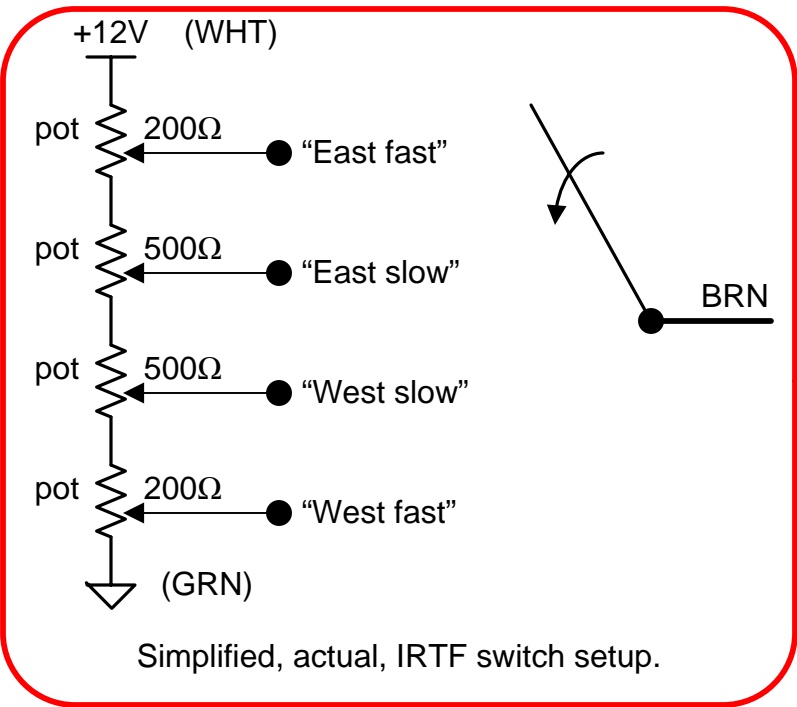


| REVISION BLOCK | | | |
|----------------|--|------|------------|
| REV | DESCRIPTION | DATE | INCORP. BY |
| - | Simulations run to verify reverse engineering. | 6/08 | EAW |

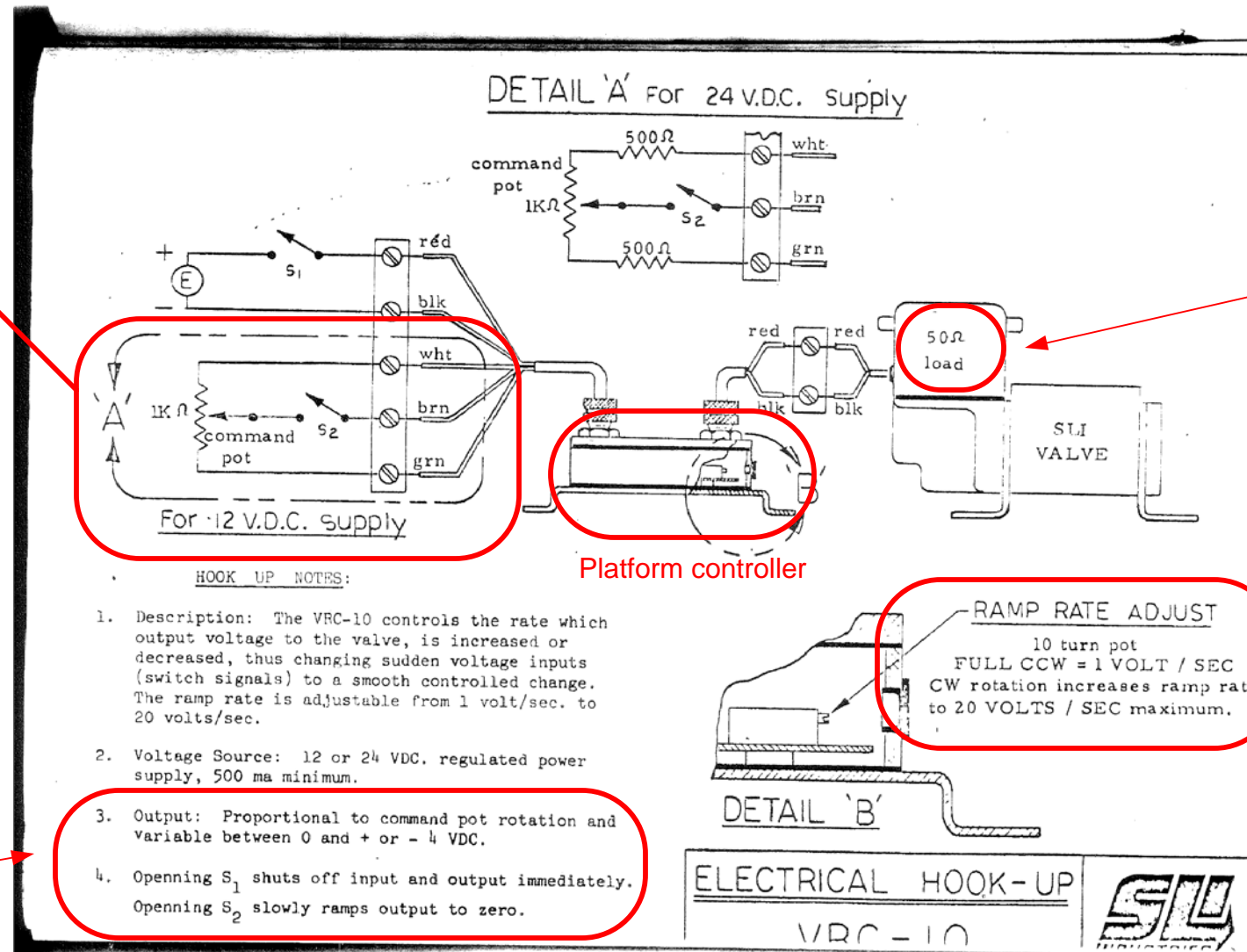
BACKGROUND

The platform controller boards for the IRTF were built in the 1970s. There are no replacements available and the IRTF has no spares. Therefore, it was decided to reverse engineer the boards and do a modern component layout. To ensure that the reverse engineered schematic operates correctly, PSPICE simulations were run. This document presents the simulation results.



Simplified, actual, IRTF switch setup.

Four inputs = four simulation cases.



Output load.

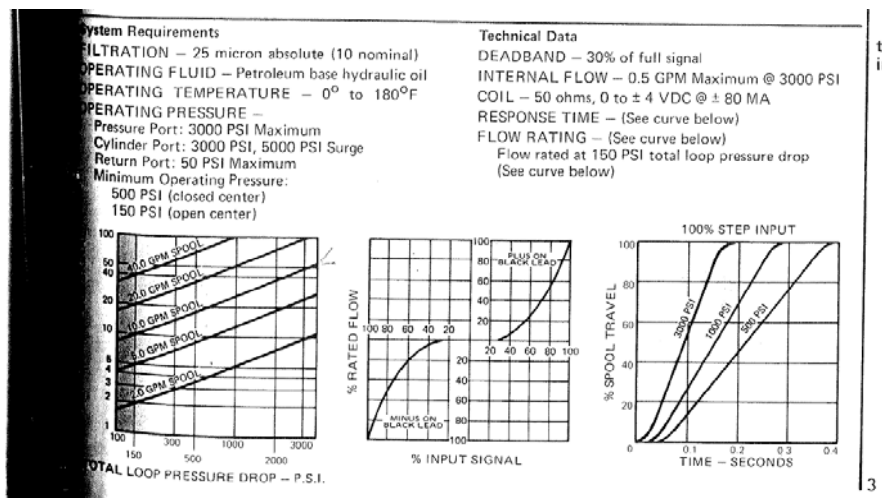
These ramp rates should be verified in the simulations.

Around 1V/s and 20V/s should be observed in subsequent simulations.

Approximate behavior.

Original vendor generic documentation. The actual IRTF setup is different (switches, pots, designators, etc.). However, electrically it is approximately the same.

ACTUATOR (Proportional Valve) driven by Platform controller.



| | | | |
|--|-----------------------------------|-------------------------------------|--------|
| University of Hawaii Institute for Astronomy | | | |
| DWG # | REV | TITLE | |
| PC-1002 | - | IRTF Platform Controller Simulation | |
| ENGINEER E. Warmbier | LAST EDIT 6/13/2008 2:24:11 PM | SIZE B | SHEET |
| FILE: Y:\public_html\Platform_Controller\Final_Documents\PC-1002_Platform_Controller_Simulations.vsd | | | 1 of 5 |

EAST "SLOW" CMD Input to Both Circuits (1&2). Max pot setting and min pot setting compared.

| Measurement Cursors | | | |
|---------------------|--------------|---------|----------|
| | Wave Name | X | Y |
| A | bridge_red_1 | 105.90m | 5.6151 |
| B | bridge_red_1 | 190.32m | 4.7979 |
| Measurement | | X | Y |
| B - A | | 84.425m | -817.21m |

BRIDGE_RED_1

Pot R14=0.99 CW
(min CCW)

=-9.68 V/s

| Measurement Cursors | | | |
|---------------------|----------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_black_1 | 105.90m | 5.6875 |
| B | bridge_black_1 | 190.32m | 6.4689 |
| Measurement | | X | Y |
| B - A | | 84.425m | 781.36m |

BRIDGE_BLACK_1

=~-19 V/s
(differential)

Referenced to Black.

=9.26 V/s

| Measurement Cursors | | | |
|---------------------|--------------|---------|----------|
| | Wave Name | X | Y |
| A | bridge_red_2 | 185.23m | 5.6169 |
| B | bridge_red_2 | 1.3311 | 4.8350 |
| Measurement | | X | Y |
| B - A | | 1.1459 | -781.90m |

BRIDGE_RED_2

Pot R36=0.01 CW
(full CCW)

=-0.65 V/s

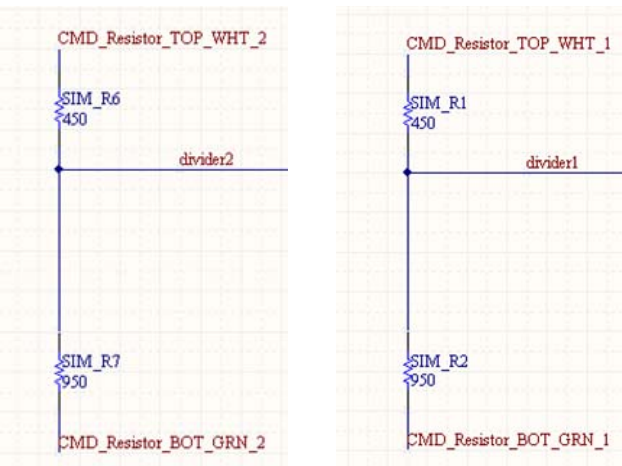
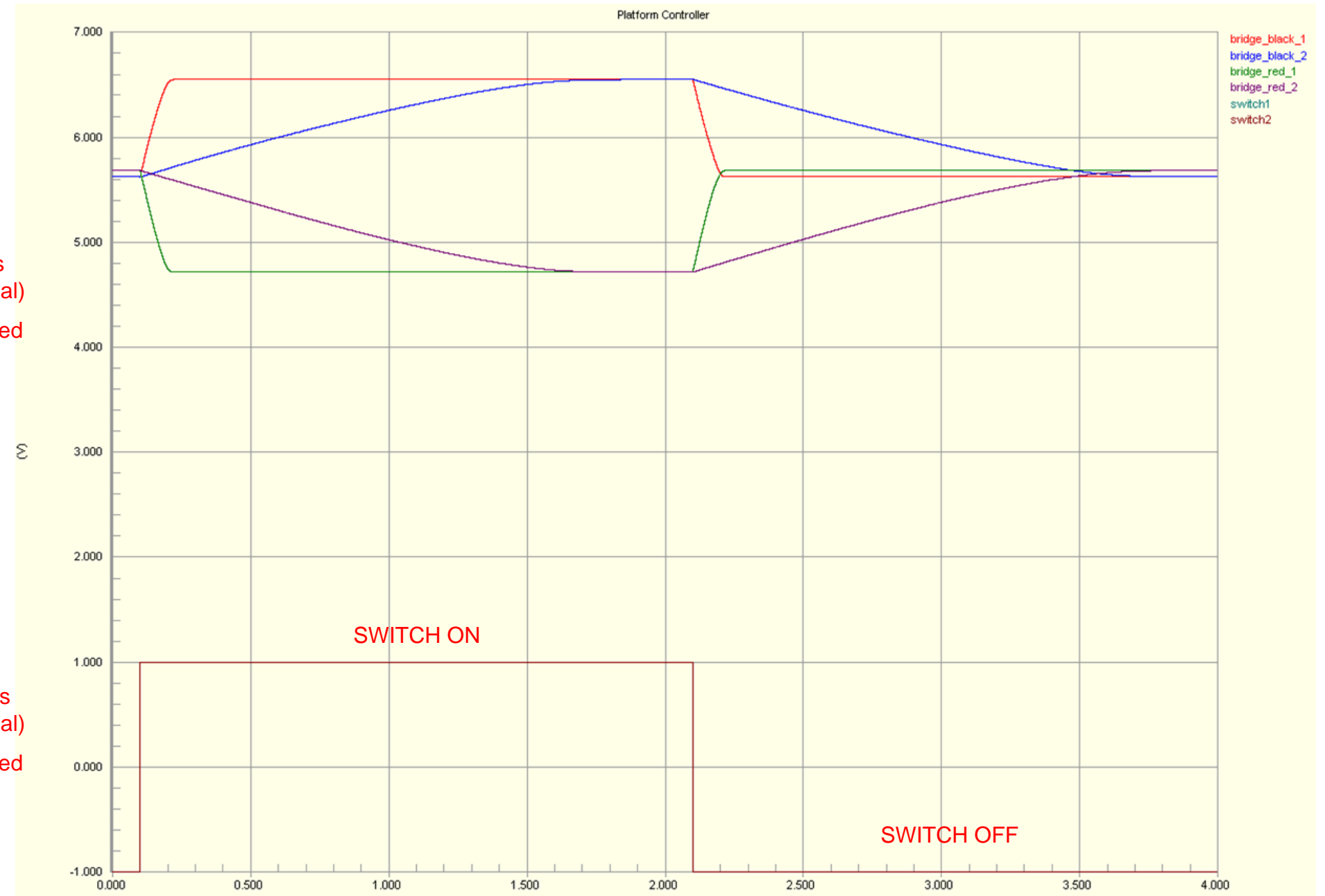
| Measurement Cursors | | | |
|---------------------|----------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_black_2 | 185.23m | 5.6891 |
| B | bridge_black_2 | 1.3311 | 6.4355 |
| Measurement | | X | Y |
| B - A | | 1.1459 | 746.38m |

BRIDGE_BLACK_2

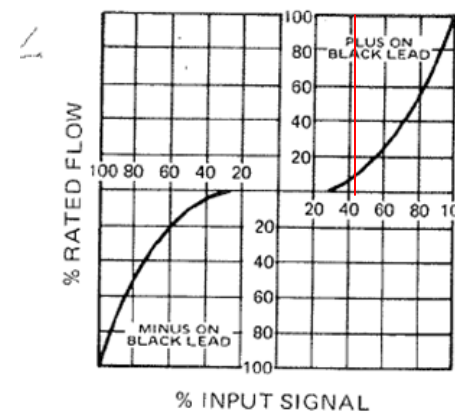
=~-1.3 V/s
(differential)

Referenced to Black.

=0.69 V/s



= EAST SLOW



1.8V Differentially
(1.8V/4V = 45%)

WEST "SLOW" CMDInput to Both Circuits (1&2). Max pot setting and min pot setting compared.

| Measurement Cursors | | | |
|---------------------|--------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_red_1 | 105.17m | 5.7446 |
| B | bridge_red_1 | 159.75m | 6.2112 |
| Measurement | | | |
| B - A | | 54.585m | 466.60m |

BRIDGE_RED_1

Pot R14=0.99 CW
(min CCW)

=8.53V/s

| Measurement Cursors | | | |
|---------------------|----------------|---------|----------|
| | Wave Name | X | Y |
| A | bridge_black_1 | 105.17m | 5.5736 |
| B | bridge_black_1 | 159.75m | 5.0785 |
| Measurement | | | |
| B - A | | 54.585m | -495.08m |

BRIDGE_BLACK_1

=~+18 V/s
(differential)

Referenced
to Black.

=-9.07 V/s

| Measurement Cursors | | | |
|---------------------|--------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_red_2 | 161.94m | 5.7332 |
| B | bridge_red_2 | 1.1154 | 6.2597 |
| Measurement | | | |
| B - A | | 953.42m | 526.56m |

BRIDGE_RED_2

Pot R36=0.01 CW
(full CCW)

=0.55 V/s

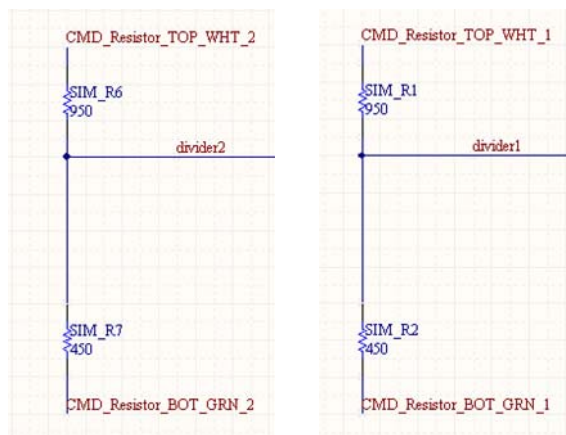
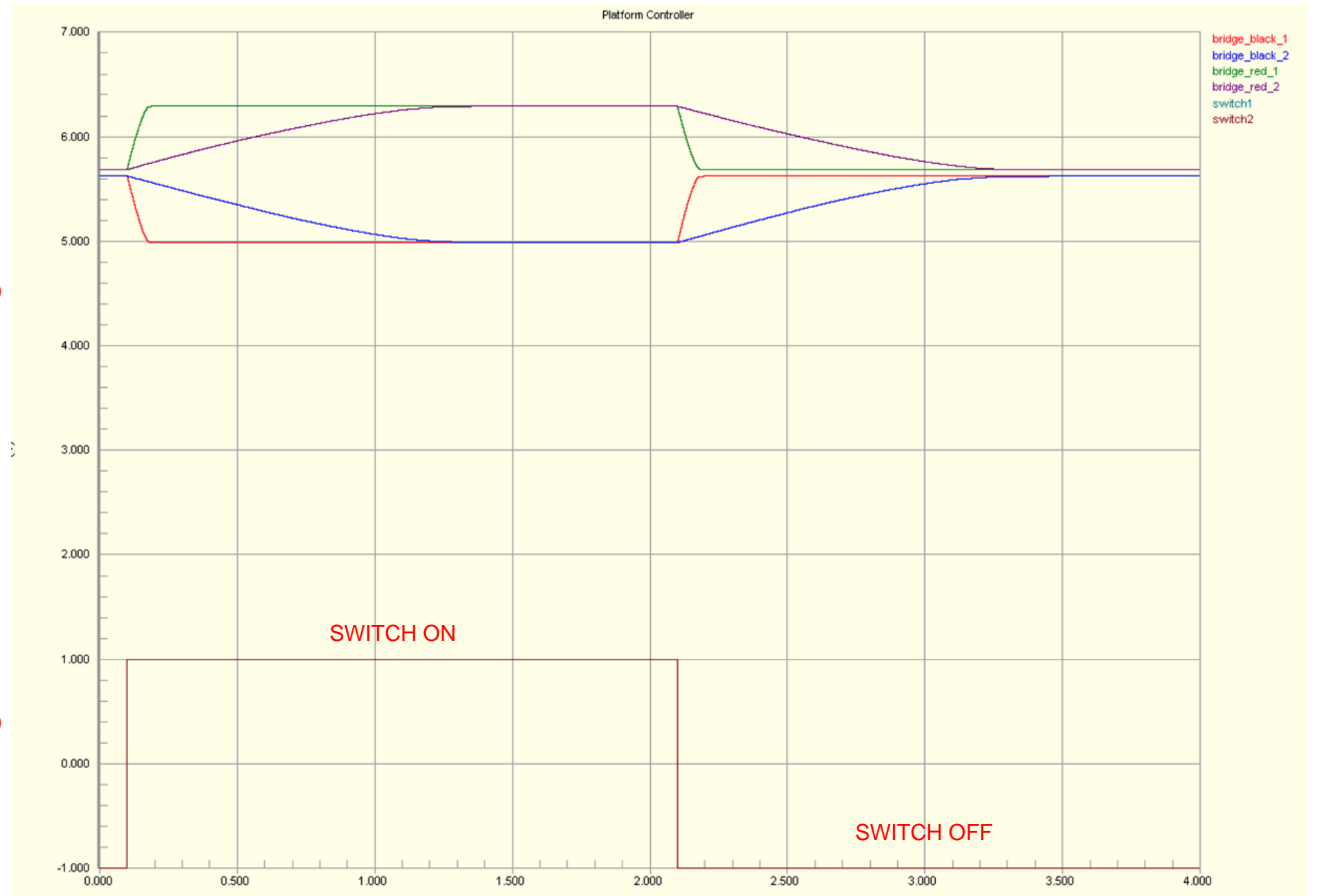
| Measurement Cursors | | | |
|---------------------|----------------|---------|----------|
| | Wave Name | X | Y |
| A | bridge_black_2 | 161.94m | 5.5819 |
| B | bridge_black_2 | 1.1154 | 5.0240 |
| Measurement | | | |
| B - A | | 953.42m | -557.88m |

BRIDGE_BLACK_2

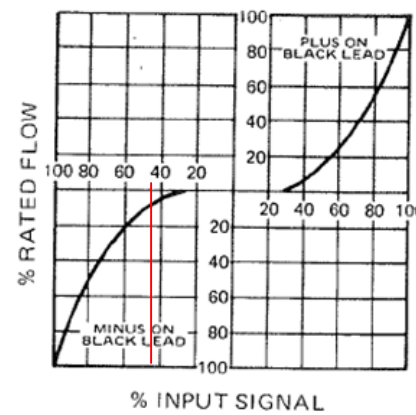
=~+1.1 V/s
(differential)

Referenced
to Black.

=-0.59 V/s



= WEST SLOW



1.8V Differentially
(1.8V/4V = 45%)

EAST "FAST" CMD Input to Both Circuits (1&2). Max pot setting and min pot setting compared.

| Measurement Cursors | | | |
|---------------------|--------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_red_1 | 108.44m | 5.5731 |
| B | bridge_red_1 | 243.81m | 3.9480 |
| Measurement | | | |
| | X | Y | |
| B - A | 135.37m | -1.6251 | |

BRIDGE_RED_1

Pot R14=0.99 CW
(min CCW)

=-12 V/s

| Measurement Cursors | | | |
|---------------------|----------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_black_1 | 108.44m | 5.7337 |
| B | bridge_black_1 | 243.81m | 7.2838 |
| Measurement | | | |
| | X | Y | |
| B - A | 135.37m | 1.5501 | |

BRIDGE_BLACK_1

=~-23 V/s
(differential)

Referenced to Black.

=11.45 V/s

| Measurement Cursors | | | |
|---------------------|--------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_red_2 | 290.39m | 5.5136 |
| B | bridge_red_2 | 2.2074 | 3.9346 |
| Measurement | | | |
| | X | Y | |
| B - A | 1.9170 | -1.5790 | |

BRIDGE_RED_2

Pot R36=0.01 CW
(full CCW)

=-0.82 V/s

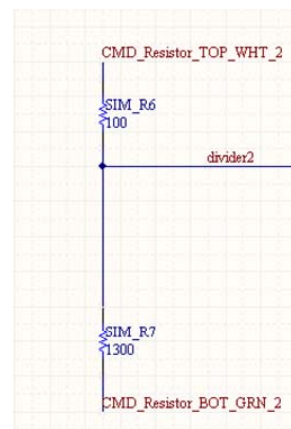
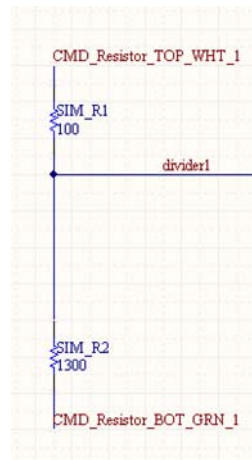
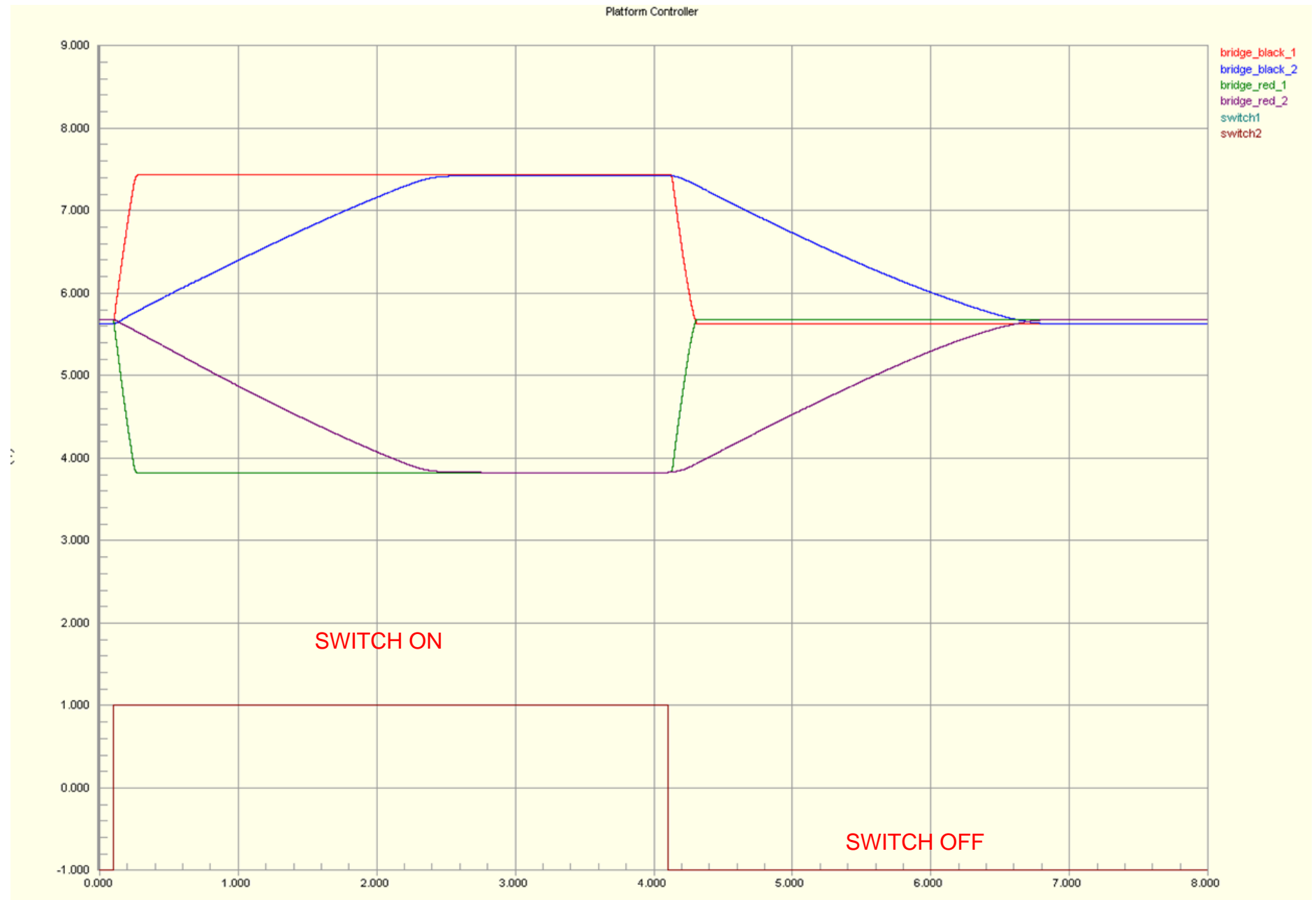
| Measurement Cursors | | | |
|---------------------|----------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_black_2 | 290.39m | 5.7971 |
| B | bridge_black_2 | 2.2074 | 7.2998 |
| Measurement | | | |
| | X | Y | |
| B - A | 1.9170 | 1.5027 | |

BRIDGE_BLACK_2

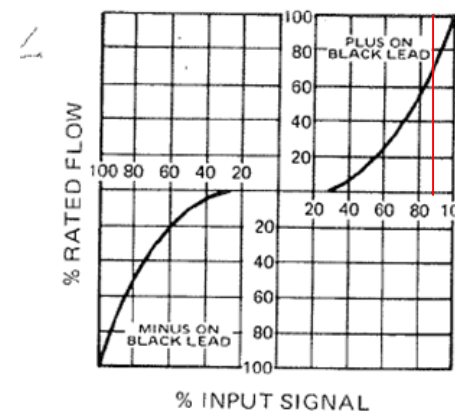
=~-1.6 V/s
(differential)

Referenced to Black.

=0.78 V/s



= EAST FAST



3.6V Differentially
(3.6V/4V = 90%)

WEST "FAST" CMD Input to Both Circuits (1&2). Max pot setting and min pot setting compared.

| Measurement Cursors | | | |
|---------------------|--------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_red_1 | 115.72m | 5.8915 |
| B | bridge_red_1 | 236.54m | 7.1790 |
| Measurement | | | |
| B - A | | 120.82m | 1.2875 |

BRIDGE_RED_1

Pot R14=0.99 CW
(min CCW)

=10.66 V/s

| Measurement Cursors | | | |
|---------------------|----------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_black_1 | 115.72m | 5.4277 |
| B | bridge_black_1 | 236.54m | 4.0644 |
| Measurement | | | |
| B - A | | 120.82m | -1.3632 |

BRIDGE_BLACK_1

=~22 V/s
(differential)

Referenced
to Black.

=-11.28 V/s

| Measurement Cursors | | | |
|---------------------|--------------|---------|--------|
| | Wave Name | X | Y |
| A | bridge_red_2 | 328.24m | 5.8882 |
| B | bridge_red_2 | 2.2904 | 7.2777 |
| Measurement | | | |
| B - A | | 1.9622 | 1.3895 |

BRIDGE_RED_2

Pot R36=0.01 CW
(full CCW)

=0.71 V/s

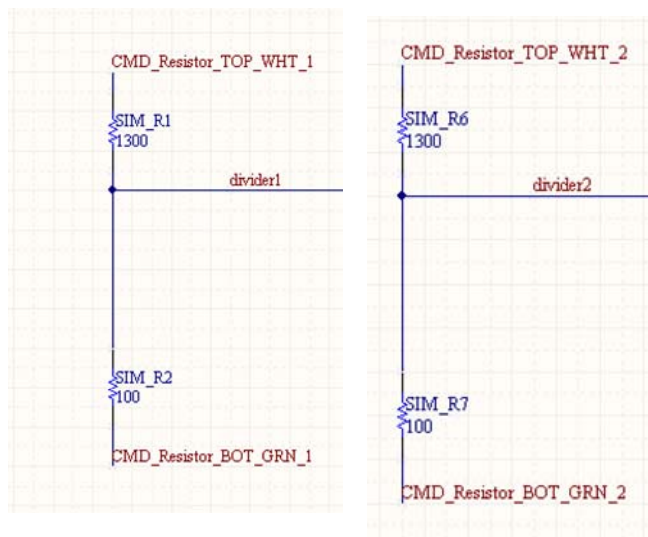
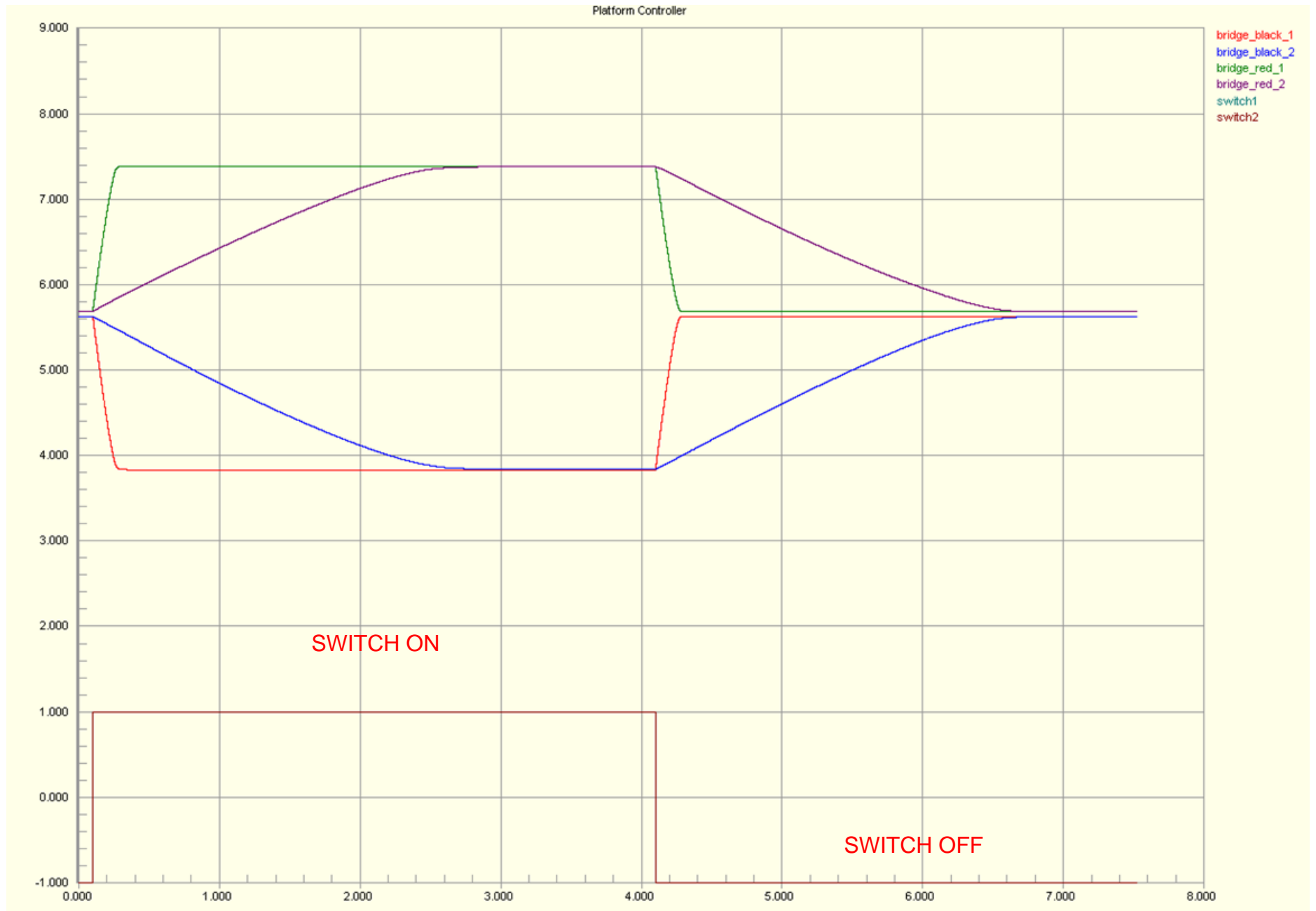
=~1.5 V/s
(differential)

Referenced
to Black.

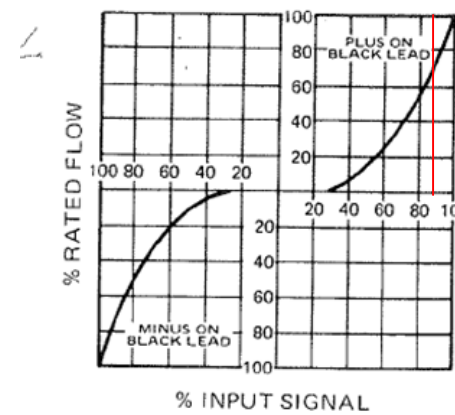
=-0.75 V/s

| Measurement Cursors | | | |
|---------------------|----------------|---------|---------|
| | Wave Name | X | Y |
| A | bridge_black_2 | 328.24m | 5.4273 |
| B | bridge_black_2 | 2.2904 | 3.9596 |
| Measurement | | | |
| B - A | | 1.9622 | -1.4677 |

BRIDGE_BLACK_2



= WEST FAST



3.6V Differentially
(3.6V/4V = 90%)