



GPS Blade Board User's Manual

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1. Overview

The NetBurner NBPKGPS Blade Board for the PK70 device allows your PK70 to receive longitude/latitude co-ordinates, time, speed, and other location aware GPS signals. The programmer can decide whether to parse the raw NMEA (National Marine Electronics Association) sentences via serial, or use the NetBurner library, which supports longitude/latitude, heading, speed, and time.

A list of features and functions of the device is below:

- GPS receiver
- GPS antenna
- 10/100 Ethernet
- DHCP and Static IP addressing
- 3.3VDC input power @ 250mA max
- Longitude/Latitude information
- Accurate Time information
- Heading/Speed information

2. IPSetup Software Utility

Setup and configuration of your NetBurner NBPKGPS Blade Board requires the IPSetup.exe Windows PC utility available for download at www.netburner.com, in the Support > Public Downloads section.

3. Initial Configuration


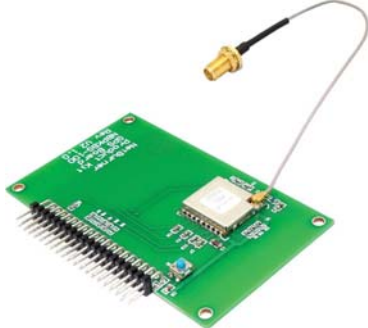

Before you can begin using your NetBurner NBPKGPS Blade Board, two areas of configuration are required. You must set up and plug in the hardware and set up the network IP settings.

1. Hardware configuration
2. Network configuration

3.1 Hardware Configuration

The NTP Time Server uses the NetBurner PK70 device with a GPS Blade Board attachment.

Table 1. NTP Time Server Parts List

NBPK70EX-100CR	PK70 Embedded Control Device	
NBPKGPS-100CR	GPS Blade Board w/ Interface SMA to U.FL Cable	
GPS-00464	Antenna GPS 3v Magnetic Mount SMA	

To begin using the NBPKGPS Blade Board, you must plug in the antenna and Ethernet cable, and then the power supply. If indoors, place the antenna as close to a window or external wall as possible. Without a clear line of sight of the sky, the GPS may not be able to get a signal.

Figure 1. GPS Antenna and GPS Connector



Once the antenna has been plugged into the module, plug in an Ethernet cable. Plug in the power supply to turn on the device.

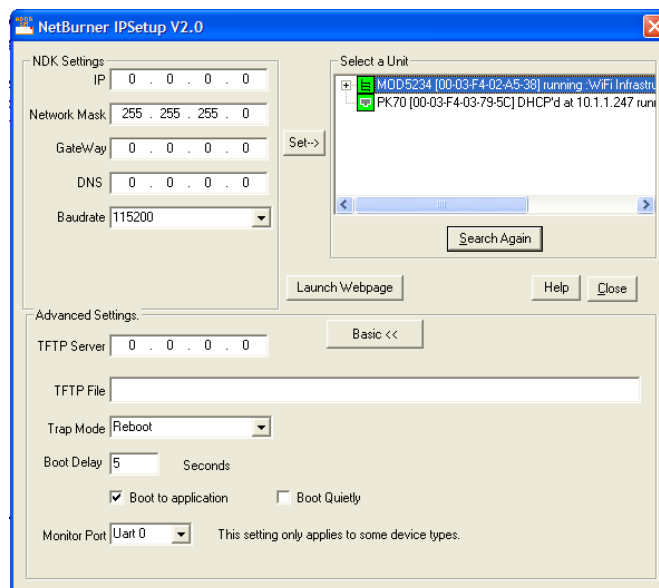
3.2 Network Configuration

1. To begin configuration, run IPSetup. If not already installed, this program is downloadable from the NTP Time Server's product page at www.netburner.com. To view the advance settings, click on the Advanced button (the button name will change to Basic).
2. Locate your PK70 device in the "Select a Unit" pane by matching its MAC address. The MAC address is located on the bottom of your PK70. If your PK70 device does not appear in the list box, verify the power, speed, and link LEDs are illuminated, and click the Search Again button. If you have multiple NetBurner devices, make sure you selected your PK70 in the "Select a Unit" pane (as shown in the screen shot) before you input your information. If you are still unable to see your PK70, remove power, correct any cabling errors, reapply power, and click the Search Again button. Note: IP Setup uses a UDP broadcast protocol and may not operate through a router.

FIREWALLS: IPSetup uses UDP and TCP port number 20034. If your computer's firewall is blocking this port number, you will need to either disable the firewall, or add a rule to the firewall to allow communication on this port number.

3. If your network supports DHCP (factory default): The assigned IP Address will appear in the "Select a Unit" pane. Write down this address. If your network does not support DHCP, configure the IP Address and Network Mask fields as shown in the screen shot below. If you need help selecting values, please read the "Selecting an IP Address" section at the end of this guide. After you have entered all of your values, click the Set button in the center of the IP Setup window to configure your PK70 device with its new parameters. Note: If you do not click the Set button, your values will not save.

Figure 2. IPSetup

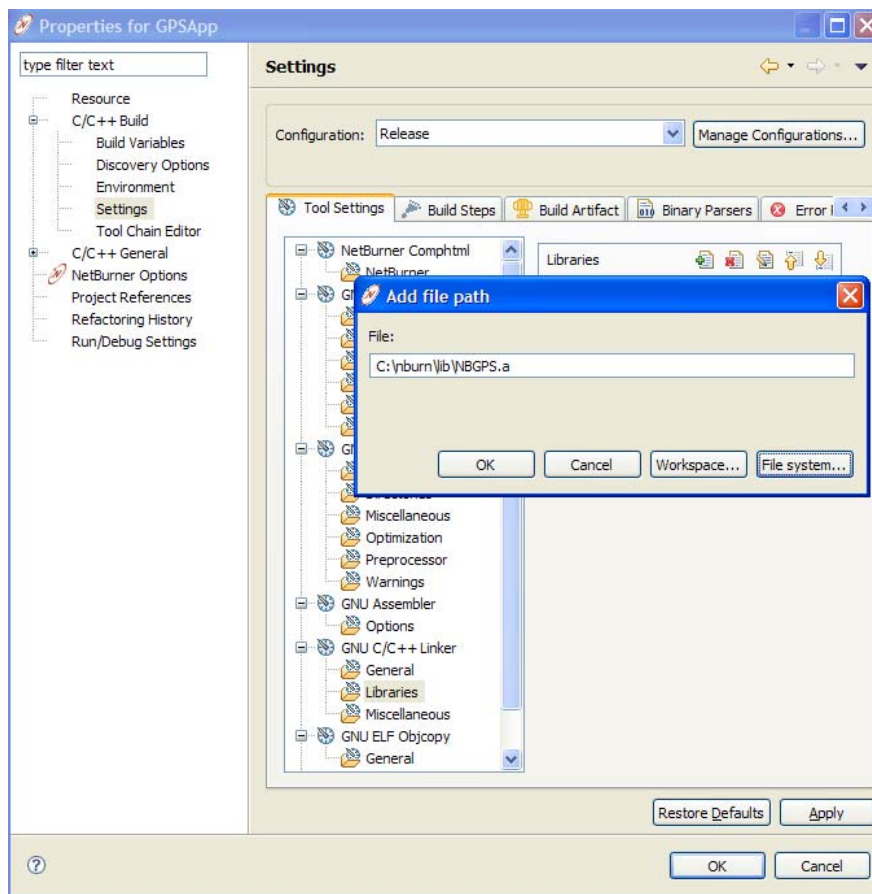


4. Using the GPS in an Example Application

The NBPKGPS Blade Board includes a software utility library that may aid in development. This library will help by creating a C++ Object that creates task which talks to the GPS Blade Board and continuously updates various GPS status variables, including time, date, heading, and location.

4.1 Including the NBGPS Library and Include Directories

To use the NBGPS library, you must first include it in your application. To begin, you should have a blank application created in NBEclipse. Right click on your project, and select Properties. Under C/C++ Build select Settings. Finally, under GNU C/C++ Linker, select Libraries. Click on the green plus to add the NBGPS library. The default location for this file is C:\Nburn\lib\NBGPS.a. If you do not have this file in your c:\nburn\lib directory, see section 9.2 to learn how to rebuild this file.



The project will also need to have the GPS include folder added to it's Properties. Once again, right click on your project and select Properties. Under C/C++ Build, select Settings. Under GNU C++ Compiler, select Directories. Click on the green plus to add the NBGPS include folder. The default location for this folder is C:\nburn\PK70\include\NBGPS. If the application contains C files (extension .c), the setting must also be applied in the GNU C Compiler, Directories folder.

4.2 A Simple Example Application

Once your project has the library properly included, you are ready to develop with the NBGPS object. In this example, we will create an NBGPS object and use it to monitor location and time. The example prints these two values out the serial port every five seconds. If less than two satellites are visible, the device will only print "No Signal". The full source follows.

```
#include "predef.h"
#include <stdio.h>
#include <ctype.h>
#include <startnet.h>
#include <autoupdate.h>
#include <dhcpclient.h>
#include <NetworkDebug.h>

#include <NBGPS.h>

extern "C" {
void UserMain(void * pd);
}

NBGPS gps;

const char * AppName="GPSApp";

void UserMain(void * pd) {
    InitializeStack();
    if (EthernetIP == 0) GetDHCPAddress();
    OSChangePrio(MAIN_PRIO);
    EnableAutoUpdate();

    iprintf("Application started\n");

    // Starting GPS Task
    gps.start();

    while (1) {
        if (gps.sats > 2) {
            iprintf("%s,
%s\r\n", gps.longitude.getFormattedLocation(), gps.latitude.getFormattedLocation());
            iprintf("The time is %s GMT\r\n", gps.ntp.getFormatedTime());
        }
        else {
            iprintf("No Signal\r\n");
        }
        OSTimeDly(100);
    }
}
```

Create the NBGPS object as a global variable, outside of UserMain. This is because the NBGPS is large, and will not fit in the default stack space. Once created, a call to `gps.start()` will start the processing of GPS serial packets.

If the device has a good signal, the output from this example will look like the following.

117, 12.458 W, 117, 12.458 W
The time is 21:38:14 GMT

5. LEDs

The PK70 has two LEDs on the side of the unit and a standard Ethernet LED on the back of the unit.

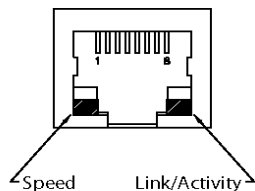
5.1 Panel LEDs

The Panel LEDs are red/green LEDs that can be configured by your application.

5.2 Ethernet LEDs

- Power LED: Illuminated while power is applied.
- LED1 on RJ-45: Ethernet speed – 10 (off) or 100 (on)
- LED2 on RJ-45: Link and data activity

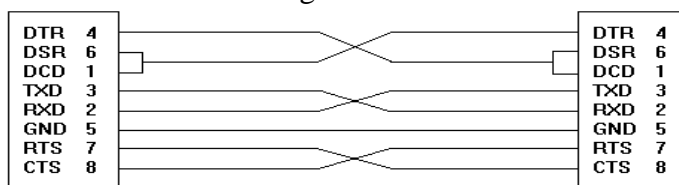
Figure 6. Ethernet LED



6. RS-232 NULL Modem Wiring

The following table and diagram shows how to create a null modem cable/adaptor for RS-232 debug output.

Figure 7. NULL Modem Wiring



7. Network IP Address Configuration

If you are part of an existing network, and are not using DHCP, you need to specify a Static IP Address and Network Mask. IP Addresses are required to route packets from place to place on an Intranet/Internet. If you are on your own LAN there are some standard private address ranges that are commonly used:

Class A: 10.0.0.0 to 10.255.255.255
Class B: 172.16.0.0 to 172.31.255.255
Class C: 192.168.0.0 to 192.168.255.255

8. Web Browsers and Proxy Servers

If you are working on a corporate LAN that uses a proxy server for Internet web browsing, you will need to exclude the IP Address of your NTP Time Server in your web browser's proxy server settings/preferences. Otherwise, an attempt to connect to a web page on the LAN will fail because the proxy server will attempt to route the request outside the LAN. For most web browsers, this can be accomplished in the advanced settings for the proxy server configuration. Set the Network Mask for your host computer's network adapter and your NTP Time Server to 255.255.255.0.

9. The NBGPS Library

9.1 *NBGPS*

9.2 *GPSLocation*

9.2.1 Introduction

The GPSLocation functions allow the user to access information pertaining to the physical location of the device. The NBGPS object contains two instances of GPSLocation. One for the latitude coordinate and one for the longitude coordinate.

9.3 *GPSNavigation*

9.4 *GPSTime*

9.5 *GPSSat*

9.6 *GPSTime*

10. Troubleshooting

10.1 *The GPS cannot get a valid signal*

If the GPS Blade Board is unable to get a valid signal, start by verifying all hardware connections. Power off the device and open the NTP Time Server case.

There are two antenna connectors in the device: A small connector wire, which connects to the GPS chip, and the main antenna, which connects to the small connector wire. Check that the connector is set properly into the GPS chip, and check that the main antenna is screwed tightly in to the connector wire.

If you are not able to get a signal after verifying the hardware, the receiver may not be able to get a signal in its current location. GPS works best with a clear view of the sky. If the antenna is indoors, try moving it to a window. Please note, it may take five or more minutes for the device to adjust and find new satellites after moving the antenna.

10.2 *I don't have an NBGPS.a or DBNBGPS.a library file*

<TO DO>

Revision History

Revision	Date	Description
1.0		Internal draft
1.1	3/2010	Initial release