

REFERENCES:

EE-3A	0007.222-001-010 (807E160TY SH6)
EE-3AG	0007.222-001-020 (15-484-0263-3)
EE-3AX	0007.222-001-021 (15-577-0729-3)
EE-3DU	0007.227-001-012 (944E995 SH11)
EE-3SD	0007.511-414-473 (3088-E1-1)
EE-3WA	0007.511-414-477 (3088-E5-1)
EE-11FG	0007.520-001-348 (793E765 SH9)
ESK-10XS05	0007.520-001-355 (793E765 SH16)
FSK-6-1A	0007.520-001-394 (793E769 SH2)
PID-6A	0007.520-001-395 (793E769 SH3)
PID-6B	0007.520-001-396 (793E769 SH4)
PGCC 7.520-5008	0007.520-001-397 (793E769 SH5)
PGCC 7.520-5022	0007.520-001-398 (793E769 SH6)
0007.159-451-315 (PW-25-1)	0007.520-001-399 (793E769 SH7)
0007.159-451-712 (CD-25-103)	0007.520-001-400 (793E769 SH8)
0007.222-001-002 (732E120AF SH1)	0007.520-001-401 (793E769 SH9)
0007.222-001-003 (807E160TY SH1)	0007.520-001-408 (793E771 SH2)
0007.222-001-004 (807E160TY SH2)	0007.520-001-410 (793E771 SH4)
0007.222-001-005 (807E160TY SH3)	
0007.222-001-007 (807E160TY SH5)	

NOTES:

1. PLANT IMPACT: LOSS OF CONTROL OF LV10C WHICH WILL CAUSE REACTOR WATER LEVEL TRANSIENTS.

2. ALL INSTRUMENTS AND EQUIPMENT NUMBERS ARE TO BE PREFIXED WITH '2FWS' EXCEPT WHERE A DIFFERENT PREFIX IS SHOWN.

3. LOOP ACTION: FXY1010C (C33-K625C TERM 5), RECEIVES A DYNAMICALLY COMPENSATED TOTAL FEEDWATER CONTROL SIGNAL FROM LC1633 (C33-K633) (SEE TL2FWS-087).

FXY1010C (C33-K625C TERM 9) PROVIDES A DYNAMICALLY COMPENSATED VALVE 'C' CONTROL SIGNAL TO:  
A) HC1010C (C33-R601C TERM 5) FOR INPUT INDICATION.  
B) HC1010C (C33-R601C TERM 12) VIA DL1010C (C33-K637C TERM 1) FOR OUTPUT INDICATION.  
C) MOD-100 (TERM 7) (LV10C CONTROLLER) VIA MV/11639C (C33-K639C TERMS 6 AND 7), VOLTAGE DIVIDER C33A-R15C, LIM-1661C (C33-K661C) AND DL1010C (C33-K637C TERM 8) TO MODULATE LV10C.  
D) DL1010C (C33-K637C TERM 11) FOR TRACKING ITSELF.

THIS OCCURS WHEN:

- A) HC1010C (C33-R601C) IS IN THE 'AUTO MODE'.
- B) THE CAVITATION INTERLOCK FLOW LIMITER LOGIC IS NOT ACTUATED.
- C) THE VALVE 'C' CONTROL SIGNAL FAILURE LOGIC IS NOT ACTUATED.
- D) THE RRCS FEEDWATER RUN BACK LOGIC IS NOT ACTUATED.

THE VALVE 'C' CONTROL SIGNAL IS LIMITED BY HIGH LIMITER LIM1640C WHEN THE CAVITATION INTERLOCK FLOW LIMITER LOGIC IS INITIATED.

HC1010C (C33-R601C) PROVIDES AN ADJUSTABLE BIAS SIGNAL (TERM 7) WHICH IS INTEGRATED WITH THE VALVE 'C' CONTROL SIGNAL AT DL1010C (C33-K637C).

THE VALVE 'C' CONTROL SIGNAL IS MANUALLY CONTROLLED AT HC1010C (C33-R601C) (TERMS 8, 9, AND 10) VIA HC1010C (C33-K638C) (TERMS 5, 6, AND 12), AND FXY1010C (C33-K638C) WHEN HC1010C (C33-R601C) IS IN THE 'MANUAL MODE'.

HC1010C (C33-K638C), AND DL1010C (C33-K637C) PROVIDE FOR A BUMPLESS TRANSFER BETWEEN 'AUTO AND MANUAL MODES'.

THE VALVE 'C' CONTROL CIRCUIT IS AUTOMATICALLY TRANSFERRED TO MANUAL, AND LV10C DRIVEN CLOSED VIA FXY1010C (C33-K638C), DL1010C (C33-K637C), AND HC1010C (C33-K638C) WHEN THE RRCS FEEDWATER RUN BACK LOGIC IS INITIATED (RELAYS C33-K24, C33A-K28, AND C33-K31C).

THE RVDT MONITORS LV10C POSITION, AND VIA THE RVDT AMPLIFIER, ISOLATOR I2, AND 1/E10C PROVIDES POSITION SIGNALS TO Z110C AND THE TRANSIENT ANALYSIS RECORDING SYSTEM.

THE VALVE 'C' CONTROL IS LIMITED BY LOW LIMITER LIM1661C (C33-K661C) (OUTPUT TERM. 9 AND INPUT TERM. 5).

ISOLATOR I3 RECEIVES A 4 TO 20mA SIGNAL (POSITION COMMAND SIGNAL) FROM MV/11639C (C33-K639C) VIA CABLE NNX009, AND IF SWITCH S4 IS IN THE 'REMOTE' POSITION, PROVIDES AN INPUT TO POSITION COMMAND METER M2 AND TERMINAL 7 OF THE MOD-100. THE MOD-100 COMPARES THIS SIGNAL TO THE POSITION FEEDBACK SIGNAL AT TERMINAL J FROM THE RVDT AND RVDT AMPLIFIER VIA THE POSITION FEEDBACK METER M3. THE MOD-100 SENDS DIRECTION AND SPEED SIGNALS VIA ISOLATOR I1, WHICH CONVERTS THE 4 TO 20mA SIGNAL TO A 0 TO 10V SIGNAL, TO THE VARIABLE FREQUENCY CONTROLLER AND THE FREQUENCY COMMAND METER M1. IF SWITCH S1 IS IN THE 'AUTO' POSITION, THE VARIABLE FREQUENCY CONTROLLER PROVIDES AN OUTPUT PROPORTIONAL TO THE INPUT FREQUENCY COMMAND SIGNAL AND THE RESULTING OUTPUT VOLTAGE IS CHANGED SO THAT THE VOLTAGE AND FREQUENCY FOLLOW THE V/Hz CURVE SET UP IN THE CONTROLLER'S SOFTWARE.

DURING LOCAL OPERATION, THE INPUT IS VIA JACKS J1 AND J2. VALVE SPEED CAN ALSO BE CONTROLLED IN MANUAL OPERATION BY R10, SPEED CONTROL POTENTIOMETER.

4. CONTACT CLOSURE (C33A-K21 DE-ENERGIZED) WHEN RRCS FEEDWATER RUN BACK LOGIC IS NOT INITIATED TO ENABLE THE AUTOMATIC CONTROL SIGNAL FROM HC1010C (C33-R601C) TO BE PROVIDED TO FXY1010C (C33-K638C), HC1010C (C33-K638C), AND DL1010C (C33-K637C).

5. CONTACT OPENS (C33A-K28 ENERGIZED) WHEN RRCS FEEDWATER RUN BACK LOGIC HAS BEEN INITIATED FOR A MINIMUM PERIOD OF TIME TO TRANSFER FXY1010C (C33-K638C) TO MANUAL MODE.

6. (C33A-K24) ENERGIZES WHEN RRCS FEEDWATER RUN BACK LOGIC HAS BEEN INITIATED FOR A MINIMUM PERIOD OF TIME TO:  
A) OPEN CONTACT M2, R2 TO DISABLE MANUAL OPEN SIGNAL FROM HC1010C (C33-R601C) TO HC1010C (C33-K638C) TO PREVENT MANUALLY OPENING LV10C.  
B) CLOSE CONTACT M1, T1 TO DECREASE HC1010C (C33-K638C) OUTPUT TO CLOSE LV10C.

7. FEEDWATER CONTROL SIGNAL FROM LC1633 (SEE TL2FWS-087 FOR LOOP CONTINUATION).

8. CONTACTS T2, M2 CLOSE AND M2, R2 OPEN (C33A-K31C ENERGIZED) WHEN FEEDWATER PUMP 'C' SUCTION PRESSURE IS LOW AND THE TURBINE IS TRIPPED TO INITIATE THE CAVITATION INTERLOCK FLOW LIMITER LOGIC. (SEE TL2CNM-101).

9. 120VAC FROM 2VBS-PNLB101 CKT. #15.

10. 460VAC FROM 2NHS-MCC003 CUB. 14A VIA TRANSFORMER XD10C.

11. VENDOR IDENTIFICATIONS ARE SHOWN IN PARENTHESIS.

12. MOD-100, TERMINAL 5 IS THE 'CLOSE' ENABLE OUTPUT WHICH ENERGIZES RELAY CRC IF SWITCH S1 IS IN THE 'AUTO' POSITION, AND EITHER LIMIT SWITCH 1 OR TORQUE SWITCH 17 IS CLOSED. THE CRC RELAY ENABLES VALVE MOVEMENT VIA THE VARIABLE FREQUENCY CONTROLLER.

13. MOD-100, TERMINAL F, IS THE 'OPEN' ENABLE OUTPUT WHICH ENERGIZES RELAY CRO IF SWITCH S1 IS IN THE 'AUTO' POSITION, AND EITHER LIMIT SWITCH 5 OR TORQUE SWITCH 18 IS CLOSED. THE CRO RELAY ENABLES VALVE MOVEMENT VIA THE VARIABLE FREQUENCY CONTROLLER.

14. MOD-100, TERMINAL 6, IS THE LOSS OF SIGNAL OUTPUT WHICH DE-ENERGIZES RELAY LOS. UPON LOSS OF SIGNAL THE MOD-100 'LOCKS-UP' AND THE VARIABLE FREQUENCY CONTROLLER ALSO 'LOCKS-UP' HOLDING THE VALVE IN THE PRESENT POSITION. ANNUNCIATOR 603142 AND AN AMBER LIGHT ARE ENERGIZED IN THE MAIN CONTROL ROOM TO ALARM THAT THERE IS A 'FEEDWATER SYSTEM CONTROL SIGNAL FAILURE.'

15. MOD-100, TERMINAL E, IS THE 'TRIP' OUTPUT WHICH DE-ENERGIZES RELAY TRIP-B WHEN THE MOD-100 SENSES THAT THE COMMAND AND FEEDBACK SIGNAL IS OUT OF THE DEAD BAND FOR LONGER THAN 5 SECONDS. THE 5 SECONDS IS SOFTWARE CONTROLLED. TIME DELAY RELAY 'TD' IS DE-ENERGIZED AND IF THE SIGNAL IS OUT OF NULL LONGER THAN 45 SECONDS ANNUNCIATOR 603143 'FD WTR CONT V 10A/10B/10C ACTUATOR TROUBLE' WILL ALARM.

16. ACTUATOR MOTOR THERMAL OVERLOAD. VALVE 'LOCKS-UP' WHEN CONTACT OPENS.

17. CONTACT CLOSED WHEN VALVE IS CLOSED, TO BYPASS THE 'TD' CONTACTS, WHEN THE COMMAND AND FEEDBACK SIGNAL ARE OUT OF NULL.

18. SWITCH S1 SHOWN IN AUTO.

19. SWITCH S4 SHOWN IN REMOTE.

SI APERTURE CARD

PLANT USE ONLY - PRINT APPROVAL		
DATE	DATE	DATE
I&C	SSS	CSO

NUCLEAR NON-SAFETY RELATED

NIAGARA MOHAWK NINE MILE POINT NUCLEAR STATION - UNIT 2 SCRIBA, N.Y.

TEST LOOP DIAGRAM MAIN FEEDWATER CONTROL VALVE 2FWS-LV10C

1	3-13-91	CEM	IM	ORIGINAL ISSUE	CK	APP	NONE	TL2FWS-087	REV. 4
MK	DATE	BY	MF	DESCRIPTION	CK	APP	SCALE	REV.	REV.

INFORMATION ONLY

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