

DCA09FR008
Lake Buena Vista, Florida
July 5, 2009

Switchbeam #8 and #9
Data Log and Postaccident Testing

Purpose:

The purpose of this narrative is to explain and analyze the data collected relative to the condition of Monorail track switches 8 & 9. This data was collected as the result of the incident that occurred with Monorail Pink and Monorail Purple on July 5, 2009 at approximately 2 AM.

Conclusions:

- 1) That the operating and mechanical systems of track switches 8 & 9 were functioning properly on July 5, 2009 prior to and following the Monorail incident.
- 2) That no command was given to move track switches 8 & 9 from the normal (main line) position to the spur position between 01:30 a.m. and 02:13:51 a.m. July 5, 2009.
- 3) That track switches 8 & 9 were not moved from the normal (main line) position to the spur position between 01:30 a.m. and 02:31:51 a.m. July 5, 2009. This is supported by contemporaneous video of track switch 9 captured during this period.

There are 2 primary sources for the data below:

PDMS – Power Distribution Monitoring System (located at the Monorail Roundhouse). Note that the PDMS system does not log all actions. PDMS logs when the ability to send power to the motors that actuate the switch beams is enabled and disabled. It also logs any errors or faults detected.

Panel View Display – located on the switch beam rectifier panel (which is located near Switch beam 8). This is a maintenance diagnostic tool. The Panel View Display displays power, position, and faults.

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Time of incident:

PDMS snapshot (from file: Monorail_Roundhouse_PDMS_July_4_and_July_5_2009.pdf)

Only 2 entries were logged relative to the time of the incident. These are highlighted immediately below.

7/4/2009 0:45:34	7/4/2009 4:56	100 Epool Station Platform Kill Switch	Digital	Epool Station Platform Kill Active	7/4/2009
7/4/2009 0:58:05	7/4/2009 4:56	100 TTC Concourse Kill Switch Zone 6 East	Digital	TTC Concourse Kill Switch Zone 6 East Active	7/4/2009
7/4/2009 0:58:05	7/4/2009 4:56	124 TTC Concourse Kill Switch Zone 4 West	Digital	TTC Concourse Kill Switch Zone 4 West Active	7/4/2009
7/4/2009 0:58:06	7/4/2009 4:56	124 TTC Concourse Kill Switch Zone 4 East	Digital	TTC Concourse Kill Switch Zone 4 East Active	7/4/2009
7/4/2009 0:58:08	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 6 East	Digital	TTC Concourse Kill Switch Zone 6 East Return to Normal	7/4/2009
7/4/2009 0:58:08	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 4 West	Digital	TTC Concourse Kill Switch Zone 4 West Return to Normal	7/4/2009
7/4/2009 0:58:09	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 4 East	Digital	TTC Concourse Kill Switch Zone 4 East Return to Normal	7/4/2009
7/4/2009 0:58:10	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 3 West	Digital	TTC Concourse Kill Switch Zone 3 West Active	7/4/2009
7/4/2009 0:58:10	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 3 East	Digital	TTC Concourse Kill Switch Zone 3 East Active	7/4/2009
7/4/2009 0:58:13	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 3 West	Digital	TTC Concourse Kill Switch Zone 3 West Return to Normal	7/4/2009
7/4/2009 0:58:13	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 3 East	Digital	TTC Concourse Kill Switch Zone 3 East Return to Normal	7/4/2009
7/4/2009 0:58:13	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 2 West	Digital	TTC Concourse Kill Switch Zone 2 West Active	7/4/2009
7/4/2009 0:58:13	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 2 East	Digital	TTC Concourse Kill Switch Zone 2 East Active	7/4/2009
7/4/2009 0:58:14	7/4/2009 4:56	109 TTC Concourse Kill Switch Zone 2 West	Digital	TTC Concourse Kill Switch Zone 2 West Return to Normal	7/4/2009
7/4/2009 0:58:14	7/4/2009 4:56	124 TTC Concourse Kill Switch Zone 2 East	Digital	TTC Concourse Kill Switch Zone 2 East Return to Normal	7/4/2009
7/4/2009 0:57:22	7/4/2009 4:57	171 SWB 9 Power Removed Externally	Digital	SWB 9 Power Removed Externally	7/4/2009
7/4/2009 0:57:22	7/4/2009 4:57	187 TTC Concourse Platform Kill Switch	Digital	TTC Concourse Platform Kill Active	7/4/2009
7/4/2009 0:57:22	7/4/2009 4:57	187 TTC Concourse Kill Switch Zone 1 West	Digital	TTC Concourse Kill Switch Zone 1 West Active	7/4/2009
7/4/2009 0:57:22	7/4/2009 4:57	187 TTC Concourse Kill Switch Zone 1 East	Digital	TTC Concourse Kill Switch Zone 1 East Active	7/4/2009
7/4/2009 0:57:28	7/4/2009 4:57	187 TTC Concourse Kill Switch Zone 1 West	Digital	TTC Concourse Kill Switch Zone 1 West Return to Normal	7/4/2009
7/4/2009 0:57:28	7/4/2009 4:57	202 TTC Concourse Kill Switch Zone 1 East	Digital	TTC Concourse Kill Switch Zone 1 East Return to Normal	7/4/2009
7/4/2009 0:57:32	7/4/2009 4:57	202 SWB 9 Power Removed Externally	Digital	SWB 9 Power Removed Externally Return to Normal	7/4/2009
7/4/2009 4:47:21	7/4/2009 4:47	718 TTC Concourse Platform Kill Switch	Digital	TTC Concourse Platform Kill Return to Normal	7/4/2009
7/4/2009 5:40:04	7/4/2009 5:40	612 Epool Station Platform Kill Switch	Digital	Epool Station Platform Kill Return to Normal	7/4/2009
7/4/2009 5:59:18	7/4/2009 5:59	643 Epool Station Platform Kill Switch	Digital	Epool Station Platform Kill Active	7/4/2009
7/4/2009 5:59:26	7/4/2009 5:59	643 Epool Station Platform Kill Switch	Digital	Epool Station Platform Kill Return to Normal	7/4/2009
7/4/2009 18:06:59	7/4/2009 19:06	469 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Active	7/4/2009
7/4/2009 18:07:14	7/4/2009 20:01	452 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Return to Normal	7/4/2009
7/4/2009 18:40:39	7/4/2009 22:37	452 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Active	7/4/2009
7/4/2009 19:40:39	7/4/2009 23:40	640 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Return to Normal	7/4/2009
7/4/2009 19:43:31	7/4/2009 23:43	671 SWB 8 Remote Power Request Fail	Digital	SWB 8 Remote Power Request Fail	7/4/2009
7/4/2009 22:03:49	7/4/2009 2:03	706 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Active	7/4/2009
7/4/2009 22:14:16	7/4/2009 2:14	706 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Return to Normal	7/4/2009
7/4/2009 22:14:20	7/4/2009 2:14	612 SWB 8 Remote Power Request Fail	Digital	SWB 8 Remote Power Request Fail Return to Normal	7/4/2009
7/4/2009 22:14:21	7/4/2009 2:14	612 C: SWB 8 Remote Power Request Fail	Digital	C: SWB 8 Remote Power Request Fail Return to Normal	7/4/2009
7/4/2009 22:14:27	7/4/2009 2:14	612 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Active	7/4/2009
7/3/2009 1:59:03	7/3/2009 1:59	176 Roundhouse Switchbeam 660 Kill Button	Digital	Roundhouse Switchbeam 660 Kill Return to Normal	7/3/2009
7/3/2009 2:01:48	7/3/2009 6:01	158 TTC Concourse Platform Kill Switch	Digital	TTC Concourse Platform Kill Active	7/3/2009
7/3/2009 2:13:42	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 6 East	Digital	TTC Concourse Kill Switch Zone 6 East Active	7/3/2009
7/3/2009 2:13:42	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 4 East	Digital	TTC Concourse Kill Switch Zone 4 East Active	7/3/2009
7/3/2009 2:13:43	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 3 East	Digital	TTC Concourse Kill Switch Zone 3 East Active	7/3/2009
7/3/2009 2:13:43	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 2 East	Digital	TTC Concourse Kill Switch Zone 2 East Active	7/3/2009
7/3/2009 2:13:43	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 1 East	Digital	TTC Concourse Kill Switch Zone 1 East Active	7/3/2009
7/3/2009 2:13:44	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 4 West	Digital	TTC Concourse Kill Switch Zone 4 West Active	7/3/2009
7/3/2009 2:13:44	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 2 West	Digital	TTC Concourse Kill Switch Zone 2 West Active	7/3/2009
7/3/2009 2:13:45	7/3/2009 6:13	218 SWB 9 Power Removed Externally	Digital	SWB 9 Power Removed Externally	7/3/2009
7/3/2009 2:13:49	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 2 East	Digital	TTC Concourse Kill Switch Zone 2 East Return to Normal	7/3/2009
7/3/2009 2:13:49	7/3/2009 6:13	265 TTC Concourse Kill Switch Zone 1 West	Digital	TTC Concourse Kill Switch Zone 1 West Active	7/3/2009
7/3/2009 2:13:50	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 2 East	Digital	TTC Concourse Kill Switch Zone 2 East Active	7/3/2009
7/3/2009 2:13:51	7/3/2009 6:13	234 TTC Concourse Kill Switch Zone 6 East	Digital	TTC Concourse Kill Switch Zone 6 East Return to Normal	7/3/2009

Photos of the Panel View Display

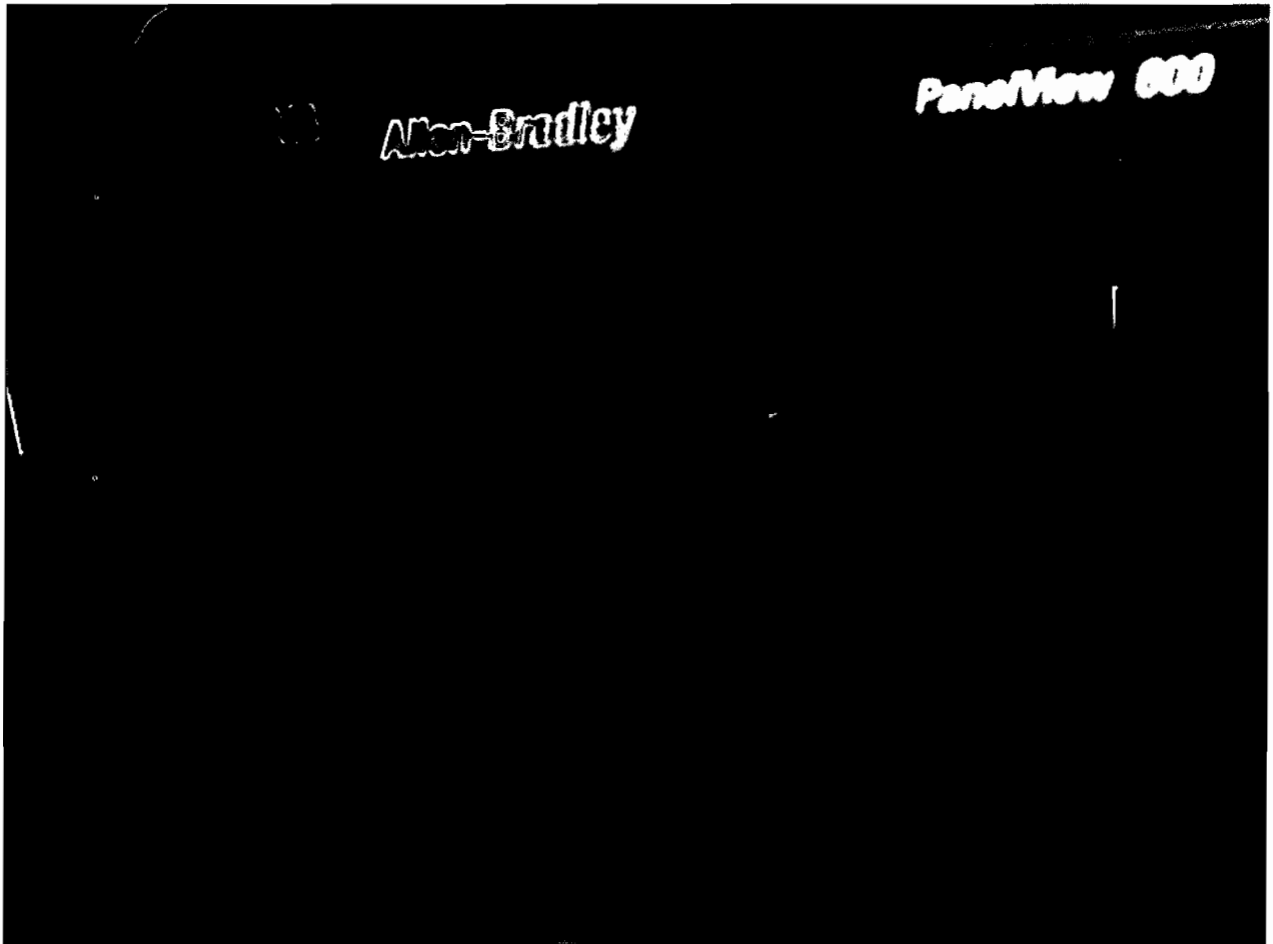


Photo 1 – Shows that remote control was enabled at 01:51:01 a.m. July 5, 2009. The next entry indicates “Switchbeam 9 Power Removed Remotely Or Power Failure” at 02:08:42 a.m. (The power removal occurred after the Monorail incident). This indicates that Switchbeam 8 was not moved to the spur position following the remote enable. (Compare to Photo 2 for display expected from a completed switching operation).

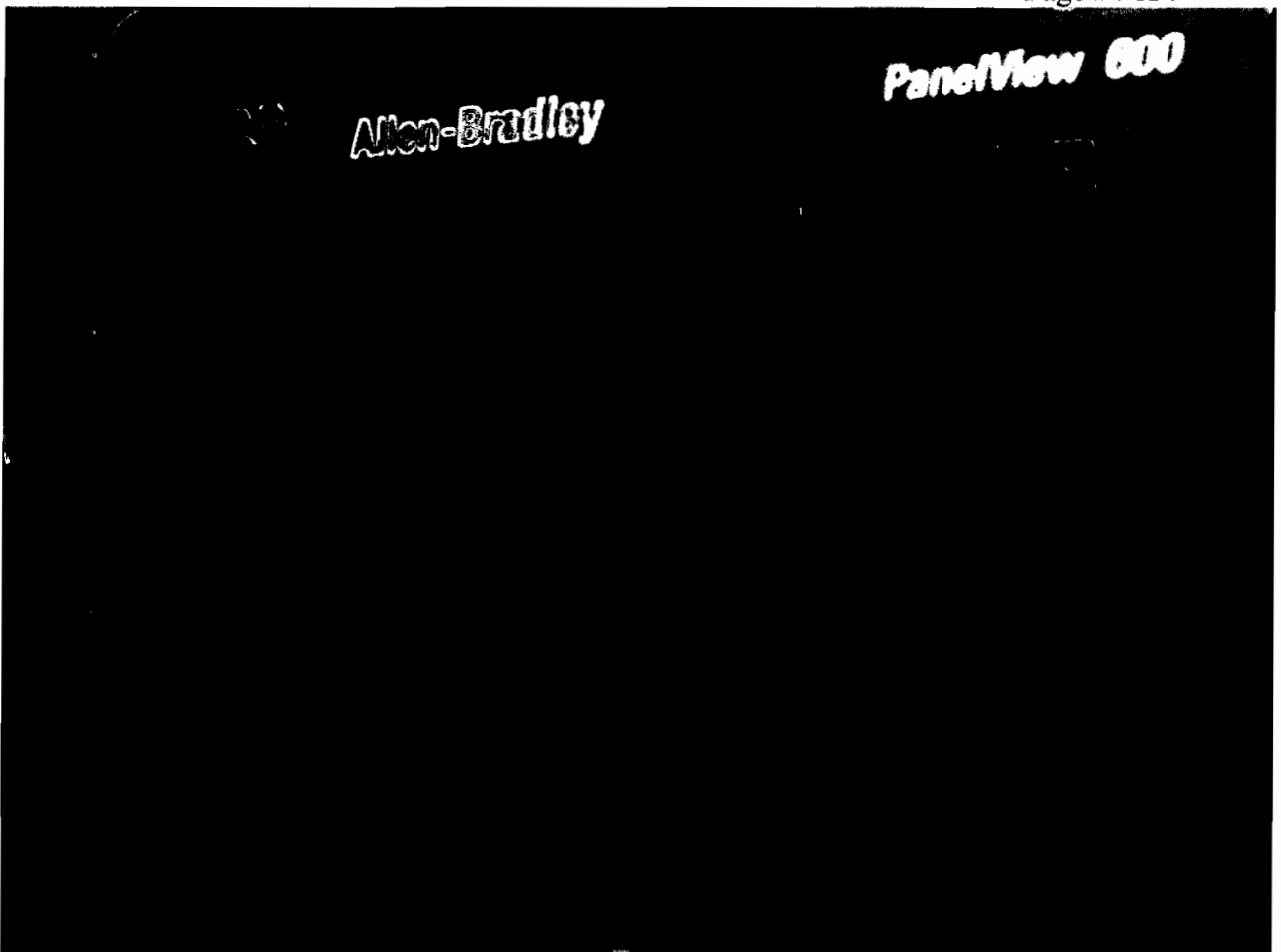


Photo 2 –Shows the display of a switching sequence performed on July 3, 2009, beginning at 12:17:33 p.m. Note that the “Remote Control Enabled” display is followed in sequence by “Switchbeam 8 Locked At Spur Position” at 12:18:50 p.m. and “Switchbeam 9 Locked At Spur Position” at 12:18:53 p.m.

Post-Incident Functional Testing of Track Switches 8 & 9:

Two sequences were performed and recorded.

For the first testing, the indicators were verified as reflecting the true positions of the switches. Then, the switches were operated several times by commanding them to move between normal (main line) position and spur position.

For the second testing, power was manually disconnected from the motors that actuate the switch beam movement at Switch 8 and Switch 9. The switches were then commanded to move from the normal (main line) position to the spur position. As expected, the system generated a fault due to the switchbeams’ failure to reach their requested position within 90 seconds of receiving the command to move. This fault is displayed and recorded by both the PDMS (located at the roundhouse switching panel) and the PanelView (located near Switch

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8). The fault also generates an audible and visual alarm that must be acknowledged at the Roundhouse switching panel to silence.

PDMS snapshot (from file:

Monorail_Roundhouse_PDMS_July_4_and_July_5_2009_Functionality_Test.pdf)

These referenced entries are highlighted immediately below.

Time	TimeUTC	Trackhouse	Source	Description	Message	EventTime
7/8/09 8:22 AM	7/8/09 12:23 PM	882	Receiver 2 24V Battery Backup Unit Ok/cls	Digital	Receiver 2 24V Battery Backup Unit Fault	7/8/2009
7/8/09 8:23 AM	7/8/09 12:23 PM	882	Receiver 2 24V Battery Ok/cls	Digital	Receiver 2 24V Battery Fault	7/8/2009
7/8/09 8:24 AM	7/8/09 12:24 PM	881	Receiver 2 24V Battery Backup Unit Ok/cls	Digital	Receiver 2 24V Battery Backup Unit Return to Normal	7/8/2009
7/8/09 8:24 AM	7/8/09 12:24 PM	881	Receiver 2 24V Battery Ok/cls	Digital	Receiver 2 24V Battery Return to Normal	7/8/2009
7/8/09 8:10 PM	7/8/09 8:10 PM	748	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Return to Normal	7/8/2009
7/8/09 8:48 PM	7/8/09 8:48 PM	128	24V B To Sour Fail	Digital	24V B To Sour Fail	7/8/2009
7/8/09 8:50 PM	7/8/09 8:50 PM	88	24V B To Sour Fail	Digital	24V B To Sour Fail Return to Normal	7/8/2009
7/8/09 8:50 PM	7/8/09 8:50 PM	88	24V B To Sour Fail	Digital	24V B To Sour Fail	7/8/2009
7/8/09 8:51 PM	7/8/09 8:51 PM	88	24V B To Sour Fail	Digital	24V B To Sour Fail Return to Normal	7/8/2009
7/8/09 8:51 PM	7/8/09 8:51 PM	128	24V B To Sour Fail	Digital	24V B To Sour Fail	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	88	24V B To Sour Fail	Digital	24V B To Sour Fail Return to Normal	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	128	24V B To Sour Fail	Digital	24V B To Sour Fail	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	88	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Active	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	88	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Return to Normal	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	128	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Active	7/8/2009
7/8/09 8:52 PM	7/8/09 8:52 PM	128	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Return to Normal	7/8/2009
7/8/09 8:17 PM	7/8/09 12:17 PM	234	Remote E-Stop Released Too Early	Digital	Remote E-Stop Released Too Early	7/8/2009
7/8/09 8:17 PM	7/8/09 12:17 PM	234	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Return to Normal	7/8/2009
7/8/09 8:18 PM	7/8/09 12:18 PM	171	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Active	7/8/2009
7/8/09 8:18 PM	7/8/09 12:18 PM	171	Roundhouse Switchman 849 K18 Button	Digital	Roundhouse Switchman 849 K18 Return to Normal	7/8/2009
7/8/09 8:21 PM	7/8/09 12:21 PM	187	Remote E-Stop Released Too Early	Digital	Remote E-Stop Released Too Early Return to Normal	7/8/2009

Photos of the Panelview Display

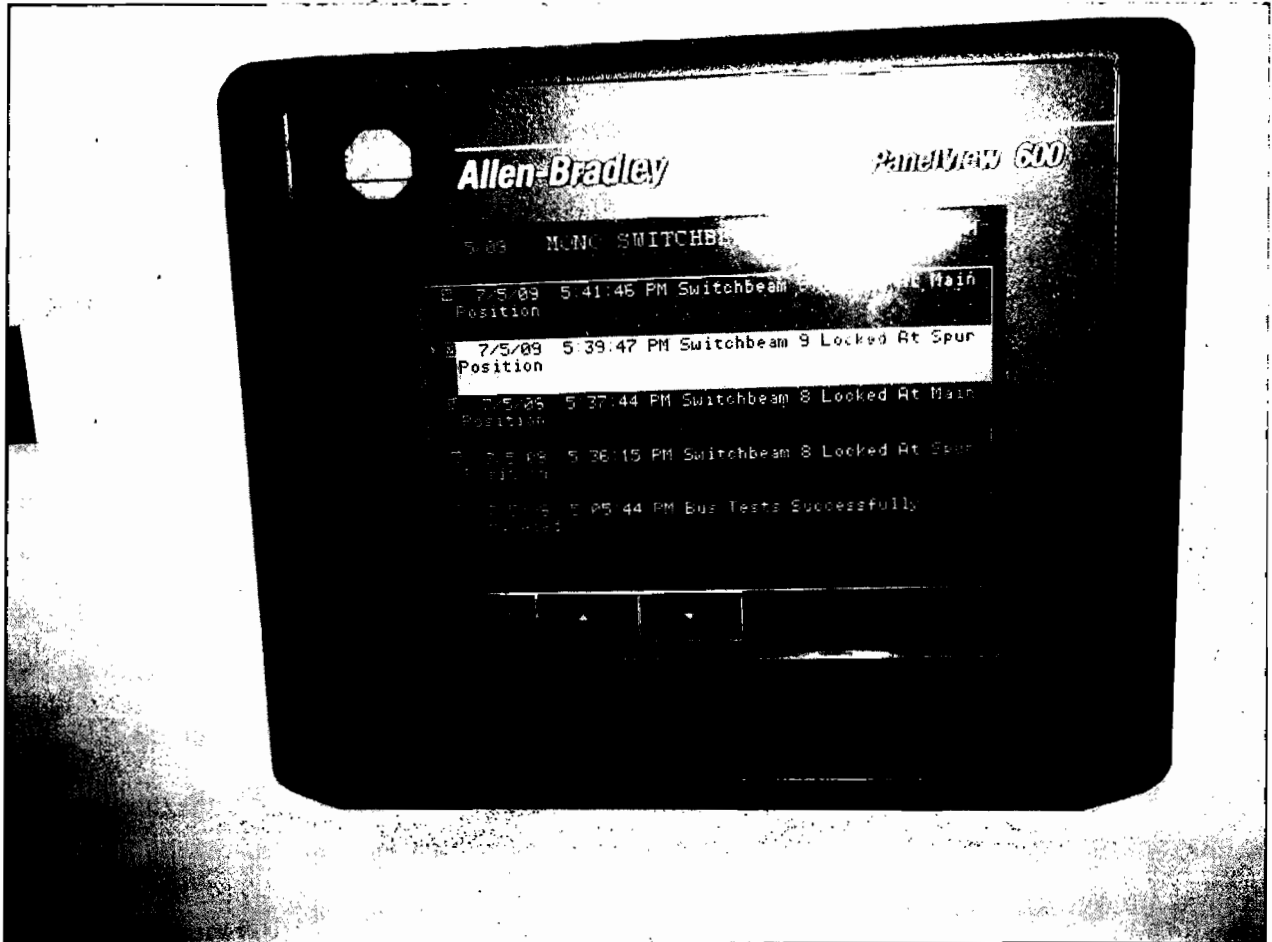


Photo 3 – Normal Operation during Post-Incident Functionality Testing

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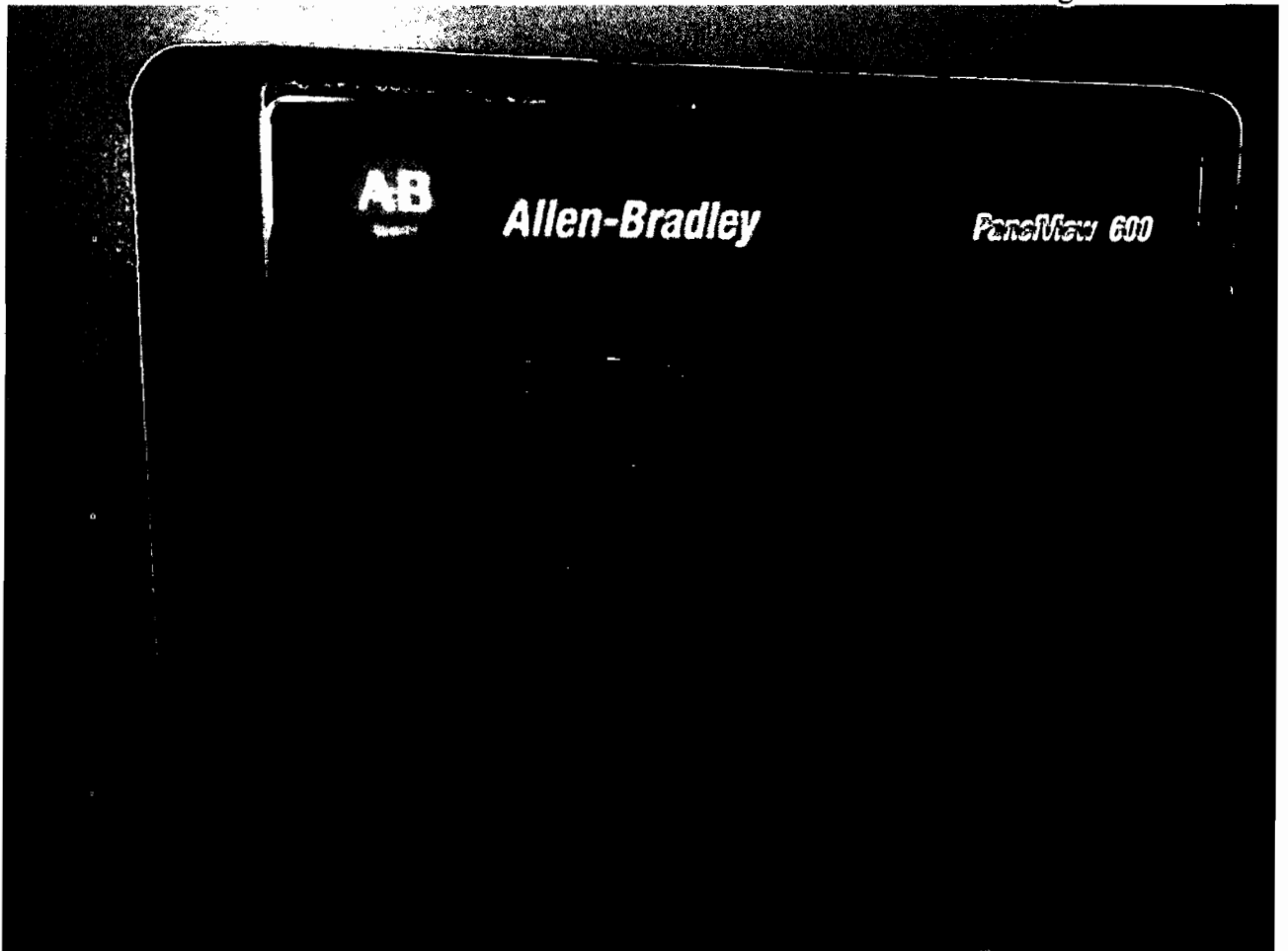


Photo 4 – Induced Fault operation during Post-Incident Functionality Testing. Switchbeam 8 Fault Detection recorded at 05:44:46 p.m. and Switchbeam 9 at 05:54:32.

END