NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

June 5, 2013

17 – Engine Monitor Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location:	Dade City, Florida
Date:	April 27, 2013
Aircraft:	Cessna 172N
Registration:	N5944J
Operator:	Private
NTSB Number:	ERA13FA217

B. GROUP - No Group

C. SUMMARY

On April 27, 2013, about 1800 eastern daylight time (EDT), a Cessna 172N, N5944J, was substantially damaged during a forced landing to a field following a total loss of engine power, near Dade City, Florida. The commercial pilot and two private pilot passengers received minor injuries. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the instructional flight that was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91 The flight departed Hernando County Airport (BKV), Brooksville, Florida at 1746.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	JPI EDM-700
Serial Number:	27498

JPI EDM-700 Device Description

The J.P. Instruments (JPI) EDM-700 is a panel mounted instrument enabling the operator to monitor and record up to 24 parameters related to engine operations. Depending on the installation, engine parameters monitored can include: exhaust gas temperature (EGT), cylinder head temperature (CHT), oil pressure and temperature, manifold pressure, outside air temperature, turbine inlet temperature (TIT), engine

revolutions per minute, compressor discharge temperature, fuel flow, carburetor temperature, and battery voltage.

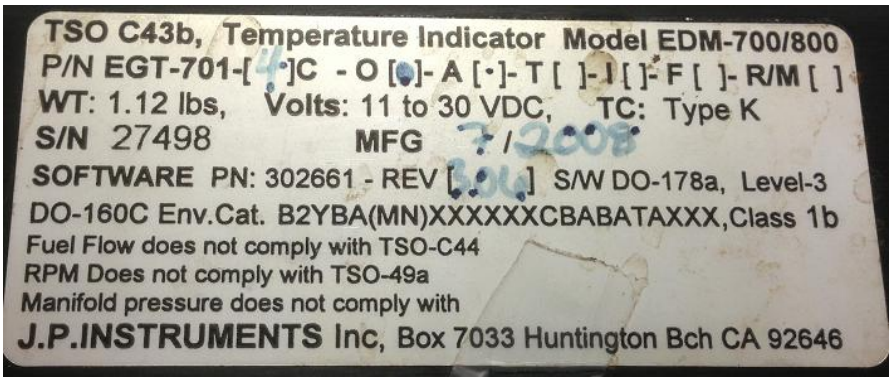
The unit can also calculate, in real-time, horsepower, fuel used, shock cooling rate and EGT differentials between the highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

The unit contains non-volatile memory[1] for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator from 2 to 500 seconds per sample. The memory can store up to 20 hours of data at a 6 second sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

Data Recovery

The unit was in good condition and the data were extracted normally. Figure 1 shows a picture of the unit data plate, indicating the firmware revision of 3.06, the number "4" inscribed next to the letter "C," and a dot next to the letter "O." There were no entries on the data plate adjacent to the letters "A," "T", "I," "F," or "R/M." The number inscribed adjacent to "MFG" was "7/2008". Figure 2 shows the unit with power applied in the NTSB Vehicle Recorder Laboratory.

Figure 1. Unit data plate.



[1] Non-volatile memory is semiconductor memory that does not require external power for data retention.

Figure 2. Unit with power applied.

Data Description

The unit contained about 21.9 hours of recorded data over 13 power cycles, recorded at a sample rate of once every 6 seconds. The recorded data spanned dates of April 25, 2013 through the accident flight on April 27, 2013, as recorded by the unit internal clock. The parameters recorded were EGT, CHT, voltage, and oil temperature. Additionally, the calculated shock cooling rate was also recorded. No other parameters were recorded by the unit.

This report examined the first flight on the recording on April 25, 2013, the flight prior to the accident flight on April 27, 2013, and the accident flight on April 27, 2013.

Engineering Units Conversion

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM-700, J.P. Instruments.

Appendix A lists the EDM-700 parameters verified and provided in this report.

Time Correlation

The EDM-700 records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. Examination of the recorded data, and comparison with the reported accident time provided by the IIC, indicated the EDM-700 internal clock was set to Coordinated Universal Time (UTC), but was 21 minutes

ahead of actual UTC. As such, 21 minutes was subtracted from all EDM-700 recorded times to correct for the error.

Correlation of the EDM-700 data to the event local time, EDT, was established by using the corrected UTC recorded time and then subtracting a 4 hour offset to change UTC to EDT. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

Plots and Corresponding Tabular Data

Figure 3 shows a plot of the first flight on the recording, which occurred on April 25, 2013. The recording shows the EGT related to cylinder 3 (EGT-3) was generally operating colder than the EGTs related to the other cylinders. The CHT on cylinder 3 (CHT-3) was generally one of the hotter CHTs.

Figure 4 shows a plot of the flight immediately prior to the accident flight, which occurred on the same day as the accident flight, April 27, 2013, earlier in the day. EGT-3 was generally operating colder than the EGTs related to the other cylinders. CHT-3 was generally one of the hotter CHTs.

Figure 5 shows a plot of the accident flight, which occurred on April 27, 2013. EGT-3 began as the coldest EGT, and transitioned to the hottest EGT between about 1745:50 and 1757:16 EDT, when CHT-3 also became the hottest CHT. At about 1757:16 EDT, EGT-3 increased momentarily, then began to decrease rapidly. Coincident with the EGT-3 change at about 1757:16 EDT, all the CHTs began to decrease.

The corresponding tabular data used to create figures 3 through 5 are provided in electronic (*.csv[2]) format as Attachment 1 to this report.

[2] Comma Separated Value format.

Figure 3. Plot of first flight on recording.

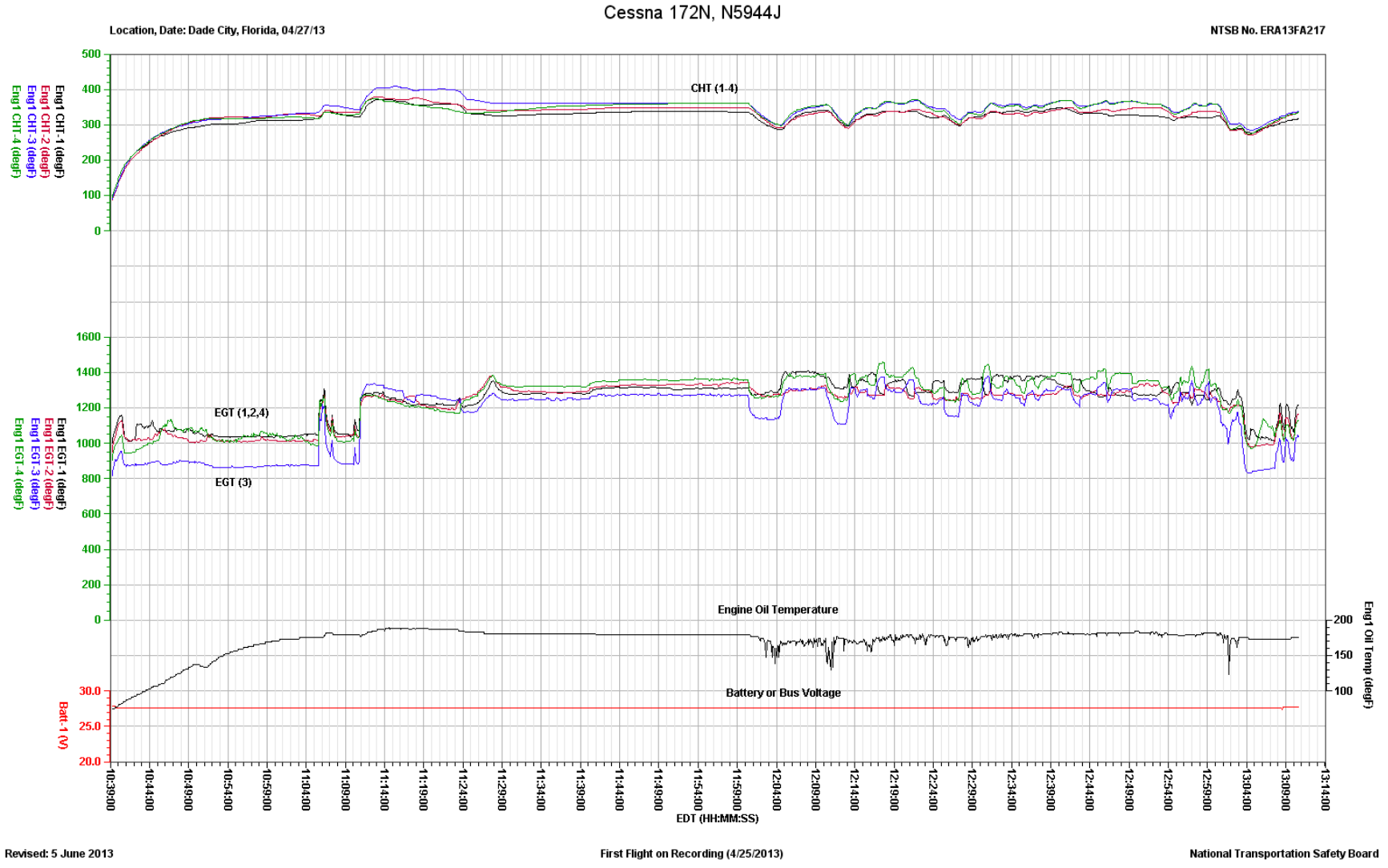


Figure 4. Plot of flight before accident flight.

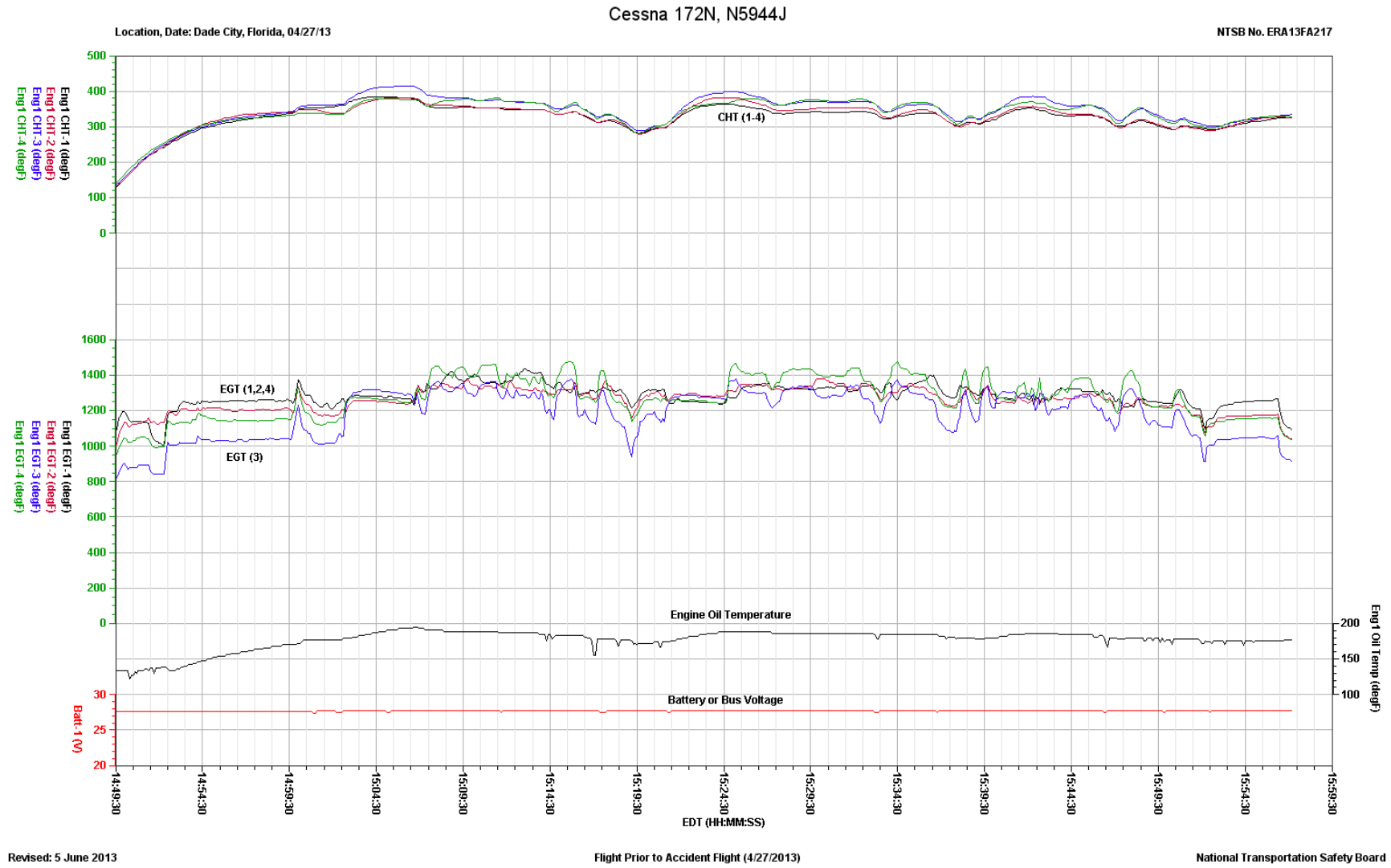
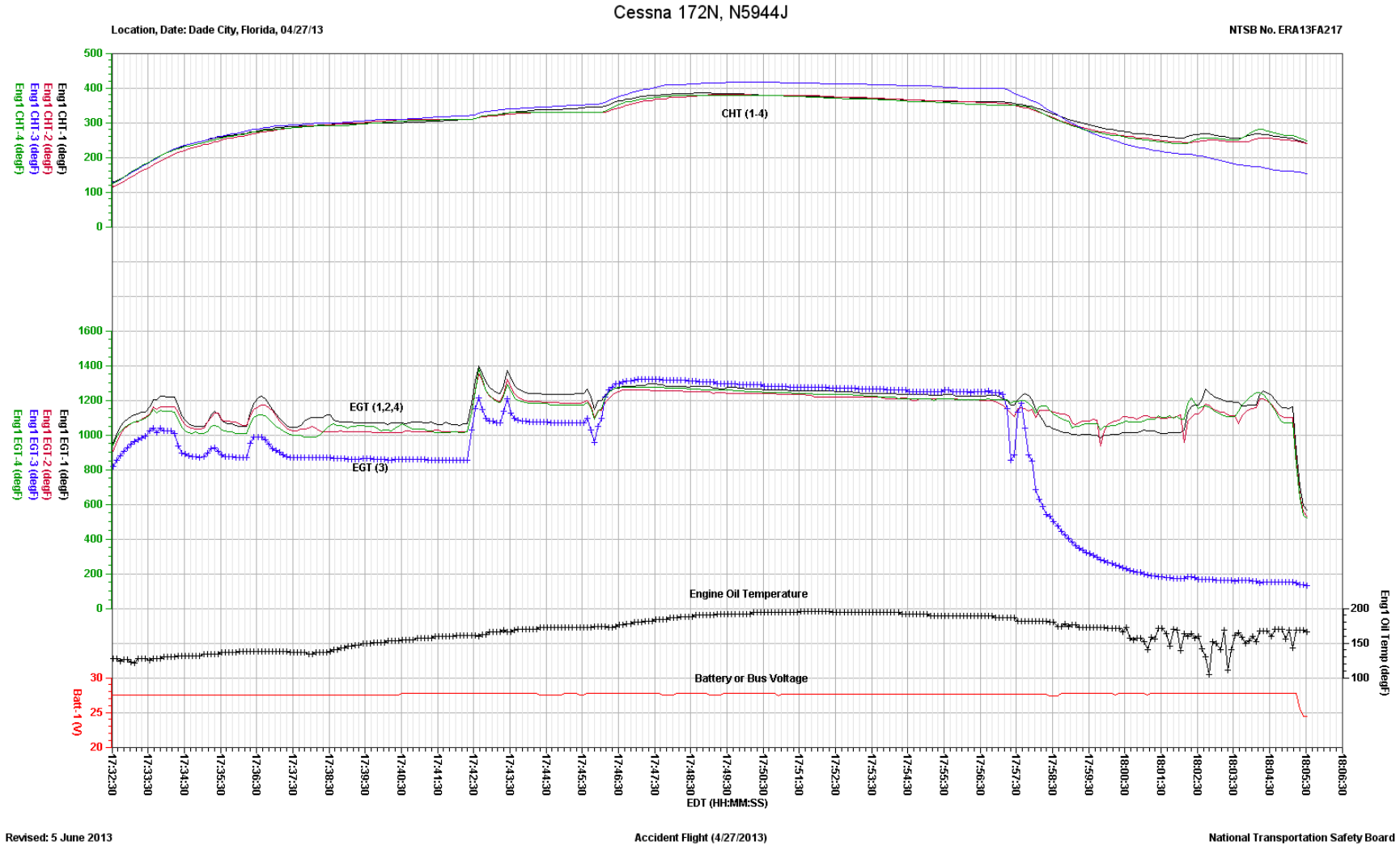


Figure 5. Plot of accident flight.



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided JPI parameters.

Parameter Name	Parameter Description
1. Batt-1 (V)	Battery or Bus Voltage Input 1
2. Eng1 CHT-1 (degF)	Cylinder Head Temperature Cylinder 1
3. Eng1 CHT-2 (degF)	Cylinder Head Temperature Cylinder 2
4. Eng1 CHT-3 (degF)	Cylinder Head Temperature Cylinder 3
5. Eng1 CHT-4 (degF)	Cylinder Head Temperature Cylinder 4
6. Eng1 EGT-1 (degF)	Exhaust Gas Temperature Cylinder 1
7. Eng1 EGT-2 (degF)	Exhaust Gas Temperature Cylinder 2
8. Eng1 EGT-3 (degF)	Exhaust Gas Temperature Cylinder 3
9. Eng1 EGT-4 (degF)	Exhaust Gas Temperature Cylinder 4
10. Eng 1 Oil Temp (degF)	Oil Temperature

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	degrees Fahrenheit
V	Volts DC