NO.	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	CODE	POSSIBLE CAUSE	SET/CLEAR ONDITIONS
1	**Controller Overcurrent** Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,2	1. External short of phase U, V, or W motor connections. 2. Motor parameters are mistuned. 3. Controller defective.	Set: Phase current exceeded the current measurement limit Clear: Cycle KSI
2	**Current Sensor Fault** Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,3	1) Leakage to vehicle frame from phase U, V, or W (short in motor stator) 2) Controller defective	Set: Controller current sensors have invalid reading Clear: Cycle KS
3	Precharge failed Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,4	1. The positive end of the capacitor is externally connected with the load, which makes the capacitor unable to charge normally	Set: Precharge failed to charge the capacitor bank to KSI voltage Clear: Cycle Interlock input or use VCL function Precharge()
4	Controller Severe Undertemp Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,5	Controller is operating in an extreme environment	Set: Heatsink temperature below -40° C Clear: Bring heatsink temperature above -40°C, and cycle interlock or KSI
5	Controller Severe Overtemp Controller Severe Undertemp Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,6	1) Controller is operating in an extreme environment 2)Excessive load on vehicle 3) Improper mounting of controller	Set: Heatsink temperature above +95°C Clear: Bring heatsink temperature below +95°C, and cycle interlock or KSI
6	Severe Undervoltage . Reduced drive torque.	1,7	1) Battery Menu parameters are misadjusted 2) Non-controller system drain on battery 3) Battery resistance 4) Battery disconnected while driving 5) Blown fuse or main contactor did not close	Set: Capacitor bank voltage dropped below the Severe Undervoltage limit with MOSFET bridge enabled Clear: Bring capacitor voltage above Severe Undervoltage limit
7	Severe Overvoltage Controller Severe Undertemp Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	1,8	1) Battery menu parameters are misadjusted 2) Battery resistance too high for given regen current 3) Battery disconnected while regen braking	Set: Capacitor bank voltage exceeded the Severe Overvoltage limit with MOSFET bridge enabled Clear: Bring capacitor voltage below Severe Overvoltage limit and then cycle KSI
8	Controller undertemp cutback None,(unless a fault action is programmed in VCL)	2 , 1	1))Controller is performance-limited at this temperature 2)Controller is operating in an extreme environment	Set: Heatsink temperature dropped by -25°C Clear: Bring heatsink temperature above -25°C
9	Controller Overtemp Cutback Reduced drive and regen brake torque	2 , 2	1) Controller is operating in an extreme environment 2) Excessive load on vehicle 3) Improper mounting of controller	Set: Heatsink temperature exceeded by +85°C Clear: Bring heatsink temperature below +85°C
10	Undervoltage Cutback Reduced drive torque	2 , 3	1) The batteries need recharging. 2) Battery parameters are misadjusted 3) Non-controller system drain on battery 4) Battery resistance too high 5) Battery disconnected while driving 6) Blown fuse or main contactor did not close	Set: Capacitor bank voltage dropped below the Undervoltage limit Clear: Bring capacitor voltage below the undervoltage limit
11	Overvoltage cutback Reduced regen brake torque	2,4	1) regen braking currents elevated the battery voltage during regen braking. 2) Battery parameters are misadjusted 3) Battery resistance too high for given regen current 4) Battery disconnected while regen braking	Set: Capacitor bank voltage exceeded the Overvoltage limit with the MOSFET bridge enabled Clear: Bring capacitor voltage below the Overvoltage limit
12	+5V Supply Failure None,(unless a fault action is programmed in VCL)	2,5	External load impedance is too low	Set: +5V supply outside the +5V +/- 10% range Clear: Bring voltage within range
13	Digital Out 6 Overcurrent Digital Output 6 will not turn on	2,6	External load impedance is too low	Set: Digital Output 6 current exceeded 15 mA Clear: Remedy the overcurrent cause and use the VCL function Set_DigOut() to turn the driver on again
14	Digital Out 7 Overcurrent Digital Output 7 will not turn on	2,7	External load impedance is too low	Set: Digital Output 7 current exceeded 15 mA Clear: Remedy the overcurrent cause and use the VCL function Set_DigOut() to turn the driver on again
15	Motor Temp Hot Cutback Reduced drive torque	2,8	1) Motor temperature is at or above the programmed Temperature Hot setting, and the requested current is being cut back 2) Motor Temperature Control Menu parameters are mistuned 3) If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be	Set: Motor thermistor input is at the voltage rail (0 or 10V) Clear: Bring the motor temperature within range
16	Motor Temp Sensor Fault MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback disabled.	2,9	1) Motor thermistor is not connected properly 2) If the application doesn't use a motor thermistor. Motor Temp Sensor Enable should be programmed OFF	Set: Motor thermistor input is at the voltage rail (0 or 10V) Clear: Bring the motor thermistor input voltage within range
17	Coil 1 Driver Open/Short ShutdownDriver1.	3,1	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Driver 1 (pin 6) is either open or shorted. This fault can be set only when Main Enable = OFF Clear: Correct open or short and cycle driver
18	Main Open/Short Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	3,1	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Main contactor driver (pin 6) is either open or shorted. This fault can be set only when Main Enable = ON Clear: Correct open or short, and cycle driver

19	Coil2 Driver Open/Short Shutdown Driver 2	3,2	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Driver 2 (pin 5) is either open or shorted. This fault can be set only when EM Brake Type = 0. Clear: Correct open or short and cycle driver
20	EMBrake Open/Short Shutdown EMBrake; Shutdown Throttle; Brake.	3,2	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Electromagnetic brake driver (pin 5) is either open or shorted. This fault can be set only when EM Brake Type > 0 Clear: Correct open or short and cycle driver
21	Coil3 Driver Open/Short ShutdownDriver3.	3,3	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Driver 3 (pin 4) is either open or shorted Clear: Correct open or short and cycle driver
22	Coil4 Driver Open/Short ShutdownDriver4	3,4	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Driver 3 (pin 4) is either open or shorted Clear: Correct open or short and cycle driver
23	PD Open/Short Shutdown PD	3,5	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	Set: Proportional driver (pin 2) is either open or shorted. Clear: Correct open or short and cycle driver
24	Encoder Fault Shutdown EMBrake;	3,6	1) Motor encoder failure 2) Bad crimps or faulty wiring	Set: Motor encoder phase failure detected. Clear: Cycle KSI
25	Motor Open Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	3,7	1) Motor phase is open 2) Bad crimps or faulty wiring	Set: Motor phase U, V or W detected open Clear: Check phase,Cycle KSI
26	Main Contactor Welded Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	3,8	1) Main contactor tips are welded closed 2) Motor phase U or V is disconnected or open 3) An alternative voltage path is providing a current to the capacitor bank (B+ connection terminal)	Set: Just prior to the main contactor closing, the capacitor bank voltage was loaded for a short time and the voltage did not discharge Clear: Cycle KSI
27	Main Contactor Did Not Close Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	3,9	1) Main contactor did not close 2) Main contactor tips are oxidized, burned, or not making good contact 3) External load on capacitor bank that prevents capacitor bank from charging 4) Blown fuse	Set: With the main contactor commanded closed, the capacitor bank voltage did not charge to B+ Clear: Cycle KSI
28	Throttle Wiper High Shutdown Throttle;	4,1	Throttle pot wiper voltage too high	Set: Throttle pot wiper (pin 16) voltage is higher than the high fault threshold (can be changed with the VCL function Setup_Pot_Faults()) Clear: Bring throttle pot wiper charge below the fault threshold
29	Throttle Wiper Low Shutdown Throttle;	4,2	Throttle pot wiper voltage too low	Set: Throttle pot wiper (pin 16) voltage is lower than the low fault threshold (can be changed with the VCL function Setup_Pot_Faults()) Clear: Bring throttle pot wiper charge above the fault threshold
30	Pot2 Wiper High Full Brake	4,3	Pot2 wiper voltage too high	Set: Pot2 wiper (pin 17) voltage is higher than the high fault threshold (can be changed with the VCL function Setup_Pot_Faults()) Clear: Bring Pot2 wiper voltage below the fault threshold
31	Pot2 Wiper Low Full Brake	4,4	Pot2 wiper voltage too low	Set: Pot2 wiper (pin 17) voltage is lower than the low fault threshold (can be changed with the VCL function Setup_Pot_Faults()) Clear: Bring Pot2 wiper voltage above the fault threshold
32	Pot Low Overcurrent Shutdown throttle Full Brake	4,5	Combined pot resistance connected to pot low is too low	Set: Pot low (pin 18) current exceeds 10mA Clear: Clear pot low overcurrent condition and cycle KSI
33	EEPROM Failure Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock Shutdown Driver 1 Shutdown Driver 2 Shutdown Driver 3 Shutdown Driver 4 Shutdown PD Brake; Shutdown Pump.	4,6	Failure to write to EEPROM memory. This can be caused by EEPROM memory writes initiated by VCL, by the CAN bus, by adjusting parameters with the programmer, or by loading new software into the controller	Set: Controller operating system tried to write to EEPROM memory and failed. Clear: Download the correct software (OS) and matching parameter default settings into the controller and cycle KSI
34	HPD/Sequencing Fault Shutdown Throttle;	4,7	1) KSI, interlock, direction, and throttle inputs applied in incorrect sequence 2) Faulty wiring, crimps, or switches at KSI, interlock, direction, or throttle inputs	Set: HPD (High Pedal Disable) sequencing fault caused by incorrect sequence of KSI, interlock, direction, or throttle inputs Clear: Reapply inputs in correct sequence
35	Emer Rev HPD Shutdown Throttle;	4,7	Emergency Reverse operation has concluded, but the throttle, forward and reverse inputs, and interlock have not been returned to neutral.	Set:At the conclusion of the Emergency Reverse,the fault was set because vaious inputs were not returned to the neutral. Clear: Reapply inputs in correct sequence
36	Parameter Change Fault Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	4,9	This is a safety fault caused by a change in certain parameter settings so that the vehicle will not operate until KSI is cycled.	Set: Adjustment of a parameter setting that requires cycling of KSI Clear: Cycle KSI
37	OEM Faults	51-67	These faults can be defined by the OEM and are implemented in the application-specific VCL code.	See OEM documentation

38	VCL RunTime Error Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock Shutdown Driver 1 Shutdown Driver 2 Shutdown Driver 3 Shutdown Driver 4 Shutdown PD Brake; Shutdown Pump.	6,8	VCL code encountered a runtime VCL error	Set: Runtime VCL code error condition Clear: Edit VCL application software to fix this error condition; flash the new complied software and matching parameter defaults; cycle KSI
39	External Supply Out of Range	6,9	1) External load on the 5V and 12V supplies draws either too much or too little current 2) Fault Checking Menu parameters Ext Supply Max and Ext Supply Min are mis-tuned	Set: The external supply current (combined current used by the 5V supply [pin 26] and the 12V supply [pin 25]) is either greater than the upper current threshold or lower than the lower current threshold. The two thresholds are defined by the External Supply Max and External Supply Min parameter settings.
40	OS General Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock Shutdown Driver 1 Shutdown Driver 2 Shutdown Driver 3 Shutdown Driver 4 Shutdown PD Brake; Shutdown Pump.	7,1	Internal controller fault	Set: Internal controller fault detected Clear: Cycle KSI
41	PDO Timeout Shutdown Interlock CAN NMT State set to Pre-operational	7,2	Time between CAN PDO messages received exceeded the PDO Timeout Period.	Set: Time between CAN PDO messages received exceeded the PDO Timeout Period Clear: Cycle KSI or receive CAN NMT message
42	Stall Detected Shutdown EMBrake; Motor disabled; Controller Mode changed to LOS (Limited Operating Strategy).	7,3	1) Stalled Motor 2) Motor encoder failure 3) Bad crimps or faulty wiring 4) Problems with power supply for the motor encoder	Set: No motor encoder movement detected Clear: Either cycle KSI or detect valid motor encoder signals while operating in LOS mode and return Throttle Command = 0 and Motor RPM = 0
43	Motor Characterization Fault Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	8,7	Motor characterization failed during characterization process. 0 = none 1 = encoder signal seen, but step size not determined; set Encoder Step Size manually 2 = motor temp sensor fault 3 = motor temp hot cutback fault 4 = controller overtemp cutback fault 5 = controller undertemp cutback fault 6 = undervoltage cutback fault 7 = severe overvoltage 8 = encoder signal not seen, or one or both channels missing 9 = motor parameters out of characterization range	Set: Motor characterization failed during the motor characterization process Clear: Correct fault; cycle KSI
44	Motor Type Fault	8,9	The Motor_Type parameter value is out of range	Set: Motor_Type parameter is set to an illegal value Clear: Set Motor_Type to correct value and cycle KSI
45	VCI/OS Mismatch Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock Shutdown Driver 1 Shutdown Driver 2 Shutdown Driver 3 Shutdown Driver 4 Shutdown PD Brake; Shutdown Pump.	9,1	The VCL software in the controller does not match the OS software in the controller	Set: VCL and OS software do not match; when KSI cycles, a check is made to verify that they match and a fault is issued then they do not. Clear: Download the correct VCL and OS software to the controller.
46	EM Brake Failed to Set Shutdown EMBrake; Shutdown Throttle;	9,2	1) Vehicle movement sensed after the EM Brake has been commanded to set. 2) EM Brake will not hold the motor from rotating	Set: After the EM Brake was commanded to set and time has elapsed to allow the brake to fully engage, vehicle movement has been sensed Clear: Activate the throttle
47	Encoder LOS (Limited Operating Strategy)	9,3	1) Limited Operating Strategy (LOS) control mode has been activated, as a result of either an Encoder Fault or Stall Detect Fault 2) Bad crimps or faulty wiring 3) Vehicle is stalled	Set: Encoder Fault (Code 36) or Stall Detect Fault (Code 73) was activated, and Brake or Interlock has been applied to activate LOS control mode, allowing limited motor control Clear: Cycle KSI, or if LOS mode was activated by the Stall Fault, clear by ensuring encoder senses proper operation, Motor RPM = 0 and Throttle Command = 0
48	Emer Rev Timeout Shutdown EMBrake; Shutdown Throttle;	9,4	1) Emergency Reverse was activated and concluded because the EMR Timeout timer has expired 2) The emergency reverse input is stuck ON	Set: Emergency Reverse was activated and ran until the EMR Timeout timer expired. Clear: Turn the emergency reverse input OFF
49	Illegal Model Number Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Brake; Shutdown Pump.	9,8	1) Model_Number variable contains illegal value 2) Software and hardware do not match 3) Controller defective	Set: Illegal Model_Number variable; when KSI cycles, a check is made to confirm a legal Model_Number, and a fault is issued if one is not found. Clear: Choose the correct controller model and download appropriate software for your controller model.
50	Dualmotor Paramete rMismatch Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake; Shutdown Pump.	9,9	Dual Motor Enable parameter is set ON and Control Mode Select parameter not set ot 0 (Speed Mode Express) or 1 (Speed Mode)	Set: When the Dual Drive software is enabled, the controller must be set to either Speed Mode Express or Speed Mode; otherwise this fault is set Clear: Adjust parameter to appropriate values and cycle KSI

OEM Faults			
CODE	**POSSIBLE CAUSE**	**FAULT DESICRIPTION**	**NOTE**
51	**Steering CAN Comm failure**	EPS CAN Communication Timeout	
52	**Severe Steering Fault**	Severe Steering Failure	
53	**Steering Fault**	Steering failure	
54	**Pedal Switch Short**	Accelerator pedal switch=on before power-on (normally it should be Off).	
55	**VCL HPD Fault**	The power-on acceleration signal exceeds the dead zone.	
56	**VCL SRO Fault**	The interlock switch is not activated, the accelerator outputs.	
57	**Battery unlock**	Battery is not locked.	
58	**Display Config Fault**	3501 display interface configuration failed.	
59	**Steer angle changed**	EPS 180°/360°mode switching.	
61	**Tillerhead Pdo timeout**	1356P/CAN Tiller head Communication Timeout.	