SOLAR ONE GENERATING STATION
DAGGETT, CALIFORNIA

STARTUP AND TEST PROGRAM MANUAL

SOUTHERN CALIFORNIA EDISON COMPANY

SOLAR ONE GENERATING STATION
STARTUP AND TEST MANUAL

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INTRODUCTION

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Startup Manual is to provide the guidelines and startup plans for the Solar One Generating Station. The manual includes the functions and responsibilities of the participating organizations, and has been approved by the management of Southern California Edison Company (SCE), the U.S. Department of Energy (DOE) and the other participating organizations.

The purpose of the Startup and Test Program is to provide planned and systematic methods and procedures to conduct the overall startup integration of the Solar One Generating Station Systems.

1.2 Scope

The Startup and Test Program will include all testing activities beginning at the completion of construction and ending with all systems and equipment fully operational and released to SCE Steam Generation Division.

2.0 STARTUP AND TEST PROGRAM ORGANIZATION

2.1 Participating Organizations and Responsibilities

2.1.1 SOUTHERN CALIFORNIA EDISON COMPANY (SCE), co-owner and operator of the facility, has overall management responsibility for the organizing and scheduling of Solar One Generating Station startup.

SCE will assign the Project Startup Engineering Supervisor (PSES) who will act as Chairman of the Test Working Group (see Exhibit I). In addition, SCE will be represented in the Test Steering Committee. SCE will provide Test Procedures for the Electric Power Generating Systems (EPGS).

2.1.2 THE UNITED STATES DEPARTMENT OF ENERGY, (DOE), majority owner of the facility, will provide the Chairman of the Test Steering Committee and the Co-Chairman of the Test Working Group.

2.1.3 MC DONNELL DOUGLASS CORPORATION (MDAC), the Solar Facilities Design Integrator, will be represented in the Test Steering Committee and Test Working Group and will provide the Chairman of the Test Analysis Group. MDAC is responsible for the preparation of Preoperational Test Procedures and Acceptance Tests.

2.1.4 TOWNSEND AND BOTTUM, INC. (T&B), Site Construction Manager, will be represented in the Test Working Group and will assign a Startup Engineer to act as interface with DOE Contractors to coordinate their activities and verify compliance with SCE Startup Standards. (Reference Section 5.0)

2.1.5 MARTIN MARIETTA CORPORATION (MMC) designer of the Collector System will be represented in the Test Working Group and will assign a Startup Engineer to interface startup activities involving the Collector System. MMC will be responsible for the preparation of Test Procedures, as assigned by SFDI.

2.1.6 SOUTHERN CALIFORNIA EDISON COMPANY, STEAM GENERATION DIVISION, will be responsible for the safe and proper operation of systems and equipment after acceptance from SCE Startup. In addition, SCE Steam Generation will support Startup and Testing as follows:

2.1.6.1 Provide chemical support

2.1.6.2 Issue clearances

2.1.6.3 Assign and administer Operating Foreman and Operators

2.1.6.4 Perform electrical, instrument and control testing in the Electric Power Generating Systems (EPGS).

2.1.6.5 Prepare operating and emergency procedures.

2.1.6.6 Develop and administer the Plant Safety Program

2.1.6.7 Comply with SCE Startup Standards - Section 5.0

2.1.6.8 Assign a Supervisor of Operation and Maintenance who will act as Co-Chairman of the Test Working Group.

2.2 Test Steering Committee

2.2.1 Members:

U.S. Department of Energy (Chairman)
Southern California Edison Company
McDonnell Douglas Corporation

2.2.2 Responsibilities:

Provide policy and direction to the Test Planning and Test Working Groups.

2.3 Test Working Group

2.3.1 Members:

Southern California Edison Company (Chairman)
U.S. Department of Energy (Co-Chairman)
McDonnell Douglas Corporation
Martin Marietta Corporation
Townsend and Bottum, Inc.

2.3.2 Responsibilities:

Startup:

- Sequence Charts
- Schedules
- Procedures
- Manual
- Construction Interface
- Coordination

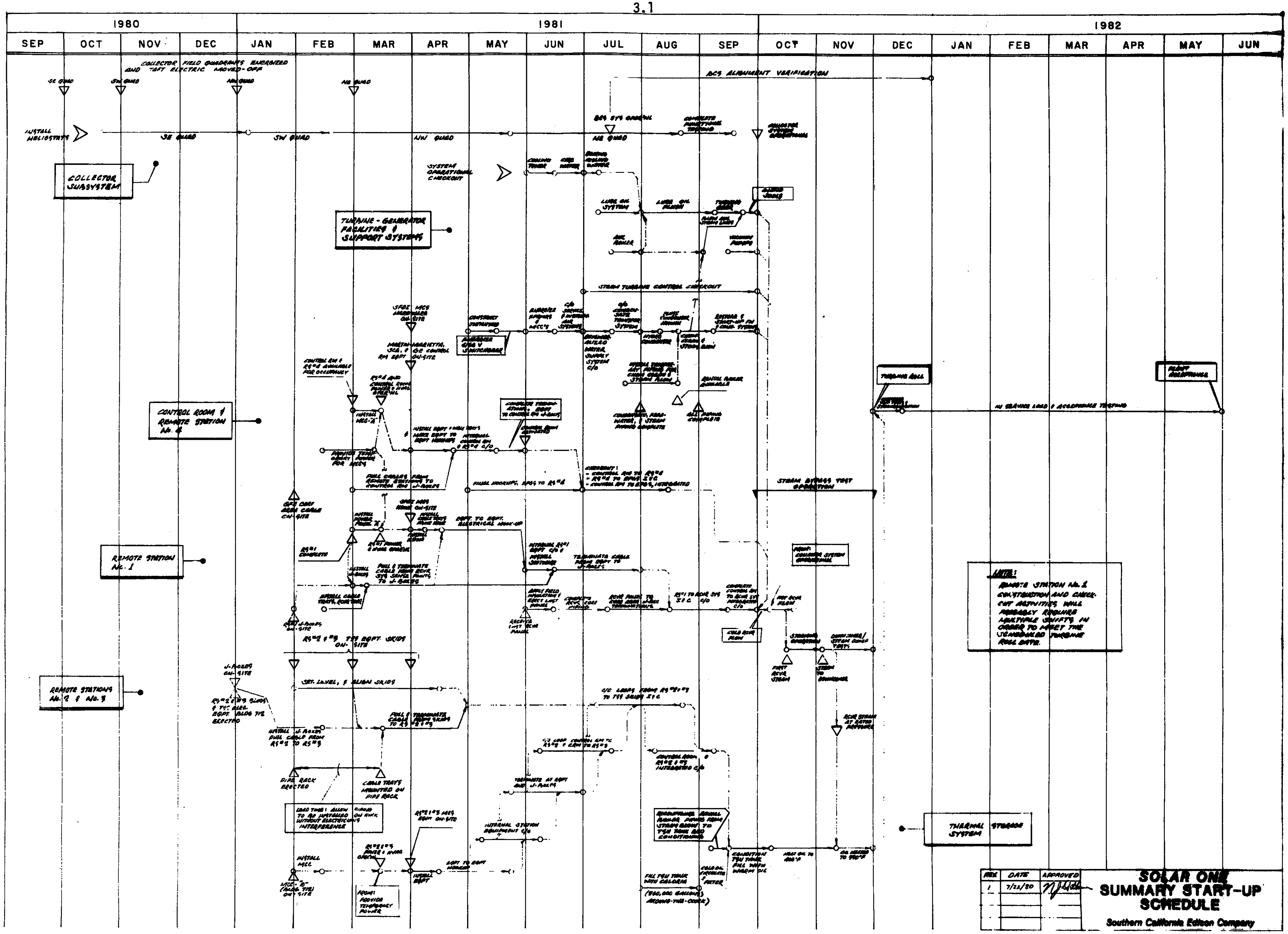
2.4 Test Analysis Group

2.4.1 Members:

McDonnell Douglas Corporation (Chairman)
(Others - Later)

2.4.2 Responsibilities

Design and Results Analysis
Test and Design Change Recommendation
Analysis of Operating Problems
Test Reports


1980
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MAR
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COLLECTOR SUBSYSTEM
TURBINE - GENERATOR FACILITIES & SUPPORT SYSTEMS
CONTROL ROOM & REMOTE STATION No. 4
REMOTE STATION No. 1
REMOTE STATIONS No. 2 & No. 3
THERMAL STORAGE SYSTEM
COLLECTOR FIELD QUADRANTS ENERGIZED AND TAFT ELECTRIC MOVED-OFF
INSTALL HELIOSTATS
SE QUAD
SW QUAD
NW QUAD
NE QUAD
BCS ALIGNMENT VERIFICATION
SYSTEM OPERATIONAL CHECKOUT
STEAM TURBINE CONTROL CHECKOUT
STEAM BYPASS TEST OPERATION
RS#2 & #3 TSS EQPT. SKIDS ON-SITE
SET, LEVEL, & ALIGN SKIDS
REV
DATE
APPROVED
1
7/22/80
SOLAR ONE
SUMMARY START-UP SCHEDULE
Southern California Edison Company

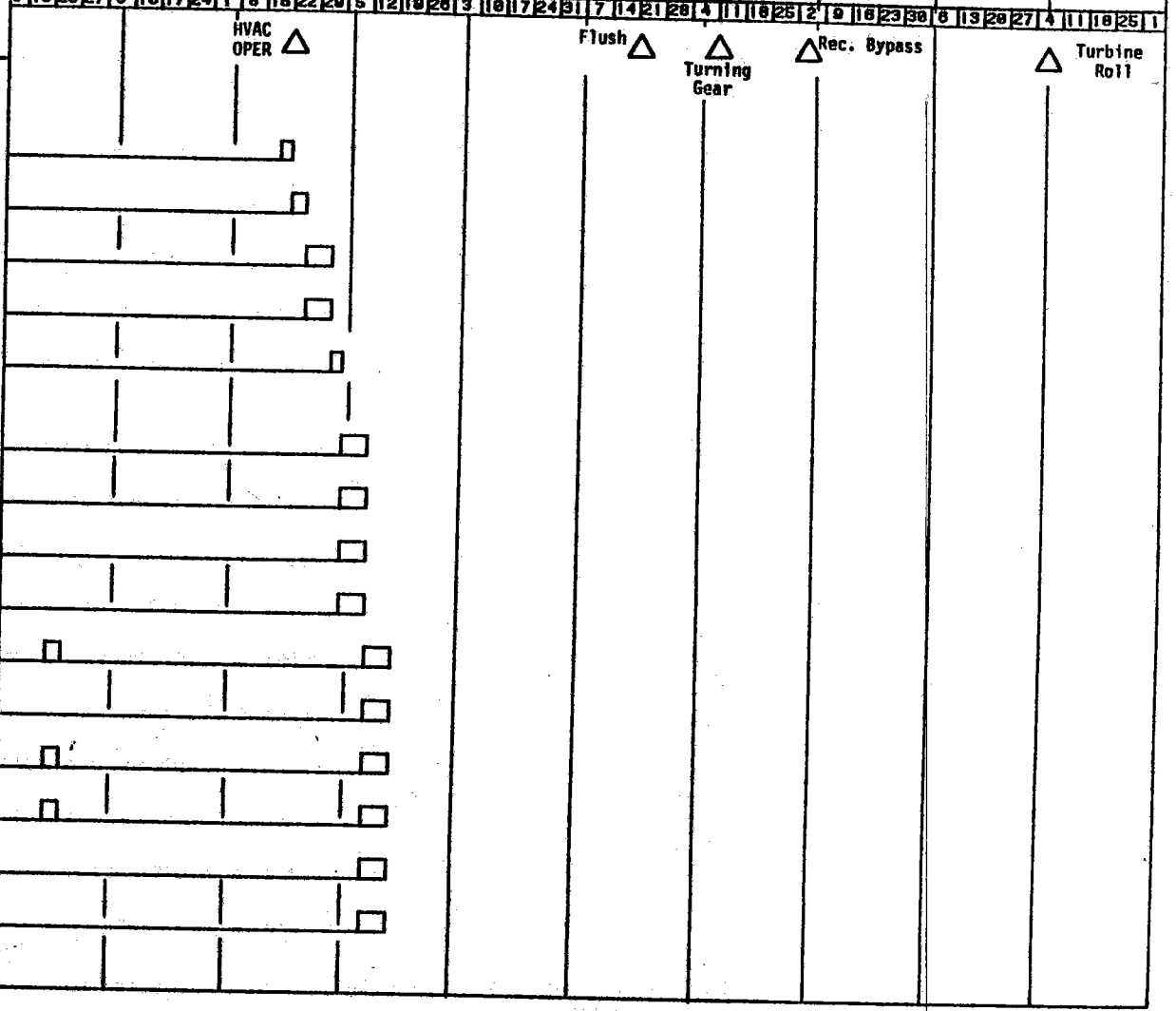
DETAIL STARTUP TEST SCHEDULE

3.2

Oct 3, 1980

1981

DESCRIPTION	NO.
ELECTRICAL SYSTEM	
DC SYSTEM	861
OFF SITE POWER SYSTEM	806
MAIN TRANSFORMER SYSTEM	801
AUXILIARY POWER SYSTEM	811
4160 V PLANT SYSTEM	816
STATION SERVICE TRANSFORMER AND 480 V BUS	831
LOAD CENTER "A"	836
COOLING TOWER TRANSF & BUS	841
4160 V COLLECTOR FIELD SYS.	821
MOTOR CONTROL CENTER "A"	847
MOTOR CONTROL CENTER "C"	849
POWER PANEL "A"	846
MOTOR CONTROL CENTER "B"	848
MOTOR CONTROL CENTER "L"	850
208 V COLLECTOR FIELD SYSTEM	826



PREPARED BY T.J. MAYS, EXT 2795

REVISION 1: NEW ACTIVITIES ADDED ON PAGE 9 AND 10

DETAIL STARTUP TEST SCHEDULE

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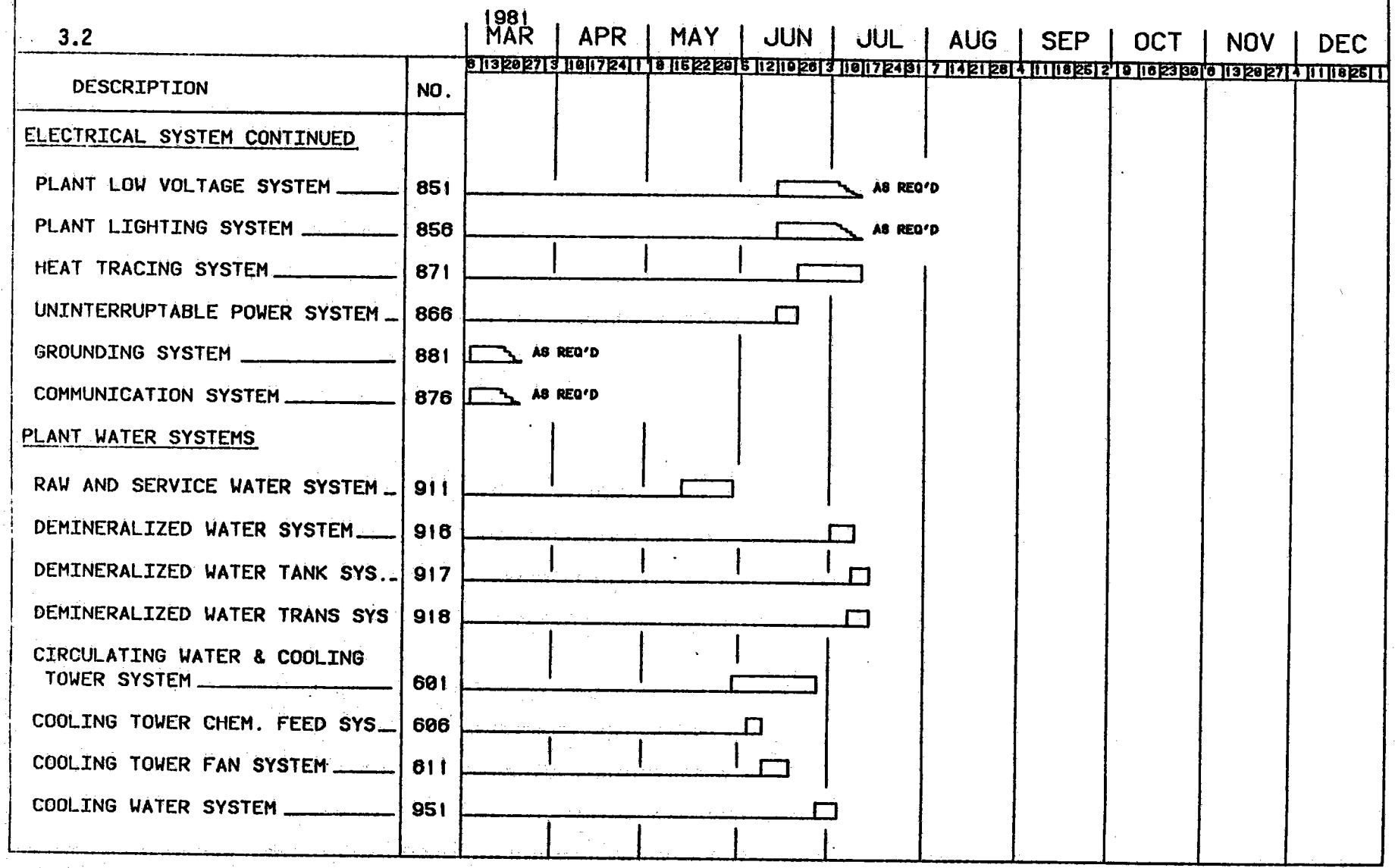

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DETAIL STARTUP TEST SCHEDULE

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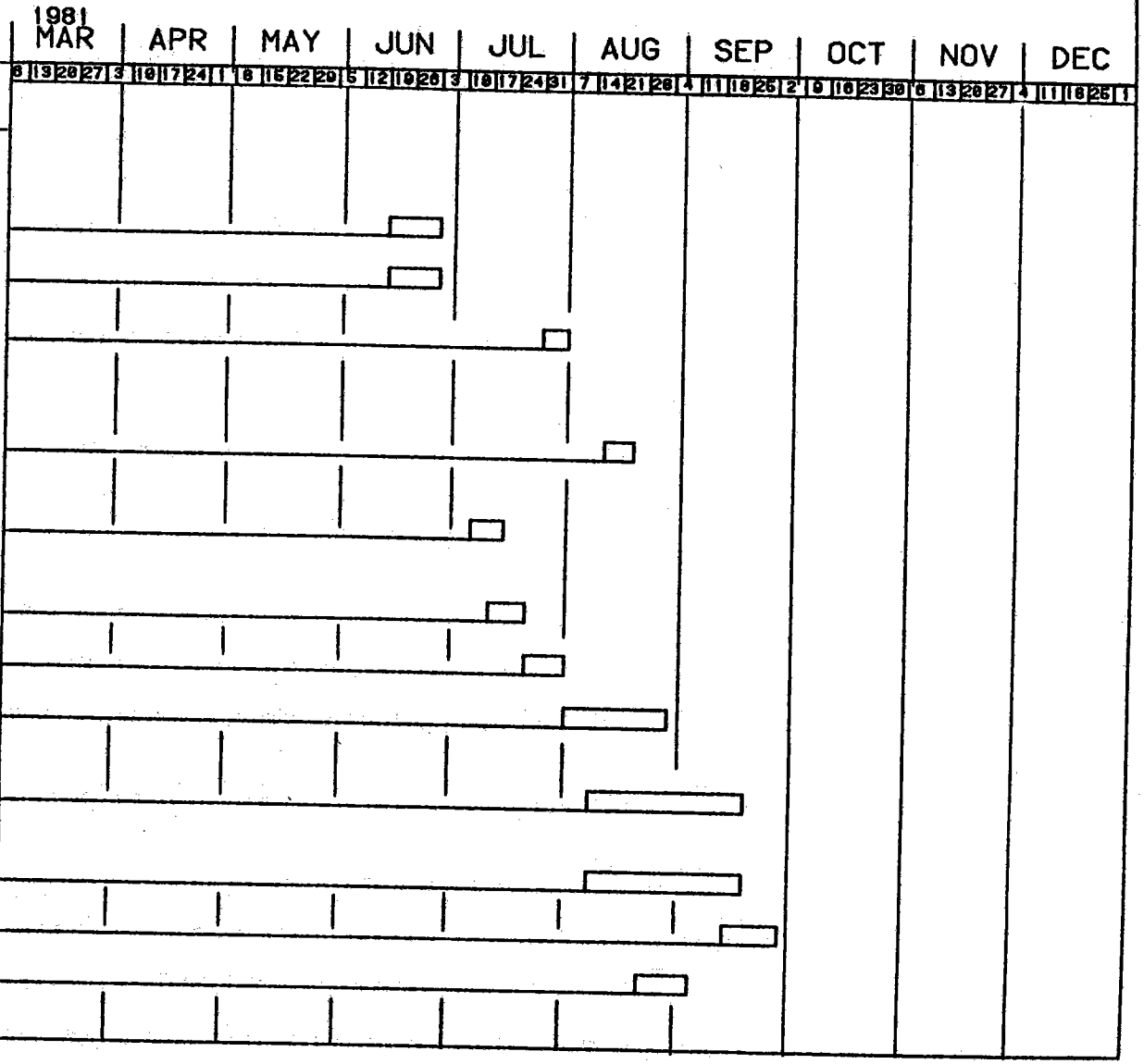

DESCRIPTION	NO.
COMPRESSED AIR AND NITROGEN SYS	
SERVICE AIR SYSTEM	901
INSTRUMENT AIR SYSTEM	904
GN 2 SUPPLY SYSTEM	906
TURBINE SYSTEM	
EPGS GN 2 SYSTEM	776
TURBINE GENERATOR LUBE OIL TRANSFER AND STORAGE SYSTEM	731
TURBINE GENERATOR LUBE OIL COND/PURIFYING SYSTEM	726
TURBINE GEN. LUBE OIL SYSTEM	721
TURBINE HYDRAULIC CONTROL SYS.	716
GENERATOR EXCITATION & VOLTAGE REGULATION SYSTEM	746
TURBINE GENERATOR CONTROL & INTERLOCK SYSTEM	761
GENERATOR LEADS & ELECT. SYS.	751
GENERATOR STATOR COOLING SYS.	741

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DETAIL STARTUP TEST SCHEDULE

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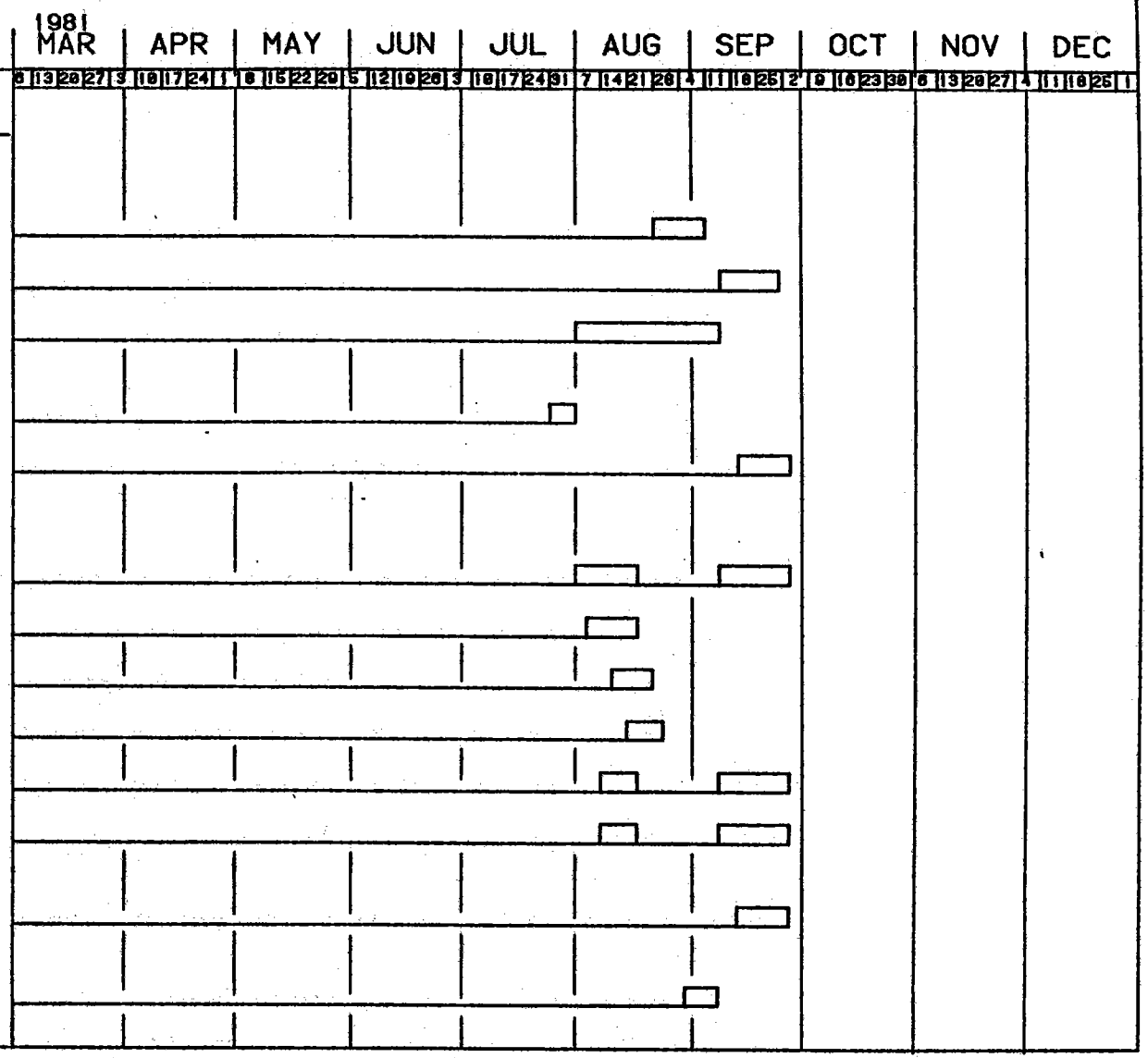

DESCRIPTION	NO.
TURBINE SYSTEM CONTINUED	
TURBINE DRAIN SYSTEM	711
TURBINE SEAL STEAM SYSTEM	706
TURBINE GENERATOR SYSTEM	701
TURBINE GENERATOR FIRE PROTECTION SYSTEM	771
CONDENSER AIR REMOVAL SYSTEM	556
FEEDWATER & CONDENSATE SYSTEMS	
CONDENSATE SYSTEM	541
TEMPORARY VELOCITY FLUSH SYS	991
TEMPORARY STEAM BLOW SYSTEM	981
TEMPORARY CHEMICAL CLEAN SYS	986
RECEIVER FEEDWATER SYSTEM	501
TS FEEDWATER SYSTEM	521
INLINE POLISHING DEMINERALIZER SYSTEM	546
DEMINERALIZER AREA CHEMICAL SAFETY SYSTEM	920

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DETAIL STARTUP TEST SCHEDULE

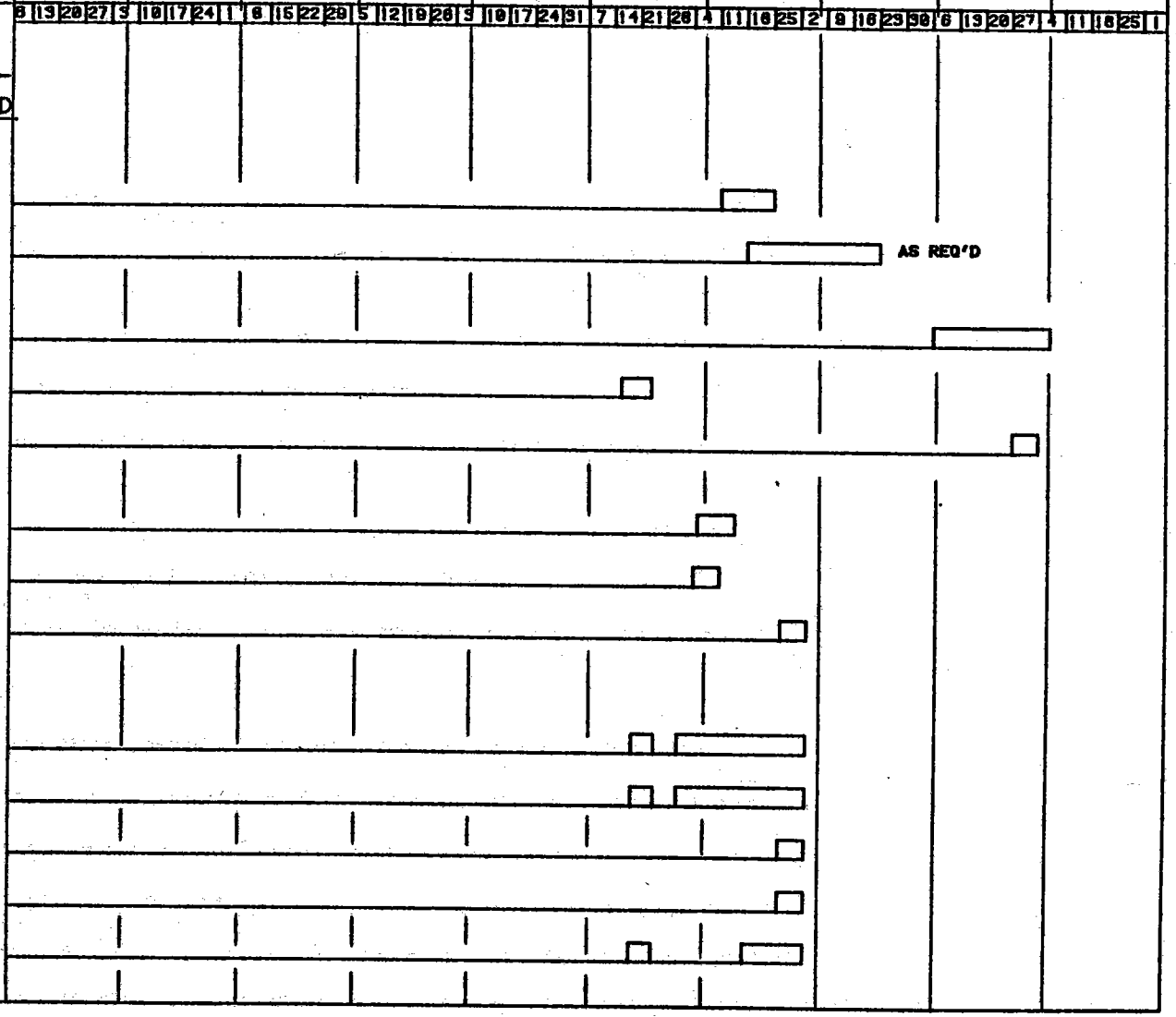
3.2

1981

MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC

6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28 4 11 18 25 2 9 16 23 30 6 13 20 27 4 11 18 25 1

DESCRIPTION	NO.
FEEDWATER & CONDENSATE SYS CONTINUED	
DEMINERALIZER CHEMICAL STORAGE AND TRANSFER SYSTEM	919
SAMPLE SYSTEM	956
H.P. FEEDWATER HEATER VENT AND DRAIN SYSTEM	506
CONDENSATE DRAIN SYSTEM	536
L.P. HEATER VENT & DRAIN SYS	551
FEEDWATER/CONDENSATE CHEMICAL FEED SYSTEM	526
REC FEED PUMP LUBE OIL SYSTEM	511
FEED PUMP SEAL WATER SYSTEM	516
RECEIVER AND STEAM SYSTEMS	
PREHEAT SYSTEM	001
BOILER SYSTEM	006
RECEIVER VENT & DRAIN SYSTEM	016
RECEIVER GN 2 SYSTEM	021
RECEIVER FLASH TANK SYSTEM	011



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DETAIL STARTUP TEST SCHEDULE

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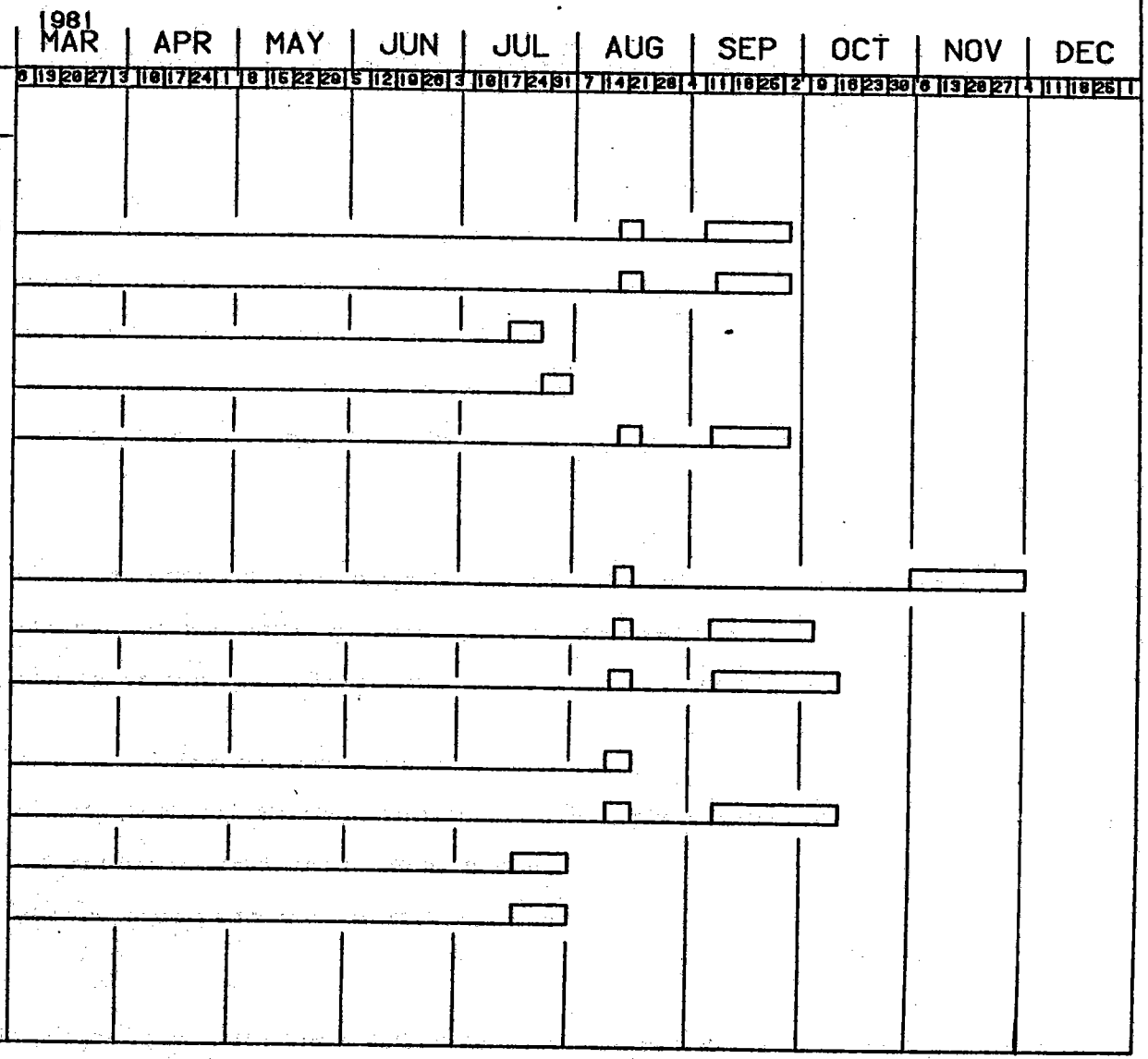

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DETAIL STARTUP TEST SCHEDULE

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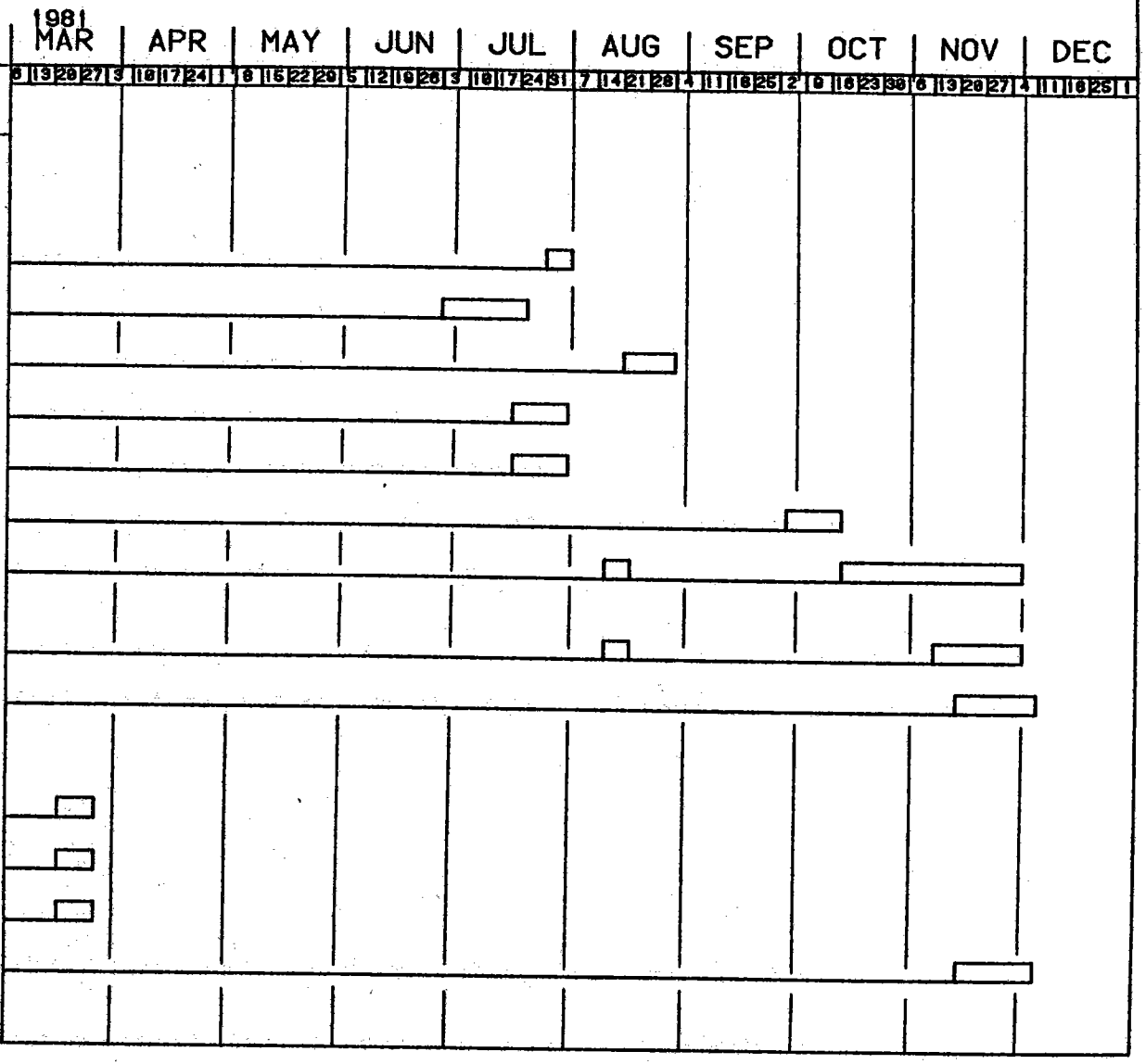

DESCRIPTION	NO.
THERMAL STORAGE AND ADMISSION STEAM SYSTEMS CONTINUED	
TS GN 2 SYSTEM	266
TS FIRE PROTECTION SYSTEM	261
ULLAGE MAINTENANCE SYSTEM	241
TS TANK EXTERNAL PIPING SYS	206
TS CHARGING OIL SYSTEM	231
TS EXTRACTION OIL SYSTEM	246
TS STEAM GENERATION SYSTEM	256
TS EXTRACTION H-X VENTS, BLOWDOWN AND DRAIN SYSTEM	251
BLANKETING STEAM SYSTEM	431
MISCELLANEOUS SYSTEMS	
HVAC CONTROL ROOM & RS4	971
HVAC (RS 1)	972
HVAC (RS 2 & 3)	973
TURBINE EXTRACTION STEAM SYS	416

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DETAIL STARTUP TEST SCHEDULE

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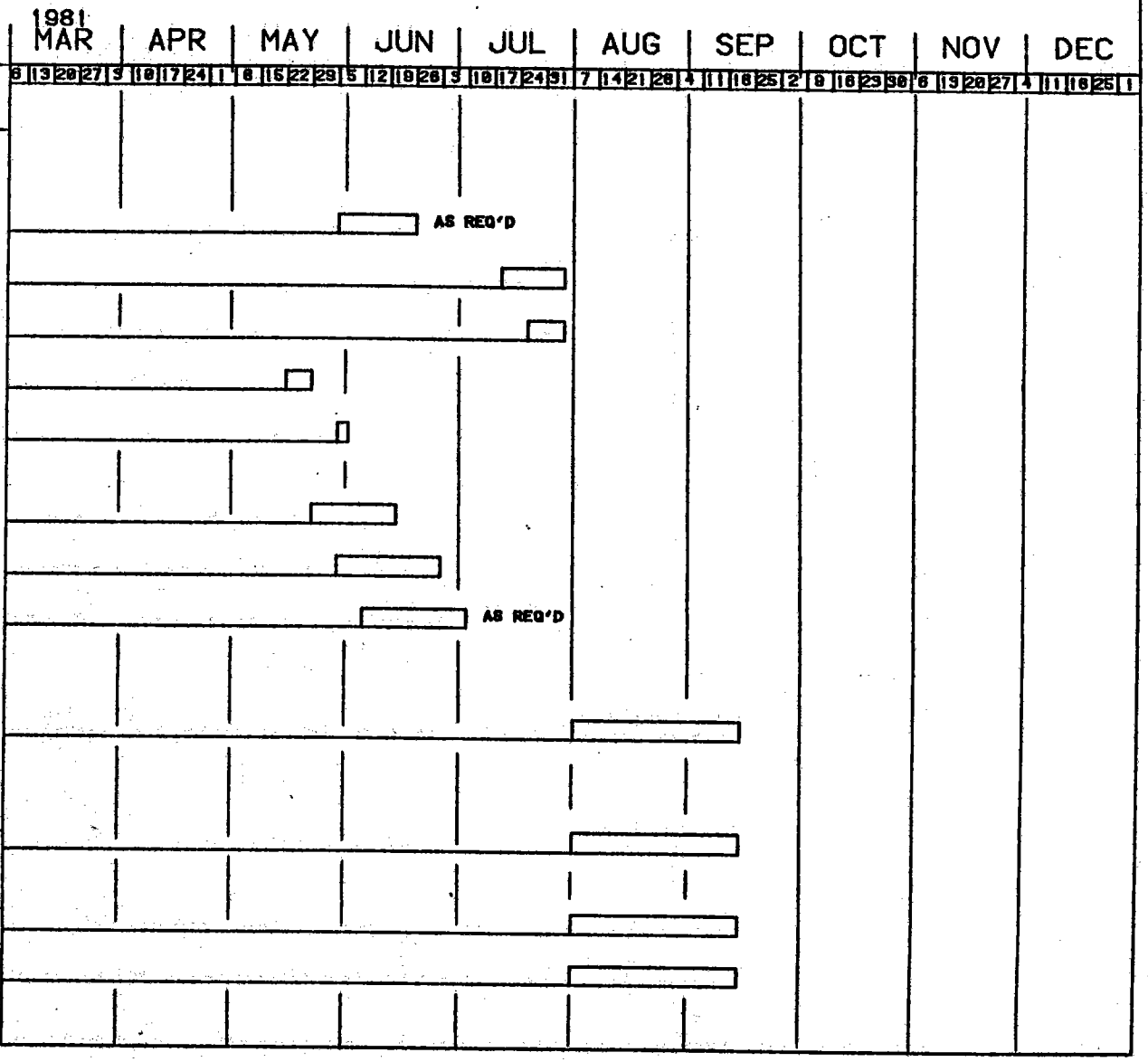

DESCRIPTION	NO.
MISCELLANEOUS SYSTEMS CONTINUED	
PLANT DRAIN SYSTEM	941
OIL WATER SEPARATOR SYSTEM	946
MAINTENANCE OIL SUMP SYSTEM	943
DIESEL PUMP FUEL SYSTEM	933
DIESEL PUMP FIRE PROTECT. SYS.	932
DIESEL FIRE PUMP AND DIESEL ENGINE	934
PLANT FIRE PROTECTION SYSTEM	931
MISC. HVAC SYSTEMS	974
COLLECTOR SYSTEM	
HELIOSTAT READINESS	101
HELIO ARRAY CONTROLLER (HAC)/ HELIO FIELD CONTROLLER (HFC) INTERFACES	106
HELIOSTAT ARRAY CONTROLLER (HAC) INITIALIZATION	111
HELIO TARGETING VERIFICATION	116

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DETAIL STARTUP TEST SCHEDULE

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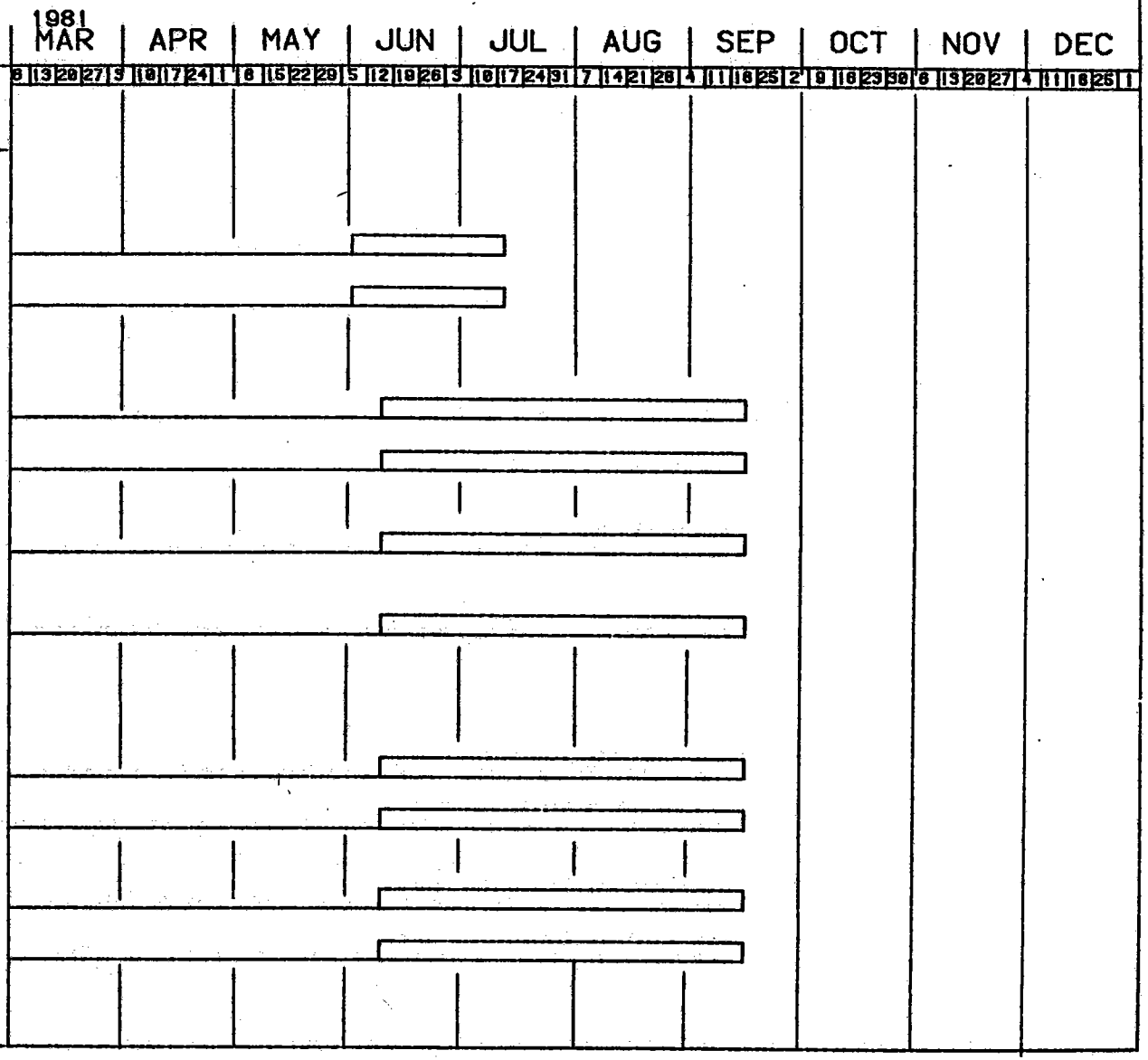

DESCRIPTION	NO.
BEAM CHARACTERIZATION SYSTEM	
BEAM CHARACT. TARGET SYSTEM	121
BEAM CHARACT. CAMERA SYSTEM	126
SYS DISTRIB. PROCESS CONTROL	
SYS DIST PROCESS CONTROL SYS	301
DATA ACQUISITION SYSTEM	321
DATA ACQUISITION REMOTE MULTI-PLEXING SYSTEM	331
METEROLOGICAL AND COLLECTOR FIELD DATA SYSTEM	345
OPERATING CONTROL SYSTEM	
SYSTEM DISTRIBUTED PROCESS CONTROLLERS/OCS INTERFACES	303
OPERATIONAL CONTROL SYSTEM	311
DATA ACQUISITION SYSTEM AND OCS INTERFACE	
INFRARED SCANNING SYSTEM	350

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DETAIL STARTUP TEST SCHEDULE

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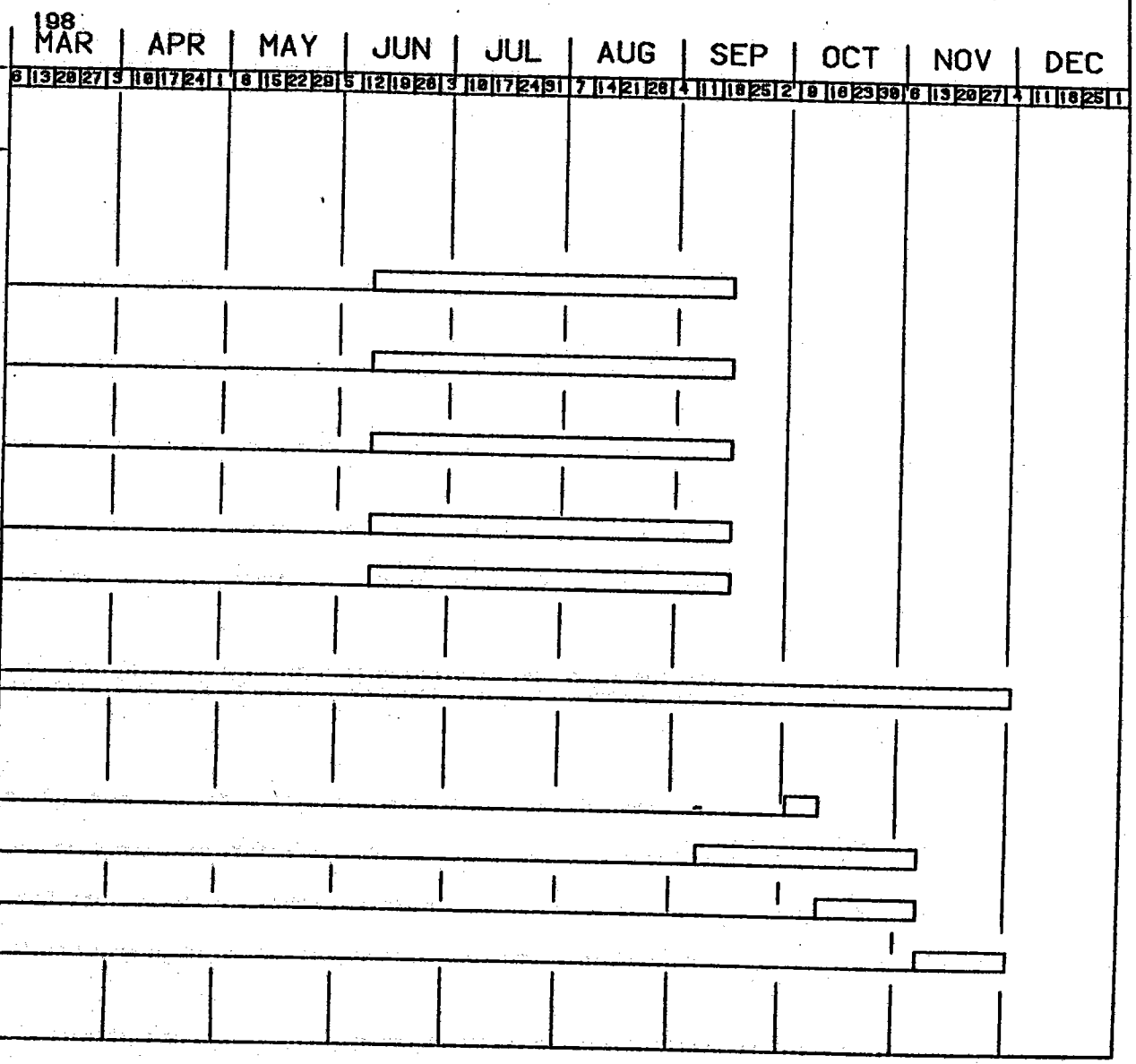

DESCRIPTION	NO.
HELIOSTAT ARRAY CONROLLER	
HELIOSTAT ARRAY CONTROLLER (CONTROL ROOM INTERFACE)	114
OPERATING CONTROL SYSTEM/ HAC INTERFACE	311
DATA ACQUISITION SYSTEM/ HAC INTERFACE	321
METEROLOGICAL AND COLLECTOR FIELD DATA SYSTEM	345
RECEIVER TRIP/HAC INTERFACE	355
PLANT SAFETY	
GENERAL PLANT SAFETY	995
FINAL PREOPERATIONAL TESTS	
RECEIVER STAND ALONE TEST	1010
THERM STOR STAND ALONE TEST	1020
COLLECTOR/REC. INTEGR. TEST	1030
INTEGRATED SOLAR SYSTEM TEST	1040

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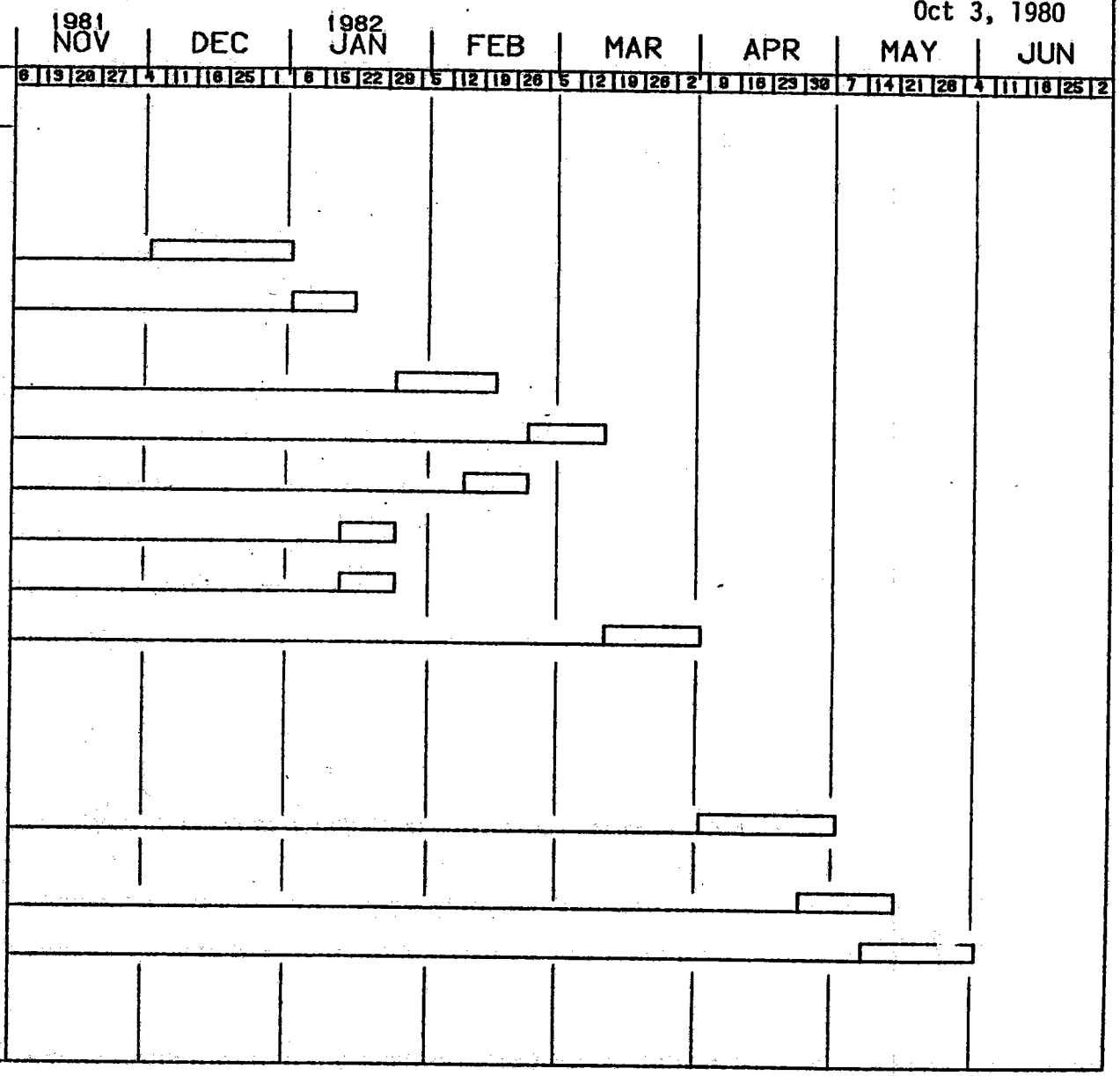
PLANT ACCEPTANCE TEST SCHEDULE

3.2

Oct 3, 1980



DESCRIPTION	NO.
ACCEPTANCE TESTS (MANUAL OPERATION	
PRELIMINARY ACCEPTANCE TEST	1105
MODE 1 - BASIC NORMAL	1110
MODE 2 - BASIC NORMAL AND CHARGING	1120
MODE 3 - STORAGE BOOSTED	1130
MODE 4 - IN-LINE FLOW	1140
MODE 5 - CHARGING ONLY	1150
MODE 6 - STORAGE DISCHARGING	1160
MODE 7 - DUAL FLOW	1170
ACCEPTANCE TESTS (OCS CONTROLLED OPERATION	
CASCADE CONTROL AND PLANT TRANSITIONS	1210
COORDINATED CONTROL AND PLANT TRANSITIONS	1220
CLEAR DAY SCENARIO	1230

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TEST PERFORMANCE

SOLAR ONE
PROPERATIONAL TEST PROCEDURE INDEX

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
000	Receiver System	SFDI (Rocketdyne)	August 1, 1981
001	Preheat System		
006	Boiler System		
011	Receiver Flash Tank		
016	Receiver Vent and Drain		
021	Receiver GN_2 System		
100	Collector System		
101	Heliostat Readiness	Martin	August 7, 1981
106	Heliostat Array Controller (HAC)/Heliostat Field Controller (HFC) Interfaces		
111	Heliostat Array Controller (HAC) Initialization		
116	Heliostat Targeting Verification		
150	Beam Characterization System	SFDI (MDAC)	June 1, 1981
121	Beam Characterization Target System		
126	Beam Characterization Camera System		
311	OCS/HAC/BCS Interface		
205	Thermal Storage Oil System	SFDI (Rocketdyne)	July 17, 1981
201	TS Tank System		
206	TS Tank External Piping System		
231	TS Charging Oil System		
236	Caloria Make-up System		
241	Ullage Maintenance System		
246	TS Extraction Oil System		
250	Thermal Steam System	SFDI (Rocketdyne)	August 10, 1981
211	TS Charging Heat Exchanger System		
216	TS Charging Steam System		
221	TS Charging Heater Vent and Drain System		
226	TS Flash Tank System		
251	TS Extraction Heat Exchanger Vents, Blowdown and Drain System		
256	TS Steam Generation System		
431	Blanketing Steam System		

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
905	Nitrogen	SFDI (S-R)	July 24, 1981
	266 TSS GN_2 System		
	776 Turbine Generator		
	906 GN_2 Supply System		
930	Fire Protection	SFDI (S-R)	May 15, 1981
	261 TS Fire Protection System		
	771 TG Fire Protection System		
	931 Plant Fire Protection System		
	932 Diesel Pump Fire Protection System		
	933 Diesel Pump Fuel System		
	934 Diesel Fire Pump and Diesel Engine		
405	Main/Admission Steam System	SFDI (S-R)	August 10, 1981
	401 Main Steam System		
	406 Steam Dump System		
	411 Admission Steam System		
420	Miscellaneous Steam Systems	SCE	July 20, 1981
	421 Auxiliary Steam System		
	426 Auxiliary Boiler System		
505	Condensate	SCE	August 1, 1981
	416 Turbine Extraction Steam System		
	526 Feedwater/Condensate Chemical Feed System		
	536 Condensate Drain System		
	541 Condensate System		
	546 Inline Polishing Demineralizer System		
	551 L.P. Heater Vent and Drain System		
	556 Condenser Vacuum System		
	919 Demineralizer Chem. Storage and Transfer System		
550	Feedwater	SCE	August 7, 1981
	501 Receiver Feedwater System		
	506 H.P. Feedwater Heater Vent and Drain System		
	511 Receiver Feed Pump Lube Oil System		
	516 Feed Pump Seal Water System		
	521 TS Feedwater System		
	531 Auxiliary Boiler/TS Feedwater System		
	416 Turbine Extraction		

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
600	Circulating Water	SCE	May 29, 1981
	601 Circulating Water and Cooling Tower System		
	606 Cooling Tower Chemical Feed System		
	611 Cooling Tower Fan System		
705	Turbine Generator - Mechanical Systems	SCE	July 3, 1981
	701 Turbine Generator System		
	706 Turbine Gland Seal Steam System		
	711 Turbine Drains System		
	741 Generator Stator Cooling System		
	716 Turbine Hydraulic Control System		
	721 Turbine Generator Lube Oil System		
	726 Turbine Generator Lube Oil Conditioning/Purifying System		
	731 Turbine Generator Lube Oil Transfer and Storage System		
750	Turbine Generator - Electrical and Control Systems	SCE	August 7, 1981
	746 Generator Excitation and Voltage Regulation System		
	751 Generator Leads and Electrical System		
	761 Turbine Generator Control and Interlock System		
901	Instrumentation and Service Air Systems	SCE	June 12, 1981
	902 Service Air System		
	904 Instrument Air System		
910	Water Supply Systems	SFDI (S-R)	May 12, 1981
	911 Raw and Service Water System		
	916 Demineralized Water System		
	917 Demineralized Water Tank System		
	918 Demimeralized Water Transfer System		
	919 Demineralizerd Chemical Storage and Transfer System		
	920 Demineralized Area Chemical Safety System		
	936 Potable Water System		
940	Plant Drains and Sumps	SFDI (S-R)	May 29, 1981
	941 Plant Drain System		
	943 Maintenance Oil Sump System		
	944 Sanitation and Sewage Disposal System		
	946 Oil Water Separator System		

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
951	Cooling Water System	SCE	June 26, 1981
956	Sampling System	SCE	September 11, 1981
960	Mechanical Support Systems	SFDI (S-R)	November 15, 1980
	961 Tower Elevator System		
	962 Building Elevator System		
	966 Tower Crane and Hoist System		
970	HVAC Systems	SFDI	March 13, 1981
	971 HVAC (Control Room & RS4)		
	972 HVAC (RS1)		
	973 HVAC (RS 2 & 3)		
	974 HVAC (RS 5)		
	975 Miscellaneous HVAC Systems		
980	Flushing and Steam Blows	SFDI (S-R)	August 5, 1981
	981 Temporary Steam Blowing System		
	982 Temporary Chemical Cleaning System		
	991 Temporary Velocity Flushing System		
805	Main/Auxiliary Power Transformers	SCE	May 10, 1981 (?)
	801 Main Transformer System		
	806 Off-Site Power System		
	811 Auxiliary Power System		
	816 4160 V Plant System		
820	Collector Power	SFDI (S-R)	May 29, 1981
	821 4160 V Collector Field System		
	826 208 V Collector Field System		

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
830	Load Centers and MCC's	SCE	
	831 Station Service Transformer and 480 V. Bus		
	836 Load Center "A"		
	841 Cooling Tower Transformer and Bus		
	846 Power Panel "A"		
	847 MCC "A"		
	848 MCC "B"		
	849 MCC "C"		
	850 MCC "L"		
	886 Construction Power System		
	889 Warehouse POwer jPanels		
855	Low Voltage Systems	SCE	June 12, 1981
	851 Plant Low Voltage System		
	853 RS Power Distribution System		
	856 Plant and Aircraft Warning Lighting System		
860	DC and UPS	SCE	May 10, 1981
	861 DC System		
	866 UPS System		
871	Heat Tracing System	SFDI (S-R)	June 19, 1981
876	Communication System		
880	Grounding Systems	SCE	March 6, 1981
	881 Grounding system		
	882 Equipment Grounding System		
	883 Instrument Grounding System		
	884 Collector Field Grounding System		
305	System Distributed Process Controllers (SDPC)	SFDI (MDAC)	July 1, 1981
	301 System Distribution Process Control System		
	321 Data Acquisition System (Interface)		
	331 Data Acquisition Remote Multiplexing System (Interface)		
	345 Meteorological and Collector Field Data System (Interface)		

		PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
340	Operating Control System 303 System Distributed Process Controllers/OCS Interface 311 Operational Control System 321 Data Acquisition System and OCS Interface 350 Infrared Scanning System	SFDI (MDAC)	July 1, 1981
360	Heliostat Array Controller 114 Heliostat Array Controller (Control Room Interface) 311 Opeating Control System/HAC Interface 321 Data Acquisition System/HAC Interface 345 Meteorological & Collector Field Data System 355 Receiver Trip/HAC Interface	SFDI (MDAC)	July 1, 1981
995	General Plant Safety	T&B (?) (MDAC)	March 1, 1981
1010	Receiver Stand Alone Test	SFDI (MDAC)	October 1, 1981
1020	Thermal Storage Stand Alone Test	SFDI (MDAC)	September 7, 1981
1030	Collector/Receiver Integrated Test	SFDI (MDAC)	October 10, 1981
1040	Integrated Solar System Test	SFDI (MDAC)	November 6, 1981

SOLAR ONE
ACCEPTANCE TEST PROCEDURE INDEX

	PREPARATION RESPONSIBILITY	IMPLEMENTATION DATE
1100 Manual Operatrion	SFDI (MDAC)	
1110 Model 1-Basic Normal	SFDI (MDAC)	December 1, 1981
1120 Mode 2-Basic Normal and Charging	SFDI (MDAC)	January 5, 1982
1130 Mode 3-Storage Boosted	SFDI (MDAC)	February 9, 1982
1140 Model 4-In-Line Flow	SFDI (MDAC)	January 20, 1982
1150 Mode 5-Charging Only	SFDI (MDAC)	December 18, 1981
1160 Mode 6-Storage Discharging	SFDI (MDAC)	December 18, 1981
1170 Mode 7-Dual Flow	SFDI (MDAC)	March 5, 1982
1200 OCS Controlled Operation	SFDI (MDAC)	
1210 Cascade Control and Plant Transitions	SFDI (MDAC)	April 1, 1982
1220 Coordinated Control and Plant Transitions	SFDI (MDAC)	April 20, 1982
1230 Clear Day Scenario	SFDI (MDAC)	May 7, 1982

4.2 PREOPERATIONAL TESTS

4.2.1 General

Test procedures are formal documents which provide detailed step-by-step instructions for the conduct of individual tests.

4.2.2 Purpose

This instruction provides the method for preparing, reviewing, approving and changing test procedures.

4.2.3 Scope

Procedures for Preoperational Tests shall be prepared in accordance with this instruction during the Startup Test Program.

Generic Tests for Electrical, Mechanical and Central Components are referenced in the SCE Startup Standards Section 5.0 and will be documented in attachments to the Preoperational Tests.

Special test procedures may be used during the test program for investigative purposes resulting primarily in data collection. These procedures shall be prepared, reviewed and approved in accordance with this instruction during the Startup Program. Sections within Preoperational Test Procedures can be dedicated to data collection instead of using a special procedure.

4.2.4 Test Procedure Responsibility

4.2.4.1 Preparation

Systems are identified in Attachment I using the Alpha-Numeric designators established by the scoped P&ID drawings.

Responsibility for the preparation of procedures is assigned primarily to the respective design organization.

More than one system can be included in a test procedure when the systems are clearly interrelated, i.e., Turbine Lube Oil System and Seal Oil System.

4.2.4.2 Review and Approval

The Test Working Group will review and approve all Preoperational Procedures.

4.2.5 Procedure Format and Contents

Test procedures shall include a title page with a signature block, a table of contents and the main body which shall be in the format shown below:

1.0 OBJECTIVES
2.0 ACCEPTANCE CRITERIA
3.0 REFERENCES
4.0 PREREQUISITES
5.0 LIMITS AND PRECAUTIONS
6.0 TEST EQUIPMENT
7.0 INITIAL CONDITIONS
8.0 PROCEDURE AND DATA COLLECTION
9.0 SYSTEM RESTORATION
10.0 ATTACHMENTS

4.2.5.1 Objectives

This section identifies the objective(s) the test is to accomplish. The objectives should be clearly stated, providing a concise non-quantitative description of the intent of the test.

The objectives will normally include some or all of the following:

a) Normal system and component startup (manual and automatic).

b) Normal system and component shutdown (manual and automatic).

c) System and component operation during appropriate operating modes.

d) Manual and automatic component operation from local and remote control stations.

e) Loss of instrument pneumatic fluid for safety related systems or if such loss causes some automatic function.

f) Loss of motive and control power, if the consequences of such losses are required by design document commitments.

g) Verification of system alarms both local and remote.

h) Verification of major system parameters.

i) Verification of system capacities (heat exchanger, battery, pump capacities, etc.).

4.2.5.2 Acceptance Criteria

The Acceptance Criteria section identifies the criteria which must be met to verify that system prformance is acceptable. Each listed criterion should identify the appropraite reference source and the step(s) in the procedure that verify the criterion has been satisified.

Acceptance criteria may be either quantitative or qualitative. Quantitative acceptance criteria specify system or equipment design values in accordance with design requirements (equipment specifications, etc.). These criteria state design values of process variables and equipment operating characteristics such as flows, temperatures, pressures, currents, voltages, etc., required under specified conditions. Such values are specified as maximums, minimums, or design values with appropriate tolerances provided. Quantitative data may appear with data collection as an attached data sheet.

Qualitative acceptance criteria specify system or equipment design functions (an event does or does not occur) such as automatic start, sequencing, or shutdown occuring under specified conditions.

4.2.5.3 References

The Reference section lists those documents necessary to support the procedure's objectives and acceptance criteria.

References are identified by document title, number, and revision (number and/or date), as appropriate. Documents which have not officially been logged as project documents should not be used as references. This section may include the following documents:

a) Pilot Plant System Description (RADL Item 2-1)

b) Logic Diagrams

c) Flow Diagrams

d) Single Line Diagrams

e) Single Line Meter and Relay Diagrams

f) Piping and Instrument Diagrams

g) Electrical Elementary Diagrams

h) Instrument Index

i) Material Requisition and/or Specification

j) Supplier Data

Additional reference headings are added, as required.

4.2.5.4 Prerequisites

The Prerequisites section identifies those activities (tests, inspections, calibrations, etc.) required to be completed, at anytime, prior to performance of the test. Initial conditions (those conditions which must exist at the start of testing), system alignment, temporary modifications, and support system requirements are not prerequisites but are considered in the Initial Conditions section.

The Prerequisites section also identifies those activities required to be completed on the system prior to performance of the test. This section will normally include the following specific prerequisites and descriptive paragraphs:

a) Master Tracking System (Turnover Punch List)

The MTS has been reviewed and outstanding items (if any) will not affect this test. A summary list of outstanding items is attached.

b) Temporary Modifications

The log of temporary modifications has been reviewed, is current, and is satisfactory for this test. (See "Abnormal Equipment & Circuits.")

c) System Tests

Additional system level prerequisites are added as required.

d) Component Level Prerequisites

Identifies those activities required to verify completion of prerequisite and generic testing on components.

e) Turnover Documentation

Ensure system turnover for preoperational testing is in accordance with 5.4 Equipment Release Procedure.

4.2.5.5 Limits and Precautions

The Limits and Precautions section provides forewarning of hazardous situations that may develop and equipment operating limitations to be observed during performance of the test. Only those precautions that are generally pertinent to the entire test are listed in this section. Specific precautions are included in the text of the procedure as CAUTION statements just prior to the step which they apply. Technical Specification Limits shall be specified as CAUTION.

The section may also include General Administrative Notes which provide additional information necessary or useful for the successful performance of the test, such as testing philosophy, special instructions, definitions, etc. General Administrative Notes may be included in the body of the procedure just prior to the steps to which they apply and are designated NOTE.

4.2.5.6 Test Equipment

This section identifies the temporary equipment required to conduct the test and collect data.

Test equipment installed or used in the performance of the test is listed by descriptive name (including range, accuracy, and service conditions) or by manufacturer make and model number. This section may include the following sub-section headings:

a) Indicating Instruments

b) Sensors and/or Transducers

c) Recording Equipment

4.2.5.7 Initial Conditions

The Initial Conditions section describes those conditions necessary before testing can start. this will normally include:

a) Temporary installations necessary to the start of the test.

b) Identification and operational status of interfacing systems and components necessary to support the testing of the systems.

c) Specification of the initial alignment and status of the components within the system under test.

d) Environmental conditions which simulate those the system will experience during normal or accident situations when necessary to adequately test the equipment. Normally, environmental conditions will be ambient.

e) Requirements to ensure that the plant is capable of supplying water of acceptable quality and quantity for the test.

4.2.5.8 Procedure and Data Collection

The Procedure and Data Collection section provides the detailed step-by-step instructions required to demonstrate test acceptance criteria are satisified and to obtain baseline operating data. The instructions must include activities that demonstrate system and component performance meet acceptance criteria.

This section is subdivided by headings for the purpose of procedure organization and clarity at the writer's option. However, it is recommended these subdivisions follow the physical characteristics of the system and the various modes of testing. Each subdivision consists of a continuous series of operations prepared under the assumption that testing, once started, will be carried to completion without interruption.

System performance parameters should be determined by one of the following methods, listed in order of preference:

a) Directly measuring the required parameters using installed permanent plant instruments.

b) Directly measuring the required parameters using test instruments.

c) Calculating the required parameters directly from measured variables (e.g., calculating pump flow by measuring the time required to pump a measured quantity of liquid).

When the Startup Engineer is expected to

calculate the value in the field, an equation must be provided.

d) Calculating the required parameters indirectly from measured variables (e.g., measuring pump head and obtaining pump flow from a certified pump curve).

Test data is normally recorded in the body of the procedure immediately following the steps that set up the required test conditions and adjacent to acceptance criteria where practicable. However, where extension or repetitive lists of data are required, data sheets may be used.

Where appropriate, the Procedure section should reference the Station operating or emergency procedures to accomplish certain Evolutions.

4.2.5.9 System Restoration

This section contains steps to return the system to a condition that satisifies existing plant operating requirements. Temporary modifications shall be controlled by "Abnormal Equipment and Circuits", 5.2.6.2

4.2.5.10 Attachments

This section contains data sheets, pertinent references, applicable equations, necessary consultants, and calculational techniques, etc., as required.

4.2.6 Test Procedure Format

The test procedure main body is prepared using the format described below:

4.2.6.1 Layout

There are various levels of headings in the test procedure denoted as follows:

1.0 MAJOR SECTION (UPPER CASE)

1.1 Subsection (Upper & Lower Case)

1.1.1 Sub-Subsection (Upper & Lower Case)

1.1.1.1 Sub-Sub-Subsection (Upper & Lower Case)

Procedure items or steps are provided under any of the above headings by using lower case alphabetic characters.

4.2.6.2 Sign Off

In the margin beside each test procedure stop, for which a significant action must be taken, a verification and date block is provided as follows:

INITIAL	/	DATE

4.2.6.3 Page Numbering

The text is paginated sequentially using Arabic numerals. The procedure number, revision number, page number, and total number shall appear in the bottom right hand corner of each page.

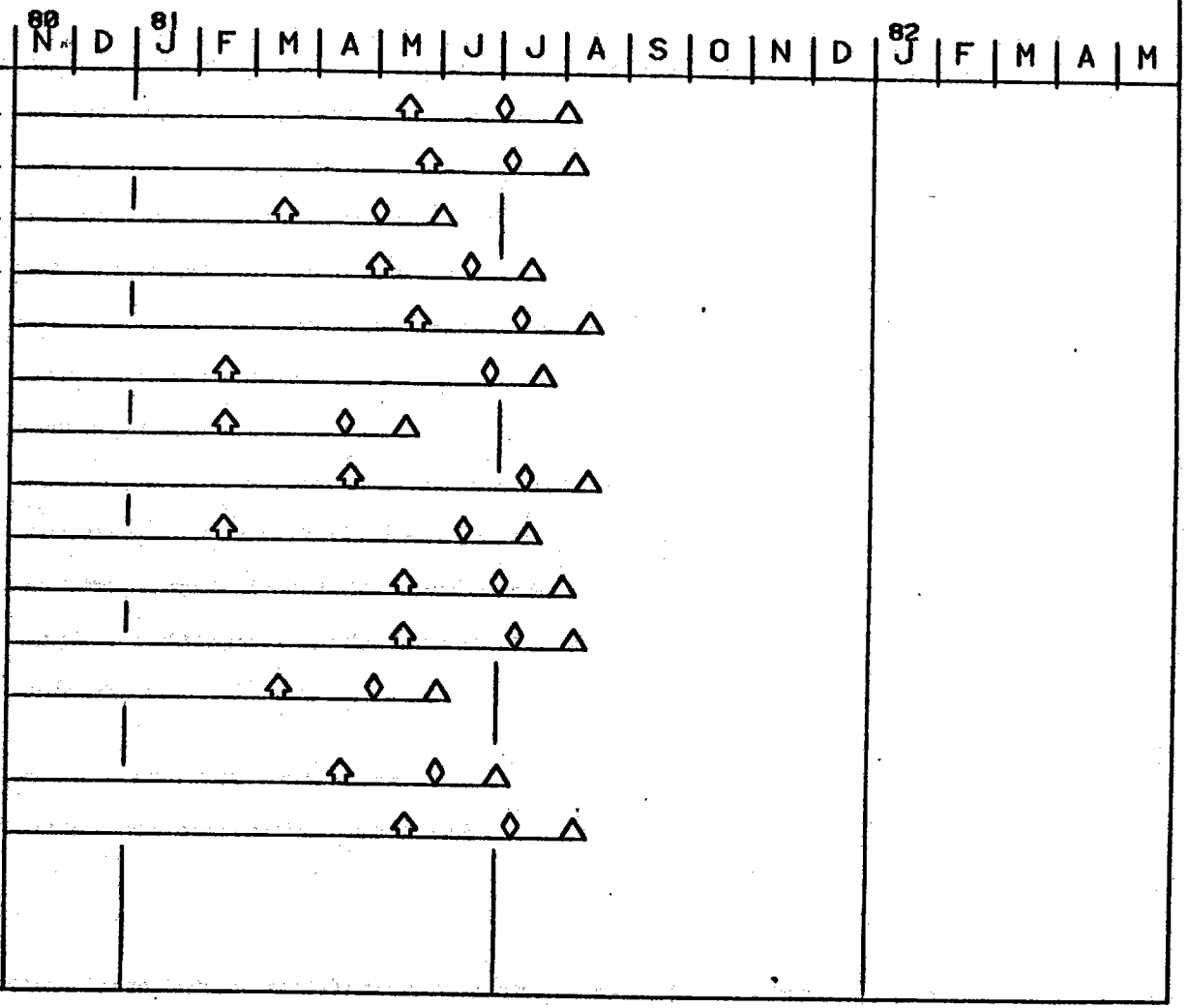
4.2.6.4 Notes and Cautions

Where used in the text, a note statement is preceded by the word NOTE typed in capital letters and centered above the note statement. When a caution is required, the entire statement will be typed in capital letters with the word CAUTION centered above the statement.

4.3

10 MWe SOLAR PILOT PLANT
PROCEDURE DEVELOPMENT SCHEDULE

Sept. 24, 1980



000	RECEIVER SYSTEM
100	COLLECTOR SYSTEM
150	BEAM CHARACTERIZATION SYSTEM
205	THERMAL STORAGE OIL SYSTEM
250	THERMAL STEAM SYSTEM
905	NITROGEN SYSTEM
930	FIRE PROTECTION SYSTEM
405	MAIN/ADMISSION STEAM
420	MISC. STEAM SYSTEMS
505	CONDENSATE SYSTEM
550	FEEDWATER SYSTEM
600	CIRCULATING WATER SYSTEM
705	TURBINE GENERATOR - MECHANICAL SYSTEMS
750	TURBINE GENERATOR - ELECT AND CONTROL SYS

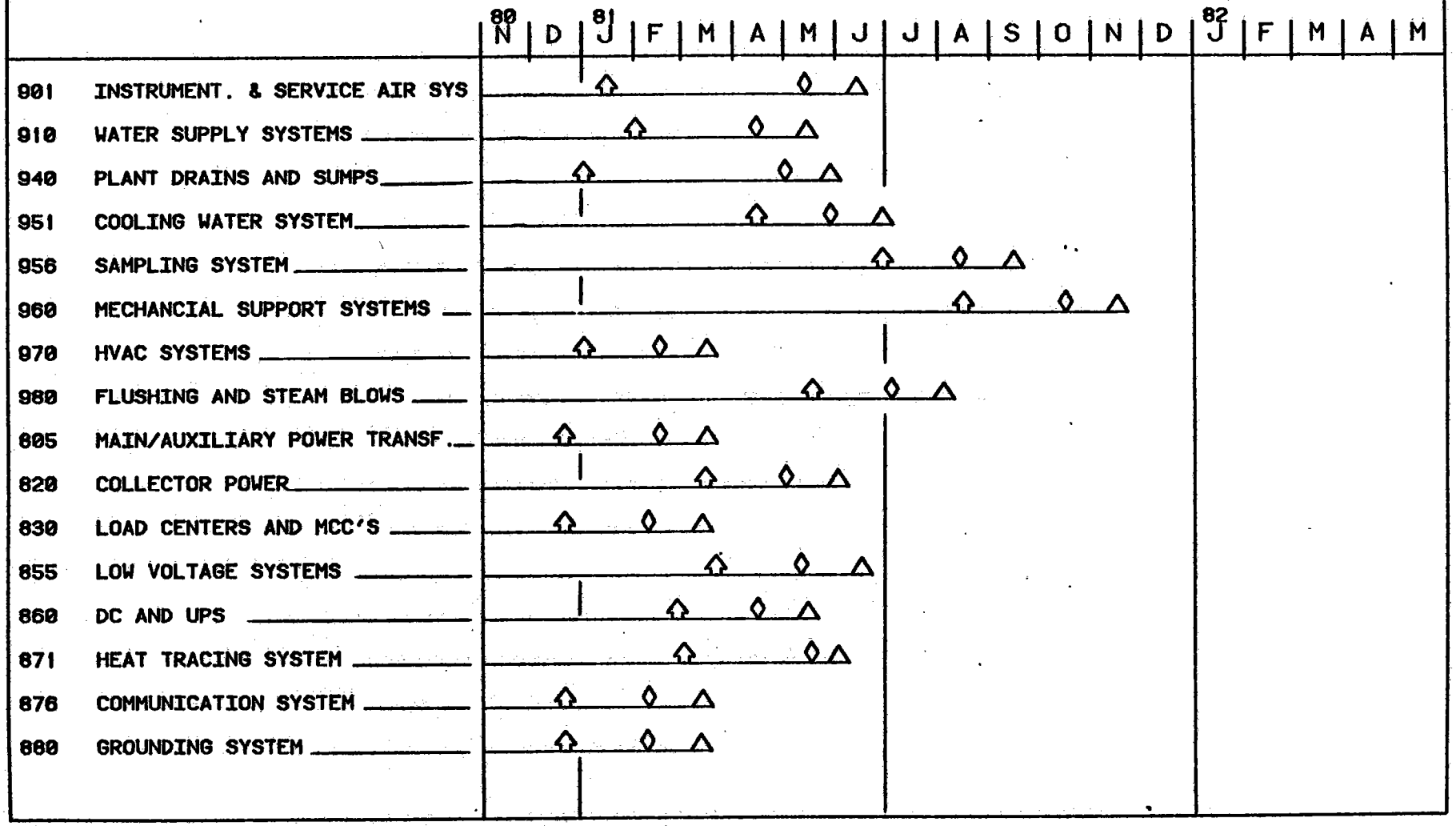
PREPARED BY: T.J. MAYS, EXT. 2795

⇧ - SUGGESTED FIRST DRAFT DATE
◊ - TWG FINAL REVIEW
△ - IMPLEMENTATION OF PROCEDURE

4.3

10 MWe SOLAR PILOT PLANT
PROCEDURE DEVELOPMENT SCHEDULE

Sept. 24, 1980

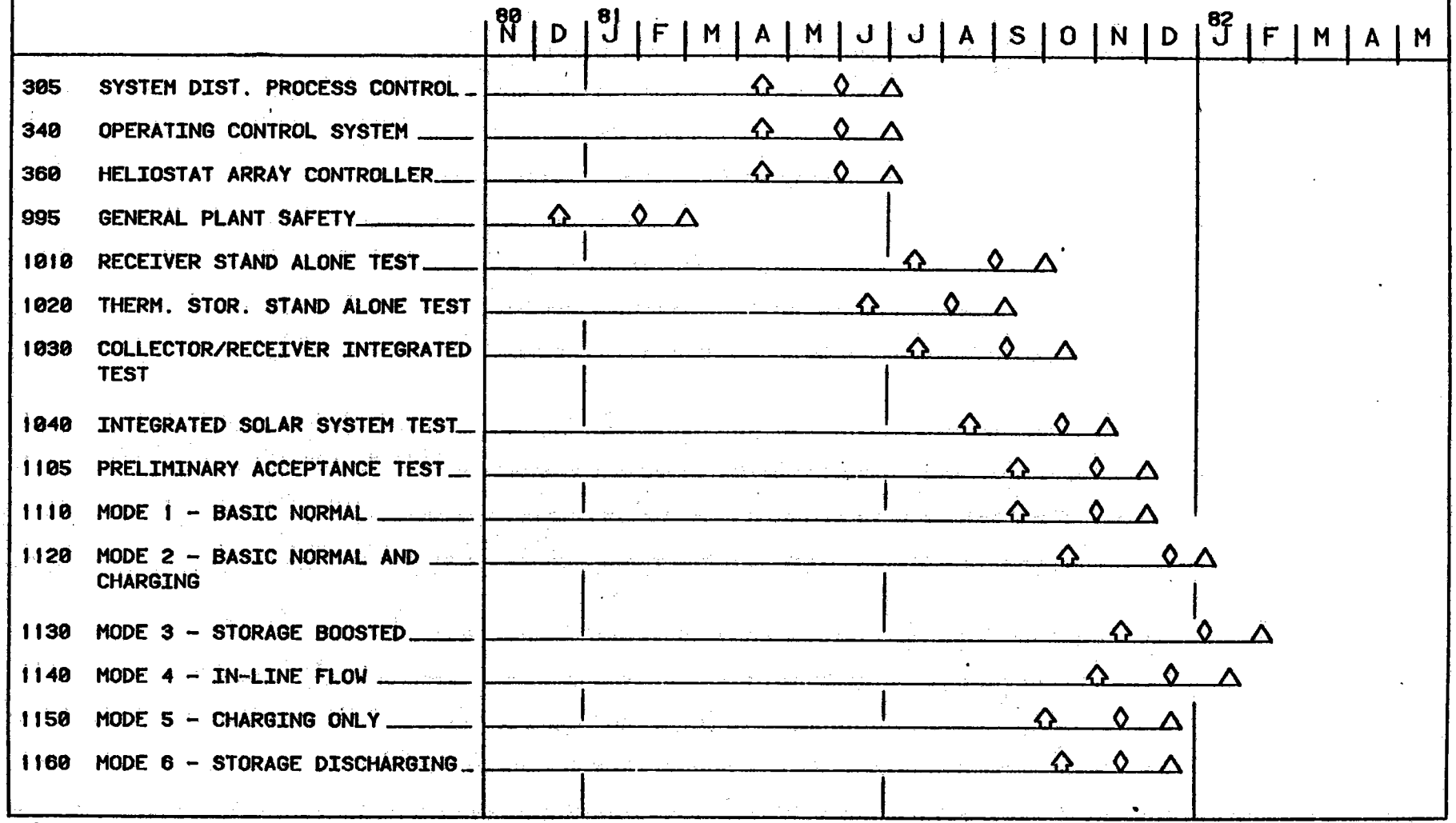


⇧ - SUGGESTED FIRST DRAFT DATE
◊ - TWG FINAL REVIEW
△ - IMPLEMENTATION OF PROCEDURE

4.3

10 MWe SOLAR PILOT PLANT
PROCEDURE DEVELOPMENT SCHEDULE

Sept. 24, 1980



△ - SUGGESTED FIRST DRAFT DATE
◊ - TWG FINAL REVIEW
△ - IMPLEMENTATION OF PROCEDURE

4.3

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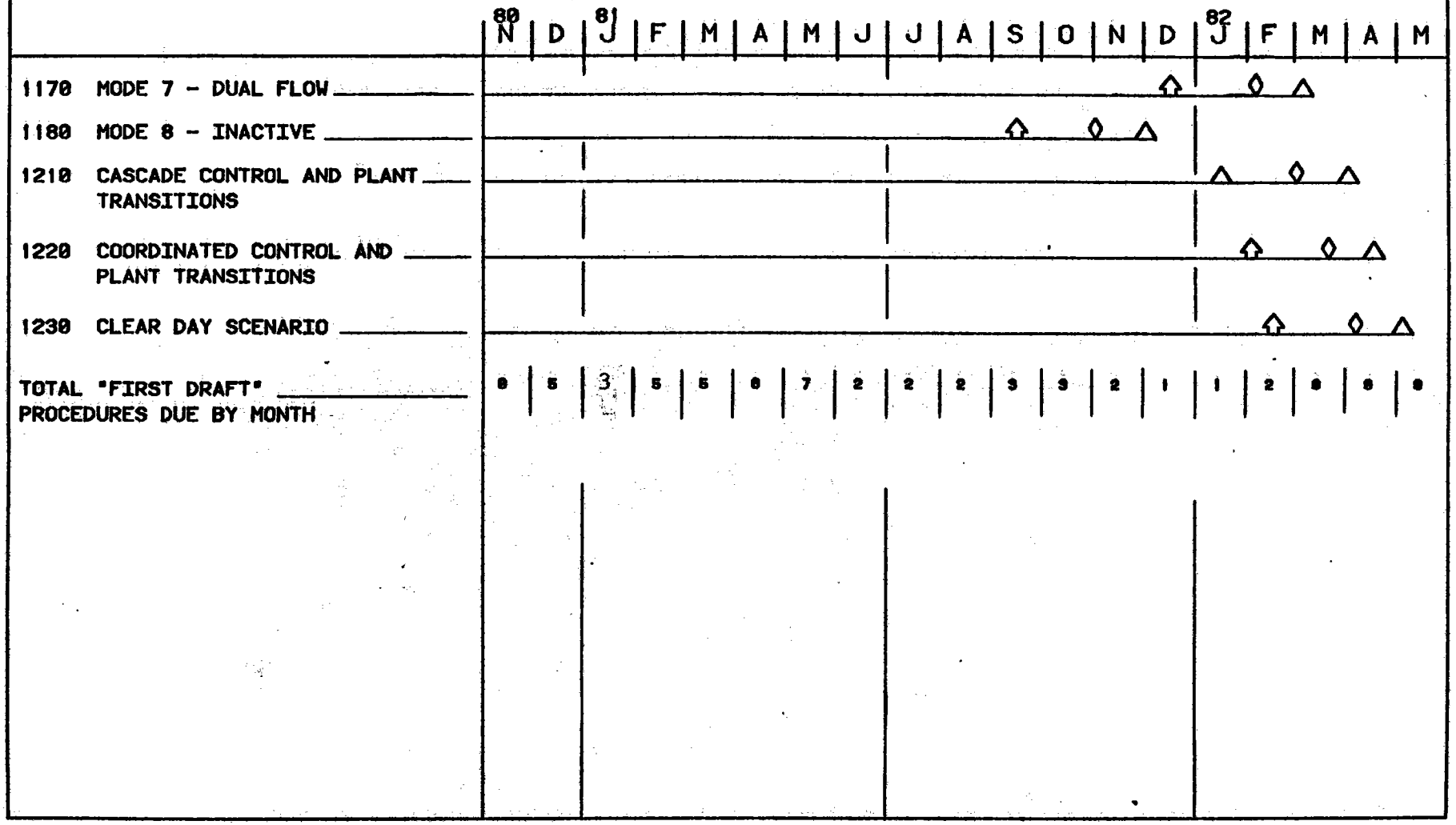
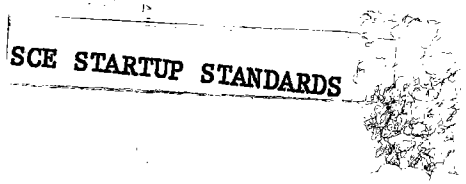
PROCEDURE DEVELOPMENT SCHEDULE

Sept. 24, 1980



△ - SUGGESTED FIRST DRAFT DATE
◊ - TWG FINAL REVIEW
△ - IMPLEMENTATION OF PROCEDURE


SCE STARTUP STANDARDS

SCE STARTUP STANDARDS

SECTION 5.1

ORGANIZATION AND RESPONSIBILITIES

CONTENTS

5.1 ORGANIZATION AND RESPONSIBILITIES

5.1.1 General

Plant Startup is defined as that period of time between the final stages of construction and the date of firm operation.

The Startup Organization consists of a Project Startup Engineering Supervisor and a number of Startup Engineers to supervise the initial placing in service and operation of all systems and equipment. The Project Startup organization will be assisted by Design Engineers and other Engineers as required to bring the startup to a successful conclusion.

5.1.2 Purpose

This section proposes to clearly define the responsibilities of the Startup Engineers, Contractors, Vendors and other individuals associated with startup. This section also proposes to define the organizational relationships required for a coordinated and comprehensive startup program.

5.1.3 Responsibilities

The Project Startup Engineering Supervisor (PSES) has the overall responsibility for startup.

The PSES is responsible for startup operations, performance tests and demonstrations and final functional check of all systems and equipment. Startup will begin during the final stages of construction and continue through firm operation. The PSES's responsibility will terminate when all equipment and units are placed on a firm operation status.

5.1.3.1 Project Startup Engineering Supervisor (PSES)

a) The PSES, or his designated representative, will remain "onsite" or "on-call" continuously from the initial operation of the first system or equipment through to firm operation of the final unit.

b) The PSES and his assistant will plan, coordinate, direct, and supervise all startup operations. These activities include, but are not necessarily limited to the following functions:

1) Plan, coordinate and supervise all startup operations.

2) Schedule all startup operations consistent with the Master Construction Schedule.

3) Coordinate Contractor and Vendor startup activities.

4) Maintain a current schedule of Startup Engineers and Vendor Representatives to insure adequate startup coverage.

5) Maintain a current address and telephone list of all personnel associated with startup.

6) Coordiante with the Supervisor of Operation and Maintenance (SOM) to insure adequate operator manning requirements.

7) Verify that all startup activities are conducted in accordance with established and approved procedures.

8) Maintain safe working conditions and insure strict adherence to safety rules and regulations.

9) Monitor systems and equipment performance. Insure that all systems and equipment meet the performance design criteria.

10) Analyze and identify equipment problem areas and initiate action for correction.

11) Provide necessary maintenance for all EPGS equipment to insure continuous and reliable service to firm operation. Such maintenance provided to be that beyond the scope or reasonable capability of the Station Maintenance and Technical Forces. Initiate requisition to purchase service, equipment and materials.

12) Process in service equipment outage requests on an approved Edison Form (OD-16).

13) Prepare and distribute programs and instructions for major startup activities.

14) Schedule and chair all Test Working Group Startup Meetings.

15) Prepare and distribute Weekly Startup Schedules and Weekly Progress Reports.

16) Maintain chronological diary of all startup activities.

17) Conduct demonstration and performance tests.

18) Prepare Startup Reports

c) All Contractor Vendor Representatives associated with Startup will report to the PSES for coordination.

d) The PSES will accept systems and equipment released for startup from the Project Construction Engineer. All systems and equipment shall be released from Construction on an approved release form with boundaries, parameters and deficiencies defined. Released systems and equipment will be checked out by the Startup Engineers and if sufficiently complete will be placed in a startup mode, after being released to startup for operation and testing.

5.1.3.2 Startup Design Engineers

The Startup Organization will be supported by SCE Design Engineers as required. While assigned directly to Startup, these Engineers will report directly to the PSES for assignment.

5.1.3.3 Lead Electrical Startup Engineer

Coordinates and directs electrical testing by SCE contractors, vendors and/or Southern California Edison Company personnel. Reviews test results by DOE Contractors to confirm acceptability for Equipment Release.

5.1.3.4 Lead I&C Startup Engineer

Coordinates and directs all instrument and controls functional testing by SCE contractors, vendors, and/or Southern California Edison Company personnel. Reviews test results by DOE Contractors to confirm acceptability for Equipment Release.

5.1.3.5 Lead Mechanical Startup Engineer

Coordinates and directs initial startup of all mechanical equipment, preoperational cleaning of piping systems and vessels. Directs Southern California Edison Company personnel, vendor representatives, Service Enginers and certain craft labor in the fulfillment of startup operations and related functions. Reviews test results by DOE Contractors to confirm acceptability for Equipment Release.

5.1.3.6 Concept

All major equipment vendors and contractors are responsible for the proper installation of their respective equipment within the scope of their contracts with DOE or SCE. Any deviations shall be approved by the respective engineering departments. The PSES shall be notified of all changes. The installation of systems and equipment will be monitored by Construction Engineers and the PSES to insure compliance with contractors and vendors contractual obligations. All contractor and vendor drawings, instruction manuals, information bulletins and other material shall be available to the PSES for his information and files.

5.1.3.7 Station Operating Personnel

The station operating personnel will operate all permanent plant equipment under the supervision of the SOM as directed by Startup Engineers. Operation by plant personnel will begin when the system and/or equipment is released from the PSES to the Station for operation. The SOM is responsible for the following:

a) Provides sufficiently trained operating personnel to operate all permanent plant equipment for the beginning of startup through firm operation.

b) Accepts equipment formally released from the PSES, providing such equipment meets the standard requirements for operation.

   1) Posts release tags on all released systems and equipment.

   2) Maintains records of released equipment.

   3) Issues necessary clearances on released equipment and posts clearance tags.

   4) Maintains records of outstanding clearances.

c) Provides technical assistance to monitor and maintain chemical limits in process systems during the entire startup consistent with standard practices.

d) Assists the Project Engineer in defining procedures and rules for general housekeeping and safety.

e) Provides competent maintenance and technical personnel to maintain, calibrate, tune and adjust equipment released for startup operations. Such services to be rendered to the limit of Station resources and to be provided from first date of release for startup operations to firm operating date.

5.1.3.8 Service Engineers, General

All DOE Contractor(s), Subcontractor(s), Vendor(s) and Consultant(s) participating in the startup program are included in this category. General responsibilities applicable to all Lead Service Engineers include:

a) Provide a current print file and technical support information on the equipment for which he is responsible.

b) Provide written procedures far enough in advance of initial start of equipment to give the PSES time for review and comment of the procedure.

c) Provide technical personnel to meet equipment operational schedules and operator training.

d) Adjust and tune instruments and controls from initial operation to completion of contractual obligation.

e) Provide a current personnel call list to the SCE Field Office Administrator.

f) Provide a current information for the Mechanical and Instrument Data Sheets.

g) Provide instrument set point data for controllers, transmitters, receivers, indicators and pressure switches.

h) Within the scope of contractual responsibility, originate requisitions against appropriate purchase orders for replacement parts and expedite delivery to meet Startup Schedules.

i) Maintain a work item list which includes estimated material delivery date and type of outage required for the work.

j) Be prepared to provide coverage with technical personnel as required during critical periods of operation.

k) Attend and participate in information and planning meetings called or scheduled by the PSES.

l) Coordiante all engineering design and "as-built" discrepancies.

m) Coordinate release of all equipment for which they are responsible.

n) Work in close cooperation with the PSES and his representative.

o) Perform mechanical equipment check out, instrument calibration, set point adjustments and electrical check out prior to operation.

p) Provide operational supervision as required by respective contracts.

5.1.4 Night Orders

Night Orders will be issued by the PSES to SCE Operations and all concerned contracto personnel covering startup activities after normal working hours and/or weekends. These orders are issued to coordinate startup activities and will detail any specific startup requirements.

SCE Operations will return their copy to the PSES by 7:00 a.m. the following day.

STARTUP NIGHT ORDERS

SOLAR ONE GENERATING STATION

The instructions listed below are to be carried out during Evening Shift hours:

Signed_____ Date_____

Project Startup Engineering Supervisor

SCE STARTUP STANDARDS

SECTION 5.2

ADMINISTRATION AND RECORDS

CONTENTS

5.2 Administration and Records

5.2.1 General

The administrative procedure for Startup provides the means to accomplish these objectives:

a) Maintain design and construction information, operating instruction, prints, plans and procedures in a current and readily accessible condition for the personnel responsible for startup activities.

b) Record and maintain the results of preoperational check out tests and initial operation of plant equipment, and the progress of startup activities for continuous evaluation of the startup program.

c) Record actual and equipment performance data during startup for comparison with design data and comparison with later operating results.

5.2.2 Purpose

This procedure describes the administrative practices, recording and reporting requirements for startup.

5.2.3 Responsibilities

5.2.3.1 Project Startup Engineering Supervisor

Is responsible for the administration of startup activities and recording and reporting startup information. In addition, the PSES is responsible for providing information and data on equipment and activities for the completion of the records and reports described in this procedure.

5.2.3.2 The Southern California Edison Company Steam Generation Division

Is responsible for:

a) Collecting and maintaining the normal unit operating records.

b) Submitting maintenance work lists on a daily basis for all systems released for operation.

c) Maintaining an adequate force to operate and maintain equipment and systems according to the current Startup Schedule and requirements of the PSES.

d) Maintain temporary records as required.

5.2.3.3 The Lead Service Engineer/Contractor Representatives

Are responsible for:

a) Checking out the equipment prior to the operational release.

b) Preparing work orders to accomplish necessary completion and maintenance work on systems and equipment.

c) To provide instrument and Equipment Data Sheets and update them weekly. (Blank forms are available from the PSES.)

d) To provide all necessary facts and data pertaining to the formulation of a trouble or incident report prepared by the PSES.

5.2.4 Communications

Communications are essential throughout the startup period to disseminate information, coordinate startup activities and for the protection of personnel and equipment. As startup activities progress, formal and information meetings will be scheduled to discuss procedures, methods, and the participation of groups and individuals in startup activities.

a) Formal meetings will be scheduled by the PSES prior to the initial startup of any major equipment, prior to the scheduling of an event involving several manufacturers, and whenever an event occurs which affects a timely scheduled completion of start-up activities.

b) Informal meetings will be held daily by the PSES, after startup activities commence, to discuss planned operations and any details for the ensuing 24 hours period. Prior to any test or unusual operation, the details, limitations and safety precautions will be discussed with the plant operators and contractor representatives.

c) Minutes of formal startup meetings will be maintained by the PSES.

5.2.5 Reports

5.2.5.1 Daily Progress Reports

Daily Progress Reports, if required, will be prepared beginning with initial startup and continue

through firm operation. Daily reports will cover developments of the proceeding 24 hours and forecast activities for the succeeding 24 hours.

5.2.5.2 Weekly Progress Report

The Weekly Startup Progress Report is prepared to provide all startup and management personnel wtih an official documentary on startup progress. The report will continue each week until commercial operation. This report will be keyed to the Master Startup Schedule.

Originator

PSES

Distribution

a) Steam Generator Division

b) Project Manager

c) Project Construction Superintendent

d) Field Office Administrator

e) Station SOM

f) Field Personnel, as required

5.2.5.3 Field Startup Schedules

These schedules will be required when deviating from the Master Startup Schedule or when startup circumstances require interim schedules.

Originator

PSES

Distribution

a) Project Construction Superintendent

b) Station SOM

c) Field Personnel, as required

5.2.5.4 Memorandum for File

This represents the equivalent of a trouble or incident report. A "Memorandum for File" shall be prepared as soon as practical after incidents such

as equipment failures, plant malfunctions, and accidents occur.

Originator

PSES

Distribution

a) Project Construction Superintendent

b) Field Personnel, as required

5.2.5.5 Plant Work List

A plant completion and maintenance work list wll be maintained at all times. This list will include work description, name of originator, outage requirements, and approval signature. No work will be accomplished unless approved by the PSES.

Originator

PSES

Distribution

a) Project Construction Superintendent

b) Station SOM

c) Field Personnel, as required

5.2.6 Records

5.2.6.1 Chronological Diary

The official Startup Diary will be maintained by the PSES. Daily entries will be made to reflect pertinent plant start-up activity and progress.

5.2.6.2 Abnormal Circuit Log

Southern California Edison Company Operations, under the direction of the Lead Electrical Startup Engineer, will maintain a current abnormal circuit log. This log shall list all jumpers installed, leads lifted, or other circuit abnormality, name of the responsible party, reason for abnormality and date.

5.2.6.3 Mechanical Equipment Data Sheets

Individual equipment data sheets will be maintained by the PSES. The appropriate Lead Service Engineer is responsible for supplying equipment nameplate data and for performance data on equipment for which he is responsible.

Distribution

a) PSES

b) Station SOM

5.2.6.4 Hydrostatic, Pneumatic and Static Test Sheets

Hydrostatic, Pneumatic and Static Test Sheets will be initiated and completed by the Responsible Construction Engineer. The completed sheets will be transmitted to the PSES who will maintain them in the files until completion of the Project. Copies of Hydrostatic, Pneumatic and Static Test Sheets should accompany equipment releases.

5.2.6.5 Instrument Set Point Data Sheets

Initial calibration of all plant instrumentation is the responsibility of the appropriate contractor representative. The instrument calibration/setting will be transmitted to the respective data sheet maintained by the PSES on a weekly basis.

Distribution

a) PSES

b) Station SOM

5.2.6.6 Electrical Data Sheets (Form 142)

The Lead Electrical Startup Engineer is responsible for delivering to the PSES a Form 142 for each circuit completed. The individual circuits to be included are itemized in the Electrical Startup Schedule. Two categories of construction completion are recognized: (a) that completed by the Test Crew, and (b) that completed by Construction (see test responsibility). Form completion after testing is the responsibility of the PSES.

Originator

Lead Electrical Startup Engineer

Distribution

a) PSES

5.2.6.7 Rotating Equipment Alignment Data

Project Construction Engineer will originate the rotating equipment alignment data. A copy of the Equipment Alignment Sheet will accompany the Construction Release Sheet.

Distribution

a) PSES

5.2.6.8 Equipment Release Sheet (Refer to Section 4)

This document is prepared by the contractor and passed on to the Project Construction Engineer and includes the items listed on the Master Startup Schedule and is accordingly numbered. All construction deficiencies shall be listed. It is transmitted to the PSES, who will check out the released equipment or systems. Next the PSES will pass on the release to the Station Superintendent, or his representative, who will again check out the equipment of the systems, at the same time noting any deficiencies not previously listed, and hanging Equipment Release Tags. Signatures of Contractor, Construction Engineer, Startup Engineer and Station Representative are required on the release form before operation of equipment or systems.

Originator

Construction Engineer

Distribution

a) PSES

b) Station Superintendent

5.2.6.10 Startup Work Requests

All work to be performed by the Construction forces after construction equipment release must be approved by the PSES. This mandate starts when the Construction Engineer delivers the "Release Sheet" to the PSES. Work requests will be initiated by the Lead Service Engineers, Operating Foremen, Startup

Engineers, and Design Engineers. Determination of payment for work accomplished lies jointly between the PSES and the responsible Construction Superintendent and appropriate Lead Service Engineer.

Originator

Lead Service Engineer, Operating Foremen, Startup Engineer, Design Engineer

Approval

PSES

Distribution

a) Project Construction Superintendent

b) Project Cost Engineer

c) File

5.2.7 Final Startup Records

The PSES will prepare the final Startup records, containing the following:

a) Summary of startup, including chronology of key activities and jobsite personnel

b) Startup schedule record

c) System and equipment cleaning records

d) Steam blow records

e) Hydrostatic, Pneumatic and Static Test Records

Distribution

a) Station SOM

b) Engineering files

SCE STARTUP STANDARDS

SECTION 5.3

CLEARANCE PROCEDURES

CONTENTS

5.3 Clearance Procedures

5.3.1 General

After startup operations are initiated, equipment and systems will be transferred, as they become available, from a construction to an operating phase. At this time, construction workers are accordingly restricted in their activities with respect to equipment on which they can work and must obtain a suitable equipment clearance before working on such operating equipment.

5.3.2 Purpose

This procedure is designed primarily to protect personnel from injury and, secondarily, to prevent damage to plant equipment after startup operations are initiated.

5.3.3 Responsibilities

5.3.3.1 Southern California Edison Company Project Startup Engineering Supervisor

a) Provide a current list of personnel authorized to take operational clearances and issue craft clearances.

b) Administer and control the clearance procedure and insure compliance with its provisions.

c) Take, hold and release operational clearances.

d) Keep Southern California Edison Operations advised of craft clearances in effect.

e) Issue all craft clearances required before any work is performed on the equipment or systems turned over by Construction.

f) Direct the restoration of operational status of equipment and systems following the release of operational clearances.

5.3.3.2 Southern California Edison Company Operations

a) Issues operational clearances to the Startup Engineer, and accepts their release when rendered.

b) Maintain the official operational clearance log.

c) Maintain a current file on all operational clearances in process and in effect.

d) Perform all operational work required to effect operational clearances and to restore systems and equipment after clearances are released.

5.3.3.3 Contractor Personnel

a) Submits clearance request to the Startup Engineer in the form of a craft tag properly filled in and signed. Every effort should be made to submit clearance requests to the Start-up Group 24 hours in advance of the scheduled work.

b) Upon receipt of the craft clearance stub, assures safe-to-work conditions and supervises corrective work.

c) Defines boundaries of craft clearance to construction personnel.

d) Inspect systems and equipment at the conclusion of work and verifies operational integrity before releasing the craft clearance.

5.3.3.4 Southern California Edison Company Maintenance Personnel Assigned to the Project

Whenever Southern California Edison Company maintenance personnel require a clearance to perform work on equipment or systems, the same procedure set forth in Section 5.3.4 will apply.

5.3.4 Clearance Procedure

The procedural steps in taking and releasing operation and craft clearances are stated below and outlined in the flow chart accompanying this procedure (Appendix A).

5.3.4.1 Clearance Requester

Submits clearance request to Southern California Edison Company Startup Engineer in the form of a craft tag with two attached stubs, properly filled out and signed.

5.3.4.2 Startup Engineer

Receives the craft clearance request and checks the effect on operations. Determines that the craft clearance will not interfere with operations, and requests an operational clearance.

5.3.4.3 Operations

Clears equipment. Hangs operational clearance "Buddy Tags" and craft tag. Notes number and location of "Buddy Tags" on back of operational clearance tag. Makes log entry and files operational clearance tag. Informs the Startup Engineer that clearance is ready for issue.

5.3.4.4 Startup Engineer

Verifies boundaries and safety clearance. Remove craft clearance stubs from craft clearance tag. Attaches craft control stub to operational clearance stub and issued craft clearance stub to requester.

5.3.4.5 Clearance Requester

To release a craft clearance, he receives the craft clearance stub from Craft Foreman, inspects the system or equipment for completion of work and operational integrity, and returns the craft clearance stub to the Startup Engineer.

5.3.4.6 Startup Engineer

Verifies the completion of work and lifts the craft clearance tag. Releases the operational clearance, and instructions Operations as to required equipment status. CAUTION: ALL CRAFT CLEARANCES MUST HAVE BEEN REMOVED PRIOR TO RELEASE OF OPERATIONAL CLEARANCE.

5.3.4.7 Operations

Removes all operational clearance tags. Files or destroys tags and stubs.

5.3.5 Precautions

a. Before equipment is turned over to Southern California Edison for the first time, all construction tags will be removed. The Startup Engineer shall be responsible for obtaining clearances on valves, switches, circuit breakers, etc., isolating all sources of energy in such a manner that untagged equipment cannot become hazardous.

b. Construction or SCE maintenance personnel cannot perform any work on equipment tagged with a release tag reading: "This Equipment Has Been Turned Over to the Southern California Edison Company," unless they hold a craft clearance on the equipment.

NOTE: IN SOME INSTANCES, LIMITED WORK CAN BE ACCOMPLISHED UNDER A "PERMISSION." PERMISSIONS FOR WORK ARE ISSUED BY THE CONTROL OPERATOR (WITH APPROPRIATE LOG BOOK ENTRIES ACCOMPANIED BY SIGNATURES OF SCE MAINTENANCE PERSONNEL OR SERVICE ENGINEER) FOR WORK THAT IS ORDINARILY PERFORMED WHILE EQUIPMENT IS ROTATING, ENERGIZED OR PRESSURIZED. EXAMPLES: ADJUSTING PUMP PACKING. CERTAIN INSTRUMENT WORK. PERMISSIONS MUST BE RELEASED ON THE DAY THEY ARE GRANTED.

c. All clearance tags shall be filled out completely. Blank tags are not to be used and shall be considered not valid.

d. Contractor and SCE Personnel requesting clearances shall be given the craft clearance stubs of the tags to hold in their possession until they are ready to have the equipment released. The stub numbers shall be matched with the tag numbers before the tags are removed. Only the man originally obtaining the clearance shall release the equipment. Craft tags shall be hung last and removed first.

e. The craft tag shall be attached with the operational clearance "Buddy Tag" on the electrical breaker or where the isolation of the system or equipment can be certified as safe for work within the boundaries of the clearance as determined by the clearance requester.

f. More than one craft clearance may be issued under one operational clearance.

g. NO CRAFT SHALL WORK UNDER THE CLEARANCE OF ANOTHER CRAFT.

h. No service organization or company shall work under the clearance held by another service organization or company.

i. Clearing mechanical equipment, such as motor driven pumps, shall require that the motor starter or circuit breaker be cleared by opening the disconnects of the starter or racking out the circuit breaker; also, the control circuit must be cleared by opening the control switch at the starter or breaker compartment. In every instance fuses shall be pulled where provided.

j. Under no circumstances shall there be a craft clearance tag hung without an operational clearance tag.

k. The Startup Engineer removing the last craft clearance tag is responsible for releasing of the operational clearance, the operational clearance is not to be used to keep equipment out of service.

1. No clearance boundaries shall be altered without the approval of the Startup Engineer.

5.3.6 Release of Systems and Equipment by Construction to Startup

a. When the construction of a system or equipment has ben completed, a release signed by the Contractor noting all construction deficiencies will be forwarded to the Project Construction Engineer. The Project Construction Engineer will transfer the system or equipment to Startup with a written release to the Startup Engineer. Copies of hydrostatic, pneumatic and static test data sheets and alignment and mechanical data sheets shall accompany this release if applicable. A P&ID marked to clearly show boundaries of the release shall accompany the release.

b. The Project Construction Engineer Receiving a release shall check out the system or equipment to satisfy himself of its operational integrity, list any deficiencies not previously listed, endorse the release and relay it to the Startup Engineer requesting boundary clearances as appropriate.

c. The Startup Engineer will inspect the released equipment, list any deficiencies not noted previously, and if satisfied with its operational readiness, release it to operations.

d. Southern California Edison Company Operations will inspect the released equipment and, if satisfied with its operational readiness, tag the equipment with release tags reading: "This Equipment Has Been Turned Over to the Southern California Edison Company."

d. Initial operation can be accomplished only when the foregoing Steps "a" through "d" have been completed. WARNING: BE SURE YOU ARE FAMILAR WITH THE CLEARANCE AND TAGGING PROCEDURE. WHEN IN DOUBT, ASK!!!!!!!!!!

5.3.7 Electrical Test Clearance

After the construction forces have completed work on electrical equipment and its associated circuits, the system will be tested in accordance with Startup Procedure No. 7, titled "Electrical Testing." At this time testing activities must be restricted by a special clearance procedure to allow limited energization of the circuit only by the holder of the "In-Test" clearance. This procedure is designed to protect personnel from injury and to avoid damage to plant equipment while allowing for adequate and complete testing of equipment.

5.3.7.1 Preparation

a) Before any testing may be started all craft clearances and operational clearances must be removed from the circuit to be tested.

b) All testing will be done with circuits in the "Test Position" only, except the following:

1) Motor Operated Valves

2) Power Receptacles

3) Motor Heaters

4) Solenoid Operated Valves

5) 4 kV Breakers may be tested in the racked in position under an "In-Test" clearance if the switchgear is open.

6) 13.8 kV generator breakers will be considered in the Test Position when the 13.8 kV disconnect switch is open.

c) The "Test Position" is defined as follows:

1) 4 kV switchgear, 4 kV starters and 480 V breakers: This is a position identified in the switchgear as the "Test Position" for testing the closing and tripping of the circuit breaker.

2) 480 V starters and equivalent devices: these are considered in the "Test Position" when the load side leads are lifted at the starter or equivalent device.

5.3.7.2 Responsibilities

a) Project Startup Engineering Supervisor

1) Maintains a current file on all "In-Test" clearances in process and in effect.

2) Approves equipment in service to be placed "In-Test."

3) Schedules and monitors all rotation check and initial operation of motors.

b) Station Operations

1) Issues "In-Test" clearances and accepts their release when rendered.

2) Maintains the official Test Clearance Log.

c) Start-up Engineer

1) Upon request from Test Personnel determines if testing can be performed.

2) Accepts or denies request for "In-Test" clearance.

3) Removes all craft clearances per normal clearance procedures.

4) Defines test parameters and effects of test on Station Operations.

5) Defines limitations on testing procedure to Test Personnel.

6) Is available for technical assistance to all personnel involved in testing.

d) Test Personnel

1) Align the circuit by racking in circuit breakers, installing fuses, and energizing control circuits as necessary to perform tests after he has received "In-Test" stub.

2) Completes the Form 142 with any data pertinent to the circuit or equipment and returns it to the Electrical Startup Engineer.

3) Keeps the Electrical Startup Engineer fully informed with respect to the status of testing, any problems that arise, and provides a written report covering faulty or inadequate components.

5.3.7.3 Electrical "In Test Clearance Procedures

a) The procedural steps in taking an "In-Test" clearance, performing electrical curcuitry test, recording the results, and releasing the clearance are stated below and outlined in the work flow chart accompanying this procedure (Appendix A).

Test Personnel: Requests "In-Test" approval on a specific circuit. Fills out "In-Test tag.

Startup Engineer: After approving "In Test" clearance, removes craft clearances as outlined in the General Clearance Procedure.

Startup Engineer: Submits "In-Test" tag with its stub and operational clearance stub to Station Operations of the circuit to be tested, including pertinent data on the condition of the equipment, the alarms which will be initiated, and the effects of the test on the tested equipment and on associated equipment. Releases operational clearance on the circuit to be tested.

Station Operations: Make entries in "In-Test" log.

Station Operations: Transmits "In-Test" stub to the test personnel informing him of any limiting conditions to his testing.

Test Personnel: Places a circuit and equipment to be tested in the "Test Position." Performs the test. Upon completion of the test he returns the "In-Test" stub and Form 142, filled in with the data of the test to the Startup Engineer. Yellow lines the record prints to identify the circuits or the parts of the circuitry tested.

Startup Engineer: Checks Form 142 for completeness. Gives Form 142 to the Lead Startup Engineer.

Start-up Engineer: Verifies job completeness. Determines preferred equipment disposition.

IF MOTOR IS TO BE CHECKED FOR ROTATION AND/OR RUN:

Test Personnel: Submits "In-Test" tag and signs off log.

Startup Engineer: Monitors all motor bumping and initial running. Completes motor running data on Form 142.

IF THE CIRCUIT AND EQUIPMENT IS TO BE RETURNED TO FULL CLEARANCE STATUS:

Startup Engineer: Requests a clearance from Southern California Edison Operations.

Station Operations: Issues new clearance on the equipment, hangs clearance tag and checks that the equipment is in the cleared condition. If "In-Test" tag has not been removed, Operations should be removed "In-Test" tag when the clearance tag is hung.

IF THE CIRCUIT AND EQUIPMENT IS READY FOR SERVICE:

Operations: Remove "In-Test" tag. Leaves circuits energized. Returns tag to Startup Engineer and signs off log.

Test Personnel: Returns completed Form 142 to Electrical Startup Engineer.

Electrical Startup Engineer: Checks the yellow lined record print. Signs the Form 142 and indicates its distribution.

WARNING: BE SURE YOU ARE FAMILIAR WITH THE CLEARANCE AND TAGGING PROCEDURE. WHEN IN DOUBT, ASK !!!!!!!!

NOTE:

TEST PERSONNEL INCLUDES: SCE STARTUP ENGINEER, SCE TEST TECHNICIANS, SCE TEST SUPERVISORS, SCE INSTRUMENT TECHNICIANS AND SERVICE ENGINEERS APPROVED FOR TAKING SCE CLEARANCES.

5.3.8 Emergency Clearance Release

In the unusual instance that a clearance must be released when the clearance holder is unavailable, the following procedures will be followed:

a) If the clearance holder is a contractor:

1) The Startup Engineer will provide notice of craft clearance release the the next higher level of contractor supervision on site, or at the emergency phone number provided by the contractor.

2) The supervisor notified will assume all the responsibilities of the original clearance holder. That is, he will be responsible for notifying the original clearance holder and craft personnel that the clearance has been released. This information must be communicated by the contractor to the craft personnel before the work resumes the following day.

3) After the contractor has been notified, the Startup Engineer will release the clearance.

4) Barrier tape and a sign labeled: "Emergency Release Has Been Made On This Equipment - Check With Control Operator Before Resuming Work" will be placed on the equipment by Operations.

b) If the clearance holder if rom the SCE Maintenance Group:

1) The SCE Startup Engineer initiating an emergency release will make every effort to call the clearance holder. If this is unsuccessful, he will notify the Opeating Foreman who will assume the responsibilities of the clearance holder.

2) After this notice has been completed, Steps 3 and 4 from Section A above will apply.

5.3.9 Exceptions

When a new or unusual situation that is not provided for in the Clearance Procedure Section arises, the Operating Foreman, Startup Engineer and Clearance Requester must work out a reasonable and safe method for getting the task accomplished. This rule applies to operational and "In-Test" clearances. The objective is to place the plant in service with minimum delay while maintaining control and personnel safety.

SCE STARTUP STANDARDS

SECTION 5.4

EQUIPMENT RELEASE PROCEDURE

CONTENTS

5.4 General

When the construction of a system or piece of equipment is completed sufficiency for startup operations, a release (SCE Form E5-389) shall be provided for the Project Startup Engineering Supervisor (PSES) and the Station Superintendent as follows:

5.4. Contractor or Vendor

1. Fills out and signs an Equipment Release Sheet, Form E5-389.

2. Enters on the release all known construction deficiencies.

3. Attaches a P&ID marked so as to clearly show the equipment or system being released and the released boundries.

4. Attached copies of hydrostatic pneumatic and static test forms, mechanical and electrical equipment data sheets and instrument calibration cards when applicable.

5. Submits the (signed) release and all applicable forms to the SCE Project Construction Superintendent.

5.4.2 Responsible Construction Superintendent or Contractor Start-up Engineer

1. Assures himself of the operational integrity of the system or equipment, noting any equipment or system deficiencies.

2. Checks that the P&ID accompanying the release clearly shows the release boundaries and that all applicable data sheets accompanying the release are properly filled out, and properly signed.

3. Endorses the release and passes it on the the PSES.

4. Submits craft clearance tags to the PSES as needed to maintain safe working conditions outside of the release boundaries.

5.4.3 Project Startup Engineering Supervisor (PSES)

1. Assures himself of the operational integrity of the system or equipment.

2. Checks that the P&ID accompanying the release shows the release boundaries and all applicable data sheets are correctly filled out and properly endorsed. Adds any deficiencies not previously noted.

3. Endorses the release and submits it to the SOM accompanied by a sufficient number of "release tags" to be attached to every valve, switch and disconnect within the release boundary. The release tags shall be assigned a release number by the PSES.

4. Retains any craft clearance tags submitted by the Project Construction Superintendent.

5.4.4 Station Supervisor of Operator and Maintenance (SOM)

1. Assures himself or the operational integrity of the system or equipment.

2. Checks that the P&ID accompanying the release clearly shows the release boundaries and that all applicable data sheets are correctly filled out and that the release is properly endorsed. Adds any deficiencies not previously noted.

3. Endorses the release and returns it to the PSES.

4. Hangs a release tag on each valve, switch and disconnect within the release boundaries.

5. Enters a release in the Controls Operator's Log. Notifies dispatcher of applicable Electrical System Releases.

5.4.5 Project Startup Engineering Supervisor (PSES)

1. Makes copies of the release and marked up P&ID accompanying the release and distributes one copy to the Station SOM. The original release and marked up P&ID will be retained by the PSES.

2. Checks over the craft clearance tags and after assuring himself they are proper, approves each one. Retains the craft control stubs and passes the craft tag and craft clearance stub to the Control Operator to issue clearances as requested to the clearance requester.

3. Request Responsible Construction Superintendent to close all vessels immediately after release inspections are complete.

4. Appraises Station Operations of action to be taken on released and tagged systems and equipment.

5.4.6 Designated Representative

For the purpose of continuity of startup operations and to assure smooth, continuing release of systems and equipment,

the responsible Construction Superintendent, the PSES and the Station SOM can designate certain qualified personnel as representatives to process and sign equipment releases. Qualified personnel are listed below:

1) Construction Superintendent

   a) Lead Construction Engineers

2) Project Startup Engineering Supervisor

   a) Startup Engineers

3) Supervisor of Operation & Maintenance

   a) Operating Foremen

5.4.7 Deficiency or Completion Items

All deficiencies listed in releases will be entered on Deficiency List Forms and will closely monitored until corrected.

Deficiencies or completion items will be monitored during Startup Meetings.

Deficiency Lists will be updated and distributed as part of the meeting minutes.

EQUIPMENT RELEASE SHEET

Date_____

Solar One Generating Station

SCE Job Order No._____

To: Supervisor of Operation and Maintenance

The following equipment has been check and is released for operation. A Release Tag accompanies this release for placement of the equipment.

Equipment_____

Further construction work is required as noted_____

Signed_____
SCE Construction Eng.

Date_____

Signed_____
Contractor

Date_____

Signed_____

Date_____

Signed_____

Date_____
Steam Generation Division

SOLAR ONE GENERATING STATION

DEFICIENCY LIST

Date Equip. Released	Release Number	Deficient Item	Responsibility	Remarks

SCE STARTUP STANDARDS

SECTION 5.5

ELECTRICAL TESTS

CONTENTS

5.5 Electrical Tests

5.5.1 General

Section 5.5, Electrical Testing, defines the responsibilities of the various personnel involved in testing electrical circuitry associated with the project. Electrical testing will begin during the final stages of construction and continue until the integrity of all circuits and devices is proven and is reliable. Functional controls testing will be performed in such a manner as to include maximum circuitry and components, i.e., normally from the initiating device through to the final action or results.

5.5.2 Purpose

This section defines the coordination, assignments, control and recording of the electrical test work during construction and startup of the project.

5.5.3 Responsibilities

Electrical testing will begin as soon as practical. The Lead Electrical Startup Engineer is responsible to schedule, control and maintain records of all electrical testing. This responsibility includes:

a) Assign and direct all personnel associated with electrical testing.

b) Schedule circuit and equipment testing consistent with the Master Startup Schedule and startup requirements.

c) Monitor electrical testing procedures of the Vendor Service Engineers.

d) Establish a procedure to become appraised of all problems associated with electrical equipment and initiate necessary corrective action.

e) Maintain strict compliance with the clearance procedures and establish safety standards.

f) Supervise the initial operation of all electrical equipment.

g) Maintain an up-to-date file on electrical prints and other material for test personnel.

h) Maintain records of all electrical testing including yellow-lined prints on circuits tested.

i) Monitor the Master Schedule and the progress of electrical systems construction pertinent to startup requirements.

j) Schedule personnel to witness formal functional and performance tests of major electrical systems.

k) Coordinate with and obtain from the Protection Engineer, desired protective device settings (OD-43 Forms).

l) Calculate electrical auxiliary system transformer taps (115,000 - 4160, 13,800 - 4160, 4160 - 480, 480 - 120/280).

m) Obtain desired generator main transformer taps from system operations.

5.5.3.1 SCE Electrical Testing

a) The Lead Electrical Startup Engineer is responsible for testing all circuits and devices, except those tested by the vendor, necessary to insure reliable protection and control.

b) SCE Test Technicians will maintain records of all circuits and devices tested and forward those records to the Lead Electrical Startup Engineer. Those records include:

1) Electrical Circuit Test Record and Equipment Data Sheet (Form 142).

2) A complete set of Elementary Diagrams for each unit shall be furnished as check-off records. The Test Technician shall yellow-line each circuit on this elementary as it is checked.

3) When drawings have been revised to the extent that is is not practical to yellow-line on the existing drawing, yellow-line information shall be transferred to a new drawing and checking procedures will be followed on a new drawing.

4) The Test Technicians shall keep a record of annunciator alarms by using the Annunciator Window Engraving drawing as a check-off print. He shall yellow-line each initiating device for each window as it is tested.

5) All check off prints shall be kept at a mutually agreed upon location available to personnel concerned.

d) The Test Technicians will insure that all circuit modifications have been accomplished before

releasing circuits and equipment to Startup. The circuit will conform with the latest Schematic, Elementary and Connection Diagram.

e) The Lead Electrical Startup Engineer shall schedule and arrange for high potential tests when equipment to be given such tests is ready.

f) Advise the Project Startup Engineering Supervisor of discrepancies or problems on circuitry, devices or equipment failures.

5.5.4 Records

5.5.4.1 Electrical Startup Schedule

The Lead Electrical Startup Engineer shall develop this schedule as soon as practical. He shall include all of the electrical items which will be tested. Revisions to this schedule will be reflected in the Weekly Rolling Schedule.

5.5.4.2 Equipment Release Sheet (E5-389)

The Project Startup Engineering Supervisor shall endorse the Equipment Release Sheet on each major item of electrical equipment after it has been tested for construction integrity and is ready for operation. Electrical equipment which is a part of, or is directly connected with, a mechanical piece of equipment shall be released with and on the same release form as the mechanical equipment with which it is associated. Equipment releases will be initiated by the Project Construction Engineer.

5.5.4.3 Electrical Circuit Test Record and Equipment Data (Form 142)

An individual record of each circuit shall be maintained. This record is the "Electrical Circuit Test Record ad Equipment Data" (Form 142, see attached table). Forms 142's will be initiated by the Test Technicians.

After (and only after) this information is entered on the Data Sheets, the forms will be returned to the Electrical Startup Engineer for further processing. The Form 142 for a circuit will be put into the "completed" file kept by the Lead Electrical Startup Engineer when the circuit has been completely tested.

When testing has been completed, the circuit will be released for operation. If testing cannot be

completed, the reasons shall be noted on Form 142 and the form shall be put into the "incomplete" file maintained by the Lead Electrical Startup Engineer.

When a circuit is changed after the original test work is completed, the review circuit will be tested and the test results will be entered as a revision on the Form 142 of the original circuit.

5.5.4.4 Abnormal Circuit Log

The Project Startup Engineering Supervisor shall maintain a historical log of all circuits made temporarily abnormal to expedite continuance of operations. The Abnormal Circuit Log book will be kept on the Control Operator's desk in the Control Room. Only the PSES or his representative shall authorize temporary changes in the circuit. All lifted leads will be tagged (Form E5-384) and tags will be dated and initialed by the Test Technician or vendor service engineer performing the work. Jumpered circuit will be logged in the Abnormal Circuit Log along with the reason for the jumper.

5.5.5 Outline of Electrical Tests

5.5.5.1 SCE Lead Electrical Startup Engineer

The general outline of tests to be performed by SCE Test Technicians is as follows:

a) Transformers

1) Test control circuits of cooling fans and pumps.

2) Test protective device circuits.

3) Test annunciator circuits.

4) Monitor for combustibles after energizing.

5) Make settings on all protection devices.

6) Check ration and polarity of all instrument transformers.

7) Check and set tap changers.

8) Check transformers while in service.

9) Make oil hi-pot test after filling.

10) Transformer turns ratio test.

11) Megger tests, grounding systems.

12) Impedance & resistance tests.

13) Transformer Oil Dobble Tests

b) Switchgear

1) Test all air circuit breakers in accordance with, but not limited to the following:

a. On 480 V breakers, check calibration and set trip points of solid-state trip devices, and check minimum trip currents.

2) Test all bus metering circuits and label all devices in accordance with the Elementary Diagrams.

3) Test all control circuits, and label all devices in accordance with the Elementary Diagrams.

4) Check ratio and polarity of all current transformers and potential transformers.

5) Perform saturation tests on current transformers.

6) Set the bus tie protection and transfer relays for the reserve auxiliary transformer and the auxiliary transformer.

7) Perform functional operation of the transfer circuits from the auxiliary transformers to reserve auxiliary transformer.

8) Set all overcurrent and trip relays of the 4.16kV circuit breakers. Also undervoltage and ground relays.

9) Set all trip relays associated with the 480 V tie and main circuit breakers.

10) Test all control circuits on 4 kV and 480 V tie and main circuit breakers.

11) Perform a final relay trip test on all 4.16 kV circuit breakers before initial operation of the equipment.

12) Hi-pot 4160 V buses and cables.

13) Spot check bus bolt torque valves.

c) Generators

1) Test ground detector relays and circuits.

2) Check ration and polarity of current and potential transformers.

3) See that phasing is correct.

4) Set all protective relays and metering.

5) Rest all protective relay circuits.

6) Perform high potential test.

7) Perform high potential test on 115 kV buses.

8) Functionally trip test all protective relays before energizing machine.

d) Excitation Switchgear (To be accomplished in collaboration with Apparatus Personnel)

1) Set and adjust all protective relays.

2) Megger exciter.

3) Functionally test main generator voltage regulators and check response.

4) Functionally test exciter and exciter DC system.

5) Check exciter for proper voltage build up.

6) Check mechanical condition of all devices.

7) Check control circuits and perform operational test of field breaker.

8) Check wiring of all control circuits.

9) Perform operational check of all control circuits.

10) Make polarity check.

e) Motors

f) Cables

g) Switchyard

h) Miscellaneous

1) Set all trip relays on relay board.

2) Test oscillographs.

3) Test synchronizing circuits.

4) Check chemical control circuits and chemical instrumentation.

i) Steam Turbines

1) Test all protective devices and protective relay circuits.

2) Trip test all protective devices before initial roll as witnessed and directed by the PSES.

3) Check control wiring.

4) Check thermocouples and temperature recorders.

5) Check and set all turbine supervisory instruments.

6) Test and prove all annunciator circuits.

5.5.5.2 Vendor, Contractors, and SCE Construction

a) Individual vendors and contractors are responsible for testing, calibrating and setting up electrical equipment that is within the scope of their contracts. This work includes initiating and entering test and calibration information on appropriate SCE forms. Vendors and contractors are responsible to the SCE Lead Startup Engineer in the performance of testing as set down in this manual.

b) Work listed in this item includes (but it is not necessarily limited to) electrical testing, calibrating, and setting up that which will be performed by Contractor personnel on equipment that is within the scope of their contracts. Contractor will perform all electrical functions listed here on the equipment within their contractual jurisdiction.

ELECTRICAL TEST FORM MATRIX

EQUIPMENT	GENERATOR HI-POT TEST (FORM PS134)	GENERAL (FORM 142A)	CKT. BKR. (FORM PSSDM43)	CABLE TEST (FORM PS122)	CURRENT XFMR (FORM 142D)	POWER XFMR (FORM T-40)	INST. POT. XFMR (FORM 142F)	RELAY SETTING FROM PROTECTION (FORM 0D43)
220KV BREAKERS		X			X		X	X
4160V MOTOR		X	X	X	X			X
4160V FEEDER BREAKER		X	X	X	X			X
4160V INSTRUMENT COMPARTMENT		X			X		X	X
4160V CABLES				X				
480V MOTOR (SWGR)		X	X					
480V MOTOR (MCC)		X						
480V SWGR. BREAKER		X	X					X
480V INSTRUMENT COMPARTMENT		X			X		X	X
480V MCC BREAKER		X						
240/120V MOTOR		X						
MAIN TRANSFORMERS		X			X	X	X	X
AUX. TRANSFORMERS		X	X	X	X	X		X
STATION SERVICE TRANSFORMERS (4160 - 480V)						X		
LIGHTING TRANSFORMERS						X		
GENERATORS	X	X			X			X
GENERATOR BREAKERS (13.8KV)		X			X		X	X
GENERATOR PPT							X	
GENERATOR SCT					X			
GENERATOR 13.8KV BUS DUCT				X				
GENERATOR VOLTAGE REGULATOR AND EXCITER		X	X					
OSCILLOGRAPH		X						

SYNCHRONOUS MACHINE OVERVOLTAGE REPORT

DIVISION_____ STATION_____ NO. ____ DATE_____

MAKE_____ N.P.KV_____ MVA_____ SERIAL NO. _____

ROTOR IN__ OUT__ IN AIR__ CO_2__ H_2 PRESS.___LBS. BEFORE OH__ BEFORE CLEAN___ AFTER___

WDG. TEMP.____C AMBIENT_____C WEATHER _____ HUMIDITY_____

I N S U L A T I O N R E S I S T A N C E T E S T (Prior to O.V. Test) TIME_____

INSTR. MAKE_____ DC VOLTS____ MACH. OFF LINE__DAYS ____ HRS. HEATERS_____

TO GROUND	AØ(BC)	BØ	CØ	FIELD
Megohms 1/2 min				
1 min				
5 min				\
10 min				\
Calc One Min R_{40C}(3)				\
P.I. This Test (4)				\
P.I. Last Test (5)				\
DATE LAST TEST				

STATOR TEST INCLUDES CABLE__BUS__OCB_____

OUTDOOR PORC___CLEANED___GREASED DC-5_____

FLD TEST ACB___ EXC___SWBD___OSCIL OFF___

STA GND TO TEST SET__TEMP DET__CT SEC____

FIELD__ROTOR__STATOR CONN TO TEST SET_____

CALC (When P.I. is below 2.0)
(1) MINIMUM R_m MEGOHMS (TABLE I) _____
(2) TEMP. COEF. (Fig. 1, Page 6A1-15) K_{t40C}___
(3) CALC. 1 MIN. R_{40C} = 1 MIN. R x K_{t40C}
(4) POL INDEX = 10 MIN R / 1 MIN. R
(=1 MIN. MICRO AMPS/10 MIN. MICRO AMPS)

O V E R V O L T A G E P R O O F T E S T

A-C____ D-C____ RISE____KV/MIN. TIME____

TEST SET MAKE_____ KV_____ VOLTMETER RANGE USED_____ SPHERE DIAM_____

TO GROUND	AØ(BC)	BØ	CØ	FIELD
Test Kv (Table I)				
Prot. Gap (Table I)				\
Test Set Trip kV				
H.V. Cur. Amps. μA.				
Time Appl. Min.				
Test Result				

DO NOT MAKE OVERVOLTAGE PROOF TEST if the Polarization Index is less than 2.0. Show the observed 1 min. Res. Calc. to 40 C (3). If less than the min. shown above in (1), or if the P.I. is significantly less than in previous tests (5). The reason for a low value should be determined. The decision to proceed or to dry out will be made by engineering supervision. Please advise the Apparatus Division when possible. Give details below. Use other side of this sheet for data on d-c tests and d-c curve.

TEST TECHNICIAN _____ BASE STATION _____ PAX _____

MAIL COPY TO APPARATUS DIVISION, GENERAL OFFICE

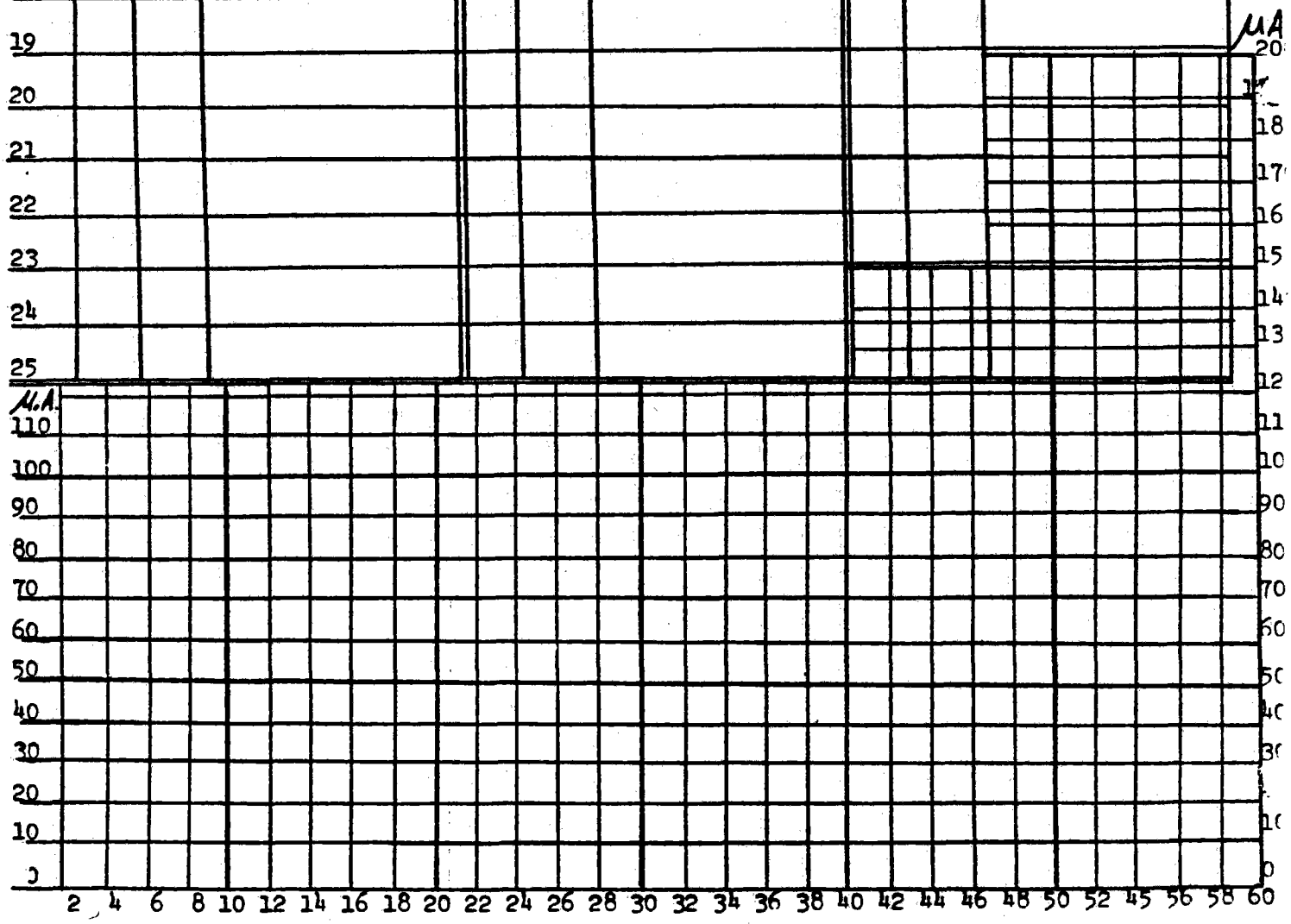
Revised
4/14/66
B. R. LOXLEY

DATE _____ D-C TEST DATA No. ____ STATION _____

_____ KV PER MIN.

TARE (Leads Only) 10 KV _____ 20 KV _____ 30 KV _____ 40 KV _____ 50 KV _____ μA

TIME (MIN)	A-PHASE kV.	A-PHASE μA.	A-PHASE REMARKS	B-PHASE kV.	B-PHASE μA.	B-PHASE REMARKS	C-PHASE kV.	C-PHASE μA.	C-PHASE REMARKS
1/2									
1									
10			PI =			PI =			PI =
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									



EO 142 NEW 10-70
S.C.E CO

ELECTRICAL CIRCUIT TEST RECORD AND EQUIPMENT DATA SHEET

EQUIPMENT IDENTIFICATION

STATION NAME		UNIT NO.	S.C.E. J.O. NO.
CONTRACTOR			CONTRACTOR J.O. NO.
FILE NO.	SCHEDULE NO.	CIRCUIT NO.	DRAWING NO.
EQUIPMENT:			

EQUIPMENT NAME PLATE DATA

NAME OF MANUFACTURER		SERIAL NO.	FRAME
TYPE	CODE	DUTY	MODEL

S.F.	H.P.	R.P.M.	AMPS	VOLTS

START-UP AND TEST DATA

TYPE MEGGER _____ MOTOR INSULATION WITH LEADS: _____ MEGAOHMS

MOTOR RESISTANCE (OHMS): ☐ WITH, ☐ WITHOUT LEADS: _____ A-B, _____ B-C, _____ C-A

GROUND STRAP CONNECTED: ☐ YES ☐ NO | MOTOR COUPLED: ☐ YES ☐ NO | LUBRICATION: ☐ FACTORY, ☐ FIELD | LUBE TAG: ☐ YES, ☐ NO

VIBRATION: _____ MILS | ROTATION VIEWED FROM COUPLING END: ☐ CCW, ☐ CW

INRUSH AMPS _____ | NO LOAD AMPS _____ | TYPE OF CONTROL: ☐ LOCAL, ☐ BOARD

OPERATING TIME IN SECONDS: CLOSE _____ OPEN _____

POWER CABLE SIZE _____ | FUSE SIZE _____ | O/L SIZE _____

COMMENTS. _____

REV. NO.	DATE REVISION	S.C.E. APPROVED	CONTRACTOR OK	DATE ASSIGNED	START DATE	DATE COMPLETED	REMARKS

SIGNED: S.C.E. START-UP ENGINEER _____ SHEET _____ OF _____

DISTRIBUTION

SERVICE ENGR. TO RETAIN ORIGINAL & SEND 1 COPY TO S.C.E. START-UP ENGR.

PSSDM 43 NEW 3-71
S.C.E. Co.

WESTINGHOUSE 4160 VOLT A.C.B.
Type DH-P

STATION _____ UNIT NO. _____ DATE _____ SERVICED BY _____

(Equipment Name) _____ (Cell No.) _____ (Serial No.) _____ (Amps) _____

STYLE NO. _____ MODEL _____

MICROHM	MEGGER READING PHASE TO PHASE	MEGGER READING PHASE TO GROUND	COIL READINGS OHMS
A _____	A to B _____	A _____	SR _____
B _____	B to C _____	B _____	TC Trip _____
C _____	A to C _____	C _____	Y Coil _____

CONTACT COMP. AND PHASING

	A	B	C
ARCING (1/2 ± 1/64)	_____	_____	_____
UPPER MAINS (3/32 - 3/16)	_____	_____	_____
LOWER MAINS	_____	_____	_____

MECHANISM ADJUSTMENTS

TRIPPING LATCH (+1/32 to -1/16") _____

CUT-OFF SW. 1. Contact made before end of closing motion _____

2. Motor limit 5A 1/16" overtravel (1/32" to 1/8") _____

LATCH CHECK SW. (Switch should close 1/8 to 3/16" from its completely reset position.) _____

TESTS

MANUALLY _____ ALARM _____ OPERATION LIGHTS _____

ELECTRICAL _____

NORMAL DC VOLTAGE _____ MIN. TRIPPING VOLTAGE _____

MIN. CLOSING VOLTAGE _____ CLOSING TIME CYCLES _____

ON CLOSING COIL ONLY _____ TRIPPING TIME CYCLES _____

REMARKS _____

_____

_____

Signed _____

PS122 NEW 73
SCE CO.

CABLE TEST REPORT

STATION_____ DIVISION_____ Date:_____
Test by:_____
CIRCUIT_____
Base Sta.:_____
Witnesses:_____

Cable Data

Manufacturer_____ Year Manufactured_____

Type of insulation (check one): Rubber or Rubberlike____, Varnished cambric_____, Paper____, Other (indicate type)_____

Conductor Size_____ Type of Sheath or Jacket_____Shielded: Yes___ No___

Cable Installation Data

Number of Conductors: Per Phase____ Per Sheath_____ Length of run_____

Number of cables per duct_____ Type of duct_____ Trench_____

Weather conditions_____ Moisture conditions in duct_____

Test Data

Test voltage:____KV. DC; ____KV. AC; Duration___Minutes. Ambient temperature F___, C___.

Test Classification: (check one)

Before Installation___, After Installation___, Routine Maintenance___

(If "Controlled Rise" DC Test see Attached Form PSST 83 for Test Data)

Current Readings (Micro-Amps DC or Amps AC)						
Minutes	_____Ø	_____Ø	_____Ø	_____Ø	_____Ø	_____Ø
0						
1/2						
1						
2						
3						
5						
10						
15						

Test Results
Failures: Phase_____, Voltage_____KV, Current_____
Phase_____, Voltage_____KV, Current_____
Other Test Results:_____

Remarks: (Conditions of Tests, Etc.)_____

FORM T 40 REV. 100 PADS 4-69
SOUTHERN CALIFORNIA EDISON COMPANY

TRANSFORMER TEST

T59 No._____

P.O. No._____

KVA_____ MAKE_____ CLASS OR TYPE_____ FORM NO._____ SERIAL NO._____

CYCLES____ PHASE____ POLARITY_____ GALLONS OIL_____ % IMPEDANCE 60 CYC._____ (50 CYC.)_____

HIGH VOLTAGE_____ LOW VOLTAGE_____

AMPERES_____ AMPERES_____

S.C.E. CO. SPEC. NO._____ WIRING DIAG. ON N.P._____ BLUE PRINT. TEST NO._____

FOR_____ INSTALLATION. METHOD OF COOLING_____ MFGR. SPEC. NO._____ M. S. T. NO._____

RATIO AND POLARITY

ADJ. POS.	STRAP CONNECTIONS	TTR NO.____ TEST RATIO H X	H X	H X	H X	H X	H X	NOMINAL RATIO HV	LV	RATIO	POLARITY DIAGRAM

RESISTANCE

INIT._____

WINDING_____ WINDING_____

INSTR. NO._____ _____°C INSTR. NO._____ _____°C

CONNECTIONS	READING	K	OHMS	CONNECTIONS	READING	K	OHMS

RESISTANCE CORRECTED TO _____°C

INIT._____

HIGH VOLTAGE WINDING_____ OHMS. COIL_____ AMPS._____ I^2R_____

LOW VOLTAGE WINDING_____ OHMS. COIL_____ AMPS._____ I^2R_____

IMPEDANCE

WINDINGS

INSTR. NO.						TEMP.____°C		H.V.____ L.V.____
% IMP.	VOLTS	K____	AMPS.	K____	E/I	WATTS	K____	W/I^2
								TEST WATTS @ °C
								I^2R WATTS @ °C
								STRAY WATTS @ °C
								STRAY WATTS @ °C
								I^2R WATTS @ °C
NORMAL								IMP. WATTS @ °C

INSULATION TESTS

INIT._____

	OIL °C	HIGH TO LOW	HIGH TO GROUND	LOW TO GROUND	CORE TO GROUND (OHMS)	OIL TEST
FINAL MEGOHMS	_____	_____	_____	_____	_____	_____

HIGH POTENTIAL TESTS { HIGH TO LOW AND GROUND_____ KV. FOR 1 MINUTE. RESULTS_____
LOW TO HIGH AND GROUND_____ KV. FOR 1 MINUTE. RESULTS_____

CORE LOSS

INIT._____

VM NO._____ AM NO._____ WM NO._____

VOLTS	K____	AMPERES			AVG.	K____	WATTS	K____	% EXC. CUR

MAKE _____ KVA _____ SERIAL NO. _____

	S.C.E. Co. Tests	Mfgr. Certified Test	Mfgr. Guarantee	Remarks
RE LOSS 100% VOLTAGE				
AE LOSS 110% "				
% EXCITING CURRENT 100% VOLTAGE				
% EXCITING CURRENT 110% "				
H.V. RESISTANCE @ °C				
L.V. RESISTANCE @ °C				
I^2R LOSS HIGH VOLTAGE				
I^2R LOSS LOW VOLTAGE				
WATTS EDDY LOSS				
IMPEDANCE WATTS @ °C				
% IMPEDANCE VOLTS				
% REGULATION 100% P. F. FULL LOAD				
% " 80% " " "				
TOTAL LOSSES				
°C RISE-COPPER-HIGH VOLTAGE WINDING				
°C RISE- " -LOW " "				
NOISE LEVEL (DECIBELS)				

EFFICIENCIES AT 100% P.F.

LOAD	25	100
% CORE LOSS		
% IMPEDANCE LOSS		
% TOTAL LOSS		
% EFF. — S.C.E. TESTS		
% EFF. — MFR.'S CERT. TEST		
% EFF. — MFR.'S GUARANTEE		

INSULATION POWER FACTOR

	H TO L-G			LO TO HI-G			H & LO TO G		
	CAPACITANCE (MF)		P.F. (%)	CAPACITANCE (MF)		P.F. (%)	CAPACITANCE (MF)		P.F. (%)
	READ	K=		READ	K=		READ	K=	
DIRECT									
REVERSED									
AVERAGE									

INIT. _____

NO. OF FANS _____ VAC.-PRESS. RELIEF DEVICE _____ EMERG. PRESS. RELIEF DEVICE _____

TYPE OF SEAL: SEALED _____ GAS _____ GAS-OIL _____ BREATHER _____ CONSERV _____

TEMPERATURE IND. _____ TESTED _____ DRYOUT _____

TAP SETTING LEFT _____ BUSHING TYPE: H.V. _____ L.V. _____

TAP CHANGER. HIGH VOLTAGE _____ LOW VOLTAGE _____ TAP CHGR. CENTERED _____

LOAD RATIO CONTROL. HIGH VOLTAGE _____ LOW VOLTAGE _____

SERIES & PARALLEL STRAPS. HIGH VOLTAGE _____ LOW VOLTAGE _____

CHECKED FOR OIL LEAKS _____ GAL. OIL REMOVED _____

MECHANICAL INSPECTION—VALVES & FITTINGS _____

CORE REMOVED BY SHOP FOR INSPECTION _____ VACUUM FILLED _____

REMARKS _____

WEIGHTS

CORE & COILS _____ LBS.

TANK & FITTINGS _____ LBS.

TANK: OIL _____ GAL. _____ LBS.

COMP'T: OIL _____ GAL. _____ LBS.

TOTAL WEIGHT _____ LBS.

FROM _____

TO _____

TEST J. O. _____

DATE _____

TESTED BY _____

CHECKED _____

APPROVED _____

FORM T 21 _____ CHECKED PRINT _____ GD 236 _____

EO 142D NEW 12-70
S.C.E. CO.

CURRENT TRANSFORMER TEST RECORD

EQUIPMENT IDENTIFICATION

STATION	UNIT NO.	SCHEDULE NO. E-
CIRCUIT NO.	DRAWING NO.	JOB NO.
EQUIPMENT NAME		Q-CLASS

EQUIPMENT NAMEPLATE DATA

MANUFACTURER	TYPE	SERIAL NO.	RATED BURDEN
PRIMARY AMPS	SEC. AMPS TAP 1 TAP 2 TAP 3 TAP 4		RATED ACCURACY

START-UP AND TEST DATA

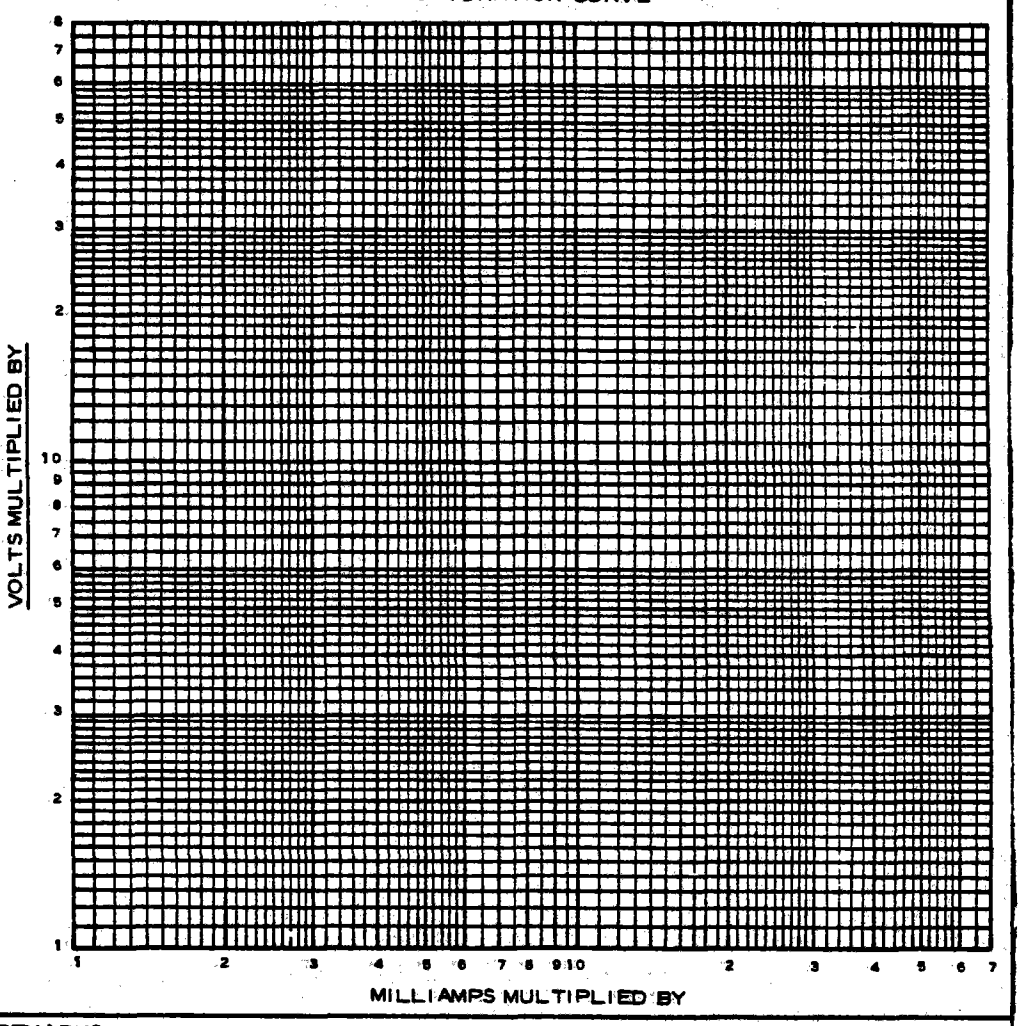
RATIO TEST

TAP	TURNS	PRI. AMPS	SEC. AMPS

SATURATION TEST

MILLI AMPS	VOLTS 1	2	3

SATURATION CURVE



POLARITY TEST

REMARKS:

PERFORMED BY:	DATE:	QA
APPROVED (SERVICE ENGR.):	DATE:	
APPROVED (S.C.E.):	DATE:	

SHEET _____ OF _____

EO 142F NEW 12-70
S.C.E. CO.

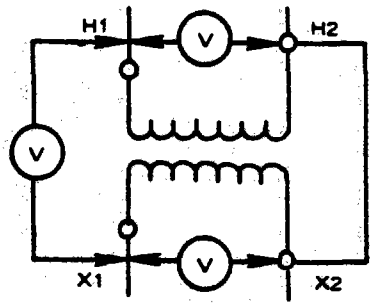
INSTRUMENT POTENTIAL TRANSFORMER TEST RECORD

EQUIPMENT IDENTIFICATION		
STATION	UNIT NO.	SCHEDULE NO. E-
CIRCUIT NO.	DRAWING NO.	JOB NO.
EQUIPMENT NAME		Q-CLASS

EQUIPMENT NAMEPLATE DATA			
MANUFACTURER	TYPE	SERIAL NO.	RATED BURDEN
RATED PRIM. VOLTS	RATED SEC. VOLTS	RATED RATIO	RATED ACCURACY

START-UP AND TEST DATA

RATIO TEST			POLARITY TEST			
VOLTAGE			VOLTAGE			
PRIMARY H1–H2	SECONDARY X1–X2	RATIO	PRIMARY H1–H2	SECONDARY X1–X2	TOTAL H1–X1	POLARITY



D.C. RESISTANCE TEST	
H1–H2	X1–X2

REMARKS:

PERFORMED BY: DATE:

APPROVED (SERVICE ENGR.): DATE:

APPROVED (S.C.E.): DATE:

QA

SHEET _____ OF _____

FORM [illegible] 4-68
SOUTHERN CALIFORNIA EDISON CO.

POWER SUPPLY
DEPT.

TO_____ NO._____

DIV._____ LOCATION_____

RELAY SETTING & TEST DATA

STATION_____ DATE_____ 19____

CIRCUIT_____ KV._____

PROTECTION_____

ISSUED BY_____ INITIAL_____ ROUTINE_____

APPROVED PROT._____ DIV._____

TESTED BY_____ DATE_____

NO CARBON PAPER REQUIRED

FORM OD-43 (9-68)
SOUTHERN CALIFORNIA EDISON CO.

POWER SUPPLY
DEPT.

TO_____ NO._____

DIV._____ LOCATION_____

RELAY SETTING & TEST REPORT

STATION_____ DATE_____ 19____

CIRCUIT_____ KV._____

PROTECTION_____

P.C.B.: MFG._____ TYPE_____ AMPS._____ KV._____

CT.: MFG._____ TYPE_____ RATIO_____

PT.: MFG._____ TYPE_____ KV._____ RATIO_____

RELAY	MODEL/STYLE	CURVE	RANGE	MISC.
Φ				
N				

	C.T. RATIO		PHASE				GROUND			
			TIME OC.			IT	TIME OC.			IT
			TAP	SEC.	AMPS	AMPS	TAP	SEC.	AMPS	AMPS
FOUND										
DESIRED										
LEFT										

TEST DATA

PHASE	AMPERES MINIMUM TRIP				SHUNT TEST		TIME LEVER	
	T. OC.—SEC.—IT		BUS — PRI — BUS				FOUND	LEFT
A								
B								
C								
N								

AUX. RELAYS OR DIODES_____

APPARATUS OPERATED BY RELAYS_____

ISSUED BY_____ INITIAL_____ ROUTINE_____

APPROVED PROT._____ DIV._____

TESTED BY_____ DATE_____

OD 498 NEW 6-60
S.C.E. CO.

POWER SUPPLY
DEPT.

TO_____ NO._____

DIV._____ LOCATION_____

MODIFICATION TO PROTECTIVE RELAY EQUIPMENT

STATION_____ DATE_____ 19____

CIRCUIT_____ KV._____

PROTECTION_____ MODEL_____

MODIFICATION NUMBER:_____

DESCRIPTION OF MODIFICATION:

DRAWING NUMBERS AND/OR DIAGRAMS:

PARTS REQUIRED AND/OR INCLUDED:

ISSUED BY_____ DIV._____

INSTALLED BY_____ DATE_____

DISTRIBUTION:
WHITE : PROTECTION SECTION
YELLOW : DIV. ENGINEER
BLUE : TEST TECHNICIAN
PINK : TEST SCHOOL

NO CARBON PAPER REQUIRED

SCE STARTUP STANDARDS

SECTION 5.6

MECHANICAL TESTS

CONTENTS

5.6 Mechanical Tests

5.6.1 General

The purpose of this section is to outline the testing and checking requirements to prepare the mechanical auxiliary equipment such as pumps, compressors, tanks, pressure vessels and piping systems.

No equipment shall be installed, tested or operated in such a manner as to void the manufacturer's warranty or guarantee. Should any test values or procedures, as indicated in this section, exceed the values or overrule the procedures recommended by the manufacturer for the equipment involved, the manufacturer's recommendation shall take precedence.

Accordingly, general procedure for inspection, check and testing are contained in this section. Should changes be required, these will be approved by the SCE Project Startup Engineering Supervisor.

Some equipment in view of the its complexity and special requirements shall be covered by a separate special procedure.

The SCE Startup Engineer will stipulate the equipment/systems in this category.

5.6.2 Pumps

5.6.2.1. Inspection

a) Verify by documentation review that the pump assembly, including driver and all accessory equipment, is installed in accordance with drawings, erection instructions, and construction procedures, related piping has had the hydrostatic test performed, and the pump assembly is ready for preliminary operational test.

b) Inspect the items below as applicable:

1) Debris removed from motor windings, pump base, drains and the general vicinity of the equipment.

2) All equipment piping is connected, including primary, balancing, equalizing bearing, cooling, smothering, gland sealing, warming, recirculating and lubricating oil piping as applicable.

3) Relief valves as specified are installed.

4) Instruments and controls are installed or available, and properly insolated or protected from damage during tests.

5) Lubrication of all bearings has been completed in strict accordance with manufacturer's instruction book, and lubrication tag attached. Grease lubricated bearings are not overlubricated and vent plug is removed as specified for run-in. Oil lubricated berings are cleaned, lubricated, and oil rings are free to rotate. Forced lubrication systems are filled and ready for operation.

6) Electric wiring, switchgear overload protection and interlock connections, and motors are installed, tested, and inspected, and power is available to equipment terminals.

7) Main piping and supports are installed.

8) Suction strainers are cleaned and/or temporary strainers are installed if required, properly instrumented and identified in the SCE Startup Department Temporary Strainer Log.

9) Verify documentation alignment of motor to driven equipment is completed, check that:

   1) Equipment and motor when rotated by hand, are found free to turn without rubbing or binding.

10) Shaft packing is in place and not binding on the shaft.

11) Coupling guards are installed when specified.

12) Verify keys are tight and locked.

5.6.2.2 Preliminary Operational Test

a) Inspection in Section 5.6.2.1 above shall be completed and piping, mechanical and electrical equipment is ready for preliminary operational test.

b) Where required, or if deemed neccessary by the Project Startup Engineering Supervisor, manufacturer's service representative shall be present

and shall satisfy himself that equipment is ready to proceed with preliminary operation test.

c) Piping and mechanical equipment shall have been flushed clean, unless flushing is being performed within line equipment, primed and valves arranged accordingly to actual or simulated service conditions. Seal and cooling water, etc., shall be turned on if required.

d) Start pump in accordance with manufacturer's starting and run-in instructions.

1) During run-in period, equipment shall be attended and observed constantly for any malfunctions. Run-in shall continue and adjustments shall be made as indicated until proper operation is established to the satisfaction of SCE's Startup Engineer. Run-in data to include baseline vibration level indication.

e) Temporary and permanent strainers shall be cleaned as often as required by predetermined maximum differential pressure, during run-in and subsequent preliminary operation.

5.6.3 Compressors

5.6.3.1 Inspection

a) Verify by documentation review that compressors, including driver and accessory equipment, is installed in accordance with drawings and erection instructions, related piping has had the hydostatic test performed, and that the compressor is ready for premilinary operational test:

b) Inspection shall include items listed below as applicable:

1) Debris is removed from motor windings, baseplates, drains and general vicinity of equipment.

2) All auxiliary piping is connected, including bearing, jacket, and gland cooling water, vents, drains and lubrication piping as applicable.

3) Relief valves, as specified, are installed and have been tested. Vent piping is complete and obstructed.

4) Instruments are properly isolated or protected from damage during tests.

c) Lubrication of all points has been completed in accordance with manufacturer's instruction book.

1) All gear cases not lubricated at the factory are flushed and relubricated, breather vents are clear.

2) Crankcase, cross head guides and cyclinders are thoroughly cleaned and relubricated as specified.

3) Bearings are correctly lubricated as specified.

4) Automatic lubrication system, if provided, is correctly filled, primed and delivering oil to all parts.

d) Electrical wiring, switchgear, overload protection interlock connections, motor, are all checked and tested; and power is available to equipment terminals.

e) Suction piping and supports are installed and inspected. Suction strainer or filter in place. All loose scale and debris between strainer or filter and intake valves are removed.

f) Suction and discharge valve assemblies are correctly adjusted.

g) Discharge piping and supports (including receivers) is inspected and ready for preliminary operational test.

h) Valve unloader piping and control system, if specified, are properly tested.

i) Verify by documentation alignment of motor to driven equipment is correct.

1) Equipment and motor when rotated by hand are found free to turn without rubbing or binding.

j) Verify keys are tight and locked.

k) Coupling and/or belt guards are installed as specified.

5.6.3.2 Preliminary Operational Test

a) Inspection of Section 5.6.3.1 above shall be completed and compressor and related piping and electrical equipment released for preliminary operational test.

b) Where required, or deemed necessary by the Project Startup Engineering Supervisor manufacturer's service representative shall be present and shall satisfy himself that equipment is ready for preliminary operational test.

c) Piping and equipment in liquid service shall have been flushed clean, unless permanent in line equipment is being used for flushing, primed and vented, and valves arranged according to actual (or simulated) service conditions.

d) Start equipment in accordance with manufacturer's starting instructions. During run-in period, equipment shall be attended and observed constantly for any malfunction, including vibration monitoring. Run-in shall continue and adjustments shall be made as indicated until proper operation is established.

e) Clean strainers as often as required, by predetermined maximum differential pressure, during run-in and subsequent preliminary operation.

5.6.4 Piping, Pressure Vessels, Tanks and Heat Exchangers

Verify, by documentation, that all pipes, valves, fitting and pressure vessels have been provided in accordance with material standards outlined in specifications and on drawings.

Hydrostatic tests, as required, will be performed after piping erection in accordance with approved test procedures. Flushing of all piping, pressure vessels, tanks and systems shall be in accordance with flushing test procedures or approved special procedures. Construction to perform hydrostatic tests that do not require plant equipment operation.

5.6.4.1 Piping Inspection

a) Verify by visual inspection and documentation that piping system is complete and that system is ready for filling. This inspection shall include:

1) Piping is clean - free from debris.

2) All joints are properly made - flange joints complete with gaskets and bolts are properly tightened. Welded joints are completely welded.

3) All terminations are made up of and all unused openings are closed.

4) Valves are correctly located, packed and operable, and identified. Hand operation, if applicable, shall be verified.

5) Motor operated valves are operable, and torque limit, and interlock switches are set. Valves must be clean, stems properly lubricated and free of foreign material, and stem covers/position indicators installed. In addition, the grease plug should be removed and the grease level checked.

6) Relief valves are correctly set.

7) Power operated control valves are correctly connected and operated smoothly with power available.

8) Instruments are properly isolation or protected during test.

9) Code and/or State inspections are made as specified.

10) Determine that all hangers and restraints are in position and that spring hangers and snubbers are operable, verify all lock-pins have been removed from hangers after hydrostic test.

5.6.4.2 Preliminary Operational Test

a) Inspection shall be complete, all required leak testing and flushing completed and equipment released for preliminary operations.

b) Temporary strainers are in place and logged in SCE Startup Department Temporary Strainer Log Book, and gauges are ready for service to measure pressure across the strainers.

c) During the initial preliminary operational test, adjust all packing glands as required.

d) Operate equipment, valves, pressure vessels, tanks, etc., in piping to demonstrate satisfactory operation.

e) Check for unusual vibration of the piping system.

5.6.4.3 Pressure Vessel and Heat Exchangers

A) Verify by inspection and documentation that vessels are complete, clean

d) Operate equipment, valves, pressure valves, tanks, etc., in piping to demonstrate satisfactory operation.

e) Check for unusual vibration of the piping system.

5.6.4.3 Pressure Vessel and Heat Exchangers

a)Verify by inspection and documentation that vessels are complete, clean internally and ready for filling. This inspection shall include:

1) Code and/or State inspections made as specified.

2) All appurtenance (trim) items - safety valves, level controls, vents and drains are properly piped and connected and are complete.

3) Interior of vessel is clean and free of all loose scale, sand or debris.

4) All internals are installed.

5) All manhole covers are flanged joints are made up complete with gaskets and bolts which are tightened.

6) All unused openings are closed.

7) Protective linings are installed and are undamaged.

8) Instruments are properly isolated or protected from damages during test.

9) All personnel are out before closing manholes.

5.6.4.4 Preliminary Operational Tests

a) Inspection shall be completed and equipment released for preliminary operational test.

5.6.4.5 Tanks

a) Verify by inspection and documentation that tanks are complete and that tanks are ready for filling. This inspection shall include:

1) All appurtenances (trim) items, level gauges, valves, etc., are properly piped and connected.

2) Flushing has been completed and interior of tank is clean and free of all loose scale, sand or debris.

3) Interior of lined tanks inspected and found to be undamaged.

4) All unused openings are closed.

5) All manhole covers and flanged joints are made up complete with gaskets and bolts.

6) All personnel are out before closing manholes.

7) Tanks used for pre-operational testing and flushing of piping have been recleaned and suitable for preliminary operational use.

8) Code and/or State inspections are made has specified.

5.6.5 Fans

Inspection

A. Verify by documentation review that fans, including driver and accessory equipment, are installed in accordance with drawings and erection instructions and that fan is ready for preliminary operational test.

B. Inspection shall include items listed below as applicable.

1) Debris is removed from baseplates, drains, and general vicinity of the equipment.

C. Lubrication of all points has been completed in accordance with manufacturer's instruction book and lubrication tag attached.

1) Bearings are correctly lubricated as specified.

2) Automatic lubrication system, if provided, is correctly filled, primed and delivering oil to all parts.

D. Electrical wiring, contactors, overload protection interlock connections, motors, are all checked and tested; power is available to equipment terminals.

5.6.5.2 Preliminary Operational Tests

A. Inspection Section 5.6.5.1 above shall be completed. Electrical equipment released for preliminary operational test.

B. Verify alignment of motor to driven equipment is correct.

C. Check back draft dampers are free to operate properly.

D. Start equipment in accordance with manufactuerer's starting instructions. Run-in shall continue and adjustments shall be made as specified until proper operation is established.

EQUIPMENT DATA SHEET
-MECHANICAL-

GENERATING STATION: _____ DATE: _____

UNIT NUMBER: _____ S.C.E. J.O. NO.: _____

EQUIPMENT: _____

MANUFACTURER: _____ SERIAL NO.: _____

RATING: _____ CAPACITY: _____

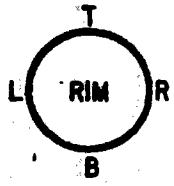
START-UP AND TEST DATA

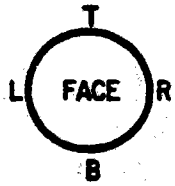
DATE OF LUBRICATION: _____ RPM: _____

SUCTION PRESSURE AND TEMPERATURE: _____ PSIG: _____ °F.

DISCHARGE PRESSURE: _____ PSIG

ALIGNMENT DATA:

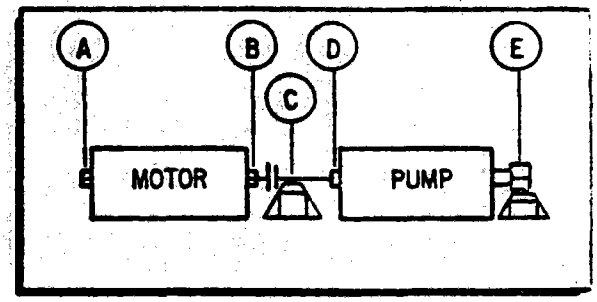




DIAL INDICATOR MOUNTED ON: _____

VIBRATION DATA:

POINT	VIBRATION, MILS		
	HORIZ.	VERT.	AXIAL
A			
B			------
C			------
D			------
E			



COMMENTS: _____

SIGNED: _____
S.C.E. START-UP ENG.

DATE: _____

SIGNED: _____
S.C.E. CONST. ENG.

DATE: _____

SIGNED: _____
CONTRACT REP.

DATE: _____

SCE STARTUP STANDARDS

SECTION 5.7

INSTRUMENT AND CONTROL TESTS

CONTENTS

5.7 INSTRUMENT AND CONTROL TESTS

5.7.1 General

Instrument and controls check out and calibration will begin during the final stages of construction and continue until all instrumentation is in service, fuctioning properly and is reliable. Instruments will be placed in service as required during startup. All instrumentation necessary for adequate control and protection will be in service when system and equipment are placed in service for the first time.

Prior to placing in service, all required instrumentation equipment shall be calibrated and "tuned" in conjunction with its related plant equipment. This work proceeds in three steps: (1) static bench tests and predelivery functional check out at factory prior to shipment and bench tests at jobsite, (2) static loop calibration of field mounted elements following erection, and (3) dynamic calibration of instruments soon after portions of the plant are placed in preliminary operation and actual operating data becomes available. This calibration or tuning is continued as additional parts of instrumentation systems and plant systems are connected and operated over wide load ranges--making available additional empirical operating data.

Upon completion of installation of each instrumentation system, subsystem or loop in the field, including interconnection piping, electrical check out of wiring, testing and flushing of piping, the inspection and static loop calibration of instrument components should begin.

Procedures in this section apply to all instruments such as gauges, thermometers, primary measuring instruments, controller, and control valves, unless specifically excluded in specialized control systems sections of this procedure, or unless further testing is directed by authorized vendor representatives in the field.

1) Testing work will include static calibration of all instruments, and all other checks necessary to prepare erected equipment for service.

2) All activities, including design changes, shall be performed in accordance, with procedures, applicable manufacturer's drawings, instruction book and SCE specifications.

3) In the event that significant equipment error or evidence of damage or serious malfunction is discvered and extensive repair, calibration or adjustment is needed, it shall be done only under recommendation of the equipment manufacturer's authorized representative, and in accordance with paragraph 2 above.

5.7.2 Purpose

a) To define the responsibilities of Field Instrument Technicians.

b) To define boundaries and interfaces of major vendor instrumentation.

c) To define the responsibilities and requirements of major vendor instrument engineers/technicians.

d) To describe the records for which instrument technicians and engineers are responsible.

5.7.3 RESPONSIBILITIES

5.7.3.1 SCE and DOE Contractors

Contractors are responsible for the installation, initial calibration and placing in service of all instruments and controls in their areas of responsibilities are defined in their respective contracts. Contractors will provide instrument technicians and/or engineers to perform the work required to place all controls and instruments in service, necessary for adequate control and protection prior to and during startup of their respective equipment. These responsibilities include:

a) To insure that instruments are properly installed and connected.

b) To check out and initially calibrate all instrumentation on their equipment.

c) To insure that instrument interfaces are properly connected.

d) To maintain current records on instrument work progress and insure that work progress is consistent with startup requirements.

e) To be responsible for expediting instrument repair and parts replacement for initial installation to firm operation.

f) To maintain current records of instruments and parts used for other units, by completing and Instrument Calibration Data Sheet, to be provided by the Controls Startup Engineer for each instrument.

g) To provide for tuning and readjusting from initial operation to firm operation.

h) To keep the Controls Startup Engineer appraised for current instrument status.

i) To provide the Controls Startup Engineer with initial set point data for respective instruments and properly filled out record forms.

j) To insure that instrumentation in general meets the standards required for adequate control and protection of their respective equipment.

k) To provide all tools and special equipment required for all their instrument work.

5.7.3.2 SCE Construction Engineer

A) Verifies all instrumentation properly under the contract is properly installed and that instrument interfaces are correctly connected.

B) Checks out and initially calibrates all instruments installed under the contract.

C) Maintains current records on instrument work progress and insures that work progress is consistent with startup requirements.

D) Completes an Instrument Data Card, to be provided by the SCE Controls Startup Engineer for each instrument.

E) Keeps the SCE Controls Startup Engineer appraised of current instrument status.

F) Provides the SCE Controls Startup Engineer with initial set point data for respective instruments and properly filled out record forms.

G) Provides all tools and special equipment required for their work.

H) Provides qualified personnel to perform instrument work within the scope of their contract.

5.7.3.3 Edison Instruction Technicians

After instruments are installed and connected Edison Instrument Technicians will perform all work necessary to initially check out, calibrate nd place in functional service all instruments and controls except those

supplied and/or installed by the major vendors. Edison Instrument Technicians will work under the direction of the Lead Startup Engineer. These responsibilities include:

a) To insure that instruments are properly installed and connected.

b) To verify that instrument interfaces are properly connected.

c) To maintain current records and keep the Controls Startup Engineer appraised of instrument work progress.

d) To expedite instrument repair and parts replacement.

e) Tune and readjust instruments as required during startup.

f) Maintain records and forms of instrument set points and initial and final calibration data.

g) Maintain and be responsible for tools and special equipment provided for their work, also inventory and calibrate test instruments as necessary to insure their accuracy and relibility.

h) To provide the Controls Startup Engineer with final set point data for respective instruments and properly filled out record forms that will be provided by the Controls Startup Engineer.

5.7.4 RECORDS

5.7.4.1 Startup Controls Engineer

a) Will maintain the current instrument schedule completion status.

b) Will maintain instrument replacement/repair and delivery data.

c) Will maintain a list of project-owned instrumentation calibration equipment and be responsible for its use and availability.

d) Will record final set point data on Startup Form No. E5-249 and E5-251.

5.7.5 Calibration

To maintain integrity of calibrated controls and recorders, a plain lead seal may be installed across the instrument access openings. This measure has been effectively used to elimnate people other than those authorized by the Startup Engineer from making adjustments. In cases of emergency, should it become necessary to break a seal and make adjustments, such action will be reported promptly to the Startup Engineer for correction and resealing.

DO NOT TEST OR CALIBRTE WITH MERCURY-FILLED INSTRUMENT CONNECTED TO A SYSTEM WITHOUT AN ISLATION CHAMBER BETWEEN THE INSTRUMENT AND THE SYSTEM TO PREVENT THE POSSIBLE ENTRANCE OF MERCURY INTO THE SYSTEM (MERCURY AND MERCURY VAPOR IS EXTREMELY CORROSIVE TO COPPER AND TO ALLOYS CONTAINING COPPER.)

a) Verify by inspection and documentation that the instrument or instrument loop is complete, and that instrument loop of instrument system or subsystem is ready for preliminary operational test, including piping and wiring. The following must be utilized to assure completion of instrumentation testing:

   1) SCE instrument list

   2) SCE set point list

   3) SCE flow diagrams

   4) Vendor manuals and drawings

   5) SCE specifications

   6) SCE schematics

   7) SCE installation details

   8) SCE annunciator list

b) Pressure switches are calibrated with dead weight tester as calibrated precision test gauge.

c) Simple control systems, such as pressure transmitter and control valve, are calibrated together for final test.

d) Float operated level meters, controllers and switches are checked for proper installation. During operational test final calibration will be made to the system.

e) Differential type level or flow instruments are calibrated by simulating differential input with a water dead eight tester throughout operating range.

f) Pneumatic or electrical pressure transmitters and receiver gauges are calibrated together as a unit using dead weight tester or calibrated precision test gauge. Control valves and control valve positioners are calibrated to produce linear or nonlinear stem position corresponding to input signal change.

g) Temperature devices that perform functions such as recording controlling or alarming devices will be actuated to verify factory calibration.

5.7.5.1 Dynamic Calibration

1) Verify by inspection and documentation that the initial loop calibration described above is complete.

2) With the system or components in operation, vary the system over wide load ranges making available additional empirical operation condition.

3) Changes to bench calibration and loop calibration data will documented on appropriate data sheets for component changes.

SCE STARTUP STANDARDS

SECTION 5.8

GLOSSARY OF STARTUP TERMS

5.8 GLOSSARY OF START-UP TERMS

TERM	DEFINITION
Acceptance Criteria	Specific criteria that must be met in the performance of a test.
Acceptance of Work	Denotes conditional acceptance only, for the purpose of a test.
Acceptance Tests	A test of systems, conducted after pre-operational tests to demonstrate the capability of systems and subsystems to meet design performance requirements.
ANSI	American National Standards Institute.
Approval	The act of endorsing or adding positive authorization or both.
Area of Jurisdiction	The domain within which an organization's authority may be exercised.
ASME	American Society of Mechanical Engineers.
Boiler Acid Cleaning	Cleaning the internal surfaces of the water-side pressure parts of a boiler subsequent to boiler boilout to remove mill scale and rust. An acid solution (usually citric acid) heated to approximately 180 to 200°F is used as the cleaning agent. The acid solution reacts with the iron scale and rust to form ferric oxide.
Boiler Boilout	Cleaning the internal surfaces of the water-side pressure parts of a boiler to remove oil, grease and protective coating. An alkaline solution of Trisodium Phosphate (TSP) and wetting agents heated to approximately 180 to 200°F is used as the cleaning agent.
Boiler Chelate Cleaning	Same as boiler acid cleaning except a chelate cleaning solution is used at approximately 90 to 100°F to remove iron oxide and rust. The chelate solution combines with the iron scale and rust so as to form a chelate ring.

TERM	DEFINITION
Boiler Hydro	The hydrostatic test of the boiler with the boundaries of the test being all piping downstream of the economizer stop valve through the waterwells, risers, downcomers, steam drum, mud drum (if applicable) and primary and secondary superheater to the main steam stop valves (or main turbine stop valves if steam stops are not installed). The cold and hot reheat lines and reheater are hydrostatically tested in the same time interval but are not part of the boiler hydro.
Boiler Lightoff	A manual operation by an operator or a computer initiated action to initially energize selected ignitors and subsequent lighting of oil or gas burners following verification that all safety requirements have been satisfied.
BOP	Balance of plant, all systems and equipment necessary to support the steam generating systems and turbine/generator.
Calibrate	To apply a measured voltage, current, temperature, or pressure, or other variable to obtain a required response within a specified tolerance.
Cognizant Engineer	Individual having knowledge and responsibility for a particular disipline or system.
Component	A single piece of equipment such as a run of pipe, valve, protective device, instrument, wire, heat exchanger, pump, turbine, etc.
Concurrence	Consent, agreement in design.
Construction Tests	Test and checkouts performed by construction on installed system, circuits and components to verify compliance with specified or design requirements and applicable standards and codes; i.e., hydrostatic tests, Hi-Pot tests, etc.
Coordinate	To integrate the functions of SCE Startup, Contractor Construction/Startup and all suppliers supporting the startup program.

TERM	DEFINITION
Engineered System	A specified grouping of components designed to perform a specific function within the configuration of the plant.
Exceptions	Incomplete work that is known at time of turnover.
Firm Operation Date	Per FPC/CPUC, this is the date at which allowance for Funds Used During Construction (AFUDC) ceases to be applicable. As this event occurs, the unit is placed into the rate base and responsibility transferred from Engineering and Construction to Power Supply. Concurrently, charges being mde to the Project Work Order are limited to those involved with completion work.
Full Load Operation	Full load operation is established prior to Firm Operation as the unit achieves consecutive hours of operation in a full automatic control mode at site adjusted base load.
Head Hydro	Head hydro is pressurizing by filling with water or other fluids to demonstrate the tightness of open vessels such as atmospheric tanks, condensers, and associated piping. A head pressure is applied equal to the highest available static head within the system.
Hold Point	A quality activity wherein a QC person shall make a personal observation of a designated step during the performance of a process or activity to verify compliance with requirements and document acceptance and permission to continue the process of activity.
Hydrostatic Test	Controlled introduction of high pressure water to a filled system to demonstrate structural integrity of the associated piping and pressure vessles. A hydraulic test pump is used to prodice a selected pressure generally 1-1/4 to 1-1/2 times the design pressure. The test will be maintained at least ten minutes, adhering to specified temperature requirements to prevent brittle fracture.
IEEE	Institute of Electrical and Electonics Engineers.

TERM	DEFINITION
Initial Energization	The initial energizing of permanent plant high voltage transformers and busses from normal and/or alternate offiste power sources.
Inspect (checkout)	To check visually for correct installation and arrangement.
Leak Testing	Leak testing is the pressurizing with water or other fluids to demonstrate the tightness of flanges, manholes, and other mechanical closures of piping and equipment. A pressure less than the settings of relief devices is applied from permanently installed pumping equipment at shut off head or source pressures of system fluid.
Operating Procedure	Procedures used by the station staff for normal day-to-day plant operation.
Performance Warranty Test	The demonstration and determination that the Unit generates the corrected base load at the guaranteed heat rate.
Plant Status	The operating condition of the plant.
Pneumatic Test	A pressure test with oil-free air or inert gas to demonstrate the tightness of a system.
Preboiler Chemical Cleaning	The circulation of a hot alkaline water solution through the preboiler systems (condensate, feedwater and feedwater drain systems) to remove oil, grease, preservatives, inhibitors and possible siliceous materials from carbon steel piping and equipment followed by an acid or chelate solution to remove iron oxide and mill scale.
Preoperational Testing Program	The period following prerequisite testing when integrated tests are conducted to demonstrate the capability of systems to meet engineered performance requirements.

TERM	DEFINITION
Prerequisite Tests	A test conducted after construction activities have been completed to verify that prerequisite requirements for components and equipment such as instrument calibration, electrical energization and control function logic requirements have been demonstrated in order to proceed with preoperational tests.
Recirculation Flush	Where a single batch of water is recirculated under pressure at a prescribed velocity in a closed path through a strainer, filter or demineralizer to remove debris and water impurities.
Safety Classification	All systems and components are classified as either safety related or non-safety related.
Scoping	Defining system boundaries usually by marking piping and instrument diagrams (P&IDs), electrical single line drawings, electrical schematics, and other engineering documents to relate and identify specific mechanical, electrical and instrument equipment to a system.
Startup	The process of placing a facility in operation for the first time. The process starts with the checkout, test, calibration, trial, demonstration, and verification steps on individual items of mechanical and electrical equipment and ends with acceptance for normal operation.
Startup Interface Diagram	Diagram listing interface activity responsibilities between Contractor, Construction, Contractor Startup, NSS/ Boiler Supplier.
Startup Milestone Event	A significant event in the life of the project when a number of activities are completed and subsequent activities can be started.
Startup Program	This program commences at construction turnover and continues through to firm operation. The program includes component and system testing to satisfy requirements for acceptance.

TERM	DEFINITION
Startup System Schedule	The listing of systems with completion dates presentd on a logical sequence to permit a smooth and orderly startup. The sequence is based upon system prerequisites, historic information from other projects and manpowr loading. The startup schedule projects scheduled activities in terms of weeks before and after turbine roll.
Steam Blow	A method of removing fabrication and erection debris and mill scale by passing saturated steam at sonic velocities through steam pipe.
Subsystem	A smaller division of a system used by Startup for planning, scheduling and turnover requirements which associates its function with the operation of only one specific engineered system. The subsystem carries the same system identifier followed by an additional identifier.
Synchronization of Generator to Line	An operational activity that takes the unit generator to synchronous speed, phases the generator voltage output to the electrical system, and electrically connects the generator and electrical system for the first time. The significance of synchronization is that the FPC/CPUC views it as an indicator of the physical status of a unit. It also serves as a point from which Edison starts to compute a differential credit for fuel consumed during startup versus power generated.
System	A specified grouping of components designed to perform a specific function within the configuration of the plant.
System Description	A document that describes systems or components design function and operation.
System or Equipment Condition	A description of the specific mode of operation of individual system or components.

TERM	DEFINITION
Technical Direction	The support provided in relation to safe, orderly, and correct performance of construction testing and startup activities. Technical direction does not include direct management, supervision, arbitration, or evaluation of contractor's, suppliers', or SCE's personnel.
Test	To apply a voltage, current, fluid or mechanical pressure to establish integrity of wiring, piping, or mechanical linkage, to obtain the specified function, response or operability of individual components.
Test Specification	An outline of the tests to be performed and the criteria to be satisfied (based on design requirements) for the safe and satisfactory performance of the system. It provides necessary design values including operating tolerances, set points and reference materials for the preoperation of detailed preoperational and/or acceptance test procedures.
Turbine Roll	Denotes the initial turbine roll from the normal steam source to design RPM.
Turnover	The jurisdictional transfer of components/ systems to Startup from Construction for care, custody, and control.
Velocity Flush	A cleaning technique that utilizes the capability of a rapidly flowing stream of liquid to scrub, sweep, or scour foreign material from the internal walls and surfaces of the systems. Particles picked up by the circulating liquid are flushed to waste or trapped and collected on a fine mesh screen or filter. Effective flushing velocities should exceed the design flow rate through the equipment.
Verify	To confirm the intended function, response, or operability under simulated or actual conditions.
Witness Point	A quality activity wherein a QA person should make a personal observation of a designated step during the performance of a process or activity to verify compliance with requirements.

Revised August 6, 1981

TEST MANUAL
INSTRUCTIONS AND PROCEDURES
INDEX

TRIP CUTOUT SWITCHES

When working on protective relaying schemes to in-service equipment, it is common practice to isolate the relay's ability to affect the in-service equipment by making the relay solid and opening trip cutout switches.

When returning the relay scheme to service, it is necessary to close the trip cutout switches.

Prior to closing the trip cutout switches, make the relay scheme automatic and check that there is no trip present at the trip cutout switches. Use either the feedback method or if there is any doubt use light bulbs to check for a trip present.

Close the switches one at a time returning the relay to service.

NOTE: Operating procedures require permission from operating personnel before removing or returning relay schemes to service.

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	DE-AC03-77SF10501
Subcontract No.	NA
Report No.	(STMPO 536) DOE/SF/10501-059
Date of Report	August 1981
Name & Phone No. of DOE Technical Representative	Mike Lopez (415) 273-4264

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: Southern California Edison
P.O. Box 800
Rosemead, CA 91770

c/o Joyce Wells Rm. 497

1. Document Title: Solar One Generating Station Start-up and Testing Manual

2. Type of Document: ☒ Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary, ☐ Copy of Oral Presentation, ☐ Other (please specify): _____

3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

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☐ 4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

a. Attention should be directed to pages _____ of this document.

b. This document describes matter relating to an invention:

i. Contractor Invention Docket No. _____.
ii. A disclosure of the invention was submitted to DOE on _____ (date)
iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
iv. A waiver of DOE's patent rights to the contractor:
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☐ 5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.

6. Remarks: Please provide copy of clearance to: Joyce Wells Room 497

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Rosemead, Ca 91770

Reviewing/Submitting Official: Name (Print/Type) Bill von KleinSmid

Title Solar One Program Director

Signature William von KleinSmid Jr. Date 9-25-84

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☒ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed Harold M. Dixon Date Mailed 10/9/84

2

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