

CAT[®] Underground Mining

Module Gp-Control
(Fleet for Underground)
User Manual (English)
Part No: 447-0328



19 March, 2015



Change History

| Date | Version |
|---------------|-----------|
| 19 March 2015 | Draft 1.1 |



Information in this document is subject to change without notice. While every effort has been made to ensure that the information contained within this document and the features and changes described are accurate, Caterpillar cannot accept any type of liability for errors in, or omissions arising from, the use of this information.

This document and all related documentation are the property of Caterpillar and may not be reproduced, transferred, sold, or otherwise disposed of, without the written permission of the owners.

Safety Warnings

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

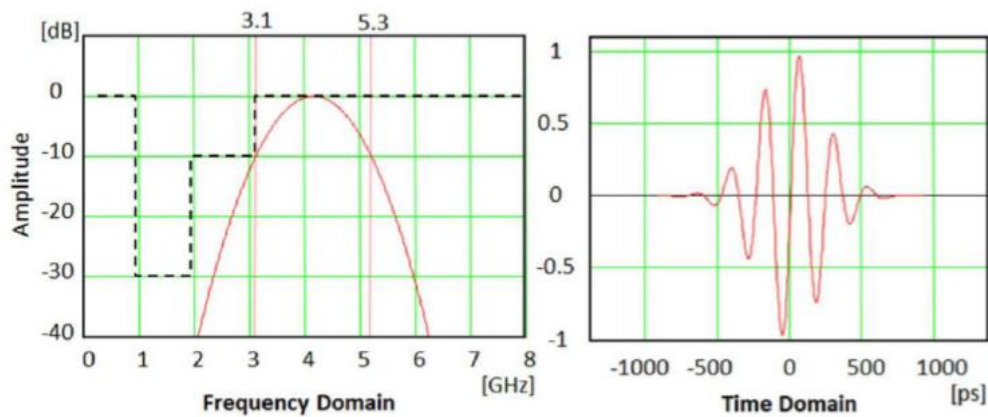
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) L'appareil ne doit pas produire de brouillage, et (2) L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.



| | | | |
|---|--|------------------------|-----------------|
| THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED | | | |
| Confidential Yellow | | Creation Date 27/02/14 | Revision No: 00 |
| Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English) | | | |

The Module Gp Control 447-0328 is designed for Caterpillar Inc. Fleet for Underground applications. It uses a P412 Time Domain PulsON® Ranging and Communications Module. The P412 is an Ultra Wide Band (UWB) transceiver that is used to provide reliable distance measurements at a high update rate. It is designed to communicate between two or more P412's.

The Module Gp Control 447-0328 transmits and receives trains of RF pulses at a nominal rate of 10MHz. This module uses the Two Way Time of Flight (TW-TOF) to measure distance. The module requesting the range measurement (the Requester) will transmit a packet of pulses that will be received by one or more units (the Responders). The Responder will then measure the leading edge of the waveform and will transmit this information in a return responding packet. This return packet is returned after a precise delay. The Requester will then determine the leading edge of the received waveform. The time between the leading edge measurements less the fixed delay is twice the distance between the units. The result is divided by two and multiplied by the speed of light results in the distance between the Responder and the Requester.



Certification:

- FCC Compliant (FCC 15.519) – UWB Emissions
- FCC Compliant (FCC 15.109) – Class A digital device
- FCC Compliant Part 15, Subpart C, Subpart F for Ultra Wide Band Intentional Radiators



| | | | |
|---|--|------------------------|-----------------|
| THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED | | | |
| Confidential Yellow | | Creation Date 27/02/14 | Revision No: 00 |
| Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English) | | | |

Specifications

| Power supply | |
|--------------|--|
| | Wide range power supply, from 9V to 60VDC, 8W min, with polarity protection. M12 4-pole connector |

| Ethernet interface | |
|--------------------|--|
| Number of ports | 2 |
| Type of ports | 10 BASE T or 100 BASE Tx |
| | Two Ultra-lock® M12 4-pole female connectors |

| Bandwidth (Effective) | |
|-----------------------|---|
| | 3.18GHz – 4.0GHz The bandwidth is defined as the frequency band bounded by the points that are 10dB below the highest radiated emission. |

| Program - USB Interface | |
|-------------------------|-----------------------------|
| | Micro B connector (USB 2.0) |

| RF Filtering | |
|--------------|---|
| | Filtering in the presence of 2.4 and 5.8GHz Signals |



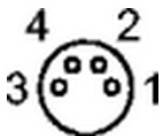
| | | | |
|---|--|------------------------|-----------------|
| THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED | | | |
| Confidential Yellow | | Creation Date 27/02/14 | Revision No: 00 |
| Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English) | | | |

Indicator Status Lights

| Indicator Status Light – Status/Diag | |
|--------------------------------------|--|
| Amber LED Toggles 1Hz | Indicates that the module has passed the Built-in Test (BIT) |
| Amber LED Flashing 10Hz | Built-In Test (BIT) Failed |
| Green LED | Initially off the green LED will blink rapidly and then flashes constantly |
| Green LED Flashing | Clock signal is being received |
| Green LED On solid or Off | Indicates a failure condition |

| Indicator Status Light - LAN1 and LAN2 LED | |
|--|---|
| Green Flashing | The ACT LEDs indicate that there is activity in the respective Ethernet port. |

USB 2.0 Micro B connector Interface

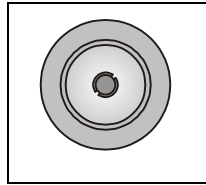
| | |
|---|---|
|  | <p>Signals names</p> <p>Pin 1 : +VE</p> <p>Pin 2 : D- (Data -)</p> <p>Pin 3 : D+ (Data +)</p> <p>Pin 4 : -VE (Ground)</p> |
|---|---|



Antenna Port

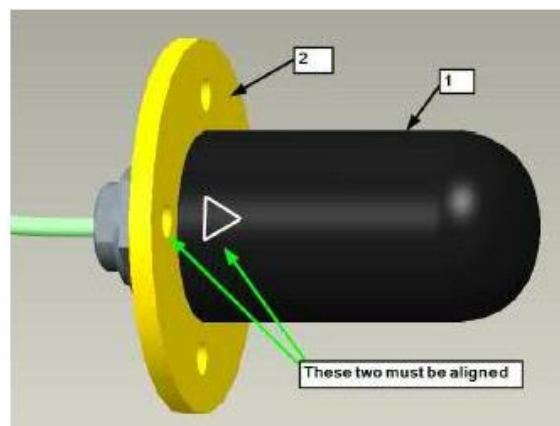
Main antenna is configured to Transmit and Receive. This is an N-Type connector used for connection to a Broadspec antenna.

N type female Connector



Antenna

Antenna As. (Fleet for Underground) 447-0331 (1) is an Ultra Wide Band (UWB) planar elliptical dipole antenna. It has a standard N-Type male connector that allows connection to the Module Gp-Control 447-0328 main antenna port. When installed onto 448-9465 Plate (2) the triangle and bolt hole must align to ensure correct orientation of the antenna when fitted onto a machine and offboard infrastructure.



When installed offboard a machine the arrow or red dot must face in the direction shown below.





THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED

Confidential Yellow

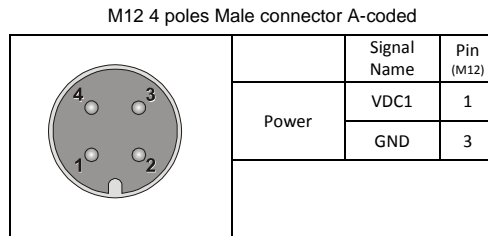
Creation Date 27/02/14

Revision No: 00

Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English)

Power Connection

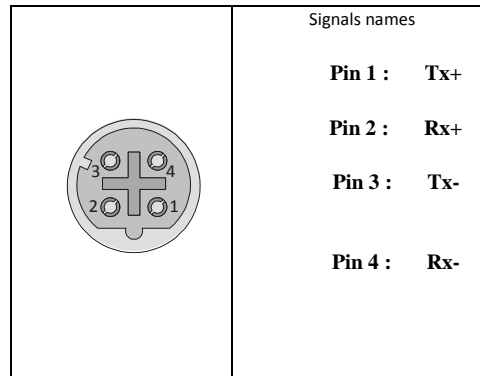
This device must be powered from a 9 – 60VDC (8W minimum) source. The device has no on/off switch and turns on automatically when power is applied.



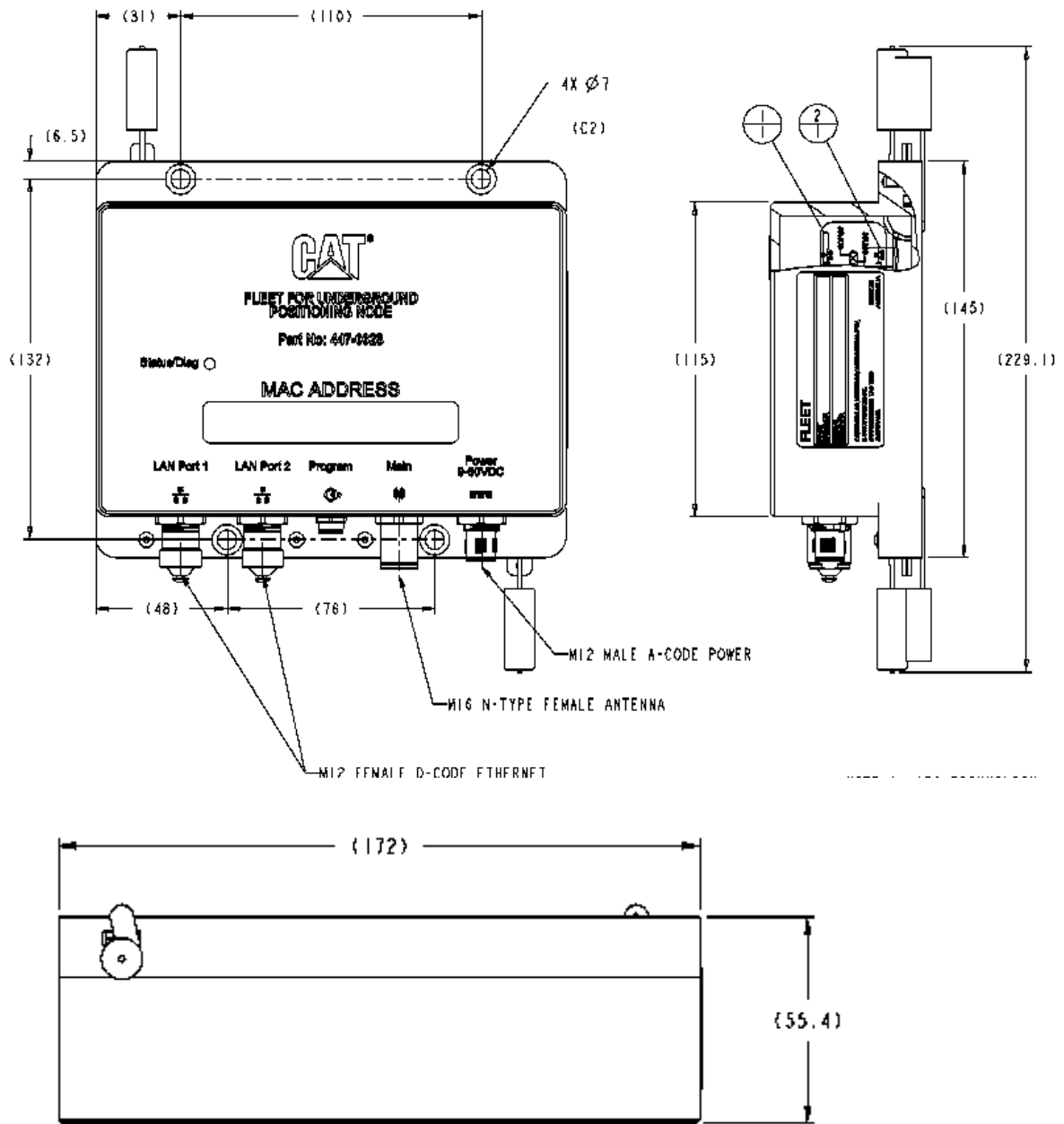
Program Ethernet port characteristics

The Ethernet ports are labelled LAN port 1 and LAN port 2. You can connect to a network via an appropriate 4 Pole D-Coded Male M12 cable to LAN Port 1 or LAN Port 2. The module supports both 10 and 100 base T Ethernet.

M12 Ultra-lock® 4 poles Female connector D-Coded



Product Dimensions



© 2014 Caterpillar Inc.



THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED

Confidential Yellow

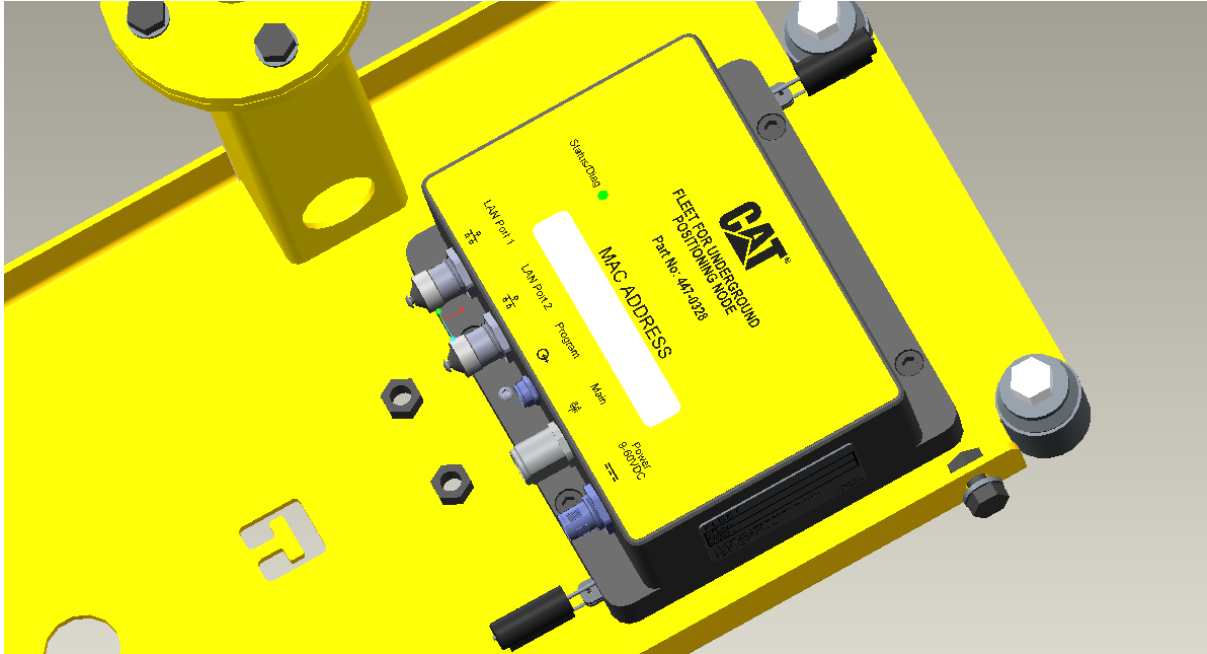
Creation Date 27/02/14

Revision No: 00

Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English)

Mounting Instructions

Using Mount As. 454-7328 attach module to mount using 4x (M6x1) Bolts



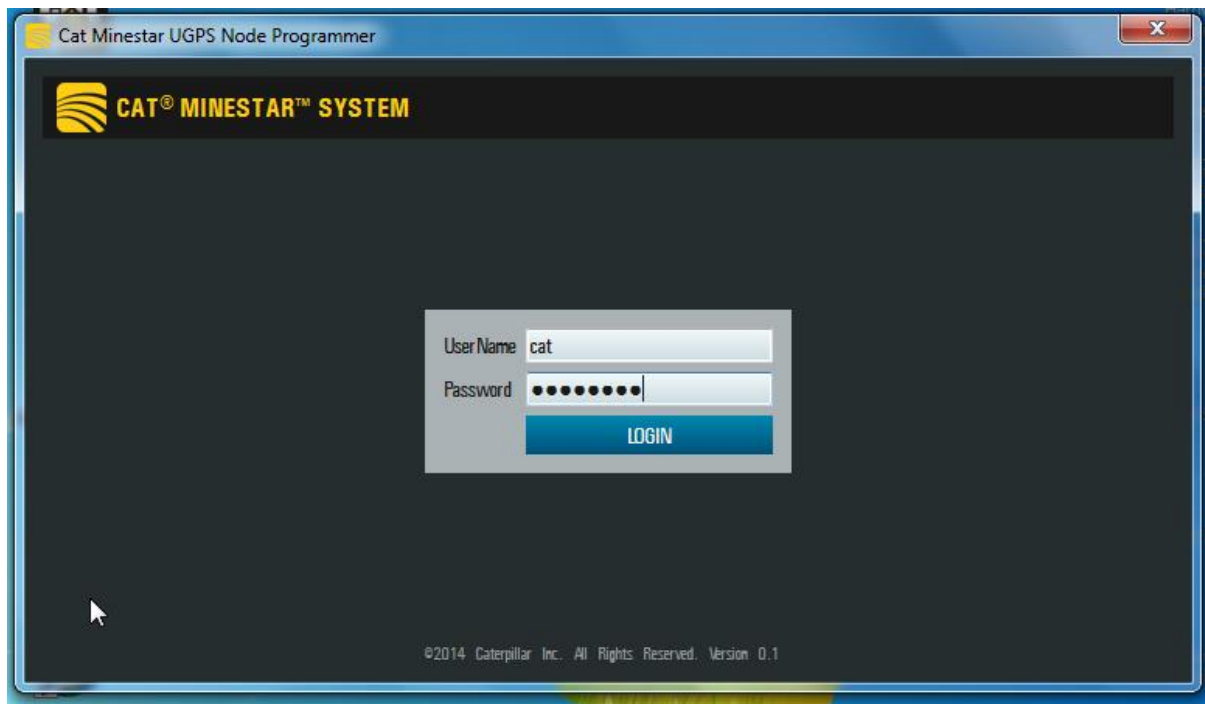
Node Programmer Set-Up Guide

Step 1 – Offboard UWB Configure

Click Node Programmer shortcut.



Enter the appropriate User Name and Password as provided by an authorised Caterpillar Inc. professional installer.



Connect Antenna cable to “Main” port on UWB node

Connect the 379-9909 Cable As. to the 9 to 60VDC port on the UWB node

Connect an M12 to RJ45 Cable from LAN Port 1 on the UWB node to the Ethernet connection on the PC and observe the “Connect Dialog” window.



| | | | |
|---|--|------------------------|-----------------|
| THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED | | | |
| Confidential Yellow | | Creation Date 27/02/14 | Revision No: 00 |
| Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English) | | | |

The CAT® Minestar™ UGPS Node Programmer window will open displaying the connected devices configuration and status.

Interface - Active connection type (USB or Ethernet).

MAC Address – MAC address of connected device will be displayed.

Comms Address – Communications port connectivity port.

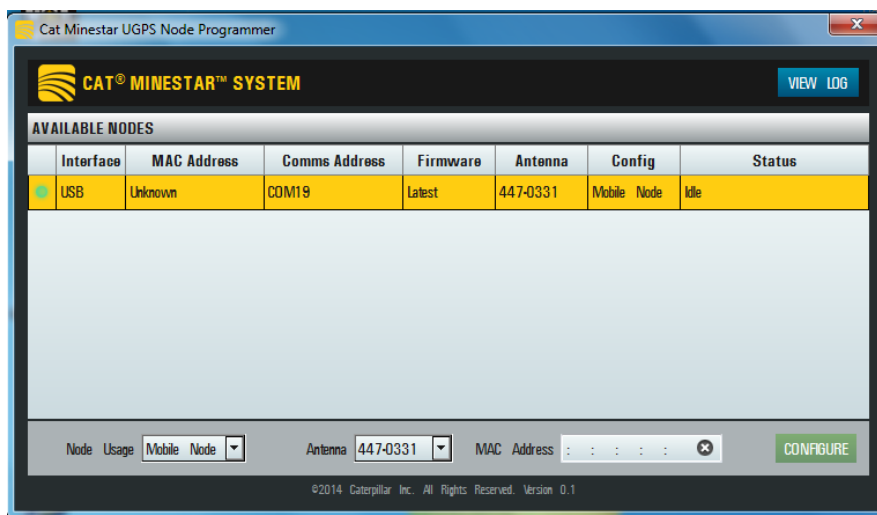
Firmware – Provides information on whether or not the firmware is current (Latest).

Antenna – Allows the user to determine what antenna is installed.

Config – Displays the current mode of operation for the device (Mobile or Fixed) node.

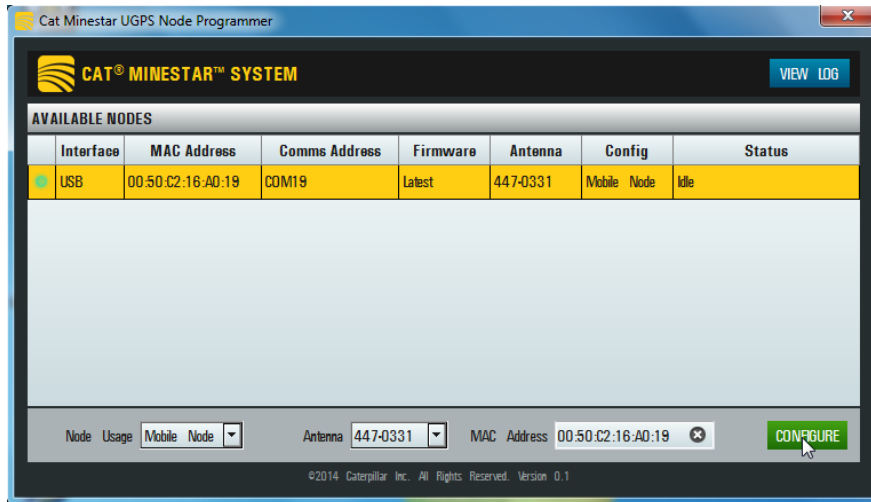
Status - Displays a description of the status of the device.

- Idle – Indicates that there are no messages between the PC and the node.
- Reading Config. – Indicates that the PC is actively reading the devices configuration.
- Writing Config. – Indicates that the PC is actively writing the configuration to the device.
- Reading Status – Indicates that the PC is checking the firmware version and device statistics.
- Updating Firmware – Indicates that the PC is actively updating and writing the firmware to the device.
- Rebooting – Indicates that the device is rebooting.
- Firmware needs updating – Indicates that the device’s firmware is out of date and requires to be updated.



| | | | |
|---|--|------------------------|-----------------|
| THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CATERPILLAR UNDERGROUND MINING PTD LTD. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMITTAL TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS LOANED, IS PROHIBITED | | | |
| Confidential Yellow | | Creation Date 27/02/14 | Revision No: 00 |
| Module Gp-Control 447-0328 (Fleet for Underground) User Manual (English) | | | |

The antenna type and node usage can be changed if the highlighted row is selected which will populate the MAC address field for the device. The drop-down menu on the Node Usage and Antenna can be changed as required for the application followed by selecting the “configure” button.



Troubleshooting

The “VIEW LOG” can be accessed to determine the status of the device by providing information such as any error messages and firmware update information.

