CSM
G&N TEST MATRIX
SC 104&SUBS

(Baseline Document is TCP K-0005/0028 V3A or V5A except where indicated)

12 February 1969

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
DSKY	Keys-Pushbuttons	DSKY Pushbutton Check	Panel 140 DSKY 04-001/V3 Panel 2 DSKY 04-007/V3	Monitor Channel 32 in R1 & R2
CMC	MDC DSKY Keycode	DSKY Pushbutton Check	04-007/V3	Insert 0-9 and verify entry in R1 & R2
CMC	LEB DSKY Keycode	DSKY Pushbutton Check	04-001/V3	Insert 0-9 and verify entry in R1 & R2
DSKY	EL Displays	Electroluminescent Test Electroluminescent Displays	02-001/V3	DSKY & CRT Displays Verified
Panel 100	G & N Power - IMU	Operate Power ON	12-008/V3	G & N Power IMU - ON
Panel 100	G & N Power - Optics	Zero Optics Test	24-001/V3	G & N Power Optics - ON
GN & C Panel	UP Telemetry SW	Uplink & Downlink Check	1. Block: 05-008/V3 2. Accept: 05-010/V3	Verify Block Uplink Lite is ON for SW in BLOCK position Monitor Panel 122
MDC	UP Telemetry SW	Uplink & Downlink Check	1. Block: 05-011/V3 2. Accept: 05-013/V3	Verify Block Uplink Lite is ON for SW in BLOCK position

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
CMC	Block Uplink SW	Uplink and Downlink Check	05-008/V3	Verify Block Uplink Lite-ON for SW in BLOCK position (Ch 33, Bit 10)
GN&C Panel	Optics Hand Controller	1. Zero Optics Test 2. Optics Slew Rate Test 3. Optics Coordinate Transformation Test 4. Slave Telescope Mode Checks 5. Optics Parallelism Tests 6. SXT CMC Function Check 7. Optics Target Alignment	1. 24-000/V3 2. 25-000/V3 3. 26-000/V3 4. 28-000/V3 5. 29-000/V3 6. 30-000/V3 7. 35-000/V3	OHC exercised throughout Sequences 24, 25, 26, 28, 29, 30 & 35. Shaft & Trun. Angles read on CRT and in R1 & R2.
GN&C Panel	Attitude Impulse Controller	1. Minimum Impulse Test 2. Minimum Impulse Test - VAB 3. Minimum Impulse Test - LC 39	1. 09-000/V3 2. 07-000/V5 3. 08-000/V5	1. AIC exercised throughout Seq. 09. Monitor Ch 32, Bits 1-6 in R1 and Minimum Impulse LITES 2&3 AIC exercised throughout Sequences 07 & 08. Monitor RCS solenoid driver ON time and RCS solenoid driver LITES.
CMC	Attitude Impulse Controller	Minimum Impulse Test	09-000/V3	AIC exercised throughout Seq. 09. Monitor Ch 32, Bits 1-6 in R1.
GN&C Panel	Mark/Mark Reject Pushbutton	Mark and Mark Reject Pushbutton Test	Mark: 10-004/V3 Mark Reject: 10-007/V3	Monitor Channel 16 (Bits 6 & 7) in R1

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
GN&C Panel	Optics Mode Switch	1. Zero Optics Test 2. SXT CMC Function Check	CMC & Manual: 1. 24-000/V3 2. 30-000/V3	Optics Mode SW used throughout Sequences 24 & 30. Monitor CMC & Manual Optics SW Lites (Ch 33, Bit 5)
GN&C Panel	Optics Zero Switch	1. Zero Optics Test 2. Optics Slew Rate Test 3. Optics Coordinate Transformation Test 4. Optics Resolution 5. Slave Telescope Mode Checks 6. Optics Parallelism Test 7. SXT CMC Function Test	OFF & ZERO: 24-000/V3 through 30-000/V3	Optics Zero SW used throughout Sequences 24 - 30. Monitor TPAC and Zero Optics SW Lite (Ch 33, Bit 4)
CMC	Zero Optics Discrete (Ch 12, Bit 10)	———	———	No evidence has been found to indicate that this discrete is either tested or used.
GN&C Panel	Optics Controller Speed Switch	Optics Slew Rate Test	Hi: 25-007/V3 Med: 25-017/V3 Lo: 25-029/V3	Compute Trunnion Slew Rates (deg./sec.)
GN&C Panel	Optics Controller Coupling Switch	1. Optics Slew Rate Test 2. Optics Coordinate Transformation Test	1. Direct Position - 25-009/V3 2. Resolve Position - 26-010/V3	1. Slew Optics to compute Slew Rates (deg./sec.) 2. Verify Target movement is in same direction as OHC

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
GN&C Panel	Optics Controller Telescope Trunnion Switch	Slave Telescope Mode Checks	1. Slave to SXT: 28-001/V3 2. 0°; 28-003/V3 - 3. 25° Offset: 28-003/V3	Drive optics with OHC then Monitor R1 & R2 to note effect of SW on Shaft & Trun. Angles
Optics Panel	Shaft & Trun TPAC's	Zero Optics Test	24-011/V3	TPAC's readings recorded after zeroing optics.
CMC	Optics Error Counter Enable	SXT CMC Function Check	30-008/V3	Optics ERR CTR Enable (Ch 12, Bit 2)
CMC	Zero Optics CDU's Discrete (Ch 12, Bit 1)	1. Zero Optics Test 2. Optics Slew Rate Test 3. Slave Telescope Mode Checks	1. 24-005/V3 2. 25-006/V3 3. 28-005/V3	OCDU's are monitored after the Optics Zero SW has been switched to ZERO
EXT	Optics to OCDU	1. Slave Telescope Mode Checks 2. SXT CMC Function Test	1. 28-002/V3 2. 30-005/V3	After using OHC Shaft & Trunnion TPAC's are compared with R1 & R2. A/D portions are checke implicitly.
EXT	OCDU DAC (AC) to Optics	SXT CMC Function Test	30-000/V3	Coarse align to predetermined target positions. STLOS reticle should be approximately centered on target.

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
CMC	Zero IMU CDU	Operate PWR-ON	12-008/V3	Zero ICDU's Lite - ON (Ch 12, Bit 5)
IMU	Earth Rate to ICDU's	1. RCS DAP Test VAB Bay 1 & 3 2. RCS DAP Test LC 39	1. 13-000/V5 2. 15-000/V5	Horizontal components of earth rate along CDUX & CDUY monitored throughout Sequences 13 & 15
MDC	IMU Cage SW	IMU Cage	17-002/V3	IMU Cage SW on Panel depressed and held
CMC	IMU Cage	IMU Cage	17-002/V3	IMU Cage Lite - ON (Ch 30, Bit 11)
CMC	Drive IMU Gimbals	Semi Automatic Moding Test	19-001/V3	Drive IMU Gimbals & Monitor CDU Angles on R1, R2 & R3
IMU	Gimbal Lock	Semi Automatic Moding Test	19-007/V3	Command MG to 90^{o} Gimbal Lock Lite - ON
CMC	Coarse Align Enable	Operate PWR - ON	12-009/V3	Coarse Align Enable Lite - ON (Ch 12, Bit 4)
EXT	IMU Gimbal Angle Resolver to FDAI's 1&2	FDAI Total Attitude/Backup Attitude Error Test	03-008/V5 through 03-048/V5	FDAI combinations of 1, 2 & 1/2 are exercised throughout Seq 03 for seven sets of IMU positions.

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
CMC	IMU Error Counter Enable	1. Operate PWR - ON 2. G&N Interface Check Yaw/Pitch/Roll Att Err C/O	1. 12-009/V3 2. 10-058/K-0004	IMU ERR CTR Enable Lite - ON (Ch 12, Bit 6)
EXT	ICDU DAC (AC) to Attitude Error Display (FDAI)	G&N IU Interface Test	16-013/V5	Monitor ICDU attitude error counter and DAC (VRMS) Attitude Error on CRT
CMC	Drive OCDU-Shaft	Optics CDU Rate Test	19-050/V3	Monitor R1 & R2 (deg./sec.)
CMC	Drive OCDU-Trunnion	Optics CDU Rate Test	19-051/V3	Monitor R1 & R2 (deg./sec.)
EXT	Rotation Hand Controller	Manual Control Test	RHC1: 01-024/V5 RHC2: 01-042/V5	Monitor Ch 31 Bits 1-6 Monitor AUTO Solenoid Drivers Monitor Direct Solenoid Drivers (Ch 5 & 6, Bits 1-8)
EXT	Translation Hand Controller	1. Manual Control Test	1. Translation: 01-060/V5	1. Monitor Ch 31, Bits 7-[illegible] Monitor AUTO Solenoid Drivers (Ch 5 & 6, Bits 1-7)
		2. a. Manual Control Test	2. a. CW: 01-016/V5	2. a. Monitor G&N A/P Control Lite Monitor SCS Control Mode Lite
		b. G&N SPS Engine Thrust ON	b. CW: 05-015/V5	b. Monitor SPS S/D Lites
		c. CMC Gimbal Commands - Motors-ON	c. CW: 09-026/V5	c. Monitor diff. clutch current
		3.	3. CCW	3. Not checked by G&N personnel

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME			REMARKS
CMC	RCS jets (SM)	1. Manual Control Test 2. RCS DAP Test VAB Bay 1 & 3 3. RCS DAP Test LC 39	1. 01-000/V5 2. 13-000/V5 3. 15-000/V5			All RCS jets are exercised throughout Sequences 01, 13 and 15. (Ch 5 & 6, Bits 1-8)
			SCS	CMC		
CMC	S/C Control SW	1. Manual Control Test	1. 01-018/V5	01-019/V5		1. Monitor SCS Control Mode Lite Monitor G&N A/P Control Lite
		2. G&N SPS Engine Thrust-ON	2. 05-019/V5	05-021/V5		2. Monitor SPS S/D Lites (Ch 31, Bit 15)
		3. CMC Gimbal Commands-Motors ON	3. 09-028/V5	09-025/V5		3. Monitor diff. clutch current
			AUTO	HOLD	FREE	
CMC	CMC Mode SW	1. RCS DAP Test VAB Bay 1&3	1. 13-011/V5 through 13-098/V5	13-105/V5	13-017/V5 through 13-101/V5	1 & 2 Auto and Free Modes alternate in sequences 13 & 15. Monitor Ch 5 & 6, Bits 1-8 according to predetermined jet firing profile. (Ch 31, Bits 13&14).
		2. RCS DAP Test LC 39	2. 15-011/V5 through 15-098/V5	15-105/V5	15-017/V5 through 15-101/V5	
		3. Minimum Impulse Test - VAB	3. 07-025/V5	07-027/V5	07-003/V5	3 & 4 Monitor RCS solenoid driver LITES-On or inhibit.
		4. Minimum Impulse Test - LC 39	4. 08-022/V5	08-024/V5	08-002/V5	

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
CMC	Pulse Inputs from PIPAS	1. TVC DAP/RAMP Response Test VAB Bay 1 & 3 2. TVC DAP/RAMP Response Test LC 39	1. 10-009/V5 through 10-024/V5 2. 12-009/V5 through 12-024/V5	PIPA Counts: +X, +Y, -Y, +Z, -Z monitored. N. B. -X not verified.
PIPAS	Accel. of gravity to PIPA's	1. TVC DAP/RAMP Response Test VAB Bay 1 & 3 2. TVC DAP/RAMP Response Test LC 39	1. 10-009/V5 through 10-024/V5 2. 12-009/V5 through 12-024/V5	PIPA's are monitored during earth rate polarity verification.
CMC	S/C Control of Saturn	1. G&N IU Interface Test 2. G&N Interface Check Mission Events	1. 16-001/V5 2. 10-018/K-0004	S/C Control of Saturn Lite-ON (Ch 30, Bit 10)
EXT	ICDU DAC (DC) to IU	1. G&N IU Interface Test 2. G&N Interface Test Yaw/Pitch/Roll Att Err C/O	1. 16-013/V5 2. 10-059/K-0004 through 10-064/K-0004	Monitor ICDU attitude error counters and DAC (VDC) to IU command on CRT
CMC	Lift Off	1. Low altitude LES Abort A (EDS initiated) 2. Lo Altitude LES Abort B 3. Hi Altitude LES Abort A (H. C. initiated) 4. Hi Altitude LES Abort B (H. C. initiated) 5. SPS Abort A 6. SPS Abort B 7. Lo Altitude LES Abort A & B 8. Hi Altitude LES Abort A & B 9. SPS Abort	1. 05-023/K-0005V1 2. 06-013/K-0005V1 3. 07-014/K-0005V1 4. 08-013/K-0005V1 5. 09-017/K-0005V1 6. 10-016/K-0005V1 7. 05-023/K-0028V1A 8. 06-014/K-0028V1A 9. 07-020/K-0028V1A	Lift Off Lite - ON (Ch 30, Bit 5)

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
CMC	Ullage Thrust Present	G&N Interface Check Mission Events	10-010/K-0004	Ullage thrust present Lite - ON (Ch 30, Bit 2)
CMC	SIVB Separate/Abort	———	———	Not checked by G&N personnel N. B. Not used by Colossus
CMC	SIVB INJ Seq. Start	1. G&N IU Interface Test 2. G&N Interface Check Mission Events	1. 16-005/V5 2. 10-017/K-0004	SAT. INJ Seq. Start Lite - ON (Ch 12, Bit 13)
CMC	SIVB Cutoff	1. G&N IU Interface Test 2. G&N Interface Test Mission Events	1. 16-007/V5 2. 10-022/K-0004	SAT. Cutoff Lite - ON (Ch 12, Bit 14)
CMC	SIVB Takeover Enable	1. G&N IU Interface Test 2. G&N Interface Test Yaw/Pitch/Roll Att Err C/O	1. 16-009/V5 2. 10-058/K-0004	SAT. Takeover Enable Lite - ON (Ch 12, Bit 9)
CMC	TVC Enable	CMC Gimbal Commands - Motors ON	09-023/V5	TVC Enable Lite - ON
CMC	Disengage Optics DAC Discrete (Ch 12, Bit 11)	———	———	No interrogation of this discrete has been found either in TCP's or in subsystems tests. It is normally set by P40. However, if it is not set when TVC enable is, the Optics will be driven by SPS commands.

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME		REMARKS
			Negative	Positive	
CMC	SPS Ready	G&N SPS Engine Thrust ON	05-007/V5		SPS Ready Lite - ON (Ch 30, Bit 3) N. B. not used by Colossus
CMC	SPS Engine-ON	G&N SPS Engine Thrust ON	05-013/V5		Engine On Lite - ON (Ch 11, Bit 13)
EXT	OCDU DAC (DC) to SPS	1. TVC DAP/RAMP Response Test VAB Bay 1 & 3	1. 10-077/V5	10-093/V5	Monitor DAC & diff clutch current on CRT
		2. TVC DAP/RAMP Response Test LC 39	2. 12-077/V5	12-093/V5	Monitor DAC & diff clutch current on CRT
CMC	LM Attached	CMC Gimbal Commands - Motors ON	09-075/V5		Switch ΔV CG SW to LM/CSM (Ch 32, Bit 11) N. B. not used by Colossus
CMC	SM Separate	Low Altitude LES Abort A	05-037/K-0005V1		CM/SM Separate Lite - ON (Ch 30, Bit 2)
CMC	GDC rates to CMC				Not checked by G&N personnel N. B. Not used by Colossus

G&N COMPONENT	ITEM AND/OR EVENT TO BE CHECKED	TEST DESIGNATION	SEQUENCE/VOLUME	REMARKS
MDC	VHF SW*		Ranging: OFF:	TCP information is forthcoming.
Panel 9	VHF Ranging SW*		RESET: NORMAL:	TCP information is forthcoming.
CMC	VHF Ranging Data*			TCP information is forthcoming.
CMC	Range Unit Data* Good Discrete			TCP information is forthcoming.

* SC106 & SUBS