Code	Programmer Display (Effect or Fault)	Possible Cause	Set/Clear Conditions
12	Controller Overcurrent	1) External short of phase U, V, or W motor connections 2) Motor parameters are mis-tuned 3) Controller defective	**Set:** Phase current exceeded the current measurement limit **Clear:** Cycle KSI
13	Current Sensor Fault	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 KSI
14	Precharge Failed	1) External load on capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging 2) See Monitor menu >> Battery: Capacitor Voltage	**Set**: Precharge failed to charge the capacitor bank to KSI voltage **Clear**: Cycle Interlock input or use VCL function *Precharge()*
15	Controller Severe Undertemp	1) See Monitor menu >> Controller: Temperature 2) 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
16	Controller Severe Overtemp	1) See Monitor menu >> Controller: Temperature 2) Controller is operating in an extreme environment 3)Excessive load on vehicle 4) Improper mounting of controller	**Set**: Heatsink temperature above +95°C **Clear**: Bring heatsink temperature below +95°C, and cycle interlock or KSI

17	Severe Undervoltage	1) Battery Menu parameters are misadjusted 2) Non-controller system drain on battery 3) Battery resistance 4) Battery disconnected while driving 5) See Monitor Menu >> Battery: Capacitor voltage 6) Blown B+ fuse or main contactor did not close	**Set:** Capacitor bank voltage dropped below the Severe Undervoltage limit with FET bridge enabled **Clear**: Bring capacitor voltage above Severe Undervoltage limit
18	Severe Overvoltage	1) See Monitor menu >> Battery: Capacitor Voltage 2) Battery menu parameters are misadjusted 3) Battery resistance too high for given regen current 4) Battery disconnected while regen braking	**Set:** Capacitor bank voltage exceeded the Severe Overvoltage limit with FET bridge enabled **Clear**: Bring capacitor voltage below Severe Overvoltage limit and then cycle KSI
22	Controller Overtemp Cutback	1) See Monitor menu >> Controller: Temperature 2) Controller is performance-limited at this temperature 3) Controller is operating in an extreme environment 4) Excessive load on vehicle 5) Improper mounting of controller	**Set**: Heatsink temperature exceeded by 85°C **Clear**: Bring heatsink temperature below 85°C

23	Undervoltage Cutback	1) Normal operation. Fault shows that the batteries need recharging. Controller performance is limited at this voltage. 2) Battery parameters are misadjusted 3) Non-controller system drain on battery 4) Battery resistance too high 5) Battery disconnected while driving 6) See Monitor Menu >> Battery: Capacitor voltage 7) Blown B+ fuse or main contactor did not close	**Set**: Capacitor bank voltage dropped below the Undervoltage limit with the FET bridge enabled **Clear**: Bring capacitor voltage below the undervoltage limit
24	Overvoltage cutback	1) Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage. 2) Battery parameters are misadjusted 3) Battery resistance too high for given regen current 4) Battery disconnected while regen braking 5) See Monitor Menu >> Battery: Capacitor voltage	**Set:** Capacitor bank voltage exceeded the Overvoltage limit with the FET bridge enabled **Clear:** Bring capacitor voltage below the Overvoltage limit
25	(+) 5V Supply Failure	1) External load impedance on the +5V supply (pin 26) is too low 2) See Monitor menu >> outputs: 5 Volts and Ext Supply Current	**Set**: +5V supply (pin 26) outside the +5V +/- 10% range **Clear**: Bring voltage within range

26	Digital Out 6 Overcurrent	1) External load impedance on Digital Output 6 driver (pin 19) is too low	**Set**: Digital Output 6 (pin 19) current exceeded 15 mA **Clear**: Remedy the overcurrent cause and use the VCL function *Set_DigOut()* to turn the driver on again
27	Digital Out 7 Overcurrent	1) External load impedance on Digital Output 7 (pin 20) is too low	**Set:** Digital Output 7 (pin 20) current exceeded 15 mA **Clear:** Remedy the overcurrent cause and use the VCL function *Set_DigOut()* to turn the driver on again
28	Motor Temp Hot Cutback	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 mis-tuned 3) See Monitor Menu >> Motor: Temperature and >> Inputs: Analog2 4) If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off.	**Set**: Motor temperature is at or above the Temperature Hot parameter setting. **Clear**: Bring the motor temperature within range
29	Motor Temp Sensor Fault	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 3) See Monitor Menu >> Motor: Temperature and >> Inputs: Analog2	**Set**: Motor thermistor input (pin 8) is at the voltage rail (0 or 10V) **Clear**: Bring the motor thermistor input voltage within range

31	Coil1 Driver Open/Short	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
31	Main Open/Short	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
32	Coil2 Driver Open/Short	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
32	EMBrake Open/Short	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
33	Coil3 Driver Open/Short	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
34	Coil4 Driver Open/Short	1) Open or short on driver load 2) Dirty connector pins 3) Bad crimps or faulty wiring	**Set**: Driver 4 (pin 3) is either open or shorted **Clear**: Correct open or short and cycle driver
35	PD Open/Short	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

36	Encoder Fault	1) Motor encoder failure 2) Bad crimps or faulty wiring 3) See Monitor menu >> Motor: Motor RPM	**Set**: Motor encoder phase failure detected. **Clear**: Cycle KSI
37	Motor Open	1) Motor phase is open 2) Bad crimps or faulty wiring	**Set**: Motor phase U, V or W detected open **Clear**: Cycle KSI
38	Main Contactor Welded	1) Main contactor tips are welded closed 2) Motor phase U or V is disconnected or open 3) An alternative voltage path (such as an external precharge resistor) is providing a current to the capacitor bank (B+ connection terminal)	**Set**: Just prior to the main contactor closing, the capacitor bank voltage (B+ connection terminal) was loaded for a short time and the voltage did not discharge **Clear**: Cycle KSI
39	Main Contactor Did Not Close	1) Main contactor did not close 2) Main contactor tips are oxidized, burned, or not making good contact 3) External load on capacitor bank (B+ connection terminal) that prevents capacitor bank from charging 4) Blown B+ fuse	**Set:** With the main contactor commanded closed, the capacitor bank voltage (B+ connection terminal) did not charge to B+ **Clear**: Cycle KSI
41	Throttle Wiper High	1) See Monitor Menu >> Inputs: Throttle Pot 2) 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

42	Throttle Wiper Low	1) See Monitor Menu >> Inputs: Throttle Pot 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
43	Pot2 Wiper High	1) See Monitor Menu >> Inputs: Pot2 Raw 2) 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
44	Pot2 Wiper Low	1) See Monitor Menu >> Inputs: Pot2 Raw 2) 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
45	Pot Low Overcurrent	1) See Monitor Menu >> Outputs: Pot Low 2) 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
46	EEPROM Failure	1) 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

47	HPD/Sequencing Fault	1) KSI, interlock, direction, and throttle inputs applied in incorrect sequence 2) Faulty wiring, crimps, or switches at KSI, interlock, direction, or throttle inputs 3) See Monitor Menu >> 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
49	Parameter Change Fault	1) This is a safety fault caused by a change in certain parameter settings so that the vehicle will not operate until KSI is cycled. For example, if a user changes the Throttle Type this fault will appear and require cycling KSI before the vehicle can operate.	**Set:** Adjustment of a parameter setting that requires cycling of KSI **Clear:** Cycle KSI
51-67	OEM Faults	1) These faults can be defined by the OEM and are implemented in the application-specific VCL code. See OEM documentation	**Set**: See OEM documentation **Clear**: Contact HPEVS for assistance
68	VCL Run Time Error	1) VCL code encountered a runtime VCL error 2) See Monitor Menu >> Controller: VCL Error Module and VCL Error. This error can then be compared to the runtime VCL module ID and error code definitions found in the specific OS system information file.	**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

69	External Supply Out of Range	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 3) See Monitor Menu >> Options: Ext Supply Current	**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. **Clear:** Bring the external supply current within range
71	OS General	1) Internal controller fault	**Set**: Internal controller fault detected **Clear**: Cycle KSI
72	PDO Timeout	1) 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
73	Stall Detected	1) Stalled Motor 2) Motor encoder failure 3) Bad crimps or faulty wiring 4) Problems with power supply for the motor encoder 5) See Monitor Menu >> Motor: Motor RPM	**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

87	Motor Characterization Fault	1) Motor characterization failed during characterization process. See Monitor Menu >> Controller: Motor Characterization Error for cause: 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
89	Motor Type Fault	1) 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
91	VCL/OS Mismatch	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.
92	EM Brake Failed to Set	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

93	Encoder LOS (Limited Operating Strategy)	1) Limited Operating Strategy (LOS) control mode has been activated, as a result of either an Encoder Fault (Code 36) or Stall Detect Fault (Code 73) 2) Motor encoder failure 3) Bad crimps or faulty wiring 4) 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
94	Emer Rev Timeout	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
98	Illegal Model Number	1) Model_Number variable contains illegal value (not 1234, 1236, 1238 or 1298) 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:** Download appropriate software for your controller model.