PALO VERDE
NUCLEAR GENERATING STATION

Instrumentation & Controls Training

Classroom Lesson

I&C Program	**Date:10/17/2007**
LP Number: NID14C000102	**Rev Author: Harry W. Gahagen**
Title: SPLA	**Technical Review:** Reynolds, James J(Z78347) Digitally signed by Reynolds, James J (Z78347) DN: cn=Reynolds, James J(Z78347) Reason: I have reviewed this document Date: 2007.10.19 09:09:44 -07'00'
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INITIATING DOCUMENTS:

Site Maintenance Training Program Description

REQUIRED TOPICS

NONE

CONTENT REFERENCES

VTM-S204-0002 SPLA Tech Manual

Lesson Plan Revision Data

Aug 08, 2007	Harry	Gahagen	Changed Course Terminal Objective, added Enabling Objective, and enhanced methods and activities field.

Tasks and Topics Covered

The following tasks are covered in SPLA:

Task or Topic Number*	Task Statement
Lesson:	SPLA
SB14	Troubleshoot Supplementary Protection Logic Assembly

Total tasks or topics: 1

TERMINAL OBJECTIVE:

1.1 Given a maintenance task, and applicable reference materials on the Supplemental Protection Logic Assembly, the I&C Technician will test and maintain the Supplemental Protection System. Mastery will be demonstrated by achieving a score of at least 80% on a written examination, and successful completion of LPE's.

1.1.1 State the purpose of the Supplementary Protection System (SPS)

1.1.2 Describe the major functions of each block of the SPLA Block Diagram

1.1.3 Describe the operation of the following SPLA circuits:
a. Input comparator module
b. Output Module
c. Test Module
d. Annunciator and indicator module.

1.1.4 Describe the function of each SPLA front panel control and indicator.

1.1.5 Describe the use of Prevent Event Tools and Electrical Safe work Practices to minimize Human Performance errors during testing or maintenance of the SPLA.

1.1.6 Given a Corrective Maintenance Work Order describing a SPLA fault, and using applicable SPLA prints, Tech Manuals, and PVNGS work control procedures the I & C Technician will determine the nature of the fault.

Lesson Introduction: SPLA

The following items are things to consider in your Lesson Introduction. They are not mandatory. You should develop your own introduction and place that material in the Program Hierarchy in the Lesson Introduction Tab or appropriate Training Unit.

CLASSROOM GUIDELINES

- If applicable, remind students of class guidelines as posted in the classroom.
- Pass the attendance sheet around and have it signed in Dark ink.
- Ensure that student materials needed for the class are available for each student.
- Emphasize student participation and remind them of your philosophy on asking and answering questions, if applicable.

ATTENTION STEP

- Give a brief statement or story to get student concentration focused on the lesson subject matter.

LESSON INTRODUCTION

- Give a brief statement that introduces the specific lesson topic. Should be limited to a single statement.

MOTIVATION

- Focus student's attention on the benefits they derive from the training. At Instructor's discretion. The need for motivation in each succeeding lesson must be analyzed by the Instructor and presented as necessary.
- Instructor should include how the STAR process can be used to improve or enhance Operator Performance, if applicable.
- Read and discuss lesson terminal objective and review lesson enabling objectives, if desired.
- If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objective review may have been sufficient.
- REINFORCE the following PVNGS management expectations as opportunities become available:

  Nuclear Safety
  Industrial Safety Practices
  STAR and Self-Checking
  Procedure Compliance
  Communication Standards
  ALARA
  Prevent Events

I. Attention Step.	I. Give a brief statement or story to get students attention focused on the course subject matter.
II. Self Introduction.	II. Introduce yourself and present your back-ground and experience, if applicable. This is the best opportunity to have students introduce themselves, if you use this technique to "open up" the class.
III. Classroom Guidelines	III. Refer to the CLASS GUIDELINES at the front of the handout and in front of this lesson plan. Read them or discuss them as applicable to the particular group in your class.
A. Attendance Sheet	A. Pass the attendance sheet around and have it signed in black ink. If applicable, have students add their mail station numbers to the attendance sheet for use when mailing out course certificates. If needed, now is a good time to fill out a seating chart or individual name cards.
B. Materials	B. Ensure that student materials needed for the class are available for each student. For materials required, refer to the list materials on the cover page. Describe the handout format, if applicable, and stress the importance of taking good notes for future reference, both in the field and for the remainder of the course.
C. Questions and Participation	C. Discuss the importance of participation and your philosophy on asking or answering questions (i.e., do they need to raise their hand, etc.), if applicable.

IV. Course Introduction	IV. Give a brief statement which introduces the course topic. It may be sufficient to point out the title on the board, and should be limited to one simple statement.
V. Motivation	V. Focus student attention on the benefits they will derive from the training. This is a good place to introduce applicable LER's, EER's, etc. which should be located at the end of the lesson plan, and at the end of this section in the handout. You will have an opportunity to read and discuss them in the lesson summary.
VI. Course Pre-summary (Overview)	
A. Given a maintenance task to perform on the Supplemental Protection Logic Assembly, the I&C Technician will test and maintain the Supplemental Protection System. Mastery will be demonstrated by satisfactory completion of the required Job Performance Measures.	A. Read and/or discuss the course terminal objective. Refer to TO00, inside front cover of handout.
B. Course Outline and Sequence: 1.Supplemental Protection Logic Assembly.	B. Review the outline of course topics or lessons, and present a general course schedule or sequence. The outline should be brief, e.g., a list of lesson titles.
C. Assignments and Evaluations	C. Preview the assignments and their due dates, if applicable. Outline the course Job Performance Measures and detail the minimum requirements for passing the LPE's and the course. Describe the type of LPE's which will be administered, including quizzes or oral questioning, if applicable. Explain the importance of LPE's as an evaluation tool and the impact to task qualification.

VII. Lesson Introduction

A. Topic Introduction	A. Give a brief statement which introduces the specific lesson topic(s).
B. Motivation	B. If applicable, relate the specific lesson topic to the students' future and present needs.
C. Lesson Pre-summary (Overview)	
1. Lesson Terminal Objective: Given a maintenance task to perform on the Supplemental Protection Logic Assembly, the I&C Technician will test and maintain the Supplemental Protection System. Mastery will be demonstrated by satisfactory completion of the required Job Performance Measures.	1. Read and discuss the lesson terminal objective, and review the lesson enabling objectives, if applicable. Refer to T000 (inside front cover of H/O).
2. Topic Summary a. Overview of SPS b.Description of equipment c.SPLA Theory of Operation d.Front Panel Controls & Indications e.Routine Maintenance f.Practical exercises (LPE's)	2. If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objective review may have been sufficient.

T.Obj 1.1	**Given a maintenance task, and applicable reference materials on the Supplemental Protection Logic Assembly, the I&C Technician will test and maintain the Supplemental Protection System. Mastery will be demonstrated by achieving a score of at least 80% on a written examination, and successful completion of LPE's.**

EO 1.1.1	**State the purpose of the Supplementary Protection System (SPS)**

1.1.1.1 Main Idea

1) Overview of the Supplementary Protection System (SPS). a) The purpose of the SPS, is to provide separate and diverse reactor trip on High Pressurizer Pressure. This is to help reduce the possibility of an "Anticipated Transient Without Scram" event from occurring.	1. Lecture using Power Point a. Read the objective aloud, display and discuss the Purpose, Function and Design Basis slides. Include the PVNGS Reactivity management program and how maintenance on the SPS could affect this program. TCS 97-1926
b) SPS Interfaces i) Pzr Press Transmitter(s) ii) Remote Pressure Indicator iii) Annunciator iv) Reactor Trip Switchgear v) SPLA Isolation Panels	b. Display the Power Point slide on the SPS interfaces, and give a brief description. Refer to the students to Fig. 1 of the Handout.

EO 1.1.2	Describe the major functions of each block of the SPLA Block Diagram

1.1.2.1 Main Idea

c.	SPLA Block Diagram Description	c. Display the Power Point slide for the SPLA block diagram, refer to Fig. 2 of the Handout, and describe the basic layout of SPLA.
1.	Description of components.	
2.	Functions of SPLA	2. Student Handout page 4.
3.	SPLA inputs and outputs.	3. Display the Power Point slide and describe the SPLA inputs and outputs. Student Handout page 10.
II.	Description of equipment	
A.	Interface Equipment	
1.	Pressurizer Pressure Transmitters (13JRCXPT-199X)	1. Refer to Student Handout
a.	Manufactured by Rosemont (1153GD)	a. Note - PPS uses Barton transmitters.
b.	Located in containment in the NW quadrant on either 100' or 120'	
c.	Range - 1500 psia to 2500 psia for 4 to 20 ma out.	
2.	Remote Pressure Indicator (13RCXPI-199X)	
a.	Manufactured by Sigma (Series 1151)	a. Diverse - Other indicators in the control room are Foxboro 257's.
b.	Located in the control room on panel RMN-B05 (A, B, C or D)	
c.	Analog meter - 1500 to 2500 psia, 1 to 5 vdc input.	
3.	Plant Annunciator System interface	3. Discuss interfaces to the plant annunciator system. Refer to Fig. 3 of the handout.
a.	Alarms:	
1)	SPLA TRIP	
a)	Generated via the SPLA Isolation Panel.	

2) SPLA TEST

a) SPLA TEST comes in from either a SPLA DOOR OPEN or a SPLA TEST ENABLED.

4. Reactor Trip Switchgear

a. Interrupts power to CEDM's causing scram (opens TCB's).

b. Same system used by RPS

c. Four SPLA channels - Each SPLA channel trips its associated reactor trip circuit breaker. Selective 2/4 to trip reactor.

d. Three input signals from SPLA:

1) Undervoltage Trip
2) Shunt Trip
3) TCB Close

e. Two Output signals to SPLA:

1) TCB Open
2) TCB Close

4. Display The Power Point, and describe the interface with the Reactor Trip Switchgear. Refer to Fig. 4 of the handout.

c. Diverse equipment, two breakers are Westinghouse and two are GE. See Fig. 5

d. Discuss SPLA TCB close pushbutton switch sticking. WMs 2459218,2669375,2669366 & 2840180.See handout pg.52

5. SPLA Isolation Panels (Plant Change Package 85-0(1),(2),(3)-SB-054-00)

a. Interrupts power to CEDM's causing scram (opens MG set #1 and #2 output breakers).

b. Four SPLA Isolation Panels - Each panel provides (2) NO contacts; one contact to each MG set output breaker selective 2/4 trip logic.

c. One input from SPLA:

1) NO contact on SPLA TRIP

d. One output to SPLA:

1) NO contact provides SPLA Trip annunciation signal thru SPLA cabinet to RK.

e. Two outputs to MG sets:

1) NO contact to MG set #1 output breaker for the selective 2/4 trip logic.
2) NO contact to MG set #2 output breaker for the selective 2/4 trip logic.

5. Discuss the SPLA Isolation Panel (Diverse trip system).

f. Local indicating lights:

1) Red; SPLA not tripped when lit.
2) Green; SPLA tripped when lit.

5. Plant Change Package 89-0(1),(2),(3)-SB-016-00)

5. Discuss SPLA inputs to the Diverse Auxillary Feedwater Actuation System (DAFAS).

a. Provides contact action from the annunciator circuits of SPLA a Diverse Scram System (DSS).

b. The four SPLA channels feed redundant PLCs in DAFAS-A & DAFAS-B.

2 of 4 DSS channels trip indicate an occurrence of an ATWS requiring Auxillary Feedwater actuation.

B. SPLA Assemblies

1. Four Cabinets - One for each Reactor Trip Circuit Breaker.

Refer to Fig. 6 & 7 of the student handout.

2. Location - 120' Aux Building, near CEDMCS.

3. Front Panel Assembly

3. Refer to Fig. 8 of Handout.

a. Hinge mounted

b. Contains the controls, indications, and test points necessary for operation and testing the SPLA.

4. Back Panel Assembly

4. Refer to Fig. 9 of Handout.

a. Panel bolted to back wall of enclosure.

b. Power supply assembly

c. Input output junction Panel

d. Initiation Relay (output module)

e. Circuit Breaker

f. Input Comparator Board

1) Accepts 4-20 ma signal from the transmitter.
2) Converts I/E.
3) Compares measured signal with fixed setpoint.
4) Generates trip signals.

g. Test board

1) Provides adjustable test signal for comparator.
2) Provides a +10 vdc reference voltage.

h. Annunciator and Indicator board

1) Provides contacts for remote annunciation.
2) Provides TCB position indication.
3) Controls closure of TCB.

i. Terminal Blocks

i. Discuss location and purpose.

EO 1.1.3	**Describe the operation of the following SPLA circuits:** **a. Input comparator module** **b. Output Module** **c. Test Module** **d. Annunciator and indicator module.**

1.1.3.1 Main Idea

III. SPLA Theory of operation	III. Lecture using Power Point, Handouts and the whiteboard. <u>Explain the operation of the following circuits, in as much detail as time allows.</u>
A. <u>Input Comparator Module</u>	A. Using Power Point and referring to Fig. 10 of the student handout, discuss the block diagram of the Input Comparator Module.
1. Purposes a. Determines and initiates a SPLA channel trip. b. Provides a signal for remote pressure indication.	
2. Input Section a. 39 vdc power supply (with isolated output), powers pressure transmitter loop. b. Pressure transmitter loop current develops two 1 to 5 vdc outputs with (2) 250 ohm resistors. 1) One output provides a signal to the comparator section, panel DVM, and test points. 2) One provides signal to remote pressure indicator on B05. c. Voltage signal to comparator section can be raised with test module output, when test is enabled. (Does not affect remote indicator).	1.Using Power Point and referring to Fig.11 of the student handout discuss the Input section.
3. Fault protection for input section a. 700 ohm resistor in current loop limits loop current	2. Using Power Point and referring to Fig. 12 of the student handout, Explain the operation of the Fault Protection for the input section.

b. Diode in current loop blocks reverse polarity faults.

c. Two zener diodes, (one across each 250 ohm resistor), limits voltage drop across resistor to 15 vdc.

d. Voltage to remote indicator fused with 1/32 amp fuse. Will not affect the input to comparator section if blown.

a. Explain the operation of the test signal section.

4. Setpoint Section

a. Provides a setpoint voltage to the comparator section and DVM.

b. Provides a +5 vdc reference used for setpoint and input comparator.

c. +5 vdc reference voltage supplies two voltage divider networks in the setpoint section

1) Setpoint. Range Voltage Divider - Provides five discrete voltage values. A voltage is selected by the setpoint range selection switch and sent to non-inverting input of U2.

2) Setpoint adjust voltage divider - Provides 0-5 vdc through ten turn pot on front panel and is sent to inverting input of U2.

d. The output of U2 = (Setpoint Range Voltage) - (Setpoint Adjust Voltage)

e. Output of U2 is sent to the comparator section and the Front Panel DVM.

3. Using Power Point and referring to Fig.13 of the student handout, explain the operation of the Setpoint section.

c. Point out TP-1, (R-22)

5. Comparator Section

a. Compares Process Voltage to Setpoint Voltage to determine Trip.

b. Setpoint voltage is fed thru filter network to non-inverting input of U1.

c. Process voltage is fed thru filter network to inverting input of U1.

d. R9 adjusts for minor component variations.

e. Output -

4. Using Power Point and referring to Fig. 14 of the student handout, explain the operation of the Comparator Section.

1) P.V. > SP V. = +15 vdc
2) SP V > P.V. = -15 vdc

6. Time Delay Section

   a. Output Comparator is sent to FET Q1, Tripped=-15 vdc, Untripped = +15 vdc.

   b. FET acts as a switch.

   c. When Untripped, FET allows Current from the +5 vdc reference thru R13 & R14 to ground - which keeps C3 discharged.

      1) This keeps the inverting input to U3 at 0 vdc.

   d. When the comparator trips, the -15 vdc output causes the FET to cut off current Flow. This causes C3 to charge up at the C3 * R14 time constant. This voltage is applied to the inverting input of U3.

   e. The Non inverting input of U3 has a constant voltage applied to it from the +5 vdc reference thru Pot R16.

   f. As long as the inverting input is < the non-inverting input, output= +15 vdc.

   g. On a trip condition, the inverting input rises to 5 vdc at an exponential rate. When this voltage exceeds the non-inverting input voltage, U3 output goes to -15 vdc.

   h. The value of voltage on the non-inverting input of U3 determines the time delay of the circuit, usually set for 100 msec.

   i. If a trip occurs < 100 msec, the output of U3 will not change.

   j. Output of U3 is sent to the output section.

5. Using Power Point and referring to Fig. 15 of the student handout, explain the operation of the Time Delay Section.

7. Output Section

   a. Purpose -

      1) Sends a trip to the output module when a trip is received from the time delay section.

      2) Provides the circuitry to indicate a trip condition on the front panel.

6. Using Power Point and referring to Fig. 16 of the student handout, explain the operation of the Output Section.

b. Input from time delay section
   1) +15 vdc = Non-trip
   2) -15 vdc = Trip

c. When trip is present, Q2 conducts, allowing current flow thru DS 100, which lights the LED to indicate a SPLA trip.

d. With no trip, Q2 is cutoff and the LED is off.

e. With No Trip, +15 vdc is applied to gate of FET Q3, which allows current flow thru the output module.

f. CR7 protects Q3 during trip from inductive surge when the relay in the output module de-energizes.

B. Output Module

B. Using Power Point and referring to Fig.17 of the student handout, explain the operation and purpose of the output module.

1. Initiates a trip signal to the Reactor Trip Switchgear.

2. Provides a trip signal to the SPLA Isolation Panel.

3. Consists of initiation relay with four sets of contacts. (3 are used)

   a. One set of N.C. contacts controls the TCB Shunt Trip Coil.

   b. One Set of N.O. contacts controls the TCB Undervoltage Trip coil.

   c. A second set of N.O. contacts is sent to the SPLA Isolation Panel.

4. Movistors are across each set of contacts to provide surge protection.

5. During non-trip conditions, current flow from the output section keeps the relay energized.

6. When a trip occurs, the relay coil de-energizes, drops out the contacts and a trip occurs.

C. Plant Change Packages 85-0(1),(2),(3)-SB-054-00

C. Plant Change Packages 85-

1. SPLA Isolation Panels

1. Discuss this modification.

   a. Purpose - Provides for 1E electrical isolation between SPLA and the MG set output breakers and provides diverse selected 2/4 trip logic to the CEDM MG sets #1 and #2

output breakers on a SPLA trip.

1) Input:

a)Receives NO contact from SPLA Output Module for SPLA trip (old RK contact).

2) Outputs:

a)(1) NO contact from the 1E isolation relay for each MG set output breaker (for the selected 2/4 logic schemes).

b)(1) NO contact from annunciation relay for SPLA TRIP (sent to RK thru SPLA cabinet).

3) Local Indications:

a)Red Light (lit if SPLA not tripped).

b)Green Light (lit if SPLA tripped)

D. Test Module

D. Using Power Point and referring to Fig. 18 of the student handout, explain the operation and purpose of the Test Module.

1. Functions:

a. Provides an adjustable test signal for the input of the comparator module.

b. Provides a +10 vdc reference

2. Test Signal Section

2. Using PowerPoint and referring to Fig.19, explain the operation of the Test Signal Section.

a. U2 op amp used in differential configurations:

1) Inverting input fed from test signal adj. pot which provides -15 vdc to +15 vdc.

2) Non-inverting input fed from the test signal range which provides five discrete voltages between +1.109 and 10 vdc

b. Q1 is used as a voltage follower to boost op amp current capability.

1) Q1 output is fed thru CR1 and test enable switch to input comparator module.

2) CR1 prevents Q1 output from lowering actual process input to input module which could prevent an actual trip.

3) Test enable switch is key operated and causes an alarm in the control room when placed in enable.

3. Voltage Reference Section

a. Consists of U1, 10 volt power supply and Pot R1.

b. Supplies test signal section, DVM, and 10 vdc reference test points on front panel.

3. Using Power Point and Fig.20, explain the operation of the Voltage Reference Section.

E. Annunciator & Indicator Module

1. Functions:

a. Provides contact signals for remote annunciation.

b. Provides indication of trip circuit breaker status.

c. Controls closure of trip circuit breaker.

E. Using Power Point and referring to Fig. 22 of the student handout, describe the basic operation and purpose of the Annunciator & Indicator Module.

2. Annunciator Section

a. Four identical circuits, only 2 are used; SPLA Test and SPLA Door Open.

b. Powered from +24 vdc through fault protection components FU-1 and CR1.

c. Input can be either switch or logic level. Currently only switch inputs are used.

d. During normal conditions, the switch is closed which places a voltage on the base of Q2, which turns on Q2. This turns on Q1 and energizes the relay.

e. For an alarm condition, the switch opens which cuts off Q2 and Q1, and de-energizes the relay.

f. The relay has two sets of form C contacts, with movistors across each set.

g. The annunciator wires are landed to one set of contacts in the N.O. configuration.

2. Using Power Point and referring to Fig.23 of the student handout, explain the operation of the Annunciator Section.

3. Indicator Section

a. Two identical circuits; one for the trip circuit breaker open indication, one of the closed indication.

3. Using Power Point and Fig. 24 of the student handout explain the operation of the Indicator Section.

b. Indicator is LED mounted on front panel.

c. Power for LED is +5 vdc, routed thru a 2 pole RC filter for high frequency filtering and to limit LED current.

d. Aux contacts in the TCB control current flow thru the circuit.

4. Trip Circuit Breaker Closing Switch

a. Momentary contact, N.O. Switch located on the front panel.

b. Connected to TCB close circuit.

c. Will close TCB only if SPLA and RPS are not Tripped.

EO 1.1.4	Describe the function of each SPLA front panel control and indicator.

1.1.4.1 Main Idea

IV. Front Panel Controls & Indicators

A. Test Enable

1. Located on the top - left side of the Front panel Assy.

2. Key operated Switch.

3. Allows the test signal to be sent to the input section.

B. Digital Voltmeter

1. Displays calibration and SPLA circuit values necessary for testing.

a. Mounted on front panel.

b. 4 1/2 digit display.

c. Powered by 5 vdc accessory supply.

d. Input selected by input selector switch on front panel.

1) Cal "0V" - Connects DVM to ground.

2) Process/test - measures process voltage input to input comparator and test voltage if test is enabled and test voltage is > process voltage.

3) External input from jacks on front panel.

4) Setpoint adjusts setpoint voltage from setpoint section of input comparator module.

5) Cal "10 V" connects DVM to +10 vdc reference.

e. 0 and 10 vdc adjustments are located on the bottom right and left of the DVM. Accessible from the front panel.

IV. Using Power Point and referring to fig. 8 of the student handout, lecture on the location and purpose of the SPLA front panel controls and indications.

C. DVM Input Select Switch

1. Located in the center.

2. Five Position Rotary Switch.

   a. Cal 10 V
   b. Setpoint Adjust
   c. External Input (w/ jacks)
   d. Process / Test
   e. Cal 0 V

Using the Power Point slide and referring to Fig. 21 of the handout discuss the SPLA DVM.

D. TCB Group

1. Located on the Top - Right side of the Front Panel Assy.

2. TCB Switch

3. SPLA Trip Indicator (green)

4. TCB Open & Closed Indicators

E. Setpoint Adjustment

1. Located in the Center - Left of the Front Panel Assy.

2. Selector Switch and 10 turn Vernier Pot.

3. Switch selects 1 of 5 voltage ranges

4. Vernier adjusts setpoint over the 1 volt range selected by the switch

F. Test Adjust

1. Located on the Center - Right of the Front Panel Assy.
2. The Configuration & Operation is the same as the setpoint adjustment.

G. Power Supply Status

1. AC power supply status
2. 39 vdc transmitter power lights and test points.
3. +/- 15 vdc input comparator power lights & test points
4. 24 vdc relay lights & TP's
5. 5 vdc Accessory lights & TP's
6. +/- 15 vdc test unit lights & TP's

H. Test Point Group

1. Located on the Bottom
2. 10 vdc Reference from test module
3. TP1 5 vdc Reference from Setpoint section.
4. TP2 delay input from time delay
5. TP3 delay output from output section

V. Routine Maintenance

V. Read the objective. Describe the routine maintenance performed on the SPLA.

A. Precautions

1. SPS is a safety system, so operation, maintenance and testing in controlled by Tech Specs.

2. <u>As most maintenance activities will cause the associated reactor trip breaker to open, ensure no other breaker is open, or no other activities on ANYTHING ELSE will cause another TCB to open.</u>

3. Prior to calibration, the SPLA should be turned on, and be in an untripped condition for 30 minutes with the door closed.

B. Adjustments
1.Power supply
2.Test Module
3. Input comparator

B. See pg.61of handout
1. See Fig. 25
2. See Fig. 26
3, See Fig. 26

C. 36ST-9SB13 "SPLA Functional test procedure"

C. Describe the Monthly Functional test procedure.

1. Performed Monthly

2. General Sequence:

2. Describe the General test Sequence.

a. Open Door & Check Annunciation

b. Check & adjust DVM 0 & 10V, and the 10 vdc reference.

c. Depress the door switch & verify alarm when enabling test.

d. Using SPLA test device, check trip Setpoint.

e. Verify Indications, alarms and TCB Open position.

f. Adjust trip setpoint if required.

g. Adjust test device until trip clears, close TCB

h. Verify alarms, indications, and TCB Close.

i. Disable Test & Remove Key.

j. Close & Lock Door, Verify alarm clears.

D. 36ST-9SB14 "SPS Channel Calibration"

1. Performed every 18 Months

2. General Sequence:

2. Describe the General test Sequence.

   a. Check power supply status lamps and voltages.

   b. Check & adjust DVM 5 & 10 vdc reference supplies.

   c. Check & adjust DVM 0 & 10 vdc readings.

   d. Using a Frequency counter, check & adjust time delay circuit for 100 msec.

      1) Use delay input (TP2) and Delay Output (TP3).

      2) Insert trip by using the test enable switch with test input adjusted to 5 vdc.

   e. Perform transmitter calibration.

   f. Perform loop A.F. by using transmation at SPLA. Adjusted to SPLA transmitter A.F. current values.

   g. Perform calibration of B05 indicator.

   h. Perform loop A.L. with transmation at SPLA. Adjusted to Transmitter A.L. current values. Restore loop.

E. 36ST-9SB15 "SPS RESPONSE TIME TEST"

E. Describe the General test Sequence.

1. Performed on one channel every 18 months.

2. General Sequence:

   a. Set up time response set at SPS transmitter.

      1) Time response test set consist of a variable pressure source with a fast responding transmitter.

      2) Pressure source connected to SPS transmitter.

      3) Fast response transmitter connected to visicorder located at TCB via loop field leads from a second SPS.

      4) Adjust pressure source to provide a

pressure from 2260 psig to 2895 psig, at a rate of 100 psi/sec.

5) Adjust transmitter output to produce proper recorder trace.

6) Place pressure at trip setpoint and note trace position on recorder.

b. Set up second trace on recorder with auxiliary contacts on TCB and power supply to monitor TCB position.

c. Place initial pressure (2260 psig) on SPS transmitter and close TCB.

d. Ramp Pressure to 2895 psig at 100 psi/sec.

e. Time response is interval between pressure reaching trip setpoint and the TCB opening. Required to be = or < 1.15 sec.

f. Remove test equipment and restore.

F. SPLA Cleaning

Reference Tech Manual

G. Troubleshooting

G. Exercises to take place in the laboratory segment of course.

EO 1.1.5	Describe the use of Prevent Event Tools and Electrical Safe work Practices to minimize Human Performance errors during testing or maintenance of the SPLA.

1.1.5.1 Main Idea

PREVENT EVENT TOOLS:

Utilizing the Whiteboard present the class with the question of listing the tools.

We have at our disposal an arsenal of prevent events tools to help prevent errors while we are working on equipment especially energized equipment.

The following is a list of these tools:

Discuss each tool and how it can be applied to working on SPLA.

1. Focus on Five
   a. What are the critical steps of the task I am about to perform?
      What document describes it? Do I understand it?
   b. What is the worst thing that can happen and how can I prevent it?
   c. What else can go wrong?
   d. What are the Safety and / or radiological considerations?
   e. Is my training and are my qualifications up to date?

2. The Pre Job brief
3. The 2 Minute drill
4. Self checking
5. Peer checking
6. Independent verification
7. Concurrent verification
8. Flagging
9. 3 Way Communications
10. Use of the Phonetic alphabet
11. Procedure use and adherence
12. Place keeping
13. A questioning attitude
14. Stopping when you are unsure
15. Providing or holding turnovers
16. A Post Job review

When working on equipment it is expected that we work on the correct component.

By having a Pre Job Brief prior to commencing work we can ensure That we understand our job, and that each member of the job understands there roles and responsibilities in the job, and the possible problems or lessons learned are highlighted. By conducting a Pre Job Brief we can minimize the potential for mistakes.

Verifying what Unit we are in and the Equipment ID is essential to Completing the Job properly and safely.

ELECTRICAL SAFTEY IN CABINETS

The SPLA cabinet has numerous operating voltages that are below 50 volts, the electrical safe work practices procedure frequently will not apply, as it specifically states that work on these voltages are not in the scope of the procedure.

Input power is 120VAC. In every case these potentials should be covered by non-conductive protective covers. When working with these higher voltages, the Electrical Safe Work Practices apply.

When working with low voltages in SPLA, general electrical safe work practices apply:

Remove rings, watches, bracelets, buckles, keys, etc, and any dangling objects or jewelry that may come in contact with or interfere with the work.

If an item can not be removed, it is to be rendered non-conductive.

Tools and other items should not protrude from your pockets.

If your ID Badge lanyard contains exposed metal rings, clips or other parts, restrain them or render non-conductive, to avoid contact with exposed energized sources.

Do not intentionally make 'bare hand' contact with energized components

Use electrically safe tools / gloves rated for the Job.

Another important consideration in the any cabinet, especially when lifting leads is to not allow leads to come in contact with the cabinet, to be grounded or to affect other signals. In any process instrument cabinet there are many signals that must remain isolated from each other. Bad lead control could not only affect the loop you are working, but other loops as well

Have the class list the various Voltages in SPLA and discuss The precautions involved working With these voltages.

The following Voltages are present in SPLA:
a. 120 Vac +/- 10% single phase ungrounded.
b. 4-20 ma process current.
c. + 5 Vdc
d. +/- 15 Vdc
e. + 24 Vdc
f. + 39 vdc +/_ 2 Vdc @ 100ma.

EO 1.1.6	**Given a Corrective Maintenance Work Order describing a SPLA fault, and using applicable SPLA prints, Tech Manuals, and PVNGS work control procedures the I & C Technician will determine the nature of the fault.**

1.1.6.1 Main Idea

		***** LABORATORY PRACTICAL ******	***** LABORATORY PRACTICAL**
I.	Introduction.		I. Give a brief statement which introduces the specific lesson topic. Use this time to transition from classroom to LPEs'.
II.	Presentation.		
	A.	Laboratory and Practical Training Safety Policies and Procedures.	A. Discuss safety items pertaining to this particular LPE. If applicable, show films, slides or demonstrate safety within the setting.
	B.	Laboratory and Practical Training Procedures.	B. Explain and discuss procedures related to use of tools, equipment, and materials. If applicable, show films, slides or demonstrate use.
	C.	Applications and Principles.	C. Reiterate relevant principles that will be applied during performance of the LPE. Use a questioning strategy to assess student's readiness to perform the exercise. Provide additional assistance as required to the students prior to performance of the LPE.
	D.	Techniques and Procedures.	D. Demonstrate the techniques and procedures associated with the LPE. Ensure students can monitor the demonstration from a proper vantage point. Divide the class into manageable groups and perform the demonstration as many times as needed. During the LPE demonstration, emphasize all precautions and limitations.

	Explain what to do when precautions and limitations are encountered.
III. PRACTICE	III. Distribute the LPE to students.
A. LPE performance.	
1. Assign students as required to perform the following LPE's.	1. Ensure each student has proper LPE, instruction sheet, tools, equipment, and materials.
a. NID14-L-001-07 b. NID14-L-002-07	Supervise student performance to ensure safe, correct performance.
	Provide assistance as needed to enable student mastery of objectives.
IV. Conclusion.	
A. Summary of Main Principles	1. Review the lesson objectives(inside front cover of H/O).
1. Objectives Review	
2. Topic Review.	2. Restate or review the main principles or ideas covered in the lesson. Relate key points to the objectives.
B. Questions and answers	1. Ask questions which implement the objectives. Discuss students' answers as needed to ensure the objectives are being met.
1. Oral questioning.	
C. Problem areas.	C. Review any problem areas discovered during the oral questioning, quizzes, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).
I. Performance Evaluation.	I. Use performance tests (LPE's) to evaluate mastery of the objectives.
A. Lab Practical Evaluation.	A. If the output of the exercise was a product, then evaluate the product. If the exercise was a process, then evaluate as student performs.
	B.

II. Feedback.	II. After testing, record results and provide feedback to students.

SUMMARY OF MAIN PRINCIPLES

The following items are things to consider in your lesson summary. They are not mandatory. You should develop your own summary.

Objectives Review

Review the Lesson Objectives

Topic Review

Restate the main principles or ideas covered in the lesson. Relate key points to the objectives. Use a question and answer session with the objectives.

Questions and Answers

Oral questioning

Ask questions that implement the objectives. Discuss students' answers as needed to ensure the objectives are being met.

Problem Areas

Review any problem areas discovered during the oral questioning, quiz, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).

Concluding Statement

If not done in the previous step, review the motivational points that apply this lesson to students needs. If applicable, end with a statement leading to the next lesson.

You may also use this opportunity to address an impending exam or practical exercise.

Should be used as a transitional function to tie the relationship of this lesson to the next lesson. Should provide a note of finality.