



## ENGINEERING BULLETIN

Bulletin Number: 07-005

Date: 1 October, 2007

This Bulletin also applies to

Engineering Change:

Iridium Modem A3LA-D Setup

System: Xpert, XDark and 9210 Data Collection Platforms

Originator: Warren Krug [warren.krug@noaa.gov](mailto:warren.krug@noaa.gov)

Approved by MSCB on: Not Required

### Background:

There are several CO-OPS measurement sites that are unable to have telephone or wireless IP service for data retrieval or maintenance service calls. The use of Iridium modems is not intended for 6-minute PORTS<sup>®</sup>-type sampling due to the cost of each call. The modems should only be used for rebooting or changing the setups of the Data Collection Platforms. Any questions on the use of these modems should be directed to the Chief RDD in Silver Spring, MD.

The Iridium system consists of 66 satellites with 13 spares in orbit. To this date, only one of the satellites has failed. The major advantages of the Iridium system are its global scale (most other satellite systems do not cover the poles in real time, if at all) and real-time communications (this is the only LEO system with intersatellite link capabilities). Since this technology uses interlinking satellite communications, it is not necessary for the satellite receiving the data to be in view of a ground station to transmit data to the gateway\*. Iridium also provides better coverage than other LEO systems because the Iridium constellation covers the two poles as well as it does the rest of Earth (Figure 5). Most other LEO satellite constellations do not cover the poles at all, or their coverage is very limited because the satellites do not pass by the poles as frequently as they do other parts of the globe.

The Iridium system has diverse support from several government agencies, including the DOD, NOAA, and the National Data Buoy Center (NDBC) Deep-Ocean Assessment and

Reporting of Tsunamis (DART) buoys. DOD uses Iridium on a very large scale and has heavily invested because of the global, two-way, real-time data access. DOD now has its own dedicated gateway in Hawaii (separate from the commercial gateway in Arizona). NOAA/NDBC and the NWS procured 160 units for its Coastal Marine Automated Network (CMAN) and also use Iridium for ship and aircraft email. Ocean US, an interagency ocean observation organization, has supported Iridium's development within the oceanographic community, and it appears that Iridium is quickly becoming the premier LEO satellite communications system for the oceanographic community. Additional information about Iridium and other LEO system can be found in the Data communication plan at

[http://tidesandcurrents.noaa.gov/publications/Data\\_Communications\\_Plan\\_52506.pdf](http://tidesandcurrents.noaa.gov/publications/Data_Communications_Plan_52506.pdf)

The Iridium Modem discussed in this Bulletin is a model A3LA-D manufactured by NAL Research, (<http://nalresearch.com>). Iridium service is provided by World Communication Center, WCC, (<http://www.wccip.com>). The service is administered by RDD in Chesapeake, and any questions should be directed to the OSTEP program lead.

These modems must be tested and connected to an Xpert system before going out to the field. It is strongly suggested that the installing technician and the laptop that will be used in the field be involved with the testing of the unit. It is recognized that this is not always possible but every effort to do so should be taken. It is a good policy to check the field computers in the shop before any field trip. Connecting to a Xpert and testing the Xterm, Procomm or other terminal emulator software and computer connections prior to any trip helps insure a successful trip. Procomm screens are used as examples in this Bulletin.

#### Required Equipment

Iridium Modem, Model A3LA-D with security code disabled on the SIMM card

Iridium Antenna, cable and mount

Power adapter, usually attached to the Modem, includes RS-232 and power cables

RS-232 Terminal board with 9 pin flat ribbon cable if the modem is mounted outside of the Xpert

Laptop computer with Xterm and Procomm software installed. Other terminal emulator software can be used but should be tested prior to deployment.

40 watt solar panel, regulator and battery

## Section 1 Antenna and Modem Installation

1. The Iridium antenna should be mounted outside the Tide House with a clear view of the sky. An L shaped mount is provided for this task. The mount itself can be attached to the side of the Tide House or on a 1.5 inch mast using the provided U-bolts (Fig 1). No hardware is provided for mounting of the mast. A 10 meter RG-8 cable with TNC connectors on both ends is provided to connect the antenna to the modem. In some cases, the cable has N type connectors and adapters are provided for each end.



Fig 1. Antenna and mount for Iridium Modem

2. The modems require 4.5 volts DC for correct operations. A DC-DC converter is attached to the modem so the user only needs to provide 12 volts DC from a battery or other source. Standard installation calls for a 12 volt 40 amp battery with a 40 watt solar panel and regulator be used for the power source for each modem. (Fig 2)



Fig 2. A3LA-D Modem with power converter, power cables, and RS-232 cable

3. Communication to the modem is via a computer using Procomm software with the RS-232 interface set at a 19200 baud rate, 8 bits, no parity and 1 stop bit.
4. The modem can be installed inside the Xpert enclosure if space is available. If the unit is mounted outside the Xpert enclosure, the installer will need to cut the RS-232 connector off the cable and use a RS-232 terminal board and ribbon cable to make the connection to the COM port. You will need to wire all 9 pins on the board, including the shield that connects to the C terminal.

| DB9      | PC board | Wire Color |
|----------|----------|------------|
| Position | Position |            |
| 1        | 1        | Brown      |
| 2        | 2        | Red        |
| 3        | 3        | Orange     |
| 4        | 4        | Yellow     |
| 5        | 5        | Green      |
| 6        | 6        | Blue       |
| 7        | 7        | Purple     |
| 8        | 8        | Gray       |
| 9        | 9        | Black      |

Table 1 RS-232 Cable Connections

5. Some Xpert COM Ports have been setup to provide 12 VDC on pin 9, check and disable this voltage on the COM Port. The Iridium modem can be damaged if connected to a COM Port with voltage on pin 9.

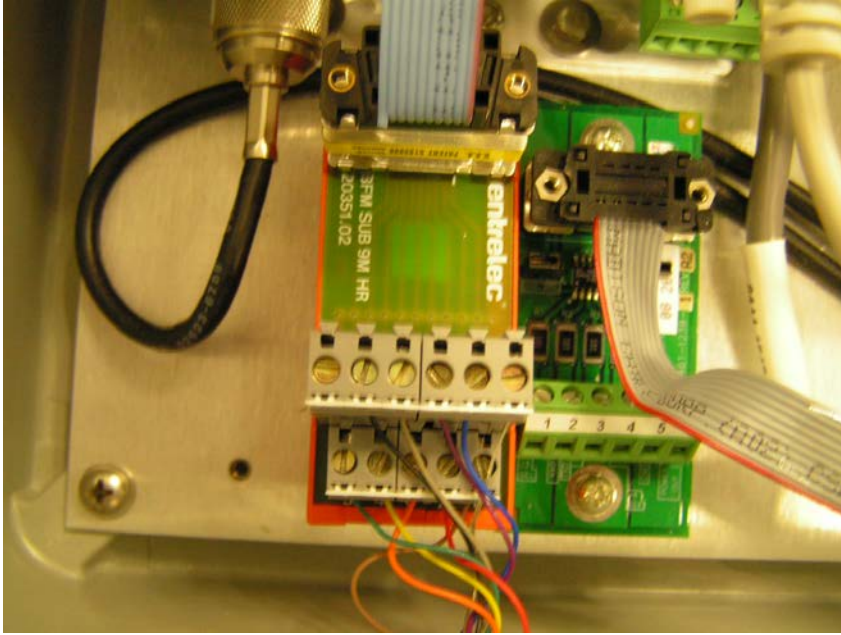


Fig 3 RS-232 Terminal Board



## Section 2 Modem Communication Testing and Setup

The modem's SIMM card has been programmed to Auto Answer on the first ring and load the correct telephone number into the unit. The next set of tests checks these setups as well as checking that the modem can receive a signal from the satellites.

1. After mounting the antenna and cable, attach the antenna cable to the TNC connector on the end of the modem. Connect the modem power leads to the power source. There is no power light or switch on the modem; the only indication will be when you communicate with the modem via Procomm. Procomm screens are used as examples in this Bulletin.
2. Connect the RS-232 cable from the modem to the computer. Start Procomm and set the system to use Direct Connect COM 1 (bottom LH of screen) using a baud rate of 19200, 8 bits, no parity and 1 stop bit as shown below. For those computers that don't have a serial port you will need to select the correct port in Procomm for the USB port that has the serial adapter. As stated above, testing this in the shop with the field computer will help make a successful trip.

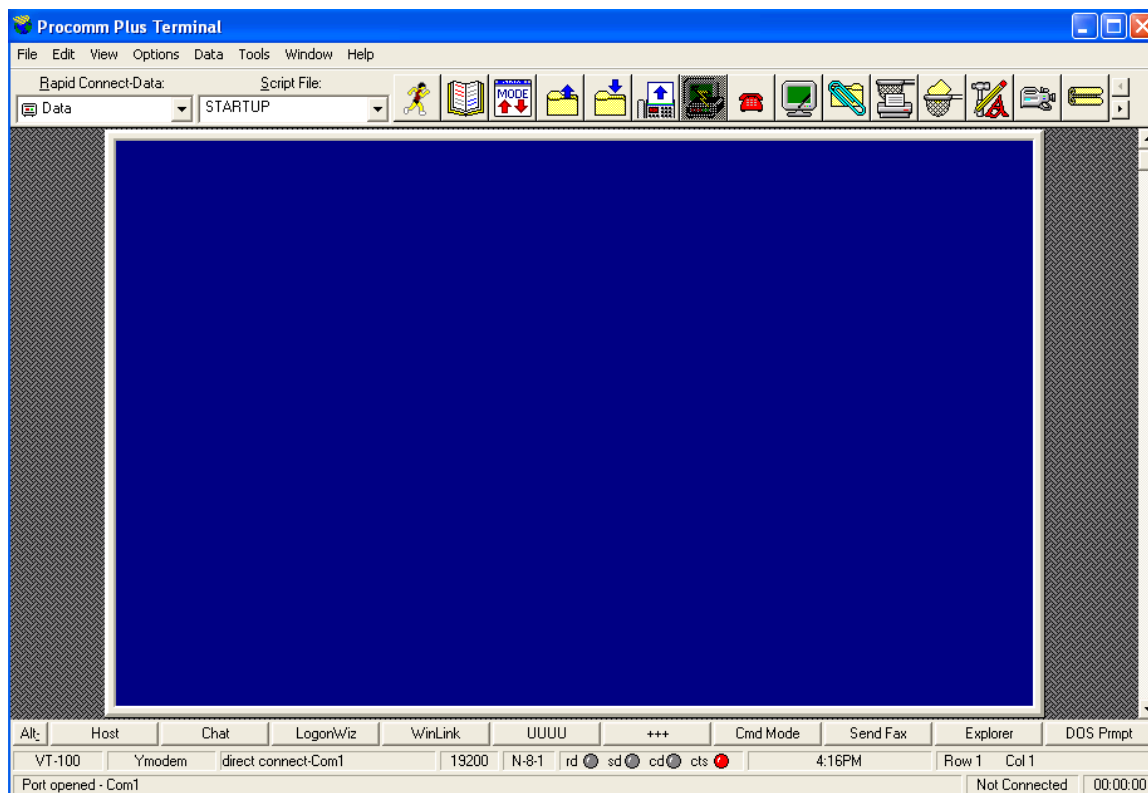


Fig 4—Procomm Terminal screen

### Section 3 Checking Communications with the Modem

1. Type: AT (*CR*) (*CR*) = Enter, upper case is not require

The modem will respond with *OK* as shown below. If you do not get the *OK* check all connections and Procomm settings. The sending of AT is to wake up the modem and tell it a command is being sent. The modem will always respond to AT with an *OK* (Fig 5).

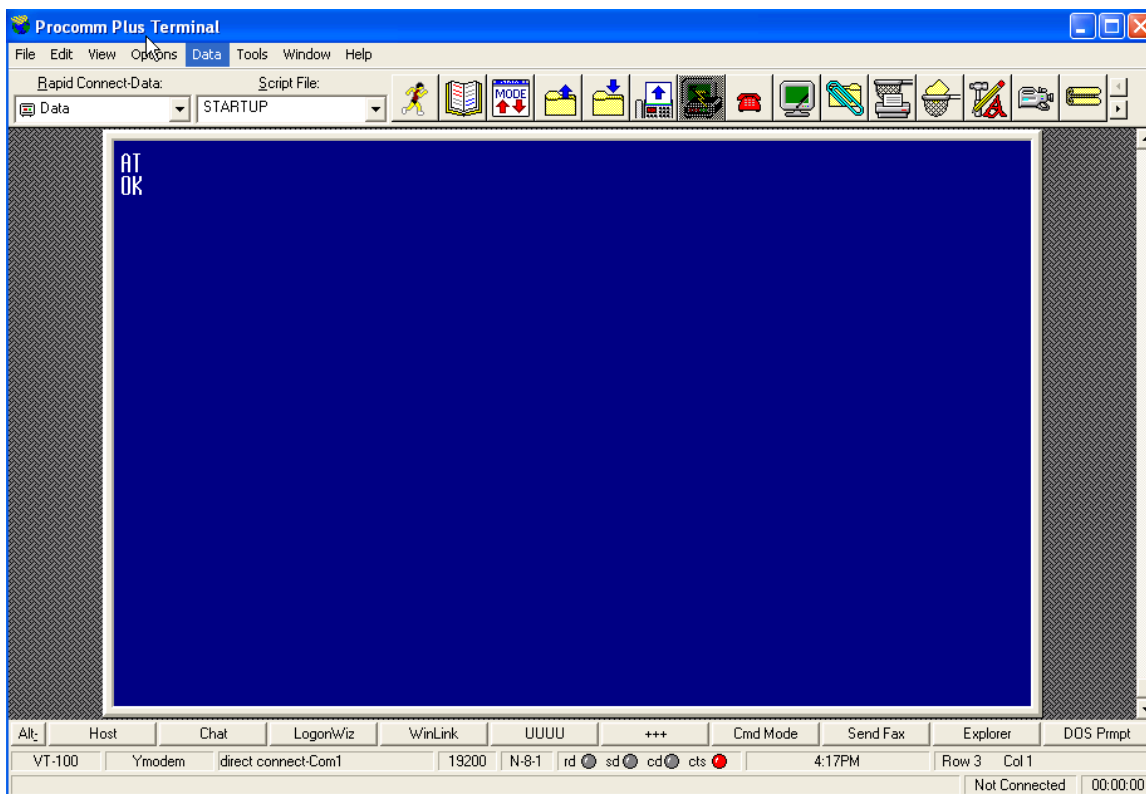


Fig 5. Procomm screen after sending the AT command

## Section 4 Testing Signal Strength

1. The modem has a built-in signal strength meter that outputs a number between 0 and 5. To check the received signal:

Type: `AT+CSQ` (*CR*)

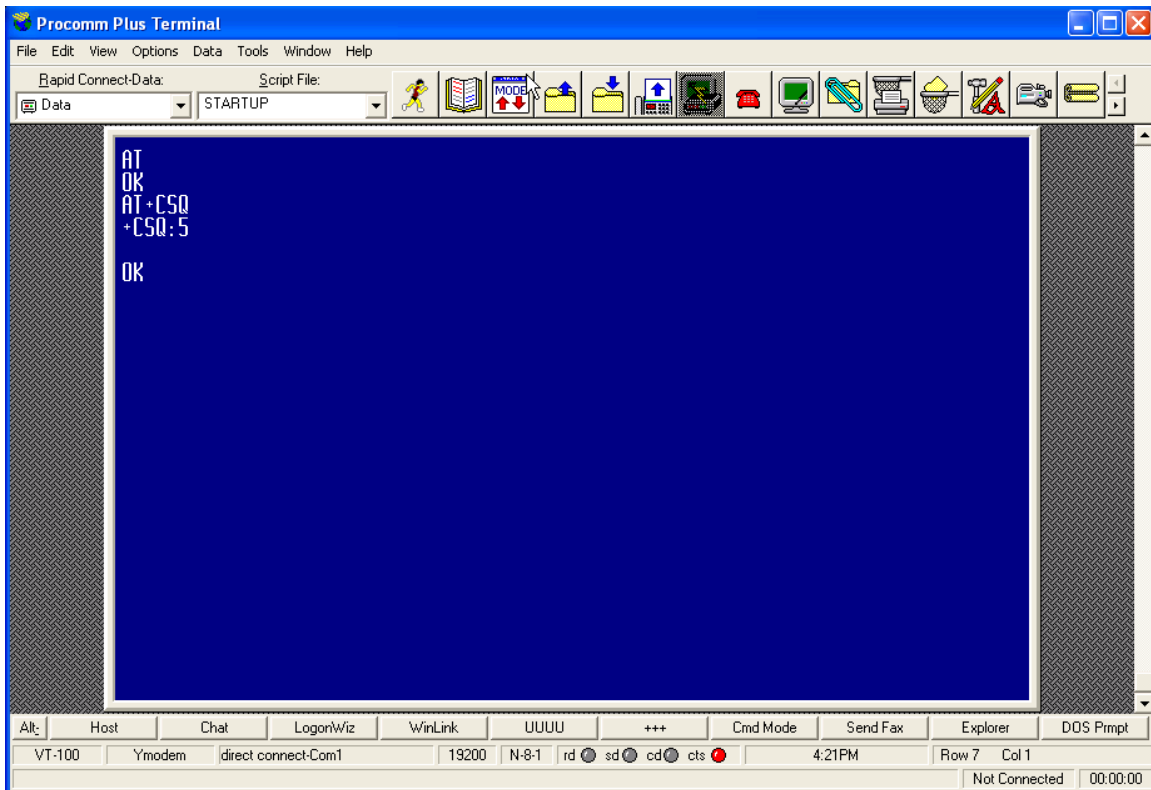


Fig 6. Procomm screen after sending the `AT+CSQ` command

The modem will respond with:

`+CSQ:5` (or some number between 0 and 5)

This is the strength of the Iridium signal. A number between 3 and 5 is good and the system will work fine. If you get a lower number, send the `AT+CSQ` command again. When the Modem receives the `AT+CSQ` command it goes out and gets the signal strength from the first satellite it sees. During normal operation it seeks out the satellite with the strongest signal before making a connection.

You may need to send the `AT+CSQ` command a few times before you get a number between 3 and 5. If you continue to receive a low number check that the antenna has a clear view of the sky and that the cable and connectors are in good order.



## Section 5 Checking Auto Answer

1. The modem must be set to *Auto Answer* any incoming call. You can check if the system is correctly programmed by typing the following:

Type: AT50? (CR)

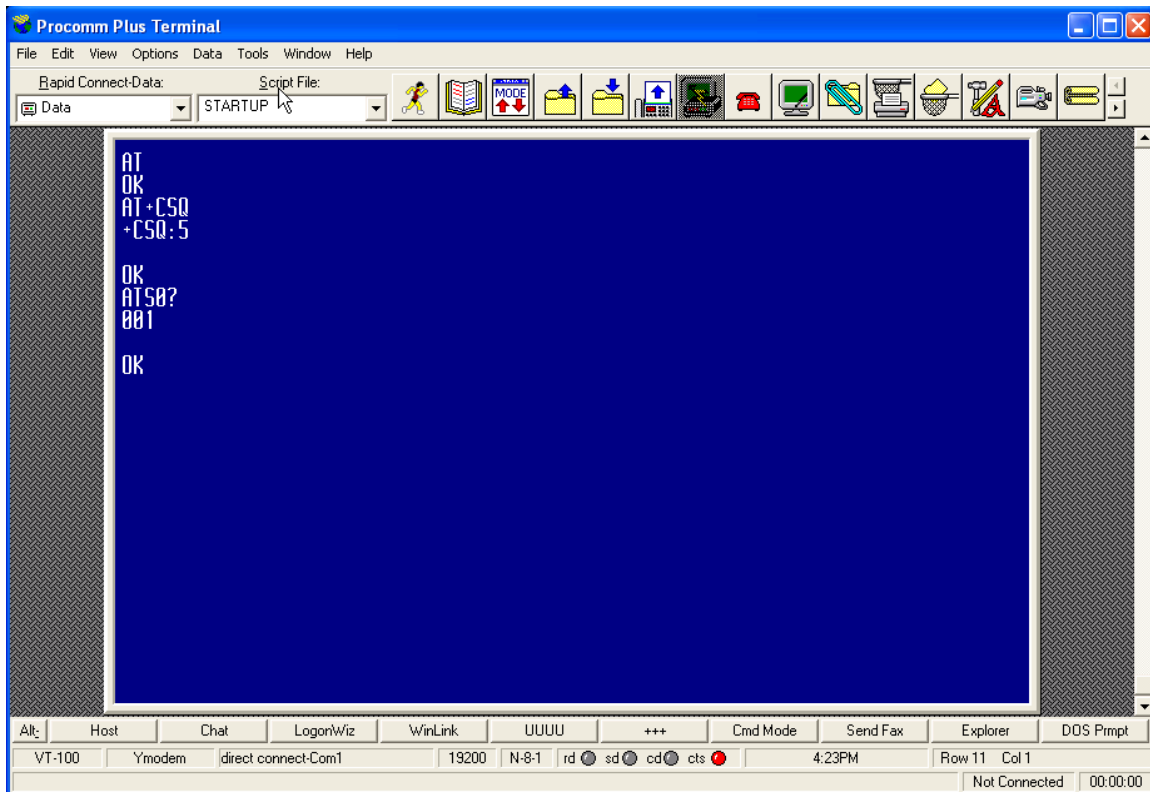


Fig 7. Procomm screen after sending the AT50 command

2. The modem will respond with a number from 000 to 010. In the case shown above (Fig 7), it responded with a 001, which is correct. If the response is 001, then skip to section 6 for the Xpert setup portion of the Bulletin (page 11).

If the modem responded with a number other than 001 for the Auto Answer, complete the remainder of this section.

3. Type: AT (CR)  
The modem will respond with an OK

Type: AT50? (CR)  
The modem will respond with the present Auto Answer number

Type: AT+V=1 (CR)  
The modem will respond with OK

Type: AT+V? (CR)  
The modem will respond with 001 and then an OK

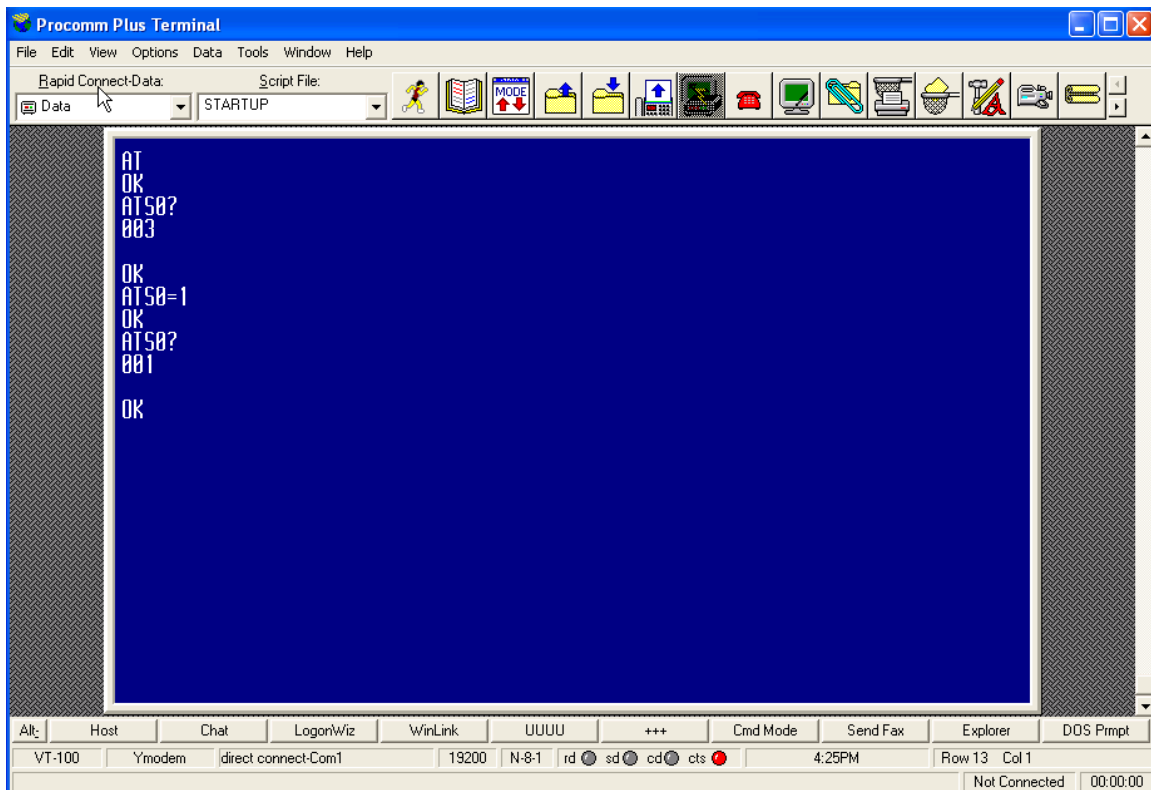


Fig 8. Procomm screen showing the Auto Answer setup

You now need to save this change in the modem setup.

1. Type: AT (CR)  
The modem will respond with an OK
2. Type: AT&W0&Y0 (CR)  
The modem will respond with an OK

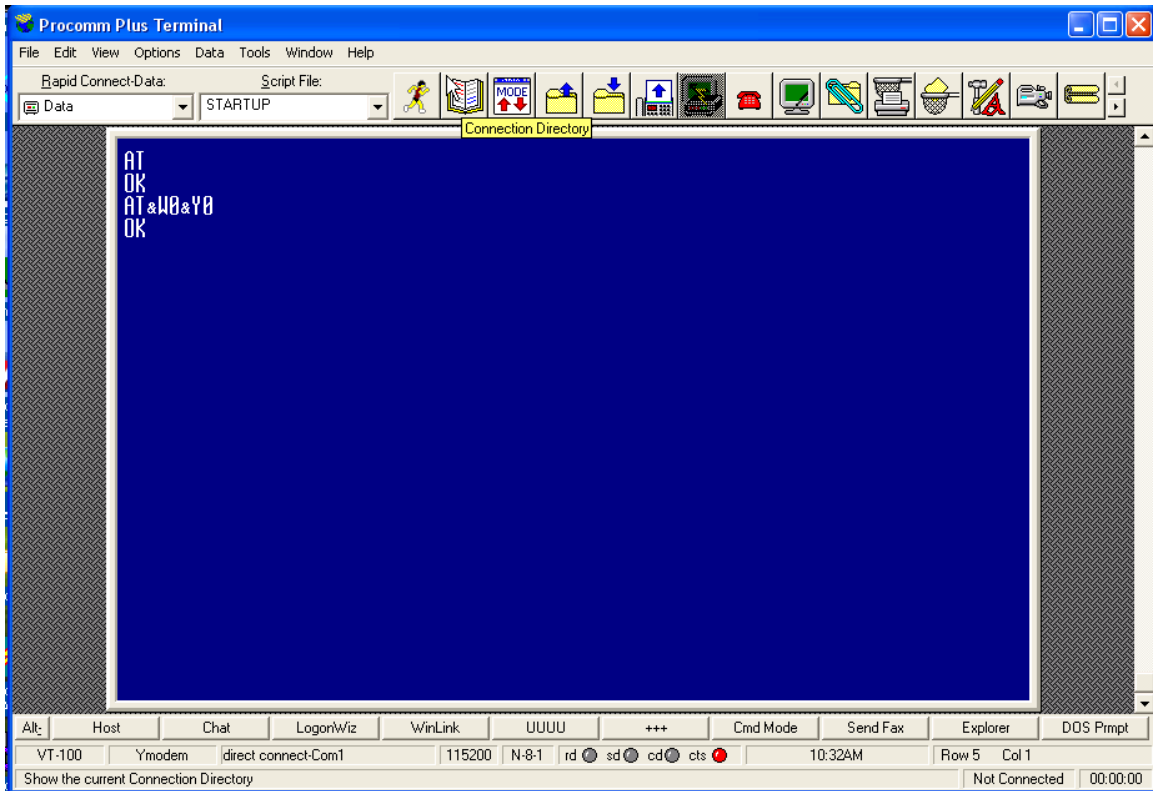


Fig 9. Procomm screen showing the saving setup command

You should check if the modem held the new settings by disconnecting it from the power source for five minutes. Reconnect the system to the power source and run the test again.

## Section 6 Xpert Setup for Using NAL A3LA-D Modem

1. Start Xterm on your computer and connect to Com 1 on the Xpert, selecting the correct COM Port on your computer and the baud rate for the Xpert. In most cases the baud rate is 115200; however, some Xpert COM1 ports are set for 9600 baud (Fig 10).

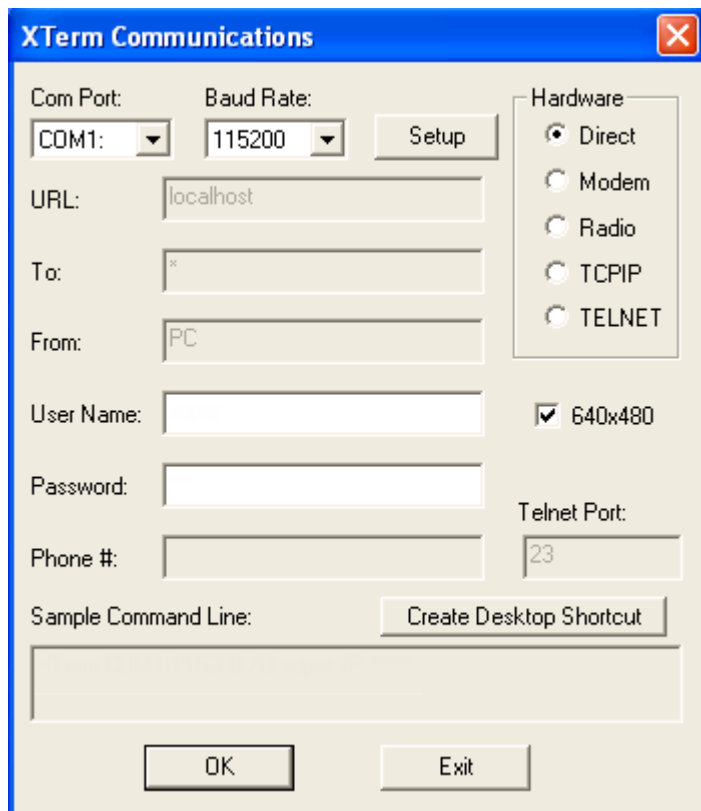


Fig 10. Xterm Startup Screen

2. Enter the User Name and Password:  
User Name: (As Required)  
Password: (As Required)
3. Press OK to connect and log into the Xpert.

You should next see the Access screen (Fig 11). If not, check the Com Port setting, the cable to the Xpert and the Baud Rate.

4. Click on *Setup Access*

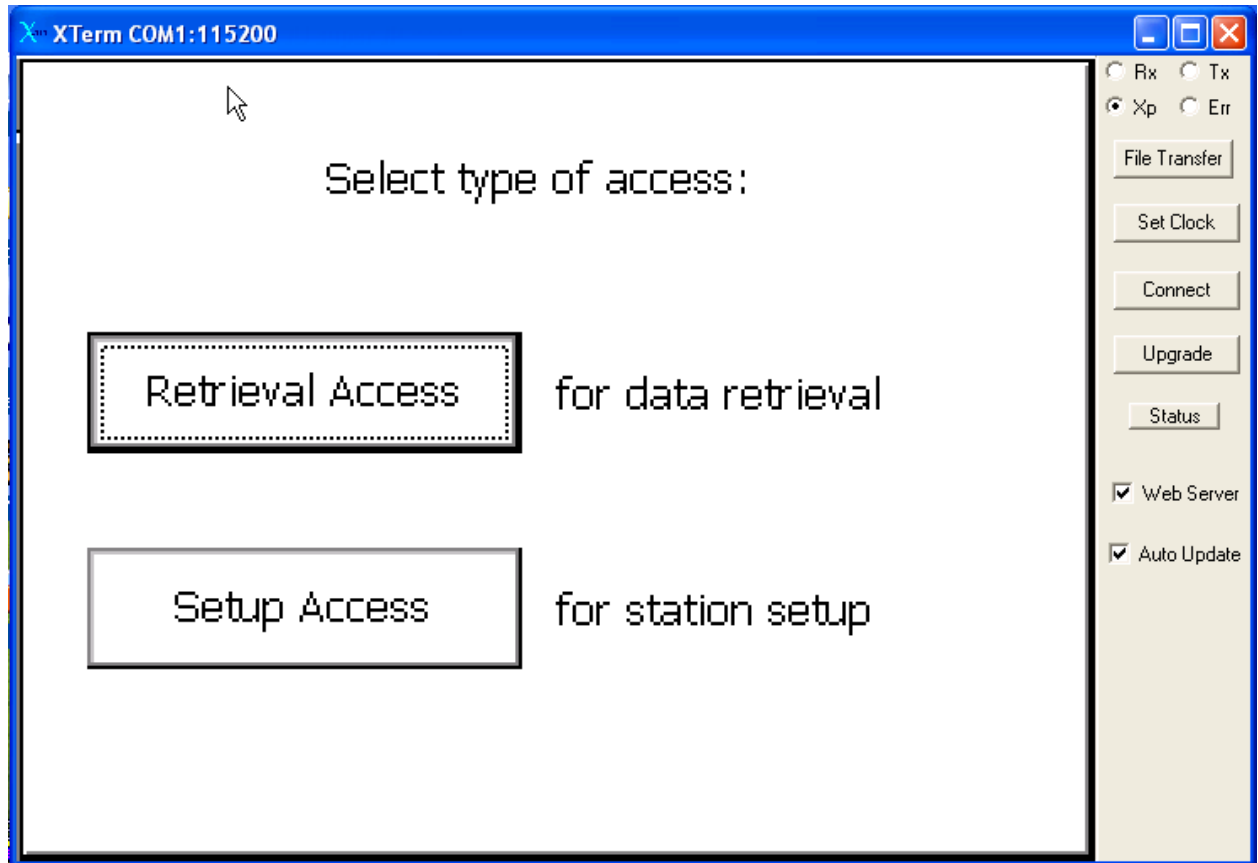


Fig 11. Xpert Access screen



5. The next screen to appear is the *Main Page* (Fig 12).

Under *Station Status* click on the *Stop* button. It may take a minute to complete this task. You are stopping the system from collecting data so that you can make changes to the setup.

The screenshot shows a software interface titled "XTerm COM1:115200". At the top, there are six tabs: "Main", "Setup", "Sensors", "Data", "Log", and "Status". The "Main" tab is currently selected. The interface is divided into several sections:

- Station Info:** Contains two input fields. The first is labeled "Date/Time:" and shows "10/09/2007 20:01:21". The second is labeled "Station name:" and shows "85754321". Both fields have a small "..." button to their right.
- Station Status:** Contains two sections. The first is labeled "Recording:" and has two buttons: "ON" and "Stop" (which is highlighted with a dashed border). The second is labeled "Alarm:" and has two buttons: "NORMAL" and "Clear".
- Battery voltage:** A section with two labels: "Ext:" followed by a box containing "13.6", and "Int: Ok".
- Logout:** A single button located at the bottom center of the main content area.

On the right side of the window, there is a vertical sidebar with several controls:

- Radio buttons for "Rx" and "Tx", and checkboxes for "Xp" (checked) and "Err".
- Buttons for "File Transfer", "Set Clock", "Connect", "Upgrade", and "Status".
- Checkboxes for "Web Server" (checked) and "Auto Update" (checked).

Fig 12. Xpert Main Page

Depending on the version of code the DCP is running, you may see a screen that is slightly different from the one above.

6. Press the *Setup* Tab to move to the *Setup* screen (Fig 13).

7. Highlight *Coms* and click *Edit...*

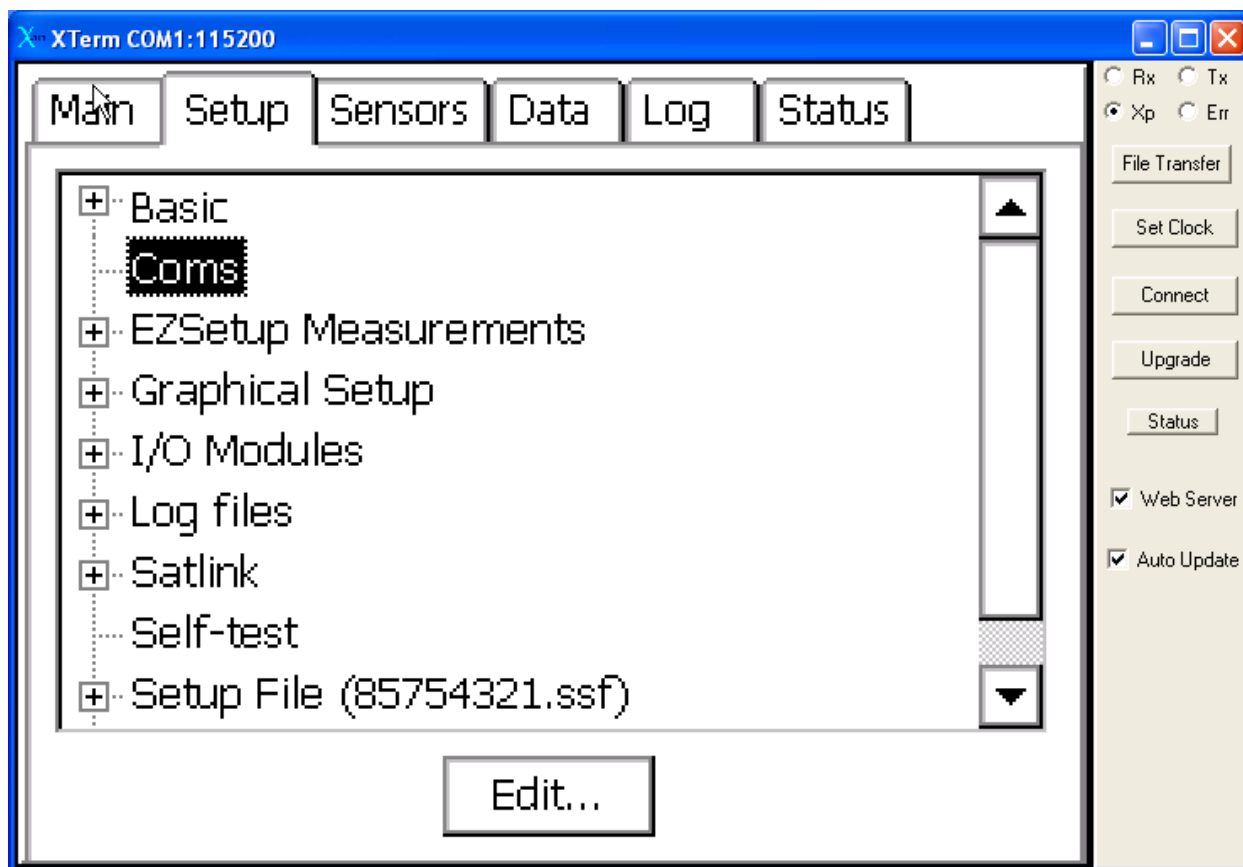


Fig 13. Xpert Setup screen

You will now see a list of all the Com ports and their setups (Fig 14). For this example, we will use Com3.

8. Go to the *Com3* line and click on the Down Arrow in the first block. A list of setting appear, click on *Modem*.

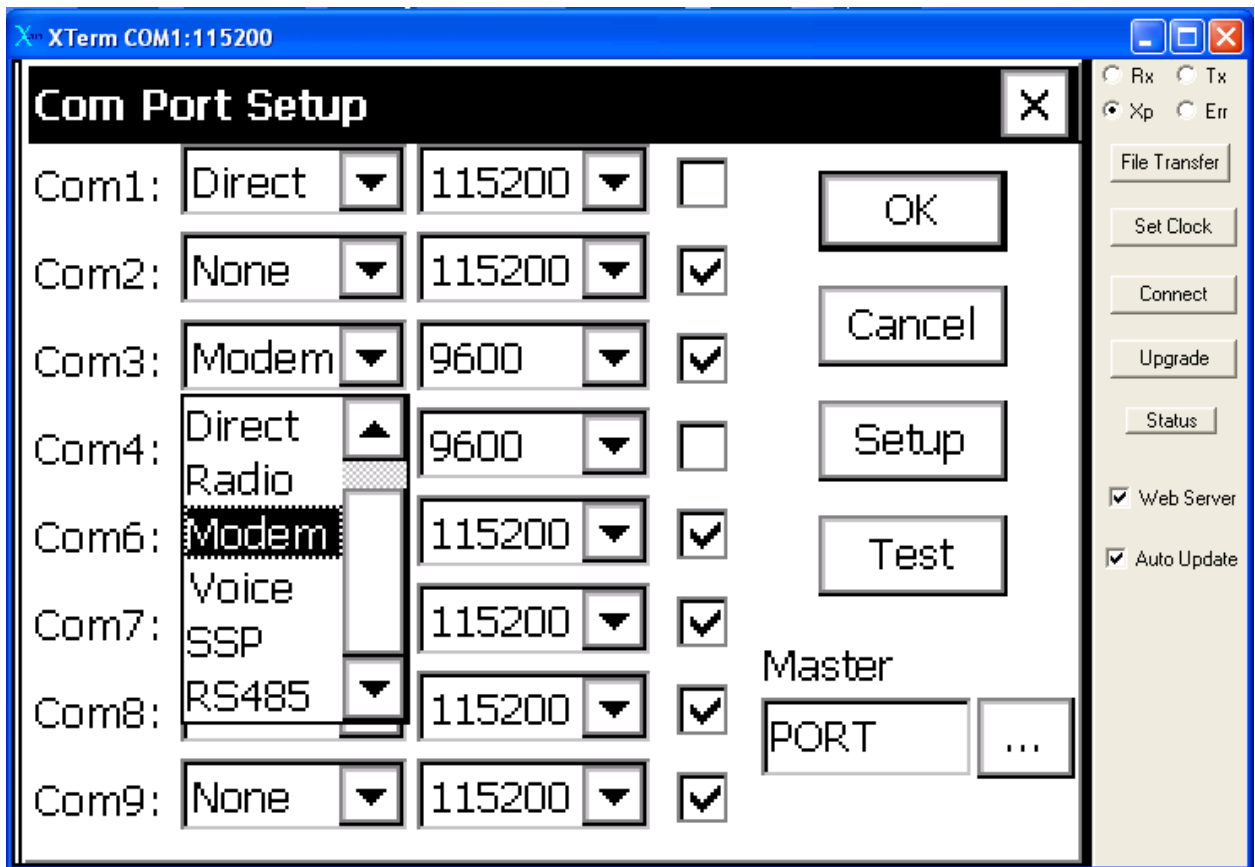


Fig 14. Xpert Com Port Setup screen

9. Go to the next block on the *Com3* line and using the Down Arrow select the baud rate of 19200 from the list (Fig 15).
10. Go the square next to the baud rate block and click on it until a “check mark” appears.

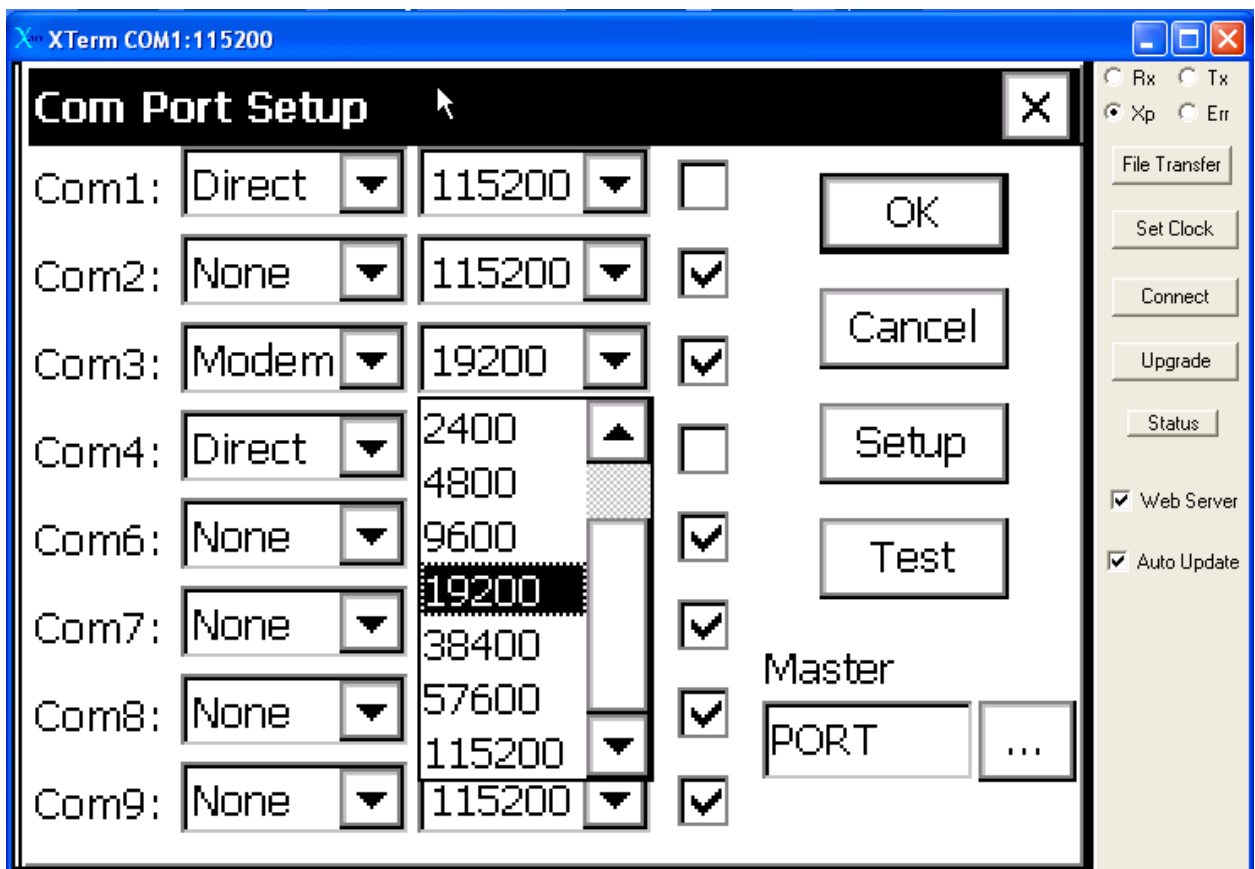


Fig 15. Xpert Com Port Setup Screen, baud rate selection

The screen should look like this (Fig 16):

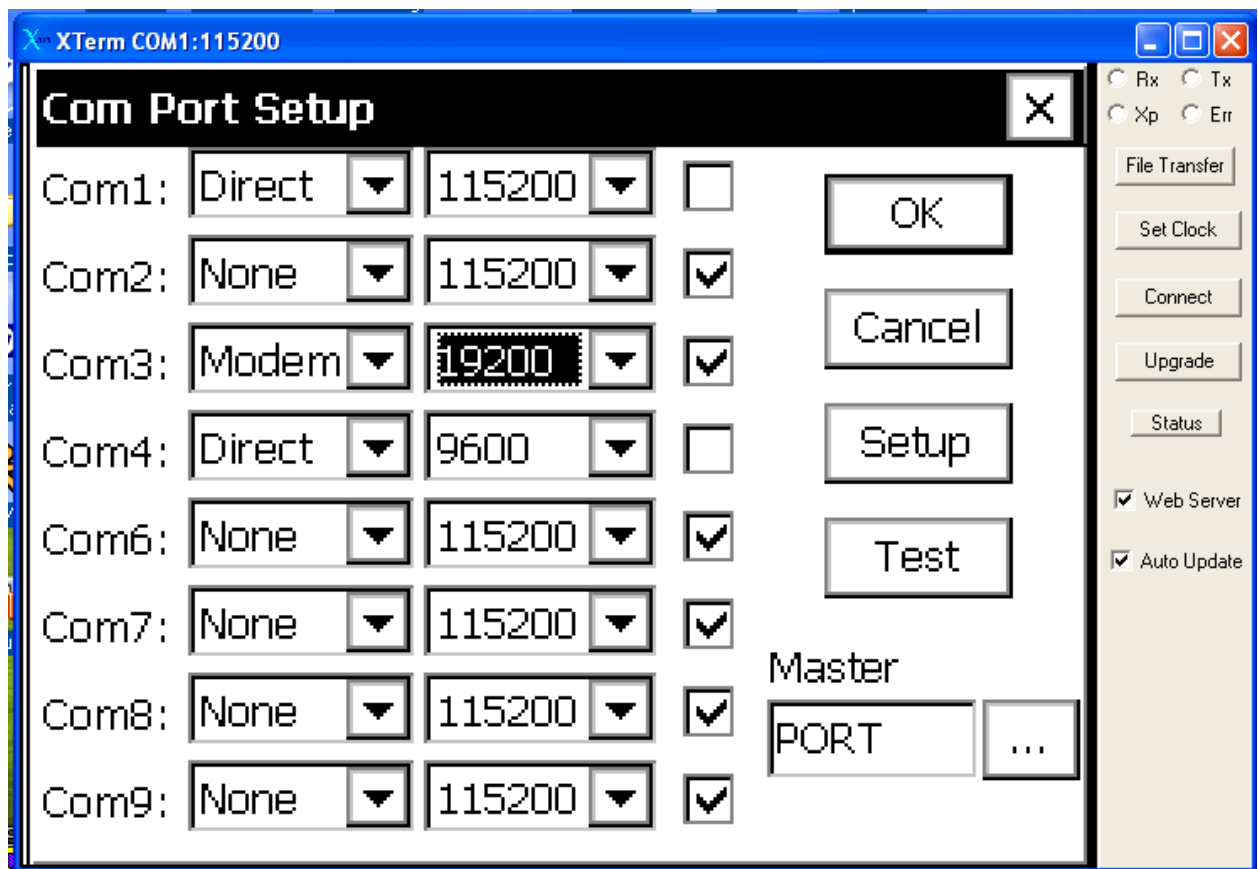


Fig 16. Xpert Com Port Setup screen after Iridium setups

11. Press the *OK* button to exit the COM Port Setup screen.



You are now back at the *Setup* Screen (Fig 17).

12. Press the *Main* Tab to get to the Main Menu.

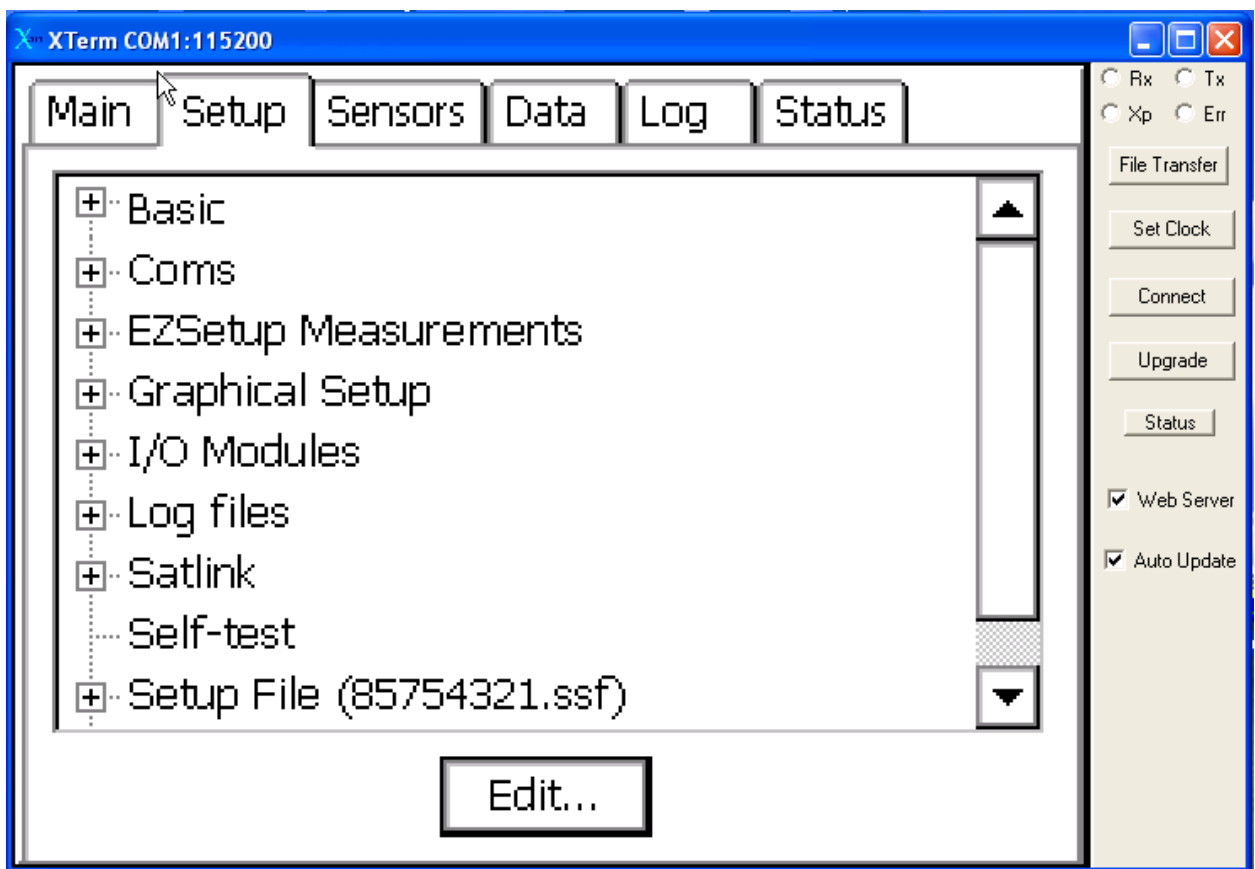


Fig 17. Xpert Setup screen

13. Under the *Station Status* section press the *Start* button (Fig 18). The system will now save the changes that you have made and start the recording of data.

14. Press *Logout* to exit the system.

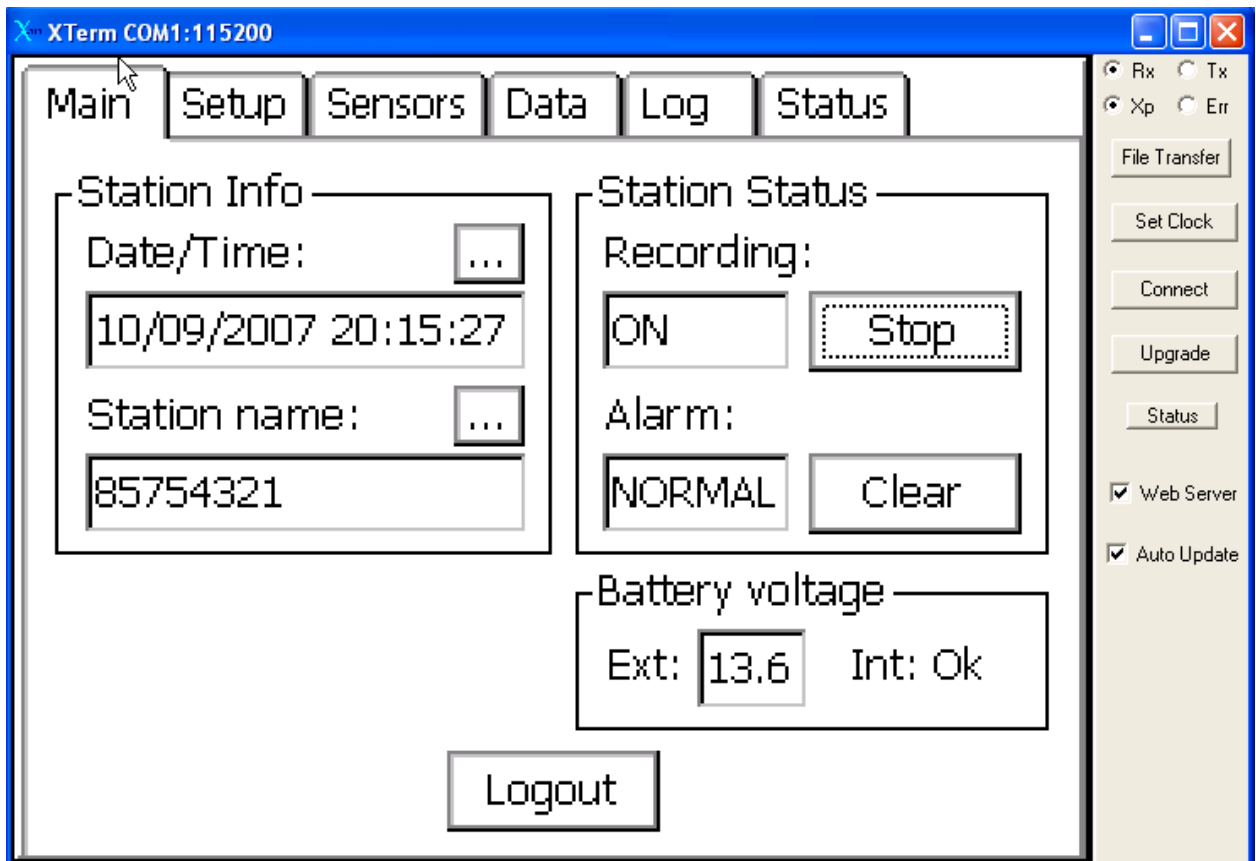


Fig 18. Xpert Main Page

15. You should now call the office and have the shop test the system by logging into the Xpert via the Iridium Modem.

16. Make sure you record the model and serial number of the modem on the station site report along with information regarding the antenna and power source.