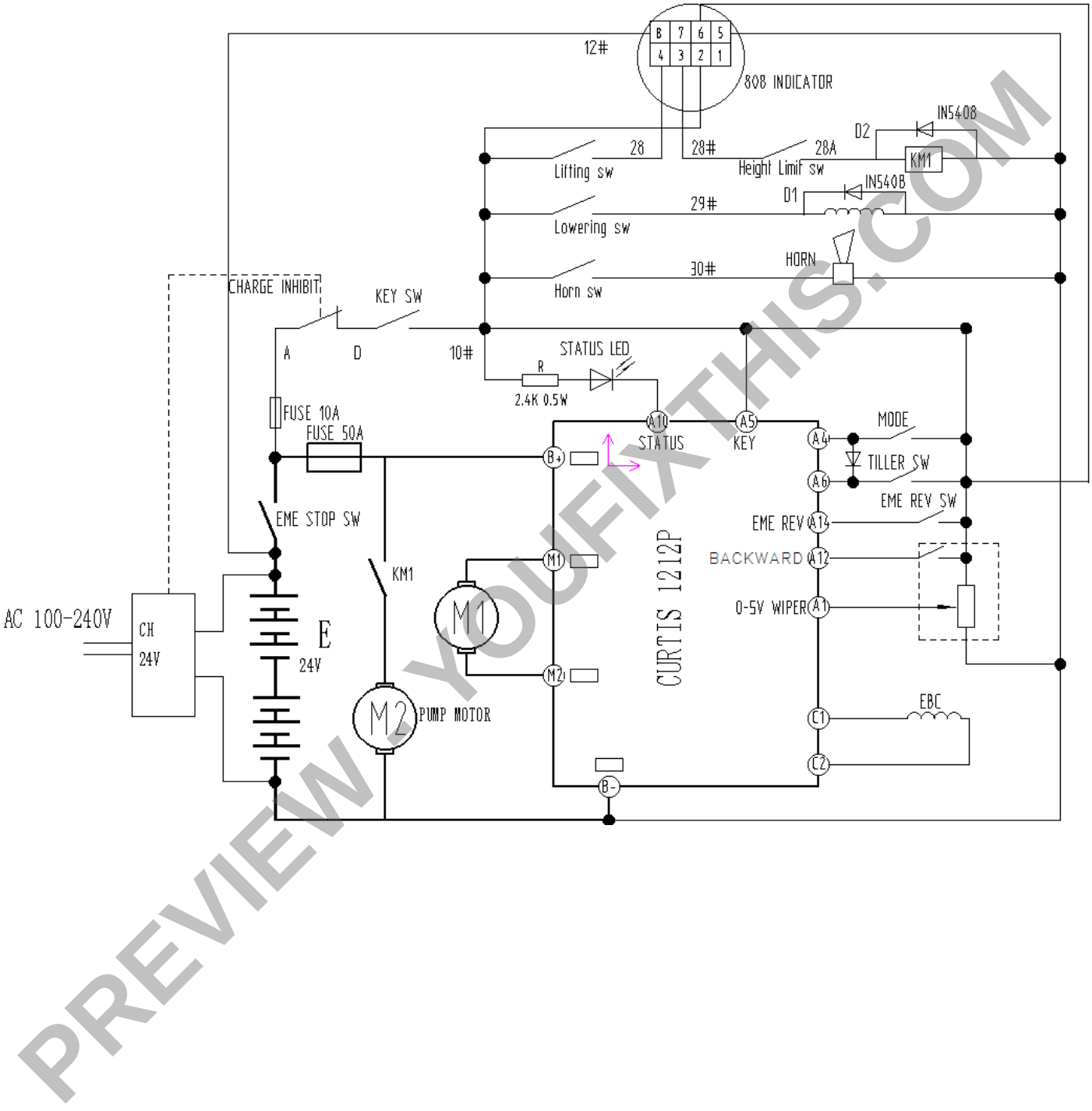
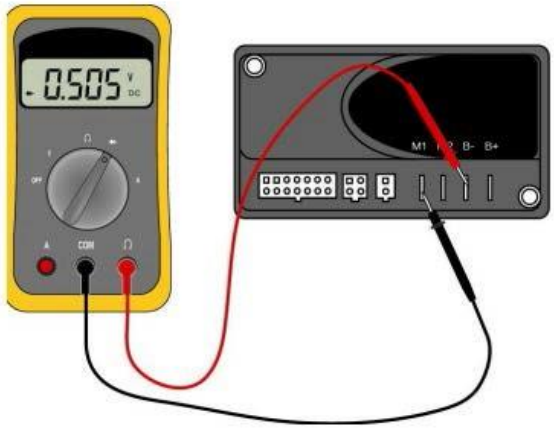
## Electrical schematic




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5. Set the digital multimeter to (polarity value detection).
6. Touch the black probe and red probe on the multimeter to the controller terminals and measure each value for tests 5-6 as indicated in **Table 1 - Controller outputs**. Record the measured values.
7. If any values are out of range, there is an internal controller fault and the controller must be replaced.

| Test | Red probe | Black probe | Acceptable range |
|---|---|---|---|
| 1 | B+ | B- | Above 40KΩ |
| 2 | B+ | M | Above 80KΩ |
| 3 | B+ | M1 | Above 80KΩ |
| 4 | M1 | M2 | Above 60KΩ |
| 5 | B- | M2 | 0.3V-0.6V |
| 6 | B- | M1 | 0.3V-0.6V |

**Table 1 - Controller outputs**

## Fault codes for the controller

The traction controller detects a wide variety of faults or error conditions.

### Diagnostics

Diagnostics information can be obtained in either of two ways.
If a 1313 handheld programmer is available, the fault log in this device displays faults that are currently set and faults that have been set since the fault log was last cleared. Faults are displayed by name in these devices.
Without a handheld device, the fault codes are communicated by the status LED on the truck itself. The patterns of this LED communicates the status of the controller (including a fault code number if there are faults present).

### Fault code identification with LED

During normal operation, the status LED is steadily on and does not flash. If there is an active fault code, the status LED will flash to indicate the two-digit number of the fault code.
The status LED will flash one or more times to indicate the first digit of the fault code, then pause. After the pause, the status LED will flash one or more times to indicate the second digit of the fault code.
For example, if fault code 4,4 MOTOR OPEN is active on the truck, the status LED will flash four times, then pause, and then flash four more times.

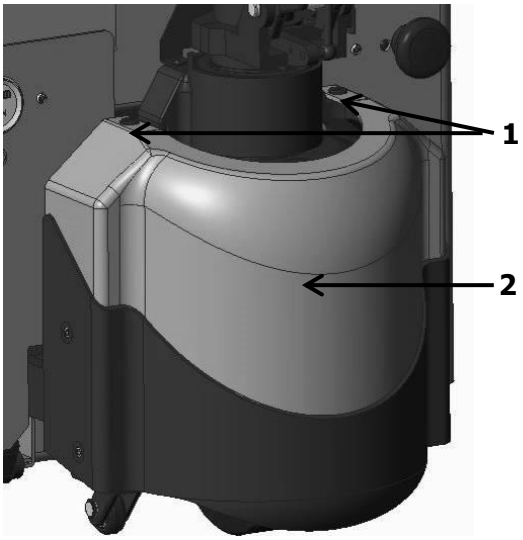
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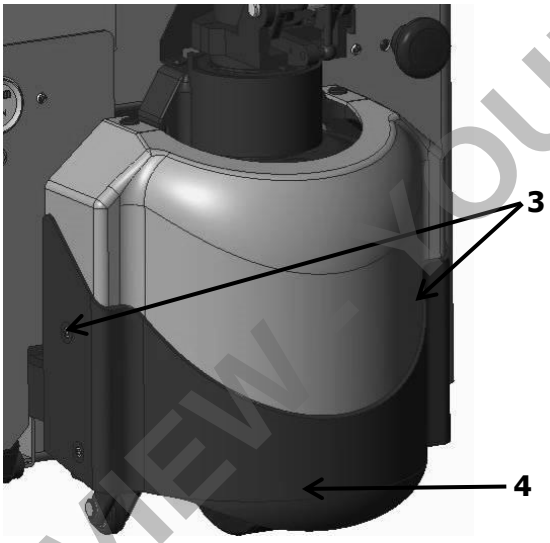
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## Drive system repair

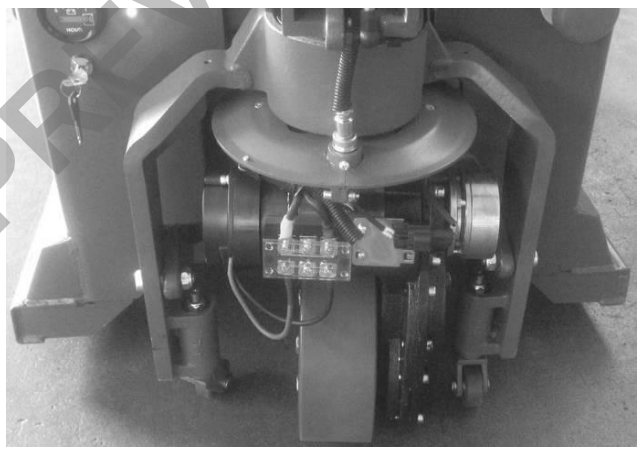
### Rear covers – remove and install




1. Remove two screws (item 1) from the rear cover, then remove the rear cover (item 2).




2. Remove two screws (item 3) from the rear panel, then remove the rear panel (item 4).



View with rear cover and rear panel removed.

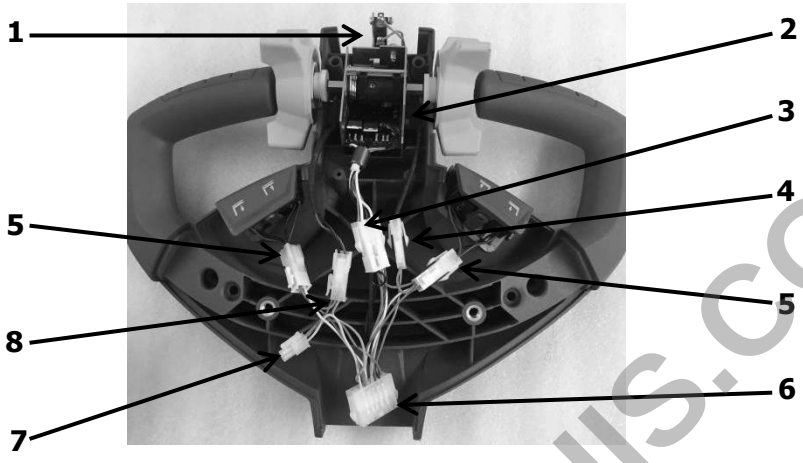
To install the rear cover and rear panel, perform steps 1 and 2 in reverse order.

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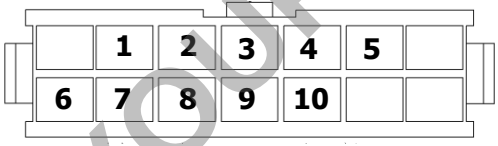
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## Tiller handle – connectors and pinout




| | | | |
|---|---|---|---|
| 1 | Emergency reverse button | 5 | Lift/lower button connector |
| 2 | Accelerator knob | 6 | Main harness connector |
| 3 | Accelerator connector | 7 | Horn button connector |
| 4 | Emergency reverse button connector | 8 | Slow button connector |

**Main harness wire connector pinout**




| Pin | Wire color | Description | Pin | Wire color | Description |
|---|---|---|---|---|---|
| 1 | Black | Negative pole | 6 | Red | Positive pole 24V |
| 2 | Blue | Forward | 7 | Brown | Emergency reverse |
| 3 | Green | Backward | 8 | White | Accelerator 0-5V |
| 4 | Purple | Lower | 9 | Yellow | Lift |
| 5 | Pink | Horn | 10 | Orange | Slow |

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| Code | Name | Description | Possible causes |
|---|---|---|---|
| 3,5 | HPD FAULT | HPD (High Pedal Disable) | 1. Improper sequence of throttle and keyswitch, push, or inhibit inputs. |
| 4,1 | CURRENT SENSE FAULT | Current sense out of range | 1. Short in motor or in motor wiring.<br>2. Controller failure*. |
| 4,2 | HARDWARE FAILSAFE | Motor voltage out of range | 1. Motor voltage does not correspond to throttle request.<br>2. Short in motor or motor wiring.<br>3. Controller failure*. |
| 4,3 | EEPROM CHECKSUM FAULT | EEPROM fault | 1. EEPROM failure or fault.<br>2. Replace the controller. |
| 4,4 | MOTOT OPEN [1212] | Motor open fault | 1. Motor wiring is open. |
| 4,5 | BATTERY DISCONNECT FAULT | Battery disconnected | 1. Battery not connected.<br>2. Poor connection to battery terminals. |
| * Jack up the vehicle and retest to confirm diagnosis. Clean connections, inspect system wiring, and retest. | | | |

**1,1 THERMAL FAULT – troubleshooting procedure**

1. Check the controller temperature.
2. If the controller temperature is out of range, let it cool or heat until it is within range.
3. After the temperature is in range, check to see if the fault is still active.
4. If the fault is still active after the controller temperature is within range, the controller temperature sensor may be damaged. Replace the controller.

**1,4 UNDERVOLTAGE FAULT, 1,5 OVERVOLTAGE FAULT, and 4,5 BATTERY DISCONNECT FAULT– troubleshooting procedure**



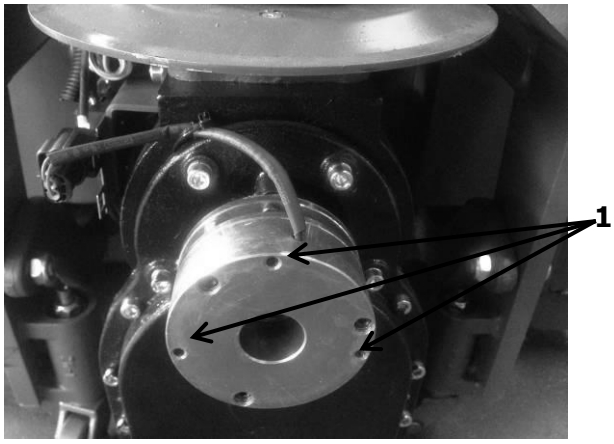

1. Use a digital multimeter to measure voltage between B+ and B- on the batteries.
2. Record the value.
3. If the voltage is out of range, charge or replace the battery.

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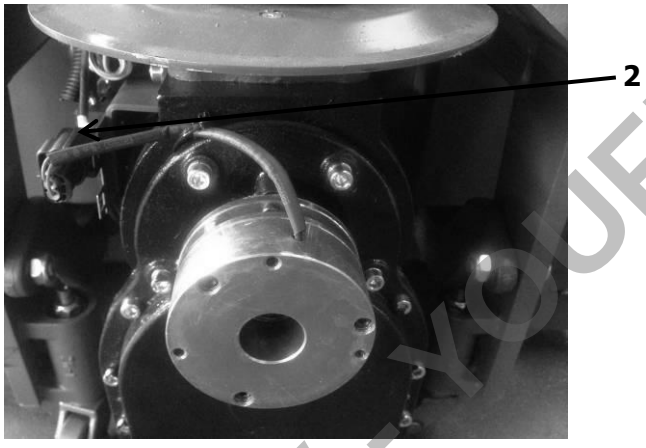


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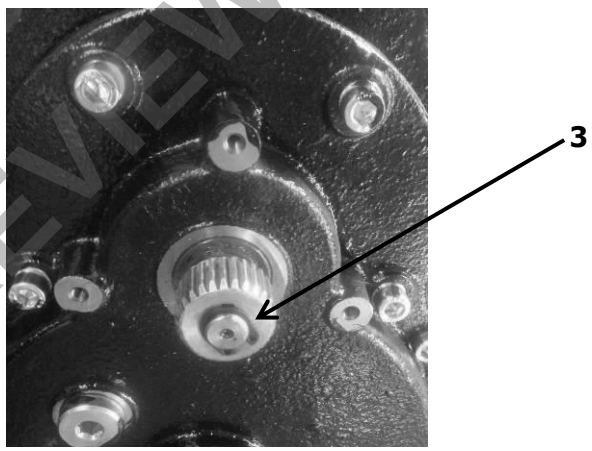
**Electromagnetic brake – remove and install**




1. Remove the rear cover and the rear panel. See **Rear covers – remove and install**.
2. Turn the tiller handle so that the brake points outward.
3. Remove three screws (item 1) from the brake.




4. Unplug electrical connector (item 2), then remove the brake.



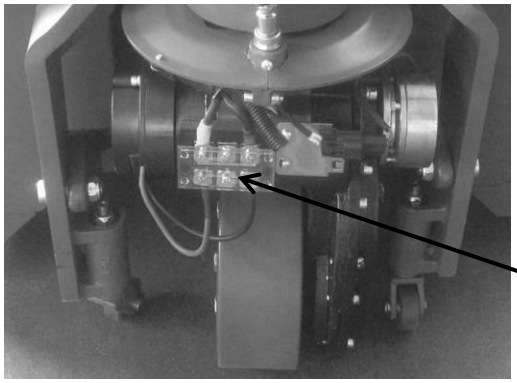

5. Remove the snap ring (item 3).

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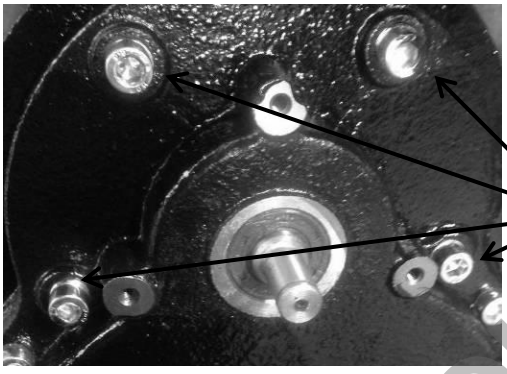


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**Traction motor – remove and install**




1. Remove the rear cover and rear panel. See **Rear covers – remove and install**.
2. Remove the electromagnetic brake. See **Electromagnetic brake – remove and install**.
3. Turn the tiller handle so that the motor wiring faces outward, then disconnect the motor wiring (item 1).




4. Remove four lock screws (item 2) from the motor.



5. Turn the tiller handle so that the motor faces outward.

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