

IPWireless

“IPWireless”

Model AJ Installation Manual
(First Generation NodeB)

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Precautions

CAUTION SIGNS

GENERAL WARNING	ELECTRICAL HAZARD	BURN/HEAT HAZARD	CORROSIVE MATERIALS	GROUND
				
GENERAL SAFETY PRECAUTION	HIGH VOLTAGE: Direct contact with these areas will result in severe physical harm and property damage	HEAT: Direct contact with this surface will result in severe burns	CORROSIVE: Direct contact with this surface will result in chemical burns	GROUND: Site for grounding equipment

These cautionary signs are used on the physical equipment and throughout this manual. For safety of personnel and protection of equipment observe these precautions when installing, operating or servicing the equipment and surrounding areas.

Electrical

Power Supply – cord fitted for AC or DC. DO NOT adapt to a different configuration. Power supply circuits carry high voltages. Remove rings, watches, and other jewellery before working with this type of equipment.

Batteries – Installation of this equipment requires working with lead acid batteries. These batteries present chemical, electric and gaseous hazards. Batteries are not supplied by IPWireless for the Node B equipment although UPS systems may be coupled with the device in order to provide back up power in case of power outages.

Modifications: DO NOT modify this equipment. This equipment has been certified by the FCC in the configuration in which it has been shipped to the user. Any changes to this equipment made by the user could invalidate the certification and the ability of the user to operate this equipment.

Physical

Weight – Each node B weighs 25 pounds. Precautions should be taken, depending on the installation site conditions, in lifting and hoisting the device. Generally one person will be able to install the unit at the site.

Spurious Emissions

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful

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interference in which case the user will be required to correct the interference at his own expense.

Environmental

There are different precautions to take within each environment. Specific precautions are listed in the installation section for that environment.

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1 OVERVIEW

Node B is the European Technical Standards Institute's (ETSI) name for the radio base station. The basic function of the Node B is to convert 100 Base T packet data into the UTRAN TD-CDMA air interface used between the Node B and the 3G Modem. The Node B can be configured to operate in configurations ranging from a single sector or omni mode, up to a 6 sector arrangement. One Node B is required for each sector of coverage, in the case of an omni configuration one Node B will be required. The Node B is controlled by an INC (Integrated network Controller) Generally co located at the site in a separate cabinet.

NODE B HIGH LEVEL SPECIFICATIONS

NODE B FRONT VIEW

Unit	Specification
Measurements	16" H x 12" W x 5" D
Weight with mounting Bracket	40 Pounds
Frequency	2500 – 2686 MHz
Power output	+34 dBm
Power Consumption	300 Watts max
Input Power	110 VAC or -48 V DC
Heat Dissipation	184 Watts
Ambient Operational Temp Range	-40°C to +55°C
Cooling	Convection
Weight	42 lbs.



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2 PRE-INSTALLATION

2.1 *Installation Check Card*

The following steps should be taken during the installation process in order to ensure safe and timely installations.

Initials/Date	Step	Action	Page
	1	Perform pre-installation site check	
	2	Parts shipped/tools required	
	3	Install Node B mounting bracket	
	4	Install conduit for power and INC connectivity	
	5	Install Antennas and Coax	
	6	Grounding installation and inspection	
	7	Inspect site for GPS line of site	
	8	Install 100 BaseT connections between INC and NodeB	
	9	Local Alarm Connections	
	10	Physical installation of Node B	
	11	Power up and Initial setup and test of Node B	
	12	Software installation	
	13	On Air final check	

2.2 *(Step 1) Pre-Installation Site Check*

1. Review site construction drawings to determine if site was constructed according to the drawings
2. Review drawings and actual installation to determine location of Node B installation.
3. Check availability of electrical connections
4. Review if construction is completed to the point that it is safe to install the Node B.

DRAFT**2.3 (Step 2) Parts Shipped**

Use this checklist to check quantity and quality of parts as they are unpacked

PARTS CHECK

Part Name	Description	Amount	Quality Checks
Node B Assembly		1 per sector	Check shipping container for damage and if quantities are correct
Bracket Assembly	Node B mounting assembly	1 per Node B	Check shipping container for damage, quantities, and type
Power Availability	-48Volt or 110 VAC	1 connection per Node B	Check to see if power cabinet is installed and the correct amount of power connections are available
Alarm Contacts	Dry contacts for external alarm		Check to see if external alarms for lights, intrusion, fire, etc are available
Antenna	Node B Transmit and receive antennas	2 antennas per Node B	Check box for damage. Check to see if quantity is correct.
Connectors	Antenna, Power, grounding		Ensure all connectors and quantities are available for installation
Cables	100 BaseT, power, coaxial cable, jumpers		Ensure all cables are available and that they are not damaged
Grounding	Lightning protection and grounding,		2 AWG stranded copper

2.4 (Step 2) Tools Required for Installation

In addition to standard construction equipment, you should have the following on hand prior to installation:

TOOLS REQUIRED PHYSICAL INSTALLATION

Tool	Description
Voltmeter	Fluke meter
Wiltron	Sweep test
Basic telecommunications tool kit	Includes screwdriver, socket wrenches, etc.
Crimper	RJ 45 crimper connector

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3 (Step 3) MOUNTING THE NODE B BRACKET

There are three ways of installing the Node B – Wall, Pole and Rack Mounts. This section explains the three different mounting types with the installation and powering procedure for each type of mount.



PRECAUTIONS

The following precautions and checks are applicable to all mounting types.

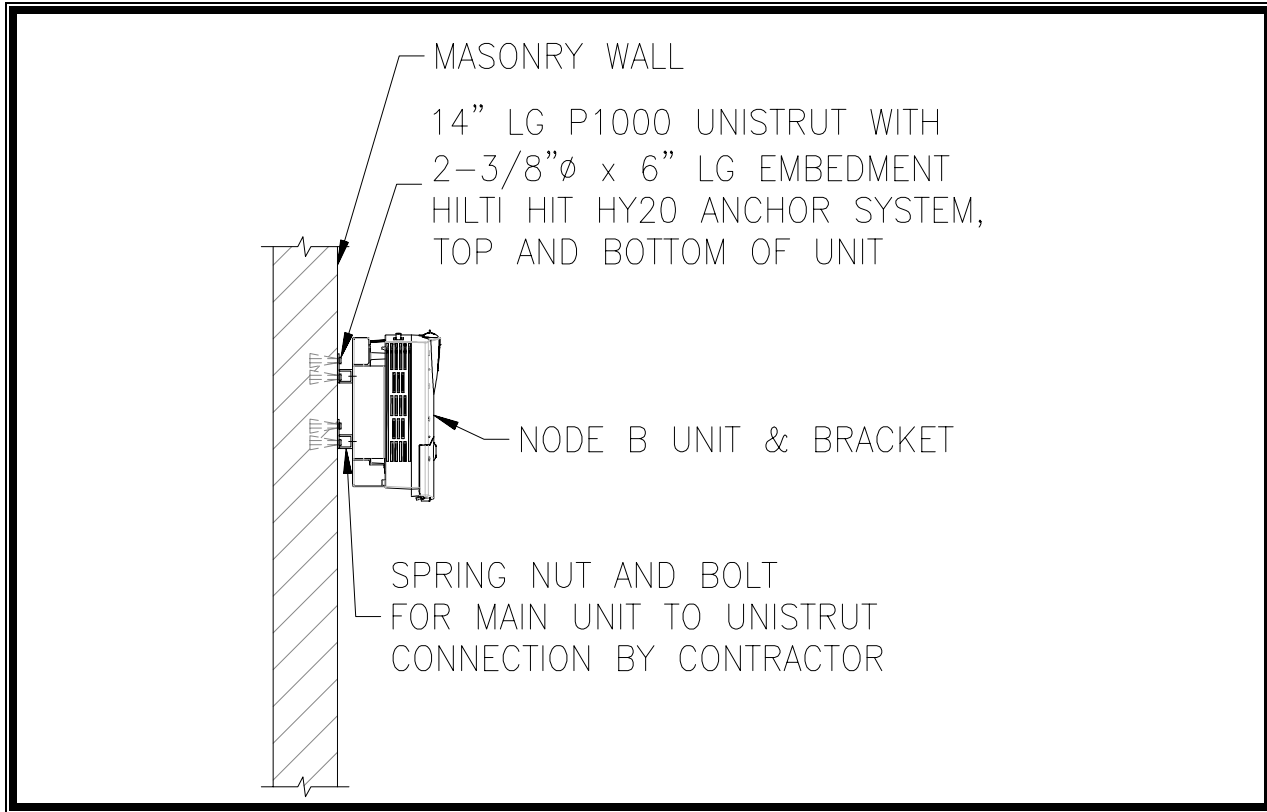
Leave blanking plugs over all connectors until they have been connected to the appropriate cabling. These plugs are specially fitted to keep moisture and contaminants out of the unit.

Connectors have been manufactured to fit their specific cables. Do not modify or force connectors.

Check Site Plans for engineering approval.

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3.1 WALL MOUNT



WALL MOUNT ASSEMBLY



General Safety Precautions:

- Wall construction is able to support the weight of the unit assembly.
- Proper grounding

3.1.1 Mounting Considerations

Consider the earthquake zone requirements for the given site being considered. Ensure that the mounting location complies with these considerations.

Review the GPS installation guidelines to ensure that the location will allow proper operation of the Node B. I.e. a Southern Exposure is required for outside installations and a remote GPS antenna or GPS repeater will be necessary in areas without a southern exposure or indoors.

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3.2 POLE MOUNT

POLE MOUNT ASSEMBLY



Illustration 3 shows antenna and mounting brackets fixed on an aluminum type pole.



General precautions –

- Do not install in winds over 40 Mph.
- Do not install when lightning is closer than 2 miles.
- Do not attempt to install in rain.

3.2.1 Mounting Considerations

Consider the earthquake zone requirements for the given site being considered. Ensure that the mounting location complies with these considerations.

Review the GPS installation guidelines to ensure that the location will allow proper operation of the Node B. I.e. a Southern Exposure is required for outside installations and a remote GPS antenna or GPS repeater will be necessary in areas without a southern exposure or indoors.

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3.3 RACK MOUNT



RACK MOUNT ASSEMBLY



General Precautions

3.3.1 Mounting Considerations

Consider the earthquake zone requirements for the given site being considered. Ensure that the mounting location complies with these considerations.

Review the GPS installation guidelines to ensure that the location will allow proper operation of the Node B. I.e. a Southern Exposure is required for outside installations and a remote GPS antenna or GPS repeater will be necessary in areas without a southern exposure or indoors.

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4 Site Preparation for Node B Installation

4.1 (Step 4) Conduit Installation

Conduit is typically required between the INC and the Power source. In the case of the outdoor installation the INC and power source are housed in the same cabinet. Power and Ethernet cables are to be pulled through the conduit, one power cable and one Ethernet cable for each Node B. If external alarms are to be utilized conduit may also be necessary between the external alarm device and the Node B for monitoring the alarm.

4.2 (Step 5) Antenna and Coax installation

Antenna's and coaxial cable should be available at the site, and are part of the construction checklist. Two antennas per Node B are required, therefore two coaxial cables per Node B should be available.

Cables should be properly marked to indicate what antenna the coaxial cables are to be connected to the Node B serving the sector or area.

The coaxial cables are to be terminated to a lightning arrestor and a jumper installed to the proper length between the lightning arrestor and the Node B location.



Main Antenna Tx & Rx –
Left Hand Side

Diversity Rx Antenna –
Right Hand Side

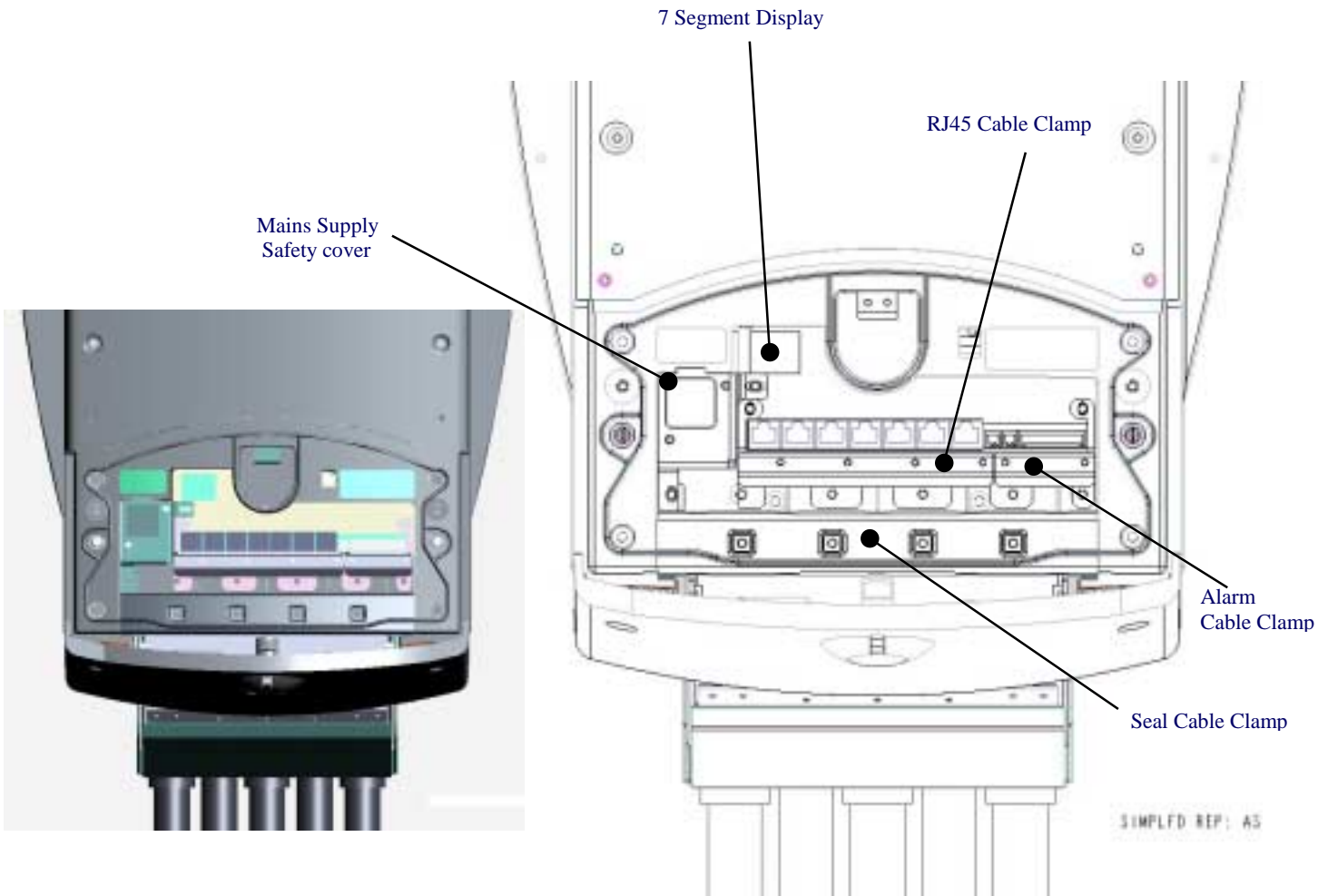
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4.3 (Step 7) GPS

For proper operation of the GPS receiver, the Node B must have a clear southern view of the sky. A site survey should be done before Node B installation to verify that the Node B installation location is suitable for GPS reception. A simple survey method is to take a handheld GPS receiver to the site and verify that GPS lock is obtained in the location of the Node B installation. The handheld GPS should be able to obtain a “locked” condition within 2 minutes of power-on, and should be able to see a minimum of 4 satellites at all times. Note that when the Node B is to be installed on or near a tower or building wall, the GPS survey should replicate this configuration exactly.

4.4 Service Cover Area

The following figures illustrate the key elements for reference in the cable interface service area of the NodeB.



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4.5 (Step 9) External Alarms

If local alarms are to be utilized for a terminal block has been provided on the Node B termination panel. The specifications for those interface requirements are below.

4.5.1 Alarm Input Specification

The alarm inputs from the Node B Patch board to the digital board shall be TTL levels and active high.

The external alarm inputs shall be opto-isolated current loops.

The voltage and currents shall be supplied by the external source.

4.5.2 Alarm Output Specification

The alarm outputs from the digital board to the Node B Patch Board shall be TTL levels and active high. .

The external alarm outputs shall be isolated normally-open relay contacts capable of switching at least 100mA DC.

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5 (Step 10) PHYSICAL INSTALLATION OF THE NODE B

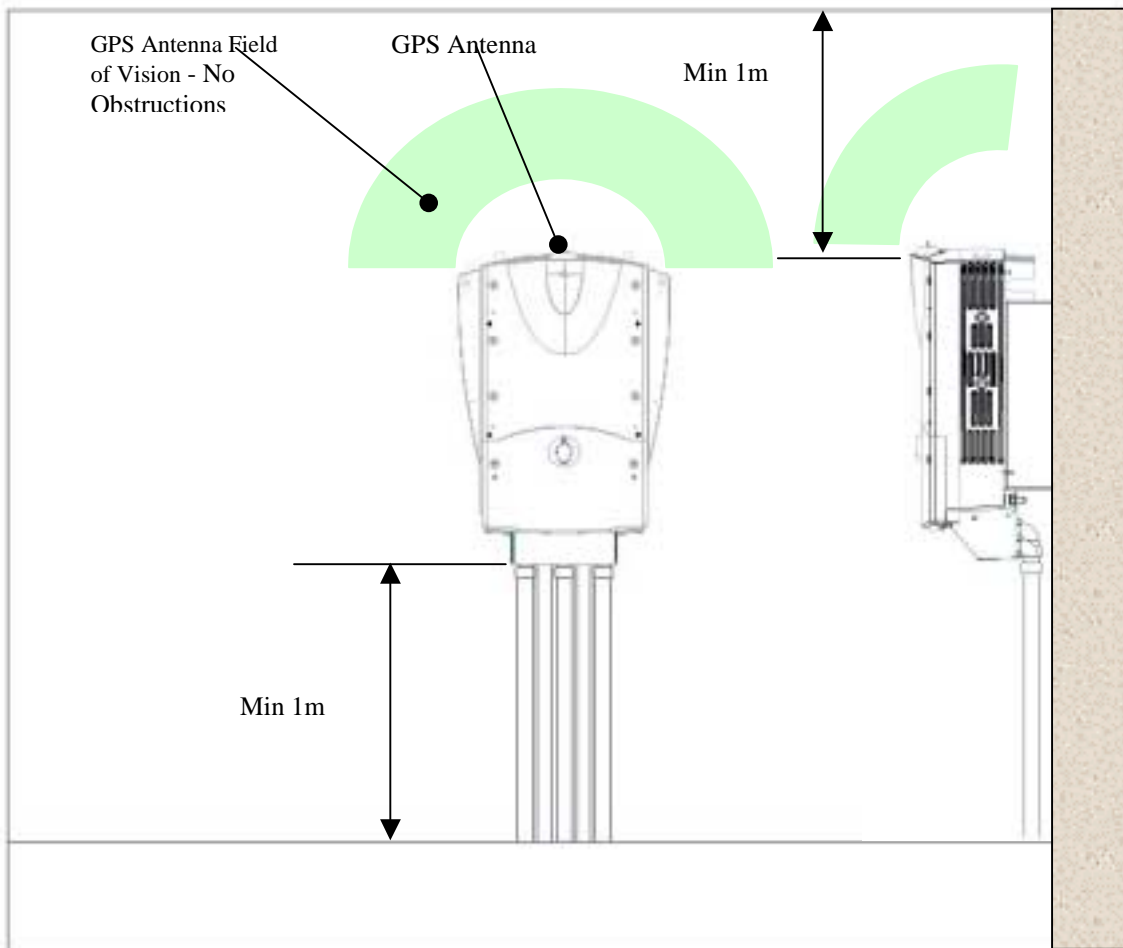
5.1 *Placing the Node B into the Rack*

It is assumed that the unit has been removed from the packing crate and that all materials are checked and present, further that all the site preparation has been planned.

Sighting the NodeB

The first priority in sighting the NodeB is that the GPS antenna can ‘see’ the sky and therefore the satellites. See section 4.4 for further guidance.

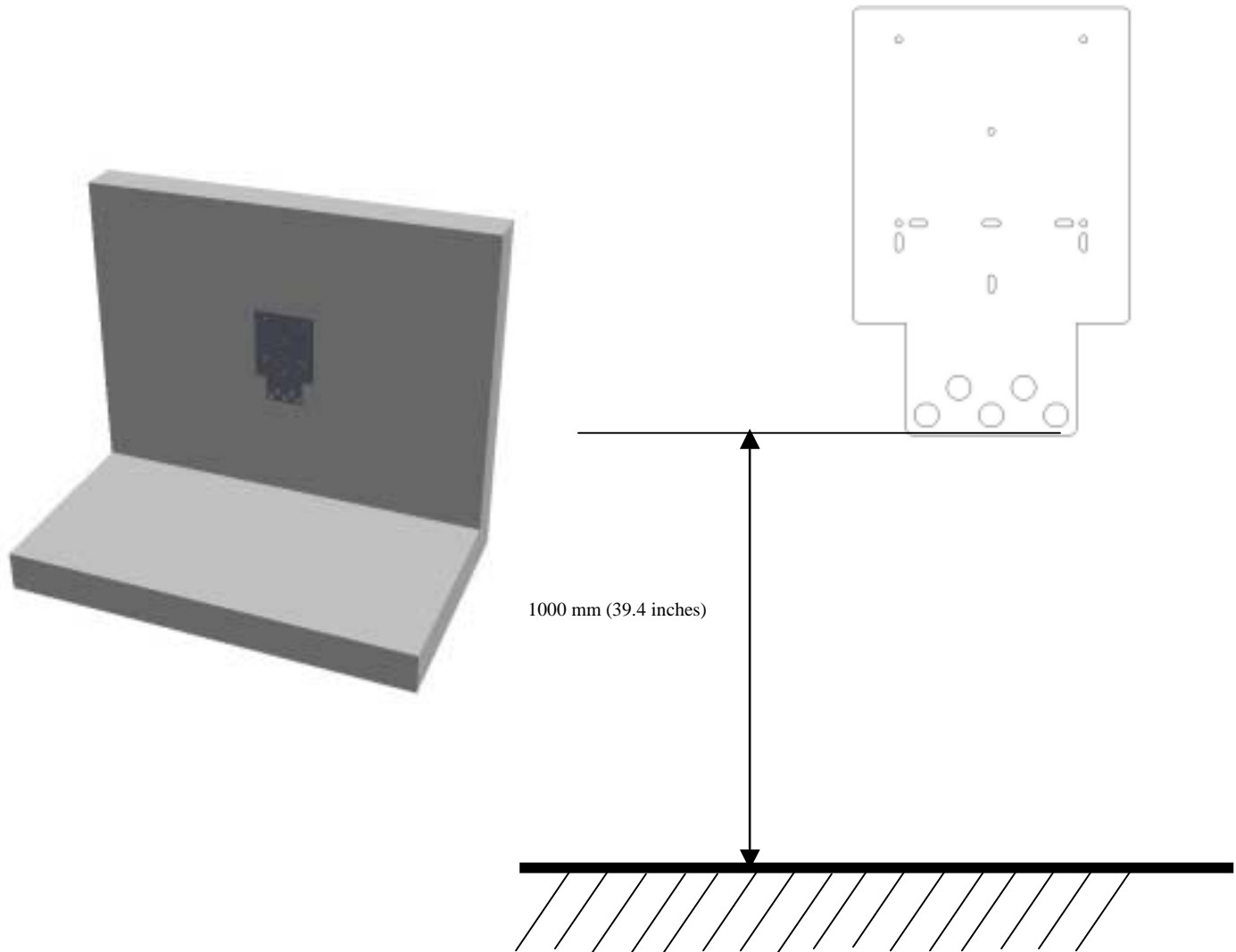
From a physical view point, the GPS antenna should ‘see’ at least a 90° quadrant of the sky above the GPS antenna, see figure below.



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Wall Bracket Mounting

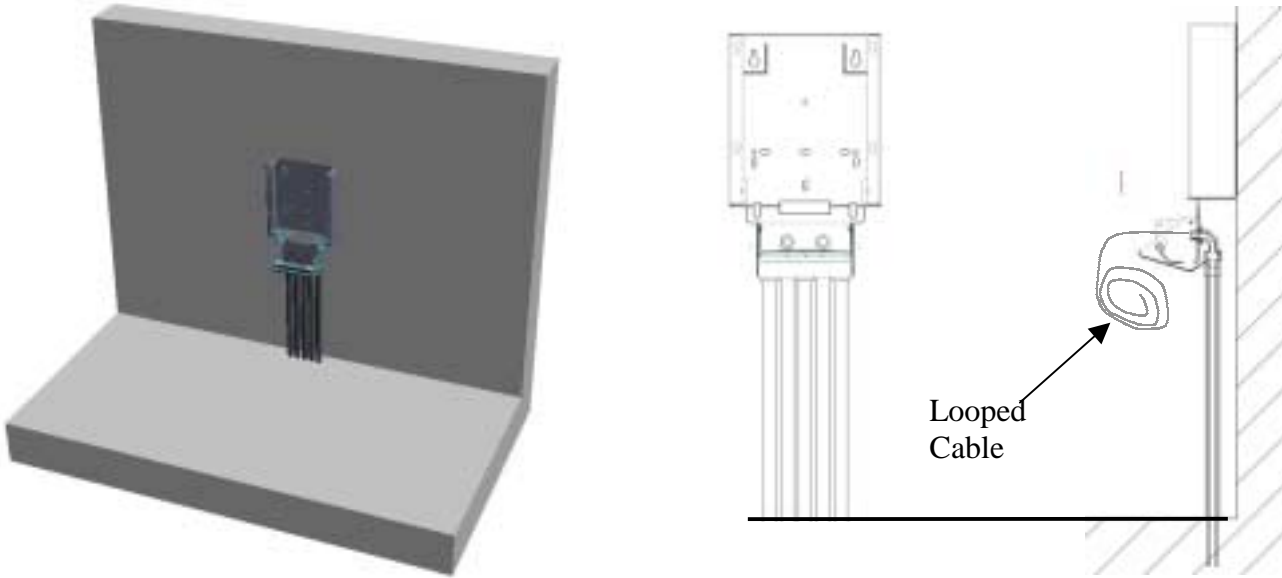
Position template and drill holes thru template at appropriate positions as marked below.



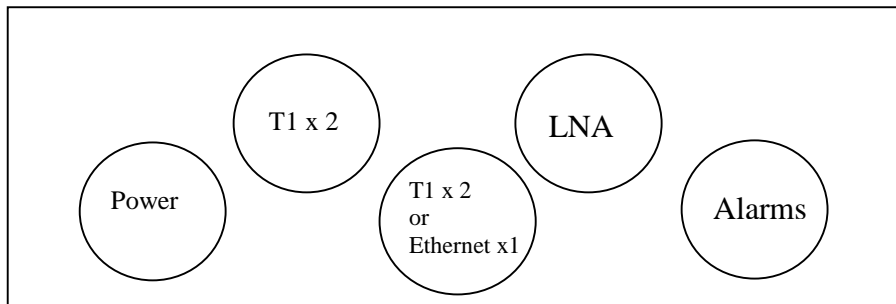
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The conduits must be fixed to the brackets prior to fixing the bracket to the wall.

Leave a sufficient loop of cables to enable them to be prep'd back to the appropriate length.



The following figure specifies the way the conduit bracket glands have been designated signifying which cables should be fed thru which gland.



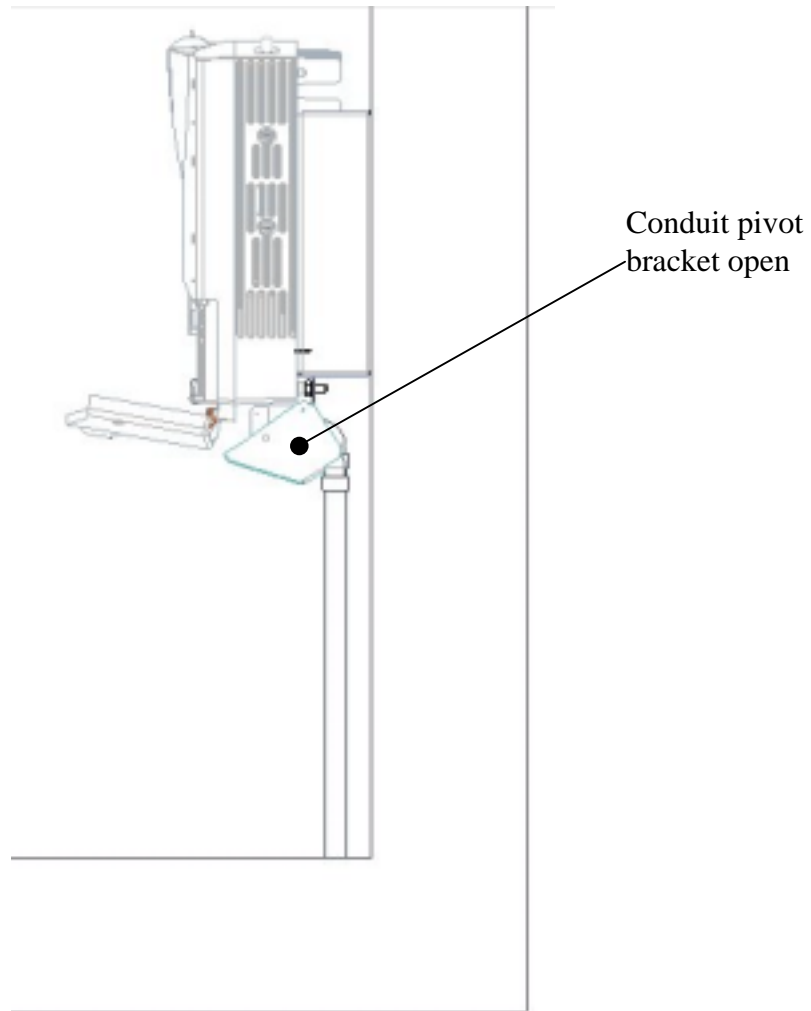
The glands and conduit should be fitted to the mount bracket prior to the NodeB being mounted onto to the mounting bracket.

The cable should be fed thru the glands and the glands 'sealed' prior to the NodeB being mounted onto to the mounting bracket. Excess cable should be fed thru.

The cables should be secured to the conduit bracket strain relief.

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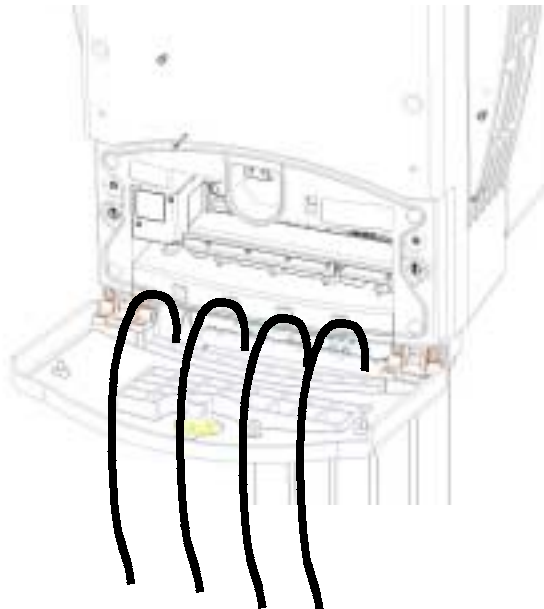
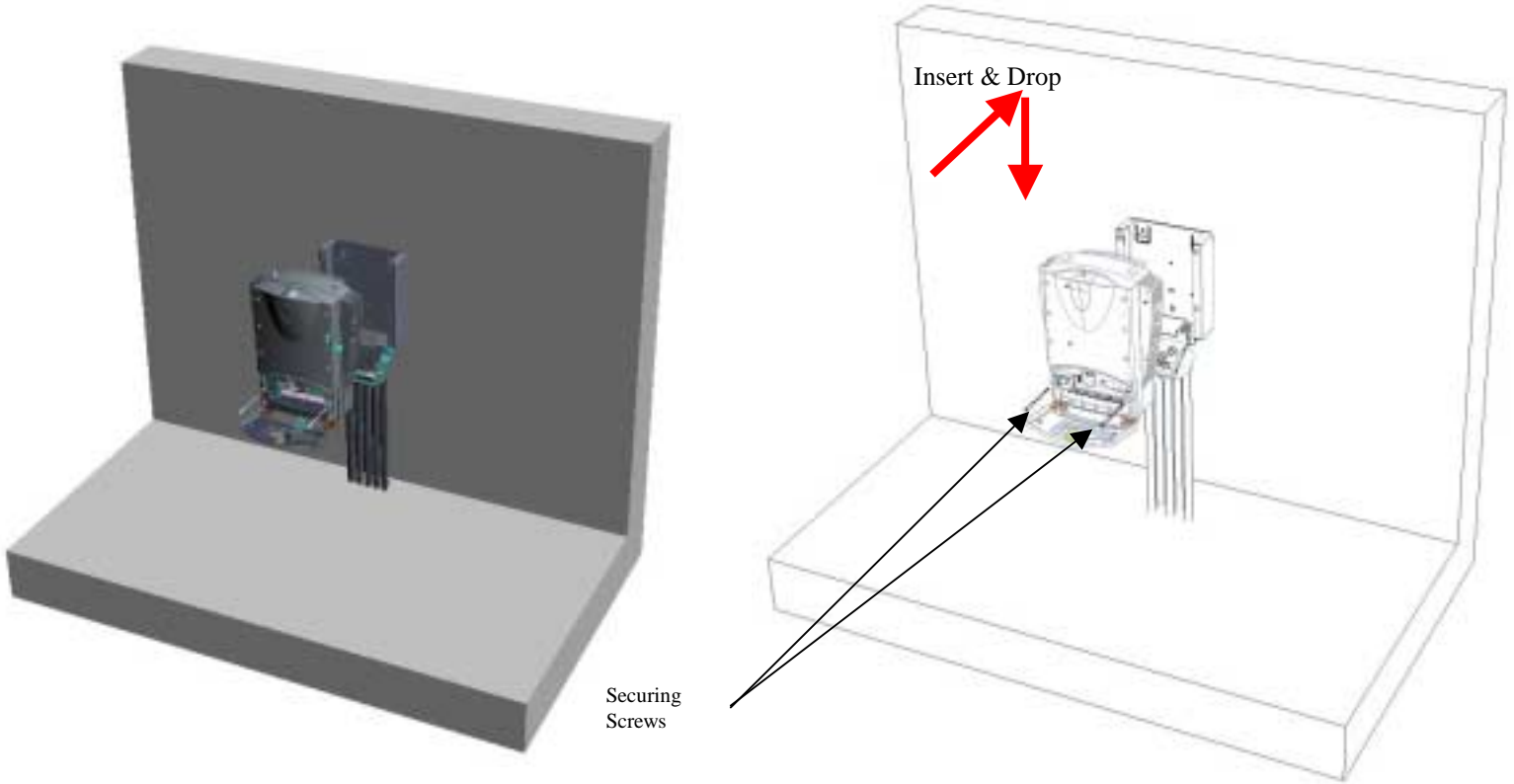
The conduit pivot bracket should be in the open position see below.



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NodeB onto Mounting Bracket

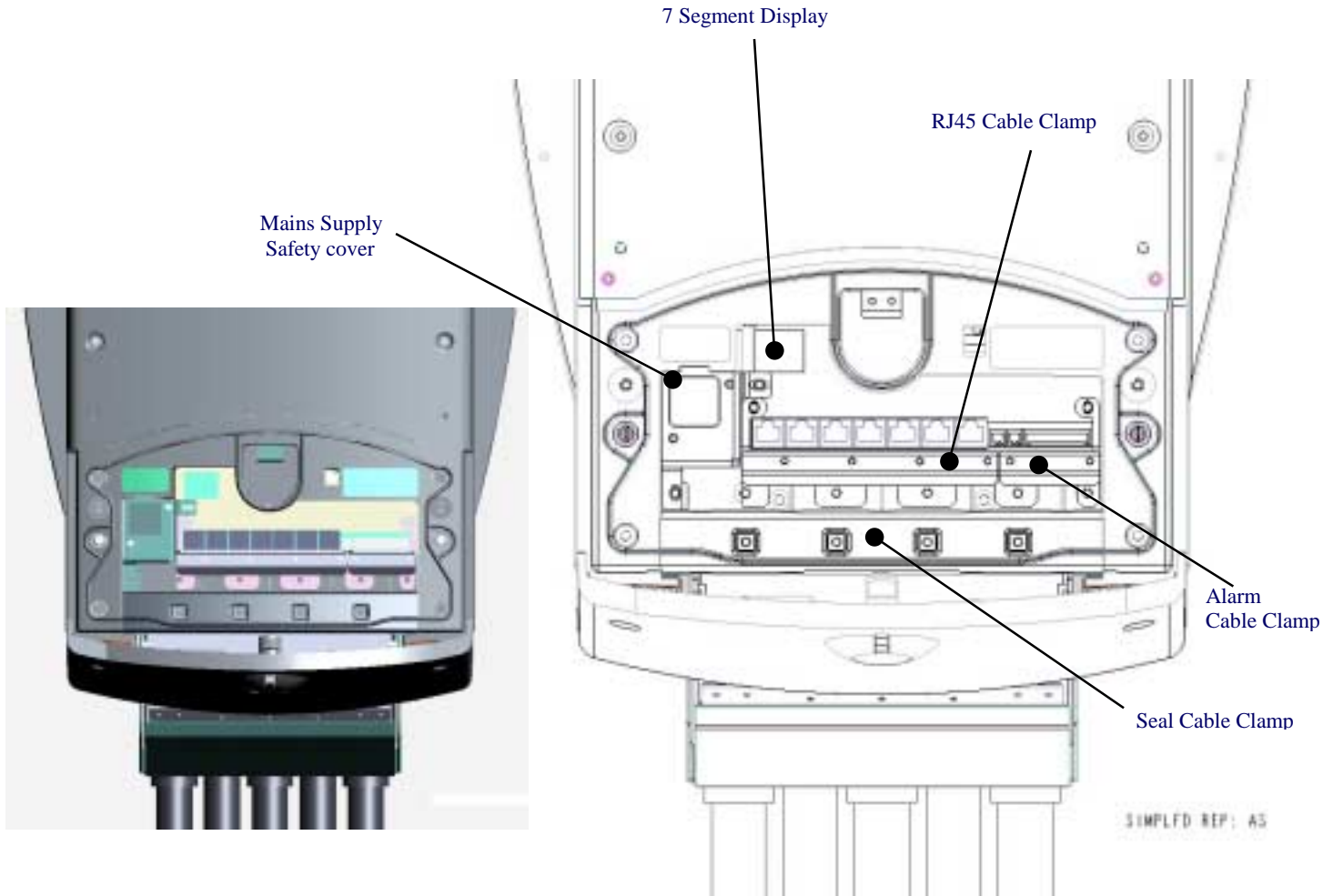
- Align the top dowel pins with top holes in bracket
- Insert & drop
- Ensure all dowels are inserted, if not repeat
- Feed cables thru gap between service cover hinges
- Secure NodeB to bracket using two screws



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5.2 Service Area Interfaces

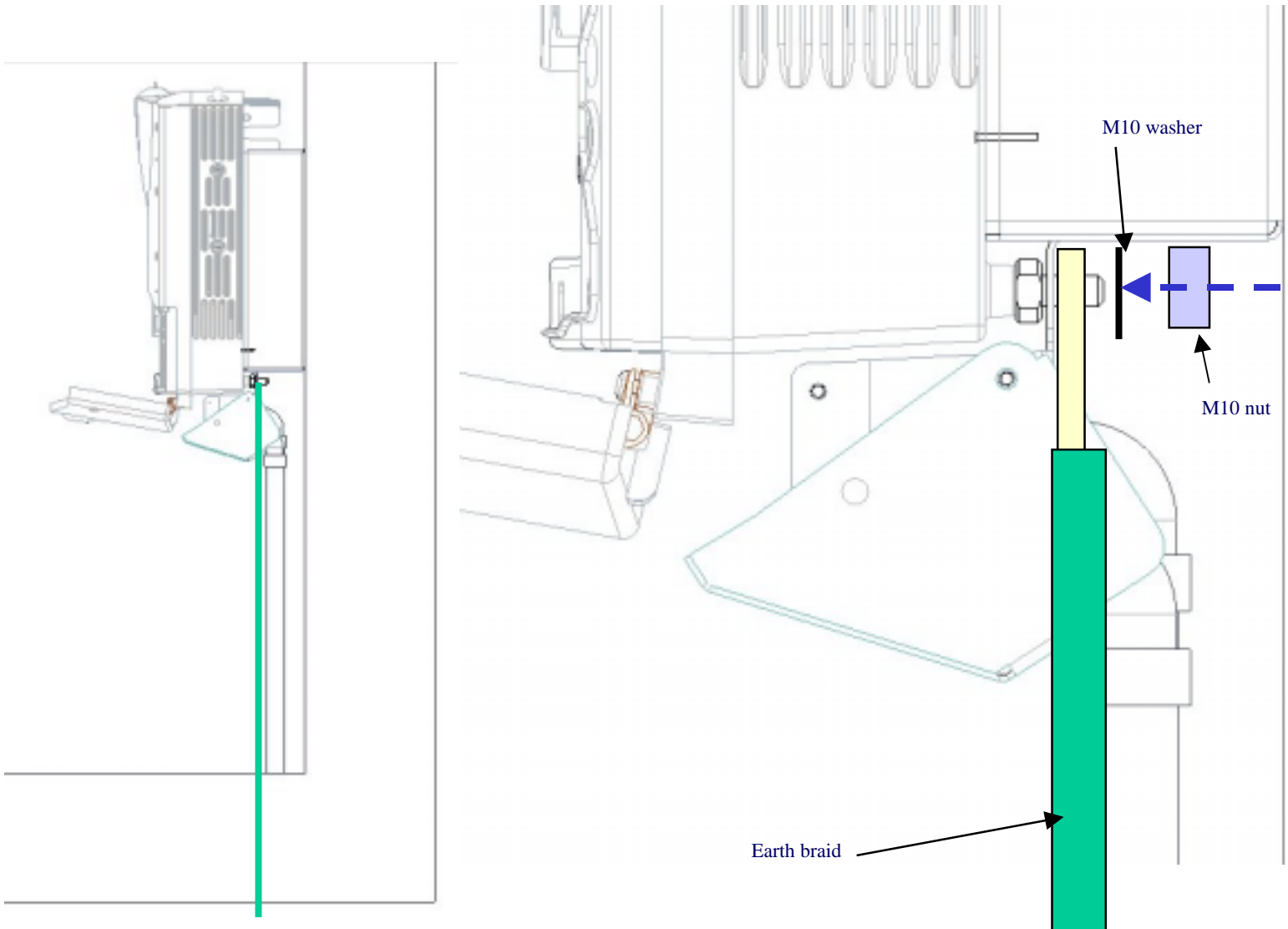
The following figures illustrate the key elements for reference in the cable interface service area of the NodeB. The ground connection is at the rear of the unit see below.



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5.3 (Step 6) Grounding Installation and Inspection

Grounding materials used for the node consist of #2 AWG BCW tinned-ring solid copper wire leading from the ground lug on the right rear section of the node to the grounding buss bar. The grounding wire crimps on a double lug lead going from the buss bar to a grounding ring via a Cadweld (exothermic) ground ring. A typical ground ring consists of eight foot long stainless steel ground rods which are 5/8" diameter. Although each site will be designed for that specific site installation.



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5.4 Cable Clamp Seal

Remove the cable clamp by loosening the 4xHex-socket head screws, see figure below.

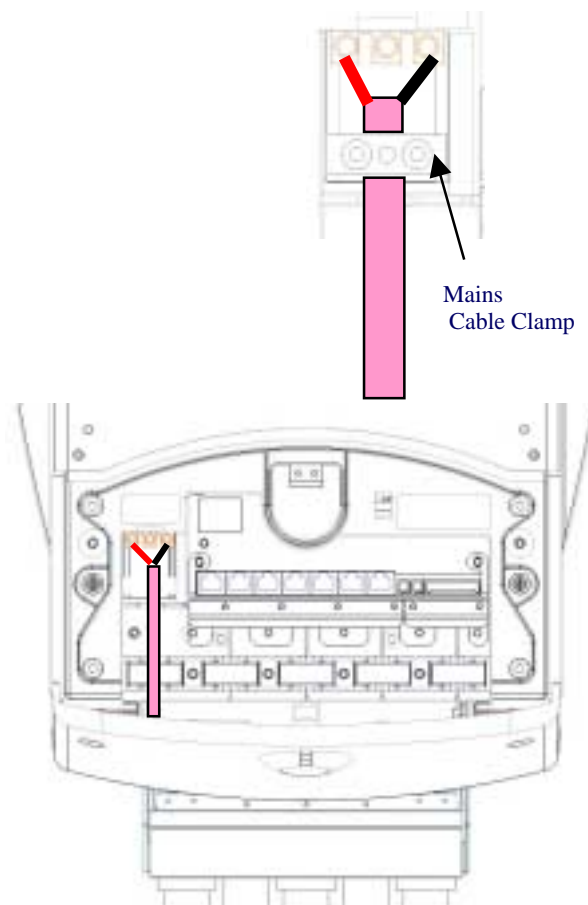


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5.5 Connecting Power to the Node B

The power supply can be either universal ACDC coverter of 300W, universal input range of 90 to 240Vac with a 12Vdc output or a -48Vdc input to 12Vdc output.

- Cable preparation – Specification: terminal blocks maximum cable size 2mm² (14AWG) & maximum size of outer diameter 7mm.
- Remove mains protective cover (2 screws)
- Loosen strain relief Clamp Earth Clamp (2 screws)
- Insert cable into terminal block
- Secure strain relief (2 screws)
- Replace protective cover (2 screws)

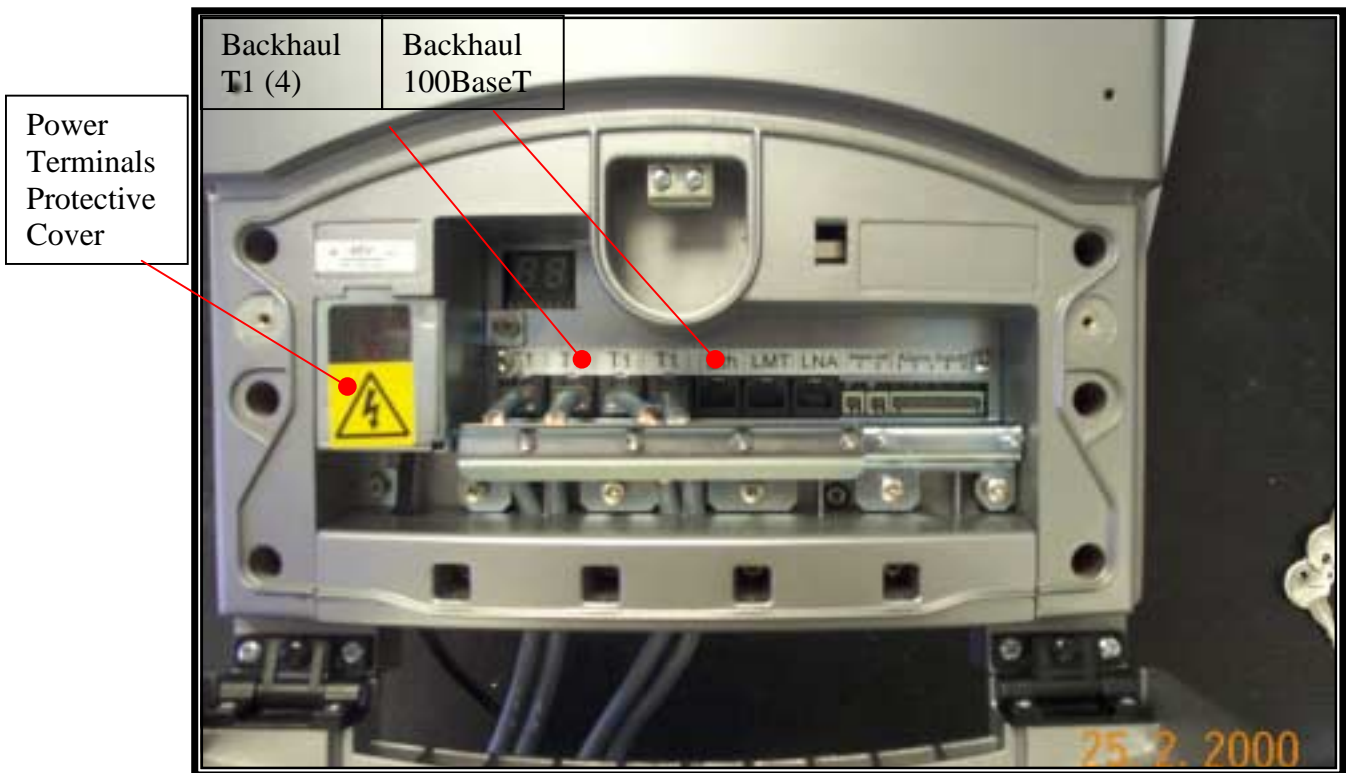


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5.6 Backhaul Connections to INC

The Node B currently requires one 100 BaseT connection to a serving INC. Future enhancements will enable (4) T1's for connection to a serving INC. The connections are labeled and shown in the figure below.

If the Node B is in not in the same site location as the serving INC, there must be no greater than a 5 millisecond delay on the backhaul connection. This can be provided by microwave or land based facilities with a very high reliability rate of 99.9995%.



Terminate the Ethernet cables with RJ48 connectors and strip the wire to allow proper connection to the earth bar. Test the continuity for the Ethernet cables with test equipment consisting of a main and a remote unit.

The termination for these interfaces is specified within the datasheets for the interfaces. The specification for both cables should be CAT5 - 4 pair, screened cable, recommended Alcatel LANmark-5 F²TP or equivalent.

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The pin-outs for the external Ethernet & T1 interfaces are given in the following tables. Source: <http://www.dcbnet.com/notes/9611t1.html>

Figure 3: Ethernet Pin-outs using RJ45

1 RX + White w/Green
2 RX - Green
3 TX + White w/Orange
4 Blue
5 White w/Blue
6 TX - Orange
7 White w/Brown
8 Brown

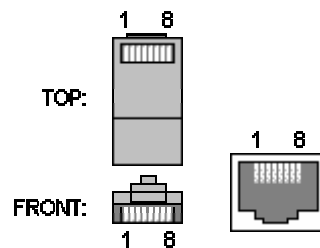


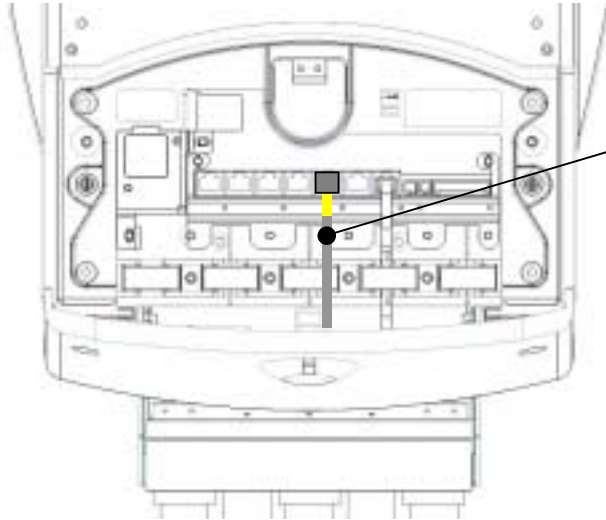
Figure 4: T1 Pin-outs

1	Receive (ring)
2	Receive (tip)
3	Not Used
4	Transmit (ring)
5	Transmit (tip)
6	Not Used
7	Not Used
8	Not Used

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Connecting T1 or 100baseT cables to NodeB

Remove the RJ45 Cable Clamp Ground Bar 4x M3 nuts.



Strip back outer plastic sheath to expose shield. Ensure shield is in contact with Earth Bracket



Replace Ground bar (4 Fixings)



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5.7 Alarm Connections

The description of the alarms is as follows

Alarm Inputs

The alarm inputs from the Node B Patch board to the digital board shall be TTL levels and active high. The external alarm inputs shall be opto-isolated current loops. The voltage and currents shall be supplied by the external source.

Alarm Outputs

The alarm outputs from the digital board to the Node B Patch Board shall be TTL levels and active high. The external alarm outputs shall be isolated normally-open relay contacts capable of switching at least 100mA DC.

The connectors are 12way (alarm inputs) and 2ways for the alarm outputs, 2.5mm pitch header that mate with the supplied cable mount – tension clamp. The cables should be stripped 5-6mm and inserted into the connector prior to mating with the NodeB.

The signals are paired starting from the right, pin1 is the right-hand-side on each connector.

Figure 4 : Alarm Outputs (2x2)

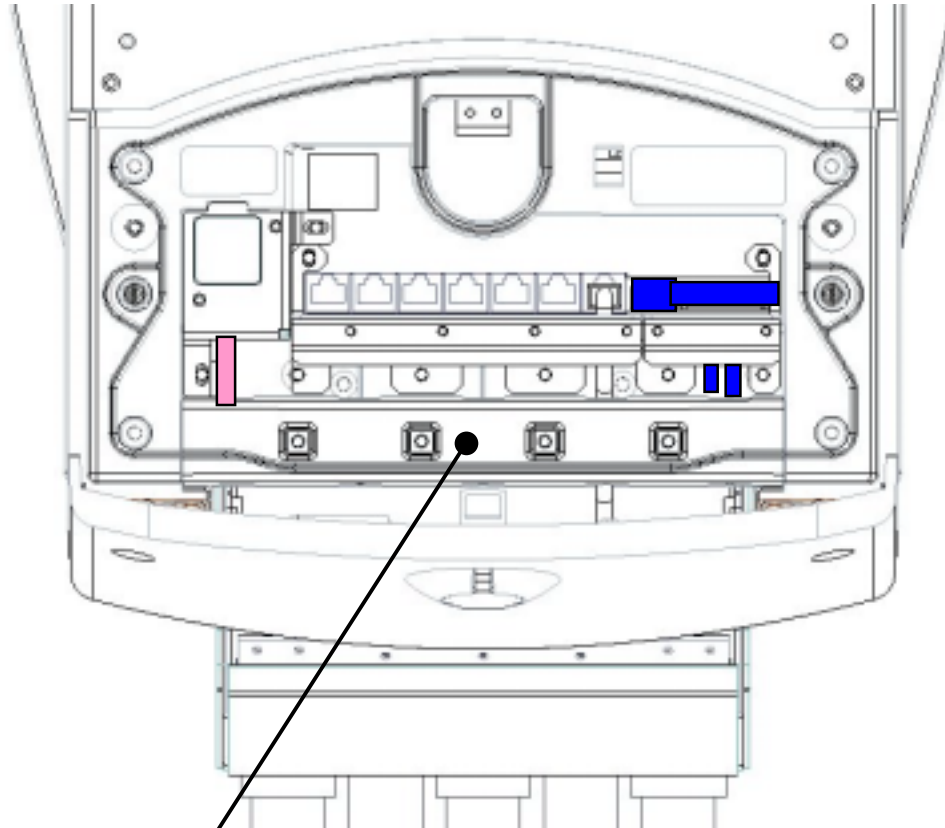


Figure 4 : Alarm Inputs



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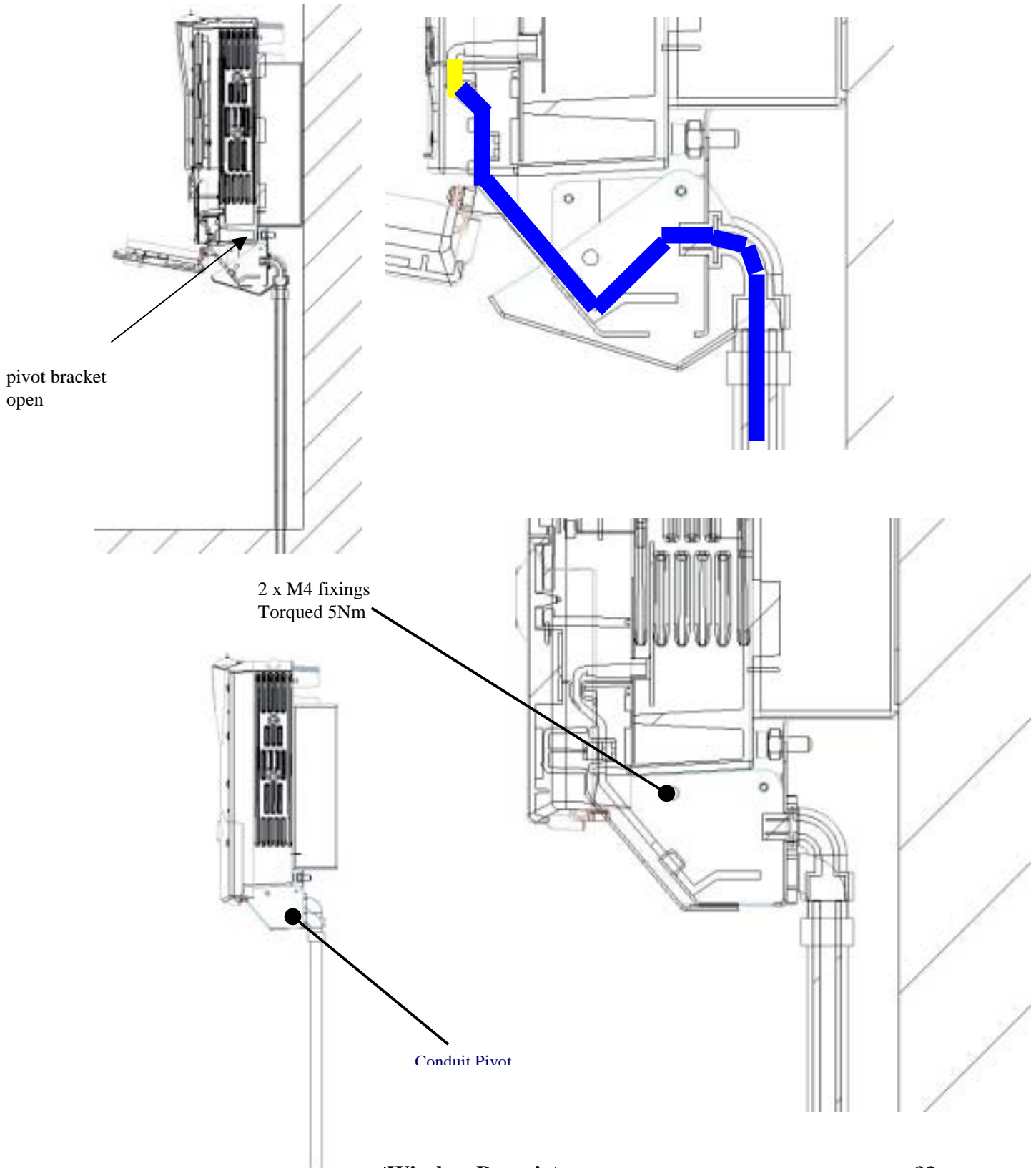
5.8 Replacement of the Seal cable clamp



Replace Seal Cable Clamp &
secure with 4 x M4 screws

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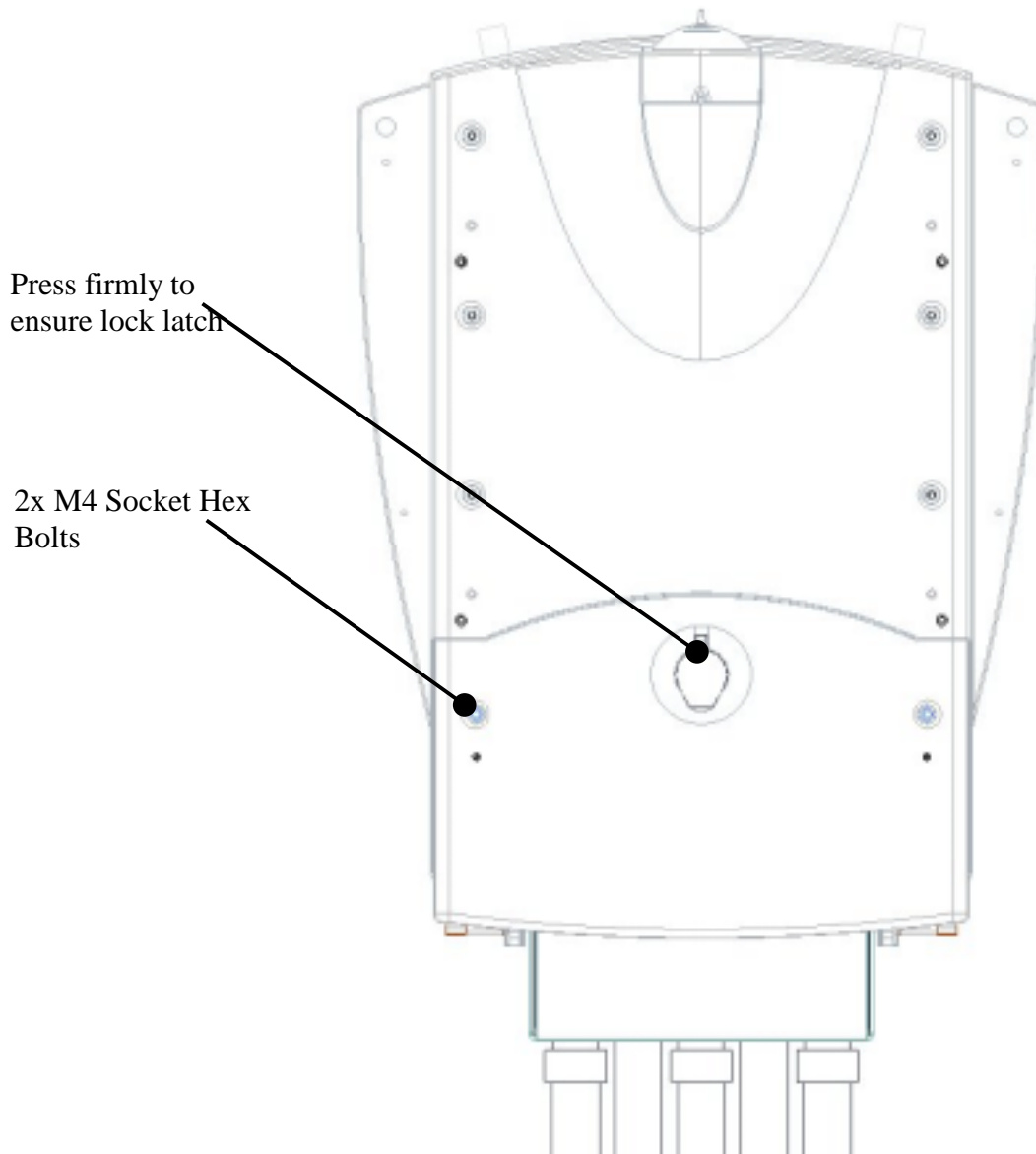
5.9 Conduit Pivot Bracket Securing



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5.10 Closing the Door and securing the NodeB

Close door and firmly press in centre point at lock ensure latch 'clicks' into place. Secure service cover with 2 screws.



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5.11 GPS

5.5.1 GPS Operation

The Node B has an integral GPS antenna and receiver, as shown in figure above. The GPS timing signal is used by the Node B for the TDD frame timing, so that all Node B's in a network are synchronized. The GPS signal is also used by the master oscillator for a frequency reference. The Node B can operate for several hours after a loss of GPS timing but a gradual drift of the frame timing will result in system interference and a loss of handoff capability.

The GPS receiver is automatically enabled when the Node B is powered and there are no adjustments or settings to be made by the user.

After installation of the Node B, verify proper operation of the GPS receiver by connecting the Local Maintenance Terminal (LMT) to the LMT port and accessing typing "gpsstats".

5.5.3 GPS Repeater Installations

A GPS repeater functions as a reradiating repeater to provide a GPS signal in areas that do not have a clear view of the sky. The repeater consists of an active antenna, a repeater block, a passive antenna, connecting cables and a +12VDC supply

The location of the active antenna should be chosen so that the antenna has a clear view of the sky. A suitable location can be verified before installation by checking for GPS lock with a handheld GPS unit. The repeater block and passive antenna are installed in the coverage area (Node B location). The +12VDC supply can be provided by a wall transformer that is connected to a UPS.

After installation and power-on, verify that the handheld GPS unit is able to obtain GPS lock inside the Node B installation area. If not, make adjustments to the antenna locations as required until the handheld GPS receiver can obtain lock. After the Node B is installed, verify that the Node B GPS receiver is able to obtain and keep GPS lock condition.

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6 (Step 11) Power up and Initial Setup of Node B

8 (Step 12) SOFTWARE INSTALLATION

Registration

IPWireless Network Controller software

9 (Step 13) On Air final check

10 Operation & Maintenance

10.1 Maintenance

Node B is designed for an in-service lifetime of 10 years.

There are no field repairable items within the NodeB.

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APPENDIX A – CONTACT INFORMATION

Colorado	California	Europe
IPWireless 1707 Cole Blvd. Golden, CO 80401	IPWireless 1250 Bayhill Drive Suite 113 San Bruno, CA 94066	IPWireless 4 Lansdowne Court Bumpers Way Chippenham SN14 6RZ
Fax# (303) 274-6252	Fax: +1-650 794-2668	

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APPENDIX B – BACKHAUL SPECIFICATIONS

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APPENDIX D – Node B SPECIFICATIONS

Size	16" H x 12" W x 5" D
Weight	42 Pounds
RF Power output	+34 dBm composite (maximum)
Receive Sensitivity	-110 dBm/6 MHz channel
Antenna connector type	N F X 3 (Tx, Tx/Rx, GPS receiver)
Maximum antenna line loss	2 dB suggested
Power consumption	300 Watts maximum
Voltage requirement	-48 VDC or 110 VAC (Optioned at time of order)
Head Disipation	184 Watts
Backhaul facility throughput	6 Mbps downlink, 3 Mbps uplink
Backhaul facility type	4 X T1, 100BT Ethernet
LMT interface	10/100BT Ethernet
Frequency Range	2500 MHz – 2686 MHz
Bandwidth	12 MHz
Air Interface	UTRAN TD-CDMA
Duplex method	Time division
Chipping Rate	7.68 Mcps
Spreading Codes	OVSF
Maximum Path loss	150 Db
Error Correction	variable punctured Turbo coding
Spreading factor	variable - 4, 8 and 16
Modulation	QPSK

DRAFT**Glossary**

ADC	Analog to Digital Converter
BTS	Base Transceiver Station
DAC	Digital to Analog Converter
Downlink	From Network to the User Equipment
DSCH	Downlink Shared Channel
ETSI	European Telecommunications Standardization Institute
FIFO	First-In First-Out (buffer)
FPGA	Field Programmable Gate Array
HTTP	Hyper-Text Transfer Protocol
INC	Integrated Node Controller
IP	Internet Protocol
ISP	Internet Service Provider
ITFS	Instructional Television Fixed Service
IUB	Iub interface – Node B to INC interface
LMT	Local Maintenance Terminal
LNA	Low Noise Amplifier
MCP	Multimedia Communications Port
MAC	Media Access Control
Mcps	Mega Chips per Second
MMDS	Multichannel Multipoint Distribution Service
MSPS	Mega Samples Per Second
MTU	Maximum Transmission Unit
Node B	A UMTS Radio Base Station
PDU	Protocol Data Unit
PLL	Phase Locked Loop
QPSK	Quadrature Phase Shift Keying
RAM	Random Access Memory
RLC	Radio Link Control
RRC	Root Raised Cosine
SDU	Service Data Unit
SRAM	Static RAM
T1	1536kbps pipe
TD-CDMA	Time Division Code Division Multiple Access
TDD	Time Division Duplex
UART	Universal Asynchronous Receiver Transmitter
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
Uplink	From User Equipment to the Network
USB	Universal Serial Bus
USCH	Uplink Shared Channel
UTRAN	UMTS Terrestrial Radio Access Network
VCXO	Voltage Controlled Crystal Oscillator