CALIBRATION REPORT
Portable Radiation Package

SERIAL NUMBER 02

DataSet Configuration: 0010
Document date: February 8, 2001

Configuration File:

```
PRP CALIBRATION INFORMATION FILE -- created: 2001-02-08 (039) 06:46:52
LAST EDIT: new file
CALIBRATION NAME: 0010
DATA POINT OF CONTACT: R. M. Reynolds
POC ADDRESS: 490D; Brookhaven National lab; Upton NY 11973; USA
POC EMAIL: reynolds@bnl.gov
PRP SERIAL NUMBER: 02
FILE NAME: INFO_02_0010.txt
DOCUMENTS: Cal02_0010.pdf
HEAD SERIAL NUMBER: 432
HEAD CALIBRATION ID: 9904
DATALOGGER SERIAL NUMBER: dl00_4
DATALOGGER CALIBRATION ID: 0010
PSP SERIAL NUMBER: 32385F3
PSP CALIBRATION ID: orig
PIR SERIAL NUMBER: 32387F3
PIR THERMOPILE CALIBRATION ID: orig
PIR TEMPERATURE CALIBRATION ID: 0010
COMMENTS: Revised file structure and matlab
```

BROOKHAVEN NATIONAL LABORATORY

Bldg 490d, Upton NY 11973 — 631-344-7836 — reynolds@bnl.gov

PRP INFO FILE

```
SETUP FOR PROCESSING PRP CALIBRATIONS: 08-Feb-2001 06:51:34
PRP S/N: 02,   Calibration identifier: 0010
Configuration file: hd:instruments:prp:prpcal:prp:02:0010:INFO_02_0010.txt
PRP CALIBRATION
PRP CALIBRATION INFORMATION FILE -- created: 2001-02-08 (039) 06:46:52
LAST EDIT: new file
CALIBRATION NAME: 0010
DATA POINT OF CONTACT: R. M. Reynolds
POC ADDRESS: 490D; Brookhaven National lab; Upton NY 11973; USA
POC EMAIL: reynolds@bnl.gov
PRP SERIAL NUMBER: 02
FILE NAME: INFO_02_0010.txt
DOCUMENTS: Cal02_0010.pdf
HEAD SERIAL NUMBER: 432
HEAD CALIBRATION ID: 9904
DATALOGGER SERIAL NUMBER: dl00_4
DATALOGGER CALIBRATION ID: 0010
PSP SERIAL NUMBER: 32385F3
PSP CALIBRATION ID: orig
PIR SERIAL NUMBER: 32387F3
PIR THERMOPILE CALIBRATION ID: orig
PIR TEMPERATURE CALIBRATION ID: 0010
COMMENTS: Revised file structure and matlab
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CALIBRATION INFO FOR HEAD 432:
# This file            : 432.CAL
# Data valid from date : 10/05/1998
# MFRSR system owner   : PNL / S/O 240
# YESDAS system password: Langley!
# Supervisor password  :  Irradiance!
# System Datalogger ID : $0000 (Hex), 0 (Dec)
# Instrument Head ID   : $091E (Hex), 2334 (Dec)
# Instrument Head S/N  : 432
-------------------
DATALOGGER CALIBRATION: ProcLoggerCal (version 101)  Run date: 08-Feb-2001 06:52:59
DATALOGGER S/N DL2000_4
CALIBRATION DATE: 20000507
TECHNICIAN: EDWARDS
VOLTAGE REFERENCE: VOLT-A-VIDER 103264
  USE PRECISION VREF CIRCUIT

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# Data valid from date : 10/05/1998
# MFRSR system owner   : PNL / S/O 240
# YESDAS system password: Langley!
# Supervisor password  :  Irradiance!
# System Datalogger ID : $0000 (Hex), 0 (Dec)
# Instrument Head ID   : $091E (Hex), 2334 (Dec)
# Instrument Head S/N  : 432
```

```
----------
DATALOGGER CALIBRATION: ProcLoggerCal (version 101)  Run date: 08-Feb-2001 06:52:59
DATALOGGER S/N DL2000_4
CALIBRATION DATE: 20000507
TECHNICIAN: EDWARDS
VOLTAGE REFERENCE: VOLT-A-VIDER 103264
  USE PRECISION VREF CIRCUIT

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PSP CALIBRATION: S/N 32385F3
  Factory calibration: 1998-02-12
8.92
  8.920
----------
PIR CALIBRATION - S/N: 32387F3
  Factory calibration: 1998-01-13
3.75
  3.750
-----------------
PIR THERMISTOR CALIBRATION -- PART 2
Process times from file lacie:instruments:prp:prpcal:pir:32387F3:32387F3_Tcal_0010.dat
Process times from pirSN = 32387F3
SAVE THE RESULTS TO FILE lacie:instruments:prp:prpcal:pir:32387F3:32387F3_Tcal_0010.mat
save lacie:instruments:prp:prpcal:pir:32387F3:32387F3_Tcal_0010.mat readme beta_case beta_dome rcav rcs
  beta_case and beta_dome are Steinhart-Hart coefficients
  tcase = steinharthart(beta_case,r) where r = thermistor resistance in ohms.
  tdome = steinharthart(beta_dome ...
  rcav and rcstd are the test resistances and the std dev for each test point.
  rdav and rdstd are ditto for the dome
  tav and tstd are the mean temperature and std dev for each test point as
     computed from the SBE834 temperature probe.
  tc_ysi and td_ysi are computed from the published YSI calibration table.
      (See function 'YSI44006.m'.)
  casefit and domefit are cubic fitted corrections to the YSI computed temperatures.
    If tcaseysi is a vector of case temperatures computed from the YSI44006.m function,
    then  tcase = tcase + polyval(casefit,tcaseysi);
     Ditto for the dome.
----------
COMPUTE PIR THERMISTOR COEFFICIENTS
Use calibrated coefficients for PIR case thermistor

Use calibrated coefficients for PIR doome thermistor
```

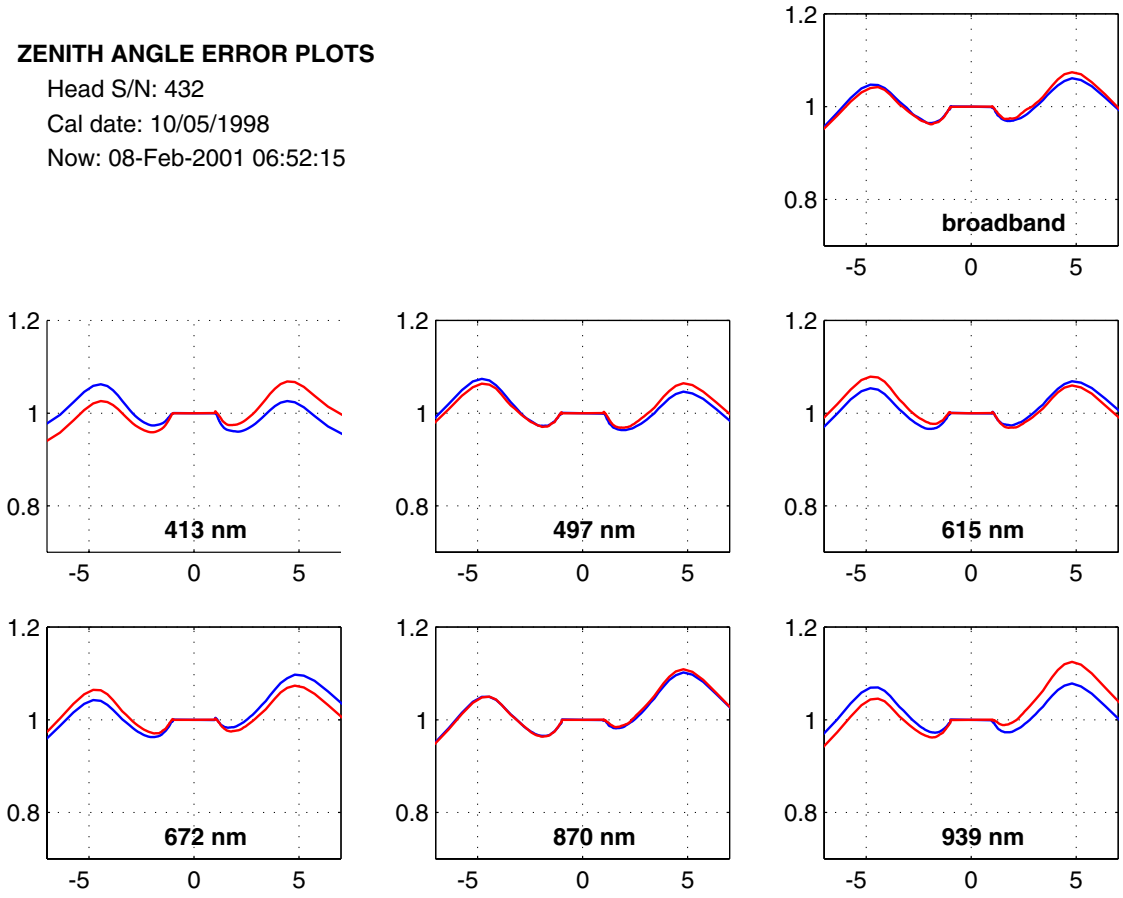


Figure 1: Zenith Angle Error

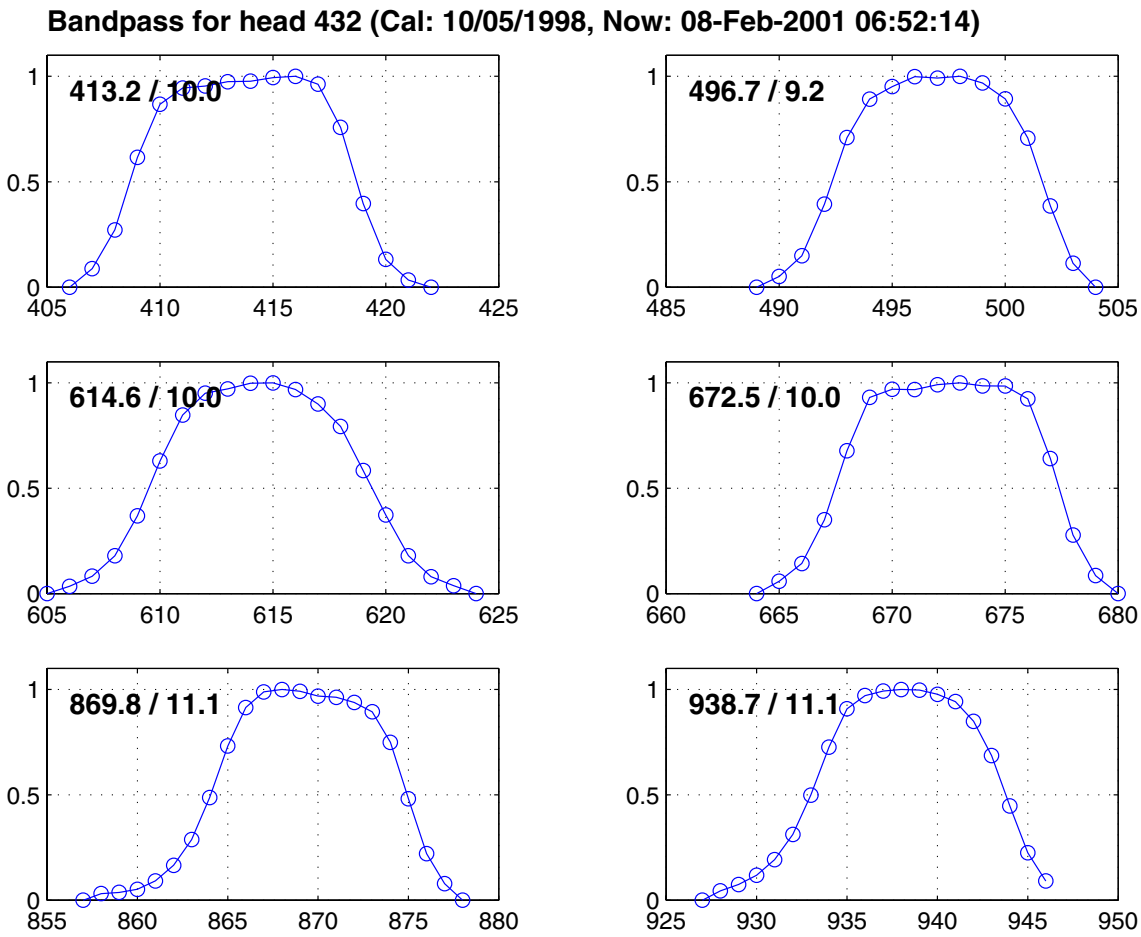


Figure 2: Zenith Angle Error

HEAD 432 TOA IRRADIANCES BASED ON ASTRONOMICAL SOLAR SPECTRUM

WAVELENGTH (nm)			IRRADIANCE (W/m^2/nm)		
LOWER	CENTER	UPPER	LOWER	MEAN	UPPER
406,	414,	422,	1.651,	1.738,	1.825
489,	497,	504,	1.846,	1.944,	2.041
605,	614,	624,	1.624,	1.709,	1.795
664,	672,	680,	1.450,	1.526,	1.602
857,	869,	878,	0.903,	0.950,	0.998
927,	938,	947,	0.783,	0.824,	0.865

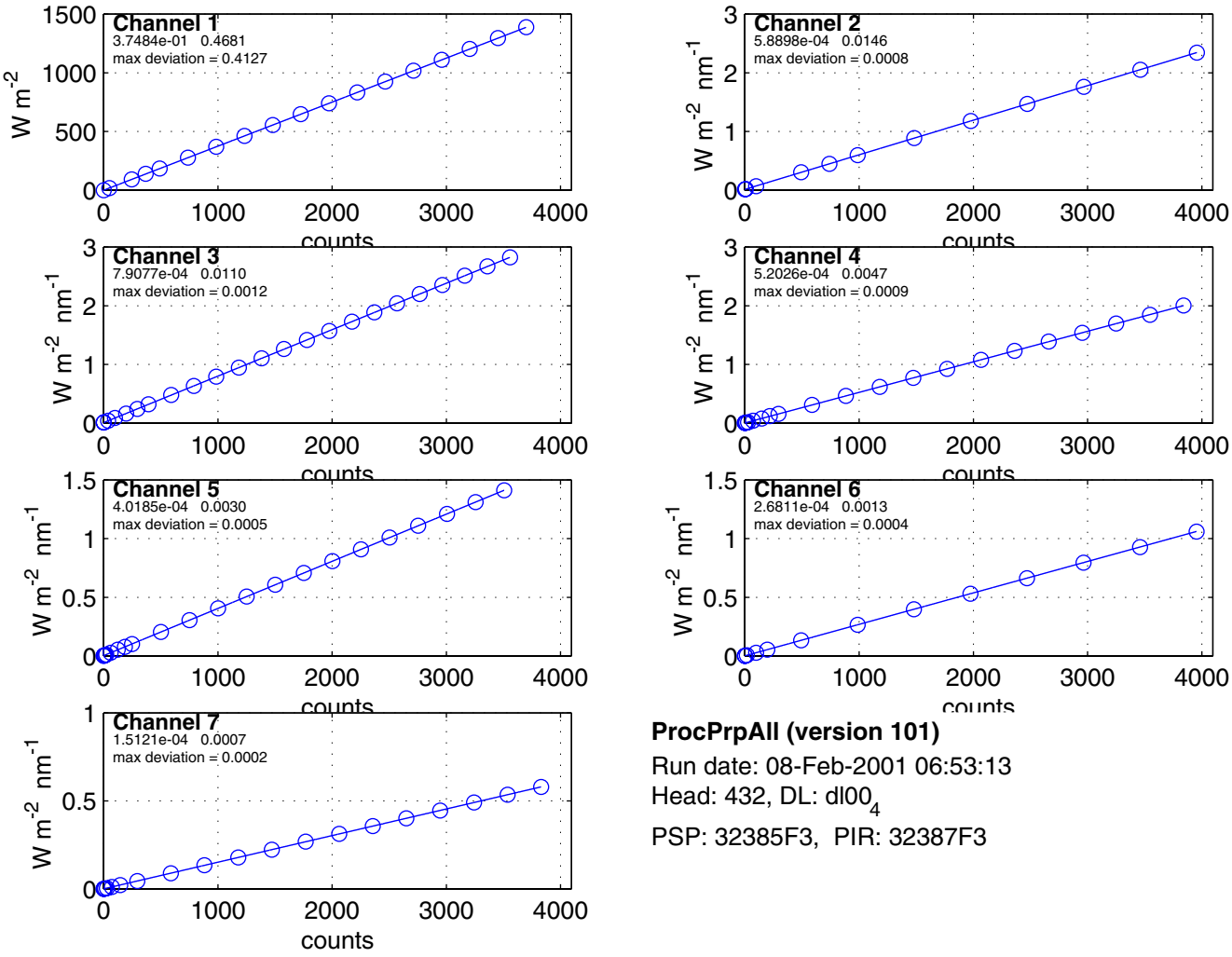


Figure 3: Head and Logger combined gains

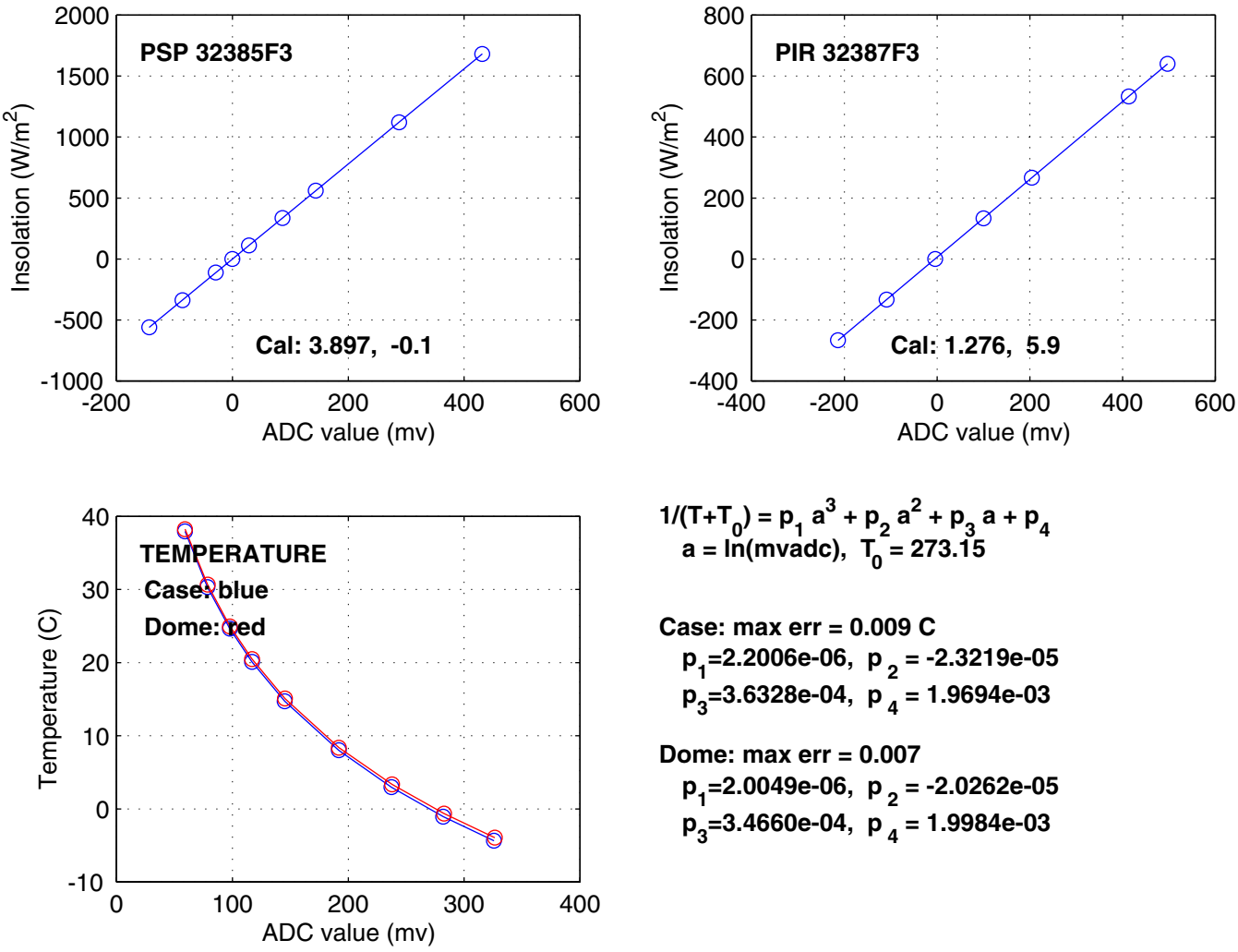


Figure 4: Head and Logger combined gains

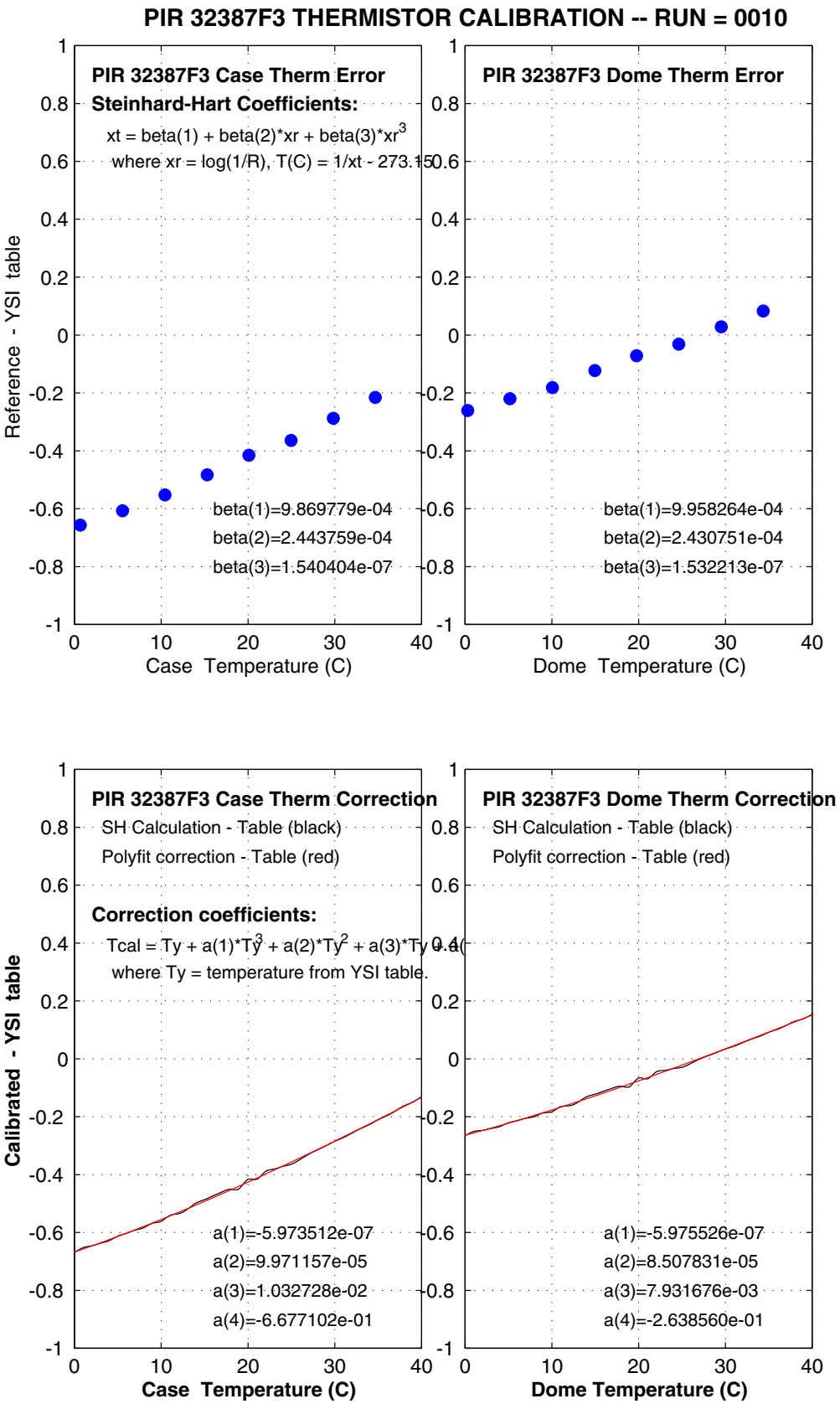
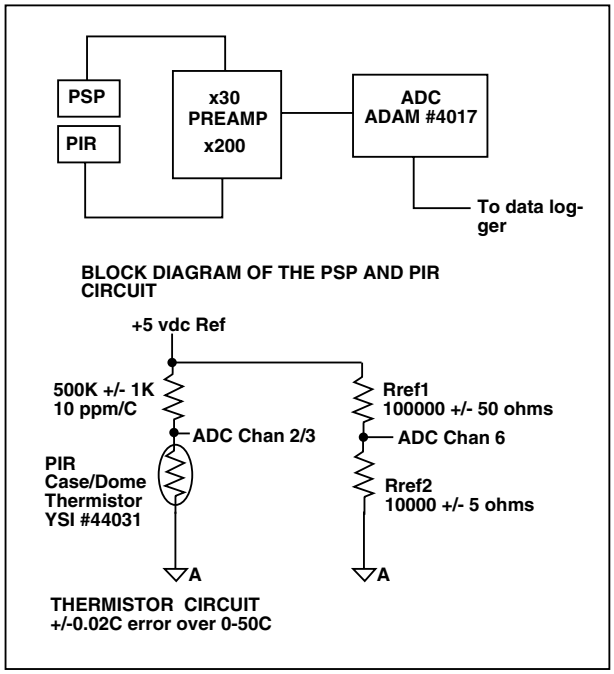


Figure 5: PIR Temperature calibration results.



TEST PLUG:

$R_{case} =$ _____ $T_{44031} =$ _____ Logger Temperature = _____

$R_{dome} =$ _____ $T_{44031} =$ _____ Logger Temperature = _____

```
COMPUTE VREF FROM R_REF AND R_THERM
PRP SN: 02        Cal ID: 0010
CASE - Rref = 499400.0
R_cal      v_T         V_REF (computed)
 6000       59.1    4979.0
 8000       78.5    4978.9
10000       97.7    4976.8
12000      116.8    4977.6
15000      145.1    4977.0
20000      191.7    4978.2
25000      237.3    4977.0
30000      282.0    4975.7
35000      325.8    4974.5

DOME - Rref = 499400.0
R_cal      v_T         V_REF (computed)
 6000       59.1    4980.7
 8000       78.6    4983.3
10000       97.8    4984.0
12000      117.0    4984.4
15000      145.4    4985.6
20000      192.0    4987.0
25000      237.7    4986.6
30000      282.5    4985.9
35000      326.5    4985.6
```

(File: hd:instruments:prp:prpcal:prp:02:0010:TcalVref_0010.dat)

```
% CALIBRATION FILE FOR PRPRX DATA COLLECTION SOFTWARE
% PSP CALIBRATION, PSP SN: 32385F3
3.8966     -0.080714
% PIR CALIBRATION, PIR SN: 32387F3
1.276  5.878
% TCASE FIT
2.20065e-06    -2.32188e-05     0.000363276    0.00196936
% TDOME FIT
2.00488e-06    -2.02618e-05     0.000346603    0.00199836
% K COEFFICIANT
4.0
% SIGMA
5.67e-8
% EPSILON
0.98
% BATTERY
0.030820 0.0
```

(File: hd:instruments:prp:prpcal:prp:02:0010:prprx_02_0010.txt)

LOGGER CALIBRATION FILE

```
%PRP02 -- ID = 0010
%MFRSR: 432
%PSP: 32385F3, COEFF: 8.92
%PIR: 32387F3, COEFF: 3.75
%PREAMP: 1
DATALOGGER S/N DL2000_4
CALIBRATION DATE: 20000507
TECHNICIAN: EDWARDS
VOLTAGE REFERENCE: VOLT-A-VIDER 103264

CHANNEL 1
0 0.00 0.00
10 48.09 0.52 49.30 -1.21
50 245.49 0.52 246.50 -1.01
75 368.68 0.48 369.75 -1.07
100 492.25 0.52 493.00 -0.75
150 738.84 0.60 739.50 -0.66
200 985.79 0.42 986.00 -0.21
250 1232.75 0.44 1232.50 0.25
300 1479.05 0.52 1479.00 0.05
350 1725.94 0.24 1725.50 0.44
400 1972.61 0.50 1972.00 0.61
450 2219.16 0.60 2218.50 0.66
500 2465.94 0.25 2465.00 0.94
550 2712.56 0.51 2711.50 1.06
600 2959.37 0.50 2958.00 1.37
650 3206.00 0.33 3204.50 1.50
700 3452.68 0.48 3451.00 1.68
750 3699.35 0.59 3697.50 1.85
CHANNEL 2
0 0.00 0.00 0.00 0.00
1 8.65 0.55 9.89 -1.24
10 97.55 0.51 98.90 -1.35
50 493.56 0.51 494.50 -0.94
75 740.67 0.52 741.75 -1.08
100 987.94 0.43 989.00 -1.06
150 1482.90 0.31 1483.50 -0.60
200 1977.63 0.50 1978.00 -0.37
250 2472.32 0.48 2472.50 -0.18
300 2966.89 0.32 2967.00 -0.11
350 3461.67 0.49 3461.50 0.17
400 3956.47 0.51 3956.00 0.47
CHANNEL 3
0 0.00 0.00 0.00 0.00
1 2.55 0.51 3.95 -1.40
10 38.17 0.59 39.50 -1.33
25 97.42 0.51 98.75 -1.33
50 196.17 0.38 197.50 -1.33
75 294.94 0.42 296.25 -1.31
100 394.00 0.59 395.00 -1.00
150 591.67 0.48 592.50 -0.83
200 789.29 0.47 790.00 -0.71
250 987.00 0.56 987.50 -0.50
300 1184.84 0.37 1185.00 -0.16
350 1382.33 0.49 1382.50 -0.17
400 1580.14 0.57 1580.00 0.14
450 1777.95 0.23 1777.50 0.45
500 1975.42 0.51 1975.00 0.42
550 2173.17 0.51 2172.50 0.67
600 2370.74 0.45 2370.00 0.74
650 2568.63 0.50 2567.50 1.13
700 2766.39 0.50 2765.00 1.39
750 2964.11 0.46 2962.50 1.61
800 3161.47 0.51 3160.00 1.47
850 3359.60 0.50 3357.50 2.10
900 3556.89 0.57 3555.00 1.89
CHANNEL 4
0 0.00 0.00 0.00 0.00
1 1.50 0.51 2.96 -1.46
5 13.11 0.46 14.80 -1.69
10 27.79 0.42 29.60 -1.81
25 72.45 0.69 74.00 -1.55
50 146.46 0.59 148.00 -1.54
75 220.16 0.50 222.00 -1.84
100 293.84 0.50 296.00 -2.16
200 589.42 0.51 592.00 -2.58
300 884.84 0.37 888.00 -3.16
400 1180.26 0.45 1184.00 -3.74
500 1475.78 0.43 1480.00 -4.22
600 1771.47 0.51 1776.00 -4.53
700 2067.16 0.50 2072.00 -4.84
800 2362.39 0.61 2368.00 -5.61
900 2658.16 0.60 2664.00 -5.84
1000 2953.58 0.51 2960.00 -6.42
1100 3249.30 0.57 3256.00 -6.70
1200 3544.47 0.51 3552.00 -7.53
1300 3840.32 0.67 3848.00 -7.68
CHANNEL 5
0 0.00 0.00 0.00 0.00
1 1.40 0.50 2.50 -1.10
5 11.10 0.55 12.50 -1.40
10 23.74 0.45 25.00 -1.26
```

```
25 61.35 0.59 62.50 -1.15
50 124.00 0.47 125.00 -1.00
75 186.58 0.51 187.50 -0.92
100 249.16 0.50 250.00 -0.84
200 499.89 0.32 500.00 -0.11
300 750.26 0.56 750.00 0.26
400 1000.89 0.46 1000.00 0.89
500 1251.58 0.51 1250.00 1.58
600 1502.16 0.50 1500.00 2.16
700 1752.56 0.51 1750.00 2.56
800 2003.37 0.50 2000.00 3.37
900 2253.58 0.51 2250.00 3.58
1000 2504.37 0.60 2500.00 4.37
1100 2754.79 0.54 2750.00 4.79
1200 3005.37 0.50 3000.00 5.37
1300 3255.84 0.37 3250.00 5.84
1400 3506.42 0.51 3500.00 6.42
CHANNEL 6
0 0.00 0.00 0.00 0.00
1 0.73 0.46 1.97 -1.24
10 18.42 0.51 19.70 -1.28
50 97.47 0.51 98.50 -1.03
100 196.42 0.51 197.00 -0.58
250 492.84 0.50 492.50 0.34
500 987.32 0.48 985.00 2.32
750 1481.32 0.48 1477.50 3.82
1000 1975.79 0.42 1970.00 5.79
1250 2469.84 0.37 2462.50 7.34
1500 2964.16 0.60 2955.00 9.16
1750 3458.58 0.51 3447.50 11.08
2000 3952.79 0.42 3940.00 12.79
CHANNEL 7
0 0.00 0.00 0.00 0.00
1 1.44 0.51 2.96 -1.52
5 13.50 0.51 14.80 -1.30
10 28.10 0.45 29.60 -1.50
25 72.33 0.48 74.00 -1.67
50 145.95 0.52 148.00 -2.05
100 293.47 0.61 296.00 -2.53
200 588.37 0.50 592.00 -3.63
300 882.95 0.52 888.00 -5.05
400 1177.68 0.58 1184.00 -6.32
500 1472.79 0.42 1480.00 -7.21
600 1767.40 0.60 1776.00 -8.60
700 2062.16 0.37 2072.00 -9.84
800 2356.89 0.46 2368.00 -11.11
900 2651.79 0.54 2664.00 -12.21
1000 2946.58 0.51 2960.00 -13.42
1100 3241.26 0.45 3256.00 -14.74
1200 3536.16 0.37 3552.00 -15.84
1300 3830.68 0.58 3848.00 -17.32
PSP
-5 -143.86 0.03
-3 -86.33 0.02
-1 -28.77 0.02
0 0.06 0.02
1 28.83 0.02
3 86.35 0.02
5 143.88 0.02
10 287.76 0.02
15 431.54 0.02
PIR
-1 -213.66 0.09
-0.5 -109.36 0.14
0 -4.40 0.18
0.5 100.02 0.13
1 204.53 0.11
2 413.42 0.17
2.4 496.75 0.15
CASE 499400 ohms reference
6000 59.11 0.01
8000 78.50 0.02
10000 97.70 0.01
12000 116.80 .01
15000   145.13 .01
20000 191.69 .01
25000 237.27 .01
30000 281.96  .01
35000  325.80  0.01
DOME 499400 ohms reference resistor
6000 59.13 0.01
8000 78.57 0.02
10000 97.84 0.01
12000 116.96 .01
15000   145.38 .01
20000 192.03 .01
25000 237.73 .01
30000 282.54  .01
35000  326.53 0.01
VREF RESISTORS - chan 6
99970 9993
END
```