SEPT 1982

HS 235-2019-1679

THEMATIC MAPPER

THEMATIC MAPPER

Prepared for
GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771
CONTRACT NAS 5-24200

FLIGHT MODEL
PRESHIPMENT REVIEW
DATA PACKAGE
VOLUME II - SUBSYSTEM DATA
PART A

Article IV - 3A

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP

HS 236-0019-1679

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SUBSYSTEMS

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FLIGHT MODEL

PRE SHIPMENT REVIEW

VOLUME II

SUBSYSTEMS

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(Continued...)

2.0 Subsystems Acceptance Data

Each of the major subsystems of the Flight Model Thematic Mapper was reviewed as an entity prior to integration into the system. The intent of this section is to present for each major subsystem, acceptance data for the subsystem (test results); reference lists of the configuration status; and reference lists of Non-Conforming Material Reports, Failure Reports (with copies), and Requests for Deviation/Waiver (with copies).

The acceptance data for each subsystem (where applicable) is contained in the Appendix to this report, as referenced in the first subsection for each subsystem.

The second subsection for each subsystem contains a tabular summary of the "as designed" and "as built" configuration lists, showing all applicable drawings, specifications, or standards. (An "as built" configuration list for the total system is included in Volume I and is also included herein immediately following this page). This is followed by a listing of all items against the subsystem, with copies of NCRM's, RT's, and RD/W's.

SUMMARY

AS-BUILT CONFIGURATION LIST

TM FLIGHT S/N 003

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
1	51065	THEMATIC MAPPER ASSY	J	J	J	003
			4257A	4257A	4257A	
			4487A	4487A	4487A	
			4557A	4557A	4557A	
			4573A	4573A	4573A	
			4643A	4643A	4643A	
			4658A	4658A	4658A	
			D143R1	D143R1	D143R1	
			D144	D144	D144	
			D146	D146	D146	
			D148	D148	D148	
			D155	D155	D155	
			D158	D158	D158	
			D161	D161	D161	
			D162	D162	D162	
			D163	D163	D163	
			D164	D164	D164	
			D165	D165	D165	
			W166	W166	W166	
			W169	W169	W169	
			W170	W170	W170	
			W171R1	W171R1	W171R1	
			W173	W173	W173	
2	50840	MAIN FRAME ASSY	E	E	E	003
2	52347	ELECTRONICS MODULE ASSY	D	B	B	201
			4588A	4091A	4091A	
				4113A	4113A	
				4242A	4242A	
				4293A	4293A	

ND VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
3	3533003-100	MULTIPLEXER ASSY	C	C	C	003
			43009	43074	43009	
			43074	65661	43074	
			65661	65662	65661	
			65662	W124	65662	
			W124	W125	W124	
			W125		W125	
3	50869	POWER SUPPLY ASSY	D	D	D	004
			2015A	2015A	2015A	
			2039A	2039A	2039A	
			4347A	4347A	4347A	
			D030	D030	D030	
			D068	D068	D068	
			W074	W074	W074	
			W092	W092	W092	
			W093	W093	W093	
			W101	W101	W101	
3	52348	CABLE ROUTING ASSY	F	F	F	005
			3844A	3844A	3844A	
2	52532	OPTICAL ASSY	F	F	F	003
			3174A	3174A	3174A	
			4100A	4100A	4100A	
			4187A	4187A	4187A	
			4266A	4266A	4266A	
			4488A	4488A	4488A	
			4559A	4559A	4559A	
			4656A	4656A	4656A	
			D-151	D-151	D-151	
			D-154	D-154	D-154	
			W-148	W-148	W-148	
3	51512	AFT OPTICS ASSY	E	D	D	003
			3646A	3646A	3646A	
			3925A	3896A	3896A	
			3959A	3925A	3925A	
			4585A	3959A	3959A	
				4134A	4134A	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
4	50795	PRIME FOCAL PLANE ASSY	J	H	H	201
			W126	3934A	3934A	
				3968A	3968A	
				3982A	3982A	
				W126	W126	
3	51200	RADIATIVE COOLER ASSY	E	E	E	003
			3922A	3922A	3922A	
			4201A	4201A	4201A	
			4216A	4216A	4216A	
			4269A	4269A	4269A	
			SB-W032	SB-W032	SB-W032	
			W144	W144	W144	
			W147	W147	W147	
			W149	W149	W149	
			W151	W151	W151	
4	50973	COLD FOCAL PLANE ASSY	B	B	B	201
			2870A	2870A	2870A	
			3895A	3895A	3895A	
			4173A	4173A	4173A	
			SB-D004	SB-D004	SB-D004	
			W102R1	W102R1	W102R1	
			W109	W109	W109	
			W111	W111	W111	
			W134	W134	W134	
			W135	W135	W135	
3	51337	TELESCOPE ASSY	D	D	D	002
			3866A	3866A	3866A	
			3917A	3917A	3917A	
			W129	W129	W129	
			W136	W136	W136	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
3	52534	RELAY OPTICS ASSY	D 1145A 4097A	D 1145A 4097A	D 1145A 4097A	003
2	3533002-100	SCAN MIRROR ASSY	E	D 13121 13122 64358 64363 64369 64374 W020	D 13121 13122 64358 64363 64369 64374 W020	004

SECTION 2.1
MULTIPLEXER

Section 2.1.1.

Multiplexer

Performance Data

The acceptance performance (test) data for the Multiplexer is contained in Appendix A of this report (Vol IV, part A).

2.1.2
Acceptance Data

2.1.2.1
Configuration Lists

AS-BUILT CONFIGURATION LIST

MULTIPLEXER
3533003-100 S/N 3

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3533003-100	MULTIPLEXER	C 43009(R) 43074 65661 65662 W124 W125	C 43074 65661 65662 W124 W125	C 43009 43074 65661 65662 W124 W125	3
	3533003-200	MULTIPLEXER	D	D	D	
	3533003-500	MULTIPLEXER	G 65604 65670	G 65604 65670	G 65604 65670	
	3533003-600	PIN/SIGNAL LIST	B 65659	B 65659	B 65659	
	259989	GROUND & VOLTAGE BUS	A	A	A	
	3362049	WASHER	-	-	-	
	3489200	HEATSINK	-	-	-	
	3569200	CONNECTOR	-	-	-	
	3569201-2	CONNECTOR	- 43055	- 43055	- 43055	
	3569202	ALTERNATE MATL HS236	A	A	A	
	3569203	CABLE ASSY, TWINAX	C 65612 65696	C 65612 65696	C 65612 65696	
	3569204-1 -2	CHANNEL SHIM	C	C	C	

NO VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569205	CABLE ASSY	B	B	B	
	3569206-2	GASKET	A 11457	A 11457	A 11457	
	3569207	SHIM, RF CONNECTOR	-	-	-	
	3569208	MULTIPLEXER	A 43003 43064 65600 65649 65674	A 43003 43064 65600 65649 65674	A 43003 43064 65600 65649 65674	
	3569209	MULTIPLEXER	A 43004 43066 43088	A 43004 43066 43088	A 43004 43066 43088	
	3569210	MULTIPLEXER	E 65673 65692	E 65673 65692	E 65673 65692	3
	3569211	WIRE LIST	F 43060 43097 65614 65660	F 43060 43097 65614 65660	F 43060 43097 65614 65660	
	3569213	COVER	D	D	D	
	3569214	COVER, TOP REAR	D 43072	D 43072	D 43072	
	3569215	TEMP COVER	B	B	B	
	3569216	CHASSIS ASSY	B	B	B	
	3569218	CHANNEL CONNECTOR PLATE	D 11428 11469(P)	D 11428	D 11428 11469	
	3569219	PLATE, REAR	C	C	C	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569220	PLATE CHASSIS	D 11470(P)	D	D	
	3569221	PLATE CHASSIS	B 11471(P)	B	B	
	3569222	PLATE, FRONT	D 11472(P)	D	D	
	3569223	BUS ASSY	- 11497	- 11497	- 11497	
	3569224	MODULE	F 65637 65677 65685(P) 65694 D026 D086	F 65637 65677 65694 D026 D086	F 65637 65677 65685 65694 D026 D086	
	3569225	PRINTED WIRING BOARD	D 43080	D 43080	D 43080	
	3569226	HEATSINK	C	C	C	
	3569228	PRINTED WIRING BOARD	F 11492(P) 11494 43087 D018	F 11494 43087 D018	F 11492 11494 43087 D018	
	3569229	ALTERNATE DESIGN	C 65642	C 65642	C 65642	
	3569234	MODULE	D 43010 43037 65626 65646 65668	D 43010 43037 65626 65646 65668	D 43010 43037 65626 65646 65668	3

NE. LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569235	ALTERNATE WIRING	A 65641 65643 65676(P)	A 65641 65643	A 65641 65643	
	3569240	MODULE	E 11464(P) 43011 D014 D084	E 43011 D014 D084	E 43011 D014 D084	3
	3569241	ALTERNATE WIRING	G 65617 65627 65628 65634	G 65617 65627 65628 65634	G 65617 65627 65628 65634	
	3569247	MODULE	D 11465(P) 43012 43039 43048 D028 D083	D 43012 43039 43048 D028 D083	D 43012 43039 43048 D028 D083	3
	3569248	ALTERNATE WIRING	D 43083	D 43083	D 43083	
	3569254	MODULE	F 11466(P) 43013 43040 65603(C) D013 D082	F 43013 43040 D013 D082	F 43013 43040 65603 D013 D082	3
	3569255	ALTERNATE WIRING	H	F 43085 43090 43091 43093 43094	F 43085 43090 43091 43093 43094	3

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569261	MODULE	G D012 D059 D081 D106	G D012 D059 D081 D106	G D012 D059 D081 D106	3
	3569262	ALTERNATE WIRING	E 65682(P) 65687(P) 65698	E 65698	E 65682 65687 65698	
	3569264	ALTERNATE DESIGN WIRING	- 65622 65636 65693	- 65622 65636 65693	- 65622 65636 65693	
	3569268	TB ASSY	A 11420 11448(R) 11449	A 11420 11449	A 11420 11449	
	3569269	COMPONENT ASSY	B	B	B	3
	3569270	INSULATOR BOARD	A	A	A	
	3569272	MDL FILTER ASSY	B	B	B	5
	3569273	FILTER FRAME	-	-	-	
	3569277	MULTIPLEXER	A 43032 43045 43050 43058 43063	A 43032 43045 43050 43058 43063	A 43032 43045 43050 43058 43063	3
	3569278	CONVERSION UNIT	B	B	B	
	3569279	COVER	B	B	B	
	3569280	COVER	A 11444	A 11444	A 11444	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569282	WIRE LIST	D 43054(R) 43061 43076	D 43061 43076	D 43054 43061 43076	
	3569283	COMPONENT BOARD ASSY	C	C	C	
	3569284	TERMINAL ASSY	A	A	A	
	3569285	ALTERNATE PARTS	- 65658 65669	- 65658 65669	- 65658 65669	
	3569290	CONNECTOR PLUG	C	C	C	
	3569291	NUT, HEXAGON	-	-	-	
	3569292	TRANSFORMER	A	A	A	
	3569293	1024 BIT-PROM	A W026	A W026	A W026	
	3569300	WIRE WRAP	D 43001 43005	D 43001 43005	D 43001 43005	
	3569301	FILTER ASSY	B	B	B	
	3569309	INDUCTOR	A	A	A	10,11, 12,24, 45,56
	3569314	INTERCONNECTION	E	E	E	
	3569315	SCHEMATIC DIAGRAM	C 65691	C 65691	C 65691	
	3569316	SCHEMATIC DIAGRAM	E 65679 65689(P)	E 65679	E 65679 65689	
	3569317	SCHEMATIC DIAGRAM	B	B	B	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3569318	SCHEMATIC DIAGRAM	E	E	E	
	3569319	SCHEMATIC DIAGRAM	D	D	D	
	3569320	SCHEMATIC DIAGRAM	C	C	C	
	3569321	SCHEMATIC DIAGRAM	D	D	D	
	3569322	SCHEMATIC DIAGRAM	C	C	C	
	3569323	SCHEMATIC DIAGRAM	D	D	D	
	3569324	SCHEMATIC DIAGRAM	E	E	E	
	3569328	INTERCONNECTION	G 65684(P) 65695	G 65695	G 65684 65695	
	3616302	CABLE	A	A	A	
	3905969	HYBRID-INPUT	A 11445 11459 11476 11477 D0010	A 11445 11459 11476 11477 D0010	A 11445 11459 11476 11477 D0010	
	3905970	SCHEMATIC DIAGRAM	B	B	B	
	3905971	HYBRID-INPUT	A	A	A	
	3905973	MICROCIRCUIT	D 11446 11460 11479 D0010	D 11446 11460 11479 D0010	D 11446 11460 11479 D0010	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3905977	MICROCIRCUIT	C 65699(N) D0010	C D0010	C D0010	

W K D Williams
QUALITY ASSURANCE

12/17/81
DATE

Jennifer Sommers
CONFIGURATION/DATA MANAGEMENT

12/17/81
DATE

MULTIPLEXER

Listing of Liens

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MULTIPLEXER

P/N 3569210

FLIGHT		PROTOFLIGHT		ENGINEER	
Failure Report No.		Failure Report No.		Failure Report No.	
Open	Closed	Open	Closed	Open	Closed
F3658-	F0372		F0360 F1929		F0547
(Spare)	F0373		F0361 F1930		F1938
F4252-	F0374		F3062 F1931		F2755
(Spare)	F0381		F0363(Void)		F5184
	F2808		F0364 F1932		
	F2812		F0365 F1933		
	F2813		F0366 F1934		
	F2814		F0367 F1935		
	F2815		F0368 F1936		
	F2816		F0369 F1937		
	F2817		F0370 F1939		
	F2818		F0371 F1940-		
	F2819		F0375 (Void)		
	F2820		F0376 F1941-		
	F2821		F0377 (Void)		
	F2822		F0378 F1942		
	F2823		F0379 F1943		
	F2824		F0380 F1944		
	F2825		F0383 F1945		
	F3657		F0384 F1946		
	F3660		F0385 F1947		
	F4253		F0386 F1948		
	F4254		F0387 F1949		
	F4255		F0388 F2805		
	F4256		F0389 F2806		
	F4257		F0390 F2807		
	F4265		F0391 F2810		
	F4266		F1919 F2811		
	F4267		F1920 F2814		
	F4268		F1921 F3005		
	F7295		F1922 F4264		
	F7296		F1923		
	F7299		F1924		
			F1925		
			F1926		
			F1927		
			F1928		

*Spare PWB Failed at card level (3569224)

MULTIPLEXER

P/N 3569210

FLIGHT MODEL

Failure Report Numbers	
Open	Closed
F3658(Spare)	F0372
F4252(Spare)	F0373
	F0374
	F0381
	F2808
	F2812
	F2813
	F2814
	F2815
	F2816
	F2817
	F2818
	F2819
	F2820
	F2821
	F2822
	F2823
	F2824
	F2825
	F3657
	F3660
	F4253
	F4254
	F4255
	F4256
	F4257
	F4265
	F4266
	F4267
	F4268
	F7295
	F7296
	F7299

Deviation	Waivers
	Closed
	W-124
	W-125

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FAILURE REPORT

F 037

1. PROGRAM NAME AND NUMBER: THOR ABLE MAULDIN 2. CLA: E330 3. MODEL: FLT 4. TIME OBSERVED: 0900 5. DATE OBSERVED: MO 8 DA 19

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3569210	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☒ MODULE ☐ MICAM ☐ CARD	A2	3569254	3	Hac
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ MMHG AT ___ ° ___ ☐ EXCERPT ☐ VIBRATION ___ AXIS PDR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: Serial Data output pattern has Wrong Format

15. TEST PROCEDURE: 92015-005 PARA 16. ORIGINATION: [signature] ORG 41 DATE 8/19/80 ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Alt wiring 3569254 implemented wrong on Conn. pin A20 (wiring from A20 to U2-7 and U20-7, should go only to U3-7, on Front assy. See item 30 on stress analysis.

19. FAILED ITEM NOMENCLATURE AND PART NUMBER: 3569210

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Remove wire, attach module in unit respectively

21. AUTHORIZATION: RL Julian ORG 41-41 DATE 8/19/80 ☐ CONTINUATION SHEET USED

MANUFACTURING/GUARD TEST

22. REWORK/RETEST ACTION TAKEN: ROTATED THE UNIT, OUTPUT DATA FORMAT IS CORRECT

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	VPR	PROCABLE DEFECT	ANALYSIS NO.

24. REWORK BY: 78816 ORG ___ DATE 8-19-80 25. RETESTED BY: H. Kaiser ORG 41-41 DATE 9/4/80 ☐ CONTINUATION SHEET USED

ENGINEERING/LIABILITY

30. CAUSE AND CORRECTIVE ACTION: NOTE: No possibility of part stress due to this wiring. All currents in spec. U20-7 double load current 40 ma vs spec 50 ma cont 100 ma

CAUSE: Operator error
G. L. Lynch

C/A. Operator instructed to check Alternate wiring.
G. L. Lynch

31. FRB CLOSURE

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION ☐ CONTINUATION SHEET USED

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURES ☐ ASSY/PAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: RL Julian ORG 41-41 DATE 10/15/80

38. SPACECRAFT SYSTEMS ENGR.: W. A. Frenwick ORG 2266 DATE 11/24

39. RELIABILITY: [signature] ORG 5141 DATE 10/27/80

40. CUSTOMER OR SUPPLIER: B-2 DATE

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SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F .0373

1. PROGRAM NAME AND NUMBER: NS 238 THEMATIC MAPPER | 2. CLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 11:00 | 5. DATE OBSERVED: MO 8 DA 21 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☑ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	F1 MULTIPLEXER	3569210	31	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

ORIGINATOR

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☑ IN-PROGRESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☑ AMBIENT ☐ CYCLING ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS PSD ____ MIN ☐ THERMAL VAC ____ TYPE ____ HRS. AT ____ ° ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: A/D REFERENCE VOLTAGES OF BANDS 1 & 5 ARE LOW, 1.985 Vo AND 1.9841 V. RESPECTIVELY (LIMITS ARE 2.000 V ± 15 MV).

15. TEST PROCEDURE: TP 32005-005 PARA 3.5.1 | 16. ORIGINATOR: H. Khazai | ORG 41-41 | DATE 8/21/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: ANALOG & DIGITAL RETURNS OF ALL ANALOG BOARDS (A5-A7, A9-A12) ARE REVERSED, i.e. ANALOG RETURN IS CONNECTED TO DIGITAL RTN SLOT & DIGITAL TO ANALOG.

19. FAILED ITEM RAISED AND PART REPLACED

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: RECONNECT THE GROUND BRAIDS CORRECTLY PER DRAWING

21. AUTHORIZATION: K. M. | ORG 41-41 | DATE 8/21/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING/GROUND TEST

23. REWORK/RETEST ACTION TAKEN: RETESTED THE UNIT (INPUT BUFFER DC RESPONSE ALL REFERENCE VOLTAGES ARE IN SPEC 2.000 V ± 15 MV (BAND-6 Limits ARE 1.980 V ± 15 MV)

24. QCI ACCEPTANCE: SQ

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: 28518 | ORG | DATE 9/10/80 | 28. RETESTED BY: H. Khazai | ORG 41-41 | DATE 9/4/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: NO POSSIBILITY OF COMPONENT STRESS DUE TO THIS OCCURRENCE.
CAUSE: OPERATOR ERROR
G. H. Kazai
C/A: OPERATOR INSTRUCTED TO VERIFY WIRING TO BLUE PRINT.
G. H. Kazai

32. FRB CLOSURE: 9/19/81

33. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ OPER'N ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☑ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☑ MAJOR ☑ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: K. L. Jillie | ORG 41-41 | DATE 10/15/80

38. SPACECRAFT/SYSTEM CNGR: W. D. Fauntleroy | ORG 22-61 | DATE 3/19/81

39. RELIABILITY: K. Mano | ORG 57-41 | DATE 10/19/80

40. CUSTOMER OR SUPPLIER | DATE

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FAILURE REPORT

F .037

ORIGINATOR

1. PROGRAM NAME AND NUMBER: NS 136 THEMATIC MAPPER | 2. GAA: E830 | 3. MODEL: FLT | 4. TIME OBSERVED: 4:50 | 5. DATE OBSERVED: MO 9 DA 3 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☑ UNIT ☐ SUBASSEMBLY ☐ MICRO ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	MULTIPLEXER	3569210	3	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAS ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☑ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☑ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ GMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: AT INPUT BUFFER DC RESPONSE TEST OUTPUT READINGS OF AL SENSORS ARE WRONG.

15. TEST PROCEDURE: TP 32015-005 PARA 3.5.3.1 | 16. ORIGINATOR: H. Khajavi | ORG 41-41 | DATE 9/4/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: AT CARD A1, SOLDERED WIRES AT PINS XA01-C6 & XA01-C7 (DC-RESTORE & DC-RESTORE BACKUP) ARE TOUCHING. THIS CAUSES THE SIGNAL TO STAY LOW AND DISABLES DC-RESTORE INPUT TO UNIT.

THE TWO TOUCHING PINS CARRY | 19. FAILED ITEM NAME AND PART NUMBER: MULTIPLEXER 3569210

20. ☑ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: CAS PINS XA01-C6 & XA01-C7 SOLDER THE WIRES AT DIFFERENT LEVELS (high & Low) AND PLACE SHRINK TUBING ON BOT PINS. RETEST PER TP 32015-005, PARA. 3.5.3.1

21. AUTHORIZATION: R.D. Wenn | ORG 41-41-11 | DATE 9/9/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Rework solder wires

Retested O.K. per TP 32015-005, PARA. 3.5.3.1

23. QA ACCEPTED TP-U S9

24. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	VDR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: 81200 | ORG | DATE 9/5/80 | 28. RETESTED BY: H. Khajavi | ORG 41-41 | DATE 9/5/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION: NOTE: NO POSSIBILITY OF PART STRESS DUE TO THIS FAILURE. SEE ITEM 18

CAUSE: WIRE WRAP PINS TOUCHING.

C/A: STRAIGHTEN ALL PINS AND USE CAUTION WHEN HANDLING ONIT.

☐ CONTINUATION SHEET USED

31. ERB CLOSURE: 10/4/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP. ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/PAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☑ WORKMANSHIP ☐ WEAR-OUT | DEFECT CODE

35. FAILURE TYPE: ☑ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☑ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [illegible] | ORG 4141 | DATE 10/15/81 | 38. SPACECRAFT SYSTEM ENGR. [illegible] | ORG 2261 | DATE 2/02

39. RELIABILITY [illegible] | ORG 71-41 | DATE 10/15/81 | 40. CUSTOMER OR SUPPLIER | DATE

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FAILURE REPORT

DUPLICATE ORIGINA

F 0381

1. PROGRAM NAME AND NUMBER	2. CLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER HS236	E330	FLT	0 1530	MO 10 DA 7 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	MULTIPLEXER	3569210	3	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A1	3569261	3	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMP ____ ☐ THERMAL VAC ____ ☐ ____ AT ____ ☐ EMC/EMI ☐ VIBRATION ____ AXIS FOR ____ MSN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: AFTER INCORPORATING SMA E.O. NO BACKUP SMA CLK OUTPUT

15. TEST PROCEDURE: 3569261 | PARA | 16. ORIGINATOR: R. YAMAUCHI | ORG: 41-41 | DATE: 10-7-80 | 17. CONTINUATION SHEET USED ☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: PRINTED CIRCUIT DAMAGED BETWEEN R5 AND Q8 ON FRONT ASSY. NOTE: NO POSSIBILITY OF COMPONENT DAMAGE OPEN CIRCUIT AT Q8 BASE CAUSES OUTPUT OF LOGIC "1" BUT DOES NOT APPEAR OUT-OF-SPECIFICATION VOLTAGES OR CURRENTS.

19. FAILED ITEM MARKS AND PART NUMBER: 3569261

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPAIR AS NECESSARY PER PRODUCT DESIGN INSTRUCTIONS

21. AUTHORIZATION: K. Ma | ORG: 41-41 | DATE: 10-7-80 | CONTINUATION SHEET USED ☐

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: ADDED JUMPER WIRE FROM R5 (BOTTOM) TO Q8-BASE PER NCMR 33251P

23A. QA REVIEW: HAC IDC 559

23B. QA REVIEW: HAC TEST S27

25. LIST ALL PART REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUM

27. REWORK BY: 16552 | ORG: 43-21 | DATE: 10-10-80 | 28. WITNESSED BY: [illegible] | ORG: 41-41 | DATE: 10/15/80 | 29. CONTINUATION SHEET USED ☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Operator crash-damage either during test or rework to incorporate Jam EO. Both test operator and rework operator were cautioned.

31. CONTINUATION SHEET USED ☐

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

33. FRB CLOSURE

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☒ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: R. L. Julian | ORG: 41-41-11 | DATE: 6/23/81

38. SPACECRAFT SYSTEM ENGINEER: [illegible] | ORG: 261 | DATE: 81062

23. RELIABILITY: [illegible] | ORG | DATE

☐ CUSTOMER SUPPLIED | DATE

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FAILURE REPORT

F 2808

1. PROGRAM NAME AND NUMBER: TYCHO Tr. Master 412-36 | 2. CLA: E330 | 3. MODEL: FLT | 4. TIME OCCURRED: 0930 | 5. DATE DISCOVERED: MO 3 DA 25 YR 88

6. HARDWARE LEVEL (WHEN FAILURE WAS DISCOVERED): ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MODULE ☐ PART

NOMENCLATURE (DESCRIPTION)	NAME	PART NUMBER	LOT	MANUFACTURER
7. SUBSYSTEM	FLT			
8. UNIT	Multiplexer	3533603-501		Hac
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3769226	15	
10. ☐ MISSILE ☐ MOTOR ☐ CARD				
11. OTHER				

12. TEST WHERE FAILURE WAS DISCOVERED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ FIELD USE ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT IF KNOWN FAILURE WAS DISCOVERED: ☐ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ MIN. AT ____ ° ____ ☐ VACUUM ____ ☐ VIBRATION ____ AXIS POS ____ MIN ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Channels 11 and 12 shorted together. A42 and A43 shorted together output & connector connected to P.A.B.

15. TEST PROCEDURE: 3769224 REV: Silv | 16. OPERATOR: Yamauchi | ORG: 441 | DATE: 3/25/88 | ☐ CONTINUATION SHEET USED

17. OBSERVATIONS AND FAILURE ANALYSIS: Pins A42 and A43 soldered together

18. PARTS LIST ITEM NUMBER AND PART NUMBER: 3769224

19. ☐ ACTIONS PERFORMED AND TEST PROGRAMS AFFECTED WHETHER OR NOT RECURRED (CHANGES): Removed to point - Removed solder bridge and retest

20. FAILURE CONFIRMED: ☐ | 21. FAILURE CONFIRMED BY: | ORG: | DATE: | ☐ CONTINUATION SHEET USED

22. LIST ALL PARTS REPLACED

PART NUMBER	TEST STEP	PART LOT NO.	DATE CODE	MFR	PROGRAM & EFFECT	ANALYSIS

23. CORRECTED BY: 19224 | ORG: 328 | DATE: 3/25/88 | 24. RETESTED BY: Yamauchi | ORG: 441 | DATE: 3/27/88 | ☐ CONTINUATION SHEET USED

25. CAUSE AND CORRECTIVE ACTION: Removed Solder Bridge 3/28/88
Improper workmanship in manufacturing - reworked and operation confirmed.

The possibility of Channel mixup due to this failure.

26. FAILURE CLASSIFIED: | ☐ CONTINUATION SHEET USED

27. DOCUMENT NUMBER INITIATING CORRECTIVE ACTION: NONE

28. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ OTHER CODE

29. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

30. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

31. RESPONSIBLE ENGINEER: R. L. Wilson | ORG: 41-41 | DATE: 6/26/88 | 32. SPACECRAFT SYSTEM ENGR: R. L. Wilson | ORG: SBUC | DATE: 6/26/88

33. APPROVED: [signature] | ORG: 51-41 | DATE: 6/26/88 | 34. CUSTOMER OR DESIGNEE: [signature] | DATE:

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FAILURE REPORT

F 281

1. PROGRAM NAME AND NUMBER: Thermatic Map 82326 | 2. GL: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 0900 | 5. DATE OBSERVED: 3/25/80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	P/N	MANUFACTURER
7. SUBSYSTEM	FLT			
8. UNIT	Multiplexer	3533903-100		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	17	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST DURING FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ HRS. AT ___ ° ___ ☐ ENCAPS ☐ VIBRATION ___ AXIS FOR ___ HRS TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: Chan. 4 DC Restore, DC Level Change

15. TEST PROCEDURE: 3569224 PARA 5.2.2.1 | 16. ORIGIN: R. YAMAUCHI ORG 4941 DATE 3/28/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: VERIFIED Tight baffles by isolating output pin 48.

18. FAILED ITEM'S NAME AND PART NUMBER: HYBRID I.D. 3905969

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replace input baffle hybrid HY1 and DC restore assembly normally. Retain hybrid for failure analysis. S/N525

20. PARTICIPANT: E. Sullivan ORG 4941 DATE 3/28/80 | ☐ CONTINUED SHEET USED

MANUFACTURING AND TEST

21. REWORK/RETEST ACTION TAKEN: Replaced HY1 on Front Assy

Retested per T.P 3569224 NC Retested OK

All circuits affected by DC failure function properly.

22. QA ☐ REJECTED ☐ ACCEPTED (EST 329) (S164)

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS REQ.
3905969	HY1	S/N525		HAC		

24. REWORK BY: 16690/78815 ORG 4141 DATE 4/1/80 | 25. RETESTED BY: E. Yamauchi ORG 4941 DATE 4/7/80 | ☐ CONTINUED SHEET USED

ENGINEERING/RELIABILITY

26. CAUSE AND CORRECTIVE ACTION: Hybrid Part malfunction - part replaced

Possibility of stress due to this failure. Circuit has areas which present excessive voltage.

REFER TO FAR #8499 ATTACHED | ☐ 27. CONTINUATION SHEET USED

28. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

29. FRB CLOSURE: 3/19/81

30. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☒ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

31. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE

32. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

33. RESPONSIBLE ENGINEER: R. Tulao ORG 41-41 DATE 8/21/80

34. SPACECRAFT SYSTEM ENGR: W. H. Arnstead ORG 22-41 DATE 8/21/

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FAILURE ANALYSIS REPORT

F2812

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Program Thematic Mapper

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Date of Failure 3-28-80	Requesting Engineer R. Julian
Date of Receipt 4-17-80	Phone ____ Bldg./MS 377/P314
Request No. F2812	
Ledger No. J2905-71	CML Project Engineer L. L. Ferrin
CMER No. 28726	Phone ____ Bldg./MS H2/C346

DEVICE INFORMATION

HAC P/N 3905969	Date Code ____
Device Type Hybrid	Lot Number ____
Vendor Hughes	Circuit Symbol ____
Vendor P/N 82577	Unit ____ S/N ____
Device S/N 525	Module ____ S/N ____

ABSTRACT

The reported failure mode "Static DCR offset voltage of channel 4 out of specification", was verified. Also a similar failure was observed on channel 3. The failure was isolated to N-channel MOS FET transistors Q3 and Q4. Shorts between source and gate of both transistors and a short between source and substrate of Q3 were noted. Internal examination revealed smearing and scratches on both transistors. Scanning Electron Microscope examination disclosed holes under the metalizations of both transistors.

The primary cause of the failure is believed to be mechanical damage which caused the shorts either via smeared metalization or by scratches which damaged underlying oxide resulting in holes in the silicon.

Edward Hartmann 6/24/80 — FAILURE ANALYST / DATE

Peter A. Parker 6-24-80 — APPROVAL / DATE

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TECHNOLOGY SUPPORT
DIVISION

FAILURE ANALYSIS REPORT

F 28/2

FAR No. 8499 Page 2 of 8

Program Thematic Mapper

COMPONENT ENGINEERING TECHNICAL COMMENTARY:

HAC hybrid (analog input buffer) Part No. 3905969 was submitted for failure analysis.

Electrical tests were performed to Specification Number TS 32015-030. Parameters were within specification requirements, except for offset voltage on channel 3 and 4 which exceeded the maximum limits.

Internal examination revealed scratches and smearing of metalization on N channel MOS FET transistor Q3 & Q4 and Q1 transistor had a defect on a bonded lead.

Electrical probing confirm that Q3 was shorted from source to gate, source to substrate and gate to substrate. Q4 was also shorted from the source to the gate.

This writer is in agreement with this failure analysis report and its conclusion.

RECOMMENDATIONS:

No corrective action required by TSD

CORRECTIVE ACTION REQUIRED BY TSD
YES ☐ NO ☑

COMPONENT ENGINEER 7/1/80 DATE

APPROVAL 7/7/80 DATE

F2812

Reported Failure Mode:

Static DCR offset voltage of channel 4 out of spec.

Available Data:

None.

Outline of Analysis:

1. External Visual Examination
2. Particle Impact Noise Test
3. Electrical Test
4. Internal Examination
5. Electrical Probe Measurements
6. Scanning Electron Microscope (SEM) Examination

Results of Analysis:

1. External Visual Examination.

   a) Case examination disclosed no anomalies.

   b) Markings:

TOP	BOTTOM
Hughes Logo	Hughes Logo
B2577	B2577
3905969	3905969
SER NO 525	SER NO 525

2. Particle Impact Noise Test.

   No loose particles were detected.

3. Electrical Test.

   The hybrid was tested in accordance with HAC ANALOG INPUT BUFFER test specification number TS32015-030 for the following parameters: 1KHz GAIN, DC offset, NOISE, 3dB Bandwidth Static DC Restoration offset voltage and power supply current at +25°C. All the parameters measured were within specified limits except for Static DC Restoration offset voltage of channel 3 and 4 which exceeded the maximum limits. Static DC Restoration voltages were measured to be as follows:

   Channel 3 = -684mV should be 0 $\pm$ 0.5mV maximum
   Channel 4 = +136mV should be 0 $\pm$ 0.5mV maximum

4. Internal Examination.

   Internal examination at magnifications 194X and greater revealed the following anomalies:

   a) Scratches and smearing of metalization on N channel MOS FET transistors Q3 and Q4. (See Figures 1 through 5.

   b) A lead bonding defect on Q1 transistor. (See Figure 6).

F2212

Results of Analysis: (continued)

5. Electrical Probe Measurements.

   Electrical probing, combined with circuit isolation via lifting the source, drain, and gate leads of N-channel MOS FET transistor Q3 and Q4 of the substrate indicated the following:

   a) Source to Gate of Q3, channel 3, had a 350 ohm short.

   b) Source to Substrate of Q3, channel 3 had a 57.5K ohm short.

   c) Gate to Substrate of Q3, channel 3, had a 52.6K ohm short.

   d) Source to Gate of Q4, channel 4, had a 600 ohm short.

6. Scanning Electron Microscope (SEM) Examination.

   SEM examination after metalization removal disclosed pinholes in the Source region of Q3 and Q4 and a pin hole in the gate bond pad region of Q3. (See Figures 7 through 11)

Conclusion:

The reported failure mode "Static DCR offset voltage of channel 4 out of spec." was confirmed. Also the Static DCR offset voltage of channel 3 exceeded the maximum specified limits of 0mV ± 0.5mV. The failure was isolated to N-channel MOS FET transistors Q3 and Q4, of channel 3 and 4. Electrical probing, combined with isolation indicated that the Source and Gate of both transistors were shorted. Also the Source and the Substrate of Q3 were shorted. Internal examination revealed scratches on both transistors expecially under the Source and Gate bond, and in the metalization of the Source and Gate

Scanning electron microscope examination after metalization removal disclosed pinholes in the oxide under the metalization of both transistors.

Analysis disclosed mechanical damage in the form of smearing and scratches in the metalization. Smearing of the metalization may have caused a short. The scratches are believed to have damaged the underlying oxide resulting in the pinholes found during SEM examination. One or more of the pinholes may have also been the cause of a short. The primary cause of failures is believed to be mechanical damage to the Q3 and Q4 chips.

F28/2

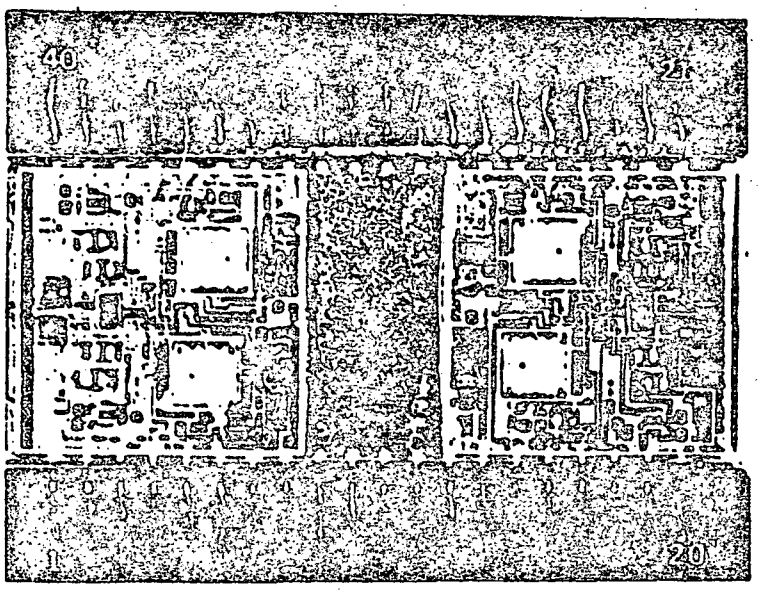

Figure No. 1
Sample No. 525

Overall internal view of the hybrid.

(4X)

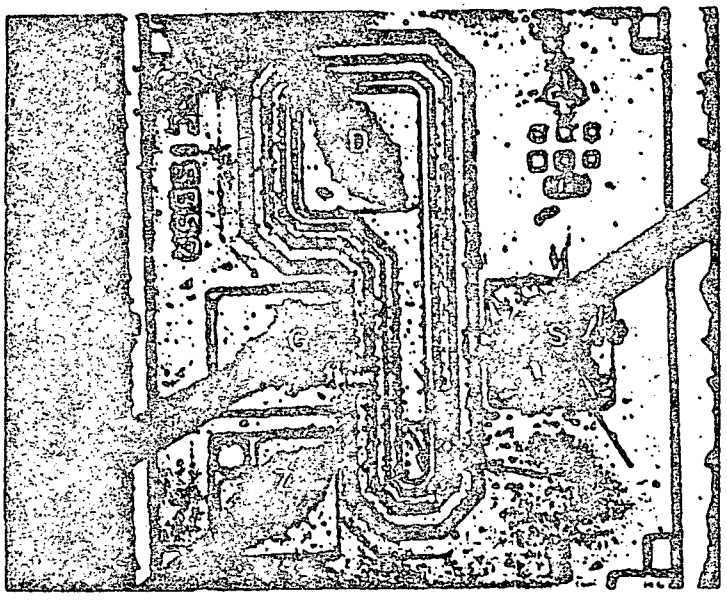

Figure No. 2
Sample No. Q3

Overall view of Q3 transistor Arrows point to the scratches on the chip.

(194X)

Figure No. 3
Sample No. Q3

Magnified view of the anomaly shown in Figure 2.

(1338X)

F28/2

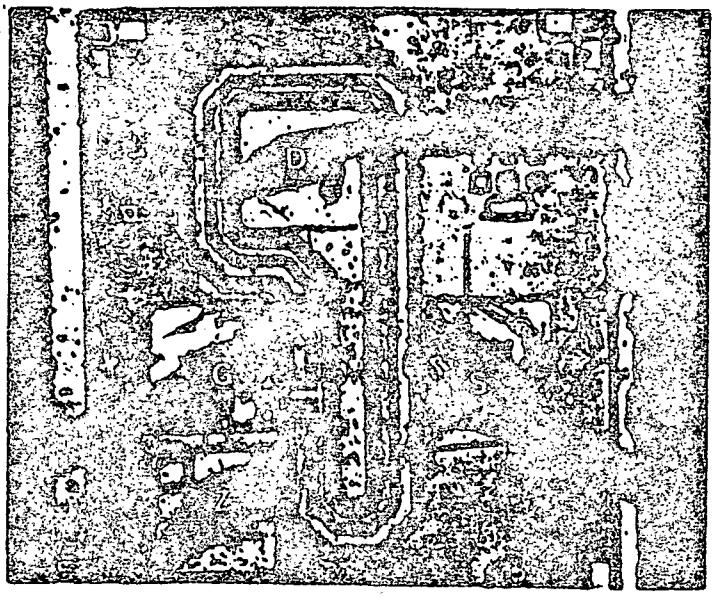

Figure No. 4
Sample No. Q4

Overall view of Q4 transistor. Arrows point to the scratches on the chip.

(194X)

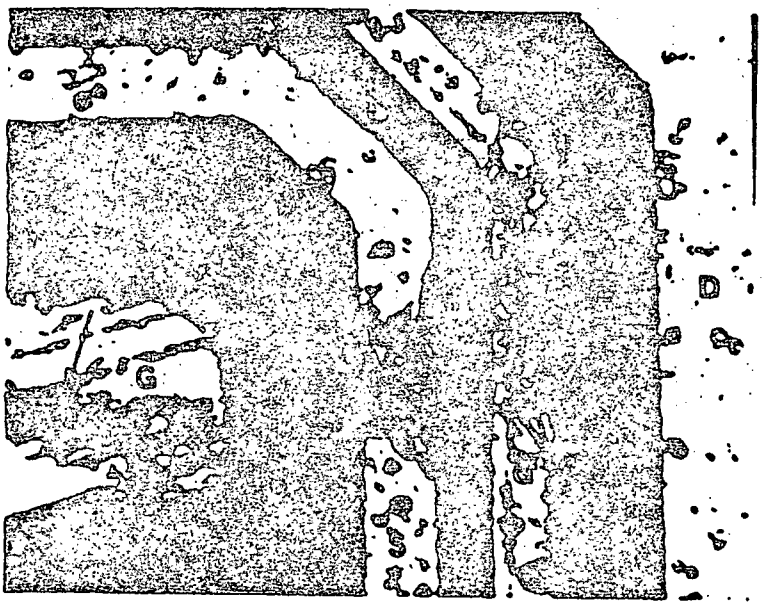

Figure No. 5
Sample No. Q4

Magnified view of the anomaly shown in Figure 4.

(1338X)

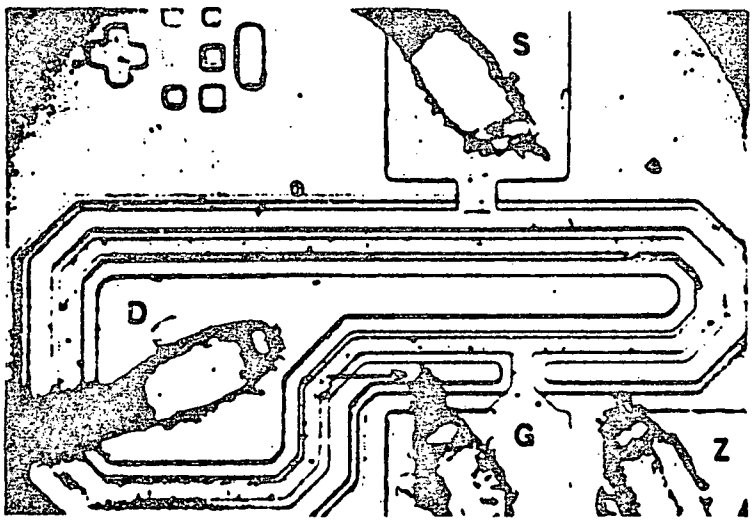

Figure No. 6
Sample No. Q1

Overall view of Q1 transistor chip Arrow points to lead bond anomaly.

(285X)

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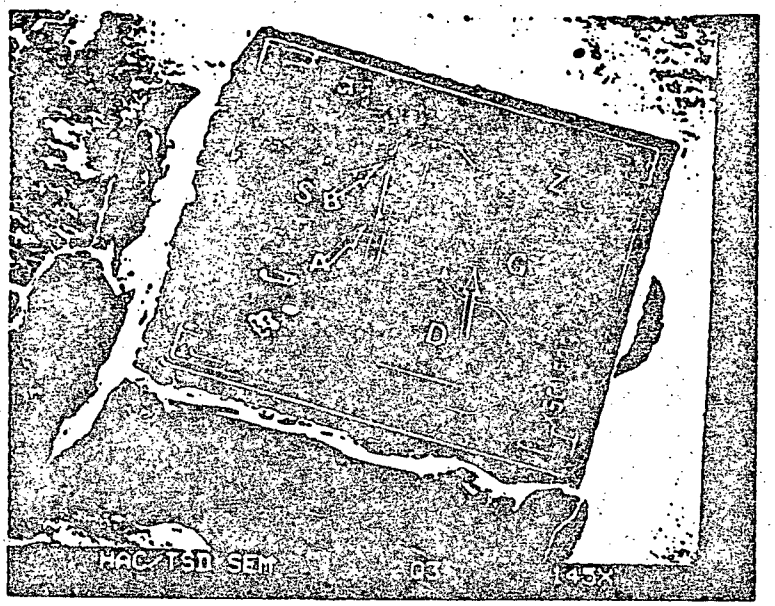

Figure No. 7
Sample No. Q3

SEM view of Q3 after metali
removal with pinholes indic

(145X)

Figure No. 8
Sample No. Q3

Magnified view of pinhole
shown in Figure 7 Arrow B.

(7400X)

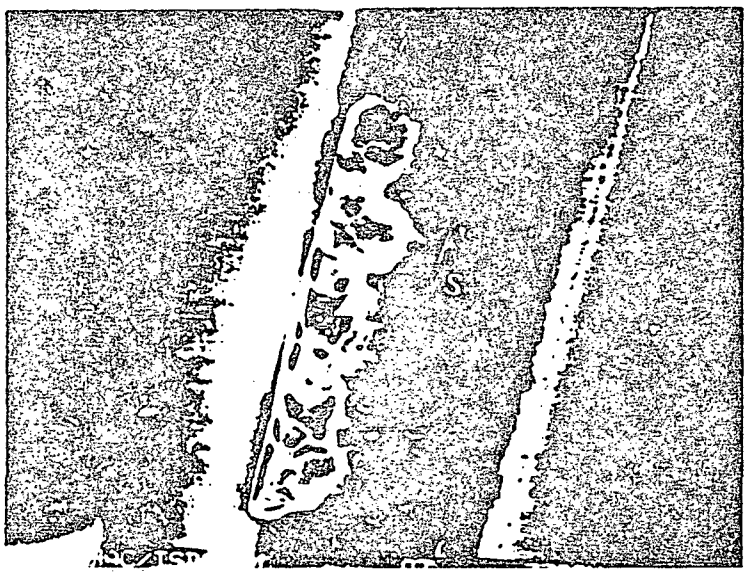

Figure No. 9
Sample No. Q3

Magnified view of the pinhol
shown in Figure 7, Arrow A.

(3700X)

F2812

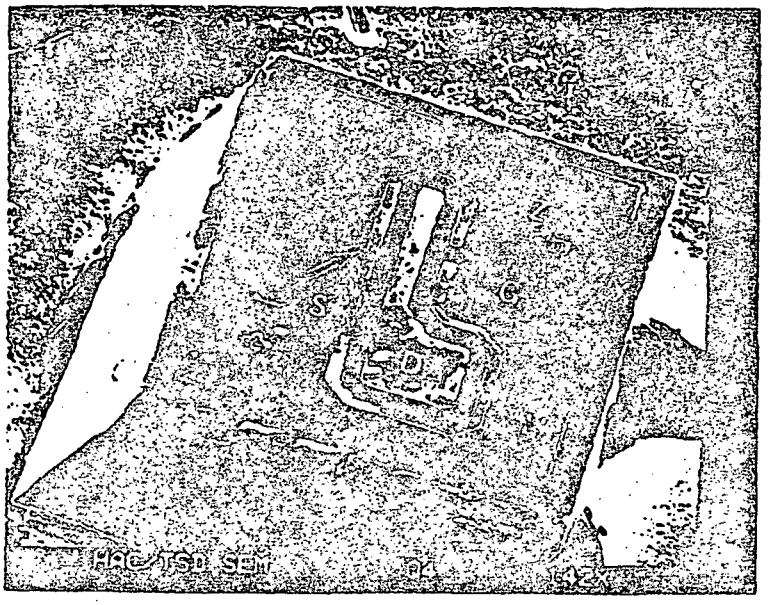

Figure No. 10
Sample No. Q4

SEM view of Q4 transistor after metalization removal with pinhole indicated.

(142X)

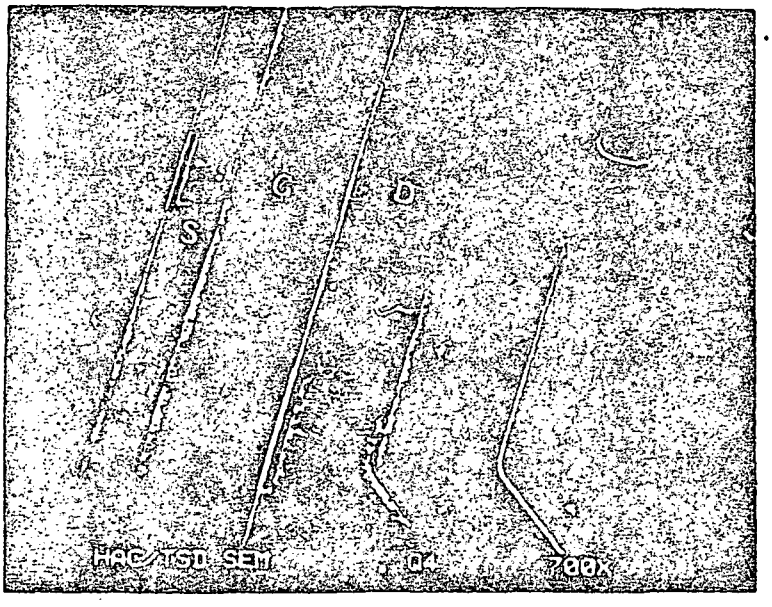

Figure No. 11
Sample No. Q4

Magnified view of the pinhole shown in Figure 10.

(700X)

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FAILURE REPORT

F 281

1. PROGRAM NAME AND NUMBER: Thematic Mapper H5236 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 1420 | 5. DATE OBSERVED: MO 3 DA 31 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	FLT			
8. UNIT	Multiplexer	3533 003-100		Hac
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	16	Hac
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ EXCERPT ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Channels 9-17 No output

15. TEST PROCEDURE: 3569224 PARA | 16. ORIGINATOR: R Yamauchi ORG 41-41 DATE 3/31/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: No analog mux output from HY2 of Rear Assy. Mux out stays @ 0 V. No possibility of damage to other components. Multiple output of +2 volts is within range of A/D Converter, and operation when other Multiplexer was on was normal.

19. FAILED ITEM NAME AND PART NUMBER: 3905973 S/N 513

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE HY2 and proceed with Test of Subassembly. Return HY2 for analysis of open output.

21. AUTHORIZATION: R L Julian ORG 41-41 DATE 4/21/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Replaced HY2 on REAR ASSY

Retest OK per TP 3569224 WC

All circuits affected by this failure function properly.

24. GLA RESPONSIBILITY: S134

TEST S29

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
3905973	HY2	S/N 513		HAC	Pin 57 output Defective. Pin 24 OK.	

27. REWORK BY: 1689 ORG 45 DATE 4/23/80 | 28. RETESTED BY: R. Yamauchi ORG 41-41 DATE 4/23/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION: Suspect Hybrid part malfunction - part replaced.

No possibility of component stress due to this failure.

31. FRB CLOSURE: [signature] 4/28

☐ 32. CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: —

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: R L Julian ORG 41-41 DATE 11/25/80

38. SPACECRAFT SYSTEM ENGR: [signature] ORG 22-61 DATE 12/1

39. RELIABILITY ORG DATE

40. CUSTOMER OR DATE

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FAILURE REPORT

F 281

2040

1. PROGRAM NAME AND NUMBER: HS236	2. CLA: A330	3. MODEL: F	4. TIME OBSERVED:	5. DATE OBSERVED: MO 3 DA 2 YR 2	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☒ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART					

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	F			
8. UNIT	MULTIPLEXER			
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A4	3533003-100		HAC
10. ☐ MODULE ☐ MICAM ☐ CARD		3569240	S/N 3	HAC
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ MBS AT ____ ° ____ ☐ SHOCK ☐ VIBRATION ____ AXIS FOR ____ HRS TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: R1 (MUX II) overheating

15. TEST PROCEDURE: T3569240 PARA

16. ORIGINATOR: K. Coe ORG 41-41 DATE 2-6-80 ☐ CONTINUATION SHEET

ENGINEERING EVALUATION

16. VERIFICATION AND FAILURE ANALYSIS: ① Value of Resistor Incorrect: It 6.8Ω ; S/B 68.0 per drawing ② All wiring done incorrect: U4-11 is connected to U4-1 which connects to gnd.; S/B U4-11 Connecting to U4-4. ③ [illegible]

17. [illegible]

18. FAILED ITEM NAME AND PART NUMBER: 3569240

20. ☐ ADDITIONAL REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: (1) Replace R1 with Correct Value (2) Remove U4-11 to U4-1 Connection; Add jumper from U4-11 to U4-4 per As Wiring (Pg. 7, Line 1, Rev C)

21. AUTHORIZATION: K. Coe ORG 41-41 DATE 4-6-80 ☐ CONTINUATION SHEET

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Worker authorized cuts & Jumpers. Void Stamped Incorrect Step. Retested per T.P. 3569240 MC All circuits affected by this FLR function properly.

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
9028661-035						

27. REWORK BY: Hood H.F. ORG 45 DATE 4/6/80

28. RETESTED BY: D. M. Valez ORG 41 DATE 4/24/80 ☐ CONTINUATION SHEET

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
1) Assy/Fab error - wrong resistor value installed
2) [illegible] Improperly wired in manufacturing - operator continued and R1 resistor replaced all
Since tester supply current limited and ☒ voltages & currents in spec. No possibility of stress to the components due to this failure.

33. FRB CLOSURE: [signature] 1/81 ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: — SEE ATTACHED SUPPLEMENTARY SHEET

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/FAB ERROR ☐ WORKMANSHIP ☒ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: K. Williams ORG 41-41 DATE 8/21/80

38. SPACECRAFT SYSTEM ENGR: W. F. Cudmore ORG 22-61 DATE 8/2

39. CUSTOMER OR [illegible] DATE

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EQUIPMENT CHECKOUT
FAILURE REPORT
CONTINUATION SHEET

FR2814 CONT. SHI LETTER*
FR SERIAL NO. | A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

ADDITIONAL CONTINUATIO SHEET(S) USE

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

This FR addresses an assembly error affecting resistor R1 of circuit MX1.1. This resistor should be wired from the +5 volt logic supply to various TTL logic inputs. Due to manufacturing error, a 6.8Ω resistor was used instead of 68Ω, and instead of being wired to the logic inputs it was wired between +5Volts and ground, leaving the logic inputs open circuit.

This error overheated the 6.8Ω resistor, which was replaced with a properly installe 68Ω resistor. No other dioides could have been damaged by this error, since the logic inputs were left open circuited, which is an allowed operating condition. Even if the inputs had been erroneously wired to ground they would not have been damaged, since their specified input voltage range includes 0 volts.

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FAILURE REPORT

F 2815

1. PROGRAM NAME AND NUMBER: HS236 | 2. CLA: E330 | 3. CODE: F | 4. TIME OBSERVED: 2040 | 5. DATE OBSERVED: MO 4 DA 8 YR 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	F			
8. UNIT	MULTIPLEXER	3533005-100		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A4	3569240	8143	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ S/C ITEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ MBL AT ____ ° ____ . ☐ DISC/PDI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: B34 of connector is connected to U24-8 C (MXII)

15. TEST PROCEDURE: TP3569240 PARA | 16. ORIGINATOR: H. Coe ORG 41-41 DATE 4-8-80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: ALT Wiring implemented incorrectly; B34 is connected to U24-8 by wire; S/B B34 connected to U24-14 per ALT Wiring (Pg 7, Line 2, Rev C)

18. FAILED ITEM NAME AND PART NUMBER: 3569240

19. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Reroute wire B34 to U24-8. [illegible]

21. AUTHORIZATION: H. Coe ORG 41-41 DATE 4-8-80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: All circuits affected by this failure function properly. Retest per T.P. 3569240 rev C

23. QA INSPECTION IP S67 | QA FINAL TEST S29

24. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	VSR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: Hasez HAC ORG 46 DATE 4/8/80 | 28. RETESTED BY: D. Lopez ORG 41 DATE 4/24/80 | ☐ CONTINUATION SHEET USED

ENGINEERING RESPONSIBILITY

30. CAUSE AND CORRECTIVE ACTION: Improperly wired in manufacturing - operator cautioned. No possibility of component stress due to this failure except device U24. No out of range voltage or current in any other device. Refer to Continuation Sheet ☐ CONTINUATION SHEET USED

31. FRB CLOSURE: [signature] 3-19-81

32. DOCUMENTATION/IMPLEMENTING CORRECTIVE ACTION: —

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☒ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE [illegible] DATE 4/10/80 | 38. SPACECRAFT [illegible] ORG CRCO DATE 4/24/80

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FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. 2815

CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

20. Replace MX 11 U24 (SN54L73, 908929-1) due to possible overstress. No-possibil-

21. [illegible] 41-41 11/6/80

23. Rework/Retest action taken:

24. QA Rework

25 QA Retest.

26. Part Replaced: /
Ckt Sym: U24 Part Lot No. Date Code Mfr.

Probable Defect: None-possible overstress but component still works.

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FAILURE REPORT

F 2816

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TRW ATS Multiplexer F236 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 10 00 | 5. DATE OBSERVED: 3 JAN 12 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	FLT			
8. UNIT	Multiplexer	3533003-103		Hac
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	14	Hac
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ KRS AT ___ ° ___ ☐ ENCAPS ☐ VIBRATION ___ AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: Channel 9 buffer has intermittent gain.

15. TEST PROCEDURE: 3569224 PARA: 3.1.2.1 | 16. ORIGINATOR: R. Yamauchi ORG: R41 DATE: 1/16/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: With output pin 21 lifted and 4V P-P in output @ -.6V.

S/N 554

18. FAILED ITEM NAME AND PART NUMBER: INPUT BUFFER / 3905969

19. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE INPUT BUFFER - HY3. RETURN REMOVED DEVICE FOR REWORK AND FAILURE ANALYSIS.

21. APPROVED BY: R.L. Sullivan ORG: R41-41 DATE: 4/16/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Replace HY3 on Front Assy.

Retested per T.P. 3569224 NC Retest OK

All circuits affected by this failure function properly.

24. QA REVIEW (P S87)

MANUFACTURING TEST 0330

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
3905969	HY3	S/N 554		HAC	GAIN Resistor Trimmed WRong	

27. REWORK BY: 48977 ORG: 45 DATE: 1/25/80 | 28. RETESTED BY: R. Yamauchi ORG: R41 DATE: 1/16/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION

Input Hybrid part malfunction - part replaced

The hybrid Input Buffer incorporates clamps to prevent its output voltage from going outside the permissible input range for the Analog Multiplexer hybrid. So no overstress voltage was applied to any point.

Responsibility of component situation due to this failure.

SEE Attached SUPPLEMENTARY SHEET | ☐ CONTINUATION SHEET USED

33. FRB CLOSURE

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: —

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: R.L. Sullivan ORG: R41-41 DATE: 1/25/80 | 38. SPACECRAFT SYSTEM ENGR. W.A. Erenbaum ORG: R22-H DATE: 12/9/

40. CUSTOMER OR ___ DATE

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FAILURE REPORT
CONTINUATION SHEET

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FR2816 | CONT. SHEET LETTER* A
FR SERIAL NO.

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

ADDITIONAL FR CONTINUATION SHEET(S) USED

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

The failure reported here (excessive gain of an analog input buffer) affects only the output of the analog input buffer hybird. Tha only sensitive point connected to the affected output is the corresponding analog multiplexer hybird analog input. There is no possibility of damage to this input because the inputs are designed to withstand applied voltages of -2V to +10V, whereas the analog input buffer hybird incorporates diode clamps which limit its output voltage range even under single failure conditions, to the range -0.7V to +3.7V.

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FAILURE REPORT

F 2817

1. PROGRAM ACRO AND NUMBER: H9236 | 2. CLA: E330 | 3. MODEL: AF | 4. TIME OCCURRED: 20'00 | 5. DATE DISCOVERED: MO 3 DA 30 YR 90

6. MAINTENANCE LEVEL WHEN FAILURE WAS DISCOVERED: ☐ SPACECRAFT ☐ SYSTEM ☐ EQUIPMENT ☐ UNIT ☐ ASSEMBLY ☒ SUBASSEMBLY ☐ MODULE ☐ MICRO ☐ CARD ☐ PART

ORIGINATOR

IDENTIFICATION	NAME	PART NUMBER	DR	MANUFACTURER
7. EXCEPTION	AF			
8. UNIT	MULTIPLEXER	3533003-100		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A2	3569254	J	HAC
10. ☐ MODULE ☐ MICRO ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS DISCOVERED: ☐ DEVELOPMENT ☒ ACCEPTANCE ☐ QUALIFICATION ☐ ACCEPTANCE ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS DISCOVERED: ☒ AMBIENT ☐ OTHER ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HOLD AT ____ ° ____ AND FOR ____ HRS ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Comm. ASB (Output C52) has excessive fall time

15. TEST PROCEDURE: 3569254 PARA | 16. ORIGINATOR: H. Coe | ORG 4641 | DATE 4-30-90 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: [illegible] — C52 does not require load resistor as noted in C1. 210-15 wiring book through Z12 & Z13 to provide load — Z12 & Z13 Delay Lines are not installed.

18. PARA ITEM # AND PART NUMBER: 3569254

19. ☐ FOLLOWING PROCEDURE/TEST REQUIRED ☐ TEST NOT REQUIRED BECAUSE: (1) [illegible] (2) [illegible] Add Z12 & Z13 Delay Lines to ASSY

21. VERIFICATION: R. Williams | ORG 4641 | DATE 4/30/90 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. ELECTRICAL/TEST ANOMALY TAGGED: All circuits affected by this failure [illegible] Retested per TP 3569254 HC

23. QA: SAT | DATE 4/30/90 | CODE 30

HAC TEST

24. LIST ALL PARTS REPLACED

PART REMOVED	CKT SYM	MFR LOT NO.	DATE CODE	MFR	NONCONFORMANCE REPORT

25. REWORK BY: Hec2 HH | ORG 45 | DATE 4/30/90 | 26. RETESTED BY: [signature] | ORG 44-01 | DATE 5/26/90 | ☐ CONTINUATION SHEET USED

ENGINEERING DISPOSITION AND CORRECTIVE ACTION

27. CAUSE AND CORRECTIVE ACTION: Delay lines were not installed. — The circuit utilized is immune while components temporarily installed before S/A Test begins. — Possibility of component drift due to this failure.

28. ☐ CONTINUATION SHEET USED | 29. FRB CLOSURE

30. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

31. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☒ TEST PROC ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ HANDLING ERROR ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

32. FAILURE TYPE: ☐ PRIMARY ☐ SECONDARY ☐ NO FAILURE | 33. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

34. RESPONSIBLE ENGINEER: ORG [illegible] DATE 6/[illegible] | 35. SPACECRAFT SYSTEM ENGR: H. Feinstein ORG 5862 DATE 6/5/90

36. RELIABILITY: [signature] ORG [illegible] DATE [illegible] | 37. CUSTOMER OR SUPPLIER: N/A DATE

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FAILURE REPORT

F 2818

1. PROGRAM NAME AND NUMBER: HS236 | 2. CLA: E330 | 3. MODEL: F | 4. TIME OBSERVED: 20:00 | 5. DATE OBSERVED: MO 3 DA 30 YR 80

6. HARDWARE LEVEL WHEN FAILURE OCCURRED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	F			
8. UNIT	MULTIPLEXER	3532003-L00		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A2	356 9254	3	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ . ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: BAND SEL BIT (C534) location incorrect

15. TEST PROCEDURE: 356 9254 PARA | 16. ORIGINATOR: R. COE | ORG 41-41 | DATE 5-30-80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: A2T Wiring implemented incorrectly, D34 at etched board cut & rewired instead at C-34. Reviewed 5-28-80 TRB

ECL signal intended for connector pin C34 went to D34. D34 is a test point with no loa

so no overstress was possible.

18. FAILED ITEM NAME AND PART NUMBER: 356 9254

19. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Rework Board to correctly implement A2T Wiring Sh5 - Line 2, Sh9 - Line 4. Reviewed 5-28-80 TRB

21. AUTHORIZATION: R D Hamm | ORG 41-41 | DATE 5/30/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Rework To Issue 20. Retested to T.P. 356 9254 All circuits affected by this failure functionally verified. WORK AUTHORIZED / Revs of JCM P22 - | 24. QUALITY REVIEW: 59 5/30/80 | HAC QUALITY TEST S27

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	VEN	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: 78915 5-28-80 | ORG | DATE | 28. RETURNED BY: R Hamm | ORG 41-41 | DATE 5/31/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Improper work in manufacturing — operator cautioned

No possibility of component stress due to this failure.

33. FRB CLOSURE: 6/18/81 | ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: — NONE

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROCEDURE ☒ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/FAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAR-OUT | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☒ INDUCED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☒ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: L. L. Tillson | ORG 41-41 | DATE 6/19/80

38. SPACECRAFT SYSTEM ENGR: W. H. Smith | ORG SBRC | DATE 6/25/80

39. RELIABILITY: [illegible] | ORG [illegible] | DATE 6-19-80

40. CUSTOMER OR SUPPLIER: [illegible] | DATE

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FAILURE REPORT

F 2S19

1. PROGRAM NAME AND NUMBER: HS236 | 2. CLASS: R330 | 3. MODEL: F | 4. TIME DISCOVERED: 19:30 | 5. DATE OCCURRED: MO 5 DA 1 YR 80

6. HARDWARE LEVEL WHEN FAILURE WAS DISCOVERED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ CIRCUIT ☐ CASE ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MODULE ☐ PART

ORIGINATOR

IDENTIFICATION | NAME | PART NUMBER | DIN | MANUFACTURER

7. SUSPECTED: F

8. UNIT: MULTIPLEXER | 3533003-100 | | H&C

9. ☐ ASSEMBLY ☒ SUBASSEMBLY: A2 | 3569254 | 3 | H&C

10. ☐ MODULE ☐ MODEL ☐ CASE

11. OTHER

12. TEST WHERE FAILURE WAS DISCOVERED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ PROTO-TYPE ☐ ACCEPTANCE ☐ SYSTEM

13. ENVIRONMENT WHERE FAILURE WAS DISCOVERED: ☐ ASCENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ AND AT ____ ° ____ ☐ DESCENT ☐ VIBRATION ____ AND FOR ____ USE TYPE ____ ☐ STATIC

14. DESCRIPTION OF FAILURE: Alma Ermac Stic Spiral (CC29) improper.

15. PART NUMBER: 3569254 | PARA | 16. ORIGINATOR: H. Coe | ORG 14-41 | DATE 5-4-80 | ☐ CONTINUATION SHEET USED

INVESTIGATION AND FAILURE ANALYSIS

17. INVESTIGATION AND FAILURE ANALYSIS: Bad Solder joint between Connector ribbon (CC29) and Board A2 Reworked & with 7809

18. ☐ FOLLOWING DESCRIBES ACTIVITY PERFORMED ☐ ACTIVITY NOT PERFORMED BECAUSE: PART NUMBER OR ASSEMBLY NUMBER: 3569254

Rework Solder Joint - Reworked 9 pins

19. ANALYZED BY: H. Coe | ORG 14-41 | DATE 5-4-80 | ☐ CONTINUATION SHEET USED

CORRECTIVE ACTION

20. CORRECTIVE ACTION: All circuits effected by this failure function properly. Retested per T.P.: 3569254C AK

21. PARTS REPLACED

PART NUMBER	CKT SYMB	PART LOT NO.	DATE CODE	USED	PROGRAM REPORT	ANALYZED

22. VERIFIED BY: 178915 | ORG 5-21-80 | DATE | 23. APPROVED BY: C. Hancock | ORG 14-41 | DATE 5-5-80 | ☐ CONTINUATION SHEET USED

ENGINEERING ANALYSIS AND CORRECTIVE ACTION

24. CAUSE AND CORRECTIVE ACTION: Improper soldering in manufacturing - operator and inspector cautioned.

25. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

26. FAILURE TYPE: ☐ PRIMARY ☒ SECONDARY ☐ INDUCED ☐ NO FAILURE

27. RESPONSIBLE ENGINEER: L. [illegible] | ORG [illegible] | DATE 6/11/80

28. SPACECRAFT SYSTEM ENGR: [illegible] | ORG 1582 | DATE 6/25/80

29. RELIABILITY: [illegible] | ORG [illegible] | DATE [illegible]

30. CUSTOMER OR SUPPLIER: [illegible] | DATE

6/80/20

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FAILURE REPORT

F 2820

1. PROGRAM NAME AND NUMBER: HS 234 | 2. CLA: E330 | 3. MODEL: F | 4. TIME OBSERVED: 2015 | 5. DATE OBSERVED: 2 24 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

OBSERVATION

EQUIPMENT IDENTIFICATION	CODE	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	F			
8. UNIT . MULTIPLEXER		3533003-100		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A1	3569261	3	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHICH FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☒ ACCEPTANCE ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ MIN. AT ____ ° ____ ☐ ENDURANCE ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: RET ON (C18) Timing incorrect. (MXDR)

15. TEST PROCEDURE: 3569261 PARA 5.3.3 | 16. OBSERVER: H. COE | 17. DATE: 4-41 5/7/80 | ☐ CONTINUATION SHEET USED

DISCUSSION AND EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Cap C35 not installed on MXDR Bd. Rear Assy.

19. FAILED ITEM'S NAME AND PART NUMBER: 3569261

20. ☐ FOLLOWING HARDWARE/DEPOT REQUIRED ☐ CONTINUATION NOT REQUIRED (CHECK): Install C35 capacitor on MXDR Bd per print (Rear Assy)

21. INVESTIGATOR: H. Coe | ORG 41-41 | DATE 5-7-80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/REPAIR ACTION TAKEN: Installed C35

All circuits effected by this failure function properly. R.T.S.d per TP 3569261 MC1

ELEMENT ALL PARTS REPLACED

PART NUMBER	CAT TYPE	PART LOT NO.	DATE CODE	USED	MODULE/S DEPOT	ANALYTICAL

27. REWORK BY: 192-21 | ORG 45 | DATE 5/8/80 | 28. RETESTED BY: Vicki Vejar | ORG 41-41 | DATE 5/8/80 | ☐ CONTINUATION SHEET USED

FAILURE ANALYSIS AND REPORT

23. CAUSE AND CORRECTIVE ACTION: Improper assembly in manufacturing - operator and inspector control.

Responsibility of corrective actions due to this failure.

24. FRB CLOSURE

25. ☐ CONTINUATION SHEET USED

26. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ (ENVIRONMENTAL) ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY PROCESS ☐ WORKMANSHIP ☐ HANDLING ERROR ☐ HANDLING ☐ AGE/WEAROUT ☐ UNKNOWN ☐ OBJECTIVE EVID.

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNASSIGNED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: ORG 41-41 | DATE 5/7/80

38. SPACECRAFT SYSTEM ENGR: Mike Wells | ORG 1SBRC | DATE 5/8/80

39. RELIABILITY: ORG - - | DATE - - -

40. CUSTOMER OR SUPPLIER: L.L. | DATE

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FAILURE REPORT

F 2821

ORIGINATOR

1. PROGRAM NAME AND NUMBER: HS 236 | 2. GLA: E330 | 3. MODEL: F | 4. TIME OBSERVED: 19:50 | 5. DATE OBSERVED: MO 5 DA 14 YR 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	F			
8. UNIT	MULTIPLEXER	3533003-100		HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A5	3569234	3	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Excessive Common Mode Noise on Buffer output, Channel B

15. TEST PROCEDURE: 3569234 PARA 5.3 | 16. ORIGINATOR: H Cos | ORG 41-41 | DATE 5-19-80 | ☐ CONTINUATION SHEET USED

DESIGN CROSS EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Buffer HYBRID, HY1, suspect part. Input pins were shorted together with a noticable effect on output common mode noise. No possibility of component stress. All voltages and currents in circuit remained within design ranges.

19. FAILED ITEM NAME AND PART NUMBER: 3569234

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REMOVE AND REPLACE INPUT BUFFER HYBRID HY1 P/N 3905969. RETEST MODULE, RETAIN HYBRID FOR FAILURE ANALYSIS S/N 553

21. AUTHORIZED BY: [signature] | ORG 1614 | DATE 5/16/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: INSTALLED 5/21/80-16555. Retested Per T.P. 3569234 REV E. All circuits effected by the R/R function properly.

24. REWORK PER S197 REV A

25. HAC RETEST PER ST S27

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
3905969	HY1	S/N 553		HAC		

27. REWORK BY: [signature] 24197 | ORG | DATE 5/21/80 | 28. RETESTED BY: H. Cos | ORG 41 | DATE 5/26/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION: Suspect HYBRID Component Failure. Suspect Hybrid was replaced. No possibility of stress to other parts due to this failure. SEE ATTACHED SUPPLEMENTARY SHEET

30. PRB CLOSURE: [signature] 1/28/81

☐ CONTINUATION SHEET USED

32. DOCUMENT REPLACEMENT/CORRECTIVE ACTION: —

33. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

34. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE

35. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: K.L. Tilton | ORG 41-41 | DATE 6/19/80

38. SPACECRAFT SYSTEM ENGR.: W.H. Trumbull | ORG 5822 | DATE 6/26/80

40. CUSTOMER OR | DATE

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EQUIPMENT CHECKOUT
FAILURE REPORT

CONTINUATION SHEET

FR2821	CONT. SHEET LETTER*
FR SERIAL NO.	A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED

The failure reported here (noise on analog insert buffer outputs) affect only the output of the analog input buffer hybird. The only sensitive point connected to the affected output is the corresponding analog multiplexer hybird analog insert. There is no possibility of damage to this input because the inputs are designed to withstand applied voltage of -2V to +10V, whereas the analog input buffer hybird incorporates diode clamps which limit its output voltage range even under single failure conditions to the range -0.7V to +3.7V.

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FAILURE REPORT

F 282

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Thermal Mapper 42226 | 2. GLA: E330 | 3. MODEL: F | 4. TIME OBSERVED: 1000 | 5. DATE OBSERVED: MO 2 DA 20

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAS ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	F	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	1328R	HAC
10. ☐ MODULE ☐ MICAS ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ MIN. AT ____ ° ____ ☐ ESD/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: RAIL Voltage "B" Test point reads in increased Specs Tolerance +14 to +16 Volts @ High Bus Voltage.

15. TEST PROCEDURE: 3569224 PARA 7.10/5.93 | 16. ORIGINATOR: R. Yamauchi ORG 4141 DATE 5/20/80 ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS

18. FAILED ITEM NAME AND PART NUMBER

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: SPEC WILL BE CHANGED - LIMITS UNDER VARYING BUS VOLTAGE NOT PROPERLY CALCULATED

20. AUTHORIZED: RL Sullivan ORG 4141 DATE 5/21/80 ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

21. REWORK/RETEST ACTION TAKEN: None

22. QA ACCEPTANCE

23. QA RETEST

24. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

25. REWORK BY: ____ ORG ____ DATE ____ | 26. RETESTED BY: ____ ORG ____ DATE ____ ☐ CONTINUATION SHEET USED

ENGINEERING RESPONSIBILITY

27. CAUSE AND CORRECTIVE ACTION: Test procedure limits too tight — Test procedure modified to relax limits. — Bl assy, OK and meets new limits NEW LIMITS 13.9V TO 17.5V

28. FRB CLOSURE

29. ☐ CONTINUATION SHEET USED

30. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: TP 3569224/SCN1

31. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☒ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN DEFECT CODE

32. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

33. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

34. RESPONSIBLE ENGINEER: RL Sullivan ORG 4141 DATE 8/7/80 | 35. SPACECRAFT SYSTEM ENGR: W. Brunetti ORG SBRC DATE 8/11/80

36. RELIABILITY: ORG 51-41 DATE 8/11/80 | 37. CUSTOMER OR SUPPLIER: N/A DATE

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FAILURE REPORT

F 282

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Intelsat V 4523C | 2. GLA: E330 | 3. MODEL: F- | 4. TIME OBSERVED: 10 00 | 5. DATE OBSERVED: MO 5 DA 20

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	F	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3179224	14 To 18	Hac
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OCCURRED: ☐ AMBIENT ☐ RADIATION ☒ TEMPERATURE 147 °F ☐ THERMAL VAC _____ HRS. AT _____ ° ☐ EMC/RFI ☐ VIBRATION _____ AXIS FOR _____ MIN TYPE _____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Rail voltage "A" test point reads lower @ Spec. Tolerance -1.6v to -1.8v. @ 147°F

15. TEST PROCEDURE: 3569224 9.4.5.9.4 | 16. ORIGINATOR: R. Yamauchi ORG 441 DATE 5/20/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS

18. FAILED ITEM NAME AND PART NUMBER

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: SPEC TO BE REVISED LIMIT GIVEN IS ERRONEOUS. UNIT PERFORMANCE IS CORRECT.

21. AUTHORIZATION: R L Julian ORG 441 DATE 6/20/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: None

23. QA REWORK

24. QA RETEST

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: ORG DATE | 28. RETESTED BY: ORG DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION

Test procedure limits too tight - Test procedure modified to relax limits - Bd. assy. OK. and meets new limits. NEW LIMITS -1.50V TO -1.90 V. (SCN 1)

33. PRB CLOSURE

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: TP3569224/SCN1

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP. ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☒ TEST PROC. ☐ ASSY/FAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAR-OUT | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☒ INDUCED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: R L Julian ORG 441 DATE 8/6/80

38. SPACECRAFT SYSTEM ENGR: W. A. Tolmanick ORG 53RC DATE 8/11/

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FAILURE REPORT

F 2S

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Hermetic Mapper H5236 | 2. CLA: E330 | 3. MODEL: F | 4. TIME OBSERVED: 10 00 | 5. DATE OBSERVED: MO 5 DA 20

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTU
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	F	Hac
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	13,14	Hac
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ RADIATION ☒ TEMPERATURE +32° F ☐ THERMAL VAC ____ HRS. AT ____ ° ☐ DSO/RPI ☐ VIBRATION ____ AXIS FOR ____ GRN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Rail Voltage "A" test point reads in excess of spec Tolerance -1.6 to -1.8V @ +32°F

15. TEST PROCEDURE: 3569224 8.5 PARA/SCN | 16. ORIGINATOR: R. Gisonne ORG 41-41 DATE 5/20/90 ☐ CONTIN SHEET

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS

18. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: SPEC TO BE REVISED. LIMIT GIVEN ERRONEOUS MODULE PERFORMANCE IS ACCEPTABLE

21. AUTHORIZATION: RL Tullius ORG 41-41 DATE 5/22/90 ☐ CONTIN SHEET

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: None

22A. QA REJN

22B. QA ROTS

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO

27. REWORK BY ____ ORG ____ DATE ____ | 28. RETESTED BY ____ ORG ____ DATE ____ ☐ CONTIN SHEET

ENGINEERING/RELIABILITY

29. CAUSE AND CORRECTIVE ACTION: Test Procedure limits too tight - test procedure modified to wider limits - Bd assy OK and meets new limits. NEW LIMITS TP2E -1.9V TO -1.5 V, SEE TP SCN 1

33. FRB CLOSURE

☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: TP3569224/SCN1

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: RL Tullius ORG 41 41 DATE 5/22/90

38. SPACECRAFT SYSTEM ENGR: M. J. Brudzinski ORG 5826 DATE 5/22

39. RELIABILITY ____ ORG ____ DATE ____

40. CUSTOMER OR ____ DATE ____

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HUGHES
HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 282

1. PROGRAM NAME AND NUMBER: Thematic Mapper HS 236 | 2. GLA: E330 | 3. MODEL: F | 4. HRS OBSERVED: 1030 | 5. DATE OBSERVED: MO 7 DA 16 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAS ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	PF			
8. UNIT	Multiplexer	3533053-100	2	Hac
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	A6	3569224	16	
10. ☐ MODULE ☐ MICAS ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ ESD/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Seven 2 Input buffer has excessive Droop on D.C. section made.

15. TEST PROCEDURE 3569224 PARA 1 | 16. ORIGINATOR R Yamauchi ORG 41-41 DATE 7/16/80 | ☐ CONTIN SHEET

17. VERIFICATION AND FAILURE ANALYSIS: Isolated to Input buffer HX1 on Front Assy

18. FAILED ITEM NAME AND PART NUMBER: 3569224

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replace HX1 on Front Assy / Retest to T.P. 3569224

21. AUTHORIZED BY R C Julien ORG 41-41 DATE 7/16/80 ☐ CONTIN SHEET

22. REWORK/RETEST ACTION TAKEN: Replaced HX1 / Retested to T.P. 3569224

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
~~Hyt~~ 3905969	HX1			HAC		

27. REWORK BY 16613 ORG 45 DATE 8/22/80 | 28. RETESTED BY R Yamauchi ORG 41 DATE 8/12/80 | ☐ CONTIN SHEET

30. CAUSE AND CORRECTIVE ACTION: ~~No failure, so no corrective action required~~. Although the hybrid did pass subassembly test, it performed within limits allowed by the design. The specification value was intentionally chosen to maximize the performance of the devices used, and will not be changed. Passes hybrid level test Subassembly (higher Assy) has tighter requirements No further action is to be taken. See hybrid investigation TM-HS 236-7402

31. FRB CLOSURE: ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: R. Julien ORG 41-41 DATE 10/15/80 | 38. SPACECRAFT SYSTEM ENGR. R.A. Leonard ORG 22-61 DATE 3/1

39. RELIABILITY: [illegible] ORG 51-41 DATE 10/15/80 | 40. CUSTOMER OR SUPPLIER: NA DATE

ENGINEERING/RELIABILITY | MANUFACTURING AND TEST | ENGINEERING EVALUATION | ORIGINATOR

F-2825

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: R.J. Wilkerson
51-41

CC: See Distribution List

DATE: 13 April 1981

REF: HS 236-7402
PE 81/72

FROM: L. O'Connell
51-41

BLDG. 774 MAIL STA. 39
EXT. 4485

SUBJECT: Input Buffer Hybrid (P/N 3905969)
Failures

On February 2, 1981 the Product Effectiveness Manager for the TM Program, Mr. R.J. Wilkerson, and the author of this memo conducted a review of the manufacturing data for subject hybrids. The purpose of this review was to determine if a generic failure mode was common to the five hybrids that failed in the multiplexer.

Investigation findings are as follows:

1. Sixty-one hybrid manufacturing records were reviewed.
2. Defects in the manufacturing cycle were random with no known trend.
3. There was not a bonding process problem and all hybrids were subjected to 100% pull test.
4. Four of the five failed hybrids had a history of major rework/workmanship problems.
5. Unable to locate a reliability to process/design problem
6. All operations on the Quality History Records were complete and Air Force concurrence was on all operations and inspections as required. Some minor documentation problems were found, however they had no effect on the hardware.

In addition to the review of the Manufacturing records, as stated above, the Reliability Organization reviewed the five Failure Reports for subject Hybrids and their findings are as follows:

1. FR 1935 (S/N 523) and FR 2816 (S/N 554).

   These Hybrids had excessive gain. S/N 523 was sent to Technical Services Division (TSD) for failure analysis. The failure mode "Excessive Gain" was confirmed. The cause of the failure was a shorted capacitor due to a scratch mark on the surface of the Capacitor. (Mechanical damage to the capacitor oxide caused the short).

2. FR 2812 (S/N 525)

   This Hybrid failed when the DC level changed in the DC Restore Circuit. This Hybrid was sent to TSD for analysis. The failure mode "Static DCR Offset Voltage of Channel 4 out of Specification", was verified. The failure was due to shorts between MOS FET transistors Q3 and Q4. The cause of the failure was mechanical

F2825

damage (smearing and scratches) that damaged the underlying oxide.

3. FR 1937 (S/N 516)

   Sensor 4 of this Hybrid failed the Buffer Limit Test. It was not sent to TSD for analysis.

4. FR 2825 (S/N 520)

   Sensor 2 of this Hybrid failed for Excessive Droop. It was not sent to TSD for analysis.

5. After the review of the Failure Reports, Failure Analysis Reports and Manufacturing History Records for the above (5) Hybrids, it has been concluded that there are occasions when Hybrids have been delivered with incipent failures that are not recognizable by Inspection after the units are sealed.

   Major rework and workmanship defects were found in the History Records of four (S/N 516, 520, 523 and 525) of the five Hybrids. This lends some credance to a correlation between failure mode and manufacturing difficulities.

Conclusions

Analysis of both the Product Effectiveness review of the Manufacturing History Records and the Reliability Review of the Failure Reports and their associated Failur Analysis Reports, the following conclusions have been reached:

1. Assuming a correlation between rework/workmanship defects, it appears that latent defects can escape the normal Hybrid In-Process Inspectior and Test Techniques.

   The findings and comments of the Product Effectiveness Investigative Team was communicated to the responsible Quality Assurance Section Head who has cognizance over the Hybrid Manufacturing Operation.

   At this time contract quanities of subject Hybrids for the Thematic Mapper have long been delivered, however the information gained will be extremely useful for future Thematic Mapper buys and other program

2. A learning curve in the Manufacturing Process for these highly comple Hybrid circuits was in effect, as evidenced by the reduction in work-manship defects and parts replacement as the manufacturing process matured.

F 2825

3. Those Hybrids with incipent defects will fail under unit test and thus be eliminated from the system.

4. It has been concluded by the undersigned that the integrity and reliability of Thematic Mapper hardware using subject Hybrids has not been impinged.

L. O'Connell
Administrative and Reliability Manager
Thematic Mapper Program

LOC:jc

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 3657

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Thematic Mapper H5236	E330	FLT	1215	MO 7 DA 11 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	H&C
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ☐ THERMAL VAC ____ HRS AT ____ ° AXIS FOR ____ SIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: J6 (Back-up NRZ) output only. .25 VAP looking differentially across J6 pin 1 and 2.

15. TEST PROCEDURE: 32015-005 | PARA: 3.6.2.2 | 16. ORIGINATOR: [signature] | ORG: 44-41 | DATE: 7/15/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Isolated to U14 Content Drawer. No possibility of other damage due to this failure. Defective part interfaces only with protected circuitry in unit test station-RLS-4

19. FAILED ITEM NAME AND PART NUMBER:

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replaced U14 on Front Assy of Module A1

21. AUTHORIZATION: [signature] | ORG: 44-41 | DATE: | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Replaced U14 on Front Assy. Related per P. 32015-005 Para 3.6.2.2 See photographs taken 12/7/81

24. QA REVIEW: S113

25. CONFIGURATION TEST: TEST S27

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMB
911958-001	U14					

27. REWORK BY: 67603 P.Y. | ORG: 45-21 | DATE: 12-20-81 | 28. TESTED BY: [signature] | ORG: 44-41 | DATE: 12/21/81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: DEFECTIVE PART - FOR ANALYSIS & CORRECTIVE ACTION REFER TO H5 236-7286 (COPY ATTACHED)

31. CONTINUATION ☐ SHEET USED

33. FRB CLOSURE

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: H5 236-7286 (COPY ATTACHED)

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R.L. Sullivan	44-41	12/9/81	[signature]	Engr	12/
39. RELIABILITY [signature]	57-41	12/23/81	40. CUSTOMER OR SUPPLIER		DATE

DATA SHEET

3.6.2.2 Serial Data and Bit Clock Parameters

SIGNAL	CONNECTOR PIN NO.	SCOPE INPUT	LOGIC "0" -0.46 to -1.36V	LOGIC "1" +0.46 to +1.36V	TRANSITION TIMES 20% to 80% REQ: ≤3.5ns tr	tf
1. Output NRZ-L Data +	MX15B01T J5-1	+	-.5	+.5	2.0	2.0
" −	B01F J5-2	−				
2. " Backup +	MX15B02T J6-1	+	-.5	+.5	2.2	2.0
" " −	B02F J6-2	−				
3. Output Bit Clock +	MX15B03T J7-1	+	-.5	+.5	3.1	3.0
" −	B03F J7-2	−				
4. " Backup +	MX15B04T J8-1	+	-.5	+.5	3.2	3.0
" " −	B04F J8-2	−				

Test passed. RJ 12/2/81

QUALITY ASSURANCE

DATA SHEET

3.5.2.2 Serial Data and Bit Clock (Cont).

SIGNAL		PHASING: Delay from + edge of Clock MX15R03			Delay from + edge of Clock MX15R04		
		to + edge t13 0 to 4.5ns	to - edge t23 0 to 4.5ns	t13- t23 -1.0 to +1.0ns	to + edge t14 0 to 4.5ns	to - edge t24 0 to 4.5ns	t14- t24 -1.0 to +1.0ns
1. Output YAZ-L Data	MX15R01T	4.0	3.9	.1	4.0	3.5	.5
"	R01F						
2. " Backup	MX15R02T	4.2	4.0	.2	3.8	3.6	.2
" "	R02F						
3. Output Bit Clock	MX15R03T				1.1 *	1.0 *	
"	R03F						
4. " Backup	MX15R04T	1.1 *	1.0 *				
" "	R04F						

Frequency of Output Bit Clock MX15R03T: 848915 KHZ
Req't. : 84.8181 to 84.9679 MHZ

* For Reference only.

Test passed by 12/x/81

HAC TEST 521

HAC TEST 521 BC02 88

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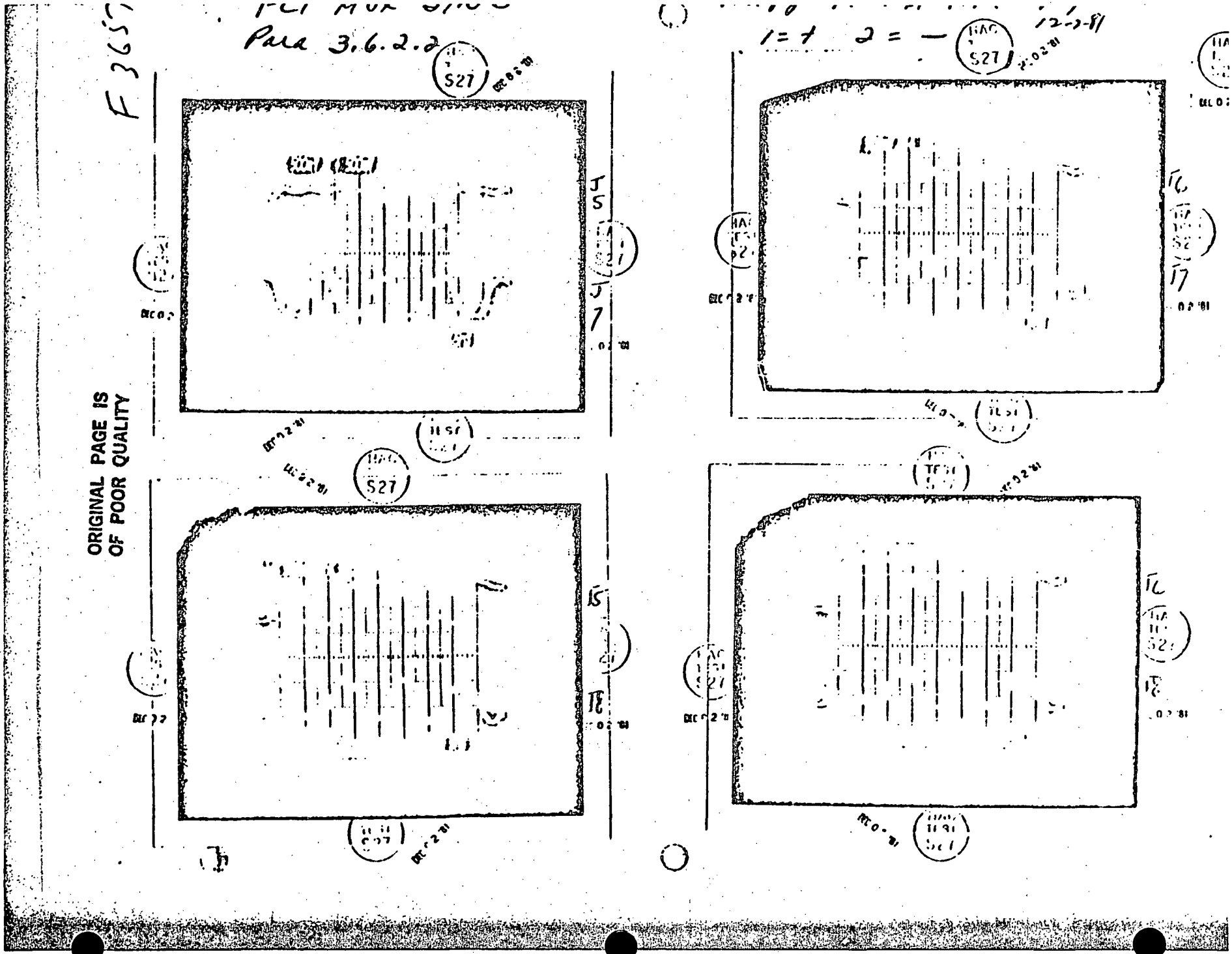

F3657

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: G. Gritt CC: L. Altman DATE: 23 December 1981

REF: HS 236-7786

SUBJECT: Failure Report F3657 FROM: PE 227:81
L. O'Connell
51-41

BLDG. B-11 MAIL STA. 39
EXT. 6293

The Failure mode reported on subject Failure Report was traced to a defective output driver (P/N 911958-001). Reliability cannot submit the defective part to TSD (Technology Services Division) for Failure Analysis because the responsible Mutliplexer personnel cannot locate the part.

Since the part is not available for analysis the author of this memo has taken the following actions:

1. Requested the Thematic Mapper Parts Board to research the El Segundo Receiving Inspection Records to determine if there were any previous defective output driver's (P/N 911958-001). This has been accomplished and there were no previous failures. (Refer to HS 236-7785 attached).

2. Reliability has reviewed the Verified Component Failure List and there were no previous failures.

3. Contacted the responsible Multiplexer Engineer and responsible Quality Assurance Engineer for the Multiplexer area and informed them as to the importance of impounding failed parts so they can be analyzed. In addition they were informed that it is mandatory to maintain discipline with all personnel so this type of error (and others) can be prevented on other programs as well as future programs.

Based on the investigation by both the Part's Board and Reliability (listed above) the author is confident that this is a random failure and no generic problem exists with these parts.

L. O'Connell, Manager
Administration and Reliability

LOC:jc

F 3657

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: L. O'Connell
51-41

CC: F. Carle

DATE: 22 December 1981

REF: HS 236-7785
PE 226:81

FROM: L. Altman
51-41

BLDG. B-11 MAIL STA. 39
EXT. 6257

SUBJECT: Integrated Circuit
P/N 911958-001

Per your request, the Parts Board has researched the Parts Analysis Laboratory's (Dept. 46-31-12) records for the previous history of subject part.

These records show no problems with Integrated Circuits (P/N 911958-001).

L. Altman, Manager
Product Effectiveness
Thematic Mapper Program

LA:jc

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 366

1. PROGRAM NAME AND NUMBER	2. GFE	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Thermal Mapper HS376	E330	FLT	1340	MO 11 DA 10 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3529003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☒ QUALIFICATION ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ☐ THERMAL VAC ____ HRS AT ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Ana1 mon-8 fails D.C. Response test - Test point appears to open in test harness or in unit. NO POSSIBILITY OF COMPONENT DAMAGE DUE TO THIS OPEN CIRCU

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUA ☐ SHEET USI
TP32015-005	3.5.3.1	[illegible]	41-41	11/30/81	

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: This test failed due to tester failure. Improperly mated connector.

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: No rework action taken on unit

21. AUTHORIZATION	ORG	DATE	22. CONTINUA ☐ SHEET US
[illegible]	41-41	11/30/81	

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: See retest on page 2 of penultimate test on 11/30/81

24. QA REWO

GP GAGES TEST S27

25. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NI

27. REWORK BY	ORG	DATE	RETESTED BY	ORG	DATE	28. CONTINU ☐ SHEET US
			[illegible]	41-41	11/30/81	

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: CAUSE: MISMATED CONNECTOR. WHEN REMATED, UNIT FUNCTIONED PROPERLY. NO FAILURE, NO FURTHER CORRECTIVE ACTION REQUIRED. R.L. Julian 12/1/81
OPERATOR INSTRUCTED TO USE GREATER CARE AND ASSURE THAT CONNECTOR IS PROPERLY MATED. Agreed Prod to MA [illegible] 12/1/81

31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

33. FRB CLOSURE [illegible] 12/2/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☒ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN DEFECT COD

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R.L. Julian	41-41	12/1/81	[illegible]	2241	12/2/81

39. [illegible]	ORG	DATE	40. ASSEMBLER OR SUPPLIER	DATE
[illegible]	57-41	12/1/81	S.O.	

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HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 425

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Hapsat 45236
2. GLA: E330
3. MODEL: FLT
4. TIME OBSERVED: 1500
5. DATE OBSERVED: MO 7 DA 1 YR 8

6. HARDWARE LEVEL WHERE FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ RADIATION ☒ TEMP +50 °C ☐ THERMAL VAC ____ HRS AT ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Band 2 sensor 7 fails the threshold test

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.3.5 | 16. ORIGINATOR: [signature] | ORG: 41-41 | DATE: 7-1-81 | 17. CONTINUATION SHEET USED ☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Failure was due to faulty relay in test box. No possibility of component damage due to this failure inputs protected by 15K resistors. RL Sullivan

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: No rework action taken on unit.

21. AUTHORIZATION: [signature] | ORG: 41-41 | DATE: 11/25/81 | 22. CONTINUATION SHEET USED ☐

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: See retest on Pg 414 of penalty test.

24. QA REWORK

25. RETEST: TEST S26

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUM

27. REWORK BY: ORG: DATE: | 28. RETESTED BY: [signature] | ORG: 41-41 | DATE: 11/25/81 | 29. CONTINUATION SHEET USED ☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Cause: Defective relay in test equipment. Relay replaced and successful retest conducted. RLS. No further corrective action required.

31. FAB CLOSURE: [signature] 12/4/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

33. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

34. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE

35. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG.	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
RL Sullivan	41-41	12/1/81	[signature]	2241	12/2/81

39. SECURITY	ORG	DATE	40. CUSTOMER OR SUPPLIER	DATE
[signature]	41-41	12/1/81	N.A.	

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4254

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Aerostar HS 236	E330	FLT	1100	MO 7 DA 6 YR 8

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☒ TEMP +50 °C ☐ THERMAL VAC ____ HRS AT ____ °C ☐ OTHER

14. DESCRIPTION OF FAILURE: Numerous x talk errors see cont sheet.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION SHEET USED
32015-005	3.5.3.6	R. Yamauchi	41-41	7/6/81	☒

ENGINEERING EVALUATION

16. VERIFICATION AND FAILURE ANALYSIS: FAILURES VERIFIED, SOME CHANNELS SLIGHTLY OUT OF SPECIFICATION. ENGINEER OF FAILED CHANNELS INDICATE THAT ANALOG MULTIPLEXER HYBRIDS MAY BE PARTIAL CAUSE.

19. FAILED ITEM NAME AND PART NUMBER: 3533003-100

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE ANALOG MULTIPLEXER HYBRIDS Board 2 H71 and Board 7 H72. Refer to H.S 236-2260 (COPY ATTACHED)

21. AUTHORIZATION	ORG	DATE	22. CONTINUATION SHEET USED
			☐

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REPLACED TWO 3905973 HYBRIDS AS STATED ABOVE. RETESTED PER TP3533003-100 PARA 3.5.3.6.

24. QA REVIEW: [illegible]

25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
3905973	H71	S/N 532				
3905973	H72	S/N 502				

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	29. CONTINUATION SHEET USED
6716-58 P.V.	45-21	10-20-81	Yamauchi	41-41	11-25-81	☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: MINOR CROSSTALK BETWEEN SOME CHANNEL PAIRS IS AN UNAVOIDABLE CONSEQUENCE OF THE ASSEMBLY AND DESIGN USED. IT WILL NOT ADVERSELY AFFECT SYSTEM PERFORMANCE. SO NO DESIGN CHANGE WILL BE UNDERTAKEN.

31. FRB CLOSURE: [signature] 12/14/81

C/A REFER TO W124 TABLE I Ref HS 236-2260 | 31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED) ATTACHED

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN — DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R. Gillian	41-41	12/9/81	[signature]	2241	12/14/81
39. RELIABILITY: Lee Crow	ORG: 51-41	DATE: 12-10-81	40. CUSTOMER OR SUPPLIER: [signature]		DATE: 12-14-81

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F 4254

CONTINUATION SHEET LETTER A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED

14	7/4/81	X talk Band and Sensor Failures	
		1 ***	7 → BAND 7 SENSOR 7 FAILURE CAUSED BY BAD RELAY IN TEST EQUIP
		2	2 → PASSED ON RETEST AFTER REMOVAL
		2 *	5 → FAILED ON RETEST - TRANSFERRED TO F-72
		2 **	6 → PASSED ON RETEST AFTER REMOVAL
		2 **	7 → PASSED " " " "
		2 **	8 → PASSED " " " "
		4	16 FAILED ON RETEST - SEE W124 TABLE
		6	1 " " " " "
		6	2 " " " " "
		6	3 " " " " "
		6	4 " " " " "
		7	7 " " " " "
		7	13 " " " " "
		7 **	15 PASSED ON RETEST AFTER REMOVAL
		7 **	16 → PASSED " " " "
14	11/25/81	Band 7 Sensor 7 and Band 7 Sensor 13 failed X talk.	
		15	5/6
		B7 S7 (B7,S5) (2) 93	≤ 30 SEE W124 - TABLE I
		B7 S13 (B7,S11) (2) 153	≤ 30 " " "

* SEE W124 - TABLE I

** PASSED ON RETEST - THEREFORE NOT ON W124

*** PROBLEM TRACED TO BAD RELAY IN TEST EQUIPM PASSES WHEN TESTED WITH REPAIRED TEST EQUIPMENT

NOTE: PASSED AFTER REMOVAL & REPLACEMENT OF HYBRIDS P/N 3905973 S/N 512 & 502. REFER TO BLOCK 23 OF THIS FR.

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4254

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

DISCREPANCY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] CHANGE [ ] CAUSE [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFD. CODE	c. SYS. MISID.	d. CONTRACT NO.
Flight	82577	TM	W124

5. BASE LINE AFFECTED: [ ] FUNC. CONFIG [ ] ALLOCATED [ ] PROD. CONFIG

6. OTHER SYSTEMS/EQUIPMENT/CONFIGURATIONS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFD. CODE	SPEC./DOC. NO.	REV
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

CFD. CODE	NUMBER	QTY.	REV. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE

Multiplexer

12. CFD NO. 13. QUALITY CLASSIFICATIONS 14. EFFECT CLASSIFICATIONS

[ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED

Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO. 18. QTY

19. DELIVERED DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE

None

21. EFFECT ON CONTRACT SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3513003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian SYS. ENGR. J E Cooper REL J E Cooper QA W R Gibson PE Daniel Weaver 12/10/81

25. PRODUCTION EFFECTIVITY OR SERIAL NUMBER

26. SUBMITTING ACTIVITY AUTHORIZED SIGNATURE: J E Cooper 81 12 10 TITLE:

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED [X] APPROVED [ ] DISAPPROVED

b. GOVERNMENT ACTIVITY: NASA GSFC SIGNATURE: Gene R Kitt DATE: 12/11/81

DD FORM 1694

GPO 1980 — 340-765/615

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

4254

FROM		TO		TEMPERATURE			
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	F. R. NUMBER(S)
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

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4254

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4254

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

4254

TO: G. Gritt

CC: L. O'Connell

DATE: 22 December 1981

REF: HS 236-2260
PE 225:81

FROM: R. Julian
41-41

BLDG. B-11 MAIL STA. 39
EXT. 6293

SUBJECT: 3905973 Hybrid Crosstalk Testing

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

1. Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.

2. The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (≈1/2% of full scale, max.) are not visible on oscilloscopes.

3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

R. L. Julian

Richard C. Julian
REA, Multiplexer
Thematic Mapper Program

RCJ:jc

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4255

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Thematic Mapper - HS 236	E330	FLT	0920	MO 7 DA 9 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ~~☐ TEMP~~ ☐ THERMAL VAC ____ HRS AT ____ AXIS FOR ____ SIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Band 1 sensor 3 and Band 5 sensor 6 Fails Input Buffer Droop Test. 5/8 ± 3.3 MV/Sec. B1 S3 is 4.2 MV/Sec. and B5 S6 is 5.04 MV/Sec.

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.3.3 | 16. ORIGINATOR: [signature] | ORG: 41-41 | DATE: 7/9/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

13. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: REFER TO WAIVER W124 (COPY ATTACHED)

21. AUTHORIZATION | ORG | DATE | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: NOT APPLICABLE - REFER TO WAIVER W124 (COPY ATTACHED) | 24. QA REWORK | 25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUM

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: REFER TO W124. TABLE 2

31. FRB CLOSURE: [signature] 12/14/81

31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED)

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
[signature]	41-41	12/9/81	[signature]	2241	12/10/81
39. RELIABILITY [signature]	ORG 51-41	DATE 12-10-81	40. DESIGNER OR SUPPLIER [signature] 12/24/81		DATE

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F4255

CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

14	11/24/81	Band 5 Sensor 6 failed droop test. is 3.46 MV/sec S/b ± 3.3 MV/sec b
14	11/30/81	Band 1 Sensor 3 failed droop test is 4.11 MV/sec S/b ± 3.3 MV/sec. Band 5 Sensor 6 failed droop test is 4.90 MV/sec S/b ± 3.3 MV/sec.

31873A JAN 80

4255

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

PROCURING ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] CHANGE [ ] CLASS II [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFG. CODE	c. SYS. DESIG.	d. DEV/WAIVER NO.
Flight	82577	TM	W124

5. BASE LINE AFFECTED: [ ] FUNC. TIONAL [ ] ALLO-CATED [ ] PROD-UCT

6. CRITICAL SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFG. CODE	SPEC./DOC. NO.	REV
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

CFG. CODE	NUMBER	REV.	SUB. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE

Multiplexer

12. CS NO. | 13. OBJECT NO. | 14. OBJECT CLASSIFICATION: [ ] CHANGE [ ] CLASS II [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED: Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO. | 18. QTY

19. REQUIRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE

None

21. EFFECT ON DELIVERY SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. NEED FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian SYS. ENGR. J F Cargill REL [signature] QA [signature]

25. [signature] 12/7/81

26. PROCURING ACTIVITY AUTHORIZED SIGNATURE: J F Cargill 81 12 10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: [signature] DATE: 12/11/81

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☆ GPO 1980 — 848-788/018

4255

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATURE	Mv/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP
FAILURE REPORT

F 4256

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Thematic Mapper HS236 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 0900 | 5. DATE OBSERVED: MO 7 DA 9 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RE ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Band 1 Sensor T failed Input Buffer AC response and DC Restore T.C.

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.3.2 | 16. ORIGINATOR: Yamauchi | ORG: 41-41 | DATE: 9/9/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Support tester failure. Verified tester failure. No possibility of component damage. Inputs to flight equipment are protected by 15K52 resistors. RL Sullivan

18. FAILED ITEM NAME AND PART NUMBER: 3533003-100

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: No rework action taken on cent, relay in test fixture replaced.

21. AUTHORIZATION: Yamauchi | ORG: 41-41 | DATE: 11-30-81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: See retest on Pg 59 & penalty relief and also pg 73 on 11/30/81

24. QA REWORK

24. QA RETEST: TEST S27 11-30-81

25. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY | ORG | DATE | 28. RETESTED BY: Yamauchi | ORG: 41-41 | DATE: 11/30/81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Defective relay in test station. Relay replaced and successful retest conducted. No further corrective action required.

31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

33. FRB CLOSURE: 12/2/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☒ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: RL Sullivan | ORG: 41-41 | DATE: 12/1/81 | 38. SPACECRAFT SYSTEM ENGINEER: [signature] | ORG: 2241 | DATE: 12/2/81

39. APPROVED: [signature] | ORG: 5741 | DATE: 12/2/81 | 40. CUSTOMER OR SUPPLIER: [signature] | DATE: 12/2/81

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W124

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4257

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Thematic Mapper HS236	E330	FLT	1400	MO 7 DA 10 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Numerous x talk Failures see continuation sheet

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION SHEET USED
32015-005	3.5.3.6	[signature]	44-41	7/10/81	☒

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Failures verified. Some channels slightly out of specification. Groupings of failed channels indicate that analog multiplexer hybrids may be partial cause.

19. FAILED ITEM NAME AND PART NUMBER: 3533003-100

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replace analog multiplexer hybrids. Band 2 H71 and Band 3 H72. Refer to H.S. 276-2260 (copy attached)

21. AUTHORIZATION | ORG | DATE | 22. CONTINUATION SHEET USED ☐

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Replaced Two 3905973 hybrids as stated above. Retested per TP3533003-100 para 3.5.3.6

24. QA APPROVAL: 10/30/81 [signature] S113

25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUM
3905973	H71	S/N537				
3905973	H72	S/N502				

27. REWORK BY: 67658 R.V. | ORG: 45-21 | DATE: 10-30-81

28. RETESTED BY | ORG | DATE

29. CONTINUATION SHEET USED ☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Minor cross talk between some channel pairs is an unavoidable consequence of the assembly and design used. It will not adversely affect system performance. So no design changes will be undertaken.
C/A refer to W124. Table I

31. CONTINUATION SHEET USED ☐

33. FRB CLOSURE: [signature] 12/14/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (copy attached)

34. BASIC CAUSE OF VERIFIED FAILURE								☐ UNKNOWN	DEFECT CODE
	☐ DESIGN	☐ TEST EQUIPMENT	☐ MFG. PROCEDURE	☐ WIRING ERROR					
	☐ ENVIRONMENTAL	☐ TEST PROCEDURE	☐ ASSY/FAB ERROR	☐ ROUGH HANDLING					
	☐ DEFECTIVE PARTS	☐ TEST SET-UP	☐ WORKMANSHIP	☐ WEAR-OUT					

35. FAILURE TYPE				36. FAILURE CLASSIFICATION			
☐ PRIMARY	☐ UNKNOWN			☐ CRITICAL	☐ MINOR		
☐ INDUCED	☐ NO FAILURE			☐ MAJOR	☐ SAFETY		

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R L Sullivan	41-41	12/9/81	L Engel	2241	12/15/81
39. RELIABILITY (Low)	ORG	DATE	40. CUSTOMER OR SUPPLIER		DATE
	51-411	12-10-81	NA		

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SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F4257

CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☑

14	7/10/81	The Following Band and Season Failed x Talk.		
		Band	Season	
		1	7	Failure Caused by bad relay in Test Equip Found on retest 12-1-81
		2	2	PASSED on retest after rework 12/1/81
		2	5	Passed on retest after rework 12/1/81
		2	6	Passed on retest after rework 12/1/81
		2	7	Passed on retest after rework 12/1/81
		2	8	Passed on retest after rework 12/1/81
		3	12	Ag 7/10/81
		4	16	Passed on retest after rework 12/1/81
		6	1	FAILED on RETEST 12/1/81
		6	2	REFER TO W124 TABLE 1
		6	3	
		6	4	
		7	13	Passed on retest after rework 12/1/81
		7	16	Passed on retest after rework 12/1/81
		Band	Season	
14	12/1/81	6	1	SEE W124 TABLE 1
		6	2	
		6	3	
		6	4	

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42-7

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

PROCURING ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] CLASS I [ ] CLASS II [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFE. CODE	c. SYS. DESIG.	d. DEVIATION NO.
Flight	82577	TM	W124

5. BASE LINE AFFECTED: [ ] FUNC. CONFIG. [ ] ALLOCATED [ ] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	NOMENCLATURE	SPEC./DOC. NO.	REV.
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

NOMENCLATURE	DRAWING NO.	REV.	DOC. NO.

9. TITLE OF DEVIATION/WAIVER: Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM: NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE: Multiplexer

12. DWG NO. 13. REVISION NO. 14. EFFECT CLASSIFICATION: [ ] CLASS I [ ] CLASS II [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED: Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO. 18. QTY

19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE: None

21. EFFECT ON DELIVERY SCHEDULE: 18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Tullien SYS. ENGR. J P Cooper REL J P Cooper QA W D Williams PE Donald McInnis 12/10/81

25. PRODUCTION EFFECTIVITY OR SERIAL NUMBER

26. SIGNATURE OF AUTHORIZED REPRESENTATIVE: J P Cooper 81 12 10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: Gene R. Britt DATE: 12-16-81

DD FORM 1694

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: G. Gritt

CC: L. O'Connell

DATE: 22 December 1981

REF: HS 236-2260
PE 225:81

FROM: R. Julian
41-41

BLDG. B-11 MAIL STA. 39
EXT. 6293

SUBJECT: 3905973 Hybrid Crosstalk Testing

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

1. Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.

2. The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (≈1/2% of full scale, max.) are not visible on oscilloscopes.

3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

R. L. Julian

Richard C. Julian
REA, Multiplexer
Thematic Mapper Program

RCJ:jc

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W124

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 426

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Intelsat V HAPAR MS 2336	E330	FLT	1715	MO 6 DA 17 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Band 6 Sensor 1 Fails A/D conversion Test. Step 160 is -1.75/kC Band 6 Sensor 2 Step 193 is 40.7dV 5/k max 3/2 and Step 234 is -.6dV 5/k min O.C. Band 6 Sensor 3 Step 193 is 42.2dV 5/k max 3/2 and Step 234 is -.7dV 5/k min O.C. Band 6 Sensor 4 Step 193 is 39.2dV 5/k max 3/2 and Step 234 is -.7dV 5/k min

15. TEST PROCEDURE: TP-52015-005 | PARA: 3.5.3.5 | 16. ORIGINATOR: R. Yamauchi | ORG: 4441 | DATE: 6/17/81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: REFER TO WAIVER W124 (COPY ATTACHED)

21. AUTHORIZATION | ORG | DATE | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: NOT APPLICABLE - REFER TO WAIVER W124 (COPY ATTACHED)

24. QA REWORK

25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUM

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: REFER TO W124 TABLE 3

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED)

33. FRB CLOSURE: 12/14

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R.L. Sullivan	4141	12/9/81	J. Engel	2245	12/14
39. RELIABILITY: Dan Evans	ORG: 5141	DATE: 12-10-81	40. CUSTOMER OR SUPPLIER: NA		DATE

D11873 SC JAN 80

12/14/81

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F4265

CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

14	11-11-81	Band 6 Sensor 1 Failed A/D Conversion Test. Step 193 to 32MS/6.31.2MV max. ~~end~~							
			STEP	IS	S/16 MAX	STEP	IS	S/16 Comp	
14	12-1-81	Band 6 Sensor 1	193	37.5MV	36.2MV	160	-0.1MV	0.0MV	
		Band 6 Sensor 2	193	37.5MV	31.2MV	160	-0.5MV	0.0MV	
		Band 6 Sensor 3	225	35.5MV	31.2MV	224	-0.8MV	0.0MV	
		Band 6 Sensor 4	193	39.6MV	31.2MV	232	-0.2MV	0.0MV	
14	12-1-81	Band 6 Sensor 1	~~FC~~	—	—	192	-0.1MV	0.0MV	
14	12-2-81	Band 6 Sensor 1	193	38.7	31.2	200	-1.5	0.0	

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4265

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

PROCURING ACTIVITY NO.:

1. ORIGINATOR NAME AND ADDRESS: Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] MINOR [ ] MAJOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER				5. BASE LINE AFFECTED	6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED
a. MODEL/TYPE	b. CFE. CODE	c. SYS. DESIG.	d. DEVIATION NO.	[ ] FUNC. [ ] ALLOCATED [ ] PRODUCT	[ ] YES [X] NO
Flight	82577	TM	W124		

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFE. CODE	SPEC./DOC. NO.	REV.
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

CFE. CODE	NUMBER	REV.	SUPP. NO.

9. TITLE OF DEVIATION/WAIVER: Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM: NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE: Multiplexer

12. CI NO. | 13. EFFECT NO. | 14. EFFECT CLASSIFICATION: [ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED: Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO. | 18. QTY

19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE: None

21. EFFECT ON DELIVERY SCHEDULE: 18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.:

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. NEED FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Tillian SYS. ENGR. [signature] REL [signature] QA [signature] PE [signature] 12/10/81

25. PRODUCTION EFFECTIVITY BY SERIAL NUMBER

26. [signature] 12/10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC SIGNATURE: [signature] DATE: 12/11/81

DD FORM 1694

GPO 1969 — 048-788/818

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.3	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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W124

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4266

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Hermetic Modem H5246 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 1300 | 5. DATE OBSERVED: MO 6 DA 18 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533083-100	3	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☒ TEMP 75 °C ☐ THERMAL VAC ___ HRS AT ___ °C AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: Band 1 Sensor 1 and Band 6 sensor 12 failed A/D threshold test. 9/30 Band 2 Sensor 11. Note: Band 1 Sensor 1 and Band 2 Sensor 11 occasionally Passes on retest. also Band 7 Sensor 13

15. TEST PROCEDURE: 3E015-005 | PARA: 3.5.3.5.2 | 16. ORIGINATOR: K. Yamauchi | ORG: 41-41 | DATE: 6/19/81 | 17. ☒ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: REFER TO WAIVER W124 (COPY ATTACHED)

21. AUTHORIZATION | ORG | DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: NOT APPLICABLE - REFER TO WAIVER W124 (COPY ATTACHED)

22A. QA REWORK

22B. QA RETEST

23. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
3905973	H71	S/N 532				
3905973	H72	S/N 502				

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: REFER TO W124 TABLE 3

31. FRB CLOSURE: 12/14/81 | ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED)

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

	ORG	DATE		ORG	DATE
37. RESPONSIBLE ENGINEER: K.K. Sullivan	41-41	12/9/81	38. SPACECRAFT/SYSTEM ENGINEER: [signature]	2241	12/14/81
39. RELIABILITY: [signature]	51-41	12-10-81	40. SUBCONTRACTOR OR SUPPLIER		DATE

12/22/81

C-2

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F4266

CONTINUATION SHEET LETTER A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

14 6/18/81 Band 1 Sensor 1 STP 32 is -.8 3/6 <0.0 *

** Band 2 Sensor 11 STP 185 is -.7 3/6 <0.0 Replaced with Serial Number [illegible]

Band 6 Sensor 1 STP 193 is -.7 3/6 <0.0 *

Band 6 Sensor 2 STP 192 is 37.3 3/6 <0.0 *

Band 6 Sensor 3 STP 192 is -0.8 3/6 min 0.0 *

Band 6 Sensor 4 STP 192 is -0.8 3/6 min 0.0 *

Band 7 Sensor 13 STP 201 is -0.4 3/6 min 0.0 *

* FAILED ON REPORT - SEE WIZY TABLE 3

~~** FAILED TWICE IN BAD RELAY IN TEST EQUIPMENT.~~

*** PASSED AFTER REMOVAL & REPLACEMENT OF HYBRID P/N 1905771 S/N 532 & FOR PASS TO BLOCK 12 OF THIS F-R.

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4260

REQUEST FOR DEVIATION/WAIVER
(See MIL-STD-480 or AR 702 for instructions)

DATE PREPARED: 12/3/81

PROCURING ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER
3. [X] CLASS I [ ] CLASS II [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. SYS. CODE	c. SYS. SERIES	d. CONFIGURATION NO.
Flight	82577	TM	W124

5. CASE LINE AFFECTED: [ ] PRELIM. [ ] CRIT. DATES [ ] PROD. CUT

6. OTHER SYSTEMS/SUBSYSTEMS/EQUIPMENT ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLANS

	SPEC. CODE	SPEC./DOC. NO.	REV.
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. CHARACTERISTICS AFFECTED

	CHAR. CODE	NUMBER	REV.	REV. NO.
a. SYSTEM				
b. ITEM				

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. IDENTIFICATION TYPE NOMENCLATURE

Multiplexer

12. CONTRACTOR OF ORIGIN: [ ] PRIME [ ] SUB [ ] SUPPLIER

13. PART NO. OF ITEM AT HIGHEST ASSEMBLY AFFECTED

Multiplexer

14. PART NO. OF TYPE CODED

17. LOT NO.

18. QTY

19. ACCOMPANYING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON INTERCHANGEABILITY

None

21. EFFECT ON MILITARY CHARACTERISTICS

18 months schedule slip is disapproved

22. EFFECT ON INTERCHANGEABLE SERVICE, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-1CO) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASONS FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julien SYS. ENGR. REL QA per

25. REMARKS (DIRECTIVE OR OTHER REFERENCE)

26. SUBMITTING ACTIVITY AUTHORIZED SIGNATURE: 81 12 10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. APPROVING ACTIVITY: NASA GSFC

SIGNATURE: TITLE: DATE:

DD Form 1694

GPO: 1980 — 640-168/3418

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

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4266

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4233
5	6	Ambient	4.90	F4233

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4266

BAND	SENSOR	TEMP °C	MAX VALUE (MV) STEP #	≤ 31.2 MV	MIN VALUE (MV) STEP #	≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	38.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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W124

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4267

ORIGINATOR

1 PROGRAM NAME AND NUMBER: Intelsat V/Hopper HS-236 | 2 GE: E330 | 3 MODEL: FLT | 4 TIME OBSERVED: 1015 | 5 DATE OBSERVED: MO 6 DA 19 YR 81

6 HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7 SUBSYSTEM				
8 UNIT	Multiplexer	3533003-100	3	HAC
9 ☐ ASSEMBLY ☐ SUBASSEMBLY				
10 ☐ MODULE ☐ MICAM ☐ CARD				
11 OTHER				

12 TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13 ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ RADIATION ☒ TEMP +50 °C ☐ THERMAL VAC _____ MBAR AT _____ °C ☐ ENCAP ☐ VIBRATION _____ AXIS FOR _____ G VIB TYPE _____ ☐ OTHER

14 DESCRIPTION OF FAILURE: Bad 6 Sensors / Fail A/D Threshold Test. SENSORS 1&V 6-1 1/2 2&3

15 TEST PROCEDURE: 3201-005 | PARA: 3.5.3.5.2 | 16 ORIGINATOR: R. Gonsalves | ORG: 41-41 | DATE: 12/8/81 | ☒ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17 VERIFICATION AND FAILURE ANALYSIS

18 FAILED ITEM NAME AND PART NUMBER

20 ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: REFER TO WAIVER W124 (COPY ATTACHED)

21 AUTHORIZATION | ORG | DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23 REWORK/RETEST ACTION TAKEN: Not Applicable - Refer to Waiver W124 (Copy Attached)

24 QA REWORK

25 QA RETEST

26 LIST ALL PARTS REPLACED

PART NUMBER	CRIT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27 REWORK BY | ORG | DATE | 28 RETESTED BY | ORG | DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30 CAUSE AND CORRECTIVE ACTION: Refer to W124

31 FRB CLOSURE: 12/14/81

☐ CONTINUATION SHEET USED

32 DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W-124 (COPY ATTACHED)

34 BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING/ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35 FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36 FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37 RESPONSIBLE ENGINEER: [signature] | ORG: 41-41 | DATE: 12/9/81 | 38 SPACECRAFT SYSTEM ENGINEER: [signature] | ORG: 2241 | DATE: 12/14/81

39 RELIABILITY: [signature] | ORG: 51-41 | DATE: 12-10-81 | 40 CUSTOMER OR SUPPLIER | DATE

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12/22/81

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HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT
CONTINUATION SHEET

FR SERIAL NO. F4267
CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

14

Band 6 Sensor 2 *

7/24/81 Step 128 is 37.0MV S/b Max 31.2MV
Step 129 is -0.1MV S/b Min 0.0MV

Band 6 Sensor 3 *
Step 128 is 36.8MV S/b Max 31.2MV
~~Step 192 is~~ Rej 7/24/81

Band 6 Sensor 4 *
Step 128 is 36.8MV S/b Max 31.2MV
Step 192 is -0.1MV S/b Min 0.0MV

* Failed at Retest - See W124 Table 3

D11873A JAN 80

4267

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

DISCREPANCY ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] CLASS I [ ] CLASS II [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFD. CODE	c. SYS. PUBLN.	d. CONFIGURED ID.
Flight	82577	TM	W124

5. BASE LINE AFFECTED: [ ] FUNC. VIGURAL [ ] ALLOCATED [ ] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFG. CODE	SPEC./DOC. NO.	REV
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

CFG. CODE	NUMBER	REV.	DOC. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE

Multiplexer

12. CD NO. | 13. DEFECT CD. | 14. EFFECT CLASSIFICATION: [ ] CLASS I [ ] CLASS II [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED

Multiplexer

16. PART NO. & TYPE CODE | 17. LOT NO. | 18. QTY

19. DELIVERIES DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE

None

21. EFFECT ON DELIVERY SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian SYS. ENGR. J E Cooper REL J E Cooper QA W D Williams PE Donald W Swain 12/10/81

25. PRODUCTION EFFECTIVITY BY SERIAL NUMBER

26. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE: J E Cooper 81 12 10 | TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: Lewis R Catt DATE: 12-11-81

DD FORM 1694

GPO 1980 — 340-134/915

4267

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

4267

FROM		TO		TEMPERATURE			
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	F. R. NUMBER(S)
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

4267

BAND	SENSOR	TEMPERATURE	MV/SEC	P. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4267

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.3	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4257
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 1. A/D CONVERSION FAILURES

HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

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W124

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4268

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
TROPO RADAR HS 236	E330	FLT	1430	MO 6 DA 26 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	MULTIPLEXER	3533003-100	3	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☒ TEMP 15 - 5 ☐ THERMAL VAC ____ HRS AT ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Numerous crosstalk failures. See attached sheet

ENGINEERING EVALUATION

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.3.6 | 16. ORIGINATOR: [signature] | ORG: 41-41 | DATE: 6/26/81 | 17. CONTINUATION SHEET USED

18. VERIFICATION AND FAILURE ANALYSIS: Failures verified. Some channels slightly out of specification. Grouping of failed channels indicate that analog multiplexer hybrids may be partial cause.

18. FAILED ITEM NAME AND PART NUMBER: 3533003-100

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replace analog multiplexer hybrids Board 2 HY1 and Board 7 HY2. REFER TO HS 236-2260 (COPY ATTACHED)

21. AUTHORIZATION: R L Julian | ORG: 41-41 | DATE: 6/28/81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Replaced two 3905973 hybrids as above. Retested per TP 3533003-100 paragraph 3.5.3.6.

24. QA REWORK (ITS) [signature]

25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
3905973	HY1	S/N 532				
3905973	HY2	S/N 502				

27. REWORK BY: Lee Sa P.N. | ORG: 45-21 | DATE: 11-20-81

28. RETESTED BY: [signature] | ORG: 41-41 | DATE: 11-24-81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Minor crosstalk between some channels is an unavoidable consequence of the assembly and design used. It will not adversely affect system performance so no design change will be undertaken. C/A REFER TO W124 (REF HS 236-2260 ATTACHED)

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED)

FRB CLOSURE: [signature] 12/14/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT/SYSTEM ENGINEER	ORG	DATE
[signature]	41-41	12/1/81	[signature]	224-1	12/14/81
39. RELIABILITY [signature]	ORG 51-41	DATE 12-10-81	40. CUSTOMER OR SUPPLIER [signature]		DATE

D11873 SC JAN 80

12/22/81

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EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F4268

CONTINUATION SHEET LETTER A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☑

14 6/24/81

Board #	Sensor #	
1	7 *	→ BIST failure caused by bad relay in test equipment
2	2	→ Passed on retest after rework 11/24/81
2	5	→ Failed A A A A Transmitted to F0729
2	6 **	→ Passed A A A A 11/24/81
2	8 **	→ A A A A A 11/24/81
3	6	Failed on RETEST - SEE 6/24 TABLE 1
3	8 **	Passed on retest after rework 12-2-81
3	10	Failed on RETEST - SEE 6/24 TABLE 1
6	1	" " " " " "
6	2	" " " " " "
6	3	" " " " " "
6	4	" A A " " "
7	13 **	Passed on retest after rework 11/24/81
7	~~6~~ 16	A A A A A A

* PROBLEM TRACED TO BAD RELAY IN TEST EQUIPMENT. PASSES WHEN TESTED WITH REPAIRED TEST EQUIPMENT.
** PASSED ON RETEST - THEREFORE NOT A 6/24.

D11873A JAN 80

4268

REQUEST FOR DEVIATION/WAIVER
(See MIL-STD-480 or 481 for instructions)

DATE PREPARED: 12/3/81

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

3a. [ ] DEVIATION [X] WAIVER

3b. [X] MAJOR [ ] MINOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. SERIAL/TYPE	b. CONT. CODE	c. CONT. CODE	d. REVISION NO.
Flight	82577	TM	W124

5. CASE LINE AFFECTED: [ ] PROC. FLOW [ ] ALLOCATED [ ] PROD. DEF

6. GFE/GFP SYSTEM/SERVICE/CONTR ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	SPEC. CODE	SPEC./REV. NO.	DATE
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

DWG. CODE	DWG. NO.	REV.	SUB. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE

Multiplexer

12. QTY

13. EFFECT ON PROD

14. SAFETY CLASSIFICATION: [ ] MAJOR [ ] MINOR [ ] CRITICAL

15. NOMENCLATURE OF PART OR LOWEST ASSEMBLY AFFECTED

Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO.

18. QTY

19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON R&M/PQ/QA

None

21. EFFECT ON CONTRACT SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian SYS. ENGR. [signature] REL [signature] QA [signature] PE [signature] 12/10/81

25. DESCRIPTION EFFECTIVITY OF SERIAL NUMBER

26. SUPERVISING ACTIVITY AUTHORIZED SIGNATURE: J F Cargill 81 12 10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: George B Britt DATE: 12/21/81

DD Form 1694

GPO 1979 — 640-726/018

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

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FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

4268

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BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

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4268

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

#268

INTERNAL MEMORANDUM

TO: G. Gritt CC: L. O'Connell DATE: 22 December 1981

REF: HS 236-2260
PE 225:81

SUBJECT: 3905973 Hybrid Crosstalk Testing

FROM: R. Julian
41-41

BLDG. B-11 MAIL STA. 39
EXT. 6293

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

1. Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.

2. The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (≤1/2% of full scale, max.) are not visible on oscilloscopes.

3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

R. L. Julian

Richard C. Julian
REA, Multiplexer
Thematic Mapper Program

RCJ:jc

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W124

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

№ F 07295

HUGHES
HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SEE REVERSE SIDE OF HARD COPY FOR INSTRUCTIONS

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Thematic Mapper #5236 | 2. GLA: F264 | 3. MODEL: FLT | 4. TIME OBSERVED: 1415 | 5. DATE OBSERVED: YR 81 MO 11 DA 25

6. HOW UNDER TEST WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	MULTIPLEXER	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐ SPECIAL TEST

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☒ TEMP +50 - 5 CYCLE ☐ THERMAL VAC ☐ OTHER

14. DESCRIBE FAILURE, INCLUDE "IS" AND "SHOULD BE" DATA: Bandpass amps fund 13 failed XCalib.

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.2.1 | 16. OBSERVATOR: K. Yamauchi | ORG: 4941 | DATE: 11-25-81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

19. FAILED ITEM NAME	FAILED ITEM PART NO.	S/N	MFR	HOW LEVEL

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: Refer to W124 (copy attached)

21. AUTHORIZATION | ORG | DATE | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Not applicable - Refer to waiver W124 (copy attached) | 24. QA REWORK | 25. QA RETEST | 26. QA RETEST (OPTIONAL)

27. LIST ALL PARTS REMOVED PART NUMBER	CKT SYM	HAC HI-REL PART LOT NUMBER	MFG DATE CODE	MANUFACTURER	REMOVAL CAUSE	FAIL CLASS	ANALYSIS NUMBER

28. REWORK BY | ORG | DATE | 29. RETESTED BY | ORG | DATE | 30. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

31. CAUSE: Refer to W124 Table I

32. CORRECTIVE ACTION: Refer to W124 Table I

33. ☐ CONTINUATION SHEET USED | 41. FRB CLOSURE: 12/14/81

34. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: Refer to W124 (copy attached) | 42. REP. FR NUMBER

35. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ OPERATOR ERROR ☐ SPECIFICATION PROBLEM

37. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 38. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

39. RESPONSIBLE ENGINEER	ORG	DATE	40. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R. Allison	4141	12/9/81	L. Arnold	2241	12/15/81
43. RELIABILITY	ORG	DATE	44. CUSTOMER OR SUPPLIER		DATE

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F07295

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

PRODUCTION ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] CLASS I [ ] CLASS II [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. LEVEL/TYPE	b. CFG. CODE	c. SYS. BASIC	d. SYS. MOD. NO.
Flight	82577	TM	W124

5. CAGE LINE AFFECTED: [ ] PURCHASED [ ] ALLOCATED [ ] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFG. CODE	SPEC./DOC. NO.	REV
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

	CFG. CODE	NUMBER	REV.	MOD. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. IDENTIFICATION ITEM NOMENCLATURE

Multiplexer

12. QTY

13. EFFECT ON

14. DEFECT CLASSIFICATION: [ ] CLASS I [ ] CLASS II [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED

Multiplexer

16. PART NO. OR TYPE DESIG.

17. LOT NO.

18. QTY

19. DESIGNATED DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE

None

21. EFFECT ON DELIVERY SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Tulisan REL [signature] QA [signature] 12/10/81

SYS. ENGR. [signature] PE [signature]

25. PRODUCTION EFFECTIVITY OF MEDIA AFFECTED

26. SIGNATURE OF AUTHORIZED REPRESENTATIVE OF CONTRACTOR [signature] 81 12 10 TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: [signature] DATE: 12/11/81

DD FORM 1694

GPO 1980 — 340-720/616

F-07295

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

F07295

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BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

F07295

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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W124

SPACE AND COMMUNICATIONS GROUP

HUGHES
HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

FAILURE REPORT

№ F07296

SEE REVERSE SIDE OF HARD COPY FOR INSTRUCTIONS

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Thematic Mapper HS 236	F764	FLT	1400	YR 81 MO 12 DA 1

6. HOW UNDER TEST WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	MULTIPLEXER	353D003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐ SPECIAL TEST

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ CYCLE ____ ☐ THERMAL VAC ____ , HRS AT ____ ° ____ AXIS POS ____ MIN TYPE ____ ☐ OTHER

14. DESCRIBE FAILURE, INCLUDE "IS" AND "SHOULD BE" DATA: The following Bands and Sensors failed XTalk. Band 1 sensors 10 and 14. Band 2 sensor 4 and 14. Band 4 sensor 16.

15. TEST PROCEDURE: 32015-005 | PARA: 3.5.3.6 | 16. ORIGINATOR: R. Yamauchi | ORG: 81-41 | DATE: 12-1-81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

19. FAILED ITEM NAME	FAILED ITEM PART NO.	S/N	MFR	HOW LEVEL

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: REFER TO W124 (COPY ATTACHED)

21. AUTHORIZATION | ORG | DATE | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: NOT APPLICABLE - REFER TO WAIVER W124 (COPY ATTACHED) | 24. QA REWORK | 25. QA RETEST | 26. QA RETEST (OPTIONAL)

27. LIST ALL PARTS REMOVED PART NUMBER	CKT SYM	HAC HI-REL PART LOT NUMBER	MFG DATE CODE	MANUFACTURER	REMOVAL CAUSE	FAIL CLASS	ANALYSIS NUMBER

28. REWORK BY | ORG | DATE | 29. RETESTED BY | ORG | DATE | 30. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

31. CAUSE: REFER TO W124 TABLE 1

32. CORRECTIVE ACTION: REFER TO W124 TABLE 1

33. ☐ CONTINUATION SHEET USED

43. FRB CLOSURE: 12/14/81

34. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (COPY ATTACHED) | 35. PFR NUMBER

36. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ OPERATOR ERROR ☐ SPECIFICATION PROBLEM

37. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 38. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

39. RESPONSIBLE ENGINEER	ORG	DATE	40. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
[signature]	81-41	12/9/81	[signature]	22-41	12/14/81

41. RELIABILITY | ORG | DATE | 42. CUSTOMER OR SUPPLIER | DATE

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REQUEST FOR DEVIATION/WAIVER

(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81 (07296)

1. ORIGINATOR NAME AND ADDRESS: Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] MINOR [ ] MAJOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. SPEC. CODE	c. SPEC. BASIC.	d. REVISION NO.
Flight	82577	TM	W124

5. CASE LINE AFFECTED: [ ] FUNC. TIONAL [ ] ALLO. CATED [ ] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	SPEC. CODE	SPEC./DOC. NO.	REV.	DOC. CODE	NUMBER	REV.	DOC. NO.
a. SYSTEM							
b. ITEM							
c. TEST PLAN							

8. DRAWINGS AFFECTED

9. TITLE OF DEVIATION/WAIVER: Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM: NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE: Multiplexer

12. CAGE NO. | 13. OFFICE SYM. | 14. EFFECT CLASSIFICATION: [ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED: Multiplexer

16. PART NO. OR TYPE DESIG. | 17. LOT NO. | 18. QTY

19. REQUIRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE: None

21. EFFECT ON DELIVERY SCHEDULE: 18 months schedule slip is disapproved

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.:

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. REASON FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian REL QA

SYS. ENGR. PE 12/10/81

25. PRODUCTION EFFECTIVITY OR BLOCK NUMBER:

26. TYPED NAME AND AUTHORIZED SIGNATURE: J Cooper 81 12 10 | TITLE:

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: Gene B. Britt DATE: 12/21/81

DD FORM 1694

07296

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

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07296

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

07296

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

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07296

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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W12B

HUGHES
HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP
FAILURE REPORT

№ F 07299

SEE REVERSE SIDE OF HARD COPY FOR INSTRUCTIONS

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
Telemetry Message H5296	F264	FLT	1530	YR 81 MO 11 DA 24

6. HOW UNDER TEST WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Multiplexer	3533003-100	3	Hac
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐ SPECIAL TEST

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☒ TEMP +15 °C CYCLE ___ ☐ THERMAL VAC ___ HRS AT ___ °C ___ AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIBE FAILURE, INCLUDE "IS" AND "SHOULD BE" DATA: Bandpass ripple & Sample Fail x Calb.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION ☐ SHEET USED
32015-005	3.5.3.6	R. Yamauchi	41-41	11/24/81	

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS

19. FAILED ITEM NAME	FAILED ITEM PART NO.	S/N	MDW	MDW LEVEL

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: Refer to W124 (copy attached)

21. AUTHORIZATION	ORG	DATE	22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Not applicable - Refer to Waiver W124 (copy attached)

24. QA REWORK | 25. QA RETEST | 26. QA RETEST (OPTIONAL)

27. LIST ALL PARTS REMOVED PART NUMBER	CKT SYM	HAC HI-REL PART LOT NUMBER	MFG DATE CODE	MANUFACTURER	REMOVAL CAUSE	FAIL CLASS	ANALYSIS NUMBER

28. REWORK BY	ORG	DATE	29. RETESTED BY	ORG	DATE	30. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

31. CAUSE: Refer to W124

32. CORRECTIVE ACTION: Refer to W124

33. CONTINUATION ☐ SHEET USED

43. FRB CLOSURE: [signature] 1/14/82

34. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W124 (copy attached) | 35. REF. FR NUMBER

33. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ OPERATOR ERROR ☐ SPECIFICATION PROBLEM

37. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

38. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

39. RESPONSIBLE ENGINEER	ORG	DATE	40. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
R. L. Wilson	41-41	12/9/81	[signature]	22-41	12/15/81
41. RELIABILITY: Lee Crane	ORG 51-41	DATE 12-10-81	42. CUSTOMER OR SUPPLIER		DATE

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07299

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 12/3/81

PREPARING ACTIVITY NO.

1. ORIGINATOR NAME AND ADDRESS

Hughes Aircraft Co, SCG, El Segundo, California

2. [ ] DEVIATION [X] WAIVER

3. [X] MINOR [ ] MAJOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFG. CODE	c. CFG. CHNG.	d. CHANGE NO.
Flight	82577	TM	W124

5. CASE LINE AFFECTED: [ ] FUNCTIONAL [ ] ALLOCATED [ ] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	CFG. CODE	SPEC./DOC. NO.	REV.
a. SYSTEM			
b. ITEM			
c. TEST PLAN			

8. DRAWINGS AFFECTED

CFG. CODE	NUMBER	REV.	SUB. NO.

9. TITLE OF DEVIATION/WAIVER

Minor Performance Discrepancies, S/N 003 Multiplexer

10. CONTRACT NO. & LINE ITEM

NAS 5-24200 L.I. 32

11. CONFIGURATION ITEM NOMENCLATURE

Multiplexer

12. CI NO. | 13. EFFECT NO. | 14. EFFECT CLASSIFICATION: [ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR ASSEMBLY AFFECTED

Multiplexer

16. PART NO. OR TYPE NO.

17. LOT NO.

18. QTY

19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE

None

21. EFFECT ON DELIVERY SCHEDULE

18 months schedule slip is disapproved

22. EFFECT ON INTERCHANGEABILITY, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include:

- Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1.
- Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2.

(Continued)

24. NEED FOR DEVIATION/WAIVER

Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance.

REA R L Julian SYS. ENGR. J F Cooper REL J F Cooper QA W D Adams PE Frank M Schwarz 12/4/81

25. PRODUCTION EFFECTIVITY BY SERIAL NUMBER

26. SIGNATURE OF ACTIVITY DISAPPROVING DEVIATION: J F Cooper 81 12 10 | TITLE

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: Gene B. Kitt | DATE: 12/11/81

DD FORM 1694

07299

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

- Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

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07299

FROM		TO		TEMPERATURE			F. R. NUMBER(S)
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	
1	10	1	8			X	F07296
1	14	1	12			X	F07296
2	4	2	2	X	X	X	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3	6	3	4		X		F4268
3	10	3	6				F4268
4	12	4	10			X	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	X	F4268, F4254, F4257
6	2	6	3	X	X	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	6	2	X	X	X	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	X			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All channel pairs were out of specification by only one multiplexer quantization level.

07299

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

07299

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SECTION 2.2
SCAN MIRROR ASSEMBLY

Section 2.2.1

Scan Mirror Assembly

Performance Data

The acceptance performance (test) data for the Scan Mirror Assembly is contained in Appendix B (Vol. IV, part B).

2.2.2
Acceptance Data

2.2.2.1
Configuration Lists

DATE: 4/22/81

P/N 3533002-100

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED			AS BUILT		
DOCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	REV.	SUPPLEMENTARY DOCUMENTS
3533002-100	D	W020 EO 64358 EO 13113 EO 64363 EO 64374 EO 64369	3533002-100	D	W020 EO 64358 EO 13113 EO 64363 EO 64374 EO 64369
TS 32015-004	B	EO 13100 EO 64391 EO 13111 EO 64385 EO 64394 EO 13112 EO 64379 EO 13105	TS 32015-004	B	EO 13100 EO 64391 EO 13111 EO 64385 EO 64394 EO 13112 EO 64379 EO 13105
3568874	B	EO 70667 EO 70504 EO 64304 EO 70565 EO 70614 EO 70583 EO 64371	3568874	B	EO 70667 EO 70504 EO 70565 EO 70614 EO 70583
3568900	C	EO 70693	3568900	C	EO 70693
3568899-2	B	W062 W044 EO 64392	3568899-2	B	W062 W044 EO 64392
3568911	B	EO 64344 EO 70672	3568911	B	EO 64344 EO 70672
3568909	A		3568909	A	
3568970	A	EO 64322 EO 64330 EO 64317 EO 64314	3568970	A	EO 64322 EO 64330 EO 64317 EO 64314

P/N 3533002-100

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED			AS BUILT		
OCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	RFV.	SUPPLEMENTARY DOCUMENTS
568972	F	W070	3568972	E	W070 EO 64335 EO 64360 EO 64352 EO 64329 EO 64323 EO 64318
568980	D	D009 D020 D024	3568980	C	D009 D020 D024 EO 64350 EO 70677 EO 64341 EO 64302 EO 64339 EO 64328 EO 64356
568995	N/C	EO 70482 EO 70546 EO 70577 EO 70615	3568995	N/C	EO 70482 EO 70546 EO 70615 EO 70577
568980 SAME AS ABOVE	D	D009 D020 D024	3568980	C	D009 D020 D024 EO 64350 EO 70677 EO 64341 EO 64302 EO 64339 EO 64328 EO 64356
1568995 SAME AS ABOVE	N/C	EO 70482 EO 70546 EO 70577 EO 70615	3568995	N/C	EO 70482 EO 70546 EO 70615 EO 70577

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED			AS BUILT		
DOCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	REV.	SUPPLEMENTARY DOCUMENTS
3568985	E	D011 D019 D023 EO 64337 EO 64342	3568985	E	D011 D019 D023 EO 64337 EO 64342
3568997	N/C	EO 70406 EO 70483	3568997	N/C	EO 70406 EO 70483
3568985-1	E	D011 D019 D023 EO 64337 EO 64342	3568985-1	E	D011 D019 D023 EO 64337 EO 64342
3568997 SAME AS ABOVE	N/C	EO 70406 EO 70483	3568997	N/C	EO 70406 EO 70483
3568990	D	D029 D017 EO 64355 EO 70684 EO 64319	3568990	D	D029 EO 64355 EO 70684 EO 64319
3569087	N/C	EO 64311 EO 64359 EO 64347	3569087	N/C	EO 64311 EO 64359 EO 64308 EO 64347
3569000	D	W070 EO 70646 EO 70679 EO 64357	3569000	D	W070 EO 70646 EO 70679 EO 64357
3569018	B	EO 70587 EO 64354 EO 64362 EO 64361	3569018	B	EO 70587 EO 64354 EO 64361

ATE: 4/22/81

P/N 3533002-100

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED			AS BUILT		
DOCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	REV.	SUPPLEMENTARY DOCUMENTS
3569010	C	D0008 EO 70622	3569010	C	D0008 EO 70662
3569093	N/C	EO 70336	3569093	N/C	EO 70336
3569010 SAME AS ABOVE	C	D0008 EO 70622	3569010	C	D0008 EO 70622
3569093 SAME AS ABOVE	N/C	EO 70336	3569093	N/C	EO 70336
3569050-1	A	EO 64332	3569050-1	A	EO 64332
9050-2	A	EO 64332	3569050-2	A	EO 64332
3 9062-1	A		3569062-1	N/C	EO 70606 EO 70551 EO 70434 EO 70564 EO 70553
3569062-2	A		3569062-2	N/C	EO 70551 EO 70606 EO 70553 EO 70434 EO 70564
3569083	N/C	EO 70391 EO 70397 EO 64346 EO 70521	3569083	N/C	EO 70391 EO 70397 EO 70521
3569114	A	EO 64345	3569114	A	EO 64345
3569019	D		3569019	C	EO 70568 EO 70575

R. L. Cook
R. L. COOK, MANAGER
THEMATIC MAPPER CMO

J. R. Gaudette
QUALITY ASSURANCE ENGINEER

SCAN MIRROR ASSEMBLY

Listing of Liens

SCAN MIRROR ASSEMBLY

P/N 353302-100

FLIGHT

Failure Report No.	
Open	Closed
	F0170*
	F1302
	F1305
	F1306
	F1307
	F1308
	F1322
	F1325
	F1327
	F1328
	F1329
	F1330
	F1342
	F1352
	F1353
	S8392
	S8116
	S8369

Deviations	Waivers
	W-121

* Spare

SCAN MIRROR ASSY.

P/N 3533002

FLIGHT		PROTOFLIGHT		ENGINEER		LTM	
Failure Report No.		Failure Report No.		Failure Report No.		Failure Report No.	
Open	Closed	Open	Closed	Open	Closed	Open	Closed
	F0170 Spare						
	F1302		F1317		A0028		F0161
	F1305		F1318		A0080		F1304
	F1306		F1344		A0081		F1309
	F1307		F1345		A0082		F1310
	F1308		F1350		A0083		F1313
	F1322		F1354		F0502		F1314
	F1325		F2642		F0503		F1315
	F1327		F2691		F0701		F1316
	F1328		F2739		F0702		F1320
	F1329		S8092		F1301		F1323
	F1330		S8300		F1312		
	F1342				F1343		
	F1352				F1351		
	F1353						
	S8116						
	S8369						
	S8392						

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FAILURE REPORT

F 1302

ORIGINATOR

1. PROGRAM NAME AND NUMBER: HS 236 THEMATIC MAPPER | 2. GLA | 3. MODEL: FLT | 4. TIME OBSERVED: 1300 | 5. DATE OBSERVED: MO 6 DA 28 YR 79

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☒ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	3533002-100 SMA	3533002-100	001 EM	
8. UNIT				
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	TORQUER ASSY	3568911	4,5,6,7	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER	SUBASSEMBLY: HOUSING ASSY - TORQUER	3568909	3,4,5,6	

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: TERMINALS E5, E1, E4, E8 ARE NOT MARKED AS PER DRAWING 3568902

15. TEST PROCEDURE | PARA | 16. ORIGINATOR: A.G. HOLER | ORG: 28 113 125 | DATE: 7/19/79 | ☐ CONTINUATION SHEET USED

EVALUATION

18. VARIFICATION AND FAILURE ANALYSIS: VISUAL INSPECTION VERIFIED DISCREPANCY

19. FAILED ITEM NAME AND PART NUMBER

ENGINEER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE

REMARK TERMINALS PER PRINT

21. AUTHORIZATION | ORG | DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: S/N 003, 004 AND 005 WERE REWORKED TO PRINT. OTHER'S ATTACHED. S/N 6 WAS USED IN ENGINEERING MODEL.

24. MRB REPORT 178

25. QA

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MRR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | ☐ CONTINUATION SHEET USED

RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: WORKMANSHIP ERROR. TECHNICIANS AND QA PERSONNEL WERE ADVISED TO USE CAUTION IN MARKING TERMINALS AND INSPECTING MARKINGS.

33. FRB CLOSURE: 3/11/80

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/MFG ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET UP ☒ WORKMANSHIP ☐ WEAR OUT | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ UNKNOWN ☐ INDUCED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ____ ORG ____ DATE ____ | 38. SPACECRAFT ____ ORG ____ DATE ____

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FAILURE REPORT

F 1305

ORIGINATOR

1. PROGRAM NAME AND NUMBER: HS 234 - TM | 2. GLA: E331 | 3. MODEL: A-1 | 4. TIME OBSERVED: 1630 | 5. DATE OBSERVED: MO 7 DA 25 YR 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☒ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☐ SUBASSEMBLY	MIXER	3568849	5	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☒ Piece To Assy Fab EM

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ MBL AT ____ ° ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Nickel Plating On Read Surface Lifted 2 Places, Near One Corner Of Hole & At Edge Near Major Axis

15. TEST PROCEDURE | PARA | 16. ORIGINATOR: E. W. Gossett | ORG 1771-45 | DATE 7/24/80 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Actually Only One Lifted Area Near Corner Pure Hole

19. FAILED ITEM NAME AND PART NUMBER: Mixer P/N 3568700

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED ESCALATE

Mixer Will Be Returned To Vendor For Rework Action Use On EM (Ref. SER TFR #1352.

21. AUTHORIZATION: [signature] | ORG 1771-45 | DATE 7/31/80 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Vendor To Strip, Replate & Recoat. Returned To Vendor By W. P. Bowers - Replated And Returned Acceptable [signature]

24. CAT 1 | 25. CAT 2

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MPR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Improper Cleaning By Vendor.

RETURN TO VENDOR REF. NCMR 316897

Supplier Corrective Action Request # 63891 Was Sent To Vendor In Accordance With Hughes Aircraft Co. Supplier Corrective Action System. ☐ CONTINUATION SHEET USED

31. FRB CLOSURE: [signature] 2/26/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: NCMR 316897

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] | ORG 1771-45 | DATE 12-3-80

38. SPACECRAFT SYSTEM ENGR: [signature] | ORG 22-61 | DATE 12/11/80

39. RELIABILITY | ORG | DATE

40. CUSTOMER OR SUPPLIER | DATE

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FAILURE REPORT

F 1306

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TM HS-236 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: --- | 5. DATE OBSERVED: 10/12/79 YR

6. HARDWARE LEVEL WHICH FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☒ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	S M A	3533002-100	---	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☒ CARD		3568985	007	HAC
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ ESC/DPI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ HRS AT ____ ° ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: AR2 rotated counter-clockwise. ART ~~was~~ work on Reg assembly drawing ambiguous.

10/10/79

15. TEST PROCEDURE: TS32015-006 PARA 4.8 | 16. ORIGINATOR: Warren Hayden ORG 77-35-22 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: -24vdc voltage adjustment faulty, due to pin rotation at AR2. Other than AR2, no parts were stressed. Power supply was current limited a 30 ma.

19. FAILED ITEM NAME AND PART NUMBER

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Replace AR2/Retest

10/12/79

21. AUTHORIZATION: Warren Hayden ORG 77-35-22 DATE | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RemovedAR2

24. QA REWORK: JP J6

Replaced E/R 10/22/79
Retested 10/30/79 Unit

25. QA RETEST: HAC

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
908950-1	AR 2	9C893-501M				

27. REWORK BY: HS ORG 77-55 DATE 10/19/79 | 28. RETESTED BY: [illegible] ORG 77-32-11 DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Drawing was nor clear

Dwg Changed - See ~~ECR-873583~~ Revision D

31. ☐ CONTINUATION SHEET USED | 33. FRB CLOSURE

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: ECR 873 583 Rev D released 1/8/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: L B Pierce ORG 77-32-11 DATE 10/16/80 | 38. SPACECRAFT SYSTEM ENGR.: W. A. Freudenstein ORG 22-61 DATE 11/21/80

39. RELIABILITY: L Pierce ORG 5744 DATE 11-12-80 | 40. CUSTOMER OR SUPPLIER: R.B. DATE 10/9/81

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FAILURE REPORT

1307

F

1. PROGRAM NAME AND NUMBER: H3-236 (TM) | 2. CI/CE 330 | 3. SERIAL NO. NS236TM | 4. TIME OBSERVED | 5. DATE OBSERVED 12/10/79 YR

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☒ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Scan Mirror Assy	3533002-103	--	HAC
9. ☒ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAL ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ ☐ EMC/EMI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Harness continuity failure. (1) No continuity for J2-22 to A1-E91. (2) P3-8 has the wire that should be connected to P3-7. P3-8 should have no connection. (3) Chassis ground & RTN are connected together/shd be isolated

15. TEST PROCEDURE TS32015-006 PARA 4.4 | 16. ORIGINATOR W. Hayden ORG 77-35-42 DATE 12/10/79 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

19. VERIFICATION AND FAILURE ANALYSIS: No power was applied, therefor one occurred. occurred.

18. FAILED ITEM NAME AND PART NUMBER

22. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Forward a description of all rework action to rear to determine if complete/partial retest is required.

12/10/79

21. AUTHORIZATION W. Hayden ORG 77-35-42 DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: (1) J2 22 wired to E3/Replaced J2-22 wire (2) Switched P38 wire to P3-9 (3) Item 13 was shorted to Item 26. Replaced Item 33. Conduct retest of harness part. Retest successful to TS 32015-006.

24. QA ASSURANCE: ZP JG

25. QA RETEST

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY Jean Haider ORG 77-55 DATE 12/13/79 | 28. RETESTED L. S. Hayden ORG 77-35-42 DATE 12/12 | ☐ CONTINUATION SHEET USED

ENGINEERING/LIABILITY

30. CAUSE AND CORRECTIVE ACTION: 1/25/80

~~Workmanship~~

Assembler has been cautioned to use extreme care when performing the wiring operation.

33. FRB CLOSURE: 2/26/81

☐ 31. CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: Verbal

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☒ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER W. Hayden ORG 77-15 DATE 1/29/80

38. SPACECRAFT SYSTEM ENGR W. H. Tschumi ORG 22-4 DATE 11/11/80

39. RELIABILITY C. Pelan ORG 51-41 DATE 11-10-80

40. CUSTOMER OR SUPPLIER ____ DATE

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FAILURE REPORT

F 1308

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TM HS-236 | 2. DLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: -- | 5. DATE OBSERVED: 10/31/79 YR

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☒ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	SMA	3533002-100	--	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY	SME	3568970	--	HAC
10. ☐ MODULE ☐ MICAM ☒ CARD	Elect.Comp.Assy.	3568990	008	HAC
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/EMI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ HRS AT ____ ° ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: CR38 polarity reversed para 4.1, 3)e test failed. E78 measured 5.6v instead of 0v indicating CR38 polarity reversed.

79

15. TEST PROCEDURE: TS 32015-006 PARA: 4.1 | 16. ORIGINATOR: W. Hayden | ORG: 77-35 | DATE: 10/31/79 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: CR38 diode ~~was~~ polarity was reversed CR38 allows high voltage to be applied to Q1. The only effect of CR38 being reversed is to block voltage to base of Q1. No damage

18. ☐ FOLLOWING REWORK/RETEST REQUIRES REWORK/RETEST NOT REQUIRED BECAUSE: FAILED ITEM NAME / PART NUMBER — REF. IDC H5236-7717 FOR STRESS ANALYSIS. (CAT NOT AFFECTED) Remove and reverse CR38. Retest.

19. AUTHORIZATION: W.Hayden | ORG: 77-35 | DATE: 10/31/79 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

20. REWORK/RETEST ACTION TAKEN: Removed & reversed CR38--

Retested 10/31/79

20A. REWORK BY: P J6

20B. QA RETEST: HAC

21. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

22. REWORK BY: P | ORG: 77-15 | DATE: 10-31-79

23. RETESTED BY: [signature] | ORG: 77-42-12 | DATE: | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

24. CAUSE AND CORRECTIVE ACTION: Part was installed backward during assembly and was not detected by assemblers or quality.

Assembler cautioned to use extreme care and reinstructed regarding this diode installation in accordance with drawing.

☐ CONTINUATION SHEET USED

25. FRB CLOSURE: [signature] 10/21/80

26. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: CAR 63100 - COPY ATTACHED

27. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/PAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

28. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

29. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

30. RESPONSIBLE ENGINEER: R.L. Cook | ORG: 77-15 | DATE: 11/29/80

31. SPACECRAFT SYSTEM ENGR: W. A. Trousdale | ORG: | DATE: 11/21/80

32. RELIABILITY: [signature] | ORG: 5/14 | DATE: 11-19-80

40. CUSTOMER ORG. OR SUPPLIER: | DATE:

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SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

F 1308

INTERNAL MEMORANDUM

TO: L. O'Connell

CC: Altman, L.
Barnett, G.C.
Day, J.G.
Data Bank

DATE: 13 November 1981

REF: HS236-7717
REAH 81/60

FROM: A. Huber

SUBJECT: FR: F1308
(SME Interface Bd,
3568990, Flt)

BLDG. B-11 MAIL STA. 102
EXT. 6246

FR: F1308, dated 10/31/79

The failure was encountered during board test of the scan mirror electronics interface board (assy. no. 3568990) and consisted of an improperly installed diode (CR38 installed with reverse polarity). Figure 1 illustrates the circuit which utilizes CR38. With CR38 installed backwards it was not possible to generate +5VDC logic power via relay K2. The diode was subsequently reinstalled with correct polarity. No overstress to interface board circuitry occurred as a result of the absence of +5VDC power.

Andrew E Huber
A. Huber

AH:jc

F1308

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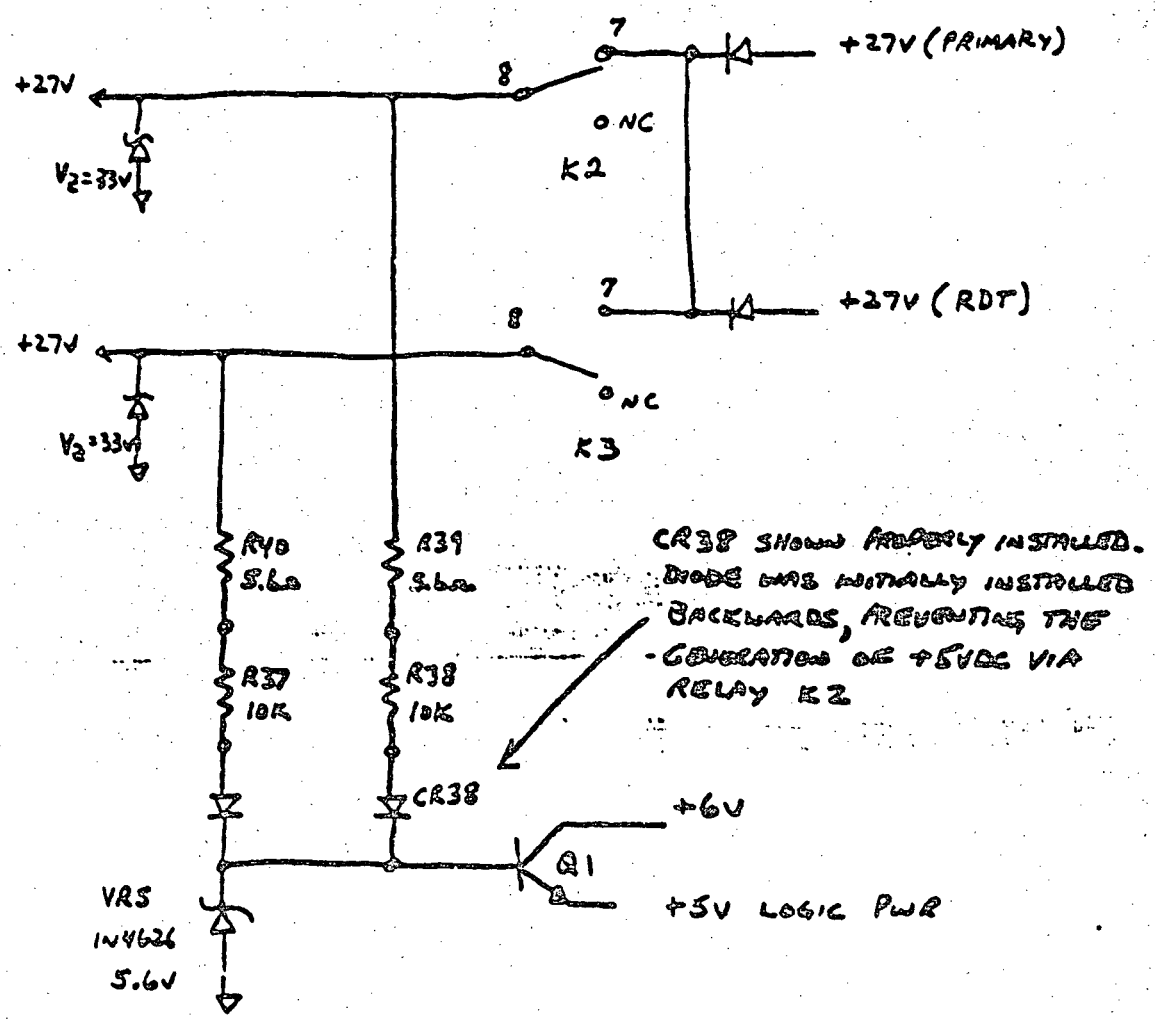

FIGURE 1. SMC INTERFACE BOARD CIRCUITRY FOR GENERATION OF +5VDC LOGIC POWER

TFR 1308

CORRECTIVE ACTION REQUEST

63100

SEE REVERSE SIDE FOR COMPLETION INSTRUCTIONS

ORIGINATOR

	NAME	SOURCE CODE	ADDRESS/ MAIL STATION	PHONE EXT.
TO:	E.A. ANDIVINO	77-07	12	4165
2. FROM:	R.L. COON	77-15	12/V104	7433

3. REFERENCE:

Failure Report. F-1308

4. E330 GLA NO.

5. PLEASE TAKE THE NECESSARY ACTION TO CORRECT THE CAUSE OF THE FOLLOWING CONDITION(S):

PROBLEM DESCRIPTION:

No Inspection of parts placement on PC Boards is taking place during failure duty test.
- See Ref Failure Report

6. R Loon SIGNATURE 1/14/80 DATE

BLDG. 12 MAIL STATION V104

RECIPIENT

7. CAUSE:

SEE ATTACHMENT

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8. THE FOLLOWING CORRECTIVE MEASURES HAVE BEEN TAKEN TO ELIMINATE THE CAUSE OF THE CONDITION(S) NOTED ABOVE

EFFECTIVITY: _____ (LOT, SERIAL, DATE, OTHER)

9. REMEDY:

SEE ATTACHMENT

10. SIGNED: [signature] DATE: 1/31/80

11. CONCLUSION – SATISFACTORY CORRECTION HAS BEEN EFFECTED – YES ☒ NO ☐

12. FOLLOW UP REQUIRED:

13. SUSPENSE DATE: _____ 14. SIGNED: R Loon ORIGINATOR DATE 2/5/80

305 REVISION 12

F 1308

Reply to CAR 63100

An investigation into this problem indicates that this was an oversight by both the Manufacturing operator and the QA inspector. Discussion with all inspection personnel has assured me they are aware of the requirement to review component polarity, component placement, component value, and workmanship during inspection operations. Therefore this is a random error.

NOTE:

Although the failure was detected by test personnel on 10-31-79, neither Manufacturing supervisor nor the operator were contacted until 1-28-80, at which time Q.A. requested Corrective Action. Q.A. was not notified of the error until 1-14-80.

REMEDY

a) Manufacturing supervision and operator were notified of discrepancy on 1-28-80.

b) A review of the affected drawing and planning was performed on 1-28-80. These documents were found to be adequate and did not contribute to the problem.

c) The inspector assigned to the program was cautioned on 1-28-80, to exercise more care during future inspections.

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FAILURE REPORT

F 1322

ORIGINATOR

1. PROGRAM NAME AND NUMBER: Thematic Mapper | 2. GLA: E330 | 3. MODEL: E-1 | 4. TIME OBSERVED: 1:30PM | 5. DATE OBSERVED: MO MAY DA 5 YR 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	Scan Mirror	3568899	005	
8. UNIT				
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ HRS. AT ___ ° ___ ☐ EMC/RFI ☐ VIBRATION ___ AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: BRDF testing showed an average Total Integrated Scatter of 0.5% and drawing Note [9] @64388 specifies less than 0.4%

15. TEST PROCEDURE ___ PARA ___ | 16. ORIGINATOR: M.P. Wirick | ORG: M-65 | DATE: 5/6/80 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: Failure verified by M.P. Wirick & Jim Siebert

18. FAILED ITEM NAME AND PART NUMBER

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: ~~Test not done for environmental testing reasons~~ SPEC CHANGED EO 64392

21. AUTHORIZATION ___ ORG ___ DATE ___ | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN | 24. QA REWORK | 25. QA RETEST

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY ___ ORG ___ DATE ___ | 28. RETESTED BY ___ ORG ___ DATE ___ | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: MEASURED VALUE IS CONSIDERED TO BE WITHIN STATE OF THE ART MFG. LIMITS. INCREASE SPEC TO ALLOW MEASURED VALUE FROM 0.4% TO 0.58% WHICH CORRESPONDS TO SCATTER SPEC AT NEXT LEVEL OF ASSEMBLY.

☐ CONTINUATION SHEET USED

31. FRB CLOSURE: [signature] 2/26

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: EO 64392

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☒ TEST PROC. ☐ ASSY/FAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAR-OUT | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☐ INDUCED ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] ORG: 77-15 DATE: 1-13-81

38. SPACECRAFT SYSTEM ENGR: [signature] ORG: 22-61 DATE: 1/16/81

39. RELIABILITY: [signature] ORG: 51-41 DATE: 1-15-81

40. CUSTOMER OR SUPPLIER: [signature] DATE: 2-11-81

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FAILURE REPORT

F 1325

1. PROGRAM NAME AND NUMBER: T.M. HS 236	2. QA: E33	3. MODEL: E-1	4. TIME OBSERVED: 10AM	5. DATE OBSERVED: MO 2 DA 2 YR 81	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☒ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART					

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER: STORAGE UNIT S/M 4		8533002-100	4	HAC

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ HRS AT ___ ° ___ . ☐ EMC/EMI ☐ VIBRATION ___ AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: TELEMETRY READOUT - LINE LENGTH WAS 000 000 000 000
(REV. I 1-26-81) TYP- LINE LENGTH IS 000 377 350 000
FAIL INDICATION WAS IN F-4 PRE-TEST AND #1098.1126-4.5.600 REPEAT 10AM (2.15)

15. TEST PROCEDURE: TS 32015-004 PARA 3.5.2 | 16. ORIGINATOR: D. Solomon | ORG: TT-31-11 | DATE: 3-2-81 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: TELEMETRY TABLE PRINTOUT REVEALED THAT NEITHER SERIAL FLAYER LINE LENGTH DATA WERE BEING RECEIVED. FURTHER INVESTIG. SHOWED THAT THIS CONDITION CAN ONLY OCCUR FOR CERTAIN INTERMI FAILURES IN THE DAS (TEST EQUIPMENT). REPAIR HAS BEEN POSTPONED FOR SUBSEQUENT (NON-DESTRUCTIVE & INTERMITTANT).

18. FAILED ITEM NAME AND PART NUMBER: DAS (TEST EQUIP)

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: CONFIRMATION OF DAS OPERABILITY TO BE PERFORMED AHEAD EACH DATA COLLECTION (PRINT 1ST 2 & LAST 2 TLMY TABLES & CONFIRM LINE LENGTH & TLMY OK) BEFORE PROCEEDING, REPAIR DAS INTERMITTANT WHEN PERMITS

21. AUTHORIZATION: [signature] | ORG: TT-32-11 | DATE: 3/2/81 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RETEST CONFIRMED INTERMITTANT FAILURE IN DAS. DATA TAKEN DURING PERIOD OF DAS POWER OPERATION CONFIRMED PROPER TELEMETRY LINE LENGTH READOUT. SEE TM SM4 F-1 MODEL ACCEPTANCE TEST DATA PG'S 25 186.

24. QA AGREE

25. QA APPROVAL JJ

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY: ___ ORG: ___ DATE: ___ | 28. RETESTED BY: [signature] ORG: ___ DATE: ___ | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: DAS INTERNAL COMPONENT FAILURE OR INTERMITTANT. REPAIR TO BE POSTPONED. REPAIR OUTLINE IN AND FROM PR. PRINCE TO AB. MARCHANT, Feb 23, 1981. TESTING WILL INCLUDE INFORMAL DATA CHECK TO CONFIRM VALID DATA BEFORE PROCEEDING TO FOLLOWING TEST. (PRINT SER. TLMY TABLES AT TREA FILE (6/6). CHECK FOR VALID DATA IN 1ST & LAST PRINT. ☐ CONTINUATION SHEET USED

31. FRB CLOSURE: [signature]

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

33. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☒ TEST EQUIP ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/PAB ERROR ☐ ROUGH HANDLING ☐ DEFECT CODE ☐ DEFECTIVE PARTS ☐ TEST SET UP ☐ WORKMANSHIP ☐ WEAR OUT

34. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☐ INDUCED ☒ NO FAILURE

35. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☐ MAJOR ☐ SAFETY

36. RESPONSIBLE ENGINEER: [signature] ORG: TT-32-11 DATE: 2-27-81

37. SPACECRAFT SYSTEM ENGR: [signature] ORG: 2261 DATE: 810314

38. RELIABILITY: [signature] ORG: T-41 DATE: 3-3-81

39. CUSTOMER OR SUPPLIER: [signature] DATE: 3/8/82

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HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR. ITEM NO. F-125

CONTINUATION SHEET LETTER

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

30 THE DAS (DATA ACQUISITION SYSTEM) WILL NOT BE REPAIRED UNLESS A FOLLOW-ON CONTRACT IS AWARDED. AT THAT TIME THE DAS WILL BE REPAIRED AS OUTLINED IN P.R. PRINCO'S AVO (DATED 2/23/81) TO A.R. MARSHALL. (COPY ATTACHED) 11/17/81

HS 236-7830 DIRECTS THAT DAS BE RED TAGGED TO FLAG DISCREPANCY AND ASSURE REPAIR PRIOR TO NEXT USE.

F1325

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company
INTERNAL MEMORANDUM

TO: G. Gaudette CC: A.B. Marchant DATE: 8 February 1982

REF: HS 236-7830
PE 21:82

FROM: A. Perline

SUBJECT: Equipment Usage Suspension for Scan Mirror Assembly DAS Test Set.

BLDG. B-11 MAIL STA. 39
EXT. 6106

1. Failure Report F1325 documents an SMA discrepancy that was discovered on 2 February 1981. The cause of this discrepancy was traced to the DAS used for testing the SMA.

2. The DAS will not be repaired unless there is some follow-up work on the Thematic Mapper.

3. It is necessary to preclude any possible future utilization of the DAS prior to repair. Therefore, you are requested to affix a red "equipment usage suspension" tag to the DAS with an explanation that maintenance is required prior to use.

A. Perline

AP:jc

Attachments: Failure Report F1325

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FAILURE REPORT

F 1327

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TM HS236 | 2. S/A: E330 | 3. MODEL: E-1 | 4. TIME OBSERVED: 10 AM | 5. DATE OBSERVED: MO 2 DA 2 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	SCAN MIRROR ASSY	3533002-100	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ . ☐ EMC/EPI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: (1) REF TFE K, L, M; DATA SHT 4.3.5.2; TURN AROUND TIME EXCEEDED 10592 ± 68 μSEC. 6 DIGITS - 11/42 10670.2 μS
(2) FAILURE IN SEQ#6 TFE'S J & K

15. TEST PROCEDURE: TS 32015-004 PARA 4.3.5.1 | 16. ORIGINATOR: R. SCHREINER | ORG 72-31-23 | DATE 2-2-81 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: Failure: From In-Data station fixture shows scan LS axis thickness should have been 2.5 mils; the shim value has been corrected (corrected turn-around times). Also Relay Mirror Position non-optimum

18. FAILED ITEM NAME AND PART NUMBER: DNA

19. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPORT TFE-H OF TS 32015-004 & PROCEED REF HS236-2043, & QS SEQUENCE #6

21. AUTHORIZATION: [signature] | ORG 72-32-11 | DATE 2/23/81 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: DONE IDC WC, TT, 3Y, SS ENS ACCEPTS EXISTING T4T. (HS236-7381) SEE (WAIVER - 121 ATTACHED)

24. Q-A REWORK

25. GA RETEST

23. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: ECR #64797 GENERATED TO INCLUDE SHIM PROCEDURE IN DP 50647 & TS 32015-004, S/N 5 & UP. TEST PERSONNEL MADE AWARE OF SENSITIVITY TO SHIMS & TORQUE. REV B of DEDP 50647 TO MORE NEARLY OPTIMIZE RELAY MIRROR POINT (TATA APROX = TATB) SER NO 5 & UP; [illegible] USE AS IS ☐ CONTINUATION SHEET USED

31. FRB CLOSURE: [signature] 4/9/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: ECR #64797 HS236-2043; ECR # 90612 [illegible]

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROC ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☒ TEST PROC ☐ ASSY/SAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET UP ☐ WORKMANSHIP ☐ WEAR-OUT | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☐ INDUCED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] | ORG 72-32-11 | DATE 2/23/81

38. SPACECRAFT SYSTEM ENGR: [signature] | ORG 22-61 | DATE 810407

39. RELIABILITY: [signature] | ORG 51 49 | DATE 4-8-81

40. CUSTOMER SUPPLIER: [signature] | DATE

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F 1327

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 18 November 1981

PROCURING ACTIVITY NO.:

1. ORIGINATOR NAME AND ADDRESS
Hughes Aircraft Company
Culver City, CA 90230

2. [ ] DEVIATION [X] WAIVER

3. [X] MINOR [ ] MAJOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. CFR. CODE	c. SYS. DESIG.	d. DEV/WAIVER NO
FL	82577	HS-236	W121

5. BASE LINE AFFECTED: [ ] FUNCTIONAL [ ] ALLOCATED [X] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	MFR. CODE	SPEC./DOC. NO.	SCN
a. SYSTEM			
b. ITEM			
c. TEST PLAN		TS32015-004	

8. DRAWINGS AFFECTED

MFR. CODE	NUMBER	REV.	NOR. NO.

9. TITLE OF DEVIATION/WAIVER
Turnaround Time Exceeds Specification

10. CONTRACT NO. & LINE ITEM
NAS 5-24200

11. CONFIGURATION ITEM NOMENCLATURE
Scan Mirror Assembly

12. CD NO. | 13. DEFECT NO | 14. DEFECT CLASSIFICATION: [ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED
Scan Mirror Assembly

16. PART NO. OR TYPE DESIG.
3533002-100

17. LOT NO. | 18. QTY

19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE
None

21. EFFECT ON DELIVERY SCHEDULE
None

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The F-1 SMA exceeded the specifications for turnaround time during acceptance test. The Specification for Turnaround time is 10590 ± 68 μsec. Four of the twenty measurements that were made exceeded the specification. The worst case exceedance was 10515.4 μsec or 13.2 μsec higher than the unit spec allows. Another was 6 μsec below the system specification. System Engineering evaluated these effects on system performance and found that they are acceptable. References: IDC HS236-7381, and Failure Report F1327 (Attached).

24. NEED FOR DEVIATION/WAIVER

Resetting the bumper springs would invalidate much of the acceptance test. The cost impact of repeating acceptance tests is not justified since this condition will not affect system performance.

REA A.B. Marchant

QA

RE

PE

25. PRODUCTION EFFECTIVITY BY SERIAL NUMBER
S/N 4 (F-1)

26. SUPPLYING ACTIVITY AUTHORIZING SIGNATURE: J.L. Enright 20 Nov 81 | TITLE: Mgr Systems Engineering

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC

SIGNATURE: Glenn B. Light | DATE: 11/23/81

DD FORM 1694

F1327

HUGHES

INTERDEPARTMENTAL CORRESPONDENCE

TO: B. Marchant
ORG:

CC: HS 236 Distribution

DATE: February 20 1981
REF. 7731.1/2043
HS 236-2043

SUBJECT: F-1 SMA Re-entry into the Acceptance Test

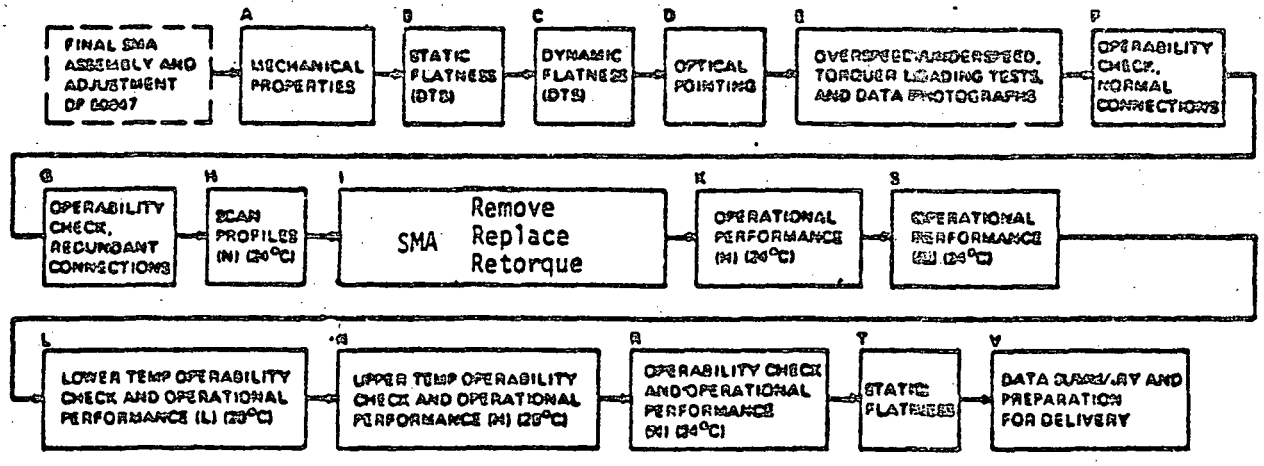
FROM: Nick J. Constantinides
ORG. 77-31-11

BLDG. 5 MAIL STA. B146
LOC. CC EXT. 7601

On February 4th the F-1 Scan Mirror Assembly Acceptance Test was interrupted. A penalty Acceptance Test was introduced so that a SAM Offset Angle variation and a pointing angle discrepancy be investigated. This investigation was completed on February 19th.

An IDC on pertinent information and findings resulting from this investigation will be published at a later time.
On February 20th, the F-1 SMA is scheduled to re-enter the Acceptance Test.

The reduced data, and the aforementioned investigation was conclussive of the fact that both SAM Offset and Pointing angle discrepancy were not related to the SMA's thermal and/or vibrational test.
For this reason the recommandation is made that the F-1 SMA re-enters the Acceptance Test starting with Test Flow Event "H" as shown below.



(a) OVERALL (N, N, L) INPUT VOLTAGES, HIGH, NOMINAL, LOW
DTS = DEVELOPMENT TEST STATION

F-1 SMA Test Flow Event Sequence.

Test flow event I was Vibration and Thermal Cycle. It has been changed to a test that consists of removing and replacing the SMA on the TDS fixture.

It is to be noted that a new scan profile baseline is established by a re-run of Test Flow Event "H" which incorporates new, corrected values for Scan Mirror pointing angles.

N. Constantinides
Systems Engineering

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F 1327

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: J. L. Engel CC: Distribution DATE: 1 April 1981
REF: HS236-7381

SUBJECT: F-1 Scan Mirror Acceptance Test Data FROM: W. H. Freudenstein

BLDG. 774 MAIL STA. 79
EXT. 4132

SUMMARY

The test data for the Flight One Model of the Thematic Mapper Scan Mirror Assembly was reviewed on 13 March 1981. The performance of the assembly as validated by the test record is excellent. The turn around time specification is exceeded. This does not pose a problem to system performance at the levels measured.

DISCUSSION

The acceptance test data for the F-1 SMA is summarized in Table I. The scan profile data is excellent and meets the required specifications in all cases. A special procedure was employed for this unit to provide a calibration profile at the end (in addition to the beginning) of the acceptance test sequence. This data showed a maximum nonlinearity of 9.9 μrad along scan and -1.7 μrad cross scan. The maximum band-to-band misregistration was determined at this point to be 0.044% compared to a specification of 0.094%. The maximum overlap/underlap is 1.23 μrad against a requirement of 2.1 μrad. Along and cross-scan geometric repeatability met specification as did line length repeatability and scan rate.

The specification for turnaround time imposed by the SMA specification had been tightened since the test of the Protoflight unit. The specification for turnaround time imposed on the Flight One SMA was 10590 ± 68 μsec. This specification was exceeded in four instances, in the worst case by 13.2 μsec at 10670.2 μsec. That number indicates an out of specification condition as far as the SMA spec is concerned. It does not represent an out of spec condition at the system level. One value of turnaround (SAM 2, turnaround B) is out of spec both with regard to the SMA spec and the system spec of 10.515 msec as compared to a system spec of 10.521 msec. Analysis of the impact of this condition indicates a minimal impact on overlap/underlap. No other system level specifications are impacted. The performance underlap/overlap is dominated by other terms to the extent that this condition will not affect system performance.

The F-1 SMA performs well and is acceptable from the view of Systems Engineering for mating with the Flight One Thematic Mapper.

W. H. Freudenstein

/lbg

F 1327

W. H. Freudenstein to J. L. Engel
HS236-7381
1 April 1981

TABLE I
SCAN PROFILE DATA

TEST SEQUENCE H	ALONG SCAN PROFILE (μRAD) FWD	REV	CROSS SCAN PROFILE (μRAD) FWD	REV	BAND-TO-BAND REGISTRATION (%) FWD	REV	OVERLAP/UNDERLAP MAX/μRAD
SME 1	+5.4	+ 7.4	+0.0	+0.3	0.051	0.039	0.82
	-6.4	- 3.9	-1.6	-1.2			
SME 2	+8.7	+10.1	+0.5	+0.9	0.044	0.045	1.23
	-3.1	- 1.7	-1.2	-0.7			

TEST SEQUENCE I	ALONG SCAN REPEATABILITY μRAD RMS FWD	REV	CROSS SCAN REPEATABILITY μRAD RMS FWD	REV
	1.39	0.85	0.56	0.77

TEST SEQUENCE K	ALONG SCAN REPEATABILITY μRAD RMS FWD	REV	CROSS SCAN REPEATABILITY μRAD RMS FWD	REV	LINE LENGTH REPEATABILITY μSEC/σ FWD	REV
SME 1	0.62	0.50	0.89	1.13	0.39	0.39
SME 2	1.26	0.65				

TEST SEQUENCE S	ALONG SCAN REPEATABILITY μRAD RMS FWD	REV	CROSS SCAN REPEATABILITY μRAD RMS FWD	REV
SME 1	0.85	1.17	0.78	1.13
SME 2	0.82	0.41	0.65	0.64

TEST SEQUENCE L	ALONG SCAN REPEATABILITY μRAD RMS FWD	REV	CROSS SCAN REPEATABILITY μRAD RMS FWD	REV
SME 1	1.57	1.71	0.50	0.61
SME 2	1.19	0.92	0.55	0.66

F 1327

W. H. Freudenstein to J. L. Engel
HS236-7381
1 April 1981

TABLE I - SCAN PROFILE DATA - Page 2 of 2

TEST SEQUENCE N	ALONG SCAN REPEATABILITY µRAD RMS FWD	REV	CROSS SCAN REPEATABILITY µRAD RMS FWD	REV
SME 1	1.13	1.29	1.17	0.82
SME 2	1.19	1.09	1.06	0.81

TEST SEQUENCE R	ALONG SCAN REPEATABILITY µRAD RMS FWD	REV	CROSS SCAN REPEATABILITY µRAD RMS FWD	REV
SME 1	1.18	0.51	0.74	0.89
SME 2	0.82	0.54	1.70	0.85

TEST SEQUENCE H-7	ALONG SCAN PROFILE (µRAD) FWD	REV	CROSS SCAN PROFILE (µRAD) FWD	REV	BAND-TO-BAND REGISTRATION (%) FWD	REV	OVERLAP/UNDERLAP /MAX/µRAD
SME 1	+6.0 -5.5	+6.6 -3.9	-0.1 -1.7	+0.2 -1.3	0.044	0.044	1.23
SME 2	+9.3 -3.0	+9.9 -1.9	-0.1 -1.7	+0.2 -1.3	0.046	0.042	0.82

TEST SEQUENCE	(µSEC) TURNAROUND TIME SAM 1 TTA	TTB	SAM 2 TTA	TTB
K	10658.3	10536.4	10653.3	10526.4
S	10651.9	10542.5	10648.9	10530.8
L	10656.0	10540.1	10647.1	10534.2
N	10653.5	10539.8	10650.6	10527.8
R	10670.2	10524.7	10664.6	10515.4

SPEC. 10590 ± 68 µSEC

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SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1328

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TM HS 236 | 2. GLA: E330 | 3. MODEL: F-1 | 4. TIME OBSERVED: 1500 | 5. DATE OBSERVED: MO 2 DA 4 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	F.I SCAN MIRROR ASSEMBLY	3535002-100	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ ° ____ HRS AT ____ TYPE AFTER THERMAL ☐ OTHER

14. DESCRIPTION OF FAILURE: TFE S, L, N: SME 2; REV SCAN OUT OF SPEC. RMS; ON GEOMETRIC WAS 1.82; 2.07; 2.61 : SHOULD BE ≤ 1.75 mrad
ALSO SME 1: TFE N. REV SCAN WAS 2.64

15. TEST PROCEDURE: TS 32015-004 PARA 4.3.4.1 | 16. ORIGINATOR: R. SCHREINER | ORG: 177-81-25 | DATE: 4-6-81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: REF HS 236-2043; TRANSMISSION OF BUMPER SPRING BRACKET TO SAM WING & FOLD MIRRORS IS DEPENDENT UPON ~~INTERFACE SHIM~~ PROPER INTERFACE SHIM & TORQUE, SHIM WAS 5 MILS & SHOULD HAVE BEEN 2.5 MILS, & THE SHIMS & TORQUES HAVE BEEN CORRECTED, TORQUE WAS INCORRECT ON INTERFACE BOLTS.

18. FAILED ITEM NAME AND PART NUMBER

20. ☐ ROL; CARRY REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPEAT TFE-H ; REMOVE & REPLACE SMA ; CONTINUE UNIT TEST SPEC, ~~PER~~ FOLLOWING TFE-H PRIOR TO REMOVAL PERFORM ENGIN TEST I SMEW SAMS ONLY, ALONG & CROSS SCAN GEO. REPEATABILITY (AT 43532)

21. AUTHORIZATION: [signature] | ORG: 177-32-11 | DATE: 4-23-81 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RETESTED SUCCESSFULLY TO TS 32015-004 Para 4.3.4.1 - DATA SHEET ATTACHED

24. QA REWORK

25. QA RETEST

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	USE	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: TEST PERSONNEL CAUTIONED ABOUT SENSITIVITY TO SHIMS & TORQUE. ECR SUBMITTED FOR SHIM PROCEDURE ADDITION TO DP 50647 & TS 32015-004, S/N 5 & UP

31. FRB CLOSURE: R J Wilkinson

☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: ECR 864797 ; EO 13112

34. BASIC CAUSE OR VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☒ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☒ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] | ORG: 177-32-11 | DATE: 4-23-81

38. SPACECRAFT SYSTEM ENGR: [signature] | ORG: 22-61 | DATE: 810414

39. RELIABILITY: [signature] | ORG: 51-41 | DATE: 4-3-81

40. CUSTOMER OR SUPPLIER: [signature] (GMEI) | DATE:

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ENGINEERING ORDER (SEE EP 1-14 FOR INSTRUCTIONS)

HUGHES

CODE IDENT 08877

DRG/SPEC NUMBER: TS92015-004

DRG/SPEC TITLE: ACCEPTANCE TEST SPECIFICATION FOR TM-SMA

☒ EO NO. 13112 SH 1 OF 3

☐

CONTROL ITEM NAME	SYS/EQPT	AUTHORITY
SMA	THEMATIC MAPPER	ECR 864797 Grp B

CONTROL ITEM PART NUMBER	CHANGE EFF	CONTROL ITEM PART NUMBER	CHANGE EFF	CONTROL ITEM PART NUMBER	CHANGE EFF
3535002-100	1 & UP				

ZONE

DESCRIPTION

p36
4.3.3.2-1 Add in the Acceptance Test Specification Document DS 32015-004 B, page 36 as Paragraph 4.3.3.2-1
The SMA INSTALLATION-REMOVAL Procedure outlined below:

4.3.3.2-1 SMA INSTALLATION & REMOVAL

Because of flatness imperfections in fabricating the SMA frame and the sensitivity of the SMA Optics to bending moments, installing and removing the SMA from its interface requires special attention.

In Fig. 4.3.3.2.1A the SMA bolts are number coded as per SBRC code and are to be torqued-down to within 30 ± 2 in-lbs in their order of appearance on the table of the figure 4.3.3.2-1A.

Insert shims between SMA and interface, using the shim location and thickness established during the SMA assembly. (DP 50647)

Verification of torquing, torque Sequence and Shimming is required by QA, and QA stamp is required to to entered on DATA SHEET 4.3.0-4 page 64a . DATA SHEET 4.3.0-4 is attached as part of this EO.

p46
4.3.7 Also add on Page 46 paragraph 4.3.7 the folowing:

4.3.7 Operability Check:

Install the SMA on the TDS as per INSTALLATION proceedure outlined on page 36 paragraph 4.3.3.2-1. CAUTION: .....

DISPOSITION OF ITEMS

N/A

	ORG CODE	DATE		ORG CODE	DATE
PREPARED BY: Nick J. Constantinides	77-31-11	2-24-81			
CHECKED BY:	77-32-10	81-03-17			
APPROVAL:	77-32-10	81-03-27	RELEASED BY:	70-910	81-03-27

9743 CS AUG 79

1328

ENGINEERING ORDER – [redacted]

(SEE EP 1-14 FOR INSTRUCTIONS)

HUGHES

CODE IDENT 62577

ED NO. 13112 SH 2 OF 3

[redacted]

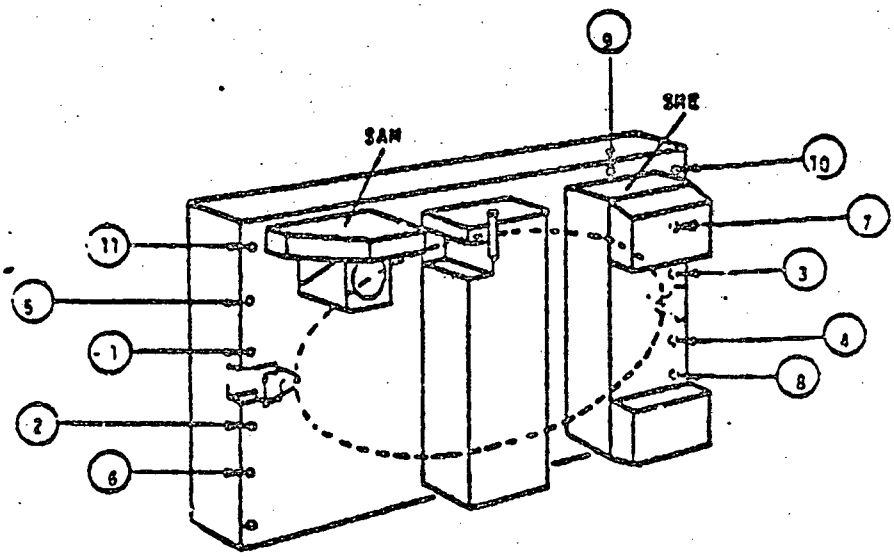
DWG/SPEC NUMBER

TS-32015-004

ZONE

DESCRIPTION

SHA INSTALLATION-REMOVAL CONFIGURATION



NOTE: Torque SHA to TDS fixture using 30 ± 2 in-lbs. Use only bolts indicated.

Order Of Torquing	Bolt # As Defined At SBRC
1	17
2	19
3	20
4	18
5	15
6	13
7	14
8	16
9	6
10	12
11	10

FIGURE 4.3.3.2-1A

97430 CS AUG 74

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ENGINEERING ORDER – ~~REVISION NOTICE~~
(SEE EP 1.14 FOR INSTRUCTIONS)

HUGHES CODE IDENT 88971	☒ EO NO. 13112 SH 3 OF 3 ☐ ~~REV NOTICE ETC~~ ~~NO~~ ~~NO~~	DWG/SPEC NUMBER TS32015-004

ZONE | DESCRIPTION

DATA SHEET 4.3.0 - 4

SSA INSTALLATION AND REMOVAL FROM THE DTS INTERFACE

INSTALLATION Initial		RE-INSTALLATION Post-Vibration	
Bolt #	QA	Bolt #	QA

Installation/Removal of SMA was executed by: _____ QA _____

NOTE: _____

SHIMS ARE LOCATED @ BOLT # _____ QA _____

DATE: _____

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TS 32015-004
8 March 1980

DATA SHEET 4.3.6-3
OPERATIONAL PERFORMANCE
ALONG SCAN GEOMETRIC REPEATABILITY
SAM MODE (and calibrated)

SMA Designation F-1 ACCEPT TEST S/N 4 SME (1) or (2) 2 Voltage: High ___, Nom ___, Low ___

IPAR COUNTS:
CALIBRATION
BUMPER A
P2 P3 3559
MID - P1 P4 328429
P0 P5 164240
BUMPER B 0
-3139

K = 0.5000079

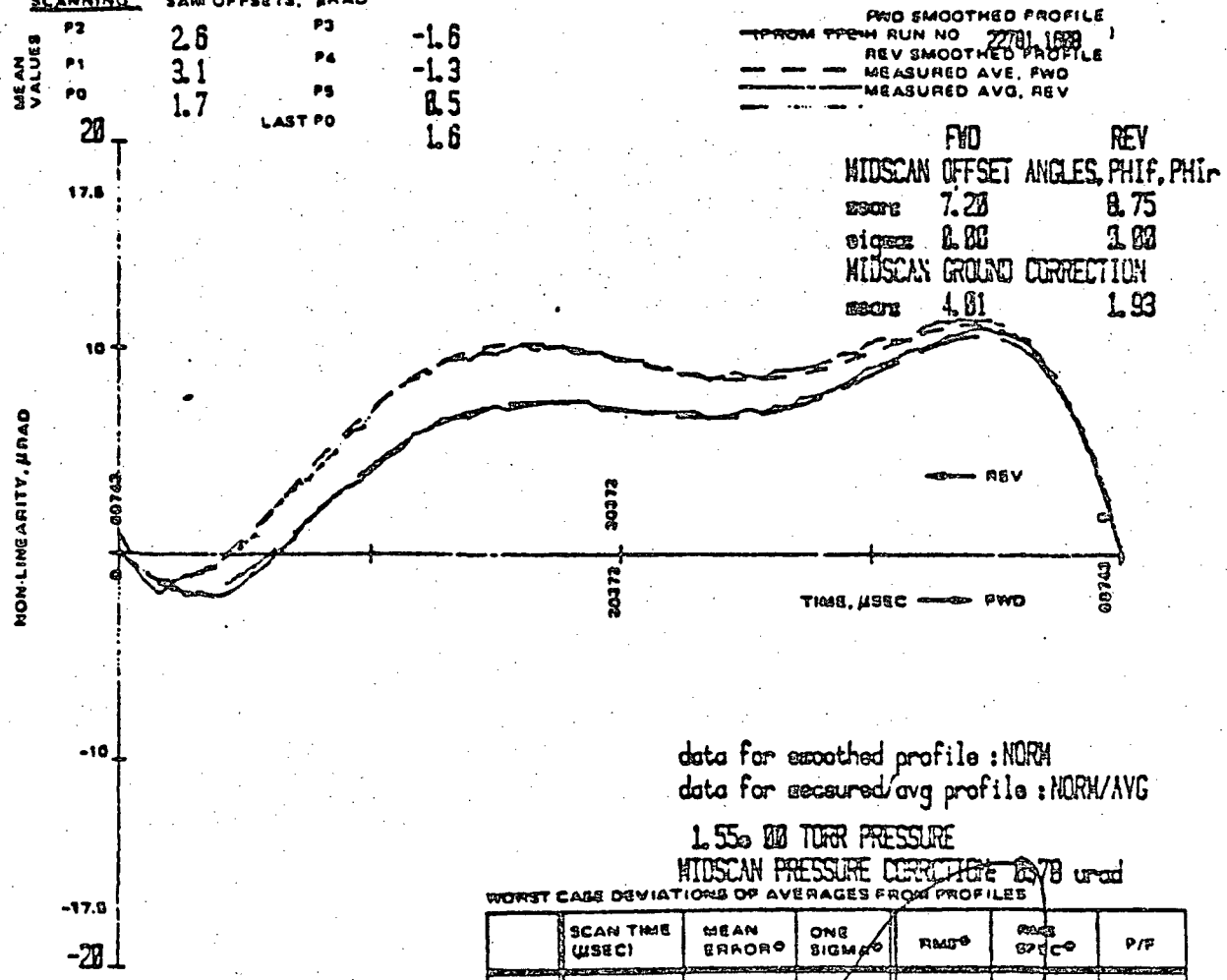
TEMPS: T1 T2 T3 T4 T5 T6 T7 T8 T9
28.9 -28.8 7.1
26.1 24.8 25.5 25.9 26.1 27.8 30.6 24.8 24.8

SAM ANGLES USED (MRAD) -67.182 67.160

SCANNING SAM OFFSETS, μRAD

MEAN VALUES

P2	2.6	P3	-1.6
P1	3.1	P4	-1.3
P0	1.7	P5	0.5
		LAST P0	1.6



data for smoothed profile : NORM
data for measured/avg profile : NORM/AVG

1.55e 00 TORR PRESSURE
MIDSCAN PRESSURE CORRECTION 0.78 urad

WORST CASE DEVIATIONS OF AVERAGES FROM PROFILES

	SCAN TIME (μSEC)	MEAN ERROR*	ONE SIGMA*	RMS*	RMS SPEC*	P/F
FWD	0.00	-0.82	0.00	0.82		
REV	46119.36	-0.41	0.36	0.54	1.75	P

* MICRORADIANS

Run No. 30981.1651
Test Flow Event R-20 seq 6
Comments test no. 20.19 FWD/19 REV SCAN, 75pts each

QA Stamp _____ Date 30981
Tested By _____

NO. REQ'D = 22

HUGHES
HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1329

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
T.M HS 236	E330	4	1500	MO 3 DA 4 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	F1 SCAN MIRROR ASSEMBLY	3533002-100	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ HRS. AT ____ ° ____ TYPE TEE H ☐ OTHER

14. DESCRIPTION OF FAILURE: CROSS SCAN RMS EXCEEDED SPEC. (-2.0). REQ'D 1.5 μradians

15. TEST PROCEDURE T.S 32015-004 PARA 4.3.4.1 | 16. ORIGINATOR R Schaeuman ORG 377-31-25 DATE 12-6-81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VARIFICATION AND FAILURE ANALYSIS: TESTS INDICATE POSSIBILITIES OF ±1 μRAD ERROR IN LINEAR TERM RE-MOVED FROM CROSS AXIS IFAR PROFILES DUE TO CROSS AXIS IFAR FIXTURE TEMP GRADIENTS. EO 13111 APPLIES A TEST IN CALIBRATION TO INSURE TEMP. STABILITY (OF TEST EQUIP). ADDITIONAL VARIATIONS IN LINEAR TERM MAY BE AN INHERANT FLEX PIVOT PHENOMINON

19. FAILED ITEM NAME AND PART NUMBER N/A (TEST EQUIP)

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPEAT TEE H & BEYOND (EXCLUDING TEE J). REF HS 236-2047

21. AUTHORIZATION J.R. Smith ORG 377-32-11 DATE Feb 23, 81 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RETESTED SUCCESSFULLY - SEE TM SN# F-1 MODEL ACCEPTANCE TEST DATA PKG, PG 357

24. QA REWORK [illegible]

25. QA RETEST [illegible]

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY ____ ORG ____ DATE ____ | 28. RETESTED BY ____ ORG ____ DATE ____ | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: ECR 864796
EO 13111 ADDS TEST TO INSURE CROSS-AXIS IFAR (TEST EQUIP) THERMAL STABILITY. WITH SOFTWARE CHANGE OF EO 13111 NO FAILURE ~~IF~~ EXISTS IN CROSS SCAN RMS. (SEE DATA SHEET ATTACHED)

31. ☐ CONTINUATION SHEET USED

33. FRB CLOSURE [signature] 4/8/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: EO 13111 TO TS 32015-004

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER [signature] ORG 377-32-11 DATE Feb 23 '81

38. SPACECRAFT SYSTEM ENGR [signature] ORG 2261 DATE 3/04/81

39. RELIABILITY [signature] ORG 51-41 DATE 4-6-81

40. CUSTOMER OR SUPPLIER [signature] DATE 4/10/81

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F 1329

HUGHES

INTERDEPARTMENTAL CORRESPONDENCE

TO: B. Marchant
ORG:

CC: HS 236 Distribution

DATE: February 20 1981
REF. 7731.1/2043
HS 236-2043
FROM: Nick J. Constantinides
ORG. 77-31-11

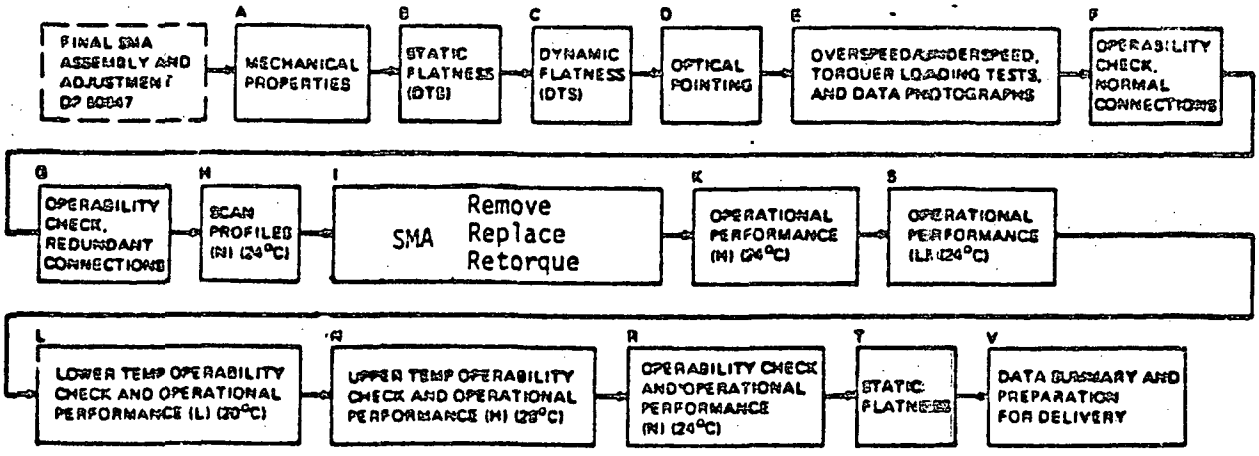
BLDG. 5 MAIL STA. B146
LOC. CC EXT. 7601

SUBJECT: F-1 SMA Re-entry into the Acceptance Test

On February 4th the F-1 Scan Mirror Assembly Acceptance Test was interrupted. A penalty Acceptance Test was introduced so that a SAM Offset Angle variation and a pointing angle discrepancy be investigated. This investigation was completed on February 19th.

An IDC on pertinent information and findings resulting from this investigation will be published at a later time.
On February 20th, the F-1 SMA is scheduled to re-enter the Acceptance Test.

The reduced data, and the aforementioned investigation was conclussive of the fact that both SAM Offset and Pointing angle discrepancy were not related to the SMA's thermal and/or vibrational test.
For this reason the recommandation is made that the F-1 SMA re-enters the Acceptance Test starting with Test Flow Event "H" as shown below.



(a) OVERALL (H, N, L) INPUT VOLTAGES, HIGH, NOMINAL, LOW
DTS = DEVELOPMENT TEST STATION

F-1 SMA Test Flow Event Sequence.

Test flow event I was Vibration and Thermal Cycle. It has been changed to a test that consists of removing and replacing the SMA on the TDS fixture.

It is to be noted that a new scan profile baseline is established by a re-run of Test Flow Event "H" which incorporates new, corrected values for Scan Mirror pointing angles.

N. Constantinides
Systems Engineering

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SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1330

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
TM HS-236	E330	F-1		MO 3 DA 3 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	SMA	3533002-100	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROGRESS ☒ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☒ TEMPERATURE 24 °C ☐ THERMAL VAC ____ HRS AT ____ ° ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Turnaround time exceeded limits 10658.3 μsec. Should be less than 10658 μsec; Bumper A out of spec .3 μsec. TFE K-1 (SME 1) High Voltage; 24°C

15. TEST PROCEDURE: TS32015-004 PARA 4.3.5 | 16. ORIGINATOR: R. Schreiner ORG 77-31-25 DATE 3-3-81 | ☐ 17. CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Spec limit exceeded verified by McVey & Prince

19. FAILED ITEM NAME AND PART NUMBER:

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Turnaround times are stable ie nothing broken or changing with time except for normal wear see IDC and measured values are acceptable to system engineering

21. AUTHORIZATION | ORG | DATE | ☐ 22. CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: IDC HS236-7381 written by SBRC systems engineering accepts existing turnaround time

24. QA REWORK

25. QA RETEST

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLY DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | ☐ 29. CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: THIS IS NOT A FAILURE
UNIT LEVEL OUT OF SPEC. CONDITION HAS BEEN ACCEPTED PER W 121 [signature] 12/2/81

31. ☐ CONTINUATION SHEET USED

33. FRB CLOSURE [signature] 12/2/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: W 121 (COPY ATTACHED)

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP. ☐ MFG. PROCEDURES ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/FAB ERROR ☐ ROUGH HANDLING ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAR-OUT

DEFECT CODE:

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☐ INDUCED ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER [signature] ORG 77-15 DATE 4/22/81

38. SPACECRAFT SYSTEM ENGR. [signature] ORG 2261 DATE 12/2/81

39. RELIABILITY [signature] ORG 57-41 DATE 4-22-81

40. CUSTOMER OR SUPPLIER [signature] DATE

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F1330

REQUEST FOR DEVIATION/WAIVER
(SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS)

DATE PREPARED: 18 November 1981

PROCURING ACTIVITY NO.:

1. ORIGINATOR NAME AND ADDRESS
Hughes Aircraft Company
Culver City, CA 90230

2. [ ] DEVIATION [X] WAIVER

3. [X] MINOR [ ] MAJOR [ ] CRITICAL

4. DESIGNATION FOR DEVIATION/WAIVER

a. MODEL/TYPE	b. MFR. CODE	c. SYS. DESIG.	d. DEV/WAIVER NO.
FL	82577	HS-236	W121

5. BASE LINE AFFECTED: [ ] FUNCTIONAL [ ] ALLOCATED [X] PRODUCT

6. OTHER SYSTEMS/CONFIGURATION ITEMS AFFECTED: [ ] YES [X] NO

7. SPECIFICATIONS AFFECTED-TEST PLAN

	MFR. CODE	SPEC./DOC. NO.	SCN
a. SYSTEM			
b. ITEM			
c. TEST PLAN		TS32015-004	

8. DRAWINGS AFFECTED

MFR. CODE	NUMBER	REV.	NOR. NO.

9. TITLE OF DEVIATION/WAIVER
Turnaround Time Exceeds Specification

10. CONTRACT NO. & LINE ITEM
NAS 5-24200

11. CONFIGURATION ITEM NOMENCLATURE
Scan Mirror Assembly

CLASSIFICATION OF DEFECT

12. CD NO. | 13. DEFECT NO | 14. DEFECT CLASSIFICATION: [ ] MINOR [ ] MAJOR [ ] CRITICAL

15. NAME OF PART OR LOWEST ASSEMBLY AFFECTED: Scan Mirror Assembly
16. PART NO. OR TYPE DESIG.: 3533002-100
17. LOT NO.
18. QTY
19. RECURRING DEVIATION/WAIVER: [ ] YES [X] NO

20. EFFECT ON COST/PRICE
None

21. EFFECT ON DELIVERY SCHEDULE
None

22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.

23. DESCRIPTION OF DEVIATION/WAIVER

The F-1 SMA exceeded the specifications for turnaround time during acceptance test. The Specification for Turnaround time is 10590 ± 68 μsec. Four of the twenty measurements that were made exceeded the specification. The worst case exceedance was 10515.4 μsec or 13.2 μsec higher than the unit spec allows. Another was 6 μsec below the system specification. System Engineering evaluated these effects on system performance and found that they are acceptable. References: IDC HS236-7381, and Failure Report F1327 (Attached).

24. NEED FOR DEVIATION/WAIVER

Resetting the bumper springs would invalidate much of the acceptance test. The cost impact of repeating acceptance tests is not justified since this condition will not affect system performance.

REA A.B. Marchant

QA

RE

PE

25. PRODUCTION EFFECTIVITY BY SERIAL NUMBER
S/N 4 (F-1)

26. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE: 20 Nov 81
TITLE: Mgr Systems Engineering

27. APPROVAL/DISAPPROVAL

a. [ ] APPROVAL RECOMMENDED

b. [X] APPROVED [ ] DISAPPROVED

c. GOVERNMENT ACTIVITY: NASA GSFC
SIGNATURE: [illegible] DATE: 11/23/81

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F

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HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

1. PROGRAM NAME AND NUMBER: HS236 Themat.c Mapper	2. GLA: E330	3. MODEL: FLT	4. TIME OBSERVED: 1300	5. DATE OBSERVED: 6 28 80	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART					

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM	(SMA) Scan Mirror Assy.	3533002-100		
8. UNIT				
9. ☑ ASSEMBLY ☐ SUBASSEMBLY	Torquer Assy.	1568911	004	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER	Subassembly: Housing Assy. Torquer	3568909	004	

ORIGINATOR

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☑ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ ESD/EMI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Torquer Motor fails OP 32015-009 dated 24 April 1978, step 4.7.1 Torquer output test. Torquer motor torqued to mid-position instead of Torquing to the right or left (normal indication)

15. TEST PROCEDURE: DP32015-009 PARA: 4.7.1 | 16. ORIGINATOR: A. G. Holer ORG: 28 15/25 DATE: 7-17 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Coil Assy. 3568908-2 was found incorrectly indexed causing a Phase Shift. NO OVERSTRESS RESULTED FROM THIS CONDITION, Failure was verified with unit in Design Configuration. 12-3-80

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Remove & Replace coils per prinr

21. AUTHORIZATION: R. L. Coon ORG: 77/15 DATE: 7/30/79 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Removed and replaced coils per prinr and retested per DP 3205-009 PARA 4.5.1 & 4.7.1

QA RECORD

23. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
3568908-2		[illegible]				

24. REWORK BY: [illegible] ORG: 73-22 DATE: 6-25-79 | 25. RETESTED BY: McVey ORG: 77-32-24 DATE: 7/80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

26. CAUSE AND CORRECTIVE ACTION: IMPROPER USE OF ASSY TOOLING AND BAD JUDGEMENT ON PART OF QUALITY SUPERVISION

SEE CAR 63109

REF FR F1302

27. FRB CLOSURE: [signature] 3/2/81

☐ CONTINUATION SHEET USED

28. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: CAR 63109

29. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☑ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

30. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 31. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☑ MINOR ☐ SAFETY

32. RESPONSIBLE ENGINEER: [signature] ORG: 77-15 DATE: 12-3-80 | 33. SPACECRAFT SYSTEM ENGR: R. A. Fitzsimmons ORG: 22-61 DATE: 2/3/81

34. RELIABILITY: [signature] ORG: 77-41 DATE: 12-2-80 | 35. CUSTOMER OR SUPPLIER: G.G. DATE: 3/11/81

11873 SC JUL 78

JFR P-1342

CORRECTIVE ACTION REQUEST

63109

SEE REVERSE SIDE FOR COMPLETION INSTRUCTIONS

NAME	SOURCE CODE	ADDRESS/MAIL STATION	PHONE EXT.
1. TO: E.A. Anzivino	77-03	12/7122	4105
2. FROM: R.L. Coon	77-15	12/7104	7433

3. REFERENCE: I/CA 42133, Same Subject

4. [illegible] GLA NO.

ORIGINATOR

5. PLEASE TAKE THE NECESSARY ACTION TO CORRECT THE CAUSE OF THE FOLLOWING CONDITION(S):
PROBLEM DESCRIPTION:

1. Reply to noted PFT was unsatisfactory to properly dispose of [illegible] Report numbers F1302 and F1343.
2. Dimensions on the drawings are clearly within the requirements of the Comp. Dr. (See 12.3, paragraph 2.3 and 5.0 paragraph 3.0 h.).
3. Documentation that story aid was not used is required (See [illegible] CIS required use of same.

6. [signature] SIGNATURE 10/5/79 DATE

BLDG. 12 MAIL STATION 7/2 c

RECIPIENT

7. CAUSE:

1. "Corrective Action Request 63103" to E. A. Anzivino from A. J. Rodenbucher Ref. 7934/681 dated 8 November 1979.
2. "Corrective Action Request 63109" to A. J. Rodenbucher from R. D. Gourlay Ref. 7631.20/323 dated 30 October 1979.

8. THE FOLLOWING CORRECTIVE MEASURES HAVE BEEN TAKEN TO ELIMINATE THE CAUSE OF THE CONDITION(S) NOTED ABOVE
EFFECTIVITY: _____
(LOT, SERIAL, DATE, OTHER)

9. REMEDY:

1. "Corrective Action Request 63109" to E. A. Anzivino from A. J. Rodenbucher Ref. 7934/681 dated 8 November 1979.
2. "Corrective Action Request 63109" to A. J. Rodenbucher from R. D. Gourlay Ref. 7631.20/323 dated 30 October 1979.

10. SIGNED: [signature] DATE 11/5/79

11. CONCLUSION – SATISFACTORY CORRECTION HAS BEEN EFFECTED – YES ☒ NO ☐

12. FOLLOW UP REQUIRED:

13. SUSPENSE DATE: _____ 14. SIGNED: [signature] DATE 11/5/79
(ORIGINATOR)

ORIGINATOR

F1342

CIP

INTERDEPARTMENTAL CORRESPONDENCE

TO: E. A. Anzivino
ORG: 77-07

CC:

DATE: 8 November 1979
REF. 7934/681

SUBJECT: Corrective Action Request 63109

FROM: A. J. Rodenbucher
ORG. 79-34

BLDG. T4005 MAIL STA. W750
LOC. CC EXT. 7898

After extensive investigation the following was found:

Traceability for the 3568902, S/N 4 housing could not be established. The fact that the 3568902 housing is not physically marked until the 3568911 assembly made obtaining history on the housing impossible.

Assuming that the 3568902 housing for torquer assembly, S/N 4 is in fact the housing manufactured as S/N 4, it is reasonable to surmise from the evidence at hand that the tooling was improperly used.

The personnel currently assigned to the involved activity have been reinformed by their department manager on the importance of strictly adhering to the operation instruction sheet and applicable drawings and specifications. Effective date of corrective action is 30 October 1979.

A judgement error was made by Quality Supervision in assessing by-passed assembly and inspection operations. Subject Supervisor has been instructed to evaluate unusual conditions in assembly/inspection operations more thoroughly. Effective date of corrective action is 8 November 1979.

A. J. Rodenbucher, Head
Engineering Divisions Support
Product Assurance
Division 79

AJR:maj

F1342

INTERDEPARTMENTAL CORRESPONDENCE

TO: A. Roderbucher ✓ CC: E. Shimbel
ORG: 79-30

DATE: 30 October 1979
REF. 7631.20/323

SUBJECT: Corrective Action Request 63109

FROM: R. D. Gourlay
ORG. 76-31

BLDG. 6 MAIL STA. D163
LOC. CC EXT. 21512

All the involved personnel in this department were interviewed regarding the fabrication of the discepant 3568911 torquer assembly. Because of the elapsed time and transfer of some involved personnel, a complete picture of the assembly process for serial #4 could not be pieced together. It is reasonable to surmise from the evidence at hand that the tooling was improperly used.

The personnel currently assigned to the involved activity have been reinformed on the importance of strictly adhering to the Operation Instruction Sheet and applicable drawings and specifications.

R. D. Gourlay, Manager
Components Development Department

RDG/gr

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HUGHES
HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1352

1. PROGRAM NAME AND NUMBER: HS236-TPA	2. GLA: E330	3. MODEL: F-1	4. TIME OBSERVED: 5:00 PM	5. DATE OBSERVED: MO 9 DA 20 YR 79	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED	☐ SPACECRAFT ☐ SYSTEM	☐ SUBSYSTEM ☐ UNIT	☐ ASSEMBLY ☐ SUBASSEMBLY	☐ MODULE ☐ MICAM	☐ CARD ☒ PART

ORIGINATION

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER PART	MIRROR	3564899	5	AOC

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROGRESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☒ SCATTER TEST

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMPERATURE ____ ° ____ AXIS FOR ____ MIN ☐ THERMAL VAC ____ HRS. AT ____ ° ____ TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: SCATTER DOES NOT MEET REQ'TS OF NOTE 19 OF DWG (0.2%) - ACTUAL SCATTER MEASURED WAS 0.4% IN ONE AXIS AND ~~-~~ % IN OTHER 0.32% 18m 12/16

15. TEST PROCEDURE: ____ ARA ____ 16. ORIGINATOR: E.W. GASSETT ORG 77-45 DATE 9/20/79 ☐ 17. CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS:
VERIFIED BY TEST - SEE ATTACHED SHEETS AND QCHR ECC 60258

19. FAILED ITEM NAME AND PART NUMBER: 3568899, MIRROR

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE:
MIRROR MUST BE REPOLISHED

21. AUTHORIZATION: [signature] ORG 77-45 DATE 9/20/79 ☐ 22. CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RETURN TO VENDOR FOR REWORK
SEE FR 1305 AND NCMR 316897 ALD
SCAR 63891

24. QA REWORK: ____ 25. QA RETEST: ____

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY ____ ORG ____ DATE ____ 28. RETESTED BY ____ ORG ____ DATE ____ ☐ 29. CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
INADEQUATE POLISHING - (SEE ITEM 23)

CORRECTIVE ACTION -
SCATTERING TESTS TO BE PERFORMED PRIOR TO MIRROR ACCEPTANCE FROM AOC.
ALSO SPEC REVISED TO 0.4% E064388 ☐ 31. CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: E064388 HS236-1654

33. FRB CLOSURE: [signature] 4/6/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☒ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN ☐ DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] ORG 72-15 DATE 12-3-80

38. SPACECRAFT SYSTEM ENGR.: [signature] ORG 22-61 DATE 12/11/80

39. RELIABILITY: [signature] ORG 51 41 DATE 12-11-80

40. CUSTOMER OR SUPPLIER: GG DATE 4/10/81

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~~F 1365~~
F 1352

HUGHES

SUPPLIER CORRECTIVE ACTION REQUEST

63891

(INSTRUCTIONS ON BACK)

SUPPLIER NO. 50762 DATE 12-7-79

SUPPLIER APPLIED OPTICS CENTER
ADDRESS 10 "B" STREET
BURLINGTON, MA.
ATTENTION QUALITY ASSURANCE MANAGER

PART NO. •90-3568899 S/N. 005
PART NAME SCAN MIRROR
P. O. NO. 04-497378-FDA
RECV'G. RCPT. NO. ----------
PREVIOUS CORRECTIVE ACTION REQUESTS
PROGRAM I. D. NO. E330

QTY RCVD. 1 LOT SIZE 1 QTY INSP. 1 QTY DISCREPANT
QTY SUSPENDED 1 SUSPENSION/REJECTION DOCUMENT NO. NCMR 316897

1. DISCREPANCIES:

MIRROR SCATTER DOES NOT MEET REQUIREMENTS OF NOTE 10 OF DWG. AND E.O. 70351.
SCATTER IS 1.8%; SHOULD BE ≤ 0.2%.
NICKEL PLATING ON BACK LIFTED ONE PLACE.

PLEASE REVIEW YOUR PROCESSES AND PROCEDURES TO DETERMINE THE CAUSE AND ADVISE HAC OF MEASURES TAKEN TO PREVENT RECURRENCES. INDICATE EFFECTIVITY DATE.

THE PERSON DIRECTLY RESPONSIBLE FOR QUALITY MUST SIGN THIS SCAR.

L. M. OLSEN [signature] 12/6
QUAL./PROD. ASSURANCE DATE

THE DISCREPANCIES NOTED ABOVE:

A ☐ CONCERN ITEMS THAT HAVE RECEIVED GOVERNMENT SOURCE INSPECTION AT YOUR PLANT.
B ☒ CONCERN PARTS THAT HAVE BEEN REVIEWED AND SUSPENDED BY QUALITY. XX MATERIAL BEING RETURNED ☐ MATERIAL NOT BEING RETURNED
C ☒ REQUIRE THAT YOU TAKE IMMEDIATE CORRECTIVE ACTION TO PRECLUDE FUTURE NON-CONFORMING DELIVERIES.
D ☒ REPLY IS TO BE SUBMITTED NOT LATER THAN
TO: HUGHES AIRCRAFT COMPANY ADDRESS: CENTINELA & TEALE, CULVER CITY, CA. 9
BUYER R. HALEY
DEPT. 70-21 BLDG. 17 M/S. J139
E ☐ SEE OTHER COMMENTS ON ATTACHED PAGE

2. SUPPLIER REPLY (See reverse side for instructions)

IF REQUIRED - SEE 2A ABOVE

GOV'T REPRESENTATIVE'S SIGNATURE DATE

CORRECTIVE ACTION EFFECTIVITY

SIGNATURE TITLE DATE

TO BE COMPLETED BY HUGHES QUALITY/PRODUCT ASSURANCE

ACTION SATISFACTORY	YES	NO
SIGNATURE DATE		

FURTHER FOLLOW-UP REQUIRED	YES	NO
SIGNATURE DATE		

NEW SCAR NO.

HUGHES
HUGHES AIRCRAFT COMPANY

NONCONFORMING MATERIAL REPORT (NCMR)

NO. 5
DATE 11-6-79
PAGE 1 OF 1

PROGRAM ID THEMATIC MAPPER | PRD/PRG | E330-EAA-21-00

PART NO.	S/N	ENG. CHANGES	NOMENCLATURE
90-3568899	005	A 70351	SCAN MIRROR

WORK ORDER DOC NO.	LOT SIZE	QTY. SUSP.	SUSPENDED IN	HARDWARE I.D. NO.	REF. DOCUMENTS
----------	--------	1	TEST (ASSY)	75 - 35 - 22	QCHR CC 60258

SUPPLIER	DIV. OR LOCATION	SUPPLIER CODE	P.O. NO.	ITEM NO.	R.R. NO.
APPLIED OPTICS CENTER	BURLINGTON, MA.	50762	04-497378-FDA	1	

ITEM NO.	QTY INSP.	QTY SUSP.	DESCRIPTION OF NONCONFORMANCE	RESP. DEPT.	PRIOR OCCUR	M.R. LEVEL	CODE
1	-	1	MIRROR SCATTER DOES MEET REQUIREMENTS OF (19) OF DWG AND EO 70351.	V	Ø	PR	F
			SCATTER IS 1.8%; SHOULD BE ≤ 0.2%.				
2	-	1	NICKEL PLATING ON BACK SIDE LIFTED ~~TWO~~ (2) PLACES.	V	Ø	PR	F
			LIFTED PLATING: VOID				

ORIGINATOR L. M. Olsen DATE 11/6/79 | QUALITY L. M. Olsen DATE 11/6/79 | ENGINEERING — DATE —

ITEM NO.	DISP. CODE	DISPOSITION/INSTRUCTIONS	STAMP
1	F	RETURN TO VENDOR FOR REWORK TO B/P REQUIREMENTS.	
		SHIP TO: APPLIED OPTICS CENTER	

[redacted]

ENGINEERING — DATE — | QUALITY — DATE — | CUSTOMER — DATE —

ITEM NO.	CAUSE OF NONCONFORMANCE	RESULTS OF CORRECTIVE ACTION INVESTIGATION	CORRECTIVE ACTION
			12-6-9 SCAR # 63891

SIGNATURE — DATE | SIGNATURE L. M. Olsen DATE

RESPONSIBILITY VENDOR	RESPONSIBILITY HAC	DEBIT VENDOR YES	DEBIT VENDOR NO	DISP.CODE	VENDOR PACKING SHEET	QTY. R.T.V.	QTY. SCRAP	BUYERS SIGNATURE	DATE	COPY
☒	☐	☒	☐	F	—	1	-----	T. G. Hulsey	11/6/79	-

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INTERDEPARTMENTAL CORRESPONDENCE

F 1352

TO: E. W. Gossett
ORG:

CC: Data Bank (3)

DATE: 3 December 1979
REF. 771510/007
HS236-1654
FROM: R.L. Coon
ORG. 77-15-10
BLDG. 12 MAIL STA. V104
LOC. CC EXT. 7433

SUBJECT: Scattering Tests for TM Mirrors

REF. TFR # F-1352

Due to the high scattering exhibited by Mirror S/N 5, all mirrors must be measured at HAC for scattering and accepted prior to coating at Denton Vacuum.

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HUGHES
HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1353

ORIGINATOR

1. PROGRAM NAME AND NUMBER: HS 236-TM | 2. GLA: C330 | 3. MODEL: E-1 | 4. TIME OBSERVED | 5. DATE OBSERVED: MO 10 DA 3 YR 79

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☒ SUBASSEMBLY		3568900	5	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☒

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: When "Scotch Clad" Stripcoat Protective Coating Per HMS16-1768 was stripped from Front Mirror Surface, Coating was Damaged

15. TEST PROCEDURE: None PARA | 16. ORIGINATOR: E. W. Gossett ORG 79-45 DATE 10/3/79 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VARIFICATION AND FAILURE ANALYSIS: Para. 4 of H236-1640 verifies that coating damage was noted during week of October 1, 1979.

19. FAILED ITEM NAME AND PART NUMBER: SCAN MIRROR 90-3568899

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Returned to vendor - See NCMR 316897 - Retested Successfully (See FR F1305, Attached)

21. AUTHORIZATION | ORG | DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: Rework to print requirements of DWG 90-3568899 | 24. QA REWORK | 25. QA RETEST

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Cause unknown. Supplier corrective Action. Request #63897 from Hughes Aircraft System. Replated and Repolished (See FR F1305, Attached)

33. FRB CLOSURE: 5/1/81

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: NCMR 316897

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/FAB ERROR ☐ ROUGH HANDLING ☐ DEFECT CODE ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAR-OUT

35. FAILURE TYPE: ☒ PRIMARY ☐ UNKNOWN ☐ INDUCED ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MINOR ☐ MAJOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: [signature] ORG 77-15 DATE 4/29/81

38. SPACECRAFT SYSTEM ENGR. [signature] ORG 2261 DATE 5/5/81

39. RELIABILITY [signature] ORG 51-41 DATE 5-1-81

40. CUSTOMER OR SUPPLIER [signature] 5/6/81 DATE

11873 SC JUL 78

NONCONFORMING MATERIAL [REPORT] (NCMR)

NO. DATE 11- PAGE 1 OF

PROGRAM ID THEMATIC MAPPER PRD/PRG E330-EAA-21-00

NO	S/N	ENG. CHANGES	NOMENCLATURE
90-3568899	005	A 70351	SCAN MIRROR

ORDER DOC NO.	LOT SIZE	QTY. SUSP.	SUSPENDED IN	HARDWARE I.D. NO.	REF. DOCUMENTS
----------	---------	1	TEST (ASSY)	75 - 35 - 22	QCHR CC 60258

SUPPLIER	DIV. OR LOCATION	SUPPLIER CODE	P.O. NO.	ITEM NO.	R.R. NO.
APPLIED OPTICS CENTER	BURLINGTON, MA.	50762	04-497378-FDA	1	

QTY IR.SP	QTY SUSP.	DESCRIPTION OF NONCONFORMANCE	RESP. DEPT.	PRIOR OCCUR	M.R. LEVEL	COD
-	1	MIRROR SCATTER DOES MEET REQUIREMENTS OF (19) OF DWG AND EO 70351.	V	Ø	PR	F
		SCATTER IS 1.8%; SHOULD BE ≤ 0.2%.				
-	1	NICKEL PLATING ON BACK SIDE LIFTED TWO (2) PLACES.	V	Ø	PR	F
		LIFTED PLATING:				

ORIGINATOR [signature] DATE 11/6/79 QUALITY [signature] DATE 11/6/79 ENGINEERING — DATE —

DISP CODE	DISPOSITION/INSTRUCTIONS	STAMP
F	RETURN TO VENDOR FOR REWORK TO B/P REQUIREMENTS.	
	SHIP TO: APPLIED OPTICS CENTER	

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ENGINEERING — DATE — QUALITY — DATE CUSTOMER — DATE —

RESULTS OF CORRECTIVE ACTION INVESTIGATION

CAUSE OF NONCONFORMANCE	CORRECTIVE ACTION
	12-6-9 SCAR # 63391

SIGNATURE DATE SIGNATURE [signature] DATE

QUALITY	DEBIT VENDOR YES	DEBIT VENDOR NO	DISP.CODE	VENDOR PACKING SHEET	QTY. R.T.V.	QTY. SCRAP	BUYERS SIGNATURE	DATE	COPY
	☑	☐	F	—	1	-----	[signature]	11/	

F 1353

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HUGHES
HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 1305

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED MO DA YR
HS 234 - TM	E331	A-1	1635	7 - 21 - 80

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☐ SUBASSEMBLY ☐ MICAM ☒ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☐ SUBASSEMBLY	MIRROR	3568849	5	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☐ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☒ PRIOR TO ASSY FOR EK

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: NICKEL PLATING ON REAR SURFACE LIFTER 2 PLACES; NEAR ENC CLOSE CURE HOLE & AT EDGE NEAR MAJOR AXIS

15. TEST PROCEDURE ____ PARA ____ 16. ORIGINATOR E. W. GISSETT ORG 177-45 DATE 7/30/80 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: ACTUALLY ONLY ONE LIFTER AREA NEAR CORNER CURE HOLE

18. FAILED ITEM NAME AND PART NUMBER: MIRROR P/N 3568849

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED (LOCALIZE): MIRROR WILL BE RETURNED TO VENDOR FOR REWORK AFTER LIFE CYCLE TEST (REF SER TEP #1352)

21. AUTHORIZATION [signature] ORG 177-45 DATE 7/31/80 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: VENDOR TO STRIP, REPLATE & REBALANCE. RETURNED TO VENDOR BY W.D. AMOS - REPLATED AND REBALANCED RETURNED ELECTRICALS [signature]

24. [illegible]

25. [illegible]

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.

27. REWORK BY ____ ORG ____ DATE ____ 28. RETESTED BY ____ ORG ____ DATE ____ 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: IMPROPER CLEANING BY VENDOR.

RETURN TO VENDOR REF. NCMR 316897

SUPPLIER CORRECTIVE ACTION REQUEST # 63891 WAS SENT TO VENDOR IN ACCORDANCE WITH HUGHES AIRCRAFT CO. SUPPLIER CORRECTIVE ACTION SYSTEM.

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: NCMR 316897

33. FRB CLOSURE [signature] 2/26/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ TEST EQUIP ☐ MFG. PROCEDURE ☐ WIRING ERROR ☐ UNKNOWN ☐ ENVIRONMENTAL ☐ TEST PROC. ☐ ASSY/PAB ERROR ☐ ROUGH HANDLING ☐ DEFECT CODE ☐ DEFECTIVE PARTS ☐ TEST SET-UP ☐ WORKMANSHIP ☐ WEAROUT

35. FAILURE TYPE: ☐ PRIMARY ☐ UNKNOWN ☐ INDUCED ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER [signature] ORG 177-15 DATE 12-3-80

38. SPACECRAFT SYSTEM ENGR [signature] ORG 22-61 DATE 12/11/80

39. RELIABILITY [signature] ORG 5121 DATE 2-11-81

40. CUSTOMER OR SUPPLIER [signature] DATE 3/17/81

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

S 8392

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
T.M. 1162		003 (F1)	1330	MO 2 DA 20 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☒ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	SCAN MIRROR ASSY	3533002	-100	HAC/CC
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	TDP ASSY	51065	003	SBRC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☒ QUALIFICATION ☐ ACCEPTANCE ☒ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ☐ THERMAL VAC ____ HRS AT ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: POWER TO SMA APPLIED, PER TP 32015-301; SMA DID NOT OPERATE. INVESTIGATION SHOWED SMA TO BE TAPED TO BUMPER. GREEN LED DID NOT LIGHT.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION ☐ SHEET USED
TP 32015-301	5.1	F.Y. NICOLAS	22-71	2-20-82	

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: NO OVERTESTS OCCURRED. POWER WAS NOT AVAILABLE TO THE SMA UNTIL ECO 4160 A WAS INSTALLED IN SMA CONTROL CONSOLE.

19. FAILED ITEM NAME AND PART NUMBER:

22. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: INSTALL ECO 4160A - MODIFICATIONS TO SMA CONTROL CONSOLE

21. AUTHORIZATION	ORG	DATE	22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: ECO INSTALLED

24. QA REWORK:

25. QA RETEST:

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: TEST SET DESIGN PROBLEM INHIBITED OPERATION AND LED INDICATION. ECO 4160 CORRECTS CONDITION.

(QA) TAPING OF MIRROR (TAB) TO BUMPER WAS A PROCEDURAL ERROR. ~~HUGHES~~ TDP HS 236-7869 ADVISED RESPONSIBLE PERSONNEL OF ERROR AND REQUESTS INDOCTRINATION OF PERSONNEL.

31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: ECO 4160

33. FRB CLOSURE

2/26/82

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE:

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
[signature]	22-42	820225	[signature]	22-41	2/25/82

39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER	DATE
[signature]	514	2-25-82	[signature] 3/2/82	

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SECTION 2.3
POWER SUPPLY

Section 2.3.1

Power Supply

Performance Data

The acceptance performance (test) data for the Power Supply is contained in Appendix C (Vol. IV, Part C).

2.3.2
Acceptance Data

2.3.2.1
Configuration Lists

AS-BUILT CONFIGURATION LIST

POWER SUPPLY ASSEMBLY
50869 S/N 004

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
01	50869	ASSY, POWER SUPPLY	D 2015A 2039A D030 D068 W074 W092 W093 W101	D 2015A 2039A D030 D068 W074 W092 W093 W101	D 2015A 2039A D030 D068 W074 W092 W093 W101	004
02	53319	CHASSIS-POWER SUPPLY	B 9090	B 9090	B 9090	N/A
03	53669	COVER, BOTTOM	A 9471	A 9471	A 9471	N/A
03	53670	COVER, TOP	A 9474 9893 2025A	A 9474 9893 2025A	A 9474 9893 2025A	N/A
02	53664	BUS BAR	A 9071	A 9071	A 9071	2
02	53308	PRINTED WIRING ASSY	A 9060 9069 9465 9485 #D123 D124	A 9060 9069 9465 9485 D124	A 9060 9069 9465 9485 #D123 D124	3,4
02	51566	PRINTED WIRING ASSY	A 8527 9055 9080 9097 2020A #D123 D124	A 8527 9055 9080 9097 2020A D124	A 8527 9055 9080 9097 2020A #D123 D124	3,4

#D123 was cancelled and replaced by D124

IHD LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
02	51578	PRINTED WIRING ASSY	B 2002A #D123 D124	B 2002A D124	B 2002A #D123 D124	2
02	53555	PRINTED WIRING ASSY	C 9881 D069 #D123 D124	C 9881 D069 D124	C 9881 D069 #D123 D124	2
02	51570	PRINTED WIRING ASSY	C D069 #D123 D124 2049A	C D069 D124 2049A	C D069 #D123 D124 2049A	3,4
02	52113	PRINTED WIRING ASSY	B 1403A #D123 D124	B 1403A D124	B 1403A #D123 D124	2
02	51574	PRINTED WIRING ASSY	C #D123 D124	C D124	C #D123 D124	4,5,6
02	52976	PRINTED WIRING ASSY	A 6998 9079 9467 #D123 D124	A 6998 9079 9467 D124	A 6998 9079 9467 #D123 D124	2
03	51562	PRINTED WIRING ASSY	D D069 #D123 D124	D D069 D124	D D069 #D123 D124	3,4
02	51594	PRINTED WIRING ASSY	B D069 #D123 D124	B D069 D124	B D069 #D123 D124	2
02	51627	FILTER ASSY	A 8891 9479 1408A 1999A	A 8891 9479 1408A 1999A	A 8891 9479 1408A 1999A	2

ITEM LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
02	51656	FILTER ASSY	A 9473 9480 1409A 1998A	A 9473 9480 1409A 1998A	A 9473 9480 1409A 1998A	1
02	51611	INPUT CHOKE	A 9049 1407A	A 9049 1407A	A 9049 1407A	3,4
02	51590	PRINTED WIRING ASSY	E D069 #D123 D124 W078 +W103 W104	E D069 D124 W078 W104	E D069 #D123 D124 W078 +W103 W104	2
02	51519	PRINTED WIRING ASSY	F 2042A 2043A 2047A 2048A D069 #D123 D124 W078 +W103 W104 2052A	F 2042A 2043A 2047A 2048A D069 D124 W078 W104 2052A	F 2042A 2043A 2047A 2048A D069 #D123 D124 W078 +W103 W104 2052A	2
02	52951	TRANSISTOR	A 1414A	A 1414A	A 1414A	N/A
02	53672	XSTR MTG BRACKET	A	A	A	N/A
03	53297	TERMINAL STRIP	A	A	A	N/A
02	51651	RETAINER, PCB	A	A	A	N/A
02	52901	INSULATOR, SCREW	A	A	A	N/A
02	53298	TERMINAL, STANDOFF	A	A	A	N/A
02	53678	CARD GUIDE, PWB	A 9489	A 9489	A 9489	N/A
02	53679	BACKUP SPRING	B	B	B	N/A

#D123 was cancelled and replaced by D124

+W103 was cancelled and replaced by W104

THD LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
02	53666	WIRE LIST, THEMATIC	D D102 W079	D D102 W079	D D102 W079	N/A
02	53299	SHIELD ASSY	B D068	B D068	B D068	2
02	51615	PWB ASSY	A 8371 9082 #D123 D124	A 8371 9082 D124	A 8371 9082 #D123 D124	2
02	53561	REGULATOR ASSY	A 8362 9068 9483 2006A	A 8362 9068 9483 2006A	A 8362 9068 9483 2006A	2
02	53668	CAPACITOR PLATE ASSY	A 9066 2010A	A 9066 2010A	A 9066 2010A	3,4
02	53674	CHOKE ASSY	A	A	A	3,4
02	53675	INDUCTOR ASSY	A	A	A	3,4
02	53311	XFMR MODULE ASSY	B 1410A	B 1410A	B 1410A	4,5
02	52531	TRANSFORMER ASSY	B 9470	B 9470	B 9470	3,4
02	53316	XFMR MODULE ASSY-MUX	B 1412A	B 1412A	B 1412A	4,5
02	53563	TRANSFORMER ASSY	A 8370 9478	A 8370 9478	A 8370 9478	3,4

#D123 was cancelled and replaced by D124

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
02	53558	POWER SUPPLY	A	A	A	N/A
03	51655	SCHEMATIC DIAGRAM	D 1415A 2007A 2041A	D 1415A 2007A 2041A	D 1415A 2007A 2041A	N/A
--	3169178	LUG, TERMINAL	- 59211	- 59211	- 59211	N/A

W D Cathey — 2-9-82

QUALITY ASSURANCE — DATE

R. D. Groves — 2-9-82

CONFIGURATION/DATA MANAGEMENT — DATE

POWER SUPPLY

Listing of Liens

POWER SUPPLY

P/N 50869

FLIGHT

Failure Report Number	
Open	Closed
F3868	F1035
S8102	F1036
	F1439
	F3864
	F3865
	F3866
	F3867
	F4831
	F4832
	F4833
	F4834
	F4835
	F4836
	F4837

Deviations	Waivers
	W-138

POWER SUPPLY

P/N 50869

FLIGHT			PROTOFLIGHT			ENGINEER	
Failure Report No.			Failure Report No.			Failure Report No.	
Open	Closed		Open	Closed		Open	Closed
F3868	F1035			F0675			F0538
S8102	F1036			F1030			F0555
	F1439			F1033			F2754
	F3864			F1034			S8094
	F3865			F1437			S8095
	F3866			F1438			
	F3867			F1440			
	F4831			F1441			
	F4832			F1442			
	F4833			F1973			
	F4834			F1974			
	F4835			F1975			
	F4836			F1976			
	F4837			F1977			
				F1978			
				F1979			
				F1980			
				F1982			
				F2690			
				F2740			
				F3881			

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FAILURE REPORT

F 1035

1. PROGRAM NAME AND NUMBER: HS-236 | 2. GLA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: — | 5. DATE OBSERVED: 3/23/81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

ORIGINATOR

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	PWM SWITCHER	51619	002	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ MBS AT ___ ° ___ ☐ SHOCK/BST ☐ VIBRATION ___ AXIS FOR ___ G'S ___ TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: SUBASSY FAILED OVER-CURRENT SHUT DOWN PER TS 16518 PARA 5.11.6.1 OVERCURRENT CIRCUIT FAILED TO FUNCTION (Q16 FAILED TO TURN ON). INVESTIGATION REVEALED DIODE CR 27 INSTALLED BACKWARDS.

15. TEST PROCEDURE NO.: TS-16518 PARA: 5.11.6.1 | 16. ORIGINATOR: G. Ericson | ORG: 41-33 | DATE: 3/26/81 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: VERIFIED DIODE CR27 INSTALLED BACKWARDS PREVENTING TRANSISTOR Q16 OPERATION. SCHEMATIC CORRECT, ASSY DWG INCORRECT. FAILURE ANALYSIS INDICATES NO OVERSTRESS CONDITION CREATED. ATTACHED

19. FAILED ITEM NAME AND PART NUMBER:

20. ☒ FOLLOWING REWORK/RETEST OCCURRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REVISE DWG 51619 (REV F) TO SHOW DIODE CR27 INSTALLED PER SCHEMATIC (51620). REORDER PWB TO REVISED CR27 AND RETEST.

21. AUTHORIZATION: G. Ericson | ORG: 41-33 | DATE: 3/26/81 | ☐ CONTINUATION SHEET USED

REWORK/RETEST AND TEST

22. REWORK/RETEST ACTION TAKEN: ECR/ECO INITIATED & REVISED TO INSTALL DIODE CR27 PER REVISED DWG. RETEST.

24. GA WITNESS (IF 5175): 7/23/81

TEST S3 PASS

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO
N/A						

27. REWORK BY: Steve Reuter | ORG: 41-33 | DATE: 4-4-81 | 28. RETESTED BY: Ray Cannard | ORG: 41-33 | DATE: 4-20-81 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
CAUSE: DRAWING ERROR IN 51619 (REV F) (SCHEMATIC 51620 IS CORRECT).
CORRECTIVE ACTION: REVISE ECO (#2042A) AND REWORK/RETEST PWB. VERIFIED P/F (SN-1) PWB HAS DIODE INSTALLED CORRECTLY.

☐ CONTINUATION SHEET USED

31. PRB CLOSURE:

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION:

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/PAB ERROR ☐ WORKMANSHIP ☐ WRITTEN ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE:

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: G. Ericson | ORG: 4-33 | DATE: 9/17/81

38. SPACECRAFT SYSTEM ENGR: [signature] | ORG: 53822-41 | DATE: Oct 81

39. RELIABILITY: [signature] | ORG: 57-11 | DATE: 10-5-81

40. CUSTOMER OR SUPPLIER: | DATE:

10/6/81

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FAILURE REPORT

F 1036

1. PROGRAM NAME AND NUMBER: HS-236 | 2. GLA: E330 | 3. MODEL: F6T | 4. TIME OBSERVED: 10:30 | 5. DATE OBSERVED: MO 3 DA 26 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	Mini Switchers	51619	002	HAC FAB
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ___ ° ___ ☐ THERMAL VAC ___ HRS. AT ___ ° ___ . ☐ SMC/RPI ☐ VIBRATION ___ AXIS FOR ___ MIN TYPE ___ ☐ OTHER

14. DESCRIPTION OF FAILURE: INCORRECT RESISTANCE MEASURED AT K6 PIN 1 PER TS 16518 PT 5. 11.95. WAS OPEN, S/B 0Ω.

15. TEST PROCEDURE: TS16518 PAR 3.11.9.5 | 16. ORIGINATOR: R.K. Coleman | ORG 4433-20 | DATE 3-26-81 | ☐ CONTINUATION SHEET USED

17. VERIFICATION AND FAILURE ANALYSIS: COMPONENT K6 IMPROPERLY INSTALLED. WAS THREAD 2 PIN C.C. ALL PINS ROTATED ONE PALMOTCH. FAILURE ANALYSIS CONCURRENT SHEET ATTACHED.

18. FAILED ITEM NAME AND PART NUMBER: K6 (90B305-5)

19. ☒ FOLLOWING ACTIONS/RETEST REQUIRED ☐ NO ACTIONS/RETEST NOT REQUIRED BECAUSE: REPLACE K6 AND AR3, AND RETEST PER TS16518. SUBJECT TO PRINT.

21. AUTHORIZATION: G Benson | ORG 41-33 | DATE 3/26/81 | ☐ CONTINUATION SHEET USED

20. ACTIONS/RETEST ACTION TAKEN: REPLACE RELAY K6 (90B305-5) AND AR3 (909971-1) | 21A. CA (ID DATE) 3/26/81 | 21B. QA HAC TEST S3

22. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	CORRECTED DEFECT	ANALYSIS NO.
90B305-5	K6	9C2827-576 DN	7630	HAC	PART ERROR	
909971-1	AR3	9C1115-5016			DIODELESS (NOTE: AR-3 NOT DIODE STACKED PER FAILURE ANALYSIS)	

23. REPORT BY: Bruce Bruce | ORG 41-33 | DATE 4-1-81 | 24. REVIEWED BY: Randy Coleman | ORG 41-33 | DATE 4-20-81 | ☐ CONTINUATION SHEET USED

25. CAUSE AND CORRECTIVE ACTION

CAUSE: COMPONENT NOT INSTALLED PER PRINT

Corrective Action: INSTRUCTED OPERATOR TO FOLLOW COMPONENT ORIENTATION AS INDICATED ON DWG AND SPECIFICATION. DWG WILL BE REVISED TO CLARIFY ORIENTATION (ECN# 20424)

☐ CONTINUATION SHEET USED

26. PRB CLOSURE

27. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

28. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ OPR/MAN ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

29. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

30. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

31. RESPONSIBLE ENGINEER: G. BENSON | ORG 41-33 | DATE 3/21/81

32. SPACECRAFT SYSTEM ENGR: [illegible] | DATE 6 OCT 81

33. RELIABILITY: A. Huber | ORG 57-71 | DATE 10/5/81

40. CUSTOMER OR SUPPLIER: PRB | DATE 10/6/81

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FAILURE REPORT

F 1439

1. PROGRAM NAME AND NUMBER: HS 236	2. GLA: E330	3. MODEL: F	4. TIME OBSERVED	5. DATE OBSERVED: MO 10 DA 28 YR 80	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☐ UNIT ☒ SUBASSEMBLY ☐ MICAM ☒ PART					

ORIGINATION

8. SUBSYSTEM IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT: Power Supply		50869	4	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY: ± 19 volt		51370	3	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROCESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ ☐ SINE/RPI ☐ VIBRATION ____ AXIS FOR ____ MIN ____ PSD ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: AT INITIAL APPLICATION OF VOLTAGE, INPUT CURRE WAS APPROACHING LIMIT SET BY T.S. 16518

15. TEST PROCEDURE: TS 16518 PARA 5.3 | 16. ORIGINATOR: E. Ellison | ORG 41-33 | DATE 10/29 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: Component U1 IMPROPERLY INSTALLED. SHOULD HAVE BEEN FLOWER POTTED. FAILURE ANALYSIS ATTACHED. COMPONENT U1 ONLY DEVICE OVERSTRESSED.

18. FAILED ITEM NAME AND PART NUMBER: U1 - 909956-1

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE U1 & RETEST PER TS 16518.

21. AUTHORIZED BY: [signature] | ORG 41-33-20 | DATE 10/29/80 | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REPLACE A2U1 PER PRINT. RETEST PER TS 16518.

24. [signature] 11/4

22. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
909956-1	A2-U1	9C034-5058			NEW PART	

27. REWORK BY: 1995 | ORG | DATE 11-7-80 | 28. RETESTED BY: RKC | ORG 41-33-30 | DATE 11-22-80 | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION

CAUSE: COMPONENT NOT INSTALLED PER PRINT.
CORRECTIVE ACTION: INSTRUCTED OPERATOR TO FOLLOW COMPONENT ORIENTATION AS INDICATED ON DWG.

33. FRB CLOSURE

☐ 11. CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP ☐ TEST PROC. ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ INDUCED ☐ PRIMARY ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: G. Rawson | ORG 41-33-30 | DATE

38. SPACECRAFT SYSTEM ENGR: [signature] | ORG 22-61 | DATE 1/20/81

39. RELIABILITY: [signature] | ORG 51-41 | DATE 1-19-81

40. CUSTOMER OR SUPPLIER: [signature] | DATE 1/29/81

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FAILURE REPORT

F 3864

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GFA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
HS-236	E330	FLT		MO 3 DA 27 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☒ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	MINI SWITCHER	51619	002	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: INCORRECT LEAD MIDDLING OBSERVED ON REDUNDANT RELAY K3 DURING CHECKOUT OF PRIMARY.

15. TEST PROCEDURE: TS-1651B | PARA: 5.11.2.5 | 16. ORIGINATOR: G. BENSON | ORG: 41-330 | DATE: 3/27/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: VERIFIED RELAY K3 INSTALLED INCORRECTLY. ALL PINS ROTATED ONE PIN NOTCH. CIRCUITRY WAS UNDER POWER, HOWEVER, GND RETURN NOT CONNECTED. THEREFORE, NO COMPONENTS OVERSTRESSED.

19. FAILED ITEM NAME AND/OR PART NUMBER: K3 (908305-5)

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE RELAY K3 AND RETEST PER TS1651B. REDLINE TO PRINT

21. AUTHORIZATION: G. Benson | ORG: 41-330 | DATE: 3/27/81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REPLACE RELAY K3 (908305-5).

24. OPERATOR (HAC ONLY): 7/29/81

25. INSPECTOR (HAC ONLY): HAC TEST S3

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
908305-5	K3	9C3A774-5 DN			ASSY ERROR	

27. REWORK BY: ELISA Bueno | ORG: 41-33 | DATE: 4-11-81 | 28. RETESTED BY: Randy Coleman | ORG: 41-33 | DATE: 4-20-81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
CAUSE: COMPONENT NOT INSTALLED PER PRINT.
CORRECTIVE ACTION: INSTRUCTED OPERATOR TO FOLLOW COMPONENT ORIENTATION AS INDICATED ON DWG AND SPECIFICATION. DWG WILL BE REVISED TO CLARIFY ORIENTATION (EO# 2042A)

31. FAB CLOSURE | 31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
G. Benson	41-33	7/17/81		5422-24	6-25-81
39. RELIABILITY	**ORG**	**DATE**	**40. CUSTOMER OR SUPPLIER**		**DATE**
A. Hatten	51-11	10/5/81			

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10/6/81

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SPACE AND COMMUNICATIONS GROUP
FAILURE REPORT

F 3865

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. CLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER	A330	FLT	1:30 PM	MO 7 DA 13 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ C/PD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY	50869	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: DURING ENGINEERING EVALUATION OF SYNC CIRCUITRY ON REDUNDANT SIDE USING EXTERNAL PULSE GENERATOR, MINI INVERTER FAILED IN HIGH INPUT CURRENT MODE AND SMOKE FROM THE MINI.

15. TEST PROCEDURE: ENGR EVALUATION | PARA | 16. ORIGINATOR: G. EASON | ORG: 41-33 | DATE: 7/13/81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: CHASSIS Q3 COLLECTOR TO BASE SHORT FOUND, R20 BURNED, R19 SCORCHED. (COMPONENT FAILURE ANALYSIS ATTACHED. REFER TO STRAT ANALYST (COPY ATTACHED)

19. FAILED ITEM NAME AND PART NUMBER: R19

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: ON A24 (MINI) R/R Q1, Q2, Q4, R19, R20, CR12, AND Q3 & Q4 ON CHASSIS PER RECOMMENDATION ON FAILURE ANALYSIS. RETEST: SHORT PROC TS 16603

21. AUTHORIZATION: G. Eason | ORG: 41-33 | DATE: 7/28/81 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: POWER: A24 WAS REPLACE Q1, Q3, Q4, R19, R20, CR12 AND REPLACE CHASSIS INTO Q3 AND Q4. RETEST: SHORT PROC TS 16603

24. QA WITNESS: 7-28-81

25. INSPECT & TEST: HAC TEST 33

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY: ELISA BENCE | ORG: 41-33 | DATE: 7-27-81 | 28. RETESTED BY: ROBERT CONNELLY | ORG: 41-33 | DATE: | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: FAILURE AS A RESULT OF LOADING BY TRIGGER INPUT OF LABORATORY INSTRUMENT WITH TRIGGER SWALE IMPEDANCE SWITCH IN 50Ω POSITION. C/A NO FURTHER REQUIREMENT TO USE AN EXTERNAL PULSE GENERATOR ON THIS OR ANY OTHER POWER SUPPLY. HOWEVER IF USE IS REQ'D. USE 50Ω POSITION AND TRIGGER IN

31. ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: POWER STAGE RATHER THAN DRIVER CKT

33. FRB CLOSURE: 10/2/81

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☒ TEST PROCEDURE ☒ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE:

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
G. EASON	41-33	7/17/81		22-61	8/10/81

39. AGENCY	ORG	DATE	40. CONTRACTOR OR SUPPLIER	DATE
	51-41	10/2/81	NO	11/25/81

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FAILURE REPORT

F 3866

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER | 2. GFA: E264 | 3. MODEL: FLIGHT | 4. TIME OBSERVED: | 5. DATE OBSERVED: MO 10 DA 30 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MCAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (FLT SN-4)	50869	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MCAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ☐ THERMAL VAC ____ HRS AT ____ ° ☐ OTHER ____ AXIS FOR ____ MIN TYP ____

14. DESCRIPTION OF FAILURE: UNIT DEMONSTRATED GREATER THAN 375 WATTS INPUT POWER DURING PRELIM. SHORT FORM TEST @ 35V PER TP 5.11.4.2-3 THRU 5.11.4.2.5. THIS IS NOT A UNIT REQUIREMENT AND THE LIMITS SHALL BE REMOVED.

15. TEST PROCEDURE: TS-16603(B) SCN-2 | PARA: 5.11.4.2.3.5 | 16. ORIGINATOR: G. ERICSON | ORG: 41-33 | DATE: 10/30/81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: THE HIGH INPUT POWER RESULTS FROM A HIGH 35V P.S. LOAD CURRENTS ON THE HIGH SIDE AND A DUE EDGE VOLTAGE SET TO THE HIGH SIDE OF NOMINAL. REVISE TS-16603 TO REMOVE LIMITS ON INPUT POWER. NO REQ'MT

19. ☐ FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED
☒ REWORK/RETEST NOT REQUIRED BECAUSE
REVISE TS-16603 TO REMOVE LIMITS ON INPUT POWER. SCN-3 RELEASED 11/3/81, ATTACHED.

21. AUTHORIZATION: G. ERICSON | ORG: 41-33 | DATE: 11/3/81 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: NONE REQUIRED

24. QA REWORK

25. QA RETEST

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY | ORG | DATE | 28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
CAUSE: INPUT POWER GREATER THAN VALUE INDICATED IN DATA SHEETS AS MAXIMUM INPUT POWER. MAXIMUM INPUT POWER AT THE UNIT LEVEL IS AN INTERNAL SPECIFICATION BASED ON TEST CONDITIONS, NOT SYSTEM PERFORMANCE.
C/A: REMOVE MAXIMUM INPUT POWER REQ'MT PER SCN-3 TO TS-16603 ATTACHED

31. FRB CLOSURE: W. Neill 12-1-81 | J. Grommes 2/11/82 | EFFECTIVE S/N 3 AND UP | ☐ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
G. ERICSON	41-33	11/19/81		2261	82/11/30
39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER		DATE
	5141	11/24/81			

2/01/82

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ATTACHMENT TO FAC #F3866

10.5 Performance test (short form) data sheets (continued)

REF. PARA.	DESCRIPTION	DVM SWITCH POSITIONS	LIMITS	MEASUREMENT PRIMARY	MEASUREMENT REDUNDANT
5.11.4.1.13	Band 6+ load current	S26-7, S34-11	mV ÷ 0.5 = mA		
5.11.4.1.14	Band 6 - load current	S26-7, S34-12	mV ÷ 0.5 = mA		
5.11.4.1.15	SMA Htr + load current	S26-8, S34-1	mV ÷ 0.5 = mA		
5.11.4.1.16	SMA Htr - load current	S26-8, S34-2	mV = mA		
5.11.4.1.17	SMA +29V load current	S26-8, S34-3	mV ÷ 0.402 = mA		
5.11.4.1.18	SMA -29V load current	S26-8, S34-4	mV ÷ 0.402 = mA		
5.11.4.1.19	SMA +7V load current	S26-8, S34-5	V ÷ 0.1 = Amps		
5.11.4.1.20	Analog - load current	S26-8, S34-6	mV ÷ 0.402 = mA		
5.11.4.1.21	Radiometer load curnt	S26-8, S34-9	mV ÷ 0.5 = mA		
5.11.4.1.22	CDVU load current	S26-8, S34-10	mV ÷ 0.5 = mA		
5.11.4.1.23	Electrnch load current	S26-8, S34-11	mV ÷ 0.402 = mA		
5.11.4.2.1	Bus power spply vltge	S26-1, S27-1 (S27-3 for RLT)			
5.11.4.2.2	Bus input current	S26-1, S27-2 (S27-4 for RDT)	mV ÷ 10 = Amps		
5.11.4.2.3	P_{IN} (Section 5.11.4)	need limits or remove			
5.11.4.2.4	P_{IN} (Section 5.11.2)				
5.11.4.2.5	P_{IN} (avg)				
5.11.4.3.1	P_{OUT}				
5.11.4.3.2	Efficiency		> 70%		
5.11.5.1	Bus voltage	S26-1, S27-1 (S27-3 for RDT)			
5.11.5.2	Input bus current	S26-1, S27-2 (S27-4 for RDT)	mV ÷ 10 = Amps		
5.11.5.3	SMA Htr + otpt vltge	S26-2, S27-5	21.20 ±2.12V		
5.11.5.4	SMA Htr + otpt rpple	Seen on Scope	<630 mV pk-pk		
5.11.5.5	SMA Htr - otpt vltge	S26-2, S27-6	-21.20 ±2.12V		
5.11.5.6	SMA Htr - otpt rpple	Seen on Scope	<630 mV pk-pk		
5.11.5.7	CDVU output voltage	S26-3, S27-3	8.00 ±0.80V		
5.11.5.8	CDVU output ripple	Seen on Scope	<240 mV pk-pk		
5.11.5.9	Outgas - otpt vltge	S26-3, S27-7	80.00 ±8.00V		
5.11.5.10	Outgas - otpt rpple	Seen on Scope	<2.5V pk-pk		
5.11.5.11	Parasitic otpt vltge	S26-3, S27-9 (S27-10 Rdt)	30.00 ±0.90V		

SCN -3

SCN -2

ATTACHMENT TO FR# F3866

10.4 Performance test (continued)

REF. PARA.	DESCRIPTION	LVM SWITCH POSITIONS	LIMITS	MEASUREMENT PRIMARY	MEASUREMENT REDUNDANT	
5.10.5.1.17	SMA +29V load current	S26-8, S34-3	mV ÷ 0.402 = mA	____	____	
5.10.5.1.18	SMA -29V	S34-4	mV ÷ 0.402 = mA	____	____	
5.10.5.1.19	SMA +7V	S34-5	V ÷ 0.1 = Amps	____	____	
5.10.5.1.20	Analog -	S34-6	mV ÷ 0.402 = mA	____	____	
5.10.5.1.21	Radiometer	S34-9	mV ÷ 0.5 = mA	____	____	
5.10.5.1.22	CDVU	S34-10	mV ÷ 0.5 = mA	____	____	
5.10.5.1.23	Electromech. load current	S26-8, S34-11	mV ÷ 0.402 = mA	____	____	
5.10.5.2.1	Bus power supply voltage	S26-1, S27-1 (S27-3 for RDT)		____	____	
5.10.5.2.2	Bus input current	S26-1, S27-2 (S27-4 for RDT)	mV ÷ 10 = Amps	____	____	
5.10.5.2.3	P_{IN} (Section 5.10.5)			____	____	SCN 3
5.10.5.2.4	P_{IN} (Section 5.10.3)			____	____	SCN 3
5.10.5.2.5	P_{IN} (avg)			____	____	SCN 3
5.10.5.2.9	Input current at current limit		26-1, 27-2 (26-1, 27-4 Rdt)	____	____	
	Input voltage at current limit		27-1 (27-3 Rdt)	____	____	
	MUX voltage at current limit		26-3, 27-1	____	____	
	MUX current at current limit		27-12	____	____	
5.10.5.3.1	P_{OUT}			____	____	SCN 2
5.10.5.3.2	Efficiency		≥70%	____	____	

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FAILURE REPORT

F 3867

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER | 2. CLA: F264 | 3. MODEL: FLIGHT | 4. TIME OBSERVED: | 5. DATE OBSERVED: MO 11 DA 2 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (PLT-SN-004)	50869	004	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☒ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: UNIT FAILED POST VIBRATION SHORT FAILURE TEST PER PT. 5.11.2-3
UNIT FAILED TO RESPOND TO TURN ON AND PRIMARY SIDE.

15. TEST PROCEDURE: TS-16603 (B) SN-2 | PARA: 5.11.2-3 | 16. ORIGINATOR: G. BENSON | ORG: 41-33 | DATE: 11/2/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: RELAY A24-K5 DOES NOT CHANGE STATE WHEN CMD OFF IS VERIFIED BY LACK OF AUDIBLE NOISE DURING CONTACT TRANSFER. UNIT WAS REMOVED AND BEFORE RELAY COULD BE FULLY INSTRUMENTED. NORMAL RELAY OPERATION RESUMED. REFER TO ANALYSIS REPORT. FAILED ITEM NUMBER A24-K5 90830?-2

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE A24-K5 PER PRINT. RETEST PER TS 16603. SUBMIT FAILED UNIT TO FAILURE ANALYSIS. REPEAT WORKMANSHIP LEVEL VIBRATION PER TS-16603. PARTS BOARD OF DIRECTORS APPROVES REPLACEMENT OF ALL 90830?-2

21. AUTHORIZATION: SN-4 P/S. G. BENSON | ORG: 41-33 | DATE: 11/30/81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REMOVE AND REPLACE K1 & K2 ON S1530 SN-3 P4 WITH CDH-00702.
REMOVE AND REPLACE K1, 2, 4, 5 ON S7619 SN-2 WITH CDH-00702.
REPEATED VIBRATION AND POST VIB PERFORMANCE TEST.

24. QA REWORK: 12-22-81 | QA RETEST: TEST S22 12-22-81

25. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
90830?-2	A24K1, K2, K4, K5		7846-0			
	A2K1, K2; A3K1, K2		7615-0			
			7330-0			

27. REWORK BY: [illegible] ORG: 80516/41-3300 | DATE: 12/10/81 | 28. RETEST BY: G. BENSON | ORG: 41-33 | DATE: 12/21/81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION
CAUSE: TEMPORARY FAILURE OF RELAY A24K5 TO TRANSFER AFTER EXPOSURE TO ACCEPTANCE LEVEL VIBRATION
C/A: REPLACED ALL 90830?-2 RELAYS IN PLT SUPPLY WITH RELAYS TESTED TO CDH-00702 PER RECOMENDATION ATTACHED. FAILURE ANALYSIS REPORT ALSO ATTACHED.

31. FRB CLOSURE: [signature] 1/6/82 | 31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☒ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ HANDLING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☒ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: G. Benson | ORG: 41-33 | DATE: 12/21/81 | 38. SPECIALTY SYSTEM ENGINEER: [signature] | ORG: 241 | DATE: 1/5/82

39. RELIABILITY: [signature] | ORG: 51-41 | DATE: 1-4-82 | 40. CUSTOMER OR SUPPLIER: [signature] 1/7/82 | DATE

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ATTACHMENTS TO FR# F3867

AVOID VERBAL ORDERS

TO	F. R. PHILLIPS	FROM	FRANK CARLE
SUBJECT	PRELIMINARY THEMATIC MAPPER PMPCB	DEPT	44-29-00 DATE 12/1/
	RECOMMENDATION - 908307-2 RELAY	BLDG	S13 MS D329
		LOC	SC EXT 5-935

CONFIRMING OUR RECENT TELEPHONE CONVERSATION, A TELEPHONE POLL OF THE THEMATIC MAPPER PMPCB HAS BEEN MADE TO ARRIVE AT AN EARLY RECOMMENDATION ON THE DISPOSITION OF THEMATIC MAPPER 908307-2 RELAYS. OUTLINED BELOW ARE PRELIMINARY RECOMMENDATIONS.

1. CHANGE OUT F-1 RELAYS FOR THOSE OF LOT DATE CODE 7846, WHICH SUCCESSFULLY PASSED SCREENING TESTS AT TELEDYNE, AND ARE BEING REIDENTIFIED TO CDU00702.
2. RETAIN THE CURRENT PROTOFLIGHT SYSTEM RELAYS (ALL OF LOT DATE CODE 7846) IN THE SYSTEM WITHOUT CHANGEOUT.

THE REASON FOR THIS RECOMMENDATION IS AS FOLLOWS:

A. INTEGRITY OF RELAYS OF LOT DATE CODE 7846 WAS ESTABLISHED BY A SCREEN OF 39 PIECES, WITHOUT A PICK-UP VOLTAGE HANG-UP.

B. LACK OF INVENTORY ON RELAYS LOT DATE CODE 7615 (ONE OF WHICH WAS THE FAILURE), AND LOT DATE CODE 7330, WHICH ARE IN F-1 PRECLUDES EARLY VALIDATION OF INTEGRITY PROVING CONCLUSIVELY THAT THE FAILURE IS RANDOM.

C. RATHER THAN SUFFER FURTHER SCHEDULE DELAYS TO F-1, CHANGEOUT TO THE SCREENED 7846 PARTS APPEARS THE EXPEDIENT SOLUTION.

E. F. Carle

E. F. CARLE

:AC

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F3867

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A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: L. O'Connell
CC: See Distribution List
DATE: 6 November 1981
REF: RS236-7711
REAR 81/57
FROM: A. Huber
BLDG. B11 MAIL STA. 102
EXT. 6246

SUBJECT: Power Supply
908307-2 Relays
(FR:F3867)

FR: F3867, dated November 2, 1981

Following acceptance test vibration of the Flight Model power supply, test of the power supply revealed that the power supply could not be commanded to the OFF state. It was verified by measuring coil current to the relay that the command to the OFF relay (A24-K5) was proper (+28V pulse for 6ms). The power supply cover was then removed and the miniswitcher board instrumented to investigate the failure. Subsequent testing found that the relay then functioned; the audible sound of relay contact transfer could be heard. (This sound was not present during earlier testing.) The relay (9G80307-2, Teledyne part no. 412-6111, date code 7615, serial no. 183) was removed and sent to Teledyne for failure analysis.

There are a total of eight 908307-2 relays in the power supply: four each in the primary and redundant supplies. Each of the four relays within a given power supply performs one of the following functions:

(a) turns the supply ON (relay 1)
(b) turns the supply OFF (relay 2)
(c) applies 30V to the multiplexer and removes 30V from the parasitic mux load (relay 3)
(d) applies 30V to the parasitic mux load and removes 30V from the multiplexer.

Figure 1 illustrates the circuitry associated with the two relays that turn a given power supply (primary or redundant) to the ON or OFF states. The 908307-2 relays are non-latching relays which momentarily (6 ms) apply signal ground to the input of 30 ms single shots. The single shots, in turn, apply voltage to the first of two high-current (power) relays to apply or remove bus voltage to power supply circuitry.

There are two power relays in series. The second power relay has associated with it a 10 ohm power resistor. This resistor limits the inrush current. When the voltage at the 10 ohm resistor reaches +18.5, the contacts of the second power relay close, thereby shorting the resistor. The power supply is then fully operational. The second power relay opens and closes as a function of line voltage (+18.5V threshold), controlled by voltage sensing circuitry within the power supply.

Once a power supply has been commanded to the ON state, the contacts of the first power relay can only be opened by three events:

(2)

(1) the issuance of an OFF command (by the 908307-2 Off command relay)
(2) a line voltage in excess of +38.5V, thereby causing overvoltage shutdown
(3) an overvoltage associated with the internally generated +30V reference voltage (+34V initiates the shutdown)

It is possible to command a power supply to the ON state (requires the presence of line voltage) and then remove the bus voltage. This leaves the contacts of the first power relay in the closed state. The contacts of the second relay open when the bus voltage drops below +18.5V (thereby reinserting the 10 ohm power resistor). Reapplication of bus voltage will cause the contacts of the second power relay to close (similar to a commanded ON sequence). Initial inrush current will be limited by the 10 ohm resistor.

The above demonstrates a sequence that can be initiated prior to launch, to guarantee that at least one power supply will receive power after launch. It removes the possibility that neither power supply can be turned on due to the failure of both ON relays.

Figure 2 illustrates the circuitry associated with the two relays that control the application and removal of 30V to the multiplexer and the parasitic mux load. Each command relay (908307-2) momentarily (6MS) applies signal ground to the input of a 30MS single shot. The single shot, in turn, applies voltage to the coil of a latching power relay.

Figure 3 illustrates the interconnection of the contacts of the multiplexer relays of the primary and redundant power supplies. For the configuration shown, the redundant power supply is connected to the multiplexer and the primary power supply is connected to the parasitic load.

A failure mode can be defined in which one power supply (primary) cannot be commanded off, and its multiplexer relay cannot be commanded to the multiplexer position (two relay failures exist). This requires that the redundant power supply be commanded ON, and that its multiplexer relay be commanded ON. The configuration is then as shown in Figure 3.

Electrically it is possible to command both power supplies ON at the same time, however, the thermal characteristics of the power supply unit with both power supplies ON has not been investigated. The power supplies will then share all loads except the multiplexer load, unless both multiplexer relays are switched to the multiplexer load. If this is done the power supplies will share the multiplexer load as well.

With both power supplies ON, the effective overcurrent shutdown threhold is increased by the degree to which the power supplies share the loads. The effective power supply efficiency is decreased

F3867

since the load power remains the same, but there are additional losses associated with the second supply. The temperatures within the power supply unit would be expected to increase because of the additional loads of the second supply.

The above concludes the report describing the power supply failure involving the 908307-2 relay. The power supply is the only assembly that uses 908307-2 relays.

Andrew E. Huber
ANDREW E. HUBER

AEH:snc

(4)

F 3867

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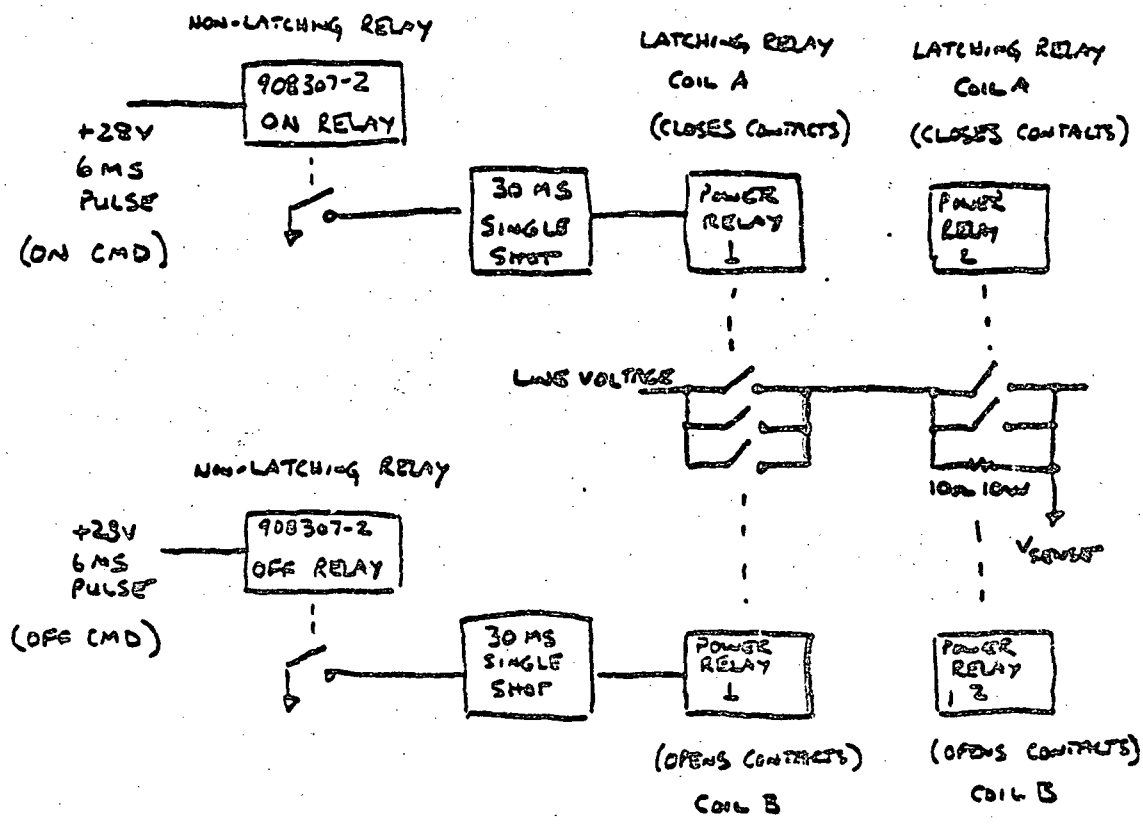

FIGURE 1. PRIMARY (OR REDUNDANT) POWER SUPPLY ON/OFF RELAY COMMAND STRUCTURE (CONCEPTUAL)

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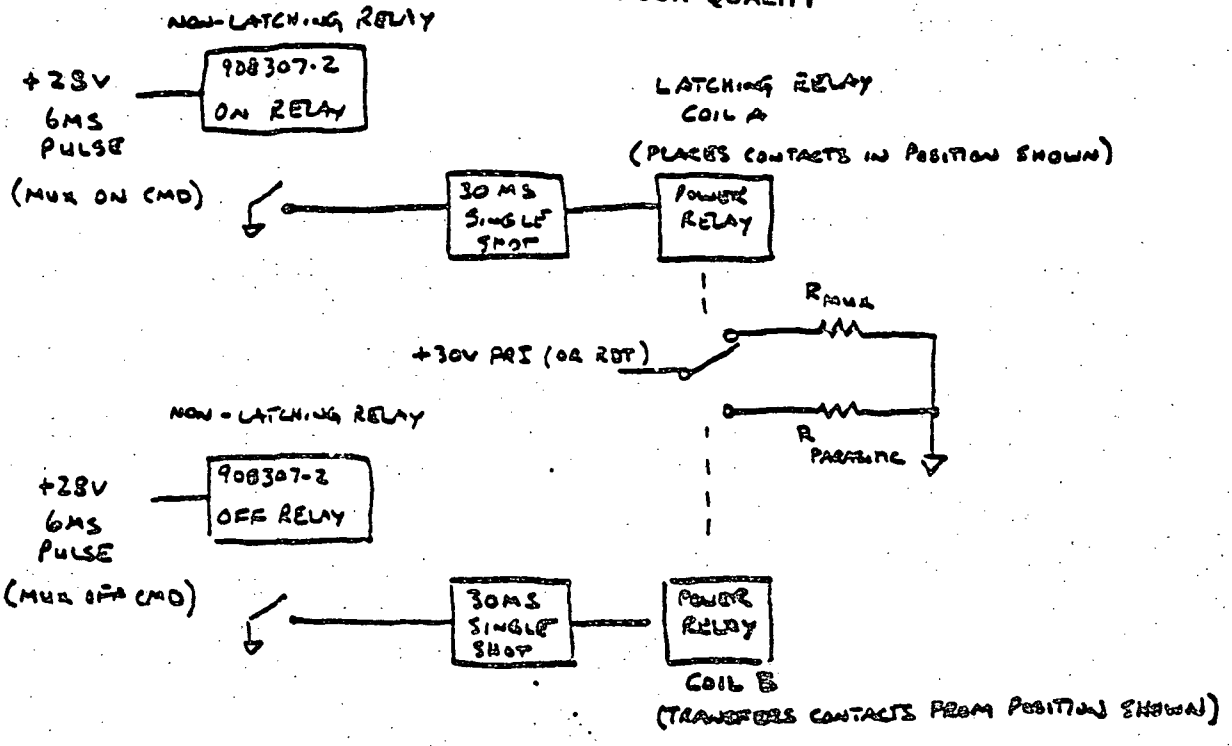

FIGURE 2. MULTIPLEXER COMMAND RELAY STRUCTURE
(ONE POWER SUPPLY)

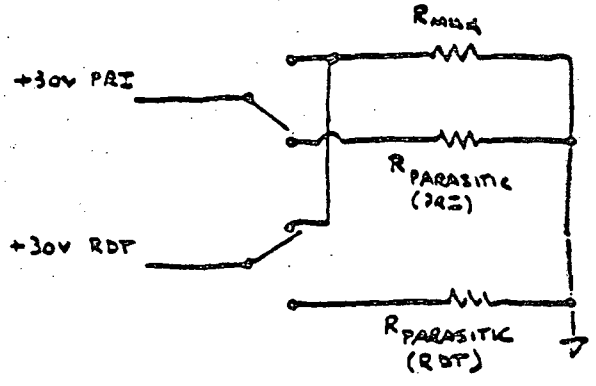

FIGURE 3. PRIMARY/REDUNDANT MULTIPLEXER RELAY CONTACT CONFIGURATION

SANTA BARBARA RESEARCH CENTER

F3867

AVOID VERBAL ORDERS

TO T.L. OCONNELL DATE 11-9-81

FROM A. HUBER SUBJECT POWER SUPPLY RELAY FAILURE (ER F3867)

NO OVERSTRESS OCCURRED AS A RESULT OF THE POWER SUPPLY OFF CMD RELAY FAILURE.

REF: HS 236-7711 (DATED 11-6-81)

A. Huber

cc: L. ALTMAN

SBRC FORM 14-0312

HUGHES

INTERDEPARTMENTAL CORRESPONDENCE

F3867

TO: E.F. Carle
ORG: 44-29

CC:

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DATE: 10 December 1981
REF. 7611.42/502

SUBJECT: SEM Analysis of Teledyne Relay, HAC P/N 908307-2, S/N 7364

FROM: P.R. Catizone
ORG. 76-11-42

BLDG. 6 MAIL STA. C136
LOC. CC EXT. 7619

INTRODUCTION

This relay failed after vibration in the Thematic Mapper flight unit. It saw 28 ±2 V in a 6mS pulse but did not transfer. It passed gross and fine leak tests. It went through vibration tests as per CDU 00691 and passed all but two where it required 18.7 and 18.2 volts to actuate as compared to the minimum of 14.7. The relay was delidded and inspected visually at Teledyne where it was determined that one of the guide pins was adjusted too high and not allowing enough play in the socket of the armature. A SEM analysis was done to look for any wear and/or material transfer at points of moving contact.

RESULTS

Upon visual inspection of the delidded relay, one could see two salient points. First of all the armature did not touch the core shank in all places (see Figure 1). In fact, the two were only in contact over a small area. Also, the right guide pin (as viewed in Figure 1) was set higher than the left. Although it may be difficult to see this in the picture, it was clearly visible with the part at hand under a microscope. This was in agreement with the visual inspection done at Teledyne. This point, together with an apparent bowing of the armature and uneveness of the core shank, is the cause of the mismatch between the two.

A view of the armature sockets under SEM revealed excessive wear along the top of the right socket (see Figure 2). Note that the socket in Figure 2 is upside down compared to the assembled relay in Figure 1. The left socket did not show nearly as much wear on the top although looked virtually the same on the sides as the right socket. This is in good agreement with the high adjustment of the guide pin and lack of play in the right side observed before dismantlement. The guide pins themselves showed no irregular surface disturbances or material transfer, so apparently the smearing of plating in the sockets is just a result of the pins rubbing and bumping, not cold welding or similar type problem.

A look at the pivot edge side of the armature showed a groove worn in (Figure 3) with most of the wear near the area that appeared in contact with the core shank (see Figure 1). A close-up of this area is shown in Figure 4. Although no nickel from the plating of the core shank was found transferred to the armature, material from the armature was found along the pivot edge of the core shank. The armature itself consists of an iron core with successive layers of copper, palladium and a thin layer of gold plating. An examination of the core shank in the area that corresponds with the groove area shown in Figure 4 revealed much transfer of gold, palladium and copper from the armature (see Figures 5 and 6). This

F 3867

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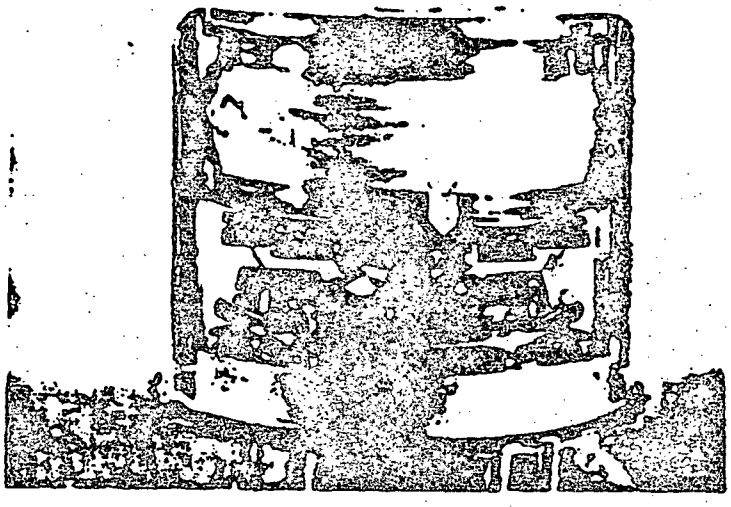

FIGURE NO. 1

Picture of delidded relay showing uneven matching between armature and core shank. The two are only in contact where the arrow indicates. Note also that the right guide pin is higher than the left.

MAGNIFICATION 10X

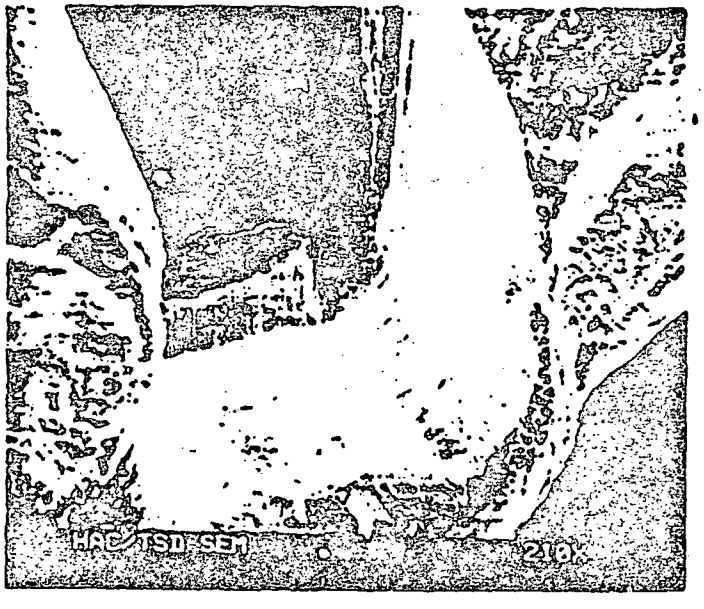

FIGURE NO. 2

Right socket showing smearing due to high guide pin.

MAGNIFICATION 210X

F 3867

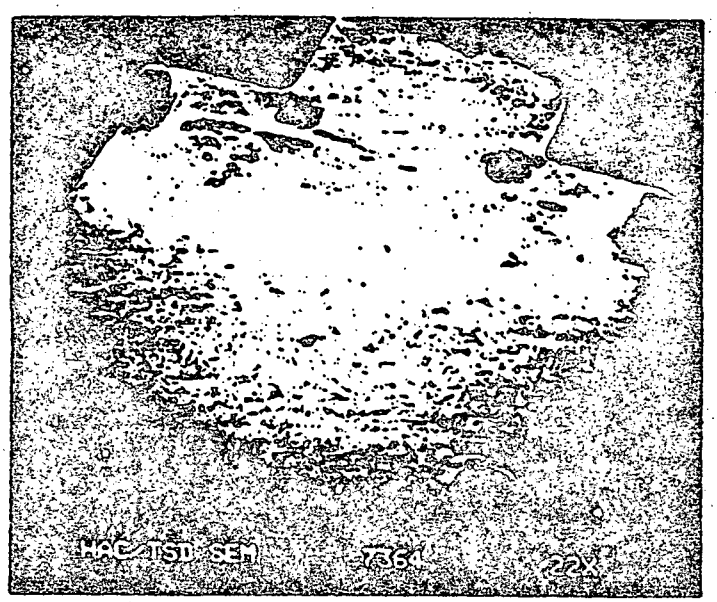

FIGURE NO. 3

View of armature actuator showing groove worn in due to pivot action against core shank.

MAGNIFICATION 22X

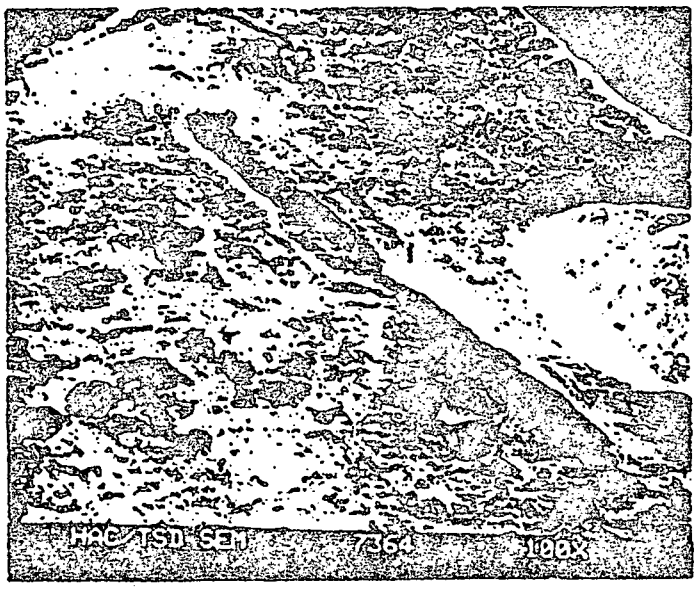

FIGURE NO. 4

Close up of area marked by arrow above. This is the area that appears in contact with the core shank in Figure 1.

MAGNIFICATION 100X

F3867

FIGURE NO. 5

Close up of pivot edge of core shank in area that appeared in contact with the armature (see Figure 1). The bright splotches are gold plating from the armature.

MAGNIFICATION 1100X

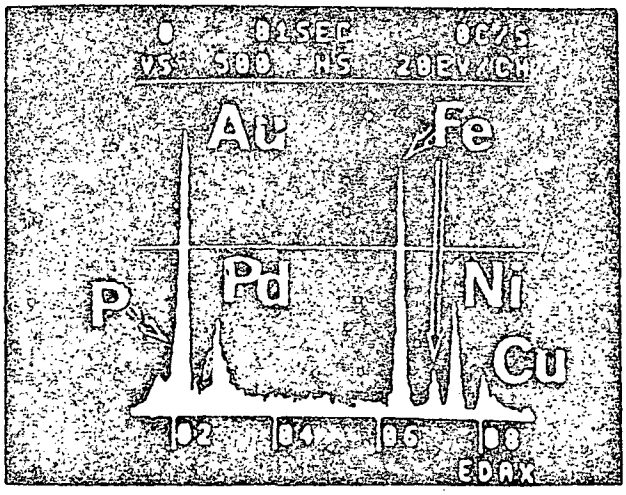

FIGURE NO. 6

EDX of pivot edge above. Note that gold, palladium and even copper have been transferred to the core shank which is iron with electroless nickel plating.

F3867

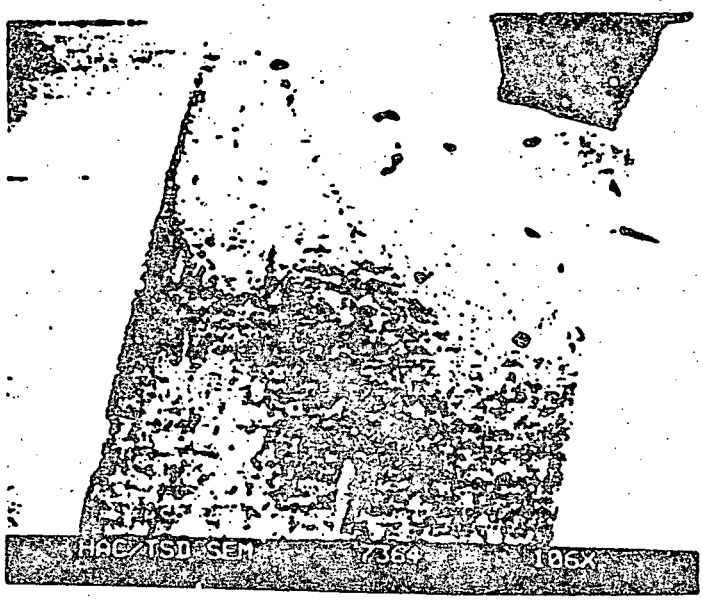

FIGURE NO. 7
View of end of spring
MAGNIFICATION 106X

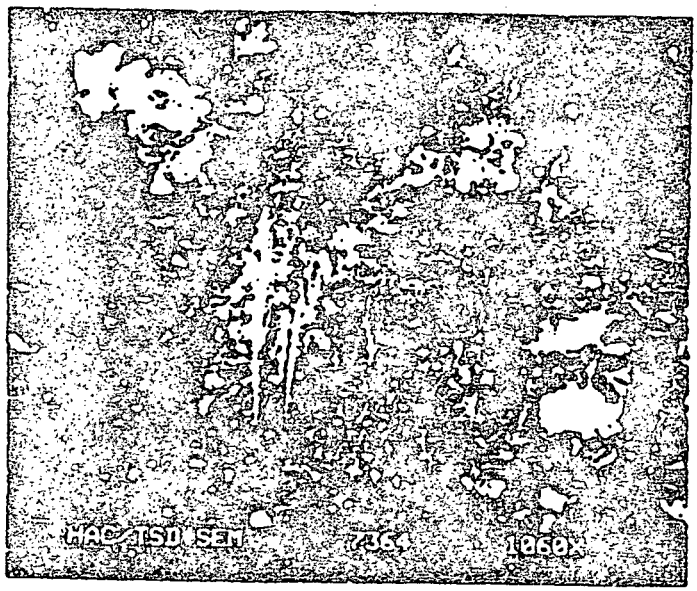

FIGURE NO. 8
Close up of spring from area marked by arrow above. Light flakes are gold.
MAGNIFICATION 1060X

F3867

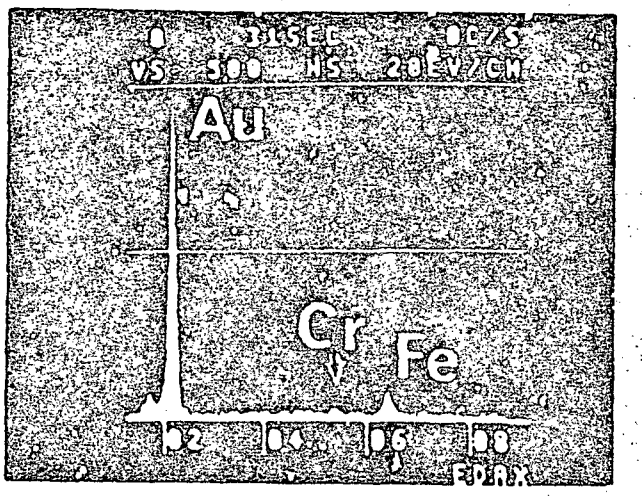

FIGURE NO. 9

EDX of a light area in Figure 6 showing presence of gold. The base metal of the spring is an Fe-Cr-Ni alloy.

FIGURE NO. 10

Close up of spring contact area on armature.

MAGNIFICATION 510X

F3867

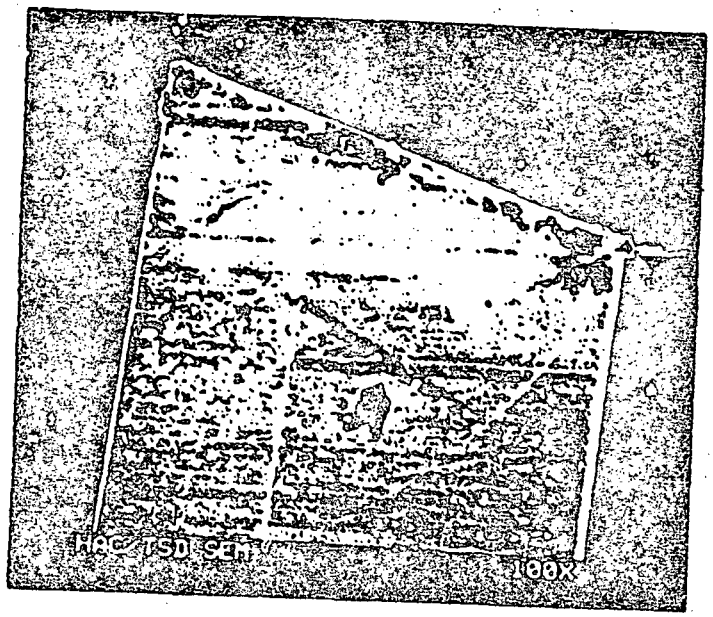

FIGURE NO. 11

View of the right movable contact showing the area that hits the lower stationary contact. The other three surfaces are very similar.

MAGNIFICATION 100X

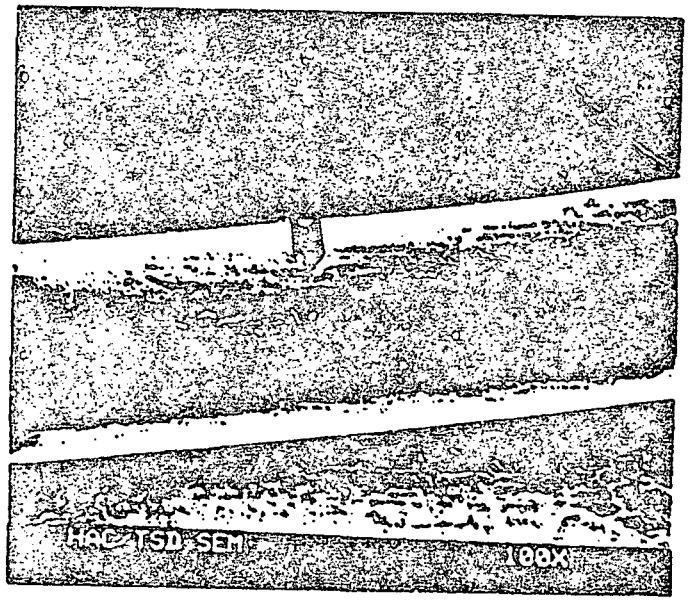

FIGURE NO. 12

View of the lower stationary contact that matches with the movable contact above. The arrows point to two lines of surface disturbances.

MAGNIFICATION 100X

F3867

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: L. O'Connell

CC: See Distribution List

DATE: 6 November 1981

REF: HS236-7711
REAH 81/57

FROM: A. Huber

BLDG. B11 MAIL STA. 102
EXT. 6246

SUBJECT: Power Supply
908307-2 Relays
(FR:F3867)

FR: F3867, dated November 2, 1981

Following acceptance test vibration of the Flight Model power supply, test of the power supply revealed that the power supply could not be commanded to the OFF state. It was verified by measuring coil current to the relay that the command to the OFF relay (A24-K5) was proper (+28V pulse for 6ms). The power supply cover was then removed and the miniswitcher board instrumented to investigate the failure. Subsequent testing found that the relay then functioned; the audible sound of relay contact transfer could be heard. (This sound was not present during earlier testing.) The relay (9080307-2, Teledyne part no. 412-6111, date code 7615, serial no. 183) was removed and sent to Teledyne for failure analysis.

There are a total of eight 908307-2 relays in the power supply: four each in the primary and redundant supplies. Each of the four relays within a given power supply performs one of the following functions:

(a) turns the supply ON (relay 1)
(b) turns the supply OFF (relay 2)
(c) applies 30V to the multiplexer and removes 30V from the parasitic mux load (relay 3)
(d) applies 30V to the parasitic mux load and removes 30V from the multiplexer.

Figure 1 illustrates the circuitry associated with the two relays that turn a given power supply (primary or redundant) to the ON or OFF states. The 908307-2 relays are non-latching relays which momentarily (6 ms) apply signal ground to the input of 30 ms single shots. The single shots, in turn, apply voltage to the first of two high-current (power) relays to apply or remove bus voltage to power supply circuitry.

There are two power relays in series. The second power relay has associated with it a 10 ohm power resistor. This resistor limits the inrush current. When the voltage at the 10 ohm resistor reaches +18.5, the contacts of the second power relay close, thereby shorting the resistor. The power supply is then fully operational. The second power relay opens and closes as a function of line voltage (+18.5V) threshold), controlled by voltage sensing circuitry within the power supply.

Once a power supply has been commanded to the ON state, the contacts of the first power relay can only be opened by three events:

F3867

since the load power remains the same, but there are additional losses associated with the second supply. The temperatures within the power supply unit would be expected to increase because of the additional loads of the second supply.

The above concludes the report describing the power supply failure involving the 908307-2 relay. The power supply is the only assembly that uses 908307-2 relays.

Andrew E. Huber
ANDREW E. HUBER

AEH:snc

F 3867

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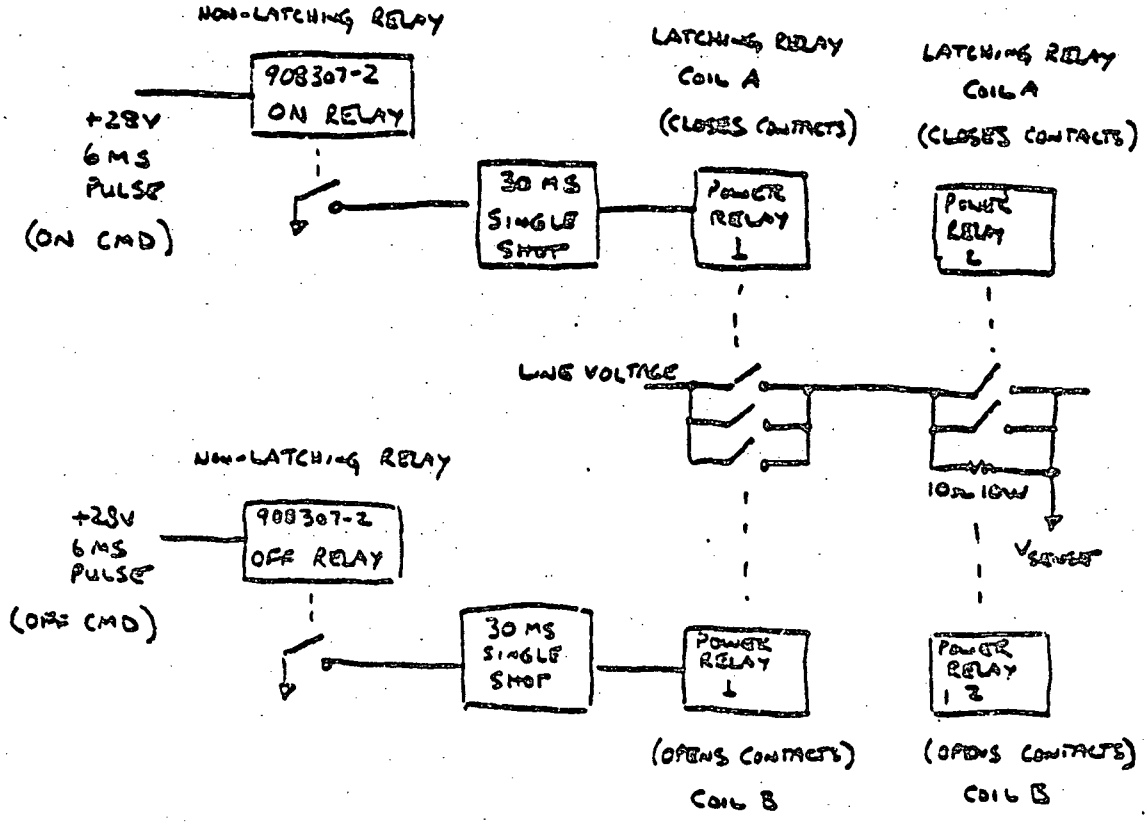

FIGURE 1. PRIMARY (OR REDUNDANT) POWER SUPPLY ON/OFF RELAY COMMAND STRUCTURE (CONCEPTUAL)

F3867

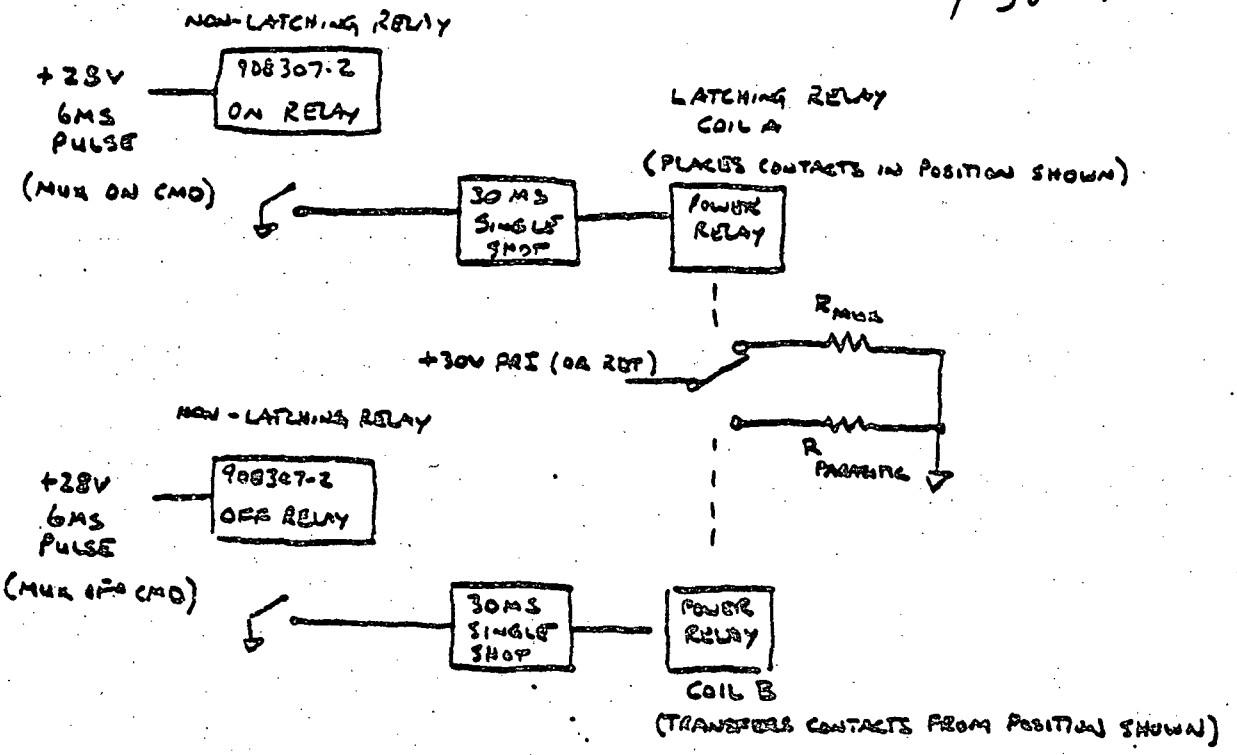

FIGURE 2. MULTIPLEXER COMMAND RELAY STRUCTURE (ONE POWER SUPPLY)

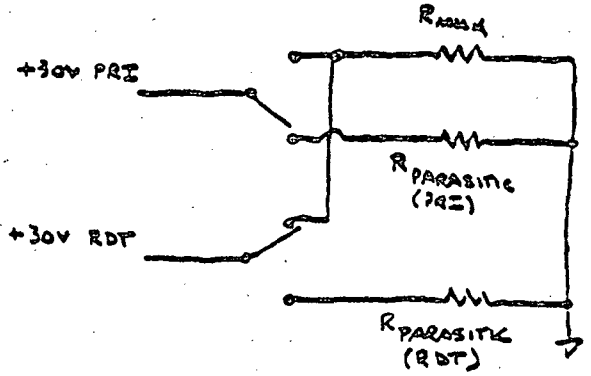

FIGURE 3. PRIMARY/REDUNDANT MULTIPLEXER RELAY CONTACT CONFIGURATION

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Data Bank (8)

SANTA BARBARA RESEARCH CENTER

F3867

AVOID VERBAL ORDERS

TO L. O'CONNELL

DATE 11-9-81

FROM A. HUBER

SUBJECT POWER SUPPLY RELAY FAILURE (FR: F3867)

NO OVERSTRESS OCCURRED AS A RESULT OF THE POWER SUPPLY OFF CMD RELAY FAILURE.

REF: HS 236-7711 (DATED 11-6-81)

A. Huber

CC: L. ALTMAN

SBRC FORM 14-0312

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

F 4831

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER HS236 | 2. GLA: E330 | 3. MODEL: FLIGHT | 4. TIME OBSERVED: | 5. DATE OBSERVED: MO 4 DA 28 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (FLT)	50869	004	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: CENTER TAP CURRENT IN MINI PRIMARY WINDING OF XFMR INDICATES 1 AMP OF PULSED CURRENT; S/B 280 MA PULSES AT CHK-OUT W/MAX BD SUPPLY TURNED "OFF"

15. TEST PROCEDURE: TS 16606 | PARA: I | 16. OPERATOR: [signature] | ORG: 41-33 | DATE: 4-29-81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: PROBLEM IS A WIRING ERROR AND WITH NO COMPONENT OR STRESSES. SUPPLY ANALYZER ATTACHED. CONNECTION MADE TO WRONG END OF INDUCTOR L2.

19. FAILED ITEM NAME AND PART NUMBER: NONE

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: MISS WIRE: FROM P6-7 to L2-E2 & P6-7 to L2-E1. RETEST PER TS 16606 PARA I

21. AUTHORIZATION: [signature] | ORG: 41-33 | DATE: 4-30-81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: WIRE FROM P6-7 to L2-E2 & P6-7 to L2-E1. RETESTED PER TS 16606 PARA I

24. G.A. WORK (HAC ID 8173) 5-4-81

25. RETEST (HAC TEST S-15) 5-7-81

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
—						
—						
—						

27. REWORK BY: ELAISA BECKER | ORG: 41-33 | DATE: 4-30-81 | 28. RETESTED BY: Dan Crawford | ORG: 41-33 | DATE: 4-29-81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: CAUSE: WIRING ERROR. C/A: OPERATOR AND WIRE CHECKER INSTRUCTED TO PHYSICALLY TRACE WIRE TO TERMINATION POINT IF POSSIBLE. CHECK WIRING TO WIRE LIST 53666 FOR CORRECT TERMINATION.

31. FRB CLOSURE: [signature] 7/27/81 | 31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/LAB ERROR ☐ WORKMANSHIP ☒ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE:

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT TEST ENGINEER	ORG	DATE
S. BENSON	41-33	7/21/81	[signature]	2261	8/07/27
39. RELIABILITY: [signature]	ORG: 51-41	DATE: 7-23-81	40. CUSTOMER OR SUPPLIER: [signature] 7/31/81		DATE

D11873 SC JAN 80

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP
FAILURE REPORT

F 4832

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. JLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER 15236	E330	FLIGHT		MO 4 DA 30 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION: NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM			
8. UNIT POWER SUPPLY (FLT)	50869	004	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY MAXI-PWB	51590	002	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD			
11. OTHER			

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ TEMP ____° ____ ☐ THERMAL VAC ____ HRS AT ____° ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: SYNC PULSE NOT ~~[illegible]~~ MAXI-BED.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION SHEET USED
TS 16606	VI	[signature]	41-33	4-30-81	☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: WIRING ERROR ON MAXI BED, A23 J2-16 to ~~[illegible]~~ PAD, S/B A23 J2-16 to A23-E36. THERE WERE NO COMPONENTS STRESSED. ~~[illegible]~~ NO COMPONENTS STRESSED ~~[illegible]~~ FAILURE ANALYSIS ~~[illegible]~~

19. FAILED ITEM NAME / NUMBER: NONE

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: ATTACHED. REWIRE PER WIRE LIST 53666 ~~A23 J2-16 ... PAD, S/B A23 J2-16 to A23 E36.~~ RETEST PER TS16606 PARA VI

21. AUTHORIZATION	ORG	DATE	CONTINUATION SHEET USED
[signature]	41-33	4-30-81	☐

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: REWIRE PER WIRE LIST 53666 ~~A23 J2-16 ... PAD, S/B A23 J2-16 to A23 E36~~ RETESTED PER TS 16606 PARA VI

24. QA REWORK: (stamp) 5-1-81
25. QA RETEST: (stamp) HAC TEST 515

23. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
—						
—						
—						

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	CONTINUATION SHEET USED
ELAISA BECKER	41-33	4-30-81	DEL COMIFED	41-33	4-30-81	☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
CAUSE: WIRING ERROR AND INSPECTION ERROR.
C/A: INSTRUCTED ASSEMBLER AND WIRE CHECK INSPECTOR TO FOLLOW WIRE TERMINATIONS AS DEFINED ON DWG 53666 (WIRE LIST)

31. CONTINUATION SHEET USED ☐

33. FRB CLOSURE: [signature] 7/27/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION:

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☒ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE:

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
[signature]	41-33	7/21/81	[signature]	2261	810727

39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER	DATE
[signature]	51-41	7-23-81	[signature]	

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FAILURE REPORT

F 4833

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER | 2. P/A: E330 | 3. MODEL: FLIGHT | 4. TIME OBSERVED: | 5. DATE OBSERVED: MO 5 DA 4 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (PLT-SN-4)	50869	4	HAC
☐ ASSEMBLY ☒ SUBASSEMBLY	MAXI-PWB	51590	2	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: MAXI-SWITCHER CHECKOUT-REDUNDANT. OBSERVED NO BASE DRIVE ON ONE LEG TO POWER TRANSISTORS DURING ATTEMPT TO PHASE UP PULSE WIDTH ON MAXI-PWB. NO LOAD CONDITION.

15. TEST PROCEDURE: TS 16606 | PHT | 16. EXAMINATOR: G. BENSON | ORG 41-33 | DATE 5/5/81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: ENGINEERING TESTS INDICATE TRANSISTOR Q17 ON A23 (51590 SN-7) FAILED - OPEN EMITTER. SUBMIT COMPONENT FOR FAILURE ANALYSIS. COMPONENT STRESS ANALYSIS ATTACHED.

19. FAILED ITEM NAME AND PART NUMBER: TRANSISTOR MOTOROLA 90888I-1 SS2938H-1 FAIL-SAFE

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REPLACE Q17 & Q18 (OVERSTRESS) SUBMIT TO PARTS RETEST PER TS-16606, PART II BOARD FAIL.

21. AUTHORIZATION: G. BENSON | ORG 41-33 | DATE 5/5/81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: RETEST PER TS 16606 PART II REMOVE AND REPLACE Q17 & Q18. RETEST.

24. QA WORK (QA to SITS) 5-13

25. PARAMETER TEST S23

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
~~90888I-1~~	~~Q17~~					
REPLACED TO REMOVE PREVIOUS						
90888I-1	Q17		7447	MOTOROLA		

27. REWORK BY: ELAISA BECKER | ORG 41-33 | DATE 5-8-81 | 28. RETESTED BY: DEL CRAWFORD | ORG 41-33 | DATE 5-12-81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION:
CAUSE: OPEN BASE LEAD IN TRANSISTOR Q17 PER FAR 8931. PROBABLE INDUCED FAILURE DURING SUBASSY C/O OR UNIT C/O TEST WHICH APPLIED HIGH CURRENT SOURCE TO BASE OF Q17. INCORRECT TEST SET-UP.
C/A: INSTRUCTED TECHNICIAN TO HAVE SECOND TECHNICIAN VERIFY TEST SETUP BEFORE VOLTAGE APPLIED.

31. FRB CLOSURE: 5/27/81 | 31. CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☒ TEST PROCEDURE ☒ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
G. BENSON	41-33	5/21/81		2761	810727
39. RELIABILITY: G. Perlman	ORG 51-41	DATE 7-23-81	40. CUSTOMER OR SUPPLIER:		DATE

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FAILURE REPORT

F 4834

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. CI/A	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER	E330	FLIGHT	≈ 10:00 AM	MO 5 DA 9 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (PLT SW-4)	50869	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYP ☐ OTHER

14. DESCRIPTION OF FAILURE: CENTER TAP CURRENT IN THE MAXI IS EXCEEDING 150MA'S WITH NO LOAD ON MAXI REDUNDANT. OCCURRED DURING CHECKOUT OF REDUNDANT MAXI-LAMP TEL. POWER STAGE.

15. TEST PROCEDURE: TS-16606 PARA: VI | 16. ORIGINATOR: E. Ellison | ORG: 41-33 | DATE: 5-11-81 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: WIRE CONNECTED (SOLDERED) TO T2-E11 FROM T4-E1 IS MAGNET WIRE AND THIS MAGNET WIRE WAS PUSHED UP AGAINST T2-E14, BREAKING MAGNET WIRE INSULATION PRODUCING A SHORT ACROSS PRIMARY OF T2 & T6. No Components Were Over Stressed - See Attachment.

19. FAILED ITEM NAME AND PART NUMBER: NONE

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: WIRE CAN BE MOVED AWAY FROM ADJACENT TERMINAL. RAISE WIRE ROUTING TO ELIMINATE SHORTING HAZARD PER WORKMANSHIP STANDARDS. RETEST PER TS-16606 VI VII

21. AUTHORIZATION: E. Ellison | ORG: 41-33 | DATE: 5/11/81 | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REWORK NOT REQUIRED BECAUSE WIRE ROUTING WAS MOVED AWAY FROM ADJACENT TERMINAL WITHOUT RESOLDERING CONNECTION. ACCOMPLISHED RETEST PER TS-16606 VI

24. QA REWORK

25. QA/INSPECTOR TEST S23

26. LIST ALL PARTS REPLACED

PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
NONE						

27. REWORK BY: N/A | ORG | DATE

28. RETESTED BY: DEE CRAWFORD | ORG: 41-33 | DATE: 5/12/81 | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION

CAUSE: OPERATOR ROUTED WIRE TOO CLOSE TO ADJACENT TERMINALS; THEREFORE RESULTING IN A SHORT.

C/A: WIRE RE-ROUTED AWAY FROM TERMINAL. OPERATOR INSTRUCTED TO FOLLOW NORMAL WORKMANSHIP STANDARDS TO AVOID HAZARDOUS WIRE ROUTING.

31. ☐ CONTINUATION SHEET USED

31. FRB CLOSURE: 7/27/81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/FAB ERROR WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE

33. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

35. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
G. Ellison	41-33	7/21/81		2261	8/07/27
39. RELIABILITY: J. Rubin	ORG: 57-41	DATE: 7-23-81	40. CUSTOMER OR SUPPLIER:		DATE

7/31/81

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FAILURE REPORT

F 4835

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER | 2. GFA: E330 | 3. MODEL: FLT | 4. TIME OBSERVED: 1:30 PM | 5. DATE OBSERVED: MO 5 DA 9 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☒ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY (FLT SN-4)	50869	4	HAC
9. ☐ ASSEMBLY ☒ SUBASSEMBLY	MAXI-PWB	51619	2	HAC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MCH TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: TRY TO TURN MAXI UP BUT IT ONLY TURNS "ON" A LITTLE, BUT WILL NOT CONTINUE TO PHASE-UP. (REDUNDANT) OCCURRED DURING CHECKOUT OF REDUNDANT MAXI-INVERTER POWER STAGE.

15. TEST PROCEDURE: TS16606 | PARA: VI | 16. ORIGINATOR: [signature] | ORG: 41-33 | DATE: 5-9-81 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: WRONG BASE to EMITTER VALUE FOR A24R58, WAS 180K 5% ¼W, SHOULD BE 5.1K 5% ¼W — No COMPONENTS WERE OVER STRESSED - SEE ATTACHMENT.

18. FAILED ITEM NAME AND PART NUMBER: NONE

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: INSTALL PER PRINT A24R58 5.1K 5% ¼W. RETEST TS16606 PARA VI.

21. AUTHORIZATION: [signature] | ORG: 41-33 | DATE: 5-9-81 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: INSTALL PER PRINT A24R58 5.1K 5% ¼W. RETEST PER TS16606 PARA- VI

24. QA REWORK: [signature] 5/13/81

25. QA RETEST: [signature] S23

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY: LAISA BECKER | ORG: 41-33 | DATE: 5-12-81 | 28. RETESTED BY: DEL CROWDER | ORG: 44-33 | DATE: 5-12-81 | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION

CAUSE: WRONG RESISTOR VALUE INSTALLED FOR A24R58.

CORRECTION - ASSEMBLER AND INSPECTOR INSTRUCTED TO FOLLOW DRAWING CAREFULLY AND VERIFY CORRECT PART IS BEING INSTALLED.

31. CONTINUATION ☐ SHEET USED

33. FRB CLOSURE: [signature] 7-21-81

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☒ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT/SYSTEM ENGINEER	ORG	DATE
G. BENSON	41-33	7/21/81	[signature]	2261	8/07/81
39. RELIABILITY: [signature]	ORG: 51-4	DATE: 7-23-81	40. CUSTOMER OR SUPPLIER: D.D.		DATE: 7/21/81

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FAILURE REPORT

F 4836

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER	E330	FLIGHT	11:00 AM	MO 5 DA 13 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY	50869	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: WHILE UNIT WAS FUNCTIONING AT 35 VOLTS BUS IN OUTGAS MODE, FOR ABOUT 4 MINUTES, IT SHUT IT'S SELF "OFF" AND COULD NOT BE RESTARTED W. PRIMARY SIDE FAILED. SECONDARY SIDE-OK.

15. TEST PROCEDURE: TS 16603 | PARA: 5.11.6 | 16. ORIGINATOR: E. Eglsaw/BCKW | ORG: 41-33 | DATE: 5-13-81 | 17. CONTINUATION SHEET USED ☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: CR3 IN 51566 ASSY & Q8 ON CHASSIS FAILED DURING TEST. (INVESTIGATION FAILURE ANALYSIS ATTACHED. FAILED SECONDARY WINDING & POWER WINDING SPEC ANALYSIS ATTACHED. REF. E. BERGH AVO DATED 11/24/81 11/30/81

19. FAILED ITEM NAME / PART NUMBER

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REWORK: INCORPORATE E.O. 2046A, INSTALL (8 EACH) RECTIFYING DIODES AND POWER TRANSISTOR (4 EACH). RETEST TS 16603 PARA 5.11.6

21. AUTHORIZATION: E. Bergh | ORG: 41-33 | DATE: 6-2-81 | 22. CONTINUATION SHEET USED ☐

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: REWORK: INCORPORATE E.O. 2046A, INSTALL NEW DIODES IN BOTH A3 & A4 ASSY. 51566 CR1 THRU CR8, REPLACE CHASSIS TRANSISTORS Q5 THRU Q8. RETEST: TS16603 5.11.6

24. QA REVIEW: SITS

25. QA INITIAL: TEST S3

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
908236-2	Q8	9C390-505 A	7952	GENERAL SEMICONDUCTOR		
908236-3	CR3		7902BE	SEMTECH		

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	29. CONTINUATION SHEET USED
ELISA BECKER	41-33	6-15-81	DELBERT CRAWFORD	41-33		☐

30. CAUSE AND CORRECTIVE ACTION

CAUSE: DESIGN DEFICIENCY IN THERMAL DISSIPATING PATH FOR DIODES ON ASY 51566.

C/A: REWORKED SUBASSY 51566 TO IMPROVE THERMAL PATH. TEMPERATURE TESTS AFTER REWORK INDICATED ACCEPTABLE 140°F MAX CASE TEMP. AT STEADY-STATE. (E0 2046A)

31. CONTINUATION SHEET USED ☐

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: E0 2046A EFFECTIVITY S/N 14 UP

33. FRB CLOSURE: 10/22/81

ENGINEERING/RELIABILITY

34. BASIC CAUSE OF VERIFIED FAILURE: ☒ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☒ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
E. EGLSAW	41-33	10/17/81		22-61	10/22/81
39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER		DATE
	51-41	10/20/81			

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FAILURE REPORT

F 4837

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER	E330	FLIGHT	2:00PM	MO 5 DA 20 YR 81

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☒ SUBSYSTEM UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	P/N PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	POWER SUPPLY	40869	4	HAC
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☒ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ RUN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: WHEN SYNC WAS TURNED "ON", UNIT WOULD NOT SYNC.

15. TEST PROCEDURE: TS 16603 PARA 5.11.2 | 16. ORIGINATOR: A. EVARS ORG 41-33 DATE 5/21/81 | 17. CONTINUATION SHEET USED ☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: SYNC SIGNAL WAS NOT GOING FROM MAIN BD TO MAIN BD, BECAUSE INTER-CONNECT CABLE DEVELOPED A SHORT AT THE SPLICE OF THE CONDUCTOR AND SHIELD ; WHICH IN TURN STRESSED A24-Q6 TRANSISTOR. FAILURE APPEARS AT THIS BD. FAILED ITEM NAME A-24-Q6 PART NUMBER 908839-1

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REWORK SPLICE BETWEEN CONNECTORS P3 AND P6 AS MANUFACTURED IN DETAIL IN SECTION #20 & REPLACE A24-Q6. P3-24 conductor to splice to P6-22 and REMOVE SHIELD P3-12 shield to splice to P6-10 & RETEST TS 16603, PARA 5.11.2

19. VERIFICATION | ORG 41-33 | DATE 5/21/81 | 21. CONTINUATION SHEET USED ☐

MANUFACTURING AND TEST

22. REWORK/RETEST ACTION TAKEN: REWORK SPLICE BETWEEN CONNECTORS P3 AND P6 AS MANUFACTURED IN DETAIL IN SECTION #20 & REPLACE A24-Q6. RETEST PER TS 16603 PARA 5.11.2

24. QA REVIEW 6/5-81 | 25. QA RETEST HAC TEST SJ 6/29

23. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFEC.	ANALYSIS NUMBER
REFER TO						
REWORK PREVIOUSLY						
908839-1	Q6					

26. REWORK BY: ELISA BERGER | ORG 41-33 | DATE 6-15-81 | 27. RETESTED BY: BRENT CRAWFORD | ORG 41-33 | DATE | 28. CONTINUATION SHEET USED ☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION

CAUSE: SPLICE IN SHIELDED WIRE DEVELOPED SHORT DUE TO FLEXURE OF MAIN & MINI PWB.

N/A: SECURE WIRING BETWEEN MAIN & MINI PWB IN BUNDLES TO REDUCE STRESS BUILDUP IN SPLICE DUE TO LOCAL FLEXURE. REFER TO ANO DATED 11/20/81 (COPY ATTACHED).

31. FRB CLOSURE: 10/22/81 | 31. CONTINUATION SHEET USED ☒

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☒ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT/SYSTEM ENGINEER	ORG	DATE
E. JENSON	41-33	7/20/81	J. Cargal	2261	8/11
39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER		DATE
	51-44	10/20/81	N.A.		

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SPACE AND COMMUNICATION GROUP
EQUIPMENT CHECKOUT
FAILURE REPORT
CONTINUATION SHEET

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F 4837 FR SERIAL NO. | CONT. SHEET LETTER*

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

Responsible manufacturing supervisor has been informed by the RFA as to the proper workmanship methods to use to obtain proper wire dressing on future units.

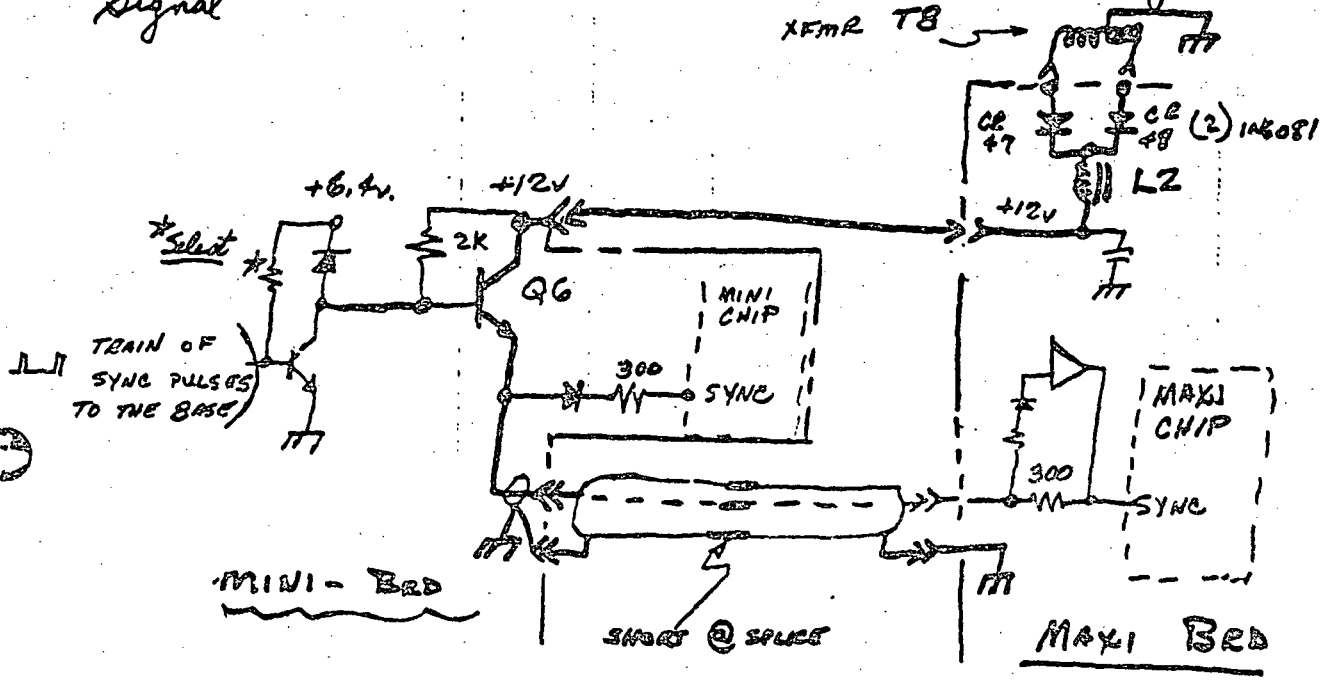
12/20/84

16060A SC AUG 78

COPY 1 ROUTE WITH DISCREPANT ITEM

FAILURE REPORT #F4837

There was a shielded wire short, which put the center conductor at return ground potential. This short was in the inter-connecting harness, from MINI-Sw. to the MAXI-Sw. that carries the "sync signal"



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AVOID VERBAL ORDERS

TO	SOURCE CODE	BLDG.	M/S	EXT.
R. S. WILKERSON				
FROM	**SOURCE CODE**	**BLDG.**	**M/S**	**EXT.**
G. BENSON	41133130	S12	V329	8-0879

SUBJECT: SPLICED WIRES ON FLT POWER SUPPLY. DATE: 11/20/81

REFERENCE FAILURE REPORT # F4837.

ORIGINAL SPLICE WAS INSTALLED PER AUTHORITY GRANTED UNDER DEVIATION D-068 "ACCEPTABILITY OF SPLICED WIRES" APPLICABLE TO BOTH PROTOFLIGHT (SN-3) AND FLIGHT (SN-4). WIRING WAS SECURED BY HALNES TIE TO REDUCE FLEXURE DURING TEST. QA INSPECTED AND APPROVED ALL REWORK OPERATIONS (MAC/QSS/AFQA)

G. BENSON
SIGNATURE

15 CS APR 79

FAILURE REPORT # F4837

A24-Q6 908839-1 (2N2222A) has a collector current maximum of 800 ma. Transistor Q6 base current was 5.6 ma with a collector current of 0.5 amps giving a beta of 89. Transistor Q6 is the only component in the 0.5 amp path that was over-stressed, due to 12 volts at its collector and a current of 0.5 amps which is 6 watts dissipation before its Emitter opened.

The diodes CR47 & CR48 of the MAR1-Sw. (A23) 908702-2 (1N6081); these diodes are rated @ 2 amps @ 25° Centi ambient. Each diode carried 0.5 amps every half cycle for 90 milli sec. which is in-sufficient time for the diode to heat up. Besides if the leads are at 70° Centi the diode can carry 12.0 amps with no stress to diodes.

The following two pages have a picture indicating the Collector voltage on top trace @ 2v/DIV., Emitter current is the bottom trace @ 1 amp/DIV. These pages also include the analysis of the choke L2 & the transformer T8 which indicates that the temperature rise in the wire of each component didn't exceed 0.05 degrees FAHR.

Conclusion is all components are all right but Q6 must be replace.

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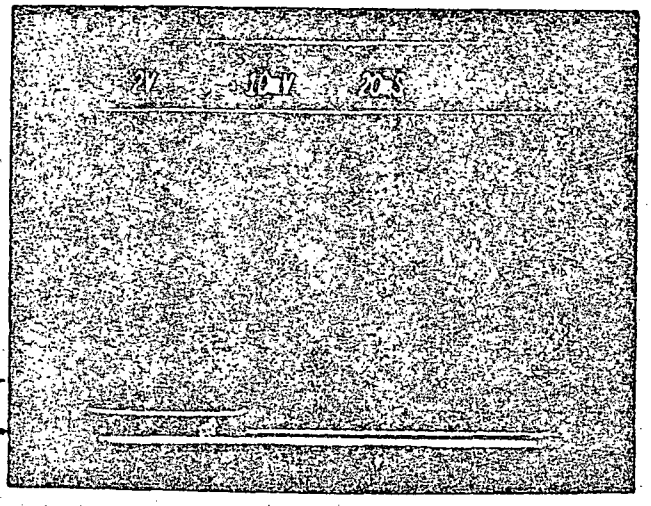
FAILURE REPORT #F4837

(3)



2N2222

V_{CE} 2V/DIV

I_E @ 1A/cm

V=0

I=0

t=0

(5) Wire size

XFMR #26 R=.225Ω (XFMR 53563 (T8))

Choke #28 R=1.05Ω (CHOKE 53541 (L2))

Wire

#26 is $40.81\ \Omega/10^3$ ft , $.7692\ \#/10^3$ ft

XFMR

$$\frac{.7692\ \#/10^3\text{ft}}{40.81\ \Omega/10^3\text{ft}} \times .225\ \Omega = 4.24 \cdot 10^{-3}\ \text{lbs/winding}$$

Choke

#28 is $64.90\ \Omega/10^3$ ft , $.4837\ \#/10^3$ ft

$$\frac{.4837\ \#/10^3\text{ft}}{64.90\ \Omega/10^3\text{ft}} \times 1.05\ \Omega = 7.826 \cdot 10^{-3}\ \text{lbs/choke}$$

(6)

Dissipation

FAILURE REPORT ④
#F4837

XFMR $I^2 \cdot R \cdot$ duty

$(.5A)^2 \cdot .225 \cdot \frac{1}{2} = 28.13\ mW$

Choke

$(.5A)^2 \cdot 1.05 \cdot 1 = 262.5\ mW$

XFMR

$$\Delta t\ (°F) = \frac{3.416 \times 28.13 \cdot 10^{-3}\ W \times 100 \cdot 10^{-3}\ sec \times 1\ hr/3600\ sec}{4.24 \cdot 10^{-3}\ lbs \times .092\ \frac{BTU}{LB\ °F}}$$

$$\boxed{\Delta t = 6.84 \cdot 10^{-3}\ °F}$$

Choke

$$\Delta t = \frac{3.416 \times 262.5 \cdot 10^{-3}\ W \times 100 \cdot 10^{-3}\ sec \times 1\ hr/3600\ sec}{7.826 \cdot 10^{-3}\ lbs \times .092\ \frac{BTU}{LB\ °F}}$$

$$\boxed{\Delta t = 34.6 \cdot 10^{-3}\ °F}$$

SECTION 2.4
MAINFRAME/ TOP MECHANICAL ASSEMBLY

2.4.1 Mainframe / Top Mechanical Assembly

2.4.1.1

No Performance data was taken at the subsystem level on this subsystem.

2.4.2
Acceptance Data

2.4.2.1
Configuration Lists

The "as built" configuration list for the Mainframe and top mechanical assembly is included in the listing for the overall system.

Listing of Liens

There were no liens recorded against the Mainframe/Top Mechanical Assembly.

SECTION 2.5
AFT OPTICS ASSEMBLY

2.5.1 Aft Optics Assembly

2.5.1.1

No performance data was taken at the subsystem level on this subsystem.

2.5.2
Acceptance Data

2.5.2.1
Configuration Lists

AS-BUILT CONFIGURATION LIST

AFT OPTICS ASSY
P/N 51512, S/N 003, FLIGHT

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
1	51512	AFT OPTICS ASSY	D + 3646A 3896A 3925A 3959A 4134A	D + 3646A 3896A 3925A 3959A 4134A	D + 3646A 3896A 3925A 3959A 4134A	003
2	50795	SILICON FOCAL PLANE ASSY	H + 3934A 3968A 3982A W-126	H + 3934A 3968A 3982A W-126	H + 3934A 3968A 3982A W-126	201
2	50843	AFT OPTICS SUPPORT	G	G	G	
2	51030	SCAN LINE CORRECTOR ASSY	E + 1012A 3823A 3956A	E + 1012A 3823A 3956A	E + 1012A 3823A 3956A	004
3	50820	TORQUE MOTOR, SLC	C	C	C	003
3	51035	MIRROR NO. 2, SLC	C	C	C	003
3	51037	MIRROR NO. 1, SLC	C	C	C	106
3	51040	FRAME ASSY-SLC	D	D	D	004
3	51887	TEMPERATURE SENSOR ASSY-SLC	B + 8689-N	B	B	401
2	51343	BLACKBODY & MOUNT ASSY	C	C	C	003
3	51346	BLACKBODY ASSY	D + 3906A	D + 3906A	D + 3906A	003
2	51364	TERMINAL BOARD ASSY	B	B	B	
2	51482	SHIM	B	B		

N-REPRESENTS A NON-MANDATORY CHANGE

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	51485	PRIME FOCAL PLANE ASSY	D	D	D	002
2	51495	CENTER BAFFLE ASSY	C	C	C	003
3	52733	BAFFLE ASSY, B3	C + 3942A W-139 W-143 **W-143 waives planning for EO 8842 which when incorporated raised dwg from B to C.**	B + 3942A W-139 W-143	B + 3942A W-139 W-143	003
2	51496	CALIBRATION LIGHT SOURCE ASSY	D + 3960A 4170A	D + 3960A 4170A	D + 3960A 4170A	003
3	51497	LAMP SOURCE ASSY	B	B	B	044 069 113
3	51546	LIGHT SOURCE ASSY	D	D	D	001 002 003
3	52959	THERMISTOR ASSY	C	C	C	202
2	52249	REDUNDANT/RESTORE SHUTTER ASSY	F + D-134	F + D-134	F + D-134	003
3	52077	SHUTTER ARM ASSY-RED/RESTORE SHUTTER ASSY	C	C	C	003
3	52083	POSITION INDICATOR PICKOFF ASSY-RED/RESTORE SHUTTER	C	C	C	203 204 205
2	52500	CAL/RESTORE FAILSAFE ASSY	B + 1040A 2054A 3980A	B + 1040A 2054A 3980A	B + 1040A 2054A 3980A	003
3	51269	HEATER LINK ASSY	E + 3790A	E + 3790A	E + 3790A	003
2	52544	CAL/RESTORE SHUTTER ASSY	C + 3742A 3969A 3984A 4040A	C + 3742A 3969A 3984A 4040A	C + 3742A 3969A 3984A 4040A PER NCMR 299682	003

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
3	52345	SHUTTER ARM ASSY-CAL/RESTORE SHUTTER ASSY	C + 9163 3871A 3940A 3958A 3992A 4017A W-139 W-141	C + 9163 3871A 3940A 3958A 3992A 4017A W-139 W-141	C + 9163 3871A 3940A 3958A ***** 4017A W-139 W-141	003
		*****W-141 waives missing planning for screw trim operation per EO 3992A				
4	51898	CAL/RESTORE FLAG ASSY	C	C	C	003
3	53517	CAL/RESTORE MOTOR ASSY	B + 3306A 3979A	B + 3306A 3979A	B + 3306A 3979A	002
4	52083	POSITION INDICATOR PICKOFF ASSY-CAL/RESTORE SHUTTER	C	C	C	201 202 206 207
4	52446	PWB ASSY, SHUTTER LED DRIVER	A + 7155 7498 7713 9359	A + 7155 7498 7713 9359	A + 7155 7498 7713 9359	101
2	52755	CABLE HARNESS, SLC, CAL LAMP, CENTER BAFFLE HEATER	C + 3614A	C + 3614A	C + 3614A	201
2	53285	CABLE HARNESS, FOCAL PLANE LED/ TELESCOPE BASEPLATE	B + 3694A	B + 3694A	B + 3694A	201
3	52753	THERMISTOR BLOCK ASSY	D + 3794A W-139	D + 3794A W-139	D + W-139	201
		*****W-139 waives conformal coat change as required per EO 3794A				
2	53649	CABLE ASSY MAIN & REDUNDANT SHUTTER	B + 8787 3695A	B + 8787 3695A	B + 8787 3695A	201
3	51787	THERMISTOR BLOCK ASSY	D + W-140	D + W-140	D + W-140	201

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	53694-1	BRACKET, CONNECTOR	B	B	B	003 004
2	53694-2	BRACKET, CONNECTOR	B	B	B	003 004
2	53883	BAFFLE, PRIMARY	A	A	A	
2	54218	SHUTTER STOP ASSY	A	A	A	003
2	54360	WASHER, FLAT	A	A	A	
2	54361	SCREW, RELIEVED	A	A	A	
2	54362	WASHER, FLAT	A	A	A	
2	54363	PIN, DOWEL	A	A	A	
2	54504	GROUND WIRE	A	A	A	201 202 203
2	54511	SPACER	A	A	A	
2	54562	SHIM	A + 3771A	A + 3771A	A + 3771A	

3-12-82

Quality Assurance

Configuration Management Office

Listing of Liens

AFT OPTICS ASSEMBLY

P/N 51512

FLIGHT

Failure Reports Number	
Open	Closed
S8128	F0554
S8129	S8361
	S8362
	S8378
	S8387
	S8469
	S8130

Deviations	Waivers
D-134	

AFT OPTICS ASSY.

P/N 51512

FLIGHT		PROTOFLIGHT		ENGINEER		LTM	
Failure Report No.		Failure Report No.		Failure Report No.		Failure Report No.	
Open	Closed	Open	Closed	Open	Closed	Open	Closed
S8128	F0554		F0569		F0506		
S8129			F0570		F0524		
			F1730		F0540		
	S8130		F1738				
	S8361		F1743				
	S8362		F1750				
	S8378		F1751				
	S8387		F1758				
	S8469		F2364				
			F2381				
			F2386				
			F2658				
			F2659				
			F2687				
			S8005				
			S8086				
			S8087				
			S8088				

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SPACE AND COMMUNICATION GROUP

FAILURE REPORT

F 0554

ORIGINATOR

1. PROGRAM NAME AND NUMBER: TM HS-236	2. GLA: E330	3. MODEL: E-1	4. TIME OBSERVED	5. DATE OBSERVED: MO 2 DA 8 YR 82	
6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART					

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANFACTUER
7. SUBSYSTEM				
8. UNIT	AFT OPTICS ASST	51512	003	as
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	SCAN LINE CORRECTOR	51030	~~003~~ S/N 002	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ QUALIFICATION ☐ INTEGRATION ☐ LAUNCH OPERATIONS ☒ IN-PROGRESS ☐ ACCEPTANCE ☐ SYSTEM ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ RADIATION ☐ TEMPERATURE ____ ° ____ ☐ THERMAL VAC ____ HRS. AT ____ ° ____ . ☐ EMC/RFI ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: SLC FUNCTIONAL TEST, AOR 51512 OPERATION 17800, PIN 5 TO 11, & TO 12 RESISTANCE SHOULD BE 4 KΩ ±20%. RESISTANCE MEASURES 5.7 KΩ.

15. TEST PROCEDURE ____ PARA ____ 16. ORIGINATOR W. Baliński ORG 22-35 DATE 2/8/82 ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: 5.7 KΩ INDICATES RESISTOR IS IN CIRCUIT BUT THERMISTOR IS NOT. VISUAL INSPECTION VERIFIES LOOSE WIRE ON TERMINAL. VISUAL INSPECTION SHOWED S/N 002 SLC IN AOR. S/B S/N 004.

18. FAILED ITEM NAME AND PART NUMBER: SCAN LINE CORRECTOR 51030

19. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: REMOVE SLC S/N 002 AND INSTALL S/N 004. REPAIR LOOSE WIRE ON S/N 002.

21. AUTHORIZATION: W. Baliński ORG 22-35 DATE 3-5-82 ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: SLC 002 REMOVED. S/N 004 INSTALLED. RETESTED TO TP 16659 Rev. D. LOOSE WIRE ON SLC RESOLDERED

24. QA ACCEPTANCE: [illegible] 2/8

25. QA NOTES: [illegible]

22. LIST ALL PARTS REPLACED

PART NUMBER	DKT SYM	PART LOT NO.	DATE CODE	MFR	PROBABLE DEFECT	ANALYSIS NO.
51030					WRONG S/N UNIT	

27. REWORK BY ____ ORG ____ DATE ____ 28. RETESTED BY ____ ORG ____ DATE ____ ☐ CONTINUATION SHEET USED

ENGINEERING/LIABILITY

30. CAUSE AND CORRECTIVE ACTION: POOR WORKMANSHIP ON SRO S/N 002 (LOOSE WIRE) CAUSE OF INSTALLATION OF WRONG S/N SLC [illegible] THE DISCREPANCIES HAVE BEEN BROUGHT TO THE ATTENTION OF ALL PERSONNEL INVOLVED IN PLANNING AND FABRICATION TO ELIMINATE SIMILAR ERRORS IN THE FUTURE. PARTICULAR CONTROL ASSEMBLY AND QUALITY CONTROL [illegible] ☐ CONTINUATION SHEET USED

31. PRB CLOSURE: [signature] 3/5/82

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIP. ☐ TEST PROC. ☐ TEST SET-UP ☒ MFG. PROCEDURES ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN DEFECT CODE

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER: W. Baliński ORG 22-35 DATE 3-5-82

38. SPACECRAFT SYSTEM ENGR. [signature] ORG 22-45 DATE 3/5/82

39. RELIABILITY [signature] ORG 151 41 DATE 3-5-82

40. CUSTOMER OR SUPPLIER [signature] DATE 3/9/82

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

CONTINUATION SHEET

FR SERIAL NO. F 0554

CONTINUATION SHEET LETTER A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

30 ALL FAILED TO VERIFY THAT THE SLC THAT WAS CALLED OUT ON THE ABCTR WAS ACTUALLY INSTALLED.

THE PRACTICE OF STOCKING FLIGHT PARTS IN THE MECHANICAL ~~AREA~~ ASSEMBLY AREA INSTEAD OF BONDED PARTS STORAGE INCREASED THE PROBABILITY OF AN ERROR OF THIS TYPE. IN THIS INSTANCE TWO UNITS, S/N 002 AND S/N 004 WERE PHYSICALLY LOCATED NEXT TO EACH OTHER ON THE SAME BENCH.

THE CORRECT PROCEDURE OF STORING ASSEMBLIES IN BONDED STORAGE HAS BEEN INITIATED IN ORDER TO PRECLUDE REPETITION OF THIS TYPE OF ERROR. ALL PARTIES CONCERNED HAVE BEEN ADVISED OF THE IMPORTANCE OF CROSS-CHECKING ASSEMBLY P/N's AND S/N's AGAINST THE ABCTR's.

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HUGHES

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP
FAILURE REPORT

ORIGINATION

1. PROGRAM NAME AND NUMBER	2. CLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
PL 1162		FLT 1	1900	MO 4 DA 13 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☒ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	CAMP SOURCE ASSY, Calib Light	51497		
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☒ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/EMI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ KM3 AT ____ ° ____ AND POR ____ JOB TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Cal Lamps 2 w/ drawing 102 ± 2 mA, and should have 104 mA. also Cal Lamp 3 w/ drawing 104 ± 2 mA, and it should have same as 2 mA

15. TEST PROCEDURE: PP 3AA-502 | PAGE: 5-8 of 9 | 16. OBSERVATION: Actual Log | ORG: 2241 | DATE: 4-13-82 | ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

17. VERIFICATION AND FAILURE ANALYSIS: PROGRAM WAS A SOFTWARE TELEMETRY BASE DISCREPANCY. CHANGES WERE REQUIRED TO CHANGE COEFFICIENTS IN DATA BASE 123

18. FAILED ITEM NAME AND PART NUMBER

19. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: SOFTWARE CHANGES ARE REQUIRED.

20. AUTHORIZATION | ORG | DATE | ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

21. REWORK/RETEST ACTION TAKEN: ECP 972732 TO CHANGE COEFFICIENTS WAS EFFECTED. RESULTED TO 104.4 mA FOR Cal LAMP 2, 104.4 FOR CAL LAMP 3.

21. QA REWORK

21. QA RETEST

22. LIST ALL PARTS REPLACED

PART NUMBER	CET SYS	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROGACLE DEFECT	ANALYSIS NUMBER

23. REWORK BY | ORG | DATE | 24. RETESTED BY | ORG | DATE | ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

25. CAUSE AND CORRECTIVE ACTION: CAUSED BY USING INCORRECT COEFFICIENTS IN DATA BASE. DATA BASE UPDATED BY ECP 972732

25. ☐ CONTINUATION ☒ SHEET USED

26. DOCUMENT SUPPORTING CORRECTIVE ACTION: ECP 972732 (COPY ATTACHED)

26. FRB CLOSURE: 5/10/82

27. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MAN PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ HANDLING ERROR ☐ BURN-IN/OUT ☐ UNKNOWN

DEFECT CODE

28. FAILURE TYPE: ☐ INTERMITTENT ☐ PERMANENT ☐ NOT FAILURE ☐ INDUCED ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

29. RESPONSIBLE ENGINEER: [signature] | ORG: 22-17 | DATE: 5/7/82

30. SPACE FLIGHT OPERATIONS MANAGER: [signature] | ORG: 2241 | DATE: 5/10/82

31. RELIABILITY: [signature] | ORG: 51 41 | DATE: 5-7-82

32. PROCESSED BY SUPPLIER: [signature] | DATE: 4/11/82

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ENGINEERING CHANGE REQUEST

HUGHES
CODE IDENT 81877

ECR NO. 58130 - 972732

SHEET 1 OF SHEETS

REQUEST

PROGRAM	SYS/EQUIP NAME OR DES	CONTROL ITEM NAME & NO.	SPECIFICATION/DWG NO.(S)
Thematic Mapper	TLM Data Bases CONF 2, 3	coefficient changes on Cal Lmp Cnts	

DESCRIPTION OF PROBLEM

Changes need to be performed on the Cal lmp Cnt coefficients in the telmentry data Bases 2 & 3. for Fl model.

PROPOSED SOLUTION

Parameter	old value	New Value
B1	.671969	.6694
B2	.710553	.6694
B4	.710553	.6694

REQUESTED BY	EXT	BLDG./MS	ORG CODE	DATE	URGENCY
Ron Hoop	6265	FM/40	22-41	9/30/82	ASAP
APPROVED K W Hubbard	6168	B11/10	22-41	5/13/82	RECM EFF 51065 SN 003 & SUBQ
APPROVED M O Adams	6293	B11/39	51-41	5/13/82	RECM DISP OF ITEMS ITEMS CONFORM

DISPOSITION

☒ ACCEPTED ☐ REJECTED — REASON FOR REJECTION

DATE RECD IN ECC	SCN REPLY DATE	ADVANCE
		☐

CHANGE CLASS	SPECIFICATION OR CONTROL ITEM	RESP SPEC ACT. OR RESP ENGRG ACT.	ECA NUMBER
☐ I ☑ IIA ☐ IIB			
DOCUMENT NO.(S) FOR IIB CHANGE			

	ORG CODE	DATE		ORG CODE	DATE	RESP ENGRG ACT.	ORG CODE	DATE
						Peter Le FRPL	22-03	5-20-8
			RESP SPEC ACT.			PROGRAM MGMT	22-41	4/29/82

CLASS IIB RELEASE AUTHORIZATION

CHANGE EFFECTIVITY	CONTRACT NO.	MANUFACTURING	DATE
DISPOSITION OF ITEMS	CUSTOMER DATE	ENGRG CHANGE CTR	DATE
			5-25-82

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5/24/82

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EL SEGUNDO, CALIFORNIA

SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

S 8361

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
THEMATIC MAPPER		F-1	11:00	MO 1 DA 6 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☒ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	REDUNDANT/RESERVE SHUTTER	52249	003	SBRC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: SHUTTER NATURAL PERIOD HAS CHANGED — IS PRESENTLY OUT OF SPEC. WAS 143.1 Hz ± 1.5 Hz. IS 143.5 Hz ± 1.5 Hz.

19. TEST PROCEDURE: | PARA: | 16. ORIGINATOR: W. BALINSKI | ORG: 22-35 | DATE: 82-1-6 | 17. CONTINUATION ☐ SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: SHUTTER DOES NOT EXHIBIT SENSITIVITY TO MOUNTING SCREW TORQUE — NO OTHER CHANGES HAVE BEEN MADE SINCE MOTOR PERIOD WAS IN SPEC. CHANGE IS ASSUMED TO BE RESULT OF DRIFT DURING FIRST FEW HOURS OF OPERATION.

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: RETRIM INERTIA TO LOWER NATURAL PERIOD TO WITHIN SPEC.

21. AUTHORIZATION: W. Balinski | ORG: | DATE: 82-1-8 | 22. CONTINUATION ☐ SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: INERTIA TRIM WEIGHTS CHANGED IN ORDER TO LOWER SHUTTER INERTIA

24. QA [illegible] 172

25. QA [illegible] 172

26. LIST ALL PARTS REPLACED PART NUMBER	CKT JYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY: [signature] | ORG: 22-74 | DATE: 1-9-82 | 28. RETESTED BY | ORG | DATE | 29. CONTINUATION ☐ SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: DRIFT DURING FIRST FEW HOURS OF SHUTTER OPERATION IS APPARENT CAUSE OF SHIFT IN PERIOD. SHUTTER ASSY PLANNING WILL BE MODIFIED TO INCLUDE 12 HOUR RUN IN TO STABILIZE MOTOR NATURAL PERIOD. PLANNING HAS BEEN CHANGED ON AHR (ATTACHED) OPER +800 S/C# 22-74.

31. ☐ CONTINUATION ☐ SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: AHR DATED 6-30-80 SUPPLEMENT 1-6-82

33. RIB CLOSURE: [signature] 1/27/82

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☒ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE:

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE | 36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☐ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
W. Balinski		82-1-20	[signature]	22-41	1/28/82

39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER	DATE
[signature]	51-41	1-28-82	[signature]	

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1/27/82

SBRC

ASSEMBLY HISTORY RECORD SUPPLEMENT

SHEET 1 OF

PART NUMBER	SERIAL OR LOT NUMBER	DRAWING NO.	DRAWING DIVISION	CS & SCHED CODE	PREPARED BY	SUPPLEMENT NO. 5 10
52249	003	52249	F	22-35	F. Saucier	AIR DATED 6-30-80

ASSEMBLY NAME

APPLICABLE S/Ns

DESIGN APPROVAL: W. Balinski

QUALITY APPROVAL: M. Gillis 1-22-82

PROGRAMMING APPROVAL 82-1-7: F. Saucier

PRODUCING APPROVAL: W. Balinski

CHGD

CHGD AFOR V. Tellez

SUPPLEMENT RELEASE DATE 82-1-6

NOTE TO PRODUCTION - UPON RECEIPT, ENTER SUPPLEMENT NO. AND RECEIPT DATE ON FRONT SHEET OF AHR. INITIAL THE ENTRY.

PURPOSE OF SUPPLEMENT - INCORPORATES NEW ASSY DWG REVISION ☐ OR EOs ☐; REWORK ☒; OTHER ☐. EXPLAIN:

Adjust period per dwg. notes 6 & 7 and Spec. 16781
Ref: FR 8361

NOTES: 16781 Rev. A EO 8293, 8312, 8666, 3647A
76440 Rev. C EO 2371A, 2968A, 3136A, 3293A, 3658A

OPER NO.	S/C NO.	INSTRUCTIONS	PERFORMED BY OPER	PERFORMED BY INSP	PERFORMED BY DATE	REMARKS
		-NOTE- ALL OPERATIONS ARE TO BE PERFORMED IN				
		A CONTROLLED CLEAN AREA SUCH AS A LAMINAR FLOW				
		BENCH, EXCEPT WHEN ENVIRONMENTAL CONDITIONS DUE				
		TO THE NATURE OF THE OPERATION ARE DIFFICULT				
		TO CONTROL: THESE MAY INCLUDE TRANSPORTATION -				
		PLATING, SOLDERING, POTTING, MEASUREMENT,				
		PAINTING AND MACHINING. Q.A. SURVEILLANCE IS				
		REQUIRED FOR ALL OPERATIONS NOTED. CLEAN LINT				
		FREE GLOVES FREE FROM ALL CONTAMINANTS MUST BE				
		WORN AT ALL TIMES, EXCEPT WHEN NOTED OTHERWISE.				
		SEQUENCE OF OPERATION MAY NOT BE ALTERED EXCEPT				
		AT THE DISCRETION OF THE REA.				

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GBRC

ASSEMBLY HISTORY RECORD CONTINUATION SHEET

SHEET 2

PART NUMBER	SERIAL OR LOT NUMBER	ASSEMBLY NAME	CONTINUATION OF:
52249	003	Redundant/Restore Shutter Assy.-Aft Optics Assy.-TM	AHR DATED AHR SUPPLEMENT NO. 5

OPER NO.	S/C NO.	INSTRUCTIONS	PERFORMED BY OPER	PERFORMED BY INSP	PERFORMED BY DATE	REMARKS
100	22-74	ASSEMBLE SHUTTER ASSEMBLY TO BALANCE FIXTURE	Brooks		1/2/82	
		NAS2770-29351				
200	22-13 22-74	CONNECT SHUTTER MOTOR TO TEST BOX PER SPEC. 16781.	J.K		1/7/82	
		PARA 3.9 USE WEAR SAVER 76440-2 AT SHUTTER MOTOR				
		CONNECTOR INTERFACE.				
300	22-13	CHECK PERIOD OF OSCILLATION AND RECORD.	J.K.		1/7/82	
		Resonant Period = 143.6 mS				
400	22-74	RELEASE TORQUE FROM MOUNTING SCREWS AND ADJUST TO	Wilson		1/7/82	
		PRE-TORQUE CONDITIONS				

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ASSEMBLY HISTORY RECORD CONTINUATION SHEET

SHEET 3

PART NUMBER	SERIAL OR LOT NUMBER	ASSEMBLY NAME	CONTINUATION OF:
52249	003	Redundant/Restore Shutter Assy.-Aft Optics Assy. TM	AHR DATED AHR SUPPLEMENT NO. 5

OPER NO.	S/C NO.	INSTRUCTIONS	PERFORMED BY OPER	PERFORMED BY INSP	PERFORMED BY DATE	REMARKS
500	22-13	CHECK PERIOD OF OSCILLATION AND RECORD. COMPARE	JY.		1/7/82	
		WITH RESULT OBTAINED IN OPER. 300				
		Resonant Period = 143.6 mS				
510	22-74	TORQUE MOUNTING SCREWS TO 11 IN-LB ± 10%.	Brnk		1/9/82	
600	22-74	PERFORM INERTIA TRIM PER DRAWING NOTES 6 & 7 AND	Brnk		1/9/82	143.06 ms
		SPEC 16781 REV. A PARA 3.9, 3.10 AND 3.11				
700	51-41	QA VERIFY PERIOD	RJ	172	1/9/82	
800	22-74	ROUTE TO ELECTRONICS AND RUN SHUTTER UNTIL PERIOD	Brnk		1/9/82	
		IS CONSTANT OVER 12 HOURS (RUN-IN NEED NOT BE CON-	JY.		1/13/82	
		TINUOUS). Resonant Period Before = 143.07				
		Resonant Period After = 143.07				

SBRC

ASSEMBLY HISTORY RECORD CONTINUATION SHEET

SHEET 4

PART NUMBER	SERIAL OR LOT NUMBER	ASSEMBLY NAME	CONTINUATION OF:
52249	003	Redundant/Restore Shutter Assy.-Aft Optics Assy.-TM	AHR DATED AHR SUPPLEMENT NO. 5

OPER NO.	S/C NO.	INSTRUCTIONS	PERFORMED BY OPER	PERFORMED BY INSP	PERFORMED BY DATE	REMARKS
800	22-74	IF PERIOD CHANGES, ADJUST AS REQUIRED. REPEAT OPER				
	Cont	600 THRU 800. IF PERIOD REMAINS STABLE, CONTINUE				
		TO NEXT OPER.				
		NOTE: Spacers to be bonded per dwg. note 7 at				
		next assy. 51512.				
900	22-73 51-41	CLEAR FAILURE REPORT FR8361	[illegible]	[illegible]	1/14/82	
		ROUTE TO NEXT HIGHER ASSEMBLY.				

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FAILURE REPORT

S 8362

ORIGINATOR

1. PROGRAM NAME AND NUMBER: THEMATIC MAPPER | 2. GLA | 3. MODEL: F-1 | 4. TIME OBSERVED: 4:00 | 5. DATE OBSERVED: MO 1 DA 18 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SUBSYSTEM ☐ ASSEMBLY ☐ MODULE ☐ CARD ☐ SYSTEM ☒ UNIT ☐ SUBASSEMBLY ☐ MICAM ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	AFT OPTICS ASSEMBLY	51512	003	
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	REDUNDANT SHUTTER	52249	003	SBRC
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☐ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RFI ☐ RADIATION ☐ VIBRATION ____ AXIS FOR ____ MIN TYPE ☐ THERMAL VAC ____ HRS AT ____ ° ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: SHUTTER NATURAL PERIOD HAS CHANGED - IS PRESENTLY OUT OF SPEC. WAS 143.07 MSEC - IS ~~143.07~~ 143.56 MSEC

15. TEST PROCEDURE | PARA | 16. ORIGINATOR: W. Belinski | ORG | DATE: 82-1-18 | 17. ☐ CONTINUATION SHEET USED

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: SHUTTER EXHIBITS SENSITIVITY TO MOUNTING SCREW TORQUE LOOSENING, RETORQUE OF SCREWS DOES NOT, HOWEVER, BRING PERIOD WITHIN SPEC. EXPECT THAT EXCESSIVE TORQUE HAS CAUSED SLIGHT DEFORMATION OF MOTOR HOUSING.

19. FAILED ITEM NAME AND PART NUMBER

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: RELIEVE ANY LOADS ON FLEX PIVOTS BY LOOSENING ~~SCREW~~ CLAMP SCREW ON FLEX PIVOT. RETRIM INERTIA AS REQUIRED.

21. AUTHORIZATION: W. Belinski | ORG | DATE | 22. ☐ CONTINUATION SHEET USED

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: PER 51512 AHR COMMENT SHEET (DR 7210-7220) LOOSENED AND RETIGHTENED CLAMP SCREW ON FLEX PIVOT. PERIOD NOW 142.95 MSEC. NO FURTHER ACTION REQUIRED (SPEC CALLS FOR 142.9 ± .3 MSEC)

24. QA REWORK: 172

25. QA RETEST: 172

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER

27. REWORK BY: J.S. Amado | ORG: 22-74 | DATE: 1-19-82

28. RETESTED BY | ORG | DATE | 29. ☐ CONTINUATION SHEET USED

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: EXCESSIVE FRICTION TORQUE ON ONE OF TWO NUTPLATES CONTRIBUTED TO APPLICATION OF EXCESSIVE CLAMP LOADS ON MOTOR HOUSING. THIS CAN IMPART A SLIGHT LOAD UPON FLEX PIVOTS, CHANGING DYNAMIC CHARACTERISTICS. NUTPLATES SHOULD BE CHECKED FOR EXCESSIVE TORQUE, REWORKED AS REQUIRED. (WORKMAN SHIP ERROR OPERATOR)

31. ☒ CONTINUATION SHEET USED

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: CAUTION TO USE MORE CARE.

33. FRB CLOSURE: 1/27/82

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/PAD ERROR ☒ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN | DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT/SYSTEM ENGINEER	ORG	DATE
W. Belinski		82-1-20		22-41	1/20/82
39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER		DATE
	81-41	1-20-82			

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1/27/82

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FAILURE REPORT

CONTINUATION SHEET

FR ORIGINAL NO. 58362

CONTINUATION SHEET LETTER*

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON

IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

30.	OPERATOR HAS BEEN INSTRUCTED TO FOLLOW DRAWING CAREFULLY AND TO VERIFY TORQUE REQUIREMENTS. ~~PART~~ IS WITHIN SPEC. SHUTTER

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FAILURE REPORT

S 8378

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
TM, HS-236		F1+	11 AM	MO Jan DA 19 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☒ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT				
9. ☒ ASSEMBLY ☐ SUBASSEMBLY	AFT OPTICS ASSY	51512	003	
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☒ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☒ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ____ AXIS FOR ____ ☐ TEMP ____ ° ____ ☐ THERMAL VAC ____ HRS AT ____ ° ____ JOIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: Resistance Measurements per Spec 17068 were too high in some cases. See continuation Sheet.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION SHEET USED
17068	3.2.2	E. Aasted	22-15	1-29-82	☒

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Sheet 13 measurement - Spec Error - See EO 4075A Sheets 10, 11, 12, 14, 15, 16 measurements - Open ground in PF PA

19. FAILED ITEM NAME AND PART NUMBER:

20. ☒ FOLLOWING REWORK/RETEST REQUIRED ☐ REWORK/RETEST NOT REQUIRED BECAUSE: Repair open ground and remeasure resistance

21. AUTHORIZATION: Comment Sheets, 52172 | ORG: | DATE: | 22. CONTINUATION SHEET USED: ☐

MANUFACTURING AND TEST

23. REWORK/RETEST ACTION TAKEN: Open ground repaired and remeasured See Comment Sheets, Assy 51512, 1/22 and 1/23/82 & Comment Sheet, Assy 50795 1/21/82, 1/24/82 & 1/25/82. (Copies Attached)

24. QA REWORK

25. QA TESTED

26. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
None						

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	29. CONTINUATION SHEET USED
Bill O'Donnel		1/22-1/23/82	Bill O'Donnel		1-23, 1-23-82	☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: CAUSE: Items 14.1, 14.2, 14.3, 14.5, 14.6 & 14.7 Listed on Attached Continuation Sheet. Opens were caused by loose screws that hold the RFPA to the AFT Optics Housing. QA: Inspection personnel have been instructed to assure that torque wrench has been adjusted for drag allowance prior to start of torque operation. R. Connell 2-2-82 (Copy Attached)

31. CONTINUATION SHEET USED: ☒

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: EO 4075A Effectivity is SN 001 & Subs

33. FRB CLOSURE: R. Connell 2-22-82

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☐ DEFECTIVE PARTS ☐ TEST EQUIPMENT ☒ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN

DEFECT CODE:

35. FAILURE TYPE: ☒ PRIMARY ☐ INDUCED ☐ UNKNOWN ☐ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
W. Balinski	22-35	2-19-82	[signature]	22-44	2/22/82

39. RELIABILITY	ORG	DATE	40. CUSTOMER OR SUPPLIER	DATE
R. Connell	57-41	2-20-82		

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2-22-82

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FAILURE REPORT
CONTINUATION SHEET

FR SERIAL NO. S 8378
CONTINUATION SHEET LETTER* A

*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON
IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN. DATE EACH ENTRY.

ADDITIONAL FR CONTINUATION SHEET(S) USED ☐

14. The following measurements were too high

	Sheet of Spec 17068	From	To	IS	S/B
14.1	10	C4	W1P30-C4	~~Charging Cap~~ OPEN	< 500Ω
14.2	11	C4	W1P30-C4	" OPEN	"
14.3	12	"	"	" OPEN	"
14.4	13	"	"	18Ω	< 12Ω
14.5	14	"	"	~~Charging Cap~~ OPEN	< 500Ω
14.6	15	"	"	" OPEN	"
14.7	16	"	"	" OPEN	"

[signature] 2/20/82

30. ITEM 14.4 ABOVE.
CAUSE: ERROR IN SPEC. 17068.
C/A EO 4075A CORRECTS SPEC. ERROR. (COPY ATTACHED.)
[signature] 2/20/82

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FAILURE REPORT

S 8387

ORIGINATOR

1. PROGRAM NAME AND NUMBER	2. GLA	3. MODEL	4. TIME OBSERVED	5. DATE OBSERVED
TM		Flight	9am	MO 2 DA 12 YR 82

6. HARDWARE LEVEL WHEN FAILURE WAS OBSERVED: ☐ SPACECRAFT ☐ SYSTEM ☐ SUBSYSTEM ☐ UNIT ☐ ASSEMBLY ☐ SUBASSEMBLY ☐ MODULE ☐ MICAM ☐ CARD ☐ PART

EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/N	MANUFACTURER
7. SUBSYSTEM				
8. UNIT	Aft Optics Bulkhead	5151V	003	
9. ☐ ASSEMBLY ☐ SUBASSEMBLY				
10. ☐ MODULE ☐ MICAM ☐ CARD				
11. OTHER				

12. TEST WHEN FAILURE WAS OBSERVED: ☐ DEVELOPMENT ☐ IN-PROCESS ☐ QUALIFICATION ☐ ACCEPTANCE ☒ INTEGRATION ☐ SYSTEM ☐ LAUNCH OPERATIONS ☐

13. ENVIRONMENT WHEN FAILURE WAS OBSERVED: ☐ AMBIENT ☐ EMC/RR ☐ RADIATION ☐ VIBRATION ☐ TEMP ____ ☐ THERMAL VAC ____ HRS AT ____ AXIS FOR ____ MIN TYPE ____ ☐ OTHER

14. DESCRIPTION OF FAILURE: All 10K thermistor readings do not agree with spec. 4K thermistor also does not meet spec.

15. TEST PROCEDURE	PARA	16. ORIGINATOR	ORG	DATE	17. CONTINUATION SHEET USED
17068	3.2.a.1	Joe Blechburg	22-13	2/12/82	☐

ENGINEERING EVALUATION

18. VERIFICATION AND FAILURE ANALYSIS: Required values shown in 17068 are valid for 77°F only. Measurements were made at 69°F. When adjusted per Specification 16117, values were well within prescribed tolerance limits.

19. FAILED ITEM NAME AND PART NUMBER

20. ☐ FOLLOWING REWORK/RETEST REQUIRED ☒ REWORK/RETEST NOT REQUIRED BECAUSE: see 18 above

21. AUTHORIZATION	ORG	DATE	22. CONTINUATION SHEET USED
			☐

MANUFACTURING AND TEST

21. REWORK/RETEST ACTION TAKEN: None

24. QA REWORK

25. QA RETEST

23. LIST ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURER	PROBABLE DEFECT	ANALYSIS NUMBER
None						

27. REWORK BY	ORG	DATE	28. RETESTED BY	ORG	DATE	29. CONTINUATION SHEET USED
N/A						☐

ENGINEERING/RELIABILITY

30. CAUSE AND CORRECTIVE ACTION: Spec limits were not stated for temperatures other than 77°. EO 4146A provides a methodology for calculating resistance values at temperatures differing from 77°.

31. CONTINUATION SHEET USED ☐

32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION: EO 4146A (Effectivity S/N 003 & up) COPY ATTACHED

33. FRB CLOSURE: 2/24/82

34. BASIC CAUSE OF VERIFIED FAILURE: ☐ DESIGN ☐ ENVIRONMENTAL ☒ DEFECTIVE PARTS ☒ TEST EQUIPMENT ☐ TEST PROCEDURE ☐ TEST SET-UP ☐ MFG. PROCEDURE ☐ ASSY/FAB ERROR ☐ WORKMANSHIP ☐ WIRING ERROR ☐ ROUGH HANDLING ☐ WEAR-OUT ☐ UNKNOWN — DEFECT CODE

35. FAILURE TYPE: ☐ PRIMARY ☐ INDUCED ☐ UNKNOWN ☒ NO FAILURE

36. FAILURE CLASSIFICATION: ☐ CRITICAL ☐ MAJOR ☒ MINOR ☐ SAFETY

37. RESPONSIBLE ENGINEER	ORG	DATE	38. SPACECRAFT SYSTEM ENGINEER	ORG	DATE
W. Baldwin	22-35	2-19-82	L. Cargal	22-41	2/24/82
39. RELIABILITY: L. Cargal	5/41	2-24-82	40. CUSTOMER OR SUPPLIER: [illegible]		DATE 2/24/82

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END

DATE

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