WAAS Technical Report
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DR# 45: Abnormal AOR-W Switchover and Extended SIS (Signal in Space) Outage GPS Week/Day: Week 1403 Day 5 (12/1/06)

Discussion:

On GPS Week 1403 Day 5, an abnormal AOR-W GUS switchover occurred. CLK GUS was set to primary mode approximately 4 seconds into the SIS outage, but it faulted immediately. The SIS outage lasted for 1244 seconds, and no Type 0 messages were broadcasted when the AOR-W SIS resumed. Two brief (1 second and 4 seconds) AOR-W message outages occurred within 35 seconds of the end of the SIS outage.

Table 1 shows the order of events.

Table 2 confirms the time and length of the SIS outage, and offers some additional details about the GUS component status at the time.

During the SIS outage, ZTL was set to be the Primary C&V source for the AOR-W GUS's, but not for the any other GUS's, resulting in a split-source configuration. Over an hour after the end of the SIS outage, ZDC was set to be the Primary C&V source for the AOR-W GUS's, so that all GUS's were then using the same C&V source again.

Ordinarily, a sequence of Type 0 messages is broadcast from a GEO following a GUS switchover. That did not occur in this case. However, all WAAS messages that would have been reset by a Type 0 message had already timed out during the SIS outage. The WAAS MOPS specifies that "the receipt of a Message Type 0 shall result in the cessation of the use and discarding of any ranging data and all message types 1-7, 9-10, 18, 24-28 obtained from that WAAS signal (PRN code)." Tables 2-1 and 2-2 in the WAAS MOPS list the timeout intervals for WAAS messages of various types. Of the types discarded upon receipt of a Type 0 message, the longest timeout is 1200 seconds. Thus by the end of the 1244-second AOR-W SIS outage, all these messages should have already been discarded by any WAAS receiver—the same effect that would have been achieved had AOR-W sent Type 0 messages when SIS resumed.

Table 1. Abnormal AOR-W GUS Switchover and Extended SIS Outage Order of Events

WAAS Time of Week	UTC	Event
462997 – 464242	08:36:23 – 08:57:08	AOR-W SIS outage
462998	08:36:24	STA-A GUS switch to Backup mode
462999	08:36:25	STA-A GUS changed to Backup mode
		CLK GUS switch to Primary mode
463000	08:36:26	CLK GUS changed to Primary mode
463001	08:36:27	CLK GUS RFU M&C Communication Fault
463004	08:36:30	CLK GUS mode changed to Faulted
463835	08:50:21	CLK GUS mode changed to Maintenance
463836	08:50:22	Selected C&V source switch (ZDC→ZTL) for AOR-W GUS's. (POR & CRW GEOs continued using ZDC.)
464054	08:54:00	CLK GUS mode changed to Verification
464228	08:56:54	CLK GUS mode changed to Backup
464235	08:57:01	CLK GUS mode changed to Primary
464242	08:57:08	AOR-W SIS resumed
464271	08:57:37	AOR-W message gap (1 second)
464276 – 464279	08:57:42 – 08:57:45	AOR-W message gap (4 seconds)
468692	10:11:18	Selected C&V source switch (ZTL→ZDC) for AOR-W GUS's. (All GEOs using ZDC C&V.)

Conclusions:

On GPS Week 1403 Day 5, an abnormal AOR-W GUS switchover occurred. SIS stopped, CLK GUS was set to Primary mode, but it reported an RFU M&C Communication Fault, and changed to Faulted mode within seconds. After the CLK GUS had restarted and come out of Verification mode, it was again set to be the Primary AOR-W GUS. AOR-W SIS then resumed, but no Type 0 messages were broadcast from the GEO. Two brief GEO message gaps occurred within 35 seconds after the end of the SIS outage.

Table 2. GUS Component Status (from Raytheon WAAS Performance Monitor).

WST	Date	Time (UTC)	Validity	Initiated by	GEO	Sel. Src C&V	Primary GUS (From/To)	L1/L5 Transponder Offset (Hz)	MT61 C&V Tx	MT61 C&V Rx(SIS)	Time w/o SIS (secs)	Primary GUS Re-Lock Time	PR/BK GUS Loop Lock N of M Test (last 10 secs)
848997399	12/1/2006	08:36:25	Abnormal	O&M_Operator	AORW	ZDC	STA-A/CLK	-185.6/9999.0	37	0	1244	1308.4	10/10

Table 2 was taken from
http://www.waasperformance.raytheon.com/performance/PERFMON/history/field/system_status/AGSVC_AORW_history.html
on December 8, 2006.