

8.0	Cooling	Pass Tests 8.1 - 8.2	COMMENTS: ALL MEASUREMENTS ARE TO BE TAKEN WITH RESPECT TO GLV_RTN.						
8.1	12V Cooling	Supply external 24V to J11.1 and return on J11.2. Situation 1: Short JP15.2/3 and jump JP9. Situation 2: Supply external 24V to J11.1 and return on J11.2. Short JP15.2/3. Supply a secondary 5V from a separate power source to J15.1 and the return to J15.8.	12V measured at pin J10.1.						
8.2	Cooling Sensors Pin Voltage	Supply external 24V to J11.1 and return on J11.2.	5V measured on pin 20.2.						
TSI Rev.5 QA HV Testing									
Test	Description	Test Method	Expected Results	Pass/Fail	Additional Implementation	Pass/Fail			
1.0	Power - High Voltage	Pass tests 1.1 - 1.5	COMMENTS: ALL MEASUREMENTS ARE TO BE TAKEN WITH RESPECT TO IO_Ground.						
1.1	Energize Subsystem Connections-24HV	Supply external 24V to J11.1 and return on J11.2. Measure PS1.3 & K1.M.	24HV measured on PS1.3 & K1.M.		X				
1.2	Energize Subsystem Connections-5HV	Supply external 24V to J11.1 and return on J11.2. Measure J5.5.	5HV measured on J6.5.		X				
1.3	Energize Subsystem Connections-3.3HV	Supply external 24V to J11.1 and return on J11.2. Measure U12.2 & U40.13.	3.3HV measured on U12.2 & U40.13.		X				
1.4	Energize Subsystem Connections-1.97HV_REF	Supply external 24V to J11.1 and return on J11.2. Measure TP14.	~1.97HV on TP14. "If it is not 1.97HV adjust RV3 until the output is ~1.97HV"		X				
1.5	Energize Subsystem Connections-1.24HV_REF	Supply external 24V to J11.1 and return on J11.2. Measure R6, R53, R16, R104 and R91.	1.24HV measured at R6, R53, R16, R104 and R91.		X				
2.0	Grounding	Pass test 2.1							
2.1	Isolated Ground Connector Continuity	Perform a continuity check between J2.1/3, JP2.2, J3.2, J5.2, J6.4.	All 5 pins will be electrically connected IO_Ground.		X				
3.0	HV Isolators	Pass tests 3.1 - 3.2	COMMENTS: ALL MEASUREMENTS ARE TO BE TAKEN WITH RESPECT TO IO_Ground.						
3.1	Safety Loop Isolator	Supply external 24V to J11.1 and return on J11.2. Short JP14. Measure TP6.	5HV measured at TP6. D17 is conducting.						
3.2	Throttle LV/HV Isolator	1. Supply external 24V to J11.1 and return on J11.2. Short JP14. 2. Apply a voltage between 5.5V-9.5V to J17.2 (5V Stepdown) 3. Apply a voltage between 0.5V-4.5V to J17.4. 4. Confirm Throttle is plausible (D4 is not lit & D11 is lit) 5. Hook up another power supply and supply 3.3V to U22.13. 6. Confirm U4.2 & SW1.4 measure as same voltage. 7. Measure the voltage at TP8 & J2.5.	24HV? measured at TP8 and J2.5.						
4.0	HV Relays	Pass tests 4.1 - 4.3	COMMENTS: ALL MEASUREMENTS ARE TO BE TAKEN WITH RESPECT TO IO_Ground.						
4.1	Open the Discharge Relay (NC)	Supply external 24V to J11.1 and return on J11.2. Short JP14. Measure the voltage on J5.1. Apply and remove the short across JP14. The toggling should open and close the relay.	24HV measured on J5.1 when toggled on and 0HV when not shorted		Hook up the relay circuit's discharge relay to the J5 header and confirm the mechanical opening and closing of the relay due to toggled power.				
4.2	Close the Precharge Relay (NO)	Supply external 24V to J11.1 and return on J11.2. Jump JP6, JP7 and JP8. Situation 1: Jumping across JP5 & Measure PC_RELAY+. Situation 2: Providing correct voltages to HV+, HV- & MC+. 1. Jump JP14 to generate Safety_Loop_HV. 2. Hook-up an additional voltage supply and supply 24V to J1.1 & J1.3 and connect J1.2 to the additional (separate) voltage supply ground. 3. Ensure voltage supplied to J1.2 relative to J1.3 is greater 1HV (TS_Voltage).	Both situations - 24HV measured at J4.1. - D5 should be conducting and lit. Exclusively Situation 2: - TP4 measures 5HV and D15 is lit - TP5 measures 5HV and D16 is lit - TP6 measures 5HV and D17 is lit.		Hook up the relay circuit's pre-charge relay to the J4 header and confirm the mechanical opening and closing of the relay due to toggled power.				
4.3	Motor Controller Power Supply Relay (NO)	Supply external 24V to J11.1 and return on J11.2. Situation 1: Jumping across JP4 and measure voltage at J2.2. Situation 2: Follow the steps listed in the test procedure for HV Relays-4.2.	Both situations - 24HV measured at J2.2. - D7 should be conducting and lit.						
5.0	Pre-Charge Circuit	Pass tests 5.1 - 5.5	COMMENTS: ALL MEASUREMENTS ARE TO BE TAKEN WITH RESPECT TO IO_Ground.						
5.1	MC+, HV+ & HV- Circuitry	Supply external 24V to J11.1 & J14.1 and the return on J11.2. Jump JP6, JP7 and JP8. Hook up an additional external supply and program the supply to supply an initial value of 1.5HV to MC+ & HV+ and the ground to HV-. 1. Before turning the power supply on, measure the TSV_Voltage and MC_Voltage. 2. Turn on the secondary power supply at 1.5HV. Measure the TSV_Voltage and MC_Voltage. 3. Vary the voltages of MC+ and HV- between 1-5HV and measure the TSV_Voltage and MC_Voltage signals.	1. Measure U21.10 & U21.12 to confirm that their voltage is 1.24HV. 2. Measure U21.10 & U21.12 to confirm that their voltage is 2.74HV. 3. Measure U21.10 & U21.12 to confirm that their voltage is whatever the value of MC_Voltage and TSV_Voltage relative to the value of HV+ + 1.24HV.						
5.2	TSV Minimum Voltage Check	Supply external 24V to J11.1 & J14.1 and the return on J11.2. Jump JP6, JP7 and JP8. Ensure that TSV_MIN_REF is -1.97V. 1. Hook up an additional external supply and program the supply to supply a value of 1V to HV+ and the ground to HV-. 2. Change value of HV+ to be 0.25V.	1. Confirm that the TS_Voltage is 2.24V and that TSV_Ready is 5HV when HV+ is HV. 2. Confirm that the TS_Voltage is 1.5V and that TSV_Ready is 0HV when HV+ is 0.25 HV.						
5.3	MC_Voltage is w/in 95% of TS_Voltage	Supply external 24V to J11.1 and return on J11.2. Short JP14. Jump JP6, JP7 and JP8. Hook up an additional external supply and program the supply to: 1. Supply 1V to HV+ and MC+ and the ground to HV-. 2. Change the value of MC+ to 0.85HV. 3. Change the value of MC+ back to 1HV.	1. Confirm that MC_Voltage is ~2.24HV and that MC_95% is 5HV, D16 is on. 2. Confirm that MC_Voltage is ~2.14V and that MC_95% is 0HV, D16 is off. 3. Confirm that MC_Voltage is ~2.24HV and that MC_95% is 5HVD16 is on.						
5.4	Safety_Loop_HV	Supply external 24V to J11.1 and return on J11.2. Short JP14.	Confirm that D17 is lit and that TP6 is measured at 5HV.						
5.5	SR Latch Output	Supply external 24V to J11.1 and return on J11.2. Short JP14. Jump JP6, JP7 and JP8. Ensure that TSV_MIN_REF is -1.97V. Hook up an additional external supply and program the supply to supply a value of 1V to HV+ and the ground to HV-. 1. Measure TP4, TP5, TP6 and TP19. 2. Cut the voltage of HV+ to 0HV. Put HV+ back to 1.5HV and then set MC+ to 0.8HV. 3. 1.5HV applied to HV+ and MC+. Remove jumper shorting JP14.	At all stages TP19 should measure at 5HV until the safety loop signal is disrupted at which then TP19 is 0HV and the PC relay will open.						