skypatrol™

TT8750+ Users Guide: TT8750

TT8750+
User Guide

Revision 2.01

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Revision History

Version	Primary Author(s)	Description of Version	Date Completed
2.00	Flor Hernandez	Initial revision.	04/08/2012
2.01	Erik Ordonez	Formats	04/23/2012

Table of Contents

Objective

The objective of this document is to provide the user with basic information on how to configure the SkyPatrol TT8750+ and verify communication with UDP API test server.

Equipment Needed

In this example the requirements are:

- SkyPatrol TT8750+
- SkyPatrol Serial / Power cable
- Power supply, 12 VDC, 2A
- Computer with one available USB port
- GSM/GPRS SIM with GPRS data enabled.
- APN (Access Point Name).
- Username and Password, if GPRS is operating on a non-transparent network.

Note: *If you don't know the name of the APN you need to use, please contact your cellular network carrier for that information.*

References

Configuration Recommendation

The SkyPatrol Mobile Tracker family of products is designed with features to support a robust connection with the network. However, there can be conditions when the connection to the network or the ability to transfer data across the network is beyond the control of the device alone.

For installations that require maximum connectivity, we strongly recommend implementing choices 1 AND 3:

i. Insure that the ignition wire is connected to a switched ignition source.

ii. Use the PING option of the AT-Command AT$TTNETWD, to verify end to end connectivity.

iii. Use type 25 (ACKED) messages instead of type 20 UDP messages, to verify end-to-end connectivity.

Using option 3 will increase the data rates of the end user because of the transmission retries. The ACK message is 5 bytes plus the IP header plus the Ethernet frame, which is a total of 63 bytes.

Procedures

SkyPatrol TT8750+ Panel Descriptions

1. Front View

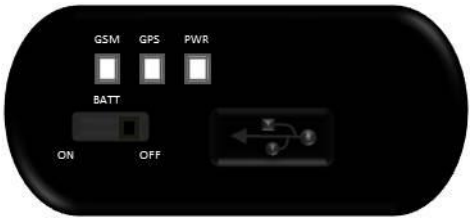


Figure 1 – SkyPatrol TT8750+ Front View

2. Rear View

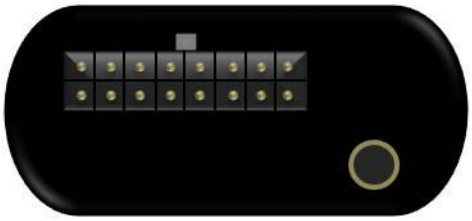


Figure 2 – SkyPatrol TT8750+ Rear View

Battery Specifications

The SkyPatrol TT8750+ uses power either from the vehicle battery, or from an optional internal battery.

The battery specifications are as follows:

Nominal voltage:	3.7 VDC
Nominal Capacity:	250 mAH
Single cell size:	4.8mm(H) x 20.5mm (W) x 31mm(L)

The features of the battery include the following:

- No memory effect
- Reliable service life
- Long-lasting performance
- No leakage and no explosion

Installation

Instructions provided in this section describe the hardware installation of the SkyPatrol TT8750+ device. To install the SkyPatrol TT8750+ in a vehicle, follow these steps:

- Choose a convenient location in the vehicle – either in the trunk or interior of a vehicle. Avoid locations that might expose the device to excessive heat or moisture.
- The SkyPatrol TT8750+ doesn't have drilled holes so in order to secure it, is necessary to fasten it with tie wrap.
- It is possible to mount the SkyPatrol TT8750+ plastic mounting rails with tie-downs.

The SkyPatrol TT8750+ is **NOT** a waterproof or sealed device. Care must be taken to ensure the device is kept away from water or any other liquids.

Installing Cables

During installation, the following precautions will help ensure proper operation of the SkyPatrol TT8750+

- Remove power from the SkyPatrol TT8750+.
- Do not create loops, sharp bends or crimps in the cables
- All cables should be attached to the vehicle and equipment in such a way to reduce stress or wear caused by vibration generated by moving vehicles.
- Use proper terminations on all power cables

Main Connector (16) Pin

The user can purchase the sixteen (16) pin external I/O connector for the SkyPatrol TT8750+ that can be used to interface with other devices. Table 1 describes the pin functionality for this 16 pin I/O connector. Pins that are not planned for usage can be left open without anything connected to them.

Pin Number	Functionality	COMMENT
Pin – 1	MICP	Single end, 2-2.2k microphone, internal bias
Pin – 2	AGND	Analog ground
Pin – 3	IGN	Ignition input, positive trigger
Pin – 4	RXD	UART RXD, RS232
Pin – 5	TXD	UART TXD, RS232
Pin – 6	GND	Power and digital ground
Pin – 7	OUT 3	Open drain, 150mA max
Pin – 8	OUT 2	Open drain, 150mA max
Pin – 9	EARNP	Differential output, 32ohm 1/4w speaker
Pin – 10	EARN	
Pin – 11	PWR	External DC power input, 8-32V
Pin – 12	IN 2	Digital input, negative trigger
Pin – 13	IN 1	Digital input, negative trigger
Pin – 14	OUT 1	Open drain, 150mA max ,with latch circuit
Pin – 15	AD1	Analog input 0 - 16.8v
Pin – 16	AD2	Analog input 0 -16.8v

Table 1 - 16 pin I/O Connector Interface

GPIO Table

Signal Name	Description	Notes
GPIO - 1	IN 1	PIN 13
GPIO - 2	IN 2	PIN 12
GPIO - 3	OUT 1	PIN 14
GPIO - 4	IN 3	Main power detection
GPIO - 5	OUT 2	PIN 8
GPIO - 6	OUT 3	PIN7
GPIO - 7	GSM LED	
GPIO - 8	GPS LED	
GPIO - 9	IGN	PIN 3

Table 2 – GPIO table

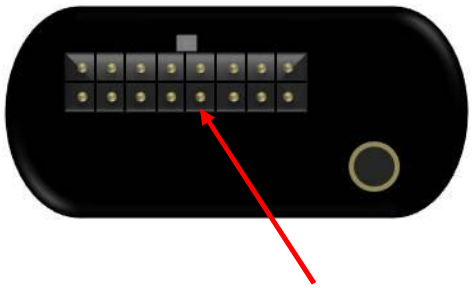


Figure 3 - I/O Connector

SkyPatrol TT8750+ Cables and Connections

SkyPatrol TT8750+ Serial Adapter (Optional)

SkyPatrol TT8750+ programming cable provides mini USB serial interface and power to the unit. The cable would be used for loading new software onto the SkyPatrol TT8750+ and configuration of the device.

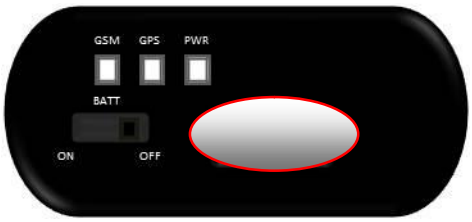


Figure 4 - USB Connection

Connecting the GPS External Antenna

The GPS external antenna must be placed in an area where it can have direct view of the sky.
Install the GPS antenna to the GPS connector on the SkyPatrol TT8750+ modem screwing the antenna into the antenna connector.

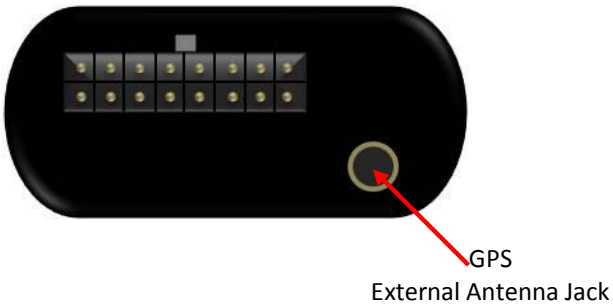


Figure 5 – GPS External Antenna Jack

Inserting the SIM

Insert the SIM per the Following Procedure:

Note: *The SIM card is not provided with the SkyPatrol TT8750+ device. The SIM must be obtained from the GSM/GPRS service provider and must be provisioned by the operator for data and/or voice. Always take care to protect the SIM.*

The SIM Lock Switch is used to ensure the SIM remains in position.

1. Open the Sim holder by sliding it horizontally, gently lift it.
2. Insert the SIM card into the SIM slot with the notch up and facing toward the left side of the SkyPatrol TT8750+.

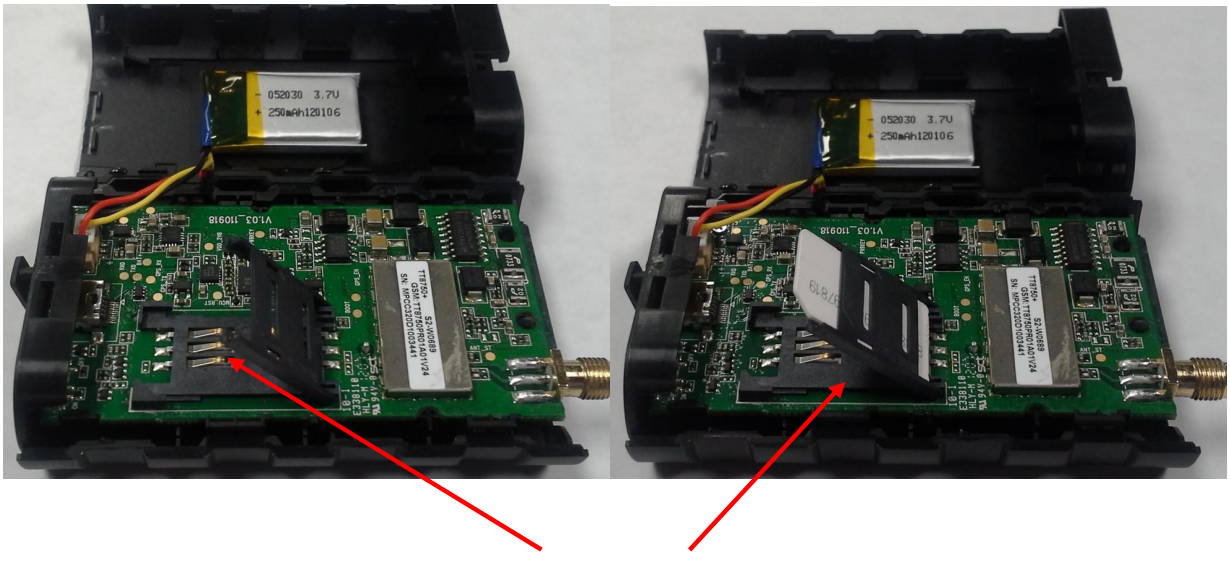


Figure 6 – SIM Slot

3. Slide the SIM Lock Door upwards to lock the SIM into the holder.

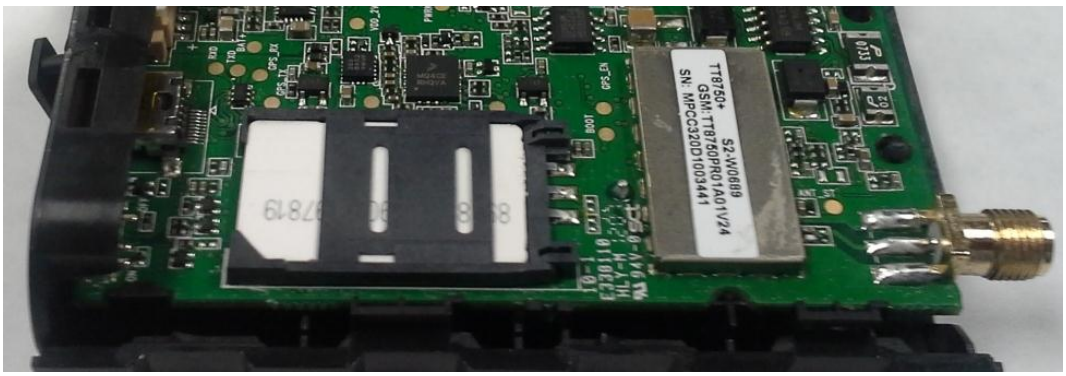


Figure 7 – SIM holder

Install the power cable as described in the following procedure:

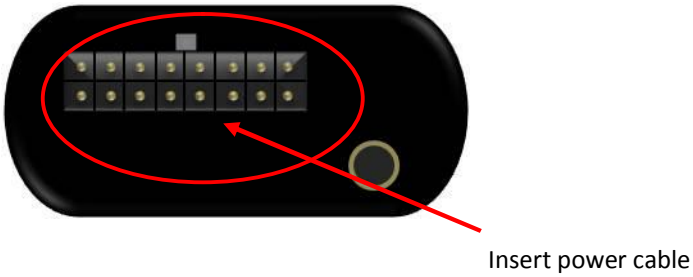


Figure 8 – Power Cable

1. Hook up the SkyPatrol TT8750+ to 8 - 32 VDC power source and apply power.
2. The **User 1 LED** (red) should start blinking.
3. Once the SkyPatrol TT8750+ attaches to the GSM network, the GSM **LED** (green) should go solid. If the **GSM LED** stays blinking, then there is a problem with the SIM or cellular reception.
4. Once the SkyPatrol TT8750+ acquires a GPS fix, the **GPS LED** (blue) will be solid red.

Connecting the Power Source

The GSM/GPRS SkyPatrol TT8750+ has an input voltage range of 8 – 32 V DC. The power and ignition pins can support 8 – 32 V DC input voltage. The user has an option to connect these wires depending on

the desired functionality. Described below are the desired functionality and their associated wire connecting procedure:

Use of the device outside of the specified voltage range may result in damage to the device and/or undesirable results.

Please follow the specifications as listed in the table below. SkyPatrol is not liable for damage to the SkyPatrol TT8750+ caused due to user error.

The SkyPatrol TT8750+ is designed to operate from 8 to 32 VDC. The user is responsible for ensuring the voltage supplied to the SkyPatrol TT8750+ remains in this voltage range to include transient voltage spikes and load dump voltages. Failure to comply with this warning may result in damage to the SkyPatrol TT8750+.

- Connect the power and ground wires of the SkyPatrol TT8750+ to the vehicle battery leads. The SkyPatrol TT8750+ will always remain ON as long as the vehicle battery lasts.
- The SkyPatrol TT8750+ will be non-operational when the input voltage and current requirements are not met (vehicle battery drains) unless the unit is equipped with a battery.
- Connect the Ignition wire to a switched source that receives positive voltage when the ignition is on.

LED Operation

The SkyPatrol TT8750+ has three LED's on its front panel.

Power LED display:

- LED ON when power line connected to the device or the internal battery is working
- LED OFF when the device is disconnected from the unit

Registration LED display (GSM):

- LED OFF when unit is not registered or not trying to register or the unit has no power
- LED blinking when unit is trying to register with the network
- LED solid ON when GSM is connected

GPS Fix LED display (GPS):

- LED OFF when a GPS fix has not been acquired
- LED solid ON when GPS fix has been acquired

The LED's on the SkyPatrol TT8750+ are controlled by the function processing capability provided in the AT command structure.

Configure the Computer and Verify Correct Communications

Note: *The following examples use Windows 2007, and HyperTerminal. Please note that HyperTerminal is not included with the Windows Vista operating system. Any terminal program should work, using the parameters in Step 1.*

1. Default Serial Parameters

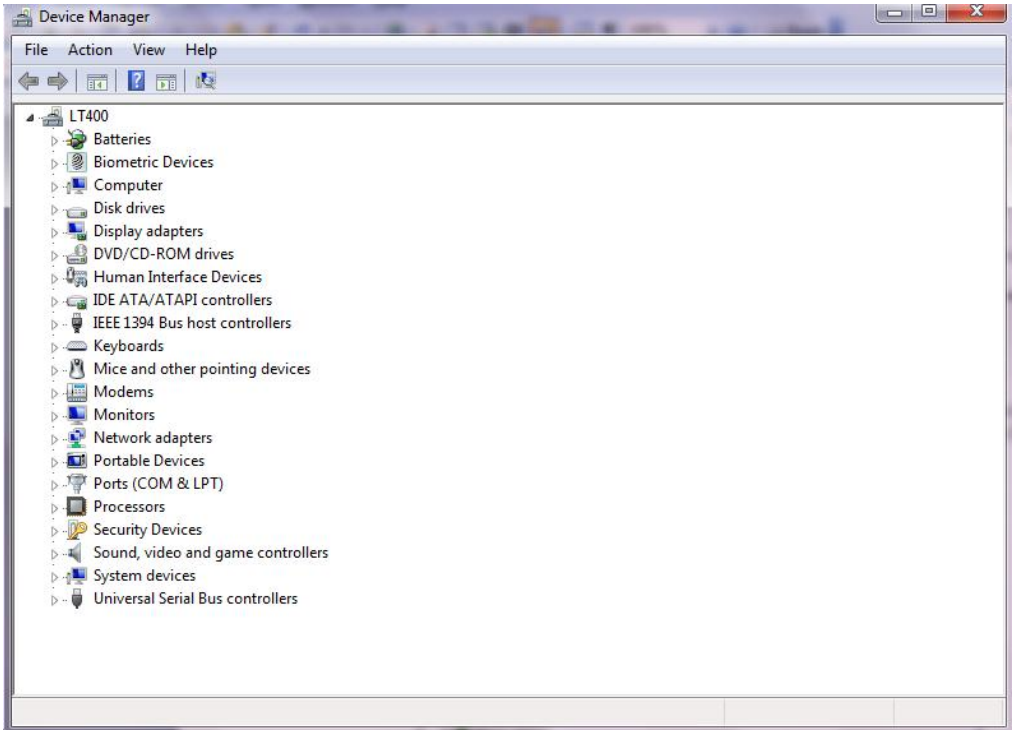
   a) 115200 baud rate
   b) 8 data bits
   c) 1 stop bit
   d) No Parity
   e) Flow Control = None

2. Determine which Com port to use

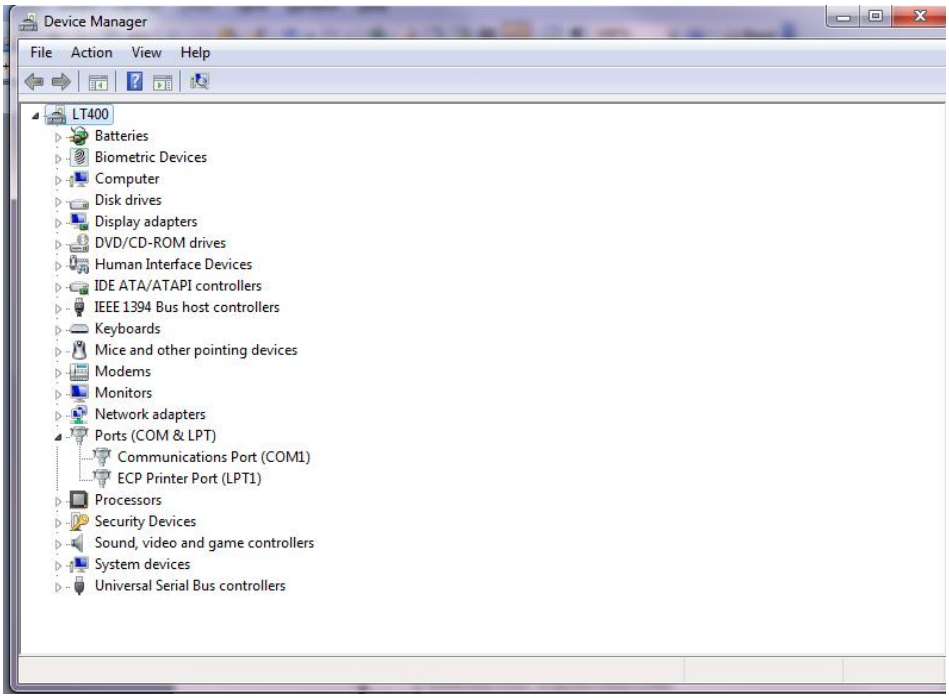
   a) With the USB port, you will need to determine which Com port it is installed on.

Note: *If the USB-to-serial converter has not been installed, install the necessary drivers. Then leave the device unplugged*.

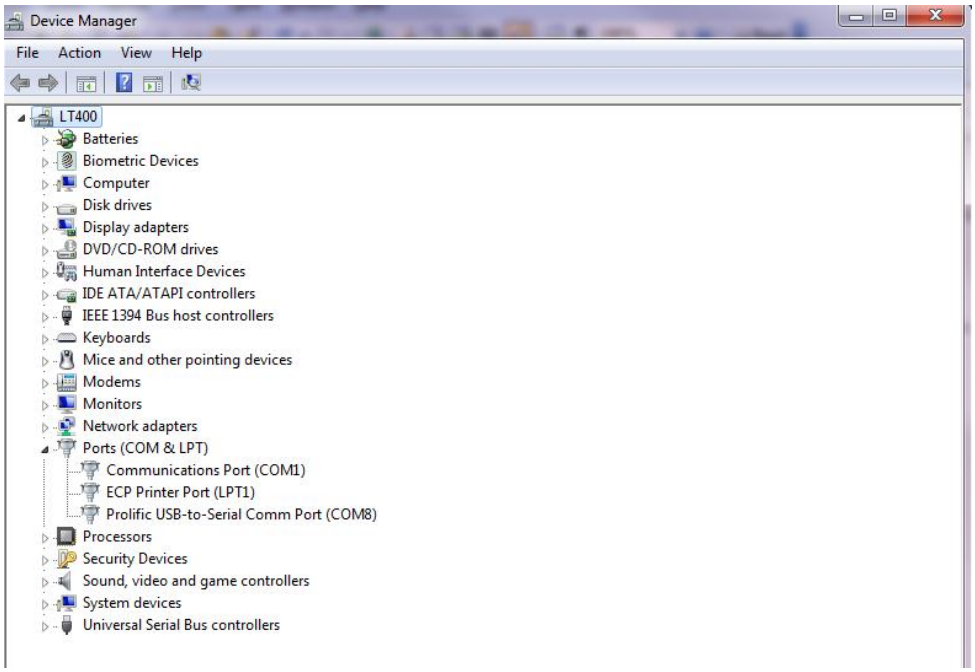
b) Open up the Device Manager window. This is done through the Control Panel: System or right-click on Computer and select Properties. Select the Device Manager link. On Windows vista and newest Windows editions the screen looks like the following:



c) Expand the Ports section by selecting the + sign beside Ports. Your window should look like the following:



d) Plug in the USB-to-Serial converter. The window should change to show the USB-to-Serial converter installed.



e) Most devices will show the Com port next to the device name. Record this number. In this case, it is COM8.

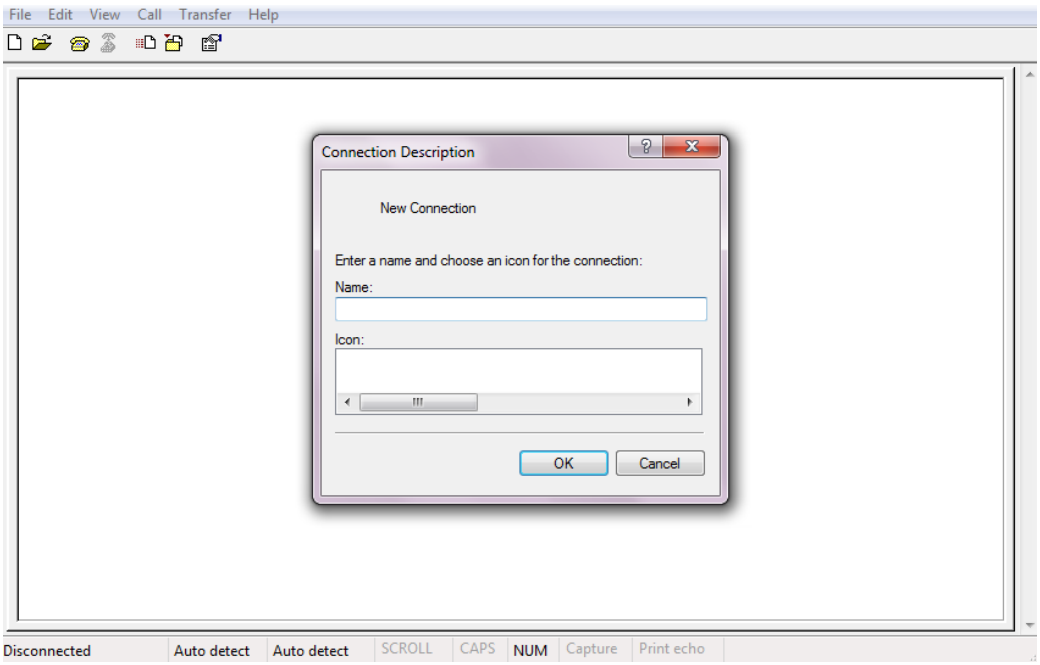
Note: *Make sure there is no "!" or "X" next to the USB device. If you see an "!" or an "X," the device is not properly installed and will not work.*

3. Start **HyperTerminal**

You can copy Hyperterminal from a Wnidows 2000 and XP. You just need to copy the hypertrm.exe and the hypertrm.dll in the same Folder.

Run the program Hyperterminal.

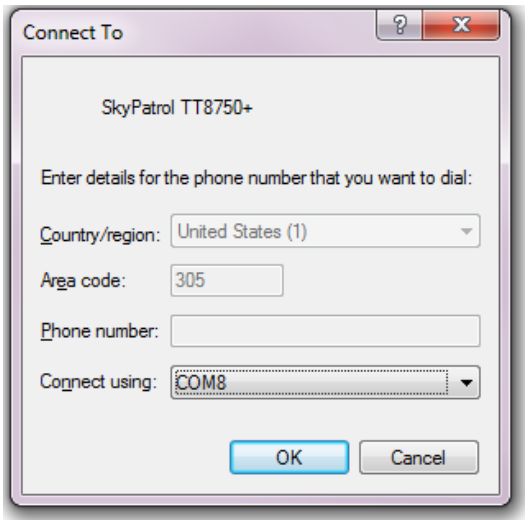
a) You should see the following screen.



b) Enter a name for the Connection. In this example, the Name is SkyPatrol TT8750+.

c) Click OK.

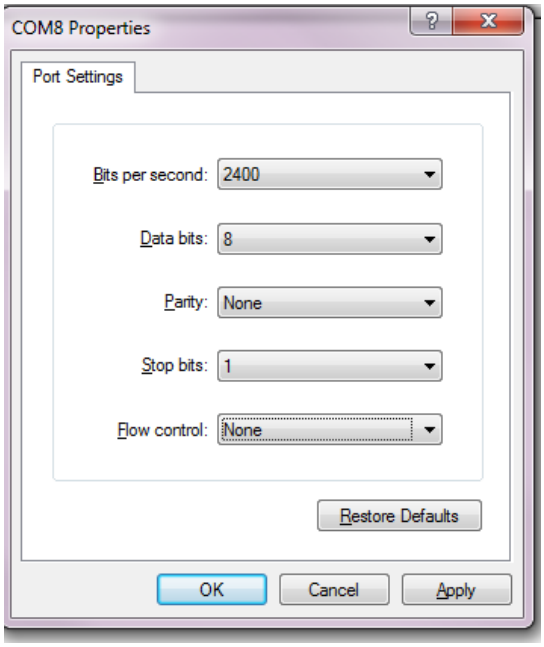
d) The next window that will appear is the Connect To window.



e) Change the Connect Using setting to the Com port that was determined in Step B.

f) Click OK.

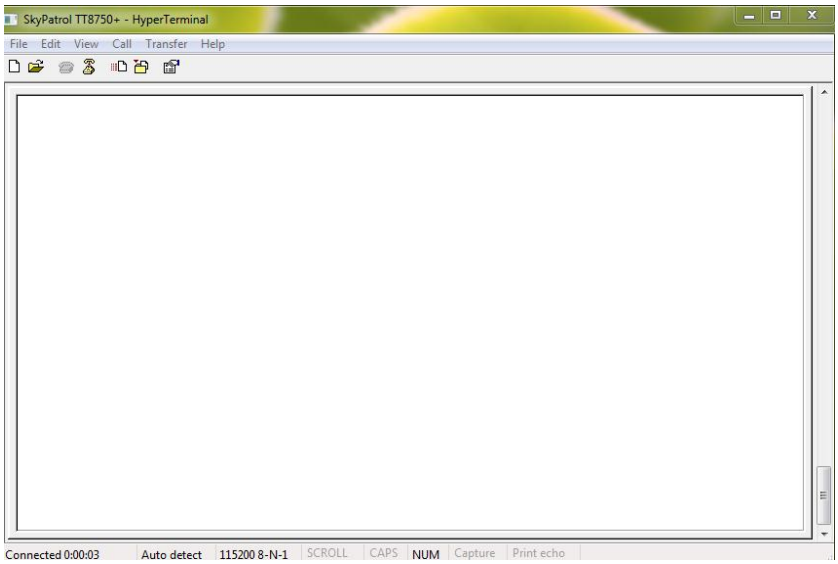
g) The next window is the Port Settings window.



h) Make sure the settings match the example.

i) Click OK.

j) Now the Main Program Window should appear.



Configure the SkyPatrol TT8750+ to Communicate with the Server

1. Connect and verify Serial connectivity with the SkyPatrol TT8750+.

   a) Connect the PC serial connector to the SkyPatrol TT8750+ mini USB port.

      Note: *In the following instructions,* ***<CR>*** *means using the* ***Enter Key*** *on the keyboard.*

   b) With HyperTerminal open, type AT <CR>. The SkyPatrol TT8750+ should respond with OK. If you do not see this response, double-check your connections. If the connections seem correct, disconnect the SkyPatrol TT8750+ from the computer and perform the serial loop-back test (instructions follow):

Serial Loop-back Testing

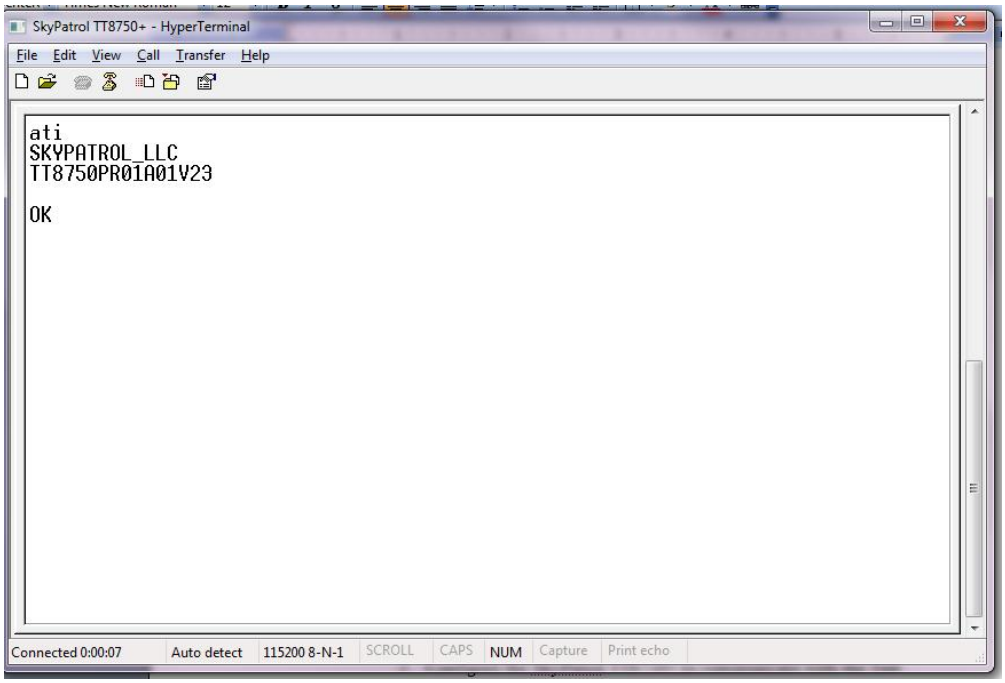
- Make sure the cursor is in the main window.
- Start typing characters.
- If all settings are correct, you should not see anything happening in the main window.
- Verify the programming cable is the correct one.
- Unplug and plug again the programming cable. Change the USB port connection if necessary and verify the COM port is the correct one.
- Start typing characters.
- You should now see what you are typing appearing in the main window.

  If this happens, the COM port is configured correctly.

c) Type AT<CR>. The SkyPatrol TT8750 should respond with OK.

d) Type ATI<CR>. The SkyPatrol TT8750 should respond with
SKYPATROL_LLC
TT8750PR01A01V23
OK

e) If you get any different response, you are not connected to the SkyPatrol TT8750+



2. Configure the SkyPatrol TT8750+ to communicate with the Test Server.

   a) The following information will need to be obtained from the SIM provider.
   b) APN
   c) Username and password (If necessary.)
   d) Reset the SkyPatrol TT8750+ to factory defaults:

      1. To restore the SkyPatrol TT8750+ to factory defaults, send the following command:
         AT&F<CR>
      2. To write current config to memory, send the following command:
         AT&W<CR>
      3. To reset the SkyPatrol TT8750+, send the following command:
         AT$RESET<CR>
         After a reset, the SkyPatrol TT8750+ will display the SIM status.

   e) Configure the SkyPatrol TT8750+ to Access the GPRS network.

      1. To configure the SkyPatrol TT8750+ with the proper APN, send the following command:
         AT+CGDCONT=1,"IP","apn"<CR> (substitute the letters "APN" for the supplied APN.)

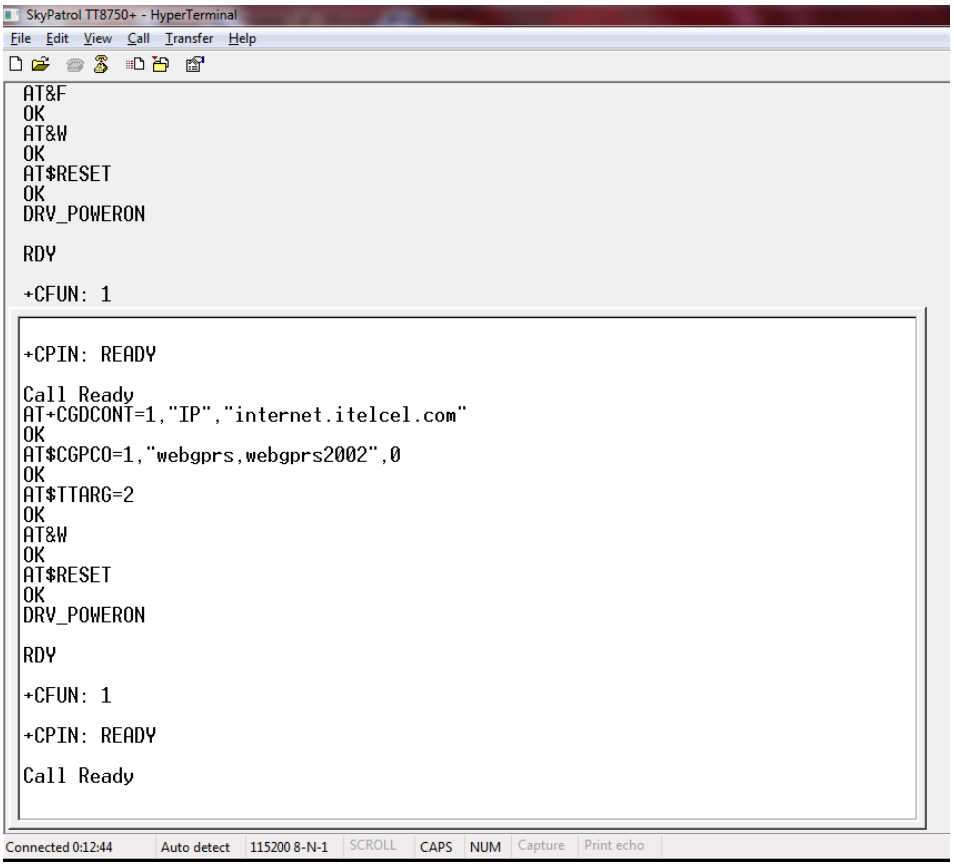
      2. To configure the SkyPatrol TT8750+ with the proper username and password, (if necessary) send the following command:
         AT$CGPCO=1,"username,password",0<CR> (substitute the correct username and password)

      3. To configure the SkyPatrol TT8750+ to enable auto GPRS registration, send the following command:

         AT$TTARG=2<CR>

      4. Store the current configuration to memory, send the following command:
         AT&W<CR>

      5. Reset the SkyPatrol TT8750+ by removing power or sending the **AT$RESET<CR>** command.



6. Verify GSM status by sending the following command:

   AT+CREG?<CR>
   If everything is working, you should receive one of two responses:

   +CREG: 0,1 (GSM registered to home network)
   OR
   +CREG: 0,5 (GSM registered roaming.)

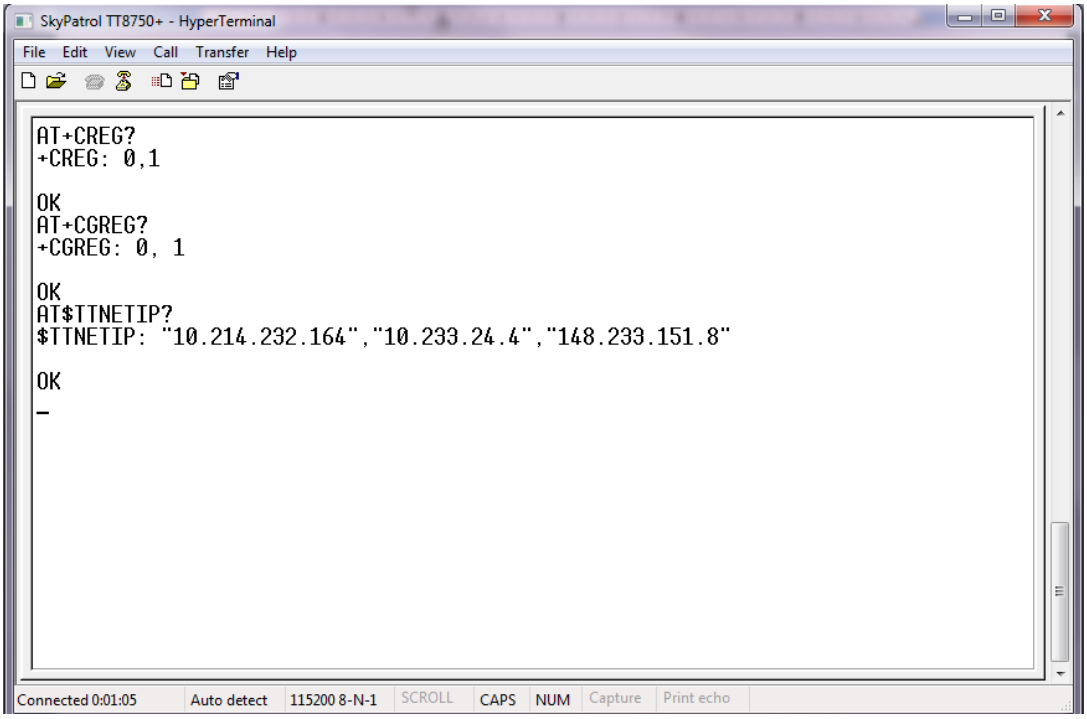
7. Verify GPRS status by sending the following command: AT+CGREG?<CR>

   If everything is working, you should receive one of two responses:

   +CGREG: 0,1 (GPRS registered to home network)
   Or
   +CGREG: 0,5 (GPRS registered roaming.)

8. Verify GPRS activation by sending the following command:
   AT$TTNETIP?<CR>

   If the response is non-zero, then everything is working. Skip to Step 10.



9. If AT$TTNETIP returns all zeros

   - Check the status of the command AT+CREG
   - Check that command AT$TTARG is set to 2.
   - Verify that the user and password set in command AT+CGDCONT are the proper ones.
   - Verify, with your local carrier company, that the SIM has GPRS service and has the proper APN.

10. Configure the SkyPatrol TT8750+ to access the Server.

Note: *To configure the SkyPatrol TT8750+ for server interoperability, several things have to be addressed:*

- Most GPRS configurations are Mobile Originate only. The mobile SkyPatrol TT8750+ must initiate a conversation with a remote server before the remote server can talk to the SkyPatrol TT8750+.
- IP addresses are dynamically assigned and can change.
- Some IP addresses are NAT and are non-routable IP addresses.

11. Give the SkyPatrol TT8750+ a unique name.

- Send the following command: AT$TTDEVID=”TT8750Plus”
  This command, combined with the wakeup message, will allow the server to associate a Public IP address with a specific SkyPatrol TT8750+ and create a window of opportunity where the server can send commands to the SkyPatrol TT8750+

Configure the SkyPatrol TT8750+ to talk with a specific server.

- Send the following command, with your server IP and port.
  AT$TTSRVDST=1,1,"**SERVER IP**",**SERVER PORT**,2

12. Enable periodic messages (wakeup) to be sent to the server every 60 seconds

- Send the following command: AT$TTWAKEUP=1,1

Verifying Server Connectivity

Note: For the following tests, is necessary to have a UDP test server.

1. Start your UDP test server

2. Search for the SkyPatrol TT8750+ name. Within approximately 60 seconds the wakeup messages should be seen in the window:

   ,TT8750Plus 4/10/2012 11:05:35 AM
   ,TT8750Plus 4/10/2012 11:04:35 AM
   ,TT8750Plus 4/10/2012 11:03:35 AM
   ,TT8750Plus 4/10/2012 11:02:40 AM

3. If an ATI command is sent, the server should show the information:

   SKYPATROL_LLC
   TT8750PR01A01V23
   OK

4. Verify that you see the following the SkyPatrol TT8750+ response with SkyPatrol_LLC. If so, you have successfully configured the SkyPatrol TT8750+ to talk with the server.

Verify GPS Operation

Follow these directions to verify GPS Operation.

1. From the terminal window, send the following command:
   AT$TTGPSQRY=10<CR>

2. The SkyPatrol TT8750+ should respond with a standard GPRMC message that looks similar to the following:

GPRMC,165203.00,**A**,1927.43632,N,09910.77234,W,0.000,0.0,100412,,,A*40

Note: The entry shown in bold is the current GPS status. There are three possible values here:

- A = OK
- V = Warning
- 9 = SkyPatrol Specific response that GPS solution is not valid and the last known GPS location is being substituted.

Here is an example of a GPRMC message without a GPS lock:

GPRMC,162639.00,V,,,,,,100412,,,N*72

The same command can be used in the server app.

Additional Software Features

The following software features are included in the SkyPatrol TT8750+:

A user can send AT commands, via SMS, to the SkyPatrol TT8750.

It's just needed to send an SMS with the AT command to the SkyPatrol TT8750+ SIM cellular phone

The ability to store event data in memory, upon event trigger occurrence, and transmit data when desired.

- "Total Number of Unread Messages" is decremented if an unread message is read via the AT$TTLOGRD command.

  Example: Assume there are 50 unread messages in the GPRS queue and the total number of messages in GPRS queue is 100. This means that the first 50 messages have been read while the last 50 messages have not been read. If a user sends AT$GPSLOGRD=0,1,51 then the total number of unread messages drops down to 49 after successful transmission of that message. However, if a user sends AT$GPSLOGRD=0,1,99 then the total number of unread messages still remains at 50 – that message is transmitted to the remote server.

- A user can also read a message that has already been read from the memory by passing in the appropriate starting index number.

Synchronize RTC time with GPS time

- RTC time is synched with GPS time automatically
- RTC time is synched with GPS time every time the device is powered up and the device acquires valid GPS data
- RTC time is synched with GPS time every time the GPS time rolls over from 23:59:59 to 00:00:01

Allow a user to append RTC date and time at the end of event data

- Bit-21 for Parm2, for output message types 20 – 26 & 37 (in AT$TTFNT command), has been added to allow users to send RTC time along with event data
- The RTC date and time contains Year, Month, Day, Hour, Minute, and Second fields
- 8 bytes of information is appended in Binary format when bit-21 is enabled. Each byte represents an individual field
- 10 ASCII character (10-bytes) representing RTC date and time is appended in ASCII format when bit-21 is enabled. Two bytes (or two ASCII characters) represents an individual field

Index