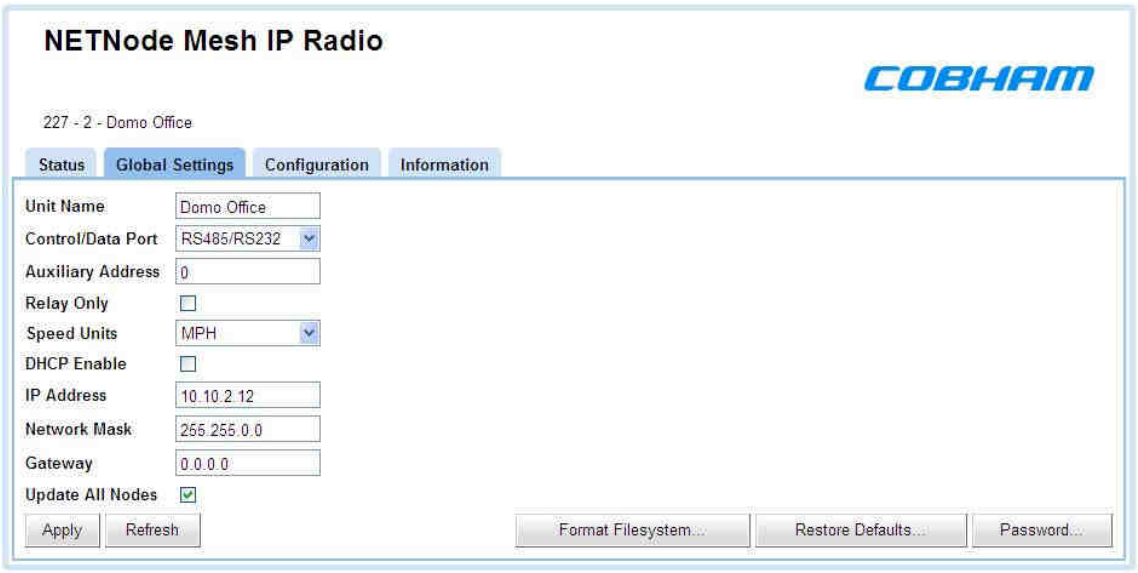
You can force the system to reset the locations of **all the nodes** or **any combination** of them.

1. Click the **Reset Locations…** button
2. The **Reset Locations** dialog opens



3. Click the **All** button or check the nodes you want to reset
4. Click **OK**
5. The system resets the locations and switches off the GPS tracking function.

7.4. Global Settings Tab



7.4.1. Unit Name

The NETNodes are uniquely identified by the **Node ID** parameter which is a number between 0 and 7.

This is not a very useful name for normal operations so this text box allows you to enter a better description for the node which will appear on network diagrams and maps within the software.

1. Type in a meaningful name for the NETNode.
2. This name will be used in all maps and network diagrams for this node

Note: You can use up to 12 alphanumeric characters for the Unit name

7.4.2. Control/Data Port

On a Phase 1 NETNode unit the Control/Data port uses the CA0288-5 cable which has an Amphenol 19-way plug (m) on one end and two D-Type 9-way plugs (f) on the other end labelled RS232 and RS485. On a Phase 2 Plain box NETNode the Control/Data port is labelled AUX and uses the CA0474 cable which has two D-Type 9-way plugs (f) on the other end labelled RS232 and RS485. On a Phase 2 Robust unit the Control/Data port uses CA0406 which has an Amphenol plug (m) on one end and two D-Type 9-way plugs (f) on the other end labelled RS232 and RS485.

Normally we use RS232 for Control and RS485 for Data Port.

There may be times when you want to change this and so this combo box enables you select other setting for the plugs on this cable.

You can select:

Setting	Means…
RS232/RS485	Control is RS232 plug, Data Port is RS485 plug (normal)
RS485/RS232	Control is RS485 plug, Data Port is RS232 plug
RS232/RS232	Special mode, only used for engineering.

7.4.3. Auxiliary Address

Normally, the NETNode will be operating with IP devices like cameras microphones or GPS units and the Auxiliary address is left as 0.

Some NETNodes (the AVI variant) are able to use composite cameras. To do this they have an extra board inside called a D510.

To ensure the NETNode uses the D510 we have to set the auxiliary address to 1. Now your composite camera can be used with the system.

Caution: If you ever reset defaults on the NETNode it will reset the Auxiliary Address to zero. You must reset this to 1 for your composite camera to work.

7.4.4. Relay Only

Normally each NETNode will have at least one source attached to it like a camera or a microphone.

Sometimes however, the NETNode only needs to act as a relay, for example when you are setting up a chain network for range extension or working with a helicopter relay.

In this case you would check the **Relay Only** check box.

Note: When the Relay Only check box is checked it simply disables any Ethernet connectivity to the NETNode.

7.4.5. Speed Units

If you have a GPS connected to a NETNode it can supply speed data. You can choose the units you want to use for speed in this combo box. The possible choices are:

- Knots
- MPH
- KPH

7.4.6. DHCP Enable

In some situations having DCHP enabled may be appropriate for advanced users of the system but in most cases it's better if each NETNode has its own fixed address. It'll make life much easier.

If checked, then the NETNode will try to acquire its IP address from a DHCP server on the network – this DHCP server can be located through another NETNode over the radio interface.

7.4.7. IP Address

If the NETNode is not automatically acquiring its IP address via a DHCP server then a fixed IP address needs to be assigned to the unit. This address is typically obtained from a network administrator to avoid a clash of IP addresses on any network. The unit is expecting an IPv4 address.

Enter an **IP address** for this NETNode in the IP address text box. It can be any class of network you choose.

7.4.8. Network Mask

The network mask allows a network administrator to break a network into smaller more efficient subnets to prevent excessive numbers of IP packets being routed through the network. This is normally defined by the network administrator

Enter a **subnet mask** in the Network mask text box.

7.4.9. Gateway

A default gateway is used by a host when an IP packet's destination address belongs to someplace outside the local subnet. The default gateway address is usually an interface belonging to the LAN's border router.

We recommend you leave the gateway at 0.0.0.0

7.4.10. Update All Nodes

When you make changes to any setting they are normally applied only to the NETNode you are currently attached to. Sometimes it's really convenient to update all the NETNodes in the mesh, for example when you want to change the frequency of all units at the same time.

Check the **Update All Nodes** checkbox to enable these global updates on all nodes. Not all parameters are updated globally on the Mesh just Frequency, Bandwidth and Encryption commands.

CAUTION: All nodes in a Mesh must be in range and connected for a 'Update all Nodes' command to work across the whole Mesh. If the command is issued and while a node has dropped out of the Mesh as it is out of range then it will not receive the command and may not reconnect to the Mesh when it returns into coverage.

7.4.11. Format File System…

There are two flash drives built into each NETNode.

- Internal Flash
- External Memory Card

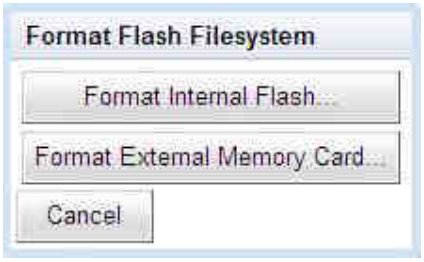
Flash	Use
Internal Flash	Holds the maps and coordinate files.
External Memory Card	Reserved for future use but may be used to record material.

Note: On a Phase 1 Unit the external Memory Card is actually located on the main board inside the unit.

Here's how you format these drives:

1. Click the **Format File System**… button

The **Format Flash File system** dialog opens



2. Click **Format Internal Flash** button
3. Your internal Flash drive will be formatted.

Caution: When you press the **Format Internal Flash** button the system does not ask you to confirm your actions – it just formats the drive. Be very sure you want to do this.

Note: If you want to format the External Memory Card, click the **Format External Memory Card** button at step 2 above.

7.4.12. Restore Defaults…

To restore a default condition to the whole unit:

1. Click the **Restore Defaults** button
2. The **Restore Defaults** dialog opens

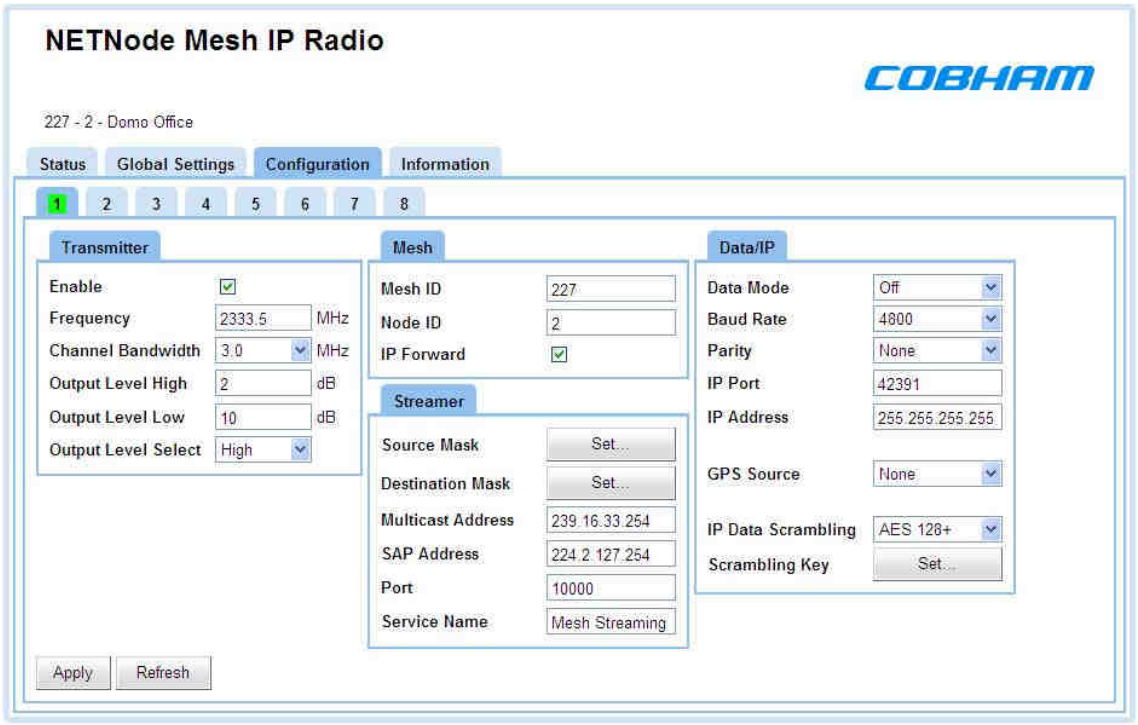
3. Click the **OK** button

7.4.13. Change Password…

1. Click the **Password…** button
2. The **Change Password** dialog opens

3. Type in the Old Password
4. Type in the New Password in the **New Password** text box
5. Type in the New Password in the **Confirm New Password** text box
6. Click the OK button

7.5. Configuration Tab – Transmitter Pane



The first thing to notice is there are eight configuration tabs enabling you to have eight completely different setups stored in the NETNode. We are going to look at just tab one – they are all identical. In the example above, the green square on tab 1 shows we are working on configuration number one.

The transmitter pane enables you to change the frequency of a NETNode, set the transmission bandwidth and adjust the output power level of the NETNode.

7.5.1. Enable Check Box

This simply turns on the transmitter when checked. Remember though that the transmitter only sends when it has data ready to move. All NETNodes in a mesh must have their transmitters enabled.

7.5.2. Frequency

Input the frequency in MHz that you want to use for this NETNode.

7.5.3. Channel Bandwidth

You can configure the channel bandwidth with this combo box. There are three choices:

2.5 MHz

3.0 MHz

3.5 MHz

7.5.4. Output Level High and Output Level Low

These two text boxes allow you to set the level of attenuation in dB that will be applied to the low and high output levels. This could be useful if your transmitter is swamping another unit in close proximity. You can set anything between 0 to 30 dB.

7.5.5. Output Level Select

You can choose high or low output level to suit the RF environment you are working in. When you select high or low here it applies any attenuation you have set in the output level setting discussed above.

7.6. Configuration Tab – Mesh Pane

7.6.1. Mesh ID

The **Mesh ID** tells the unit which **group** it belongs to. All NETNodes on Mesh ID 122 for example will communicate with each other.

This means you could set up **another mesh** with Mesh ID 125 for example on the **same frequency** which would run independently of Mesh 122 (though you *would* have to be careful about interference).

You can choose any numbers from **001 to 999** for your **Mesh ID**.

7.6.2. Node ID

The **Node ID** gives the unit a **unique** ID within the mesh. You can have up to **eight** NETNodes in a mesh and they each must carry a unique Node ID.

You can choose any numbers from **0 to 7** for your **Node ID**.

7.6.3. IP Forward

If this node is connected to an IP source checking the IP Forward check box will ensure this data is passed around the mesh for access on other units.

7.7. Configuration Tab – Streamer Pane

When you have got the asset to the NETNode, you may want to stream that information down a fixed IP link. The streamer pane enables you to configure this facility easily.

Streaming is the transmission of digital audio or video or the listening and viewing of such data without first storing it.

In Cobham systems we have the ability to carry streams using multicast protocols and these streams can come from external or internal sources. This is controlled by the **Source Mask**.

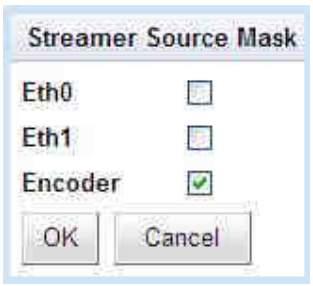
To ensure we don't overload the bandwidth we want to be able to choose which nodes get to receive the stream. This is controlled by the **Destination Mask.**

7.7.1. Source Mask

The Source Mask enables the streaming of Video that originates from a network connected to either one of the two NETNode Ethernet ports or from the internal encoder (if it is fitted).

Here's how to configure it:

1. Click the Source Mask **Set...** button
2. The **Streamer Source Mask** dialog will open



3. Place a check mark in the check box that is the source to stream down the link.
4. Click **OK**

In our example we are planning to stream from the composite camera connected to the encoder.

Here are all the possible connections involved:

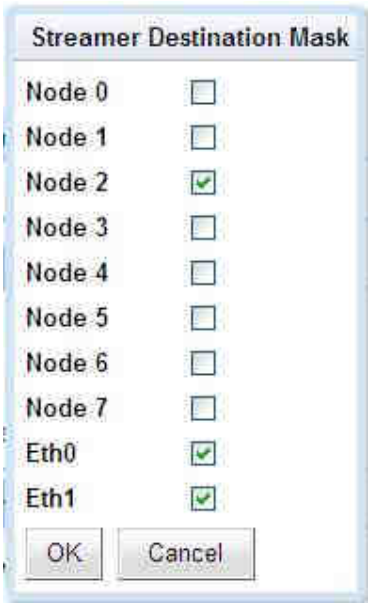
Source	Front Panel Label	Connector (Robust Units)	Connector (Plain Box)
Eth0	IP	Amphenol	RJ45 (f)
Eth1	CTRL/DATA	Amphenol	RJ45 (f)
Encoder	Internal (if fitted)	Internal (if fitted)	Internal (if fitted)

Eth0 and **Eth1** will be from a **network** connected to the NETNode. **Encoder** will ONLY be valid if the NETNode has the AVI-UP option (internal AV Encoder) fitted.

7.7.2. Destination Mask

You can choose which NETNodes will receive the stream. Your NETNode could have up to eight NETNodes attached to it via the mesh. Streaming to all nodes is an inefficient use of mesh capacity and so you need to be able to restrict the multicast to specific nodes.

1. Click the Destination Mask **Set...** button
2. The **Streamer Destination Mask** dialog will open



3. Check the node check boxes for the NETNodes that you want to receive the stream.
4. Click **OK**

Note: The **Eth0** and **Eth1** are ticked by **default**. These ports will be used as the exit point from the mesh at the node(s) you have specified.

7.7.3. Multicast Address

This text box enables you to change the multicast address used by the unit. The default value is 239.16.33.254.

7.7.4. SAP Address

This text box enables you to change the value of 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.

7.7.5. Port

Protocols like TCP or UDP use port numbers in the header to direct traffic around the network. Low port numbers are used by computer systems for predefined tasks. For example SMPT (for your email service) uses port 25.

A good rule is to use numbers above 10,000 to avoid conflict with existing services.

When you set up a port number on several computers on a network they will all listen for packets directed to that port.

The default value is 10000.

7.7.6. Service Name

This text box lets you name the multicast stream as delivered in the SAP/SDP packets from the unit. Default is **MPEG Stream.**

7.8. Configuration Tab – Data/IP Pane

The NETNode can send and receive data through either its RS232 serial port or its RS485 serial port. The switch between the RS232 port and the RS485 port is found under the **Global Settings** tab.

7.8.1. Data Mode

The Data Port can be configured in three ways:

- Off
- UDP
- TCP

7.8.1.1. Off

Data transfer is switched off.

7.8.1.2. UDP

UDP (User Datagram Protocol) is used to move data about the network. The packets are sent out and the system does not expect a reply. There is no way that the sending device can tell if the data arrived at the destination.

7.8.1.3. TCP

TCP (Transmission Control Protocol) is used to move data about the network. The packets are sent out and the system will expect a reply. Each message is acknowledged by the destination device.

7.8.2. Baud Rate

This is where you set the speed at which data will be transferred across the network. Speeds available are: None, Illegal, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.

Note: The data is assumed to be 8 bits.

7.8.3. Parity

A **parity bit** is a bit that is added to ensure that the number of bits with the value one in a set of bits is even or odd. Parity bits are used as the simplest form of error detecting code.

There are two variants of parity bits: **even parity bit** and **odd parity bit**. When using even parity, the parity bit is set to 1 if the number of ones in a given set of bits (including the parity bit) is even. When using odd parity, the parity bit is set to 1 if the number of ones in a given set of bits (including the parity bit) is odd. In other words, an even parity bit will be set to "1" if the number of 1's + 1 is even, and an odd parity bit will be set to "1" if the number of 1's +1 is odd.

This combo box allows you to set: **None**, **Even** and **Odd**.

7.8.4. IP Port and IP Address

These set an IP address and Port to and from which the data will transferred.

The user can connect to the data port via telnet by setting the mode to TCP and the port number to 23.

The user can connect two data ports on different units together via setting UDP mode and using the matching port numbers.

7.8.5. GPS Source

It is possible to connect a GPS receiver to a NETNode. This switch enables you to select the source for the GPS. There are three choices: **None**, **Data Port** and **Encoder**.

7.8.5.1. None

This simply turns off the GPS facility.

7.8.5.2. Data Port

This is set when the GPS has been connected to the Data port on the NETNode and this is where the system will look for GPS data.

7.8.5.3. Encoder

This is set when the GPS has been connected to the Encoder port (AV) and this is where the system will look for GPS data. This is only possible with the AVI variant of the NETNode.

7.8.6. IP Data Scrambling

It can be very important to scramble received assets before they are passed across networks.

The system offers AES128 and AES 256 and this encrypts all user data exchanged over the network.

The AES128+ and AES256+ settings ensure that the network will only process encrypted data. Any data sent in the clear by any nodes will not be presented or accepted by a NETNode if the AES+ is set on the unit.

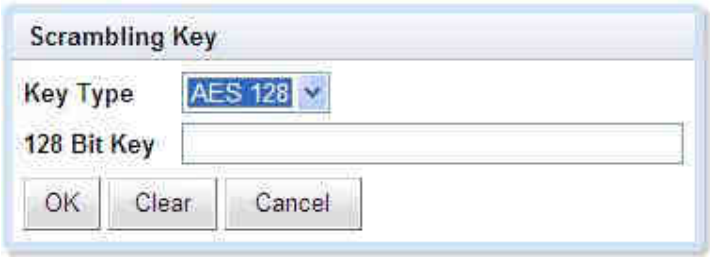
This combo box enables you to select the scrambling scheme you want to use. You can select: AES128, AES128+, AES256 and AES256+.

7.8.7. Scrambling Key

When you choose to use a scrambling scheme you need to specify a key that it will use.

Here's how:

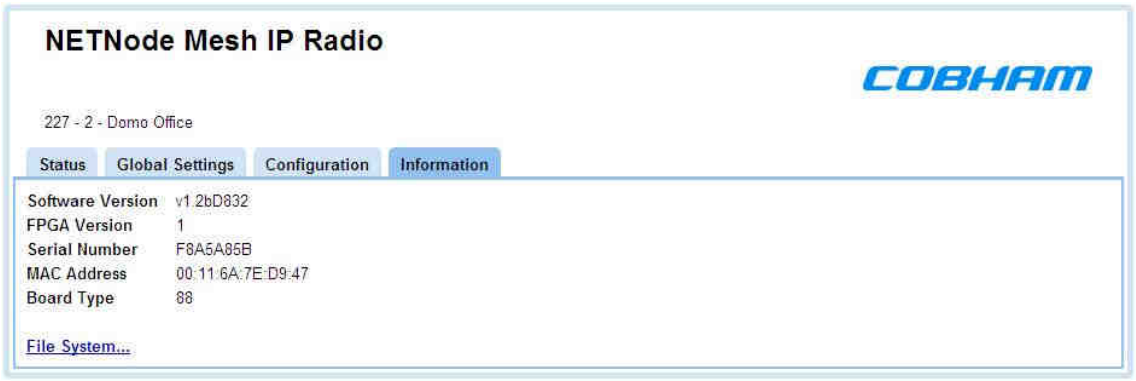
1. Click the Scrambling Key **Set...** button
2. The Scrambling Key dialog open



3. Select the Key type from the Key Type combo box
4. Type your key in the xxx bit key combo box
5. Click OK

Note: If you make a mistake when typing the key, use the **Clear** button.

7.9. Information Tab



The information tab gives you some details about the hardware and software loaded into your NETNode unit. This could be very valuable during a support call to help our engineers to assist you.

We discussed how to load maps and coordinates in an earlier section of this guide. By clicking on the **File System…** hyperlink on this page you can get access to the files. Here you'll find all your maps and configuration files which you may want to share with other units.

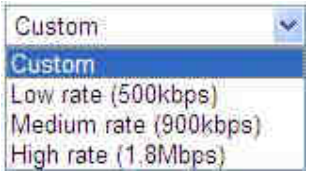
7.10. Encoder Tab

If you have a NETNode which has the AVI option installed you will be able to use a **composite** camera (PAL or NTSC) connected to the AV jack on the front panel of the unit.

When you are using a NETNode with a video encoder, you'll see an extra tab on the control software called **Encoder**. This is where you configure the encoder features.

7.10.1. Encoder Preset

You can choose from a number of encoder options.



7.10.2. Video Lock

This block will show Red when there is no video lock. It shows Green when video is locked.

7.10.3. Audio Enable

Check the Audio Enable check box to turn on the audio. Audio will now take some of the available bandwidth. For some applications you may wish to turn off audio to allow all the bandwidth to be used by video.

7.10.4. Scrambling

It can be very important to scramble received composite assets before they are passed across networks.

The system offers AES128 and AES 256 and this encrypts all composite assets exchanged over the network.

This combo box enables you to select the scrambling scheme you want to use. You can select: AES128 or AES256.

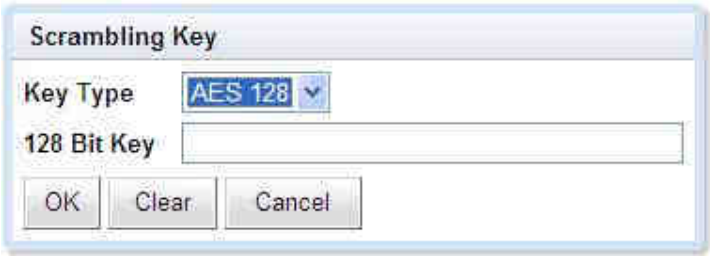
Note: This scrambling of the **composite signal** is independent of the **main IP Scrambling** on the node. This composite scrambling is **nested** under the main IP scrambling. This means you can scramble the Composite signal and then scramble the whole IP data again.

7.10.5. Scrambling Key

When you choose to use a scrambling scheme you need to specify a key that it will use.

Here's how:

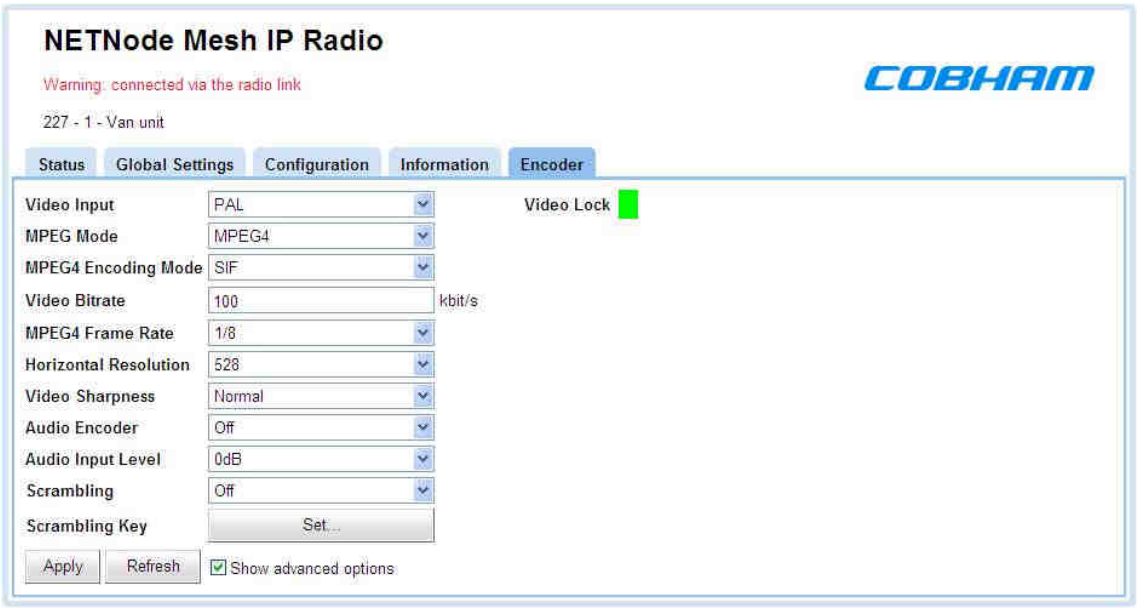
1. Click the Scrambling Key **Set...** button
2. The Scrambling Key dialog open



3. Select the Key type from the **Key Type** combo box
4. Type your key in the **xxx bit key** combo box
5. Click **OK**

Note: If you make a mistake when typing the key, use the **Clear** button.

If you check the **Show Advanced Options** check box, the dialog will expand like this:



8. Streaming Video over IP

8.1. General Info

This section is relevant only to customers that have the **NETNode-AVI-UP** option fitted into their NETNode unit.

8.2. Streamer

The received video 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 once 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 Session Announcement Protocol and Sessions Description Protocol data (SAP and SDP), which contain information regarding the nature and location of the stream itself.

8.3. Configuration of the Streamer

The web-server control allows configuration of the streaming function.

8.3.1. Source Mask

This pop-up box enables the streaming of Video from either one of the two external Ethernet ports or from the internal encoder (if it is fitted). Enabling one of the two Ethernet ports allows a stream on an external network to pass into the Mesh network or from the internal MPEG encoder (if fitted in the NETNode as option NETNode-AVI-UP).

8.3.2. Destination Mask

This pop up box allows the user to specify precisely which nodes need to receive the stream. Streaming to all nodes may be an inefficient use of MESH IP capacity and so the user may wish to restrict the multicast to specific nodes.

Note: Please note after hitting the OK box on the source or destination mask, the main Apply Bottom must be pressed to action the command.

8.3.3. Multicast Address

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

8.3.4. 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.

8.3.5. Stream Port Number

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

8.3.6. Service Name

Textual information naming the multicast stream as delivered in the SAP/SDP packets from the unit. Default is "Mesh Streaming"

8.4. Configuration Tab – Streamer Pane

When you have got the asset to the NETNode, you may want to stream that information down a fixed IP link. The streamer pane enables you to configure this facility easily.

Streaming is the transmission of digital audio or video or the listening and viewing of such data without first storing it.

In Cobham systems we have the ability to carry streams using multicast protocols and these streams can come from external or internal sources. This is controlled by the **Source Mask**.

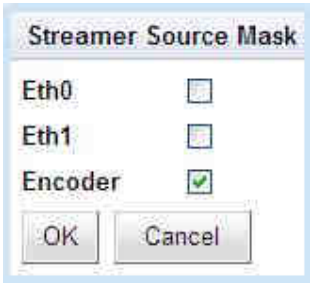
To ensure we don't overload the bandwidth we want to be able to choose which nodes get to receive the stream. This is controlled by the **Destination Mask.**

8.4.1. Source Mask

The Source Mask enables the streaming of Video that originates from a network connected to either one of the two NETNode Ethernet ports or from the internal encoder (if it is fitted).

Here's how to configure it:

1. Click the Source Mask **Set...** button
2. The **Streamer Source Mask** dialog will open



3. Place a check mark in the check box that is the source to stream down the link.

4. Click **OK**

In our example we are planning to stream from the composite camera connected to the encoder.

Here are all the possible connections involved:

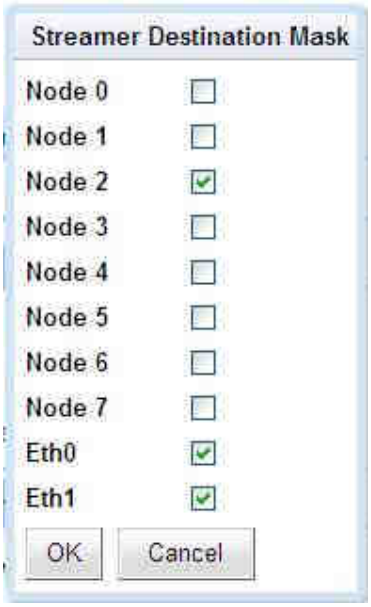
Source	Front Panel Label	Connector (Robust Units)	Connector (Plain Box)
Eth0	IP	Amphenol	RJ45 (f)
Eth1	CTRL/DATA	Amphenol	RJ45 (f)
Encoder	Internal (if fitted)	Internal (if fitted)	Internal (if fitted)

Eth0 and **Eth1** will be from a **network** connected to the NETNode. **Encoder** is ONLY valid IF the NETNode has the AVI-UP Option (internal AV Encoder) fitted.

8.4.2. Destination Mask

You can choose which NETNodes will receive the stream. Your NETNode could have up to eight NETNodes attached to it via the mesh. Streaming to all nodes is an inefficient use of mesh capacity and so you need to be able to restrict the multicast to specific nodes.

1. Click the Destination Mask **Set...** button
2. The **Streamer Destination Mask** dialog will open



3. Check the node check boxes for the NETNodes that you want to receive the stream.
4. Click **OK**

Note: The **Eth0** and **Eth1** are ticked by **default**. These ports will be used as the exit point from the mesh at the node(s) you have specified.

8.4.3. Multicast Address

This text box enables you to change the multicast address used by the unit. The default value is 239.16.33.254.

8.4.4. SAP Address

This text box enables you to change the value of 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.

8.4.5. Port

Protocols like TCP or UDP use port numbers in the header to direct traffic around the network. Low port numbers are used by computer systems for predefined tasks. For example SMPT (for your email service) uses port 25.

A good rule is to use numbers above 10,000 to avoid conflict with existing services.

When you set up a port number on several computers on a network they will all listen for packets directed to that port.

The default value is 10000.

8.4.6. Service Name

This text box lets you name the multicast stream as delivered in the SAP/SDP packets from the unit. Default is **MPEG Stream.**

9. Configuring your NETNode for GPS

9.1. General Information

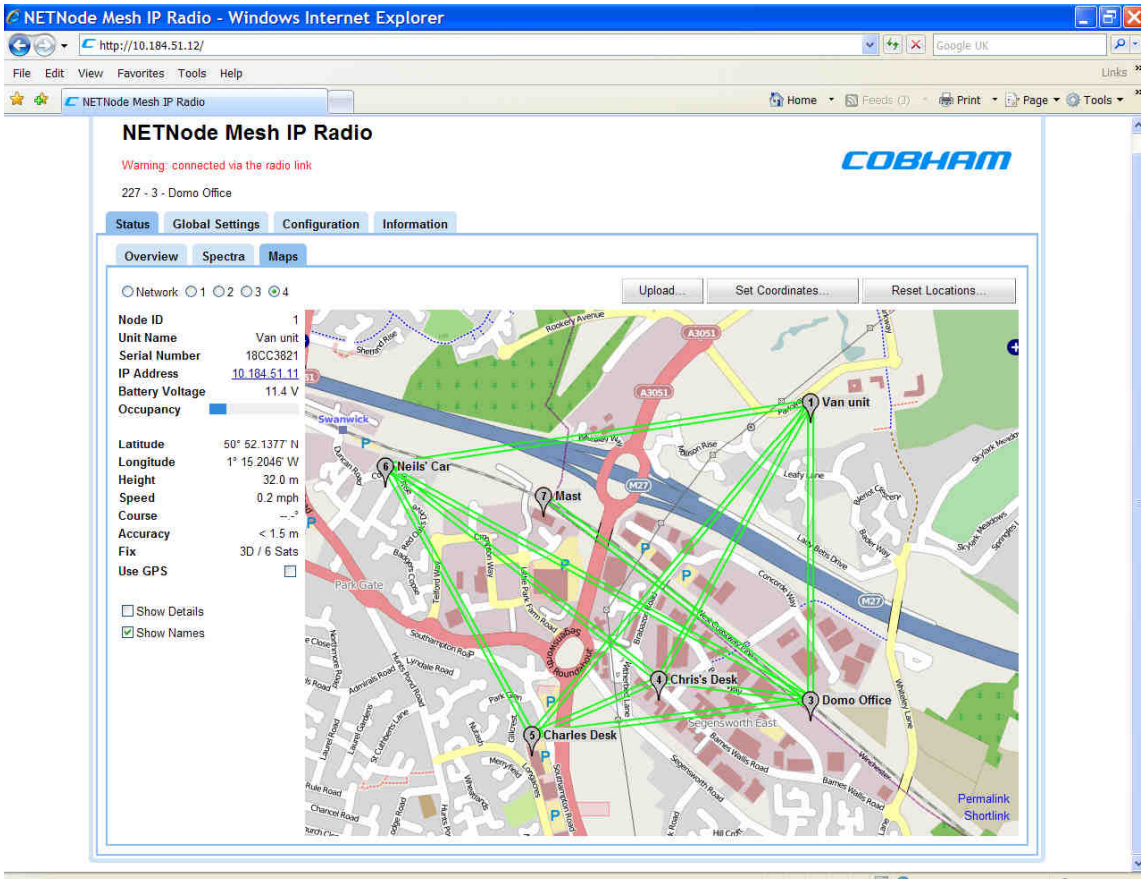
This section is relevant only to customers that want to use GPS with the NETNode unit. This chapter will explain how to enable GPS position data on your system.

It can be very useful to show the position of all the nodes on a digital mapping screen.

Sometimes these nodes will be in a fixed position on top of buildings for example. In other situations the nodes may be constantly moving in a vehicle or aircraft for example.

On the **Status →Maps** tab you can either:

- Place a node in a **fixed** location by dragging and dropping.
- Let the node **position itself** using GPS data



You can enable GPS position data using a suitable GPS receiver on as many nodes within the mesh as you wish.

For GPS position data to be used to move nodes on the map you must place a checkmark in the **Use GPS** checkbox.

Now the GPS position data will be automatically used to position the nodes on the digital mapping you have loaded into the mesh system.

The mesh system uses the **NMEA 0183** GPS protocol to passing data.

9.2. Connecting the GPS unit to the NETNode

The connections you use for the GPS will depend on the GPS receiver being used and the type of NETNode you have. We'll take the example of connecting a **Phase 2 Plain Box NETNode** and a **Garmin 17X GPS** receiver.

Take the 15-way High Density D-Type plug (Male) and connect it to the 15-way High Density D-Type jack (female) labelled AUX on the Phase 2 Plain Box NETNode.

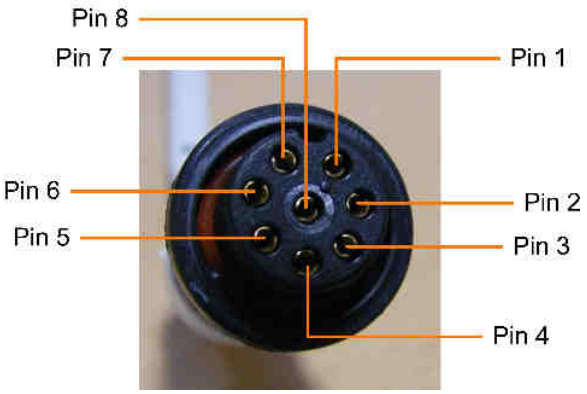
Now, take the 8-way Garmin plug (female) and connect it to the 8-way Garmin jack (male) on the Garmin17X GPS receiver.

The wiring is as follows;

Function	Garmin Pin	AUX pin
Power	3	6
Ground	2	3
RS485 A (+)	6	4
RS485 B (-)	5	5

This connects the RS485 data NMEA data out of the Garmin into the RS485 port on the NETNode and connects the power out of the NETNode to the Garmin device.

9.3. 8-Way Garmin Plug (female) Pin Out



Pin No	Function	Wire Colour
3	Power	Red
2	Ground	Black
4	Accessory On	Orange
6	Tx A (+)	Grey
5	Tx B (-)	White/Red
1	Rx A (+)	White
7	Rx B (-)	White/Orange
8	Pulse per Second (PPS)	Purple

9.4. 15-Way High Density D-Type Plug (male) Pin Out

Pin No	Function
1	RS485 TX+
2	RS485 TX-
3	GND
4	RS485 RX+
5	RS485 RX-
6	+12V
7	RS232 TX1
8	RS232 RX1
9	RS232 GND
10	RS232 TX2
11	RS232 RX2
12	RS232 GND
13	RC trainer +
14	RC trainer -
15	GND

10. Software Decoder

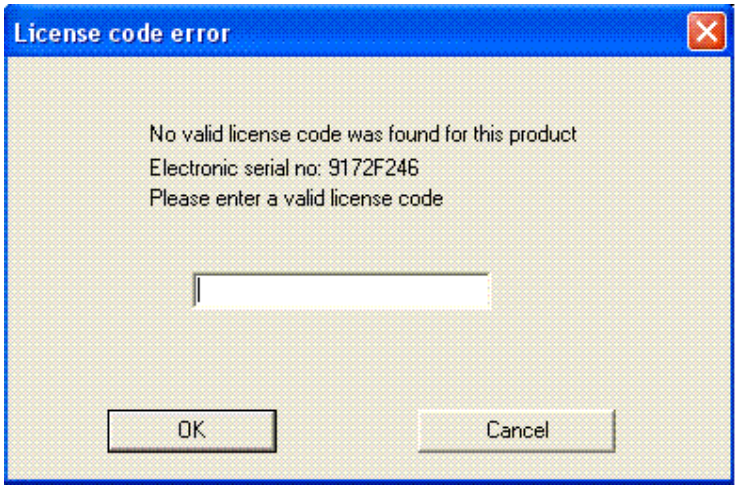
10.1. General Information

The **domo** software decider application (part number **NETSWDR**) is delivered on CD. The product is installed by following the prompts offered by a comprehensive Install Shield.

The product is licensed, after installing the product from the Installation shield the user should double click on the application icon, which may appear as depicted below.

Note: Later revisions of the software decoder may feature different icons or application names.

When the application is executed, if the PC is unlicensed then the following prompt box appears



Assuming the user has pre-paid for their Software decoder licence then the user then simply needs to email the Electronic Serial number to **domo** (sales@domo.co.uk) quoting the pre-paid token number. After receipt of this email **domo** will then provide a licence key. The licence key should be entered into the prompt box in the application window above which will licence the PC.

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 **domo**.

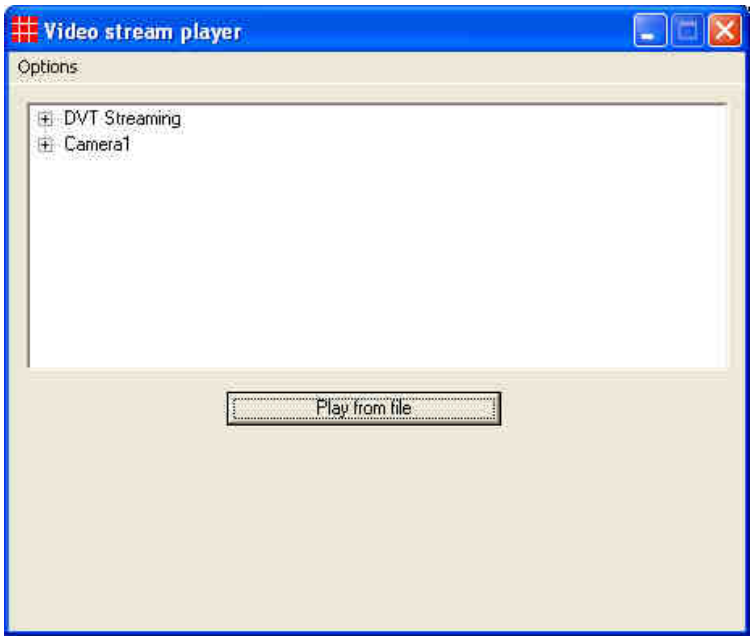
Note: if a user has not purchased a pre-paid licence then the user will have to contact **domo** sales to purchase a licence prior to receiving a licence code.

The **domo** software decoder can decode and present MPEG streams that are available from two sources.

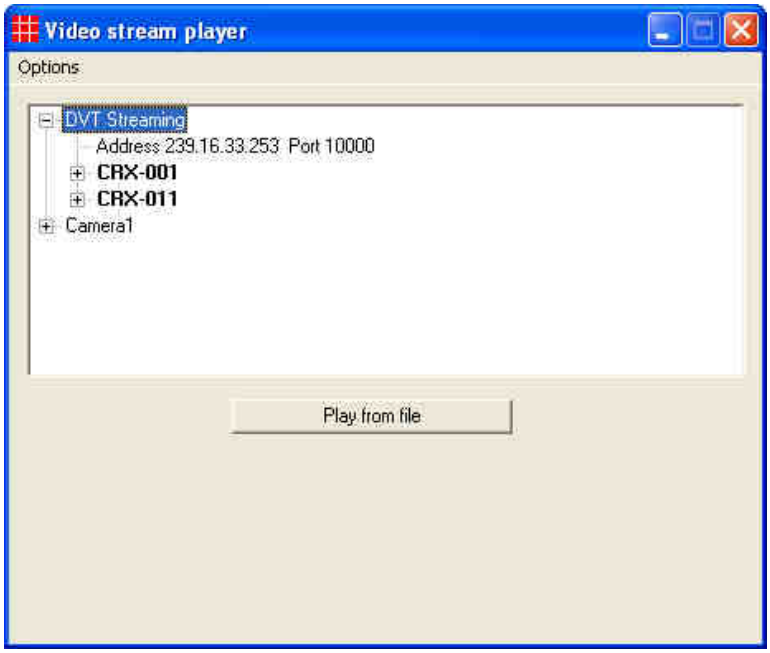
- Multicast streams being played out on the connected network by a NETSTREAM or NETCRXIPUP IP upgrade in the CRX.
- Files available locally on the target PC or network.

10.2. Decoding Multicast Streams

If the application is started on a PC, which is connected to a network shared by the NETSTREAM or CRX IP stream, then it will present a view of available streams that can be software decoded and viewed on the PC.

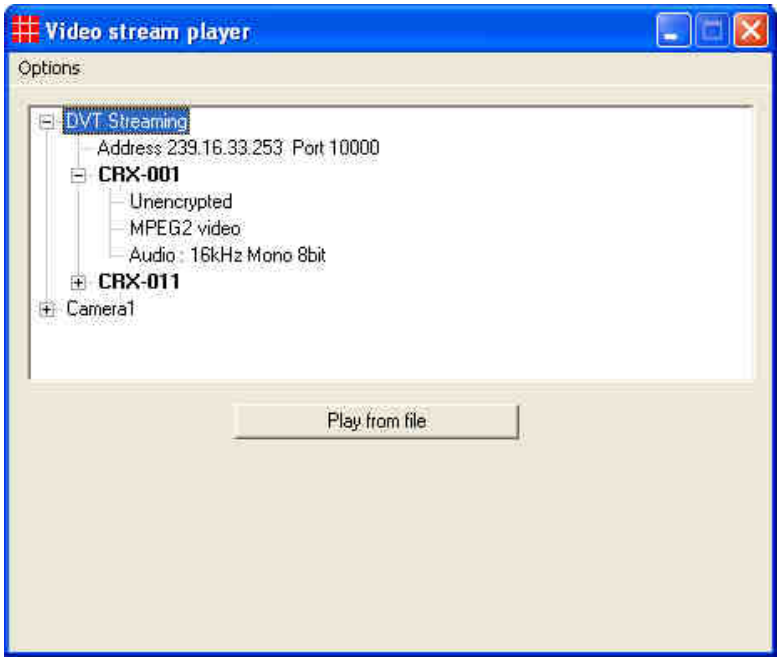


The name of the multicast stream is listed in the window, alongside an expandable crosshair. Clicking the crosshair presents the streams multicast details and a list of any services contained within a stream:



In the above example the stream "DVT Streaming" has a multicast address of 239.16.33.253 and is streaming to port number 10000. It contains two services, named "CRX-001" and "CRX-002".

It can be seen that there is an expandable crosshair alongside each of the service names. Clicking these provides more details about each service:



In this case we see that the service "CRX-001" is unencrypted, uses MPEG2 video encoding, and has single channel (mono) audio encoded with an 8-bit companding scheme with a sampling rate of 16kHz.

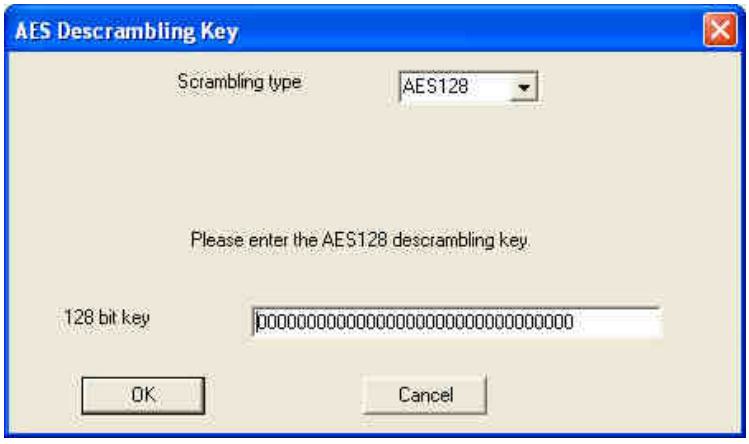
To start decoding a service the user should "double click" the appropriate service name. Service names are always highlighted in bold text in the main player window. If the service is unencrypted the main decoder window will be launched.

10.3. Encrypted Streams

If the service selected is being encrypted by upstream hardware, then the user will be prompted for the reciprocal key. The video stream player can detect from information in the stream whether ABS or AES encryption is being used. It will present a window appropriate to the type of encryption. For ABS the following window will appear:

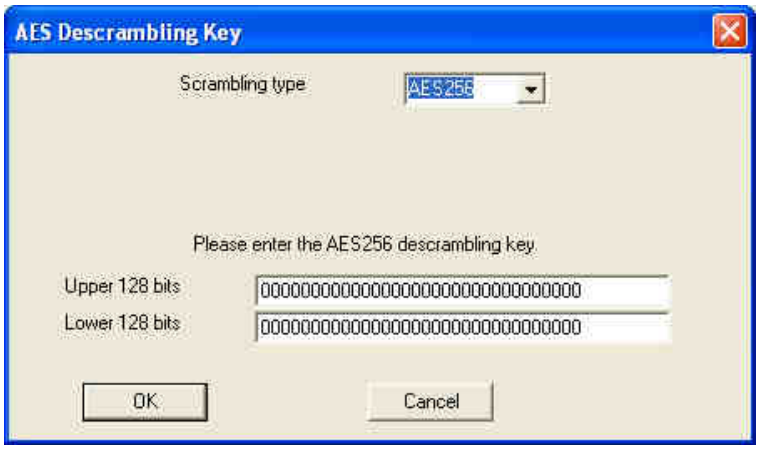
This requires the 32-bit ABS decryption key to be entered as 8 hexadecimal characters. This is not case sensitive.

Although the player is able to distinguish a service encrypted with AES, it cannot detect whether 128-bit or 256-bit AES encryption has been used. Therefore the following window will be presented to the user when AES encryption is detected:



By default this window is expecting a 128-bit (to be entered as 32 hexadecimal characters) decryption key. If the service is encrypted with AES256 encryption, the user should select

this from the "Scrambling type" drop-down list in the window. The appearance of the window will then change to the following:

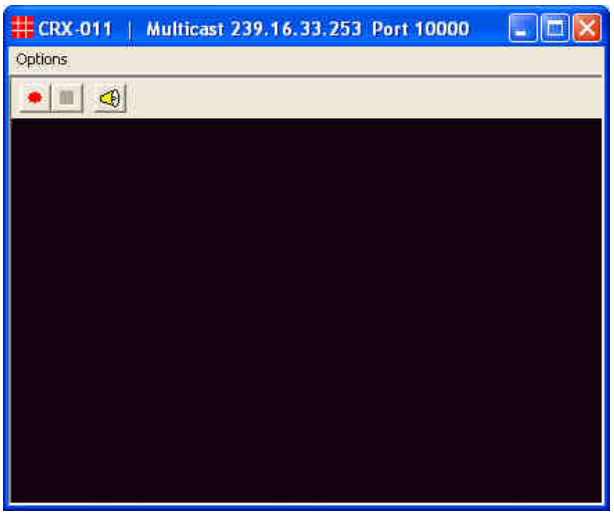


The user can now enter the AES256 key in the two fields provided.

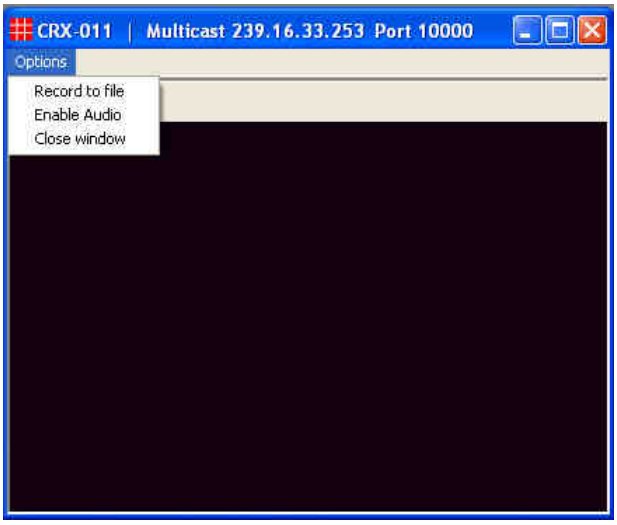
Once the key is entered, the main decoder window will be launched.

10.4. Main Decoder Window

The main decoder window will appear as follows:



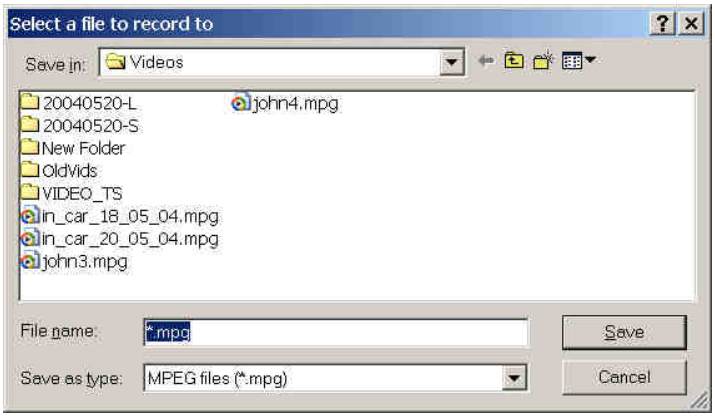
The title bar of the window presents the service name and the streams multicast details. Below this there is a menu-bar with an **Options** drop-down menu and a toolbar with some icons on it. Each of the icons corresponds to a selection in the **Options** menu. The following selections are available in the menu:



10.4.1. Record to File

This option gives the user the option of recording the file that is being decoded to disk.

The user is prompted with a standard Windows "File Save" dialog box:



When recording is active, this menu option is changed to "Stop Recording" which can be used to stop writing to disk.

Two buttons on the toolbar can be used to control recording:

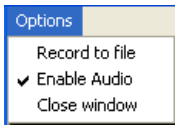
 to start recording

 to stop recording

When recording is inactive, the stop recording button will appear greyed out and un-selectable. The start recording button will appear in similar fashion when recording is active.

10.4.2. Enable audio

This option will only appear in the menu if the service has audio. When more than one service includes audio only one window can decode audio at any one time. When audio is enabled in a service, the enable audio option will appear with a tick beside it in the menu:



Selecting this option simply toggles whether audio is enabled or disabled. If another window was previously decoding audio it will be forced to disable its audio as the new window is now the audio decoding window.

When audio is enabled, the  button will appear on the toolbar. Clicking this button will disable audio. When audio is disabled this button will change its appearance and appear as  , clicking which will enable audio.

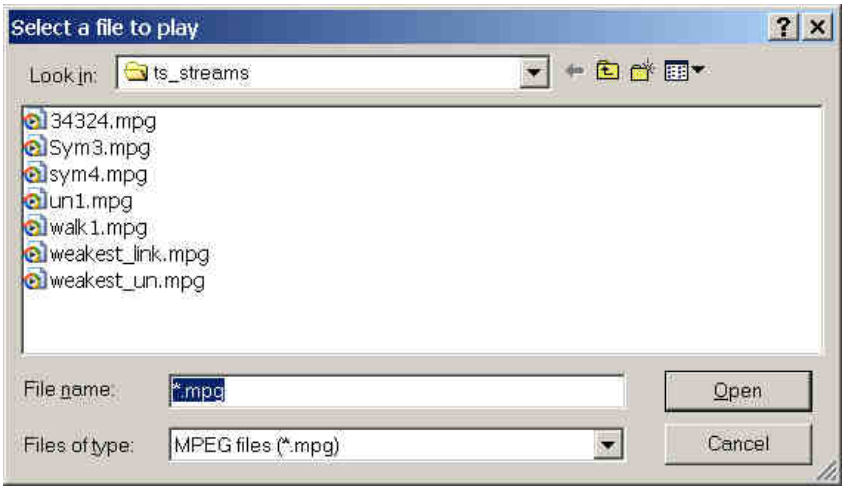
10.4.3. Close window

This closes the main decoder window.

10.5. Decoding Locally Stored Files

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 on the main application window should be pressed.

This opens a standard Windows "Open File" dialog box to make the selection.



Note: the default file extension is ****.mpg.***

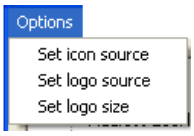
The application will scan through the selected file for any services available. If the stream contains only one service the application will select this automatically and operation will be as described in the preceding sections after a service is selected.

If there are multiple services in the file the application will present a pop-up window with a list of the services in:

The user should "double-click" the service they wish to decode. Thereafter, operation is as described in the preceding sections.

10.6. Miscellaneous Application Options

The main application window has a menu-bar with an **Options** drop-down menu. This presents the following selections:



These options relate to the main application icon, which normally appears as  and an optional logo. By default there is no logo presented. The user may select a bitmap to appear as a logo below the "Play from file" button on the main application window.

Selecting either the "Set icon source" or "Set logo source" options will open a standard Windows file dialog box. For icon files, this is set to filter for files with a .ico file extension. These are standard Windows icon files. A 32 x 32 pixel icon is expected. For logo files, the dialog box is set to filter for bitmap files with a .bmp file extension. The size of the bitmap file is not important as the application will automatically make it fit to the available space. The logo size can be altered by selecting the "Set logo size" option in the menu.

11. Fault Finding

To be completed as field information is compiled.

12. LED Indicators

12.1. NETNode Phase 1 Unit

12.1.1. Top Led

This lights green if power is applied to the unit.

12.1.2. Bottom Led

This lights green if the unit is successfully connected to other NETNode units in a Mesh.

12.2. NETNode Phase 2 Robust Unit

The LEDS are mounted behind a plastic 'flip' cover. The position and function is identical to the Phase 1 unit.

12.3. NETNode Phase 2 Plain Box Unit

The LEDS are mounted behind a plastic 'flip' cover. The position and function is identical to the Phase 1 unit.

The slot beside the LED allows a user to insert a SD card.

13. Connector Pin Outs (Phase 1)

13.1. POWER – 2-way Female Amphenol Male Size 10

Pin No	Function
A	12 V
B	Ground

13.2. CTRL / DATA 19-way Female Amphenol Size 14

Pin No	Function
A	RS485 Tx+
B	RS485 Tx-
C	GND
D	RS485 Rx+
E	RS485 Rx-
F	GND
G	Engineering Use Only
H	Engineering Use Only
J	GND
K	RS232 Control TX
L	RS232 Control RX
M	GND
N	Radio Controller Trainer +
P	Radio Controller Trainer -
R	GND
S	Secondary Ethernet OP
T	Secondary Ethernet ON
U	Secondary Ethernet IP
V	Secondary Ethernet IN

13.3. IP 4-way Female Amphenol Size 08

Pin No	Function
A	Ethernet OP
B	Ethernet ON
C	Ethernet IP
D	Ethernet IN

13.4. AV 10-way Female Amphenol Size 12

Pin No	Function
A	Audio Left
B	Ground Audio Left
C	Audio Right
D	Ground Audio Right
E	Ground
F	Composite / S-Video Luma
G	Video Ground
H	S-Video Chroma
J	Ground Chroma
K	Ground

14. Connector Pin Outs (Phase 2 Plain Box)

14.1. AV - 4-pin 0B LEMO Socket (TX and RX)

Pin No	Function
1	12 V
2	12 V
3	GND
4	GND

14.2. Data - 3-pin 0B LEMO Socket

Pin No	Function
1	TX
2	RX
3	GND

14.3. Aux 15-way Female High Density D-Type

Pin No	Function
1	RS485 TX+
2	RS485 TX-
3	GND
4	RS485 RX+
5	RS485 RX-
6	+12V
7	RS232 TX1
8	RS232 RX1
9	RS232 GND
10	RS232 TX2
11	RS232 RX2
12	RS232 GND
13	RC trainer +
14	RC trainer -
15	GND

14.4. RJ45 1 and 2

Standard RJ45 female 10/100 Base-T Connector

14.5. A/V Input - 5-pin 0B LEMO socket (Only with A/V option)

Pin No	Function
1	Audio Right In
2	Audio Left In
3	GND
4	Composite In
5	GND

14.6. T/B - 5-pin 0B LEMO socket (Not yet supported)

Pin No	Function
1	Audio In 1
2	Audio In 2
3	Audio in GND
4	Audio Out 1
5	Audio Out 2
6	Audio Out GND

14.7. RF Connectors

1 SMA (f) Receive only

1 SMA (f) Transmit and Receive

15. Phase 2 Robust Unit

15.1. Power Amphenol 38999 Series 3 11-98 6 way chassis plug

Pin No	Function
A	+12V Power Input
B	Ground
C	ETH_OP
D	ETH_ON
E	ETH_IP
F	ETH_IN

15.2. Camera Connector Amphenol 38999 Series 3 15-19 19 way chassis socket

Pin No	Function
A	+12V
B	GND
C	RS485 TX+
D	RS485 TX-
E	RS485 RX+
F	RS485 RX-
G	EthTX+2
H	EthTX-2
J	EthRX+2
K	EthRX-2
L	RS232 TX1
M	RS232 RX1
N	RS232 GND
P	Video 1
R	Video 2
S	Video 1 & 2 GND
T	Audio in 1
U	Audio in 2
V	Audio in GND

15.3. Misc Connector Amphenol 38999 Series 3 13-35 22 way chassis socket

Pin No	Function
1	+12V
2	GND
3	RS232 TX1
4	RS232 RX1
5	RS232 GND
6	RS232 TX2
7	RS232 RX2
8	RS232 GND
9	GPIO
10	GPIO
11	GPIO GND
12	RS232 TX data
13	RS232 RX
14	RS232 GND
15	spare
16	spare
17	Audio In 1
18	Audio In 2
19	Audio in GND
20	Audio Out 1
21	Audio Out 2
22	Audio Out GND

15.4. RF Connectors

1 N-Type (f) Receive only

1 N-Type (f) Transmit and Receive

16. Control Protocols

The control protocols for the NETNode are available upon request to dome Technical Support.

The unit can be controlled via RS232 command, RS485 command or Ethernet.

17. Default Configurations

This section tabulates the default configuration settings for the **domo** NETNode product.

Item	NETNode1W-217250
RF Output	OFF
Frequency	2405MHz
Mode	1.8Mbps
Power mode	Low
MESH ID	
Node ID	
GPS Source	None
Data Mode	OFF
Scrambling	OFF
AES Key	None
AVI-UP Option	
Video Input	PAL (if AVI-UUP fitted)
Audio	OFF
Horizontal Resolution	528

17.1. Default IP Address

192.168.2.101

17.2. Default Subnet Mask

255.255.255.0