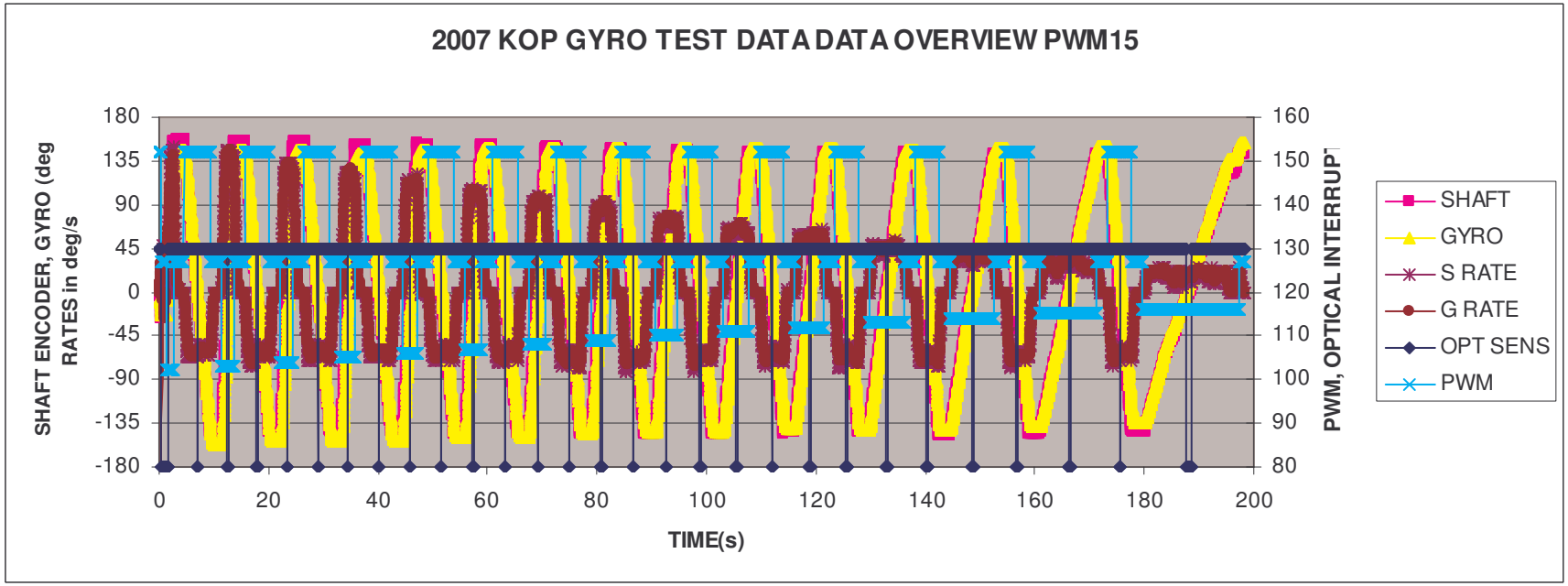


Figure 1 -- 2007 KOP GYRO TEST OVERVIEW

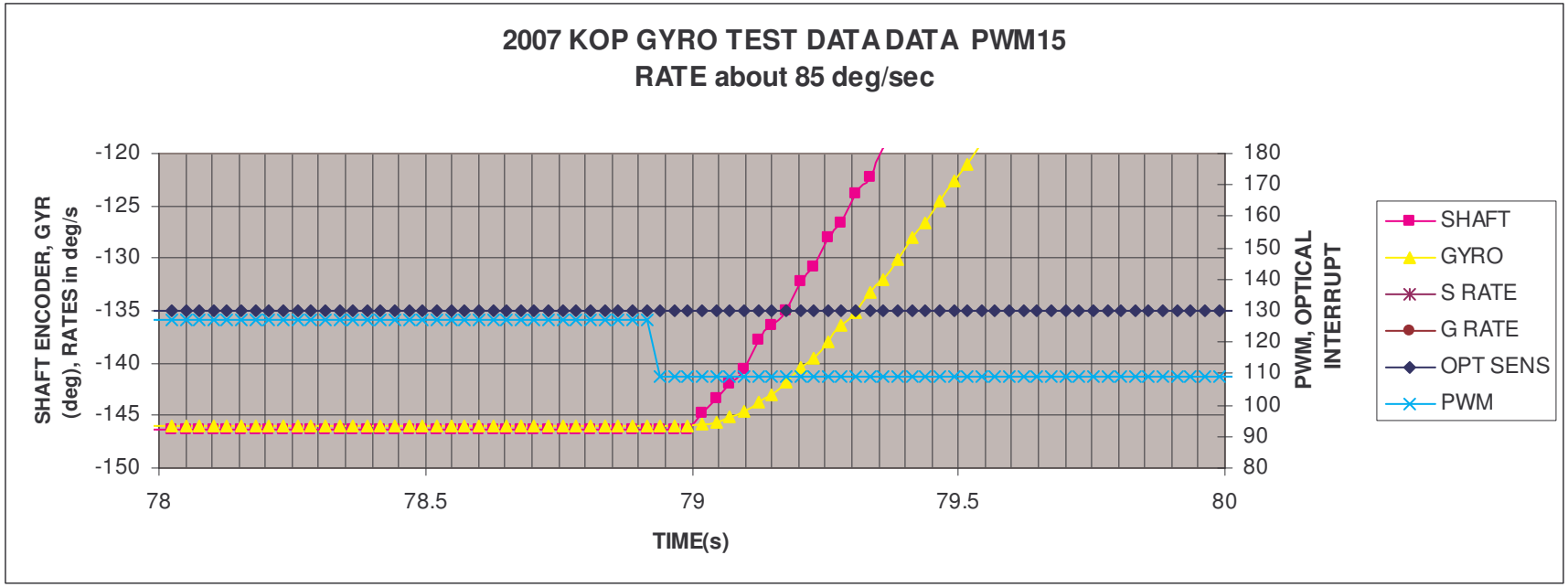


Figure 2 -- Beginning of Rotation

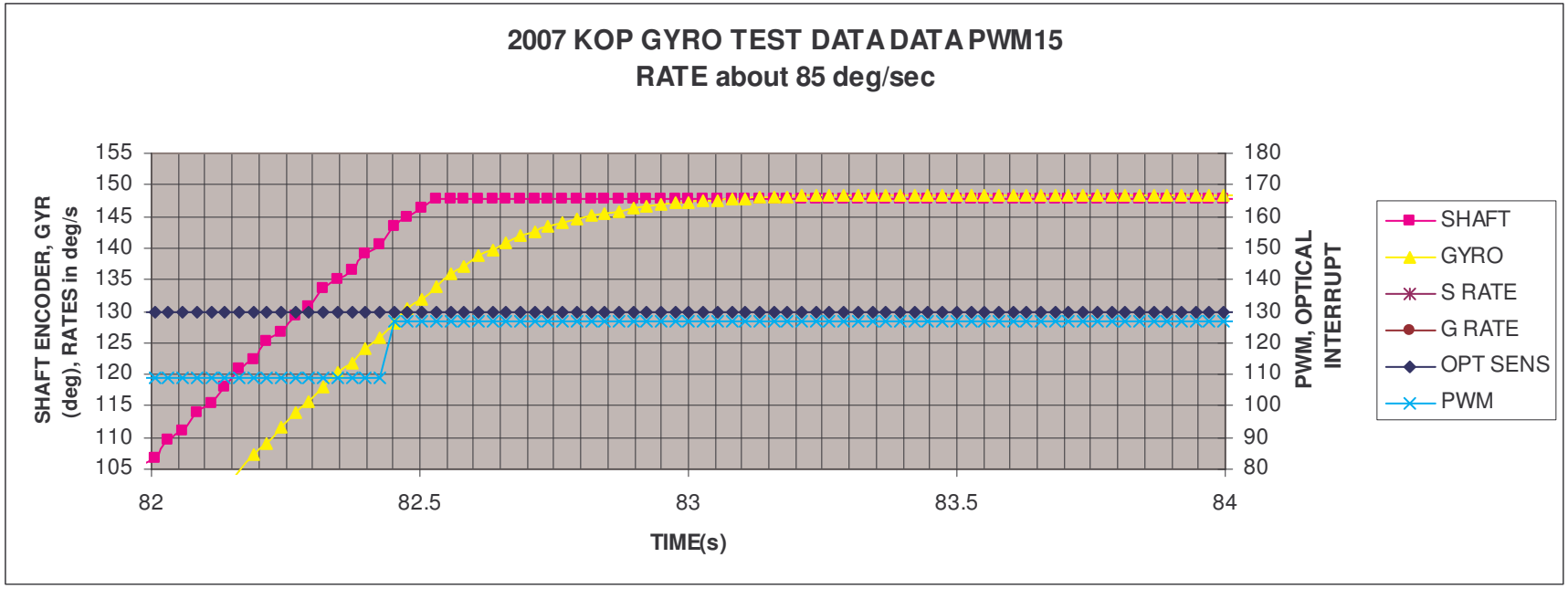
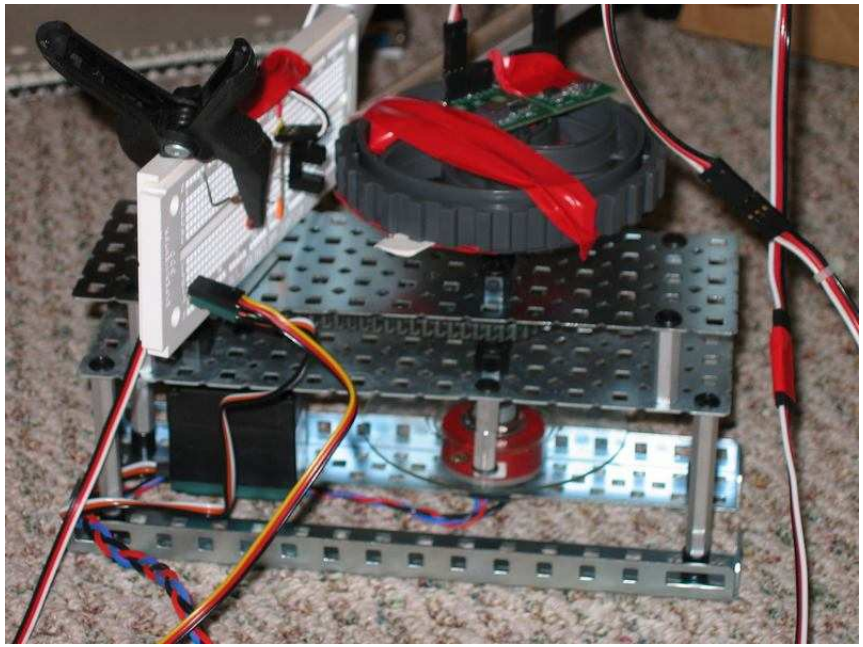


Figure 3 – End of Rotation

This data was taken using a setup mostly built of VEX components but controlled by a standard RC. The reason this data was taken was to measure the latency and accuracy of the 2007 KOP gyro. The Gyro was found to respond up to an angular rate of 148 degrees per second, close to the specified 150 degrees. This data set ranges from approximately 150 degrees per second to 25 degrees per second, the slowest the VEX motor would drive the turntable without stalling.

The test setup is shown here:



The gyro was placed on the wheel with the other end of the drive shaft connecting to a 256 pulse per rotation quadature shaft encoder A tab on the wheel passes through the optical interrupt sensor at approximately “0 degrees” and is used mainly to insure that the shaft encoder data is not missing or adding pulses. More information on the test setup and preliminary data is posted on Chief Delphi.

Rotation Start Time (s)	Average Rate (deg/sec)	Delay at -125 deg (ms)	Delay at 110 deg	Gyro Gain Tweak
11.5	145	150	250	1.023
22.25	130	150	225	1.025
33.25	125	150	200	1.023
44.5	115	150	175	1.020
79	85	160	175	1.023
130	45	185	157	1.023
161	25	225	100	1.023

For this table:

Rotation Start Time is just about when the rotation started – see the overview graph
Average Rate – is the approximate rotation rate
Delay at -125 deg is the time difference between when the shaft encoder and gyro read the same heading close to the beginning of the rotation
Delay at 110 deg is the time difference between when the shaft encoder and gyro read the same heading close to the end of the rotation.
Gyro Gain Tweak is the gain factor I had to use to get the starting and ending heading to agree between the gyro and the shaft encoder. Obviously, our gyro code is not calibrated as well as it could be. I didn't have to change it much so it looks like the gyro is good over the rates tested.

Results:

This data was taken because we were trying to use the gyro to rotate our robot to a precise heading as fast as possible and it looked as though there was a at least 120ms of delay between when a PWM value was changed and rotation rate was sensed by the gyro. Our first assumption was that this was mostly delay in the PWM output and the VICTOR as well as some motor and gear train/chain delay. With this VEX setup and using PWM15 so that there are no MP PWM delays the time from when the PWM value is changed until the result is seen in the shaft encoder output is less than 50ms. The delay between the shaft encoder info and the gyro info is dependent on the angular rate however, the gyro eventually catches up as long as the peak angular rate does not exceed about 148 deg/sec. Some other data showing failure at faster rates is posted on Chief Delphi – user name "yoyodyne". The two "zoomed in" plots are for the table row at time 79 for reference.

In this test, the gyro did build up a bias of about 10 degrees. I don't know if that had anything to do with rotating too fast for it at the beginning of the test or not. The bias calculation and dead band are accurate enough so that the gyro will continue to read "0" for at least 10 minutes so this drift is induced by movement.