



NOTICE: Always refer to the appropriate Vehicle Service Manual when troubleshooting electrical problems. See all GENERAL INSTRUCTIONS WARNINGS AND PRECAUTIONS



DECODING DIAGNOSTIC LED ALARM CODES FOR H2 TRACTION CONTROLLERS

The diagnostic LED found on the Controller may be used to give a general indication of what the problem may be with the traction system. Below is a table that shows which possible alarms may have occurred in relation to the number of flashes you count on the LED. Use the Hand Set to determine which alarms are causing the problem.

NUMBER OF LED FLASHES	POSSIBLE ALARM MESSAGES ON HANDSET	TYPE OF ALARM	NOTES
1	EEPROM DATA KO EEPROM PAR. KO EEPROM CONF. KO EEPROM OFF-LINE CHOPPER NO CONF WATCH-DOG	LOGIC TEST FAIL	Truck does not operate
2	INCORRECT START	START TEST FAIL	
3	NO FULL CONDUCTION VMN LOW	VMN TEST FAIL	Truck does not operate Check contactor tips Check motor wiring
4	VACC NO OK	ACCEL POT HIGH	Truck does not operate
5	I HIGH AT STAND I=0 EVER	CURRENT READING TEST FAIL	Truck does not operate
6	DRIVER SHORTED COIL SHORTED	CONTACT DRIVER CIRCUIT MALFUNCTION	Truck does not operate
7	TH. PROTECTION	TEMPERATURE HIGH	Truck operates slower or not at all. Temp over 80 deg C.
8	BRAKE CONT. OPEN DIR CONTR. OPEN VMN HIGH **	CONTACTORS DO NOT CLOSE OR VMN HIGH	Truck does not operate
9	BRAKE CON CLOSED	REGEN CONTACTOR STUCK	
32	BATTERY	LOW BATTERY CONDITION	Truck operates slower if BATTERY CHECK parameter in SET OPTIONS is set in ON
ON - NO FLASHING	FORW BACK	BOTH DIRECTION CONTACTORS ON AT SAME TIME	Truck does not operate

Refer to Truck Manual for a more detailed description of the alarm messages that appear on the Hand Set.

NOTE: ** VMN means Voltage Motor Negative - voltage on Mosfets.

DECODING HAND SET ALARMS FOR TRACTION CONTROLLER

1) BRAKE CON CLOSED. (only for Controllers set up with regenerative braking)

This test is performed both with the truck moving and with regenerative braking.

If, when the driving contactor closes, VMN is $> 2/3VBATT$, then this alarm is reported.

Possible causes:

a) The regen braking contactor, which is usually open, is stuck closed. Open the contactor and clean it. If it is damaged, replace the contactor or the contacts.

b) The regen braking contactor is always energized (ON) because of a defect in the logic board or because the regen braking contactor negative wire is shorted.

To check if the fault comes from one of these sources, select the speed and turn the accelerator without pressing the foot switch. If the regen braking contactor start is synchronous with the accelerator control, do as follows:

disconnect the wire from the regen braking contactor negative connector, and perform the test above again. If

the contactor is stays open, replace the logic board. If the contactor continues to follow the accelerator

command, check that the regen contactor negative wire is not shorted with some metal part.

2) DIR. CONT. OPEN

This test is performed in case of travel request. The driving contactor is closed by checking that the VMN signal is present.

Possible causes:

A1) There is a poor contact on the NO (Normally Open) contact of the forward contactor or on the NC (Normally Closed) contacts on the reverse contactor because of contamination. Clean the contacts. If necessary, remove the contamination with a very light abrasive action.

A2) There is a poor contact on the normally open contact of reverse contactor or on the normally closed contact of the forward contactor, because of contamination. Clean the contacts. If necessary, remove the contamination with light abrasive action. It may be necessary to replace the two contactors.

A3) The most probable cause is that the normally closed contacts on the regen braking contactor have poor contact towards the negative pole of the battery because of contamination or because the contact does not close completely owing to a mechanical fault.

It may be necessary to replace the contactor.

Other causes: The motor connection may have been broken for one of the following reasons:

Brushes raised from commutator.

Brush wire burned out.

Lack of negative wire to the regen braking contactor.

B1) The forward contactor is powered at the correct voltage, but does not close. Possible causes:

1 The contactor coil is open: Check its resistance using a ohmmeter.

2 The contact does not move because it is mechanically jammed.

3 The rated voltage of the contactor coil is higher than the battery voltage.

B2) The reverse contactor is powered at the correct voltage but does not close. The possible causes are the same as for the forward contactor described in paragraph B1 above.

B3) The forward and back contactors are powered at the correct correctly but they do not close. The possible causes are the same as for the forward contactor described in paragraph B1 above.

C1) Power does not reach the forward contacts. Check wiring to the forward contactor positive and negative connections.

C2) Power does not reach the reverse contacts. Check wiring to the reverse contactor positive and negative connections.

C3) Power does not reach the forward and reverse contacts. Check wiring to the forward and reverse contactor positive and negative connections.

NOTE: It may be necessary to replace the Controller for problems not corrected in paragraphs C1, C2, or C3.

3) BRAKE CONT. OPEN. (only for Controller set up for regenerative braking)

This test is performed during the travel start after closing the direction contactor and the regen braking contactor.

If VMN does not go from $< 1/3$ to $> 2/3 +VB$ the alarm occurs.

A4) There is poor contact on the Normally Open contacts of the Regen Braking Contactor. Clean or replace the contacts.

A5) Lack of the positive wire on the Regen Braking contactor.

B4) Replace the contactor coil or the whole contactor.

B5) Mechanically jammed contactor. Free it or replace it.

B6) Contactor with a rated coil working voltage higher than the battery voltage.

C4) Power does not reach the coil. Check wiring and connections from the coil to positive and negative Regen Braking connectors. It can be caused by a fault of the logic card. Replace it if there are no faults in the wiring.

4) DIR. CON. CLOSED

Forward or Reverse Direction contactor stuck closed.

This test is performed when putting the truck in neutral or while braking. In these cases the direction contactor is supposed to open.

Possible causes:

- a) Forward or Reverse contactor stuck closed or slow to open.
- b) Broken logic card.

5) VMN LOW.

This test is performed with the truck stopped and with the truck moving at up to 80% of PWM. If the VMN voltage is lower than 1/3 of the battery voltage this alarm is caused.

B7) If the Forward or Reverse contactor is always energized, check:

- 1) that the wires connected to the negative side of the coils on the contactors are not shorted accidentally with a metal part connected to the negative pole of the battery.
- 2) if the Controller is faulty, disconnect the contactor positive wire from the Controller connector. If the contactor coil is no longer energized, replace the Controller.

B8) A direction contactor is stuck closed in the working position. Free up the contactor. It may be necessary to replace the contactor.

D1) Incorrect connection of the motor wires. Stators and rotors are crossed.

D2) There is a short circuit in the motor between the stator and the armature windings or some electric parts inside the motor.

D3) Ensure there are no metal pieces in the electrical panel causing a short circuit towards the between the negative battery pole and the points connected to -SH and +SH.

C5) It is very likely that the fault is inside the Controller. Replace it.

E1) If there is a bypass or field weakening contactor, check that it is not closed or that it is not too slow to open. To check this, disconnect the bypass or field weakening contactor and check if the fault disappears. Replace the contactor if this corrects the fault.

Warning: Remember that the contactors connected to the Controller must not have arc suppression installed on the coils, because they are inside the Controller. Additional external arc suppression devices, such as MOVs will change the contactor opening times.

6) VMN HIGH.

This test is performed with the truck at rest.

If the VMN voltage is higher than 2/3 VBATT, this alarm is caused. Possible causes:

- a) Closed contactor. (only standard traction configuration)
- b) Short circuit between +BATT and VMN. Check that there are no metal parts causing a short circuit on the panel.
- c) Broken Controller. Braking diodes probably broken, replace the Controller.

7) NO FULL COND.

This test is performed at full conduction.

If in this condition it is found that VMN is higher than 1/3 VBATT, this means that something is not working in the diagnostic circuit. The truck is automatically stopped. If the fault continues, replace the logic card.

8) TH. PROTECTION

It indicates that the Controller temperature has exceeded 80°C.

The maximum current is gradually reduced to a value of zero at a temperature of 85°C.

- a) If the alarm occurs immediately when the truck is turned on and the Controller is cold, it is very likely that the heat detection circuit on the power or on the Controller is broken. In this case replace the Controller.
- b) If the alarm occurs frequently just a short time after the truck has been switched on, it is probably due to little cooling. Check that the securing nuts are bolted tightly and that the Controller is correctly installed.

9) BATTERY

The battery is discharged.

The alarm occurs only if the "battery check" option has been selected by a serial (default) Hand Set. When it appears, the maximum current is limited to 50%.

10) INCORRECT START

Wrong start sequence.

The truck starts only if the sequence: Turn key on first, followed by accelerator demand is followed.

Possible causes:

- a) Direction switch closed.
- b) Wrong sequence followed by the operator, accelerator switch turned when the key is turned on.
- c) Wrong wiring. If the fault is not detected externally, it is necessary to replace the logic card.

11) FORW - BACK

This test is always performed. The alarm occurs when forward and reverse travel requests are made at the same time.

Possible causes:

- a) Faulty wiring.
- b) Forward or Reverse switch is closed.
- c) If no external faults are detected, it is necessary to replace the Controller logic card.

12) VACC NOT OK

This test is performed with the accelerator released.

The alarm indicates that the accelerator voltage is 1volt higher than the minimum stored value. Possible causes:

- a) The potentiometer negative or positive wire is broken (the pin floats high with a broken wire) or the potentiometer negative pole has not been connected to the pin C2 of the Controller. In this case the alarm occurs because the logic card does not detect the load on pin C2.
- b) The accelerator potentiometer is badly calibrated. Recalibrate using the Hand Set.
- c) The accelerator potentiometer is faulty (open).

13) HIGH CURRENT

This test is performed with the truck at rest. Check for the absence of current.

If this does not happen the alarm occurs and the truck will not move.

Possible causes:

- a) The current sensor is broken or the logic card is broken. Replace at first the logic card. If the fault does not disappear, replace the entire Controller.

14) I=0 EVER

This test is performed with accelerator demand.

During travel the current is higher than a minimum value. If this does not happen, the alarm occurs and the truck stops.

Possible causes:

- a) The current sensor is broken. Replace the Controller.
- b) Wrong connection of the power wires to bars -SH and +SH.

15) EEPROM PAR. KO

Fault in the memory area containing the setting parameter data.

The alarm stops the truck.

If the fault persists after turning the key off and back on again, replace the Controller logic card.

If the alarm disappears, previously stored parameters have been cleared and replaced with default values. You must reset the parameters.

16) EEPROM CONF. KO

Fault in the memory area containing the Controller special configuration data. If the fault persists after turning the key off and back on again, replace the logic card.

If the fault disappears the Controller configuration has been replaced with default values (regeneration version, etc...), so it will be necessary to reprogram it. Use the Hand Set and follow the instructions for Initializing a new

Controller.

17) EEPROM DATA KO

The data relating to the hour meter memory area are incorrect. The alarm does not stop the truck. If the alarm disappears when the truck is turned off and back on again, the hour meter data have been set to zero.

18) EEPROM OFF LINE

Fault in the nonvolatile memory containing the hour meter data, stored alarms and programming parameters. If the fault persists after turning off and back on again, replace the logic card.

19) CHOP NO CONF.

This alarm is similar to No.16, but in this case, though the data are incorrect, they do not correspond to a hardware configuration recognized by the Controller.

If the fault persists after turning the key off and back on again, replace the logic card.

If the fault disappears chopper configuration has been replaced with default values (regeneration version, etc...),, so it will be necessary to reprogram it. Use the Hand Set and follow the instructions for Initializing a new Controller.

20) WATCH - DOG

This test is performed both at all times when the power is turned on to the Controller.

It is a self-diagnostic function inside the logic card. It may be reset by turning off the key.

If the alarm persists, replace the logic card.

21) COIL SHORTED

On the contactor negative drivers there is an a short circuit to the battery positive pole. Possible causes:

a) The contactor coils are shorted or they absorb more than 6 amps.

b) Short circuit with +BATT of the wiring coming out of the contactor connectors. The alarm indicates that there has been an overload but not a failure of one of the Controller components. After removing the external cause restart the truck.

22) DRIVER SHORTED

This test is performed with the truck stopped. It consists in checking that the driving voltage of the drivers controlling the contactors have the expected voltage.

Possible causes:

a) Fault in the logic card .

b) The drivers are broken, because of an overvoltage in the contactor negative wiring of the contactor negative poles. Replace Controller.