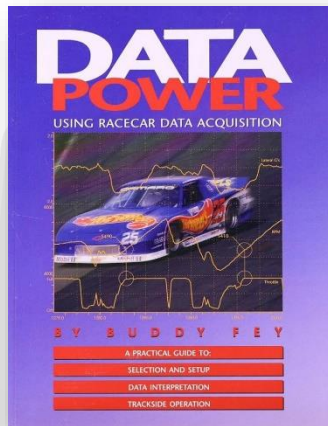




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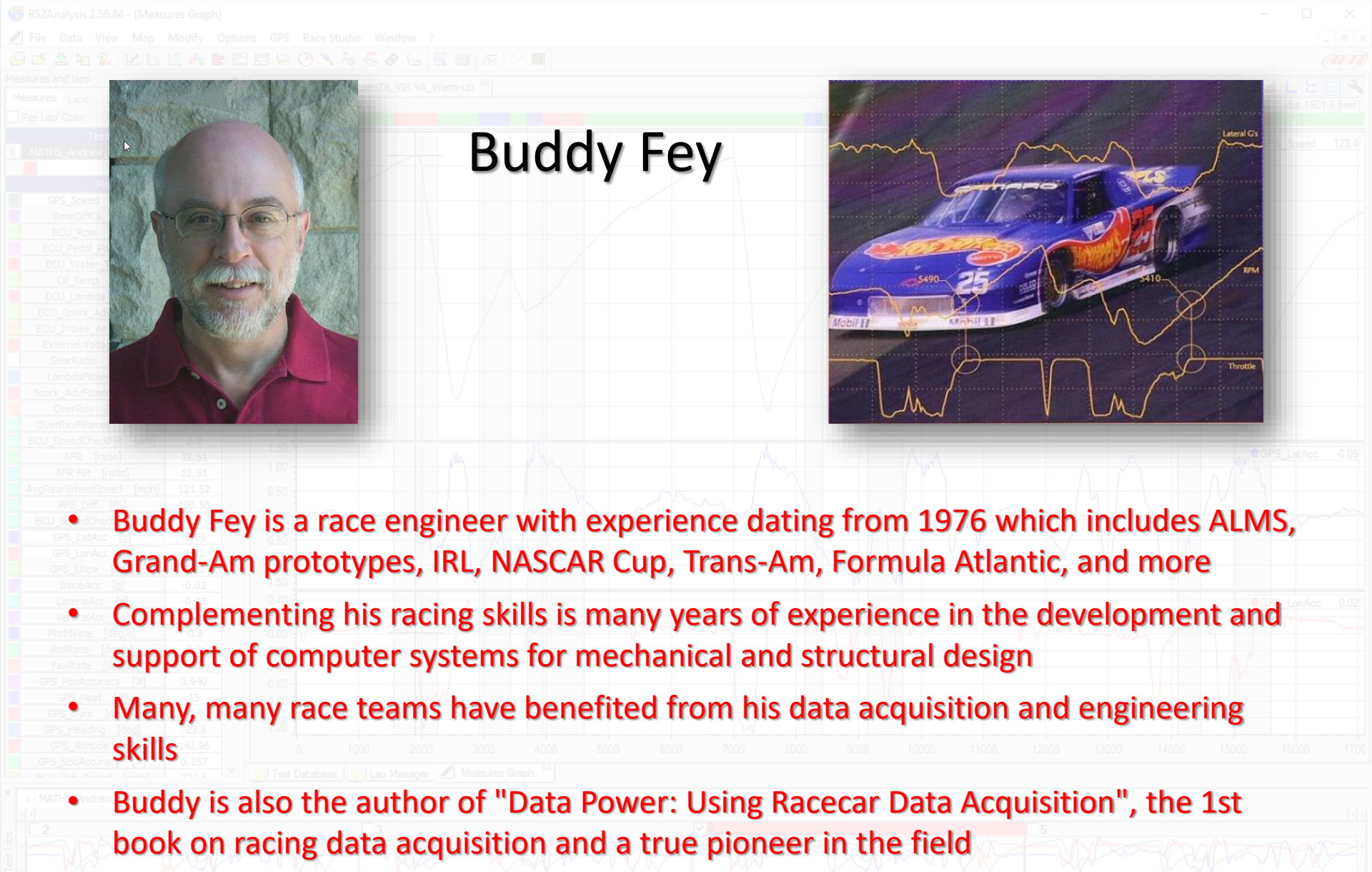
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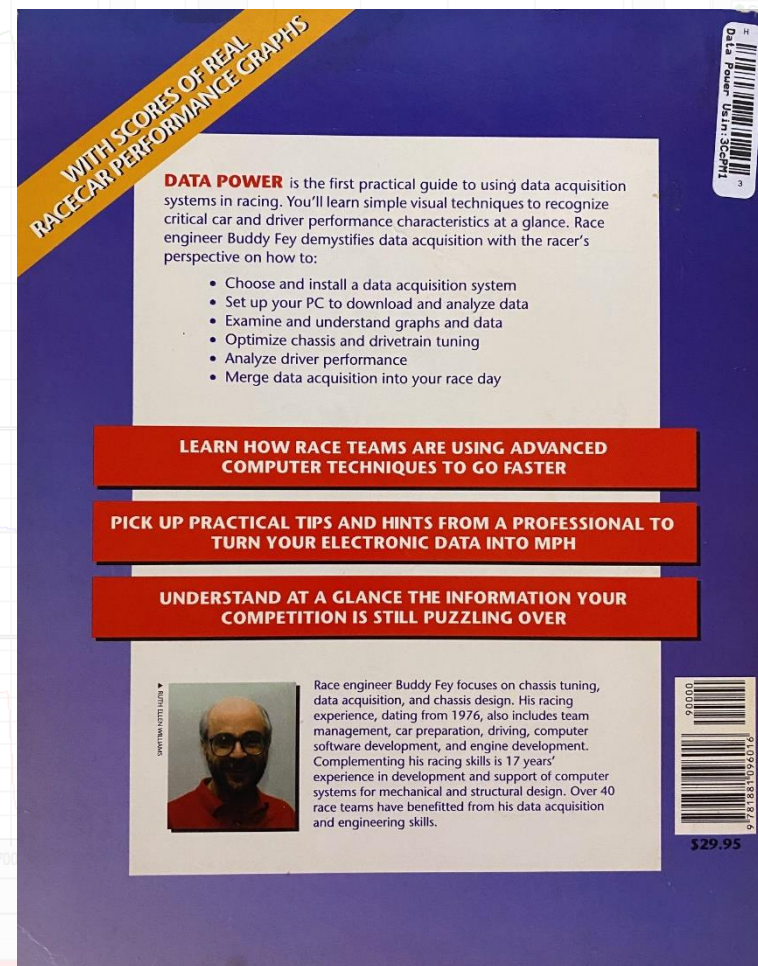
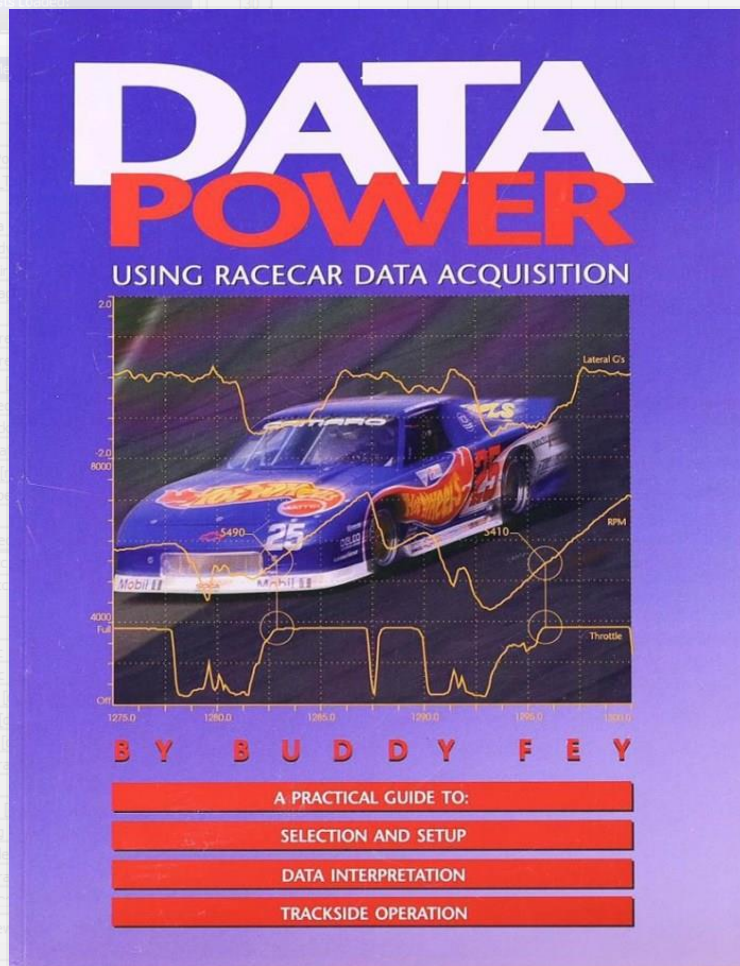


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Data Power: Using Racecar Data Acquisition



Introduction

1 INTRODUCTION

Data acquisition, like any other technology, is a broad and complex subject. Most of us in racing have neither the time nor the desire to master every aspect of it. We simply want a useful tool to help win races and enough knowledge to use that tool effectively. In a nutshell, that defines this book.

Data Power is largely about the “soft” side of using data acquisition systems—setting up good work habits, interpreting data, and using the knowledge gained effectively. The brief discussion of hardware focuses mainly on ensuring accuracy and repeatability of data, both of which are essential to confidence in diagnosis.

The essence of using a data acquisition system is in understanding the data it captures. The numbers themselves are fairly simple to decipher and mainly convey end results. When the data system reveals that speed on the main straight peaked at 142 MPH or that cornering force in Turn 1 reached 1.54 G's, it tells you what happened, but not why.

Any record of events on the track is simply history. To go faster, it's essential to learn why the car and driver behaved as they did. Fortunately, the graphs from a data acquisition system often form distinctive “signatures,” indicating a particular condition in the car or driver.

Visual recognition of these patterns is the core of the diagnostic methods advocated by *Data Power*. While more sophisticated analysis methods are possible, these tools are not required to examine a graph, recognize a common pattern, and conclude “We've got power-on understeer coming out of Turn 5.” *Data Power* unveils the graph patterns for a wide cross section of car and driver behavior. Hopefully, what were once meaningless squiggles on a graph will now be indicators as arresting as the shriek of a rotary engine at 10,000 RPM.

Continuing the theme of using a simple approach to data acquisition, the analysis methods to follow are based on six channels: lateral and longitudinal G's, MPH, RPM, throttle position, and steering angle. These channels are the common denominators in many data acquisition systems. They speak volumes about both car and driver. Useful information can also be gained from the popular and inexpensive speed and G loggers. Much of this book applies directly to them.

Graphs based on recorded data beyond these six channels are not discussed in *Data Power*, largely because the next steps often focus heavily on chassis engineering, and this is not a vehicle dynamics book.

Introduction

1-1

Data Power isn't a cookbook, even though it attempts to simplify a potentially complex subject. You still have to understand the car, the driver, and the track to correctly interpret graphs and profit from your data acquisition system. Thoughtful and thorough investigation of every fact available is essential. Data systems don't change one racing fundamental—you still have to dig deep to figure out how to win.

OK, now that we're finished with the philosophizing, let's get on with the fun part.

“Data systems don't change one racing fundamental – you still have to dig deep to figure out how to win.”

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Measures and laps

Measures Laps User Profiles

1 - MATHS_Andrew_MuleHTS_VIR_VA_Warm-up

[Distance base]

Time 0:11:36.8 dist 1501.5 feet

☐ Per Lap Color

Tests Log

MATHS_Andrew_Mule

4:02

Measure

GPS_Speed [mph]

RearDiffCk [%]

ECU_Rpm [rpm]

ECU_Pedal_Pos [°]

ECU_Water_T [°F]

Oil_Temp [°F]

ECU_Lambda [A]

ECU_Spark_Adv [°]

ECU_Intake_Air_T [°F]

External Voltage

GearRatio [ratio]

LambdaFiltered

Spark_AdvFiltered

OverRev [secs]

OverRevFiltered [secs]

ECU_SpeedCheckFilter

AFR [ratio]

AFR_Filt [ratio]

AvgRearWheelSpeed

RPS_Diff [%]

ECU_SpeedCheck

GPS_LatAcc [g]

GPS_LonAcc [g]

GPS_Slope [deg]

InlineAcc [g]

LateralAcc [g]

VerticalAcc [g]

PitchRate [deg/s]

RollRate [deg/s]

YawRate [deg/s]

GPS_PosAccuracy [m]

GPS_Healt [°]

GPS_Gyro [deg/s]

GPS_Heading [deg]

GPS_Altitude [m]

GPS_SpdAccuracy [m/s]

GPS_1_Wide_Pass

GPS_2_Wide_Pass

GPS_3_Wide_Pass

GPS_4_Wide_Pass

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GPS_12_Wide_Pass

GPS_13_Wide_Pass

GPS_14_Wide_Pass

GPS_15_Wide_Pass

FOUR BASIC RULES

You'll probably need to change your routine at the track to get the most from your data system. The detailed information it provides about the car and driver will put a new spin on making setup decisions and change testing strategies. Follow these rules without fail.

1—Use the system **EVERY** time the car runs on the track.

Even the briefest practice or tire scrubbing session can reveal important facts.

2—**ALWAYS** examine the data as soon as possible.

Debrief the driver first, while impressions of the session are still fresh. Then, examine the data and discuss it with the driver and the chassis setup wizard before deciding what to try in the next session.

3—**ALWAYS** examine the data again later, at leisure.

Time constraints at the track rarely allow enough time to scrutinize data thoroughly. Look at the data again each evening at the motel, rather than waiting until you get home. Put your discoveries to work the next day.

4—**USE** your racing knowledge.

Data acquisition isn't magic. You still have to understand the car, the driver, and the track. Use your common sense for insight into what the data patterns and values are trying to tell you.

GPS_Speed 123.4

GPS_LatAcc -0.09

GPS_LonAcc 0.02

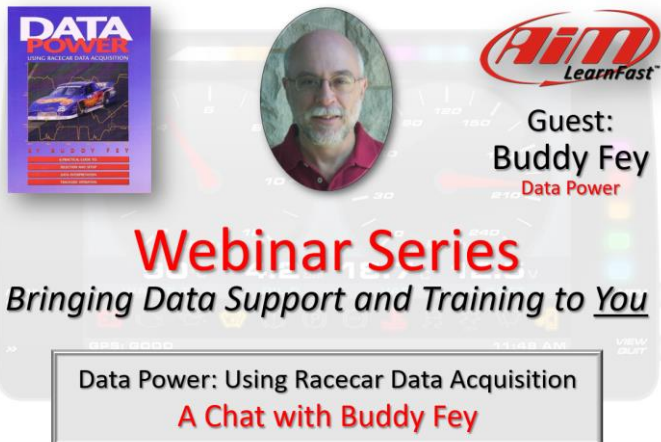
15000 17000



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- Customizing AiM Device Logos
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- **I Have Downloaded my Data, Now What - Part 1*
- **I Have Downloaded my Data, Now What - Part 2*
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- Data Views
- Measure Units
- Sort Channels
- Test Properties
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- Export Tests
- Channel Reports
- Setting Time
- Track Mapping
- Selection Criteria
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FileDataViewMapModifyOptionsGPSSRaceStudioWindow?

Measures and laps

MeasuresLapsUser Profiles

Per Lap Color

Sort Channels

Tests Loaded:

MATHS_Andrew_MuleHT8_VIR_VA_Warm-up

4 02:11.1

Measures:

GPS_Speed

RearDiffCo

ECU_Rpm [rpm]

ECU_Pedal_Pos [%]

ECU_Water_T [°F]

Oil_Temp [°F]

ECU_Lambda [A/F]

ECU_Spark_Adv [deg]

ECU_Intake_Air_T [°F]

External_Voltage [V]

GearRatio [ratio]

LambdaFiltered []

Spark_AdvFiltered [deg]

130

100

80

60

40

20

0

1 - MATHS_Andrew_MuleHT8_VIR_VA_Warm-up

[distance base]

time 0:11.368

dist 1301.6 feet

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10:00am Pac / 1:00pm East



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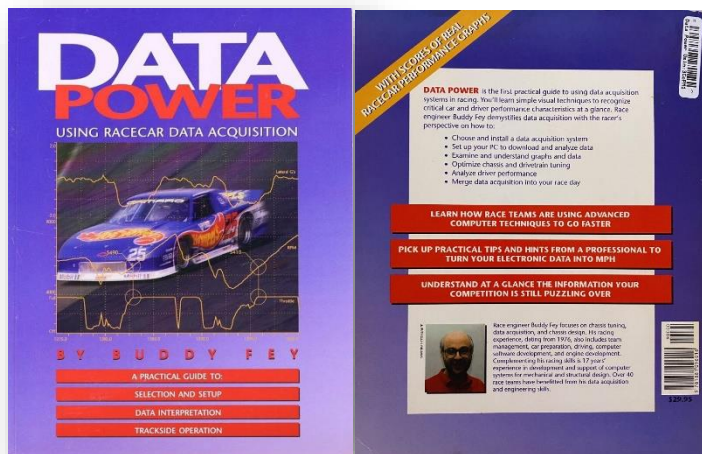


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A Chat with Jeff Braun





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