FOOBARENGINEERING

CAN-SLIP-ANGLE

CAN-SLIP-ANGLE User Guide

An imaging sensor using optical flow to measure slip angle.

CAN-Slip-Angle
www.FooBarEngineering.com

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Introduction

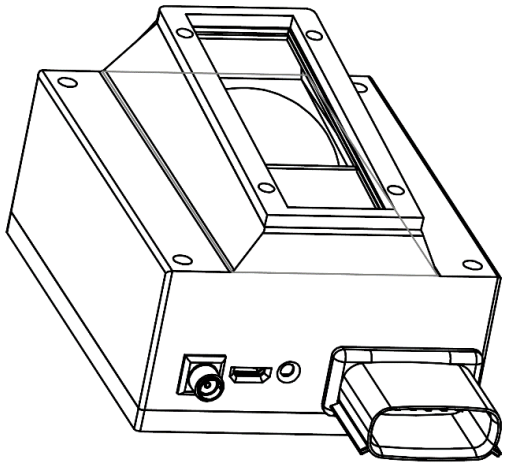
The FooBarEngineering's CAN slip angle (CAN-SLIP-ANGLE) sensor is based on the proven WSL range of loggers and designed to interface to a vehicle's logger using a CAN bus.

The CAN-SLIP-ANGLE uses an imaging sensor and infra-red-light source to track features in the road and measure displacement of the road surface. Using these measurements, it can calculate slip angle. In addition, the unit reports an absolute count for the x and y directions.

The CAN-SLIP-ANGLE can be configured to have a user-specified CAN address and device configuration.

Further cost options include in built-in GPS, IMU and logging functions based on the WSL range of loggers. These extend the capability of the CAN-SLIP-ANGLE to a measurement device that can provide data to calculate absolute road speed in the x and y direction by fusing the distance to target and alignment to the target with the slower rate GPS based speed.

Hardware



Specifications

Electrical data

Supply Voltage	10Vdc to 20Vdc
Supply Protection	Reverse and overvoltage
Supply Current	800mA @ 12V
Temperature Range Operating	-0°C to +60°C
Temperature Range Storage	-20°C to +70°C

I/O information

1x CAN	1Mbit, 512k, 256k, 128k software selectable
1x GPS SMA connector	Active antenna input for 18Hz Location and GPS speed.
50Hz IMU	100Hz 3 Axis Gyro/Accel/Magnetometer
Ride height	50Hz 1.5m SPAD scanning time of flight ride height sensor +/-3 mm
Camera lens	100Hz x y displacement and slip angle data interpreted from the high rate image data

Communication ports

1x USB (Debug use only)	RS232 terminal for setup and in use testing/offloading of data
CAN 2.0B	Communication with an external logger or controller

Safety

Sensor head can become very hot and may cause injury if power has been applied to the sensor for extended periods of time. This is especially true if the sensor is used in hot environmental conditions.

Invisible radiation from light emitting diodes!

Do not observe with optical instruments.

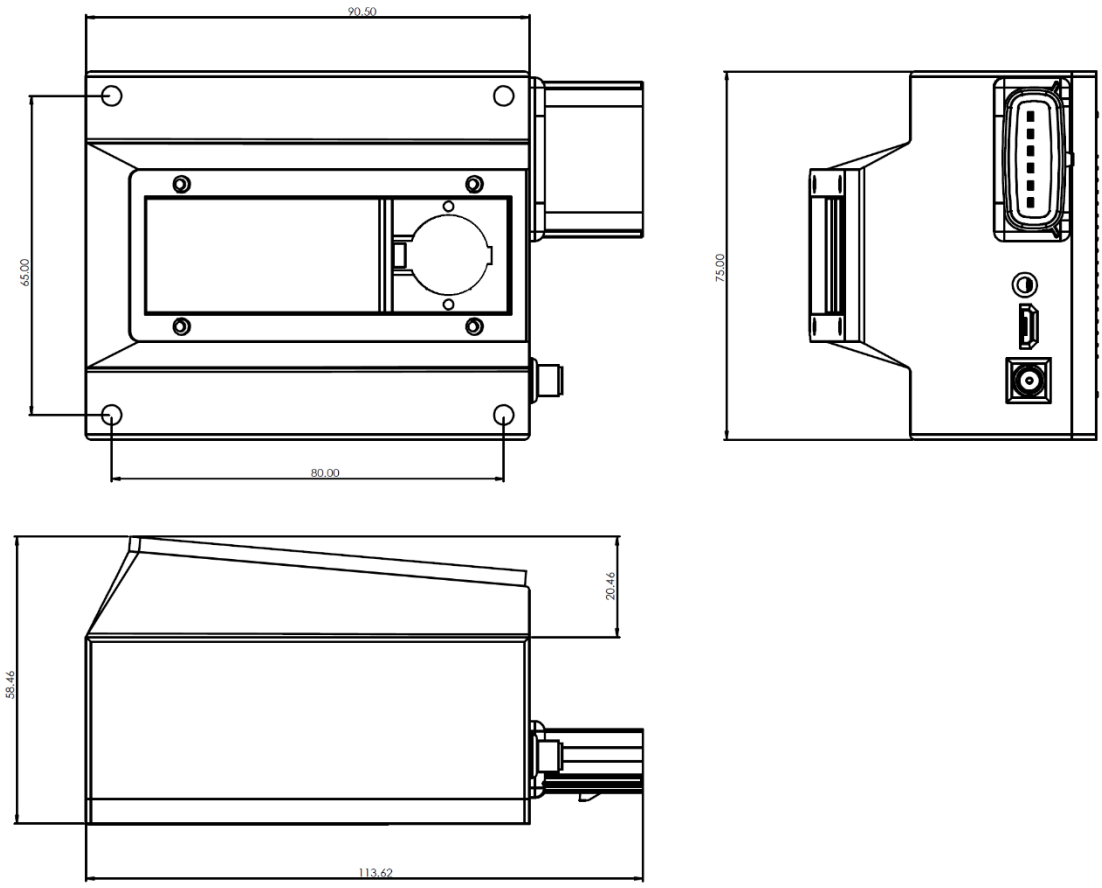
Mechanical data

CAD model of the unit available on request.

Size (without mating connectors) 114 x 75 x 60.00 mm

Mounting is expected to be behind a surface with cut out. The unit must be AV mounted and isolated from heat and shock. 4 x m3 threaded inserts on the on front face 80 x 65 mm spacing are provided for the use with suitable AV rubber bobbin mounts. (RS 171-2566).

Do not mount in areas that are subjected to water spray, unit is not intended for submersion and is not waterproof.



Weight 250 grams

Wiring connections

Vehicle connection pinout.

1	V Supply
2	CAN H
3	CAN L
4	RS232 Tx
5	RS232 Rx
6	Gnd

Mating connector Molex 33471-0606 Mx150.

GPS SMA.

Active 3.3V DC SMA GPS Antenna input.

Channels sourced from sensors

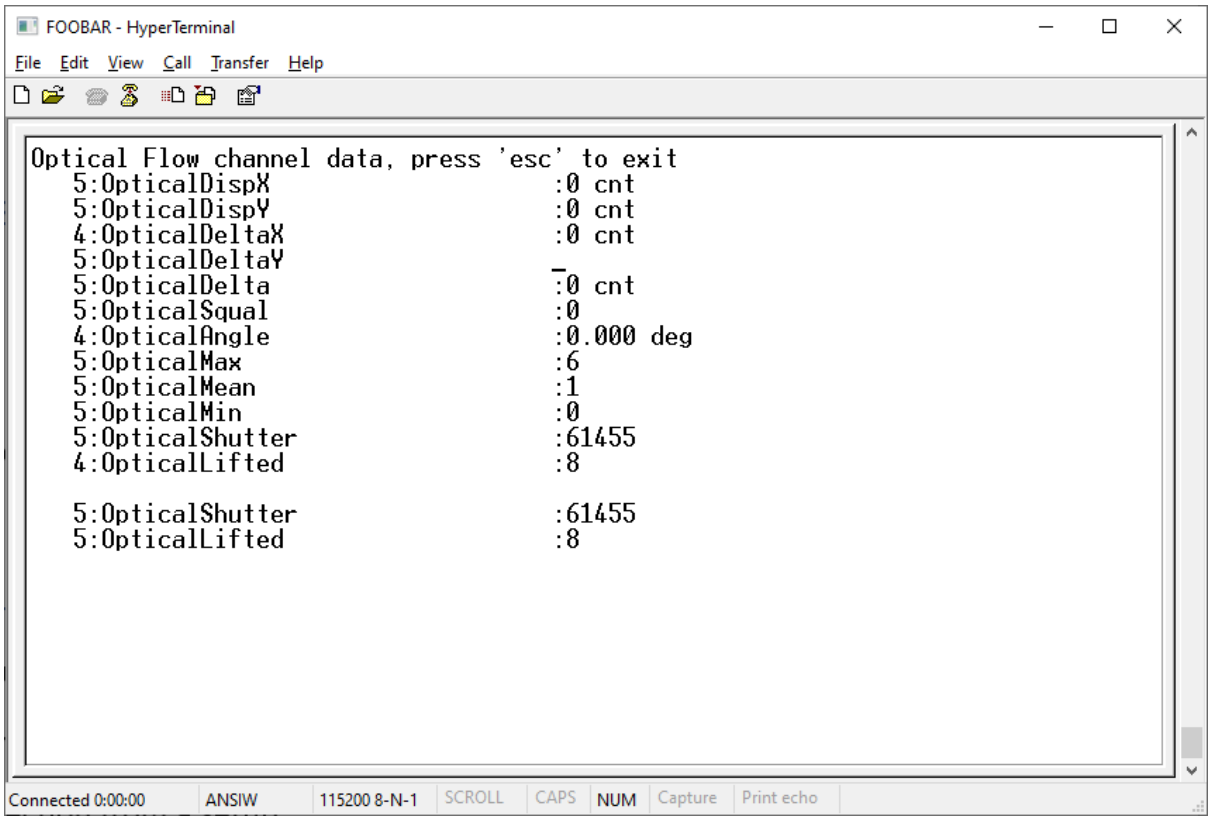
Here is a list of the data sourced from the sensors in the unit.

Channel name	Unit	Rate (Hz)
GPS-latitude	degrees	18
GPS-longitude	degrees	18
GPS-altitude	m	18
GPS-speed	kph	18
IMU-X-axisAcceleration	g	50
IMU-Y-axisAcceleration	g	50
IMU-Z-axisAcceleration	g	50
IMU-X-axisGyroscope	degrees/s	50
IMU-Y-axisGyroscope	degrees/s	50
IMU-Z-axisGyroscope	degrees/s	50
IMU-X-axisMagnetometer	a.u.	50
IMU-Y-axisMagnetometer	a.u.	50
IMU-Z-axisMagnetometer	a.u.	50
IMU-Roll	degrees	10
IMU-Pitch	degrees	10
IMU-Yaw	degrees	10
LD-RideHeight	m	50
OpticalDispX	counts	200
OpticalDispY	counts	200
OpticalDeltaX	counts/s	200
OpticalDeltaY	counts/s	200
OpticalDelta	counts	200
OpticalAngle	degrees	200

Note: some of these channels are from cost options.

Viewing real-time data for a connected device

Data and channel status can be viewed in real time from the sensors within a terminal using the “flow“ command.



CAN message transmit of data

The CAN protocol is user-configurable via a small csv setup file. Any channel sourced can be sunk by a CAN message.

Here is an example CAN configuration section from a setup.

Setup	CAN	1					
Termination	0						
Speed	1000000						
Name	CanId	offset	size	Signed	ratio	zero	period
OpticalDispX	500	0	32	1	0.01	0	5
OpticalDispY	500	32	32	1	0.01	0	5
OpticalSqual	501	0	8	0	1	0	5
OpticalMin	501	8	8	0	1	0	5
OpticalMean	501	16	8	0	1	0	5
OpticalMax	501	24	8	0	1	0	5
OpticalShutter	501	32	16	0	1	0	5
OpticalLifted	501	48	8	0	1	0	5
OpticalDeltaX	502	0	16	1	0.01	0	5
OpticalDeltaY	502	16	16	1	0.01	0	5
OpticalDelta	502	32	16	1	0.01	0	5
OpticalAngle	502	48	16	1	0.01	0	5
GPS-latitude	100	0	-32	1	0	0	55
GPS-longitude	100	32	-32	1	0	0	55
GPS-time	101	0	-32	0	0.001	0	55
GPS-speed	101	32	-16	0	0.1	0	55
GPS-altitude	101	48	-16	1	1	0	55
GPS-date	102	0	24	0	1	0	100
GPS-status	102	24	-8	0	1	0	100
IMU-X-axisAcceleration	110	0	16	1	0.01	0	10
IMU-Y-axisAcceleration	110	16	16	1	0.01	0	10
IMU-Z-axisAcceleration	110	32	16	1	0.01	0	10
IMU-X-axisGyroscope	111	0	16	1	0.05	0	10
IMU-Y-axisGyroscope	111	16	16	1	0.05	0	10
IMU-Z-axisGyroscope	111	32	16	1	0.05	0	10
IMU-X-axisMagnetometer	112	0	16	1	0.1	0	10
IMU-Y-axisMagnetometer	112	16	16	1	0.1	0	10
IMU-Z-axisMagnetometer	112	32	16	1	0.1	0	10
IMU-Roll	113	0	16	1	0.05	0	10
IMU-Pitch	113	16	16	1	0.05	0	10
IMU-Yaw	113	32	16	1	0.05	0	10

The unit supports up to 8 separate can IDs with up to 16 channels contained within them.

CAN dbc for default setup

Available on request.

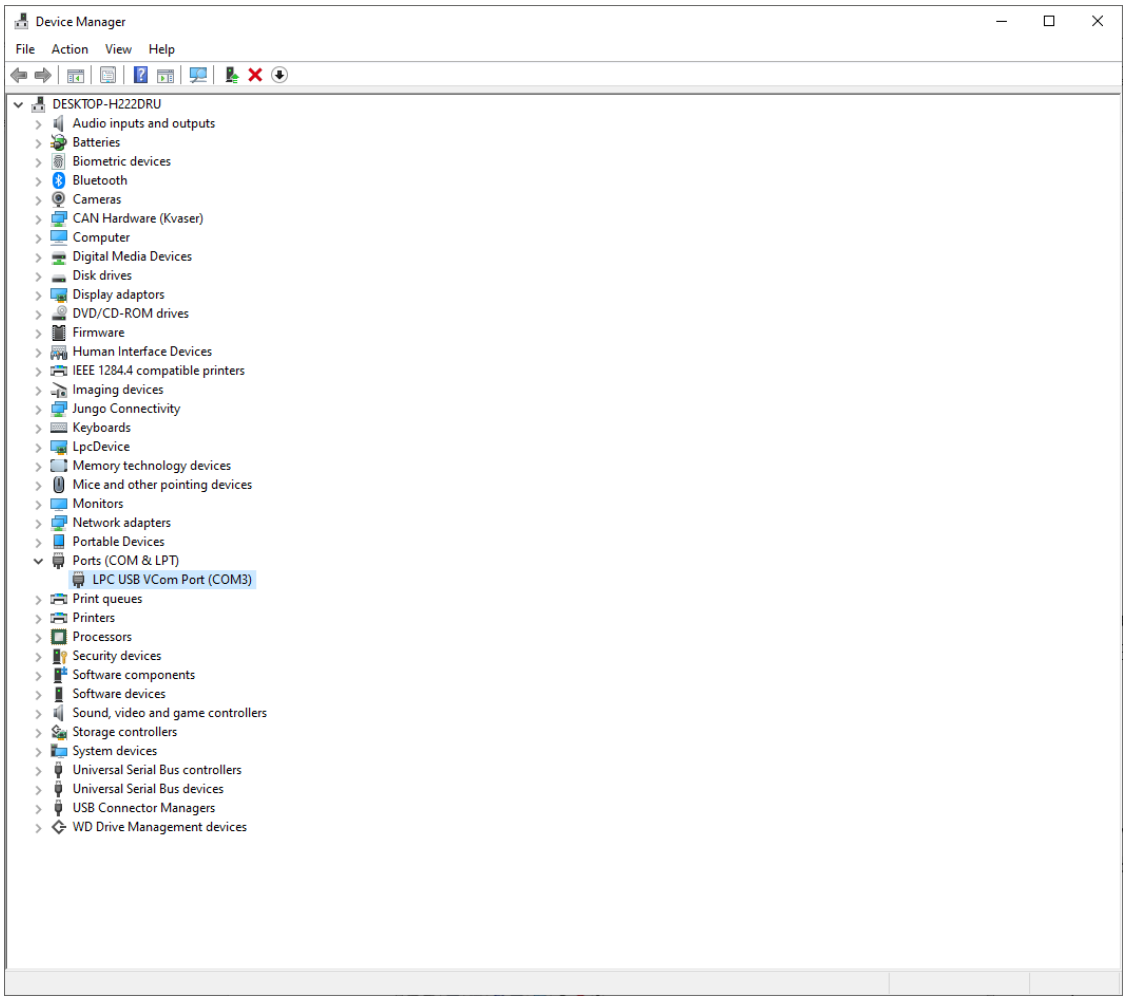
Configuration using USB debug interface

Connection to the WSL is done through Hyperterminal and a USB serial port connection. If you have not connected to a WSL before, you will need to install the correct USB drivers.

Installing USB drivers

The correct USB drivers can be found on the NXP website. lpcopen_examples_windows_usb_drivers_v1.20.

Connect the WSL to the computer via a USB cable, switch the WSL on via the switch on the top of the unit. The computer might make the sound that a new USB device has been connected.

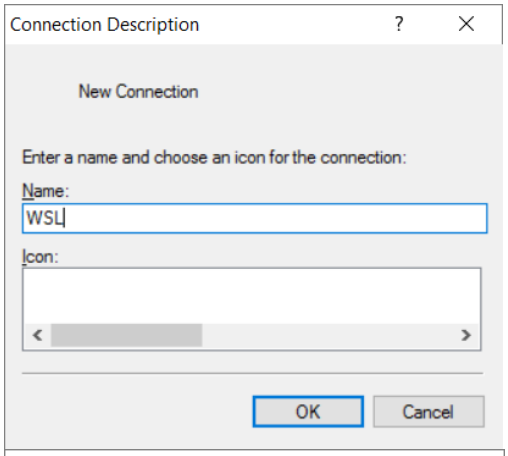


Search for device manager, click on the Ports, find the port that has a question mark. Right click, Update driver. Browse for the driver folder located on the USB flash driver, the x64 folder if your computer is a 64 bit machine.

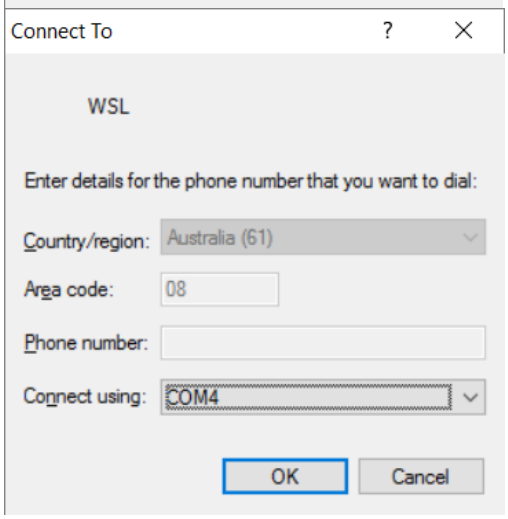
The computer should then install the correct drivers for the WSL and give the port a specific number – such as COM3.

Configuring Hyperterminal to connect to a WSL

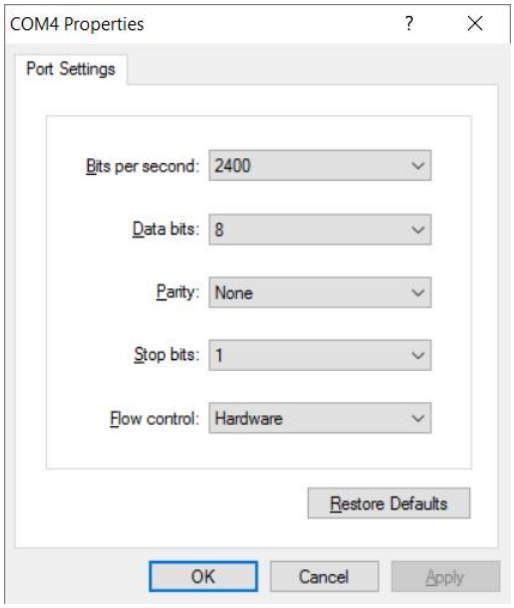
Open Hyperterminal and create a new connection using the com port that the driver created.



Give connection a name.

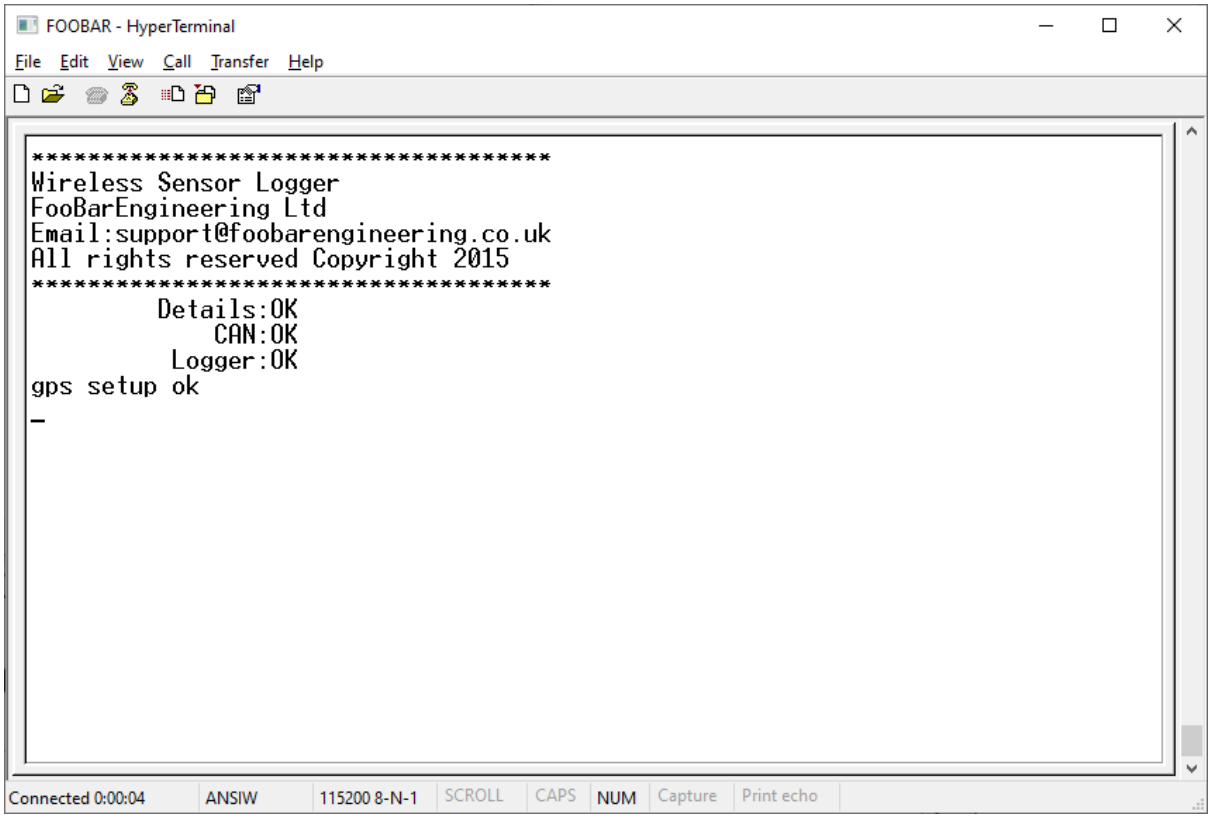


Select port for the connection to use.



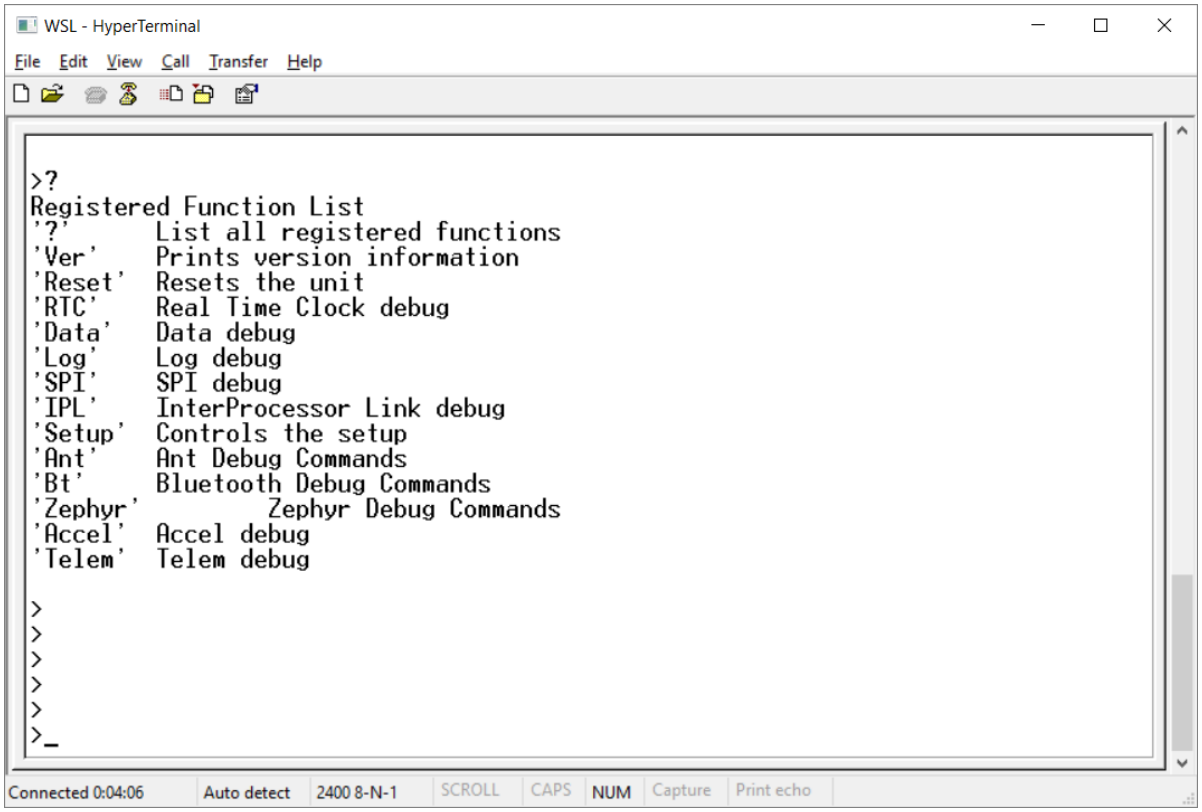
Configure port parameters.

On connection (press telephone icon) to the unit you should see this welcome text. This shows that you are communicating to the WSL. At this point you can now program the WSL, watch incoming information, look at the details of the configuration etc.


FOOBAR - HyperTerminal
File Edit View Call Transfer Help
****
Wireless Sensor Logger
FooBarEngineering Ltd
Email:support@foobarengineering.co.uk
All rights reserved Copyright 2015
****
Details:OK
CAN:OK
Logger:OK
gps setup ok
Connected 0:00:04
ANSIW
115200 8-N-1
SCROLL
CAPS
NUM
Capture
Print echo

List of useful commands

You can view all the available commands on the WSL by typing a '?' and pressing enter at the command prompt.



Here is a list of the basic commands:

'Ver' Prints version information.

'Reset' Resets the unit.

'Can' view the CAN bus status and data.

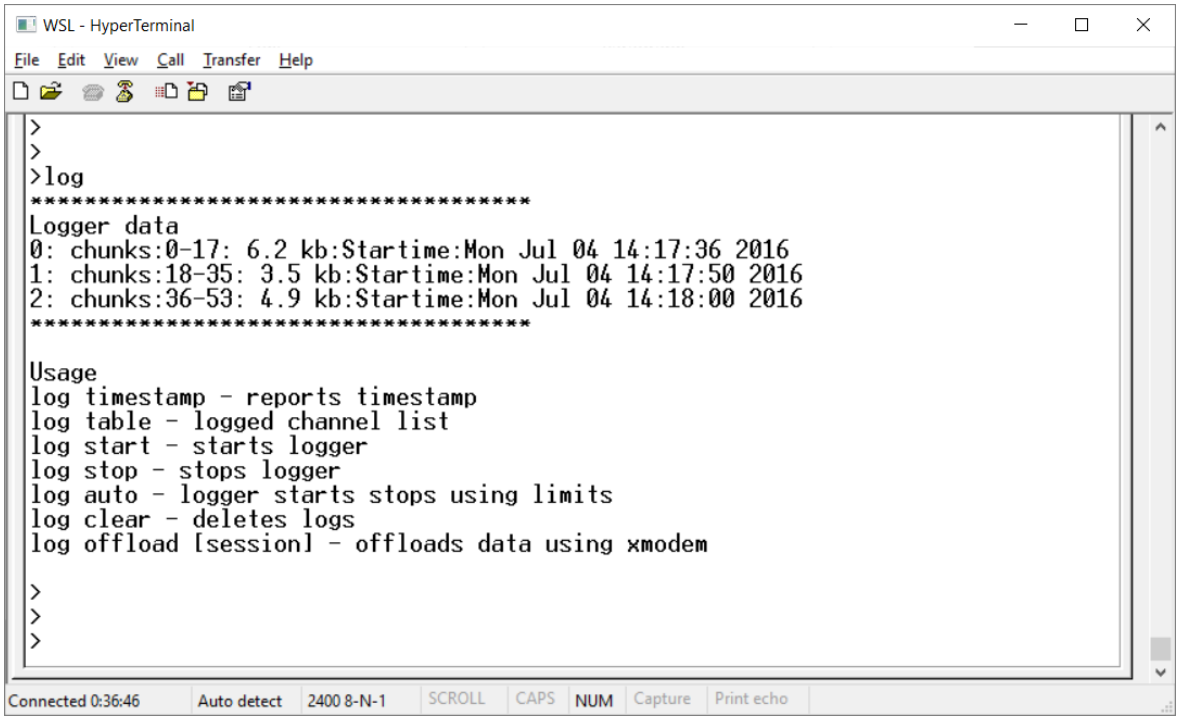
'Log' internal data logger.

'Setup' used to load setup files to the unit.

Internal Data Logger

The WSL units are capable of logging data internally (Cost Option) and offloading a tab delimited text file that can be used with many viewers.

The Log command gives access to the all the Log functions such as offloading data files from the box.

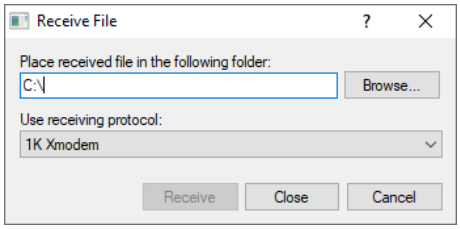


If the WSL has recorded data, then the logs are listed under logger data. To offload the data, use the command

log offload [session] – the session number being the number of the left hand side under Logger data. An example would be – log offload 1, press enter and you will then follow the procedure to complete a data offload. If you don' designate an effort to offload then the last recorded data set is offloaded.

When you type log offload 1, you will be prompted to Retrieve log data using 1K modem. From the HyperTerminal menu select Transfer, Receive File…

A dialogue will open. Select the folder where you want the data to download to and select 1K modem for the receiving protocol, press enter or Receive



A second dialogue will open which is where you set the file name. We have been using a file name definition of date_rider_effort.txt.

An example file name would be 20160704_PC_01.TXT

The transfer might time out because you have a limited time to set the information in the two dialogues. If it times out, just repeat the previous two steps, it remembers the first dialogue information so the second time through should be quicker, thus enabling the download.

Once complete a confirmation is printed on the screen.

Loading new device firmware

Firmware updates are released to add feature and fix bugs.

To load code you need to

1.Connect to the USB and the unit will appear as a com serial port to the computer,

2.Then you connect to it using Hyperterminal

3. Use the command interface to set the unit into in app programming mode by typing “reset iap” at which point the unit will look like a memory stick mass storage device called “crp disabld”.

4. Delete the file on the memory stick folder and drag drop the bin file attached onto the folder.

5. Power cycle the unit , it will now present itself as a com port again.

Loading new device setups

Setups configure the device for your application, if the default device setup doesn’t meet your requirements you may need to load a new setup.

To load the setup

1. Connect to the USB and the unit will appear as a com serial port to the computer

2. Then you connect to it using Hyperterminal

3. Use the command interface to receive a setup by typing “setup load”, the unit will then wait for a file via Xmodem

4. Send the csv file using xmodem from within Hyperterminal

5. Once finished type “reset” and reconnect Hyperterminal , you will see the result of the load and the command prompt