Xeos Technologies Inc.

XMA-11K User Manual

ARGOS Beacon

Version 2.2
Feb 2016

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Version History

Version	Date	Description
1.0	Nov 2013	Initial document
1.1	Sept 25, 2014	Updated format and O-ring specifications
2.0	Mar 31, 2015	Format revision
2.1	Nov 25, 2015	Command section corrections
2.2	Feb 03, 2016	Small update to Appendix A

General Description

The XMA-11K is an independently powered, self-contained Argos beacon that is fully submersible to 7,500m (24,606 feet). This beacon is designed to protect your valuable assets and make their recovery even easier. The use of Argos makes your assets track-able from anywhere in the world and is packaged in an all titanium enclosure with a solid state surface sensor and optional remote head. The XMA-11K is designed to meet or exceed you operational requirements for an ultra-deep water submersible beacon.

Inside the XMA-11K titanium chassis, is a fully functional Argos PTT (Stand-alone transmitter) that can be quickly integrated into mission specific packages, or used alone to gather Doppler based position information. The circuit board benefits from an incredibly small package and advanced power management, making it an ideal choice for long range, long term monitoring projects. Advanced firmware provides multiple options for data acquisition.

The XMA-11K is intended for subsurface and surface deployments. Xeos Technologies Inc. (Xeos) manufactures other specific products for subsurface and surface applications.

See www.xeostech.com for details or call (902) 444-7650.

Theory of Operation

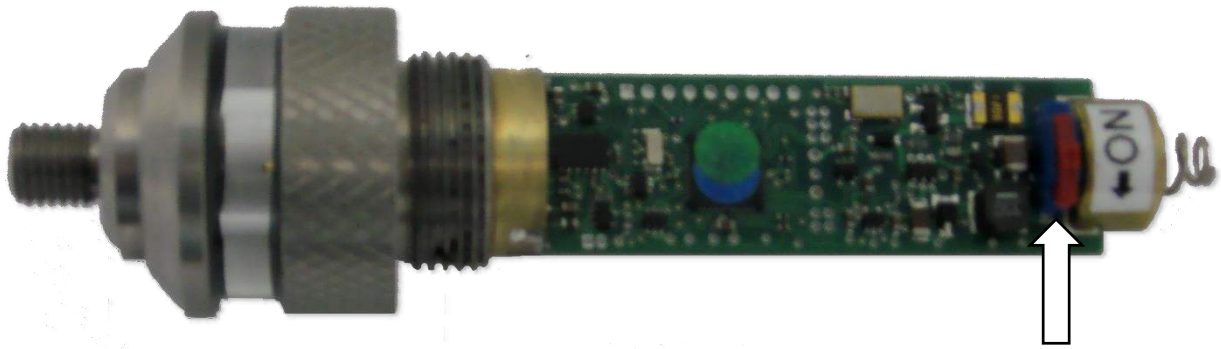
The XMA-11K is intended for instantly locating and recovering high value, free drifting assets at sea with Argos Doppler accuracy. After being activated, the XMA-11K is submerged (to a maximum depth of 11K meters), where it enters Underwater Mode. Here, it monitors water conductivity between the top disk and the bulkhead for up to 2 years.

Once it reaches the surface, XMA-11K will transmit its Doppler position and will continue to send is Doppler position until it is manually turned off, the battery pack drops below the minimum voltage requirement of 7v, or the XMA-11K is re-submerged.

Operating Instructions

On/Off Modes and Testing

The XMA-11K beacon is turned ON and OFF through the use of an internal switch. To turn XMA-11K ON, open the tube and remove the circuit board. Switch the switch to the 'ON' position. Screw the circuit board and antenna back into the tube. Once turned on, the device will transmit a pre-programmed frequency. Every time the device sends out a transmission, a green LED will flash in the translucent antenna spacer. To turn the device off, repeat the above step but put the switch in the 'OFF' position. Once turned off, the device will no longer transmit the pre-programmed frequency.



On/Off Switch

IMPORTANT NOTE 1:

It is important that the beacon has a good view of the sky during any test, therefore the test must take place outside of any building.

IMPORTANT NOTE 2:

Cycling power for any reason, for example: by using the switch to turn On/Off or by removing battery power, will start the above-water Alarm Mode.

Changing the Batteries

The chassis can easily be taken apart by unscrewing the top antenna end off of the unit. This must be done carefully as the circuit board is attached to the antenna, and will come out of the unit when then top is taken off the chassis. The batteries are inserted into the chassis with the positive end facing the circuit board, and the negative end facing the bottom of the chassis. When changing the batteries, ensure that the plastic protecting sleeve is still within the chassis.

The XMA-11K accepts 6x 1.5V AA batteries in the standard chassis. A short chassis that accepts 7 CR123A 3V lithium batteries is also available.

Ensure that all batteries are inserted into the chassis with the correct polarity. The negative terminal of the battery should be facing the bottom of the chassis. The positive terminal of the battery should be facing the antenna and the circuit board.

IMPORTANT NOTE:

The batteries inside the chassis are protected by a plastic tube. When replacing batteries, ensure that the plastic tube is still intact inside the chassis.

Working with ARGOS

Overview of ARGOS

Argos is a globally used location and data collection system. It can be used to find any mobile object, anywhere around the world, as long as it is fitted with a compatible Argos transmitter. Satellites orbiting close to the Earth receive messages transmitted from Argos compatible transmitters located on a deployed unit. These messages are then re-transmitted from the satellites to receiver stations located on the Earth. The receiver stations then re-transmit the messages to an Argos Processing Centre.

The Argos Processing Centre measures the Doppler Effect (i.e. the change in frequency of a wave relative to wave origin and observer) on the transmitted frequency. Using this measurement, position or original transmission can be calculated. The Argos Processing Centre will process any data collected and then send both the collected data and the unit position to the user. For more information related to Argos, see the Argos website or the Argos manual.

Account Setup

If the user does not already have an Argos account set up, or the unit to be deployed does not have an Argos ID number, an SUA (System Use Agreement) Form and/or an ID Number Request Form must be filled out and given to User Services. Both of these forms can be downloaded here.

Once the appropriate form has been processed, a Service Contract/Order Form and a Prices List will be sent back to the user. These forms will also need to be filled out and returned to User Services. Once the signed order form has been received, User Services will send a Program Overview to the user, and the device will be authorized for deployment using Argos.

Data Acquisition

There are many different ways to access positioning data from ARGOS.

- ArgosWeb is a secure website that displays location of the unit using Google Maps and has an option to download all collected data.
- ArgosServer provides the user with remote access to Argos data with TELNET.
- ArgosDirect allows data to be sent to the user through E-mail, FTP (File Transfer Protocol), or CD-ROM.
- ArgosShare allows users to share any collected data with other personnel.
- ArgosMonitor monitors the position of unit, unit state, and any sensor data for changes in state. Any change in state will create an alert that is sent to the user by E-mail, SMS (Short Message Service) or Fax. For more information on Data Acquisition, see chapter 6 of the Argos Manual

Programming the XMA-11K

You Will Need

Hardware

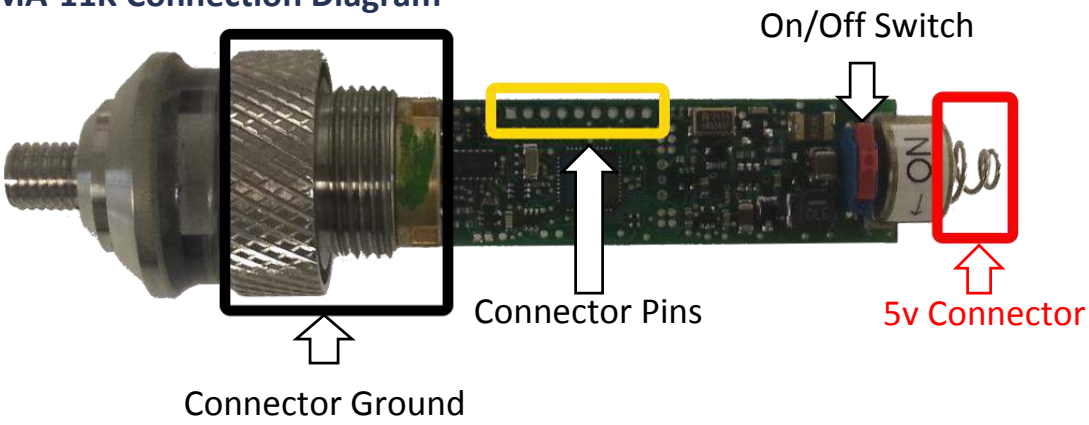
1. A programming cable
2. The XMA-11K unit, removed from its enclosure
3. A Windows PC

Software

1. uCon
2. uCon configuration file
3. Silicon Labs CP210x USB to UART driver

Connecting the Programming Cable

XMA-11K Connection Diagram



Pin Diagram

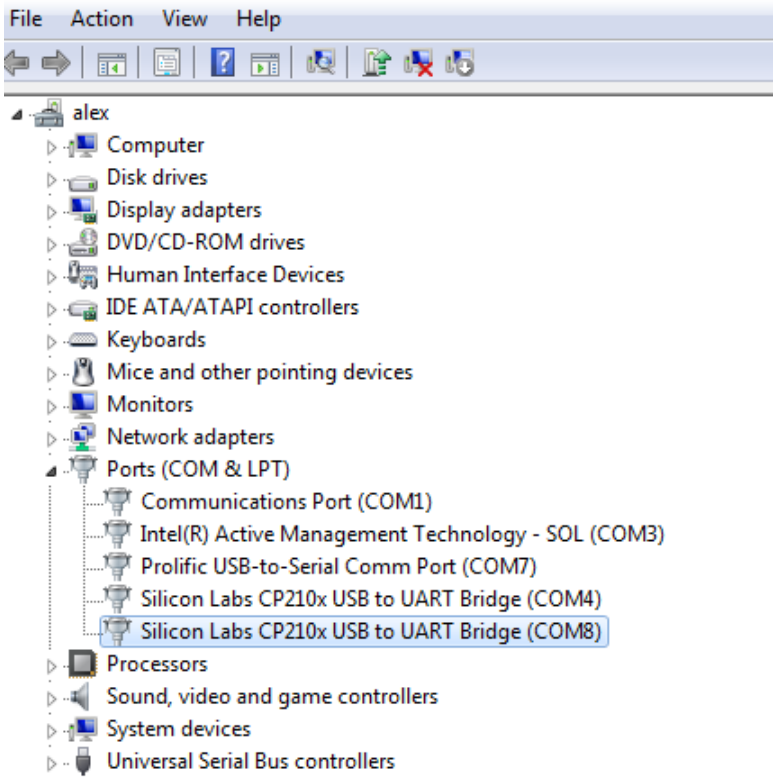
Instructions

Note: The pins run toward the 5v connector. 1 is closest to the large metal thread, while 9 is closest to the On/Off switch

1. Connect the red alligator clip t the 5V power connector.
2. Insert the programming pins into the connector pins.
   The black wire (GND) connects to pin 7, while the yellow wire (Rx) connects to pin 9
3. Plug the micro-USB cable into the blue box.
4. Plug the other end of the micro-USB into your PC.

Drivers

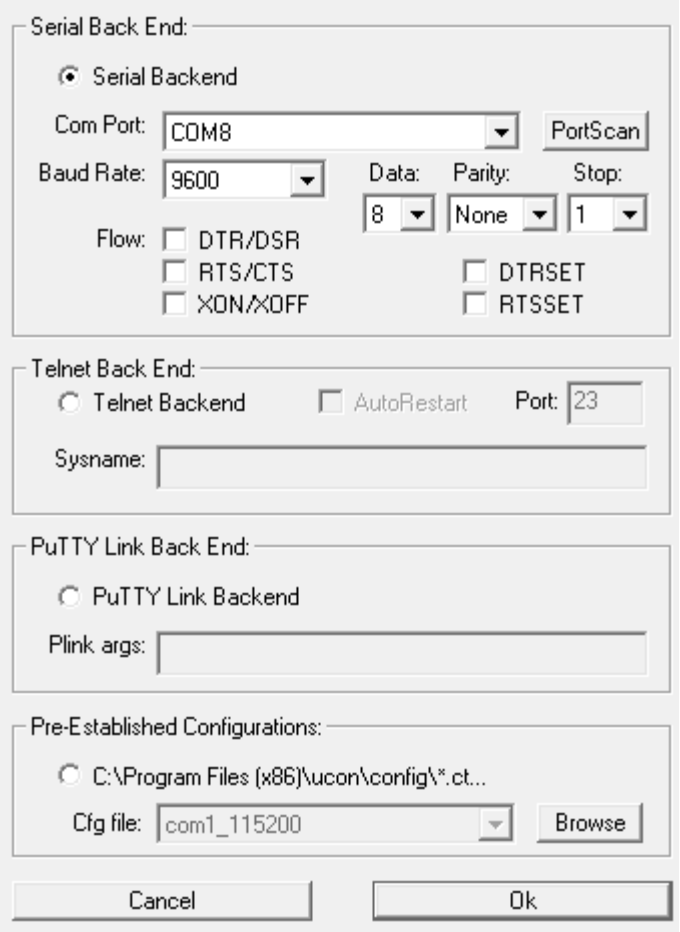
1. Navigate to the device manager: Control Panel -> Device Manager
2. Check to see if the UART to USB bridge has been recognized and installed on your computer:



3. If it has not, download and install the Silicon Labs CP210x Device driver.

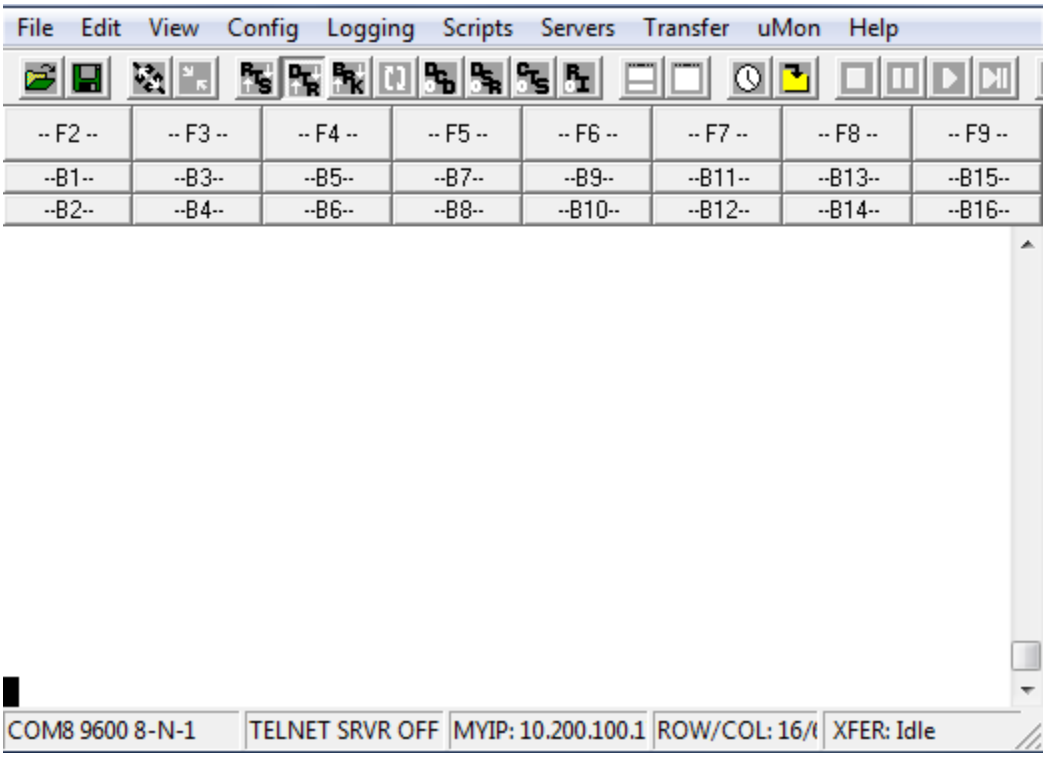
Connecting with uCon

1. Download and install the uCon terminal program.
2. Start uCon, you should see this screen:

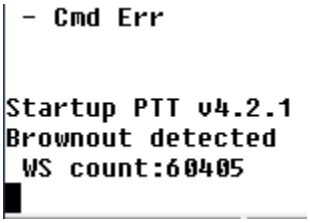


3. Change the Com port to what was seen in the device manager.
   In this case: COM8
4. Change the Baud Rate to 9600
5. If DTRSET is checked, uncheck it
6. Press OK

7. You should now see this screen:



8. Change the On/Off switch to on.
9. The XMA-11K will boot up with this message:



10. Type **$et** the console will enter command mode.
11. To change your Hex ID, type **$siXXXXXXX** where XXXXXXX is your desired Hex ID.
12. Type **$sq** to verify your settings.

XMA-11K Settable Parameters

Repetition Period (Rep Rate)

The Repetition Rate is the amount of time between each transmission of the XMA-11K. To change the Repetition Rate, type **$srXXX** and press enter, where **XXX** is the number of seconds you want between each transmission.

Example:

Type ***$sr090*** and press Enter to change the Repetition Rate to 90 seconds.

Hex ID

The Hex ID is the unique identifier that the XMA-11K uses to transmit positional data to the ARGOS satellites. To change the Hex ID, type **$siXXXXXXX** and press enter, where **XXXXXXX** is the 7 digit Hex ID.

Example:

Type ***$si1A2B3C4*** and press Enter to change the Hex ID to 1A2B3C4.

IMPORTANT NOTE:

If you have an old 20 bit ID that only contains 5 digits, you must enter two zeros “00” at the end of the 5 digits to make it 7 digits. Otherwise the XMA-11K will not accept the changes.

Settings Query

A Settings Query will display the ARGOS related settings of the XMA-11K such as Hex ID, Repetition Period, Channel, and Transmit Lifetime.

To display the ARGOS settings, type **$sq** and press Enter. Use this command to verify settings changes.

Appendix A: XMA-11K Firmware Update Procedure

Introduction

This document will guide the user through the process of uploading new firmware onto the XMA-11K.

The XMA-11K Board Pin-out

Figure 1

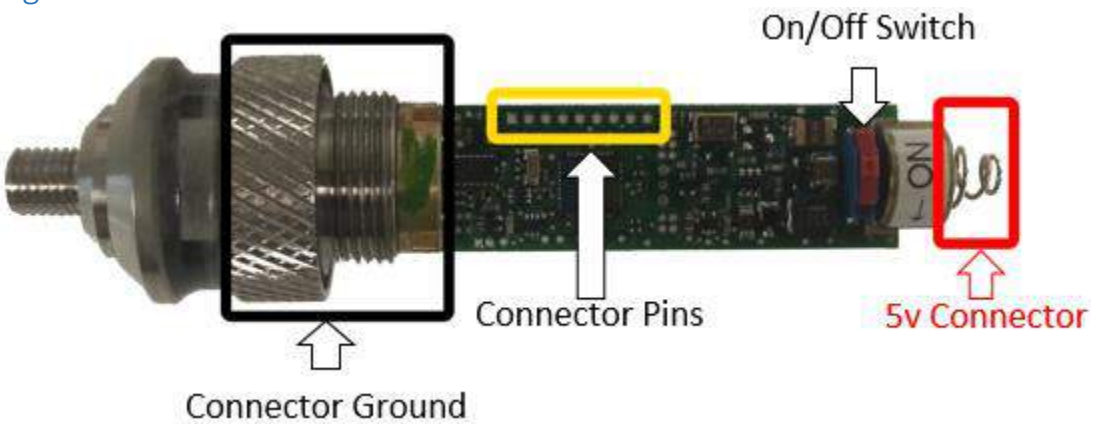


Figure 2

Items Required

Software (Download from Xeostech.com)

- MegaUploader
- uCon

Files

- Latest firmware file (hex file)
- Device driver for the USB port

Equipment

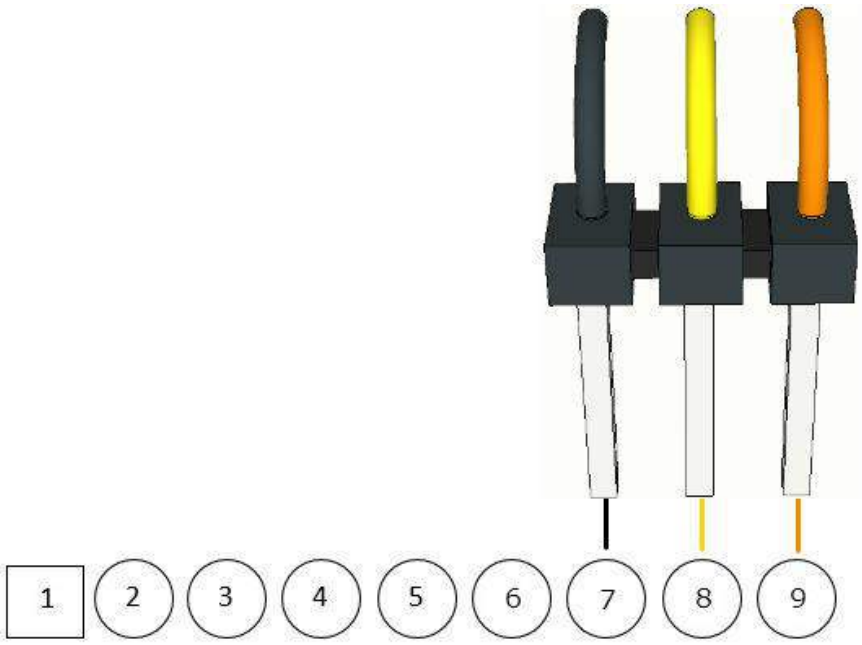
- XMA-11K board
- UART to USB Bridge
- PC
- Power Supply

Updating the Firmware

Hardware Setup

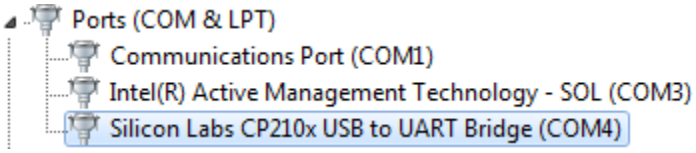
1. Plug the UART to USB Bridge dongle into your PC
2. Insert the serial connector into the XMA-11K connector:

Figure 4



3. Apply ground and power(5V) to your XMA-11K board from the power supply
4. Check the COM port of your UART to USB Bridge by going to:

   Control Panel -> Device Manager -> Ports (COM & LPT)

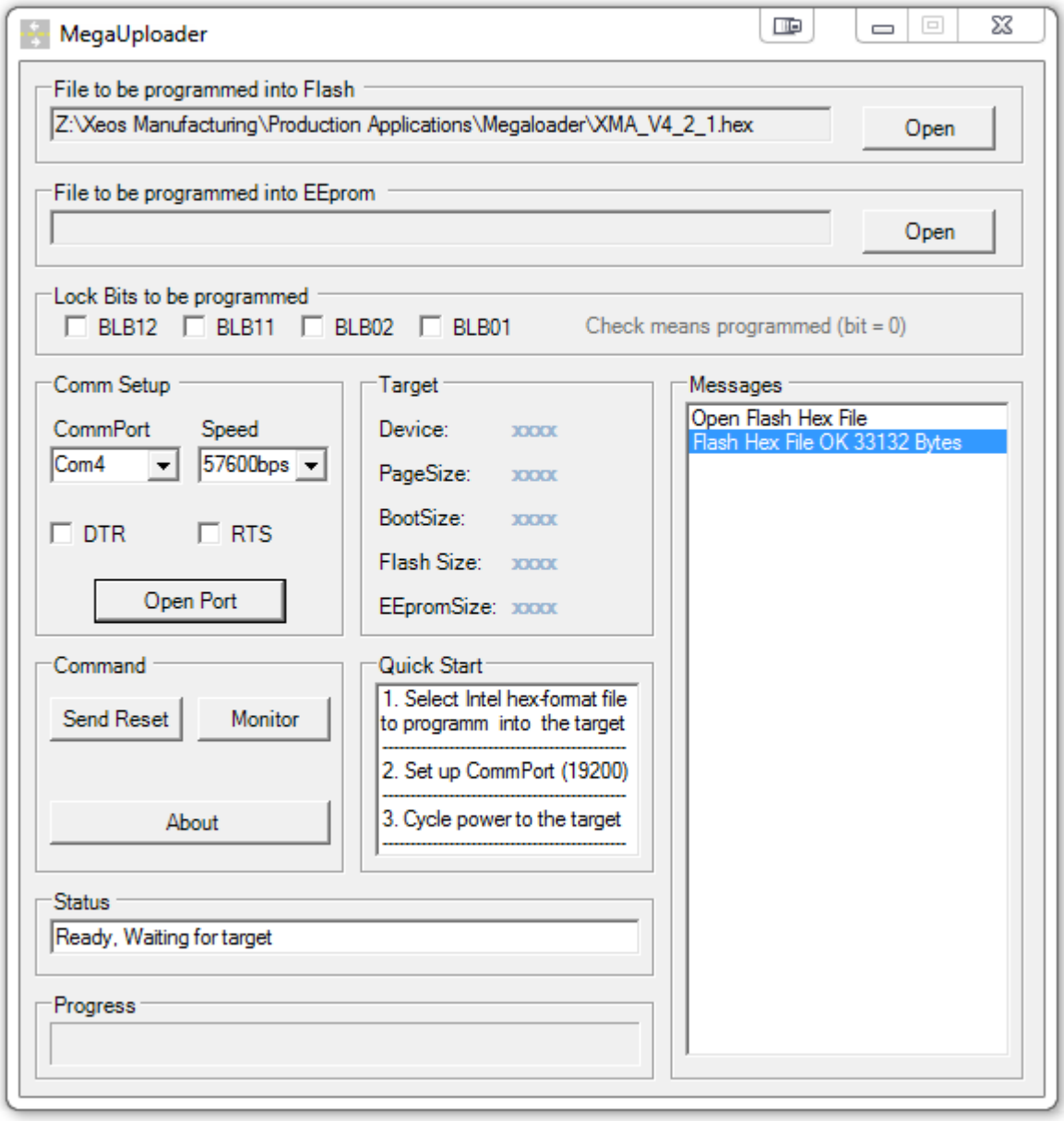


   In this case: COM4

5. If the CP210x is not present in the Device Manager, see Installing the Serial to USB Driver
6. Open the MegaUploader application

MegaUploader

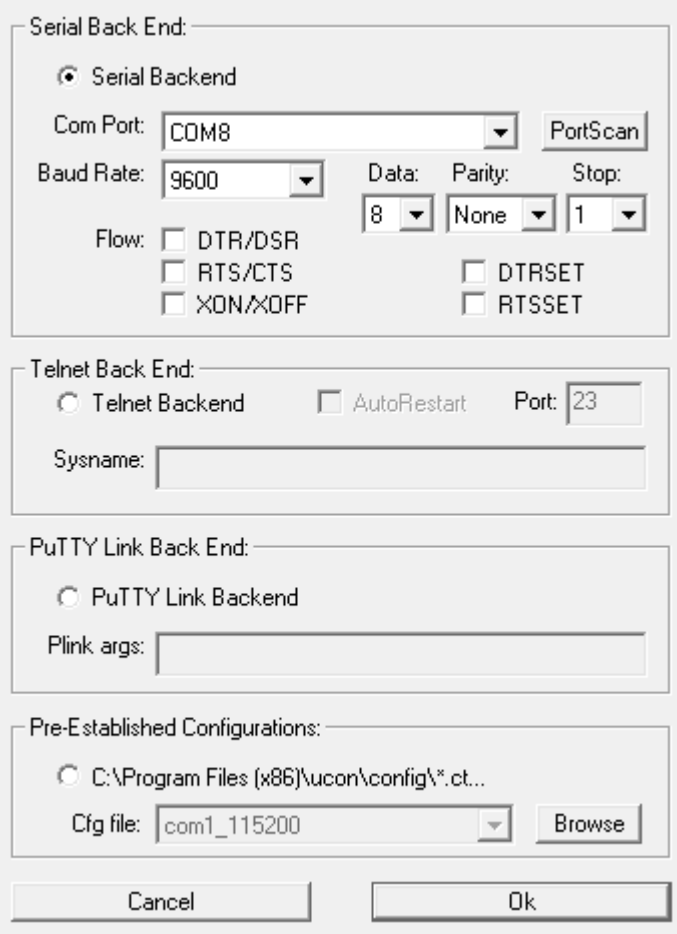
1. In the **File to be programmed into Flash** section, open the appropriate **.hex** file
2. Use the following settings:



3. Click the Open Port button
4. Move the On/Off switch to on
5. The bootloader should begin loading onto your board
6. Once this operation is complete, close the MegaUploader program and turn the On/Off switch to Off

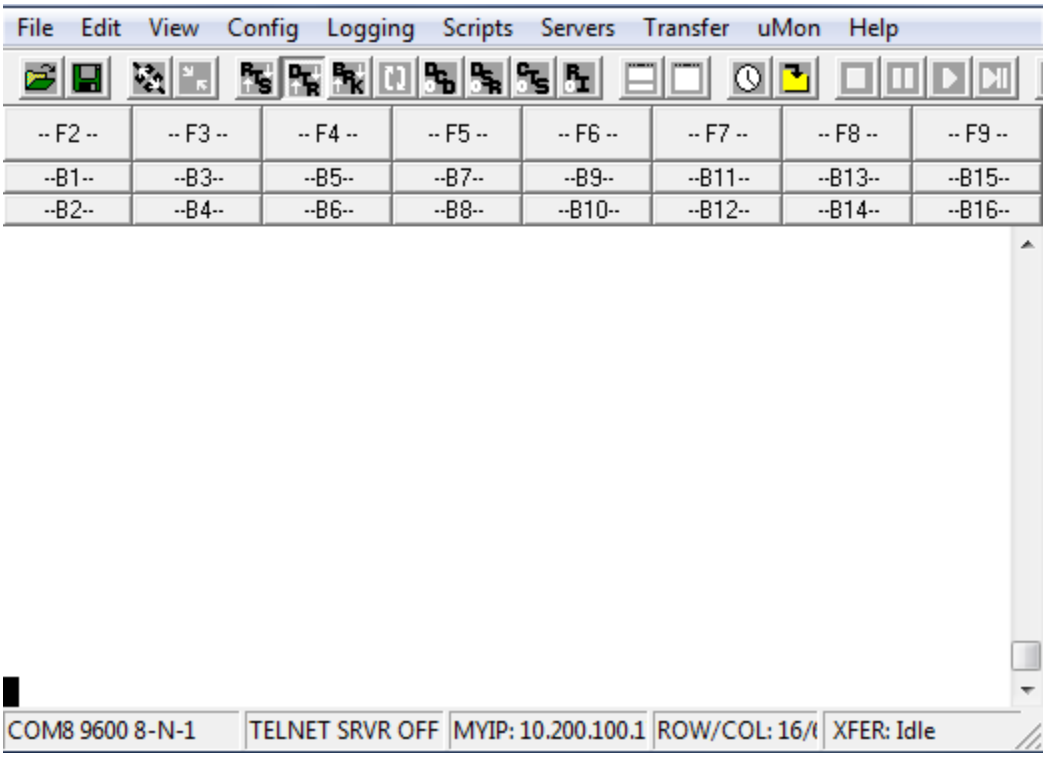
Connecting with uCon and Verifying settings

13. Download and install the uCon terminal program.
14. Start uCon, you should see this screen:

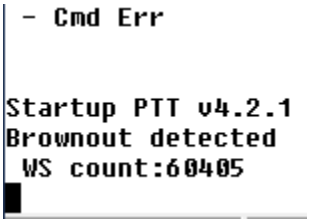


15. Change the Com port to what was seen in the device manager.
    In this case: COM4
16. Change the Baud Rate to 9600
17. If DTRSET is checked, uncheck it
18. Press OK

19. You should now see this screen:



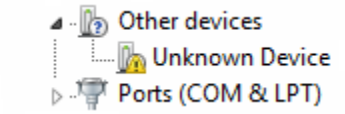
20. Change the On/Off switch to on.
21. The XMA-11K will boot up with this message:



22. Type **$et** the console will enter command mode.
23. Type **$sq** to verify your settings.
24. Type **$h** to see a full list of commands
25. Enter **$en** to resume normal operating mode

Installing the Serial to USB Driver

1. Navigate to: **Control Panel → Device Manager**
2. The Serial to USB device should be present as an unknown device:



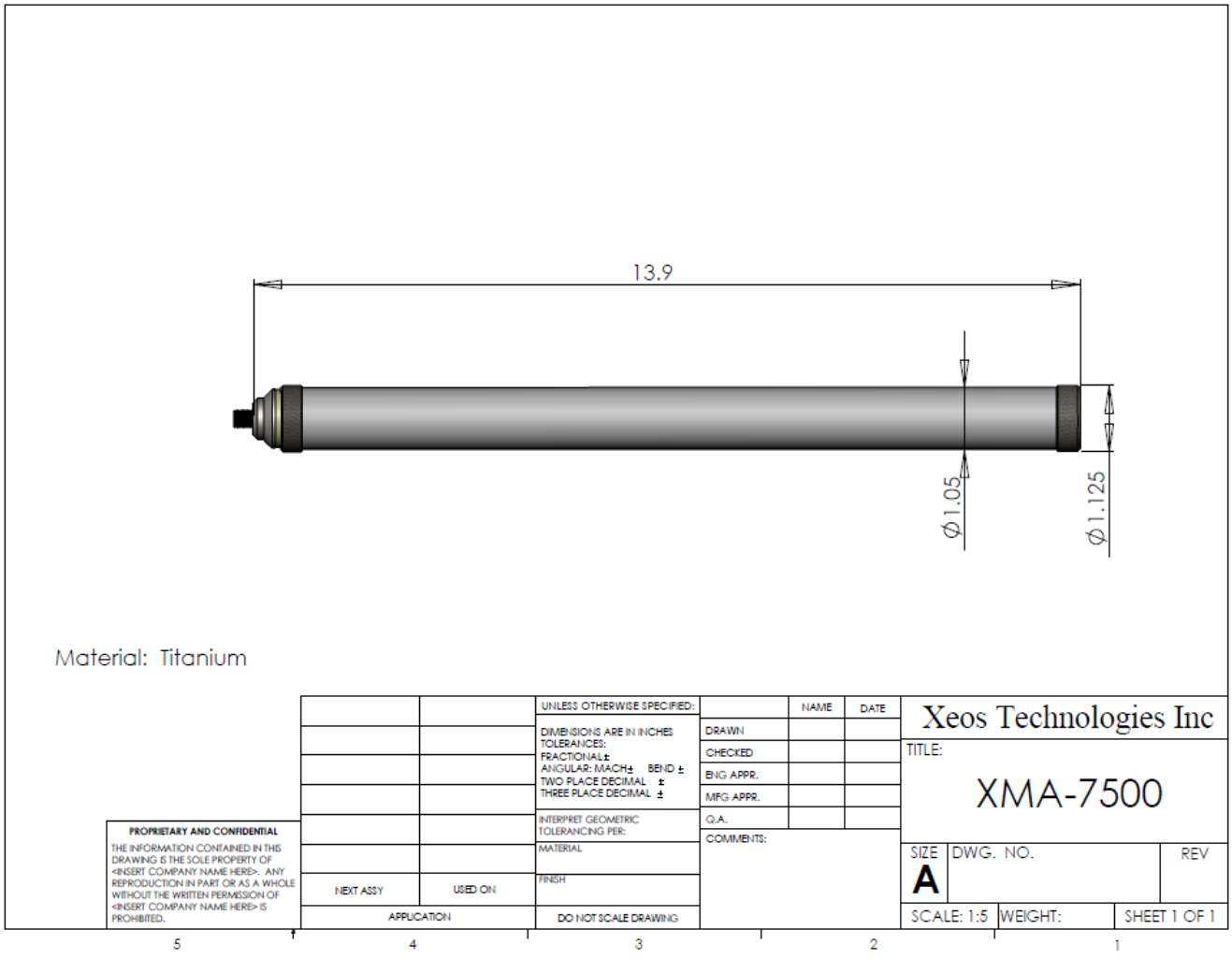
3. Right click the **Unknown Device**, select **Update Driver Software**.
4. In the new window, click **Browse my computer for driver software**.
5. Click on the **Browse** button and navigate to folder containing the Silicon Labs device driver.
6. Click **Next** and the driver should install.

Appendix B: Technical Specification – Standard

Mechanical

Material	Tube: Grade 9 Titanium
	Antenna: Stainless Steel
	Spacer: Glass
Dimensions	Length: 13.9”L x 1.125” diameter
	Diameter of tube: 1.05”
	Antenna: 7” length
Weight	Out of Water: 644g
	In Water: 431g
O-Rings	2-020 70 DURO BUNA
O-Ring Lube	Dow Corning compound

Mechanical Drawing



Appendix B: Technical Specification – Short

Mechanical

Material	Tube: Grade 9 Titanium
	Antenna: Stainless Steel
	Spacer: Glass
Dimensions	Length: 16.23”L x 1.125” diameter
	Diameter of tube: 1.05”
	Antenna: 7” length
Weight	Out of Water: 644g
	In Water: 431g
O-Rings	2-020 70 DURO BUNA
O-Ring Lube	Dow Corning compound

Appendix C: Electrical Characteristics

Power Supply

CR123A Batteries

Internal Battery Supply	7x CR123A 3 volt lithium batteries
Voltage	21 volts nominal
Capacity	1.4 Amp-hours
Life Expectancy	22 months (12 months subsurface, 10 months at surface). Based on 90 second Repetition Rate
Power Dissipation	1 Watt

AA Batteries

Internal Battery Supply	6x AA 1.5 volt batteries
Voltage	9 volts nominal
Capacity	Varies by chemistry (1.8 Ah – 3.4 Ah)
Life Expectancy	18 months (12 months subsurface, 6 months at surface). Based on 90 second Repetition Rate
Power Dissipation	1 Watt

Electronics

Digital Controller	Xeos Hammerhead
Antenna Output Impedance	50 ohms
Sleep Current	<30µA
Transmit Current	325mA @ 800mW Output
Channels	User selectable, 401.630 MHz to 401.656 MHz
Serial Interface	TTL level 9,600 baud (Firmware bootloader standard)

Appendix D: Environmental Characteristics

Operating Temperature	-30° C to +70° C (-22° F to +158° F) – chassis
	-40° C to +60° C (-40° F to +140° F) – circuit board
Storage Temperature	-50° C to +80° C (-58° F to +176° F)
Depth Rating	Submersible to 11,000 m (36,089 feet)

Appendix E: Warranty, Support and Limited Liability

Xeos Technologies Inc. warranties the Rover Beacon to be free of defects in material or manufacturing for a period of one year following delivery. Liability is limited to repair or replacement of the defective part and will be done free of charge.

LIMITED WARRANTY: Xeos Technologies Inc. warrants that the product will perform substantially in accordance with the accompanying written materials for a period of one year from the date of receipt.

CUSTOMER REMEDIES: Xeos Technologies Inc. entire liability and your exclusive remedy shall be at Xeos Technologies Inc. option, either (a) return of the price paid or (b) repair or replacement of the product that does not meet Xeos Technologies Inc. Limited Warranty and that is returned to Xeos Technologies Inc. with a copy of your receipt. This Limited Warranty is void if failure of the product has resulted from accident, abuse, or misapplication. Any replacement product will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer.

NO OTHER WARRANTIES: Xeos Technologies Inc. disclaims all other warranties, either express or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the product or the accompanying written materials. This limited warranty gives you specific legal rights. You may have others, which vary from state to state.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES: In no event shall Xeos Technologies Inc. or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of equipment, for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use this Xeos Technologies Inc. product, even if Xeos Technologies Inc. has been advised of the possibility of such damages.