

## A Portable Serial Data-logger for the FRC Robot Controller

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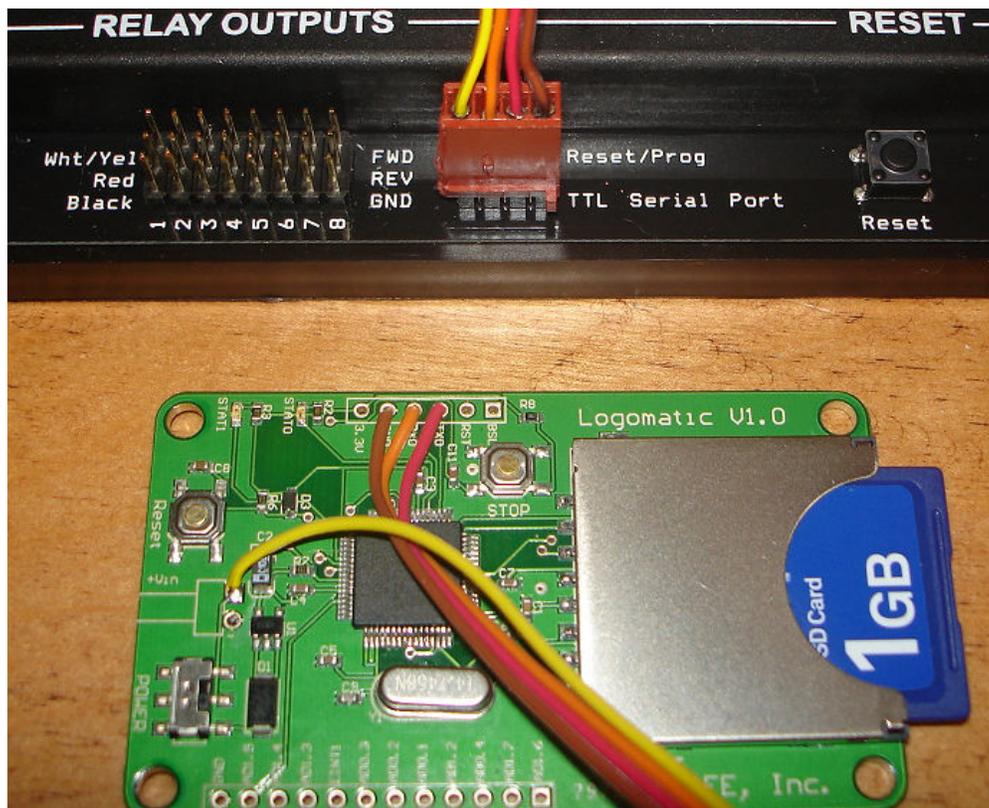
As teams start to add autonomous and hybrid modes to their robots, the need quickly arises to display diagnostic data so the programmers can assess the robot's response to feedback sensors.

Unfortunately these modes often require free (un-tethered) operation of the robot, which makes data collection difficult. It IS possible to provide a wireless link between the robot and a diagnostic station, but this may NOT be used during competition.

This paper describes a simple method of logging diagnostic data through the Robot Controller's second serial port. The concept is to add a FLASH memory based serial logger to the RC, and provide a simple software macro for sending data to the logger.

The logging device chosen for this purpose is the "Logomatic V1.0" sold by Spark Fun Electronics (<http://www.sparkfun.com>) for just under \$60.

This module uses an SD FLASH card (sold separately) for storage, and weighs less than an ounce. It can be powered by 5V and it uses a TTL based serial interface. These attributes make it ideal for connecting to the RC's TTL serial port. I simple 4 wire cable can be used to supply power and data to the board, as shown in the photo below.



The first time the Logomatic is powered up with a formatted SD card installed, it writes a default configuration file onto the memory card. The SD card can then be removed and plugged into a PC's card reader. A text editor is then used to modify the Logomatic's default configuration.

For optimum RC performance, I chose to set the Logomatic's Baud rate to 115200, so I only needed to change one parameter in the configuration file (called LOGCON.TXT). Since we are not using any of the Logomatic's analog inputs, only the first and third lines are important. **Mode = 0** tells the logomatic to record all the serial data that it receives, and **Baud = 8** corresponds to 115200 baud.

```
MODE = 0
ASCII = N
Baud = 8
```

Once the memory card is returned to the logomatic, and a reset is performed, the new parameters will become active.

Next I needed to be able to send data to the memory device. For this purpose I modified a couple of the files from Kevin Watson's FRC code library. This included:

1) Setting the baud rate for the second serial port in IFI\_FRC.C

```
Init_Serial_Port_Two(BAUD_115200);
```

2) Adding a SDLOG define to the IFI\_FRC.H file to enable printing to the serial port

```
#define _SDLOG

// SDLOG() is a macro that can be used just like printf() to send
// debugging information to the Logger on Serial Port 2.
#ifdef _SDLOG
#define SDLOG(x) stdout_serial_port = SERIAL_PORT_TWO; printf x; stdout_serial_port = SERIAL_PORT_ONE
#else
#define SDLOG(x)
#endif
```

This macro switches the printf output to serial port two for the duration of the call.

Now I was ready to send diagnostic data to the SD card by simply calling SDLOG() like it was a printf statement, except that an additional pair of parenthesis are used.

The following line is called periodically in the Teleop() function to see how well the robot is tracking a straight line.

```
SDLOG(("Gyro Angle=%d\r\n", (int)temp_gyro_angle));
```

Now, before starting a run, the "reset" button on the Logomatic is pressed (which starts a new log file), and then the robot is set free to do it's worst. After a match, the SD Card is removed and plugged into the PC's reader. The log file is a simple ASCII text file record of all the data that was written to the serial port.

What you send as diagnostic data is completely up to you, but the first thing I'll be adding is a time stamp to help determine what went wrong when ☺