

CHAPTER 7— INSTRUMENTATION AND CONTROLS LIST OF FIGURES

Figure 7.1-1	Chapter 7 Symbol Legend	7.1-190
Figure 7.1-2	Distributed Control System Functional Architecture	7.1-206
Figure 7.1-3	Safety Information and Control System Architecture (QDS Portion)	7.1-207
Figure 7.1-4	Deleted.....	7.1-208
Figure 7.1-5	Deleted.....	7.1-208
Figure 7.1-6	Protection System Architecture.....	7.1-209
Figure 7.1-7	Safety Automation System Architecture	7.1-210
Figure 7.1-8	Priority and Actuator Control System Architecture.....	7.1-211
Figure 7.1-9	Deleted.....	7.1-211
Figure 7.1-10	Reactor Control, Surveillance, and Limitation System Architecture.....	7.1-212
Figure 7.1-11	Process Automation System Architecture (Nuclear Island)	7.1-213
Figure 7.1-12	Process Automation System Architecture (Turbine Island and Balance of Plant)	7.1-214
Figure 7.1-13	Diverse Actuation System Architecture.....	7.1-215
Figure 7.1-14	Measuring Ranges of Excore Instrumentation.....	7.1-216
Figure 7.1-15	Excore Instrument Detector Locations.....	7.1-217
Figure 7.1-16	Boron Concentration Measurement System Arrangement	7.1-218
Figure 7.1-17	Deleted.....	7.1-219
Figure 7.1-18	Deleted.....	7.1-219
Figure 7.1-19	Implementation of Independence Between Redundant Divisions.....	7.1-220
Figure 7.1-20	Implementation of Independence Between Safety and Non- Safety I&C.....	7.1-221
Figure 7.1-21	PACS Priority Module Logic Diagram	7.1-222
Figure 7.1-22	Distributed Control System Physical Architecture.....	7.1-224
Figure 7.1-23	Signal Conditioning and Distribution System Architecture.....	7.1-225
Figure 7.1-24	Self Powered Neutron Detector Functional Arrangement.....	7.1-226

Figure 7.1-25	Rod Position Measurement System Arrangement.....	7.1-227
Figure 7.1-26	Control Rod Drive Control System Arrangement.....	7.1-228
Figure 7.1-27	Turbine Trip Logic within Turbine Generator I&C	7.1-229
Figure 7.1-28	Definition and Allocation of Response Times	7.1-230
Figure 7.1-29	SAS Switchover Configuration.....	7.1-231
Figure 7.1-30	Operational I&C Disable Switch Configuration	7.1-232
Figure 7.2-1	Typical RT Actuation.....	7.2-34
Figure 7.2-2	Deleted.....	7.2-34
Figure 7.2-3	Manual RT	7.2-35
Figure 7.2-4	Safety Related RT Devices.....	7.2-36
Figure 7.2-5	Rod Drop Detection	7.2-37
Figure 7.2-6	Low DNBR	7.2-38
Figure 7.2-7	High Linear Power Density	7.2-39
Figure 7.2-8	High Neutron Flux Rate of Change.....	7.2-40
Figure 7.2-9	High Core Power Level & Low Saturation Margin.....	7.2-41
Figure 7.2-10	Low RCS Flow Rate.....	7.2-42
Figure 7.2-11	Low - Low RCS Flow Rate.....	7.2-43
Figure 7.2-12	Low RCP Speed	7.2-44
Figure 7.2-13	High Neutron Flux.....	7.2-45
Figure 7.2-14	Low Doubling Time	7.2-46
Figure 7.2-15	Low Pressurizer Pressure & High Pressurizer Pressure	7.2-47
Figure 7.2-16	High Pressurizer Level.....	7.2-48
Figure 7.2-17	Low Hot Leg Pressure	7.2-49
Figure 7.2-18	SG Pressure Drop.....	7.2-50
Figure 7.2-19	Low SG Pressure.....	7.2-51
Figure 7.2-20	High SG Pressure	7.2-52
Figure 7.2-21	Low SG Level.....	7.2-53
Figure 7.2-22	High SG Level.....	7.2-54
Figure 7.2-23	High Containment Pressure.....	7.2-55
Figure 7.2-24	RT Signal Generation	7.2-56
Figure 7.2-25	P2 Permissive Logic	7.2-57
Figure 7.2-26	P3 Permissive Logic	7.2-58

Figure 7.2-27	P5 Permissive Logic	7.2-59
Figure 7.2-28	P6 Permissive Logic	7.2-60
Figure 7.2-29	Deleted.....	7.2-60
Figure 7.2-30	P8 Permissive Logic	7.2-61
Figure 7.2-31	P12 Permissive Logic	7.2-62
Figure 7.2-32	P13 Permissive Logic	7.2-63
Figure 7.2-33	P14 Permissive Logic	7.2-64
Figure 7.2-34	P15 and P7 Permissive Logic	7.2-65
Figure 7.2-35	P16 Permissive Logic	7.2-66
Figure 7.2-36	P17 Permissive Logic	7.2-67
Figure 7.2-37	P18 Permissive Logic	7.2-68
Figure 7.3-1	ESF Actuation	7.3-58
Figure 7.3-2	SIS Actuation	7.3-63
Figure 7.3-3	EFWS Actuation.....	7.3-64
Figure 7.3-4	EFWS SG Level Control and Pump Flow Protection	7.3-65
Figure 7.3-5	EFWS Isolation	7.3-66
Figure 7.3-6	EFWS Actuators (Div. 1&2)	7.3-67
Figure 7.3-7	EFWS Actuators (Div. 3&4)	7.3-68
Figure 7.3-8	Partial Cooldown Actuation.....	7.3-69
Figure 7.3-9	MSRT Setpoint Formation	7.3-70
Figure 7.3-10	MSRIV Opening (Div. 1&2).....	7.3-71
Figure 7.3-11	MSRIV Opening (Div. 3&4).....	7.3-72
Figure 7.3-12	MSRCV Control	7.3-73
Figure 7.3-13	MSRT Isolation	7.3-74
Figure 7.3-14	Main Steam Isolation (Div. 1&2)	7.3-75
Figure 7.3-15	Main Steam Isolation (Div. 3&4)	7.3-76
Figure 7.3-16	MFWS Isolation - Full Load.....	7.3-77
Figure 7.3-17	MFWS Isolation - SSS	7.3-78
Figure 7.3-18	MFW Actuators (Div. 1&2)	7.3-79
Figure 7.3-19	MFW Actuators (Div. 3&4)	7.3-80
Figure 7.3-20	Containment Isolation	7.3-81
Figure 7.3-21	CVCS Charging Isolation	7.3-82

Figure 7.3-22	CVCS Isolation for Anti-Dilution	7.3-83
Figure 7.3-23	EDG Actuation	7.3-84
Figure 7.3-24	PSRV Opening (Brittle Fracture Protection)	7.3-85
Figure 7.3-25	SG Isolation (Div. 1&2)	7.3-86
Figure 7.3-26	SG Isolation (Div. 3&4)	7.3-87
Figure 7.3-27	RCP Trip	7.3-88
Figure 7.3-28	MCR Air Conditioning System Isolation and Filtering	7.3-89
Figure 7.3-29	Turbine Trip on Reactor Trip Initiation	7.3-90
Figure 7.3-30	Hydrogen Mixing Dampers Opening.....	7.3-91
Figure 7.3-31	AVS Accident Filtration Train Heater Control.....	7.3-92
Figure 7.3-32	AVS Accident Train Switchover	7.3-93
Figure 7.3-33	CCWS Common 1.b and 2.b Automatic Backup Switchover	7.3-94
Figure 7.3-34	CCWS Emergency Temperature Control.....	7.3-96
Figure 7.3-35	CCWS Emergency Leak Detection.....	7.3-97
Figure 7.3-36	CCWS Emergency Leak Detection - Switchover Valves Leakage or Failure	7.3-98
Figure 7.3-37	SCWS Condenser Supply Water Flow Control.....	7.3-99
Figure 7.3-38	ESWPBVS ESWS Pump Rooms Temperature Control.....	7.3-100
Figure 7.3-39	FBVS Safety-Related Rooms Heater Control	7.3-101
Figure 7.3-40	FBVS EBS / FPCS Pump Rooms Heat Removal	7.3-102
Figure 7.3-41	FPCPS Pump Trip on Low SFP Level	7.3-103
Figure 7.3-42	CRACS Iodine Filtration Train Heater Control	7.3-104
Figure 7.3-43	CRACS Heater Control for Outside Inlet Air	7.3-105
Figure 7.3-44	CRACS Pressure Control	7.3-106
Figure 7.3-45	CRACS Cooler Temperature Control.....	7.3-107
Figure 7.3-46	SBVS SIS / RHRS Pump Rooms Heat Removal.....	7.3-108
Figure 7.3-47	SBVS CCWS / EFWS Valve Rooms Heat Removal.....	7.3-109
Figure 7.3-48	SBVSE Supply and Recirculation-Exhaust Air Flow Control	7.3-110
Figure 7.3-49	SBVSE Supply Fan Safe Shut-Off	7.3-111
Figure 7.3-50	SBVSE Recirculation Fan Safe Shut-Off	7.3-112
Figure 7.3-51	SBVSE Exhaust Fan Safe Shut-Off	7.3-113
Figure 7.3-52	SBVSE Supply Air Temperature Heater Control.....	7.3-114
Figure 7.3-53	SBVSE Freeze Protection.....	7.3-115

Figure 7.3-54	SBVSE Supply Air Temperature Control for Supply Air Cooling.....	7.3-116
Figure 7.3-56	SBVSE Battery Room Heater Control.....	7.3-117
Figure 7.3-57	SBVSE Battery Room Supply Air Temperature Control	7.3-118
Figure 7.3-58	SBVSE EFWS Pump Room Heat Removal.....	7.3-119
Figure 7.3-59	SBVSE CCWS Pump Room Heat Removal	7.3-120
Figure 7.3-60	SIS / RHRS Automatic RHRS Flow Rate Control	7.3-121
Figure 7.3-62	Isolation of FBVS on Containment Isolation	7.3-122
Figure 7.3-63	Deleted.....	7.3-123
Figure 7.3-65	SBVS Isolation of Mechanical Areas of Safeguard Building on Containment Isolation	7.3-124
Figure 7.3-66	SBVS Iodine Filtration Train Electric Heater Control	7.3-125
Figure 7.3-67	FBVS Isolation of the Fuel Pool Room	7.3-126
Figure 7.3-68	FBVS Isolation of the Emergency Airlock and Equipment Hatch.....	7.3-127
Figure 7.3-69	ESWS Flood Prevention in the Safeguard Building.....	7.3-128
Figure 7.6-1	CCWS Switchover Valves Interlock.....	7.6-15
Figure 7.6-2	CCWS RCP Thermal Barrier Containment Isolation Valves Interlock	7.6-16
Figure 7.6-3	MHSI Large Miniflow Valves Interlock Between P14 and P17 Permissives.....	7.6-17
Figure 7.6-4	IRWSTS Boundary Isolation for Preserving IRWST Water Inventory Interlock.....	7.6-18
Figure 7.6-5	SCWS Train 1 to Train 2 Switchover on Train 1 Loss of Pump / Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-Start Failure Interlock.....	7.6-19
Figure 7.6-6	SCWS Train 2 to Train 1 Switchover on Train 2 Loss of Pump / Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-Start Failure Interlock	7.6-20
Figure 7.6-7	SCWS Train 3 to Train 4 Switchover on Train 3 Loss of Pump / Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-Start Failure Interlock	7.6-21
Figure 7.6-8	SCWS Train 4 to Train 3 Switchover on Train 4 Loss of Pump / Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-Start Failure Interlock.....	7.6-22



Figure 7.6-9	Deleted.....	7.6-23
Figure 7.6-10	Deleted.....	7.6-23
Figure 7.6-11	RHR Isolation Valves Interlock	7.6-24
Figure 7.6-12	CCWS RCP Thermal Barrier Containment Isolation Valves Opening Interlock.....	7.6-25
Figure 7.7-1	Average Coolant Temperature Control Logic	7.7-31
Figure 7.7-2	Rod Speed Control Program.....	7.7-32
Figure 7.7-3	RCS Pressure Setpoints	7.7-33
Figure 7.7-4	Pressurizer Level Setpoints	7.7-34
Figure 7.7-5	Steam Generator Level Setpoints.....	7.7-35
Figure 7.7-6	Signal Flow from SCDS through CU.....	7.7-36

Next File