



R-Series Serial Protocol

PLXApp016 (V1.0) October 28, 2005

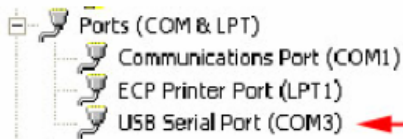
Summary

This application note describes the R-Series serial protocol for 3rd party interface. Software developers are free to interface with the onboard USB port to obtain information from Speed1, Speed2, Analog1, Analog2, Analog3, Analog4, AFR, EGT, and Knock.

The USB Port



The R-300/500 Wideband Computer contains an onboard USB port. Although interface is made via USB port, from the perspective of the software developer, this port can be treated as a standard serial COM port. To find out which COM port the R-300/500 is assigned to, go to "Start" > "Control Panel" > "Systems" > "Hardware" > "Devices Manager" and look under the "Ports" tab.



The Serial Protocol

Speed1Low	Speed1High	Speed2Low	Speed2High	Analog1	Analog2	Analog3	Analog4	EventPacket
-----------	------------	-----------	------------	---------	---------	---------	---------	-------------

Speed1Low – LSB 8Bit of Speed Input #1 (First Byte Transmitted)

Speed1High – MSB 8Bit of Speed Input #1

Speed2Low – LSB 8Bit of Speed Input #2

Speed2High – MSB 8Bit of Speed Input #2

Analog1 – 8Bit of Analog Input #1

Analog2 – 8Bit of Analog Input #2

Analog3 – 8Bit of Analog Input #3

Analog4 – 8Bit of Analog Input #4

EventPacket – Decimal value of 255 (Binary value 11111111) (9th Byte Transmitted)

(Sequence is repeated)

PLXAPP016 (V1.0) October 28, 2005

www.plxdevices.com

(408)745-7591



Speed Inputs:

Upon receiving bytes Speed1Low and Speed1High, some math needs to be performed to convert the two data bytes into a frequency value. Speed inputs have a range of 4Hz – 10KHz. Here's a sample C function.

```
//Combines Speed Low/High Packets into Freq Value
double SpeedToFreq1(int lowbyte, int highbyte)
{
    freq = (highbyte << 8) + lowbyte; //Shifts highbyte 8 bits to the left, then adds lowbyte
    freq = 200000/temp; //freq is now equal to the actual frequency of Speed1

    if(freq <= 4)
        return 0.0; //If freq is less than 4Hz, return 0.0
    else
        return freq; //Actual frequency value in Hz is returned
}
```

The returned value "freq" is the actual frequency of the speed signal in Hz. (Range 0Hz – 10KHz)

Analog Inputs:

Analog inputs are mapped the following way.

8 bit decimal value 0 = 0 Volts
8 bit decimal value 255 = 5 Volts

*Please note due to the use of the event packet, 255 does not occur. Thus 254 is the maximum possible decimal value = 4.98V.

8 bit decimal value 254 = 4.98 Volts

Event Packet:

The event packet is ALWAYS a decimal value of 255 (binary 11111111). This packet signifies the end of the sample cycle. Please note that the decimal value of 255 NEVER occurs in any packet other than the event packet. The software developer does not need to account for this, the R-Series serial protocol automatically takes care of this. This is simply a note the software developer should be aware of.

Modes of Operation

Real-time Streaming:

Baud: 2400
Data Bits: 8
Parity: Even
Stop: 1 Bit

In real-time Streaming mode, The 9 data bytes are sent continuously at a rate of 10Hz (10 times per second). A small delay is inserted between byte 9 and byte 1 to ensure 10Hz transmission rate. The R-300/500 continuously streams data in this mode EXCEPT when the user toggles to the Upload to PC menu. The following is an example of the packet sequence.

Speed1Low
Speed1High
Speed2Low
Speed2High
Analog1
Analog2
Analog3
Analog4
EventPacket

(delay)

Speed1Low
 Speed1High
 Speed2Low
 Speed2High
 Analog1
 Analog2
 Analog3
 Analog4
 EventPacket

(delay)

Upload to PC from flash:



Baud: 38400
 Data Bits: 8
 Parity: Even
 Stop: 1 Bit

A prerecorded data logged session, stored in internal flash, can be sent at high speeds in this mode. When the user initializes the upload, the 9 data bytes are sent consecutively in the same format as described above. An end of transmission is indicated with two event packets back to back. The last 3 samples will look like the following:

Speed1Low
 Speed1High
 Speed2Low
 Speed2High
 Analog1
 Analog2
 Analog3
 Analog4
 EventPacket

(no delay)

Speed1Low
 Speed1High
 Speed2Low
 Speed2High
 Analog1
 Analog2
 Analog3
 Analog4
 EventPacket

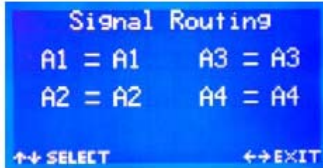
(no delay)

Speed1Low
 Speed1High
 Speed2Low
 Speed2High
 Analog1

Analog2
 Analog3
 Analog4
 EventPacket
 EventPacket

Capturing AFR

R-500: The R-500 can have the AFR value tied to any analog input. A1, A2, A3, and/or A4 can be "routed" to AFR through this menu.



R-300: The R-300 permanently has A4 tied to AFR.

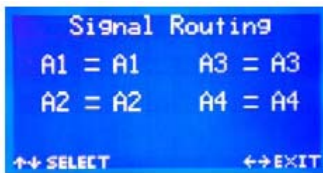
Byte Mapping:

Decimal 0 = 0.68 lambda = 10AFR (gasoline)
 Decimal 255 = 1.36 lambda = 20 AFR (gasoline)

(mapped linearly)

Capturing EGT (R-500 Only)

R-500: The R-500 can have the EGT value tied to any analog input. A1, A2, A3, and/or A4 can be "routed" to EGT through this menu.



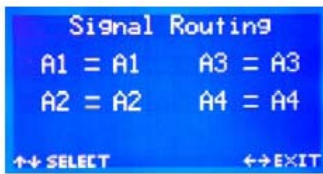
Byte Mapping:

Decimal 0 = 0 Deg C = 0 Deg F
 Decimal 255 = 1500 Deg C = 2732 Deg F

(mapped linearly)

Capturing Knock Volts (R-500 Only)

R-500: The R-500 can have the KNK value tied to any analog input. A1, A2, A3, and/or A4 can be “routed” to KNK through this menu.



Byte Mapping:

Decimal 0 = 0 Volts
Decimal 255 = 5 Volts

(mapped linearly)

Revision History

Version 1.0 (10/28/05)	Initial release
------------------------	-----------------