NERVA TEST OPERATIONS

Nuclear Rocket Development Station

P. O. BOX 2027, JACKASS FLATS, NEVADA-89028

MASTER

7 June 1967

NTO-M-15563

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Attention: J. R. DaVolio

Subject: Support Operational Requirements Document
for NES Design Demonstration Test Phase II,
NTO-I-0223, Revision A, Final Issue

Dear Dr. Wetmore:

Attached is the Final Issue of the subject SORD.

Very truly yours,

N. E. Erickson, Manager
NERVA Test Operations

WLM:NEE:dsa

Enclosure

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NTO-I-0223

REVISION A

MASTER

SUPPORT OPERATIONAL
REQUIREMENTS DOCUMENT
FOR
NES DESIGN DEMONSTRATION TEST
PHASE II

Prepared by: ETS-1 Test Planning

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FINAL ISSUE

June 1967

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1.0 INTRODUCTION

1.1 GENERAL

1.1.1 Phase I of the NERVA Exhaust System (NES) Design Demonstration test represented the first operation of the NES Duct and all duct subsystems at simulated engine operating conditions using the temporary engine compartment. Although it was impractical to simulate actual engine temperatures, these tests demonstrated the performance capabilities and structural integrity of the NES by flowing cold gaseous nitrogen at mass flow rates and pressures required for equivalent engine thrust conditions.

1.1.2 The Phase II test program will integrate into the NES system for the first time the Engine Test Compartment (ETC). Figure 2 shows the ETC arrangement. Due to facility limitations, the test program will be conducted at approximately the NERVA engine intermediate power level condition which is above the duct "pull-in" point utilizing first gaseous nitrogen and then gaseous hydrogen as the primary fluid. The effects of excessive engine test compartment (ETC) seal leakage and excessive turbine exhaust flow will be investigated. In addition, the thermal radiation on the Test Stand from the exhaust plume will be investigated.

2.0 TEST OBJECTIVES

The primary purpose of Phase II of the NES Design Demonstration Test Program is to integrate the Engine Test Compartment (ETC) into the Nuclear Exhaust System, to verify the duct dynamics using gaseous hydrogen and to evaluating exhaust plume thermal radiation effects on the test stand.

2.1 NEPN-I - LOSS OF STEAM TEST

- 2.1.1 Evaluate repressurization rate of the ETC under various conditions of primary flow when the steam generators are shutoff simultaneously and individually.
- 2.1.2 Evaluate the ETC seal leakage under two steam generator operating conditions by shutting off the seal actuator and buffer gas GN_2 supply.

2.2 NEP-V - GN_2 PRIMARY FLOW TEST

- 2.2.1 Evaluate ETC "pull-down" characteristics during a 12 second start-up ramp to 210 psia primary nozzle pressure.
- 2.2.2 Evaluate the effect of excess turbine exhaust and excess seal leakage on ETC pressure and primary nozzle separation at 210 psia primary chamber pressure using gaseous nitrogen.
- 2.2.3 Verify that one steam generator prohibits back flow into the ETC during a simulated XE "loss of flow" shutdown.
- 2.2.4 Verify ETC inerting procedures prior to and after primary flow conditions.
- 2.2.5 Evaluate the ETC seal leakage under various operating conditions by shutting off the seal actuator and buffer gas GN_2 supply.

2.3 NEP-VI - GH_2 PRIMARY FLOW TEST

- 2.3.1 Evaluate ETC "pull down" characteristics during the 6 second ramp to 210 psia primary chamber pressure.
- 2.3.2 Evaluate the NES dynamic performance at 210 psia primary chamber pressure using gaseous hydrogen with design turbine exhaust flow rate and normal seal leakage.

- 2.3.2.1 Determine recirculation effects between the primary nozzle and turbine nozzle in the volume of space between the primary nozzle and the turbine exhaust nozzle and line.
- 2.3.3 Evaluate the ETC "drop-out" characteristics during a 6 second shutdown ramp.
- 2.3.4 Evaluate the thermal radiation heating effects on the test stand during all conditions of hydrogen flow.
- 2.3.5 Verify ETC inerting procedures prior to and after primary flow conditions.

2.4 SECONDARY OBJECTIVES

These objectives will be evaluated during each test:

- 2.4.1 Verify proper operation of Flare Stack FS-5002.
- 2.4.2 Verify effectiveness of the Steam Line modifications.
- 2.4.3 Evaluate the NES duct drain valve remote operational capability.
- 2.4.4 Evaluate the NES duct drain coolant tubes discharge circuit modification.
- 2.4.5 Evaluate the effect on ETC coolant flow from duct and steam generator water demands.
- 2.4.6 Evaluate the effectiveness of the constant propellant bleed modification incorporated into the SGS.
- 2.4.7 Evaluate the ability of the $O_2 - H_2$ permanent ETC analyzer system to operate at reduced pressures.
- 2.4.8 Verify ETC S-2 remote electrical connector panels (CP-1, CP-2, NCP-3) continuity during Phase II testing.

3.0 TEST DESCRIPTION

3.1 GENERAL

- 3.1.1 A summary description of the three tests to be conducted is presented in Figure 1.
- 3.1.2 Schematics of the flow system are shown in Figures 3, 4, 5 and 6.
- 3.1.3 For NEPN-I and NEP-V, GN₂ primary flow, purge flow and simulated seal leakage will be supplied by three (3) GN₂ storage vessels and one (1) supply header 1-GN-8".
- 3.1.4 For NEP-VI, GH₂ primary flow will be supplied by three (3) GH₂ storage vessels and two (2) headers, 106-He-6" and 1-GH-6".
- 3.1.5 During the flow tests, the primary nozzle chamber pressure will be the controlling parameter and will be indicated on the temporary NES console (TNC) meters. Primary flow is controlled by PCV-449 through a feedback loop from PT-905 and PT-906, auctioned to select the highest primary chamber pressure. The valve controller includes a ramp generator for automatic startup and shutdown.
- 3.1.6 At full engine chamber pressure of 550 psia, the design turbine exhaust is 7.0 lb/sec. In this document when design turbine exhaust is specified at lower primary chamber pressures, the turbine exhaust flow rate shall be proportionally reduced.

- 3.1.7 Turbine exhaust flow will be supplied by GH_2 stored in the high pressure Dewar (V-5002). The GH_2 will flow through line 4-LH-6 inch to the turbine nozzle utilizing PCV-472 for control. Flow as a function of chamber pressure is presented in Figure 7.
- 3.1.8 Gaseous nitrogen for ETC inerting and simulated seal leakage will be supplied from line 1-GN-8 inch. The flow will be indicated by flow elements FE-426 and FE-427 and controlled by PCV-621 and PCV-447.
- 3.1.9 During all tests the hydrogen will be flared at the duct exit by FS-5002.
- 3.1.10 Cooling water will flow through the duct during each test.
3.1.10.1 Design flow is specified as 38000 GPM.
3.1.10.2 Minimum flow is specified as 43000 GPM.
- 3.1.11 Shield water shall be flowing for these tests.
- 3.1.12 Prior to the introduction of GH_2 , the O_2 concentration within the ETC shall be reduced to $3\frac{1}{2}\%$ or less. The temporary O_2 analyzers will be used to monitor the O_2 concentration during the test.
- 3.1.13 Prior to permitting the re-entry of air into the ETC, the GH_2 concentration shall be reduced to 2% or less.
- 3.1.14 ETC pressure shall be monitored throughout each test. Should the ETC pressure rise 2 psi above the P_{cell} vs P_{c} operational curve, not to exceed one (1) atmosphere during primary flow, the test shall be terminated.

3.1.14 In order to evaluate the effect on the test stand when hydrogen is being exhausted from the NES duct and burned, special instrumentation will be provided and will include surface temperature measurements, hydrogen monitoring sensors, radiometers and calorimeters.

3.1.15 Instrumentation will be provided to measure the various thermal aspects of the burning exhaust plume from the NES duct. The thermal radiation will be measured with various radiometers, calorimeters and thermocouples. The plume geometry, size, and spatial location will be determined by infrared photography. To determine the wind effect, smoke pots, photographed with color motion picture cameras, will be provided. The locations, color and number of the smoke bombs are as follows:

a. Vault opening plane

(1) Vault door bottom

(a) Vault door lower edge right-red smoke "pot".

(b) Vault door lower edge left-green smoke "pot".

(2) Top of light standard or first level of stairway from ditch floor - white smoke "pot" both sides.

(3) Vault opening (suspended units)

(a) Five feet below vault ceiling and nine feet each side of duct centerline -

- (3) Vault opening (suspended units) CONT'D
 - (a) CONT'D
 - purple smoke "pot" both sides.
 - (b) Thirty feet below vault ceiling and eight feet each side of duct centerline - orange smoke "pot" both sides.
 - (c) Plane at end of concrete ditch side walls - one green smoke "pot" on each side about 20 feet up on the guniting ditch sides.
 - (d) Plane at end of ditch rails - one white smoke "pot" on each side about 20 feet up on the guniting ditch sides.

3.1.16 Instrumentation for measuring wind velocity and air temperature will be provided.

The locations will be as follows:

- (a) Adjacent to the white smoke "pots" described in Paragraph 3.1.15.
- (b) On the duct centerline, between the green smoke "pots" described in Paragraph 3.1.15.
- (c) On the duct centerline, between the purple smoke "pots" described in Paragraph 3.1.15.
- (d) Adjacent to the orange smoke "pots" described in Paragraph 3.1.15.

3.2 NEPN-I- LOSS OF STEAM TEST

- 3.2.1 The ETC will be inerted and 1.5 lb/sec GN_2 purge flow will be established.
- 3.2.2 After inerting the ETC and duct, the duct cooling circuit flow will be brought to minimum flow conditions.
- 3.2.3 The SGS will be started and brought up to full steam condition using a standard startup procedure. The steam temperature will be controlled at $1460^\circ\text{R} \pm 50^\circ\text{R}$.
- 3.2.4 One steam generator module will be returned to idle and 10 seconds later the second steam generator module will be returned to idle.
- 3.2.5 The steam generators will be returned to full steam condition.
- 3.2.6 After two SGS modules have been brought to full steam, the ETC seal actuator and buffer zone supply valve will be closed. After approximately 60 seconds, the valves will be opened.
- 3.2.7 The steam generator modules will be returned to idle, simultaneously.
- 3.2.8 The steam generators will be returned to full steam conditions.
- 3.2.9 The ETC GN_2 purge flow will then be increased to 5 lb/sec.
- 3.2.10 The steam generator modules will be returned to idle simultaneously; after which the ETC purge flow will be reduced to 1.5 lb/sec.
- 3.2.11 Operation of FS-5002 will be terminated.
- 3.2.12 The steam generators will be returned to full steam conditions.
- 3.2.13 Primary flow will be ramped to a Pc of 120 psia in 7 seconds.
- 3.2.14 One burner of FS-5002 will be relit during the 120 psia hold.
- 3.2.15, The steam generator modules will be returned to idle simultaneously; after which the ETC purge flow will be increased to 20 lb/sec.

- 3.2.16 The primary flow will then be decreased to zero psig using a 3 second shutdown ramp and the purge flow terminated.
- 3.2.17 The steam generator will be returned to full steam conditions.
- 3.2.18 The purge flow will be established at 1.5 lb/sec.
- 3.2.19 Primary flow will then be ramped to 50 psia in 3 seconds.
- 3.2.20 The steam generator modules will be returned to idle simultaneously; after which the ETC purge flow will be increased to 10 lb/sec.
- 3.2.21 The primary flow will then be decreased to zero psig in 3 seconds, and ETC purge flow will then be terminated.
- 3.2.22 The run profile is shown in Figure 8.

3.3 NEP-V GN₂ PRIMARY FLOW TEST

- 3.3.1 After inerting the ETC and duct, the duct cooling circuit flow will be brought to design flow conditions.
- 3.3.2 The SGS will be started and brought up to full steam condition using a standard startup procedure. The steam temperature will be controlled at $1460^{\circ}\text{R} \pm 50^{\circ}\text{R}$.
- 3.3.3 ETC purges off for 60 seconds.
- 3.3.4 When the ETC pressure has stabilized, an inerting GN₂ flow of 1.5 lb/sec will be introduced into the simulated TSA-UTS and the smoke pots initiated.
- 3.3.5 Primary GN₂ flow will be ramped to a P_c of 210 psia in 12 seconds. After achieving 210 psia, the ETC seal purge and actuation gas will be terminated for five seconds. If pressure shows a sharp tendency to approach atmospheric pressure. The ETC seal purge and actuation gas will be reinitiated. The test will be terminated if any seal pressure reaches atmospheric pressure.

- 3.3.6 After achieving a P_c of 210 psia, GH_2 turbine exhaust flow will be ramped to 15 lb/sec in 5 seconds and reduced to design conditions within 5 seconds. Design turbine exhaust flow will be terminated when the 30 lb/sec seal leakage has been established.
- 3.3.7 After achieving the design turbine exhaust flow, the seal leakage (purge) will then be increased from 1.5 lb/sec to 30 lb/sec in approximately 5 seconds maintained for 5 seconds, then reduced to 1.5 lb/sec in approximately 5 seconds.
- 3.3.8 The single steam generator modules operation will be terminated after the ETC hydrogen concentration has been reduced to 2%. The duct flow will be reduced to minimum flow conditions at the conclusion of the primary flow test and terminated at the completion of steam generator operation.
- 3.3.9 The run profile is shown in Figure 9.
- 3.4 NEP-VI- GH_2 PRIMARY FLOW TEST
- 3.4.1 After inerting the ETC and duct, the duct cooling circuit flow will be brought to minimum flow conditions.

- 3.4.2 The SGS will be started and brought to full steam conditions with the steam temperature being controlled at $1460^{\circ}\text{R} \pm 50^{\circ}\text{R}$.
- 3.4.3 While the ETC pressure is stabilizing, design flow conditions will be established in the duct cooling circuit, an inerting GN_2 flow of 1.5 lb/sec will be introduced into the simulated TSA-UT S.
- 3.4.4 Primary GH_2 flow will be established at 210 psia using a 6 second startup ramp held for a minimum of 10 seconds or tailoff and ramped to zero psig in 6 seconds. Eight seconds after achieving steady-state condition, the smoke "pot" system will be initiated.
- 3.4.5 Design turbine exhaust flow will be established throughout the period of primary flow approximating the primary flow startup and shutdown ramps.
- 3.4.6 Steam Generator operation will be terminated after the ETC hydrogen concentration has been reduced to 2% by purging. The duct flow will be reduced to minimum flow conditions at the conclusion of the primary flow test and terminated at the completion of the steam generator operation.
- 3.4.7 The run profile is shown in Figure 10.

4.0 TEST LIMITS (Cont'd)

<u>FUNCTION</u>	<u>CONDITION</u>	<u>ACTION</u>
Duct Seal Purge Press SW	Press SW Alarms	Terminate Test with H ₂ in ETC.
Plenum Coolant Water Jacket Outlet Temperature	660°R	Terminate Primary and Turbine Exhaust Flows, initiate purge and shutdown SGS.
Wind Conditions	35 MPH on stand wind + 45° as measured by CP anemometer.	Tests not to be initiated.
AC Power	Loss of ETS-1 AC Power	Terminate with contingency procedure.

5.0 SAFETY REQUIREMENTS

- 5.1 The area surveillance and warning system will be operating during each test.
- 5.2 All zones of the Fire Protection System will be completely automated prior to testing.
- 5.3 The NRDS Fire Department will have hoses charged in the ETS-1 Facility prior to testing.
- 5.4 Remote combustible gas and oxygen detectors in all areas shall be operating and calibrated prior to each test.
- 5.5 The safety requirements for steam generator testing are specified in NTO-SOP-0068.
- 5.6 The ETS-1 tunnel blast valve shall be unlocked prior to testing.
- 5.7 ETS-1 Lock and Tag procedures will be in force as applicable.
- 5.8 All areas of potentially reduced oxygen content shall be cleared for access prior to personnel entry by the Safety member of the re-entry team.
- 5.9 Area Control will be as shown in Figure 11.
- 5.10 All units of the ventilation system will be operating normally prior to testing.

6.0 TEST SCHEDULE

The tests are currently schedule for June 1967.

7.0 STATUS BOARD AND AREA CONTROL

- 7.1 A Status Board will be established for each run and will assume control of the facility at 1600 on R-2. Input to the Status Board will be submitted to Test Planning by R-7 Day.
- 7.2 Area Control will be established at 0800 hours of each R-Day per Figure 11.

8.0 PRODUCT ASSURANCE

- 8.1 Before the start of testing, it shall be verified that current calibrations exist for all test equipment.
- 8.2 Product Assurance shall document the serial numbers of the SGS main stage injectors, ignitors and combustion chambers.
- 8.3 Product Assurance shall maintain a discrepancy log for all systems utilized in the conduct of this test series. (NTO-A-0013).
- 8.4 Following each test, a complete visual examination shall be made of the entire duct inside and out. Particular attention shall be given to inspection of the weld of the primary section inner shell to the lower end cap. In addition, this weld shall be dye penetrant inspected following completion of the Phase II test program.
- 8.5 Prior to ETC initial closure all fasteners within the compartment shall be inspected, tested and certified as being adequately torqued and "shake proof." A "shake proof" fastener is defined as a properly tensioned fastener that has been either lock "washered," cotter pinned, safety wired, cemented, welded, bolt thread deformed or double nut "locked" to prevent separation of fastener components in a vibration environment.
- 8.6 A thorough inspection of the ETC shall be performed to insure that the compartment is devoid of any loose objects.

9.0 OPERATIONAL REQUIREMENTS

9.1 CONTROL POINT

The following consoles and their associated equipment will be operational for the conduct of Phase II of the NES Design Demonstration Tests:

Test Director	Gas Fill and Service
Test Conductor	Electrical Power
Temporary NES	Lead Safety Engineer

Test Stand Engineer	Lead Instrument Engineer
Assistant Stand Engineer	Digital Data
Lead Facility Engineer	Remote Recorder
Facility Engineer Right	Television
Facility Engineer Left	Remote Installation - Control System Engr.

9.2 FACILITY AND TEST STAND

The following systems and their associated equipment will be operational for the conduct of Phase II of NES Design Demonstration Tests:

- Gas fill and Stroage System
- Gas Distribution System
- Gaseous Helium Purge System
- Steam Generator System
- Fire Protection System
- Area Surveillance and Warning System
- Utility and Process Water Systems
- Duct Exhaust Igniter System
- NES Duct Support Systems
- Combustible Gas Detection System (H_2/C_3H_8)
- Oxygen Detection System
- Facility H_2/O_2 Detection System.

9.3 FLUID REQUIREMENTS

9.3.1 NEPN-I

V-3201, 3202, 3203 pressurized to 2475 ± 25 psig with GN_2
Utility water tank minimum level of 15 feet. P~~ro~~cess water
tank minimum level of 48 feet; Propane tank (V-3401) minimum
level of 12000 gallons; Liquid oxygen storage tank (V-2801)
Minimum level of 20000 gallons.

9.3.2 NEP-V

V-3201, 3202, 3203, pressurized to minimum of 2475 psig with GN₂; Utility water tank minimum level of 15 feet; Process water tank minimum level of 48 feet; Propane tank (V-3401) minimum level of 12000 gallons; Liquid oxygen storage tank (V-2801) minimum level of 20000 gallons; V-5002 pressurized to 1000 $\pm$ 50 psig with GH₂.

9.3.3 NEP-VI

V-3201, 3202, 3203, pressurized to minimum of 2000 psig with GN₂; V-3207, 3208, 3209 pressurized to minimum of 2475 psig with GH₂; Utility water tank minimum level of 15 feet. Process water tank minimum level of 22 feet. Propane tank (V-3401) minimum level of 12000 gallons. Liquid oxygen storage tank (V-2801) minimum level of 20000 gallons. V-5002 pressurized to a minimum of 350 psig with GH₂.

9.4 TELEVISION REQUIREMENTS

9.4.1 Television coverage will be required for test observation and surveillance of the facility for safety considerations. The following television cameras will be used to monitor this test:

<u>Monitor No.</u>	<u>Camera No.</u>	<u>Location</u>	<u>Observation</u>
1	3 (Infrared)	W. of Ditch	NES Duct, Flare Stack
2	13	N.E. of Steam Generator	SG Enclosure
3	1	N. of Ditch	NES Duct, Duct Vault

CONT'D

<u>Monitor No.</u>	<u>Camera No.</u>	<u>Location</u>	<u>Observation</u>
4	20	N. of LOX Dewar	LO ₂ Tank, Pipeline, Bottle Shed
5	6	Top of 3801 LH ₂ Storage	East Face of Test Stand and Mix Station
6	9	Pipe Vault	Steam Line Lower Elbow
7	11 (infrared special effects)	Top of Test Stand	Exhaust Plume
8	10	In Duct Vault	Duct
	9.4.2	Other cameras will be operational in the event substitution is required. Auxiliary illumination of the SGS enclosure, duct vault, and pipe vault will be provided by search lights and flood lamps.	
	9.4.3	Kinescope capability will be available during all phases of the test operation.	
9.5	<u>COMMUNICATIONS</u>		
	9.5.1	The ETS-1 communication system will be operational and audio tape recording of selected trunk lines will be required.	
	9.5.2	RF communications will be required.	
9.6	<u>PHOTOGRAPHIC SUPPORT REQUIREMENTS</u>		
	9.6.1	Two high speed cameras, 16 mm 200 frames per second (FPS) for 18 seconds, will be used to record any movement of the steam line during startup and shutdown transients.	
	9.6.2	Four color cameras, 16 mm 24 FPS for 10 minutes, will be used. One will be located to view the steam generator enclosure; two will be placed in the drainage ditch to view the smoke pots, and the other will be	

9.6.2 (CONT'd)

placed to view the side of the exhaust plume.

9.6.3 Two infrared cameras, 70 mm 5 FPS for 8 minutes, will be used to view the exhaust plume.

9.6.4 Still photographs shall be taken to show details of any portion of the NES which fails during testing.

9.7 RECORDING DISPLAY REQUIREMENTS

The requirements are specified in Appendix "A".

10.0 REPORT REQUIREMENTS

A test report will be issued following completion of Phase II of the NES Design Demonstration Test Program.

TEST		TEST SYSTEMS REQUIRED								
No.	Description	Duct H ₂ O Coolant		Simulated GN ₂ Excess	GH ₂ Turbine Exhaust		Primary Flow			
							Fluid (1)		Start Ramp	Stop Ramp
		Low	Design		Leakage	Design	Excess	GN ₂		
NEPN-I	Loss of Steam	X		X			X			
NEP-V	Primary Flow P _c =210 psia		X	X		X	10 Sec. Min.		12 sec	XE loss of flow shut- down ramp
NEP-VI	Primary Flow P _c =210 psia		X		X			10 Sec. Min.	6 Sec.	6 Sec.

NOTES: (1) Numbers indicated are steady state P_c periods.

FIGURE 1, TEST SUMMARY

FIG-2 ENGINE TEST COMPARTMENT
ARRANGEMENT WITH PERMANENT
AND TEMPORARY GAS
ANALYZERS INSTALLED

Ⓚ - DENOTES TEMPORARY H₂/O₂
PROBE LOCATIONS

ETS-1
NES DEMONSTRATION
SIMPLIFIED SCHEMATIC

FIG. 4 NES DUCT FLOW SCHEMATIC

Figure 6, Steam Generator Flow Schematic

NOTE:
 1. STEAM GENERATOR UNITS 2 & 3 ARE IDENTICAL TO UNIT 1; COMPONENTS ARE NUMBERED THE SAME WITH A SUFFIX FOR UNIT (ie PT-410-1 IS IN UNIT 1, PT-410-2 IS IN UNIT 2, etc.)

FOR CONT
 SEE
 FIGURE 5

FOR CONT
 SEE
 FIGURE 3

Figure 7, Flow Curve, NES/DDT Turbine Exhaust Assembly

NES DESIGN DEMONSTRATION TESTS
APPROXIMATE FLOWS AND PRESSURES VS TIME

NES DESIGN DEMONSTRATION TESTS
APPROX. FLOWS & PRESSURES VS TIME

NES DESIGN DEMONSTRATION TESTS
APPROX. FLOWS & PRESSURES VS TIME

Figure 11, Area Security Map

APPENDIX A. NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*	*R*R*R*R*R*R*	*R	*D*D*D*	*E*F*S	*S*L*M*CON-	* * *
			*A*B*C*D*E*F*FC*CS*	*L*M*H*	* * *	*W*	* * *	*SOLE	* * *
BC701W.FSG	SG1 START SEQUENCE	NA		X	X				
BC701X.FSG	SG2 START SEQUENCE	NA		X	X				
BC701Y.FSG	SG3 START SEQUENCE	NA		X	X				
BS454..	PRV107 LOADING PRESS	500PSG						X	TS
BS480W.FSG	SG1 CMBUS CHBR PRESS SW	NA		X					
BS480X.FSG	SG2 CMBUS CHBR PRESS SW	NA		X					
BS480Y.FSG	SG3 CMBUS CHBR PRESS SW	NA		X					
CF050..RGN	GN2 CD SYS FCV-MAN CTL POT	0-100PC				X	X	P	IS
CF423W.FSG	SG1 H2O THROTTLE VLV-CTL	0-100PC		X				P	FL
CF423X.FSG	SG2 H2O THROTTLE VLV-CTL	0-100PC		X				P	FL
CF423Y.FSG	SG3 H2O THROTTLE VLV-CTL	0-100PC		X				P	FL
CP446..F50	PRG TEST FLOW CNTL (2**)	0-100 %				X	X	P	TN
CP447..F50	PRG TEST FLOW CNTL (1**)	0-100 %				X	X	P	TN
CP449..RLC	NFS PRIMARY FLOW PCV-CTL	0-100PC				X X	X	P	TN
CP472..RLC	LH CD PCV-CTL	0-100PC				X	X	P	TN TS
DF031..FND	DCT H2O FLW CTL-POS 6	0-100PC				X			X LF
DF032..FND	DCT H2O FLW CTL-POS 20	0-100PC				X			X LF
DF050.MRGN	GN2 CD SYS FCV-VLV POS	0-100PC				X	X		X TS

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*H*C*D*E*F*F*G*CS*L*M*H* * * *W* * *SOLE *
DF423WMFSG SG1	H2O THROTTLE VLV-POS	0-100PC	X X X FL
DF423XMFG SG2	H2O THROTTLE VLV-POS	0-100PC	X Y X FL
DF423YMFSG SG3	H2O THROTTLE VLV-POS	0-100PC	X X X FL
DP446.MF50	PRG TEST FLOW CNTL (2#)	0-100 %	X X X TN25
DP447.MF50	PRG TEST FLOW CNTL (1#)	0-100 %	X X X TN28
DP449.MRLC NES	PRIMARY FLOW PCV-CTL	0-100PC	X X X TN
DP449.RRLC NES	PRIMARY FLOW PCV-CTL		X
DP472.MRLC LH CD	SYS-VLV POS	0-100PC	X X X TN32
DT001..FSS	SHLD S1/S2 OTRD TOP POS	0-6 IN	X X RIC
DT002..FSS	SHLD S1/S2 INRD TOP POS	0-6 IN	X X RIC
DT003..FSS	SHLD S1/S2 OTRD BOT POS	0-6 IN	X X RIC
DT004..FSS	SHLD S1/S2 INRD BOT POS	0-6 IN	X X RIC
DT005..FSS	SHLD S1/S5 POS	0-6 IN	X X RIC
DT006..FSS	SHLD S2/S5 POS	0-6 IN	X X RIC
E.700..FSS	CNTNUTY CP1-1 PINS 41/42		X
E.701..FSS	CNTNUTY CP1-2 PINS 69/76		X
E.702..FSS	CNTNUTY CP1-4 PINS 9/10		X
E.703..FSS	CNTNUTY CP2-1 PINS 29/30		X

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
E.704..	FSS CNTNUTY CP2-2 PINS 69/76		X
E.705..	FSS CNTNUTY CP2-3 PINS 31/32		X
E.706..	FSS CNTNUTY CP2-4 PINS 9/10		X
F.426..	FPF FLO FE426 AT 60 F (CAL)	0-40 PPS	R1 X X TN27
F.427..	FPF FLO FE427 AT 60F (CAL)	0-6 PPS	R2 X X TN30
FT030..	FWS WATER FLOW METER DELTA P	0-10PSD	L4 X
FT031..	FWS DCT H2O SPLY-PART 12IN LN	0-5 PSID	X X LF
FT032..	FWS DCT H2O SPLY-TOTAL	0-5 PSID	6 X X LF
FT054..	FND DCT SEC1 LT H2O IN FLO	0-50 PSID	X X X LF
FT055..	FND DCT SEC1 RT H2O IN FLO	0-50 PSID	X X X LF
FT056..	FND DCT SEC2 LT CLG H2O IN FLO	0-25 PSID	X X X LF
FT056..	FND DCT SEC 2 RT CLG H2O IN FL	0-25PSID	X X X LF
FT057..	FND DCT SEC2 RT CLG H2O IN FLO	0-25 PSID	X X X LF
FT057..	FND DCT SEC2 LF CLG H2O IN FLO	0-25PSID	X X X LF
FT058..	FND DCT SEC3 LT CLG H2O IN FLO	0-50 PSID	X X X LF
FT059..	FND DCT SEC3 RT CLG H2O IN FLO	0-50 PSID	X X X LF
FT060..	FND DCT SEC2 JKT H2O IN FLO	+5 PSID	X X LF
FT061..	FND GN2 SEC4-RT SIDE-OUT	0-100(	X X RIC

APPENDIX A, VES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
FT062..FND	GN2 SEC5-RT SIDE-OUT	0-1000	X X RIC
FT063..FND	GN2 SEC5-RT SIDE-OUT	0-1000	X X RIC
FT064..FND	GN2 SEC6-RT SIDE-OUT	0-1000	X X RIC
FT087..FND	SFC3 CLNG H2O-3IN LV	0-1000CPS	5 X
FT405W.FSG	SG1 3RD STG PRO VNTR P-FLW 0-500PSIG		X 6 X X FL
FT405X.FSG	SG2 3RD STG PRO VNTR P-FLW 0-500PSIG		X 6 X X FL
FT405Y.FSG	SG3 3RD STG PRO VNTR P-FLW 0-500PSIG		X 6 X X FL
FT406W.FSG	SG1 H2O VNTR DP(FLW) 0-250PSID		X 5 X X FL
FT406X.FSG	SG2 H2O VNTR DP(FLW) 0-250PSID		X 5 X X FL
FT406Y.FSG	SG3 H2O VNTR DP(FLW) 0-250PSID		X 5 X X FL
FT409W.FSG	SG1 3RD ST L02 VNTR PR-FLW 0-500PSIG		X 3 X X FL
FT409X.FSG	SG2 3RD ST L02 VNTR PR-FLW 0-500PSIG		X 3 X X FL
FT409Y.FSG	SG3 3RD ST L02 VNTR PR-FLW 0-500PSIG		X 3 X X FL
FT428..FSG	SG1 L02 FLOW RATE 0-500CPS		X X
FT701..FSG	FUEL FLOW RATE 0-500CPS		X 8 X
FT750..FSS	SHLD PRG-GN2 FLW-TOTAL		X
GG004..FND	DCT REAR LT TRUN STR 0-1500		X B29RI
GG005..FND	DCT RT REAR TRUN STR 0-1500		X B30RI

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
GG006..FND DCT FRNT LT TRUN STR	0-1500	X	B31RI
GG007..FND DCT FRNT RT TRUN STR	0-1500	X	B32RI
GG011..FND DCT SEC2 CONE BOT STR	0-1500	X	B35RI
GG012..FND DCT SEC2 CONE RS STR	0-1500	X	
GG013..FND DCT SEC2 CONE TOP STR	0-1500	X	B36RI
GG015..FND DCT SEC3 BOT STR	0-1500	X	B38RI
GG016..FND DCT SEC3 RS STR	0-1500	X	
GG017..FND DCT SEC3 TOP STR	0-1500	X	B39RI
GG018..FND DCT SEC3 LS STR	0-1500	X	
GG019..FND DCT SEC3 FWD HOR TRUSS STR	0-1500	X	
GG901..FND SECT 1 FRONT-TOP	0-1000		X
GG903..FND SECT 1 FRONT-MIDSPAN	0-1000		X
GG904..FND SECT 1 REAR-MIDSPAN	0-1000		X
GG905..FND SECT 1 FRONT-BOTTOM	0-1000		X
GG908..FND ELBOW H2O JKT-REAR-TOP	0-1000		X
GG911..FND SECT3 MIDSPAN-TOP	0-1000		X
GG913..FND SEC3-45DEG ELBOW-TOP	0-1000		X
GG914..FND SEC3-45DEG ELBOW-BOTTOM	0-1000		X

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
HT001..FND	DCT SEC1 SEAL TABLE-1X VIR	0-15 G	X
HT002..FND	DCT SEC1 SEAL TABLE-2Y VIR	0-15 G	X
HT003..FND	DCT SEC1 SEAL TABLE-3Z VIR	0-15 G	X
HT004..FND	DCT SEC2 ELB-1X VIB	0-15 G	X
HT005..FND	DCT SEC2 ELBOW-2Y VIB	0-15 G	X
HT006..FND	DCT SEC2 ELBOW-3Z VIR	0-15 G	X
HT007..FND	DCT SEC3 MIDSPAN-1X VIR	0-15 G	X
HT008..FND	DCT SEC3 MIDSPAN-2Y VIR	0-15 G	X
HT009..FND	DCT SEC3 MIDSPAN-3Z VIR	0-15 G	X
HT010..FND	STA4-NEAR FLD SOUND LVL	110-140DB	X
HT011..FND	STA5-NEAR FLD SOUND LVL	110-140DB	X
HT827..FSG	ACCMTRS FOR STEAM LN-1	20G	X
HT828..FSG	ACCMTRS FOR STEAM LN-2	20G	X
HT829..FSS	ETC POS1-SOUND LVL	110-140DB	X
HT830..FSS	ETC POS2-SOUND LVL	110-140DB	X
HT901..FND	SECT 1 MIDSPAN SPT RING	0-15 G	X
HT902..FND	SECT 1 MIDSPAN SPT RING	0-15 G	X
HT903..FND	SECT 1 MIDSPAN SPT RING	0-15 G	X

APPENDIX A. NPS DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
HT904..FND	ELBOW H2O JACKET-FRONT	0-15 G	X
HT905..FND	ELBOW H2O JACKET-FRONT	0-15 G	X
HT906..FND	ELBOW H2O JACKET-FRONT	0-15 G	X
HT907..FND	SECT 3 H2O INLET M	0-15 G	X
HT908..FND	SEC3 H2O INLT MNFLD	0-15 G	X
HT909..FND	SFC3 H2O INLT MNFLD	0-15 G	X
HT910..FND	RFAR TRUN MIDSPAN	0-15 G	X
HT911..FND	REAR TRUN MIDSPAN	0-15 G	X
HT912..FND	RFAR TRUN MIDSPAN	0-15 G	X
HT913..FND	FRONT TRUN MIDSPAN	0-15 G	X
HT914..FND	FRONT TRUN MIDSPAN	0-15 G	X
HT915..FND	FRONT TRUN MIDSPAN	0-15 G	X
KN600W.FND	WIND VEL LF WHT POT WAX.	0-50MPH	X
KN600X.FND	WIND VEL LF WHT POT XAX.	0-50MPH	X
KN600Y.FND	WIND VEL LF WHT POT YAX.	0-50MPH	X

RECORDING DISPLAY REQUIREMENTS

X

X

X

X

X

X

X

X

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APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNFL * * NUMBER *	CHANNEL TITLE	* MEAS * * RANGE *	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
KN604W.	FND WIND VEL LF ORGE POT WAX.	0-50MPH	X
KN604X.	FND WIND VEL LF ORGE POT XAX.	0-50MPH	X
KN604Y.	FND WIND VEL LF ORGE POT YAX.	0-50MPH	X
KN605W.	FND WIND VEL RT ORGE POT WAX.	0-50MPH	X
KN605X.	FND WIND VEL RT ORGE POT XAX.	0-50MPH	X
KN605Y.	FND WIND VEL RT ORGE POT YAX.	0-50MPH	X
KT001..	FPE 02 CON ETC CHAN 1	0-10 MV	5 X
KT001.	MFPE 02 CON ETC CHAN 1	0-5 0-25 %	X X LFE
KT002..	FPE 02 CON ETC CHAN 2	0-10 MV	6 X
KT002.	MFPE 02 CON ETC CHAN 2	0-5 0-25 %	X X LFE
KT003..	FPE H2 CON ETC CHAN 1	0-10 MV	7 X
KT003.	MFPE H2 CON ETC CHAN 1	0-5 0-100%	X X LFE

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
KT004..	FPE H2 CON ETC CHAN 2	0-10 MV	8 X
KT004..	MFPE H2 CON ETC CHAN 2	0-5 0-100%	X X LFE
KT005..	SGC 02 DETECTOR-FS5001	0-250	X X FR
KT006..	SGC 02 DETECTOR-SG ENCLOSURE	0-1000	X X LS
KT007..	SGC 02 DETECTOR-TST STD EQP RM	0-1000	X X LS
KT008..	SGC 02 DETECTOR-FS3801	0-250	X X FR
KT013..	SGC H2/PRO DETECT-FS5001	0-40	X X FR
KT014W..	SGC PRO DETECT-SG ENCLOSURE-1	0-1000	X X LS
KT014X..	SGC PRO DETECT-SG ENCLOSURE-2	0-1000	X X LS
KT015..	SGC H2 DETECT-TSB OVR H2 PMP	0-40	X X LS
KT016..	SGC H2/PRO DETECT-FS3801	0-40	X X FR
KT017..	SGC H2 DETECT-GSA NEAR TUN DR	0-40	X X LS
KT018..	SGC PRO DETECT-UFB,F-1 DSCHG	0-1000	X X LS
KT019..	SGC H2 DETECT-3801 RVTMT	0-40	X X LS
KT020..	SGC PRO DETECT-TSB OVR H2 PMP	0-1000	X X LS
KT704..	FPF OXYGEN CONCENTRATION 5	0-5 0-25 %	5 X
KT705..	FPF OXYGEN CONCENTRATION 6 6	0-5 0-25 %	6 X
KT706..	FPF OXYGEN CONCENTRATION 7	0-5 0-25 %	7 X

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*F*CS*L*M*H* * * *W* * *SOLE *
KT707.	FPF OXYGEN CONCENTRATION R	0-5 0-25 %	8 X X TN19
KT709.	FND H2 CONC. DUCT VLT	0-40	X 13
KT710.	FND H2 CONC DUCT VLT	0-40	X 14
KT711.	FND H2 CONC DUCT VLT	0-40	X 15
KT712.	FND H2 CONC DUCT VLT	0-40	X 16
KT713.	FND H2 CONC DUCT VLT	0-40	X 17
KT714.	FND H2 CONC DUCT VLT	0-40	X 18
LT001.	FSG LO V-2801 TNK LVL	0-10PSID	X X FL
LT011.	FSG PRO V3401 TNK LVL	0-10PSID	X X FL
LT015.	FWS PROCESS H2O SPLY TNK-LVL	0-50 FEET	X X LF
PT001.	FGF GF V3201 TNK PR	0-3000PSIG	X X GF
PT002.	FGS GS DIST HDR (1-GN) PR	0-3000PSIG	X X GF

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
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RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
PT003..	FGS GS DISTR HDR (1-GH) PR	0-3000PSIG	X X GF
PT004..	FGF GF V3202 TNK PR	0-3000PSIG	X X GF
PT005..	FSG GS DISTR HDR ,106HE. PR	0-3000PSG	X X GF
PT007..	FGF GF V3203 TNK PR	0-3000PSIG	X X GF
PT049..	FSG LO V2001 TNK PRESS	0-500PSIG	X X FL
PT097..	RLC V5002 HP LH DEWR PR	0-2000PSIG	1 X X X AC10
PT101..	RLC LH CD SPLY PRESS	0-2000PSIG	X X X TS
PT118..	FSG PRO V3401 TNK PRESS	0-500PSIG	X X FL
PT168..	FWS PROCESS H2O HDR PRESS	0-300PSIG	4 X X LF
PT191..	RGN GN2 CD PRE-MIX PRESS	0-500PSIG	X X TS
PT203..	FND DCT SEC1 RT H2O IN PRESS	0-250 PSIG	X
PT204..	FND DCT SEC 1 LTH2O OTLT PRESS	0-100PSIG	X B21RI
PT204X..	FND DCT SEC 1 LT H2O OTLT PRES	0-100PSIG	X
PT206..	FND DCT SEC2 RT H2O IN PRESS	0-250 PSIG	X
PT207..	FND DCT SEC3 RT H2O IN PRESS	0-250 PSIG	X
PT209..	FND DCT SEC 2 RT LWR H2O OTLT	0-100PSIG	X B26RI
PT209X..	FND DCT SEC2 RT LWR H2O OTLT P	0-100PSIG	X
PT221..	FND DCT SEC1 LT H2O IN PRESS	0-250 PSIG	X

APPENDIX A, NES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R*R	*R	*D*D*D*E*F*S	*S*L*M*CON-	*SOLE
PT223..FND DCT SEC 1 RT H2O OTLT PRES	0-100PSIG				X		B22R1
PT223X.FND DCT SEC1 RT H2O OTLT PRES	0-100PSIG				X		
PT224..FND DCT SEC2 LT H2O IN PRESS	0-250 PSIG				X		
PT225..FND DCT SEC3 LT H2O IN PRESS	0-300 PSIG				X		
PT226..FND DCT SEC2 LT LWR H2O OUTLT	0-100PSIG				X		B25R1
PT226X.FND DCT SEC2 LT LWR H2O OTLT P	0-100PSIG				X		
PT239..FND DCT STM HDR PRESS	0-250PSG	X			L3		X LF
PT239..FND DCT STM ADR PRESS	0-250PSIG	X			L3	X	X LF
PT290..FSS ETC PRESS - TOP SHLD	0-20 PSIA				X		X TN23
PT291..FSS TOP CHBR PRESS IND	0-10PSA				X		
PT292..FSS BOT CHBR PRESS	0-20 PSIA				L5	X	
PT293..FSS HOT CHBR PRESS	0-10PSA				X		
PT40/W.FSG SG1 1ST STG PRO INJTN PRES	0-500PSIG		X	1		X	
PT407X.FSG SG2 1ST STG PRO INJTN PRES	0-500PSIG		X	1		X	
PT407Y.FSG SG3 1ST STG PRO INJTN PRES	0-500PSIG		X	1		X	
PT408W.FSG SG1 2ND STG PRO VMTR IN PR	0-500PSIG		X	2		X	
PT408X.FSG SG2 2ND STG PRO VMTR IN PR	0-500PSIG		X	2		X	
PT408Y.FSG SG3 2ND STG PRO VMTR IN PR	0-500PSIG		X	2		X	

APPENDIX A, VES DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
PT410W,FSG	SG1 CHBR JKT H2O DSCH PR	0-200PSIG	X
PT410X,FSG	SG2 CHBR JKT H2O DSCH PR	0-200PSIG	X
PT410Y,FSG	SG3 CHBR JKT H2O DSCH PR	0-200PSIG	X
PT416W,FSG	SG1 1ST STAGE IG PRESS	0-250PSIG	X X FL
PT416X,FSG	SG2 1ST STAGE IG PRESS	0-250PSIG	X X FL
PT416Y,FSG	SG3 1ST STAGE IG PRESS	0-250PSIG	X X FL
PT417W,FSG	SG1 2ND STAGE IG PRESS	0-250PSIG	X X FL
PT417X,FSG	SG2 2ND STAGE IG PRESS	0-250PSIG	X X FL
PT417Y,FSG	SG3 2ND STAGE IG PRESS	0-250PSIG	X X FL
PT420.,FSG	SG PRO IN PRESS	0-500PSIG	X 7 X X FLTC1
PT421.,FSG	SG LO MN FLD PRESS	0-500PSIG	X 7 X X TC5FL
PT425.,FSG	SG PLEN STM NO.1 PR	0-250PSIG	X L2 X X FL
PT426.,FSG	SG PLEN STM NO2 PR	0-250PSIG	X X X TC9FL
PT427.,FSG	SG MN H2O MN FLD PRESS	0-300PSIG	X 7 X X FL
PT428.,FSG	SG GN PRG SPLY PRESS	0-500PSIG	X X X FL
PT438W,FSG	SG1 LWR 3RD STG PRESS PR	0-250PSIG	X 4 X X TC6FL
PT438X,FSG	SG2SLWR 3RD STG PRESS	0-250PSIG	X 4 X X TC7FL
PT438Y,FSG	SG3 LWR 3RD STG PRESS PR	0-250PSIG	X 4 X X TC8FL

APPENDIX A, NFS DESIGN DEMONSTRATION TEST, PHASE II
JUNE 7, 1967

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
PT439	FSG PRO TANK DOME REG-PRESS	0-500PSIG	X FL
PT439.	FSG RMT LDR PRO TANK PRESS	0-500PSIG	X FL
PT440.	FSG RMT LDR LO2 TANK PRESS	0-500PSIG	X FL
PT440.	FSG RMT LDR LOZ TANK PRESS	0-500PSIG	X FL
PT441.	FGF GF V-3207 TNK PRESS	0-4000PSIG	X GF
PT442.	FGF GF V-3208 TNK PRESS	0-4000PSIG	X GF
PT443.	FGF GF V-3209 TNK PRESS	0-4000PSIG	X GF
PT474.	FPF PRESS DWNSTRM CHV-1722	0-300 PSIG	3 X
PT484.	RLC LH CD SYS PRESS	0-1500PSIG	L6 X X TS
PT574.	FSG 150LB GN SPLY PRESS	0-250PSIG	X FL
PT596.	FWS DCT CLNT OLT-PRESS	0-300 PSIG	8 X LF
PT597.	FWS DCT CLNT INLT-PRESS	0-300 PSIG	7 X LF
PT600.	FWS DCT CLNT FCV OTLT-PRESS	0-30 PSIA	X
PT601.	RLC 50FE012 DELTA PRESS	0-25 PSID	R3 X
PT602W.	FPT DELTA PRESS - FE426	0-50 PSID	1 X X
PT602W.	FPT DELTA PRESS-FE426	0-50PSID	1 X
PT602X.	FPT DELTA PRESS - FE426 COMP	0-50PSID	
PT603W.	FPF DELTA PRESS - FE427	0-50 PSID	X X

RECORDING DISPLAY REQUIREMENTS

CHANNEL NUMBER	TITLE	MEAS RANGE	*01*02*03*R*R*R*R*R*R*R*R * * * *A*B*C*D*E*F*FC*CS*L*M*H* * *	*D*D*D*E*F*S * * * *S*L*M*CON- * * * *W* * *SOLE *
PT603X	FPF DELTA PRESS - FE427 COMP	0-50PSID		
PT625..	FSS GSKT CVTY PRG-WEST	0-5PSIG	1	X
PT626..	FSS GSKT CVTY PRG-EAST	0-5PSIG	2	X
PT627..	FSS CNVLTE PRG-OUTBOARD	0-5PSIG	3	X
PT628..	FSS CNVLTE PRG-INBOARD	0-5PSIG	4	X
PT629..	FSS CNVLTE SEAL PRG-OUTBOARD	0-5PSIG	1	X
PT630..	FSS CNVLTE SEAL PRG-INBOARD	0-5PSIG	2	X
PT631..	FSS BOT SEAL BLD PRG	0-5PSIG	3	X
PT632..	FSS S1 SEAL BLD PRG	0-5PSIG	4	X
PT633..	FSS S2 SEAL BLD PRG	0-5PSIG	5	X
PT634..	FSS TOP SEAL BLD PRG	0-5PSIG	6	X
PT636..	FSS TOP BLWS/VAC XDCR	0-40PSIA	7	X
PT787..	FSG SG PLENUM CLNT H2O ORF DP	0-100PSID		X
PT796..	FPF 50 FE 426 PRG/LKG STAT PRS	0-300PSIA	2	X X
PT797..	FPF 50 FE 427 PRG/LKG STAT PRE	0-300PSIA	2	X X
PT800..	FSS ETC DELTA P TOP-BTM SHLD	0-5 PSID	R6	X

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RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
PT801.,FPF PRESS UPSTRM 50-R0-45	0-300 PSIG	4	X X TN29
PT802W.,FPF PRESS PURGE RING A	0-300 PSIA		X X TN26
PT802X.,FPF PRESS PURGE RING B	0-300 PSIA		X
PT802Y.,FPF PRESS PURGE RING C	0-300 PSIA		X
PT811.,RLC HYD PUMP PRESS-PERM	0-3000PSIG		X X TN11
PT813.,RLC PCV449 HYD ACT SPLY PRESS	3000PSG		X X TN11
PT844.,FSS SHLD PRG-GN2 PRESS	0-1000PSIG		X
PT874.,FSS TOP CHMBR PRESS	0-15PSIA	X	L7 X
PT875.,FSS BOT CHMBR PRESS	0-15PSIA	X	L8 X
PT901.,FND TURB EXHST CHMBR PTC-1	0-100 PSIA		R4 X X X TN33
PT902.,FND TURB EXHST NOZ-1 PTE-1	0-5 PSIA		X X X
PT903.,FND TURB EXHST NOZ-2 PTE-2	0-5 PSIA		X X
PT904.,FND PRI GAS SPLY LINE PS	0-3000PSIG	3	X X
PT905.,FND PRI CHMBR-1	0-500PSA		R5 X X X TN16
PT906.,FND PRI CHMBR-2 PPC-2	0-500 PSIA	2	X X X TN15
PT909.,FND PRI NOZ EXIT-1 PE-1	0-30 PSIA		R8 X X
PT910.,FND PRI NOZ EXIT-2 PE-2	0-5 PSIA		X X X TN21
PT911.,FND PRI NOZ EXIT-3 PE-3	0-30 PSIA		R7 X X X TN22

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RECORDING DISPLAY REQUIREMENTS

★ CHANNEL ★ NUMBER	★ CHANNEL TITLE	★ MEAS ★ RANGE	★01★02★03★R★R★R★R★R★R★R★R★R★R★D★D★E★F★S★S★L★M★CON-★ ★ ★ ★ ★A★R★C★D★E★F★FC★CS★L★M★H★ ★ ★ ★W★ ★ ★SOLE★
PT912.,FND PRI NOZ EXIT-4 PE-4	0-5 PSIA		X X
TE057.,FND DCT SEC1 RT H2O OTLT TEMP	492-711		X X LF
TE058.,FND DCT SEC2 LT LWR H2O OTLT	492-711		X X LF
TE059.,FND DCT SEC3 RT CLG H2O OTLT	492-711		X X LF
TE060.,FND DCT SEC2 RT LWR H2O OTLT	492-711		X
TE061.,FND DCT SEC2 RT UPR H2O OTLT	492-711		X
TE066.,FND DCT SEC1 LFT H2O OTLT	492-711		X X LF
TE067.,FND DCT SEC2 LFT H2O OTLT	492-711		X X LF
TE068.,FND DCT SEC3 LFT H2O OTLT	492-711		X X LF
TE075.,FND DCT SEC2 STA529 H2O	492-711		X B5 RI
TE076.,FND DCT SEC2 STA539 H2O	492-711		X B6 RI
TE077.,FND DCT SEC2 STA554 H2O	492-711		X X LF
TE078.,FND DCT SEC2 STA563 H2O	492-711		X B7 RI
TE079.,FND DCT SEC2 STA579 H2O	492-711		X B8 RI
TE083.,FND DCT SEC2 STA596 H2O	492-711		X B11RI
TE084.,FND DCT SEC2 STA598 H2O	492-711		X B12RI
TE085.,FND DCT SEC2 STA588 H2O	492-711		X B9RI
TE086.,FND DCT SEC2 STA590 H2O	492-711		X B10RI

RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE087..FND	DCT SEC1 STA63 H2O	492-711	X B1 RI
TE088..FND	DCT SEC1 STA280 H2O	492-711	X B2 RI
TE089..FND	DCT SEC1 STA358 H2O	492-711	X B3 RI
TE090..FND	DCT SEC1 STA422 H2O	492-711	X B4 RI
TE158..FND	DCT SEC3 DPAIN H2O TEMP	492-711	X B15RI
TE159..FND	STM HDR TEMP	490-2707R	X L1 X TC10
TE164..FND	DCT SEC1 RT TRS H2O TEMP	492-711	X
TE165..FND	DCT SEC1 LFT TRS H2O TEMP	492-711	X
TE166..FND	DCT SEC3 UPR TRS STA 823	492-711	X
TE167..FND	DCT SEC3 LWR TRS STA 823	492-711	X
TE180..FSS	S1 TROUGH TEMP	492-935	X X X X LFE
TE182..FSS	S1 TROUGH TEMP	492-935	X X X X LFE
TE235..FSS	S2 TROUGH TEMP	492-935	X X X X LFE
TE237..FSS	S2 TROUGH TEMP	492-935	X X X X LFE
TE295..FSS	BOT TROUGH TEMP	492-935	X X X X LFE
TE295..FSS	BOT TROUGH TEMP	492-935R	X
TE298..FSS	BOT TROUGH TEMP	492-935	X X X X LFE
TE299..FSS	BOT TROUGH TEMP	492-935	X X X X LFE

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* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*R*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE302..FSS BOT TROUGH TEMP	492-935		X X X LFE
TE320..FND DCT SEC3 H2O DRAIN TEMP	492-711		X B14RI
TE480..FSG L02 BLEED TEMP	65-655R		X FL
TE534..FND STM HDR TEMP	492-2707	X	X FL
TE776..FSG STM LN SKIN TEMP T1	492-1660R		X

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RECORDING DISPLAY REQUIREMENTS

* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE777.	FSG STM LN SKIN TEMP T2	492-1660R	X
TE778.	FSG STM LN SKIN TEMP T3	492-1660R	X
TE779.	FSG STM LN SKIN TEMP T4	492-1660R	X
TE780.	FSG STM LN SKIN TEMP T5	492-1660R	X
TE781.	FSG STM LN SKIN TEMP T6	492-1660R	X
TE782.	FSS HORZ SHLD CAR TEMP-VE1	460-1000R	X
TE783.	FSS HORZ SHLD CAR TEMP-NE2	460-1000R	X
TE784.	FSS HORZ SHLD CAR TEMP-NW1	460-1000R	X
TE785.	FSS HORZ SHLD CAR TEMP-NW2	460-1000R	X
TE786.	FSS TEST STD NE COL-TEMP	460-1000R	X
TE787.	FSS TEST STD SE COL-TEMP	460-1000R	X
TE788.	FSS TEST STD SW COL-TEMP	460-1000R	X
TE789.	FSS TEST STD NW COL-TEMP	460-1000R	X
TE790.	FND DCT VLT DOOR T1	460-1000R	X
TE791.	FND DCT VLT DOOR T2	460-1000R	X
TE792.	FND DCT VLT DOOR T3	460-1000R	X
TE793.	FMS TS WEATHER DOOR 11	460-1000R	X
TE794.	FMS TS WEATHER DOOR 12	460-1000R	X

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* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE795..	FND DCT VLT AREA T1	460-1000R	X
TE796..	FND DCT VLT AREA T2	460-1000R	X
TE797..	FND DCT VLT AREA T3	460-1000R	X
TE798..	FND HEAT FLUX-DITCH BNTH PLUME	0-10MV	X
TE798..	FND RAD-DITCH BNTH PLUGE	0-60 B/F25	X
TE799..	FND HEAT FLUX-TOP DCT VLT DOOR	0-10MV	X
TE799..	FND RAD-TOP DUCT VLT	0-15 B/F25	X
TE800..	FND HEAT FLUX-NW WEATHER DOOR	0-10MV	X
TE800..	FND CAL-TOP WEATHER DOOR	0-15 B/F25	X
TE802..	FSS TOTAL GN2 SHLD PRG-TEMP	492-711R	X
TE804..	FND RAD-150 FT DCT CL	0-60B/F25	X
TE805..	FND CAL-MID VAULT DOOR	0-60B/F25	X
TE806..	FND CAL-FWD DUCT STRUCTURE RGT	0-60B/F25	X
TE807..	FND CAL-FWD DUCT STRUCTURE LFT	0-60B/F25	X
TE808..	FMS CAL-BOT WEATHER DOOR	0-60B/F25	X
TE809..	FSS CAL-TEST STD-NW COL	0-15B/F25	X
TE810..	FND TEMP ETC-T1	400-600R	X
TE811..	FND TEMP ETC-T2	400-600R	X

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* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*R*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE812..FND	TEMP ETC-T3	400-600R	X
TE813..FND	TEMP ETC-T4	400-600R	X
TE814..FND	TEMP ETC-T5	400-600R	X
TE815..FND	TEMP ETC-T6	400-600R	X
TE816..FND	DUCT EXIT STRUCTURE	400-600R	X
TE816..FND	DUCT EXIT STRUCTURE	400-600R	X
TE817..FND	DUCT EXIT STRUCTURE	492-1460R	X
TE818..FND	DUCT EXIT STRUCTURE	492-1460R	X
TE819..FND	DUCT EXIT STRUCTURE	492-1460R	X
TE820..FND	TEMP LF WHITE POT DITCH SID	492-1460R	X
TE821..FND	TEMP RT WHITE POT DITCH SID	492-1460	X
TE822..FND	TEMP DCT CL BTWN GRN POTS	492-1460R	X
TE823..FND	TEMP DCT CL BTWN PURP POTS	492-1460R	X
TE824..FND	TEMP DCT VLT LF ORGE POTS	492-1460R	X
TE825..FND	TEMP DCT VLT RT ORGE POTS	492-1460R	X
TE826..FPF	R045 OUTLET-TEMP	247-725R	X
TE829W.FSG	MOD L02 BLEED TEMP SG1	65-655R	X X AC9
TE829X.FSG	MOD L02 BLEED TEMP SG2	65-655R	X X AC8

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* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * * *A*R*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TE829Y.FSG	MOD LO2 BLEED TEMP SG3	65-655R	X AC7
TE902..FND	TURR EXHST CHMBR TTC	65-654	X X
TE903..FND	PRI CHMBR TPC	492-771	X X
TT028..RLC	LH CD SPLY TEMP	135-610	X X
TT047..FWS	DCT CLNT INLT-TEMP	460-560	X X LF
TT048..FWS	DCT CLNT OFLT-TEMP	460-560	X X LF
TT431..FSG	SG PLEN H2O JKT TEMP	460-610	X X TC3FL
TT434W.FSG	SG1 CHBR JKT H2O DSCHG T	460-610	X
TT434X.FSG	SG2 CHBR JKT H2O DSCHG T	460-610	X
TT434Y.FSG	SG3 CHBR JKT H2O DSCHG T	460-610	X
TT478..FSG	SG FUEL MNFLD TEMP	460-560	X 8 X TC2FL
TT479..FSG	LO2 MNFLD TEMP	35-325	8 X X TC4FL
TT483..FSG	PRO V3401 TANK TEMP	460-560	X X FL
TT484..FGF	GAS V3207 TNK TEMP	360-610R	X X GF
TT485..FGF	GAS V3208 TNK TEMP	360-610R	X X GF
TT486..FGF	GAS V3209 TNK TEMP	360-610R	X X GF
TT489..FGF	V3201 TNK TEMP	360-610	X X GF
TT490..FGF	V-3202 TNK TEMP	360-610	X X GF

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* CHANNEL * NUMBER	* CHANNEL TITLE	* MEAS * RANGE	*01*02*03*R*R*R*R*R*R*R *R *D*D*D*E*F*S *S*L*M*CON- * * * *A*B*C*D*E*F*FC*CS*L*M*H* * * *W* * *SOLE *
TT491.	FGF V-3203 INK TEMP	360-610	X X GF
TT901.	FPF TEMP OF FE426	492-771	X
TT901.	FPF TEMP OF FE426	492-711R	X
MN L02 OPN SG1	START SEQUENCE	NA	X
MN PRO OPN SG1	START SEQUENCE	NA	X
MN L02 OPN SG2	START SEQUENCE	NA	X
MN PRO OPN SG2	START SEQUENCE	NA	X
MN L02 OPN SG3	START SEQUENCE	NA	X
MN PRO OPN SG3	START SEQUENCE	NA	X

NUMBER OF CHANNELS LISTED IS 441.
THE END