

#	System	Topic	Description		Coding - Action Item	Control Philosophy Page #	Impacts on other parts of the code	Category #	JLAB Effort	ALATUS Effort	ALATUS Comment	Coding Status	Testing Status	HMI Impact
1	Sequence	Turbine	Turbine 4 Trip Sequence, X547	PV22485 shall open with no ramp	T4 trip should jump PV22485 to 50% (currently ramps). It must not do this on a trip of the whole cold box.	72	No	1: Code changes	Implement			Complete		
2	Sequence	Cool Down & 4.5K Supply	Cold box cooldown trip State X600	Force all auxillary sequence in their intial state	'PS_Supply' 'CD_State.0' logic should supersede stop and run states.	78, 94	No	1: Code changes	Implement			Complete		
3	Sequence	Cold Intercept	Cold Intercept Initial State X800		Cold intercepts state X800 should set, not ramp, valves closed.	93	No	1: Code changes	Correction			Complete		
4	Sequence	Cool Down	Cool down State X608		In step X608, stop control of PV22389 and set it to 0%.	81	No	3: Additional/new	Implement	Define		Complete		
5	PID	PIC22392	Cold Intercept Supply		Secondary loop '*.OFST' (off state output) values should be 0 % for PV22392A.	43	No	1: Code changes	Correction			Complete		
6	Sequence	Cool Down	Cold box cooldown trip X600	Stop and reset all remaining control loops (output = 0)	Turn off all loops on a trip. The following aren't called for in logic but must be done: a. PV22520, b. EHTR22418A/B, c. EHTR22465	84	No	2: Control philosophy + code changes	Implement	Define	PV22520, EHTR22418A/B and EHTR22465 added	Complete		
7	Sequence	4.5K Supply	4.5 K Supply Intial State X900		4K supply logic should put PV22391 in sequencer->closed if in state X900.	95	No	1: Code changes	Correction			Complete		
8	PID	Turbine	Attenuators	Auto and Manual Attenuation Value	Adjust operator attenuator inputs to be inputs 0-1 instead of 0-100%.	27	No	1: Code changes	Correction			Complete		Yes
9	General	Flow meter	Mass Flow calculation		Add values to density calculation array for flow meters.	135, 136	No	1: Code changes	Implement			Complete		
10	Sequence	Turbine	Turbine Stop Sequence		Turbine stop sequence stops PIC224X6 loop. Actuator EV-224X6 should be commanded closed. (Refer # 24).	65		2: Control philosophy + code changes	Implement	Define	PIC-224X6 now conditioned on PIC-22405 status	Complete		
11	Sequence	Cool Down	Cool down States X603 - X606		Cooldown logic should proceeds when turbine is in X514 OR X517 (don't wait for efficiency calculation to come on) in cooldown rungs 5/6/7.	79	No	1: Code changes	Correction			Complete		
12	Sequence	Cool Down	HP Inlet Valve PV22402		Adjust PV22402 per a pending control philosophy revision. (Using 1 PID loop to control PV22400/PV22402)	78	Yes	2: Control philosophy + code changes	Implement	Define		Complete		
13	Sequence	Cool Down	TIC22400A	Initial Output shall be 100%	PV22400A OFST value should be 100% so that when the PID loop starts it starts from 100% per the control philosophy.	78	No	1: Code changes	Correction			Complete		
14	Sequence	Cool Down	PIC22193	Initial setpoint shall be 1.05 atm	The PV22193 OVH setpoint values in Cooldown rung 4 must be set correctly.	79	No	1: Code changes	Implement			Complete		
15	Valves	Adsorber	80K and 20 K Beds		The bed valves should have variables for their manual mode positions. (set to 100 by default but user controllable).	75, 78	No	1: Code changes	Implement		Bed valves are control valves and shall be coded as all other control valves	Complete		Yes
16	Valves	Cool down line logic	Transient and nominal mode		Add individual tags for return injection transient and nominal modes.	55	No	1: Code changes	Correction			Complete		
17	Sequence	Turbine	Brake pressure control PIC224X6		Set brake pressure control primary loop off state to 0. (Align with #10 and about EV-224X6 closed and #24)	64	No	2: Control philosophy + code changes	Implement		When Brake Pressure Controller is OFF, EV-224X6 is closed	Complete		
18	Sequence	General	All Sequence Trips	Sequence trip logic shall be independent of sequence stop logic, any valve or setpoint ramping should not execute	Valve ramps in CBX Stop should not execute in state 0 to reduce problems that could occur if they were ramping when stop was reached (which would close valves to 0 anyway).	82	Yes	1: Code changes	Implement	Note		Complete		
19	Sequence	All	Sequence Stop Command		Unlatch stop commands when they are given (Supply 4K rung 5, Shield Cold rung 8, Dewar Rung 12, Warm Shield rung 18).		No	1: Code changes	Correction			Complete		
20	Sequence	Cool Down	Cool down state X607	LIC22520	When controller .CMD is off, stop any setpoint ramp from executing.	81	No	1: Code changes	Implement	Note				
21	Sequence	Cool Down	Cool down state X622	Open PV22485 in ramp 5%/s	Ramp rate on PV22485 should be 5% in cooldown rung 22.	82	No	1: Code changes	Implement			Complete		
22	Sequence	Turbine	Turbine trip		Turbine trip resets must be on Rung 0 and have a one-shot to prevent harm from latching that reset somehow.	65	Yes	1: Code changes	Correction			Complete		

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23	Alarm/Trip	All	ALATUS to redefine initial phase/state specific Alarm and Trip for Turbines		ALATUS will identify Turbines alarms/trips that should be active when in state 0.	109	Yes	2: Control philosophy + code changes	Implement	Define				
24	Sequence	Turbine/Control Down	Brake pressure control PIC224X6		Start/stop brake pressure controllers with the bearing pressure control loop (control philosophy mod).	78	Yes	2: Control philosophy + code changes	Implement	Define		Complete		
25	Sequence	Turbine	Authorization for turbines in X510		Authorization for turbines should not be lost on a trip/stop (The CD starts should be one shots, and the stop revision should unlatch).	65	Yes	3: Additional/new	Implement		No need to specify in control philosophy. It's convenient but not mandatory.	Complete		
26	Trip	Turbine	Turbine 1/2/3/4 Outlet valve opening		Condition for turbine outlet valve limit switch trips should take longer in turbine state 1 (100 seconds).	112	Yes	2: Control philosophy + code changes	Implement	Define		Complete		
27	Sequence	Turbine	PV22432 Air supply solenoid valve EV22432		Turn on/off solenoids for T2/3/4 outlet valves in tandem with the output 0/100% command (check if we really have a positioner on those valves).	65	Yes	2: Control philosophy + code changes	Implement		No positioners on these 3 valves	Complete		
28	Sequence	Turbine	Turbine outlet valve		If these outlet valves are control valves (4-20mA), adjust for a ramp per a pending control philosophy revision. [THEY HAVE NO 4-20mA]	65	Yes	2: Control philosophy + code changes	Implement		No positioners on these 3 valves	Complete	N/A	
29	Trip	General	Sub-system trip shall occur any trip sensor fails		Ensure turbine trips if relevant signals fail (relevant = used in a trip). Each trip should be logically checked before implementation.	111	Yes	2: Control philosophy + code changes	Implement	Define	General note added at the beginning of Alarm / Trip sections	Partially Complete		
30	Sequence	Turbine	Set point Ramping TIC224X2		Set ramp setpoints for turbine ramps to remember setpoint changes in nominal mode (as in analog input rung 0). (Refer # 46 as well)	64	Yes	2: Control philosophy + code changes	Implement	Define	Ramp Speed Set Point (up and down) 50Hz/s	Complete		
31	PID	Turbine	EIC224X6	Turbine Efficiency Controller	Set turbine efficiency on signal for all turbines to also require the .CMD signal that the state machine controls.	30	Yes	1: Code changes	Correction			Complete		
32	Sequence	Turbine	T4 bypass		T4 control rung 19 should only set PV22485 to sequencer if it is <50%.	70	Yes	1: Code changes	Correction			Complete		
33	PID	Turbine	Set point Range	PID Controller with range shall limit user input restricted.	PID loops that have a range (for example turbine secondary loop feeds into setpoints) should be restricted to not go outside of their range even if a user requested it.	23,30	Yes	1: Code changes	Correction			Complete		
34	Interlock	All	Interlock reset - valve position shall be defined per Auto/Manual mode.	JLAB and ALATUS to define actuator type specific operation. PID Controller shall not enter in Manual Mode during Interlock Condition. Operator access should be blocked.	Interlocks should override auto/manual action. Condition of actuators/heaters should be defined on interlock reset. All Interlocks that aren't return injection types need to be rewritten. All interlock requires review and adjustment in control philosophy.	122	No	2: Control philosophy + code changes	Implement	Define	Column "Fallback position" added			
35	PID	Turbine	Turbine Brake Pressure PID SP Vs Trip/Alarm SP	Trip setpoint is within nominal operating conditions.	Brake pressure for T1, T2 and T4 are set to operate at a point (up to 6.0 atm). That is extremely close to the trip point for normal outlet pressures. This will require a control philosophy revision. [REVISION CHANGES SETPOINTS TO 5.0 ATM]	30, 111	Yes	2: Control philosophy + code changes	Implement	Define	Nominal brake pressure changed to 5 atm for all 4 turbines. Will be adjusted onsite if needed.	Complete		
36	PID	All	Controller Modes	JLAB should add Interlock valves and separate Interlock and Manual Mode. Addition to better adapt to SLAC PID Faceplate. Rename Breakdown as Interlock Mode	Adjust interlocks/breakdown PID mode so that it a. flows with SLAC's HMI faceplate interlock section. A few extra fields, no functional change.		Yes	3: Additional/new	Implement			Complete		
36	PID	All			b. does not accept requests to go into manual mode.			1: Code changes	Correction			Complete		
36	PID	All	Any sensor connected to a control loop fails including software calculated signals	Turn off the control loop & fail the valve to fail safe position	c. reenables protector mode upon input signal failure. Add input signal failure for calculated values.	122		1: Code changes	Correction			Complete		
36	PID	All	PID Mode Status strings		d. includes off and interlock/breakdown mode strings.			1: Code changes	Correction			Complete		
37	Sequence	Turbine	Turbine Start Sequence	Disable Manual Mode if active for SIC22432, TIC22332, PIC22436 and EIC22436 as well as DPIC22241 and DPIC22242	Make turbine start sequences un-flag manual commands for turbine inlet/shield/brake.	51, 64	Yes	3: Additional/new	Implement	Note		Complete		

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38	PID	Adsorber	80K Adsorber Heater PID Controller TIC22418A/B		Fix the bed heater temperature PID loop so that it always scans. Set it's ".CMD" and sequencer to go with the user enable/disable.	17	No	1: Code changes	Correction			Complete		
39	PID	Adsorber	80K Adsorber Heater PID Controller TIC22418A/B	Process Values couldn't be accessed by the Controller	Adjust 80K bed temperature names to correctly set maximum temperature to heater controller.	17	No	1: Code changes	Correction			Complete		
40	Alarm	Adsorber	80K & 20K Beds	Alarm if temperature difference > 30K between heater elements	Alarm on bed temperature differentials.	17, 18	No	1: Code changes	Implement			Complete		Yes
41	PID	LN2 Subcooler	LN2 Phase separator Level Controller, LIC22520		Fix rung 340 of 'Obtain_CVAL_Index' routine so that the LT22510 is not commented out as a spare.	14	Yes	1: Code changes	Correction			Complete		
42	PID	Dewar	Dewar Level Controller, LIC31000		Add LT31005 (Dewar DP level calc) as an optional controllable signal.	50	No	1: Code changes	Implement			Complete		Yes
43	PID	All	Verify All Process Variables are accessible	Naming is consistent and is mapped to corresspoing values in array	Double-check PID loop controllable signals.	14	No	1: Code changes	Correction					
44	Interlock	Vacuum	Vacuum Sequence Interlocks doesn't map to Solenoid Valve routine		Look at vacuum interlocks, since it appears the 'Insulating_Vacuum' routine interlocks and the 'Solenoid_Valves' routine interlocks no longer match up.	128	Yes	1: Code changes	Correction			Complete		
45	Sequence	Turbine	Turbine Controllers	SIC224X2: Setpoint shall be made equal to PV. Limit MAX Change to 50Hz/sec of ramp TIC22432: Setpoint shall be made equal to PV	Adjust turbine sequence so that it ramps PV22432 setpoint (at 50Hz/sec) when it first starts up (Set it so that the Setpoint of PV22432 is ramped to the PV22432A output for example, and set setpoint = speed when the turbine starts up. Do so for all turbines.	64	Yes	2: Control philosophy + code changes	Implement	Define	Added on Step X5X4: Ramp speed Set Point (up and down) 50Hz/s	Complete		
46	PID	Turbine	Turbine Controllers	Set point Should be accessible to Operator; Set point should switch back to defined value upon EIC22486 off	Set up turbine brake PIDs to not adjust primary setpoint when efficiency calc is not on. Set it up so that a user can change the setpoint variable in this condition and the system will remember that default whenever the efficiency calculation turns on/off again. This requires a ramp to go back to default setpoint when efficiency calculation loop is off due to being out of range.	23	Yes	2: Control philosophy + code changes	Implement	Define	When secondary controller is OFF, the PID calculation shall stop and output must be aligned with Primary controller set point. Note: Same modification made for speed controllers to allow Temperature controller (as secondary control of speed) to be turned OFF.	Complete		
47	PID	Turbine	Turbine Efficiency Controller	Process Values couldn't be accessed by the Controller needs to be set to ET22436	Turbine efficiency PID loops need to be set for EV22436 for T1, for example. The same should be done on T2/3/4.	30	Yes	1: Code changes	Correction			Complete		Yes, display default value
48	PID	Turbine	Attenuators	MCB Valves Routine needs adjustment, Don't set the OVAL field	Attenuators calculation in 'MCB_Valves' routine needs adjustment so they don't set the '*.OVAL' field.		Yes	1: Code changes	Correction			Complete		
49	Trip	Turbine	Speed and Pressure Variation calculations, ST22433TripVH & PT22332TripVH	Suggested: outlet Pressure dPT %/200 ms	Speed and pressure variation calculations may require adjustment (ALAT specified method may not be ideal) – 200 ms scanning and % on the outlet pressure.	121	No	2: Control philosophy + code changes	Implement	Define	Scrutation time 200ms Trip parameter to be divided by 5 to adjust 1s to 5x200ms	Complete		
50	PID	All	PID Mode Status strings	Interlock, Protector and Off Strings should be added	Consider renaming breakdown mode.		Yes	1: Code changes	Correction			Complete		
51	Trip	Turbine	Turbine 1 outlet valve closed trip, PV22432TripLo	Closed position compared to <3% rather than 10%. Remove Test senario of FT and PT	T1 inlet valve '*.ORBV' trip should be 3% instead of 10%, Copy to T2/3/4. Remove flow and pressure parts of this for T1.	111	Yes	2: Control philosophy + code changes	Implement	Define	Position feedback <3% during 180s	Complete		
52	Sequence	Turbine	Turbine Stop Sequence X516		Adjust turbine shutdown codes to shut fast inlet close solenoid when they begin closing outlet valve.	64	Yes	2: Control philosophy + code changes	Implement	Define	Added in each Turbine Step X5X6	Complete		

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53	Sequence	Adsorber	Adsorber sequence		Create adsorber state computation per control philosophy. (proposal may or may not be implemented).	100	No	3: Additional/new	Implement if schedule permit	Note	Adsorbers operation is Manual. The following logic is a proposal intended to help the operation team. It may or may not be implemented by JLAB		N	
54	Alarm	Sensor	Sensor signal out of range during 2 sec		Add a 2-second timer on signal failures to generate individualized alarms for failed signals to display in red. (require implementation).	107	No	1: Code changes	Implement			Complete		
55	Valves	Cool down line logic	Cooldown Line Valves shall close when Cooldown Line logic is disabled	Even after Operator enables/disables Manual Mode, check if this logic contradicts with #60	Return injection rung 10 needs to allow valves to close if return injection line logic is off.	55	Yes	1: Code changes	Correction			Complete		
56	Trip	Turbine	Turbine High Discharge Pressure Variation PT223X2TripVH	% variation specified instead of raw value variation	On turbine, the output pressure variation alarm needs to be a percent value and not a raw data. This is with regards to the discharge pressure variation high trip. It also needs to be fixed on the HMI.	121	Yes	1: Code changes	Correction			Complete		
57	PID		PID Faceplate		The code needs to support the SLAC PID faceplate including the mode description.		No	3: Additional/new	Implement			Complete		
58	Alarm	Valves	Proposal: Valve command vs Readback Descripancies > 5% (during ST + 10 sec)		Discrepancies between valve outputs and readbacks should generate an alarm.	107	No	3: Additional/new	Implement	Define	HART feedback position differs from Valve Position Set Point by more than 2%			
59	Sequence	Cooldown & Vacuum	Cause of trip text message	Trip message implemented for turbines; required of other parts as well	Add a cause of shutdown indication for the cooldown mode (x600) and vacuum systems, similar to what's done for the turbines.		No	3: Additional/new	Implement	Note				
60	Valves	Cool down line logic	Return Injection Line Valve to Vaporizer	ALATUS shall define control philosophy when cooldown line logic is disabled	ALATUS will revise the control philosophy to open PV22110 on pressure conditions that will need to be implemented.	55	Yes	2: Control philosophy + code changes	Implement	Define	Interlock added: If PT-22190 > 3 atm And PT-22190 - PT-21000 > 0.3 atm Force min opening of PV-22110 at 15%	Complete		
61	Valves	All	First scan of PLC Code settings	ALATUS to define how valves should act (Manual Mode Close)	ALATUS will revise the control philosophy to set the first-scan (power-on) condition of the valves.		Yes	3: Additional/new	Implement	Define	At first scan (Power ON), all Automatic actuators (Control Valves, ON/OFF Valves, Heaters) shall be set in Automatic in their Failure Position. Control loops shall all be turned OFF			
62	Alarm	All	Alarms shall be Operator accessible	Variables required instead of hardcoding	Alarms that are hard coded need to have variables made for their set points. Alarm latches need to be added for operator information.	107	No	3: Additional/new	Implement		Nice to have. No need to be defined in Control Philosophy		2:5655	
63	Sequence	Warm Shield	Need to condition the closing of PV-22242 (T1 outlet valve) to the Turbine 1 sequence step.	This is to make sure the valve will not open if Turbine 1 sequence is OFF.	Need to condition the closing of PV-22242 (T1 outlet valve) to the Turbine 1 sequence step. This is to make sure the valve will not open if Turbine 1 sequence is OFF.	90	Yes	2: Control philosophy + code changes	Implement	Define	In warm shields stop and Trip sequence, added: "If Sequence 510 not in step X510, then open PV-22242"	Complete		
64	Trip		PV22242TripLo	Turbine 1 Outlet valve opening issue	Must not trip in X510 and X511 - identified by JLAB (Refer # 26)	112	No	2: Control philosophy + code changes	Implement	Define		Complete		
65	Sequence	Turbines	Turbine Sequence Trip (Cold Box Trip) X540		Turbine 4 Trip Sequence for entire cold box	73	No	1: Code changes	Correction			Complete		
66	PID	Testing	Test Heater Operation		Add test heater PID control for the operators		Yes	1: Code changes	implement					Yes