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RECEIVER STEAM GENERATION (CONTROLS) PREOPERATIONAL TEST PROCEDURE 1030 REVISION 0 SECTIONS 1 THROUGH 9

UNITED STATES DEPARTMENT OF ENERGY/ SOUTHERN CALIFORNIA EDISON COMPANY

> 10 MWe SOLAR PILOT PLANT DAGGETT, CALIFORNIA

## MCDONNELL DOUGLAS ASTRONAUTICS COMPANY HUNTINGTON BEACH, CALIFORNIA

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Test 1030 Revision 0 Page 1 of 543

## RECEIVER STEAM GENERATION (CONTROLS) PREOPERATIONAL TEST PROCEDURE 1030

### TABLE OF CONTENTS

SECT	ION			PAGE
1.0	OBJEC	TIVES		12
	1.1	"Hot Wat	er" Receiver Operation - Flow to Flash Tank	12
	1.2	"Steamin	ıg" Receiver Operation - Flow to Flash Tank	13
		1.2.1	Panel Steam Cure - Panels 209, 210, 211, 212	13
		1.2.2	Flash Tank Control Tuning - Steam Loops	13
		1.2.3	Control Tests - Panels 210, 212, Steam Loop Operation	13
		1.2.4	Panel Steam Cure - Panels 213, 214, 215, 216	14
		1.2.5	Control Tests - Panels 214 and 216 - Steam Loop Operation	15
		1.2.6	Panel Steam Cure - Panels 204, 205, 206, 207, 208	15
		1.2.7	Control Tests - Panels 204 and 206, Steam Loop Operation	16
		1.2.8	Panel Steam Cure - Panels 217, 218, 219, 220, 221	17
		1.2.9	Control Tests - Panels 217, 219, 221 - Steam Loop Operation	17
		1.2.10	Control Tests - Low Flow - Panels 204, 208, 217, 221	18
		1.2.11	Partial Receiver Start - Panels 209 Through 214	19
		1.2.12	Partial Receiver Start - Panels 204 Through 208	19
		1.2.13	Partial Receiver Start - Panels 215 Through 221	20
		1.2.14	Integrated Receiver Start (Flow to Flash Tank)	20
		1.2.15	Verification of Proper Thermal Expansions of Receiver Panels	21
		1.2.16	Verification of Dynamic Operation of Water Panel Light Seals	21
	1.3	"Steamir	ıg" Receiver Operation - Flow to Downcomer	22
		1.3.1	Condition Downcomer and Steam Dump System	22
		1.3.2	Control Tests - Steam Dump System	22
		1.3.3	Control Tests - Receiver Feedpump - Rated Pressure	22
		1.3.4	Control Tests - Panels 214, 217, 219, 221 - Low Flow	23
			_	

Test 1030 Revision 0 Page 2 of 543

		1.3.5	Control Tests - Panels 214, 217, 219, 221 - Moderate Flow	24
		1.3.6	Control Test - Steam Dump System - High Flow	24
		1.3.7	Control Tests - Panels 214, 217, 219, 221 - High Flow	25
		1.3.8	Control Tests - Auxiliary Steam - Loop Tuning	26
		1.3.9	Control Tests - All Panels - Blended Temperature Control	26
		1.3.10	Control Tests - Large Signal Flux/Setpoint Response Tests - Rated Steam Conditions - Blended Temperature Control	27
		1.3.11	Control Tests - Derated Steam Conditions - Temperature Control	28
		1.3.12	Moisture Separators and Accumulator	28
2.0	ACCEP	TANCE CRI	TERIA	29
	2.1	"Hot Wate	er" Receiver Operation - Flow to Flash Tank	29
	2.2	Steaming	Receiver Operation - Flow to Flash Tank	30
		2.2.1	Panel Steam Cure - Panels 209, 210, 211 & 212	30
		2.2.2	Flash Tank Control Tuning - Steam Loops	30
		2.2.3	Control Tests - Panels 210, 212, Steam Operation Loop	31
		2.2.4	Panel Steam Cure - Panels 213, 214, 215 & 216	32
		2.2.5	Control Tests - Panels 214 & 216 - Steam Loop Operation	32
		2.2.6	Panel Steam Cure - Panels 204, 205, 206, 207, & 208	33
		2.2.7	Control Tests - Panels 204 & 206, Steam Loop Operation	33
		2.2.8	Panel Steam Cure - Panels 217, 218, 219, 220, & 221	34
		2.2.9	Control Tests - Panels 217, 219, 221 - Steam Loop Operation	34
		2.2.10	Control Tests - Low Flow - Panels 204, 208, 217, & 221	35
		2.2.11	Partial Receiver Startup - Panels 209 & 214	<b>3</b> 5
		2.2.12	Partial Receiver Startup - Panels 204 & 208	36
		2.2.13	Partial Receiver Startup - Panels 215 & 221	36
		2.2.14	Integrated Receiver Startup (Flow to Flash Tank)	36
		2.2.15	Receiver Panel Thermal Expansion	37
		2.2.16	Receiver Panel Light Tightness	37

Test 1030 Revision 0 Page 3 of 543

	2.3	"Steami	ng" Receiver Operation - Flow to Flash Tank	37
		2.3.1	Condition Downcomer and Steam Dump System	37
		2.3.2	Control Tests - Steam Dump System	38
		2.3.3	Control Tests - Receiver Feed Pump - Rated Pressure	38
		2.3.4	Control Tests - Panels 214, 217, 219, 221 - Low Flow	39
		2.3.5	Control Tests - Panels 214, 217, 219, 221 - Moderate Flow	40
		2.3.6	Control Test - Steam Dump System - High Flow	40
		2.3.7	Control Tests - Panels 214, 217, 219, 221 - High Flow	41
		2.3.8	Control Tests - Auxiliary Steam - Loop Tuning	42
		2.3.9	Control Tests - All Panels - Blended Temperature Control	42
		2.3.10	Control Tests - Large Signal Flux/Setpoint Response Tests - Rated Steam Conditions - Blended Temperature Control	44
		2.3.11	Control Tests - Derated Steam Conditions - Blended Temperature Control	44
		2.3.12	Moisture Separator and Accumulator	45
3.0	REFER	ENCES		46
	3.1	Pilot Pl	ant System Documentation	46
		3.1.1	Pilot Plant System Description, Dec. 1980	46
		3.1.2	Pilot Plant Startup and Acceptance Test Plan, Dec. 1980	46
		3.1.3	Plant Operating/Training Manual - Book 1 - Operating Instructions, July 1981	46
	3.2	Logic Di	agrams	46
		3.2.1	Controller Logic Diagrams, Issued May 1981	46
	3.3	Line Sch	nedules	46
	3.4	Single Line Diagrams		46
	3.5	Piping a	nd Instrumentation Diagrams	46
	3.6	Electric	al Loop Diagrams	47
	3.7	Instrume	ent Index	48
		3.7.1	Master Equipment List (MEL)	48
		3.7.2	Measurements List	48
		3.7.3	Measurement User File (MUF)	48

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Test 1030 Revision O Page 4 of 543

	3.8	Materia	Requisition and/or Specification	48
	3.9	Vendor [	Data	49
	3.10	Standard	is	49
	3.11	Startup	Schedule	49
		3.11.1	"Best Effort" Working Startup Schedule October 20, 1981	49
4.0	PRERE	QUISITES		50
5.0	LIMIT	S AND PRI	ECAUTIONS	52
6.0	TEST	EQUIPMENT	Г	54
	6.1	Indicati	ing Instruments	54
	6.2	Sensors	and Transducers	54
	6.3	Recordir	ng Equipment	54
		6.3.1	Strip Chart Recorders	54
	6.4	Others		54
		6.4.1	Control Test Unit	54
		6.4.2	Transfer Function Analyzer	54
		6.4.3	Function (Wave) Generator	55
7.0	INITI	AL CONDIT	TIONS	56
	7.1	Environm	nental Conditions	56
	7.2	Temporar	ry Installations	56
	7.3	Support	Systems/Plant Operating Status	56
	7.4	Process	Conditions	57
8.0	PROCE	DURE AND	DATA COLLECTION	61
	8.1	"Hot Wat	er" Receiver Operation - Flow to Flash Tank	61
	8.2	"Steamir	ng" Receiver Operation - Flow to Flash Tank	82
		8.2.1	Steam Cure of Panels 209-212	84
		8.2.3	Control Tests - Panels 210, 212 - Steam Loop Operation	104
		8.2.4	Steam Cure of Panels 213-216	138
		8.2.5	Control Tests - Panels 214 and 216 - Steam Loop Operation	143
		8.2.6	Steam Cure of Panels 204-208	173
		8.2.7	Control Tests - Panels 204 and 206 - Steam Loop Operation	178
		8.2.8	Steam Cure of Panels 217-221	20 <b>9</b>
		8.2.9	Control Tests - Panels 217, 219, 221 - Steam Loop Operation	214

Test 1030 Revision 0 Page 5 of 543

	8.2.10	Control Tests - Low Flow - Panels 204, 208, 217, 221	257
	8.2.11	Receiver Startup Sequence (Panels 209-214)	286
	8.2.12	Receiver Startup Sequence (Panels 204-208)	305
	8.2.13	Receiver Startup Sequence (Panels 215-221)	318
	8.2.14	Integrated Receiver Startup (Flow to Flash Tank)	334
8.3	"Steamin	g" Receiver Operation - Flow to Steam Dump	339
	8.3.1	Condition Downcomer and Steam Dump System	340
	8.3.2	Control Tests on the Steam Dump System	343
	8.3.3	Control Tests - Receiver Feedpump - Rated Pressure	355
	8.3.4	Control Tests - Panels 214, 217, 219, & 221 - Low Flow	362
	8.3.5	Control Tests - Panels 214, 217, 219, & 221 - Moderate Flow	414
	8.3.6	Control Test - Steam Dump System - High Flow	438
	8.3.7	Control Tests - Panels 214, 217, 219, & 221 - High Flow	441
	8.3.8	Control Tests - Auxiliary Steam - Loop Tuning	494
	8.3.9	Control Tests - Panels 214 thru 221 - High Flow - Blended Temperature Control	499
	8.3.10	Control Tests - Large Signal Flux/Setpoint Response Tests Rated Steam Conditions	522
	8.3.11	Control Tests - Derated Steam Conditions - Blended Temperature Control	52 <b>9</b>
	8.3.12	Moisture Separators and Accumulator	542
SYSTE	M RESTORA	TION	543

10.0 ATTACHMENTS (separate book)

9.0

Test 1030 Revision O Page 6 of 543

#### INSERT

#### RECEIVER STEAM GENERATION TEST (1030) SAFETY POLICIES

(December 23, 1981)

#### INTRODUCTION

This outlines the Safety Policies that will be followed during the Receiver Steam Generation Test (1030) period. In addition to these Safety Policies, all personnel involved in the program are encouraged to read and understand the SCE Accident Prevention Manual (APM). Questions regarding these rules should be directed to your immediate supervisor.

ONLY AUTHORIZED PERSONNEL will be allowed in the Collector Field, Receiver Tower, Core Area or Control Room during actual test periods. <u>AUTHORIZED PERSONNEL</u> are those individuals who have obtained approval from the Operating Foreman and/or who have previously demonstrated familiarity with the solar facilities design and the safety procedures.

#### GENERAL

1. SCE Accident Prevention Rules and Solar One Generating Station Operating Procedures shall be followed when working on all process and electrical distribution systems. Particular emphasis will be placed on SCE Clearance Procedures as defined in the APM.

2. In the event of an accident, SCE and DOE shall be notified and SCE will conduct an inquiry to identify the cause of the accident and take measures necessary to prevent its recurrence.

3. All personnel involved in testing and operations shall be cognizant and understand these Safety Policies. It will be the responsibility of ALL supervisors to insure these Safety Policies are followed.

4. SCE Control Operators shall have prior knowledge of <u>ALL</u> personnel working in a hazardous area, and will maintain communication with these personnel by use of pagers.

5. <u>ALL</u> personnel shall obtain approval from the Operating Foreman <u>BEFORE</u> entering designated hazardous areas or working on any equipment. Personnel shall be notified by the Control Operator of any designated hazardous areas related to the requested approval.

6. <u>ALL</u> control systems related to Receiver Steam Generation (1030) Testing shall be in good working condition.

7. A warning system shall be devised to indicate; test start, wire walk, stray heliostat, emergency stow, and test end. This warning system could be a sequence of whistle soundings, a public address message or flashing lights.

8. Identification badges will be issued to all personnel and shall be worn in a conspicuous location by everyone.

Test 1030 Revision 0 Page 1A of 543 9. Hard hats shall be worn by all personnel within the plant area.

10. The Operating Foreman shall be notified immediately of any abnormal or hazardous situations observed.

#### GUESTS

1. Guests shall be accompanied by a qualified person when entering Collector Field, Receiver Tower, Core Area or Control Room during non operating periods. Guests will not normally be allowed in these areas during operating periods.

2. Guests on an exception basis may be allowed in the Collector Field, Receiver Tower, Core Area or Control Room during operating periods with the <u>approval of the Operating Foreman</u> and accompanied by <u>AUTHORIZED</u> PERSONNEL at all times.

3. Use of cameras shall be allowed only with the appropriate approvals. The Security Officer should be contacted regarding approval authority.

4. Temporary identification badges shall be issued by plant security and worn in a conspicuous location.

#### COLLECTOR FIELD

1. <u>ONLY AUTHORIZED PERSONNEL</u> shall be allowed in the Collector Field during its operation and only with the approval of the Operating Foreman. This limitation applies to the access roads leading to and from the Core Area.

2. <u>AUTHORIZED PERSONNEL</u> working in the Collector Field shall carry and wear, if required, safety approved dark glasses and maintain communication with the Control Operator by use of pagers.

3. Personnel working in the Collector Field with motorized vehicles shall not leave vehicles unattended unless the Control Operator has cleared that area specifically for that purpose.

4. The Weather Station Towers are "OFF LIMITS" to all personnel during (1030) testing.

5. In the event of loss of electrical power, the Collector Field shall be cleared.

6. All heliostats involved in testing shall normally be placed in "standby" before sunrise. These heliostats shall normally not be moved to face down stow until after sunset, except in emergency conditions or in accordance with test requirements, and after an appropriate warning signal.

7. Wire walks involving the southeast quadrant should be initiated only from the ALT-1 stow position.

Test 1030 Revision 0 Page 2A of 543 8. If more than two heliostats in one quadrant are required to wire walk, a wire walk notification shall be given.

9. Areas designated "Location of Bottom of Wire Walk" shall be marked in a conspicuous matter and will immediately be evacuated when the "wire walk" alarm is sounded.

10. Established "wire walks" will be used when moving heliostats between stow and "standby".

11. Sun images on heliostats should not be viewed intentionally with the naked eye or through any type of lensed mechanism.

#### RECEIVER TOWER

1. <u>ONLY AUTHORIZED PERSONNEL</u> will be allowed on the Receiver Tower during (1030) testing.

2. Receiver Tower access shall normally be made by the elevator and limited to times when heliostats are in "standby" or "track" and only with the approval of the Operating Foreman. Movement up and down the Receiver Tower during wire walk periods shall be limited to emergency situations and requires the approval of the Operating Foreman.

3. Receiver panels should not be viewed directly by the naked eye or through any type of lensed mechanism.

4. Hazardous areas shall be posted and local danger spots safety striped. These areas are to be avoided during wire walks.

5. Personnel shall be restricted from the fifteenth level (directly above the BCS targets) during Receiver operation or with any portion of the Collector Field in track except for special situations left up to the discretion of the Operating Foreman. Dark glasses shall be used as protection from Receiver brightness.

Test 1030 Revision 0 Page 3A of 543

#### INTRODUCTION

The purposes of this 1000 series preoperational test are to:

- Verify the "process" operation of solar specific portions of the plant.
- (2) Develop the control functions and/or field tune the individual plant controllers.
- (3) Verify selected portions of the Plant Operating Procedures(Ref. RADL 2-36, Plant Operating/Training Manual)

As a result in addition to satisfying the stated Acceptance Criteria (Section 2.0), portions of this procedure are designed to gather data required to develop and refine the basic control functions. Also, the actual procedures themselves (step-by-step activities) will be evaluated against currently published operating procedures. In the event selected steps of the procedure do not produce the desired condition or better ways of achieving the desired conditions are identified, the operating and test procedures will be revised (red lined in the field) to support subsequent testing.

In the event stated test objectives or acceptance criteria are not fully satisfied due to technical, cost, or schedule considerations, a field decision will be made by the members of the Test Working Group to move forward through the test procedure or to retest (with possible equipment modification) until satisfactory results are achieved. From a program cost and schedule standpoint, it is intended to move forward through the procedure unless issues of equipment or personnel safety are involved. Problem areas will be so noted and serve as detailed test objectives for subsequent "in depth" test activities to be carried out as part of the Operational Test Program.

> Test 1030 Revision O Page 7 of 543

Preoperational Test 1030 involves a series of "hot flow" tests in which heliostats are applying redirected power to the receiver. The major activities of Test 1030 are:

- 1) Hot water flow to the flash tank
- 2) Steam flow to the flash tank
- 3) Steam flow to the downcomer

Major process elements to be investigated during this test are shown in Figure 1.

The overall flow of the 1030 test procedure is shown in Figure 2. A detailed functional flow of all test objectives is shown in Figure 3 with references to paragraphs which describe the test objectives. The generic test types consist of panel cure tests and control tests. The panel cure tests are designed to cure the pyromark and gather heat flux distribution data. Control tests are designed to gather design data required to tune controllers (open loop tests) and also to directly tune simple loops. Controls tests are designed to confirm control system operation, stability, and transient response at the maximum and minimum design conditions for temperature, pressure flow, and disturbance conditions.

The scope of this test procedure includes items that should be tested to ensure proper receiver and related system operation. During the course of the test, specific test areas may be deleted or expanded upon on the basis of test data and problem areas identified at that point. All such deviations, expansions, or deletions will be made with the consent of the Test Working Group.

> Test 1030 Revision 0 Page 8 of 543

Main Steam Downcomer





Test 1030 Revision 0 Page 9 of 543







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#### 1.0 OBJECTIVES

- 1.1 "Hot Water" Receiver Operation Flow to Flash Tank
  - 1.1.1 Demonstrate that heat flux is properly applied to the receiver.
  - 1.1.2 Carryout low temperature cure of the Pyromark point  $(T \le 460^{\circ}F)$  in prescribed temperature steps by controlling individual panel flows to produce the desired panel metal temperatures.
  - 1.1.3 Obtain panel incident flux versus absorbed power data for each panel.
  - 1.1.4 Verify proper thermal expansion of receiver panels.
  - 1.1.5 Verify dynamic operation of inter panel light seals.

Test 1030 Revision 0 Page 12 of 543

- 1.2 "Steaming" Receiver Operation Flow to Flash Tank
  - 1.2.1 Panel Steam Cure panels 209, 210, 211, 212.
    - 1.2.1.1 Demonstrate that heat flux is properly applied to the receiver panels.
    - 1.2.1.2 Carryout high temperature cure of the Pyromark paint on panels 209, 210, 211, 212 (T  $\leq 850^{\circ}$ F) in prescribed temperature steps by controlling individual panel flows to produce the desired panel metal temperatures (appropriate to all boiler panels).
    - 1.2.1.3 Obtain open loop process control responses to small signal flux and flow changes.
  - 1.2.2 Flash Tank Control Tuning Steam Loops
    - 1.2.2.1 Demonstrate satisfactory closed loop operation of the flash tank vent valve pressure controllers (PC-2906, PC-1000, and PC-647B) and the desuperheater spray water temperature controller TC-1002.
  - 1.2.3 Control Tests panels 210, 212, Steam Loop Operation
    - 1.2.3.1 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 210 and 212. Obtain both step and frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ ramp response to small signal flux disturbances.

Test 1030 Revision 0 Page 13 of 543

- 1.2.3.2 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 210 and 212. Obtain both step and frequency response to valve disturbance at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.
- 1.2.3.3 Obtain closed loop response data on panel temperature controllers TC-2501, TC-2503 to temperature set point and flux changes at a nominal temperature of 660°F. Tune control loops as required.
- 1.2.3.4 Obtain closed loop response data in panel temperature controllers TC-2501 and TC-2503. Determine response to temperature set point and flux changes at a nominal temperature of 850°F. Tune control loops as required.
- 1.2.3.5 Obtain closed loop response data on receiver feedpump controller PC-1105 in the valve control mode. Determine response to setpoint and valve disturbances with receiver panels under flow control. Tune control loop as required.
- 1.2.4 Panel Steam Cure panels 213, 214, 215, 216
  - 1.2.4.1 Demonstrate that heat flux is properly applied to the receiver panels.
  - 1.2.4.2 Carry out high temperature cure of the Pyromark paint on panels 213, 214, 215, 216 ( $T \le 850^{\circ}F$ ) in prescribed temperature steps by controlling individual panel flows to produce the desired panel metal temperatures (appropriate to all boiler panels.

Test 1030 Revision O Page 14 of 543

- 1.2.4.3 Obtain loop process control response data to small signal flux and flow changes.
- 1.2.5 Control Tests panels 214 and 216 Steam Loop Operation
  - 1.2.5.1 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 214 and 216. Obtain both step and frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ramp response to small signal flux disturbances.
  - 1.2.5.2 Obtain process control open loop data response for tuning of receiver temperature control loops on panels 214 and 216. Obtain both step and frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ramp response to small signal flux disturbances.
  - 1.2.5.3 Obtain closed loop response data on panel temperature controllers TC-2601 and TC-2701 to temperature set point and flux changes at a nominal temperature 660°F. Tune control loops as required.
  - 1.2.5.4 Obtain closed loop response data in panel temperature controllers TC-2602 and TC-2701. Determine response to temperature set point and flux changes at a nominal temperature of 850°F. Tune control loops as required.
- 1.2.6 Panel Steam Cure panels 204, 205, 206, 207, 208
  - 1.2.6.1 Demonstrate that heat flux is properly applied to the receiver panels.

Test 1030 Revision 0 Page 15 of 543

- 1.2.6.2 Carry out high temperature cure of the Pyromark paint on panels 204, 205, 206, 207, 208, 209  $(T \le 850^{\circ}F)$  in prescribed temperature steps by by controlling individual panel flows to produce the desired panel metal temperatures (appropriate to all boiler panels).
- 1.2.6.3 Obtain open loop process control responses to small signal flux and flow changes.
- 1.2.7 Control Tests panels 204 and 206, Steam Loop Operation
  - 1.2.7.1 Obtain process control open loop data required for tuning of the receiver temperature control loops on panels 204 and 206. Obtain both step and frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ ramp response to small signal flux disturbances.
  - 1.2.7.2 Obtain process control open loop data required for tuning of the receiver temperature control loops on panels 204 and 206. Obtain both step and frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.
  - 1.2.7.3 Obtain closed loop response data on panel temperature controllers TC-2301 and TC-2303 to temperature set point and flux changes at a nominal temperature of 660°F. Tune control loops as required.

Test 1030 Revision 0 Page 16 of 543

- 1.2.7.4 Obtain closed loop response data on panel temperature controllers TC-2301 and TC-2303. Determine response to temperature set point and flux changes at a nominal temperature of 850°F. Tune control loops as required.
- 1.2.8 Panel Steam Cure panels 217, 218, 219, 220, 221
  - 1.2.8.1 Demonstrate that heat flux is properly applied to the receiver panels.
  - 1.2.8.2 Carry out high temperature cure of Pyromark paint on panels 217, 218, 219, 220, 221  $(T \le 850^{\circ}F)$  in prescribed temperature steps by controlling individual panel flows to produce the desired panel metal temperatures (appropriate to all boiler panels).
  - 1.2.8.3 Obtain open loop process control responses to small signal flux and flow changes.
- 1.2.9 Control Tests panels 217, 219, 221 Steam Loop Operation
  - 1.2.9.1 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 217, 219 and 221. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 850°F. Obtain step/ ramp response to small signal flux disturbances.

Test 1030 Revision 0 Page 17 of 543

- 1.2.9.2 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 217, 219 and 221. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 660°F. Obtain step/ramp response to small signal flux disturbances.
- 1.2.9.3 Obtain closed loop response data on panel temperature controllers TC-2801, TC2803 and TC-2702, to temperature set point and flux change at a nominal temperature of 660°F. Tune control loops as required.
- 1.2.9.4 Obtain closed loop response data in panel temperature controllers TC-2701, TC-2801 and TC-2803. Determine response to temperature set point and flux changes at a nominal temperature of 850°F. Tune control loops as required.
- 1.2.10 Control Tests Low Flow panels 204, 208, 217, 221
  - 1.2.10.1 Obtain process control open loop data sequences for tuning of receiver temperature control loops on panels 204, 208, 217, 221. Obtain both step and frequency response both to valve disturbance at nominal temperature of 660°F and start-up flow conditions. Obtain step/ramp response to small signal flux disturbances.
  - 1.2.10.2 Obtain closed loop response data on panel temperature controllers TC-2301, TC-2402, TC-2702, TC-2803 to temperature set point and flux changes at a nominal temperature of 660°F and equivalent start-up flow conditions. Tune control loops as required.

Test 1030 Revision O Page 18 of 543

#### 1.2.11 Partial Receiver Start - panels 209 thru 214

- 1.2.11.1 Demonstrate that heat flux is properly applied of the receiver panels for the start-up heliostat field configuration.
- 1.2.11.2 Verify start up procedures and sequencing for receiver panels 209 thru 214.
- 1.2.11.3 Obtain closed loop response data on panel temperature controllers TC-2403 thru TC-2602 to temperature set point and flux changes at nominal temperature of 660°F and 485 psia under start-up flux/field configuration conditions. Tune control loops as required.
- 1.2.12 Partial Receiver Start panels 204 thru 208
  - 1.2.12.1 Demonstrate that heat flux is properly applied to the receiver panels for the start-up heliostat configuration.
  - 1.2.12.2 Verify start up procedures and sequencing for receiver panels 204 thru 208.
  - 1.2.12.3 Obtain closed loop response data on panel temperature controllers TC-2301 thru TC-2402 to temperature set point and flux changes at nominal temperature of 660°F and 485 psia under start-up flux/field configuration conditions. Tune control loops as required.

Test 1030 Revision 0 Page 19 of 543

- 1.2.13 Partial Receiver Start panels 215 thru 221
  - 1.2.13.1 Demonstrate that heat flux is properly applied to the receiver panels for the start-up heliostat field configuration.
  - 1.2.13.2 Verify start-up procedures and sequencing for receiver panels 215 thru 221.
  - 1.2.13.3 Obtain closed loop response data on panel temperature controllers TC-2603 thru TC-2803 to temperature set point and flux changes at a nominal temperature of 660°F and 485 psig under start-up flux/field configuration conditions. Tune control loops as required.
- 1.2.14 Integrated Receiver Start (Flow to Flash Tank)
  - 1.2.14.1 Demonstrate that heat flux is properly applied to all receiver panels for the start-up heliostat field configuration.
  - 1.2.14.2 Verify start-up procedures and sequencing for receiver panels 201 thru 224.
  - 1.2.14.3 Obtain closed loop response data on panel temperature controllers TC-2301 thru TC-2803 to temperature set point and flux changes at a nominal temperature of 660°F and 485 psig under start-up flux/field configuration conditions. Tune control loops as required.
  - 1.2.14.4 Verify satisfactory operation of PC-1105 in valve control mode. Tune controller as required.

Test 1030 Revision 0 Page 20 of 543

- 1.2.15 Verification of Proper Thermal Expansion of Receiver Panels
  - 1.2.15.1 Verify that receiver panel thermal expansions are in reasonable agreement with predicted values.
  - 1.2.15.2 Verify that there is no evidence of panel binding or distortion.
- 1.2.16 Verification of Dynamic Operation of Water Panel Light Seals
  - 1.2.16.1 Verify that there are no light leaks observed between panels during visual light tigheness cracks.

Test 1030 Revision 0 Page 21 of 543

#### 1.3 "Steaming" Receiver Operation - flow to downcomer

#### 1.3.1 Condition Downcomer and Steam Dump System

- 1.3.1.1 Verify that the downcomer can be properly conditioned.
- 1.3.2 Control Tests Steam Dump System
  - 1.3.2.1 Demonstrate satisfactory closed loop operation of PC-1001 and TC-1002 at nominal flash tank pressure conditions. Obtain closed loop response data on PC-1001 and TC-1002 to set point and flow disturbances conditions. Tune control loops as required.
  - 1.3.2.2 Verify that the transition from receiver flash tank pressure control to SDS pressure control is satisfactory.
  - 1.3.2.3 Demonstrate satisfactory closed loop operation of PC-1001 and TC-1002 at rated reciever pressure conditions. Verify receiver panel controls, feedpump control and SDS control operation is satisfactory during pressure ramps from flash tank limits rated pressure conditions. Obtain closed loop response data on PC-1001 & TC-1002 to set point and flow disturbances. Tune loops as required.
- 1.3.3 Control Tests Receiver Feedpump rated pressure
  - 1.3.3.1 Obtain process control open loop response data for receiver feedpump speed changes at rated pressure conditions.

Test 1030 Revision 0 Page 22 of 543

- 1.3.3.2 Demonstrate satisfactory closed loop control of the receiver feedpump (PC-1105) in both the pressure and valve control modes. Obtain closed loop responses to set point changes.
- 1.3.3.3 Verify that the automatic pressure run-back capability on the combined steam dump/receiver feedpump system is satisfactory.
- 1.3.4 Control Tests panels 214, 217, 219, 221 low flow
  - 1.3.4.1 Obtain process control open loop data for tuning of receiver temperature controllers (TC-2602, TC-2702, TC-2801, TC-2803) at rated pressure, derated temperature and low flow. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 660°F. Obtain step/ramp response to flux disturbances.
  - 1.3.4.2 Demonstrate satisfactory closed loop control of receiver panel temperatures for TC-2602, TC-2702, TC-2801, TC-2803 at rated pressure, derated temperature and low flow. Obtain response to temperature set point and flux changes. Tune control loops as required.
  - 1.3.4.3 Obtain process control open loop data for tuning of receiver temperature controllers (TC-2602, TC-2702, TC-2801, TC-2803) at rated pressure, moderate temperature and low flow. Obtain both step and frequency response data disturbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.

Test 1030 Revision O Page 23 of 543

- 1.3.4.4 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 at rated pressure, moderate temperature and low flow. Obtain response to temperature set point and flux changes. Tune control loops as required.
- 1.3.5 Control Tests panels 214, 217, 219, 221 Moderate flow
  - 1.3.5.1 Obtain process control open loop data for tuning of receiver temperature controllers (TC-2602, TC-2702, TC-2801, TC-2803) at rated pressure, moderate temperature and moderate flow. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.
  - 1.3.5.2 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 at rated pressure, moderate temperature and moderate flow. Obtain response to temperature set point and flux changes. Tune control loops as required.
- 1.3.6 Control Test Steam Dump System High Flow
  - 1.3.6.1 Demonstrate satisfactory closed loop control of the Steam Dump System for PC-1001, TC-1002 at rated pressure, moderate temperature and high flow. Obtain response to pressure set point and flow changes. Tune control loops as required.

Test 1030 Revision 0 Page 24 of 543

#### 1.3.7 Control Tests - panels 214, 217, 219, 221 - High Flow

- 1.3.7.1 Obtain process control open loop data for tuning of receiver temperature controllers (TC-2602, TC-2702, TC-2801, TC-2803) at rated pressure, moderate temperature and high flow. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.
- 1.3.7.2 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 at rated pressure, moderate temperature and high flow. Obtain response to temperature set point and flux changes. Tune control loops as required.
- 1.3.7.3 Obtain process control open loop data for tuning of receiver temperature controllers (TC-2602, TC-2702, TC-2801, TC-2803) at rated pressure, rated temperature and high flow. Obtain both step and frequency response data to valve disturbances at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances.
- 1.3.7.4 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 at rated pressure, rated temperature and high flow. Obtain response to temperature setpoint and flux changes. Tune control loops as required.

Test 1030 Revision 0 Page 25 of 543

- 1.3.7.5 Demonstrate satisfactory closed loop control of all receiver panel temperatures for TC-2301 thru TC-2803 in panel temperature control mode at rated pressure, rated temperature and high flow. Obtain response to temperature set point and flux charges. Tune control loops as required.
- 1.3.8 Control Tests Auxiliary Steam Loop Tuning
  - 1.3.8.1 Demonstrate satisfactory closed loop control of auxiliary steam pressure controller PC-1003 and temperature controller TC-1004. Obtain response to set point and flow changes. Tune control loops.
- 1.3.9 Control Tests all panels Blended temperature control
  - 1.3.9.1 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 using blended temperature control at rated pressure, rated temperature and high flow. Obtain response to temperature set point and flux changes. Tune control loops as required.
  - 1.3.9.2 Demonstrate satisfactory closed loop control of receiver temperature for TC-2301 thru TC-2803 in the blended temperature control mode. For temperature set point and flux changes at rated pressure, rated temperature and high flow conditions. Tune control loops as required.

Test 1030 Revision 0 Page 26 of 543

- 1.3.9.3 Demonstrate satisfactory closed loop control of receiver temperature for TC-2301 thru TC-2803 in the blended temperature control mode. Obtain response to temperature set point and flux changes at rated pressure, rated temperature and moderate flow conditions. Tune control loops as required.
- 1.3.9.4 Demonstrate satisfactory closed loop control of receiver temperatures for TC-2301 thru TC-2803 in the blended temperature control mode. Obtain response to temperature set point and flux changes at rated pressure, rated temperature and low flow conditions. Tune control loops as required.
- 1.3.10 Control Tests Large Signal Flux/Setpoint response tests -Rated Steam conditions - Blended temperature control
  - 1.3.10.1 Induce maximum flux gradients on the receiver panels via heliostat field configuration and verify satisfactory control response and operating conditions are within design limits.
  - 1.3.10.2 Verify satisfactory control system response on all panels to a maximum induced decreasing flux condition (100% to 10%) and a maximum increasing flux condition (10% to 100%).
  - 1.3.10.3 Verify satisfactory control system response to a maximum temperature set point ramp rate from rated to derated steam conditions and from derated to rated steam conditions.

Test 1030 Revision 0 Page 27 of 543

- 1.3.11 Control Tests Derated Steam Conditions Blended Temperature Control
  - 1.3.11.1 Demonstrate satisfactory closed loop control of receiver temperature for TC-2301 thru TC-2803 in the blended temperature control mode. Obtain response to temperature set point and flux changes at rated pressure, derated temperature and high flow conditions. Tune control as required.
  - 1.3.11.2 Demonstrate satisfactory closed loop control of receiver panel temperature for TC-2602, TC-2702, TC-2801, TC-2803 using blended temperature control at rated pressure, derated temperature and low flow. Obtain response to temperature set point and flux changes. Tune control loops as required. Determine control system stability margins at low flow.
  - 1.3.11.3 Determine the low flow controllability limit on temperature control for the receiver panels.
  - 1.3.11.4 Verify satisfactory control system response on all panels to a maximum induced decreasing flux condition (100% to 10%) and a maximum increasing flux condition (10% to 100%) at derated temperature conditions.
- 1.3.12 Moisture Separators and Accumulator
  - 1.3.12.1 Verify proper operation of the receiver panel moisture separators and accumulator level control functions.

Test 1030 Revision 0 Page 28 of 543

2.0	ACCEPTANCE CRITERIA	Verification Paragraph	Objective
2.1	"Hot Water" Receiver Operation - Flow to Flash Tank		
2.1.1	Measured heat flux is in reasonable agreement with calculated values and uncooled surfaces are not exposed to excessive incident power (as deter- mined through visual inspection and structural temperature probes).	8.1.7-9 8.1.14 8.1.17-19 8.1.24 8.1.27-29 8.1.34 8.1.37-39 8.1.44	1.1.1
2.1.2	Receiver panel paint has been cured for the specified time periods at 300, 360, 410, and 460°F (±35°F) by controlling hot water flow to the individual panels.	8.1.10-13 8.1.20-23 8.1.30-33 8.1.40-43	1.1.2
2.1.3	Acceptable data has been produced and recorded which allows the correlation between incident power (as measured by individual flux sensors) and absorbed power (as measured by water enthalpy rise) to be made.	8.1.14 8.1.24 8.1.34 8.1.44	1.1.3
2.1.4	Measured receiver panel thermal expansions are in reasonable agreement with predicted values based on panel metal temperature data. No evidence of panel binding or distortion is evident upon post test inspection.	8.1.14 8.1.24 8.1.34 8.1.44	1.1.4
2.1.5	No light leaks are observed during visual light tightness checks con- ducted during non operating periods.	8.1.45	1.1.5
		Test Revi Page	: 1030 sion 0 29 of 543

		Initial	Date
2.2	Steaming Receiver Operation - Flow to Flash Tank		
2.2.1	Panel Steam Cure - Panels 209, 210, 211 & 212		
2.2.1.2	Receiver panel paint has been cured for the specified time periods at 520, 585, 660, 720, 780, and 850°F (±35°F) by controlling feedwater flow to indivi- dual panels.	8.2.1.10- 8.2.1.15	1.2.1.2
2.2.1.3	Open loop process control response data has been gathered and recorded for small changes in incident flux and flow.	8.2.1.7- 8.2.1.15	1.2.1.3
2.2.2	Flash Tank Control Tuning - Steam Loops		
2.2.2.1	Closed loop test acceptance criteria applied to PC2906, PC1000, PC647B, and TC1002	8.2.2.4 8.2.2.7 8.2.2.10 8.2.2.11 8.2.2.13	1.2.2.1
	<ul> <li>Closed loop response is stable and well behaved in the presence of set point changes and process disturbances</li> </ul>		
	<ul> <li>Mode switching transients do not significantly degrade plant oper- ation or cause conditions to exceed design requirements.</li> </ul>		
	<ul> <li>All alarms and limits are acceptable for safe, controlled operation.</li> </ul>	Test	1030 on 0
		Page 3	0 of 543

		Verification Paragraph	Objective
	<ul> <li>Control Logic for initialization, mode transfers, and shutdown is satisfactory.</li> </ul>		
	<ul> <li>Monitored, displayed, and recorded data is satisfactory for evaluating the closed loop test performance.</li> </ul>		
2.2.3	Control Tests - Panels 210, 212, Steam Operation Loop		
2.2.3.1	Open loop test acceptance criteria applied to control loops on panels 210 & 212: Monitored and recorded data are valid and meed the evaluation requirements (parameter scan rate, calibration, measurable output) over the specified range of test conditions	8.2.3.1 s,	1.2.3.1
2.2.3.2	Same as 2.2.3.1	8.2.3.2	1.2.3.2
2.2.3.3	Closed loop test acceptance criteria applied to controllers TC2501 & TC2503 while operating under temperature control (Same as criteria listed in Section 2.2.2.1).	8.2.3.3	1.2.2.3
2.2.3.4	Same as 2.2.3.3	8.2.3.4	1.2.3.4
2.2.3.5	Closed loop test acceptance criteria applied to controller PC1105 while operating under valve control (Same as criteria listed in Section 2.2.2.1).	8.2.3.5	1.2.3.5

Test 1030 Revision O Page 31 of 543

		Verification Paragraph	Objective
2.2.4	Panel Steam Cure - Panels 213, 214, 215, & 216		
2.2.4.1	Measured heat flux is in reasonable agreement with predicted values.	8.2.4.10- 8.2.4.15	1.2.4.1
2.2.4.2	Receiver panel paint has been cured for the specified time periods at 520, 585, 660, 720, & 850°F (±35°F) by controlling feedwater flow to individual panels.	8.2.4.10- 8.2.4.15	1.2.4.2
2.2.4.3	Open loop process control response data has been gathered and recorded for small changes in incident flux and flow.	8.2.4.7- 8.2.4.15	1.2.4.3
2.2.5	Control Tests - Panels 214 & 216 - Steam Loop Operation		
2.2.5.1	Open loop test acceptance criteria applied to control loops on panels 214 & 216. (Same as criteria in Section 2.2.3.1).	8.2.5.1	1.2.5.1
2.2.5.2	Same as 2.2.5.1	8.2.5.2	1.2.5.2
2.2.5.3	Closed loop test acceptance criteria applied to controllers TC2602 & TC2701 (Same as criteria listed in Section 2.2.2.1).	8.2.5.3	1.2.5.3
2.2.5.4	Same as 2.2.5.3	8.2.5.4	1.2.5.4
		Test	1030

Revision O Page 32 of 543

		Verification Paragraph	Objective
2.2.6	Panel Steam Cure - Panels 204, 205, 206, 207, & 208		
2.2.6.1	Measured heat flux is in reasonable agreement with predicted values.	8.2.6.10- 8.2.6.15	1.2.6.1
2.2.6.2	Receiver panel paint has been cured for the specified time periods at 520, 585, 660, 720, & 850°F (±35°F) by controlling feedwater flow to individual panels.	8.2.6.10- 8.2.6.15	1.2.6.2
2.2.6.3	Open loop process control response data has been gathered and recorded for small changes in incident flux and flow.	8.2.6.7- 8.2.6.15	1.2.6.3
2.2.7	Control Tests - Panels 204 & 206, Steam Loop Operation		
2.2.7.1	Open loop test acceptance criteria applied to control loops on panels 204 & 206: Monitored and recorded data are valid and meet the evaluation requirements (parameters, scan rate, calibration, measurable output) over the specified range of test conditions.	8.2.7.1	1.2.7.1
2.2.7.2	Same as 2.2.7.1	8.2.7.2	1.2.7.2
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Revision O Page 33 of 543
		Verification Paragraph	Objective
2.2.7.3	Closed loop test acceptance criteria applied to controllers TC2301 & TC2303 while operating under temperature control (Same as criteria listed in Section 2.2.2.1).	8.2.7.3	1.2.7.3
2.2.7.4	Same as 2.2.7.3	8.2.7.4	1.2.7.4
2.2.8	Panel Steam Cure - Panels 217, 218, 219, 220, & 221		
2.2.8.1	Measured heat flux is in reasonable agreement with predicted values.	8.2.8.10- 8.2.8.15	1.2.8.1
2.2.8.2	Receiver panel paint has been cured for the specified time periods at 520 585, 660, 720, 780, & 850°F (±35°F) by controlling feedwater flow to individ- ual panels.	8.2.8.10- 8.2.8.15	1.2.8.2
2.2.8.3	Open loop process control response data has been gathered and recorded for small changes in incident flux and flow.	8.2.8.7- 8.2.8.15	1.8.8.3
2.2.9	Control Tests - Panels 217, 219, 221 - Steam Loop Operation		
2.2.9.1	Open loop test acceptance criteria applied to control loops on panels 217, 219, & 221 (Same as criteria listed in Sections 2.2.3.1).	8.2.9.1	1.2.9.1
2.2.9.2	Same as 2.2.9.1	8.2.9.2	1.2.9.2
		Test Revi Page	: 1030 sion 0 34 of 543

		Verification Paragraph	Objective
2.2.9.3	Closed loop test acceptance criteria applied to controllers TC2702, TC2801, & TC2803 while operating under temp- erature control (Same as criteria listed in Section 2.2.2.1).	8.2.9.3	1.2.9.3
2.2.9.4	Same as 2.2.9.3	8.2.9.4	1.2.9.4
2.2.10	Control Tests - Low Flow - Panels 204, 208, 217, & 221		
2.2.10.1	Open loop test acceptance criteria applied to control loops on panels 204, 208, 271, & 221. (Same as criteria listed in Section 2.2.3.1).	8.2.10.1	1.2.10.1
2.2.10.2	Closed loop test acceptance criteria applied to controllers TC2301, TC2402, TC2702, & TC2803 while operating under temperature control (Same as criteria listed in Section 2.2.2.1).	8.2.10.2	1.2.10.2
2.2.11	Partial Receiver Startup - Panels 209 & 214		
2.2.11.1	A satisfactory procedure has been carried out for the establishment of panel steaming operation.	8.2.11.2-	1.2.11.1
2.2.11.2	Closed loop test acceptance criteria applied to controllers TC2403 & TC2602. (Same as criteria listed in Section 2.2.2.1).	8.2.11.11-	1.2.11.2

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Test 1030 Revision O Page 35 of 543

		Verification Paragraph	Objective
2.2.12	Partial Receiver Startup - Panels 204 & 208		
2.2.12.1	A satisfactory procedure has been carried out for the establishment of panel steaming operation.	8.2.12.2- 8.2.12.9	1.2.12.1
2.2.12.2	Closed loop test acceptance criteria applied to controllers TC2301 & TC2402. (Same as criteria listed in Section 2.2.2.1).	8.2.12.11- 8.2.12.20	1.2.12.2
2.2.13	Partial Receiver Startup - Panels 215 & 221		
2.2.13.1	A satisfactory procedure has been carried out for the establishment of panel steam operation.	8.2.12.2- 8.2.12.9	1.2.13.1
2.2.13.2	Closed loop test acceptance criteria applied to controllers TC2403 & TC2402. (Same as criteria listed in Section 2.2.2.1).	8.2.13.11- 8.2.13.22	1.2.13.2
2.2.14	Integrated Receiver Startup (Flow to Flash Tank)		
2.2.14.1	A satisfactory procedure has been carried out for the establishment of receiver steam operation.	8.2.14.2- 8.2.14.12	1.2.14.1
		Test Revi Page	1030 sion 0 36 of 543

		Verification Paragraph	Objective
2.2.14.2	Closed loop test acceptance criteria applied to all receiver boiler panels when operating in temperature control. (Same as criteria listed in Section 2.2.2.1).	8.2.14.13-8.2.14.16	1.2.14.2
2.2.14.3	Field pump controller operates in a stable and satisfactory manner when reacting to changes in receiver control valve position.	8.2.14.13- 8.2.14.16	1.2.14.3
2.2.15	Receiver Panel Thermal Expansion		
2.2.15.1	Measured receiver panel thermal ex- pansions are in reasonable agreement with predicted values based on panel metal temperature data. No evidence of panel binding or distortion is evident upon post test inspection.	8.2.1.9 8.2.4.9 8.2.6.9 8.2.8.9	1.2.15
2.2.16	Receiver Panel Light Tightness		
2.2.16	No light leaks are observed during visual light tightness checks conducted during non operating periods.	8.2.16	1.2.16
2.3	"Steaming" Receiver Operation - Flow to Flash Tank		
2.3.1	Condition Downcomer and Steam Dump System		
2.3.1.1	A proper procedure is carried out to thermally condition the downcomer piping and remove condensed moisture through the automatic low point drains.	8.3.1.1- 8.3.1.8	1.3.1
		, J	 Test 1030 Revision 0 Page 37 of 543

		Verification Paragraph	Objective
2.3.2	Control Tests - Steam Dump System		
2.3.2.1	Closed loop test acceptance criteria applied to controllers PC1001 and TC1002. (Same as criteria listed in Section 2.2.2.1).	8.3.2.5 8.3.2.8	1.3.2.1
2.3.2.2	Steam pressure control can be trans- ferred from flash tank vent system to the steam dump system in a relatively bumpless fashion without creating an upset in the process conditions.	8.3.2.9	1.3.2.2
2.3.2.3	Closed loop test acceptance criteria applied to controllers PC1001 and TC1002 during pressure ramping sequence (Same as criteria listed in Section 2.2.2.1).	8.3.2.13 8.3.2.15	1.3.2.3
2.3.3	Control Tests - Receiver Feed Pump - Rated Pressure		
2.3.3.1	Open loop test acceptance criteria applied to feed pump controller PC1105 (See criteria listed in Section 2.2.3.1).	8.3.3.1 (all sub- sections)	1.3.3.1
2.3.3.2	Closed loop test acceptance criteria applied to PC1105 while operating in pressure and valve control modes at high discharge pressure (Same as cri- teria listed in Section 2.2.2.1).	8.3.3.2 (all sub- sections)	1.3.3.2
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Test 1030 Revision O Page 38 of 543

		Verification Paragraph	Objective
2.3.3.3	The control system is capable of auto- matically running back the set point pressure from rated pressure to 500 psig in 3 minutes.	8.3.3.3.5- 8.3.3.3.10	1.3.3.3
2.3.4	Control Tests - Panels 214, 217, 219, 221-Low Flow		
2.3.4.1	Open loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, derated temperature, and low flow (See open loop criteria listed in Section 2.2.3.1).	8.3.4.1 (all sub- sections)	1.3.4.1
2.3.4.2	Closed loop test acceptance criteria applied to controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, derated temperature, and low flow (Same as criteria listed in Section 2.2.2.1).	8.3.4.2 (all sub- sections)	1.3.4.2
2.3.4.3	Open loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moderate temperature, and low flow (See open loop criteria listed in Section 2.2.3.1).	8.3.4.3 (all sub- sections) ,	1.3.4.3
2.3.4.4	Closed loop test acceptance criteria applied to controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moderate temperature, and low flow (Same as criteria listed in Section 2.2.2.1).	8.3.4.4	1.3.4.4
		lest Revi	5 1030 sion 0 39 of 543
		Page	: 39 01 343

		Verification Paragraph	Objective
2.3.5	Control Tests - Panels 214, 217, 219, 221 - Moderate Flow		
2.3.5.1	Open loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moder- ate temperature, and moderate flow (See open loop criteria listed in Section 2.2.3.1).	8.3.5.1 (all sub- sections)	1.3.5.1
2.3.5.2	Closed loop test acceptance criteria applied to controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moderate temperature, and moderate flow (Same as criteria listed in Section 2.2.2.1).	8.3.5.2 (all sub- sections)	1.3.5.2
2.3.6	Control Test - Steam Dump System - High Flow		
2.3.6.1	Closed loop test acceptance criteria applied to controllers PC1001 and TC1002 while operating at rated pressure, moderate temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.6.1 (all sub- sections)	1.3.6.1
		Tost	1030

Test 1030 Revision 0 Page 40 of 543

		Verification Paragraph	Objective
2.3.7	Control Tests - Panels 214, 217, 219, 221 - High Flow		
2.3.7.1	Open loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moderate temperature, and high flow (See open loop criteria listed in Section 2.2.3.1).	8.3.7.1 (all sub- sections)	1.3.7.1
2.3.7.2	Closed loop test acceptance criteria applied to controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, moderate temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.7.2 (all sub- sections)	1.3.7.2
2.3.7.3	Open loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, rated temperature, and high flow (See open loop criteria listed in Section 2.2.3.1).	8.3.7.3 (all sub- sections)	1.3.7.3
2.3.7.4	Closed loop test acceptance criteria applied to controllers TC2602, TC2702, TC2801, and TC2803 operating at rated pressure, rated temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.7.4 (all sub- sections)	1.3.7.4
		l Test Revi	: 1030 sion 0

		Verification Paragraph	Objective
2.3.7.5	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in temperature control mode at rated pressure, rated temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.7.5 (all sub- sections)	1.3.7.5
2.3.8	Control Tests - Auxiliary Steam - Loop Tuning		
2.3.8.1	Closed loop test acceptance criteria applied to auxiliary steam pressure and temperature controllers (PC1003 and TC1004) (Same as criteria listed in Section 2.2.2.1).	8.3.8.1- 8.3.8.6	1.3.8.1
2.3.9	Control Tests - All Panels - Blended Temperature Control		
2.3.9.1	Closed loop test acceptance criteria applied to receiver panel controllers TC2602, TC2702, TC2801, TC2803 while controlling to blended steam and panel metal temperature at rated pressure, rated temperature, and high flow. (Same as criteria listed in Section 2.2.2.1.).	8.3.9.1 (all sub- sections)	1.3.9.1
		Test Revis Page	1030 ion 0 42 of 543

		Verification Paragraph	Objective
2.3.9.2	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in a blended steam and metal temperature control mode at rated pressure, rated temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.9.2 (all sub- sections)	1.3.9.2
2.3.9.3	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in a blended steam and metal temperature control mode at rated pressure, rated temperature, and moderate flow (Same as criteria listed in Section 2.2.2.1).	8.3.9.3 (all sub- sections)	1.3.9.3
2.3.9.4	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in a blended steam and metal temperature control mode at rated pressure, rated temperature, and low flow (Same as criteria listed in Section 2.2.2.1).	8.3.9.4 (all sub- sections)	1.3.9.4
		Test Revi Page	: 1030 ision 0 : 43 of 543

		Verification Paragraph	Objective
2.3.10	Control Tests - Large Signal Flux/Setpoint Response Tests - Rated Steam Conditions - Blended Temperature Control		
2.3.10.1	Satisfactory panel flow distribution occurs within individual panels to maintain panel metal temperature gradients to <200°F when the panels are exposed to the maximum design heat flux gradients.	8.3.10.1 (all sub- sections)	1.3.10.1
2.3.10.2	Satisfactory panel control system response occurs when the receiver is exposed to flux transients from 100% to 10% and 10% to 100% while operating at rated temperature and pressure.	8.3.10.2 (all sub- sections)	1.3.10.2
2.3.10.3	Satisfactory control system response occurs when ramping the receiver temperature set point from rated to derated and back to rated conditions.	8.3.10.3 (all sub- sections)	1.3.10.3
2.3.11	Control Tests - Derated Steam Conditions - Blended Temperature Control		
2.3.11.1	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in a blended steam and metal temperature control mode at rated pressure, derated temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.11.1 (all sub- sections)	1.3.11.1

Test 1030 Revision O Page 44 of 543

		Verification Paragraph	Objective
2.3.11.2	Closed loop test acceptance criteria applied to all receiver panel tempera- ture controllers (TC2301 - TC2803) operating in temperature control mode at rated pressure, rated temperature, and high flow (Same as criteria listed in Section 2.2.2.1).	8.3.11.2 (all sub- sections)	1.3.11.2
2.3.11.3	Sufficient data has been gathered to define the receiver low flow controll- ability limit.	8.3.11.3 (all sub- sections)	1.3.11.3
2.3.11.4	Satisfactory panel control system response occurs when the receiver is exposed to flux transients from 100% to 10% and 10% to 100% while operating at rated temperature and pressure.	8.3.11.4 (all sub- sections)	1.3.11.4
2.3.12	Moisture Separator and Accumulator		
2.3.12.1	The receiver moisture separator and accumulator operates properly and maintains level within set point limits.	8.3.12	1.3.12.1
		Tes Rev	st 1030 vision 0
		Pag	e 45 of 543

## 3.0 REFERENCES

3.1	Pilot	Plant System Documentation
	3.1.1	Pilot Plant System Description, Dec. 1980
	3.1.2	Pilot Plant Startup and Acceptance Test Plan, Dec. 1980
	3.1.3	Plant Operating/Training Manual Book 1 - Operating Instructions, July 1981
3.2	Logic	Diagrams
	3.2.1	- Controller Logic Diagrams, Issued May 1981
3.3	Line S	chedules
		40P7002133104 Rev. 4 March 20, 1981
	a)	Condensate (CO)
	b)	Feedwater FW)
	c)	Nitrogen (N)
	d)	Instrument Air (NA)
	e)	Vents (VT)
3.4	Single	Line Diagrams
	a)	40E700 5133351, Main One Line Diagram
	Ь)	40E700 5133353-1, 4160 Volt System
	c)	40E700 5133354, 480 V. Switchgear "B01"
	d)	40E700 5133106, 4160 Volt Feeders, Collector Subsystem
	e)	40E700 5133192, 480 V. MCC B
	f)	40E700 5133193, 480 V. MCC C
	g)	40E300 5132029, Load Center "A" and Receiver F.W. Pump
3.5	Piping	and Instrumentation Diagrams
	a)	P3-1201, Receiver Preheat Panel Feedwater
	b)	P3-1202, Receiver Boiler Panels RB-204 thru RB-206
	c)	P3-1203, Receiver Boiler Panels RB-207 thru RB-209

Test 1030 Revision O Page 46 of 543

- d) P3-1204, Receiver Boiler Panels RB-210 thru RB-212
- e) P3-1205, Receiver Boiler Panels RB-213 thru RB-215
- f) P3-1206, Receiver Boiler Panels RB-216 thru RB-218
- g) P3-1207, Receiver Boiler Panels RB-219 thru RB-221
- h) P3-1208, Main Steam Manifold, GN2, and Drain System
- i) P3-1901, Steam System
- j) P3-1903, Feedwater and Condensate
- 3.6 Electrical Loop Diagrams

a)	9033/4	SK-EL1,	TV-2301	Sheets 1-3
b)	9033/4	SK-EL2,	TV-2302	Sheets 1-3
c)	9033/4	SK-EL3,	TV-2303	Sheets 1-3
d)	9033/4	SK-EL4,	TV-2401	Sheets 1-3
e)	9033/4	SK-EL5,	TV-2402	Sheets 1-3
f)	9033/4	SK-EL6,	TV-2403	Sheets 1-3
g)	9033/4	SK-EL7,	TV-2501	Sheets 1-3
h)	9033/4	SK-EL8,	TV-2502	Sheets 1-3
i)	9033/4	SK-EL9,	TV-2503	Sheets 1-3
j)	9033/4	SK-EL10,	TV-2601	Sheets 1-3
k)	9033/4	SK-EL11,	TV-2602	Sheets 1-3
1)	9033/4	SK-EL12,	TV-2603	Sheets 1-3
m )	9033/4	SK-EL13,	TV-2701	Sheets 1-3
n)	9033/4	SK-EL14,	TV-2702	Sheets 1-3
o)	9033/4	SK-EL15,	TV-2703	Sheets 1-3
p)	9033/4	SK-EL16,	TV-2801	Sheets 1-3
q)	9033/4	SK-EL17,	TV-2802	Sheets 1-3
r)	9033/4	SK-EL18,	TV-2803	Sheets 1-3
s)	9033/4	SK-EL19,	TV-2906	Sheet 1
t)	9033/4	SK-EL20,	TV-2002	Sheet 1
u)	9033/4	SK-EL21,	UV-2905	Sheets 1-2
v)	9033/4	SK-EL32,	PV-1000	Sheet 1
w)	9033/4	SK-EL33,	PV-1001	Sheets 1-2
x)	9033/4	SK-EL34,	TV-1002	Sheet 1
у)	9033/4	SK-EL35,	PV-1003	Sheet 1
z)	9033/4	SK-EL36,	TV-1004	Sheet 1
aa)	9033/4	SK-EL49,	PV-647B	Sheet 1

Test 1030 Revision 0 Page 47 of 543

bb)	9033/4	SK-EL50,	LV-74A Sheet 1
cc)	9033/4	SK-EL51,	LV-74E Sheet 1
dd)	9033/4	SK-EL52,	P-917 Sheets 1-4
ee)	9033/4	SK-EL55,	TY-2009 Sheet 1
ff)	9033/4	SK-EL56,	FY-2233 Sheets 1-2
gg)	9033/4	SK-EL57	HS-2913 Sheet 1
hh)	9033/4	SK-EL58,	Flow Meter Power Sheet 1
ii)	9033/4	SK-EL59,	RS SOV to ILS (RS #1) Sheet 1
jj)	9033/4	SK-EL60,	RS POS SW to ILS & DARM (RS #1) Sheet 1
kk)	9033/4	SK-EL61,	RS POS SW to MUX (RS #1) Sheet 1
11)	9033/4	SK-EL62,	RS PRESS SW to MUX (RS #1) Sheet 1
mm)	9033/4	SK-EL63,	RS T/C to MUX (RS #1) Sheet 1
nn)	9033/4	SK-EL64,	RS Heat Flux to MUX (RS #1) Sheets 1-2
00)	9033/4	SK-EL65,	RS XTMR & RTD to MUX (RS $\#1$ ) Sheet 1
pp)	9033/4	SK-EL66,	PSS Misc. SW to MUX (RS #1) Sheet 1
qq)	9033/4	SK-EL67,	PSS TEMP SW to MUX (RS $\#1$ , 2, & 3) Sheet 1
rr)	9033/4	SK-EL76,	PSS SOV to ILS (RS #2) Sheet 1
ss)	9033/4	SK-EL77,	PSS POS SW to ILS (RS #2) Sheet 1
tt)	9033/4	SK-EL78,	PSS Level SW to ILS (RS #2) Sheet 1
uu)	9033/4	SK-EL79,	PSS POS SW to MUX (RS #2) Sheet 1
vv)	9033/4	SK-EL88,	RS Deflection XTMR to DARM (RS #1) Sheets 1-2
ww)	9033/4	SK-EL89,	RS RTD to DARM (RS #1) Sheets 1-2
xx)	9033/4	SK-EL90,	RS PRESS XTMR to DARM (RS #1) Sheet 1
уу)	9033/4	SK-EL91,	RS T/C to DARM (RS #1) Sheets 1-2

3.7 Instrument Index

3.7.1 Master Equipment List (MEL)

3.7.2 Measurements List

3.7.3 Measurement User File (MUF)

3.8 Material Requisition and/or Specification  $$\rm N/A$$ 

Test 1030 Revision 0 Page 48 of 543 3.9 Vendor Data N/A

3.10 Standards N/A

3.11 Startup Schedule

3.11.1 "Best Effort" Working Startup Schedule October 20, 1981

Test 1030 Revision O Page 49 of 543

		Initial	Date
.O P	REREQUISITES		
4	.1 Turnover of the system to SCE is complete and in accordance with Section 5.4 of the SCE Startup Manual.		
4	.2 Referenced material has been reviewed and later revision (if any) will not affect this test.		
4	.3 The Master Tracking System has been reviewed and outstanding items (if any) will not affect this test. A summary list of outstanding items is attached on Appendix 10A.		
4	.4 The Abnormal Equipment and Circuitry Log has been reviewed, is current, and is satisfactory for this test. A summary list is attached on Appendix 10B.		
4	.5 The system has been walked through and verified complete to the extent required to conduct this test.		
4	.6 Related prerequisite and preoperational tests (Test numbers 000-980) have been completed to the extent required to demonstrate the operability of the plant systems required for this test.	he	
4	.7 All test equipment as per section 6.0, is available, calibrated and in working order.		
		<b>Test</b> 1 Revisi Page 5	030 on 0 50 of 543

			Initial	Date
4.8	Protective plant trip circuits listed in Appendix 10G have been electrically verified.			
4.9	A pretest coordination meeting has been held to familiarize test and operations personnel with the requirements of this t	est.		
	·			
			Test Revis Page	 1030 ion 0 51 of 54

## 5.0 LIMITS AND PRECAUTIONS

- 5.1 This test involves the use of redirected power on to the receiver. As a result, no personnel are permitted on or above the 15th tower level during these operating periods. Test personnel are permitted however in remote station #1 at the 13th and 14th level.
- 5.2 High temperature, high pressure steam and feedwater will be flowing throughout the plant except to the turbine and thermal storage equipment. Care should be exercised when working around any operating or flowing system. Avoid areas exposed to safety valve discharges.
- 5.3 Opening of the system for inspection, maintainance, or repair should be done only after internal temperatures and pressures have reached ambient conditions and proper clearances have been received.
- 5.4 The heliostat field should be kept clear of unattended vehicles. Personnel working in the collector field must be in communication with the control room and be working under the direction of the control room operator.
- 5.5 Visual inspections of hot areas should only be accomplished after cooldown and under extremely guarded conditions after proper clear-ances have been received.
- 5.6 Groups of 4 or more heliostats shall not perform simultaneous wire walks during operating hours without "alarming" personnel in the field and on the tower.
- 5.7 In case of a power failure or sustained dropout, tracking heliostats shall be directed to face up stow position.

Test 1030 Revision 0 Page 52 of 543

- 5.8 Operating personnel should be familiar with emergency procedures involving defocus of the collector field during normal operation and following loss of primary field power.
- 5.9 Safety policies and procedures as contained in the Southern California Edison Accident Prevention Manual and the "solar specific" supplements shall be followed.

## 6.0 TEST EQUIPMENT

NOTE: Test equipment equivalent to that specified may be used. Equipment serial number will be recorded prior to start of test and calibration shall be verified for expected test time period.

6.1 Indicating Instruments

None required

6.2 Sensors and Transducers

None required

- 6.3 Recording Equipment
- 6.3.1 Strip Chart Recorders

Make: Gould Model: Brush 260 Number Required: 2

- 6.4 Others
- 6.4.1 Control Test Unit

Serial Number: MDAC Supplied Number Required: 2

6.4.2 Transfer Function Analyzer

Make: EMR Number Required: 1

> Test 1030 Revision 0 Page 54 of 543

6.4.3 Function (Wave) Generator

Make: Hewlett Packard Model: 3310A Number Required: 1

> Test 1030 Revision O Page 55 of 543

		Initial	Date
7.0	INITIAL CONDITIONS		
7.1	Environmental Conditions		
7.1	Testing during subfreezing periods should be avoided. In the event of a freezing condition, the receiver should be drained per the procedure listed in the Plant Operating/Training Manual (RADL 2-36), Instruction T-19.		
7.1.2	Testing should be carried out during cloud free periods or during "hazy" periods when a uniform and constant insolation is avail- able. Testing during partly cloudy periods should be avoided except for specific tests designed to monitor cloud induced transients.		
7.2	Temporary Installations		
7.2.1	The Controls Test Units, Transfer Function Analyzer, Function Generator, and strip chart recorders are installed as required to support Section 8 testing.		
7.3	Support Systems/Plant Operating Status		
7.3.1	This test requires the operation of all plant systems excluding:		
	<ul> <li>Thermal storage system</li> <li>Beam characterization system</li> <li>Operational control system (OCS) and all related power, instrumentation, and control equipment.</li> </ul>	Test 1 Revisi Page 5	030 on 0 5 of 543

		Initial	Date
7.3.2	Auxiliary steam should be available to the deaerator and turbine seal steam regulator		
	in sufficient quantities to properly		
	deaerate the condensate and maintain a		
	turbine/condenser vacuum. Condenser vacuum		
	system shall be operational		
7.3.3	Turbine shall be on turning gear with the		
	lube oil system operational.		
7.3.4	All flow path to and from the turbine and		
	the thermal storage system shall be isolated		
	to prevent undesired feedwater or hot		
	receiver flow (hot water or steam) from		
	entering those portions of the plant.		<u></u>
7.3.5	All aspects of the Data Acquisition System as		
	it involves SDPC, DARMS, and SHIMMS informa-		
	tion shall be operational including data		
	transmission to and recording at MDAC Huntington		
	Beach. In the event the data transmission link		
	to Huntington Beach becomes inoperable, testing		
	Startup Engineer		
7.4	Process Conditions		
	The following process and SDPC controller		
	conditions should exist for the respective		
	portions of this test: (Note that in carrying		
	out the indicated Section 8 steps, controllers		
	and hand switches are manipulated in accordance		
	with the procedure.		
		Test 1	030
		Revisi	on 0 7 of 542
		raye 5	1 01 543

		Initial	Date
	"Initial condition" tabulations referenced in		
	this section refer to those specific control-		
	lers or hand switches which must be reinitial-		
	ized prior to proceeding to the next portion		
	of Section 8. Those items that are unchanged		
	from a previous initialization table or do		
	not require further manipulation beyond its		
	previous status are not listed in the		
	initialization table).		
7.4.1	Applies to Test Section 8.1		
7.4.1.1	Feedwater flow shall be established through		
	the individual receiver panels while panel		
	controllers are operating in flow control		
	regulating to preset (default) valves.		
	Flash tank nitrogen pressure shall be set		
	and controlled (by the operator) to prevent		
	cavitation across the control valves.		
7.4.1.2	The following heliostat groups should be in		
	"Standby" and available to "Track" the		
	receiver:		
	Collector Field Segments Panels Cured		
	505,506,507 209-212		
	506,507,508 213-216		
	402,403,504,505 204-208		
	410,411,508, 509 217-221		
7.4.1.3	Controllers and hand switches shall be in the		
	status identified in Table 10C-1a.		
		Test 10	030
		Revisio Page 58	n U of 543

		Initial	Date
7.4.1.4	Process conditions should be established		
	which approach those listed in Table 10C-1b.		<b>.</b>
7.4.2	Applies to Section 8.2.1 - 8.2.10		
7.4.2.1	The following heliostat groups should be		
	in "Standby" and available to "Track" the		
	receiver:		
	Panels Cured/ Collector Field Wedges Controls Testin	<u>g</u>	
	01,02,05,06,07 209-212		
	01,06,07,08,12 213-216		
	01,02,03,04,05,12 204-208		
	01,08,09,10,11,12 217-221		
7.4.2.2	Process conditions should be established which approach those referenced in Figure 4 for the appropriate test objective and procedure. Refer to initial condition tables in Appendi	ch e x 10C	
7.4.3	Process conditions should be established whi approach those referenced in Figure 4 for th appropriate test objective and procedure. Refer to initial condition tables in Appendi	ch e x 10C	
		Test 10	)30
		Revisi Page 5	9 of 543

## FIGURE 4. ROADMAP FOR TEST OBJECTIVES, PROCEDURES, INITIAL CONDITIONS.

TEST OBJECTIVES	PROCEDURE	PROCESS/LOOP INITIAL CONDITIONS TABLE NO.
1.1	8.1	10C-8.1A, 8.1B
1.2.1	8.2.1	10C-8.2.1A,B
1.2.2	8.2.2	10C-8.2.2A,B
1.2.3	8.2.3	10C-8.2.3A,B
1.2.4	8.2.4	10C-8.2.4A,B
1.2.5.1	8.2.5.1	10C-8.2.5.1A
1.2.5.4	8.2.5.4	10C-8.2.5.4B
1.2.6	8.2.6	10C-8.2.6.A,B
1.2.7	8.2.7.1	10C-8.2.7.1A
1.2.7.1.4	8.2.7.1.4	10C-8.2.7.1.4B
1.2.8	8.2.8	10C-8.2.8A,B
1.2.9	8.2.9	10C-8.2.9A,B
1.2.10	8.2.10	10C-8.2.10A,B
1.2.11	8.2.11	10C-8.2.11A,B
1.2.12	8.2.12	10C-8.2,12A,B
1.2.13	8.2.13	10C-8.2.13A,B
1.2.14	8.2.14	10C-8.2.14A,B
1.3.1	8.3.1	10C-8.3.1A,B
1.3.2	8.3.2	10C-8.3.2A,B
1.3.3	8.3.3	10C-8.3.3A,B
1.3.4	8.3.4	10C-8.3.4A,B
1.3.5	8.3.5	10C-8.3.5A,B
1.3.6	8.3.6	10C-8.3.6A,B
1.3.7	8.3.7	10C-8.3.7A,B
1.3.8	8.3.8	10C-8.3.8A,B
1.3.9	8.3.9	10C-8.3.9A,B
1.3.10	8.3.10	10C-8.3.10A,B
1.3.11	8.3.11	10C-8.3.11A,B

Test 1030 Revision O Page 60 of 543

		Initial	Date
8.0	PROCEDURE AND DATA COLLECTION		
8.1	"HOT WATER" RECEIVER OPERATION - FLOW TO FLASH TANK		
8.1.1	Verify that the initial conditions have been established as required in Section 7.4.1.		
	Steps 8.1.2 - 8.1.24 are required to carry- out the hot water cure of panels 209-216. Cure of panels 209-212 should be carried out during the morning to noon time period while the cure of panels 213-216 should be carried out during the noon to afternoon period. Initial flows assigned to individual panels assume a cool, windy ambient con- dition. If the cure is carried out on a hot, still day, some reduction in the heliostat track commands will be required. Under no circumstances shall the total feedwater flow to the receiver exceed 50,000 LB/HR.		
	When heat is first applied to the receiver, it shall be done through a series of steps that gradually increases the total incident power to the final desired value. During this period, uncooled surfaces shall be monitored for excessive temperature and heated panels shall be monitored for suf- ficient water flow to prevent excessive temperatures. As part of the cure holds point for each panel, the incident power (flux meter data), feedwater flow rate, and		

Test 1030 Revision O Page 61 of 543

			Initial	Date
	feedwater temperature inc	crease through the		
	panel shall be recorded t	co allow a correla-		
	tion between incident (me	easured) power and		
	absorbed power to be made	e. Individual panel		
	lengths and wall temperat	ures shall be		
	recorded (both in a heate	ed and unheated		
	state) for panel growth a	nalysis.		
	Hot Water Cure of Panels (Steps 8.1.2-8.1.14)	209-212		
8.1.2	Call up the individual fl	ow control loops		
	FCM-2301, FCM-2302,FCM			
	each of the controllers f			
	"Console" and input the a			
	points listed below.			
		Controller Set Point (LB/HR)		
	FCM-2301	0		
	FCM-2302 - FCM-2303	500		
	FCM-2401	1500		
	FCM-2402	4000		
	FCM-2403* - FCM-2503*	6000		
	FCM-2601 - FCM-2602	6000		
	FCM-2603	4000		
	FCM-2701	1500		
	FCM-2702 ~ FCM-2703	500		
	FCM-2801 - FCM-2803	0		
	*Panels to be cured			

Test 1030 Revision 0 Page 62 of 543

		Initial	Date
8.1.3	Verify that the valve control set point for the receiver feed pump is 80% and switch feed pump controller, PC-1105 to valve control.		
8.1.4	Verify that the flows set in step 8.1.2 are maintained at their set point values.		
8.1.5	Verify that the receiver flash tank vent set point is 485 psig (adjustment of PC-2906, PC-1000, and PC-647B).		
8.1.6	Verify that collector field segments 505, 506, and 507 are in "Standby" and ready to track the receiver.		
8.1.7	Issue the following heliostat "Increase" commands and verify adequate flow to main- tain panel metal temperature <360°F and no excessive heating of uncooled structures (half power check point). Verify that all heated panel temperature gradients are <200°F. Maximum metal temperature and gradient constraints shall be as monitored by (top) panel DAS sensors, TEX-2354B, C, & D - TEX-2856B, C, & D. (Sensors on sub- stantially heated panels are TEX-2454B, C, & D - TEX-2754B, C & D).		
	Increase 15/S/505, 507 Increase 5/S/506		
		 Test 1 Revisi Page 6	030 on 0 3 of 543

Limit.

Date

NOTE: Receiver structural temperatures should not be allowed to exceed the following values. These temperature limit criteria apply to all subsequent sections of this procedure where uncooled structures and shields are exposed to incident flux.

Tag	No.	Location	F
TEX 2	2053A	Heat shield front, level 17	1200
TEX 2	2053B	Beam near heat shield, level 17	700
TEX 2	2053C	Back of shield, top of module 12	1200
TEX 2	2053D	Top of aircraft beacon, north side	200
TEX 2	2053E	Air at base of aircraft beacon	160
TEX 2	2053G	Air near vent values	160
TEX :	20531	Slide R0012882-11, item 4, el. 347.8 ft. panel 12	700
TEX	2053J	Transverse beam R0012846, item 1, el. 357.8 ft. panel 12	700
TEX 3	2053K	T.B. base R0012876, item 1, el. 357.8 ft. panel 12	700
TEX	2053L	T.B. bar R0012876, item 9, el. 347.8 ft. panel 12	700
TEX	2053M	Support near manifold, ROO12845, item 18, el. 382.4 ft. panel 12	700
TEX	2053N	Slide R0012882-11, item 4, el. 371.9 ft. panel 12	700

Test 1030 Revision 0 Page 64 of 543

	_	Initial	Dat
8.1.8	If an excessive temperature condition is not		
	experienced during step 8.1.7, issue the		
	following beliestat "Increase" command and		
	verify adoguate flow to maintain paral metal		
	verify adequate flow to maintain panel metal		
	temperatures 360°F and no excessive heating		
	of uncooled structures (75% power check		
	point). Verify that panel temperature		
	gradients are <200°F. Verification carried		
	out with temperature sensors listed in 8.1.7.		
	Increase 9/505/507		
	Increase 2/S/506		
8.1.9	Repeat Step 8.1.8 for the full test incident		
	power command unless excessive temperature		
	conditions (>360°F) or gradients (>200°F)		
	were experienced or can be anticipated based		
	on a 33% increase in incident nower		
	on a 55% increase in incruent power.		
	Increase 6/S/505, 507		
	Increase 2/S/506		·····
	At this point in the procedure, flow control		
	set points for individual panels can be made		
	to produce the desired temperature for panel		
	cure.		
8.1.10	Reduce the flow control set points for panel		
	controllers FCM-2403-FCM-2503 (papels 209-212)		
	to produce a panel metal temperature of		
	$0.315^{\circ}$ E as indicated by SDDC data points		
	TI 24024 on P TI 25024 on P Venter that		
	11-2403A or $B = 11-2503A$ or $B$ . Verity that		
	une DAS sensors (TEX-2456B, U, & D -		
		Test 1	030
		Revisi	on O

_	Initial	Date
TEX-2556B, C, & D) are all indicating temper- atures <360°F. (In the event the DAS sensors are indicating an excessive temperature (>360°F), increase appropriate panel flow until the DAS reading is reduced to 360°F). Increase flow through adjacent heated panels (205-208 and 213-218) as required to maintain the metal temperature at <360°F as measured by TEX-2355B, C, & D - TEX-2455B, C, & D and TEX-2654B, C, & D - TEX-2756B, C, & D. Main- tain the cure condition on panels 209-212 for a 20 min hold period. Make any flow adjust- ments required due to changing sun position. Record on the cure log sheet (Appendix 10H) that this step of the cure has been completed for panels 209-212. (Carryout Step 8.1.14 during each hold period.)		
8.1.11 Reduce the flow control set points for panel controllers FCM-2403 - FCM-2503 (panels 209-202) to produce individual panel temperatures of $360 \pm 35^{\circ}$ F as indicated by TI-2403A or TI-2503A or B. Adjust flows as required to maintain adjacent heated panel temperatures at $\leq 360^{\circ}$ F and gradients $\leq 200^{\circ}$ F as measured by TEX-2355B, C, & D - TEX-2455B, C, & D and TEX-2654B, C, & D - TEX-2756B, C, & D. Maintain the cure condition on panels 209-212 for a 20 min hold period. Make any flow adjustments required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 209-212.		

Test 1030 Revision 0 Page 66 of 543

		Initial	Date
8.1.12	Repeat Step 8.1.11 to produce panel metal temperatures of 410 $\pm$ 35°F as measured by TI-2403A or B - TI-2503A or B (panels 209-212).		
8.1.13	Repeat Step 8.1.11 to produce panel metal temperatures of 460 + 10 - 35°F as measured by TI-2403A or B - TI-2503A or B (panels 209-212). Hold for 1 hr to accomplish cure step.		
8.1.14	<ul> <li>During each of the cure hold periods (Steps 8.1.10 - 8.1.13), the following parameters should be recorded to support subsequent collector system "optical" performance and panel thermal expansion analyses.</li> <li>Time and day</li> <li>Insolation</li> <li>Collector field-ring-track status</li> <li>Receiver panel incident flux measurements YI-2110A, B &amp; C - YI-2112A, B, &amp; C YI-2210A, B &amp; C - YI-2212A, B, &amp; C YI-2307A &amp; B YTX-2307C YI-2308A, B &amp; C - YI-2309A, B, &amp; C YI-2407A &amp; B YTX-2407C YI-2408A, B &amp; C - YI-2409A, B, &amp; C YI-2507A &amp; B YTX-2507C</li> </ul>		

Test 1030 Revision O Page 67 of 543

		_	Initial	Date
	YTX-2607C			
	YI-2608A, B & C - YI-	-2609A, B, & C		
	YI-2707A & B			
	YTX-2707C			
	YI-2708A, B & C - YI-	-2709A, B, & C		
	YI-2807A & B			
	YTX-2807C			
	YI-2808A, B & C - YI-	-2809A, B, & C		
	<ul> <li>Individual receiver par</li> </ul>	nel flows		
	<ul> <li>Individual panel inlet</li> </ul>	and outlet		
	temperatures			
	• Panel metal temperature	25		
	<ul> <li>Panel strain gauges</li> </ul>			
	Hot Water Cure of Panels 2 (Steps 8.1.15-8.1.24)	213-216		
8115	Call up the individual par	al flow controllers		
0.1.15	(ECM-230) = ECM-2803) and	verify that they		
	are in the console mode.	Input the appro-		
	priate set points listed b	pelow.	-	
		Point (LB/HR)		
	FCM-2301 - FCM-2303	0		
	FCM-2401 - FCM-2402	500		
	FCM-2403	1500		
	FCM-2501	4000		
	FCM-2502 - FCM-2503	6000		
	FCM-2601* - FCM-2701*	6000		
	FCM-2702	4000		
	FCM-2703	1500		
	FCM-2801 - FCM-2802	1000		
	FCM-2803	0		
*Panels to	o be cured		Test 1 Revisi Page 6	030 on O 8 of 543

	-	Initial	Date
8.1.16	Verify that collector field segments 506, 507, and 508 are in "Standby" and ready to		
	track the receiver.		
8.1.17	Issue the following heliostat "Increase" com- mands and verify adequate flow to maintain panel metal temperatures <360°F and no excessive heating of uncooled structures (half power check point). Verify that all heated panel temperature gradients are <200°F. Maximum metal temperature gradient constraints shall be as monitored by (top) panel DAS sensors, TEX-2354B, C, & D - TEX-2856B, C, & D. (Sensors on sub-		
	stantially heated panels are TEX-2456B, C, & D - TEX-2756B, C, & D).		
	Increase 5/S/507		
8.1.18	If an excessive temperature condition is not experienced during Step 8.1.17, issue the following heliostat "Increase" command and verify adequate flow to maintain panel metal temperatures <360°F and no excessive heating of uncooled structures (75% power check point). Verify that panel temperature gradients are <200°F. Verification carried out with temperature sensors listed in Step 8.1.17.		
	Increase 9/S/506, 508		
	Increase 2/S/507		
		l Test 1 Revisi Page 6	030 on 0 9 of 543
	-	Initial	Date
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8.1.19	Repeat Step 8.1.17 for full test incident power command unless excessive temperature conditions ( <u>&gt;</u> 360°F) or gradients (>200°F) were experienced or can be anticipated based on a 33% increase in incident power.		
	Increase 6/S/505, 507 Increase 2/S/506		
	At this point in the procedure, flow control set points for individual panels can be made to produce the desired temperature for panel cure.		
8.1.20	Reduce the flow control set points for panel controllers FCM-2601 - FCM-2701 (panels 213-216) to produce a panel metal temperature of 315°F as indicated by SDPC data points TI-2601A or B - TI-2701A or B. Verify that the DAS sensors (TEX-2654B, C, & D - TEX- 2754B, C, & D) are all indicating tempera- tures $\leq$ 360°F. (In the event the DAS sensors are indicating an excessive temperature (>360°F), increase appropriate panel flow until the DAS reading is reduced to 360°F). Increase flow through adjacent heated panels (207-212 and 217-220) as required to maintain the metal temperature at $<$ 360°F as measured by TEX-2454B, C, & D - TEX-2556B, C & D and TEX-2755B, C, & D - TEX-2855B, C, & D. Main- tain the cure condition on panels 213-216 for a 20 min hold period. Make any flow adjust-		

Test 1030 Revision 0 Page 70 of 543

		Initial	Date
	Record on the cure log sheet (Appendix 10H) that this step of the cure has been completed for panels 213-216. (Carryout Step 8.1.24 during each hold period).		
8.1.21	Reduce the flow control set points for panel controllers FCM-2601 - FCM-2701 (panels 213-216) to produce individual panel metal temperatures of $360 \pm 35^{\circ}$ F as indicated by TI-2601A or B - TI-2701A or B. Adjust flows as required to maintain adjacent heated panel temperatures at <360°F and gradients <200°F as measured by TEX-2454B, C, & D - TEX-2556B, C, & D and TEX-2755B, C, & D - TEX-2855B, C, & D. Maintain the cure con- dition on panels 213-216 for a 20 min hold period. Make any flow adjustment required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 213-216.		
8.1.22	Repeat Step 8.1.21 to produce panel metal temperatures of 410 $\pm$ 35°F as measured by TI-2601A or B - TI-2701A or B (panels 213-216).		
8.1.23	Repeat Step 8.1.21 to produce panel metal temperatures of 460 ± 10 - 35°F as measured by TI-2601A or B - TI-2701A or B (panels 213-216). Hold for 1 hr to accomplish cure step.		
		Test 1 Revisi Page 7	030 on 0 1 of 543

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	-	Initial	Date
8.1.24	During each of the cure hold periods (Steps		
	8.1.20 - 8.1.23), the following parameters		
	should be recorded to support subsequent col-		
	lector system "optical" performance analysis		
	(ref Step 8.1.14)		
	• Time and day		
	Insolation		
	<ul> <li>Collector field-ring-track status</li> </ul>		
	<ul> <li>Collector field status</li> </ul>		
	<ul> <li>Receiver panel incident flux measurements</li> </ul>		
	<ul> <li>Individual receiver panel flows</li> </ul>		
	<ul> <li>Individual panel inlet and outlet</li> </ul>		
	temperatures		
	Steps 8.1.25 - 8.1.44 are required to carry-		•
	out the hot water cure of receiver panels		
	204-208 and 217-221. Cure of panels 204-208		
	shall be carried out during the morning to		
	noon time period while cure of panels 217-221		
	shall occur during the noon to afternoon		
	period. Sufficient flow shall be distributed		
	through the heated panels to prevent exces-		
	sive temperature or temperature gradient		
	conditions. The maximum allowable feedwater		
	flow is 50,000 lb/hr.		
	During the individual cure hold points for		
	each panel, incident flux, feedwater flow.		
	and feedwater temperature rise. data shall be		
	recorded for subsequent absorbed versus inci-		
	dent power correlation analysis. Individual		
	panel lengths and wall temperatures shall be		
		 Test 10	30
		Revisio	n 0 1 of 543
		i aye 72	

		-	Initial	Date
	recorded (both in a heated a	ind unheated		- - -
	state) for panel growth anal	ysis.		
	<u>Hot Water Cure of Panels 204</u> (Steps 8.1.25 - 8.1.34)	-208		·
8.1.25	Verify that the individual r control loops FCM-2031 - FCM	eceiver flow 1-2803 are in		
	console mode and input the a points listed below:	ppropriate set		
		Controller Set Point (LB/HR)		
	FCM-2301* - FCM-2402*	5500		
	FCM-2403	5500		
	FCM-2501	4000		
	FCM-2502 - FCM-2503	3000		
	FCM-2601 - FCM-2701	1000		
	FCM-2702 - FCM-2803	0		
	*Panels to be cured	-		
8.1.26	Verify that collector field 403, 504, 505 are in "Standb track the receiver.	segments 402, oy" and ready to		
8.1.27	Issue the following heliosta commands and verify adequate panel metal temperatures <36 sive heating of uncooled str power check point). Verify panel temperature gradients	at "Increase" e flow to maintain 60°F and no exces- ructures (half that all heated are <200°F.		
			Test 10 Revisio Page 73	030 n 0 s of 543

	-	Initial	Date
	Maximum metal temperature and gradient con- straints shall be as monitored by (top) panel DAS sensors, TEX-2354B, C, & D - TEX-2856B, C & D. (Sensors on substantially heated panels are TEX-2354B, C, & D - TEX-2556B, C, & D).		
	Increase 10/S/402, 403, 505 Increase 7/S/504		
8.1.28	If an excessive temperature condition is not experienced during Step 8.1.27, issue the following heliostat "Increase" command and verify adequate flow to maintain panel metal temperatures <360°F and no excessive heating of uncooled temperature gradients are <200°F. Verification carried out with temperature sensors listed in Step 8.1.27.		
	Increase 5/S/402, 403, 505 Increase 3/S/504		
8.1.29	Repeat Step 8.1.28 for the full test inci- dent power command unless excessive tempera- ture conditions (>360°F) or gradients (>200°F) were experienced or can be antici- pated based on a 33% increase in incident power.		
	Increase 5/S/402, 403, 505 Increase 4/S/504		
		Test 1 Revisi Page 7	030 on 0 4 of 543

		Initial	Date
	At this point in the procedure, flow control set points for individual panels can be made to produce the desired temperature for panel cure.		
8.1.30	Reduce the flow control set points for panel controllers FCM-2301 - FCM-2402 (panels 203-208) to produce a panel metal temperature of $\sim$ 315°F as indicated by SDPC data points TI-2301A or B - TI-2402A or B. Verify that the DAS sensors (TEX-2354B, C, & D - TEX- 2654B, C, & D) are all indicating tempera- tures <360°F. (In the event the DAS sensors are indicating on excessive temperature (>360°F), increase appropriate panel flow until the DAS reading is reduced to 360°F.) Increase flow through adjacent heated panels (209-214) as required to maintain the metal temperature at <360°F as measured by TEX- 2456B, C, & D - TEX-2655B, C, & D. Maintain the cure condition on panels 203-208 for a 20 min hold period. Make any flow adjust- ments required due to changing sun position. Record on the cure log sheet (Appendix 10H) that this step of the cure has been completed for panels 203-208. (Carryout Step 8.1.34 during each hold period.)		
8.1.31	Reduce the flow control set points for panel controllers FCM-2301 - FCM-2402 (panels 203-208) to produce individual panel metal temperatures of 360 $\pm$ 35°F as indicated by TI-2301A or B - TI-2402A or B. Adjust flows		

Test 1030 Revision 0 Page 75 of 543

		Initial	Date
	as required to maintain adjacent heated panel temperatures at <360°F and gradients <200°F as measured by TEX-2456B, C, & D - TEX-2655B, C, & D. Maintain the cure condition on panels 203-208 for a 20 min hold period. Make any flow adjustments required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 203-208.		
8.1.32	Repeat Step 8.1.31 to produce panel metal temperatures of 410 $\pm$ 35°F as measured by TI-2301A or B - TI-2402A or B (panels 203-208).		
8.1.33	Repeat Step 8.1.31 to produce panel metal temperatures of 460 $\pm$ 10 - 35°F as measured by TI-2301A or B - TI-2402A or B (panels 203-208). Hold for 1 hr to accomplish cure step.		
8.1.34	During each of the cure hold periods (Steps 8.1.30 - 8.1.33), the following parameters should be recorded to support subsequent col- lector system "optical" performance and panel thermal expansion analyses (ref Step 8.1.14)		
	<ul> <li>Time and day</li> <li>Insolation</li> <li>Collector field-ring-track status</li> <li>Collector field status</li> <li>Receiver panel incident flux measurements</li> <li>Individual receiver panel flows</li> </ul>		
		l Test l Revisio Page 76	030 on 0 5 of 543

		_	Initial	Date
	• Individual panel inlet	and outlet		
	temperature			
	• Panel metal temperature	S		
	<ul> <li>Panel strain gauges</li> </ul>	_		
	Hot Water Cure of Panels 2	17-221		
	(31245 0.1.33 - 0.1.44)			
8.1.35	Call up the individual pan	el flow controllers		
	(FCM-2301 - FCM-2803) and	verify that they		
	are in the console mode.	Input the appro-		
	priate set points listed b	elow.		
		Controller Set Point (LB/HR)		
	FCM-2301 - FCM-2402	U 1000		
	FUM-2403 - FUM-2503	1000		
	FCM-2601 - FCM-2602	3000		
	FCM-2603	4000		
	FCM-2701	5500		
	FUM-2/02* - FUM-2803*	5500		
	*Panels to be cured			
8.1.36	Verify that collector fiel	d segments 508,		
	509, 410, and 411 are in "	Standby" and ready		
	to track the receiver.	_		
8.1.37	Issue the following helios	tat "Increase"		
011107	commands and verify adequa	te flow to maintain		
	panel metal temperatures <	360°F and no exces-		
	sive heating of uncooled s	tructures (half		
	power check point). Verif	v that all heated		
	,			
			Test 10	030
			Revisi	on 0
			Page 7	/ of 543

		Initial	Date
	panel temperature gradients are <200°F. Maximum metal temperature and gradient con- straints shall be as monitored by (top) panel DAS sensors, TEX-2354A, B, & C - TEX-2856A, B, & C. (Sensors on substantially heated panels are TEX-2654A, B, & C - TEX-2856A, B & C).		
	Increase 10/S/410, 411, 508 Increase 7/S/509		
8.1.38	If an excessive temperature condition is not experienced during Step 8.1.37, issue the following heliostat "Increase" command and verify adequate flow to maintain panel metal temperatures <360°F and no excessive heating of uncooled structures (75% power check point). Verify that panel metal temperature gradients are <200°F. Verification carried out with temperature sensors listed in Step 8.1.28.		
	Increase 5/S/410, 411, 508 Increase 3/S/509		
8.1.39	Repeat Step 8.1.38 for the full incident power command unless excessive temperature conditions ( $\geq$ 360°F) or gradients (>200°F) were experienced or can be anticipated based on a 33% increase in incident power.		
	Increase 5/S/410, 411, 508 Increase 4/S/509		
		Test 10 Revisio Page 7	)30 on 0 3 of 543

	-	Initial	Date
	At this point in the procedure, flow control		
	set points for individual panels can be made		
	to produce the desired temperature for panel		
	cure.		
8.1.40	Reduce the flow control set points for panel		
	controllers FCM-2702 - FCM-2803 (panels		
	217-221) to produce a panel metal temperature		
	of 300°F as indicated by SDPC data points		
	TI-2702A or B - TI-2803A or B. Verify that		
	the DAS sensors (TEX-2755B, C, & D - TEX-		
	2856B, C, & D) are all indicating temperatures		
	<360°F. (In the event the DAS sensors are		
	increase appropriate panel flow until the DAS		
	reading is reduced to 360°F). Increase flow	-	
	through adjacent heated panels (211-216) as		
	required to maintain the metal temperature		
	at <360°F as measured by TEX-2555B, C, & D -		
	TEX-2754B, C, & D. Maintain the cure con-		
	dition on panels 217-221 for a 20 min hold		
	period. Make any flow adjustments required		
	due to changing sun position. Record on the		
	cure log sheet (Appendix 10H) that this		
	step of the cure has been completed for		
	panels 217-221. (Carryout Step 8.1.44 during		
	each hold period.)		
8.1.41	Reduce the flow control set points for panel		
	controllers FCM-2702 - FCM-2803 (panels 217-		
	221) to produce individual panel metal tem-		
	peratures of 360 $\pm$ 35°F as indicated by		
	TI-2702A or B - TI-1803A or B. Adjust flows		
		Test 1	030

Revision O Page 79 of 543

		Initial	Date
· ·	as required to maintain adjacent heated panel temperatures at <360°F and gradients <200°F as measured by TEX-2555B, C, & D - TEX-2754B, C, & D. Maintain the cure condition on panels 217-221 for a 20 min hold period. Make any flow adjustments required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 217-221.		
8.1.42	Repeat Step 8.1.41 to produce panel metal temperatures of 410 ± 35°F as measured by TI-2702A or B - TI-2803A or B (panels 217-221).		
3.1.43	Repeat Step 8.1.41 to produce panel metal temperatures of 460 ± 10 - 35°F as measured by TI-2702A or B - TI-2803A or B (panels 217-221). Hold for 1 hr to accomplish cure step.		
3.1.44	During each of the cure hold periods (Steps 8.1.40 - 8.1.43), the following parameters should be recorded to support subsequent col- lector system "optical" performance and panel thermal expansion analyses (ref Step 8.1.14)		
	<ul> <li>Time and day</li> <li>Insolation</li> <li>Collector field-ring-track status</li> <li>Collector field status</li> <li>Receiver panel incident flux measurements</li> <li>Individual receiver panel flows</li> </ul>		
		 Test 1 Revisi	030 on 0

Page 80 of 543

		Initial	Date
	<ul> <li>Individual panel inlet and outlet temperatures</li> <li>Panel metal temperatures</li> <li>Panel strain gauges</li> </ul>		
8.1.45	Periodically inspect the inter panel light seals during non operating periods of the water cure procedure to verify the integrity of the light seal. As a minimum, inspections should be made upon completion of each of the major sections of the water cure procedure (panels 209-212, 213-216, 204-208, and 217-221).		
8.1.46	Periodically inspect the individual receiver panels during non operating periods for indications of binding caused by thermal expansion. As a minimum, inspections should be made upon completion of each of the major sections of the water cure procedure (panels 209-212, 213-216, 204-208, and 217-221).		
		Test 1 Revisi Page 8	030 on 0 31 of 5

Initial

## "STEAMING" RECEIVER OPERATION - FLOW TO FLASH TANK

This portion of Section 8 involves the steam (high temperature) cure of the receiver boiler panels as well as open and closed loop controls testing of receiver related control systems. The final portion of this section (8.2) involves the routine startup of the receiver (per the published operating instructions) and the establishment of panel steaming operation while under temperature control. Since all receiver discharge flow will pass to the flash tank during this section of the procedure, total feedwater flow is limited to <50,000 lb/hr while the steam generation rate is limited to 40,000 lb/hr. The steam cure of the individual boiler panels is divided into 4 activities (panels 209-212, panels 213-216, panels 204-208, and panels 217-221). During each cure activity, power is also supplied to the receiver preheat panels to carryout a curing function for those panels and provide higher temperature feedwater to the boiler panels which approaches their normal inlet operating temperatures.

During the course of all testing carried out as part of section 8.2, the flash tank vent pressure setting shall be maintained at  $\sim$ 485 psig to provide a more or less constant pressure test environment. Steam that is produced during these tests will be

> Test 1030 Revision 0 Page 82 of 543

8.2

preferentially diverted to the deaerator to provide some feedwater heating. Excess steam will be diverted to the condenser. As a result, feedwater temperature supplied to the receiver may range from  $\sim$ 220 to  $\sim$ 350°F, depending on the quantity of steam produced by the receiver and the degree of heat recovery used during any particular test.

The receiver feed pump shall be operated in either a pressure or valve position control mode depending on the particular test. When operating in pressure control, set points will be selected which are compatible with the 485 psig flash tank vent controller setting. When operating in valve control, the pump discharge pressure will automatically adjust to the system demands as controlled by the flash tank pressure setting and receiver control valve action.

After each of these cure activities, control checkout testing is carried out for applicable receiver controllers. Testing of the flash tank vent controllers occurs after completion of the cure of panels 209-212, when significant steam is available.

> Test 1030 Revision 0 Page 83 of 543

Date

		_	Initial	Date		
	Curing of panel groupings 2	204-208 and 209-212				
	as well as carrying out re	lated controls				
	checkout testing should be					
	ing the morning to noon tim	ne period. Cor-				
	responding point cure and	controls checkout				
	testing for panel groups 2	13-216 and 217-221				
	should be accomplished dur	ing the noon to				
	afternoon time period.					
3.2.1	Steam Cure of Panels 209-2	12				
	Step 8.2.1.1 - 8.2.1.15)					
8.2.1.1	Verify that the initial co	nditions have been				
	established as required in	Section 7.4.2.				
3.2.1.2	Call up the individual panel flow controllers					
	(FCM-2301 - FCM-2803) and verify that they					
	are in the "console" mode.	Input the appro-				
	priate set points listed b	elow.				
		Controller Set Point (LB/HR)				
	FCM-2301 - FCM-2303	500				
	FCM-2401	1500				
	FCM-2402	3500				
	FCM-2403*	4500				
	FCM-2501* - FCM-2503*	5000				
	FCM-2601	5000				
	FCM-2602	4500				
	FCM-2603	3500				
	FCM-2701	2000				
	FCM-2702	1000				
	FCM-2703 - FCM-2803	500				
	*Panels to be cured		Toc+ 1	130		
			Dovici	n n		

Revision O Page 84 of 543

	-	Initial	Date
8.2.1.3	Verify that the valve control set point for the receiver feed pump is 80% and switch feed pump controller, PC-1105 to valve control.		
8.2.1.4	Verify that the flows set in Step 8.2.1.2 are maintained at their set point values.		
8.2.1.5	Verify that the receiver flash tank vent set point is 485 psig (adjustment of PC-2906, PC-1000, and PC-647B).		
8.2.1.6	Verify that collector field wedges 01, 05, 06, 07, and 12 are in "Standby" and ready to track the receiver.		
8.2.1.7	Issue the following heliostat "Increase" com- mands and verify adequate flow to maintain panel metal temperatures <520°F as indicated by TI-2301A or B - TI-2803A or B and no excessive heating of uncooled structures (half power check point). Verify that all heated panel temperature gradients are <200°F as indicated by panel (top) DAS sensors TEX-2354B, C, & D). "Track" command should be issued in a "rapid" fashion to produce a "step" change in input power to the receiver which simulates actual operating transients to be expected. Transient data to be recorded during the "step" change in power		

Test 1030 Revision 0 Page 85 of 543

	-	Initial	Date
	includes flow rate, metal temperatures, and		
	inlet/outlet fluid temperatures for each		
	panel as well as system pressures.		
	Increase 17/W/05, 07		
	Increase 8/W/01, 12		
	Increase 5/W/06		
8.2.1.8	Repeat Step 8.2.1.7 using the following		
	heliostat "Increase" command (75% power check		
	point). Carryout all temperature verifica-		
	tion and data recording functions listed in		
	Step 8.2.1.7.		
	Increase 9/W/05, 07		
	Increase 4/W/01, 12		
	Increase 2/W/06 -		
8.2.1.9	Repeat Step 8.2.1.7 using the following		
	heliostat "Increase command (10% test power		
	check point). Carryout all temperature		
	verification and data recording functions		
	listed in Step 8.2.1.7. Note: this step		
	should be deleted or modified if excessive		
	metal temperatures or temperature gradients		
	were experienced during Step 8.2.1.8 or can		
	be anticipated as a result of a 33% increase		
	in incident receiver power.		
	Increase 9/W/05, 07		
	Increase 4/W/01, 12		
	Increase 2/W/06		
		Test 10 Revisio Page 86	030 on 0 5 of 543

Date

At this point in the procedure, flow control set points for individual panels can be made to produce the desired temperature for panel cure. Whenever possible panel flow set point changes required to transition from one cure condition to the next should be done through step changes (reductions) in flow to permit the gathering of dynamic receiver data. In selecting the step changes in flow set points, conservation should be used to prevent a panel over temperature condition from occurring.

During each cure hold point (Step 8.2.1.10 -8.2.1.15), the following parameters should be recorded to support subsequent collector system "optical" performance and panel thermal expansion analyses.

- Time and day
- Insolation
- Collector field-ring-track status
- Collector field status
- Receiver panel incident flux measurements
- Individual receiver panel flows
- Individual panel inlet and outlet temperatures
- Panel metal temperatures
- Panel strain gauges
- 8.2.1.10 Reduce the flow control set points for panel controllers FCM-2403 FCM-2503 (panels 209-212) to produce individual panel metal temperatures of 520 ± 35°F as indicated by TI-2403A

Test 1030 Revision 0 Page 87 of 543

		Initial	Date
	or B - TI-2503A or B. Adjust flows as required to maintain adjacent heated panel temperatures <520°F and gradients <200°F as measured by TEX-2354B, C, & D - TEX-2455B, C, & D and TEX-2654B, C, & D - TEX-2856B, C, & D. Maintain the cure condition on panels 209-212 for a 20 min hold period. Make any flow adjustments required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 209-212.		
8.2.1.11	Repeat Step 8.2.1.10 to produce panel metal temperatures of $585 \pm 35^{\circ}F$ as indicated by TI-2403A or B - TI-2503A or B (panels 209-212).		
8.2.1.12	Repeat Step 8.2.1.10 to produce panel metal temperatures of 660 $\pm$ 35°F as indicated by TI-2403A or B - TI-2503A or B (panels 209-212).		
8.2.1.13	Repeat Step 8.2.1.10 to produce panel metal temperatures of 720 $\pm$ 35°F as indicated by TI-2403A or B - TI-2503A or B (panels 209-212).		
8.2.1.14	Repeat Step 8.2.1.10 to produce panel metal temperatures of 780 $\pm$ 35°F as indicated by TI-2403A or B - TI-2503A or B (panels 209-212).		
		Test 1 Revisi Page 8	030 on 0 88 of 543

		Initial	Dat
8.2.1.15	Repeat Step 8.2.1.10 to produce panel metal		
	temperatures of 850 $\pm$ 35°F as indicated by		
	TI-2403A or B - TI-2503A or B (panels		
	209-212).		
		1	
		Test 1	030
		Revisi	on O

		Initial	Date
8.2.2	Demonstrate satisfactory closed loop opera- tion of the flash tank vent valve pressure controllers (PC2906, PC1000, and PC647B) an the desuperheater spray water temperature controller TC1002. Refer to Figure 8.2.2-1 through 8.2.2-4.	d	
8.2.2.1	Verify that the initial conditions have bee established as required in Section 7.4.2.	n	
8.2.2.2	Confirm that the flow to the flash tank and receiver operation is stable and well behaved.		
8.2.2.3	Increase the energy flow to the flash tank to achieve steady state steam flow out of flash tank at the desired flash tank operat ing pressure. Confirm PC2906 is active and controlling flash tank pressure.	-	
8.2.2.4	Tune PC2906 - flash tank pressure controller (Figure 8.2.2-1) by carrying out the follow- ing steps using loop tuning form.	r -	
	A) Set receiever console to configure mode.		
	B) Decrease pressure set point of PC2906 by 10% and observe the response on the strip chart.	/	
	C) Increase PC2906 set point back to nomina value and observe the response on the strip chart.	1]	
		Test 10	30

Revision 0 Page 90 of 543



Test 1030 Revision O Page 91 of 543

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			Initial	Date
	D)	Increase/decrease proportional gain, Kl (Cl-ll, AL-l0).*		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease PC2906 set point 10% and observe response.		
	G)	Increase PC2906 set point to nominal value and observe pressure response.		
	H)	Increase/decrease reset gain, K2 (C1-11, AL-10) in the ± 30% increments.	,	
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary PC2906 controller gains and record.		
	K)	Adjust set points, alarms, and limits if required.		
8.2.2.5	Inc lim PC2	crease flow to maximum flash tank flow hits and verify satisfactory operation of 2906. Tune loops is required.		
8.2.2.6	Est PC6 pre PC6 poi	cablish transition conditions such that 647B is active and controlling deaerator essure. (i.e. increase D.A. pressure to 647B set point or decrease PC647B set int to D.A. operating conditions).		
			 Test 1	030

Revision 0 Page 92 of 543

		Initial	Date
8.2.2.7	Tune PC647B - D.A. pressure controller (Fig- ure 8.2.2-2) by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure set point of PC647B by 10% and observe the response on the stri chart.	p	
	C) Increase PC647B set point back to nomina value and observe the response on the strip chart.	1	
	D) Increase/decrease proportional gain, Kl (C4-4, AL-1).*		
	E) Repeat steps B D as required until response is satisfactory.		
	F) Decrease PC647B set point 10% and observ response.	e	
	G) Increase PC647B set point to nominal value and observe pressure response.		
	H) Increase/decrease reset gain, K2 (C4-4, AL-1) in the $\pm$ 30% increments.		
	I) Repeat steps F H as required until response is satisfactory.		
		Toct 1	030

Test 1030 Revision O Page 93 of 543



Figure 8.2.2-2. Receiver Flash Tank Steam Drain to Deaerator Controller (With High Temperature Override) Functional Block Diagram – PC647B

Test 1030 Revision 0 Page 94 of 543

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		Initial	Date
	J) Establish preliminary PC647B controller gains and record.		
	K) Adjust set point, alarms and limits if required.		
8.2.2.8	Verify satisfactory operation of the high temperature override on PC647B.		
8.2.2.8.1	Confirm that PC1000 is in auto mode with setpoint of 500 psig. Confirm TC1002 is in auto mode.		
8.2.2.8.2	Select PD647B and switch from pressure con- trol mode to temperature control mode. Con- firm that control response diverts steam flow from the deaerator to the condenser thru PC1000 and the transition is well behaved. Tune TC2907 control parameters if required.		
8.2.2.8.3	Select PD647B and switch back from temper- ature control override mode to pressure control.		
8.2.2.8.4	Decrease temperature control setpoint and override alarm threshold (C4-4, AL-2, PV Alarm) such that the temperature override loop will automatically initiate. Confirm response is satisfactory for temperature override control. Tune TC2907 control param- eters if required using loop tuning form.		
		Test 1 Revisi Page 9	030 on 0 5 of 543

	_	Initial	Date
8.2.2.8.5	Reset TC2907 setpoint and override alarm threshold back to nominal conditions.		
8.2.2.9	Transition flash tank outlet flow from dea- erator to condenser.		
8.2.2.9.1	Verify PC1000 is in auto mode with a setpoint of 500 psig. Verify TC1002 is in auto mode		
8.2.2.9.2	Select AM647B, set to manual mode and adjust output to divert partial flow from deaerator to condenser. (Note - Flash tank pressure should increase resulting in PC2906 opening up and PC1000 assuming flash tank pressure control.) Verify that PC1000 and PC2906 are functioning properly.		
8.2.2.10	Tune PC1000 - Flash tank high pressure con- troller (Figure 8.2.2-3) by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure set point on PC1000 by 10% and observe the response on the strip chart.		
	C) Increase pressure set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (C2-5, AL-19).*		
		Test 1 Revis Page 9	030 on 0 06 of 543



			Initial	Date
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease PC1000 set point 10% and observe response.		
	G)	Increase PC1000 set point to nominal value and observe pressure response.		
	H)	Increase/decrease reset gain, K2 (C2-5, AL-19) in the ± 30% increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary PC1000 controller gains and record.		
	K)	Adjust setpoint, alarms, limits as required.		
8.2.2.11	Tun tro fol	ne TC1002 - desuperheater temperature con- oller (Figure 8.2.2-4) by carrying out the lowing steps using loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TCM1002 by 10% and observe the response on the strip chart.		
	C)	Increase TCM1002 set point back to nominal value and observe the response on the strip chart.	Test 10	030
			Revisio Page 98	on 0 8 of 543



Figure 8.2.2-4. Steam Dump Line Desuperheater Temperature Controller Functional Block Diagram - TC1002

Test 1030 Revision 0 Page 99 of 543

		-	Initial	Date
	D)	Increase/decrease proportional gain, Kl (C2-5, AL-15).*		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TCM1002 set point 10% and observe response.		
	G)	Increase TCM1002 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C2-5, AL-15) in the ± 30% increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TV1002 controller gains and record.		
	К)	Adjust setpoints, alarms, limits as required.		
8.2.2.12	Ver TC1	rify satisfactory operation of PC1000 and 002 at high flow conditions.		
8.2.2.12.1	Sel ing con	ect AM647B and close valve PV647B divert-   full flash tank outlet steam flow to  denser		
			Test 1 Revisi	030 on 0

		Initial	Date
8.2.2.12.2	Confirm satisfactory operation of PC1000 and TC1002 under high flow conditions. Tune PC1000 and TC1002 if required.		
8.2.2.13	Verify override logic on PC1000		
8.2.2.13.1	Simulate condenser high pressure conditions by reducing pressure override alarm value (C2-5, AL-20, PV Alarm) and pressure set- point (PCY640B) to condenser pressure valve. Note - Caution: Flash tank pressure must be closely monitored during the test since there is no longer direct control over it.		
8.2.2.13.2	Observe response and verify that PCY640B is active and controlling condenser pressure.		
8.2.2.13.3	Tune PC1000 - condenser pressure mode con- troller PCY640B (Figure 8.2.2-3) by carrying out the following steps using tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure set point of PCY640B by 10% and observe the response on the strip chart.		
	C) Increase PCY640B set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (C2-5, AL-20).*		
		Test Revis Page	  030 ion 0  01 of 543

			Initial	Date
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease PCY640B set point 10% and observe response.		
	G)	Increase PCY640B set point to nominal value and observe pressure response.		
	H)	Increase/decrease reset gain, K2 (C2-5, AL-20) in the ± 30% increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary PCY640B controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.2.13.4	Res to	et condenser pressure override alarm valve its nominal condition.		
8.2.2.13.5	Sel ove sat res	ect PD1000 and initiate condenser pressure erride control operator command. Confirm cisfactory transition and control system sponse.		
8.2.2.13.6	Sel pre bac	ect PD1000 and reset back to flash tank essure control. Reset PCY640B setpoint ek to its nominal value.		
			Test 1	030

Test 1030 Revision O Page 102 of 543

		Initial	Date
8.2.2.14	Reset nominal operating flow path from flash tank.		
8.2.2.14.1	Select AM647B and set to auto. Confirm that PC647B is active and nominal flow is established to the deaerator.		
8.2.2.14.2	Confirm flash tank pressure control transi- tions from PC1000 to PC2906 and this transition is satisfactory.		
8.2.2.15	Verify valve override logic on TCl002 is functional and operates satisfactorily.		
8.2.2.16	Restore system back nominal operating conditions.		
		Test	1030
		Revis Page	10n 0 103 of 543

		Initial	Date
8.2.3	CONTROL TESTS - PANELS 210, 212 - STEAM LOOP OPERATION		
8.2.3.1	Obtain process control open loop data required for tuning of receiver temperature control loops on panels 210 & 212 (refer to Figures 8.2.3-1 and 8.2.3-2). Obtain both step & frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ramp response to small signal flux disturbances.		
8.2.3.1.1	Verify that the prerequisites have been met as required in Section 4.2.3.		
8.2.3.1.2	Verify that the initial conditions have been established as required in Section 7.4.2.		
8.2.3.1.3	Re-establish the approximate heliostat con- figuration and flow conditions used for the 850° panel cure (see Section 8.2.1.15).		
8.2.3.1.4	Adjust flowrate setpoints (FCM2501, FCM2503) to achieve 850°F outlet panel steam tempera- ture on panels 210 & 212. Monitor T12504 & T12506.		
8.2.3.1.5	Verify that the control test unit is installed and operating on TV2501 & TV2503.		
8.2.3.1.6	Verify receiver feedpump is in pressure control (PCl105).		
		T <b>est</b> Revis Page	1030 ion 0 104 of 543

MVCU 1-4



Figure 8.2.3-1. RS Steam Temperature Controller Functional Block Diagram TC-2501

543
Flow PID Output UY2929B-2 15 UY2929B TC2601 A/F A/D ÷ (Enthalpy) AI-16 63 Same MVCU 1 Hz YI2509A YT2509A 62 A/F A/D AI-06 16 LAG 39 (Panel 14 ► UY 1105e D/A < >FC2503A AO-03 Flux) 1 Hz YT2509B AI-05 A/D Y12509 A/F FCM2503 64 Y12509B MT1,2,7,9 FC2503B F.O. TC2503 1 Hz 13' X **17**' Σ (Temperature 12 PID 18 Setpoint) PL D/A A/F A/D ۲ 60 AI-08 Δ 61 65 TV2503 AO-01 TY2929B Temp Remote Tuning Control **9**59 (HDL)  $\Sigma^{\overline{1}}$ Valve 10  $- f(x)_1$ 58 F12503 TC2503A MT1,2,3,4 56 TI2503A TI2503 MT1, 2, 5, 6 09 f(x)<sub>2</sub> 07 1 Hz TE2503A AI-01 A/F A/D FT2503 A/D A/F 57 05<sup>1</sup> P 55 AI-14 (Panel 20 2.5 Hz ٦ 03 Inlet A/M (Panel Temp) T12503B 53 08 f(x)<sub>3</sub>◀ <Flow) 51 1 Hz TE 2503B 54 AI-02 68 A/D A/F + 06 52 04 Σ D Δ T12506A TC2503B 1 Hz TE2506A AI-03 A/D A/F TI2506 Revision Page 106 Test 02 01 D (Steam Temp) TI2506B Rev Σ <Date \_\_\_\_\_\_ 50 1 Hz TE2506B 1030 AI-04 49 A/F E & R A/D Engr MT<sub>1</sub>, 2, 5, 6 0f

2.5 Hz

Figure 8.2.3-2. RS Steam Temperature Controller Functional Block Diagram TC-2503

543

**MVCU 1-5** 

		Initial	Date
8.2.3.1.7	Obtain open loop step response data on panel		
	210 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a		
	steady state condition for approximately		
	5 minutes.		
	B) Set FCM2501 to manual mode.		
	C) Implement a step decrease in FCM2501 output		
	by approximately 10% of nominal valve		
	(increase valve opening) and allow		
	pressures, flows, temperatures to reach		
	steady state.		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in order		
	to achieve a measureable response change in		
	flow and temperature - flow of $\pm 0.1$ lb/sec and		
	temperatures of $\pm 50$ to $100^{\circ}$ F are desired. Rec	ord	
	final command change. Monitor the following		1
	parameters on a strip chart to verify that dat	6	
	is recorded. $ECM2501$ (PV & CO) T12501	u.	
	$T_{12504}$ V12504 D12002		
	112004, 112004, 112902.		
	FCM2501 Output%		
	Command Change		
	D) Implement a step increase (back to nominal)		
	in FCM2501 output (closing valve) and allow		
	temperatures, pressure and flowrate to		
	reach steady state conditions.		
	E) Reset FCM2501 back to auto.		
		Test	1030
		Revis	ion 0
		Page	1U/ OT 5

		Initial	Date
8.2.3.1.8 Obtain open lo	op step/ramp response to a flux		<u>,</u>
disturbance or	panel 210 & 212 by carrying		
out the follow	ring steps.		
A) Confirm th	at the receiver panels are in a		
steady sta	te condition for approximately		
5 min.			
B) Set FCM250	1, FCM2503 to manual mode.		
C) Implement	a step/ramp decrease in the power		
level on p	anel 210 & 212 by approximately		
10% of nom	inal power. Allow panel tempera-		
tures, pre	ssure and flowrate to reach steady		
state. Mo	nitor the following parameters on		
a strip ch	art recorder to verify data is		
recorded:	FCM2501 (PV & CO), T12501, T12504,		
Y12507A/B,	FCM2503 (PV & CO), TI2503, TI2506,		
Y12509A/B,	P12902.		
Note: An adju	stment in the magnitude of the		
power char	ge (number of heliostats on/off		
target) ma	y be required in order to achieve		
measureabl	e response changes in flow and		
temperatur	res and flux. Flux changes $\geq$ 20%		
and temper	ature changes $\geq$ 50 to 100°F		
are desire			
U) Implement	a step/ramp increase in panel		
power (bac	K to nominal). Allow panel		
temperatur	es, pressures, tiux and tiows		
to reach a	steady state condition.		
Monitor ar	a aajust as in Section C		
E) Set FCM250	1, FCM2503 back to auto.		
		Test 10	030
		Revisi Page 1	0N U N8 of 543

		_	Initial	Date
8.2.3.1.9	Per	rform frequency response tests on panel 210		
	(Se	ee TC2501, Figure 8.2.3-1) by carrying out		
	the	e following steps.		
	1)	Verify that the controls test unit (CTU)		
		is installed and operating on TC2501.		
		(Installation is in RS-1).		
	2)	Verify the receiver feedpump is in		
		pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in		
	,	a steady state condition for approximately		1 1 -
		2 minutes.		
	4)	Adjust the neak to neak amplitude on the		
	т)	transfer function analyzer output to be		
		consistent with the required output change		
		determined in Section 8 2 3 1 7 C		
		determined in Section 6.2.5.1.7 C.		
	Not	e: Verify that the TFA input to the CTU		
		is switched out.		
	5)	Select FCM2501 and adjust setpoint to achieve		
	•	a nominal 850°F steam outlet temperature on		
		TC2501.		
	6)	Set FCM 2501 to manual mode		
	0,			
	7)	Using the transfer function analyzer (TFA)		
		insert a O.1 HZ sin wave into the CTU) and		
		adjust the TFA output such that a + 400 lb/hr		
		peak-to-peak response is achieved on F12501.		
			Test 1	030
			Revisi	on 0
			Page 1	09 of 54:

		Initial	Date
8.2.3.1.9	7)	Set the TFA to 0.02 HZ allow the system	
	·	to reach steady state (3-4) cycles).	
		Repeat 4) at a frequency of 0.05 HZ	
		Repeat 4) at a frequency of 0.07 HZ	
		Repeat 4) at a frequency of 0.1 HZ	
		Repeat 4) at a frequency of 0.2 HZ	
		Repeat 4) at a frequency of 0.5 HZ	
		Repeat 4) at a frequency of 0.7 HZ	
		Repeat 4) at a frequency of 1 HZ	
		Repeat 4) at a frequency of HZ Determined	
		Repeat 4) at a frequency of HZ during test	
	Not	te: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room).	
		(2) If panel temperature drifts off the	
		nominal test condition - adjust	
		FCM2501 output from operator station	
		to correct - if cannot successfully	
		adjust - return to Step 5.	
	8)	Switch TFA input out of CTU.	
	9)	Set FCM2501 back to auto.	
8.2.3.1.10	0bt	ain open loop step response data on panel	
	212	by carrying out the following steps.	
	A)	Confirm that the receiver panels are in a	
		steady condition for approximately 5 minutes	
		Test	1030
		Revi Page	sion 0 110 of 543

	_	Initial	Date
8.2.3.1.10	B) Set FCM2503 to manual mode.		
	C) Implement a step decrease in FCM2503		
	value (increase valve opening) and allow		
	pressures, flows, temperatures to reach		
	steady state.		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in		
	order to achieve a measureable response		
	change in flow and temperature - flow of		
	$\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F		
	are desired. Record final command change.		
	Monitor the following parameters on a strip		
	chart to verify that data is recorded:		
	FCM2503 (PV & CO), T12503, T12506, YI2509, & PI2902.		
	FCM2503 Output%		
	Command Change		
	D) Implement a step increase (back to nominal) in FCM2503 output (closing valve) and allow terrorectures, pressure and flowrate to reach		
	steady state conditions.		
	E) Reset FCM2503 back to auto.		
8.2.3.1.11	Perform frequency response tests on panel 212		
	(See TC2503, Figure 8.2.3-2) by carrying out the following steps.		
		Test	1030
		Revis	ion 0
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		-	Initial	Date
8.2.3.1.11	1)	Verify that the controls test unit (CTU) is installed and operating on TC2503. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.3.1.10 C.		
	Not	e: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2503 and adjust setpoint to achieve a nominal 850°F steam outlet temperature on TC2503.		
	6)	Set FCM2503 to manual mode.		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a $\pm$ 400 lb/hr peak-to-peak response is achieved on FI2503.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).		
			 Test 1 Revisi Page 1	030 on 0 12 of 543

		Initial	Date
8.2.3.1.11 7) Repea	t 4) at a frequency of 0.05 HZ		
Repea	t 4) at a frequency of 0.07 HZ		
Repea	t 4) at a frequency of 0.1 HZ		
Repea	t 4) at a frequency of 0.2 HZ		
Repea	t 4) at a frequency of 0.5 HZ		
Repea	t 4) at a frequency of 0.7 HZ		
Repea	t 4) at a frequency of 1 HZ		
Repea	t 4) at a frequency of HZ De	termined	
Кереат	t 4) at a frequency of HZ du	ring test	
Note: (1)	) The TFA output amplitude may need	to	
	be adjusted during the test as		
	required to obtain a measureable		
	output response (determined by		
	test by engineers in RS-1 or DAS		
	room).		
(2)	If namel temperature drifts off		
(-)	the nominal test condition - adju	st	
	FCM2503 output from operator stat	ion	
	to correct - if cannot successful	ly	
	adjust - return to Step 5.	······	
8) Switch	I TFA INPUL OUL OF CIU.	•	
9) Set F	CM2503 back to auto.		
			i
		Toct 1	030
		Revisi	on 0
		Page 1	13 of 543

<ul> <li>8.2.3.2 Obtain process control open loop data required for tuning of receiver temperature control loops on panels 210 &amp; 212 (refer to Figures 8.2.3-1 and 8.2.3-2). Obtain both step &amp; frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.</li> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
<pre>for tuning of receiver temperature control loops on panels 210 &amp; 212 (refer to Figures 8.2.3-1 and 8.2.3-2). Obtain both step &amp; frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances. 8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0. 8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</pre>	
<ul> <li>loops on panels 210 &amp; 212 (refer to Figures 8.2.3-1 and 8.2.3-2). Obtain both step &amp; frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.</li> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
<ul> <li>8.2.3-1 and 8.2.3-2). Obtain both step &amp; frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.</li> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
<pre>frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.</pre> 8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0. 8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.	
<ul> <li>at nominal temperature of 660°F. Obtain step/ ramp response to small signal flux disturbances.</li> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
<ul> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
<ul> <li>8.2.3.2.1 Verify that the prerequisites have been met as required in Section 4.0.</li> <li>8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.</li> </ul>	
required in Section 4.0.	
8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.	
8.2.3.2.2 Verify that the initial conditions have been established as required in Section 7.4.2.	
established as required in Section 7.4.2.	
8.2.3.3.3 Re-establish the approximate heliostat	
configuration and flow conditions used for	
660°F panel cure (See Section 8.2.1.12).	<u> </u>
8.2.3.2.4 Adjust flowrate setpoints (FCM2501 & FCM2503)	
to achieve 660°F outlet panel steam tempera-	
ture on panels 210 & 212. Monitor 112504 &	
112506.	
8.2.3.2.5 Verify that the control test unit is installed	
and operating on TV2501 & TV2503.	
8.2.3.2.6 Verify receiver feedpump is in pressure	
control (PC1105).	
0 2 2 2 7 Obtain open loop step response data on panel	
210 by carrying out the following steps.	
A) Confirm that the receiver panels are in a	
steady state condition for approximately	
5 minutes. Test 1	
Revision Page 1	030

		Initial	Date
8.2.3.2.7	B) Set FCM2501 to manual mode		
	C) Implement a step decrease in FCM2501 output by approximately 10% nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2501 (PV & CO), TI2501, TI2504, YI2507, & PI2902.		
	FCM2501 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2501 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2501 back to auto. —		
8.2.3.2.8	Obtain open loop step/ramp response to a flux disturbance on panel 210 & 212 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> <li>5 min.</li> </ul>		
	- · · · · · · · ·	Test Revis Page	1 1030 ion 0 115 of 543

			Initial	Date
8.2.3.2.8	B)	Set FCM2501, & FCM2503 to manual mode.		
	C)	Implement a step/ramp decrease in the power level on panel 210 & 212 by approximately 10% nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2501 (PV & CO), TI2501, TI2504, YI2507A/B, FCM2503 (PV & CO), TI2503, TI2506, YI2509A/B & PI2902.		
	Not	te: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\leq 50$ to 100°F are desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM2501 & FCM2503 back to auto		
8.2.3.2.9	Per (Se the	form frequency response tests on panel 210 e TC2501, Figure 8.2.3-1) by carrying out following steps.		
			Test	1030

Revision O Page 116 of 543

		_	Initial	Date
8.2.3.2.9	1)	Verify that the controls test unit (CTU) is installed and operating on TC2501. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.3.2.7 C.		
	Not	e: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2501 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2501. –		
	6)	Set FCM2501 to manual mode	<u></u>	
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a ± 400 lb/hr peak-to-peak response is achieved on FI2501.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).		
			Test Revis Page	  030  0n 0  17 of 543

		Initial	Date
8.2.3.2.9	7) Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ	Determined during test	
	<ul> <li>Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room).</li> <li>(2) If panel temperature drifts off the nominal test condition - adjust FCM2501 output from operator station to correct - if cannot successfully adjust - return to Step 5.</li> </ul>		
	8) Switch TFA input out of CTU.		
	9) Set FCM2501 back to auto.		
8.2.3.2.10	Obtain loop step response data on panel 212 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in steady state condition for approximately 5 minutes.</li> </ul>	a Test Revisi	030 on 0

		Initial	Date
8.2.3.2.10	B) Set FCM2503 to manual mode.		
	C) Implement a step decrease in FCM2503 output by approximately 10% of nominal value (increase valve opening) and allow pressures flows, temperatures to reach a steady state	5,	
	Note: An adjustment in the magnitude of the value step command may be required in order to achieve a measureable ± .1 lb/sec, temperate of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2503 (PV & CO), TI2505, TI2506, YI2507, & PI2902.	lve ures 3,	
	FCM2503 Output% Command Change D) Implement a step increase (back to nominal)	· · · · ·	
	in FCM2503 output (closing value) and allow temperatures, pressure and flowrate to reac steady state conditions.	h	
	E) Reset FCM2503 back to auto.		
8.2.3.2.11	Perform frequency response tests on panel 212 (See TC2503, Figure 8.2.3-2) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2503.</li> </ol>		
		Test Revis Page	 1030 ion 0 119 of 543

		_	Initial	Date
8.2.3.2.11	2)	Verify the receiver feedpump is in		
	pressure control mode (PC1105).			
	3)	Confirm that the receiver panels are in		
		a steady state condition for approximately		
		2 minutes.		
	4)	Adjust the neak to neak amplitude on the		
	''	transfer function analyzer output to be		
		consistent with the required output change		
		determined in Section 8.2.3.2.10 C.		
	Not	e: Verify that the TFA input to the CTU is		
		switched out.		
	E )	Solast ECM2E02 and adjust saturate to		
	5)	select runzbus and adjust selpoint to		
		tomporature on TC2503		
		temperature on rezous.		
	6)	Set FCM2503 to manual mode.		
	7)	Using the transfer function analyzer (TFA)		
		insert a 0.1 HZ sin wave into the CTU) and		
		adjust the TFA output such that a $\pm$ 400		
		lb/hr peak-to-peak response is achieved on		
		F12503.		
		Set the TEA to $0.02 \ \text{HZ}$ allow the system to		
		reach steady state (3-4) cycles)		
		reach steady state (5 +) cycles).		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
			Test	030
			Revisi	on U

		Initial Date
8.2.3.2.11	7) Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of HZ Repeat 4) at a frequency of HZ	rmined ng test
	Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room.	
	(2) If panel temperature drifts off the nominal test condition - adjust FCM2503 output from operator station to correct - if cannot successfully adjust - return to Step 5.	
	8) Switch TFA input out of CTU.	
	9) Set FCM2503 back to auto.	
		 Test 1030 Revision 0 Page 121 of 543

		Initial	Date	l
8.2.3.3	Obtain closed loop response data on panel temperature controllers TC2501, & TC2503 to temperature setpoint and flux changes at a nominal temperature of 660°F. Tune control loops as required.			
8.2.3.3.1	Verify that the receiver panel 210 is in a steady state condition at approximately 485 psig and 660°F. TC2501 in flow control. Adjust flow setpoint if required to achieve 660°F.			
8.2.3.3.2	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2501, set to console mode and set temperature setpoint to current PV value.			
8.2.3.3.3	<pre>Initiate panel metal temperature control on TC2501. Select TD2301B and initiate switch to on position. Allow panel to achieve steady state temperature.</pre> Note: If controller fails to satisfactory			
	control metal temperature, Select TD2501A and switch back to flow control. Also Select TD2501B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.3.3.1).			
8.2.3.3.4	Tune TC2501 - panel metal temperature controller (See Figure 8.2.3-1) by carrying out the follow- ing steps using the loop tuning form.	Test	1030	ſ

Revision 0 Page 122 of 543

			Initial	Date
8.2.3.3.4	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2501 by 10% and observe the response on the strip chart.		
	C)	Increase TC2501 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-4, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2501 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2501 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (C1-4, AL-12) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2501 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test 1 Rovici	030 on 0

Revision O Page 123 of 543

		Initial	Date
8.2.3.3.5	Verify that the receiver panel 212 is in a steady state condition at approximately 485 psig and 660°F. TC2503 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.3.3.6	Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2503, set to console mode and set temperature setpoint to current PV value.		
8.2.3.3.7	Initiate panel metal temperature control on TC2503. Select TD2503B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, Select TD2503A and switch back to flow control. Also Select TD2503B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.3.3.5).		
8.2.3.3.8	Tune TC2503 - panel metal temperature controller (See Figure 8.2.3-2) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2503 by 10% and observe the response on the strip chart.		
		Test	1030 ion 0

Revision 0 Page 124 of 543

			Initial	Date
8.2.3.3.8	C)	Increase TC2503 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-5, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2503 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2503 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (C1-5, AL-12) in the ± 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2503 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test 1 Revis Page	030 ion 0 125 of 543

			Initial	Date
8.2.3.3.9	0btai	n closed loop response on TC2501 &		
	TC250	3 to a flux disturbance on panels 210 and		
	212 b	y carrying out the following steps.		
	A) C	Confirm that receiver panels 210 &		
	2	12 are in a steady state condition		
	f	for approximately 2 minutes.		
	B) (	Confirm TC2501 & TC2503 is in metal		
	t, t	cemperature control mode.		
	-			
	C) I	mplement a step/ramp decrease in the		
	p	oower level on panel 210 & 212 by		
	а	approximately 10% of nominal power.		
	Þ	Allow panel temperatures, pressure		
	a	ind flowrate to reach steady state.		
	٢	Nonitor the following parameters on a		
	S	trip chart recorder to verify data is		
	r	recorded: FCM2501 (PV & CO), TI2501,		
	T	12504, YI2507A/B, FCM2503 (PV & CO),		
	Т	12503, TI2506, YI2509A/B & PI2501.		
	Note	An adjustment in the magnitude of the		
	rio ce i	nower change (number of heliostats on/off		
	۲ +	arget) may be required in order to achieve		
	m	peasureable response changes in flow and		
	+	remperatures and flux $remperatures > 1$		
	2	20% and flow changes > 1000 lb/hr are		
	2	$\frac{1}{2}$ and $\frac{1}{2}$ to $\frac{1}{2}$ to $\frac{1}{2}$ to $\frac{1}{2}$ to $\frac{1}{2}$ to $\frac{1}{2}$		
	U			<u> </u>
			1	

Test 1030 Revision 0 Page 126 of 543

			Initial	Date
8.2.3.3.9	D)	Implement a step/ramp increase in panel		
		power (back to nominal). Allow panel temperatures pressures flux and flows		
		to reach a steady state condition.		
		Monitor and adjust as in Section C.		
	- \			
	E)	Ubserve temperature response 112501 &		
		exceed $\pm$ 50°F - adjust flux loop gains		
		via the following.		
		I) Set receiver console to configure mode		
		2) Select Cl-4, AL-16 and Cl-5, AL-16 -		
		using loop tuning form increase/		
		decrease gain and low time constant		
	F)	If gains are adjusted repeat Steps C		
		thru E. Record final tuned flux loops		
		garn.		
	G)	Set console back to monitor mode.		
			Test 1	030
			Revis Page	ion U 127 of 543

		Initial	Date
8.2.3.4	Obtain closed loop response data on panel temperature controllers TC2501 & TC2503 to temperature setpoint and flux changes at a nominal temperature of 850°F. Tune control loops as required.		
8.2.3.4.1	Verify that the receiver panel 210 is in a steady state condition at approximately 485 psig and 660°F. TC2501 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.3.4.2	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2501, set to console mode and set temperature setpoint to 850°F.		
8.2.3.4.3	Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, Select TC2501 and switch back to 600°F setpoints - consult test engineer for controller parameter adjustments and go back to Section 8.2.3.3.1).		
8.2.3.4.4	Tune TC2501 - panel metal temperature controller (See Figure 8.2.3-1) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
		Test Revis	  030 ion 0  28 of 543

			Initial	Date
8.2.3.4.4	B)	Decrease temperature setpoint of TC2501 by 10% and observe the response on the strip chart.		
	C)	Increase TC2501 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (C1-4, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2501 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2501 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-4, AL-12) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2501 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test Revis Page	 1030 ion 0 129 of 543

		Initial	Date
8.2.3.4.5	Verify that the receiver panel 212 is in a steady state condition at approximately 485 psig and 660°F. TC2503 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.3.4.6	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2503, set to console mode and set temperature setpoint to 850°F.		
8.2.3.4.7	Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, Select TC2503 and switch back to 600°F setpoints - consult test engineer for controller parameter adjustments and go back to Section 8.2.3.4.1).		
8.2.3.4.8	Tune TC2503 - panel metal temperature controller (See Figure 8.2.3-2) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2503 by 10% and observe the response on the strip chart.		
	C) Increase TC2503 setpoint back to nominal value and observe the response on the strip chart.	Test 1 Revisi Page 1	030 on 0 30 of 543

			Initial	Date
8.2.3.4.8	D)	Increase/decrease proportional gain Kl (Cl-5, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2503 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2503 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-5, AL-12) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2503 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test Revis Page	1030 ion 0 131 of 543

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		_	Initiał	Date
8.2.3.4.9	0bt	ain closed loop response on TC2501 &		
	TC2	503 to a flux disturbance on panels 210 and		
	212	by carrying out the following steps.		
	A)	Confirm that receiver panels 210 & 212		
		are in a steady state condition for		
		approximately 2 minutes.		
	B)	Confirm TC2501 & TC2503 is in metal		
	57	temperature control mode.		
	C)	Implement a step/ramp decrease in the		
		power level on panel 210 & 212 by		
		approximately 10% of nominal power.		
		Allow panel temperatures, pressure		
		and flowrate to reach steady state.		
		Monitor the following parameters on a		
		strip chart recorder to verify data is		
		recorded: FCM2501 (PV& CO), TI2501,		
		TI2504, YI2507A/B, FCM2503 (PV & CO),		
		TI2503, TI2506, YI2509A/B & PI2501.		
	Not	e. An adjustment in the magnitude of the		
		power change (number of heliostats on/off		
		target) may be required in order to		
		achieve measureable response changes in		
		flow and temperatures and flux Flux		
		changes $> 20\%$ and flow changes		
		> 1000  lb/hr are desired		

Test 1030 Revision 0 Page 132 of 543

			Initial	Date
8.2.3.4.9	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	<pre>Observe temperature response TI2501 &amp; TC2503. If temperature excursions exceed ± 50°F - adjust flux loop gains via the following. 1) Set receiver console to configure</pre>		
		<pre>mode. 2) Select C1-4, AL-16 and C1-5, AL-16 - using loop tuning form increase/ decrease gain and low time constant as required.</pre>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain.		
	G)	Set console back to monitor mode.		
			Test 1 Revisi Page 1	030 on 0 33 of 543

		Initial	Date
8.2.3.5	Obtain closed loop response data on receiver feedpump controller PC-1105 in the valve control mode. See Figure 8.2.3-3. Determine response to setpoint and valve disturbances with receiver panels under flow control. Tune control loop as required.		
8.2.3.5.1	<pre>Demonstrate satisfactory closed loop control of the receiver feedpump while under valve control for flowrates ∿ 40,000 lb/hr. Configure the system to the desired test conditions by carrying out the following steps: 1) Verify TC2301 TC2803 are operating on</pre>		
	flow control. 2) Verify PC1105 is operating on pressure control.		
8.2.3.5.2	Increase the setpoint on FCM2501 until the valve command of FCM2501 exceeds all other valve commands by 50%. Record value.		
8.2.3.5.3	Set this maximum valve command setpoint on pump controller PC1105.		
		Test Revis Page	  030 ion 0  34 of 543





Test 1030 Revision 0 Page 135 of 543

		Initial	Date
8.2.3.5.4	Switch PC1105 from pressure control to valve control mode. Observe response on DAS strip charts for FCM2501, UC1105, SI1105, PI2002, PI2006, FCM2503, and PDTX2230. Allow system to achieve steady state conditions.		
8.2.3.5.5	Increase FCM2501 setpoint by 20% above the nominal value established in 8.2.3.5.2. Observe the response and allow to reach steady state.		
8.2.3.5.6	Decrease FCM2501 setpoint back to nominal and allow to reach steady state.		
8.2.3.5.7	Decrease FCM2501 setpoint by 20% below the nominal value established in 8.2.3.5.2. Observe the response and allow to reach steady state.		
8.2.3.5.8	Increase FCM2501 setpoint back to nominal and tune controller PC1105 if required using loop tuning form. (C1-10, AL-6)		
	Reconfigure the system to the desired test conditions by carrying out the following steps:		
	<ol> <li>Reduce the setpoint on FCM2301 back to the original value as it existed in step 8.2.3.5.1.</li> </ol>		
	<ol> <li>Verify TC2301 TC2803 are operating on flow control.</li> </ol>		
		T <b>est</b> Revisi Page 1	1030 on 0 36 of 543

							 Initial	Date	
8.2.3.5.8	3)	Verify PC1105 control.	is	operating	on	pressure			
							 		-
							·		
							:		
							Test	030	
							Revisi Page l	on 0 37 of 54	3

		_	Initial	Date
8.2.4	STEAM CURE OF PANELS 213 8.2.4.15)	8-216 (STEP 8.2.4.1 -		
8.2.4.1	Verify that the initial	conditions have been		
	established as required	in Section 7.4.2.		
8.2.4.2	Call up the individual p	anel flow controllers		
	(FCM2301 - FCM2803) and	verify that they are		
	in the "console" mode.	Input the appropriate	i L	
	setpoints listed below.			
	Cor	ntroller Setpoint (LB/HR)		
	FCM2301 - FCM2401	500		
	FCM2402	1000		
	FCM2403	2000		
	FCM2501	3500		
	FCM2502	4500		
	FCM2503	5000		
	FCM2601* - FCM2603*	5000		
	FCM2701*	4500		
	FCM2702	3500		
	FCM2703	1500		
	FCM2801 - FCM2803	500		
	* panels to be cured	-		
8.2.4.3	Verify that the valve co	ontrol setpoint for		
	the receiver feedpump is	s 80% and switch		
	feedpump controller, PC			
8.2.4.4	Verify that the flows se	et in step 8.2.4.2 are		
	maintained at their set			
			_	
			Test 1	030 NR 0
			Page 1	38 of 543

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Date Initial 8.2.4.5 Verify that the receiver flash tank vent setpoint is 485 psig (adjustment of PC2906, PC1000, and PC647B). 8.2.4.6 Verify that collector field wedges 01, 06, 07, 08, and 12 are in "Standby" and ready to track the receiver. 8.2.4.7 Issue the following heliostat "Increase" commands and verify adequate flow to maintain panel metal temperatures < 520°F as indicated by TI2301A or B - TI2803A or B and no excessive heating of uncooled structures (half power check point). Verify that all heated panel temperature gradients are < 200°F as indicated by panel (top) DAS sensors TEX2354B, C, & D -TEX2856B, C, & D. (Sensors on substantially heated panels are TEX2456B, C, & D - TEX2756B, C, & D). "Track" command should be issued in a "rapid" fashion to produce a "step" change in input power to the receiver which simulated actual operating transients to be expected. Transient data to be recorded during the "step" change in power includes flow rate, metal temperatures, and inlet/outlet fluid temperatures for each panel as well as system pressures. Increase 17/W/06, 08 Increase 8/W/01, 12 Increase 5/W/07 Test 1030

Revision O Page 139 of 543

		Initial	Date
8.2.4.8	Repeat Step 8.2.4.7 using the following		
	heliostat "Increase" command (75% power		
	check point). Carryout all temperature		
	verification and data recording functions		
	listed in Step 8.2.4.7.		
	Increase 9/W/06, 08		
	Increase 4/W/01, 12		
	Increase 2/W/07		
8.2.4.9	Repeat Step 8.2.4.7 using the following		
	heliostat "Increase" command (10% test power		
	point). Carryout all temperature verifica-		
	tion and data recording functions listed in		
	Step 8.2.4.7.		
	Note: This step should be deleted or modified		
	if excessived metal temperatures or tem-		
	perature gradients were experienced during		
	Step 8.2.4.8 or can be anticipated as a		
	result of a 33% increase in incident	· · · ·	
	receiver power.		-
	Increase 9/W/06, 08		
	Increase 4/W/01, 12		
	Increase 2/W/07		
	At this point in the procedure, flow control		
	setpoints for individual panel can be made to		
	produce the desired temperature for panel cure.		
	Whenever possible panel flow setpoint changes		
	required to transition from one cure condition		
	to the next should be done through step		
	change (reductions) in flow to permit the		
		Test 1	030
		Revisi	on $0$

Revision 0 Page 140 of 543

	-	Initial	Date
	gathering of dynamic receiver data. In		
	selecting the step changes in flow setpoints,		
	conservation should be used to prevent a		
	panel over temperature condition from		
	occurring.		
	During each cure hold point (Step 8.2.4.10 -		
	8.2.4.15), the following parameters should		
	be recorded to support subsequent collector		
	system "optical" performance and panel thermal		
	expansion analyses.		
	• Time and day		
	Insolation		
	<ul> <li>Collector field-ring-track status</li> </ul>		
	<ul> <li>Collector field status</li> </ul>		
	<ul> <li>Receiver panel incident flux measurements</li> </ul>		
	<ul> <li>Individual receiver panel flows</li> </ul>		
	<ul> <li>Individual panel inlet and outlet temperatures</li> </ul>		
	<ul> <li>Panel metal temperatures</li> </ul>		
	Panel strain gauges		
8.2.4.10	Reduce the flow control setpoints for panel		
	controllers FCM2601 - FCM2701 (panels 213-		
	216) to produce individual panel metal		
	temperatures of 520 $\pm$ 35°F as indicated by		
	TI2601A or B - TI2701A or B. Adjust flows		
	as required to maintain adjacent heated panel		
	temperatures < 520°F and gradients < 200°F as		
	measured by TEX2354B, C, & D - TEX2556B, C,		
	& D and TEX2755B, C, & D - TEX2856B, C, & D.		
	Maintain the cure condition on panels 213-216		
	for a 20 min hold period. Make any flow		
		Test	1030

lest 1030 Revision 0 Page 141 of 543
		Initial	Date
	adjustments required due to changing sun		
	positions. Record on the cure log sheet		
	that this step of the cure has been		
	compreted for panets 213-216.		<u></u>
8.2.4.11	Repeat Step 8.2.4.10 to produce panel metal		
	temperatures of 585 $\pm$ 35°F as indicated by		
	TI2601A or B - TI2701A or B (panels 213-216).		
o o <b>e</b> 10			
8.2.4.12	Repeat Step 8.2.4.10 to produce panel metal		
	TI2601A or B - TI2701A or B (panels 213-216).		
		<b></b>	
8.2.4.13	Repeat Step 8.2.4.10 to produce panel metal		
	temperatures of 720 $\pm$ 35°F as indicated by		
	TI2601A or B - TI2701A or B (panels 213-216).		
8 2 4 14	Repeat Step 8.2.4.10 to produce panel metal		
0.2.	temperatures of 780 $\pm$ 35°F as indicated by		
	TI2601A or B - TI2701A or B (panels 213-216).		
8.2.4.15	Repeat Step 8.2.4.10 to produce panel metal		
	temperatures of 850 $\pm$ 35°F as indicated by		
	112001A 01 B - 112701A 01 B (panets 213-210).		
		Test 1 Povici	030 on 0
		Page 1	42 of 543

		Initial	Date
8.2.5	CONTROL TESTS - PANELS 214 & 216 - STEAM LOOP OPERATION		
8.2.5.1	Obtain process control open loop data required for tuning of receiver temperature control loops on panels 214 & 216 (refer to Figures 8.2.5-1 thru 8.2.5-2). Obtain both step & frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ramp response to small signal flux disturbances.		
8.2.5.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.2.5.1.2	Verify that the initial conditions have been established as required in Section 7.4.2.		
8.2.5.1.3	Re-establish the approximate heliostat con- figuration and flow conditions used for 850°F panel cure (See Section 8.2.4.15).		
8.2.5.1.4	Adjust flowrate setpoint (FCM2602, FCM2701) to achieve 850°F outlet panel steam temperature on panels 214 & 216. Monitor T12605 & T12704.		
8.2.5.1.5	Verify that the control test unit is installed and operating on TV2602 & TV2701.		
8.2.5.1.6	Verify receiver feedpump is in pressure control (PC1105).		
		Testl Revis Page	 030 ion 0 143 of 543



Figure 8.2.5-1. RS Steam Temperature Controller Functional Block Diagram TC-2602

543



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A/F

A/D

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49

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			Initial	Date
8.2.5.1.7	0bt	ain open loop step response data on panel		
	214	by carrying out the following steps.		
	Α.	Confirm that the receiver panels are in a st	eady	
		state condition for approximately 5 minutes.		
	Β.	Set FCM2602 to manual mode.		
	С.	Implement a step decrease in FCM2602 output		
		by approximately 10% of nominal value (incre	ase	
		valve opening) and allow pressures, flows,	l	
		temperatures to reach steady state.		
	NOT	E: An adjustment in the magnitude of the val	ve	
		step command may be required in order to ach	ieve	
		a measureable response change in flow and te	m-	
		perature - flow of $\pm$ .1 lb/sec, temperatures	of	
		$\pm$ 50 to 100°F are desired. Record final com	mand	
		change. Monitor the following parameters on	a	
		strip chart to verify that data is recorded:		
		FCM2602 (PV & CO), T12602, T12605, Y12608,		
		& P12902.		
		FCM2602 Output		
		Command Change%		
	D.	Implement a step increase (back to nominal)	in	
		FCM2602 output (closing valve) and allow tem	per-	
		atures, pressure and flowrate to reach stead	у	
		state conditions		
	Ε.	Reset FCM2602 back to auto.		

Test 1030 Revision O Page 146 of 543

	_	Initial	Date
8.2.5.1.8	Obtain open loop step/ramp response to a flux disturbance on panel 214 & 216 by carrying out the following steps.		
	A. Confirm that the receiver panels are in a steady state condition for approximately 5 min.		
	B. Set FCM2602 & FCM2701 to manual mode.		
	C. Implement a step/ramp decrease in the power level on panels 214 & 216 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2602 (PV & CO), T12602, T12605, Y12608A/B, FCM2701 (PV & CO), T12701, T12704, Y12707A/B & P12902.		
	NOTE: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes $\geq kw/m$ and temperature changes $\geq 50$ to $100^{\circ}F$ are desired.	2	
	D. Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E. Set FCM2602 & FCM2701 back to auto.	Test 1 Revisi Page 1	030 on 0 47 of 543

		· · · ·	Initial	Date
8.2.5.1.9	Per: (See	form frequency response test on panel 214 e TC2501, Figure 8.2.5-1) by carrying out		
	the	following steps.		
	1.	Verify that the controls test unit (CTU) is installed and operating on TC2602. (Installation is in RS-1).		
	2.	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3.	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4.	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.5.1.7C.		
		NOTE: Verify that the TFA input to the CTU is switched out.		
	5.	Select FCM2602 and adjust setpoint to achieve a nominal 850°F steam outlet temperature on TC2602.		
	6.	Set FCM2602 to manual mode.		
	7.	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a $\pm$ 400 lb/hr peak-to-peak response is achieved on F12602.		
			T <b>est</b> 1 Revisi Page 1	030 ion 0 .48 of 543

		Initial	Date
8.2.5.1.9	7. Set the TFA to 0.02 HZ allow the system to		
	reach steady state (3-4) cycles).		
	Repeat 4) at a frequency of 0.05 HZ		
	Repeat 4) at a frequency of 0.07 HZ		
	Repeat 4) at a frequency of 0.1 HZ		
	Repeat 4) at a frequency of 0.2 HZ		
	Repeat 4) at a frequency of 0.5 HZ		
	Repeat 4) at a frequency of 0.7 HZ		
	Repeat 4) at a frequency of 1 HZ		
	Repeat 4) at a frequency ofHZ_Determi	ned	
	Repeat 4) at a frequency ofHZ during	test	
	NOTE: (1) The TFA output amplitude may need to	be	
	adjusted during the test as required to obt	ain	
	a measureable output response (determined b	у	
	test engineers) in RS-1 or DAS room.		
	NOTE: $(2)$ If namel temperature drifts off the n	ominal	
	test condition - adjust ECM2602 output from	operator	
	station to correct - if cannot successfully	operater	
	adjust - return to Step 5.		
	8. Switch TFA input out of CTU.		
	9. Set FCM2602 back to auto.		
8.2.5.1.10	Obtain open loop step response data on panel 21	6	
3121011170	by carrying out the following steps.		
	A. Confirm that the receiver panels are in a		
	steady state condition for approximately 5		
	minutes.		
	R Set ECM2701 to manual mode		
	b. Set ronzyor to manual mode.	l <b>est</b> 10 Revisio	130 m 0
		Page 14	19 of !

		Initial	Date
8.2.5.1.10	C. Implement a step decrease in FCM2701 output by approximately 10% nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	NOTE: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of $\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2701 (PV & CO), T12701, T12704, Y12707 & P12902.		
	FCM2701 Output% Command Change		
	D. Implement a step increase (back to nominal) in FCM2701 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E. Reset FCM2701 back to auto.		
8.2.5.1.11	Perform frequency response tests on panel 216 (See TC2701, Figure 8.2.5-2) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2701. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify that receiver feedpump is in pressure control mode (PC1105).</li> </ol>	Test 1	030
		Revisi Page l	on u 50 of 543

		Initial	Date
8.2.5.1.11	<ol> <li>Confirm that the receiver panels are in steady state condition for approximately 2 minutes.</li> </ol>	a /	
	<ol> <li>Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output chan determined in Section 8.2.5.10C.</li> </ol>	ige	
	NOTE: Verify that the TFA input to the CTU is switched out.		
	5. Select FCM2701 and adjust setpoint to achieve a nominal 850°F steam outlet temperature TC2701.		
	6. Set FCM2701 to manual mode.		
	<ol> <li>Using the transfer function analyzer (TF a 0.1 HZ sin wave into the CTU) and adju TFA output such that a + 400 lb/hr peak- response is achieved on F12701.</li> </ol>	A) insert st the to-peak	
	Set the TFA to 0.02 HZ allow the system steady state (3-4) cycles).	to reach	
	Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of HZ Dete Repeat 4) at a frequency of HZ test	ermined during Test 10 Revisi	130 on 0

	-	Initial	Date
8.2.5.1.11	7. (Continued)		
	Note <sup>(1)</sup> The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test engineers) in RS-1 or DAS room.		
	(2) If panel temperature drifts off the nominal test condition - adjust FCM270l output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8. Switch TFA input out of CTU.		
	9. Set FCM2701 back to auto		
		Toota	220
	Υ.	Revis Page	on 0 52 of 543

		Initial	Date
8.2.5.2	Obtain process control open loop data required for tuning of receiver temperature control loops on panels 214 & 216 (refer to Figures 8.2.5-1 thru 8.2.5-2). Obtain both step & frequency response data to valve disturbances at nominal temperature of 660°F. Obtain step/ramp response to small signal flux disturbances.		
8.2.5.2.1	Verify that the prerequisites have been met as required in Section 4.2.5.	<u> </u>	
8.2.5.2.2	Verify that the initial conditions have been established as required in Section 7.3.5.		
8.2.5.2.3	Re-establish the approximate heliostat configu- ration and flow conditions used for the 660°F panel cure (See Section 8.2.4).		
8.2.5.2.4	Adjust flowrate setpoints (FCM2602 & FCM2701) to achieve 660°F outlet panel steam temperature on panels 214 & 216. Monitor T12605 & T12704		
8.2.5.2.5	Verify that the control test unit is installed an operating on TV2602 & TC2704.	d	
8.2.5.2.6	Verify receiver feedpump is in pressure control (PC1105).		
8.2.5.2.7	Obtain open loop step response data on panel 214 by carrying out the following steps.		
	<ul> <li>A. Confirm that the receiver panels are in a steady state condition for approximately</li> <li>2 minutes.</li> </ul>	Test 1 Revisi Page 1	030 on 0 53 of 543

			Initial	Date
8.2.5.2.7	Β.	Set FCM2602 to manual mode.		
	C.	Implement a step decrease in FCM2602		
		output by approximately 10% nominal		
		value (increase valve opening) and		
		allow pressures, flows, temperatures		
		to reach steady state.		
	NOT	E: An adjustment in the magnitude of the		
		valve step command may be required in order		
		to achieve a measureable response change in		
		flow and temperature - flow of $\pm$ .1 lb/sec,		
		temperatures of $\pm$ 50 to 100°F are desired.		
		Record final command change. Monitor the		
		following parameters on a strip chart to		
		verify that data is recorded: FCM2602		
		(PV & CO), T12602, T12605, Y12608 & P12902.	<u>_</u>	
		FCM2602 Output %		
		Command Change		
	D.	Implement a step increase (back to nominal)		
		in FCM2602 output (closing valve) and allow		
		temperatures, pressure and flowrate to reach		
		steady state conditions.		
	E.	Reset FCM2602 back to auto.		
8.2.5.2.8	0bt	ain open loop step/ramp response to a flux		
	dis	turbance on panel 214 & 216 by carrying out		
	the	following steps.		
	Α.	Confirm that the receiver panels are in a		
		steady state condition for approximately		
		2 minutes.		
	B	Set ECM2602 & ECM270] to manual mode	÷. 1	020
	Β.	Set FCM2602 & FCM2/01 to manual mode.	Test 1	030

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Revision 0 Page 154 of 543

		Initial	Da
8.2.5.2.8	C. Implement a step/ramp decrease in the		
	power level on panels 214 & 216 by		
	approximately 10% nominal power. Allow		
	panel temperatures, pressure and flowrate		
	to reach steady state. Monitor the follow-		
	ing parameters on a strip chart recorder		
	to verify data is recorded: ECM2602		
	(PV & CO) = TI2602 = TI2605 = YI2608A/B.		
	ECM2701 (PV & CO TI12701, TI2704, YI2707A/B		
	& P12902.		
	NOTE: An adjustment in the magnitude of the		
	power change (number of heliostats on/off		
	target) may be required in order to achieve		
	measureable response changes in flow and		
	temperatures and flux. Flux changes $> 20\%$	[	
	are temperature changes $> 50$ to $100^{\circ}$ F are	[	
	desired		
	D. Implement a step/ramp increase in panel power		
	(back to nominal). Allow panel temperatures,		
	pressures, flux and flows to reach a steady		
	state condition. Monitor and adjust as in		
	Section C.		
	E. Set FCM2602 & FCM2701 back to auto.		. <b>.</b>
8.2.5.2.9	Perform frequency response tests on panel 214		
	(See TC2602, Figure 8.2.5-1), by carrying out		
	the following steps.		
	1. Verify that the controls test unit (CTU) is		
	installed and operating on TC2602.		
	(Installation is in RS-1).		- <u>-</u>
		Test 1	030_
		Revisio	n O

			Initial	Date
.2.5.2.9	2.	Verify the receiver feedpump is in pressure		
		control mode (PC1105).		•
	3.	Confirm that the receiver panels are in a		
		steady state condition for approximately		
		2 minutes.		
	4.	Adjust the peak to peak amplitude on the		
		transfer function analyzer output to be		
		consistent with the required output change		
		determined in Section 8.2.5.2.7C.		
	ΝΟΤ	F· Verify that the TFA input to the CTU		
	NOT	is switched out		
		13 Switched Out.		
	5.	Select FCM2602 and adjust setpoint to achieve	2	
		a nominal 660°F steam outlet temperature on		
		TC2602.		
	6.	Set FCM2602 to manual mode.		
	7.	Using the transfer function analyzer (TFA)		
		insert a 0.1 HZ sin wave into the CTU) and		
		adjust the TFA output such that a + 400 lb/hr		
		peak-to-peak response is achieved on FI2602.		
		Set the TFA to 0.02 HZ allow the system to		
		reach steady state (3-4) cycles).		
		$P_{0}$		
		Repeat 4) at a frequency of $0.03$ HZ		
		$\begin{array}{c} \text{Repeat 4} \text{ at a frequency of 0.07 HZ} \\ \text{Repeat 4} \text{ at a frequency of 0.1 H7} \end{array}$		
		$\begin{array}{c} \text{Repeat 4} \text{ at a frequency of 0.1 Hz} \\ \text{Repeat 4} \text{ at a frequency of 0.2 H7} \end{array}$		
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			 Test 10	30
			Revisio	on O
			Page 15	56 of 543

		Initial	Date
8.2.5.2.9	7. Repeat 4) at a frequency of 0.5 HZ		
	Repeat 4) at a frequency of 0.7 HZ		
	Repeat 4) at a frequency of I HZ		
	Repeat 4) at a frequency of HZ Determined Repeat 4) at a frequency of HZ during tes	t l	
	······································		
	NOTE: <sup>(1)</sup> The TFA output amplitude may need to b	e	
	adjusted during the test as required to obtain a		
	measureable output response (determined by test b	у	
	engineers) in RS-1 or DAS room.		
	(2) If papel temperature drifts off the		
	nominal test condition - adjust FCM2602 output		
	from operator station to correct - if cannot		
	sucessfully adjust - return to Step 5.		
	8. Switch TFA input out of CIU.		
	9. Set FCM2602 back to auto.		
8 2 5 2 10	Obtain open loop step response data on panel 216		
0.2.9.2.10	by carrying out the following steps.		
	A. Confirm that the receiver panels are in a		
	steady state condition for approximately		
	5 miņutes.		
	B. Set FCM2701 to manual mode.		
	C. Implement a step decrease in FCM2701 output		
	by approximately 10% nominal value (increase		
	valve opening) and allow pressures, flows,		
	temperatures to reach steady state.		
		l Test 10	30
		Revisio	n 0 7 of 543
		raye 10	1 01 040

			Initiał	Date
8.2.5.2.10.	С.	Continued		
	NOT	E: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of $\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2701 (PV & CO), TI2701, TI2704, YI2707 & PI2902.		
		FCM2701 Output% Command Change		
	D.	Implement a step increase (back to nominal) in FCM2701 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E.	Reset FCM2701 back to auto.		
8.2.5.2.11	Per (Se the	form frequency response tests on panel 216 e TC2701, Figure 8.2.5-2) by carrying out following steps.		
	1.	Verify that the controls test unit (CTU) is installed and operating on TC2701. (Installation is in RS-1)		
	2.	Verify the receiver feedpump is in pressure control mode (PC1105).		
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Test 1030 Revision 0 Page 158 of 543

	_	Initial	Date
8.2.5.2.11	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> </ol>		
	<ol> <li>Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.5.2.10C.</li> </ol>		
	NOTE: Verify that the TFA input to the CTU is switched out.		
	<ol> <li>Select FCM2701 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2701.</li> </ol>		
	6. Set FCM2701 to manual mode		
	7. Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a + 400 lb/hr peak-to-peak response is achieved on FI2701.		
	Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).		
	Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ	Test 10 Revisio Page 1	030 on 0 59 of 543

		Initial	Date
8.2.5.2.11	7. Repeat 4) at a frequency of HZ {Determined Repeat 4) at a frequency of HZ {during tes	t	
	NOTE <sup>(1)</sup> The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers) in RS-1 or DAS room.		
	(2) If panel temperature drifts off the nominal test condition - adjust FCM2701 output from operator station to correct if cannot successfully adjust - return to Step 5.	-	
	8. Switch TFA input out of CTU.		
	9. Set FCM2701 back to auto.		
		Test 1 Revisi Page 1	030 on 0 60 of 543

		Initial	Date
8.2.5.3	Obtain closed loop response data on panel temperature controllers TC2602 & TC2701 to temperature set point and flux changes at a nominal temperature of 660°F. Tune con- trol loops as required.		
8.2.5.3.1	Verify that the receiver panel 214 is in a steady state condition at approximately 485 psig and 660°F. TC2602 in flow con- trol. Adjust flow setpoint if required to achieve 660°F.		
8.2.5.3.2	Confirm that the test data base is config- ured to initiate and maintain panel metal temperature control. Select TC2602, set to console mode and set temperature set- point to current PV valve.		
8.2.5.3.3	Initiate panel metal temperature control on TD2602. Select TD2602 and initiate switch to on position. Allow panel to achieve steady state temperature.		
	NOTE: If controller fails to satisfactory control metal temperature, select TD2602A and switch back to flow control. Also select TD2602B and switch out metal temp- erature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.5.3.1).		
		Toc+ 1	030

Test 1030 Revision O Page 161 of 543

			Initial	Date
8.2.5.3.4	Tun	e TC2602 - panel metal temperature		
	cor	troller (See Figure 8.2.5-1) by		
	car	rying out the following steps using		
	the	loop tuning form.		
	Α.	Set receiver console to configure		
		mode.		
	Β.	Decrease temperature setpoint of		
		TC2602 by 10% and observe the		
		response on the strip chart.		
	С.	Increase TC2602 setpoint back to		
		nominal value and observe the		
		response on the strip chart.		
	D.	Increase/decrease proportional gain		
		K1 (C1-6, AL-12)*.		
	Ε.	Repeat steps B D as required until		
		response is satisfactory.		
	F	Description TOOCOO estratist 10% and		
	۲.	Decrease 102602 setpoint 10% and		
		observe response on strip chart.		
	C	Increase IC2602 setupint to nominal		
	а.	value and observe tomperature re-		
		change on strip chart		
		sponse on strip chart.		
	Н	Increase/decrease reset gain. K2		
		(C1-6, AI-12) in the ± 30 increments.		
	Ι.	Repeat steps F H as required until		
		response is satisfactory.		
		· · · · · ·		220

Test 1030 Revision O Page 162 of 543

		Initial	Date
8.2.5.3.4	J. Establish preliminary TC2602		
	controller gains in metal		
	record		
	K. Adjust setpoints, alarms, and		
	limits if required.		·
8.2.5.3.5	Verify that the receiver panel 216 is in a		
	steady state condition at approximately $400$		
	Adjust flow setpoint if required to achieve		
	660°F.		
0 7 F 7 F	Confirm that the test data base is configured		
0.2.3.3.0	to initiate and maintain panel metal tempera-		
	ture setpoint to current PV valve.		
8.2.5.3.7	Initiate panel metal temperature control on		
	TC2701. Select TD2701B and initiate switch		
	to on position. Allow panel to achieve		
	steady state temperature.		
	NOTE: If controller fails to satisfactory		
	control metal temperature, select TD2701A		
	and switch back to flow control. Also		
	select TD2701B and switch out metal temp-		
	erature loop - consult test engineer for		
	controller parameter adjustments and to		
	back to Section 8.2.5.3.5).		
		_	
		Test 1 Revisi	030 on ()
		Page 1	63 of 543

		-	Initial	Date
8.2.5.3.8	Tun	ne TC2701 - panel metal temperature con-		
	tro	oller (See Figure 8.2.5-2) by carrying		
	out	the following steps using the loop		
	tun	ning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2701		
		by 10% and observe the response on the		
		strip chart.		
	C)	Increase TC2701 setpoint back to nominal		
	- /	value and observe the response on the		
		strip chart.		
	n)	Inchasco/dochasco proportional gain Kl		
	U)	(C1-7, AL-12)*.		
	E)	Repeat steps B D as required until		
		response is satisfactory.		
	F)	Decrease TC2701 setpoint 10% and observe		
		response on strip chart.		
	C)	Increase IC2701 setnoint to nominal value		
	u)	and observe temperature response on strip		
		chart.		
	H)	Increase/decrease reset gain, K2 (Cl-7,		
		AL-12) in the $\pm$ 3U increments.		
	I )	Repeat steps F H as required until		
		response is satisfactory.		
			<b>T</b> .	
			lest	1130

Revision 0 Page 164 of 543

		Initial	Date
8.2.5.3.8	J) Establish preliminary TC2701 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.5.3.9	Obtain closed loop response on TC2602 & TC2701 to a flux disturbance on panel 214 & 216 by carrying out the following steps.		
	A) Confirm that receiver panels 214 & 216 are in a steady state condition for approximately 2 minutes.		
	B) Confirm TC2602 & TC2701 are in a metal temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 214 & 216 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2602 (PV & CO), TI2602, TI2605, YI2608A/B, FCM2701, (PV & CO), TI2701, TI2704, YI2707A/B & PI2902.		
		Test 1 Revisi Page 1	030 on 0 65 of 543

			Initial	Date
8.2.5.3.9	NOT	E: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes > 20% and flow changes <u>&gt;</u> 1000 lb/hr are desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response TI2602 & TI2701. If temperature excursions exceed $\pm$ 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-6, AL-16 and Cl-7, AL-16 - using loop tuning form increase/ decrease gain and low time constant as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain.		
	G)	Set console back to monitor mode.		
				220

Test 1030 Revision 0 Page 166 of 543

		Initial	Date
8.2.5.4	Obtain closed loop response data on panel temperature controllers TC2602 & TC2701 to temperature setpoint and flux changes at a nominal temperature of 850°F. Tune control loops as required.		
8.2.5.4.1	Verify that the receiver panel 214 is in a steady state condition at approximately 485 psig and 660°F. TC2602 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.5.4.2	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2602 set to console mode and set temperature setpoint to 850°F.		
8.2.5.4.3	Allow panel to achieve steady state temperature.		
	NOTE: If controller fails to satisfactory control metal temperature, select TC2602 and switch back to 660°F setpoint - consult test engineer for controller parameter adjustments and go back to Section 8.2.5.4.1).		
8.2.5.4.4	Tune TC2602 - panel metal temperature controller (See Figure 8.2.5-1) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
		Test Revisi Page 1	1030 on 0 67 of 543

			Initial	Date
8.2.5.4.4	B)	Decrease temperature setpoint of TC2602 by 10% and observe the response on the strip chart.		
	C)	Increase TC2602 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain K1 (Cl-6, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2602 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2602 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (C1-6, AL-12) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2602 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test 1	130

Test 1030 Revision O Page 168 of 543

	-	Initial	Date
8.2.5.4.5	Verify that the receiver panel 216 is in a steady state condition at approximately 485 psig and 660°F. TC2701 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.5.4.6	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2701, set to console mode and set temperature setpoint to 850°F.		
8.2.5.4.7	Allow panel to achieve steady state temperature.		
	NOTE: If controller fails to satisfactory control metal temperature, select TC2701 and switch back to 600°F setpoint - consult test engineer for controller parameter adjustments and go back to Section 8.2.5.4.5).		
8.2.5.4.8	Tune TC2701 - panel metal temperature con- troller (See Figure 8.2.5-2) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2701 by 10% and observe the response on the strip chart.		
	C) Increase TC2701 setpoint back to nominal value and observe the response on the strip chart.		
		Test 1 Revisi Page 1	030 on 0 69 of 543

			Initial	Date
8.2.5.4.8	D)	Increase/decrease proportional gain, Kl (Cl-7, AL-12)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2701 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2701 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (C1-7, AL-12) in the $\pm$ 30 increments.		
	Ι)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2701 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
8.2.5.4.9	Obt to out	ain closed loop response on TC2602 & TC2701 a flux disturbance on panel 210 by carrying the following steps.		
	A)	Confirm that receiver panels 214 & 216 are in a steady state condition for approximately 2 minutes.		
			Test Revis Page	 1030 ion 0 170 of 543

	-	Initial	Date
8.2.5.4.9	B) Confirm TC2602 & TC2701 are in metal		
	temperature control mode.		
	C) Implement a step/ramp decrease in the		
	power level on panels 214 & 216 by		
	approximately 10% of nominal power.		
	Allow panel temperatures, pressure and		
	flowrate to reach steady state. Monitor		
	the following parameters on a strip chart		
	recorder to verify data is recorded:		
	FCM2602 (PV & CO), TI2602, TI2605, YI2608A/E	,	
	FCM2/01, (PV & CO), 112/01, T12704,		
	Y12707A/B & P12902.		
	NOTE: An adjustment in the magnitude of the		
	power change (number of heliostats on/off		
	target) may be required in order to achieve		
	measureable response changes in flow and		
	temperatures and flux. Flux changes >		
	20% and flow changes $\geq$ 1000 lb/hr are		
	desired.		·
	D) Implement a step/ramp increase in panel		
	power (back to nominal). Allow panel		
	temperatures, pressures, flux and flows		
	to reach a steady state condition.		
	Monitor and adjust as in Section L		
	E) Observe temperature response TI2602 &		
	TC2701. If temperature excursions		
	exceed $\pm$ 50°F - adjust flux loop		
	gains via the following.		
		Tost 1	030
		Revisi	on 0
		Page 1	71 of 543

			Initial	Date
8.2.5.4.9	E)	<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-6, AL-16 &amp; Cl-7, AL-16 - using loop tuning form increase/ decrease gain and low time constant as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain.		
	G)	Set console back to monitor mode.		
			Test 1 Revisi Page 1	030 on 0 72 of 543

			Initial	Date
8.2.6	STEAM CURE OF PANELS 8.2.6.15)	204-208 (STEP 8.2.6.1 -		
8.2.6.1	Verify that the initi established as requir	al conditions have been ed in Section 7.4.2.		
8.2.6.2	Call up the individua (FCM2301 - FCM2803) a in the "console" mode setpoints lists below	l panel flow controllers nd verify that they are . Input the appropriate		
		Controller Setpoint (LB/HR)		
	FCM2301*	4500		
	FCM2302* - FCM-2402*	5000		
	FCM2403	6500		
	FCM2501	6000		
	FCM2502	4000		
	FCM2503	1500		
	FCM2601 - FCM2602	500		
	FCM2603, FCM2701 - FCM2703, FCM2801	0		
	FCM2802 - FCM2803	500		
	* panels to be cured			
8.2.6.3	Verify that the valve receiver feedpump is controller, PC1105 to	e control setpoint for the 80% and switch feedpump o valve control.		
8.2.6.4	Verify that the flows maintained at their s	s set in step 8.2.6.2 are setpoint values.		
8.2.6.5	Verify that the rece setpoint is 485 psig PC1000, and PC647B).	iver flash tank vent (adjustment of PC2906,		
	-		[est ]	1030 ion 0
			Page	173 of 543

	-	Initial	Date
8.2.6.6	- Verify that collector field wedges 01, 02, 03,		
	04 and 05, are in "Standby" and ready to		
	track the receiver.		
8.2.6.7	Issue the following heliostat "Increase"		
	commands and verify adequate flow to maintain		
	panel metal temperatures < 520°F as indicated		
	by TI2301A or B - TI2803A or B and no excessive		
	heating of uncooled structures (half power		
	check point). Verify that all heated panel		
	temperature gradients are < 200°F as indi-		
	cated by panel (top) DAS sensors TEX2354B,		
	C, & D - TEX2856B, C, & D. (Sensors on		
	substantially heated panels are TEX2354B,		
	C, & D - TEX2556B, C, & D). "Track" command		
	should be issued in a "rapid" fashion to		
	produce a "step" change in input power to the		
	receiver which simulates actual operating		
	transients to be expected. Transient data to		
	be recorded during the "step" change in power		
	includes flow rate, metal temperatures, and		
	inlet/outlet fluid temperatures for each panel		
	as well as system pressures.		
	Increase $17/W/03$		
	Increase $14/W/02$		
	Increase 12/W/05		
	Increase 11/W/04		
	Increase 5/W/01		

Test 1030 Revision 0 Page 174 of 543

		lnitiał	Date
8.2.6.8	Repeat Step 8.2.6.7 using the following		
	heliostat "Increase" command (75% power check		
	point). Carryout all temperature verification		
	and data recording functions listed in		
	Step 8.2.6.7.		
	Increase 9/W/03		
	Increase 7/W/02		
	Increase 6/W/05		
	Increase 5/W/04		
	Increase 3/W/01		
8.2.6.9	Repeat Step 8.2.6.7 using the following		
	heliostat "Increase" command (100% test		
	power test check point). Carryout all		
	temperature verification and data recording		
	functions listed in Step 8.2.6.7.		
	NOTE: This step should be deleted or modified		
	if excessive metal temperatures or tempera-		
	ture gradients were experienced during		
	Step 8.2.6.8 or can be anticipated as a		
	result of a 25% increase in incident		
	receiver power.		
	Increase 8/W/03		
	Increase 6/W/02		
	Increase 6/W/05		
	Increase 5/W/04		
	Increase 2/W/01		
		Test 1	030

Revision 0 Page 175 of 543

Initial

Date

8.2.6.9 At this point in the procedure, flow control setpoints for individual panels can be made to produce the desired temperature for panel cure. Whenever possible, panel flow setpoint changes required to transition from one cure condition to the next should be done through step change (reductions) in flow to permit the gathering of dynamic receiver data. In selecting the step changes in flow setpoints, conservation should be used to prevent a panel over temperature condition from occurring.

> During each cure hold point (Steps 8.2.6.10 -8.2.6.15), the following parameters should be recorded to support subsequent collector system "optical" performance and panel thermal expansion analyses.

- Time and day
- Insolation
- Collector field-ring-track status
- Collector field status
- Receiver panel incident flux measurements
- Individual receiver panel flows
- Individual panel inlet and outlet temperatures
- Panel metal temperatures
- Panel strain gauges
- 8.2.6.10 Reduce the flow control setpoints for panel controllers FCM2301 - FCM2402 (panels 204-208) to produce individual panel metal temperatures of 520  $\pm$  35°F as indicated by TI2301A or B -TI2402A or B. Adjust flows as required to

Test 1030 Revision 0 Page 176 of 543

			Initial	Date
	8.2.6.10	maintain adjacent heated panel temperature		
		< 520°F and gradients < 200°F as measured by		
		TEX2456B, C, & D - TEX2856B, C, & D. Maintain		
		the cure condition on panels 204-208 for a		
		20 min hold period. Make any flow adjustments		
		required due to changing sun positions. Record		
		on the cure log sheet that this step of the		
		cure has been completed for panels 204-208.		<u> </u>
	8.2.6.11	Repeat Step 8.2.6.10 to produce panel metal		
		temperatures of 585 $\pm$ 35°F as indicated by		
		TI2301A or B - TI2402A or B (panels 204-208)		
	8.2.6.12	Repeat Step 8.2.6.10 to produce panel metal		
		temperatures of 660 $\pm$ 35°F as indicated by		
		TI2301A or B - TI2402A or B (panels 204-208). $\_$		·····
	8.2.6.13	Repeat Step 8.2.5.10 to produce panel metal		
		temperatures of 720 $\pm$ 35°F as indicated by		
		TI2301A or B - TI2402A or B (panels 204-208)		
	8.2.6.14	Repeat Step 8.2.6.10 to produce panel metal		
		temperatures of 850 $\pm$ 35°F as indicated by		
		TI2301A or B - TI2402A or B (panels 204-208).		
	8.2.6.15	Repeat Step 8.2.6.10 to produce panel metal		
		temperatures of 850 $\pm$ 35°F as indicated by		
		TI2301A or B - TI2402A or B (panels 204-208).		
		A preheater inlet temperature of 220°F		
		should not be exceeded.		
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			Test 1	030
			Revisi	on 0
			rage I	// UT 543
		Initial	Date	
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8.2.7	CONTROL TESTS - PANELS 204 AND 206 - STEAM LOOP OPERATION			
8.2.7.1	Obtain process control loop data required for tuning of receiver temperature control loops on panels 204 and 206 (refer to Figures 8.2.7-1 thru 8.2.7-2). Obtain both step and frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ramp response to small signal flux disturbances.			
8.2.7.1.1	Verify that the prerequisites have been met as required in Section 4.0.			
8.2.7.1.2	Verify that the initial conditions have been established as required in Section 7.4.2.			
8.2.7.1.3	Re-establish the approximate heliostat configuration and flow conditions used for the 850°F panel cure (See Section 8.2.6.15).			
8.2.7.1.4	Adjust flowrate setpoints (FCM2301, FCM2303) to achieve 850°F outlet panel steam temper- ature on panels 204 and 206. Monitor TI2304 and TI2306.			
8.2.7.1.5	Verify that the control test unit is installed and operating on TV2301 and TV2303.			
8.2.7.1.6	Verify receiver feedpump is in pressure control (PC1105).			
		Test 1 Revis Page	030 ion 0 178 of 543	







		Initial	Date
8.2.7.1.7	Obtain open loop step response data on panel		
	204 by carrying out the following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approxi-		
	mately 5 minutes.		
	B) Set FCM2301 to manual mode.		
	C) Implement a step decrease in FCM2301		
	output by approximately 10% of nominal		
	value (increase valve opening) and		
	allow pressures, flows, temperatures		
	to reach steady state.		
	Note: An adjustment in the magnitude of		
	the valve step command may be		
	required in order to achieve a		
	measurable response change in		
	flow and temperature - flow of		
	$\pm.1$ lb/sec, temperatures of $\pm50$		
	to 100°F are desired. Record		
	final command change. Monitor		
	the following parameters on a		
	strip chart to verify that data		
	is recorded: FCM2301 (PV & CO),		
	TI2301, TI2304, YI2307, and PI2902.		
	FCM2301 Output%		
	Command Change		
	D) Implement a step increase (back to		
	nominal) in FCM2301 output (closing		
	valve) and allow temperatures, pressure		
	and flowrate to reach steady state	Test 1	030
	conditions.	Revisi	on $0$
		Page I	01 OT 543

			Initial	Date
8.2.7.1.7	E)	Reset FCM2301 back to auto.		
8.2.7.1.8	Obt dis out	ain open loop step/ramp response to a flux turbance on panels 204 and 206 by carrying the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approximately 5 min.		
	B)	Set FCM2301 and FCM2303 to manual mode.	·	
	C)	<pre>Implement a step/ramp decrease in the power level on panels 204 and 206 by approximately 10% nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301 (PV &amp; CO), TI2301, TI2304, YI2307A/B, FCM2303 (PV &amp; CO), TI2303, TI2306, YI2309A/B and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes ≥ 20% and temperature changes ≥50 to 100°F are desired.</pre>		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state	Test Revis	1030 ion 0

		Initial	Date
8.2.7.1.8	D) condition. Monitor and adjust as in Section C.		
	E) Set FCM2301 and FCM2303 back to auto.		
8.2.7.1.9	Perform frequency response tests on panel 204 (See TC2301, Figure 8.2.7-1) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2301. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistant with the required output change determined in Section 8.2.7.1.7C. Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2301 and adjust setpoint to achieve a nominal 850°F steam outlet temperature on TC2301.		·····
	6) Set FCM2301 to manual mode.		
		Test Revisi Page 1	1030 on 0 83 of 543

		-	Initial	Date
8.2.7.1.9	7) Usin	g the transfer function analyzer (TFA)		_
	inse	rt a O.1 HZ sin wave into the CTU and		
	adju	st the TFA output such that a + 400		
	1b/h	r peak-to-peak response is achieved		
	on F	12301.		
	Set	the TFA to 0.02 HZ allow the system		
	to r	each steady state (3-4) cycles).		
	Repe	at 4) at a frequency of 0.05 HZ		
	Repe	at 4) at a frequency of 0.07 HZ		
	Repe	at 4) at a frequency of 0.1 HZ		
	Repe	at 4) at a frequency of 0.2 HZ		
	Repe	at 4) at a frequency of 0.5 HZ		
	Repe	at 4) at a frequency of 0.7 HZ		
	Repe	at 4) at a frequency of 1 HZ		
	Repe	at 4) at a frequency of HZ		
		Determined during test		
	Repe	at 4) at a frequency ofHZ		
		Determined during test		
	(Note: <sup>(1</sup>	) The TFA output amplitude may need		
		to be adjusted during the test as		
		required to obtain a measurable		
		output response (determined by		
		test by engineers in RS-1 or DAS		
		room.		
	(2	) If panel temperature drifts off		
		the nominal test condition -		
		adjust FCM2301 output from		
		operator station to correct - if		
		cannot successfully adjust -		
		return to Step 5.		
			Test	1030
			Revisi	on O
			Page 1	84 of 543

		Initial	Date
8.2.7.1.9	8) Switch TFA input out of CTU.		
	9) Set FCM2301 back to auto.		
8.2.7.1.10	Obtain open loop step response data on panel 206 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in steady state condition for approximately</li> <li>5 minutes.</li> </ul>		
	B) Set FCM2303 to manual mode.		
	C) Implement a step decrease FCM2303 output by approximately 10% nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±.1 lb/sec, temperatures of ±50 to 100°F are desired. Record final command change.		
	Monitor the following parameters on a strip chart to verify that data is recorded: FCM2303 (PV & CO), TI2303, TI2306, YI2309, and PI2902.		
		Test Revisi Page 1	1030 on 0 85 of 543

			Initial	Date
8.2.7.1.10	D)	Implement a step increase (back to nominal) in FCM2303 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E)	Reset FCM2303 back to auto.		
8.2.7.1.11	Per (Se the	form frequency response test on panel 206 e TC2303, Figure 8.2.7-2) by carrying out following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistant with the required output change determined in Section 8.2.7.1.10 C. Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2303 and adjust setpoint to achieve a nominal 850°F steam outlet temperature on TC2303.		
	6)	Set FCM2303 to manual mode.	 Test 10 Revisi Page 1	030 on O 86 of 543

		Initial	Date
8.2.7.1.11 7) Using th	ne transfer function analyzer (TFA)		
insert a	9.1 HZ sin wave into the CTU) and		
adjust t	he TFA output such that a + 400		
lb/hr pe FI2303.	eak-to-peak response is achieved on		
Set the	TFA to 0.02 HZ allow the system		
to reach	n steady state (3-4) cycles).		
Repeat 4	) at a frequency of 0.05 HZ		
Repeat 4	) at a frequency of 0.07 HZ		
Repeat 4	) at a frequency of 0.1 HZ		
Repeat 4	) at a frequency of 0.2 HZ		
Repeat 4	) at a frequency of 0.5 HZ		
Repeat 4	) at a frequency of 0.7 HZ		
Repeat 4	) at a frequency of 1 HZ		
Repeat 4	) at a frequency of HZ		
	Determined during test.		
Repeat 4	) at a frequency ofHZ		
	Determined during test.		
(Note: <sup>(1)</sup> T	he TFA output amplitude may need		
t	o be adjusted during the test as		
r	equired to obtain a measurable		
0	utput response (determined by		
t	est by engineers in RS-1 or DAS		
r	room.		
(2) <sub>I</sub>	f panel temperature drifts off		
t	the nominal test condition -		
a	djust FCM2303 output from		
0	operator station to correct -		
i	f cannot successfully adjust -		
r	eturn to Step 5.		
		ا Test ۱ Revisi Page ۱	030 on 0 87 of 54

			Initial	Date
.2.7.1.11	8)	Switch TFA input out of CTU.		
	9)	Set FCM2303 back to auto.		

Test 1030 Revision O Page 188 of 543

		Initial	Date
8.2.7.2	Obtain process control open loop data required		
	for tuning of receiver temperature control		
	loops on panels 204 and 206 (refer to Figures		
	8.2.7-1 thru 8.2.7-2). Obtain both step and		
	frequency response data to valve disturbances		
	at nominal temperature 660°F. Obtain both		
	step and frequency response data to valve		
	disturbances at nominal temperature 660°F.		
	Obtain step/ramp response to small signal flux		
	disturbances.		
8.2.7.2.1	Verify that the prerequisites have been met as		
	required in Section 4.0.	<b>#</b>	
8.2.7.2.2	Verify that the initial conditions have been		
	established as required in Section 7.4.2.		
8.2.7.2.3	Re-establish the approximate heliostat con-		
	figuration and flow conditions used for the		
	660°F panel cure (See Section 8.2.6.12).		
8.2.7.2.4	Adjust flowrate setpoints (FCM2301 and		
	FCM2303) to achieve 660°F outlet panel		
	steam temperature on panels 204 and 206.		
	Monitor 112304 and 112306.	<u> </u>	
0 0 7 0 5	Navi ( that the control toot unit is		
8.2.7.2.5	installed and encysting on TV2201 and		
	TV2202		
	142503.		
8 2 <b>7</b> 2 6	Verify receiver feednumn is in pressure		
0.2.7.2.0	control (PC1105)		

Test 1030 Revision 0 Page 189 of 543

			Initial	Date
8.2.7.2.7	0bt	ain open loop step response data on		
	pan	el 204 by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a		
		steady state condition for approximately		
		5 minutes.		
	B)	Set FCM2301 to manual mode.		
	57			
	C)	Implement a step decrease in FCM2301		
		output by approximately 10% of nominal		
		value (increase valve opening) and		
		allow pressures, flows, temperatures		
		to reach steady state.	:	
	Not	e: An adjustment in the magnitude of the		
		valve step command may be required in		
		order to achieve a measurable response		
		change in flow and temperature - flow		
		of $\pm$ .l lb/sec, temperatures of $\pm 50$ to		
		100°F are desired. Record final		
		command change. Monitor the following		
		parameters on a strip chart to verify		
		that data is recorded: FCM2301 (PV &		
		CO), TI2301, TI2304, YI2307, and PI2902.		
		FCM2301 Autput %		
		Command Change		
		oommand onange		
	D)	Implement a step increase (back to nominal)		
		in FCM2301 output (closing valve) and allow		
		temperatures, pressures and flowrate to		
		reach steady state conditions.		
	E)	Reset FCM2301 back to auto.		
	,		Revisi Page 1	on 0 90 of 543

	-	Initial	Date
8.2.7.2.8	Obtain open loop step/ramp response to a flux disturbance on panel 214 and 206 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> <li>5 min.</li> </ul>		
	B) Set FCM2301 and FCM2303 to manual mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 and 206 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301 (PV & CO), TI2301, TI2304, YI2307A/B, FCM2303 (PV & CO), TI2303, TI2306, YI2309A/B and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\geq 50$ to $100^{\circ}$ F are desired.		
	<ul> <li>D) Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition.</li> <li>Monitor and adjust as in Section C.</li> </ul>		
	E) Set FCM2301 and FCM2303 back to auto.	Test 1 Revisi Page 1	030 on 0 91 of 543

			Initial	Date
.2.7.2.9	Per	form frequency response tests on panel 204		
	(Se	e TC2301, Figure 8.2.7-1) by carrying out		
	the	following steps.		
	1)	Verify that controls test unit (CTU) is		
	installed and operating on TC2301. (Installation is in RS-1).			
	2)	Verify the receiver feedpump is in		
		pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in		
		a steady state condition for approximately		
		2 minutes.		
	4)	Adjust the neak to neak amplitude on		
	4)	the transfer function analyzer output to		
		be consistant with the required output		
		change determined in Section 8.2.7.1.7C.		
		Note: Verify that the TFA input to the		
		CTU is switched out.		
	<b>۲</b> \	Callest FONO201 and adjust astraight to		
	5)	Select FCM2301 and adjust selpoint to		
		temperature on TC2301.		
	6)	Set FCM2301 to manual mode		
	7)	Using the transfer function analyzer		
	.,	(TFA) insert a 0.1 HZ sin wave into the		
		CTU) and adjust the TFA output such that		
		a + 400 lb/hr peak-to-peak response is		
		achieved on FI2301.		
			Test 10	030

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Revision 0 Page 192 of 543

	_	Initial	Date
8.2.7.2.9 7) Set the TFA to 0.02 HZ all	ow the system		
to reach steady state (3-4	) cycles).		
Repeat 4) at a frequency o	f 0.05 HZ		
Repeat 4) at a frequency o	f 0.07 HZ		
Repeat 4) at a frequency o	f 0.1 HZ		
Repeat 4) at a frequency o	f 0.2 HZ		
Repeat 4) at a frequency o	f 0.5 HZ		
Repeat 4) at a frequency o	f 0.7 HZ		
Repeat 4) at a frequency o	f 1 HZ		
Repeat 4) at a frequency o	fHZ		
Determined durin	g test.		
Repeat 4) at a frequency o	fHZ		
Determined durin	g test.		
(Note <sup>(1)</sup> The TFA output amplit be adjusted during th required to obtain a output response (dete test by engineers in room.	ude may need to e test as measurable rmined by RS-1 or DAS		
(2) If panel temperature	drifts off the		
nominal test conditio	n - adjust		
FCM2301 output from o	perator station		
to correct - if canno	t successfully		
adjust - return to St	ep 5		
8) Switch TFA input out of CT	U		
9) Set FCM2301 back to auto.	_		
		 Test 10 Revisi Page 19	)30 on 0 93 of 543

			Initial	Date
8.2.7.2.10	0bt	ain open loop step response data on		
	pan	el 206 by carrying out the following steps		
	A)	Confirm that the receiver panels are in a		
		steady state condition for approximately		
		5 minutes.		
	В)	Set FCM2303 to manual mode.		
	C )	Implement a step decrease in FCM2303		
		output by approximately 10% nominal value		
		(increase valve opening) and allow		
		pressures, flows, temperatures to reach		
		steady state.		
	Not	e: An adjustment in the magnitude of the		
	-	valve step command may be required in		
		order to achieve a measurable response		
		change in flow and temperature - flow		
		af + 1 b/sec temperatures of +50 to		
		100% and desired . Record final		
		command change. Moniton the following		
		command change. Monicor the fortowing		
		parameters on a strip chart to verify		
		that data is recorded: FLM2303 (PV &		
		CO), 112303, 112306, Y12309 and P12902		<u></u>
		FCM2303 Output%		
		Command Change		
	D	Implement a step increase (back to pominal)		
	υ.	in ECM2303 output (closing valve) and allow		
		tomponatures processing valve, and allow		
		stoody stote conditions		
		Steauy State Conditions.		
	F	Reset FCM2303 back to auto		
	L. •		lest 10	)30

Revision O Page 194 of 543

<ul> <li>8.2.7.2.11 Perform frequency response tests on panel 206 (See TC2303 Figure 8.2.7.2) by carrying out the following steps.</li> <li>1) Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).</li> <li>2) Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ul> <li>(See TC2303 Figure 8.2.7.2) by carrying out the following steps.</li> <li>1) Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).</li> <li>2) Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ul> <li>the following steps.</li> <li>1) Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).</li> <li>2) Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).</li> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>Adjust the peak to peak amplitude on the</li> </ol>	
<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2303. (Installation is in RS-1).</li> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>Adjust the peak to peak amplitude on the</li> </ol>	
<ul> <li>is installed and operating on TC2303. (Installation is in RS-1).</li> <li>2) Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ul> <li>(Installation is in RS-1).</li> <li>2) Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>Adjust the peak to peak amplitude on the</li> </ol>	
<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>Adjust the peak to peak amplitude on the</li> </ol>	
<ul> <li>pressure control mode (PC1105).</li> <li>3) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ul> <li>3) Confirm that the receiver panels are in <ul> <li>a steady state condition for approximately</li> <li>2 minutes.</li> </ul> </li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
<ul> <li>3) Confirm that the receiver panels are in <ul> <li>a steady state condition for approximately</li> <li>2 minutes.</li> </ul> </li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
a steady state condition for approximately 2 minutes. 4) Adjust the peak to peak amplitude on the	
<ul> <li>2 minutes.</li> <li>4) Adjust the peak to peak amplitude on the</li> </ul>	
4) Adjust the peak to peak amplitude on the	
4) Adjust the peak to peak amplitude on the	
transfer function analyzer output to be	
consistant with the required output	
change determined in Section 8.2.7.1.10C.	
Note: Verify that the TFA input to the	
CTU is switched out.	
E) Solect ECM2202 and adjust setupint to	
schiove a nominal 850°E steam outlet	
tomporature on TC2303	
6) Set FCM2303 to manual mode.	
7) Using the transfer function analyzer	
(TFA) insert a 0.1 HZ sin wave into the	
(TTI) and adjust the TFA output such that	
a + 400 lb/br peak-to-peak response is	
achieved on FI2303.	
 Test 10	

Revision O Page 195 of 543

			Initial	Date
8.2.7.2.11	7)	Set the TFA to 0.02 HZ allow the system		
		to reach steady state (3-4) cycles).		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
		Repeat 4) at a frequency of 0.5 HZ		
		Repeat 4) at a frequency of 0.7 HZ		
		Repeat 4) at a frequency of 1 HZ		
		Repeat 4) at a frequency ofHZ		
		Determined during test		
		Repeat 4) at a frequency ofHZ		
		Determined during test		
	(No	ote <sup>(1)</sup> The TFA output amplitude may need		
		to be adjusted during the test as		
		required to obtain a measurable		
		output response (determined by test		
		by engineers in RS-1 or DAS room.		
		<sup>(2)</sup> If panel temperature drifts off the		
		nominal test condition - adjust		
		FCM2303 output from operator		
		station to correct - if cannot		
		successfully adjust - return to		
		Step 5.		·····
	8)	Switch TFA input out of CTU.		
	9)	Set FCM2303 back to auto.		<u></u>
			ו Test T	030
			Revisi	on 0 06 of 543
			Page I	90 01 343

		Initial	Date
8.2.7.3	Obtain closed loop response data on panel temperature controllers TC2301 and TC2303 to temperature set point and flux changes at a nominal temperature of 660°F. Tune control loops as required.		
8.2.7.3.1	Verify that the receiver panel 204 is in a steady state condition at approximately 485 psig and 660°F. TC2301 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.7.3.2	Confirm that the test data base is configured to initiate and maintain panel metal temper- ature control. Select TC2301, set to console mode and set temperature setpoint to current PV value.	,	
8.2.7.3.3	Initiate panel metal temperature control on TC2301. Select TD2301B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	(Note: If Controller fails to satisfactory control metal temperature, select TD2301A and switch back to flow control. Also select TD2301B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.7.3.1).		
		Test Revis Page	  030 ion 0 197 of 543

			Initial	Date	
8.2.7.3.4	Tun con out tun	ne TC2301 - panel metal temperature ntroller (See Figure 8.2.7-1) by carrying t the following steps using the loop ning form.			
	A)	Set receiver console to configure mode.			
	B)	Decrease temperature setpoint of TC2301 by 10% and observe the response on the strip chart.			
	C)	Increase TC2301 setpoint back to nominal value and observe the response on the strip chart.			
	D)	Increase/decrease proportional gain Kl (Cl-1, AL-12)*.			
	E)	Repeat steps B D as required until response is satisfactory.			
	F)	Decrease TC2301 setpoint 10% and observe response on strip chart.			
	G)	Increase TC2301 setpoint to nominal value and observe temperature response on strip chart.			
	H)	Increase/decrease reset gain, K2 (Cl-1, AL-12) in the ±30 increments.			
	I)	Repeat steps F H as required until response is satisfactory.			
			Test	1030	i

Revision 0 Page 198 of 543

		Initial	Date
8.2.7.3.4	J) Establish preliminary TC2301 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.7.3.5	Verify that the receiver panel 206 is in a steady state condition at approximately 485 psig and 660°F. TC2303 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.7.3.6	Confirm that the test data base is configured to initiate and maintain panel metal temper- ature control. Select TC2303, set to console mode and set temperature setpoint to current PV value.		
8.2.7.3.7	Initiate panel metal temperature control TC2303. Select TD2303B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	(Note: If controller fails to satisfactory control metal temperature, select TD2303A and switch back to flow control. Also select TD2303B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.7.3.5).		
		Test 1	030

Revision O Page 199 of 543

		_	Initial	Date
8.2.7.3.8	Tun con out for	e TC2303 - panel metal temperature htroller (See Figure 8.2.7-2) by carrying the following steps using the loop tuning m.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2303 by 10% and observe the response on the strip chart.		
	C)	Increase TC2303 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-2, AL-12)*		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2303 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2303 setpoint to nominal value and observe temperature response on strip chart.		
	Н)	Increase/decrease reset gain, K2 (C1-2, AL-12) in the ±30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
			Test 1(	)30

Test1030 Revision 0 Page 200 of 543

	_	Initial	Date
8.2.7.3.8	J) Establish preliminary TC2303 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.7.3.9	Obtain closed loop response on TC2301 and TC2303 to a flux disturbance on panels 204 and 206 by carrying out the following steps.		
	A) Confirm that receiver panels 204 and 206 are in a steady state condition for approximately 2 minutes.		
	B) Confirm TC2301 and TC2303 are in metal temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 and 206 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301 (PV & CO), TI2301, TI2304, YI2307A/B, FCM2303, (PV & CO), TI2303, TI2306 YI2309A/B and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes ≥ 20% and flow changes		
	$\geq$ 1000 lb/hr are desired	Toot 1	020

Revision 0 Page 201 of 543

			Initial	Date	(
8.2.7.3.9	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition.			
		Monitor and adjust as in Section C.			
	E)	Observe temperature response TI2301 and TC2303 if temperature excursions exceed ±50°F - adjust flux loop gains via the following.			
		<ol> <li>Set receiver console to configure mode.</li> </ol>			
		<ol> <li>Select Cl-1, AL-16 and Cl-2, AL-16 - using loop tuning form increase/ decrease gain and low time constant as required.</li> </ol>			ł
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux gain.			
	G)	Set console back to monitor mode.		<b>_</b>	
			Test 1 Revisi Page 2	030 on 0 02 of 543	

		Initial	Date
8.2.7.4	Obtain closed loop response data on panel temperature controllers TC2301 and TC2303 to temperature set point and flux changes at a nominal temperature of 850°F. Tune control loops as required.		
8.2.7.4.1	Verify that the receiver panel 204 is in a steady state condition at approximately 485 psig and 660°F. TC2301 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.7.4.2	Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2301, set to console mode and set temperature setpoint to 850°F.		
8.2.7.4.3	Allow panel to achieve steady state temperature.		
	(Note: If controller fails to satisfactory control metal temperature, Select TC2301 and switch back to 660°F setpoint. Consult test engineer for controller parameter adjustments and go back to Section 8.2.7.3.1).		
		Test Revisi Page 2	1030 on 0 03 of 543

		_	Initial	Date
8.2.7.4.4	Tur cor	e TC2301 - panel metal temperature troller (See Figure 8.2.7-1) by carrying		
	out	the following steps using the loop		
	tur	ing form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of		
		TC2301 by 10% and observe the response		
		on the strip chart.		
	C)	Increase TC2301 setpoint back to		
		nominal value and observe the response		
		on the strip chart.		
	D)	Increase/decrease proportional gain Kl		
		(C1-1, AL-12)*.		
	E)	Repeat steps B D as required until		
		response is satisfactory.		
	F)	Decrease TC2301 setpoint 10% and observe		
		response on strip chart.		
	G)	Increase TC2301 setpoint to nominal		
	Ĩ	value and observe temperature response		
		on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-1,		
		AL-12) in the $\pm 30$ increments.		
	I)	Repeat steps F H as required until		
		response is satisfactory.		
			Test 1 Revisi	030 on 0
			Page 2	04 of 543

		Initial	Date
8.2.7.4.4	J) Establish preliminary TC2301 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.7.4.5	Verify that the receiver panel 206 is in a steady state condition at approximately 485 psig and 660°F. TC2303 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.7.4.6	Confirm that the test data base is configured to initiate and maintain panel metal temper- ature control. Select TC23C3, set to console mode and set temperature setpoint to 850°F.		
8.2.7.4.7	Allow panel to achieve steady state temperature.		
	(Note: If controller fails to satisfactory control metal temperature, Select TC2303 and switch back to 660°F setpoint. Consult test engineer for controller parameter adjustments and go back to Section 8.2.7.4.1).		
		Test Revis Page 2	1030 ion 0 205 of 543

			Initial	Date
8.2.7.4.8	Tune	e TC2303 - panel metal temperature		
	cont	troller (See Figure 8.2.7-2) by carrying		
	out	the following steps using the loop		
	tun	ing form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2303		-
		by 10% and observe the response on the		
		strip chart.		
	c)	Increase TC2202 cotraint back to nominal		
	0)	value and observe the response on the		
		strip chart		
	D)	Increase/decrease proportional gain Kl		
		(C1-2, AL-12)*.		
	E)	Peneat steps B D as required until		
	L)	response is satisfactory		
		response is succine to y.		
	F)	Decrease TC2303 setpoint 10% and observe		
		response on strip chart.		
	G)	Increase TC2303 setpoint to nominal value		
	ω,	and observe temperature response on strip		
		chart.		
	H)	Increase/decrease reset gain, K2 (C1-2,		
		AL-12) in the $\pm 30$ increments.		
	I)	Repeat steps F H as required until		
		response is satisfactory.		

Test 1030 Revision 0 Page 206 of 543

	_	Initial	Date
8.2.7.4.8	J) Establish preliminary TC2303 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		1
8.2.7.4.9	Obtain closed loop response on TC2301 and TC2303 to a flux disturbance on panel 204 and 206 by carrying out the following steps. A) Confirm 204 and 206 that receiver panels		
	204 and 206 are in a steady state condi tion for approximately 2 minutes.		
	B) Confirm TC2301 and TC2303 is in metal temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panel 204 and 206 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301 (PV & CO), TI2301, TI2304, YI2307A/B, FCM2303 (PV & CO), TI2303, TI2306, YI2309A/B and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flow		
	changes <u>&gt;</u> 1000 lb/hr are desired.	Test Revisi Page 2	 1030 on 0 07 of 54

			Initial	Date
.2.7.4.9	D)	Implement a step/ramp increase in panel		
		power (back to nominal). Allow panel		
		temperatures, pressures, flux and flows		
		to reach a steady state condition.		
		Monitor and adjust as in Section C.		
	E)	Observe temperature response TI2301 and		·
		TC2303. If temperature excursions		
		exceed ±50°F - adjust flux loop gains		
		via the following.		
Ŷ				
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		2) Select CI-I, AL-16 and CI-2, AL-16 -		
		using loop tuning form increase/		
		decrease gain and low time constant		
		as required.		
	E)	If aring any adjusted monost Stops (		
	F)	the E Becond final tuned flux loops		
		chine . Record final tuned flux toops		
		ya m		
	G)	Set console back to monitor mode.		
	ω,			
			Test 1	030
			Revisi	on 0 08 of 542
			Page 2	U8 01 543

		-	Initial	Date
8.2.8 ST (S	EAM CURE OF PANELS 217-221 TEPS 8.2.8.1 - 8.2.8.15)			
8.2.8.1	Verify that the initial	conditions have been		
	established as required	in Section 7.4.2.		
8.2.8.2	Call up the individual	panel flow controllers		
	(FCM-2301 - FCM-2803) a	nd verify that they		
	are in the "console" mo	de. Input the appro-		
	priate set points liste	d below.		
		Controller Set Point (LB/HR)		
	FCM-2301	500		
	FCM-2302	500		
	FCM-2303, FCM-2401 - FCM-2403, FCM-2501	0		
	FCM-2502 - FCM-2503	500		
	FCM-2601	1500		
	FCM-2602	4000		
	FCM-2603	6000		
	FCM-2701	6500		
	FCM-2702* - FCM-2802*	5000		
	FCM-2803*	4500		
	*panels to be cured	-		
8.2.8.3	Verify that the valve o	control set point for		
	the receiver feed pump	is 80% and switch		
	feed pump controller, F	PC-1105 to valve		
	controller.	-		
8.2.8.4	Verify that the flows s	set in step 8.2.8.2		
	are maintained at their	r set point values		
			Test 1 Revisi Page 2	030 on 0 209 of 543

st 1030
vision 0 de 210 of 543

	_	Initial	Date
8.2.8.8	Repeat Step 8.2.8.7 using the following		
	heliostat "Increase" command (75% power check		
	point). Carryout all temperature verification		
	and data recording functions listed in Step		
	8.2.9.7.		
	Increase 9/W/10		
	Increase 7/W/11		
	Increase 6/W/08		
	Increase 5/W/09		
	Increase 3/W/12		
8.2.8.9	Repeat Step 8.2.8.7 using the following helio-		
	stat "Increase" command (100% test power check		
	point). Carryout all temperature verifica-		
	tion and data recording functions listed in		
	Step 8.2.9.7. Note: this step should be		
	deleted or modified if excessive metal		
	temperatures or temperature gradients were		
	experienced during Step 8.2.9.8 or can be		
	anticipated as a result of a 25% increase		
	in incident receiver power.		
	Increase 8/W/10		
	Increase 6/W/11		
	Increase 6/W/08		
	Increase 5/W/09		
	Increase 2/W/12		
	At this point in the procedure, flow control		
	set points for individual panels can be made		
	to produce the desired temperature for panel		
	cure. Whenever possible, panel flow set point		
	changes required to transition from one cure		
		Test Revisi Page 2	030 on 0 11 of 54

	_	Initial	Date
8.2.8.9	condition to the next should be done		
	through step changes (reductions) in flow		
	to permit the gathering of dynamic receiver		
	data. In selecting the step changes in	i	
	flow set points, conservation should be	i	
	used to prevent a panel over temperature		
	condition from occuring.		
	During each cure hold point (Steps 8.2.8.10 -		
	8.2.8.15), the following parameters should be		
	recorded to support subsequent collector		
	system "optical" performance and panel		
	thermal expansion analyses.		
	• Time and day		
	Insolation		-
	<ul> <li>Collection field-ring-track status</li> </ul>		
	• Collector field status		
	<ul> <li>Receiver panel incident flux measurements</li> </ul>		
	<ul> <li>Individual receiver panel flows</li> </ul>		
	<ul> <li>Individual panel inlet and outlet</li> </ul>		
	temperatures		
	<ul> <li>Panel metal temperatures</li> </ul>		
	<ul> <li>Panel strain gauges</li> </ul>		
8.2.8.10	Reduce the flow control set points for panel		
	controllers FCM-2702 - FCM-2803 (panels 217-		
	221) to produce individual panel metal temper-		
	atures of 520 $\pm$ 35°F as indicated by TI-2702A		
	or B - TI-2803A or B. Adjust flows as required		
	to maintain adjacent heated panel temperatures		
	<520°F and gradients <200°F as measured by		
	TEX-2354B, C, and D - TEX-2754B, C, and D.		
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Test 1030 Revision 0 Page 212 of 543

		Initial	Date
8.2.8.10	Maintain the cure condition on panels 217-221 for a 20 minute hold period. Make any flow adjustments required due to changing sun positions. Record on the cure log sheet that this step of the cure has been completed for panels 217-221.	- -	
8.2.8.11	Repeat Step 8.2.8.10 to produce metal temperature of 585 $\pm$ 35°F as indicated by TI-2702A or B - TI-2803A or B (panels 217-221).		
8.2.8.12	Repeat Step 8.2.8.10 to produce panel metal temperature of 660 ± 35°F as indicated by TI-2702A or B - TI-2803A or B (panels 217-221).		
8.2.8.13	Repeat Step 8.2.8.10 to produce panel metal temperature of 720 ± 35°F as indicated by TI-2702A or B - TI-2803A or B (panels 217-221).		
8.2.8.14	Repeat Step 8.2.8.10 to produce metal temperatures of 780 ± 35°F as indicated by TI-2702A or B - TI-2803A or B (panels 217-221).		
8.2.8.15	Repeat Step 8.2.8.10 to produce panel metal temperatures of 850 $\pm$ 35°F as indicated by TI-2702A or B - TI-2803A or B (panels 217-221). A preheater inlet temperature of 220°F should not be exceeded.		
		Test Revis Page	 1030 ion 0 213 of 543
	-	Initial	Date
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8.2.9	CONTROL TESTS - PANELS 217, 219, 221 - STEAM LOOP OPERATION		
8.2.9.1	Obtain process control open loop data required for tuning of receiver temperature control loops on panels 217, 219 and 221 (refer to figures 8-2.9-1 thru 8.2.9-3). Obtain both step and frequency response data to valve disturbances at nominal temperature of 850°F. Obtain step/ramp response to small signal flux disturbances.		
8.2.9.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.2.9.1.2	Verify that the initial conditions have been established as required in Section 7.4.2.		
8.2.9.1.3	Re-establish the approximate heliostat config- uration and flow conditions used for the 850° panel cure (see Section 8.2.8.15).		
8.2.9.1.4	Adjust flowrate setpoints (FCM2702, FCM2801, FCM2803) to achieve 850°F outlet panel steam temperature on panels 217, 219, and 212. Monitor TI27021, TI2804 and TI2806.		
8.2.9.1.5	Verify that the control test unit is installed and operating on TV2702, TV2801 and TV2803.		
8.2.9.1.6	Verify receiver feedpump is in pressure control (PC1105).		
		 Test 10 Revisio Page 2	)30 on 0 14 of 543



Figure 8.2.9-1. RS Steam Temperature Controller Functional Block Diagram TC-2702





543



Figure 8.2.9-3. RS Steam Temperature Controller Functional Block Diagram TC-2803

543

		_	Initial	Date
8.2.9.1.7	0bt	ain open loop step response data on panel 217	,	
	by	carrying out the following steps.		
	A)	Confirm that the receiver panels are in a		
		steady state condition for approximately		
		5 minutes.		
	B)	Set FCM2702 to manual mode.		
	C)	Implement a step decrease in FCM2702		
		output by approximately 10% of nominal		
		value (increase valve opening) and allow		
		pressures, flows, temperatures to reach		
		steady state.		
		Note: An adjustment in the magnitude of		
		the valve step command may be required		
		in order to achieve a measurable		
		response change in flow and		
		temperature - flow of $\pm$ .1 lb/sec,		
		temperatures of $\pm 50$ to $100^{\circ}\text{F}$ are		
		desired. Record final command change.		
		Monitor the following parameters on		
		a strip chart to verify that data is		
		recorded: FCM2702 (PV & CO), TI2702,		
		112705, Y12708, P12902.		
	D)	Implement a step increase (back to nominal)		
		in FCM2702 output (closing valve) and		
		allow temperatures, pressure and flowrate		
		to reach steady state conditions.		
	E)	Reset FCM2702 back to auto		
			Test	1030 Ion 0

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Page 218 of 543

		Initial	Da
8.2.9.1.8	Obtain open loop step/ramp response to a flux		
	disturbance on panel 217 by carrying out the		
	following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approximately		
	5 min.		
	B) Set FCM2702 50 manual mode.		
	C) Implement a step/ramp decrease in the		
	power level on panels 217, 219, 221 by		
	approximately 10% of nominal power. Allow		
	panel temperatures, pressure and flowrate		
	to reach steady state. Monitor the follow-		
	ing parameters on a strip chart recorder		
	to verify data is recorded: FCM2302		
	(PV & CO), TI2702, TI2705, YI2708A/B,		
	FCM2801 (PV & CO), TI2801, TI2804,		
	YI2807A/B, FCM2832, (VU & CO) TI2803,		
	TI2806, YI2809A/B and PI2902.		
	Note: An adjustment in the magnitude of		
	the power change (number of helio-		
	stats on/off target) may be required		
	in order to achieve measurable		
	response changes in flow and tempera-		
	tures and flux. Flux changes $\geq$ 20%		
	and temperature changes $\geq$ 50 to		
	100°F are desired.		

Test 1030 Revision O Page 219 of 543

			Initial	Date
8.2.9.1.8	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel tem- peratures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM2702, FCM2801, FCM2803 back to auto.		
8.2.9.1.9	Per (se the	form frequency response tests on panel 217 e TC2702, Figure 8.2.9-1) by carrying out following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2702. (Installation is in RS-1)		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.9.1.7C.		
		Note: Verify that the TFA input to the CTU is switched out.		
			Test 10 Revisi Page 2	)30 on 0 20 of 543

			Initial	Dat
8.2.9.1.9	5)	Select FCM2702 and adjust setpoint to		
		achieve a nominal 850°F steam outlet		
		temperature on TC2702.		
	6)	Set FCM 2702 to manual mode.		
	7)	Using the transfer function analyzer (TFA)		
		insert a 0.1 Hz sin wave into the CTU)		
		and adjust the TFA output such that a		
		+ 400 lb/hr peak-to-peak response is		
		achieved on FI2702.		
		Set the TFA to 0.02 Hz allow the system		
		to reach steady state (3-4) cycles.		
		Repeat 4) at a frequency of 0.05 Hz		
		Repeat 4) at a frequency of 0.07 Hz		
		Repeat 4) at a frequency of 0.1 Hz		
		Repeat 4) at a frequency of 0.2 Hz		
		Repeat 4) at a frequency of 0.5 Hz		
		Repeat 4) at a frequency of 0.7 Hz		
		Repeat 4) at a frequency of 1 Hz		
		Repeat 4) at a frequency of Hz mined		
		Repeat 4) at a frequency of Hz during		
		liest		
		Note: (1) The TFA output amplitude		
		max need to be adjusted during the		
		the test as required to obtain a		
		measurable output response (deter-		
		mined by test by engineers in		
		RS-1 or DAS room.		

Test 1030 Revision 0 Page 221 of 543

			Initial	Date
8.2.9.1.9	7)	Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2102 output from operator station to correct if cannot successfully adjust - return to Step 5.		
	8)	Switch TFA input out of CTU		
	9)	Set FCM2702 back to auto		
8.2.9.1.10	0bt 219	ain open loop step response data on panel by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	B)	Set FCM2801 to manual mode.		
	C)	Implement a step decrease in FCM2801 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
			Test Revis Page	1030 ion 0 222 of 543

		Initial	Date
8.2.9.1.10	C) Note: An adjustment in the magnitude of		
	the valve step command may be required		
	in order to achieve a measurable		
	response change in flow and tempera-		
	ture - flow of $\pm$ .1 lb/sec, tempera-		
	tures of $\pm$ 50 to 100°F are desired.		
	Record final command change. Monitor		
	the following parameters on a strip		
	chart to verify that data is recorded:		
	FCM2801 (PV & CO), TI2801, TI2804,		
	YI2807, PI2902.		
	FCM2801 Output%		
	Command Change		
	D) Implement a step increase (back to nominal)		
	in FCM2801 output (closing valve) and		
	allow temperatures, pressure and flowrate		
	to reach steady state conditions.		
	E) Reset FCM2801 back to auto.		
8.2.9.1.11	Perform frequency response tests on panel 219		
	(See TC2801, Figure 8.2.9-2) by carrying out		
	the following steps.		
	<ol> <li>Verify that the controls test unit (CTU)</li> </ol>		
	is installed and operating on TC2801.		
	(Installation is in RS-1)		
	(1		
	2) Verify the receiver feedback is in		
	pressure control mode (PC1105).		
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		Toet 1	020
		Revisi	osu on 0
		Page 2	23 of 543

		-	Initial	Date
.2.9.1.11	3)	Confirm that the receiver panels are in a		
	-	steady state condition for approximately		
		2 minutes.		
	4)	Adjust the peak to peak amplitude on the		
		transfer function analyzer output to be		
		consistent with the required output change		
		determined in Section 8.2.9.1.7C.		
		Note: Verify that the TFA input to the		
		CTU is switched out.		
	٤)	Soloot ECM2001 and adjust cotroint to		
	5)	achieve a nominal 850°E steam outlet		
		temperature on TC2803		
	6)	Set FCM 2801 to manual mode.		
	7)	Using the transfer function analyzer (TFA)		
		insert a 0.1 Hz sin wave into the CTU and		
		adjust the TFA output such that a		
		+ 400 lb/hr peak-to-peak response is		
		achieved on FI2501.		
		Set the TFA to 0.02 Hz allow the system		
		to reach steady state (3-4) cycles.		
		Repeat 4) at a frequency of 0.05 Hz		
		Repeat 4) at a frequency of 0.07 Hz		
		Repeat 4) at a frequency of 0.1 Hz		
		Repeat 4) at a frequency of 0.2 Hz		
		Repeat 4) at a frequency of 0.5 Hz		
		Repeat 4) at a frequency of 0.7 Hz		
		Repeat 4) at a frequency of 1 Hz		
			Test 1 Revisio	030 an 0
			Page 2	24 of 543

		Initial	Date
8.2.9.1.11	7) Repeat 4) at a frequency of Hz Deter- mined Repeat 4) at a frequency of Hz during test		
	Note: (1) The TFA output amplitude max need to be adjusted during the test as		
	required to obtain a measurable output response (determined by test by engi- neers in RS-1 or DAS room.		
	<pre>(2) If panel temperature drifts off the nominal test condition - adjust ECM2801 output from operator</pre>		
	station to correct - if cannot successfully adjust - return to		
	Step 5.		
	8) Switch TFA output out of CTU.		
	9) Set FCM2801 back to auto.		, , , , ,
8.2.9.1.12	Obtain open loop step response data on panel 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> <li>5 minutes.</li> </ul>		
	B) Set FCM2803 to manual mode.		
	C) Implement a step decrease in FCM2803 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperature to reach steady state.	<b>T</b> . 1	020
		lest Revis Page 2	030 ion 0 225 of 543

	_	Initial	Date
8.2.9.1.12	C) Note: An adjustment in the magnitude of		
	the valve step command may be required		
	in order to achieve a measurable		
	response change in flow and temperature	_	
	flow of $\pm$ .1 lb/sec. temperatures of		
	+ 50 to 100 F are desired. Record		
	final command change Monitor the		
	following parameters on a strip chart		
	to vorify that data is recorded.		
	FCH2003 (PV a CO), 112003, 112000,		
	Y12809, P12902.		
	FCM2803 Output %		
	Command Change		
	command change		
	D) Implement a step increase (back to nominal)		
	in FCM2803 output (closing valve) and allow		
	temperatures, pressure and flowrate to		
	reach steady state conditions.		
	· _		
	E) Reset FCM2803 back to auto.		
8.2.9.1.13	Perform frequency response tests on panel 221		
	(See TC2803, Figure 8.2.9-3) by carrying out		
	the following steps.		
	<ol> <li>Verify that the controls test unit (CTU)</li> </ol>		
	is installed and operating on TC2803.		
	(Installation is in RS-1).		
	2) Verify the receiver feedpump is in pressure		
	control mode (PC1105).		
		Test	030

Revision O Page 226 of 543

		-	Initial	Date
8.2.9.1.13	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.9.1.7C.		
		Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2803 and adjust setpoint to achieve a nominal 850°F steam outlet temperature on TC2803.		
	6)	Set FCM 2803 to manual mode.		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 Hz sin wave into the CTU and adjust the TFA output such that a + 400 lb/hr peak-to-peak response is achieved on FI2803.		
		Set the TFA to 0.02 Hz allow the system to reach steady state (3-4) cycles.		
		Repeat 4) at a frequency of 0.05 Hz Repeat 4) at a frequency of 0.07 Hz Repeat 4) at a frequency of 0.1 Hz Repeat 4) at a frequency of 0.2 Hz Repeat 4) at a frequency of 0.5 Hz Repeat 4) at a frequency of 0.7 Hz Repeat 4) at a frequency of 1 Hz		
			Test Revis Page	1 1030 ion 0 227 of 543

			Initial	Date
8.2.9.1.13	7)	Repeat 4) at a frequency of Hz (Deter-		
		Repeat 4) at a frequency of Hz during		
		Note: (1) The TFA output amplitude max		
		need to be adjusted during the test as		
		required to obtain a measurable output		
		response (determined by test by engi-		
		neers in RS-I or DAS room.		
		(2) If panel temperature drifts		
		off the nominal test condition - adjust		
		FCM 2803 output from operator station		
		to correct - if cannot successfully		
		adjust - return to Step 5.		
	_ \			
	8)	Switch IFA input out of CIU.	·, ··,	
	9)	Set FCM 2803 back to auto.	· · · · · · · · · · · · · · · · · · ·	
			_	1020
			Test Revisi	1030 ion 0
			Page 2	228 of 543

		Initial	Date
8.2.9.2	Obtain process control open loop data required		
	for tuning of receiver temperature control loops		
	on panels 217, 219 & 221 (refer to figures 8.2.9-	·]	
	thru 8.2.9-3). Obtain both step & frequency		
	response data to valve disturbances at nominal		
	temperature of 660°F. Obtain step/ramp response		
	to small signal flux disturbances.		
8.2.9.2.1	Verify that the prerequisites have been met as		
	required in Section 4.0.		
8.2.9.2.2	Verify that the initial conditions have been		
0,11,111	established as required in Section 7.4.2.		
		,	
8.2.9.2.3	Re-establish the approximate heliostat config-		
	uration and flow conditions used for the 660		
	panel cure (see Section 8.2.8.12).		
8.2.9.2.4	Adjust flowrate setpoints (FCM 2702, FCM 2801,		
	FCM 2803) to achieve 660°F outlet panel steam		
	temperature on panels 217, 219 & 221.		
	Monitor TI2702, TI2804 & TI2806.		
8.2.9.2.5	Verify that the control test unit is installed		
	and operating on TV2702, TV2801 & TV2803.		· · · · · · · · · · · · · · · · · · ·
82026	Varify receiver foodpump is in proceure control		
0,2.9.2.0	(PC1105).		
		Test 1	030
		Revisi	on 0
		Page 2	29 of 543

		_	Initial	Date
8.2.9.2.7	0bta 217	ain open loop step response data on panel by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B)	Set FCM2702 to manual mode.		
	C)	Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pres- sures, flows, temperatures to reach steady state.		
		Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature flow of ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2702 (PV & CO), TI2702, TI2705, YI2708, PI2902.	-	
	D)	Implement a step increase (back to nominal) in FCM2702 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E)	Reset FCM2702 back to auto.	-,	
			Test Revis Page	 1030 ion 0 230 of 543

en loop step/ramp response to a flux ce on panel 217 by carrying out the steps. rm that the receiver panels are in a y state condition for approximately CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- y 10% of nominal power. Allow panel	r	
ce on panel 217 by carrying out the steps. rm that the receiver panels are in a y state condition for approximately CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- y 10% of nominal power. Allow panel	r	
steps. rm that the receiver panels are in a y state condition for approximately CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- y 10% of nominal power. Allow panel	r	
rm that the receiver panels are in a / state condition for approximately CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- / 10% of nominal power. Allow panel	r	
rm that the receiver panels are in a y state condition for approximately CM2702 to manual mode. nent a step/ramp decrease in the power on panels 217, 219, 221 by approxi- y 10% of nominal power. Allow panel	r	
y state condition for approximately CM2702 to manual mode. nent a step/ramp decrease in the power on panels 217, 219, 221 by approxi- y 10% of nominal power. Allow panel	r	
CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel	r	
CM2702 to manual mode. ment a step/ramp decrease in the power on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel	r	
CM2702 to manual mode. nent a step/ramp decrease in the power on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel	r	
nent a step/ramp decrease in the power on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel	r	
nent a step/ramp decrease in the power on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel	r	
on panels 217, 219, 221 by approxi- v 10% of nominal power. Allow panel		
v 10% of nominal power. Allow panel		
,		
ratures, pressure and flowrate to		
steady state. Monitor the follow-		
arameters on a strip chart recorder		
rify data is recorded: FCM2302		
CO), TI2702, TI2705, YI2708A/B,		
D1 (PV & CO), TI2801, TI2804,		
7A/B, FCM2803 (PV & CO), TI2803,		
6, YI2800A/B, and PI2902.		
An adjustment in the magnitude of		
he power change (number of helio-		
tats on/off target) may be required		
n order to achieve measurable respons	е	
hanges in flow and temperatures and		
lux. Flux change > 20% and		
emperature changes > 50 to 100°F are		1
esired.		
esired.		
	/ 10% of nominal power. Allow panel ratures, pressure and flowrate to steady state. Monitor the follow- arameters on a strip chart recorder rify data is recorded: FCM2302 CO), TI2702, TI2705, YI2708A/B, Ol (PV & CO), TI2801, TI2804, 7A/B, FCM2803 (PV & CO), TI2803, 5, YI2800A/B, and PI2902. An adjustment in the magnitude of he power change (number of helio- tats on/off target) may be required n order to achieve measurable respons hanges in flow and temperatures and lux. Flux change $\geq$ 20% and emperature changes $\geq$ 50 to 100°F are esired.	<pre>/ 10% of nominal power. Allow panel ratures, pressure and flowrate to steady state. Monitor the follow- arameters on a strip chart recorder rify data is recorded: FCM2302 CO), T12702, T12705, Y12708A/B, D1 (PV &amp; CO), T12801, T12804, 7A/B, FCM2803 (PV &amp; CO), T12803, 5, Y12800A/B, and P12902. An adjustment in the magnitude of he power change (number of helio- tats on/off target) may be required h order to achieve measurable response hanges in flow and temperatures and lux. Flux change <math>\geq</math> 20% and emperature changes <math>\geq</math> 50 to 100°F are esired.</pre>

Test 1030 Revision 0 Page 231 of 543

			Initial	Date
8.2.9.2.8	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel tem- peratures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM2702, FCM2801, FCM2803 back to auto.		-
8.2.9.2.9	Per (Se the	form frequency response tests on panel 217 e TC2702, Figure 8.2.9-1) by carrying out following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2702. (Installation is in RS-1).	·	
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyer output to be consistent with the required output change determined in Section 8.2.9.2.7C.		
		Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2702 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2702.		
			Test Revis Page 2	1030 ion 0 232 of 543

		_	Initial	Date
8.2.9.2.9	6)	Set FCM2702 to manual mode.		
	7)	Using the transfer function analyzer (TFA)		
		insert a 0.1 Hz sin wave into the CTU and		
		adjust the TFA output such that a +400 lb/		
		hr peak-to-peak response is achieved on		
		F12702.		
		Set the TFA to 0.02 Hz allow the system		
		to reach steady state (3-4) cycles.		
		Repeat 4) at a frequency of 0.05 Hz		
		Repeat 4) at a frequency of 0.07 Hz		
		Repeat 4) at a frequency of 0.1 Hz		
		Repeat 4) at a frequency of 0.2 Hz		
		Repeat 4) at a frequency of 0.5 Hz		
		Repeat 4) at a frequency of 0.7 Hz		
		Repeat 4) at a frequency of 1 Hz		
		Repeat 4) at a frequency of Hz mined		
		Repeat 4) at a frequency of Hz during test		
		Note: (1) The TFA output amplitude max		
		need to be adjusted during the test		
		as required to obtain a measurable		
		output response (determined by test		
		by engineers in RS-1 or DAS room.		
		(2) If panel temperature drifts		
		off the nominal test condition -		
		adjust FCM2102 output from operator		
		station to correct - if cannot		
		successfully adjust - return to		
		Step 5.		
			Test	1030
			кеvisi Page 2	on U 33 of 54

		_	Initial	Date
8.2.9.2.9	8)	Switch TFA input out of CTU.		
	9)	Set FCM2702 back to auto.		
8.2.9.2.10	0bt	ain open loop step response data on panel		
	219	by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a		
		5 minutes.		
	B)	Set FCM2801 to manual mode		
	C)	Implement a step decrease in FCM2801 output by approximately 10% of nominal value		
		(increase valve opening) and allow pressures flows, temperatures to reach steady state.	5,	
		Note: An adjust in the magnitude of the		
		valve step command may be required		
		in order to achieve a measurable		
		temporature flow of the lib (see		
		temperature - flow of $\pm$ .1 D/sec,		
		desired Record final command change		
		Monitor the following parameters on a		
		strip chart to verify that data is		
		recorded: $FCM2801$ (PV & CO), T12801.		
		TI2804, YI2807, PI2902.		
		FCM2801 Output%		
		Command Change		
			Toot	1020
			Revisi Page 2	on 0 34 of 543

		Initial	Date
8.2.9.2.10	D) Implement a step increase (back to nominal) in FCM2801 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2801 back to auto.		
8.2.9.2.11	Perform frequency response tests on panel 219 (See TC2801, Figure 8.2.9-2) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2801. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		<u></u>
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately</li> <li>minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.9.2.7C.		
	Note: Verify that the TFA input to the CTU is switched out.		
		Test 1 Revisi Page 2	030 on 0 35 of 543

		_	Initial	Date
8.2.9.2.11	5)	Select FCM2801 and adjust setpoint to		
		achieve a nominal 660°F steam outlet		
		temperature on TC2803.		
	6)	Set FCM 2801 to manual mode.		
	7)	Using the transfer function analyzer (TFA)		
		insert a 0.1 Hz sin wave into the ClU and		
		adjust the IFA output such that a + 400 lb/		
		hr peak-to-peak response is achieved on		
		F12501.		
		Set the TFA to 0.02 Hz allow the system to		
		reach steady state (3-4) cycles).		
		Repeat 4) at a frequency of 0.05 Hz		
		Repeat 4) at a frequency of 0.07 Hz		
		Repeat 4) at a frequency of 0.1 Hz		
		Repeat 4) at a frequency of 0.2 Hz		
		Repeat 4) at a frequency of 0.5 Hz		
		Repeat 4) at a frequency of 0.7 Hz		
		Repeat 4) at a frequency of 1 Hz		
		Repeat 4) at a frequency of Hz mined		
		Repeat 4) at a frequency of Hz during test		
		Note: (1) The TFA output amplitude max		
		need to be adjusted during the test		
		as required to obtain a measurable		
		output response (determined by test		
		by engineers in RS-1 or DAS room.		
				10-0
			Test	1030

Revision O Page 236 of 543

	-	Initial	Date
8.2.9.2.11	7) Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2801 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU		
	9) Set FCM2801 back to auto		
8.2.9.2.12	Obtain open loop step response data on panel 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> <li>5 minutes.</li> </ul>		
	B) Set FCM2803 to manual mode.		
	C) Implement a step decrease in FCM2803 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
		_	
		lest 1 Revisi Page 2	U30 on 0 37 of 543

		-	Initial	Date
8.2.9.2.12	C)	Note: An adjustment in the magnitude of		
		the valve step command may be required		
		in order to achieve a measurable		
		response change in flow and temperature	-	
		flow of $\pm$ .1 lb/sec, temperatures of		
		$\pm$ 50 to 100°F are desired. Record		
		final command change. Monitor the		
		following parameters on a strip chart		
		to verify that data is recorded:		
		FCM2803 (PV & CO), T12803, T12806		
		Y12809 PI2902		
		FCM2803 Output%		
		Command Change		
	D)	Implement a step increase (back to nominal)		
		in FCM2803 output (closing valve) and allow		
		temperatures, pressure and flowrate to		
		reach steady state conditions.		
	E)	Reset FCM2803 back to auto.		
2 2 0 2 13	Por	form frequency response tests on panel 221		
	(Se	e T(2803 Figure 8 2 $9-3$ ) by carrying out		
	the	following steps		
	CIIC	torrowing steps.		
	1)	Verify that the controls test unit (CTU)		
		is installed and operating on TC2803.		
		(Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure		
		control mode (PC1105).		
		_		
			Test 10	)30 Dr. 0
			10110N	<u>ו מו</u>

Revision O Page 238 of 543

		_	Initial	Date
8.2.9.2.13	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.9.2.7C.		
		Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2803 and adjust setpoint to achiev a nominal 660°F steam outlet temperature on TC2803.	e	
	6)	Set FCM2803 to manual mode		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 Hz sin wave into the CTU and adjust the TFA output such that a + 400 lb/ hr peak-to-peak response is achieved on FI2803.		
		Set the TFA to 0.02 Hz allow the system to reach steady state (3-4) cycles.		
		Repeat 4) at a frequency of 0.05 Hz Repeat 4) at a frequency of 0.07 Hz Repeat 4) at a frequency of 0.1 Hz Repeat 4) at a frequency of 0.2 Hz Repeat 4) at a frequency of 0.5 Hz Repeat 4) at a frequency of 0.7 Hz Repeat 4) at a frequency of 1 Hz		
			Test	1030
			Page	239 of 543

			Initial	Date
8.2.9.2.13	7)	Repeat 4) at a frequency of Hz Deter- mined Repeat 4) at a frequency of Hz during test		
		Note: (1) The TFA output amplitude max need to be adjusted during the test as required to obtain a measurable output response (determined by test by engineers in RS-1 or DAS room.		
		(2) If panel temperature drifts off the nominal test condition - adjust FCM2803 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8)	Switch TFA input out of CTU.		
	9)	Set FCM2803 back to auto.		·
			Test 1 Revis Page 1	 030 ion 0 240 of 543

	_	Initial	Date
8.2.9.3	Obtain closed loop response data on panel temperature controllers (TC2702, TC2801 & TC2803 to temperature set point and flux changes at a nominal temperature of 660°F. Tune control loops as required.		
8.2.9.3.1	Verify that the receiver panel 217 is in a steady state condition at approximately 485 psig and 660°F. TC2702 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.9.3.2	Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2702, set to console mode and set temperature setpoint to current PV value.		
8.2.9.3.3	Initiate panel metal temperature control on TC2702. Select TD2702 and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactorily control metal temperature, select TD2702A and switch back to flow control. Also select TD2702B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.9.3.1).		
		Test 1 Revis Page 2	030 ion 0 241 of 543

	_	Initial	Date
8.2.9.3.4	Tune TC2702 - panel metal temperature controller (See Figure 8.2.9-1) by carrying out the follow-		
	ing steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2702 by 10% and observe the response on the strip chart.		
	C) Increase TC2702 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain Kl (C1-7, AL-32)*.		
	E) Repeat step B D as required until response is satisfactory.		
	F) Decrease TC2702 setpoint 10% and observe response on strip chart.		
	G) Increase TC2702 setpoint to nominal value and observe temperature response on strip chart.		
	H) Increase/decrease reset gain, K2 (Cl-7, AL-32) in the $\pm$ 30 increments.		
	I) Repeat steps F H as required until response is satisfactory.		

Test 1030 Revision O Page 242 of 543

		Initial	Date
8.2.9.3.4	J) Establish preliminary TC2702 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.9.3.5	Verify that the receiver panel 219 is in a steady state condition at approximately 485 psi and 660°F. TC2801 in flow control. Adjust flow setpoint if required to achieve 660°F.	g	
8.2.9.3.6	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2801, set to console mode and set temperature setpoint to current PV value.		
8.2.9.3.7	Initiate panel metal temperature control on TC2801. Select TD2801B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactorily control metal temperature, select TD2801A and switch back to flow control. Also select TD2801B and switch out metal tem- perature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.9.3.5).		
		Test Revi Page	1030 sion 0 243 of 54

		-	Initial	Date
8.2.9.3.8	Tun con out tun	e TC2801 - panel metal temperature troller (See Figure 8.2.9-2) by carrying the following steps using the loop ing form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2801 by 10% and observe the response on the strip chart.		
	C)	Increase TC2801 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-8, AL-32)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2801 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2801 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-8, AL-32) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		

Test 1030 Revision 0 Page 244 of 543

		Initial	Date
8.2.9.3.8	J) Establish preliminary TC2803 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.9.3.9	Verify that the receiver panel 221 is in a steady state condition at approximately 485 psig and 660°F. TC2803 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.9.3.10	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2803, set to console mode and set temperature setpoint to current PV value.		
8.2.9.3.11	Initiate panel metal temperature control on TC2803. Select TD2803B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, select TD2803A and switch back to flow control. Also select TD2803B and switch out metal temperature loop - consult test engi- neer for controller parameter adjustments and go back to Section 8.2.9.3.9).		
		Test 1 Revis Page 2	1 030 ion 0 245 of 543

		_	Initial	Date
8.2.9.3.12	Tun	e TC2803 - panel metal temperature controller		
	(Se	e Figure 8.2.9-3) by carrying out the follow-		
	ing	steps using the loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature setpoint of TC2803 by		
		10% and observe the response on the strip chart.		
	C)	Increase TC2803 setpoint back to nominal		
		value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl		
		(C1-9, AL-32)*.		
	E)	Repeat steps B D as required until		
		response is satisfactory.		
	F)	Decrease TC2803 setpoint 10% and observe		
		response on strip chart.		
	G)	Increase TC2803 setpoint to nominal value		
		and observe temperature response on strip		
		chart.		
	H)	Increase/decrease reset gain, K2 (Cl-9,		
		AL-32) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until		
	-	response is satisfactory.		
			Test 1	030

Revision O Page 246 of 543

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		_	Initial	Date
8.2.9.3.12	J)	Establish preliminary TC2803 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
8.2.9.3.13	0bt & T 219	ain closed loop response on TC2702, TC2801, C2803 to a flux disturbance on panels 217, & 221 by carrying out the following steps.		
	A)	Confirm that receiver panels 217, 219 & 221 are in a steady state condition for approximately 2 minutes.		
	B)	Confirm TC2702, TC2801 & TC2803 are in metal temperature control mode.		
	C)	Implement a step/ramp decrease in the power level on panel 217, 219, & 221 by approxi- mately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2702, TI2702, TI2705, YI2708A/B, FCM2801, TI2801, TI2804, YI2807A/B, FCM2803, TI2803, TI2806, YI2809A/B, PI2902.		
			Test Revis Page 2	030 ion 0 247 of 543

		_	Initial	Date
8.2.9.3.13	C)	Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and flow changes $\geq 1000$ lb/hr are desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response TC2702, TI2801 & TC2803. If temperature excursions exceed $\pm$ 50°F - adjust flux loop gains via the following.		
		1) Set receiver console to configure mode.		
		<ol> <li>Select Cl-7, AL-36, Cl-8, AL-36, Cl-9, AL-36 - using loop tuning form increase/decrease gain and low time constant as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain		
	G)	Set console back to monitor mode		
			Test Revis Page 2	1030 ion 0 248 of 543

		Initial	Date	
8.2.9.4	Obtain closed loop response data on panel			
	temperature controllers TC2702, TC2801,			
	& TC2803 to temperature set point and flux			
	changes at a nominal temperature of 850°F.			
	Tune control loops are required.			
8.2.9.4.1	Verify that the receiver panel 217 is in a			
	steady state condition at approximately			
	485 psig and 660°F. TC2702 in metal			
	temperature control. Adjust setpoint if			
	required to achieve 660°F.			
8.2.9.4.2	Confirm that the test data base is configured			
	to initiate and maintain panel metal tempera-			
	ture control. Select TC2702, set to console			
	mode and set temperature setpoint to 850°F.	1		
8.2.9.4.3	Allow panel to achieve steady state temperature.			
	Note: If controller fails to satisfactorily			
	control metal temperature, select TC2702			
	and switch back to 660°F setpoint -			
	consult test engineer for controller			
	parameter adjustments and go back to			
	Section 8.2.9.4.1).			
8.2.9.4.4	Tune TC2702 - panel metal temperature controller			
	(See Figure 8.2.9-1) by carrying out the			
	following steps using the loop tuning form.			
	A) Set receiver console to configure mode.			
		Test 1	030	
		Revisi	on 0	
		Page Z	49 OT 543	
		_	Initial	Date
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8.2.9.4.4	В)	Decrease temperature setpoint to TC2702 by 10% and observe the response on the strip chart.		
	C)	Increase TC2702 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-7, AL-32)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2702 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2702 setpoint to nominal value and observe temperature response on strip chart.		
	Н)	Increase/decrease reset gain, K2 (Cl-7, AL-32) in the ± 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2702 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			 Test 1 Revisi Page 2	030 on 0 50 of 543

		Initial	Date
8.2.9.4.5	Verify that the receiver panel 219 is in a steady state condition at approximately 485 psig and 660°F. TC2801 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
8.2.9.4.6	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2801, set to console mode and set temperature setpoint to 850°F.		
8.2.9.4.7	Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactorily control metal temprature, select TC2801 and switch back to 660°F setpoint - consult test engineer for controller parameter adjustments and go back to Section 8.2.9.4.1).		
8.2.9.4.8	Tune TC2801 - panel metal temperature controller (See Figure 8.2.9-2) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2801 by 10% and observe the response on the strip chart.		
	C) Increase TC2801 setpoint back to nominal value and observe the response on the strip chart.		
		Test 1 Revisi Page 2	030 030 0n 0 251 of 543

		Initial	Date
8.2.9.4.8	D) Increase/decrease proportional gain Kl (C1-8, AL-32)*.		
	E) Repeat steps B D as required until response is satisfactory.		
	F) Decrease TC2801 setpoint 10% and observe response on strip chart.		
	G) Increase TC2801 setpoint to nominal value and observe temperature response on strip chart.		
	H) Increase/decrease reset gain, K2 (C1-8, AL-32) in the ± 30 increments.		
	I) Repeat steps F H as required until response is satisfactory.		
	J) Establish preliminary TC2801 controller gains in metal temperature control mode and record.		
	K) Adjust setpoints, alarms, and limits if required.		
8.2.9.4.9	Verify that the receiver panel 221 is in a steady state condition at approximately 485 psig and 660°F. TC2803 in metal temperature control. Adjust setpoint if required to achieve 660°F.		
		 Test 1 Revisi Page 2	030 on 0 52 of 543

	_	Initial	Date
8.2.9.4.10	Confirm that the test data base is configured		
	to initiate and maintain panel metal tempera-		
	ture control. Select TC2803, set to console		
	mode and set temperature setpoint to 850°F.		
8.2.9.4.11	Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory		
	control metal temperature, select TC2803		
	and switch back to 660°F setpoint -		
	consult test engineer for controller		
	narameter adjustments and go back to		
	Section $8 2.9 4.9$		
		·····	
8 2 9 / 12	Tune TC2803 - panel metal temprature controller		
0.2.9.4.12	(See Figure 8.2.9-3) by carrying out the		
	following stops using the loop tuning form		
	Torrowing steps using the roop turning room.		
	A) Set receiver console to configure mode.		
	R) Decrease temperature setucint of TC2803		
	by $10\%$ and observe the response of the		
	strip chart		
	C) Increase TC2803 setpoint back to nominal		
	value and observe the response on the		
	strip chart.		
	D) Increase/decrease proportional gain Kl		
	$(C_{1}-9, A_{1}-32)*$		
	F) Repeat steps B D as required until		
	response is satisfactory		
		T	000
		Revisi	030 on 0
		Page 2	53 of 543

			Initial	Date
8.2.9.4.12	F)	Decrease TC2803 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2803 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-9, AL-32) in the ± 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2803 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
8.2.9.4.13	0bt & T 219	ain closed loop response on TC2702, TC2801, C2803 to a flux disturbance on panels 217, & 221 by carrying out the following steps.		
	A)	Confirm that receiver panels 217, 219 & 221 are in a steady state condition for approximately 2 minutes.		
	B)	Confirm TC2702, TC2801 & TC2803 are in metal temperature control mode.		
			Test 1 Revis	030 ion 0
			Page 2	2 <b>54</b> of 543

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		_	Initial	Date
8.2.9.4.13	C)	Implement a step/ramp decrease in the power level on panel 217, 219, & 221 by approxi- mately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2702, TI2702, TI2705, YI2708A/B, FCM2801, TI2801, TI2804, YI2807A/B, FCM2803, TI2803, TI2806, YI2809A/B, PI2902.		
		Note: An adjustment in the magnitude of the power change (number of helio- stats on/off target) may be required in order to achieve measurable response changes in flow and tempera- tures and flux. Flux changes $\geq$ kw/m <sup>2</sup> and flow changes $\geq$ 1000 lb/hr are desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressure, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response TC2702, TI2801 & TC2803. If temperature excursions exceed ± 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
			Test Revis Page 2	  030 ion 0 255 of 54

			Initial	Date
3.2.9.4.13	E)	<ol> <li>Select Cl-7, AL-36, Cl-8, AL-36, Cl- AL-36 - using loop tuning form increase/decrease gain and low time constant as required.</li> </ol>	-4,	
	F)	If gains are adjusted repeat Steps C thr E. Record final tuned flux loops gain.	•u	
	G)	Set console back to monitor mode.		
			Test 1	030
			Revisio Page 2	on 0 56 of 543

	_	Initial	Date
8.2.10	CONTROL TESTS - LOW FLOW - PANELS 204, 208, 217, 221		
8.2.10.1	Obtain process control open loop data sequences for tuning of receiver tempera- ture control loops on panels 204, 208, 217, 221. Obtain both step and frequency response both to valve disturbance at nominal temper- ature of 660°F and start-up flow conditions. Obtain step/ramp response to small signal flux disturbances.		
8.2.10.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.2.10.1.2	Verify that the initial conditions have been established as required in Section 7.4.2.		
8.2.10.1.3	Establish the plant startup heliostat con- figuration for panels 204, 208, 217, 221 Ref. Plant Operating/Training Manual, RADL 2-36, Appendix A.		
8.2.10.1.4	Adjust flowrate setpoints (FCM2301, FCM2402, FCM2702, FCM2803) to achieve 660°F outlet panel steam temperature on panels 204, 208, 217, 221. Monitor TI2301, TI2402, TI2702, TI2803.		
8.2.10.1.5	Verify that the control test unit is in- stalled and operating on TV2301, TV2402, TV2702, TV2803.		

Test 1030 Revision 0 Page 257 of 543

	-	Initial	Date
8.2.10.1.6	Verify receiver feedpump is in pressure control (PC1105).		
8.2.10.1.7	Obtain open loop step response data on panel 204 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a ready state condition for approxi- mately 5 minutes.		
	B) Set FCM2301 to manual mode.		
	C) Implement a step decrease in FCM2301 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ± 0.1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final com- mand change. Monitor the following parameters on a strip chart to verify that the following parameters on a strip chart to verify that data is recorded: FCM2301 (PV & CO), TI2301, TI2304, YI2307, PI2902.		
	FCM2301 Output% Command Change	Toot	020
		Revisi Page 2	oso on O 58 of 543

		Initial	Date
	D) Implement a step increase (back to nominal) in FCM2301 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2301 back to auto.		
8.2.10.1.8	Obtain loop step/ramp response to a flux disturbance on panel 204 and 208 by carry- ing out the following steps.		
	A) Confirm that the receiver panels are in a ready state condition for approxi- mately 5 min.		
	B) Set FCM2301 and FCM2402 to manual mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 and 208 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301 (PV & CO), TI2301, TI2304, YI2307A/B, FCM2402, TI2402, TI2405, YI2408A/B, PI2902.		
		Test 1 Revisi Page 2	030 on 0 59 of 543

	-	Initial	Date
	Note: An adjustment in the magnitude of the power change (number of heliostats on/ off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\geq 50$ to $100^{\circ}$ F are desired.		
	D) Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor as in Section C.		
	E) Set FCM2301 and FCM2402 back to auto.		
8.2.10.1.9	Perform frequency response tests on panel 204 (see TC2301, Figure 8.2.7-1) by carry- ing out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2301. (Installation is in RS-1.)</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	3) Confirm that the receiver panels are in a steady-state condition for approxi- mately 2 minutes.		
		Test 10 Revisio Page 20	)30 on 0 50 of 543

	-	Initial	Date
4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.7.1.7 C.		
Not	e: Verify that the TFA input to the CTU is switched out.		
5)	Select FCM2301 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2301		
6)	Set FCM2301 to manual mode		
7)	Using the transfer function analyzer (TFA) insert a 0.1 Hz sin wave into the CTU) and adjust the TFA output such that a +400 lb/hr peak-to-peak response is achieved on FI2301.		
	Set the TFA to 0.02 Hz allow the system to reach steady state (3-4 cycles.		
	Repeat 4) at a frequency of 0.05 Hz Repeat 4) at a frequency of 0.07 Hz Repeat 4) at a frequency of 0.1 Hz Repeat 4) at a frequency of 0.2 Hz Repeat 4) at a frequency of 0.5 Hz Repeat 4) at a frequency of 1 Hz Repeat 4) at a frequency of 1 Hz Repeat 4) at a frequency of 1 Hz	nined J	

Test 1030 Revision O Page 261 of 543

				Initial	Date
	Note	e: (1)	The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room.		
		(2)	If panel temperature drifts off the nominal test condition - adjust FCM2301 output from operator station to correct if cannot successfully adjust - return to Step 5.		
	8)	Switch	TFA input out of CTU.		
	9)	Set FC	M2301 back to auto		
8.2.10.1.10	0bt 208	ain ope by car	n loop step response data on panel rying out the following steps.		
	A)	Confir in a s mately	m that the receiver panels are teady state condition for approxi- 5 minutes.		
	B)	Set FC	M2402 to manual mode.		
	C)	Implem output value pressu steady	ent a step decrease in FCM2402 by approximately 10% of nominal (increase valve opening) and allow res, flows, temperatures to reach state.		
				Test 1	030

Revision O Page 262 of 543

	-	Initial	Date
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following param- eters on a strip chart to verify that data is recorded: FCM2402 (PV & CO), T12402, T12405, Y12408, P12902.		
	FCM2402 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2402 output (closing valve) and allow temperatures, pres- sures and flowrate to reach steady state conditions.		
	E) Reset FCM2402 back to auto		
8.2.10.1.11	Perform frequency response tests on panel 208 (see TC2402, Figure 8.2.7-2) by carry- ing out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2402. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
		 Test 1 Revisi Page 2	030 on 0 63 of 543

	-	Initial	Date
3)	Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.		
4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.10.1.10 C.		
Not	e: Verify that the TFA input to the CTU is switched out.		
5)	Select FCM2402 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2402.		
6)	Set FCM2402 to manual mode.		
7)	Using the transfer function analyzer (TFA) insert a O.1 Hz sin wave into the CTU) and adjust the TFA output such that +400 lb/hr peak-to-peak response is achieved on FI2402.		
	Set the TFA to 0.2 Hz allow the system to reach steady state (3-4) cycles).		
	Repeat 4) at a frequency of 0.05 Hz Repeat 4) at a frequency of 0.07 Hz Repeat 4) at a frequency of 0.1 Hz Repeat 4) at a frequency of 0.2 Hz Repeat 4) at a frequency of 0.5 Hz		
		 Test 10 Revisi Page 2	030 on 0 64 of 543

		Initial	Date
	$P_{opol}(A)$ at a frequency of 0.7 Hz		
	Repeat 4) at a frequency of $1 \text{ Hz}$		
	Repeat 4) at a frequency of Hz Determ Repeat 4) at a frequency of Hz during Repeat 4) at a frequency of Hz test	ined	
	<ul> <li>Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measurable output response (determined by test by engineers in RS-1 or DAS room.</li> <li>(2) If panel temperature drifts off the nominal test condition - adjust FCM2402 output from operator station to correct -</li> </ul>		
	if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2402 back to auto.		
8.2.10.1.12	Obtain open loop step response data on panel 217 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition of approxi- mately 5 minutes.		
	B) Set FCM2702 to manual mode.		
		Test 1 Revisi Page 2	030 on 0 65 of 543

		-	Initial	Date
	C)	Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	D)	e: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following param- eters on a strip chart to verify that data is recorded: FCM2702 (PV & CO), TI2702, TI2705, YI2708, PI2902. FCM2702 Output% Command Change Implement a step increase (back to nominal) in FCM2702 output (closing valve) and allow temperatures, pres- sure and flowrate to reach steady state		
	E)	conditions		
8.2.10.1.13	Obt flu out	ain open loop step/ramp response to a ax disturbance on panel 217 by carrying the following steps.		
			Test Revisi Page 2	030 on 0 66 of 543

		Initial	Date
A)	Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
B)	Set FCM2702 to manual mode.		
C)	Implement a step/ramp decrease in the power level on panels 217 and 221 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2302 (PV & CO), TI2702, TI2705, YI2708A/B, FCM2803 (PV & CO), TI2803, TI2806, YI2809A/B		
Not	e: An adjustment in the magnitude of the power change (number of heliostats on/ off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\geq 50$ to $100^{\circ}$ F are desired.		
D)	Implement a step/ramp increase in power (back to nominal). Allow panel temper- atures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
E)	Set FCM2702 and FCM2803 back to auto.		
		Test 1 Revis Page 2	030 on 0 267 of 543

		-	Initial	Date
8.2.10.1.14	Per	form frequency response tests on panel		
	217	(See TC2702, Figure 8.2.9-1) by carrying		
	out	the following steps.		
	1)	Verify that the controls test unit (CTU)		
		is installed in RS-1).		
	2)	Verify the receiver feedpump is in pressure		
	-,	control mode (PC1105).		<u> </u>
	3)	Confirm that the receiver namels are in		
	57	a steady state condition for approximately		
		2 minutes.		
	<u>4</u> )	Adjust the neak to neak amplitude on the		
	4)	transfer function analyzer output to be		
		consistent with the required output change		
		determined in Section 8.2.10.1.7 C.		
	Not	e: Verify that the TFA input to the CTU		
		is switched out.		
	5)	Select ECM2702 and adjust setpoint to		
	5)	achieve a nominal 660°F steam outlet		
		temperature on TC2702		
	6)	Set ECM2702 to manual mode		
	0)			
	7)	Using the transfer function analyzer		
		(TFA) insert a 0.1 HZ sin wave into the		
		CTU) and adjust the TFA output such		
		that a + 400 ID/hr peak-to-peak response is achieved on EI2702		
			Test 1	030
			Povici	n 0

Revision O Page 268 of 543

		Initial	Date
8.2.10.1.14	<ol> <li>Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).</li> </ol>		
	Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of HZ	ermined ing test	
	<ul> <li>(2) If panel temperature drifts off the nominal test condition - adjust FCM2702 output from operator station to correct - if cannot successfully adjust - return to Step 5.</li> <li>8) Switch TEA input out of CTU</li> </ul>		
	by Switch ITA Input out of cio.		
	9) Set FCM2702 back to auto.		
		Test 1 Revisio Page 20	030 on 0 59 of 543

	,	Initial	Date
8.2.10.1.15	Obtain open loop step response data on panel		
	221 by carrying out the following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approxi-		
	mately 5 minutes.		
	B) Set FCM2803 to manual mode.		
	C) Implement a step decrease in FCM2803 out-		
	put by approximately 10% of nominal value		
	(increase valve opening) and		
	allow pressures, flows, temperatures to		
	reach steady state.		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in		
	order to achieve a measureable response		
	change in flow and temperature - flow of		
	$\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F		
	are desired. Record final command change.		
	Monitor the following parameters on a		
	strip chart to verify that data is		
	recorded: RCM2803 (PV & CO), TI2803,		
	TI2806, YI2809, PI2902.		
	FCM2803 Output		
	Command Change		
	communa change		
	D) Implement a step increase (back to		
	nominal) in FCM2803 output (closing		
	valve) and allow temperatures, pressure		
	and flowrate to reach steady state		
	conditions.		
		Test 1	030
		Page	270 of 543

		Initial	Date
8.2.10.1.15	E) Reset FCM2803 back to auto.		<u> </u>
8.2.10.1.16	Perform frequency response tests on panel 221 (See TC2803, Figure 8.2.9-3) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2803. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.2.9.1.7 C.		
	Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2803 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2803.		
	6) Set FCM2803 to manual mode		
		Test 1 Revisi Page 2	030 on 0 71 of 543

				Initia	al Date
3.2.10.1.16	7)	Using t	ne transfer function analyzer		
		(TFA) iı	nsert a 0.1 HZ sin wave into		
		the CTU	) and adjust the TFA output		
		such tha	at a + 400 lb/hr peak-to-peak		
		response	e is achieved on FI2803.		
		Set the	TFA to 0.02 HZ allow the system	1	
		to reac	n steady state (3-4) cycles).		
		Repeat 4	1) at a frequency of 0.05 HZ		
		Repeat 4	1) at a frequency of 0.07 HZ		
		Repeat 4	1) at a frequency of 0.1 HZ		
		Repeat 4	1) at a frequency of 0.2 HZ		
		Repeat 4	1) at a frequency of 0.5 HZ		
		Repeat 4	1) at a frequency of 0.7 HZ		
		Repeat 4	1) at a frequency of 1 HZ		
		Repeat 4	<pre>1) at a frequency of HZ</pre>	Determine	d
		Repeat 4	1) at a frequency of HZ	during te	st
	Not	e: (1)	The TFA output amplitude may		
			need to be adjusted during		
			the test as required to obtain		
			a measureable output response		
			(determined by test by engi-		
			neers in RS-1 or DAS room.		
		(2)	If panel temperature drifts		
			off the nominal test condition	-	
			adjust FCM2803 output from		
			operator station to correct -		
			if cannot successfully		
			adjust - return to Step 5.		
				Te	st 1030
				Ke Pa	VISION U de 272 of 543

			Initial	Date
8.2.10.1.16	8)	Switch TFA input out of CTU.		
	9)	Set FCM2803 back to auto.		
			Test Revi Page	: 1030 sion 0 273 of 543

8.2.10.2 Obtain closed loop response data on panel temperature controllers TC2301, TC2402, TC2702, TC2803 to temperature setpoint and	
flux changes at a nominal temperature of 660°F and equivalent start-up flow conditions. Tune control loops as required.	
8.2.10.2.1 Verify that the receiver panel 204 is in a steady state condition at approximately 485 psig and 660°F. Verify that the heliostat field is in the plant start-up configuration. TC2301 in flow control. Adjust flow setpoint if required to achieve 660°F.	
8.2.10.2.2 Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2301, set to console mode and set temperature setpoint to current PV value.	
<ul> <li>8.2.10.2.3 Initiate panel metal temperature control on TC2301. Select TD2301B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature, Select TD2301A and switch back to flow control. Also Select TD2301B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.1).</li> </ul>	

Test 1030 Revision 0 Page 274 of 543

		Initial	Date
8.2.10.2.4	Tune TC2301 - panel metal temperature con- troller (See Figure 8.2.7.3-1) by carrying		
	out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2301 by 10% and observe the response on the strip chart.		
	C) Increase TC2301 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain Kl (Cl-1, AL-12)*.		
	E) Repeat steps B D as required until response is satisfactory.		
	F) Decrease TC2301 setpoint 10% and observe response on strip chart.		
	G) Increase TC2301 setpoint to nominal value and observe temperature response on strip chart.		
	H) Increase/decrease reset gain, K2 (C1-1, AL-12) in the ± 30 increments.		
	I) Repeat steps F H as required until response is satisfactory.		
		Tost 1	030

Test 1030 Revision 0 Page 275 of 543

<ul> <li>8.2.10.2.4 J) Establish preliminary TC2301 controller gains in metal temperature control mode and record.</li> <li>K) Adjust setpoints, alarms, and limits if required.</li> <li>8.2.10.2.5 Verify that the receiver panel 208 is in a steady state condition at approximately 485 psig and 660°F. TC2402 in flow control. Adjust flow setpoint if required to achieve 660°F.</li> <li>8.2.10.2.6 Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2402, set to console mode and set temperature setpoint to current PV value.</li> <li>8.2.10.2.7 Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5.</li> </ul>			Initial	Date
<ul> <li>K) Adjust setpoints, alarms, and limits if required.</li> <li>8.2.10.2.5 Verify that the receiver panel 208 is in a steady state condition at approximately 485 psig and 660°F. TC2402 in flow control. Adjust flow setpoint if required to achieve 660°F.</li> <li>8.2.10.2.6 Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2402, set to console mode and set temperature setpoint to current PV value.</li> <li>8.2.10.2.7 Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature, Select TD2402A and switch back to flow control. Also Select TD2402B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5.</li> </ul>	8.2.10.2.4	J) Establish preliminary TC2301 controller gains in metal temperature control mode and record.		
<ul> <li>8.2.10.2.5 Verify that the receiver panel 208 is in a steady state condition at approximately 485 psig and 660°F. TC2402 in flow control. Adjust flow setpoint if required to achieve 660°F.</li> <li>8.2.10.2.6 Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2402, set to console mode and set temperature setpoint to current PV value.</li> <li>8.2.10.2.7 Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature. Select TD2402A and switch back to flow control. Also Select TD2402B and switch out metal temperature for controller parameter adjustments and go back to Section 8.2.10.2.5.</li> </ul>		K) Adjust setpoints, alarms, and limits if required.		
<ul> <li>8.2.10.2.6 Confirm that the test data base is configured to initiate and maintain panel metal temperature control. Select TC2402, set to console mode and set temperature setpoint to current PV value.</li> <li>8.2.10.2.7 Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature, Select TD2402A and switch back to flow control. Allso Select TD2402B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5.</li> </ul>	8.2.10.2.5	Verify that the receiver panel 208 is in a steady state condition at approximately 485 psig and 660°F. TC2402 in flow control. Adjust flow setpoint if required to achieve 660°F.		
<ul> <li>8.2.10.2.7 Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.</li> <li>Note: If controller fails to satisfactory control metal temperature, Select TD2402A and switch back to flow control. Also Select TD2402B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5.</li> </ul>	8.2.10.2.6	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2402, set to console mode and set temperature setpoint to current PV value.		
Note: If controller fails to satisfactory control metal temperature, Select TD2402A and switch back to flow control. Also Select TD2402B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5. Test 1030	8.2.10.2.7	Initiate panel metal temperature control on TC2402. Select TD2402B and initiate switch to on position. Allow panel to achieve steady state temperature.		
Test 1030		Note: If controller fails to satisfactory control metal temperature, Select TD2402A and switch back to flow control. Also Select TD2402B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.5.		
			Test	1030

Revision O Page 276 of 543

		Initial	Date
8.2.10.2.8	Tune TC2402 - panel metal temperature con- troller (See Figure 8.2.7-2) by carrying out the following steps using the loop		
	tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2402 by 10% and observe the response on the strip chart.		
	C) Increase TC2402 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain Kl (Cl-3, AL-12)*.		
	E) Repeat steps B D as required until reponse is satisfactory.		
	F) Decrease TC2402 setpoint 10% and observe response on strip chart.		
	G) Increase TC2402 setpoint to nominal value and observe temperature response on strip chart.	2	
	H) Increase/decrease reset gain, K2 (C1-3, AL-12) in the ± 30 increments.		
	I) Repeat steps F H as required until re- sponse is satisfactory.		
		l Test 1	030

Revision 0 Page 277 of 543

			Initial	Date
8.2.10.2.8	J)	Establish preliminary TC2402 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
8.2.10.2.9	0bta TC24 208	ain closed loop response on TC2301 & 402 to a flux disturbance on panel 204 & by carrying out the following steps.		
	A)	Confirm that receiver panels 204 & 208 are in a steady state condition for approxi- mately 2 minutes.		
	B)	Confirm TC2301 & TC2402 is in metal temperature control mode.		
	C)	Implement a step/ramp decrease in the power level on panel 204 & 208 by approxi- mately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: FCM2301, (PV & CO) TI2301, TI2304, YI2307A/B, FCM2402, (PV & CO), TI2402, TI2405, YI2408A/B, PI2902.	2	
	Note	e: An adjustment in the magnitude of the		
		power change (number of heliostats on/off target) may be required in order to achieve		
		measureable response changes in flow and		
			Test	  030

Revision O Page 278 of 543

		Initial	Date
8.2.10.2.9	temperatures and flux. Flux changes		
	$\geq$ 20% and flow changes $\geq$ 1000 lb/hr		
	are desired.		
	D) Implement a step/ramp increase in panel		
	power (back to nominal). Allow panel		
	temperatures, pressures, flux and flows		
	to reach a steady state condition.		
	Monitor and adjust as in Section C.		
	E) Observe temperature response TI2301 &		
	TI2402. If temperature excursions		
	exceed ± 50°F - adjust flux loop gains		
	via the following.		
	<ol> <li>Set receiver console to configure</li> </ol>		
	mode.		
	2) Soloct (1, 1, $\lambda$ ) 16 and (1, 3, $\lambda$ ) $=$ 16 $=$		
	2) Select CI-1, AL-10 and CI-3, AL-10 -		
	deenesse gain and low time constant		
	as required		
	as required.		
	F) If gains are adjusted repeat Steps C		
	thru E. Record final tuned flux loops		
	gain.		
	G) Set console back to monitor mode.		
.2.10.2.10	Obtain closed loop response data on panel		
	temperature controllers TC2702 & TC2803 to		
	temperature setpoint and flux changes at a		
	nominal temperature of 660°F. Tune control		
	loops as required.		
		Test 1	030
		Revisi	on O
		Page 2	79 of 543

		Initial	Date
8.2.10.2.11	Verify that the heliostat field is in plant start-up configuration for panels 217, 221. Verify that the receiver panel 217 is in a steady state condition at approximately 485 psig and 660°F. TC2702 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.10.2.12	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2702 set to console mode and set temperature setpoint to current PV value.		
8.2.10.2.13	Initiate panel metal temperature control on TC2702. Select TD2702B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, Select TD2702A and switch back to flow control. Also Select TD2702B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.1.		
8.2.10.2.14	Tune TC2702 - panel metal temperature con- troller (See Figure 8.2.9-1) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
		 Test 1 Revisi Page 2	030 on 0 80 of 543

		_	Initial	Date
8.2.10.2.14	B)	Decrease temperature setpoint of TC2702 by 10% and observe the response on the strip chart.		
	C)	Increase TC2702 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-7, AL-32)*.		
	E)	Repeat steps B D as required until response is satsifactory.		
	F)	Decrease TC2702 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2702 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (C1-7, AL-32) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2702 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		
			Test Revisi Page 2	030 on 0 81 of 543

		Initial	Date
8.2.10.2.15	Verify that the receiver panel 221 is in a steady state condition at approximately 485 psig and 660°F. TC2803 in flow control. Adjust flow setpoint if required to achieve 660°F.		
8.2.10.2.16	Confirm that the test data base is configured to initiate and maintain panel metal tempera- ture control. Select TC2803, set to console mode and set temperature setpoint to current PV value.		
8.2.10.2.17	Initiate panel metal temperature control on TC2803. Select TD2803B and initiate switch to on position. Allow panel to achieve steady state temperature.		
	Note: If controller fails to satisfactory control metal temperature, Select TD2803A and switch back to flow control. Also Select TD2803B and switch out metal temperature loop - consult test engineer for controller parameter adjustments and go back to Section 8.2.10.2.15.		
8.2.10.2.18	Tune TC2803 - panel metal temperature con- troller (See Figure 8.2.9-1) by carrying out the following steps using the loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint of TC2803 by 10% and observe the response on the strip chart.	Test 1 Revist Page 2	030 on 0 82 of 543

		_	Initial	Date
8.2.10.2.18	C)	Increase TC2803 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain Kl (Cl-9, AL-32)*.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2803 setpoint 10% and observe response on strip chart.		
	G)	Increase TC2803 setpoint to nominal value and observe temperature response on strip chart.		
	H)	Increase/decrease reset gain, K2 (Cl-9, AL-32) in the $\pm$ 30 increments.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish preliminary TC2803 controller gains in metal temperature control mode and record.		
	K)	Adjust setpoints, alarms, and limits if required.		

Test 1030 Revision 0 Page 283 of 543

	-	Initial	Date
8.2.10.2.19	Obtain closed loop response on TC2702 &		
	TC2803 to a flux disturbance on panels		
	217 & 221 by carrying out the following		
	steps.		
	A) Confirm that receiver panels 217 & 221		
	are in a steady state condition for		
	approximately 2 minutes.		
	B) Confirm 102801 & 102803 are in metal		
	temperature control mode.		
	C) Implement a step/ramp decrease in the		
	power level on panel 217 & 221 by		
	approximately 10% of nominal power.	I	
	Allow panel temperatures, pressure and		
	flowrate to reach steady state. Monitor		
	the following parameters on a strip		
	chart recorder to verify data is recorded:		
	FCM2702, TI2702, TI2705, YI2708A/B,		
	FCM2803, TI2803, TI2806, YI2809A/B,		
	PI2902.		
	Note. An adjustment in the magnitude of the		
	Note: An adjustment in the magnitude of the		
	target) may be required in order to		
	achieve measureable response changes		
	in flow and temperatures and flux Flux		l
	changes $> 20\%$ and flow changes		i

Test 1030 Revision 0 Page 284 of 543

			Initial	Date
8.2.10.2.19	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		-
	E)	<pre>Observe temperature response TI2702, IT2803. If temperature excursions exceed ± 50°F - adjust flux loop gains via the following.</pre> 1) Set receiver console to configure		
		<pre>mode. 2) Select Cl-7, AL-36, Cl-9, AL-36 - using loop tuning form increase/ decrease gain and low time constant as required.</pre>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain.		
	G)	Set console back to monitor mode.		
			Test 1 Revisi Page 2	030 07 0 85 of 543
		Initial	Date	
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8.2.11	RECEIVER STARTUP SEQUENCE (PANELS 209-214)			
	This section of the procedure is designed to			
	simulate the startup of the receiver using a			
	portion of the 18 boiler namels and to allow			
	final closed loop tuning of individual boiler			
	panels prior to the startup and operational			
	paners prior to the startup and operational			
	verification of the entire receiver (Section			
	8.2.14). The operational sequence verified			
	in this section of the procedure is derived			
	from published operating instructions (Ref:			
	Plant Operating/Training Manual - RADL 2-36,			
	Instruction(T-2) - Receiver Startup).			
0 0 11 1	Novice that the initial couldtions have been			
8.2.11.1	verity that the initial conditions have been			
	established as shown in Section 7.4.2.		<u> </u>	
8.2.11.2	Set the receiver temperature control set			
	point (TSP-2929) to 585°F			
8.2.11.3	Verify the receiver flash tank pressure			
	control set point is 485 psig			
0 0 11 4				
8.2.11.4	verity that the pump controller is operating			
	in a valve control mode with an 80% valve			
	position set point.			
8.2.11.5	Place panel controllers FCM-2301 - FCM-2402			
	and ECM-2603 - ECM-2803 in manual and estab-			
	lish the following set points:			
		Tect 10	120	
		Revisi	50 5n 0	
		Page 28	6 of 543	

		_	Initial	Date
		Set Point (1b/hr)		
	FCM-2301 - FCM-2302	1000		
	FCM-2303	2000		
	FCM-2401 - FCM-2402	3000		
	FCM-2603 - FCM-2701	3000		
	FCM-2702	2000		
	FCM-2703 - FCM-2802	1000		
	FCM-2803	500		
	Verify that the remain	boiler panel control-		
	lers (TC-2403 - TC-2602	) are in the flow		
	control mode and contro	lling to default flow		
	values.			
	Def	ault Value (lb/hr)		
	TC-2403	1000		
	TC-2501	1100		
	TC-2502 - 2602	1200	<u> </u>	
8.2.11.6	Issue appropriate helio	state track commands		
	for collector field wed	ges 4-8 <u>only</u> as deter-		
	mined from Tables A-6 a	nd A-7 and Figures A-8		
	and A-9 (Ref: Plant Op	erating/Training		
	Manual - RADL 2-36) whi	ch are enclosed in		
	this procedure.			
8.2.11.7	Monitor panels 209-214	and observe the tran-		
	sition to steam generat	ion operation. Verify		
	that controllers TC-240	3 - TC-2602 switch from		
	flow control to tempera	ture control at the		
	585°F transition set po	int and subsequently		
	modulates flow to maint	ain the control		
	temperature.			
			Test Revis Page	1030 sion 0 287 of 543

## TABLE A-6. COLLECTOR FIELD/RECEIVER STARTUP CONFIGURATION

(Number of Heliostats Per Wedge in "Track")

Valid Dates: Jan 5 through Feb 4

Nov 11 through Dec 6

		Wedge										
Time	1	2	3	4	5	6	7	8	9	10	11	12
Before 9:50 a.m.	9	6	11	10	11	13	14	13	12	20	18	14
Between 9:50 a.m. and 3:45 p.m.	7	8	15	10	9	11	11	9	11	14	8	11

## TABLE A-7. COLLECTOR FIELD/RECEIVER STARTUP CONFIGURATION (Number of Heliostats Per Wedge in "Track")

Valid Dates: Dec 7 through Jan 4

		Wedge										
Time	1	2	3	4	5	6	7	8	9	10	11	12
Before 9:35 a.m.	9	7	11	11	11	15	14	16	11	26	20	15
Between 9:35 a.m. and 12:45 p.m.	6	4	6	7	6	10	8	9	7	16	11	9
Between 12:45 p.m. and 4:00 p.m.	13	12	15	7	9	8	10	6	7	7	5	4





Test 1030 Revision O Page 289 of 543



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Test 1030 Revision O Page 290 of 543

		Initial	Date
8.2.11.8	Monitor receiver panels 204-208 and 215-221 and verify that discharge temperatures are 550°F (as indicated by TI-2301 - TI-2402 and TI-2603 - TI-2803). Verify temperature gradients are 200°F as indicated by TEX-2354B, C, & D - TEX-2455B, C, & D and TEX-2656B, C, & D - TEX-2856B, C, & D. Increase flow set points as required in these panels to satisfy		
	the temperature limits. Total receiver flow shall not exceed 40,000 lb/hr.		
8.2.11.9	Monitor panel control valve positions and pump speed and verify that the pump speed modulates to keep the most wide open receiver panel control valve at 80% stroke (80% open). In the event the 80% valve corresponds to a fixed panel (204-208 and 215-221), reduce the flow set point for that controller in order to cause another valve to become the limiting 80% open valve. Verify that the feed pump speed modulates automatically to maintain the new limiting (80% open) valve at the 80% position.		
	The following steps are carried out to tune controllers TC-2403 - TC-2602 at a 660°F tem- perature set point and at the nominal flash tank operating pressure (485 psig).		
8.2.11.10	Adjust the receiver temperature control set point (TSP-2929) to 660°F and observe the panel temperature increase (TI-2403 - TI-2602) and control to the new set point value.		
		Test	 1030

Revision O Page 291 of 543

			Initial	Date
8.2.11.11	Per Fig rec us <sup>-</sup>	rform closed loop test of TC-2403. (See gure 8.2.11-1) Tune control loop if quired by carrying out the following steps ing loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2403 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2403 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-3, AL-32)* as required.		
	E)	Repeat steps B D as required until Response is satisfactory.		
	F)	Decrease TC-2403 set point 10% (600°F) and observe response.		
	G)	Increase TC-2403 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-3, AL-32) in the $\pm 10\%$ increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
			Test	1030

Revision O Page 292 of 543



		_	Initial	Date	
	J)	Establish TC-2403 start-up controller gains and record.			
	K)	Adjust setpoints, alarms, limits as required.			
8.2.11.12	Per Fig rec usi	rform closed loop tests of TC2501 (See gure 8.2.3-1). Tune control loop if guired by carrying out the following steps ng loop tuning form.			
	A)	Set receiver console to configure mode.			
	B)	Decrease temperature set point on TC2501 by 10% (600°F) and observe the response on the strip chart.			
	C)	Increase TC2501 set point back to nominal value and observe the response on the strip chart.	·		
	D)	Increase/decrease proportional gain, Kl (Cl-4, AL-12)* as required.			
	E)	Repeat steps B D as required until response is satisfactory.			
	F)	Decrease TC2501 set point 10% (600°F) and observe response.			
	G)	Increase TC2501 set point to nominal value and observe temperature response.	ļ		
			Test Revisi Page 2	1030 on 0 94 of 543	

		_	Initial	Date
	H)	Increase/decrease reset gain, K2 (C1-4, AL-12) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC2501 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.11.13	Per Fig req usi	form closed loop tests of TC2502 (See pure 8.2.11-2). Tune control loop if puired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC2502 by $10\%$ (600°F) and observe the response on the strip chart.		
	C)	Increase TC2502 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-4, AL-32)* as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
			Test	030

Revision O Page 295 of 543

MVCU 1-4



Figure 8.2.11-2. RS Steam Temperature Controller Functional Block Diagram TC-2502

	_	Initial	Date
	F) Decrease TC2502 set point 10% (600°F) and observe response.		
	G) Increase TC2502 set point to nominal value and observe temperature response.		
	H) Increase/decrease reset gain, K2 (C1-4, AL-32) in the ±10% increments as required.		
	<ol> <li>Repeat steps F H as required until response is satisfactory.</li> </ol>		
	J) Establish TC2502 start-up controller gains and record.		
	K) Adjust setpoints, alarms, limits as required.		
8.2.11.14	Perform closed tests of TC2503 (See Figure 8.2.3-2). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature set point on TC2503 by 20% (600°F) and observe the response on the strip chart.		
	C) Increase TC2503 set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (C1-5, AL-12)* as required.	Test Revisi Page 2	1030 ion 0 297 of 543

			Initial	Date
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2503 set point 10% (600°F) and observe response.		
	G)	Increase TC2503 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-5, AL-12) in the $\pm 10\%$ increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC2503 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.11.15	Per Fig req usi	form closed loop test of TC2601 (See gure 8.2.11-3). Tune control loop if guired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC2601 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC2601 set point back to nominal value and observe the response on the strip chart.	Test Revis	1030 ion 0

**MVCU 1-5** 



Figure 8.2.11-3. RS Steam Temperature Controller Functional Block Diagram TC-2601

543

		-	Initial	Date
	D)	Increase/decrease proportional gain, Kl (Cl-5, AL-32)* as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC2601 set point 10% (600°F) and observe response.		
	G)	Increase TC2601 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain K2 (C1-5, AL-32) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC2601 start-up controller gains and record.	İ	
	K)	Adjust setpoints, alarms, limits as required.		
8.2.11.16	Per Fig req usi	form closed loop test of TC2602 (See ure 8.2.5-1). Tune control loop if uired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC2602 by 10% (600°F) and the response on the strip chart.		
			Test [	1030
			Revisi Page 3	on 0 00 of 543

			Initial	Date
	C) I r c	Increase TC2602 set point back to nominal value and observe the response on the strip chart.		
	D) ] (	Increase/decrease proportional gain, Kl (Cl-6, AL-12)* as required.		
	E) F r	Repeat steps B D as required until response is satisfactory.		
	F) [ a	Decrease TC2602 set point 10% (600°F) and observe response.		
	G) I v	ncrease TC2602 set point to nominal value and observe temperature response.		
	H) I A r	Increase/decrease reset gain, K2, (Cl-6, AL-12) in the ±10% increments as required.		
	I) R r	Repeat steps F H as required until response is satisfactory.		
	J) E g	stablish TX2602 start-up controller pains and record.		
	K) A	Adjust setpoints, alarms, limits as required		
8.2.11.17	Verif have mode.	Ty that controllers TC 2403 - TC 2602 been returned to the cascade control -		
			Test Revis Page :	 1030 ion 0 301 of 543

		Initial	Date
8.2.11.18	Ramp Temperature set point for panels 209-214 simultaneously from 660°F to 800°F using TSP 2929 and allow to reach steady state. Observe panel temperatures and control valve responses during the transition period.		
8.2.11.19	Ramp temperature set point for panels 209-214 simultaneously from 800°F to 660°F using TSP 2929 and allow to reach steady state. Observe panel temperatures and control valve responses during the transition period.		
8.2.11.20	Introduce a "step" change in input power to the receiver by issuing "DECREASE" commands of 20% to the wedges tracking the receiver. Observe panel temperatures and control valve responses for panels 209-214 during the tran- sition period.		
8.2.11.21	Return the heliostat configuration/panel power level back to the original value of the previous step by issuing the appropriate "INCREASE" command. Observe panel tempera- tures and control valve responses for panels 209-214 during the transition period.		
8.2.11.22	Command "Tracking"heliostats to "Standby" and switch controllers TC 2403 - TC 2602 to flow control mode through CRT switch functions and allow all panels and flash tank to flood. Continue to shutdown the receiver or proceed to Section 8.2.12, proper flash tank pressure		
		Test 1	030

Revision O Page 302 of 543

	Initial	Date
should be established by opening SOV 2019A (HS 2019) and allowing GN <sub>2</sub> to pressurize the flash tank. Proper tank pressure is deter- mined from Figure 8.2.11-4.		
	Test Revisi Page 3	1030 on 0 03 of



Recirculation Line to the Condenser

Figure 8.2.11-4. Flash Tank Nitrogen Pressurization Curve

	_	Initial	Date
8.2.12	RECEIVER STARTUP SEQUENCE (PANELS 204-208)		
	This Section assumes a continuation of		
	activities carried out in Section 8.2.11,		
	i.e., water flowing through the receiver		
	panels and required heliostats tracking the		
	"Standby". For this section of the procedure,		
	heliostats from wedges 1-5 are required. If a		
	receiver shutdown occurred prior to this sec-		
	tion, initial feedwater circulation and cleanup		
	per Plant Operating/Training Manual - RADL 2-36,		
	Instruction T-1 is required prior to carrying		
	out this section.		
	In carrying out this section of the procedure,		
	selected modifications were made to the oper-		
	ating instructions to permit panels 204-208		
	to follow the flow control/temperature control		
	sequence while the balance of the panels		
	remain in a manual (flow control) condition.		
8.2.12.1	Verify that the initial conditions have been		
	established as shown in Section 7.4.2.		
8.2.12.2	Verify the receiver temperature control set		
	point (TSP 2929) is set to 585°F.	·	
8.2.12.3	Verify the receiver flash tank pressure		
	control set point is 485 psig		
8.2.12.4	Verify that the pump controller is operating		
	in a valve control mode with an 80% valve		
	position set point		
		Test	 1030

Revision 0 Page 305 of 543

			Initial	Date
8.2.12.5	Place controllers FCM24	03 - FCM2803 in		
	manual and establish th	e following set points:		
,				
,		<u>Set Point (lb/hr)</u>		
	FCM 2403 - FCM 2501	3000		
	FCM 2502	2000		
	FCM 2503 - FCM 2602	1000		
	FCM 2603 - FCM 2803	0		
8.2.12.5	Verify that the remaining	ng boiler panel con-		
	trollers (TC2301 - TC24	02) are in the flow		
	control mode and contro	lling to default flow		
	values.			
	Default	Values (1b/hr)		
	TC 2301	556		
	TC 2302	600		
	TC 2302	700		
	TC 2401	800		
	TC 2402	900		
8.2.12.6	Issue appropriate belios	stat track commands		
	for collector field wedd	ies 1-5 only as deter-		
	mined from Tables A-6 ar	nd A-7 and Figures		
	A-8 and A-9 (Ref: Plant	: Operating/Training		
	Manual - RADL 2-36) whic	ch are enclosed in		
	this procedure (Section	8.2.11).		
8.2.12.7	Monitor panels 204-208 a	nd observe the tran-		
	sition to steam generati	on operation. Verify		
	that controllers TC2301	- TC2402 switch from		
	flow control to temperat	ure control at the		
	585°F transition set poi	nt and subsequently		
	,	· · · · · ·	Tact	1020
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Page 306 of 543

		Initial	Date
	modulate flows to maintain the control temperature.		
8.2.12.8	Monitor receiver panels 209-214 and verify that discharge temperatures are 550°F (as indicated by TI2403 - TI2602). Verify tem- perature gradients are 200°F as indicated by TEX2456B, C, & D - TEX2655B, C, & D. Increase flow set points as required in these panels to satisfy the temperature limits. Total receiver flow shall not exceed 40,000 lb/hr.		
8.2.12.9	Monitor panel control valve position and pump speed and verify that the pump speed modulates to keep the most wide open receiver panel control valve at 80% stroke (80% open). In the event the 80% valve corresponds to a fixed flow panel (209-204), reduce the flow set point for that controller in order to cause another valve to become the limiting 80% open valve. Verify that the feed pump speed modulates automatically to maintain the new limiting (80% open) valve at the 80% position.		
	The following steps are carried out to tune controllers TC-2301 - TC-2402 at a 660°F tem- perature set point and at a nominal flash tank operating pressure (485 psig).		
		Test Revis Page	 1030 ion 0 307 of 543

		-	Initial	Date
8.2.12.10	Ad poi par TI- val	just the receiver temperature control set int (TSP-2929) to 660°F and observe the nel temperature increase (TI-2301 - 2402) and control to the new set point ue.		
8.2.12.11	Per Fig by loc	form closed loop test of TC-2301. (See gure 8.2.7-1) Tune control loop if required carrying out the following steps using op tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2301 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2301 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-1, AL-12) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2301 set point 10% (600°F) and observe response.		
	G)	Increase TC-2301 set point to nominal value and observe temperature response.		
			Test	1030 on 0

Revision O Page 308 of 543

			Initial	Date
	H)	Increase/decrease reset gain, K2 (C1-1, AL-12) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2301 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.12.12	Per Fig req usi	form closed loop tests of TC-2302 (See pure 8.2.12-1). Tune control loop if puired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2302 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC2302 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-1, AL-32) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
			Test	1030

Revision O Page 309 of 543



			Initial	Date
	F)	Decrease TC-2302 set point 10% (600°F) and observe response.		
	G)	Increase TC-2302 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-1, AL-32) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2302 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
2.12.13	Per Fig req ste	form closed loop tests of TC-2303 (See ure 8.7.2-2). Tune control loop if uired by carrying out the following ops using loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2303 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2303 set point back to nominal value and observe the response on the strip chart.		
			Test Revis Page	 1030 ion 0 311 of 543

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			Initial	Date
	D)	Increase/decrease proportional gain, Kl (Cl-2, AL-12) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2303 set point 10% (600°F) and observe response.		
	G)	Increase TC-2303 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-2, AL-12) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2303 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.12.14	Per 8.2 car tun	form closed tests of TC-2401 (See Figure 2.12-2). Tune control loop if required by prying out the following steps using loop ing form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2401 by 10% (600°F) and observe the response on the strip chart.		
			T <mark>est</mark> Revis Page	1 1030 ion 0 312 of 543

MVCU1-2



543

			Initial	Date
	C)	Increase TC-2401 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, K1 (C1-2, AL-32) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2401 set point 10% (600°F) and observe response.		
	G)	Increase TC-2401 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-2, AL-32) in the $\pm 10\%$ increments as required.		
	Ι)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2401 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.12.15	Per Fig req usi	form closed loop test of TC-2402 (See ure 8.2.7-2). Tune control loop if uired by carrying out the following steps ng loop tuning form.		
			Test	1030

Revision O Page 314 of 543

	-	Initial	Date
A)	Set receiver console to configure mode.		
B)	Decrease temperature set point on TC-2402 by 10% (600°F) and observe the response on the strip chart.		
C)	Increase TC-2402 set point back to nominal value and observe the response on the strip chart.		
D)	Increase/decrease proportional gain, Kl (Cl-3, AL-12) as required.		
E)	Repeat steps B D as required until response is satisfactory.		
F)	Decrease TC-2402 set point 10% (600°F) and observe response.		
G)	Increase TC-2402 set point to nominal value and observe temperature response.		
H)	Increase/decrease reset gain K2 (Cl-3, AL-12) in the $\pm 10\%$ increments as required.		
1)	Repeat steps F H as required until response is satisfactory.		
J)	Establish TC-2402 start-up controller gains and record.		
К)	Adjust setpoints, alarms, limits as required.		
		Test Revis Page	 1030 ion 0 315 of 543

		Initial	Date
8.2.12.16	Verify that controllers TC-2301 - TC-2402 have been returned to the cascade control mode.		
8.2.12.17	Ramp temperature set point for panels 204- 208 simultaneously from 660°F to 800°F using TSP-2929 and allow to reach steady state. Observe panel temperatures and con- trol valve responses during the transition period.		
8.2.12.18	Ramp temperature set point for panels 104- 108 simultaneously from 800°F to 660°F using TSP-2929 and allow to reach steady state. Observe panel temperatures and control valve responses during the transition period.		
8.2.12.19	Introduce a "step" change in input power to the receiver by issuing "DECREASE" commands of 20% to the wedges tracking the receiver. Observe panel temperatures and control valve responses for panels 204-208 during the transition period.		
8.2.12.20	Return the heliostat configuration/panel power level back to the original value of the previous step by issuing the appropriate "INCREASE" command. Observe panel tempera- tures and control valve responses for panels 204-208 during the transition period.		
8.2.12.21	Command "Tracking" heliostats to "Standby" and switch controllers TC-2301 - TC-2402 to flow control mode through CRT switch	Test Revisi Page 3	1030 on 0 16 of 543

	Initial	Date
functions and allow all panels and flash		
tank to flood. Continue to shutdown the		
receiver or proceed to Section 8.2.12.13.		
Proper flash tank pressure should be estab-		
lished by opening SOV-2019A (HS-2019) and		
allowing GN <sub>2</sub> to pressurize the flash tank.		
Proper tank pressure is determined from		
Figure 8.2.11-4.		

Test 1030 Revision 0 Page 317 of 543

Initial Date 8.2.13 RECEIVER STARTUP SEQUENCE (PANELS 215-221) This Section assumes a continuation of activities carried out in Section 8.2.12 i.e., water flowing through the receiver panels and required heliostats tracking the "Standby". For this section of the procedure, heliostats from wedges 7-12 are required. If a receiver shutdown occurred prior to this section, initial feedwater circulation and cleanup per Plant Operating/Training Manual -RADL 2-36, Instruction T-1 is required prior to carrying out this section. In carrying out this section of the procedure, selected modifications were made to the operating instruction to permit panels 215-221 to follow the flow control/temperature control sequence while the balance of the panels remain in a manual (flow control) condition. 8.2.13.1 Verify that the initial conditions have been established as shown in Section 7.4.2. Verify the receiver temperature control set 8.2.13.2 point (TSP 2929) is set to 585°F. 8.2.13.3 Verify the receiver flash tank pressure control set point is 485 psig. 8.2.13.4 Verify that the pump controller is operating in a valve control mode with an 80% valve position set point.

Test 1030 Revision 0 Page 318 of 543

			Initial	Date
8.2.13.5	Place panel controllers FCM	-2402 - FCM-2602		
	and FCM-2301 in manual and	establish the		
	following set points:			
		Set Point (1b/hr)		
	FCM-2301, FCM-2402-FCM-2502	1000		
	FCM-2503	2000		
	FCM = 2601 = FCM = 2602	3000		
	FCM-2302 - FCM-2401	0		
	Verify that the remaining be trollers (TC-2603 - TC-2803	oiler panel con- ) are in the flow		
	control mode and controlling values.	g to default flow		
	Default V	alues (lb/hr)		
	TC-2603	1100		
	TC-2701	1000		
	TC-2702	900		
	TC-2703	800		
	TC-2801	700		
	TC-2802	600		
	TC-2803	556		
8.2.13.6	Issue appropriate heliostat	track commands		
	for collector field wedges	7-12 <u>only</u> as deter-		
	mined from Tables A-6 and A	-7 and Figures A-8		
	and A-9 (Ref: Plant Operat	ing/Training		
	Manual - RADL - 2-36) which	are enclosed		
	in this procedure (Section	8.2.11).		
			Test	1030
			Revis	ion 0 319 of
			iuye	

		Initial	Date
8.2.13.7	Monitor panels 215-221 and observe the transition to steam generation operation. Verify that controllers TC-2603 - TC-2803 switch from flow control to temperature con- trol at the 585°F transition set point and subsequently modulates flow to maintain the control temperature.		
8.2.13.8	Monitor receiver panels 203, 208-214 and verify that discharge temperatures are 550°F (as indicated by TI-2301, TI-2404-TI-2602). Verify temperature gradients are 200°F as indicated by TEX-2354B, C, & D, TEX-2455B, C, & D - TEX-2655B, C, & D. Increase flow set points as required in these panels to satisfy the temperature limits. Total receiver, flow shall not exceed 40,000 lb/hr.		
8.2.13.9	Monitor panel control valve positions and pump speed and verify that the pump speed modulates to keep the most wide open receiver panel control valve at 80% stroke (80% open). In the event the 80% valve corresponds to a fixed flow panel (204, 209-214), reduce the flow set point for that controller in order to cause another valve to become the limiting 80% open valve. Verify that the feed pump speed modulates automatically to maintain the new limiting (80% open) valve at the 80% position.		
	The following steps are carried out to tune controllers TC-2603 - TC-2803 at a	Test	1030
		Revis Page	10n 0 320 of 543

		Initial	Date
	660°F temperature set point and at the nominal flash tank operating pressure (485 psig).		
8.2.13.10	Adjust the receiver temperature control set point (TSP-2929) to 660°F and observe the panel temperature increase (TI-2603 - TI-2803) and control to the new set point value.		
8.2.13.11	Perform closed loop test of TC-2603 (See Figure 8.2.13-1). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature set point on TC-2603 by 10% (600°F) and observe the response on the strip chart.		
	C) Increase TC-2603 set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (C1-6, AL-32) as required.		
	E) Repeat steps B D as required until response is satisfactory.		
	F) Decrease TC-2603 set point 10% (600°F) and observe response.		
		Test	 1030

lest 1030 Revision O Page 321 of 543
MVCU 1-6



Figure 8.2.13-1. RS Steam Temperature Controller Functional Block Diagram TC-2603

			Initial	Date
	G)	Increase TC-2603 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (Cl-6, AL-32) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2603 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.13.12	Per Fig req usi	form closed loop tests of TC-2701 (See ure 8.2.5-2). Tune control loop if uired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point TC-2701 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2701 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (C-17, AL-12) as required.	· ····	
			Test Revisi Page 3	1030 ion 0 323 of 543

			Initial	Date
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2701 set point 10% (600°F) and observe response.		
	G)	Increase TC-2701 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-7, AL-12) in the $\pm 10\%$ increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2701 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.13.13	Per Fig req usi	form closed loop tests of TC-2702 (See ure 8.2.9-1). Tune Control loop if uired by carrying out the following steps ng loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2702 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2702 set point back to nominal value and observe the response on the strip chart.	Test Revisi Page 3	030 on 0 324 of 543

		-	Initial	Date
	D)	Increase/decrease proportional gain, Kl (Cl-7, AL-32) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2702 set point 10% (600°F) and observe response.		
	G)	Increase TC-2702 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (Cl-7, AL-32) in the $\pm 10\%$ increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TX-2702 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.2.13.14	Per 8.2 car tun	form closed tests of TC-2703 (See Figure 1.13-2). Tune control loop if required by rying out the following steps using loop ing form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2703 by 10% (600°F) and observe the response on the strip chart.		
			Test Revis Page	1030 ion 0 325 of 543



Figure 8.2.13-2. RS Steam Temperature Controller Functional Block Diagram TC-2703

		-	Initial	Date
	C)	Increase TC-2703 set point back to nominal value and observe response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-8, AL-12) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2703 set point 10% (600°F) and observe response.		
	G)	Increase TC-2703 set point to nominal value and observe temperature response.		
	H)	Increase/decrease reset gain, K2 (C1-8, AL-12) in the ±10% increments as required.		
	I)	Repeat steps F H as required until response is satisfactory.		
	J)	Establish TC-2703 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as		
8.2.13.15	Per Fig req usi	form closed loop test of TC-2801 (See gure 8.2.9-2). Tune control loop if guired by carrying out the following steps ing loop tuning form.		
			Test Revis Page	1030 ion 0 327 of 543

	_	Initial	Date
A)	Set receiver console to configure mode.		
В)	Decrease temperature set point on TC-2801 by 10% (600°F) and observe the response on the strip chart.		
C)	Increase TC-2801 set point back to nominal value and observe the response on the strip chart.		
D)	Increase/decrease proportional gain, Kl (Cl-8, AL-32) as required.		
E)	Repeat steps B D as required until response is satisfactory.		
F)	Decrease TC-2801 set point 10% (600°F) and observe response.		
G)	Increase TC-2801 set point back to nominal value and observe temperature response.		
H)	Increase/decrease reset gain K2 (Cl-8, AL-32) in the $\pm 10\%$ increments as required.		
I)	Repeat steps F H as required until response is satisfactory.		
J)	Establish TC-2801 start-up controller gains and record.		
K)	Adjust setpoints, alarms, limits as required.		
		Test	1030 on 0

Revision O Page 328 of 543

		Initial	Date
8.2.13.16	Perform closed loop test of TC-2802 (See Figure 8.2.13-2). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature set point on TC-2802 by 10% (600°F) and the response on the strip chart.		
	C) Increase TC-2802 set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (Cl-9, AL-12) as required.		
	E) Repeat steps B D as required until response is satisfactory.		
	F) Decrease TC-2802 set point 10% (600°F) and observe response.		
	G) Increase TC-2802 set point to nominal value and observe temperature response.		
	H) Increase/decrease reset gain, K2, (C1-9, AL-12) in the $\pm 10\%$ increments as required.		
	<ol> <li>Repeat steps F H as required until response is satisfactory.</li> </ol>		
		Test	1030

Revision 0 Page 329 of 543

		_	Initial	Date
	J)	Establish TC-2802 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as		
8.2.13.17	Per Fig req ste	form closed loop tests of TC-2803 (See gure 8.2.9-3). Tune control loop if guired by carrying out the following eps using loop tuning form.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC-2803 by 10% (600°F) and observe the response on the strip chart.		
	C)	Increase TC-2803 set point back to nominal value and observe the response on the strip chart.		
	D)	Increase/decrease proportional gain, Kl (Cl-9, AL-32) as required.		
	E)	Repeat steps B D as required until response is satisfactory.		
	F)	Decrease TC-2803 set point 10% (600°F) and observe response.		
	G)	Increase TC-2803 set point to nominal value and observe temperature response.		
			Test Revis Page	 1030 ion 0 330 of 543





		Initial	Date	(
	H) Increase/decrease reset gain, K2 (C1-9, AL-32) in the ±10% increments as required.	į		
	<ol> <li>Repeat steps F H as required until response is satisfactory.</li> </ol>			
	J) Establish TC-2803 start-up controller gains and record.	:		
	K) Adjust setpoints, alarms, limits as required.			
8.2.13.18	Verify that controllers TC-2603 - TC-2803 have been returned to the cascade control mode.			
8.2.13.19	Ramp temperature set point for panels 215- 221 simultaneously from 660°F to 800°F using TSP 2929 and allow to reach steady state. Observe panel temperatures and control valve responses during the transition period.			
8.2.13.20	Ramp temperature set point for panels 215- 221 simultaneously from 800°F to 660°F using TSP 2929 and allow to reach steady state. Observe panel temperatures and control valve responses during the transition period.			
8.2.13.21	Introduce a "step" change in input power to the receiver by issuing "DECREASE" commands			
		Test Revisi Page 3	030 on 0 32 of 543	

		Initial	Date
	of 20% to the wedges tracking the receiver. Observe panel temperatures and control valve responses for panels 215-221 during the transition period.		
8.2.13.22	Return the heliostat configuration/panel power level back to the original value of the previous step by issuing the appropriate "INCREASE" command. Observe panel tempera- tures and control valve responses for panels 215-221 during the transition period.		
8.2.13.23	Command "Tracking" heliostats to "Standby" and switch controllers TC-2603 - TC-2803 to flow control mode through CRT switch functions and allow all panels and flash tank to flood. Continue to shutdown the receiver or proceed to Section 8.2.14, proper flash tank pressure should be estab- lished by opening SOV 2019A (HS 2019) and allowing GN <sub>2</sub> to pressurize the flash tank. Proper tank pressure is determined from Figure 8.2.11-4.		
		Test Revisi Page 3	1030 on 0 333 of 543

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				Initial	Date
8.2.14	INTEGRATED REC TANK)	EIVER STARTUP (F	LOW TO FLASH		
	The intent of	this section of <sup>.</sup>	the procedure		
	is to duplicat	e the normal star	rtup sequence		
	for the receiv	er and to verify	proper plant		
	operation unde	r these condition	ns. The initial		
	conditions lis	ted in Section 7	are designed		
	to create a co	ndition that wou	ld exist in the		
	receiver (and	system) immediate	ely after		
	filling of the	receiver and the	e initiation of		
	circulation th	rough the panels	•		
8.2.14.1	Verify that th	e initial condit	ions have been		
	established as	shown in Section	n 7.4.2.		
8.2.14.2	Verify the tem	perature set poi	nt for the		
	18 panel contr	ollers is 585°F a	as set by		
	TSP 2929.		-		- <u></u>
8.2.14.3	Verify the rec	eiver flash tank	pressure con-		
	trol set point	is 485 psig.	-		
8.2.14.4	Verify that al	l panel controlle	ers are in the		
	flow control m	ode and controll	ing to the		
	following defa	ult values:			
			Measured Flow		
	Controllers	Flow Tag ID	(1b/hr)		
	TC2301/TC2803	FI2301/FI2803	556		
	TC2302/TC2802	FI2302/FI2802	600		
	TC2303/TC2801	FI2303/FI2801	700		
	TC2401/TC2703	FI2401/FI2703	800		
	TC2402/TC2702	FI2402/FI2702	900		
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Revision 0 Page 334 of 543

			-	Initial	Date
	Controllers	Flow Tag ID	Measured Flow (lb/hr)		
• · · ·	TC2403/TC2701	FI2403/FI2701	1000		
	TC2501/TC2603	FI2501/FI2603	1100		
	TC2502/TC2602	F12502/F12602	1200		
	If proper flow	does not exist,	verify the		
	data base for	the proper value	and investigate		
	for a possible	plugged filter.	Do not pro-		
	ceed until the	proper flow is	established		· · · · · · · · · · · · · · · · · · ·
8.2.14.5	Issue the appro mands for the determined from Figures A-8 and Training Manua tained in Sect	opriate heliosta collector field n Tables A-6 and d A-9 (Ref: Pla l - RADL 2-36) w ion 8.2.ll of th	te track com- wedges as A-7 and nt Operating/ hich are con- is procedure		
8.2.14.6	Monitor all re- and observe the tion operation TC-2301 - TC-2 to temperature tion set point flows to maint	ceiver boiler pa e transition to . Verify that c 803 switch from control at the and subsequentl ain the control	nels (204-221) steam genera- ontrollers flow control 585°F transi- y modulate temperature.		
8.2.14.7	Monitor receiv tion (AI-2301 troller PC-110 when the great full stroke. ulates to main at 80% stroke.	er panel control - AI-2803) and s 5 to automatic ( est open valve r Verify that pump tain the control	valve posi- witch con- valve control) eaches 80% of speed mod- ling valve		
				Test	1030

Revision O Page 335 of 543

	-	Initial	Date
8.2.14.8	Observe flash tank pressure build during the initial receiver heatup process. Verify that the flash tank vent system controls the pressure to the 485 psig set point valve. When initial venting occurs, monitor deaerator and condenser pressure and observe the effect of the $GN_2$ slug that will vent from the flash tank. Monitor the system for possible over pressure conditions that could result in a plant trip. Operate remote deaerator vent valve as required to aid in the release of $GN_2$ .		
8.2.14.9	Monitor the flows (process conditions and valve position) of PV 1000 and FV 1007 which divert flash tank steam to the condenser. Verify that an oscillatory condition does not exist between the two valves, particularly at low flows.		
8.2.14.10	Monitor the individual receiver panels for satisfactory control. Continue operation until all panels have transitioned to temper- ature control and are controlling to the 585°F set point condition.		
8.2.14.11	Enable the moisture accumulator drain func- tion through the dedicated hand switch. Verify proper operation of the level control function by monitoring LI 2901 and the cleaning of LAHL 2901.		
		Test Revisi Page 3	1030 on 0 36 of 543

		Initial	Date
8.2.14.12	Ramp receiver control temperature set point		
	to 660°F (TSP 2929). Verify the ramp is		
	carried out in a stable fashion and the		
	receiver comes to equilibrium at the 660°F		
	set point by monitoring TI-2301A or B -		
	TI-2803A or B. Verify that the feed pump		
	speed has been modulated to maintain the		
	widest open receiver control valve at 80%		
	stroke.	·	
8.2.14.13	Ramp temperature set point for all panels		
	simultaneously from 660°F to 800°F using		
	TSP 2929 and allow to reach steady state.		
	Observe panel temperatures and control		
	valve responses during the transition		
	period. Observe feed pump controller and		
	tune as required.		
8.2.14.14	Ramp temperature set point for all panels		
	simultaneously from 800°F to 660°F using		
	TSP 2929 and allow to reach steady state.		
	Observe panel temperatures and control		
	valve responses during the transtion		
	period. Observe feed pump controller and		
	tune as required.	····	
8 2 14 15	Introduce a "step" change in input power		
0,11,1,1,1	to the receiver by issuing "DECREASE" com-		
	mands of 20% to the wedges tracking the		
	receiver. Observe panel temperatures and		
	control valve responses for all panels		
	during the transition period. Observe feed		
	pump controller and tune as required.	·	
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		lest Revis	1030 ion 0
		Page	337 of !

	_	Initial	Date
8.2.14.16	Return the heliostat configuration/panel		
	power level back to the original value of		
	the previous step by issuing the appropriate		
	"INCREASE" command. Observe panel tempera-		
	tures and control valve responses for all		
	panels during the transition period.		
	Observe feed pump controller and tune as required.		
8.2.14.17	Command "Tracking" heliostats to "Standby"		
	and switch all controllers to flow control		
	mode through CRT switch functions and allow		
	all panels and flash tank to flood. Continue		
	to shutdown the receiver or proceed to Sec-		
	tion 8.3. Proper flash tank pressure should		
	be established by opening SOV 2019A (HS 2019)		
	and allowing $GN_2$ to pressurize the flash		
	tank. Proper tank pressure is determined		
	from Figure 8.2.11-4.		
8.2.15	Periodically inspect the individual receiver		
	panels during non-operating periods for		
	indications of binding caused by thermal		
	expansion. As a minimum, inspections should		
	be made upon completion of each of the major		
	sections of the steam cure procedure (panels		
	209-212, 213-216, 204-208, and 217-221).		
8.2.16	Periodically inspect the inter panel light		
	seals during non-operating periods of the steam		
	cure procedure to verify the light integrity of		
	the seals. As a minimum, inspections should	1	
	be made upon completion of each of the major		
	sections of the steam cure (panels 209-212,		
	213-216, 204-208, and 217-221).	Test 1 Revisi Page 3	030 on 0 38 of 543

Initial

Date

"STEAMING" RECEIVER OPERATION - FLOW TO STEAM DUMP

Tests contained in Section 8.3 of this procedure involve the flow of steam down the downcomer and the subsequent checkouts involving the steam dump and related systems as well as receiver operation at high pressure. Unless required otherwise by a particular test, the receiver feed pump will operate in a valve control mode in which the pump reacts to the receiver valve positions. Resulting feedwater pressures will be those that naturally occur as a result of steam dump system pressure control and the receiver panel control valves.

Feedwater temperatures will be those that naturally occur when auxiliary steam is introduced to the deaerator to provide for the normal deaerator function. No attempt will be made to otherwise "artificially" control the feedwater temperature. If excessive feedwater temperatures occur resulting in high receiver preheater temperatures, incident power delivered to the preheat panels should be reduced. This operation would duplicate the normal corrective action required during routine operation.

> Test 1030 Revision 0 Page 339 of 543

8.3

		Initial	Date
	Receiver temperature control tests to be carried out in Section 8.3 involve two types of tests:		
	(i) panel metal temperature control		
	<pre>(ii) blended metal and steam tempera- ture control.</pre>		
	Receiver panel temperature control tests through Section 8.3.8 involve control of panel metal temperature exclusively. Starting with Section 8.3.9, the steam temperature portion of the control loop will be closed result- ing in controlling the panel in a "blended" (steam and metal) mode of operation.		
8.3.1	Condition Downcomer and Steam Dump System		
8.3.1.1	Verify that the initial conditions have been established as required in Section 7.4.2.		
		Test 10 Revisio Page 34	030 on 0 10 of 543

				Initial	Date
8.3.1.2	Verify that valve, the operated va storage inl (MOV 1030)	the turbine main turbine inlet ste lve (MOV 1031), a et steam motor op are closed.	steam stop am motor nd the thermal erated valve		
8.3.1.3	Place contr mand the va Verify the feedback ZI	roller PC 1003 in alve to the closed valve is closed b [ 1003.	manual and com- position. by position		
8.3.1.4	Command ope valves and position.	en the following l verify that they	ow point drain are in the open		
	Valve	Handswitch	Feedback		
	LV1011	HS 1011	ZI 1011		
	LV 1012	HS 1012	ZI 1012		
	LV 1013	HS 1013	ZI 1013		4
	LV 1015	HS 1015	ZI 1015		
	LV 1016	HS 1016	HS 1016		
8.3.1.5	Command th position a feedback Z	e steam dump valve nd verify position I 2905.	e to a 5% open n through		
				T <b>est 1</b> Revisi Page 3	030 on 0 41 of 543

			-	Initial	Date
8.3.1.6	Open the manua and allow warr atomizing stea system.	al bypass valve an ning steam to flow am line into the s	round FV 1006 w through the steam dump		
8.3.1.7	Monitor pipe f TI 1001 and TH until pipe ter Pipe heatup ra Adjust downcor TC 2905 to acc cycle.	temperature rise f EX 2950. Continue nperature TI 1001 ate should not exe ner valve position celerate or retare	through e warmup exceed 350°F. ceed 60°F/min. n through d the warmup -		
8.3.1.8	Input "closed drain level v position feed	" commands to the alves and monitor back.	low point valve		
	Valve	Handswitch	Feedback		
	LV 1011	HS 1011	ZI 1011		
	LV 1012	HS 1012	ZI 1012		
	LV 1013	HS 1013	ZI 1013		
	LV 1015	HS 1015	ZI 1015		
	LV 1016	HS 1016	ZI 1016		
	Continue warm no longer hel	up until the leve d continuously in	l valves are an open		
	position due	to high condensate	e level		
	Continue on to Section 8.3.2	o the Steam Dump S	System Tests,		
				Test 10 Revisio Page 34	30 n 0 2 of 543

		Initial	Date
8.3.2	Control Tests on the Steam Dump System		
8.3.2.1	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.2.2	Open the steam downcomer valve by command- ing controller UC 2905 to the 100% valve position. Verify that flash tank temper- ature conditioning valves AOV 2914 and AOV 2915 are open (ZI 2914 and ZI 2915).		
8.3.2.3	Verify that steam dump desuperheater tem- perature controller TC 1002 is ready for automatic operation with a set point of 20°F (degrees of superheat).		
8.3.2.4	Place steam dump controller PC 1001 in manual (AM 1001) and command the value to a 10% open position. Allow steam to stabilize. Verify that the atomizing steam valve FV 1006 and spray water temperature valve TV 1002 open and control the steam temperature to 20°F superheat. Adjust position of steam dump valve as required to permit proper operation (opening) of TV 1002.		
8.3.2.5	Perform closed loop tests of TC 1002 (see Figure 8.3.2-1). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
		l Test 10 Revisic Page 34	30 n 0 3 of 543



Figure 8.3.2-1. Steam Dump Line Desuperheater Temperature Controller Functional Block Diagram - TC1002



		Initial	Date
B)	Increase temperature setpoint on TC 1002 to 40°F and observe the response on the strip chart.		
C)	Decrease TC 1002 setpoint back to nominal value and observe the response on the strip chart.		
D)	Increase/decrease proportional gain, Kl (C2-5, AL-15) as required.		
E)	Repeat steps B thru D as required until response is satisfactory.		
F)	Increase TC 1002 setpoint to 40°F and observe response.		
G)	Decrease TC 1002 setpoint to nominal value and observe temperature response.		
Н)	Increase/decrease reset gain, K2 (C2-5, AL-15) in the ± 10% increments as required.		
I)	Repeat steps F thru H as required until response is satisfactory.		
J)	Establish TC 1002 start-up controller gains and record.		
К)	Adjust setpoints, alarms, limits as required.		
		Test 1 Revisi Page 3	030 on 0 45 of 543

	-	Initial	Date
8.3.2.6	Observe the current pressure value indicated by PI 1001 and adjust the pressure control set point of PC 1001 to 20 psi below the indicated value (PC 1001 still in manual).		
8.3.2.7	Switch controller PC 1001 to automatic (pressure control) and allow system to stabilize. Observe conditions both at the steam dump valve and in the receiver flash tank which may be sharing the total receiver output flow. Switch flash tank pressure controller PC 2906 to manual. Verify proper operation of the steam dump desuperheater.		
8.3.2.8	Perform closed loop tests of PC 1001 (see Figure 8.3.2-2). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure setpoint on PC 1001 by 40 psi and observe the response on the strip chart.		
	C) Increase PC 1001 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, K1 (C2-5, AL-3) as required.		
		Test ](	)30 on 0

Revision 0 Page 346 of 543





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	-	Initial	Date
	E) Repeat steps B thru D as required until response is satisfactory.		
	F) Decrease PC 1001 setpoint 40 psi and observe response.		
	G) Increase PC 1001 setpoint to nominal value and observe pressure response.		
	H) Increase/decrease reset gain, K2 (C2-5, AL-3) in the ± 10% increments as required.		
	<ol> <li>Repeat steps F thru H as required until response is satisfactory.</li> </ol>		
	J) Establish PC 1001 start-up controller gains and record.		
	K) Adjust setpoints, alarms, limits as required.		
8.3.2.9	Close the receiver flash tank inlet valve AOV 2911 (HS 2911) and allow total receiver flow to pass through the steam dump system. Verify stable system operation. Return flash tank pressure control valve controller PC 2906 to the automatic mode.		
8.3.2.10	Verify that the receiver feed pump is in valve control and operating properly i.e., no pump problems are observed that would prevent a speed increase and a buildup of system pressure to the full operating level.	Test 10 Revisi	)30 on 0

		Initial	Date
8.3.2.11	Adjust receiver steam temperature setpoint (TSP 2929) to 660°F and allow steam con- ditions to stabilize.		
8.3.2.12	Adjust steam dump valve pressure setpoint to 900 psi. Observe pressure ramp by moni- toring PI 1001. Monitor the receiver control valve positions and pump speed and verify that they response properly to the pressure ramp. Monitor the receiver steam generation process and verify that no significant upset in the process occurs.		
8.3.2.13	Perform closed loop tests of PC 1001 (see Figure 8.3.2-2). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure setpoint on PC 1001 by 50 psi and observe the response on the strip chart.		
	C) Increase PC 1001 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, K1 (C2-5, AL-3) as required.		
	E) Repeat steps B thru D as required until response is satisfactory.		
		l Test 10	030

Revision O Page 349 of 543

		Initial Date
	F) Decrease PC 1001 setpoint to 50 psi and observe response.	
	G) Increase PC 1001 setpoint to nominal value and observe pressure response.	
	H) Increase/decrease reset gain, K2 (C2-5), AL-3) in the ± 10% increments as required.	
	<ol> <li>Repeat steps F thru H as required until response is satisfactory.</li> </ol>	
	J) Establish PC 1001 start-up controller gains and record.	
	K) Adjust setpoint, alarms, limits as required.	
8.3.2.14	Adjust steam dump valve pressure setpoint to 1505 psi. Observe pressure ramp by monitoring PI 1001. Monitor the receiver control valve position and pump speed and verify that they respond properly to the pressure ramp. Monitor the receiver steam generation process and verify that no significant upset in the process occurs.	
8.3.2.15	Perform closed loop tests of PC 1001 (see Figure 8.3.2-2). Tune control loop if required by carrying out the following steps.	
	A) Set receiver console to configure mode.	Test 1030 Revision 0 Page 350 of 543

		Initial	Date
В)	Decrease pressure set point on PC 1001 by 50 psi and observe the response on the strip chart.		
C)	Increase pressure set point back to nominal value and observe the response on the strip chart.		
D)	Increase/decrease proportional gain, Kl (C2-5, AL-3) as required.		
E)	Repeat steps B thru D as required until response is satisfactory.		
F)	Decrease PC 1001 set point to 50 psi and observe response.		
G)	Increase PC 1001 set point to nominal value and observe pressure response.		
Н)	Increase/decrease reset gain, K2 (C2-5, AL-32) in the ± 10% increments as required.		
Ι)	Repeat steps F thru H as required until response is satisfactory.		
J)	Establish PC 1001 start-up controller gains and record.		
К)	Adjust setpoints, alarms, limits as required.		
		Test 10	)30
		Revisi Page 3	on U 151 of 543

		Initial	Date
8.3.2.16	Reduce the pressure set point for PC 1001 to 500 psi. Monitor the pressure decay process. Verify stable equipment operation (feed pump, receiver control valves, steam dump valve, etc). Verify that a process upset condition does not occur in the receiver.		
8.3.2.17	Increase the pressure set point for PC 1001 to 1505 psi and allow process conditions to stabilize.		
8.3.2.18	<pre>Input a simulated receiver trip signal into MVCU 2-5. Observe the steam dump system automatically ramp the system pressure down to 485 psi. Verify that process conditions remain stable. Remove simulated trip signal. Proceed to Section 8.3.3 or carryout a system shutdown.</pre>		
		Test 1 Revisi Page 3	030 on 0 52 of 543

	-	Initial	Date
8.3.3	Control Tests - Receiver Feedpump - Rated Pressure		
8.3.3.1	Obtain loop process control data required for control tuning of the receiver feed pump (PC1105 - refer to Figure 8.3.3-1). Determine pressure, flow, speed response characteristics to commanded pump speed changes for flow rates of 100 thru 120,000 lb/hr at rated receiver pressure.		
8.3.3.1.1	Configure the system to the desired test conditions by carrying out the following steps:		
	<ol> <li>Adjust receiver incident power to achieve a flow rate of ∿100,000 to 120,000 lb/hr.</li> </ol>		
	<ol> <li>Confirm all panels are in temperature control i.e., (TC2301 thru TC2803) are in auto and console mode.</li> </ol>		
	3) Set FCM 2301 to manual.		
	4) Set FCM 2501 to manual.		
	5) Set AM 1105 to manual.		
	6) Confirm receiver system is in steady state.		
8.3.3.1.2	Perform open loop step response test on the receiver feed pump by carrying out the following steps:		
	1) Implement a step increase in speed command (AM 1005) by 10% of nominal	T <mark>est</mark> Revis Page 3	1030 ion 0 53 of 543



Test 1030 Revision 0 Page 354 of 543

	_	Initial	Date
	and monitor on DAS strip charts PI 2007, PI 2006, FI 2301, PDTX 2330, ZI 2301, FI 2501, PDTX 2530, ZI 2501, FCM 2303, PDTX 2332, ZI 2302, FCM 2503, PDTX 2532, and ZI 2503. Allow system to reach steady state condition.		
	<ol> <li>Apply a step decrease in speed command (AM 1105) back to nominal value and allow system to reach steady state.</li> </ol>		
	<ol> <li>Decrease speed command (AM 1105) by 10% (step) from nominal and allow system to reach steady state.</li> </ol>		
	<ol> <li>Increase speed command (step) back to nominal value and allow system to reach steady state.</li> </ol>		
	5) Set FCM 2301, FCM 2501, and AM 1105 back to auto.		
8.3.3.1.3	Perform open loop frequency response test on the receiver feed pump by carrying out the following steps:		
	<ol> <li>Insert the controls test unit (CTU) on to the drive of the receiver feed pump (AM 1105 output - analog output #4, MVCU 1-10).</li> </ol>		
	2) Verify AM 1105 in manual mode.		
	3) Verify FCM 2302 thru FCM 2803 (excluding FCM 2501) are in auto while FCM 2301 and FCM 2501 are in manual mode.		
		Test   Revis Page (	 030 ion 0 355 of 543

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	-	Initial	Date
4)	Using the transfer function analyzer (TFA), insert a 0.1 Hz sin wave into the CTU and adjust the TFA output such that a $\pm$ 10% of nominal speed variation (peak to peak) is achieved.		
5)	Verify that the variation in output flow and pressure on panels 204, 206, 210, and 212 are measurable on strip charts and on the DAS recording system. If not, adjust TFA amplitude to achieve desired response.		
6)	Set the TFA frequency to 0.01 Hz and allow system to reach steady state (3-4 cycles).		
7)	Repeat 6) at a frequency of 0.02 Hz		
8)	Repeat 6) at a frequency of 0.05 Hz		
9)	Repeat 6) at a frequency of 0.07 Hz		
10)	Repeat 6) at a frequency of 0.1 Hz		
11)	Repeat 6) at a frequency of 0.2 Hz		
12)	Repeat 6) at a frequency of 0.5 Hz		
13)	Repeat 6) at a frequency of 0.7 Hz		
14)	Repeat 6) at a frequency of 1.0 Hz		
15)	Repeat 6) at a frequency of 2.0 Hz	Test 1 Revis Page (	030 on 0 356 of 543

		Initial	Date
8.3.3.1.4	Restore the system to the desired		
	conditions.		
	l) Remove CTU from system		
	2) Set FCM 2301 to auto		
	3) Set FCM 2501 to auto		
	4) Set AM 1105 to auto		
	5) Confirm PC 1105 in pressure control		
8.3.3.2	Demonstrate satisfactory closed loop con-		
	trol of the receiver feedpump (PC 1105) in		
	both the pressure and valve control modes.		
	Obtain closed loop responses to setpoint		
	changes.		
8.3.3.2.1	Configure the system to the desired test		
	conditions by carrying out the following		
	steps:		
	l) Verify TC 2301 thru TC 2803 are operat-		
	ing on metal temperature control.		
	2) Verify PC 1105 is operating on pres-		
	sure control.		
8.3.3.2.2	Tune PC1105 receiver feedpump pressure con-		
	troller (Figure 8.3.3-1) by carrying out		
	the following steps using loop tuning		
	form.		
	A) Set receiver console to configure mode.		
		Test 10	30
		Revisio Page 20	on 0 57 of 57
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		Initial	Date
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B) Dec by str	crease pressure set point on PC 1105 10% and observe the response on the rip chart.		
C) Inc nom on	crease pressure set point back to ninal value and observe the response the strip chart.	2	
D) Inc Kl	crease/decrease proportional gain, (Cl-1, AL-7).*		
E) Rep res	peat steps B thru D as required unti sponse is satisfactory.	i]	
F) Dec obs	crease PC 1105 set point 10% and erve response.		
G) Inc val	crease PC 1105 set point to nominal ue and observe pressure response.		
H) Inc (Cl	rease/decrease reset gain, K2 -10, AL-7) in the ± 30% increments.		
I) Rep res	eat steps F thru H as required unti ponse is satisfactory.	1	
J) Est gai	ablish preliminary PC1105 controlle ns and record.	er	
K) Adj	ust setpoints, alarms, limits as uired.		

Test 1030 Revision 0 Page 358 of 543

	-	Initial	Dat
83323	Demonstrate satisfactory closed loop control		
0.3.3.2.3	of the receiver feed nump while under valve		
	control for rated flowrates rated pressure		
	control for faced flowfates, faced pressure.		
8.3.3.2.4	Determine the receiver temperature con-		
	troller with the most open control valve		
	command at steady state conditions.		
	Record valve (i.e. minimum C.O.)		
	Maximum Valve Command %		
	Controller Tag FCM		
8.3.3.2.5	Select UC 1105. Switch to console mode and		
	set valve command setpoint to previous		
	valve determined in 8.3.3.2.4.		
8.3.3.2.6	Switch PC 1105 from pressure control to		
	valve control mode. Observe response on		
	DAS strip charts for UC 1105, SI 1105,		
	PI 2002, PI 2005, FCM 2301-FCM 2803 and		
	PDTX 2230 Allow system to achieve		
	stordy state conditions	1	
	steady state conditions.		
8.3.3.2.7	Provide a step increase in temperature set-		
	point on controls TC (as determined in		
	8.3.3.2.4) by 10%. Monitor flowrate, valve		
	position and temperature response on this		
	panel. Allow system to reach steady state		
	conditions.		

Test 1030 Revision 0 Page 359 of 543

	-	Initial	Date
8.3.3.2.8	Implement a step decrease in temperature setpoint (back to nominal) on the selected controller. Monitor flowrate, valve position and temperature response. Adjust gains in C1-10, A1-6 if required. Repeat 8.3.3.2.7 if gains are adjusted.		
8.3.3.3	Verify that the automatic pressure run- back capability on the combined steam dump/receiver feedpump system is satisfactory.		
8.3.3.3.1	Confirm that TC 2301 thru TC 2803 are in metal temperature control mode.		
8.3.3.3.2	Confirm that PC 1105 is in valve control mode.		
8.3.3.3.3	Select PC 1001 and ramp setpoint from rated pressure to 500 psig in a 3 minute period. Allow system to reach steady state condition.		
8.3.3.3.4	Select PC 1001 and ramp setpoint from 500 psig to rated pressure in a 3 minute period. Allow system to reach steady state condition.		
8.3.3.3.5	Initiate an automatic pressure run-back transient into the coupled steam dump/ receiver feedpump system by implementing the following steps.		
		Test 10 Revisio Page 30	30 3n 0 50 of 543

		Initial Date
	<ol> <li>Verify the receiver system is in steady state.</li> </ol>	
	<ol> <li>Select PCT 1001, set to manual mode.</li> <li>Adjust output to 100%. This will initiate automatic run-back.</li> </ol>	
8.3.3.3.6	Monitor system pressure, PC 1001, UC 1005 for satisfactory performance. Adjust con- trol parameters and control logic if required.	
8.3.3.3.7	Select PCT 1001. Set output to 0%.	
8.3.3.3.8	Initiate pressure setpoint run-ups to simulate start-up pressure ramp by imple- menting the following steps.	
	1) Set PD 1001A to start-up	
	<ol> <li>Set PDC 1001C to on - to initiate set- point ramp.</li> </ol>	
8.3.3.3.9	Monitor system pressure, PC 1001, UC 1005 for satisfactory performance. Adjust con- trol logic if required.	
8.3.3.3.10	If control logic or parameters are adjusted in 8.3.3.3.6 or 8.3.3.3.9 then repeat 8.3.3.3.5 thru 8.3.3.3.9.	
		l Test 1030 Revision 0 Page 361 of 543

		Initial	Date
8.3.4	CONTROL TESTS - PANELS 214, 217, 219, & 221 - LOW FLOW		
8.3.4.1	Obtain process control open loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 & TC2803) at rated pressure, derated temperature and low flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain both step and frequency response data to valve disturbances at a nominal temperature of 660°F. Obtain step/ramp response to flux disturbances.	9	
8.3.4.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.4.1.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.4.1.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 660°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates > 1800 lb/hr.		
8.3.4.1.4	Verify that all panels are in metal tempera- ture control and a nominal setpoint of 660°F. Adjust TC2301 thru TC2803 setpoints as required.		
8.3.4.1.5	Verify that control test unit (CTU) is installed and operating on TV2602, TC2702, TV2801, & TV2803.		
		 Test 1 Revisi Page 3	030 on O 62 of 543

Confirm that the receiver feedpump controller (PC1105) is in pressure control mode (Select		
(PC1105) is in pressure control mode (Select		
PD1105A).		
Obtain open loop step response data on panel		
214 by carrying out the following steps.		
A) Confirm that the receiver panels are in		
a steady state condition for approximately		
5 minutes.		
B) Set FCM2602 to manual mode.		
C) Implement a step decrease in FCM2602		
output by approximately 10% of nominal		
value (increase valve		
opening) and allow pressures, flows,		
temperatures to reach steady state.		
Note: An adjustment in the magnitude of		
the valve step command may be required		
in order to achieve a measureable response		
change in flow and temperature - flow		
of $\pm$ .1 lb/sec, temperatures of $\pm$ 50 to		
100°F are desired. Record final command		
change. Monitor the following parameters		
on a strip chart to verify that data is		
recorded: FCM2602 (PV & CO), TI2602,		
TI2605, YI2608, PI2902.		
FCM2602 Output %		
Command Change		
	Tort 1	030
	Revisi	oso on O
	<ul> <li>Obtain open loop step response data on panel 214 by carrying out the following steps.</li> <li>A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.</li> <li>B) Set FCM2602 to manual mode.</li> <li>C) Implement a step decrease in FCM2602 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.</li> <li>Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2602 (PV &amp; CO), TI2602, TI2605, YI2608, PI2902.</li> <li>FCM2602 Output% Command Change</li> </ul>	<pre>Obtain open loop step response data on panel 214 by carrying out the following steps. A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes. B) Set FCM2602 to manual mode. C) Implement a step decrease in FCM2602 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state. Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2602 (PV &amp; CO), TI2602, TI2605, YI2608, PI2902. FCM2602 Output% Command Change Test 1 Revisio Page 3</pre>

		-	Initial	Date
8.3.4.1.7	D)	Implement a step increase (back to nominal) in FCM2602 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E)	Reset FCM2602 back to auto.		
8.3.4.1.8	Per 214 out	form frequency response tests on panel (See TC2602, Figure 8.3.4-1) by carrying the following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2602. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).	2	
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.1.7 C.		
	Note	e: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2602 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2602.	Test	030
			Revisi Page 3	ion 0 864 of 543

MVCU 1-6



Figure 8.3.4-1. RS Steam Temperature Controller Functional Block Diagram TC-2602

543

				Initial Date	
8.3.4.1.8	6)	Set FCM	2602 to manual mode.		
	7)	Using t	he transfer function analyzer		
		(TFA) i	nsert a 0.1 HZ sin wave into the		
		CTU) an	d adjust the TFA output such that		
		a + 400	lb/hr peak-to-peak response is		
		achieve	d on FI2602.		
		Set the	TFA to 0.02 HZ allow the system		
		to reac	h steady state (3-4) cycles).		
		Repeat	4) at a frequency of 0.05 HZ		
		Repeat	4) at a frequency of 0.07 HZ		
		Repeat	4) at a frequency of 0.1 HZ		
		Repeat	4) at a frequency of 0.2 HZ		
		Repeat	4) at a frequency of 0.5 HZ		
		Repeat	4) at a frequency of 0.7 HZ		
		Repeat	4) at a frequency of 1 HZ		
		Repeat	4) at a frequency of HZ		
		Repeat	4) at a frequency of HZ dur	ing test	
	Not	e: (1)	The TFA output amplitude may need		
			to be adjusted during the test		
			as required to obtain a		
			measureable output response		
			(determined by test by		
			engineers in RS-1 or DAS room.		
		(2)	If panel temperature drifts off		
			the nominal test condition -		
			adjust FCM2602 output from		
			operator station to correct -		
			if cannot successfully adjust -		
			return to Step 5.		
				I Test 1030	
				Revision 0	_
				Page 366 of 543	3

		Initial	Date
8.3.4.1.8	8) Switch TFA input out of CTU.		
	9) Set FCM2602 back to auto.		
8.3.4.1.9	Obtain open loop step response data on panel 217 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B) Set FCM2702 to manual mode.		
	C) Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2702 (PV & CO), TI2702, TI2705, YI2708, PI2902.		
	FCM2702 Output% Command Change		
		Test Revis Page	 1030 ion 0 367 of 543

_	Initial	Date
plement a step increase (back to		
minal) in FCM2702 output (closing		
lve) and allow temperatures, pressure		
d flowrate to reach steady state		
nditions.		
set FCM2702 back to auto.		
		L
m frequency response tests on panel		
ee TC2702, Figure 8.3.4-2) by carrying		
e following steps.		
rify that the controls test unit (CTU)		
installed and operating on TC2702.		
nstallation is in RS-1).		
rify the receiver feedpump is in pres-		
re control mode (PC1105).		
nfirm that the receiver panels are in		
steady state condition for approxi-		
tely 2 minutes.		
just the peak to peak amplitude on the		
ansfer function analyzer output to be		
nsistent with the required output change		
termined in Section 8.3.4.1.9 C.		
Verify that the TFA input to the CTU		
switched out.		
lest FCM0700 and adjust astroint to		
tect runz/uz and dajust setpoint to		
nieve a nominal oou'r Steam Outlet		
mperature on it 2702.		
	lest ] Povici	030 on 0
	Page 3	68 of 543
	<pre>olement a step increase (back to ninal) in FCM2702 output (closing lve) and allow temperatures, pressure d flowrate to reach steady state nditions. set FCM2702 back to auto. m frequency response tests on panel ee TC2702, Figure 8.3.4-2) by carrying e following steps. rify that the controls test unit (CTU) installed and operating on TC2702. nstallation is in RS-1). rify the receiver feedpump is in pres- re control mode (PC1105). nfirm that the receiver panels are in steady state condition for approxi- tely 2 minutes. just the peak to peak amplitude on the ansfer function analyzer output to be nsistent with the required output change termined in Section 8.3.4.1.9 C. Verify that the TFA input to the CTU switched out. lect FCM2702 and adjust setpoint to nieve a nominal 660°F steam outlet mperature on TC 2702.</pre>	Initial Delement a step increase (back to ninal) in FCM2702 output (closing live) and allow temperatures, pressure d flowrate to reach steady state nditions. Set FCM2702 back to auto. In frequency response tests on panel ee TC2702, Figure 8.3.4-2) by carrying e following steps. rify that the controls test unit (CTU) installed and operating on TC2702. nstallation is in RS-1). rify the receiver feedpump is in pres- re control mode (PC1105). nfirm that the receiver panels are in steady state condition for approxi- tely 2 minutes. just the peak to peak amplitude on the ansfer function analyzer output to be nsistent with the required output change termined in Section 8.3.4.1.9 C. Verify that the TFA input to the CTU switched out. Rect FCM2702 and adjust setpoint to nieve a nominal 660°F steam outlet mperature on TC 2702. Test in Revisis Page 3

**MVCU 1-7** 





543

			Initial	Date
8.3.4.1.10	6)	Set FCM2702 to manual mode.	,	
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a + 400 lb/hr peak-to-peak response is achieved on FI2702.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).		
		Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ	ermined ng test	
	Not	te: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room.		
			Test 1 Revisi Page 3	030 on 0 70 of 543

	_	Initial	Date
8.3.4.1.10	Note: (2) If panel temperature drifts off		
	the nominal test condition -		
	adjust FCM2702 output from		
	operator station to correct -		
	if cannot successfully adjust -		
	return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2702 back to auto.		
8.3.4.1.11	Obtain open loop step response data on panel		
	219 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B) Set FCM2801 to manual mode.		
	C) Implement a step decrease in FCM2801 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of $\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters		
		Tes+	1030

Revision 0 Page 371 of 543

	_	Initial	Date
8.3.4.1.11	on a strip chart to verify that data is		
	recorded: FLM2801 (PV & CO), 112801, T12804, Y12807, P12902,		
	D) Implement a step increase (back to nominal)		
	in FCM2801 output (closing valve) and allow		
	temperatures, pressure and flowrate to reach steady state conditions		
	E) Reset FCM2801 back to auto.		
8.3.4.1.12	Perform frequency response tests on panel 219		
	(See TC2801, Figure 8.3.4-3) by carrying out		
	the following steps.		
	<ol> <li>Verify that the controls test unit (CTU)</li> </ol>		
	is installed and operating on TC2801.		
	(Installation is in RS-1).		
	2) Verify the receiver feedpump is in		
	pressure control mode (PC1105).		
	3) Confirm that the receiver panels are		
	mately 2 minutes.		
	4) Adjust the peak to peak amplitude on the		
	transfer function analyzer output to be		
	determined in Section 8.3.4.1.11 C.		
	······································		
	Note: Verify that the TFA input to the CTU		
	is switched out.		
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		Revis	on 0
		Page 3	372 of 543





543

			Initial	Date
8.3.4.1.12	5)	Select FCM2801 and adjust setpoint to		
		achieve a nominal 660°F steam outlet		
		temperature on TC2801.		
	6)	Set FCM2801 to manual mode.		
	7)	Using the transfer function analyzer		
		(TFA) insert a O.1 HZ sin wave into the		
		CTU) and adjust the TFA output such		
		that a + 400 lb/hr peak-to-peak response		
		is achieved on FI2801.		
		Set the TFA to 0 02 H7 allow the system		
		to reach steady state $(3-4)$ cycles)		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
		Repeat 4) at a frequency of 0.5 HZ		
		Repeat 4) at a frequency of 0.7 HZ		
		Repeat 4) at a frequency of 1 HZ		
		Repeat 4) at a frequency of HZ	rminad	
		Repeat 4) at a frequency of HZ duri	ng test	
	Not	e: (1) The TFA output amplitude may		
		need to be adjusted during the		
		the test as required to obtain		
		a measureable output response		
		(determined by test by		
		engineers in RS-1 or DAS room.		

Test 1030 Revision 0 Page 374 of 543

		Initial	Date
8.3.4.1.12	Note: (2) If panel temperature drifts		
	off the nominal test condition -		
	adjust FCM2801 output from		
	operator station to correct -		
	if cannot successfully adjust -		
	return to Step 5		
	8) Switch TFA input out of CTU		
	9) Set FCM2801 back to auto		
8.3.4.1.13	Obtain open loop step response data on panel		
	221 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a		
	steady state condition for approximately		
	5 minutes.		
	B) Set FCM2803 to manual mode		
	C) Implement a step decrease in FCM2803		
	output by approximately 10% of nominal		
	value (increase valve		
	opening) and allow pressures, flows,		
	temperatures to reach steady state		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in order		
	to achieve a measureable response change		
	in flow and temperature - flow of $\pm$ .1 lb/		
	sec, temperatures of $\pm$ 50 to 100°F are		
	desired. Record final command change.		
	Monitor the following parameters on a		
		Test	1030
		Revisi	on O
		Page 3	75 of 543

		Initial	Date
8.3.4.1.13	strip chart to verify that data is recorded: FCM2803 (PV & CO), TI2803,		
	TI2806, YI2809, PI2902.		
	FCM2803 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2803 output (closing		
	valve) and allow temperatures, pressure		
	and flowrate to reach steady state		
	E) Reset FCM2803 back to auto.		
8.3.4.1.14	Perform frequency response tests on panel 221 (See TC2803, Figure 8.3.4-4) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2803.</li> </ol>		
	(Installation is in RS-1).		<del></del>
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately</li> <li>minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8 3 4 1 13 C		
		 Test ]	030
		Revisi	on Ö
		Page 3	76 of 543



Figure 8.3.4-4. RS Steam Temperature Controller Functional Block Diagram TC-2803

	_	Initial	Date
8.3.4.1.14	Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2803 and adjust setpoint to achieve a nominal 660°F steam outlet temperature on TC2803.		
	6) Set FCM2803 to manual mode.		
	<ul> <li>7) Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a + 400 lb/hr peak-to-peak response is achieved on FI2803.</li> <li>Set the TFA to 0.02 HZ allow the system to reach steady state (3-4) cycles).</li> <li>Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency 6 HZ Repeat 4) at a frequency 6 HZ Rep</li></ul>	ermined ing test	
	as required to obtain a measureable output response (determined by test by engi-		
		Test Revisi Page 3	 1030 on 0 378 of 543

	-	Initial	Date
8.3.4.1.14	Note: (2) If panel temperature drifts off		
	the nominal test condition -		
	adjust FCM2803 output from		
	operator station to correct -		
	if cannot successfully adjust -		
	return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2803 back to auto		
* 8.3.4.1.15	Obtain open loop step/ramp response to a flux		
	disturbance on panels 214, 217, 219, 221 by		
	carrying out the following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approximately 5 min.		
	B) Set FCM2602, FCM2702, FCM2801, FCM2803,		
	to manual mode.		
	C) Implement a step/ramp decrease in the		
	power level on panels 214, 217, 219, 221		
	by approximately 10% of nominal power.		
	Allow panel temperatures, pressure and		
	flowrate to reach steady state. Monitor		
	the following parameters on a strip		
	recorded. Panel flows steam & metal		
	temperatures, flux, valve commands &		
	PI2902.		
			ł

Test 1030 Revision 0 Page 379 of 543

		Initial	Date	
8.3.4.1.15	Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\geq 50$ to $100^{\circ}$ F are desired.			
	D) Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		·	
	E) Set FCM2602, FCM2702, FCM2801, FCM2803, back to auto.			
	×	ا Test ۱ Revisi Page 3	030 on 0 80 of 543	

	_	Initial	Date
8.3.4	CONTROL TESTS - PANELS 214, 217, 219, & 221 - LOW FLOW		
8.3.4.2	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 & TC2803) at rated pressure, derated temperature and low flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain step response data to setpoint changes at a nominal temperature of 660°F. Obtain step/ramp response to flux disturbances.		
8.3.4.2.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.4.2.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.4.2.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve $660^{\circ}$ F outlet steam temperature on panels $214-221$ with minimum individual panel flowrates $\geq$ 1800 lb/hr.		
8.3.4.2.4	Verify that all panels are in metal temperature control and a nominal setpoint of 660°F. Adjust TC2301 thru TC2803 setpoints as required.		
8.3.4.2.5	Verify that control test unit (CTU) external input is switched out.		
		Test Revis Page	  030 ion 0 381 of 543

		Initial	Date
8.3.4.2.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.4.2.7	Obtain closed loop response on TC2602 to a temperature setpoint change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 is in a steady state condition for approximately 2 minutes. Panel conditions: T = 660°F;</li> <li>P = 1450 psig; F = 1800 lb/hr.</li> </ul>		
	B) Confirm TC2602 is in metal temperature control mode.		
	C) Implement a step decrease in TC2602 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	D) Implement a step increase in TC2602 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Confirm temperature response is satisfactory If not adjust control loop gains via the following:		
		Test Revis <sup>+</sup> Page 3	1030 ion 0 382 of 543

		Initial	Date
8.3.4.2.7	E) 1) Set receiver console to configure mode.		
	<ol> <li>Select Cl-6. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.4.2.8	Obtain closed loop response on TC2702 to a temperature setpoint change on panel 217 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 2702 in a steady state condition for approximately 2 minutes. Panel conditions: T = 660°F;</li> <li>P = 1450 psig; F = 1800 lb/hr.</li> </ul>		
	B) Confirm TC2702 is in metal temperature control mode.		
	C) Implement a step decrease in TC2702 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the follow- ing parameters on a strip chart recorder to verify data is recorded: panel flow, steam	&	
		Test Revis Page	1 1030 ion 0 383 of 54

		Initial	Date
8.3.4.2.8	C) metal temperatures, flux valve position & command, setpoint.		
	D) Implement a step increase in TC2702 setpoint (back to nominal). Allow panel temperatures pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.	3	
	E) Confirm temperature response is satisfactory If not adjust control loop gains via the following:	•	
	1) Set receiver console to configure mode.		
	<ol> <li>Select Cl-7. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.4.2.9	Obtain closed loop response on TC2801 to a temperature setpoint change on panel 219 by carrying out the following steps.		
		Test Revisi Page (	1030 on 0 384 of 543

		_	Initial	Date
8.3.4.2.9	A)	Confirm that receiver panel 219 is in a steady state condition for approximately 2 minutes. Panel conditions: T = 660°F; P = 1450 psig; F = 1800 lb/hr.		
	B)	Confirm TC2801 is in metal temperature		
	C)	Implement a step decrease in TC2801 set- point by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	D)	Implement a step increase in TC2801 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Confirm temperature response is satisfactor If not adjust control loop gains via the following:	у.	
		1) Set receiver console to configure mode.		
		<ol> <li>Select C1-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
			Test Revis Page	1030 ion 0 385 of 543

		-	Initial	Date
8.3.4.2.9	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode.		
8.3.4.2.10	Obt tem car	ain closed loop response on TC2803 to a perature setpoint change on panel 221 by rying out the following steps.		
	A)	Confirm that receiver panel 221 is in a steady state condition for approximately 2 minutes. Panel conditions: T = 660°F; P = 1450 psig; F = 1800 lb/hr.		
	B)	Confirm TC2803 is in metal temperature control mode.		
	C)	Implement a step decrease in TC2803 setpoin by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.	ıt	
	D)	Implement a step increase in TC2803 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.	Test Revis Page	1030 ion 0 386 of 543

		Initial D	ate
8.3.4.2.10	E) Confirm temperature response is satisfactory If not adjust control loop gains via the following:	/.	
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select C1-9. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.4.2.11	Obtain closed loop response on TC2602, TC2702, TC2801, TC2803 to a flux disturbance on panel 214, 217, 219, 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214, 217, 219,</li> <li>221 is in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 660°F; P = 1450 psig; F = 1800 lb/hr</li> </ul>		
	B) Confirm TC2602, TC2702, TC2801, TC2803 are in metal temperature control mode.		,
		Test 1030 Revision O Page 387 o <sup>.</sup>	f 543

			Initial	Date
8.3.4.2.11	C)	Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221 by approximately 10% nominal power.		
		Allow panel temperatures, pressure and flowrate to reach steady state. Monitor		
		the following parameters on a strip chart		
		recorder to verify data is recorded:		
		flux, valve position & command, setpoint.		
		An adjustment in the magnitude of the power		
		change (number of heliostats on/off target) may be required in order to		
		achieve measureable response changes in		
		flow and temperatures and flux. Flux changes $> 20\%$ and flow changes		
		$\geq$ 500 lb/hr are desired.		
	(ח	Implement a step/ramp increase in papel		
	0,	power (back to nominal). Allow panel		
		temperatures, pressures, flux and flows		
		to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature responses. If		
		temperature excursions exceed $\pm$ 50°F -		
		adjust flux loop gains via the following.		
		1) Set receiver console to configure		
		mode.		
		2) Select AL-16 of appropriate MVCU and usi	ng	
		loop tuning form increase/decrease gain		
		and control parameters as required.		
			Test 1 Revisi	030 on 0

			Initial	Date
8.3.4.2.11	F)	If gains are adjusted repeat Steps C		
		thru E. Record final tuned flux loops		
		gain. Set console back to monitor mode.		
			- · -	
			Test 1 Revisi	030 on 0
			Page 3	89 of 543

	_	Initial	Date
8.3.4.3	Obtain process control open loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801, TC2803) at rated pressure, derated temperature and low flow. (Refer to Figures 8.3.4-1 thru 8.3.4-4.) Obtain both step and frequency response data to valve dis- turbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.	9	
8.3.4.3.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.4.3.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.4.3.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if requested to achieve 800°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates > 1800 lb/hr.		
8.3.4.3.4	Verify that all panels are in metal temperature control and a nominal setpoint of 660°F. Adjust TC2301 - TC2803 setpoints as requested.		
8.3.4.3.5	Verify that the control test unit (CTU) is installed and operating on TV2602, TV2702, TV2801, TV2803.		
		Test 1 Revisi Page 3	030 on 0 90 of 543

		Initial	Date
8.3.4.3.6	Confirm that the receiver field pump con-		
	troller (PCllO5) is in pressure control		
	mode (Select PD1105A).		
8.3.4.3.7	Obtain open loop step response data on panel		
	214 by carrying out the following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approximately		
	5 minutes.		
	B) Set FCM2602 to manual mode		
	C) Implement a step decrease in FCM2602 output		
	by approximately 10% of nominal value		
	(increase valve opening)		
	and allow pressures, flows, temperatures		
	to reach steady state.		
	Noto. An adjustment in the magnitude of the		
	Note. An adjustment in the magnitude of the	1	
	ander to achieve a measureable response		
	change in flow and temperature flow of		
	change in flow and temperature - flow of $\frac{1}{2}$		
	$\pm$ .1 D/sec, temperatures of $\pm$ 50 to 100 F		
	Moniton the following parameters on a		
	strip shart to vorify that data is		
	scrip chart to verify that data is $r_{0}$		
	$\frac{1}{12002}, \frac{1}{12002}, 1$		
	112003, 112008, 112902.		
	FCM2602 Output%		
	Command Change		
		Test	 1030
		Revis	ion 0 301 of 543
		rage .	543

	-	Initial	Date
8.3.4.3.7	D) Implement a step increase (back to nominal) in FCM2602 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state con- ditions.		
	E) Reset FCM2602 back to auto.		
8.3.4.3.8	Perform frequency response tests on panel 214 (See TC2602, Figure 8.3.4-1) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CIT) is installed and operating on TC2602. (Installation is in RS-1).</li> </ol>		
	2) Verify the receiver feedpump is in pres- sure control mode (PC1105).	· · · · · · · · · · · · · · · · · · ·	
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> </ol>		
	<ol> <li>Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.3.7 C.</li> </ol>		
	Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2602 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2602.	Test Revis	   1030 ion 0

	Initia	Date	
8.3.4.3.8	6) Set FCM2602 to manual mode.		
-			
	<ol><li>Using the transfer function analyzer (TFA)</li></ol>		
	insert a 0.1 HZ sin wave into the CTU) and		
	adjust the TFA output such that a + 400		
	lb/hr peak-to-peak response is achieved		
	on F12602.		
	Set the TFM to $0.02$ UZ allow the system to		
	Set the TFA to $0.02 \text{ Hz}$ allow the system to		
	reach steady state (3-4) cycles).		
	Repeat 4) at a frequency of 0.05 HZ		
	Repeat 4) at a frequency of 0.07 HZ		
	Repeat 4) at a frequency of 0.1 HZ		
	Repeat 4) at a frequency of 0.2 HZ		
	Repeat 4) at a frequency of 0.5 HZ		
	Repeat 4) at a frequency of 0.7 HZ		
	Repeat 4) at a frequency of 1 HZ		
	Repeat 4) at a frequency of HZ Determined	1	
	Repeat 4) at a frequency of HZ during tes	st	
	Note: $(1)$ The TFA cutout emplitude may		
	Note: (1) The TFA output amplitude may		
	test as required to obtain a		
	measureable output response		
	(determined by test by engi-		
	neers in RS-1 or DAS room.		
	(2) If panel temperature drifts off		
	the nominal test condition -		
	adjust FCM2602 output from		
	operator station to correct -		
	if cannot successfully adjust -		
	return to Step 5.		
	Te	st 1030	
	Pa	ige 393 of 543	
		Initial	Date
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8.3.4.3.8	8) Switch TFA input out of CTU.		
	9) Set FCM2602 back to auto.		
8.3.4.3.9	Obtain open loop step response data on panel 217 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B) Set FCM2702 to manual mode.		
	C) Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± .1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2702 (PV & CO), TI2702, TI2705, YI2708, PI2902.		
	FCM2702 Output% Command Change	Test	1030
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Revision O Page 394 of 543

		Initial	Date
8.3.4.3.9	D) Implement a step increase (back to		
	nominal) in FCM2702 output (closing		
	valve) and allow temperatures, pressure		
	and flowrate to reach steady state con-		
	ditions.		
	E) Reset FCM2702 back to auto.		
8343.10	Perform frequency response tests on panel 217		
0.0.4.0.10	(See TC2707, Figure $8.3.4-2$ ) by carrying out		
	the following steps.		
	<ol> <li>Verify that the controls test unit (CTU)</li> </ol>		
	is installed and operating on TC2702.		
	(Installation is in RS-1).		
	2) Verify the receiver feedpump is in		
	pressure control mode (PC1105).		
	3) Confirm that the receiver namels are		
	in a steady state condition for approxi-		
	mately 2 minutes		
	4) Adjust the peak to peak amplitude on the		
	transfer function analyzer output to be		
	consistent with the required output change		
	determined in Section 8.3.4.1.9 C.		
	Note: Verify that the TFA input to the CTU		
	is switched out.		
	5) Select FCM2702 and adjust setpoint to		
	achieve a nominal 800°F steam outlet		
	temperature on TC2702.		
		Test	I 1030
		Revis	ion O
		Page 3	395 of 543



		Initial	Date
8.3.4.3.10	8) Switch TFA input out of CTU.		
	9) Set FCM2702 back to auto.		
8.3.4.3.11	Obtain open loop step response data on panel 219 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> <li>5 minutes.</li> </ul>		
	B) Set FCM2801 to manual mode.		
	C) Implement a step decrease in FCM2801 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of $\pm$ .1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2801 (PV & CO), TI2801, TI2804, YI2807, PI2902.		
	FCM2801 Output% Command Change		
		Test Revis Page	 1030 sion 0 397 of 543

		Initial	Date
8.3.4.3.11	D) Implement a step increase (back to nominal) in FCM2801 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2801 back to auto.		
8.3.4.3.12	Perform frequency response tests on panel 219 (See TC2801, Figure 8.3.4-3) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2801. Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> </ol>	<u></u>	
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.3.11 C.		
	Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2801 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2801.	Test	1030
		Page	398 of 543

	Initial D	ate
8.3.4.3.12	6) Set FCM2801 to manual mode.	
	7) Using the transfer function analyzer	
	(TFA) insert a 0.1 HZ sin wave into the	
	CTU) and adjust the TFA output such that	
	a + 400 lb/hr peak-to-peak response is	
	achieved on FI2801.	
	Set the TFA to 0.02 HZ allow the system	
	to reach steady state (3-4) cycles).	
	Repeat 4) at a frequency of 0.05 HZ	
	Repeat 4) at a frequency of 0.07 HZ	
	Repeat 4) at a frequency of 0.1 HZ	
	Repeat 4) at a frequency of 0.2 HZ	
	Repeat 4) at a frequency of 0.5 HZ	
	Repeat 4) at a frequency of 0.7 HZ	
	Repeat 4) at a frequency of 1 HZ	
	Repeat 4) at a frequency of HZ Determined	
	Repeat 4) at a frequency of HZ during test	
	Note: (1) The TFA output amplitude may	
	need to be adjusted during the	
	test as required to obtain	
	a measureable output response	
	(determined by test by engi-	
	neers in RS-1 or DAS room.	
	(2) If panel temperature drifts off	
	the nominal test condition -	
	adjust FCM2801 output from	
	operator station to correct -	
	if cannot successfully adjust -	
	return to Step 5.	
	· Test 1030	
	Revision	0
	Page 399	of

		Initial	Date
8.3.4.3.12	8) Switch TFA input out of CTU.		
	9) Set FCM2801 back to auto		<b>_</b>
8.3.4.3.13	Obtain open loop step response data on panel		
	221 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately</li> </ul>		
	5 minutes		<u> </u>
	B) Set FCM2803 to manual mode.		
	C) Implement a step decrease in FCM2803 outpu	t	
	by approximately 10% of nominal value		
	(Increase valve opening)		
	to reach steady state.		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in		
	order to achieve a measureable response		
	change in flow and temperature - flow		
	$0T \pm .1$ TD/Sec, temperatures of $\pm$ 50 to		
	change Monitor the following parameters		
	on a strip chart to verify that data is		
	recorded: FCM2803 (PV & CO), TI2803,		
	TI2806, YI2809, PI2902.		
	FCM2803 Output%		
	Command Change		
		Tot	1020
		Revis Page	ion 0 400 of 543

		Initial	Date
8.3.4.3.13	D) Implement a step increase (back to nominal) in FCM2803 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2803 back to auto.		
8.3.4.3.14	Perform frequency response tests on panel 221 (See TC2803, Figure 8.3.4-4) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2803. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressur control mode (PC1105).</li> </ol>	e	
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.3.13 C.		
	Note: Verify that the TFA input to the CTU is switched out.		
	5) Select FCM2803 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2803.	_	
		lest Revis Page 4	1030 ion 0 401 of 543

			Initial	Date
8.3.4.3.14	6) Set FCM2	2803 to manual mode.		
	7) Using th	ne transfer function analyzer		
	(TFA) in	asert a 0.1 HZ sin wave into the		
	CTU) and	adjust the TFA output such that		
	a + 400	1b/hr peak-to-peak response is		
	achieved	d on FI2803.		
	Set the	TFA to 0.02 HZ allow the system		
	to reach	n steady state (3-4) cycles).		
	Repeat 4	) at a frequency of 0.05 HZ		
	Repeat 4	l) at a frequency of 0.07 HZ		
	Repeat 4	1) at a frequency of 0.1 HZ		
	Repeat 4	1) at a frequency of 0.2 HZ		
	Repeat 4	l) at a frequency of 0.5 HZ		
	Repeat 4	1) at a frequency of 0.7 HZ		
	Repeat 4	1) at a frequency of 1 HZ		
	Repeat 4	<pre>1) at a frequency of HZ Dete</pre>	rmined	
	Repeat 4	<pre>1) at a frequency of HZ duri</pre>	ng test	
	Note: (1)	The TFA output amplitude may		
		need to be adjusted during		
		the test as required to obtain		
		a measureable output response		
		(determined by test by engi-		
		neers in RS-1 or DAS room.		
	(2)	If panel temperature drifts off		
		the nominal test condition -		
		adjust FCM2803 output from		
		operator station to correct - if		
		cannot successfully adjust -		
		return to Step 5.		
			Test 1	030
			Revisi	on 0 102 of 54
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			Initial	Date
	8.3.4.3.14	8) Switch TFA input out of CTU		
•		9) Set FCM2803 back to auto. —		
	8.3.4.3.15	Obtain open loop step/ramp response to a flux disturbance on panels 214, 217, 219, 221 by carrying out the following steps.		
		<ul> <li>A) Confirm that the receiver panels are in a steady state condition for approximately 5 min.</li> </ul>		
		B) Set FCM2602, FCM2702, FCM2801, FCM2803, to manual mode.		
	·	C) Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flows, steam & metal temperatures, flux, valve commands & PI2902.		
		Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes $\geq$ 20% and temperature changes $\geq$ 50 to 100°F are desired.	2	
			Tes Rev Pag	 t 1030 ision 0 e 403 of 543

			Initial	Date
8.3.4.3.15	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM2602, FCM2702, FCM2801, FCM2803 back to auto.		
			Test Revis Page	1030 500 0

		Initial	Date	
8.3.4.4	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 & TC2803) at rated			
	pressure, derated temperature and low flow (refer to Figures 8.3.4-1 thru 8.3.4-4).			
	Obtain step response data to setpoint changes at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.			
8.3.4.4.1	Verify that the prerequisites have been met			
	as required in Section 4.0.			
8.3.4.4.2	Verify that the initial conditions have been established as required in Section 7.4.3.			
8.3.4.4.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 800°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates > 1800 lb/hr.			
8.3.4.4.4	Verify that all panels are in metal temperature control and a nominal setpoint of 800°F. Adjust TC2301 thru TC2803 setpoints as required.			
8.3.4.4.5	Verify that control test unit (CTU) external input is switched out.			
		Test	1030	
		Revis Page	310n U 405 of	543

		Initial	Date
8.3.4.4.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.4.4.7	Obtain closed loop response on TC2602 to a temperature setpoint change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 is in a steady state condition for approxi- mately 2 minutes. Panel conditions: T = 800°F; P = 1450 psig; F = 1800 lb/hr.</li> </ul>		
	B) Confirm TC2602 is in metal temperature control mode.		
	C) Implement a step decrease in TC2602 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.	t 	
	D) Implement a step increase in TC2602 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Confirm temperature response is satsifactor. If not adjust control loop gains via the following:	<b>y.</b> Test	1030
		Revis Page	ion 0 406 of 543

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		Initial	Date
8.3.4.4.7	E) 1) Set receiver console to configure mode.		
	<ol> <li>Select Cl-6. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.4.4.8	Obtain closed loop response on TC2702 to a temperature setpoint change on panel 217 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 217 is in a steady state condition for approximately 2 minutes. Panel conditions: T = 800°F;</li> <li>P = 1450 psig; F = 1800 lb/hr.</li> </ul>		
	B) Confirm TC2702 is in metal temperature control mode.		
	C) Implement a step decrease in TC2702 setpoin by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the follow ing parameters on a strip chart recorder to verify data is recorded: panel flow,	nt	
		Test Revis <sup>:</sup> Page 4	 1030 107 0 107 of 54

		Initial	Date
8.3.4.4.8	C) steam & metal temperatures, flux valve position & command, setpoint.		
	D) Implement a step increase in TC2702 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Confirm temperature response is satisfactor If not adjust control loop gains via the following:	у.	
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-7. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.4.4.9	Obtain closed loop response on TC2801 to a temperature setpoint change on panel 219 by carrying out the following steps.		
	A) Confirm that receiver panel 219 is in a steady state condition for approximately		
		Test Revis Page 4	1 1030 ion 0 408 of 543

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			nitial	Date
8.3.4.4.9	A)	2 minutes. Panel conditions: T = 800°F; P = 1450 psig; F = 1800 lb/hr		
	B)	Confirm TC2801 is in metal temperature control mode.		
	C)	Implement a step decrease in TC2801 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the follow- in parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	D)	Implement a step increase in TC2801 setpoint (back to nominal). Allow panel temperatures pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.	5	
	E)	Confirm temperature response is satisfactory If not adjust control loop gains via the following:	· •	
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
			Test 2 Revisi Page 4	1030 on 0 09 of 543

		Initial Date
8.3.4.4.9	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.	
	G) Set receiver console back to monitor mode.	
8.3.4.4.10	Obtain closed loop response on TC2803 to a temperature setpoint change on panel by carrying out the following steps.	
	<ul> <li>A) Confirm that receiver panel 221 is in a steady state condition for approximately 2 minutes. Panel conditions: T = 800°F;</li> <li>P = 1450 psig; F = 1800 lb/hr.</li> </ul>	
	B) Confirm TC2803 is in metal temperature control mode.	
	C) Implement a step decrease in TC2803 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.	
	D) Implement a step increase in TC2803 setpoin (back to nominal). Allow panel temperature pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.	t s,
		Test 1030 Revision O Page 410 of 543

		nitial Date
8.3.4.4.10	E) Confirm temperature response is satisfactory If not adjust control loop gains via the following:	· -
	<ol> <li>Set receiver console to configure mode.</li> </ol>	
	<ol> <li>Select C1-9. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>	
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.	
	G) Set receiver console back to monitor mode.	
8.3.4.4.11	Obtain closed loop response on TC2602, TC2702, TC2801, TC2803 to a flux disturbance on panels 214, 217, 219, 221 by carrying out the follow- ing steps.	
	<ul> <li>A) Confirm that receiver panel 214, 217, 219, 221 is in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 800°F; P = 1450 psig; F = 1800 lb/hr.</li> </ul>	
	B) Confirm TC2602, TC2702, TC2801, TC2803 is in metal temperature control mode	
		Test 1030 Revision 0 Page 411 of 54

			Initial	Date
8.3.4.4.11	C)	Implement a step/ramp decrease in the		
		power level on panels 214, 217, 219,		
		221 by approximately 10% nominal power.		
		Allow panel temperatures, pressure and		
		flowrate to reach steady state. Monitor		
		the following parameters on a strip chart		
		recorder to verify data is recorded:		
		panel flow, steam & metal temperatures,		
		flux, valve position & command, setpoint.		
		An adjustment in the magnitude of the		
		power change (number of heliostats on/off		
		target) may be required in order to achieve	e	
		measureable response changes in flow and	-	
		temperatures and flux - Flux changes >		
		20% and flow changes > 500 lb/hr		
		and desired		
		are destred.		
	D)	Implement a step/ramp increase in panel		
	,	power (back to nominal). Allow panel		
		temperatures, pressures, flux and flows		
		to reach a steady state condition.		
		Monitor and adjust as in Section C.		
	E)	Observe temperature response, if		
		temperature excursions exceed $\pm$ 50°F -		
		adjust flux loop gains via the following:		
		<ol> <li>Set receiver console to configure</li> </ol>		
		mode.		
		2) Select Cl-X, AL-16 - using loop		
		tuning form increase/decrease gain		
		and control parameters as required.		
			<b>T</b> 1	1020
			lest Povisi	1030
			Page 4	412 of 543

	Initial	Date
8.3.4.4.11 F) If gains are adjusted repeat	Steps C	
. thru E. Record final tuned	flux loops	
gain. Set console back to m	onitor mode.	
	Test	1030
	Revis	ion 0

			Initial	Date
	.3.5	CONTROL TESTS - PANELS 214, 217, 219, AND 221 - MODERATE FLOW		
8	.3.5.1	Obtain process control open loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 and TC2803) at rated pressure, derated temperature and moderate flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain both step and fre- quency response data to valve disturbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.	- -	
8.	.3.5.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.	.3.5.1.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.	.3.5.1.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 800°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates > 3600 lb/hr.		
8.	.3.5.1.4	Verify that all panels are in metal temperature control and a nominal setpoint of 800°F. Adjust TC2301 thru TC2803 set- points as required.		
8.	.3.5.1.5	Verify that control test unit (CTU) is installed and operating on TV2602, TC2702, TV2801, and TV2803.	Test Revis	1030 ion 0

		Initial	Date
8.3.5.1.6	Confirm that the receiver feedpump con- troller (PC1105) is in pressure control mode (Select PD1105A).		
8.3.5.1.7	Obtain open loop step response data on panel 214 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B) Set FCM 2602 to manual mode.		
	C) Implement a step decrease in FCM 2602 output by approximately 10% of nominal value, (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
- · · ·	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/ sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2602 (PV & CO), TI2602, TI2605, YI2608, PI2902.		
	FCM 2602 Output% Command Change		
		Test Revis Page	 1030 ion 0 4]5 of 54

			Initial	Date
8.3.5.1.7	D)	Implement a step increase (back to nominal) in FCM 2602 output (closing valve) and allow temperatures, pres- sure and flowrate to reach steady state conditions.		
	E)	Reset FCM 2602 back to auto.		
8.3.5.1.8	Perf 214 carr	form frequency response tests on panel (see TC2602, Figure 8.3.4-1) by ying out the following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2602. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.5.1.7 C. Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM 2602 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2602.		
			Test Revis Page	 1030 ion 0 416 of 543

		_	Initial	Date
8.3.5.1.8	6)	Set FCM 2602 to manual mode.		
	7)	Using the transfer function analyzer		
		(TFA) insert a 0.1 HZ sine wave into		
		the CTU and adjust the TFA output such		
		that a ±400 lb/hr peak-to-peak res-		
		ponse is achieved on FI2602.		
		Set the TFA to 0.02 HZ allow the		
		system to reach steady state (3-4)		
		cycles.		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
		Repeat 4) at a frequency of 0.5 HZ		
		Repeat 4) at a frequency of 0.7 HZ		
		Repeat 4) at a frequency of 1 HZ		
		Repeat 4) at a frequency of HZ(Deter-		
		Repeat 4) at a frequency of HZ during test		
		Note (1): The TFA output amplitude		
		may need to be adjusted during		
		the test as required to obtain a		
		measurable output response		
		(determined by test by engineers		
		in RS-1 or DAS room).		
		(2): If panel temperature drifts		
		off the nominal test condition -		
		adjust FCM 2602 output from oper-		
		ator station to correct - if		
		cannot successfully adjust -		
		return to Step 5.		
			Test Revis Page	1030 ion 0 417 of 543

			Initial	Date
8.3.5.1.8	8)	Switch TFA input out of CTU.		
•	9)	Set FCM 2602 back to auto.		
8.3.5.1.9	0bt 217	ain open loop step response data on panel by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	В)	Set FCM 2702 to manual mode.		
	C)	Implement a step decrease in FCM 2702 output by approximately 10% of nominal value, (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
		Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/ sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM 2702 (PV & CO), TI2702, TI2705, YI2708, PI2902.		
		FCM 2702 Output% Command Change		
			Test Revis Page	 1030 ion 0 418 of 543

			Initial	Date
8.3.5.1.9	D)	Implement a step increase (back to nominal) in FCM 2702 output (closing valve) and allow temperatures, pres- sure and flowrate to reach steady state conditions.		
	E)	Reset FCM 2702 back to auto.		
8.3.5.1.10	Perf 217 carr	orm frequency response tests on panel (see TC2702, Figure 8.3.4-2) by ying out the following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2702. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.5.1.9 C. Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM 2702 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2702.		
			Test Revis Page A	 1030 ion 0 119 of 54

		_	Initial	Date
8.3.5.1.10	6)	Set FCM 2702 to manual mode.		
	7)	Using the transfer function analyzer		
		(TFA) insert a 0.1 HZ sine wave into		
		the CTU and adjust the TFA output such		
		that a ±400 lb/hr peak-to-peak res-		
		ponse is achieved on FI2702.		
		Set the TFA to 0.02 HZ allow the		
		system to reach steady state (3-4)		
		cycles.		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
		Repeat 4) at a frequency of 0.5 HZ		
		Repeat 4) at a frequency of 0.7 HZ		
		Repeat 4) at a frequency of 1 HZ		
		Repeat 4) at a frequency of HZ (Deter-		
		Repeat 4) at a frequency of HZ during test		
		Note (1): The TFA output amplitude		
		may need to be adjusted during the		
		test as required to obtain a		
		measurable output response		
		(determined by test by engineers		
		in RS-1 or DAS room).		
		(2): If panel temperature drifts		
		off the nominal test condition -		
		adjust FCM 2702 output from opera-		
		tor station to correct - if cannot		
		successfuly adjust - return to Step 5.		
			Test	1030

		Initial	Date
8.3.5.1.10	8) Switch TFA input out of CTU.		
	9) Set FCM 2702 back to auto.		
8.3.5.1.11	Obtain open loop step response data on panel 219 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	B) Set FCM 2801 to manual mode		
	C) Implement a step decrease in FCM 2801 output by approximately 10% of nominal value, (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/ sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM 2801 (PV & CO), TI2801, TI2804, YI2807, PI2902.		
	FCM 2801 Output% Command Change		
		Test Revis Page	 1030 ion 0 421 of 54

			Initial	Date
8.3.5.1.11	D)	Implement a step increase (back to nominal) in FCM 2801 output (closing valve) and allow temperatures, pres- sure and flowrate to reach steady state conditions.		
	E)	Reset FCM 2801 back to auto.		
8.3.5.1.12	Perf 219 carr	form frequency response tests on panel (See TC2801, Figure 8.3.4-3) by Tying out the following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2801. (Installation is in RS-1).		
	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approx- imately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required out- put change determined in Section 8.3.4.1.1.1 C. Note: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM 2801 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2801.		
			Test	1 1030

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Revision O Page 422 of 543

			Initial	Date
8.3.5.1.12	6)	Set FCM 2801 to manual mode		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sine wave into the CTU and adjust the TFA output such		
		is achieved on FI2801.		
		Set the TFA to 0.02 HZ allow the sys- tem to reach steady state (3-4) cycles).		
·		Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of $\begin{array}{c} HZ\\ HZ\\ HZ\\ HZ\\ HZ\\ HZ\\ HZ\\ HZ\\ HZ\\ HZ\\$		
		Note (1): The TFA output amplitude may need to be adjusted during the test as required to obtain a measurable output response (determined by test by engineers in RS-1 or DAS room). (2): If panel temperature drifts off the nominal test condition - adjust FCM 2801 output from opera- tor station to correct - if cannot successfully adjust - return to		
		Step 5. —	Test Revis Page	1030 ion 0 423 of 543

		_	Initial	Date
8.3.5.1.12	8)	Switch TFA input out of CTU		
	9)	Set FCM 2801 back to auto		
8.3.5.1.13	0bta 221	in open loop step response data on panel by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes		
	B)	Set FCM 2803 to manual mode		
	C)	Implement a step decrease in FCM 2803 output by approximately 10% of nominal value, (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
		Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measurable response change in flow and temperature - flow of ±0.1 lb/ sec, temperatures of ±50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM 2803 (PV & CO), TI2803, TI2806, YI2809, PI2902.		
		FCM 2803 Output% Command Change	Test 2 Revis	1030 ion 0

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		Initial	Date
8.3.5.1.13	D) Implement a step increase (back to nominal) in FCM 2803 output (closing valve) and allow temperatures, pres- sure and flowrate to reach steady state conditions.		
	E) Reset FCM 2803 back to auto		
8.3.5.1.14	Perform frequency response tests on panel 221 (See TC2803, Figure 8.3.4-4) by carrying out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2803. (Installation is in RS-1).</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required out- put change determined in Section 8.3.5.1.13 C. Note: Verify that the TFA input to the CTU is switched out		
	5) Select FCM 2803 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2803.		
		Test Revis Page	 1030 ion 0 425 of 5



Revision 0 Page 426 of 543

			Initial	Date
8.3.5.1.14	8)	Switch TFA input out of CTU.		
	9)	Set FCM 2803 back to auto.		
8.3.5.1.15	Obta flux 221	ain open loop step/ramp response to a k disturbance on panels 214, 217, 219, by carrying out the following steps.		
	A)	Confirm that the receiver panels are in a steady state condition for approximately 5 min.		
	B)	Set FCM 2602, FCM 2702, FCM 2801, FCM 2803, to manual mode.		
	C)	Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221 by approximately 10% of nominal power. Allow panel temperatures, pres- sure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flows, steam and metal temperatures, flux, value commands and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/ off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq$ 20% and temperature changes >50 to 100°F are desired.		

Page 427 of 543

		-	Initial	Date
8.3.5.1.15	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM 2602, FCM 2702, FCM 2801, FCM 2803 back to auto.		
			Test 2 Revisi Page 4	.030 on 0 28 of 542

		Initial	Date
8.3.5.2	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 and TC2803) at		
	rated pressure, derated temperature (metal temperature control) and moderate flow (refer		
	to Figures 8.3.4-1 through 8.3.4-4). Obtain step response data to setpoint changes at a nominal temperature of 800°F. Obtain step/ ramp response to flux disturbances.		
8.3.5.2.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.5.2.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.5.2.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 800°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates >3600 lb/hr.		
8.3.5.2.4	Verify that all panels are in metal temperature control and a nominal setpoint of 800°F. Adjust TC2301 through TC2803 setpoints as required.		
8.3.5.2.5	Verify that control test unit (CTU) external input is switched out.		
		Test	1030
		Revi Page	sion 0 429 of 543
		Initial	Date
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8.3.5.2.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.5.2.7	Obtain closed loop response on TC2602 to a temperature setpoint change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T= 800°F, P= 1450 psig; F= 3600 lb/hr.</li> </ul>		
	B) Confirm TC2602 is in metal temperature control mode.		
	C) Implement a step decrease in TC2602 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D) Implement a step increase in TC2602 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
		Test	1030

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Revision 0 Page 430 of 543

		Initial	Date
8.3.5.2.7	E) Confirm temperature response is		
	loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	2) Select Cl-6. Using loop tuning form		
	increase/decrease selected gains and tuning parameters as required.		
	turing parameters as required.		
	F) If gains are adjusted repeat Steps C		
	eters. Adjust setpoints, alarms, and		
	limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.5.2.8	Obtain closed loop response on TC2702 to a		
	temperature setpoint change on panel 21/ by carrying out the following steps.		
-			
	A) Confirm that receiver panel 2702 in a steady state condition for approxi-		
	mately 2 minutes. Panel conditions:		
	T= 800°F; P= 1450 psig; F= 3600 lb/hr.		
	B) Confirm TC2702 is in metal temperature control mode.		
		Test Revis Page	1030 sion 0 431 of 543

		-	Initial	Date
8.3.5.2.8	C)	Implement a step decrease in TC2702		
		setpoint by approximately 10% of nominal.		
		Allow panel temperatures, pressure and		
		flowrate to reach steady state. Monitor		
		the following parameters on a strip		
		chart recorder to verify data is		
		recorded: panel flow, steam and metal		
		temperatures, flux valve position and		
		command, set point.		
	D)	Implement a step increase in TC2702		
		setpoint (back to nominal). Allow		
		panel temperatures, pressures, flux		
		and flows to reach a steady state		
		condition. Monitor and adjust as in		
		Section C.		
	E)	Confirm temperature response is satis-		
		factory. If not adjust control loop		
		gains via the following:		
		1) Set receiver console to configure		
		mode.		
		2) Select Cl-7. Using loop tuning		
		form increase/decrease selected		
		gains and tuning parameters as		
		required.		
	F)	If gains are adjusted repeat Steps		
		C through E. Record final tuned		
		parameters. Adjust setpoints, alarms,		
		and limits if required and record.		
	G)	Set receiver console back to monitor mode.	Tect 1	030
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Revision O Page 432 of 543

	-	Initial	Date
8.3.5.2.9	Obtain closed loop response on TC2801 to a		
	temperature setpoint change on panel 219 by		
	carrying out the following steps.		
	A) Confirm that receiver panel 219 in a		
	steady state condition for approximately		
	2 minutes. Panel conditions: T= 800°F;		
	p= 1450 psig; F= 3600 lb/hr.		
	B) Confirm TC2801 is in metal temperature		·
	control mode.		
	C) Implement a step decrease in TC2801		
	setpoint by approximately 10% of		
	nominal. Allow panel temperatures,		
	pressure and flowrate to reach steady		
	state. Monitor the following parameters		
	on a strip chart recorder to verify data		
	is recorded: panel flow, steam and metal		
	temperatures, flux valve position and		
	command, set point.		
	D) Implement a step increase in TC2801		
	setpoint (back to nominal). Allow		
	panel temperatures, pressures, flux		
	and flows to reach a steady state		
	conditon. Monitor and adjust as in		
	Section C.		
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		Test 1	030
		Revisi	on O

			Initial	Date
8.3.5.2.9	E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C through E. Record final tuned param- eters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode.		
8.3.5.2.10	Obt tem by	ain closed loop response on TC2803 to a perature setpoint change on panel 221 carrying out the following steps.		
	A)	Confirm that receiver panel 221 in a steady state condition for approxi- mately 2 minutes. Panel conditions: T= 800°F; P= 1450 psig; F= 3600 lb/hr.		
	B)	Confirm TC2803 is in metal temperature control mode.		
			Test Revis Page	 1030 ion 0 434 of 543

		_	Initial	Date
3.5.2.10	C)	Implement a step decrease in TC2803 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux		
	D)	Implement a step increase in TC2803 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state		
	- )	condition. Monitor and adjust as in Section C.		
	E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-9. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C through E. Record final tuned param- eters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode	Test Revis Page 4	1030 ion 0 135 of 543

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		Initial	Date
8.3.5.2.11	Obtain closed loop response on TC2602, TC2702, TC2801, TC2803 to a flux disturbance on panel 214, 217, 219, 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214, 217, 219, 221 is in a steady state condition for approximately 2 minutes. Panel conditions: T= 800°F; P= 1450 psig; F= 3600 lb/hr.</li> </ul>		
	B) Confirm TC2602, TC2702, TC2801, TC2803 is in metal temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221 by approximately 10% nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, set point. An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes $\geq$ 20% and flow changes $\geq$ 500 lb/hr are desired.		
		Test	1030

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Revision 0 Page 436 of 543

			Initial	Date
8.3.5.2.11	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response TI if temperature excursions exceed <u>+</u> 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-X, AL-16 - using loop tuning form increase/decrease gain and control parameters required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C through E. Record final tuned flux loops gain. Set console back to monitor mode.		
			Test 1 Revisi Page 4	.030 on O 37 of 543

	-	Initial	Date
8.3.6	CONTROL TEST - STEAM DUMP SYSTEM - HIGH FLOW		
8.3.6.1	Demonstrate satisfactory closed loop con- trol of the Steam Dump System for PC 1001, TC 1002 at rated pressure, moderate tem- perature and high flow. Obtain response to pressure setpoint and flow changes. Tune control loops as required.		
8.3.6.1.1	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.6.1.2	Verify all panels are in metal temperature control with nominal setpoint if 800°F. Confirm that all panels are controlling in a satisfactory manner.		
8.3.6.1.3	Confirm that the receiver feedpump control- ler (PC 1105) is in valve control mode (Select PD 1105B).		
8.3.6.1.4	Implement a ramp increase in the power level on all panels from moderate to high power (80-90% of rated) over a 10 minute period. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, set point.		
		Test 1 Revisi Page 4	)30 on 0 38 of 543

	-	Initial	Date
8.3.6.1.5	Confirm PC 1001 is controlling pressure to 1515 psig in a satisfactory manner.		
8.3.6.1.6	Perform closed loop tests of PC 1001 (see Figure 8.3.2-2). Tune control loop if required by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure set point on PC 1001 by 100 psi and observe the response on the strip chart.		
	C) Increase PC 1001 set point back to nominal value and observe the response on the strip chart.		
	D) Increase/decrease proportional gain, Kl (C2-5, AL-3) as required.		
	E) Repeat steps B thru D as required until response is satisfactory.		
	F) Decrease PC 1001 set point 100 psi and observe response.		
	G) Increase PC 1001 set point to nominal value and observe pressure response.		
		Test 1 Revisi	030 on 0
		Page 4	39 OT 543

			Initial	Date
	H)	Increase/decrease reset gain, K2 (C2-5, AL-3) in the ± 10% increments as required.		
	I)	Repeat steps F thru H as required until response is satisfactory.		
	J)	Establish PC 1001 start-up controller gains and record.		
	K)	Adjust setpoints, alarms, limits as required.		
8.3.6.1.7	Res mor	et receiver control console back to nitor mode.		
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			Test 1 Revisi Page 4	030 on O 40 of 543

		Initial	Date
8.3.7	CONTROL TESTS - PANELS 214, 217, 219, & 221 - HIGH FLOW		
8.3.7.1	Obtain process control open loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 & TC2803) at rated pressure, moderate temperature and high flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain both steps and frequency response data to valve disturbances at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.		
8.3.7.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.7.1.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.7.1.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve $800^{\circ}$ F outlet steam temperature on panels 214-221 with minimum individual panel flowrates $\geq$ 7200 lb/hr.		
8.3.7.1.4	Verify that all panels are in metal tempera- ture control and a nominal setpoint of 800°F. Adjust TC2301 thru TC2803 setpoints as required.		
8.3.7.1.5	Verify that control test unit (CTU) is installed and operating on TV2602, TC2702, TV2801, and TV2803.		
		Test 1 Revisi Page 4	030 on 0 41 of 543

		Initial	Date
8.3.7.1.6	Confirm that the receiver feedpump controller (PC1105) is in pressure control mode (Select PD1105A).		
8.3.7.1.7	Obtain the loop step response data on panel 214 by carrying out the following steps.		
	A. Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	B. Set FCM2602 to manual mode.		
	C. Implement a step decrease in FCM2602 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± 0.1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2602 (PV & CO), TI2602, TI2605, YI2608, PI2902.		
	FCM2602 Output% Command Change		
		Test 10 Revisio Page 44	030 on 0 12 of 543

		Initial	Date
8.3.7.1.7	D) Implement a step increase (back to nominal) in FCM2602 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions		
	E) Reset FCM2602 back to auto.		
8.3.7.1.8	Perform frequency response tests on panel 214 (see TC2602, Figure 8.3.4-1) by carry- ing out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2602. (Installation is in RS-1.)</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pres- sure control mode (PC1105).</li> </ol>		
	<ol> <li>Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 3.8.7.1.7.C.		
	Note: Verify that the TFA input to the CTU is switched out.		
		Test 1 Revis Page 4	030 ion 0 143 of 543

		Initial	Date
8.3.7.1.8	5) Select FCM2602 and adjust setpoint		
	to achieve a nominal 800°F steam outlet		
	temperature on TC2602.		
	6) Set FCM2602 to manual mode.		
	7) Using the transfer function analyzer		
	(TFA) insert a 0.1 HZ sin wave into the		
	CTU) and adjust the TFA output such that		
	a + 400 lb/hr peak-to-peak response is		
	achieved on FI2602.		
	Set the TFA to 0.02 HZ allow the system		
	to reach steady state (3-4 cycles).		
	Repeat 4) at a frequency of 0.05 HZ		
	Repeat 4) at a frequency of 0.07 HZ		
	Repeat 4) at a frequency of 0.1 H7		
	Repeat 4) at a frequency of $0.2 \text{ HZ}$		
	Repeat $A$ ) at a frequency of 0.5 HZ		
	Repeat $(4)$ at a frequency of 0.7 HZ		
	Repeat 4) at a frequency of $1 \text{ H7}$		
	Repeat 4) at a frequency of $H7^*$		
	Repeat 4) at a frequency of HZ*		
	Note: (1) The TFA output amplifier may		
	need to be adjusted during the test		
	as required to obtain a measureable		
	output response (determined by test		
	by engineers in RS-1 or DAS room.		
	*Determined during test	Tost 1	030
	•	Revisi	030 on ()
		Page 4	44 of 543

		Initial	Date
8.3.7.1.8	Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2602 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2602 back to auto.		
8.3.7.1.9	Obtain open loop step response data on panel 217 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approximately 5 minutes.		
	B) Set FCM2702 to manual mode.		
	C) Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
		Test Revis Page	1030 ion 0 445 of 543

	-	Initial	Date
8.3.7.1.9	Note: An adjustment in the magnitude of the		
	valve step command may be required in		
	order to achieve a measureable response		
	change in flow and temperature - flow of		
	$\pm$ 0.1 lb/sec, temperatures of $\pm$ 50 to		
	100°F are desired. Record final command		
	change. Monitor the following parameters		
	on a strip chart to verify that data is		
	recorded: FCM2702 (PV & CO), TI2702,		
	TI2705, YI2708, PI2902.		
	FCM 2702 Output Command Change %		
	D) Implement a step increase (back to nominal)		
	in FCM2702 output (closing valve) and allow		
	temperatures, pressure and flowrate to		
	reach steady state conditions.		
	E) Reset FCM2702 back to auto.		
8.3.7.1.10	Perform frequency response tests on panel 217		
	(see TC2702, Figure 8.3.4-2) by carrying out		
	the following steps.		
	<ol> <li>Verify that the controls test unit (CTU)</li> </ol>		
	is installed and operating on TC2702.		
	(Installation is in RS-1.)		
	2) Verify the receiver feedpump is in pres-		
	sure control mode (PC1105).		
	3) Confirm that the receiver panels are in		
	a steady state condition for approxi- mately 2 minutes.		
		Test 1 Revis	1030 ion 0
		Page 4	446 of 543

			Initial	Date
8.3.7.1.10	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.7.1.9.C		
		Note: Verify that the TFA output to the CTU is switched out.		
	5)	Select FCM2702 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2702.		
	6)	Set FCM2702 to manual mode.		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a $\pm$ 400 lb/hr peak-to-peak response is achieved on FI2702.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4 cycles).		
		Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of HZ* Repeat 4) at a frequency of HZ*		
			Test Revi Page	 1030 sion 0 447 of 543

		Initial	Date
8.3.7.1.10	Note: (1) The TFA output amplitude may		
	need to be adjusted during the test as		
	required to obtain a measureable output		
	response (determined by test by engineers		
	in RS-1 or DAS room.		
	(2) If panel temperature drifts off		
	the nominal test condition - adjust		
	FCM2702 output from operator station to		
	correct - if cannot successfully adjust -		
	voturn to Stop 5		
	8) Switch TFA input out of CTU.		
	9) Set FCM2702 back to auto		
8.3.7.1.11	Obtain open loop step response data on		
	panel 219 by carrying out the following		
	steps.		
	A) Confirm that the receiver panels are		
	in a steady state condition for approxi-		
-	mately 5 minutes.		
	B) Set FCM2801 to manual mode.		
	C) Implement a step decrease in FCM2801		
	output by approximately 10% of nominal		
	value (increase valve opening) and allow		
	pressures, flows, temperatures to reach		
	steady state.		
		Test 1	030
		Revisi Page /	0N U 148 of 543

		Initial	Date
8.3.7.1.11	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of $\pm$ 0.1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2801 (PV & CO), TI2801, TI2804, YI2807, PI2902.		
	FCM2801 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2801 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2801 back to auto		
8.3.7.1.12	Perform frequency response tests on panel 219 (see TC2801, Figure 8.3.4-3) by carry- ing out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2801. (Installation is in RS-1.)</li> </ol>		
	2) Verify the receiver feedpump is in pressure control mode (PC1105).		
		Test Revis Page	  030 ion 0 449 of 543

	Initial	Date
Confirm that the receiver panels are in		
a steady state condition for approxi-		
mately 2 minutes.		
Adjust the peak to peak amplitude on		
the transfer function analyzer output		
to be consistent with the required out-		
put change determined in Section		
8.3.7.1.11 C.		
te. Verify that the TFA input to the		
CTU is switched out.		
Select FCM2801 and adjust setpoint to		
achieve a nominal 800°F steam outlet		
temperature on TC2801.		
Set FCM2801 to manual mode		
Using the transfer function analyzer		
(TFA) insert a 0.1 HZ sin wave into the		
CTU) and adjust the TFA output such that		
a ± 400 lb/hr peak-to-peak response is		
achieved on FI2801.		
Set the TFA to 0.02 HZ allow the system		
to reach steady state (3-4 cycles).		
Repeat 4) at a frequency of 0.05 HZ		
Repeat 4) at a frequency of 0.07 HZ		
Repeat 4) at a frequency of 0.1 HZ		
Repeat 4) at a frequency of 0.2 HZ		 
Repeat 4) at a frequency of 0.5 HZ		
Repeat 4) at a frequency of 0.7 HZ		
Repeat 4) at a frequency of 1 HZ	Test 1	030
	Revis Page	10n () 450 of 543
	Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes. Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required out- put change determined in Section 8.3.7.1.11 C. te: Verify that the TFA input to the CTU is switched out. Select FCM2801 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2801. Set FCM2801 to manual mode. Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a ± 400 lb/hr peak-to-peak response is achieved on FI2801. Set the TFA to 0.02 HZ allow the system to reach steady state (3-4 cycles). Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ	Initial         Confirm that the receiver panels are in         a steady state condition for approximately 2 minutes.         Adjust the peak to peak amplitude on         the transfer function analyzer output         to be consistent with the required output change determined in Section         8.3.7.1.11 C.         te: Verify that the TFA input to the         CTU is switched out.         Select FCM2801 and adjust setpoint to         achieve a nominal 800°F steam outlet         temperature on TC2801.         Set FCM2801 to manual mode.         Using the transfer function analyzer         (TFA) insert a 0.1 HZ sin wave into the         CTU) and adjust the TFA output such that         a ± 400 lb/hr peak-to-peak response is         achieved on FI2801.         Set the TFA to 0.02 HZ allow the system         to reach steady state (3-4 cycles).         Repeat 4) at a frequency of 0.05 HZ         Repeat 4) at a frequency of 0.1 HZ         Repeat 4) at a frequency of 0.2 HZ         Repeat 4) at a frequency of 0.5 HZ         Repeat 4) at a frequency of 0.7 HZ         Repeat 4) at a

		Initial	Date
8.3.7.1.12	Repeat 4) at a frequency ofHZ* Repeat 4) at a frequency ofHZ*		
	Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room.		
	(2) If panel temperature drifts off the nominal test condition - adjust FCM2801 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2801 back to auto		
8.3.7.1.13	Obtain open loop step response data on panel 221 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		-
	B) Set FCM2803 to manual mode.		
	*Determined during test	Test Revis Page	1030 ion 0 451 of 543

			Initial	Date
8.3.7.1.13	C)	Implement a step decrease in FCM2803 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Not D)	e: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temprature - flow of ± 0.1 lb/sec, temperatures of ± 50 to 100°F are desired. Recorded final com- mand change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2803 (PV & CO), T12803, T12806, Y12809, P12092. FCM2803 Output Command Change% Implement a step increase (back to nominal) in FCM2803 output (closing		
·	E)	valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
83711/	Por	form frequency response tests on panel		
0.5.7.1.14	221	(see TC2803) Figure 8 3 4-4) by carry-		
	ing	out the following steps.		
	1)	Verify that the controls test unit (CTU) is installed and operating on TC2803. (Installation is in RS-1).		
			Test Revis Page 4	030 ion 0 152 of 543

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			Initial	Date
8.3.7.1.14	2)	Verify the receiver feedpump is in pressure control mode (PC1105).		
	3)	Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.		
	4)	Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.7.1.13 C.		
	Not	e: Verify that the TFA input to the CTU is switched out.		
	5)	Select FCM2803 and adjust setpoint to achieve a nominal 800°F steam outlet temperature on TC2803.		
	6)	Set FCM2803 to manual mode.		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a + 400 lb/hr peak-to-peak response is achieved on FI2803.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4 cycles).		
		Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ		
			Test 1 Revis Page 4	1 030 ion 0 153 of 543

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· · ·	~ .		• •	•		

- Repeat 4) at a frequency of 0.1 Hz Repeat 4) at a frequency of 0.2 Hz Repeat 4) at a frequency of 0.5 Hz Repeat 4) at a frequency of 0.7 Hz Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of \_\_\_\_ HZ\* Repeat 4) at a frequency of \_\_\_\_ HZ\*
- Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room.

(2) If panel temperature drifts off the nominal test condition adjust FCM2803 output from operator station to correct - if cannot successfully adjust - return to Step 5.

8) Switch TFA input out of CTU.

9) Set FCM2803 back to auto.

- 8.3.7.1.15 Obtain open loop step/ramp response to a flux disturbance on panels 214, 217, 219, 221 by carrying out the following steps.
  - A) Confirm that the receiver panels are in a steady state condition for approximately 5 min.

\*Determined during test

Test 1030 Revision 0 Page 454 of 543

Date

Initial

		Initial	Date
8.3.7.1.15	B) Set FCM2602, FCM2702, FCM2801, FCM2803, to manual mode.		
	C) Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221, by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Moni- tor the following parameters on a strip chart recorder to verify data is recorded: Panel flows, steam and metal temperatures, flux, valve commands and PI2902.		
	Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes $\geq$ 20% and temperature changes $\geq$ 50 to 100°F are desired.		
	D) Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Set FCM2602, FCM2702, FCM2801, FCM2803, back to auto.		
		Test Revis Page	 1030 sion 0 455 of 543

		Initial	Date
8.3.7.2	Obtain process control closed loop data for tuning of receiver temperatures controllers		
	(TC2602, TC2702, TC2801, and TC2803) at rated pressure, moderate temperature (metal temperature		
	control) and high flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain step respons- data to set- point changes at a nominal temperature of 800°F. Obtain step/ramp response to flux disturbances.		
8.3.7.2.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.7.2.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.7.2.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 800°F output steam temperature on panels 214-221 with minimum individual panel flowrates > 7200 lb/hr.		
8.3.7.2.4	Verify that all panels are in metal temper- ature control and a nominal setpoint of 800°F. Adjust TC2301 thru TC2803 setpoints as required.		
		Test Revis Page	1030 ion 0 456 of 54

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		Initial	Date
8.3.7.2.5	Verify that control test unit (CTU) external input is switched out.		
8.3.7.2.6	Confirm that the receiver feedpump con- troller (PC1105) is in valve control mode (Select PD1105B).		
8.3.7.2.7	Obtain closed loop response on TC2602 to a temperature setpoint change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 in a steady state condition for approximately 2 minutes. Panel conditions: T = 800°F;</li> <li>P = 1450 psig; F = 7200 lb/hr.</li> </ul>		
	B) Confirm TC2602 is in metal temperature control mode.		
·	C) Implement a step decrease in TC2602 set- point by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D) Implement a step increase in TC2602 set- point (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
		Test 1 Revisi Page 4	030 on 0 57 of 543

			Initial	Date
8.3.7.2.7	E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select C1-6. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode.		
8.3.7.2.8	Obt tem by	cain closed loop response on TC2702 to a operature setpoint change on panel 217 carrying out the following steps.		
	A)	Confirm that receiver panel 2702 in a steady state condition for approximately 2 minutes. Panel conditions: T = 800°F; P = 1450 Psig; F = 7200 lb/hr.		
	B)	Confirm TC2702 is in metal temperature control mode.		
			Test 1 Revisi Page 4	030 on 0 58 of 543

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			Initial	Date
8.3.7.2.8	C)	Implement a step decrease in TC2702 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D)	Implement a step increase in TC2702 set- point (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following: 1) Set receiver console to configure		
·		mode. 2) Select Cl-7. Using loop tuning form increase/decrease selected gains and tuning parameters as required.		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
			Test 1 Revis Page 4	 030 ion 0 459 of 543

		Initial	Date
8.3.7.2.8	G) Set receiver console back to monitor mode.		
8.3.7.2.9	Obtain closed loop response on TC2801 to a temperature setpoint change on panel 219 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 219 in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T= 800°F; P= 1450 psig; F= 7200 lb/hr.</li> </ul>		
	B) Confirm TC2801 is in metal temperature control mode.		
	C) Implement a step decrease in TC2801 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, setpoint.		
	D) Implement a step increase in TC2801 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
		Test Revis Page	1030 1030 101 0

		Initial	Date
8.3.7.2.9	E) Confirm temperature response is satisfactory. If no adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select C1-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C through E. Record final tuned param- eters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.7.2.10	Obtain closed loop response on TC2803 to a temperature setpoint change on panel 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 221 in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 800°F; P = 1450 psig; F = 7200 lb/hr.</li> </ul>		
	B) Confirm TC2803 is in metal temperature control mode.		
		Test Revis Page	1030 ion 0 461 of 543

		_	Initial	Date
8.3.7.2.10	C)	Implement a step decrease in TC2803 set-		
		point by approximately 10% of nominal.		
		Allow panel temperatures, pressure and		
		flowrate to reach steady state. Monitor		
		the following parameters on a strip		
		chart recorder to verify data is recorded:		
		panel flow, steam and metal temperatures,		
		flux valve position and command, set		
		point.		
	n)	Implement a step increase in TC2803 set-		
	-,	point (back to nominal) Allow papel		
		temperatures pressures flux and flows		
		te words a standy state condition		•
		to reach a steady state condition.		
		Monitor and adjust as in Section C		
	E)	Confirm temperature response is satis-		
		factory. If not adjust control loop		
		gains via the following:		
		1) Set receiver console to configure		
		mode.		
		2) Select Cl-9. Using loop tuning form		
		increase/decrease selected gains and		
		tuning parameters as required.		
	F)	If gains are adjusted repeat Steps C thru		
	• ,	F Record final tuned narametors Adjust		
		compoints alarma and limits if possived		
		and washed		
		and record	<u>-</u>	
	G)	Set receiver console back to monitor		
		mode.		
			Test	1030 ion 0
			Page	462 of 54

		Initial	Date
8.3.7.2.11	Obtain closed loop response on TC2602,		
	TC2702, TC2801, TC2803 to a flux dis-		
	turbance on panel 214, 217, 219, 221 by		
·	carrying out the following steps.		
	A) Confirm that receiver panel 214, 217,		
	219, 221 is in a steady state condition		
	for approximately 2 minutes. Panel		
	conditions: T = 800°F; P = 1450 psig;		
	F = 7200 lb/hr.		
	B) Confirm TC2602, TC2702, TC2801, TC2803,		
	is in metal temperature control mode.		
	·		
	C) Implement a step/ramp decrease in the		
	power level on panels 214, 217, 219, 221		
	by approximately 10% nominal power.		
	Allow panel temperatures, pressure and		
	flowrate to reach steady state. Monitor		
	the following parameters on a strip		
	chart recorder to verify data is recorded:		
	panel flow, steam and metal temperatures,		
	flux, valve position and command, set		
	point. An adjustment in the magnitude		
	of the power change (number of heliostats		
	on/off target) may be required in order		
	to achieve measureable response changes		
	in flow and temperatures and flux. Flux		
	changes > 20% and flow changes		
	> 500 lb/hr are desired.		1

Test 1030 Revision 0 Page 463 of 543

			Initial	Date
8.3.7.2.11	D )	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	Ε)	<ul> <li>Observe temperature response. If temperature excursions exceed ± 50°F - adjust flux loop gains via the following.</li> <li>1) Set receiver console to configure mode.</li> </ul>		
		<ol> <li>Select CI-x, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C through E. Record final tuned flux loops gain. Set console back to monitor mode.		
			Test Revis Page	 1030 ion 0 464 of 543

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	-	Initial	Date
8.3.7.3	Obtain process control open loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 and TC2803) at rated pressure, rated temperature (metal temperature control) and high flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain both step and frequency response data to valve disturbances at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances.		
8.3.7.3.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.7.3.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.7.3.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve $960^{\circ}$ F outlet steam temperature on panels 214-221 with minimum individual panel flowrates $\geq$ 7200 lb/hr.		
8.3.7.3.4	Verify that all panels are in metal temper- ature control and a nominal setpoint of 960°F. Adjust TC2301 thru TC2803 setpoints as required.		
		Test Revis Page	 1030 ion 0 465 of 543
		Initial	Date
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8.3.7.3.5	Verify that control test unit (CTU) is installed and operating on TV2602, TC2702, TV2801, and TV2803.		
8.3.7.3.6	Confirm that the receiver feedpump controller (PC1105) is in pressure control mode (Select PD1105A).		
8.3.7.3.7	Obtain open loop step response data on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that the receiver panels are</li> <li>in a steady state condition for approx-</li> <li>imately 5 minutes.</li> </ul>		
	B) Set FCM2602 to manual mode		
	C) Implement a step decrease in FCM2602 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature – flow of $\pm$ 0.1 lb/sec, temperatures of $\pm$ 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify the data is recorded: FCM2602 (PV & CO), TI2602,	-	
	TI2605, YI2608, PI2902.	Test 1 Revisi Page 4	030 on 0 66 of 543

		Initial	Date
8.3.7.3.7	FCM2602 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2602 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2602 back to auto.		
8.3.7.3.8	Perform frequency response tests on panel 214 (see TC2602, Figure 8.3.4-1) by carry- ing out the following steps.		
	<ol> <li>Verify that the control test unit (CTU) is installed and operating on TC2602. (Installation is in RS-1.)</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
·	3) Confirm the receiver panels are in a steady state condition for approxi- mately 2 minutes.		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.3.7 C. Note: Verify that the TFA input to the CTU is switched out.		
		Test 1 Revisi Page 4	030 on 0 67 of 54

			Initial	Date
8.3.7.3.8	5)	Select FCM2602 and adjust setpoint to achieve a nominal 960°F steam outlet		
		temperature on TC2602.		
	6)	Set FCM 2602 to manual mode.		
	7)	Using the transfer function analyzer		
		(TFA) insert a O.1 HZ sin wave into the		
		CTU) and adjust the TFA output such that		
		a ± 400 lb/hr peak-to-peak response is		
		achieved on FI2602.		
		Set the TFA to 0.02 HZ allow the system		
		to reach steady state (3-4 cycles).		
		Repeat 4) at a frequency of 0.05 HZ		
		Repeat 4) at a frequency of 0.07 HZ		
		Repeat 4) at a frequency of 0.1 HZ		
		Repeat 4) at a frequency of 0.2 HZ		
		Repeat 4) at a frequency of 0.5 HZ		
		Repeat 4) at a frequency of 0.7 HZ		
		Repeat 4) at a frequency of 1 HZ		
		Repeat 4) at a frequency of HZ*		
		Repeat 4) at a frequency of HZ*		1
	Not	e: (1) The TFA output amplitude may need		
		to be adjusted during the test as required		
		to obtain a measureable output response		
		(determined by test by engineers in RS-1		
		or DAS room.		
		*Determined during test		
			Test 1	030
			- · ·	2

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Revision O Page 468 of 543

		Initial	Date
8.3.7.3.8	Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2602 output from operator station to correct - if cannot successfully adjust - return to Step 5.		· · ·
	8) Switch TFA input out of CTU.		
	9) Set FCM2602 back to auto.		
8.3.7.3.9	Obtain open loop step response data on panel 217 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	B) Set FCM2702 to manual mode.		
	C) Implement a step decrease in FCM2702 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± 0.1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2702 (PV & CO), TI2702, TI2705, YI2708, PI2902.	1	
		Test 1	030

Revision O Page 469 of 543

	Initial	Date
FCM2702 Output%		
Command Change		
)) Implement a step increase (back to		
nominal) in FCM2702 output (closing		
valve) and allow temperatures, pressure		
and flowrate to reach steady state		
conditions.		
E. Reset FCM2702 back to auto.		
Perform frequency response tests on panel 217		
see TC2702, Figure 8.3.4-2) by carrying out		
the following steps.		
) Verify that the controls test unit (CTU)		
is installed and operating on TC2702.		
(Installation is in RS-1.)		
2) Verify the receiver feedpump is in		
pressure control mode (PC1105).		
3) Confirm that the receiver panels are in		
a steady state condition for approxi-		
mately 2 minutes.		
) Adjust the peak to peak amplitude on the		
transfer function analyzer output to be		
consistent with the required output		
change determined in Section 8.3.7.3.9 C.		
Note: Verify that the TFA input to the		
CTU is switched out.		
	Test 1	030
	Revisi Page A	on 0 70 of 543
	<ul> <li>FCM2702 Output% Command Change</li> <li>Implement a step increase (back to nominal) in FCM2702 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.</li> <li>Reset FCM2702 back to auto.</li> <li>Perform frequency response tests on panel 217 (see TC2702, Figure 8.3.4-2) by carrying out the following steps.</li> <li>Verify that the controls test unit (CTU) is installed and operating on TC2702. (Installation is in RS-1.)</li> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> <li>Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.7.3.9 C. Note: Verify that the TFA input to the CTU is switched out.</li> </ul>	FCM2702 Output%         Command Change         D) Implement a step increase (back to nominal) in FCM2702 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.         E. Reset FCM2702 back to auto.         Perform frequency response tests on panel 217         See TC2702, Figure 8.3.4-2) by carrying out the following steps.         ) Verify that the controls test unit (CTU) is installed and operating on TC2702. (Installation is in RS-1.)         2) Verify the receiver feedpump is in pressure control mode (PC1105).         2) Confirm that the receiver panels are in a steady state condition for approximately 2 minutes.         3) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.7.3.9 C. Note: Verify that the TFA input to the CTU is switched out.         Test 1         Revisi Paned

		Initial	Date
8.3.7.3.10	5) Select FCM2702 and adjust setpoint to achieve a nominal 960°F steam output		
	temperature on TC2702.		
	6) Set FCM2702 to manual mode.		
	7) Using the transfer function analyzer		
	(IFA) insert a U.I HZ sin wave into the		
	CIU) and adjust the IFA output such that		
	a $\pm$ 400 ID/nr peak-to-peak response is achieved on FI2702.		
	Set the TFA to 0.02 HZ allow the system		
	to reach steady state (3-4 cycles).		
	Repeat 4) at a frequency of 0.05 HZ		
	Repeat 4) at a frequency of 0.07 HZ		
	Repeat 4) at a frequency of 0.1 HZ		
	Repeat 4) at a frequency of 0.2 HZ		
	Repeat 4) at a frequency of 0.5 HZ		
	Repeat 4) at a frequency of 0.7 HZ		
	Repeat 4) at a frequency of 1 HZ		
	Repeat 4) at a frequency of HZ		
	Repeat 4) at a frequency of HZ		
	Note: (1) The TFA output amplitude may		
	need to be adjusted during the test as		
	required to obtain a measureable output		
	response (determined by test by engi-		
	neers in RS-I or DAS room.		
	*Determined during test.		
		Tost 1	030
		Revisi Page 4	on 0 71 of 543

		Initial	Date
8.3.7.3.10	Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2702 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2702 back to auto.		
8.3.7.3.11	Obtain open loop step response data on panel 219 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approxi- mately 5 minutes.		
	B) Set FCM2801 to manual mode.		
	C) Implement a step decrease in FCM2801 output by approximately 10% of nominal value (increase valve opening) and allow pressures, flows, temperatures to reach steady state.		
	Note: An adjustment in the magnitude of the valve step command may be required in order to achieve a measureable response change in flow and temperature - flow of ± 0.1 lb/sec, temperatures of ± 50 to 100°F are desired. Record final command change. Monitor the following parameters on a strip chart to verify that data is recorded: FCM2801 (PV & CO), TI2801,	Test T Revisi Page 4	030 on 0 72 of 543

		Initial	Date
8.3.7.3.11	FCM2801 Output% Command Change		
	D) Implement a step increase (back to nominal) in FCM2801 output (closing valve) and allow temperatures, pressure and flowrate to reach steady state conditions.		
	E) Reset FCM2801 back to auto.		
8.3.7.3.12	Perform frequency response tests on panel 219 (see TC2801, Figure 8.3.4-3) by carry- ing out the following steps.		
	<ol> <li>Verify that the controls test unit (CTU) is installed and operating on TC2801. (Installation is in RS-1.)</li> </ol>		
	<ol> <li>Verify the receiver feedpump is in pressure control mode (PC1105).</li> </ol>		
·	<ol> <li>Confirm that the receiver panels are in a steady state condition for approxi- mately 2 minutes.</li> </ol>		
	4) Adjust the peak to peak amplitude on the transfer function analyzer output to be consistent with the required output change determined in Section 8.3.4.3.11 C. Note: Verify that the TFA input to the CTU is switched out.		
		Test 1 Revisi Page 4	030 on 0 73 of 543

			Initial	Date
8.3.7.3.12	5)	Select FCM2801 and adjust setpoint to achieve a nominal 960°F steam outlet temperature on TC2801.		
	6)	Set FCM2801 to manual mode.		
	7)	Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a $\pm$ 400 lb/hr peak-to-peak response is achieved on FI2801.		
		Set the TFA to 0.02 HZ allow the system to reach steady state (3-4 cycles).		
		Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ		
	Not	te: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engi- neers in RS-1 or DAS room).		
		*Determined during test		
			Test Revis Page	 1030 ion 0 474 of 543

		Initial	Date
8.3.7.3.12	Note: (2) If panel temperature drifts off		
	the nominal test condition - adjust		
	FCM2801 output from operator station to		
	correct - if cannot successfully adjust -		
	return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2801 back to auto.		
8.3.7.3.13	Obtain open loop step response data on panel		
	221 by carrying out the following steps.		
	A) Confirm that the receiver panels are in		
	a steady state condition for approxi-		
	mately 5 minutes.		
	B) Set FCM2803 to manual mode.		
	C) Implement a step decrease in FCM2803		
	output by approximately 10% of nominal		
	value (increase valve opening) and allow		
	pressures, flows, temperatures to reach		
	steady state.		
	Note: An adjustment in the magnitude of the		
	valve step command may be required in		
	order to achieve a measureable response		
	change in flow and temperature - flow of		
	$\pm$ 0.1 ID/sec, temperatures of $\pm$ 50 to		
	change Moniton the following papameters		
	on a strip chart to verify that data is		
	recorded: $FCM2803$ (PV & CO), TI2803		
	TI2806, YI2809, PI2902.	Tect 1	030
		Revisi	on O
		Page 4	75 of 543

		Initial	Date
8.3.7.3.13	FCM2803 Output%		
	Command Change		
	D) Implement a step increase (back to		
	nominal) in FCM2803 output (closing		
	valve) and allow temperatures, pressure		
	and flowrate to reach steady state		
	conditions.		
	E) Reset FCM2803 back to auto.		
	,		
3.3.7.3.14	Perform frequency response tests on panel		
	221 (see TC2803, Figure 8.3.4-4) by carry-		
	ing out the following steps.		
	5 5 1		
	1) Verify that the controls test unit		
	(CTU) is installed and operating on		
	TC2803. (Installation is in RS-1.)		
	(,,,,,,,		
	2) Verify the receiver feedpump is in	2	
	pressure control mode (PC1105).		
	3) Confirm that the receiver panels		
	are in a steady state condition for		
	approximately 2 minutes.		
	4) Adjust the peak to peak amplitude		
	on the transfer function analyzer out-		
	put to be consistent with the required		
	output change determined in Section		
	8.3.7.3.13 C. Note: Verify that the		
	TFA input to the CTU is switched out.		
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		Initial	Date
8.3.7.3.14	5) Select FCM2803 and adjust setpoint to achieve a nominal 960°F steam outlet temperature on TC2803.		
	6) Set FCM2803 to manual mode.		
	7) Using the transfer function analyzer (TFA) insert a 0.1 HZ sin wave into the CTU) and adjust the TFA output such that a ± 400 lb/hr peak-to-peak response is achieved on FI2803.		
	Set the TFA to 0.02 HZ allow the system to reach steady state (3-4 cycles).		
	Repeat 4) at a frequency of 0.05 HZ Repeat 4) at a frequency of 0.07 HZ Repeat 4) at a frequency of 0.1 HZ Repeat 4) at a frequency of 0.2 HZ Repeat 4) at a frequency of 0.5 HZ Repeat 4) at a frequency of 0.7 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ Repeat 4) at a frequency of 1 HZ		
	Note: (1) The TFA output amplitude may need to be adjusted during the test as required to obtain a measureable output response (determined by test by engineers in RS-1 or DAS room).		
	*Determined during test	Test	1030
		Revis Page 4	10n U 177 of 543

		Initial	Date
8.3.7.3.14	Note: (2) If panel temperature drifts off the nominal test condition - adjust FCM2803 output from operator station to correct - if cannot successfully adjust - return to Step 5.		
	8) Switch TFA input out of CTU.		
	9) Set FCM2803 back to auto.		
8.3.7.3.15	Obtain open loop step/ramp response to a flux disturbance on panels 214, 217, 219, 221 by carrying out the following steps.		
	A) Confirm that the receiver panels are in a steady state condition for approxi- mately 5 min.		
	B) Set FCM2604, FCM2702, FCM2801, FCM2803, to manual mode.		
	C) Implement a step/ramp decrease in the power level on panels 214, 217, 219, 221 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Moni- tor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve commands and PI2902. Note: An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in	Test 10 Revisio	030 0n 0

			Initial	Date
8.3.7.3.15		flow and temperatures and flux. Flux changes $\geq 20\%$ and temperature changes $\geq 50$ to $100^{\circ}$ F desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Set FCM2602, FCM2702, FCM2801, FCM2803, back to auto.		
			Test Revis	 1030 tion 0
			Page	479 of 543

Obtain process control closed loop data for tuning of receiver temperature con- trollers (TC2602 TC2702 TC2801 and		
for tuning of receiver temperature con-		
trollers (TC2602 TC2702 TC280] and		
TC2803) at rated pressure, rated tempera-		
ture and high flow (refer to Figures 8.3.4-1		
thru 8.3.4-4). Obtain step response data to		
setpoint changes at a nominal temperature of		
960°F. Obtain step/ramp response to flux		
disturbances.		
Verify that the prerequisites have been met		
as required in Section 4.0.		
Verify that the initial conditions have been		
established as required in Section 7.4.3.		
Verify that the heliostat field is in the		
receiver start-up configuration. Adjust		
input power if required to achieve 960°F		
outlet steam temperature on panels 214-221		
with minimum individual panel flowrates		
> 7200 lb/hr.		
Verify that all panels are in metal temper-		
ature control and a nominal setpoint of		
960°F. Adjust TC2301 thru TC2803 setpoints		
as required.		····
Verify that control test unit (CTU)		
external input is switched out.		
	Test 1 Revisi	030 on 0
	thru 8.3.4-4). Obtain step response data to setpoint changes at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances. Verify that the prerequisites have been met as required in Section 4.0. Verify that the initial conditions have been established as required in Section 7.4.3. Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates ≥ 7200 lb/hr. Verify that all panels are in metal temper- ature control and a nominal setpoint of 960°F. Adjust TC2301 thru TC2803 setpoints as required. Verify that control test unit (CTU) external input is switched out.	thru 8.3.4-4). Obtain step response data to setpoint changes at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances. Verify that the prerequisites have been met as required in Section 4.0. Verify that the initial conditions have been established as required in Section 7.4.3. Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels 214-221 with minimum individual panel flowrates ≥ 7200 lb/hr. Verify that all panels are in metal temper- ature control and a nominal setpoint of 960°F. Adjust TC2301 thru TC2803 setpoints as required. Verify that control test unit (CTU) external input is switched out. Test 1 Revisi Page 4

	-	Initial	Date
8.3.7.4.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.7.4.7	Obtain closed loop response on TC2602 to a temperature setpoint change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 960°F; P = 1450 psig; F = 10,800 lb/hr.</li> </ul>		
	B) Confirm TC2602 is in metal temperature control mode.		
	C) Implement a step decrease in TC2602 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position & command, set point.		
	D) Implement a step increase in TC2602 set- point (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
		Test 1 Revisi Page 4	030 on 0 81 of 543

		Initial	Date
8.3.7.4.7	E) Confirm temperature response is satisfactory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-6. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.7.4.8	Obtain closed loop response on TC2702 to a temperature setpoint change on panel 217 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 217</li> <li>in a steady state condition for approx- imately 2 minutes. Panel conditions:</li> <li>T = 960°F; P = 1450 psig; F = 7200 to</li> <li>9000 lb/hr.</li> </ul>		
	B. Confirm TC2702 is in metal temperature control mode.		
		Test 1 Revisi Page 4	030 on 0 82 of 543

			Initial	Date
8.3.7.4.8	C)	Implement a step decrease in TC2702 set- point by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D)	Implement a step increase in TC2702 set- point (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	<ul> <li>Confirm temperature response is satisfactory. If not adjust control loop gains via the following.</li> <li>1) Set receiver console to configure mode.</li> </ul>		
		<ol> <li>Select C1-7. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
			Test Revis Page	 1030 ion 0 483 of 543

			Initial	Date
8.3.7.4.8	G)	Set receiver console back to monitor mode.		
8.3.7.4.9	Obt at by	cain closed loop response on TC2801 to cemperature setpoint change on panel 219 carrying out the following steps.		
	A)	Confirm that receiver panel 219 in a steady state condition for approximately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 6300 lb/hr.		
	B)	Confirm TC2801 is in metal temperature control mode.		
·	С.	Implement a step decrease in TC2801 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D)	Implement a step increase in TC2801 set- point (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Moni- tor and adjust as in Section C.		
			Test Revis Page	1030 ion 0 484 of 543

		Initial	Date
8.3.7.4.9	E) Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.7.4.10	Obtain closed loop response on TC2803 to a temperature setpoint change on panel by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 221 in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 960°F; P = 1450 psig; F = 3600 lb/hr.</li> </ul>		
	B. Confirm TC2803 is in metal tempera- ture control mode.		-
		Test Revi Page	 1030 sion 0 485 of 5

			Initial	Date
8.3.7.4.10	C)	Implement a step decrease in TC2803 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		
	D)	Implement a step in TC2803 setpoint (back to nominal). Allow panel tem- peratures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
·	E)	<ul> <li>Confirm temperature response is satisfactory. If not adjust control loop gains via the following:</li> <li>1) Set receiver console to configure mode.</li> </ul>		
		<ol> <li>Select Cl-9. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
			Test Revis Page	 1030 ion 0 486 of 543

	-	Initial	Date
8.3.7.4.10	G) Set receiver console back to monitor mode.		
8.3.7.4.11	Obtain closed loop response on TC2602, TC2702, TC2801, TC2803 to a flux disturbance on panels 214, 217, 219, 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214, 217, 219, 221 is in a steady state condition for approximately 2 minutes. Panel conditions: T - 960°F; P - 1450 psig; F = 3600 to 10800 lb/hr.</li> </ul>		
	B) Confirm TC2602, TC2702, TC2801, TC2803, is a metal temperature control mode.		
	C) Implement a step/ramp decrease in the lower level on panels 214, 217, 219, 221 by by approximately 10% nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, set- point. An adjustment in the magnitude of the power change (number of heliostat on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux changes > 20% and flow changes > 500 lb/hr are desired.		

Test 1030 Revision 0 Page 487 of 543



		Initial	Date
8.3.7.5	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2602, TC2702, TC2801 and TC2803) at rated pressure, rated temperature and high flow (refer to Figures 8.3.7-1 through 8.3.7-18). Obtain step response data to setpoint changes at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances.		
8.3.7.5.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.7.5.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.7.5.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels 204-221 with minimum individual panel flowrates >3600 to 10,800 lb/hr.		
8.3.7.5.4	Verify that all panels are in metal temperature control and a nominal setpoint of 960°F. Adjust TC2301 through TC2803 setpoints as required.		
8.3.7.5.5	Verify that control test unit (CTU) External Input is switched out.		
		Test	 1030
		Page	489 of 543

		Initial	Date
8.3.7.5.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.7.5.7	Obtain closed loop response on TC2301 through TC2803 to a temperature setpoint change on panel 204 through 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 204 through 221 are in a steady state condition for approximately 2 minutes. Panel condi- tions: T= 960°F; P= 1450 psig;</li> <li>F= 3600 to 10,800 lb/hr.</li> </ul>		
	B) Confirm TC2301 through TC2803 are in metal temperature control mode and in cascade with TSP2929. Verify rate limits on TSP2929 are removed.		
	C) Implement a step decrease in TSP2929 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following para- meters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, set point.		

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Test 1030 Revision 0 Page 490 of 543

			Initial	Date
8.3.7.5.7	D)	Implement a step increase in TSP2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-X. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C through E. Record final tuned para- meters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode.		
			Test Revis Page	1030 sion 0 491 of 543



Test 1030 Revision 0 Page 492 of 543

			Initial	Date
8.3.7.5.8	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response and if temperature excursions exceed <u>+</u> 50°F - adjust flux loop gains via the following. 1) Set receiver console to configure		
		mode.		
		<ol> <li>Select C1-X, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain. Set console back to monitor mode.		
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			Revis Revis Page	493 of 543

	-	Initial	Date
8.3.8	CONTROL TESTS - AUXILIARY STEAM - LOOP TUNING		
8.3.8.1	Demonstrate satisfactory closed loop con- trol of auxiliary steam pressure controller PC 1003 and temperature controller TC 1004. Obtain response to setpoint and flow charges. Tune control loops.		
8.3.8.2	Confirm receiver outlet temperature and pressure are controlled and operating in a satisfactory manner.		
8.3.8.3	Select TCM 1004, adjust setpoint to 345°F. Set to auto mode.		
8.3.8.4	Select PCM 1003, adjust setpoint to 68 psig. Set to auto mode.		
8.3.8.5	Tune PC 1003 - auxiliary steam pressure controller (Figure 8.3.8-1) by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease pressure set point on PC 1003 by 10% and observe the response on the strip chart.		
	C) Increase pressure set point back to nominal value and observe the response on the strip chart.		
		Test   Revisi Page 4	[ 030 0n 0 194 of 543

MVCU 2-4





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Figure 8.3.8-1. Auxiliary Steam - Main Steam Pressure Controller Functional Block Diagram PC 1003

	· · · · ·	Initial	Date
	D) Increase/decrease proportional gain, K1 (C2-4, AL-7).*		
	E) Repeat steps B thru D as required until response is satisfactory.		
	F) Decrease PC 1003 set point to 10% and observe response.		
	G) Increase PC 1003 set point to nominal value and observe pressure response.		
	H) Increase/decrease reset gain, K2 (C2-4, AL-7) in the ± 30% increments.		
	<ol> <li>Repeat steps F thru H as required until response is satisfactory.</li> </ol>		
	J) Establish preliminary PC 1003 controller gains and record.		
	K) Adjust setpoint, alarms, limits as required.		
8.3.8.6	Tune TC 1004 - desuperheater temperature controller (Figure 8.3.8-2) by carrying out the following steps using loop tuning form.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature set point on TCM 1004 by 10% and observe the response on the strip chart.		
		Test 10 Revisio Page 49	30 n 0 6 of 543

MVCU 2-4



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Figure 8.3.8-2. Auxiliary Steam – Desuperheater Temperature Controller Functional Block Diagram TC 1004

	-	Initial	Date
C)	Increase TCM 1004 set point back to nominal value and observe the response on the strip chart.		
D)	Increase/decrease proportional gain, K1 (C2-4, AL-8).*		
E)	Repeat steps B thru D as required until response is satisfactory.		
F)	Decrease TCM 1004 set point 10% and observe response.		
G)	Increase TCM 1004 set point to nominal value and observe temperature response.		
H)	Increase/decrease reset gain, K2 (C2-4, AL-8) in the ± 30% increments.		
I)	Repeat steps F thru H as required until response is satisfactory.		
J)	Establish preliminary TV 1004 controller gains and record.		
К)	Adjust setpoints, alarms, limits as required.		
		Test 10 Revisio Page 40	)30 on 0 38 of 543

	-	Initial	Date
8.3.9	CONTROL TESTS - PANELS 214, 217, 219, AND 221 - HIGH FLOW - BLENDED* TEMPERATURE CONTROL		
8.3.9.1	Obtain process control closed loop data for tuning of receiver temperature controllers (TC 2602, TC 2702, TC 2801 and TC 2803) at rated pressure, derated temperature and high flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain step response data to setpoint changes at nominal temperature of 960°F. Obtain step/ramp response to flux disturbances.		
8.3.9.1.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.9.1.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.9.1.3	Verify that the heliostat field is in the receiver normal configuration. Adjust input power if required to achieve 960 outlet steam temperature on panels 214- 221 with minimum individual panel flow- rates > 3600 to 10,800 lb/hr.		
8.3.9.1.4	Verify that all panels are in metal temper- ature control and a nominal setpoint of 960 F. Adjust TC 2301 thru TC 2803 set- points as required.		
8.3.9.1.5	Verify that control test unit (CTU) external input is switched out.		
*Blended te combined m	emperature control invovles controlling to a metal and steam temperature input signal.	 Test   Revisi Page 4	030 on 0 99 of 543

		Initial	Date
8.3.9.1.6	Confirm that the receiver feedpump con- troller (PC 1105) is in valve control mode (Select PD 1105B).		
8.3.9.1.7	Obtain closed loop response on TC 2602 to a temperature set point change on panel 214 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 214 is in a steady state condition for approxi- mately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 10,800 lb/hr.</li> </ul>		
	B) Select TD 2602C and switch controller TC 2602 to blended temperature control mode.		
	C) Implement a step decrease in TC 2602 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, set point.		
	D) Implement a step increase in TC 2602 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach steady state con- dition. Monitor and adjust as in Section C.		
		Test 1 Revisi Page 5	030 on 0 00 of 543

		Initial	Date
	E) Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-6. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.9.1.8	Obtain closed loop response on TC 2702 a temperature setpoint change on panel 217 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 2702 is in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 960°F; P = 1450 psig; F = 7200 lb/hr.</li> </ul>		
	B) Select TD 2702C and switch controller TC 2702 to blended temperature control mode.		
		Test 10 Revisio Page 50	)30 on 0 )1 of 543
	-	Initial	Date
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C)	Implement a step decrease in TC 2702 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, set point.		
D)	Implement a step increase in TC 2702 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state con- dition. Monitor and adjust as in Section C.		
E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-7. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
		Test 10 Revisio Page 50	)30 on 0 )2 of 543

	-	Initial	Date
	G) Set receiver console back to monitor mode.		
8.3.9.1.9	Obtain closed loop response on TC 2801 to a temperature setpoint change on panel 219 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panel 219 is in a steady state condition for approximately 2 minutes. Panel conditions:</li> <li>T = 960°F; P = 1450 psig; F = 6300 lb/hr.</li> </ul>		
	B) Select TD 2801C and switch controller TC 2801 to blended temperature control mode.		
	C) Implement a step decrease in TC 2801 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, setpoint.		
	D) Implement a step increase in TC 2801 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
		 Test10 Revisio Page 50	30 on O )3 of 543

		Initial Date
	E) Confirm temperature response is satis- factory. If not adjust control loop gains via the following:	
	<ol> <li>Set receiver console to configure mode.</li> </ol>	
	<ol> <li>Select Cl-8. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>	
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters Adjust setpoints, alarms, and limits if required and record.	S.
	G) Set receiver console back to monitor mode.	
3.3.9.1.10	Obtain closed loop response on TC 2803 to a temperature setpoint change on panel 221 by carrying out the following steps.	
	<ul> <li>A) Confirm that receiver panel 221 is in a steady state condition for approxi- mately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 3600 lb/hr.</li> </ul>	
	B) Select TD 2803C and switch controller TC 2803 to blended temperature control mode.	
		Test 1030 Revision O Page 504 of 543

		Initial	Date
C)	Implement a step decrease in TC 2803 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, setpoint.		
D)	Implement a step increase in TC 2803 setpoint (back to nominal). Allow panel tempertures, pressures, flux and flows to reach steady state condi- tion. Monitor and adjust as in Section C.		
E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-9. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
		  Test]   Revisi  Page 5	030 on 0 05 of 543

		-	Initial	Date
	G)	Set receiver console back to monitor mode.		
8.3.9.1.11	Obt TC dis 221	ain closed loop response on TC 2602, 2702, TC 2801, and TC 2803 to a flux turbance on panels 214, 217, 219 and by carrying out the following steps.		
	A)	Confirm that receiver panels 214, 217, 219 and 221 are in a steady state condition for approximately 2 minutes. Panel conditions: $T = 960^{\circ}F$ ; $P = 1450$ psig; $F = 3600 \rightarrow 10,8000$ lb/hr.		
	B)	Confirm TC 2602, TC 2702, TC 2801, and TC 2803 are in blended temperature control mode.		
	C)	Implement a step/ranp decrease in the power level on panels 214, 217, 219 and 221 by approximately 10% of nominal power. Allow panel temperatures, pres- sure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux, valve position and command, setpoint. An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measurable response changes in flow and temperatures and flux. Flux		
			Test 10	30

Revision 0 Page 506 of 543

		Initial	Date
	changes $\geq$ 20% and flow changes $\geq$ 500 lb/hr are desired.		
	D) Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Observe temperature response. If tem- perature excursions exceed ± 50°F - adjust flux loop gains via the following.		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-X, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain. Set console back to monitor mode.		
8.3.9.2	Obtain process control loop data for tuning of receiver temperature controllers (TC 2301 thru TC 2803) at rated pressure, rated tem- perature and high flow (refer to Figures 8.3.4-1 thru 8.3.4-18). Obtain step response data to setpoint change at a nominal temperature of 960°F. Obtain step/ ramp response to flux disturbances.		
		lest 1 Revisi	030 on 0

Page 507 of 543

	-	Initial	Date
8.3.9.2.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.9.2.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.9.2.3	Verify that the heliostat field is in the receiver startup configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels $214 \rightarrow 221$ with minimum individual panel flow-rates $\geq$ 3600 to 10,800 lb/hr.		
8.3.9.2.4	Select TD 2301C thru TD 2803C and switch to blended temperature control. Verify that all panels are in blended temperature con- trol and nominal setpoint of 960°F. Adjust TC 2301 thru TC 2803 setpoints as required.		
8.3.9.2.5	Verify that control test unit (CTU) external input is switched out.		
8.3.9.2.6	Confirm that the receiver feedpump control- ler (CP 1105) is in valve control mode (Select PD 1105B).		
8.3.9.2.7	Obtain closed loop response on TC 2301 thru TC 2803 to a temperature setpoint change at high flow panels 204 thru 221 by carrying out the following steps.		
		Test 10	030

Revision O Page 508 of 543

		Initial	Date
A)	Confirm that receiver panels 204 thru 221 are in a steady state condition for approximately 2 minutes. Panel condi- tions: T = 960°F; P = 1450 psig; F = 3600 thru 10,800 lb/hr.		
В)	Confirm TC 2301 thru TC 2803 are in blended temperature control mode. Remove ramp rate limits on panel set point (C1-10, AL-24).		
C)	Implement a step decrease in TSP 2929 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following param- eters on a strip chart recorder to verify data is recorded: panel flow, steam and metal temperatures, flux valve position and command, setpoint.		
D)	Implement a step increase in TSP 2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach steady state condition. Monitor and adjust as in Section C.		
E)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
		Test Revis Page S	1030 ion 0 509 of 543

		Initial	Date
	<ol> <li>Select C1-X. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.9.2.8	Obtain closed loop response on TC 2301 thru TC 2803 to a flux disturbance at high flow on panels 204 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 214 thru</li> <li>221 are in a steady state condition for approximately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 3600 thru 10,800 lb/hr.</li> </ul>		
	B) Confirm TC 2301 thru TC 2803 are in blended temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 thru 221 by approximately 10% nominal power. Allow panel temperatures, pressure and flow- rate to reach steady state. Monitor the following parameters on a strip		
		 Test 10 Revisio Page 51	30 on 0 0 of 543

		Initial	Date
chart recorder to v recorded: panel fl temperatures, flux command, set point. the magnitude of th (number of heliosta may be required in measurable response temperatures and fl $\geq$ 20% and flow chan are desired.	verify data is ow, steam and metal valve position and An adjustment in me power change ats on/off target) order to achieve e changes in flow and ux. Flux changes ages > 500 lb/hr		
D) Implement a step/ra power (back to nomi temperatures, press to reach a steady s Monitor and adjust	mp increase in panel nal). Allow panel sures, flux and flows state condition. as in Section C.		
<ul> <li>E) Observe temperature perature excursions adjust flux loop gat following.</li> <li>1) Set receiver comode.</li> <li>2) Select Cl-X, Alt tuning form incomand control para</li> </ul>	e response. If tem- s exceed ± 50°F - ains via the onsole to configure 16 - using loop crease/decrease gain rameters as required.		
F) If gains are adjust thru E. Record fir gain. Set console mode.	ed repeat Steps C nal tuned flux loops back to monitor	Test 1 Revisi Page 5	030 on 0 11 of 543

		Initial	Date
8.3.9.3	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2301 thru TC2803) at rated pressure, rated temperature and moderate flow (refer to Figures 8.3.4-1 thru 8.3.4-4). Obtain step response data to setpoint change at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbances.		
8.3.9.3.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.9.3.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.9.3.3	Verify that the heliostat field is in receiver start-up configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels 204 thru 221 with minimum individual panel flowrates $\geq$ 1800 thru 7200 lb/hr.		
8.3.9.3.4	Select TD2301C thru TD2803C and switch to blended temperature control. Verify that all panels are in blended temperature control and a nominal setpoint of 960°F. Adjust TC2301 thru TC2803 setpoints as required.		
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Test 1030 Revision 0 Page 512 of 543

	-	Initial	Date
8.3.9.3.5	Verify that control test unit (CTU) external input is switched out.		
8.3.9.3.6	Confirm that the receiver feedpump controller (PC1105) is in valve control mode (Select PD1105B).		
8.3.9.3.7	Obtain closed loop response to TC2301 thru TC2803 to a temperature setpoint change at moderate flow on panels 204 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 204 thru</li> <li>221 are in a steady state condition</li> <li>for approximately 2 minutes. Panel</li> <li>conditions: T = 960°F; P = 1450 psig;</li> <li>F = 1800 thru 7200 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode. Remove ramp rate limits on panel setpoint (C1-10, AL-24).		
	C) Implement a step decrease in TSP2929 setpoint by approximately 10% of nomi- nal. Allow panel temperatures, pres- sure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
		Test 1 Revisi Page 5	030 on 0 13 of 543

			Initial	Date
8.3.9.3.7	D)	Implement a step increase in TSP2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
·	E)	<ul> <li>Confirm temperature response is satis-factory. If not adjust control loop gains via the following:</li> <li>1) Set receiver console to configure mode.</li> </ul>		
		<ol> <li>Select Cl-x. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G)	Set receiver console back to monitor mode.		
8.3.9.3.8	Obta TC28 flow	ain closed loop response on TC2301 thru 303 to a flux disturbance at moderate w by carrying out the following steps.		
			Test 10 Revisio Page 5	030 on 0 14 of 543

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8.3.9.3.8	A)	Confirm that receiver panels 204 thru 221 are in a steady state condition for approximately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 1800 thru 7200 lb/hr.		
	B)	Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C)	Implement a step/ramp decrease in the power level on panels $204 \rightarrow 221$ by approximately 10% nominal power. Allow panel temperatures, pressure and flow- rate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux, valve position & command, set point. An adjustment in the magnitude of the power change (number of helio- stats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux change $\geq 20\%$ and flow changes $\geq 500$ lb/hr are desired.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.	Test 1 Revisio	030 on 0



		Initial	Date
8.3.9.4	Obtain process control closed loop data for tuning of receiver temperature controllers (TC2301 thru TC2803) at rated pressure, rated temperature and low flow. Obtain step response data to setpoint change at a nominal temperature of 960°F. Obtain step/ramp response to flux disturbance.		
8.3.9.4.1	Verify that the prerequisites have been met as required in Section 4.0.		
8.3.9.4.2	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.9.4.3	Verify that the heliostat field is in the receiver start-up configuration. Adjust input power if required to achieve 960°F outlet steam temperature on panels 204-221 with minimum individual panel flowrates > 900 thru 1800 lb/hr.		
8.3.9.4.4	Select TD2301C thru TD2803C and switch to blended temperature control. Verify that all panels are in blended temperature control and a nominal setpoint of 960°F. Adjust TC2301 thru TC2803 setpoints as required.		
		T <b>est</b> 1 Revisi Page 5	.030 on 0 17 of 543

	-	Initial	Date
8.3.9.4.5	Verify that control test unit (CTU) external input is switched out.		
8.3.9.4.6	Confirm that the receiver feedpump con- troller (PC1105) is in valve control mode (Select PD1105B).		
8.3.9.4.7	Obtain closed loop response on TC2301 thru TC2803 to a temperature setpoint change at low flow on panels 204 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 204 thru</li> <li>221 are in a steady state condition</li> <li>for appoximately 2 minutes. Panel</li> <li>conditions: T = 960°F; P = 1450 psig;</li> <li>F = 900 thru 1800 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode. Remove ramp rate limits on panel set point (C1-23, AL-24).		
	C) Implement a step decrease in TSP2929 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		

Test 1030 Revision 0 Page 518 of 543

		Initial	Date
8.3.9.4.7	D) Implement a step increase in TSP2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E) Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
	<ol> <li>Set receiver console to configure mode.</li> </ol>		
	<ol> <li>Select Cl-x. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	F) If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	G) Set receiver console back to monitor mode.		
8.3.9.4.8	Obtain closed loop response to TC2301 thru TC2803 to a flux disturbance at low flow on panels 204 thru 221 by carrying out the following steps.		
		Test 10 Revisi Page 5	)30 on 0 19 of 543

		_	Initial	Date
8.3.9.4.8	A)	Confirm that receiver panels 204 thru 221 are in a steady state condition for approximately 2 minutes. Panel conditions: T = 960°F; P = 1450 psig; F = 900 thru 1800 lb/hr.		
	B)	Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C)	<pre>Implement a step/ramp decrease in the power level on panels 204 thru 221 by approximately 10% nominal power. Allow panel temperatures, pressure and flow- rate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam &amp; metal temperatures, flux, valve position &amp; command, setpoint. An adjustment in the magnitude of the power change (number of heliostats on/ off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes ≥ 20% and flow changes ≥ 500 lb/hr are desired.</pre>		·
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
			I Test 10 Revisi Page 5	030 on 0 20 of 543

			Initial	Dat
8.3.9.4.8	E)	Observe temperature response. If temperature excursions exceed $\pm$ 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-x, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain. Set console back to monitor		
		node.		
			Test 10 Revisio	)30 on 0

		Initial	Date
8.3.10	CONTROL TESTS - LARGE SIGNAL FLUX/SETPOINT RESPONSE TESTS RATED STEAM CONDITIONS		
8.3.10.1	Induce maximum flux gradients on the receiver panels via heliostat field configuration and verify satisfactory control response and operating conditions are within design limits.		
8.3.10.1.1	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.10.1.2	Verify that the heliostat field is in the maximum power configuration.		
8.3.10.1.3	Verify that all panels are in blended temperature control with a nominal setpoint of 960°F.		
8.3.10.1.4	Adjust heliostat configuration to induce maximum flux gradients on the receiver panels - Refer to table 8.3.10.1.		
8.3.10.1.5	Confirm that all receiver panels are in a steady state condition for at least 10 minutes and that maximum panel tube temperatures are within design limits.		
8.3.10.1.6	Re-adjust heliostat field back to the "normal" maximum power configuration.		
		Test 1 Revisi Page 5	030 on 0 22 of 543

		Initial	Da
8.3.10.2	Verify satisfactory control system response on all panels to a maximum induced decreas- ing flux condition (100% to 10%) and a maximum increasing flux condition (10% to 100%).		
8.3.10.2.1	Obtain closed loop response on TC2301 thru TC2803 to a flux disturbance on panel 204 thru 221 by carrying out the following steps.		1
	<ul> <li>A) Confirm that receiver panels 204 thru</li> <li>221 are in a steady state condition</li> <li>for approximately 2 minutes. Panel</li> <li>conditions: T = 960°F; P = 1450 psig;</li> <li>F = 3600 thru 10,800 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 thru 221 from 100% to 50% of rated power in 1 minute. Allow panel temperatures, pressure and flow rate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux, valve position & command, set point.		

Test 1030 Revision O Page 523 of 543



			Initial	Date
8.3.10.2.2	B)	Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C)	Implement a step/ramp decrease in the power level on panels 204 thru 221 from 100% to 10% of rated power in 1 minute. Allow panel temperatures, pressure and flowrate to reach steady state. Moni- tor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux, valve position & command, set point.		
	D)	Implement a step/ramp increase in panel power (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	Observe temperature response and if temperature excursions exceed ± 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-x, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
			Test 10 Revisio Page 52	)30 on 0 25 of 543

			Initial	Date
8.3.10.2.2	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux loops gain. Set console back to monitor mode.		
8.3.10.3	Ver to a from from	ify satisfactory control system response a maximum temperature set point ramp rate n rated to derated steam conditions and n derated to rated steam conditions.		
8.3.10.3.1	Obta TC28 pane fo1	ain closed loop response on TC2301 thru 803 to a temperature setpoint change on els 204 thru 221 by carrying out the lowing steps.		
	A)	Confirm that receiver panels 204 thru 221 are in a steady state condition for approximately 2 minutes. Panel condi- tions: T = 960°F; P = 1450 psig; F = 3600 thru 10,800 lb/hr.		
	B)	Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C)	Implement a step decrease in TSP2929 setpoint to 800°F. Allow panel tempera- tures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
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Test 1030 Revision 0 Page 526 of 543



			Initial	Date
8.3.10.3.1	I)	Implement a step decrease in TSP2929 setpoint to 660°F. Allow panel tempera- tures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	J)	Confirm temperature response is satis- factory. If not adjust control loop gains via the following:		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-x. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ol>		
	K)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.		
	L)	Set receiver console back to monitor mode.		
			Test 10 Revisio Page 52	30 n O 3 of 543

		Initial	Date
8.3.11	CONTROL TESTS - DERATED STEAM CONDITIONS - BLENDED TEMPERATURE CONTROL		
8.3.11.1	Demonstrate satisfactory closed loop control of receiver temperature for TC2301 thru TC2803 in the blended temperature control mode. Obtain response to temperature set- point and flux changes at rated pressure, derated temperature and high flow condi- tions. Tune control as required.		
8.3.11.1.1	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.11.1.2	Obtain closed loop response on TC2301 thru TC2803 to a temperature setpoint change at high flow on panels 204 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 204 thru</li> <li>221 are in a steady state condition</li> <li>for approximately 2 minutes. Panel</li> <li>conditions: T = 660°F; P = 1450 psig;</li> <li>F = 3600 thru 10,800 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode. Remove ramp rate limits on panel set point (C1-10, AL-14).		
		Test 1 Revisi Page 5	030 on 0 29 of 543

		-	Initial	Date
8.3.11.1.2	C)	Implement a step decrease in TSP2929 setpoint by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	D)	Implement a step increase in TSP2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	<ul> <li>Confirm temperature response is satisfactory. If not adjust control loop gains via the following:</li> <li>1) Set receiver console to configure mode.</li> <li>2) Select Cl-x. Using loop tuning form increase/decrease selected gains and tuning parameters as required.</li> </ul>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned parameters. Adjust setpoints, alarms, and limits if required and record.	Test 1 Revisi	030 on 0

		Initial	Date
8.3.11.1.2	G) Set receiver console back to monitor mode.		
8.3.11.1.3	Obtain closed loop response on TC2301 thru TC2803 to a flux disturbance at high flow on panels 214 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 214 thru</li> <li>221 are in a steady state condition</li> <li>for approximately 2 minutes. Panel</li> <li>conditions: T = 960°F; P = 1450 psig;</li> <li>F = 3600 thru 10,800 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 thru 221 by approximately 10% of nominal power. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint. An adjustment in the magnitude of the power change (number of heliostats on/off target) may be required in order to achieve measureable response changes in flow and temperatures and flux. Flux changes _ 20% and flow obspace > 500 lb/km		

Revision O Page 531 of 543



Revision 0 Page 532 of 543

		Initial	Date
8.3.11.2.1	Verify that the initial conditions have been established as required in Section 7.3.11.		
8.3.11.2.2	Implement a ramp decrease in the power level on panels 204 thru 221 to a low power condition (40,000 lb/hr) over a 10 minute period. Allow panel temperatures, pressure and flowrate to reach steady state. Moni- tor the following parameters on a strip chart recorder to verify data is recorded: panel flows, steam & metal temperatures, flux, valve position & command setpoint.		
8.3.11.2.3	Obtain closed loop response on TC2301 thru TC2803 to a temperature setpoint change at low flow on panels 204 thru 221 by carrying out the following steps.		
	<ul> <li>A) Confirm that receiver panels 204 thru</li> <li>221 are in a steady state condition</li> <li>for approximately 2 minutes. Panel</li> <li>conditions: T = 660°F; P = 1450 psig;</li> <li>F = 900 thru 1800 lb/hr.</li> </ul>		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode. Remove ramp rate limits on panel set point (C1-23, AL-24).		
		Test 1 Revisi Page 5	030 on 0 33 of 543

		-	Initial	Date
8.3.11.2.3	C)	Implement a step decrease in TSP2929 set- point by approximately 10% of nominal. Allow panel temperatures, pressure and flowrate to reach steady state. Moni- tor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux valve position & command, setpoint.		
	D)	Implement a step increase in TSP2929 setpoint (back to nominal). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
	E)	<ul> <li>Confirm temperature response is satisfactory. If not adjust control loop gains via the following:</li> <li>1) Set receiver console to configure mode.</li> <li>2) Select Cl-x. Using loop tuning form, increase (decrease colorted prime and selected prime</li></ul>		
	F)	Increase/decrease selected gains and tuning parameters as required		
		Adjust setpoints, alarms, and limits if required and record.	Test 10 Revisio Page 53	930 97 0 94 of 543

	-	Initial	Date
8.3.11.2.4	Stability margin test - TC2602, TC2702, TC2801, & TC2803 at derated temperature, low flow conditions		
8.3.11.2.4.1	Confirm stability margin on TC2602 by carrying out the following steps.		
	A) Set receiver console to configure mode.		
	B) Decrease temperature setpoint on TC2602 by 10% and observe the response on the strip chart.		
	C) Increase TC2602 setpoint back to nominal value and observe the response on the strip chart.		
	D) Increase proportional gain, Kl (Cl-6, AL-12)*. By 20% - use loop tuning form.		
	E) Repeat steps B thru D as required until response is marginally stable (oscillatory).		
	F) Record gains for neutral stability.		
	G) Reset gains back to nominal condition.		

Test 1030 Revision 0 Page 535 of 543

			Initial	Date
8.3.11.2.4.2	Confi	rm stability margin on TC2702 by		
0.0000000000000000000000000000000000000	carry	ing out the following steps.		
	A)	Set receiver console to configure		
		induc.		
	B)	Decrease temperature setpoint on		
		TC2702 by 10% and observe the		
		response on the strip chart.		
	C)	Increase TC2702 setpoint back to		
		nominal value and observe the		
		response on the strip chart.		
	D)	Increase proportional gain, Kl		
		(C1-7, AL-32)*. By 20% - use		
		loop tuning form.		
	E)	Repeat steps B thru D as required		
	1	until response is marginally stable		
		(oscillatory).		
	F)	Record gains for neutral stability.		
	G)	Reset gains back to nominal		
	~, · ·	condition.		
8.3.11.2.4.3	Confi	rm stability margin on TC2801 by		
	Carry	ing out the forrowing steps.		
	A) :	Set receiver console to configure		
	r	node.		
			Test 1	030
			Page 5	36 of 543

			Initial	Date
8.3.11.2.4.3	B)	Decrease temperature setpoint on TC2801 by 10% and observe the response on the strip chart.		
	C)	Increase TC2801 setpoint back to nominal value and observe the response on the strip chart.		
	D)	Increase proportional gain, Kl (Cl-8, AL-32)*. By 20% - use loop tuning form.		
	E)	Repeat steps B thru D as required until response is marginally stable (oscillatory).		
	F)	Record gains for neutral stability.		
	G)	Reset gains back to nominal condition.		
8.3.11.2.4.4	Conf out	firm stability on TC2803 by carrying the following steps.		
	A)	Set receiver console to configure mode.		
	B)	Decrease temperature set point on TC2803 by 10% and observe the response on the strip chart.		
	C)	Increase TC2803 set point back to nominal value and observe the response on the strip chart.		
			Test 1 Revis Page 5	1 .030 ion 0 537 of 543
		Initial	Date	
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8.3.11.2.4.4	D) Increase proportional gain, Kl (Cl-9, AL-32)*. By 20% - use loop tuning form.			
	E) Repeat steps B thru D as required until response is marginally stable (oscillatory).			
	F) Record gains for neutral stability.			
	G) Reset gains back to nominal condition.			
8.3.11.3	Determine the low flow controllability limit on temperature control for the receiver panels.	·	•	
8.3.11.3.1	Implement a step/ramp decrease in the power level on panels 204 thru 221 in minimum power increments at 10 minute intervals. Allow panel temperatures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux, valve position & command, setpoint.			
8.3.11.3.2	Continue decreasing power until temperature control is no longer stable or satisfactory.			

Test 1030 Revision 0 Page 538 of 543

	-	Initial	Date
8.3.11.4	Verify satisfactory control system response on all panels to a maximum induced decreas- ing flux condition (100% to 10%) and a maximum increasing flux condition (10% to 100%) at derated temperature conditions.		
8.3.11.4.1	Verify that the initial conditions have been established as required in Section 7.4.3.		
8.3.11.4.2	Verify that the heliostat field is in a receiver low power configuration. Adjust input power if required to achieve $660^{\circ}$ F outlet steam temperature on panels 214 thru 221 with minimum individual panel flowrates $\geq$ 900 thru 1800 lb/hr.		
8.3.11.4.3	Implement a step/ramp increase in panel power (back to rated power conditions). Allow panel temperatures, pressures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C.		
8.3.11.4.4	Observe temperature response. If tempera- ture excursions exceed ± 50°F - adjust flux loop gains via the following.		
	1) Set receiver console to configure mode.		
	<ol> <li>Select Cl-x, AL-16 - Using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
		Te <b>st</b> 10 Revisio Page 53	)30 m 0 9 of 543

	-	Initial	Date
3.3.11.4.5	Obtain closed loop response on TC2301 thru TC2803 to a flux disturbance on panels 204 thru 221 by carrying out the following steps.		
	A) Confirm that receiver panel $204 \rightarrow 221$ is in a steady state condition for approximately 2 minutes. Panel condi- tions: T = 660°F; P = 1450 psig; F = 3600 thru 10,800 lb/hr.		
	B) Confirm TC2301 thru TC2803 are in blended temperature control mode.		
	C) Implement a step/ramp decrease in the power level on panels 204 thru 221 from 100% to 10% of rated power in a 1 minute period. Allow panel tempera- tures, pressure and flowrate to reach steady state. Monitor the following parameters on a strip chart recorder to verify data is recorded: panel flow, steam & metal temperatures, flux, valve position & command setpoint.		
	D) Implement a step/ramp increase in panel power (back to rated power condi- tion). Allow panel temperatures, pres- sures, flux and flows to reach a steady state condition. Monitor and adjust as in Section C		

Revision O Page 540 of 543

			Initial	Date
8.3.11.4.5	E)	Observe temperature response and if temperature excursions exceed ± 50°F - adjust flux loop gains via the following.		
		<ol> <li>Set receiver console to configure mode.</li> </ol>		
		<ol> <li>Select Cl-x, AL-16 - using loop tuning form increase/decrease gain and control parameters as required.</li> </ol>		
	F)	If gains are adjusted repeat Steps C thru E. Record final tuned flux		
		loops gain. Set console back to monitor mode.		
			Test 10 Revisio Page 54	030 on 0 11 of 543

		Initial	Date
8.3.12	MOISTURE SEPARATORS AND ACCUMULATOR (Test to be carried out during all of Section 8.3 when dry superheated steam is being produced by the individual boiler panels).		
8.3.12.1	Enable the moisture accumulator level drain function and permit normal automatic operation between the low and high setpoint values.		
8.3.12.2	Monitor LAHL2901 during steaming operation to detect the inability to pass sufficient flow (high level alarm caused by excessive moisture carryover). Low level alarms could be caused by an excessive drain rate or a natural drying process which occurs during normal high temperature steaming operation. Correlate high level alarms to setpoint steam temperature.		
8.3.12.3	Monitor the following thermocouples for indications of moisture carryover. Correlate moisture carryover with setpoint tempera- ture, total steam flow, and panel gradients.		
		Test 10 Revisi Page 54	)30 on 0 42 of 543

		Initial	Date
9.0	SYSTEM RESTORATION		
9.1	Shutdown the system and prepare for Mode 1 operation.		
9.2	Initiate trace heating if a subfreezing condition is anticipated.		
9.3	Remove supporting electronic checkout equipment e.g., strip chart recorders, control test unit, or transfer function analyzer from the individual MVCU's (unless required for subsequent testing) and restore control wiring.		
9.4	Inform SCE station shift operating foreman that the test is completed and the plant may be prepared for the next test.	Test 1	030
		Revis <sup>4</sup> Page 5	on 0 543 of 543

### AUG 1 3 1984

John Raetz and/or Bob Riedesel

Were there letters of transmittal to STMPO for Test Procedures 1010 or 1030 (1030 came in two pieces, Sections 1-9 and Section 10-Appendices)? I've never seen transmittal letters or memos, and they may just have been handed to DOE without formal correspondence. (For heaven's sake, don't concoct any at this late date!).

Jost

#### <u>2UC 1 8 1984</u>

John Reetz and/or Bob Riedesel

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Department of Energy Son Francisco Operations Office 1914 - La packary Caktar & California - **94612** 

Reply To: DOE Solar One Project Office P.O. Box 366 Daggett, CA 92327

AUG 1 6 1984

Mr. Robert L. Gervais Solar One Project Office McDonnell Douglas Astronautics Corp. P.O. Box 366 Daggett, CA 92327

Subject: Clearance of Control Contract DE-ACO3-79SF10499 Solar One Reports for DOE/TIC Inclusion.

Dear Bob:

Enclosed are copies of covers and title pages of eight reports prepared by McDonnell Douglas Astronautics Corporation for the Solar One Project under the above referenced contract. In preparation for delivery of these documents to DOE/TIC, I have prepared a SAN form 70 "Request for Patent Clearance" and a DOE form RA-426 "Recommendations for Announcement and Distribution of Documents" for each document.

Please have the appropriate MDAC personnel complete and sign these forms. As agreed, SAN form 70 should be forwarded to SAN/OPC by your office with copies of the completed SAN form 70 and the transmittal letter being sent to me. The completed DOE form RA-426 should be sent directly back to me.

The documents covered by this letter are:

Primary Document No.	Secondary No.	Brief Title	
DOE/SF/10499-T117	STMP0 581	Test Procedure 210, Rev. 1	
DOE/SF/10499-T118	STMP0 587	Test Procedure 820, Rev. 0	
DOE/SF/10499-T119	STMP0 588	Test Procedure 871, Rev. 0	
DOE/SF/10499-T120	STMP0 589	Test Procedure 905, Rev. 0	
DOE/SF/10499-T121	STMP0 590	Test Procedure 910, Rev. 0	
DOE/SF/10499-T138	STMP0 593	Test Procedure 1010, Rev. 0	
DOE/SF/10499-T139	STMP0 593	Test Procedure 1030, Rev. 0, Sec. 1-9	
DOE/SF/10499-T140	STMP0 595	Test Procedure 1030, Rev. 0, Sec. 10	

If you should have any questions or concerns please do not hesitate to contact me by telephone at, (619) 254-2672.

Sincerely, Clob

S.D. Elliott, Jr., Director DOE Solar One Project Office

SDE/aks Project File: CCC005.RN0(SA3)

Encl: Eight Document Covers W/forms 70 and RA-426

cc: Roger Gaither, SAN/OPC W.D. Matheny, DOE/TIC Mike Lopez, DOE/SAN (FGS) Mary Soderstrum, B&McD

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		Prime Contract No.				
	CONTRACTOR REQUEST FOR PATENT CLEARANCE FOR RELEASE OF UNCLASSIFIED DOCUMENT	DE-AC03-79SF10499				
		Subcontract No.				
TO:	Roger S. Gaither, Asst. Chief for Prosecution	(N/A)				
	Office of Patent Counsel/Livermore Office	Report No. (STMPO 594)				
	Livermore, California 94550	DOE/SF/10499-T139				
		Date of Report				
FROM:		July 1981				
	McDonnell Douglas Corporation					
	3855 Lakewood Blvd.	Name & Phone No. of DOE Technical Representative				
	Long Beach, CA 90846	S.D. Filiott In				
		(519) 254-2672				
1.	Document Title: Receiver Steam Generation (Controls) Pre Procedure 1030, Revision 0, Sections 1 t	operational Test hrough 9				
2.	2. Type of Document: 🛱 Technical Report, 🗆 Conference Paper, 🗇 Journal Article, 🗔 Abstract or Sum:					
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OMB NO, 038-R0190

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	DOE/SF/10499-T139 DE-AC03-79SF10499 UC 62, 62c, 62d					
4.	Title Receiver Steam Generation (Controls) Preoperational Test Procedure					
	1030, Revision 0, Sections 1 through 9					
5.	Type of Document ("x" one)					
	Q a. Scientific and technical report					
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H009-	M-807 DEPARTMENT OF ENERGY		SAN	FORM	70	10/80
ALL UNIT	CONTRACTOR REQUEST FOR PATENT CLEARANCE FOR RELEASE OF UNCLASSIFIED DOCUMENT	Prime DE-/	Contract ACO3-79	No. 9SF1049	9	
TO:	Roger S. Gaither, Asst. Chief for Prosecution Office of Patent Counsel/Livermore Office P.O. Box 808, L-376 Livermore, California 94550	(N/) Report	A) rt No. (S /SF/104	5. STMPO 5 199-T13	94) 9	
FROM	McDonnell Douglas Corporation 3855 Lakewood Blvd. Long Beach, CA 90846	Date July Name Techi S.D	of Report y 1981 & Phone nical Repu	No. of D resentative ott, Jr	OE	
	. Document Title: Receiver Steam Generation (Controls) Pred Procedure 1030, Revision 0, Sections 1 th	L <u>(619</u> operation prough	<del>9) 254-</del> ional 1 9	- <u>2672</u> Test		
:	. Type of Document: 🖓 Technical Report, 🗌 Conference Paper, 🔲 Jour	rnal Artic y):	le, 🗆 .	Abstract (	or Summ	ary,
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	Reviewing/Submitting Official: Name (Print/Type) <u>Donald L. Rove</u> Title <u>Asst. Chief Patent Cour</u>	nsel,	MDC	(MS 12	2-23	)

Office of Patent Counsel/Livermore Office

□ No patent objection to above-identified release.

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D Please defer release until advised by this office.

DOE Form RA-426 (10/80)

Signature

# U.S. DEPARTMENT OF ENERGY

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	DOE/SF/10499-T139	DE-AC03-79SF10499	<u>UC 62, 62c, 62d</u>
4.	Title Receiver Steam Generat	ion (Controls) Preoperat	ional Test Procedur
	1030, Revision 0, Sect	ions 1 through 9	
5.	Type of Document ("x" one)		
	🔯 a. Scientific and technical report		
	b. Conference paper: Title of conference		
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