

1080i/720p CODEC INTEROPERABILITY TEST RESULTS
MARCH 2005 and JULY 2005
TELESAT, OTTAWA
VIDEO

Test Description	Test Parameters	# of Encoders/Decoders	# of Tests¹	# of Failures²
BISS E	1080i/60; 40 Mbps; 4:2:2	1 encoder; 2 decoders	2 ³	0 ³
Satellite Test	1080i/60; 40 Mbps; 4:2:2	6 encoders; 4 decoders	24	0
New Aastra Encoder	720p/60; 40 Mbps	1 encoder; 4 decoders	4	0
General Video	1080i/60 720p/60 1080i/50 All at 60 Mbps and 40 Mbps All at 4:2:2 except 4:2:0 for 4:2:0 decoder	8 encoders; 7 decoders	226	12

- ¹ Tests were not performed where codec testing parameter compliance sheet showed codec did not support testing format. Data do not include tests or test results where encoder did not actually support testing format despite claim in testing parameter compliance sheet.
- ² Data do not include failures where original failure cleared through: reset; retest, where original test had operator error; retest using different firmware; restart using spare encoder; retest where PID reset.
- ³ Data do not include tests or test results where tests showed faulty BISS card.

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TEST RESULTS VIDEO

1. 262 VIDEO TESTS
2. 12 FAILURES
3. 10 FAILURES ASSOCIATED WITH SINGLE 4:2:0 DECODER
4. VIRTUALLY NO INTEROPERABILITY PROBLEM WITH VIDEO

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VIDEO -- ADDENDUM

Test Description	Test Parameters	# of Encoders/Decoders	# of Tests¹	# of Failures
720p/50 1 st Round	720p/50; 4:2:2 and 4:2:0 60 Mbps and 40 Mbps	2 encoders; 3 decoders	10	0
720p/50 2 nd Round	720p/50; 4:2:2 60 Mbps and 40 Mbps	2 encoders; 2 decoders	6	0

¹ Tests were not performed where codec testing parameter compliance sheet showed codec did not support testing format. Data do not include tests or test results where encoder did not actually support testing format despite claim in testing parameter compliance sheet.

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AUDIO

Test Description	Test Parameters	# of Encoders/Decoders	No. of Tests ¹	No. of Failures ²
BISS E	4 CH MPEG	1 encoder; 2 decoders	2	1
Dolby E 1 st Round	Dolby E (1080i/60; 40 Mbps)	7 encoders; 6 decoders	34	5
Dolby E 2 nd Round	Dolby E	5 encoders; 4 decoders	11	1
2 CH PCM 1 st Round	2 CH PCM (1080i/60; 40 Mbps)	7 encoders; 7 decoders	67	13
2 CH PCM 2 nd Round	2 CH PCM (1080i/60; 40 Mbps)	6 encoders; 4 decoders	6	2
2 CH MPEG 1 st Round	2 CH MPEG (1080i/60; 40 Mbps)	8 encoders, 7 decoders	45	6
4 CH MPEG 1 st Round	4 CH MPEG (1080i/60; 40 Mbps)	8 encoders; 7 decoders	45	12
4 CH MPEG 2 nd Round	4 CH MPEG (1080i/60; 40 Mbps)	6 encoders; 4 decoders	19	0
Satellite Test	4 CH MPEG	6 encoders; 4 decoders	24	0

¹ Tests were not performed where codec testing parameter compliance sheet showed codec did not support testing format. Data do not include tests or test results where encoder did not actually support testing format despite claim in testing parameter compliance sheet. Data do not include tests or test results where tests were not conducted due to: failure to lock; PCR error; analog input only (PCM).

² Data do not include failures where original failure cleared through: reset; retest, where original test had operator error; retest using different firmware; restart using spare encoder; retest where PID reset.

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TEST RESULTS AUDIO

1. 253 AUDIO TESTS
2. 40 FAILURES
3. OVERALL INTEROPERABILITY RATE = 84%
4. 10 AUDIO FAILURES ASSOCIATED WITH SINGLE 4:2:0 DECODER
5. OVERALL AUDIO INTEROPERABILITY RATE WITH 4:2:0 DECODER EXCLUDED = 88%
6. MPEG (2 CH and 4 CH) – 18 FAILURES / 133 TESTS = 86%
7. DOLBY E – 6 FAILURES / 45 TESTS = 87%
8. PCM – 15 FAILURES / 73 TESTS = 79%
9. SIGNIFICANT INTEROPERABILITY ISSUE WITH AUDIO

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2 CH / 4 CH MPEG FAILURES

FIRST ROUND FAILURES -- 18 FAILURES / 90 TESTS

1. Harmonic / Thomson
2. Harmonic / NTT Electronics
3. Harmonic / Mitsubishi
4. Tandberg / Mitsubishi
5. Tandberg / Thomson
6. Tandberg / NTT Electronics
7. Aastra / Thomson
8. Aastra / NTT Electronics
9. Aastra / Mitsubishi
10. Scientific Atlanta / Thomson
11. Scientific Atlanta / Mitsubishi
12. Scientific Atlanta / NTT Electronics
13. Tandberg / Mitsubishi
14. Tandberg / Thomson
15. Tieman / Sencore
16. NTT Electronics / Sencore
17. Mitsubishi / Sencore
18. Thomson / Sencore

SECOND ROUND FAILURES - 0 FAILURES / 48 TESTS

1. Aastra / NTT Electronics -- Retest Pass
2. Harmonic / NTT Electronics -- Retest Pass
3. Tandberg / NTT Electronics -- Retest Pass
4. Tieman / NTT Electronics -- Retest Pass

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PCM FAILURES

FIRST ROUND FAILURES - 13 FAILURES

1. Tandberg / Mitsubishi
2. Aastra / Thomson
3. Aastra / NTT Electronics
4. Aastra / Mitsubishi
5. Tandberg / Aastra (objective)
6. Tandberg / Mitsubishi
7. Tiernan / Sencore
8. Tandberg / Sencore
9. Tandberg / Aastra (subjective)
10. Aastra / Sencore
11. NTT Electronics / Sencore
12. Mitsubishi / Sencore
13. Thomson / Sencore

ENCODERS NOT SUPPORTING PCM

Scientific Atlanta
Harmonic

SECOND ROUND FAILURES – 2 FAILURES

1. Tandberg / Aastra
2. Tiernan / Aastra

SECOND ROUND RETESTS

1. Aastra / NTT Electronics - Pass
2. Tandberg / Aastra - Fail

ENCODERS NOT SUPPORTING SMPTE 302M-2002, BUT SUPPORTING SMPTE 302M-1998 ONLY – Tandberg, Tiernan & Harmonic

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DOLBY E FAILURES

FIRST ROUND FAILURES – 5 FAILURES

1. Tandberg / Mitsubishi
2. Aastra / Thomson
3. Aastra / NTT Electronics
4. Aastra / Mitsubishi
5. Tandberg / Aastra

ENCODERS NOT SUPPORTING DOLBY E¹: Scientific Atlanta

SECOND ROUND FAILURES – 1 FAILURE

1. Tiernan / Aastra

SECOND ROUND RETESTS

1. Aastra / NTT Electronics - Pass
2. Harmonic / NTT Electronics - Pass
3. Harmonic / Aastra - Pass
4. Harmonic / Tandberg - Pass
5. Harmonic / Tiernan - Pass
6. Tandberg / Aastra - Pass

¹ During First Round, Harmonic personnel erroneously believed that Harmonic encoder did not support Dolby E.

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LIP SYNC TEST RESULTS

LATENCY TEST RESULTS

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LIP SYNC TEST RESULTS

1. Measured with the Vistek VALID system.
2. Specification was +/- 4 ms.
3. Decoder was not adjusted to accommodate delay.
4. Measurement made before / after ASI interrupt.
5. Long term (12 hr.) test.

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LIP SYNC TEST RESULTS

Test Description	Test Parameters	# of Encoders/Decoders	No. of Tests	No. of Failures
A/V Sync 1st Measure	4 CH MPEG (1080i/60; 40 Mbps)	6 encoders; 4 decoders	24	17
A/V Sync 1st Measure	2 CH PCM (1080i/60; 40 Mbps)	6 encoders; 4 decoders	16	12
A/V Sync 1st Measure	DOLBY E (1080i/60; 40 Mbps)	6 encoders; 4 decoders	24	8 ¹
A/V Sync 2nd Measure ASI Interrupt	4 CH MPEG (1080i/60; 40 Mbps)	6 encoders; 4 decoders	24	16
A/V Sync 2nd Measure ASI Interrupt	DOLBY E (1080i/60; 40 Mbps)	6 encoders; 4 decoders	23	6 ¹
A/V Sync Long Term 12 hr.	4 CH MPEG (1080i/60; 40 Mbps)	3 encoders; 4 decoders	12	6

¹ Failures do not include delays of multiples of 33 ms where equipment set-up could have compensated for the 33 ms video-frame-related delay inherent in Dolby E.

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LATENCY TEST RESULTS

Test Description	Test Parameters	# of Encoders/ Decoders	No. of Tests	Range of Results
Latency	(1080i/60; 40 Mbps)	6 encoders; 5 decoders	30	299 ms - 1800ms

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LATENCY TEST RESULTS

1. 2x – 3x higher than SD.
2. Lowest: 299 ms
3. Highest: 1800 ms
4. Typical: 500 – 600 ms.
5. Both Encoders & Decoders cause variation.
6. Will we obtain 200 ms MPEG-2 HD Latency?