

CALIBRATION REPORT
Portable Radiation Package

SERIAL NUMBER 05

DataSet Configuration: 0107
Document date: July 3, 2001

Configuration File:

PRP CALIBRATION INFORMATION FILE -- created: 2001-07-03 (184) 13:15:47
LAST EDIT: new file
CALIBRATION NAME: 0107
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: 05
FILE NAME: INFO_05_0107.txt
DOCUMENTS: Cal05_0107.pdf
HEAD SERIAL NUMBER: 473
HEAD CALIBRATION ID: orig
DATALOGGER SERIAL NUMBER: dl00_6
DATALOGGER CALIBRATION ID: 0106
PSP SERIAL NUMBER: 31282F3
PSP CALIBRATION ID: orig
PIR SERIAL NUMBER: 30169F3
PIR THERMOPILE CALIBRATION ID: 0101
PIR TEMPERATURE CALIBRATION ID: 0101
COMMENTS: PRP 05 as prepared for installation on the
Explorer of the Seas. Note, we removed head 461
and replaced it with the new head 473. Head 473
was purchased for the Ex Seas originally by rsmas.



PRP INFO FILE

CALIBRATION INFO FOR HEAD 473:

```
# This file          : 473.CAL
# Data valid from date : 07/24/2000
# MFRSR system owner  : Royal Caribbean Cruise Lines
# YESDAS system password: Langley!
# Supervisor password : Irradiance!
# System Datalogger ID : $2816 (Hex), 10262 (Dec)
# Instrument Head ID   : $5704 (Hex), 22276 (Dec)
# Instrument Head S/N  : 473
```

CALIBRATION INFO FOR HEAD 473:

```
# This file          : 473.CAL
# Data valid from date : 07/24/2000
# MFRSR system owner  : Royal Caribbean Cruise Lines
# YESDAS system password: Langley!
# Supervisor password : Irradiance!
# System Datalogger ID : $2816 (Hex), 10262 (Dec)
# Instrument Head ID   : $5704 (Hex), 22276 (Dec)
# Instrument Head S/N  : 473
```

```
DATALOGGER CALIBRATION: ProcLoggerCal (version 101) Run date: 29-Jun-2001 15:26:12
USE PRECISION VREF CIRCUIT
```

```
PSP CALIBRATION: S/N 31282F3
Factory cal: 2000 8.51, 2001-01-23 8.39
8.39
8.390
```

```
PIR CALIBRATION - S/N: 30169F3
New calibration 2001-01-23 4.08
4.08
4.080
```

CALIBRATION INFO FOR HEAD 473:

```
# This file          : 473.CAL
# Data valid from date : 07/24/2000
# MFRSR system owner  : Royal Caribbean Cruise Lines
# YESDAS system password: Langley!
# Supervisor password : Irradiance!
# System Datalogger ID : $2816 (Hex), 10262 (Dec)
# Instrument Head ID   : $5704 (Hex), 22276 (Dec)
# Instrument Head S/N  : 473
```

COMPUTE PIR THERMISTOR COEFFICIENTS

```
Use calibrated coefficients for PIR case thermistor
Use calibrated coefficients for PIR doome thermistor
```

ZENITH ANGLE ERROR PLOTS

Head S/N: 473

Cal date: 07/24/2000

Now: 03-Jul-2001 13:20:24

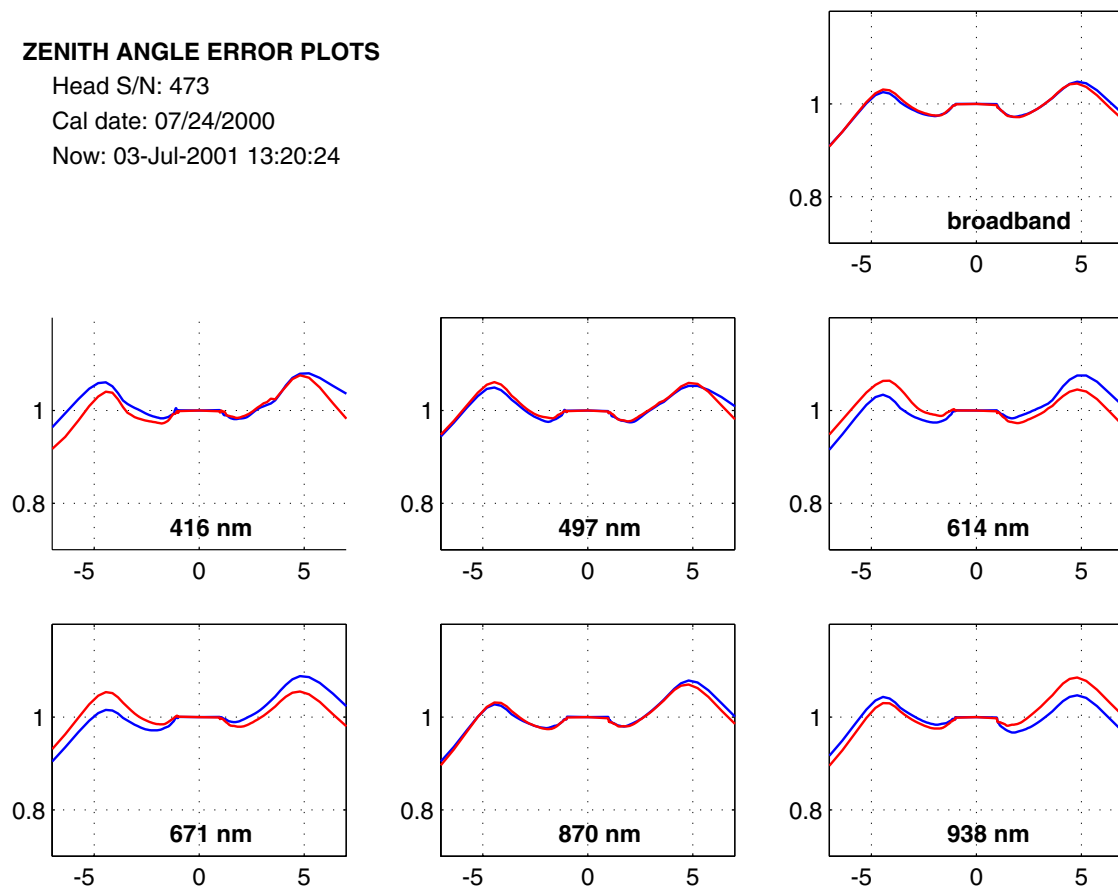


Figure 1: Zenith Angle Error

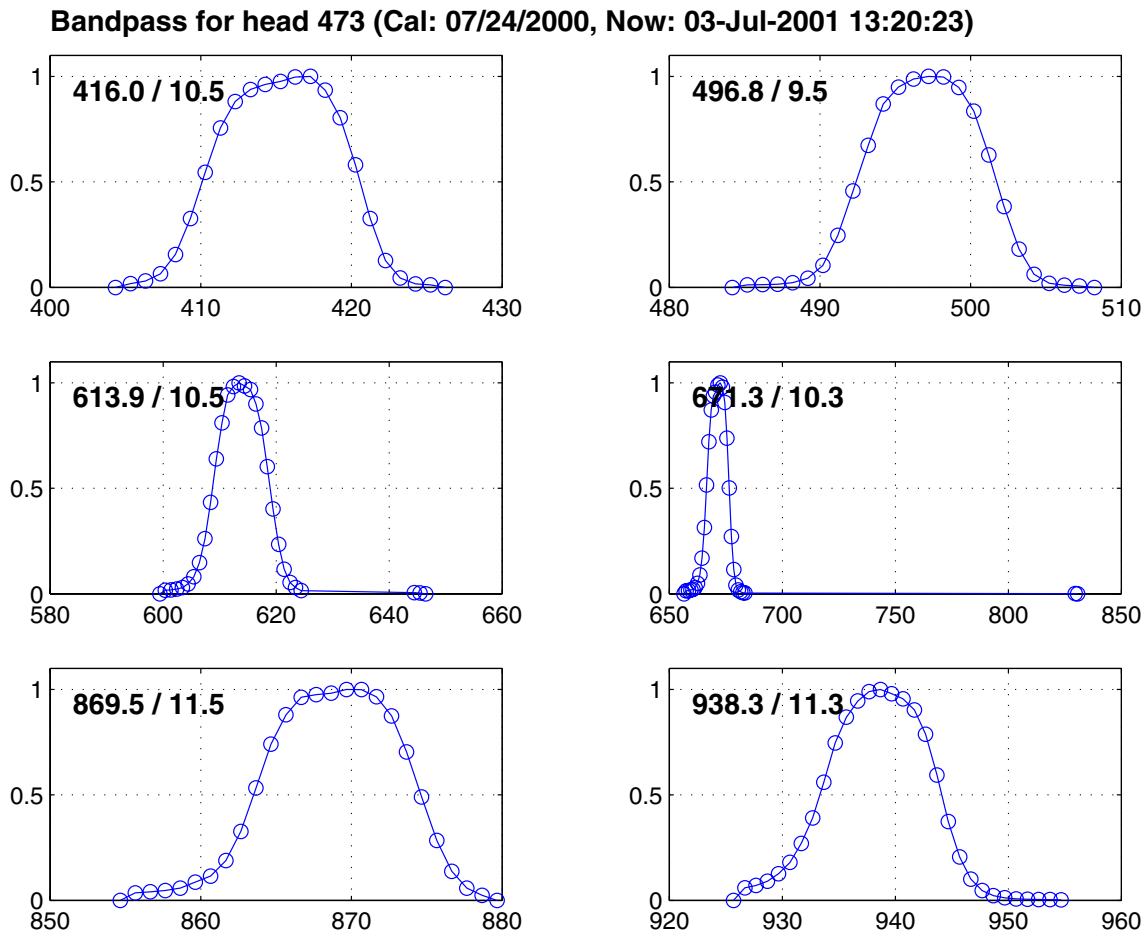


Figure 2: Zenith Angle Error

HEAD 473 TOA IRRADIANCES BASED ON ASTRONOMICAL SOLAR SPECTRUM
 SIMBIOS STANDARD DATA SET -- thuillier98
 Errors set at +/- 2%

WAVELENGTH (nm)			IRRADIANCE (W/m ² /nm)		
LOWER	CENTER	UPPER	LOWER	MEAN	UPPER
404,	415,	426,	1.684,	1.773,	1.861
484,	497,	508,	1.885,	1.984,	2.083
599,	614,	646,	1.608,	1.692,	1.777
657,	672,	831,	1.452,	1.529,	1.605
855,	869,	880,	0.952,	1.002,	1.052
926,	938,	955,	0.766,	0.806,	0.847

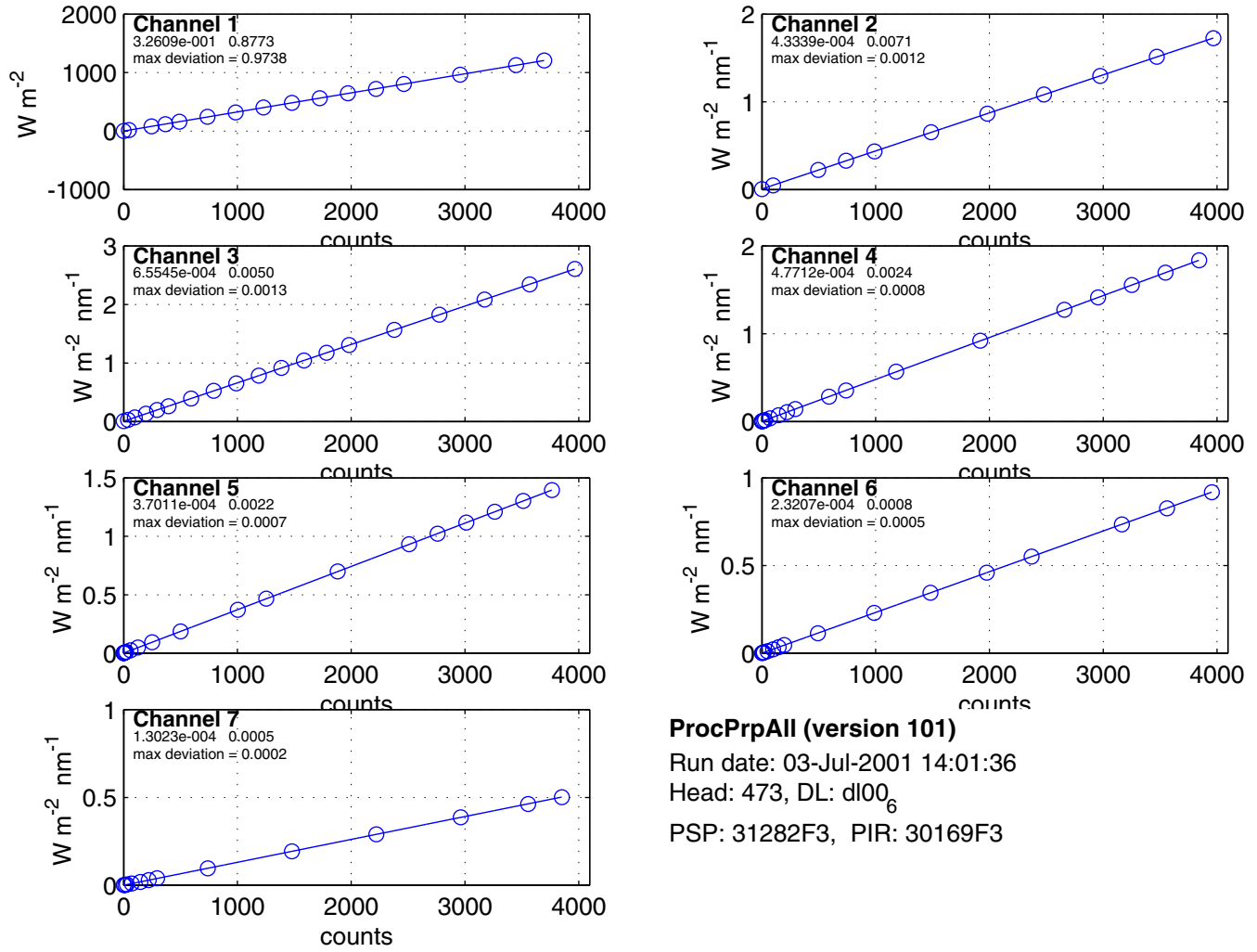
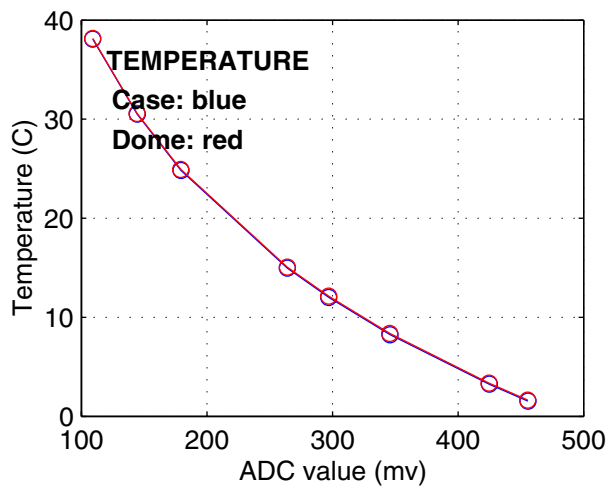
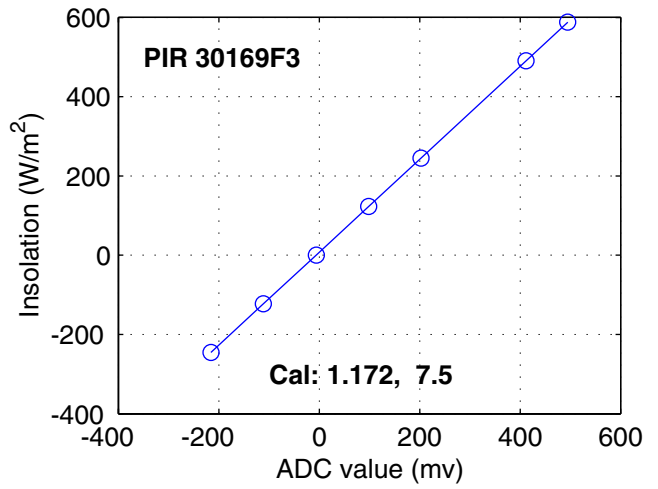
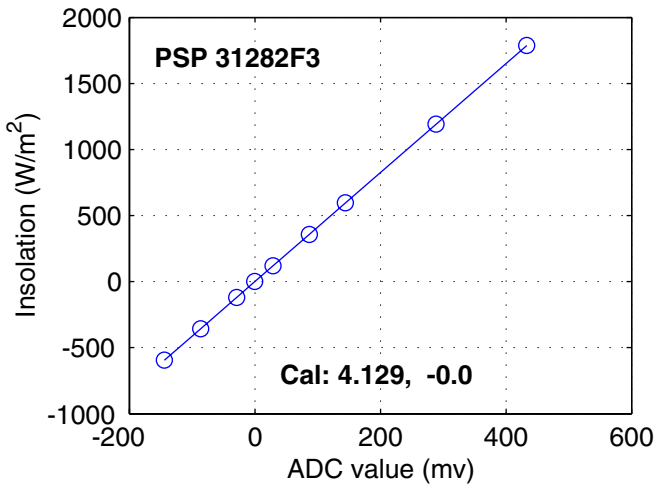


Figure 3: Head and Logger combined gains



$$1/(T+T_0) = p_1 a^3 + p_2 a^2 + p_3 a + p_4$$

$$a = \ln(\text{mvadc}), T_0 = 273.15$$

Case: max err = 0.005 C

$$p_1 = 3.1537e-006, p_2 = -3.8611e-005$$

$$p_3 = 4.3834e-004, p_4 = 1.6804e-003$$

Dome: max err = 0.009

$$p_1 = 2.7260e-006, p_2 = -3.1485e-005$$

$$p_3 = 3.9849e-004, p_4 = 1.7541e-003$$

Figure 4: Head and Logger combined gains

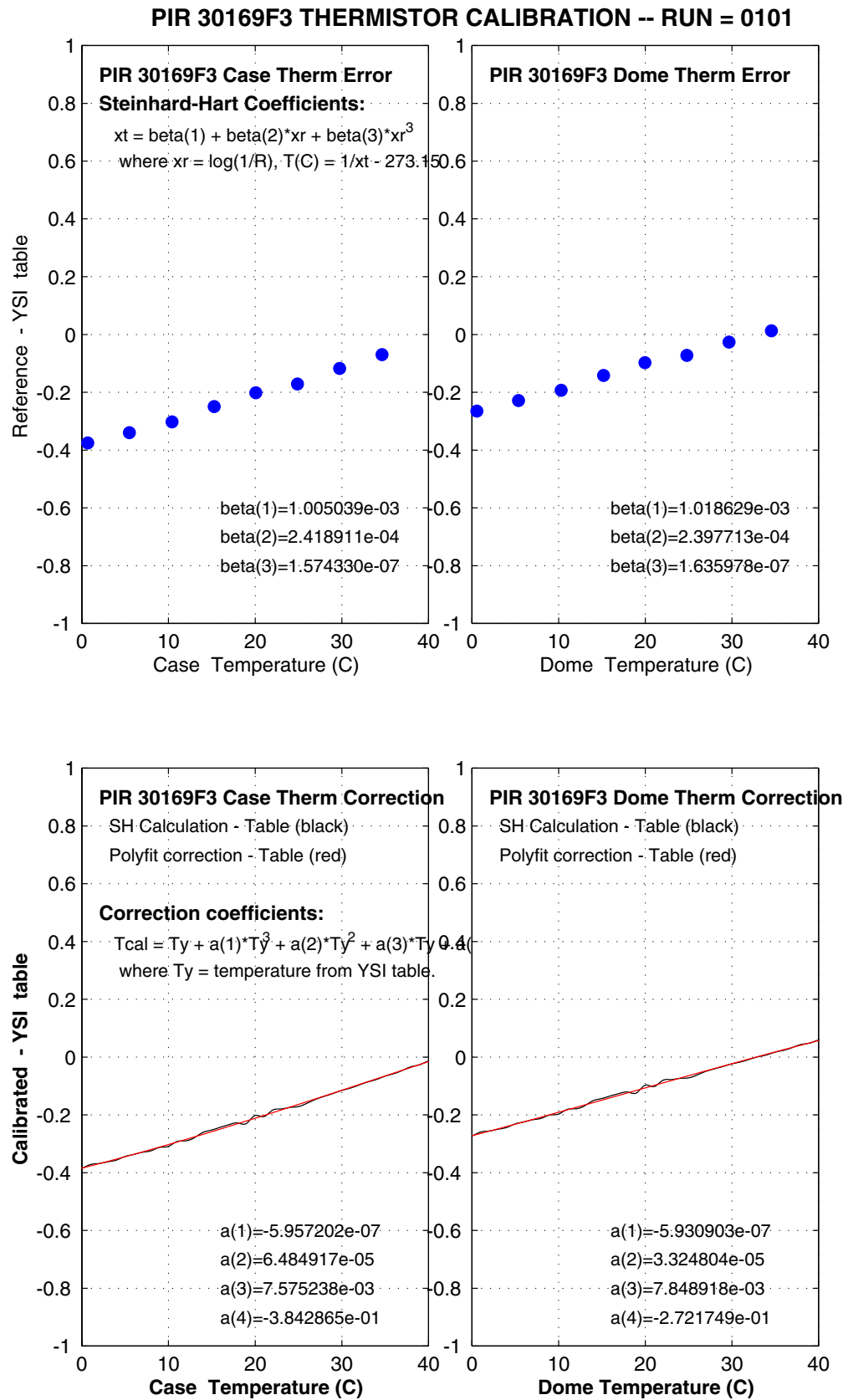
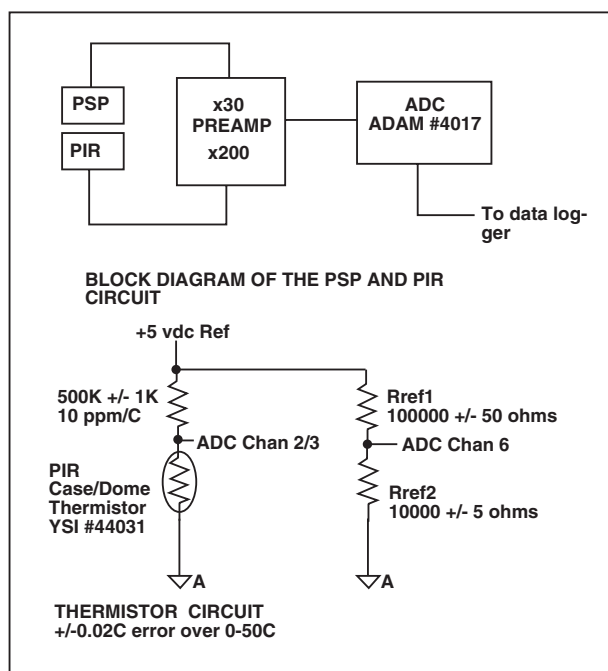


Figure 5: PIR Temperature calibration results.



TEST PLUG:

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

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

COMPUTE VREF FROM R_REF AND R_THERM

PRP SN: 05 Cal ID: 0107

CASE - Rref = 268880.0

R_cal	v_T	V_REF (computed)
6000	109.1	5000.1
8000	144.4	4999.4
10000	179.3	5000.3
15000	264.1	4998.0
17000	297.2	4997.2
20000	346.0	4997.3
25000	424.9	4995.1
27000	455.7	4994.2

DOME - Rref = 268950.0

R_cal	v_T	V_REF (computed)
6000	109.1	4998.1
8000	144.4	4997.9
10000	179.2	4999.1
15000	264.0	4997.1
17000	297.0	4996.4
20000	345.5	4992.2
25000	424.8	4994.2
27000	455.6	4993.4

(File: d:instruments:prp:prpcal:prp:05:0107:TcalVref_0107.dat)

```
% CALIBRATION FILE FOR PRPRX DATA COLLECTION SOFTWARE
% PSP CALIBRATION, PSP SN: 31282F3
4.1287      -0.038391
% PIR CALIBRATION, PIR SN: 30169F3
1.1722  7.5431
% TCASE FIT
3.15366e-006      -3.86105e-005      0.00043834      0.00168041
% TDOME FIT
2.72597e-006      -3.14854e-005      0.000398491      0.0017541
% K COEFFICIENT
4.0
% SIGMA
5.67e-8
% EPSILON
0.98
% BATTERY
0.030820 0.0
```

(File: d:\instruments:prp:prpcal:prp:05:0107:prprx_05_0107.txt)

LOGGER CALIBRATION FILE

DL00_6 (P05)	250 989.95 0.69
CAL DATE: 000626	300 1188.33 0.80
TECH: EDWARDS	350 1386.24 1.00
VOLT REF: VOLTAVIDER	400 1585.08 0.74
PSP: 31282F3 (8.39)	450 1783.38 0.90
PIR: 30169F3 (4.08)	500 1981.88 0.74
MFRSR: 461	600 2378.66 0.64
	700 2775.18 0.67
	800 3171.97 0.65
CHANNEL 1.00	900 3569.00 0.75
0 0.00 0.00	1000 3965.69 0.47
10 46.45 0.88	CHANNEL 4.00
50 243.68 0.91	0 0.00 0.00
75 366.83 0.89	1 1.46 0.93
100 490.00 0.99	5 13.70 0.63
150 737.00 0.63	10 28.48 0.79
200 983.64 0.81	25 72.24 1.02
250 1230.18 0.85	50 146.32 0.95
300 1477.21 0.93	75 220.50 0.91
350 1723.67 0.91	100 294.05 0.84
400 1970.50 1.01	200 589.81 0.87
450 2217.27 0.70	250 737.90 0.99
500 2463.69 0.84	400 1180.86 1.15
600 2956.80 1.06	650 1920.59 0.61
700 3450.52 1.04	900 2659.81 0.96
750 3697.28 0.68	1000 2955.57 0.80
CHANNEL 2.00	1100 3251.30 0.80
0 0.00 0.00	1200 3546.97 0.91
10 96.21 0.95	1300 3842.42 0.94
50 493.47 0.70	CHANNEL 5.00
75 741.00 0.75	0 0.00 0.00
100 989.81 0.98	1 0.56 0.78
150 1486.61 0.72	5 10.84 1.03
200 1982.43 1.00	10 23.55 0.96
250 2479.22 0.80	25 61.04 0.82
300 2975.18 0.85	50 123.62 0.92
350 3471.95 0.84	100 249.33 0.86
400 3968.14 0.91	200 500.32 0.88
CHANNEL 3	400 1002.50 0.93
0 0.00 0.00	500 1253.36 0.94
10 37.48 0.93	750 1881.13 0.81
25 97.29 0.76	1000 2509.07 0.93
50 196.43 0.81	1100 2759.96 0.84
75 295.28 0.79	1200 3011.16 0.80
100 394.71 0.81	1300 3261.96 0.88
150 593.30 0.73	1400 3513.23 0.86
200 791.55 0.91	

1500 3764.36 0.67	-1 -28.84 0.04
CHANNEL 6.00	0 -0.02 0.04
0 0.00 0.00	1 28.87 0.04
1 0.39 0.50	3 86.62 0.04
5 7.74 0.93	5 144.34 0.04
10 17.87 0.81	10 288.75 0.05
25 47.48 0.87	15 433.01 0.05
50 96.77 0.88	PIR
75 145.96 0.93	-1 -215.88 0.19
100 195.91 1.00	-0.5 -111.11 0.17
250 492.56 0.80	0 -6.13 0.20
500 987.10 0.86	0.5 98.37 0.16
750 1482.08 0.80	1 202.90 0.12
1000 1976.76 0.79	2 411.78 0.14
1200 2372.31 0.82	2.4 495.03 0.13
1600 3163.73 0.81	CASE 268880.00
1800 3559.78 0.95	6000 109.14 0.01
2000 3955.19 0.88	8000 144.45 0.01
CHANNEL 7.00	10000 179.30 0.01
0 0.00 0.00	15000 264.09 0.01
1 1.57 0.68	17000 297.16 0.01
5 13.71 0.56	20000 345.98 0.01
10 28.46 0.51	25000 424.93 0.01
25 72.33 0.80	27000 455.74 0.01
50 147.03 0.64	DOME 268950.00
75 220.89 0.77	6000 109.07 0.01
100 295.29 0.69	8000 144.37 0.01
250 739.27 0.87	10000 179.21 0.01
500 1480.42 0.72	15000 263.98 0.01
750 2221.00 0.74	17000 297.04 0.01
1000 2962.00 0.89	20000 345.54 0.01
1200 3555.00 0.87	25000 424.75 0.01
1300 3851.35 0.71	27000 455.56 0.01
PSP	"VREF resistors, chan 6"
-5 -144.32 0.05	99960 9993.00
-3 -86.61 0.05	END