Section 5 Installation

The installation of a VersaNet2 Node can be split into three main areas. The first covers the physical siting and installation of the enclosure, the second the siting of the antenna system and the third covers all the necessary terminations.

5.1 Hardware Installation

If the Node is to be mounted in a protected location, such as a control panel, then the module stack can be mounted directly without the IP67 Enclosure. For exposed locations an IP67 Enclosure must be used to protect the modules from ingress of dust and moisture. For larger Nodes, usually at a central control location, a 4U equipment rack can be used.

A Node constructed from single or multiple enclosures may be installed with or without the modules fitted. In fact, an assembled stack of modules complete with metal base may be completely removed from an enclosure by unscrewing the four large bolts located at the four corners of the base plate. This may facilitate enclosure handling during installation.

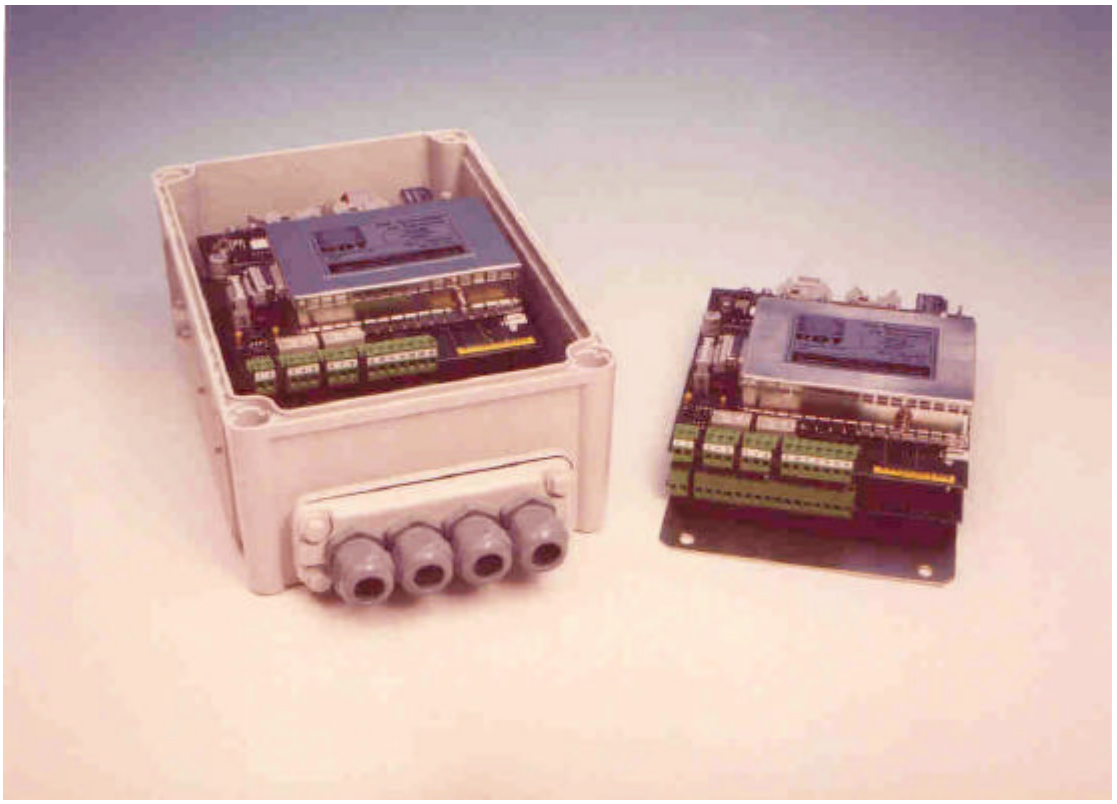

Figure 9 Node Construction

5.1.1 Choice of Location

The location of a Node will depend upon its application, although it is suggested the following guide-lines are considered.

- Avoid locating near to High Tension electrical equipment or to machinery likely to generate excessive electrical noise.

- Avoid locating near to existing radio equipment.

- Choose a location that minimises cable runs, particularly the RF cable.

- Avoid extremes of temperature, humidity and vibration.

- Locate in a convenient position for making terminations and accessing the Node for future re-configuration or monitoring purposes.

- A Node may be mounted in any physical orientation, although upright against a flat, vertical surface is the most practical.

- Ensure sufficient clearance is allowed for cables, particularly considering any bending radius restrictions.

5.1.2 Fixing Method

Four mounting holes are provided outside the sealed area for fixing to the chosen surface, spaced as shown in Fig. 10. Bolts or screws of M6 x 40mm or equivalent should be used. When installing multiple enclosure Nodes, use a fixing bolt through all mounting holes to achieve maximum physical stability. Alternatively, a Node may be mounted onto a pole or other structure using simple metal braces. Nodes may also be secured inside outer cabinets or marshalling kiosks to suit the application.

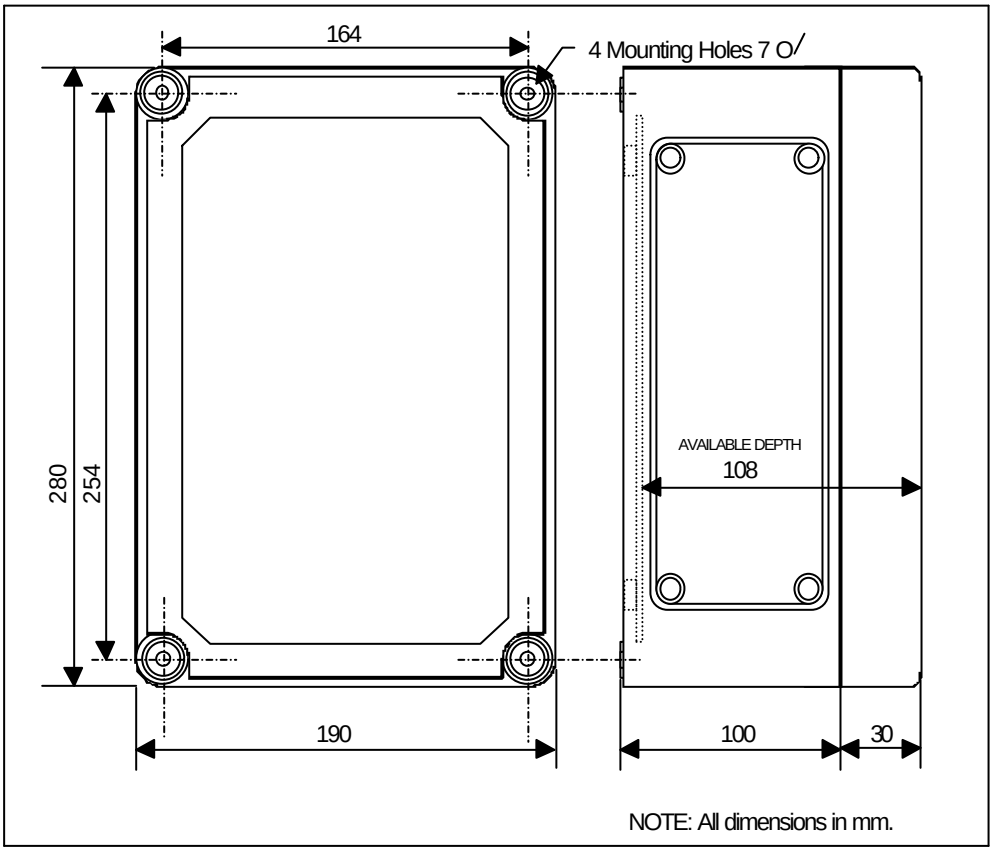

Figure 10 Mechanical Drawing of Enclosure

5.2 Antenna Installation

The performance of an antenna and hence the equipment using it, is very dependent upon the environment in which it is mounted. Although it is often advisable to employ specialist personnel to install antenna systems, following the broad guide-lines contained in this section will result in successful installations in the majority of situations. In all cases, antennas should be vertically polarised. The precise type of antenna will have been selected during system planning, although further details may be found in Section 3.6 of this manual.

5.2.1 Choice of Location

As a general rule, the less directional the antenna, the more likely it is to be affected by the environment it is mounted in.

In practice, a Yagi antenna should be mounted with all its elements at least one wavelength (70cms) away from the supporting structure i.e., walls. This avoids excessive degradation of both the directional and gain performance of the antenna. Omni directional antennas such as dipoles and collinear arrays only achieve genuine omni directional performance when mounted at the top of its supporting structure.

When deciding upon the location of an antenna, consideration should be given to the effect of the surrounding land on the radio signal. In general, Nodes should be located so that their antennas are in line-of-sight of each other. Following this guideline will result in reliable signal paths up to about 20 km for 500mW ERP in the majority of situations.

An additional factor in radio propagation is the effect of multiple signal paths between sites, often caused by reflections off buildings, water or other fixed objects. This can cause a dramatic reduction in received signal strength due to phase cancellation, but can be cured easily by moving the receiving antenna about 0.3m (half a wavelength).

Temporary fading of the received signal can also occur due to reflections off moving vehicles again due to multiple paths. This phenomenon is less important in fixed link data networks, as its effect is only momentary and VersaNet's retry algorithm will offset this problem.

Also, an antenna mounted just below the brow of a hill should theoretically receive very little signal. In practice, however, it is likely that such an antenna would receive a reasonable signal due to the bending of the wave front over the hill by diffraction.
The antenna should be mounted as far away as possible from another antenna. If this is unavoidable, the antennas must be mounted at different levels.

Section 5 of the manual covers the procedure for measuring the performance of the paths, but it will be assumed that the antenna location has already been decided upon. It is worth noting here, however, that increased range performance can usually be attained by raising the height of an antenna by only a few metres.

5.2.2 Antenna Cables and Connectors

It is advisable to keep the antenna feeder down to as short a length as possible to avoid unnecessary degradation of signal.

For the majority of applications, UR-M67, RG213/U or equivalent cable should be used with N-type connectors. The Antenna Bulkhead Cable Kit provides a bulkhead-mounted N-type female enabling an antenna feeder cable to be

connected. Fitting RF connectors to RF cable is a specialist task and should only be carried out by trained personnel. Alternatively, a number of organisations, particularly antenna suppliers, offer a cost-effective cable making service. **A poorly fitted connector can seriously impair the operation of a radio system**.

All exposed metal connectors should be protected from the ingress of moisture by using non-setting sealing pastes, self-amalgamating tapes or by using the PVC boots or drip-covers often supplied already fitted to antennas.

Where particularly long antenna feeders cannot be avoided, or if the feeders may be adjacent to other higher power radio-systems, semi-rigid or double-screened cables should be used. It is also advisable to ensure that if antenna feeders must cross each other, they do so at right-angles to reduce any coupling.

5.2.3 Lightning Protection

Antenna systems can be particularly prone to lightning strikes due to their generally exposed location and relatively high structures. It is not possible to completely remove the possibility of a lightning strike although a number of sensible precautions may be taken to reduce the risk and minimise any damage caused in the event of a strike.

Antenna supply and installation organisations will have specific experience with regard to lightning protection and should be consulted where possible. Additionally, the relevant British Standard (BS6651:1985) Code of Practice for the Protection of Structures Against Lightning, may be consulted. By following the guide-lines contained here, the risk can be minimised.

The overall aims are to provide the shortest, most direct path to earth for the lightning current, to ensure good bonding between all site metalwork and the earthing system to reduce side flashing, and to avoid the entry of flashes or surges into buildings. The general guide-lines include:

- All earth straps, tapes and bonding interconnections should be of uninsulated copper tape of minimum cross section 25 x 3mm

- All connections, clamps and supports should be protected by non-reactive paste or tape.

- Ground mounted support structures should be connected at their base to an earth ring arrangement by the method described.

- Roof mounted structures should be connected to the building earth by the most direct route possible.

- Mast guy wires should be directly bonded to earth at their lowest point.

- Antenna feeders should be bonded to the supporting structure at the upper and lower ends and earthed at the point of entry into the building. Surge arresters may be fitted at this point, although they will not prevent damage arising from a direct strike.

- Associated plant, pipes, fences or gantries and other metalwork within about 3 metres of the support structure should be bonded directly to earth.

An earth ring usually consists of copper tape with driver electrodes or radial tapes around the base of the structure, as close as possible. The ring should be buried to a depth of between 0.6m and 1.0m where conditions permit. It should be connected to the main building earth by the most direct route possible, buried as appropriate

5.3 Connecting Cables to a Node

In addition to any RF cable, power and signal connections will also need to be made to a Node. There connections are made via the two-part terminals fitted to all VersaNet2 modules.

Cables of up to 2.5mm cross sectional area may be used in the connectors. Cables are passed up through the nearest cable glands and inserted into the correct terminal using a small flat-bladed screwdriver. The terminals are designed to be removed from the module-mounted section to allow easy connection. Where possible, avoid armoured cable directly entering a Node as this will make manipulations more difficult.

Take particular care when making connections to 2-way connectors as damage can be caused by excess flexing of the connector. When used in an external cabinet or kiosk, connections can be made to a sequentially numbered DIN rail fitted with suitable terminals and corresponding to an approved wiring scheme.
It is suggested that a wiring scheme be drawn up prior to installation and numbered ferrules used to aid identification. The function of all the I/O and Power Supply terminals are shown in Section D of this manual and on the Module Datasheets supplied with each module.

Once connections have been made, the cable glands may be tightened to form an environmental seal, preventing the ingress of dust and moisture.

NOTE: Whilst precautions have been taken to make VersaNet2 a rugged product, transient dips and spikes on the power supply should be avoided, as far as possible.