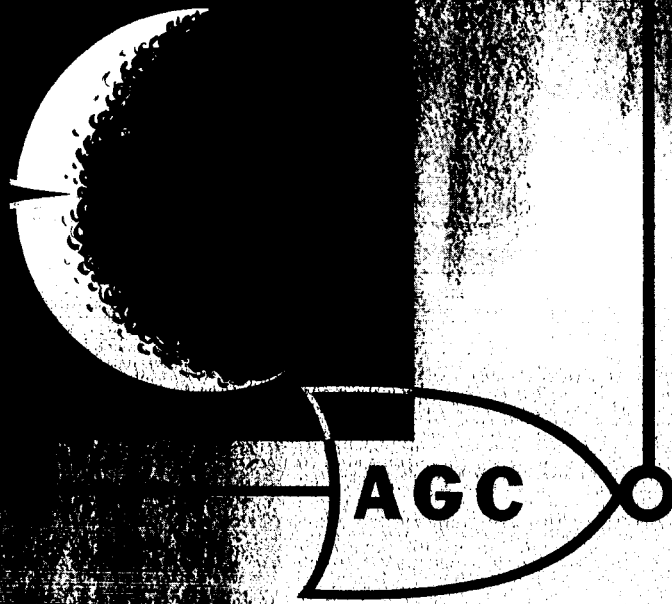


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# APOLLO GUIDANCE COMPUTER AND ASSOCIATED GROUND SUPPORT EQUIPMENT [U]

QUARTERLY TECHNICAL REPORT

NO. 8

FR-4-362

INCLUDES MONTHLY REPORT NO. 24

RAYTHEON COMPANY

SPACE AND INFORMATION SYSTEMS DIVISION



(NASA-CR-116741) APOLLO GUIDANCE COMPUTER  
AND ASSOCIATED GROUND SUPPORT EQUIPMENT  
QUARTERLY TECHNICAL REPORT, 1 APR. - 30 JUN.  
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RAYTHEON

QUARTERLY TECHNICAL REPORT NO. 8

FR-4-362

(INCLUDES MONTHLY REPORT NO. 24)

APOLLO GUIDANCE COMPUTER AND ASSOCIATED  
GROUND SUPPORT EQUIPMENT

[U]

Reporting Period

1 April 1964 - 30 June 1964

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Sudbury, Massachusetts

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SPACE AND INFORMATION SYSTEMS DIVISION

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~~GROUP 4~~

Downgraded at 5 year intervals;  
declassified after 12 years.

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SECTION 1  
PROGRAM MANAGEMENT

1.1 TECHNICAL DIRECTIVES

This is Quarterly Technical Report No. 8 which includes Monthly Technical Report No. 24. This report is issued in accordance with Work Statement for Industrial Support E-1097. Information contained in this report relates to the period 1 April through 30 June 1964.

One hundred ninety-four TD's have been received to date; 135 have been formally accepted, 84 have been completed, superseded, or incorporated into other TD's, 51 are active. Man Hour Status Charts and Active Resident Status Charts are grouped at the end of this section of the report. The Raytheon Apollo Milestone Chart has been updated and included as figure 1-1. The Raytheon Apollo Hardware Delivery Schedule is shown in figure 1-2.

The progress of active TD effort is normally reflected in the following sections of the report as indicated:

Section 1: R-1, R-9, R-129.

Section 2: R-49, R-95, R-108, R-122, R-132, R-139, R-145.

Section 3: R-55, R-67, R-82, R-86, R-102, R-134, R-148

Section 4: R-8, R-58, R-79, R-89, R-90, R-136, R-143.

Section 5: R-16, R-18, R-63, R-75, R-83, R-125, R-163, R-164, R-165.

Section 6: R-11, R-21, R-26, R-39, R-43, R-66, R-91, R-112, R-131.

Section 7: R-107, R-109, R-110, R-111, R-113, R-114, R-116, R-141,  
R-152.

1.2 SCHEDULE REVIEW

The ninth NASA Status Review meeting for the Raytheon Apollo Program

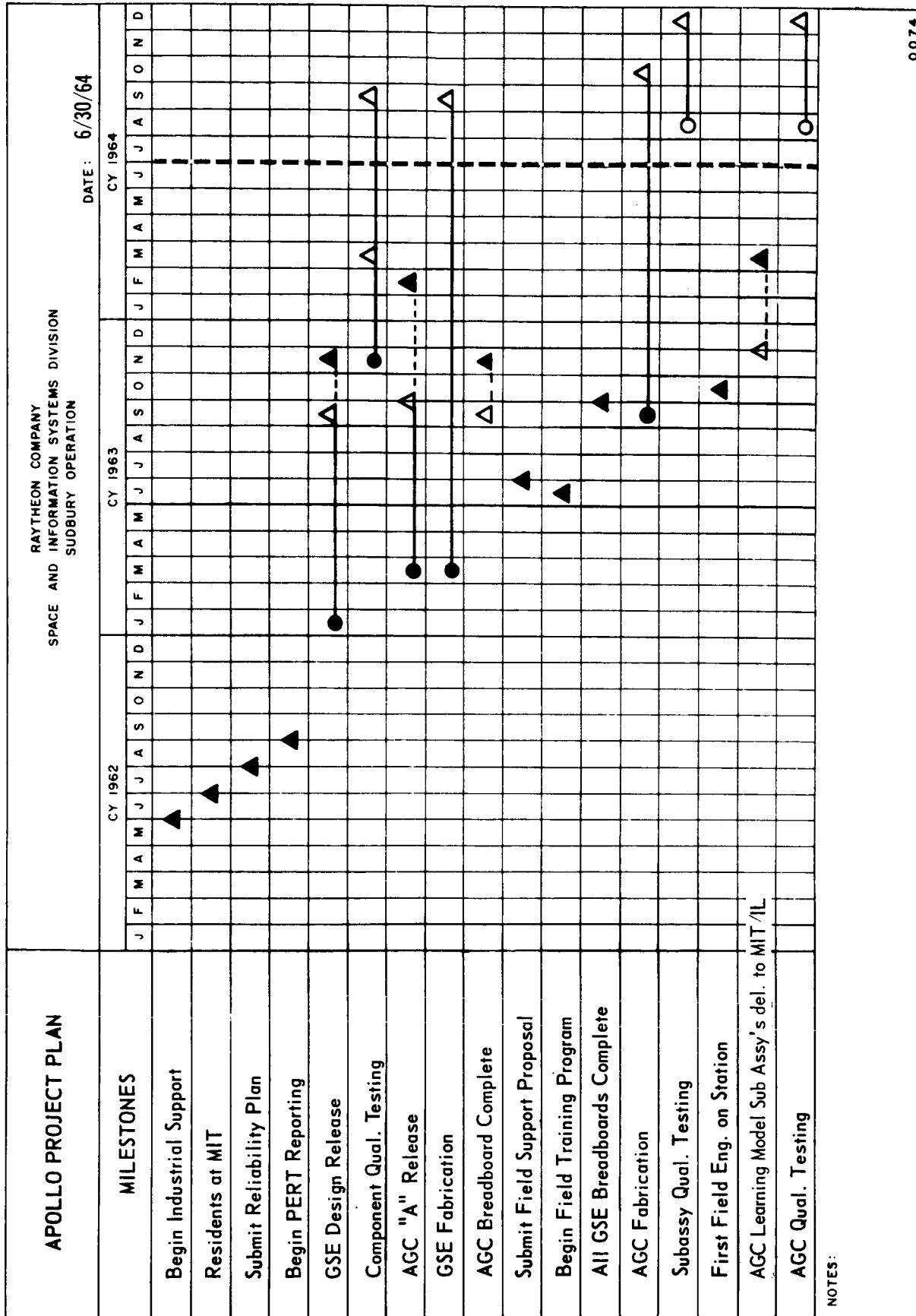
was conducted on 9 June, 1964. The following matters relative to equipment status were reviewed and discussed.

AGC 6 was reviewed in detail with respect to schedule and status. It was noted that potting problems, Malco pin incompatibility, ARTEMIS rope production and late wiring changes were prime factors in the slippage of AGC 6. Contrary to previous expectations, DSKY's have not been gating items in AGC 6. Vibration and life testing of AGC were discussed and it was stressed that if such tests were required, additional slippage would result.

AGC 7 production status was also discussed in some detail; this system is now at preliminary test. No problems are expected regarding Navigational and Main DSKY's. Raytheon's present plans include vibration and life tests on System 8.

Apollo Hardware Deliveries were reviewed and it was noted that some schedule recovery was expected at AGC 20 and production operations are building up to expected load of two (2) systems per month. The Hughes connector problem has slipped delivery of spares kits.

AGC System Test schedule is being hampered by the lack of Computer Test Sets. Without an additional Computer Test Set, extensive transfer of CTS's will be necessary to handle peak loading requirements (four AGC's simultaneously). Core rope status was reviewed and production plans discussed.



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Figure 1-1. Raytheon Apollo Milestone Chart







CONTRACT NAS 9-498

TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR COMMAND MODULE

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964				1965				1966				COMMENTS			
					EXP THIS MONTH	TOTAL EST.	J	J	A	S	O	N	D	J	A	S	O	N		D	J	F
R-18	4.42	VENDOR RELIABILITY & QUALITY CONTROL	G. MAYO E. DRISCOLL L. HAWORTH	7 24 62 7 24 62	158	22,301	14,469															PROJECTED TO 31 DECEMBER 1964
R-19	4.222	GSE DESIGN	E. OLSSON J. SCHMACK	7 20 62 7 20 62	35	-	142,670															EFFORT COMPLETED MAY 1964. FOLLOW ON EFFORT UNDER OTHER TD'S
R-20	4.212	ENGINEERING SUPPORT	E. HALL J. POUNDSTONE	7 24 62 7 24 62	99	-	204,573															EFFORT COMPLETED MAY 1964. FOLLOW ON EFFORT UNDER OTHER TD'S
R-21	4.63	PROGRESS REPORTS	E. HALL J. POUNDSTONE	7 24 62 7 24 62	439	13,556	11,024															PROJECTED TO DECEMBER 1964
R-22	4.221	CLOCK & SCALER BREADBOARD CONSTRUCTION	E. HALL J. POUNDSTONE	7 24 62 7 24 62	-	-	324															COMPLETED AUGUST 1962
R-23	4.231	BREADBOARD COMPUTER	E. HALL J. POUNDSTONE	7 24 62 7 24 62	<117>	-	37,433															EFFORT COMPLETED MAY 1964
R-24	4.13	ENGINEERING SUPPORT - RE-ENTRY	D. LICKLEY F. NESLINE	7 27 62 7 27 62	-	-	993															COMPLETED JANUARY 1963
R-25	4.11	RESIDENT ENGINEER	E. DUGGAN J. POUNDSTONE	7 27 62 7 27 62	<8>	-	2670															EFFORT COMPLETED
R-26	4.62	DOCUMENTATION ADMINISTRATION	J. LEVY J. AVTGES	8 30 62 9 19 62	190	5180	3975															EFFORT PROJECTED TO DECEMBER 1964
R-27	4.63	DOCUMENTATION CO-ORDINATION	J. LEVY J. AVTGES	8 23 62 8 24 62	-	-	793															EFFORT COMPLETED APRIL 1963. FOLLOW ON EFFORT COVERED ON OTHER TD'S
R-28	4.11	RESIDENT ENGINEER	E. DUGGAN R. FRONCILLO	8 21 62 8 22 62	-	-	1077															EFFORT COMPLETED APRIL 1963
R-29	4.62	DOCUMENTATION FOR TECHNICAL REPORTS	J. LEVY J. AVTGES	9 4 62 9 19 62	-	-	1438															EFFORT COMPLETED OCTOBER 1963. FOLLOW ON COVERED ON OTHER TD'S
R-30	4.63	DISTRIBUTION OF AGC INFORMATION TO MIT AND RAYTHEON	E. HALL J. POUNDSTONE	9 19 62 10 16 62	34	-	15,079															EFFORT COMPLETED MAY 1964
R-31	4.42	APOLLO FAILURE REPORTING SYSTEM	G. MAYO L. HAWORTH	9 18 62 10 16 62	-	-	55															COMPLETED MARCH 1963. FOLLOW ON EFFORT COVERED ON TD 16
R-32	4.42	DESIGN REVIEW	G. MAYO L. HAWORTH	9 18 62 10 16 62	-	-	814															EFFORT COMPLETED DECEMBER 1963. FOLLOW ON COVERED ON OTHER TD'S
R-33	4.63	POTTING SPECIFICATIONS	S. COPPS V. WHITE	10 2 62 10 16 62	-	-	163															COMPLETED JULY 1964
R-34	4.42	EVALUATION OF EFFECT OF RESISTANCE WELDING ON SEMI-CONDUCTOR DEVICES	G. MAYO V. WHITE	10 26 62 10 16 62	-	-	307															EFFORT COMPLETED 14 FEBRUARY 1964

( ) INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT

**TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR COMMAND MODULE**

CONTRACT\_NAS 9-498

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965					1966					COMMENTS
					EXP THIS MONTH	TOTAL EST	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	
R-35	4.13	MID COURSE GUIDANCE ANALYSIS	R. SCHOLTEN F. NESLINE	10 3/62 10 16 62	-	-	1606																					EFFORT COMPLETED APRIL 1963	
R-36	4.13	RESIDENT ENGINEERS	E. DUGGAN J. POUNDSTONE	10 3/62 10 16 62	<8>	-	3002																					EFFORT COMPLETED MAY 1964	
R-37	4.1	LAYOUT DRAFTSMAN	E. DUGGAN D. GRASSI	10 2/62 10 16 62	7	-	59,614																					EFFORT COMPLETED MAY 1964	
R-38	4.7	PSA PLANNING SUPPORT	E. DUGGAN R. FRONCILLO	10 2/62 10 16 62	-	-	-																					COMPLETED MARCH 1963 NECESSARY EFFORT WILL NOT BE CHARGED DIRECTLY	
R-39	4.63	SPECIAL PROCESSES AND MATERIAL SPECIFICATIONS	J. LEVY R. FRONCILLO	10 2 62 10 2 62	<11>	2784	1742																					PROJECTED THRU DECEMBER 1964	
R-40	4.223	ROPE STUDY	S. COPPS J. POUNDSTONE	10 9/62 10 9/62	-	-	4558																					EFFORT COMPLETED JANUARY 1964 FOLLOW ON EFFORT COVERED BY OTHER TD'S	
R-41	4.7	OPERATOR WELDING TRAINING	G. MAYO R. GOULART	10 15/62 10 15 62	-	-	55																					EFFORT COMPLETED NOV. 1962	
R-42	4.63	PROCESS SPECIFICATIONS	G. MAYO R. SPARACINO V. WHITE	11 8/62 11 28/62	-	-	-																					COMPLETED DECEMBER 1962 EFFORT CHARGED TO TD 20	
R-43	4.63	PROGRAM PROGRESS AND STATUS REPORTING	J. LEVY J. AVTGES	11 21 62 11 28 62	62	3915	3432																					EFFORT PROJECTED TO DECEMBER 1964	
R-44	4.63	SPECIFICATION CONTROL DRAWINGS	J. LEVY J. AVTGES	11 28/62 11 28 62	-	-	9456																					COMPLETED APRIL 1964 FOLLOW ON EFFORT COVERED ON OTHER TD'S	
R-45	4.232 4.222	GSE DESIGN: BREADBOARD COMPUTER SIMULATOR	J. GILMORE/ D. SCOLAMERO	11 28/62 11 30/62	-	-	706																					EFFORT COMPLETED APRIL 1963. FOLLOW ON EFFORT COVERED UNDER TD 19	
R-47	5.41	AGC FABRICATION	E. HALL J. POUNDSTONE	11 28/62 11 30/62	-	-	-																					ALL EFFORT TRANSFERRED TO TD 139	
R-48	4.12	SPACE STUDY TEAM	E. OLSSON J. POUNDSTONE	12 31/62 1 7/63	-	-	864																					COMPLETED MARCH 1963	
R-49	4.2.13	THERMAL INTERFACE COMMITTEE	E. HALL J. POUNDSTONE	11 28 62 11 28 62	880	9594	8943																					PROJECTED TO AUG 1964	
R-50	4.221	DC - DC CONVERTER DESIGN	E. HALL J. POUNDSTONE	11 28 62 11 28 62	-	-	1766																					COMPLETED SEPTEMBER 1963	
R-51	4.63	PROCESS SPECIFICATIONS	G. MAYO R. FRONCILLO	12 18/62 12 26 62	-	-	-																					EFFORT COMPLETED UNDER TD'S 20 AND 39	
R-52	0WLD	SUPPORT ENGINEER FOR FIELD MAINTENANCE PROCEDURES & PLANNING	R. BOYD R. WILSON	12 20 62 1 7 63	-	-	-																					CANCELLED 14 FEBRUARY 1963	

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TECHNICAL DIRECTIVE MAN HOUR STATUS  
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AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965					1966					COMMENTS	
					EXP THIS MONTH	TOTAL EST.	J	J	A	S	O	N	D	J	J	A	M	A	M	J	J	A	S	O	N	D	J	F		M
R-54	4.2 5.42	AGC CALIBRATION EQUIPMENT	J. GILMORE D. SCOLAMIERO J. SCHRACK	1 4 63 2 15 63	1	-																								EFFORT COMPLETED APRIL 1963
R-55	5.2 4.32	SPECIAL TOOLING AND TEST EQUIPMENT	J. GILMORE D. SCOLAMIERO J. SCHRACK	1 4 63 1 9 63	200	23,494																								PROJECTED TO 30 JULY 1964
R-56	4.2.1.2 4.3	AGC OSCILLATOR DOCUMENTATION	E. HALL J. POUNDSTONE	1 7 63 1 9 63	3	-																								EFFORT COMPLETED MAY 1964. FOLLOW ON EFFORT COVERED BY OTHER TD'S
R-57	5.4	ERASABLE MEMORY TESTER	E. HALL J. POUNDSTONE	1 14 63 3 18 63	131	-																								EFFORT COMPLETED APRIL 1964
R-58	5.4	APOLLO MODULE TESTER	E. HALL J. POUNDSTONE	1 14 63 2 28 63	256	4959																								PROJECTED TO JULY 1964
R-59	4.12	ENGINEERING SUPPORT	R. ALONSO J. POUNDSTONE	1 14 63 1 21 63	-	-																								EFFORT COMPLETED MARCH 1964
R-60	4.5	LOGISTICS SUPPORT FOR FIELD OPERATIONS	R. BOYD, JR. R. WILSON	1 24 63 2 6 63	-	-																								COMPLETED JULY 1963 FOLLOW ON EFFORT COVERED ON OTHER TD'S
R-62	4.2.1	TRAJECTORY CHECKS AND EVALUATION	W. SEARS F. NEELINE	1 18 63 2 6 63	-	-																								COMPLETED JUNE 1963 COMPUTER TIME ONLY
R-63	4.4	MICROLOGIC EVALUATION AND QUALIFICATION PROGRAM	E. HALL J. POUNDSTONE	1 27 63 1 28 63	63	6223																								PROJECTED TO AUGUST 1964
R-64	4.12	AGC/GSE RESIDENT	D. SCOLAMIERO J. POUNDSTONE	1 21 63 1 28 63	-	-																								EFFORT COMPLETED FEB 1963
R-65	4.42	EVALUATION OF MIT'S MICROLOGIC	L. HANLEY L. HAWORTH	1 24 63 2 15 63	-	-																								COMPLETED SEPTEMBER 1963
R-66	4.63	AGC INTERFACE SPECIFICATION	E. HALL J. POUNDSTONE	1 24 63 2 21 63	87	1649																								PROJECTED TO DECEMBER 1964
R-67	5.3	GSE MODULE AND DRAWER FABRICATION	D. SCOLAMIERO J. GILMORE J. SCHRACK	1 30 63 2 1 63	4960	37,774																								PROJECTED TO AUGUST 1964
R-68	5.3b	COMPUTER SIMULATOR, PROTOTYPE	D. SCOLAMIERO/ J. GILMORE J. SCHRACK	1 30 63 3 14 63	196	-																								EFFORT COMPLETED AUGUST 1963
R-69	5.3b	BREADBOARD COMPUTER TEST SETS	D. SCOLAMIERO J. SCHRACK	1 30 63 2 7 63	-	-																								COMPLETED SEPTEMBER 1963
R-70	4.31 5.41	AGC WIRE WRAP TOOLING	E. DUGGAN V. WHITE	2 28 63 2 27 63	(4)	-																								EFFORT COMPLETED MAY 1964
R-71	4.1.2	RESIDENTS FOR SYSTEM TEST PREPARATION	J. FLENING J. POUNDSTONE	2 21 63 2 28 63	(8)	-																								EFFORT COMPLETED MAY 1964

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T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964			1965			1966					COMMENTS		
					EXP THIS MONTH	TOTAL EST	J	J	A	S	O	N	D	J	J	A	M		J	J
R-72	LETTER*	ROPE SIMULATOR DESIGN AND FABRICATION	E. HALL J. POUNDSTONE	3-15-63 3-20-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED JANUARY 1964
R-73	52	MICROLOGIC PROCUREMENT	E. HALL	3-18-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964 (MATERIAL ONLY)
R-73	53		J. POUNDSTONE	3-20-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R-74	52	BLOCK I AGC PROCUREMENT	E. HALL J. POUNDSTONE	2-21-63 3-25-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964 (MATERIAL ONLY)
R-75	541	SCREENING & BURN-IN EQUIPMENT	G. MAYO L. HAWORTH	2-21-63 3-4-63	1092	19,912	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO JULY 1964
R-76	411b	RESIDENT EFFORT GUIDANCE ANALYSIS	R. BATTIN J. POUNDSTONE	2-26-63 3-14-63	<100>	616	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964
R-77	411	SCD COORDINATION MECHANICAL DESIGN COORDINATION	E. DUGGAN J. POUNDSTONE	2-28-63 3-14-63	<8>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964
R-78	463	FAMILIARIZATION MANUAL	J. LEVY J. AVTGES	3-28-63 3-28-63	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED APRIL 1964
R-79	43 54	AGC GSE IN-PROCESS TESTING EQUIP. (CONT. & HI POT TESTER)	E. HALL J. POUNDSTONE	3-19-63 4-1-63	2627	29,377	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO JULY 1964
R-80	442	VENDOR RELIABILITY AND QUALITY CONTROL	G. MAYO L. HAWORTH	3-26-63 4-2-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964
R-81	462 463-7	AGC & GSE MANUALS	R. BOYD J. AVTGES	3-28-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SUPERSEDED BY TD 84
R-82	53b	COMPUTER SIMULATOR FABRICATION (RETROFITTING)	D. SCOLAMIERO J. GILMORE J. SCHIRMACK	3-29-63 4-5-63	99	20,163	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO JULY 1964
R-83	442	DESIGN EVALUATION AND QUALIFICATION TEST PROGRAM	G. MAYO L. HAWORTH	4-4-63 1-15-64	46	9327	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO DECEMBER 1964
R-84	462	MAINTENANCE & REPAIR MANUALS	J. LEVY J. POUNDSTONE	4-18-63 4-25-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TD SUPERSEDED BY TD 131, ALL EFFORT TRANSFERRED.
R-85	412a	POST INSTALLATION TESTING	J. FLEMING J. BERNARD	4-3-63 4-8-63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED APRIL 1964
R-86	53b	AGC CALIBRATION EQUIPMENT MANUFACTURE (RETROFIT)	D. SCOLAMIERO J. GILMORE J. SCHIRMACK	4-8-63 4-18-63	21	7784	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO JULY 1964
R-88	412a	P.A.C.E. INTEGRATION	J. FLEMING J. BERNARD	4-16-63 4-22-63	<16>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EFFORT COMPLETED MAY 1964
R-89	541	MICROLOGIC STICK TESTER	E. HALL J. POUNDSTONE	4-25-63 5-3-63	127	9690	-	-	-	-	-	-	-	-	-	-	-	-	-	PROJECTED TO JULY 1964

\* NASA LETTER WRITTEN BY M. HOLZMAN, SUBJECT CONTRACT NAS 9-498 CORE ROPE SIMULATOR EXPT. DATED 13 MARCH 1963 (>) INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT

# TECHNICAL DIRECTIVE MAN HOUR STATUS FOR COMMAND MODULE

CONTRACT NAS 9-498

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965					1966					COMMENTS				
					EXP THIS MONTH	TOTAL EST	J	J	A	S	O	N	D	J	J	A	M	A	M	J	J	A	S	O	N	D	J	J		A	M	A	M
R-90	5.41	SCREENING & BURN-IN EQUIPMENT	E. HALL J. POUNDSTONE	4 25 '63 5 3 '63	1877	14,100																											PROJECTED TO JULY 1964
R-91	4.62b 4.63c	PREPARATION OF INTERFACE SPECIFICATIONS	J. GILMORE J. AVTGES	4 30 '63 5 6 '63	8	-																										PROJECTED TO DECEMBER 1964	
R-92	4.223	ENGINEERING SERVICES	E. HALL J. POUNDSTONE	5/1/63 5/6/63	<10>	45,261																										EFFORT COMPLETED MAY 1964. FOLLOW ONCOVERED BY OTHER TD'S	
R-93	4.13	RESIDENT DETAILER	E. BUGGAN J. POUNDSTONE	5/1/63 5/1/63	-	-																										EFFORT COMPLETED SEPT 1963	
R-94	5.2 5.3 4.4	SUPPLEMENTAL MICROLOGIC PROCUREMENT	E. HALL J. POUNDSTONE	5/1/63 5/15/63	-	-																										SUPERSEDED BY TD 99 JUNE 1963	
R-95	5.41	ACC TOOLING	E. HALL V. WHITE	5 9 '63 5 22 '63	472	19,096																										PROJECTED TO SEPT 1964	
R-96	4.11	DRAFTING SQUAD LEADER	E. BUGGAN D. GRASSI	5/21/63 5/23/63	<10>	2088																										EFFORT COMPLETED MAY 1964	
R-97	TXW 777	FABRICATION OF ONE COMPUTER SIMULATOR	E. HALL R. FRONCILLO	5/31/63 6/17/63	-	-																										TO BE INCORPORATED INTO TD 82 PER AG 61-64 COMPLETED 28 JANUARY 1964	
R-99	5.2 5.3	SUPPLEMENTAL MICROLOGIC PROCUREMENT	E. HALL J. POUNDSTONE	5/28/63 6/5/63	-	-																										EFFORT COMPLETED DECEMBER 1963 (MATERIAL ONLY)	
R-101	4.1.3	ANALYTICAL SUPPORT FOR SPACE GUIDANCE ANALYSIS DIVISION POWERED FLIGHT GROUP	R. BATTIN J. POUNDSTONE	6/5/63 6/13/63	-	-																										EFFORT COMPLETED MAY 1964	
R-102	5.3 b	COMPUTER TEST SET PRODUCTION	J. GILMORE J. POUNDSTONE	6/17/63 6 28 '63	27,269	120,000																										PROJECTED TO SEPTEMBER 1964	
R-103	**	EXTRA COMPUTER TEST SET	J. GILMORE J. POUNDSTONE	6/17/63 6/28/63	-	-																										INCORPORATED INTO TD 102 22 MARCH 1964	
R-105	5.1.3	ACC POWER SUPPLY AND OSCILLATOR	E. HALL J. POUNDSTONE	6/17/63 6/28/63	6	-																										COMPLETED OCTOBER 1963	
R-106	4.2.1.2	YUL SYSTEM DESCRIPTIVE WRITING	T. LAWSON J. POUNDSTONE	6/18/63 6/25/63	-	-																										COMPLETED DECEMBER 1963	
R-107	4.3.3*	FIELD OPERATIONS TRAINING	R. BOYD R. WILSON	6 25 '63 7 17 '63	1057	17,226																										EFFORT PROJECTED TO DEC. 1964	
R-108	4.2.1.2	ACC FIXTURE AND SHIPPING CONTAINER	E. HALL J. POUNDSTONE	10 8 '63 10 15 '63	318	1073																										PROJECTED TO SEPTEMBER 1964	
R-109	4.2.1*	FIELD OPERATIONS MANAGEMENT	R. BOYD R. WILSON	6 25 '63 7 17 '63	1221	16,530																										EFFORT PROJECTED TO DEC. 1964	

\*NASA LETTER DATED 13 JUNE 1963. SUBJECT: SPECIFICATIONS OF FIELD OPERATION PROGRAM \*\*NASA, TXW SGC-4-533 (ITEM 2.C.2.H) DATED 10 APRIL 63 < > INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT

CONTRACT NAS 9-498

## TECHNICAL DIRECTIVE MAN HOUR STATUS FOR COMMAND MODULE

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965					1966					COMMENTS
					EXP MONTH	TOTAL EST	J	J	A	S	O	N	D	J	J	A	M	A	M	M	J	F	M	A	M				
					DATE																								
R-110	4.3.2*	MATERIAL & SPARES INTEGRATION	R. BOYD R. WILSON	6/25/63 7/17/63	548	6612																							
R-111	4.1*	RESIDENT EFFORT, FIELD OPERATIONS	R. BOYD R. WILSON	6/28/63 7/17/63	150	5220																							PROJECTED THRU DECEMBER 1964
R-112	4.3.4*	PROCUREMENT SPECIFICATIONS	R. BOYD R. WILSON	6/28/63 7/17/63	1318	7482																							PROJECTED THRU DECEMBER 1964
R-113	4.3.1*	MAINTENANCE ANALYSIS SUPPORT	R. BOYD R. WILSON	6/25/63 7/17/63	504	6090																							PROJECTED THRU DECEMBER 1964
R-114	3.2* 4.4.2	SPECIAL TEST EQUIPMENT	R. BOYD R. WILSON	6/25/63 7/17/63	-	3308																							PROJECTED THRU DECEMBER 1964
R-115	4.1.3 b	RESIDENT EFFORT-GUIDANCE ANALYSIS	M. SEARS J. POUNDSTONE	6/28/63 7/16/63	-	-																							EFFORT COMPLETED MAY 1964
R-116	3.1 SEC.5	SPARES PROCUREMENT	R. BOYD R. WILSON	7/12/63 7/18/63	495	10,000																							MAJOR EFFORT PRESENTLY CHARGED TO RESPECTIVE HARDWARE TDS
R-117		ACC IN-FLIGHT MAINTENANCE STUDY	E. HALL J. POUNDSTONE	6/28/63	-	-																							CANCELLED BY TD 9L
R-120		SUBASSEMBLY QUALIFICATION TEST PROGRAM	G. MAYO L. HAWORTH	3 26 64	37	-																							NOT FORMALLY ACCEPTED
R-121	5.1 5.2 5.3	ACC - 5A FABRICATION	E. HALL J. POUNDSTONE	8/23/63 9/5/63	-	-																							COMPLETED OCTOBER 1963
R-122	4.5	FABRICATION OF BLOCK I AGC'S	E. HALL J. POUNDSTONE	8 19 63 9 5 63	42,946	187,146																							PROJECTED TO AUGUST 1964
R-123	4.5	RESIDENT EFFORT - APOLLO SYSTEM TEST GROUP	J. FLEMING J. POUNDSTONE	8/20/63 9/3/63	<0>	1827																							EFFORT COMPLETED MAY 1964
R-125		COMPONENT QUALIFICATION TEST PROGRAM	G. MAYO L. HAWORTH	3 18 64 3 25 64	1485	17,194																							PROJECTED TO DECEMBER 1964
R-126	4.1.2	ENGINEERING SUPPORT	R. ALONSO J. POUNDSTONE	8/26/63 9/6/63	-	-																							EFFORT COMPLETED MARCH 1964
R-128	5.1	HALF-ROPE STICKS	A. HOPKINS J. POUNDSTONE	8/26/63 9/10/63	-	-																							EFFORT COMPLETED DECEMBER 1963
R-129	TWX 227	IMPLEMENTATION OF PACE AND STU SYSTEM TEST ACTIVITY	J. FLEMING J. POUNDSTONE	9 9 63 9 23 63	1244	21,924																							PROJECTED TO FEBRUARY 1965
R-131	4.6.2	MAINTENANCE AND REPAIR MANUALS	L. LARSON J. POUNDSTONE	9 9 63 2 26 64	3322	27,345																							PROJECTED TO DECEMBER 1964

\*NASA LETTER DATED 13 JUNE 1963. SUBJECT: SPECIFICATIONS OF FIELD OPERATION PROGRAM (X) INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT



CONTRACT NAS 9-498

TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR COMMAND MODULE

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964							1965							1966					COMMENTS	
					EXP THIS MONTH	TOTAL EST	J	J	A	S	O	N	D	J	J	A	M	A	M	J	J	A	M	J	F		M
R-132	5.2	AGC BLOCK I ROPES	E HALL J. POUNDSTONE	9 9 63 9 16 63	10.427	37.020																					PROJECTED THRU DECEMBER 1964
R-133																											
R-134	*	AGC SIMULATION COMPUTERS	E HALL J. POUNDSTONE	9 23 63 9 30 63	15.431	67.210																					EFFORT PROJECTED THRU JULY 1964
R-135		AGC SIMULATION COMPUTERS CORE ROPES	E HALL J. POUNDSTONE	9 23 63 9 30 63	-	11.106																					ALL EFFORT CURRENTLY CHARGED TO TD 132. PROJECTED TO JULY 1964
R-136	5.4.1	AGC COMPUTER POWER SUPPLY TESTER	E HALL J. POUNDSTONE	9 27 63 10 4 63	160	1349																					PROJECTED THRU JUNE 1964
R-137		FAILURE EFFECTS ANALYSIS	C MAYO J. POUNDSTONE	3 18 64	-	-																					NOT FORMALLY ACCEPTED
R-138																											
R-139	5.1	AGC 4B FABRICATION	E HALL J. POUNDSTONE	10 15 63 10 22 63	497	33,069																					PROJECTED TO JUNE 1964
R-140	5.1	AGC 4B CORE ROPES	E HALL J. POUNDSTONE	10 15 63 10 22 63	-	7404																					ALL EFFORT CURRENTLY CHARGED TO TD 132. PROJECTED TO JULY 1964
R-141	4.2.2 (FO. SOW)	DEPLOYMENT OF FIELD TEST AND OPERATIONS PERSONNEL	R. T. BOYD R. D. WILSON	10 17 63 10 24 63	4624	69,235																					PROJECTED TO DECEMBER 1964
R-142																											
R-143	5.4.1	AGC DISPLAY AND KEYBOARD TEST STATION	E HALL J. POUNDSTONE	10 18 63 10 23 63	736	2088																					PROJECTED THRU JUNE 1964
R-144																											
R-145	NA	GROUND TEST DATA REDUCTION AND ANALYSIS PLANNING	J. FLEMING J. POUNDSTONE	2 7 64 2 21 64	857	10,218																					PROJECTED THRU DECEMBER 1964
R-146	NA	RESIDENT EFFORT CBDU & GSE	J. MILLER R. FRONCILLO	12/2/63 12/9/63	<16>	-																					EFFORT COMPLETED MAY 1964
R-147	NA	SPECIFICATION CONTROL DWGS	G MAYO R. FRONCILLO	11 21 63	1331	10,440																					NOT FORMALLY ACCEPTED
R-148	NA	AGC ROPE SIMULATORS	E HALL J. POUNDSTONE	2 3 64 2 10 64	4601	14,787																					PROJECTED THRU JULY 1964

\*\*NASA LETTER APOCAN (FDN:amp) 30 AUGUST 63 < > INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT

TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR COMMAND MODULE

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965												1966												COMMENTS
					EXP THIS MONTH	TOTAL EST.	EXP TO DATE	J			A			S			O			N			D			J			F			M			A			M					
								J	J	J	A	A	A	S	S	S	O	O	O	N	N	N	D	D	D	J	J	J	F	F	F	M	M	M	A	A	A						
R-149																																											
R-150		BLOCK I DRAWINGS - MAINTENANCE	L. LARSON R. FRONCILLO	3 5 64		3900	275,007	20,095																															NOT FORMALLY ACCEPTED				
R-151																																											
R-152		GSE INSTALLATION TEAM	R. J. BOYD R. D. WILSON	2 17 64 2 24 64		186	1548	533																																PROJECTED TO DECEMBER 1964			
R-153																																											
R-154		AGC PROGRAM DOCUMENTATION	E. HALL R. VOLPI	3 5 64		1365	13,226	2032																																NOT FORMALLY ACCEPTED			
R-155		STU MAIN DSKY	C. SPERLING J. POUNDSTONE	4 8 64		70	3952	70																																NOT FORMALLY ACCEPTED			
R-156																																											
R-157																																											
R-158		POWER SUPPLY REDESIGN	E. HALL J. POUNDSTONE	5 8 64		1021	4856	1327																																	NOT FORMALLY ACCEPTED		
R-159																																											
R-160		AGC OSCILLATOR REDESIGN	E. HALL R. FRONCILLO	5 8 64		532	3534	1811																																	NOT FORMALLY ACCEPTED		
R-161		RELIABILITY PROGRAM PLAN	G. MAYO L. HAWORTH	3 26 64																																					NOT FORMALLY ACCEPTED		
R-162		RELIABILITY DESIGN SUPPORT - CM BLOCK II	G. MAYO R. FRONCILLO	4 7 64		387	-	695																																NOT FORMALLY ACCEPTED			
R-163		FAILURE ANALYSIS	G. MAYO R. FRONCILLO L. HAWORTH	4 7 64 4 14 64		1051	5493	1850																																	PROJECTED TO DECEMBER 1964		
R-164		FAILURE REPORTING AND CORRECTIVE ACTION	G. MAYO R. FRONCILLO L. HAWORTH	4 3 64 4 10 64		196	2130	432																																PROJECTED TO DECEMBER 1964			
R-165		RELIABILITY ANALYSIS	G. MAYO R. FRONCILLO L. HAWORTH	4 3 64 4 10 64		124	900	261																																PROJECTED TO DECEMBER 1964			

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TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR COMMAND MODULE

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964							1965					1966					COMMENTS		
					EXP THIS MONTH	TOTAL EST	J	J	A	S	O	N	D	J	F	A	M	J	J	A	M	J	J		A	M
R-166		MAIN DSKY TEST STAND	C SPERLING K. BROWN	5 13 64	1044	-	1333																			NOT FORMALLY ACCEPTED
R-167		AGC PRODUCTION EFFORT ENGINEERING	E. HALL D. GRASS	5 8 64	21,875	38,922																				NOT FORMALLY ACCEPTED
R-168		BLOCK II AGC PACKAGING	E. DUGGAN D. GRASS	4/10/64	<39>	3400	478																			EFFORT COMPLETED MAY 1964
R-169		BLOCK I GSE PRODUCTION SUPPORT ENGINEERING	E. OLSSON W. KURTZ J. POUNDSTONE	5 8 64	3978	6407																				NOT FORMALLY ACCEPTED
R-170		BLOCK II PROGRAM MANAGEMENT	L. LARSON W. KURTZ	5 8 64	1296	2237																				NOT FORMALLY ACCEPTED
R-171		BLOCK II DESIGN ENGINEERING SUPPORT (MFG. TECHNIQUE TOOLING)	E. HALL W. KURTZ/ J. POUNDSTONE	5 8 64	96	120																				NOT FORMALLY ACCEPTED
R-172		BLOCK II DOCUMENTATION/ (ENGINEERING SERVICES)	L. LARSON W. KURTZ/ J. POUNDSTONE	5 8 64	-	3306																				NOT FORMALLY ACCEPTED
R-173		BLOCK II DESIGN ENGINEERING SUPPORT (INFORMATION SERIES)	E. HALL W. KURTZ/ G. ROLT	5 8 64	-	-																				NOT FORMALLY ACCEPTED
R-174		BLOCK II DESIGN ENGINEERING SUPPORT (PROGRAM REQUIREMENTS)	E. HALL W. KURTZ J. POUNDSTONE	5 8 64	-	-																				NOT FORMALLY ACCEPTED
R-175		BLOCK II DESIGN ENGINEERING SUPPORT (AGC ELECTRICAL MECHANICAL DESIGN)	E. HALL W. KURTZ/ J. POUNDSTONE	5 8 64	128	128																				NOT FORMALLY ACCEPTED
R-176		BLOCK II DESIGN ENGINEERING SUPPORT (AGC GSE)	E. HALL W. KURTZ J. POUNDSTONE	5 8 64	-	-																				NOT FORMALLY ACCEPTED
R-177		BLOCK II DESIGN ENGINEERING SUPPORT (DISPLAY AND KEYBOARDS)	E. HALL W. KURTZ J. POUNDSTONE	5 8 64	1027	1027																				NOT FORMALLY ACCEPTED
R-178		BLOCK II FABRICATION (DSKY'S)	E. HALL W. KURTZ J. POUNDSTONE	5 8 64	-	-																				NOT FORMALLY ACCEPTED
R-179																										
R-180																										
R-181		BLOCK II FABRICATION (AGC PROTOTYPES)	E. DUGGAN W. KURTZ J. POUNDSTONE	5 8 64	-	-																				NOT FORMALLY ACCEPTED
R-182		BLOCK II FABRICATION (BITS AND PIECES)	E. DUGGAN W. KURTZ J. POUNDSTONE	5 8 64	-	-																				NOT FORMALLY ACCEPTED

< > INDICATES ACCOUNTING CHANGE FROM PREVIOUS REPORT

**TECHNICAL DIRECTIVE MAN HOUR STATUS FOR COMMAND MODULE**

CONTRACT NAS 9-498

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS			1964							1965					1966					COMMENTS					
					EXP FMS MONTH	TOTAL EST	EXP DATE	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O		N	D	J	F	M
R-183		BLOCK II RESIDENT EFFORT	E. HALL W. KURTZ J. POUNDSTONE	5 8 64	7926	25,056	12,359																							NOT FORMALLY ACCEPTED
R-184		BLOCK II FABRICATION (AGC FIXED MEMORY CORE ROPE MODULES)	E. HALL W. KURTZ J. POUNDSTONE	5 8 64																										NOT FORMALLY ACCEPTED
R-185																														NOT FORMALLY ACCEPTED
R-186		BLOCK II CDU DESIGN ENGINEERING SUPPORT	J. MILLER W. KURTZ/ J. POUNDSTONE	5 8 64																										NOT FORMALLY ACCEPTED
R-187		BLOCK II CDU MANUFACTURING PROCESS DEVELOPMENT	D. TEST/J. MILLER W. KURTZ/ J. POUNDSTONE	5 8 64																										NOT FORMALLY ACCEPTED
R-188		DESIGN ENGINEERING SUPPORT (DART INPUT/OUTPUT EQUIPMENT, IOE)	E. HALL J. POUNDSTONE	5/21/64																										NOT FORMALLY ACCEPTED
R-189		DART IOE FABRICATION	E. HALL J. POUNDSTONE	5/21/64																										NOT FORMALLY ACCEPTED
R-190		BLOCK II FABRICATION (BLOCK II AGC/GSE RETROFIT KITS)	E. OLSSON J. POUNDSTONE	5 8 64																										NOT FORMALLY ACCEPTED
R-191		FABRICATION OF PROTOTYPES BLOCK II CDU DIGITAL MODULES	D. TEST/ J. MILLER J. POUNDSTONE	5 8 64																										NOT FORMALLY ACCEPTED
R-192																														
R-193		BLOCK I (F) DESIGN ENGINEERING SUPPORT (DSKY'S)	E. HALL J. POUNDSTONE	5/14/64																										NOT FORMALLY ACCEPTED
R-194		BLOCK II FABRICATION (TEST EQUIPMENT AND TOOLING AGC)	E. HALL J. POUNDSTONE	5/14/64																										NOT FORMALLY ACCEPTED
R-195		BLOCK II FABRICATION (TEST EQUIPMENT AND TOOLING GSE)	E. HALL J. POUNDSTONE	5/12/64																										NOT FORMALLY ACCEPTED
R-196		BLOCK II FABRICATION (DSKY TEST EQUIPMENT AND TOOLING)	E. HALL J. POUNDSTONE	5/11/64																										NOT FORMALLY ACCEPTED
R-197		BLOCK I (100 SERIES) FABRICATION (AGC TEST EQUIPMENT AND TOOLING)	E. HALL J. POUNDSTONE	5/26/64																										NOT FORMALLY ACCEPTED
R-198		BLOCK I (100 SERIES) AGC FABRICATION	E. HALL J. POUNDSTONE	5 26 64																										NOT FORMALLY ACCEPTED
R-199		BLOCK I (100 SERIES) FABRICATION (FIXED MEMORY CORE ROPE MODULES)	E. HALL J. POUNDSTONE	5 26 64																										NOT FORMALLY ACCEPTED



TECHNICAL DIRECTIVE MAN HOUR STATUS  
FOR LEM G8N CONCEPT DESIGN

CONTRACT NAS 9-498

AS OF 30 JUNE 1964

T.D.	W.S.	SUBJECT	MIT ENGR RAY ENGR	ISSUED ACCEPTED	MAN HOURS		1964												1965					1966					COMMENTS
					EXP THIS MONTH	TOTAL EST.	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	
R-1L	3D 5D&E	LEM PROJECT MANAGEMENT	P. K. BRYANT J. POUNDSTONE	6/19/63 6/24/63	-	-	2444																				COMPLETED MARCH 1964		
R-2L	3A	RESIDENT EFFORT	P. K. BRYANT J. POUNDSTONE	6/19/63 6/25/63	-	-	876																				COMPLETED MARCH 1964		
R-3L	4C	DOCUMENTATION	P. K. BRYANT J. POUNDSTONE	6/19/63 6/24/63	-	-	254																				COMPLETED MARCH 1964		
R-4L	4B 5C	SCHEDULING AND REPORTING	P. K. BRYANT J. POUNDSTONE	6/19/63 6/26/63	-	-	210																				COMPLETED 28 FEBRUARY 1964		
R-5L	3E2	LEM HARDWARE FABRICATION	J. GILMORE J. POUNDSTONE	6/19/63	-	-	-																				CANCELLED PER AG 896-63 18 OCTOBER 1963		
R-6L					-	-	-																						
R-7L					-	-	-																						
R-8L	3A	LGE SYSTEMS TEST PROCEDURES	J. FLEMING J. BERNARD	6/28/63 7/16/63	-	-	-																				EFFORT COVERED ON TD 2L		
R-9L	3b	AGC IN FLIGHT MAINTENANCE STUDY	E. HALL J. POUNDSTONE	8/6/63 8/13/63	-	-	1880																				EFFORT COMPLETED FEBRUARY 1964		
R-10L	3a	LEM G&N GSE RESIDENT	D. SCOLAMIERO J. SHRACK	8/7/63 8/7/63	-	-	-																				EFFORT COVERED ON TD 2L		
R-11L	3.b.1	GSE REQUIREMENTS FOR LGC	D. SCOLAMIERO J. SHRACK	8/6/63 8/13/63	-	-	107																				EFFORT COMPLETED FEBRUARY 1964		
R-12L	3.b.1	THERMAL AND STRUCTURAL ANALYSIS OF LGC DESIGN	E. DUGGAN R. FRONCILLO	8/6/63 8/13/63	-	-	1315																				EFFORT COMPLETED 7 FEBRUARY 1964		
R-13L	3.b.1	CORE ROPE MANUFACTURING STUDY FOR LGC	E. DUGGAN R. FRONCILLO	8/6/63 8/13/63	-	-	527																				EFFORT COMPLETED JANUARY 1964		
R-14L	3.b.(2), (c)	LEM CM INTERCHANGEABLE HARDWARE	E. HALL R. FRONCILLO	10/15/63 10/22/63	-	-	-																				EFFORT COVERED ON TD 2L		
R-15L	3.b.(2), (d)	LGC CIRCUIT AND LOGIC DESIGN	E. HALL R. FRONCILLO	10/17/63 10/24/63	-	-	391																				EFFORT COMPLETED FEBRUARY 1964		
R-16L	3.b.(2), (e)	LGC MECHANICAL DESIGN	E. HALL R. FRONCILLO	10/17/63 10/24/63	-	-	2892																				EFFORT COMPLETED FEBRUARY 1964		
		TOTALS			-	-	18,596																				PREPARED BY D.J. WHALEN		









## SECTION 2

### COMPUTER SUBSYSTEM

#### 2.1 APOLLO GUIDANCE COMPUTERS

System testing of AGC 6 was conducted in April using the AGC 4A monitor. The central processor, sequence generator, counter increment priority logic, interrupt priority logic, programmable alarms, rate circuits, and erasable memory subsystem were checked out during April using the AGC 4A monitor.

Computer Test Set (CTS) No. 4 was connected to AGC 6 during the quarter and all 13 EXTEST programs (part of the ARTEMIS program) were successfully run. Upon completion of the complete Final Test Method (FTM) run, the computer was scheduled for potting. Core Rope Simulator (CRS) No. 2 was integrated and checked out with AGC 4A in April. In addition, core ropes were tested using the AGC 4A and CTS 2.

AGC 4A was updated during May to reflect the revised wirelist which was issued during the previous quarter. The G & N Harness (Tray C) for AGC 5 was completed on 11 May. All AGC 5 items except for replacement Trays A and B were delivered to MIT/IL. System testing of AGC 6 was conducted during May using the CTS, as well as both DSKY's. The final revision of the FTM was used and several changes were made to Interface Signal Measurement and DSKY checkout parts. The FTM portion dealing with core rope program checkout was not attempted because the necessary ropes were not available at the time.

Problems were encountered with Tray A modules bulging after potting. This situation is currently being investigated. The first approach is to epoxy hardcoat the outer surfaces. Two sticks are now being potted in this fashion and will be ready for thermal cycling during the next reporting period. This attempted fix is primarily for 125 sticks which have already been potted.

~~CONFIDENTIAL~~

A dummy stick containing no internal elements except mylar insulators and a bead of 2216 epoxy on one side of the header and a bead of Ecco Bond 45 on the other side was potted in foam. The second thermal cycle caused the side with Ecco Bond to bulge. This stick is now being bisected to determine if there is foam separation in the header.

The epoxy impregnated glass cloth has been eliminated from Tray B modules to solve the problem of covers separating from the potting. An epoxy coat is being used to replace the glass cloth with excellent results. The time delay circuit in the strand gate module was redesigned in June. The change will be effective at System No. 10 with all Block I sub-systems to be retrofitted.

A TDRR was submitted in June to relocate the diode in the core rope component holder. This modification will eliminate the effects of temperature gradient on matched diodes. A set of Sunrise modules are being potted to evaluate the potting procedure, as well as the material being used for potting (Epocast 212). In addition, a hold has been placed on potting to investigate the lack of adherence of the epoxy encapsulant to the header.

AGC oscillators for Systems Nos. 5 and 6 were calibrated, tested, and released to Production during the quarter. A prototype thermal electric oven with the capability of compensating and testing two oscillators concurrently has been developed and is operational (see figure 2-1 of Apollo Monthly Technical Progress Report No. 22, FR-4-265).

With the delivery of the G & N Harness Tray, the end connector, and Trays A and B on 22 June, 1964, the gating item for the start of AGC 6 FTM testing is the completion of thirteen logic sticks now being reworked. The anticipated shipping date for AGC 6 is now 9 July, 1964.

The mechanical trays and Navigation Panel DSKY for AGC 7 are on hand. Because of the stick potting problem, the number of sticks required for testing purposes are unavailable. The expected completion date for this system is now 5 August, 1964.

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The expected completion date for AGC 8 has been improved by one week because of a re-estimate of the activity time required for final testing. The oscillator and Tray A potted modules continue to be the gating items. The anticipated completion date is 18 August, 1964. AGC 20 and AGC 10 hold virtually the same status as AGC 8 with expected completion dates of 27 August and 2 September, respectively.

## 2.2 DISPLAY AND KEYBOARD UNITS (DSKY'S)

The Navigation Panel DSKY for System No. 5 was delivered to MIT/IL in April. Main Panel DSKY No. 6 was fabricated and successfully tested in an unpotted state during April. The unit was then integrated into testing for System No. 6.

Effort on Block I DSKY's was completed during May with the exception of the implementation of minor production and testing changes. Studies and estimates were performed to determine the design approach and level of effort for the Block II DSKY's. Plans were also made for improved DSKY moisture resistance.

Additional potted areas have been added to the backs of the electroluminescent lights, as well as to the keyboard, brightness potentiometer, and UPTL switch terminals for System 8 DSKY's and subsequent.

A gasket for sealing was designed during the quarter and the tooling order is in process. These gaskets will be retrofitted into System 8 and subsequent DSKY's when available. A mechanical stop has been added to the thumb wheel of the brightness control to prevent damage to the potentiometer when its control limit is reached.

Effective at System No. 8, the Check Fail light was changed to Keyboard Release light. An addition, signals to the Computer Fail Light were changed. Systems Nos. 5, 6, and 7 will be retrofitted to reflect these modifications.

The magnesium portions of DSKY decoding modules are being painted

with epoxy paint for environmental protection purposes. Block 100 series will have a Dow 17 coating in addition to a black finish.

### 2.2.1 Main DSKY Pedestal Mount

The Main DSKY Pedestal Mount drawings were first reviewed on June 3, 1964. At that time it was decided to hold their release pending the fabrication and checkout of the Serial No. 1 (breadboard) unit. The unit (figure 2-1) was fabricated between 3 June and 23 June. All drawings were reviewed and released on 24 June 1964.

### 2.3 PROGRAM SUPPORT

The AGC Factory Diagnostics Programs were completely checked out during the quarter. The diagnostic programs, which check out thirty-five different types of sticks were used to exercise and check-out AGC 6 with the Core Rope Simulator (CRS) and the Computer Test Set (CTS). In addition, the ARTEMIS programs, entered via punched paper tape, were used to determine the operational and functional capability of AGC 6.

A program to produce Core Rope Tester (CRT) tapes was written and debugged during April. The tapes were produced and verified. The program was prepared as back-up for one which was previously produced by Raytheon personnel at MIT/IL. In this manner, prompt delivery of all desired tapes is assured.

The ARTEMIS, EXTEST, and AGC Factory Diagnostics programs were used extensively during May for verification of AGC operational and functional capabilities, as well as for diagnostic assistance in the isolation of malfunctions.

A series of programs was produced for the MH-800 computer to verify each punched paper tape produced during the core rope manufacturing.



Figure 2-1. Main DSKY Pedestal Mount

procedure. These programs will assist in eliminating hardware mispunching which has been prevalent in the past.

The Final Test Method (FTM) procedures which will be used during factory sell-off were exercised during June and minor changes were incorporated. A preliminary Computer Subsystem Field Verification Procedure (FR-4-423) has been written in conjunction with MIT/IL. This document will accompany AGC's into the field and will be used for receiving inspection and subsystem testing at all field sites.

A Tally machine to reproduce and verify punched paper tapes has been ordered and will be delivered during August, 1964. A set of programs were coded during June. These programs will be used to produce tapes for a new wiring machine at MIT/IL.

#### 2.4 SPECIAL TOOLING

The Signal Layer Punch (figure 2-2) was used to manufacture 144 matrices during the quarter. A portion of the matrices have been assembled into sticks which are currently being evaluated by MIT/IL. All matrix drawings submitted to date have been programmed. The submissions constitute a completion of 94 drawings. The production of approximately 384 more matrices is being anticipated in the near future. Back-up punches have also been completed. An additional die is being made and a delivery of 20 July is expected. A new punch configuration is being evaluated, as well as a thicker stripper plate which gives the solenoids a greater usable velocity and greater penetration of the nickel material used in the punch. The service manual for the signal layer punch was completed in June.

Changes have been made to the wire guides of the Eubanks Wire Stripper. Preliminary results from the modification indicate improved performance of the stripper. The overall performance of the stripper portion of the system is not up to proficiency standards, however, and the vendor has been contacted



Figure 2-2. LEM Signal Layer Punch



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for action. Meanwhile, the equipment will continue to be tested to assure an efficient wirewrap system. During this period of evaluation, the equipment can still be used in Production but at a slightly decreased efficiency. The service manual has been written and will be issued during the next reporting period.

The equipment designed for the insertion of 0.200 center Malco pins has been completed and production parts are being assembled. An updated manual for the 0.125 center equipment has been re-issued.

Eight core rope machines have been completed and delivered to Production. These machines have been retrofitted with an advanced design bell crank linkage for smoother vertical aperture movement. A new inhibit wiring attachment was designed during the quarter for existing core rope machines. The order for the first model will be issued during the next reporting period. A new one-piece steel weldment is being designed for the standard core rope machines, as well as the new inhibit machine.

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SECTION 3  
GROUND SUPPORT EQUIPMENT

3.1      COMPUTER TEST SET

Computer Test Set (CTS) No. 3 was integrated with AGC 4B during the quarter. During the integration process, several changes were made to the CTS to achieve operational integrity. All design features of CTS 3 were fully exercised and results indicated that the integration of CTS 3 with AGC 4B was complete and acceptable. Considerable retrofitting was deemed necessary, however, to update CTS 3 to current electrical and mechanical production configurations.

The formal retrofit for CTS 5, 6, and 9 was completed at NAA and ACSP during June. Retrofits for CTS 4, 7, and 8 will be completed when NASA gives authorization for these units. The updating of CTS 2 to the electrical configuration of CTS 7 was completed on 29 June. CTS 9 was shipped to ACSP on 23 June, 1964. CTS 10 is in final test with an expected completion date of 1 July, 1964.

3.2      COMPUTER SIMULATOR

The final sale of Computer Simulator No. 11 was completed in April. This shipment constituted fulfillment of Raytheon's contractual commitments for these units. MIT/IL requested a retrofit in the simulator and associated marked drawings were completed during May. Engineering effort on the Computer Simulator Retrofit was completed during June and the marked prints were reviewed by the Raytheon Design Review Committee.

### 3.3 AGC/CTS OPERATION CONSOLE

Minor mechanical modifications were made to console subassemblies because of alignment problems during the quarter. A new cable was designed for the AGC Self Test which will connect the Power and Servo Assembly (PSA) programmable counter outputs to PSA counter inputs. Cable changes were also made to the Operation Console during April, as a result of pin connector changes in the Main and Navigation Panel DSKY's. Final test and sale of Computer Simulator No. 1 was completed during May.

Operation Console No. 1 (see figure 3-1) was integrated with CTS 4 and AGC 6 in June. Several wiring problems were encountered during the testing. Three wires were in error and a noise problem was encountered in the tray extenders. The noise in the tray extenders effected a redesign in the type of wires used. Twisted pairs and coaxials were specified in the redesign. The cable drawings for the new tray extenders are currently being prepared. Operation Console No. 2 is in final test with System No. 3 scheduled for testing during the next reporting period.

### 3.4 SIMULATION COMPUTER

Logic modules for Simulation Computer No. 1 were completed in April. The cabinet for System 1 was delivered on 13 May, 1964. Changes and additions to the Simulation Computer were studied during the quarter for integration with the current configuration. These modifications were as follows:

1. Use of 28V output from PSA for internal power
2. Modification of J box to channel all non-common DSKY signals to the Main DSKY connector
3. Allowance for operation with the Core Rope Simulator

Plug-in modules for Tray A were completely fabricated and tested during the quarter. Plug-in modules for Tray B have been fabricated and



Figure 3-1. AGC/CTS Operation Console

tested, however, the incorporation of flyable Class I changes has necessitated retesting. The majority of the affected boards are ready for retest and are awaiting the availability of test equipment currently being used for other production purposes.

Trays for System No. 1 have been wirewrapped at RCA and checked out at Raytheon-Waltham. Keying pins and ground busses are now being installed. Inter-tray hand wiring should begin during the next reporting period.

The power control and junction box panels are being redesigned. Additional parts are on order for the Power Control Panel and a new panel is being machined. New drawings for the assembly will be issued during July. The Junction Box Panel was redesigned to accommodate connectors from the Core Rope Simulator. A new panel has been machined and is now being painted. A formal drawing of the new configuration is now being prepared.

A vane operated switch has been installed in the air duct of the blower to shut off the computer should the blower fail. Stick extenders remain a design problem and effort is being concentrated on the rotating lock of the extender. A new design is in process and will be completed during the next reporting period.

### 3.5 CORE ROPE SIMULATOR

The Core Rope Simulator is presently being built in the model shop. All drawings were final released during the quarter with the exception of the signal interconnection, logic flow, and the one-shot module. Final release of these drawings will be accomplished during the next reporting period. The first Simulator will be ready for electrical check-out during the reporting period. Marked sepias will be submitted for review during July.

### 3.6 AGC CALIBRATION SYSTEM

The printer connector for Calibration System No. 1 was received during June and the printer interface was updated to reflect Calibration System No. 2 and subsequent models. The retrofit kit will be checked out upon receipt of a digital ohmmeter from a vendor. The gating item on the procurement of this test equipment is the SCD which is currently in process.

SECTION 4  
FACTORY TEST EQUIPMENT

Apollo factory test equipment is divided into four categories: AGC in-process, GSE in-process, AGC/GSE in-process, and AGC/GSE incoming inspection test stations. The status of Apollo factory test equipment is shown in table 4-1.

TABLE 4-1  
APOLLO FACTORY TEST EQUIPMENT

Test Station		Remarks
Number	Name	
AGC/GSE Incoming Inspection		
1 201	Pulse Transformer	* Checkout complete
1 202	Semiconductor Leakage	* Checkout complete
1 203	Gross Leak	* Checkout complete
1 204	Oscillator (GSE)	* Checkout complete
1 205	Helium Leak	* Checkout complete
1 206	Automatic Semiconductor (TACT) (Figure 4-1)	* Checkout complete
1 207	Lead	* Checkout complete
1 208	Visual	* Checkout complete
1 209	High-Temperature Storage	* Checkout complete
1 210	Constant Acceleration (Figure 4-2)	* Checkout complete
1 212	Micrologic	* Checkout complete
1 213	Relay (Figure 4-3)	* Checkout complete
1 214	Power Supply	* Checkout complete
1 215	Resistor	* Checkout complete
1 216	Micrologic Burn-in	* Checkout complete
1 217	Transistor Burn-in	* Checkout complete
1 218	Diode Burn-in	* Checkout complete

\* Indicates test station in use.

TABLE 4-1  
 APOLLO FACTORY TEST EQUIPMENT (continued)

Test Station		Remarks
Number	Name	
AGC/GSE Incoming Inspection		
1 220	Tape Wound Rope Core	* Checkout complete
1 221	Capacitor	* Checkout complete
1 222	Indicator Light (Figure 4-4)	* Checkout complete
1 224	Transformer and Inductor	* Checkout complete
1 225	Power Semiconductor	* Checkout complete
1 226	Power Semiconductor (Figure 4-5)	* Checkout complete
1 227	Relay (for AGC)	* Checkout complete
1 228	Thermal Shock	* Checkout complete
1 229	Marking	* Checkout complete
1 230	Propagation Delay (Figure 4-6)	* Checkout complete
1 231	Integrated Sense Amp- lifier (Figure 4-7)	* Checkout complete
1 233	Varicap	* Checkout complete
AGC In-Process		
1002	Micrologic Stick	* Checkout complete
1003	Erasable Memory	* Checkout complete
1004	Core Rope	* Checkout complete
1006	DSKY	* Checkout complete
1008	Power Supply	* Checkout complete
1009	AGC Oscillator (Figure 4-8)	Checkout in process
GSE In-Process		
1101	Control Panels	*Checkout complete
1102	Computer Simulator	
1103	Computer Test Set	
1104	Module	

\* Indicates test station in use.



TABLE 4-1  
 APOLLO FACTORY TEST EQUIPMENT (continued)

Test Station		Remarks
Number	Name	
GSE In-Process (continued)		
1105	Operation Console	* Checkout complete
1106	Coldplate	
AGC/GSE In-Process		
1301	Module	* Checkout complete
1302	Interconnection Assemblies	

\* Indicates test station in use.

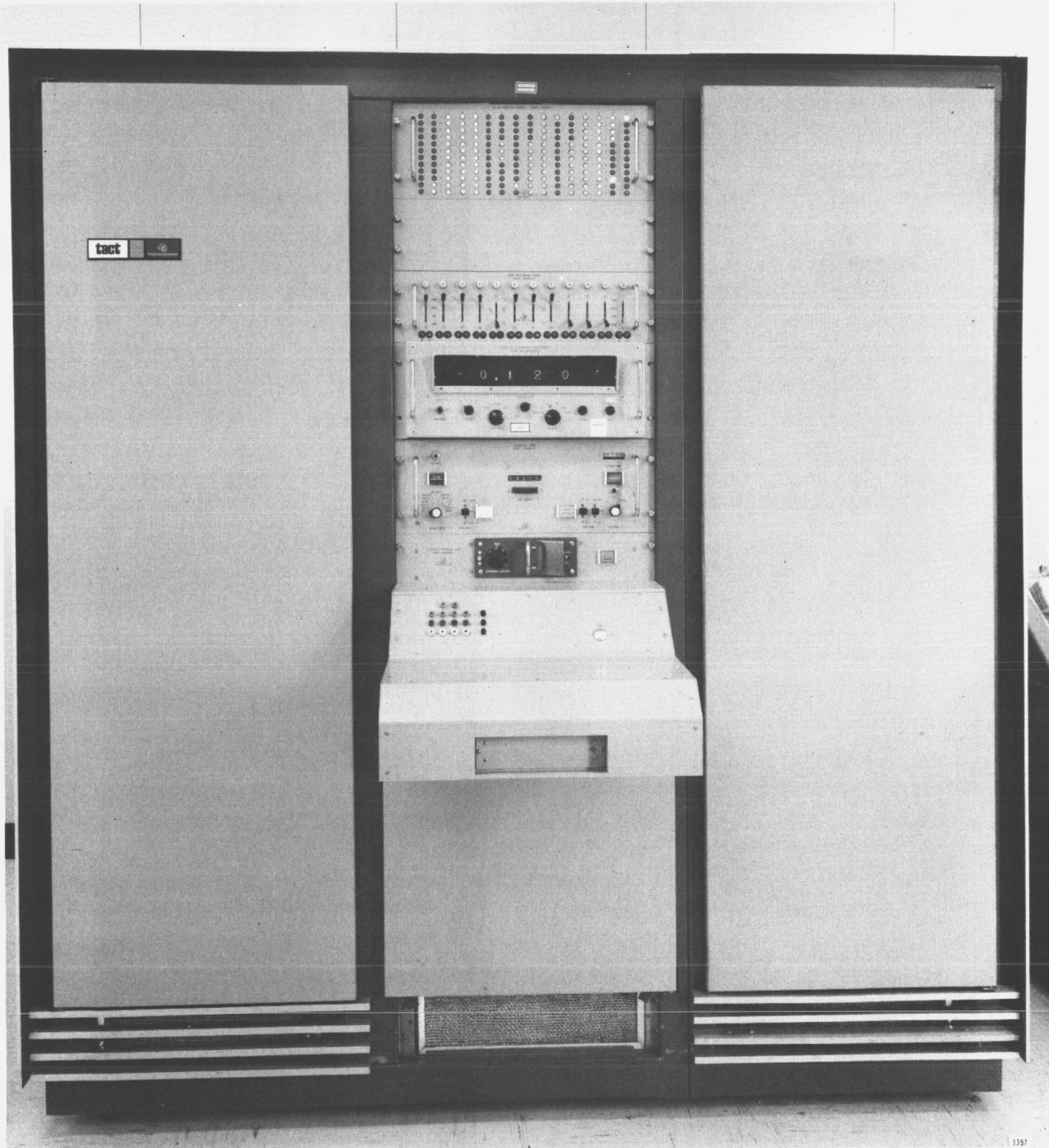


Figure 4-1. Automatic Semiconductor Test Station No. 1206 (TACT)



Figure 4-2. Constant Acceleration Test Station No. 1210

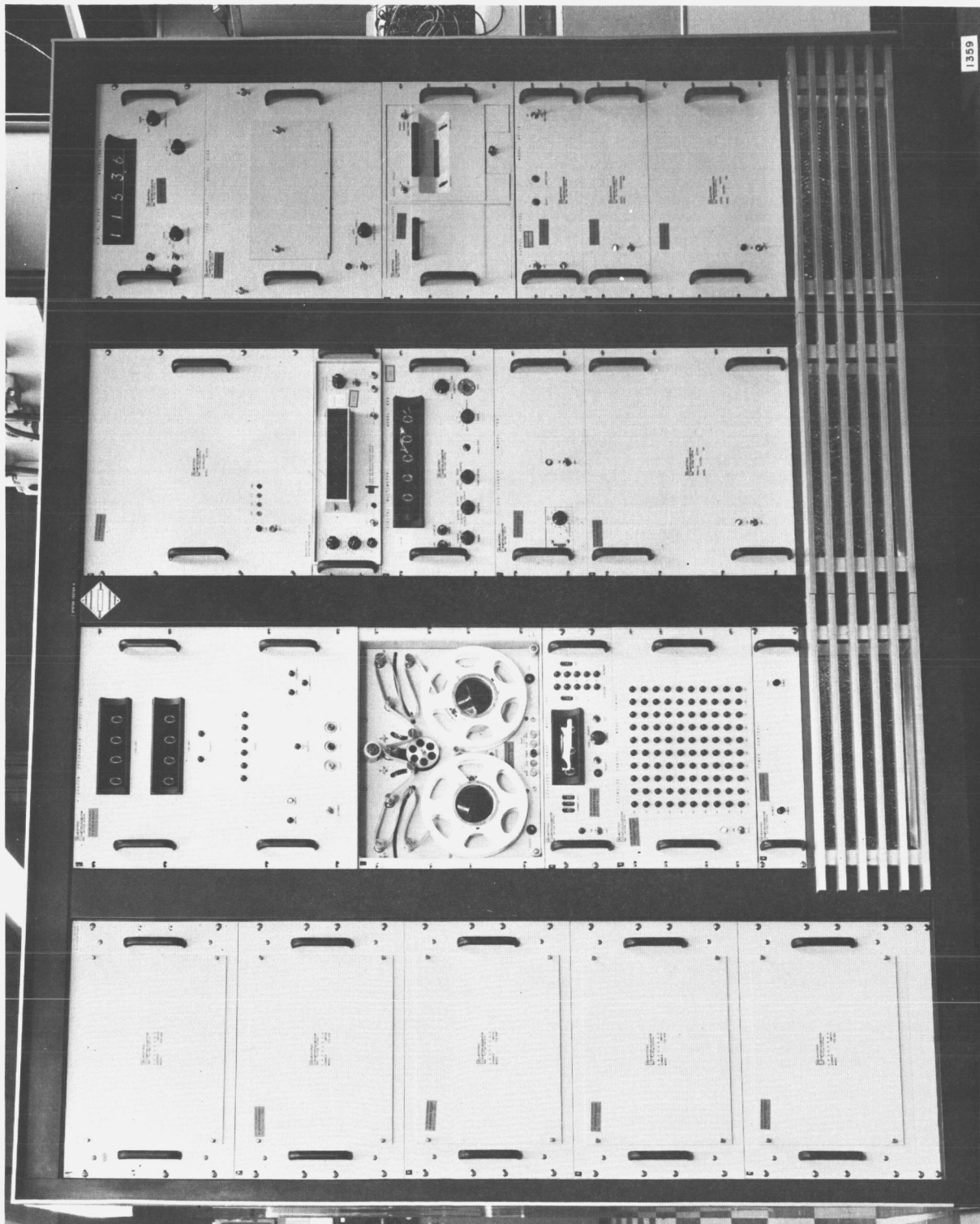


Figure 4-3. Relay Test Station No. 1213

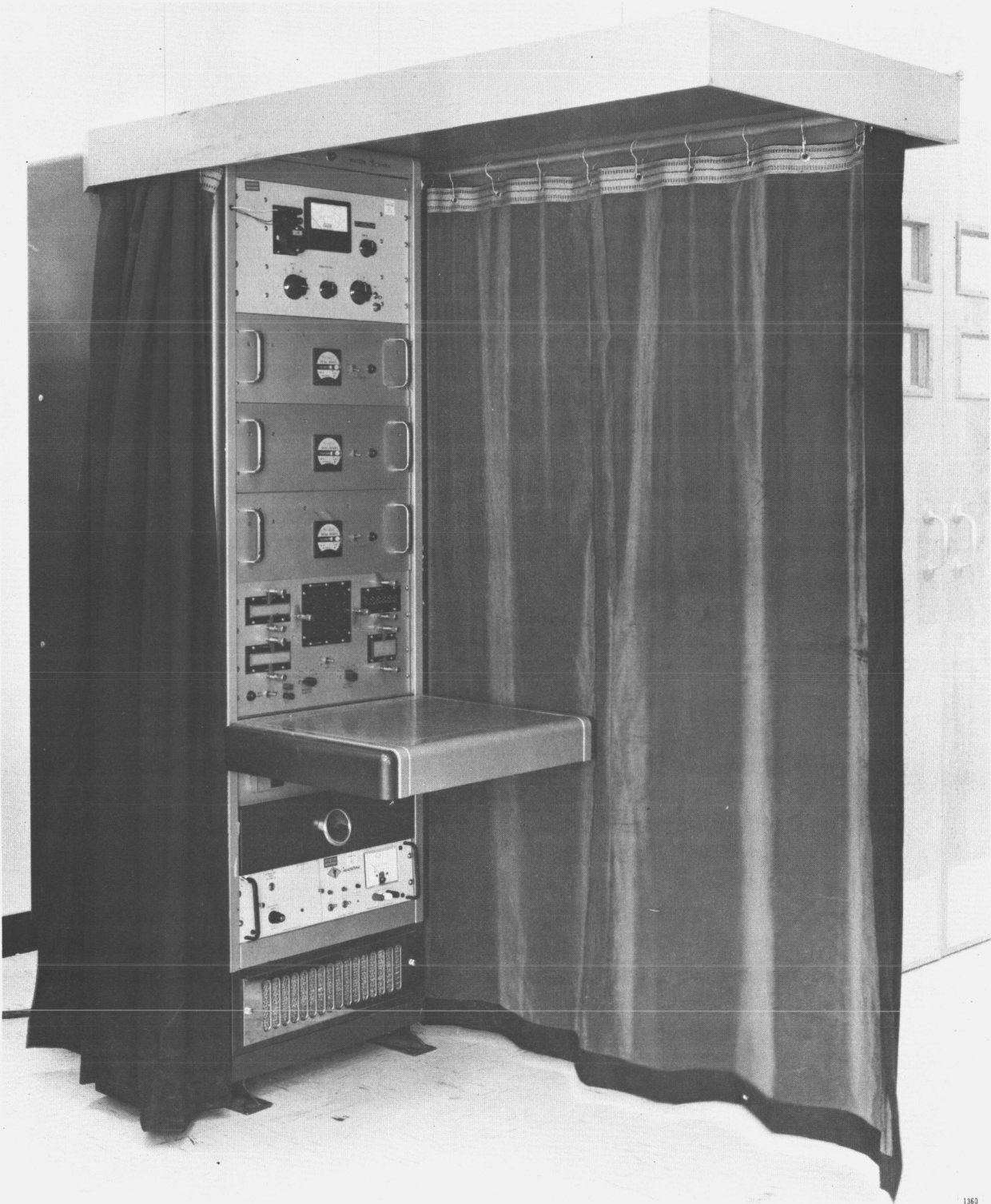


Figure 4-4. Indicator Light Test Station No. 1222

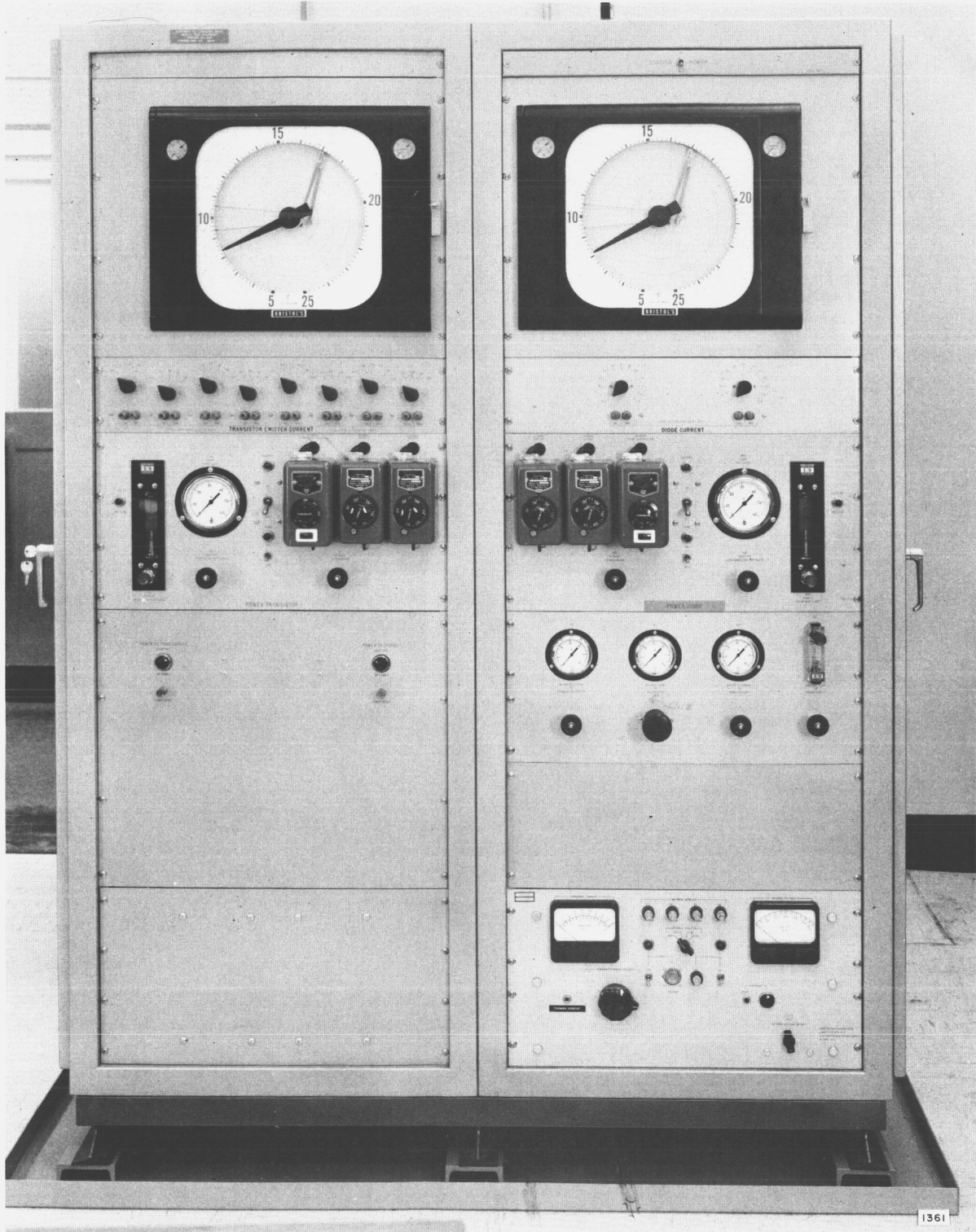


Figure 4-5. Power Semiconductor Test Station No. 1226

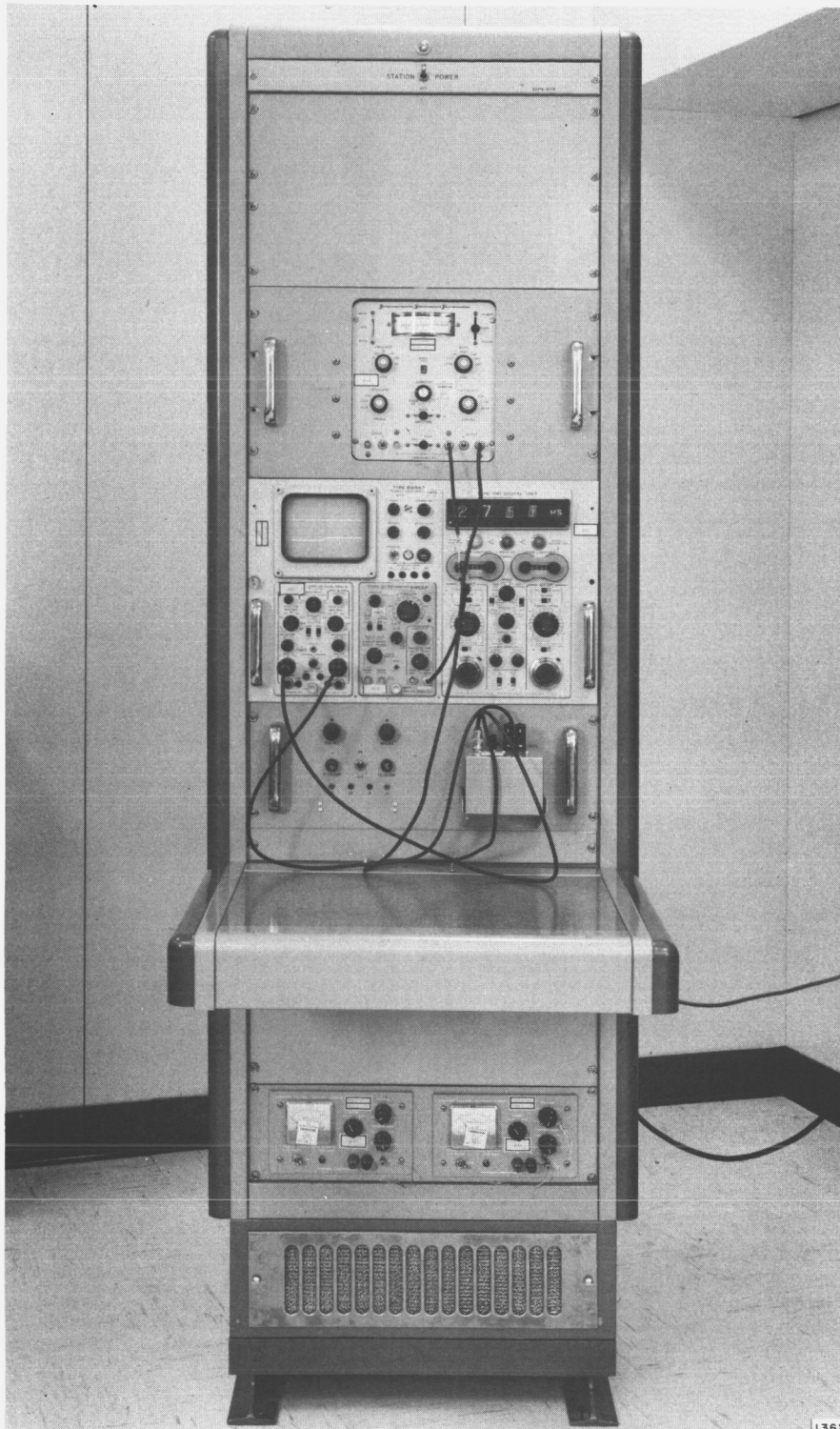


Figure 4-6. Propagation Delay Test Station No. 1230

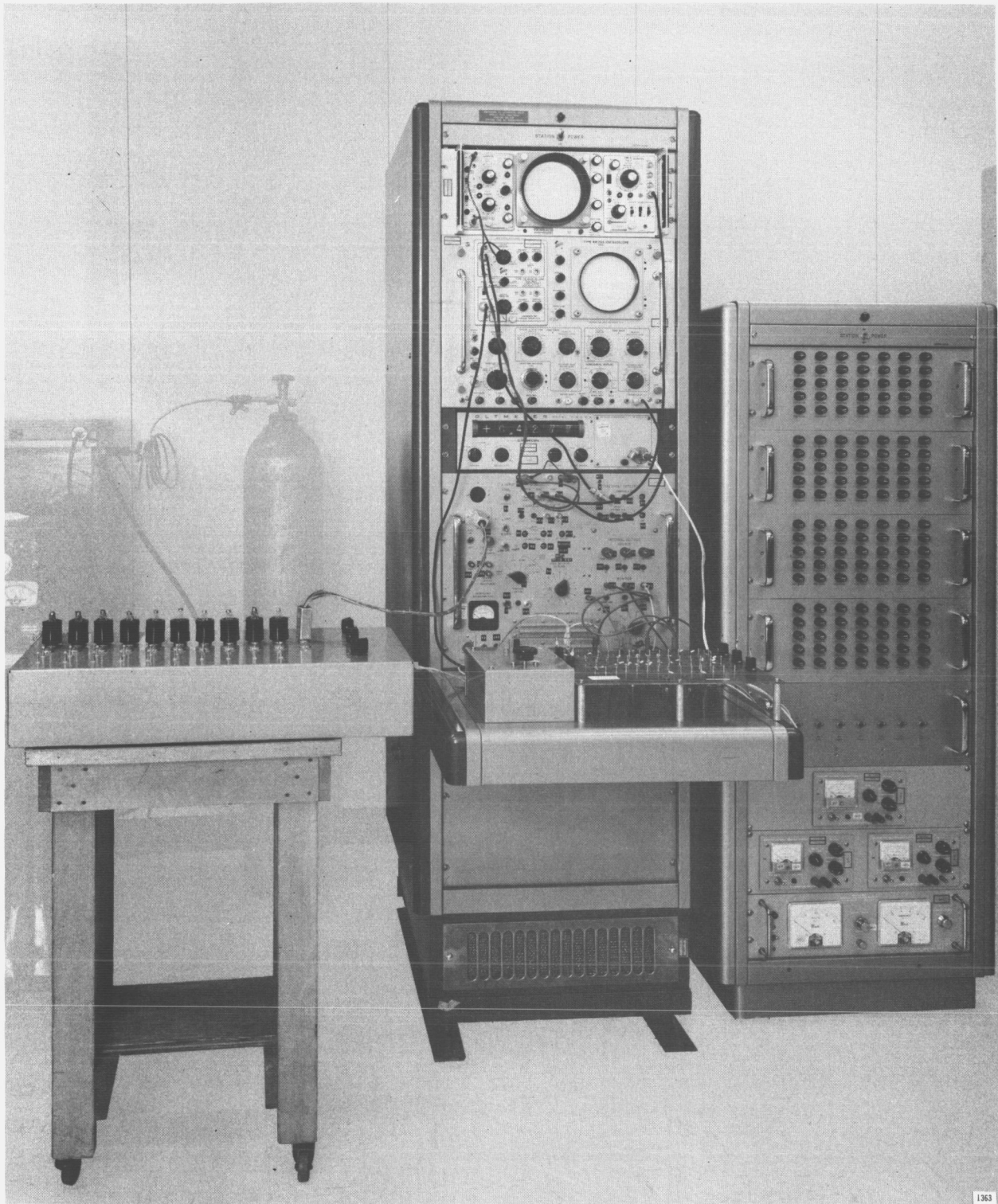


Figure 4-7. Integrated Sense Amplifier Test Station No. 1231



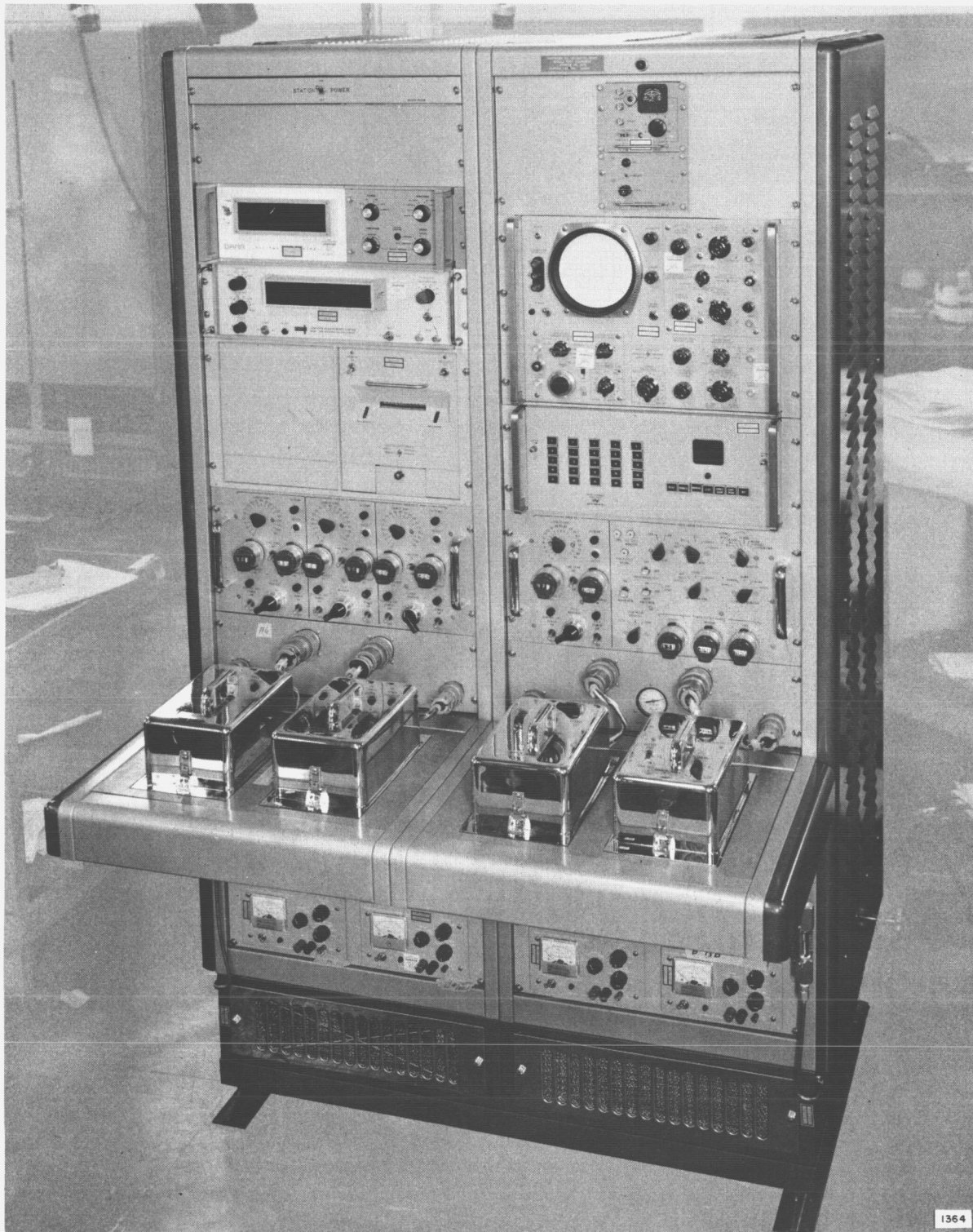


Figure 4-8. AGC Oscillator No. 1009

SECTION 5  
RELIABILITY

5.1      RELIABILITY ENGINEERING

Two groups of sense amplifiers were subjected to the complete screen and burn-in cycle during April. The cycle revealed a bonding control problem in one vendor device. A conference was held with the vendor and the following corrective action resulted:

- 1) Intensive operator instructions
- 2) Jewel tightening
- 3) Stringent daily monitoring of wire bond strength and pull test
- 4) One-hundred percent, 20,000 g centrifuge testing of devices prior to shipment.

Five types of pulse transformers manufactured by four different vendors to SCD 1006762 were chemically depotted during the quarter to analyze the reliability of their mechanical design and construction. This examination indicated potential failure mechanisms in two of five devices. (A complete summary of the analysis can be found in Apollo Monthly Technical Progress Report No. 23, FR-4-306).

Effort to determine the cause of transformer driver module failures was conducted during June. There was no conclusive data reported to indicate poor reliability of the module. To date, no satisfactory way to remove the potting material without damaging electrical parts has been found. A new mechanical method of removing the potting is being investigated, as well as a determination regarding possible excessive use of potting material.

## 5.2 RELIABILITY ANALYSIS LABORATORY

Vendor transistors which conform to SCD 1006759 were analyzed during the quarter. Two of the groups had two separate patterns of masking. Most of the units showed a considerable amount of purple plague. (A complete description of the nature of purple plague can be found in Apollo Monthly Technical Report No. 22, FR-4-265).

Two other transistor units were submitted for inspection. The electrical tests on both units proved to be satisfactory. Two different patterns were used. Both units displayed signs of purple plague. A surface ripple resulted in one unit which was probably caused by dislocations in the epitaxial layer and highly pitted oxide around the emitter.

A routine inspection of transistors which conform to SCD 1006752 was conducted during the reporting period. Four units were received in each lot except for ID 8486 from which three were received. All of these devices proved to be electrically sound. All of these units showed signs of purple plague, some quite pronounced. For a detailed description and photos of the complete transistor (SCD 1006752) evaluation refer to Apollo Monthly Technical Progress Report No. 23, FR-4-306.

The following information was assembled in June concerning transformer 1006762 used in transformer driver module 1014053. There are 122 used in the AGC, 11 used in the CTS, as well as extensive use in the Computer Simulator. The internal magnet wire is AWG 31. Five vendors were considered and evaluated, and a sole source was chosen to supply the transformer. Transformers that have been examined internally display good design and workmanship. Transformers that were temperature cycled had stable electrical and mechanical characteristics. Two out of 800 have been rejected at incoming inspection. Future plans call for negotiation of some changes with the vendor, as well as the selection of a second source of supply. Samples will then be obtained and subjected to qualification testing and analyzed in the analysis laboratory.

### 5.3 COMPONENTS ENGINEERING

A timing problem in relays (SCD 1006815) was investigated during April. Vendor test equipment indicated that the parts were satisfactory. Inquiries were received during the quarter from several vendors regarding the supplying of wire to SCD 1006732. Test equipment was set up in the analysis laboratory for testing the wire per the applicable SCD as it arrived. No completion date was established for completion of this program. Effort is also being expended in setting up and calibrating the electroluminescent panel test set.

A tentative list was established in June for vendor survey trips. These trips will be made in conjunction with AC Spark Plug and Kollsman Instrument with Raytheon as acting chairman of the group. It is anticipated that with this tentative planning, other relative information will be received from the cooperating companies.

### 5.4 RELIABILITY ANALYSIS AND STATISTICS

Summary reports on screening and burn-in results for three Vendor "A" and two Vendor "B" micrologic lots were issued during April. Testing of these units constituted completion of all backlog for these lots. Summary charts for each vendor are being prepared which give a quality history of components tested. These charts will be continually updated as data becomes available.

A package for an Apollo Block I maintainability program was prepared in May in a joint effort with Field Operations. A new format for the Apollo Failure Report was approved in June with the suggestion that block numbers pertaining to system, component, assembly, and part run consecutively across the form.

SECTION 6  
DOCUMENTATION

Apollo Documentation Milestone Charts are presented in this section. It should be noted that the specification control drawing section lists only SCD's in process. Table 6-1 is a summary of the SCD effort.

TABLE 6-1  
SPECIFICATION CONTROL DRAWINGS

Type		Received	Completed	Cancelled	In-Process
AGC	Revisions	25	25	0	0
	Class B	170	121	39	10
GSE	Revisions	175	175	0	0
	Class B	221	182	34	5
PSA	Revisions	41	41	0	0
	Class B	181	155	26	0



**APOLLO DOCUMENTATION MILESTONES**

DATE: 6/30/64

DOCUMENT SERIES: <u>Special Process (ND)</u>	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
		I	X	X	X	X	X	X	X	X		
1002009	Embedding and/or Staking with Silicone Rubber	I	X	X	X	X	X	X	X	X	8/14/63	Class "A"
1002017	Special Test Requests for Sense Amplifier	I	X	X	X	X	X	X	X	X	2/15/63	Class "B"
1002019	General Marking	I	X	X	X	X	X	X	X	X	6/26/63	Class "A"
1002025	Std-Weld Repair	I	X	X	X	X	X	X	X	X	9/20/63	
1002026	Inspection Criteria of Welds in Electrical Assemblies	I	X	X	X	X	Cancelled	Cancelled	8/21/63			Refer to ND 1002005
1002027	Wire Stripping, Magnetic	I	X	X	X	X	Cancelled	Cancelled	6/21/63			
1002028	Core Replacement	I	X	X	X	X	Cancelled	Cancelled	6/21/63			
1002029	Fixed Memory Wiring	I	X							8/31/64		
1002030	Matrix Bonding	I	X	X	X	X	X	X	X	12/15/63	12/30/63	Class "A"
1002031	Wire Wrapping	I	X	X	X	X	X	X	X	1/31/64	2/21/64	Class "A"
1002032	Fabrication of Wiring Harness in Wired Assemblies	I	X	X	X	X	X	X	X	X	9/10/63	Class "A"
1002107	Wire, PVC Insulated, Nylon Jacketed	I	X	X	X	X	X	X	X	1/31/64	2/21/64	Class "A"
1002117	Process for Encapsulating with Thermally Cond. Resin	I	X	X	X	X	X	X	X	X	9/5/63	Class "A"



**APOLLO DOCUMENTATION MILESTONES**

DATE: 6/30/64

NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
DOCUMENT SERIES: <u>Special Process (ND)</u>												
1002119	Process Specification for Scotchcast No. 8	I	X	X	X	X	X	X	X	X	8/8/63	Class "A"
1002121	Installation of Keenserts	I	X	X	X	X	X	X	X	X	8/8/63	Class "A"
1002126	Process for Embedding with Epoxy Resin	I	X	X	X	X	X	X	X	X	8/8/63	Class "A"
1002183	Casting with 2850 FT Epoxy Resin	I	X	X	X	X	X	X	X	X	9/5/63	Class "A"
1002186	Insulating with Silicone Rubber	I	X	X	Cancelled	8/21/63						
1002212	Filling Coldplate of CTS Handling Fixture With an Inhibited Ethylene Glycol Coolant	I	X	X	X	X	X	X	X	X	4/7/64	Class "B"
1002217	Potting with low density Silicone Rubber	I	X	X	X	X	X	X	X	5/30/64	6/23/64	Class "A"
1002221	Application of Epoxy Gel-Coat	I	X	X	X							
1002226	Encapsulating with a Low Viscosity Epoxy Resin		X									



**APOLLO DOCUMENTATION MILESTONES**

DATE: 6/30/64

DOCUMENT SERIES:	APOLLO DOCUMENTATION MILESTONES											DATE RELEASED	REMARKS
	AGC - Final Test Method (FTM)	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED		
NUMBER	TITLE												
	Computer - AGC	I	X	X	X	X	X	X	X	X	5/20/64	Required by work statement 11/23/62	
	Tray A:												
1003074	Arithmetic	I	X	X	X	X	X	X	X		5/15/64		
1003174-26	Parity	I	X	X	X	X	X	X	X		5/15/64		
1003174-2	GSA Service	I	X	X	X	X	X	X	X		5/15/64		
1003123	Interface (A19)	I	X	X	X	X	X	X	X		5/15/64		
1003115	Interface (A20)	I	X	X	X	X	X	X	X		5/5/64		
1003174-3	Control Pulse 1	I	X	X	X	X	X	X	X		6/12/64		
1003174-4	Control Pulse 2	I	X	X	X	X	X	X	X		6/19/64		
1003174-6	Control Pulse 3	I	X	X	X	X	X	X	X		6/26/64		
1003174-5	Instruction Decode	I	X	X	X	X	X	X	X		5/15/64		
1003174-7	SQ Complex	I	X	X	X	X	X	X	X		6/19/64		





APOLLO DOCUMENTATION MILESTONES

DATE: 6/30/64

NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
			X	X	X							
1003174-8	Time Pulse Counter	I	X	X	X					6/16/64		
1003174-9	Bank Register	I	X	X	X					6/21/64		
1003174-10	Ring Counter	I	X	X	X					5/7/64		
1003174-11	Alarms	I	X	X	X					5/14/64		
1003174-13	Counter Service	I	X	X	X					5/21/64		
1003174-12	Counter Priority	I	X	X	X					5/28/64		
1003174-14	Scaler	I	X	X	X					6/4/64		
1003174-15	Ferrite Address	I	X	X	X					6/11/64		
1003174-16	Rate Circuits	I	X	X	X					6/18/64		
1003174-17	Rupt Service	I	X	X	X					6/25/64		
1003174-18	Down-link	I	X	X	X					6/25/64		
	Tray B:											
1003113	Power Switch	I	X							5/15/64		

DATE: 6/30/64

APOLLO DOCUMENTATION MILESTONES

NUMBER	TITLE	DOCUMENT TYPE							DATE RELEASED BY CCB	REMARKS	
		START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS			SUBMIT TO CCB
1003527	Oscillator									7/31/64	
1003165	Driver Service	X	X	X						7/31/64	
1003153	Current Switch	X	X	X						7/31/64	
1003069	Erasable Memory	X	X	X	X					7/31/64	
1003139	Erasable Driver	X	X	X						7/31/64	
1003138	Erasable Sense	X	X	X						7/31/64	
1003150	Power Supply Control	X								8/28/64	
1003133	Rope	X	X	X	X			X	X	6/27/64	6/27/64
1003167	Strand Gate	X	X	X						8/28/64	
1003132	Rope Strand Select	X	X	X						8/28/64	
1003178	Rope Driver	X	X	X						8/28/64	
1003154	Rope Sense Amplifier	X	X	X						8/28/64	
1003457	Connector Cover Plate Assy	X	X	X							



APOLLO DOCUMENTATION MILESTONES

DATE: 6/30/64

DOCUMENT SERIES: <u>GSE - Final Test Method (FTM)</u>	APOLLO DOCUMENTATION MILESTONES										REMARKS		
	NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS		SUBMIT TO CCB	DATE RELEASED BY CCB
1014156	GSE - Test Set	I	X	X	X	X	X	X	X	X	3/19/64	3/20/64	Required by work state-ment 11/23/62
1014061	GSE - Simulator	I	X	X	X	X	X	X	X	X	8/14/63	8/15/63	Required by work state-ment 11/23/62
1014217	GSE - Calibration Equipment	I	X	X	X	X	X	X	X	X	1/17/64	12/4/63	Required by work state-ment 11/23/62
1014465	GSE - Operational Console	I	X	X	X	X	X	X	X	X	5/5/64	5/20/64	Required by work state-ment 11/23/62
1014064	Diode	I	X	X	X	X	X	X	X	X	9/30/63	10/10/63	Required by work state-ment
1014209	Interface Coupling	I	X	X	X	X	X	X	X	X	1/3/64	3/10/64	
1014096	Driver	I	X	X	X	X	X	X	X	X	1/3/64	1/24/64	
1014053	Transformer Driver	I	X	X	X	X	X	X	X	X	1/31/64	6/17/64	
1014065-1	Resistor	I	X	X	X	X	X	X	X	X	11/15/63	1/24/64	
1014034	NOR	I	X	X	X	X	X	X	X	X	1/3/64	6/17/64	
1014079	Gated Flip-Flop	I	X	X	X	X	X	X	X	X	3/2/64	6/17/64	

DOCUMENT SERIES: <u>GSE - Final Test Method</u> (FTM) continued		APOLLO DOCUMENTATION MILESTONES										DATE: <u>6/30/64</u>	
		NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB
1014065-2	Resistor	I	X	X	X	X	X	X	X	X	11/15/63	1/24/64	
1014226	Clock	I	X	X	X	X	X	X	X	X	2/26/64	3/10/64	
1014219	DAC	I	X	X	X	X	X	X	X	X	1/6/64	3/10/64	
1014230	Interface Receiver	I	X	X	X	X	X	X	X	X	1/6/64	3/10/64	
1014065-3	Resistor (510)	I	X	X	X	X	X	X	X	X	3/16/64	3/31/64	



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DOCUMENT SERIES: DSKY - Final Test Methods (FTM)

NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
1003530	DSKY Decoding Module	I	X	X						6/5/64		
1003097	NAV DSKY Keyboard	I								6/5/64		
1003539	Main DSKY Keyboard	I								6/12/64		
1003524	NAV DSKY	I	X	X	X					6/12/64		
1003540	Main DSKY	I	X							6/12/64		
1003532	DSKY Power Supply Module	I								6/19/64		



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DATE: 6/30/64

DOCUMENT SERIES: Interface Specs (ND)

NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
			X	X	X	X	X	X	X	X	X	X
1002076	AGC & DSKY	I	X							5/29/64		
1002192	GSE - Test Set	I	X	X	X					6/19/64		
1002193	GSE - Simulator	I	X	X	X	X	X	X	X		10/30/63	Class "A"
1002194	GSE - Calibration Equipment	I	X	X	X	X	X	X	X	3/6/64	4/22/64	
1002222	GSE - Operation Console	I	X	X	X							

RAYTHEON		APOLLO DOCUMENTATION MILESTONES										DATE: 6/30/64	
DOCUMENT SERIES: GSE - Procurement Specs (PS)		DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS	
NUMBER	TITLE												
	GSE - Modules												
1014064	Diodes	I	X	X	X	X	X	X	X	1/22/64	3/10/64	Class "B"	
1014209	Interface Coupling	I	X	X	X	X	X	X	X	3/13/64	3/31/64		
1014096	Driver	I	X	X	X	X	X	X	X	3/13/64	3/31/64		
1014053	Transformer Driver	I	X	X	X	X	X	X	X	4/6/64	5/6/64		
1014065	Resistor*	I	X	X	X	X	X	X	X	1/22/64	3/10/64	Class "B"	
1014034	NOR	I	X	X	X	X	X	X	X	1/22/64	3/10/64	Class "B"	
1014079	Gated Flip-Flop	I	X	X	X	X	X	X	X	4/18/64	5/19/64		
1014226	Clock	I	X	X	X	X	X	X	X	3/17/64	4/22/64		
1014219	DAC	I	X	X	X	X	X	X	X	2/26/64	3/31/64		
1014230	Interface Receiver	I	X	X	X	X	X	X	X	2/26/64	3/31/64		

\*All resistor modules covered under (1) specification



**APOLLO DOCUMENTATION MILESTONES**

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DOCUMENT SERIES:	APOLLO DOCUMENTATION MILESTONES										REMARKS	
	AGC and GSE Manuals	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB		
NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
1021037	Familiarization Manual	II	X	X	X	X	X	X	X	NA	NA	Released to ACSP 2/21/64
1021001	Computer Subsystem Checkout, Maintenance and Repair Manual	I	X	X	X	X	X	X	X			Preliminary copy to MIT 15 May 1964
1021000	AGC Test Set Checkout Maintenance and Repair Manual	I	X	X	X	X	X	X	X			1. To MIT 4/16/64 2. Returned 4/9/64
1021003	AGC Simulator Checkout Maintenance and Repair Manual	I	X	X	X	X	X	X	X	X		1. To MIT 12/30/64 2. Returned 4/9/64
1021002	AGC Calibration System Checkout Maintenance & Repair Man.	I	X	X	X	X	X	X	X	X		1. To MIT 1/10/64 2. Returned 4/10/64
FR-4-355	Core Rope Simulator Operation and Maintenance Manual	III	X									
1021004	AGC Simulator Field Test Procedure	I	X	X	X	X	X	X	X			TD-R-138 Cancelled
1021005	AGC Test Set Connections Manual (3 Volumes)	I	X	X	X	X						
FR-4-282	Simulation Computer Operation and Maintenance Manual	III	X									
FR-4-323	Computer Subsystem Field Verification Procedures	III	X	X								
	Information Series	III										
FR-2-100 Series	Issues 1 thru 13 and 15	III	X	X	X	X	X	NA	NA	NA		Complete
	Revisions - Issue 12	III	X	X	X	X	X	NA	NA	NA		Complete
	Issue - 2, 5, 15	III	X	X	X	X	X	NA	NA	NA		





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DOCUMENT SERIES: Reports and Plans		NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
	Monthly Technical Progress			II	EACH MONTH									
	Quarterly Technical Progress			II	EACH QUARTER									
	Still Photos (300)			II	AS REQUIRED									
	Motion Pictures (20 min)			II	AS REQUIRED									
	Emergency Action			II	AS REQUIRED									
	Lesson Plan (Training)			III	AS REQUIRED									
	Failure Data			II	AS REQUIRED									
	Qualification Test			I										
	Documentation Plan			II	COMPLETE									To be updated
	Development Plan			II	COMPLETE									To be updated
	Factory Test Plan (GSE)			III										Update as re-quired
	Factory Test Plan (AGC)			III	X									
	Master Summary Schedule			III	COMPLETE									



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DOCUMENT SERIES: <u>Specification Control</u> Drawings	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
1006225	I	X	X	X	X	X	X	X		4/29/64	GSE
1006226	I	X	X	X							GSE CANCELLED
1006227	I	X	X	X	X	X	X	X	5/27/64	5/28/64	GSE
1006228	I	X	X	X	X	X	X	X	2/20/64	4/15/64	GSE
1006229	I	X	X	X	X	X	X	X	4/9/64	4/24/64	GSE
1006230	I	X	X	X	X	X	X	X	4/9/64	4/24/64	GSE
1006231	I	X	X	X	X	X	X	X	4/9/64	4/24/64	GSE
1006232	I	X	X	X	X	X	X	X	5/27/64	5/28/64	GSE
1006233	I	X	X	X	X	X	X	X	5/27/64	5/28/64	GSE
1006234	I	X	X	X	X	X	X	X	3/19/64	4/15/64	GSE
1006235	I	X	X	X	X	X	X	X	3/19/64	4/13/64	GSE
1006236	I	X	X	X	X	X	X	X	3/12/64	4/15/64	GSE
1006237	I	X	X	X	X	X	X	X	3/20/64	4/15/64	GSE
1006266	I	X	X	X	X	X	X	X	4/14/64	4/22/64	ACC

DOCUMENT SERIES: <u>Specification Control</u> Drawings		APOLLO DOCUMENTATION MILESTONES										DATE: 6/30/64		
		DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS		
NUMBER	TITLE													
1006267	Curing Agent	I	X	X	X	X	X	X	X	X	X	4/14/64	4/22/64	AGC
1006268	Connector, Plug, Elec, 244 Pins	I	X	X	X	X	X	X	X	X	X	3/23/64	3/31/64	AGC
1006269	Connector, Recept, Elec, 244 Sockets	I	X	X	X	X	X	X	X	X	X	3/23/64	3/31/64	AGC
1006270	Chromate Conversion Compound	I	X	X	X	X	X	X	X	X	X	3/20/64	3/31/64	AGC
1006271	Ink, Epoxy Base	I	X	X	X	X	X	X	X	X	X	3/20/64	4/14/64	AGC
1006693	Connector, Plug, Elec, 68 Pins	I	X	X	X	X	X	X	X	X	X	5/21/64	6/10/64	GSE
1006695	Terminal, Coaxial	I	X	X	X	X	X	X	X	X	X	3/12/64	4/15/64	GSE
1006696	Tubing	I	X	X	X	X	X	X	X	X	X	2/7/64	3/6/64	GSE
1006697	Strap, Cable	I	X	X	X	X	X	X	X	X	X	2/7/64	3/6/64	GSE
1006698	Adapter, Connector	I	X	X	X	X	X	X	X	X	X	3/20/64	4/15/64	GSE
1006699	Cyclohexanone	I	X	X	X	X	X	X	X	X	X	2/7/64	3/6/64	GSE
1006742	Plastic, Polyurethane	I	X	X	X	X	X	X	X	X	X	3/6/64	3/18/64	AGC
1006743	Catalyst	I	X											AGC CANCELLED
1006744	Indicator	I	X	X	X	X	X	X	X	X	X	5/14/64	5/27/64	AGC



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NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
	DOCUMENT SERIES: <u>Specification Control</u> <u>Drawings</u>											
1006745	Indicator	I	X	X	X	X	X	X	X	5/14/64	5/14/64	AGC
1006746	Indicator	I	X	X	X	X	X	X	X	5/14/64	5/14/64	AGC
1006748	Catalyst	I	X									CANCELLED
1006945	Wire	I	X	X	X	X	X	X	X	3/6/64	4/14/64	GSE
1006274	Thinner	I	X	X	X	X	X	X	X	6/12/64	6/17/64	AGC
1006272	Curing Agent	I	X	X	X	X	X	X	X	5/5/64	5/20/64	AGC
1006275	Magnet Wire	I	X	X	X	X	X					AGC
1006273	Screw, Cap	I	X	X	X	X	X	X	X	5/20/64	5/27/64	AGC
1006238	Fastener Ass'y, Captive	I	X	X	X	X	X	X	X	5/27/64	5/28/64	GSE
	K Core	I	X									CANCELLED
	Epoxy Resin	I	X	X	X	X	X					AGC
	Epoxy Resin	I	X	X	X	X	X					AGC
	Curing Agent	I	X	X	X	X	X					AGC
	Curing Agent	I	X	X	X	X	X					AGC

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NUMBER	TITLE	DOCUMENT TYPE	START FIRST DRAFT	COMPLETE FIRST DRAFT	REVIEW FIRST DRAFT	INCORPORATE COMMENTS	SIGNATURE CYCLE COMPLETE	MIT COMMENTS	INCORPORATE MIT COMMENTS	SUBMIT TO CCB	DATE RELEASED BY CCB	REMARKS
	DOCUMENT SERIES: Specification Control Drawings											
1006276	Pigment	I	X	X	X	X	X	X	X	6/12/64	6/17/64	AGC
1006277	Silica	I	X	X	X	X	X	X	X	5/20/64	5/27/64	AGC
1006279	Nut, Hexagon	I	X	X	X	X	X	X	X	5/20/64	5/27/64	AGC
1006239	Lanyard Assembly	I	X	X	X	X	X	X	X	5/20/64	6/2/64	GSE
1006240	Cap, Protective, Plastic	I	X	X	X	X	X	X	X			GSE
1006241	Plug, Protective, Plastic	I	X	X	X	X	X	X	X			GSE
1006242	Channel, Rubber	I	X	X	X	X	X	X	X			GSE
1006280	Pigment	I	X	X	X	X	X					AGC
1006281	Resin, Urethane Foam	I	X									AGC
1006282	Relay Armature	I	X									AGC
1006288	Epoxy Resin	I	X									AGC
1006289	Curing Agent	I	X									AGC
1006243	Flange, Floor	I	X	X								GSE
1006244	Ohmmeter, Digital	I	X	X								GSE

SECTION 7  
SYSTEMS SUPPORT

7.1      SUPPORT ENGINEERING

7.1.1    Personnel

Deployment of personnel from the second class was completed in April. Four field engineers retained from the second class successfully completed the Soldering and Welding course of instruction.

The field site personnel deployment status upon completion of the second class was as follows:

<u>Company</u>	<u>Location</u>	<u>Number</u>
ACSP	Milwaukee, Wisconsin	8
NAA	Downey, California	13
Raytheon	(Temporary Special Assignments)	4

7.1.2    Training

The third class consisting of 13 field engineers commenced training on 6 April, 1964. The present teaching schedule has been updated to include uninterrupted continuation of training during the scheduled vacation period (3 July through 19 July). Training of the third class is progressing on schedule. The Inertial Subsystem Section has been completed, and instruction has begun on the AGC Programs Section.

### 7.1.3 Equipment Status

Two failures were reported during April. One failure was reported at ACSP and another at MIT/IL. (Complete descriptions of these failures can be found in Apollo Monthly Technical Report No. 22, FR 4-265.) One failure was reported at ACSP during May and three failures were reported at Raytheon Company. (Complete descriptions of these failures can be found in Apollo Monthly Technical Report No. 23, FR 4-306).

Two failures were reported at NAA during June. The first of these consisted of a lack of reception on the 20 kc channel of the Gertsch Receiver in AGC Calibration System No. 4. The unit was returned to Gertsch for evaluation. A detailed report will be submitted by Gertsch upon completion of the evaluation. The second failure consisted of broken wires in a relay module of Navigation Panel DSKY No. 4. These wires have been repaired.

### 7.1.4 GSE Deployment Status

The deployment of Ground Support Equipment (GSE) is as follows:

<u>Serial No.</u>	<u>Computer Simulator</u>	<u>AGC Calibration System</u>	<u>CTS</u>
2	MIT	MIT	
3	MIT	ACSP	
4	ACSP	NAA	RAY
5	ACSP	RAY	ACSP
6	ACSP	MIT	NAA
7	NAA		RAY
8	ACSP		MIT
9	ACSP		ACSP
10	ACSP		
11	ACSP		

## 7.2 LOGISTICS

### 7.2.1 Maintenance Engineering Analysis

In response to an April MIT/IL request, Raytheon Logistics prepared and delivered to MIT/IL an analysis of "D" forms of the maintenance activities for the Block I AGC to be performed at the NAA Guidance and Navigation (G&N) Laboratory (A complete report of this activity can be found in Apollo Monthly Technical Report No. 22, FR 4-265.)

Raytheon Logistics representation, in support of MIT/IL, participated in a presentation of the Apollo G&N Field Maintenance philosophy and plans at NASA in Houston. The presentation included:

- (1) Flow charts of the maintenance activities
- (2) Floor space requirements at field sites
- (3) Tools and test equipment
- (4) Maintenance parameters (stated and assumed)
- (5) Anticipated G&N system operating hours
- (6) Isometric drawings of the prime equipments
- (7) Estimated depth of field maintenance for each equipment

During the quarter, Raytheon responded to an MIT/IL request for data on the support requirements of the Apollo GSE (AGC/CTS Operation Console, Computer Test Set, AGC Calibration System, and Computer Simulator), as well as for listings of "Soft Consumable Items" and Bulk Item Requirements". (A complete report on this subject can be found in Apollo Monthly Technical Report No. 23, FR-4 306).

### 7.2.2 Spares Documentation

Master Number 4 of the Recommended Spare Parts List (RSPL) was submitted during this reporting period. Logistics periodically issues a



complete revision of the RSPL in order to provide an up-to-date RSPL with all the latest revisions integrated into the listing. The frequency of the issuance of a master list is determined by the quantity and complexity of the revisions to the previous master. Master No. 4 supersedes all previous submissions of the RSPL, as well as RSPL revisions. Spares Recommendations for support of the Core Rope Simulator were prepared and submitted to RASPO during the quarter.

### 7.2.3 Spares Production and Status

The Apollo Field Site and Factory Inventory and Consumption Reports for March, April and May were prepared and submitted during the quarter. The May report constituted a revision to the report of the previous month.

The first Apollo Equipment Status and Location Report was submitted in May. In accordance with a request by ACSP, the major assemblies of the Apollo equipments have been included in this report. This requirement is necessary since design changes to the equipments will be reflected by part number changes up through the major assemblies, the equipment identifications will not be changed, however, when a design change is incorporated.

Authorization was received from NASA to procure and fabricate the approved spares for the Simulation Computer, and a release for this order was made to the Manufacturing Department.