

# Mastercorp Maintenance Form How-To Guide

To assist with completion of some required fields, the following data collection tips are provided.

## BATTERY VOLTAGE & WATERING:

Each battery must be measured individually with a voltmeter. The concern is if one or more batteries are more than .5 volts difference from others, this may indicate the beginning of a failing battery, unequal charging or a point of excess current draw.

Example:



Front # 4	Rear # 4	Battery pack required 2 gallons of distilled water.
6.2v	6.3v	
Front # 3	Rear # 3	
6.2v	6.3v	
Front # 2	Rear # 2	
6.3v	5.6v	
Front # 1	Rear # 1	
6.2v	6.2v	



In example above, battery Rear #2 indicates there may be an issue. Monitor this battery and if low again at the next check, perform a load test and/or troubleshoot possible wiring issues.

Also noted is that battery pack seemed to take excessive amount of water. Verify operators or other staff members are instructed how to water batteries as part of weekly operations

## ON BOARD BATTERY CHARGING DATA:

During each PM the battery charger data must be acquired using the laptop, dongle and DQ software. To read data, disconnect the charger B-terminal from the battery pack. Hook the dongle connections to the charger B+ and B- cables (not the battery pack) and plug in the AC charger cord to 120VAC outlet. Launch the DeltaView software on the computer, connecting to the charger. View the onscreen display and record the number of normal charge cycles. In the photo you can see the unit has 23 normal cycles. Record this on the PM form.



Charger Summary	
S/N: DQDB481645100516	
Total Ahr Delivered	4996.50
Total Charge Duration (days)	17.48
Normal Charge Cycles	23
Incomplete Charge Cycles	0
Equalization Charge Cycles	0
AC Fail Cycles	122
DC Out of Range Cycles	20
External Disable Cycles	0
<b>Total Charge Cycles</b>	<b>165</b>
Maintenance Cycles	0
AC Brownout	3
AC Out of Range	27
Thermal Shutdown	255
Battery Low V	0
Battery High V	0
Charge Timeout	0
Battery Defective	0
Charger Internal Fault	0
Battery Temp	0
Over Temperature	0
<b>Total Faults</b>	<b>0</b>

This data is collected to look at battery issues. In this example the vehicle has been in the field for 484 days and only fully charged 23 times. This has caused irreparable damage to the battery pack due to the customer's abuse.

### TIRE PRESSURES:

Each tire pressure must be set in accordance with the recommended setting for that specific tire. Measure each tire PSI, and record BEFORE filling.

Example:



<i>FL:</i> 50 #	<i>FR:</i> 42 #		Filled FR to 50 #
<i>RL:</i> 50 #	<i>RR:</i> 50 #	OK	

In example above, Front Right tire indicates there may be an issue. Monitor this tire and if low again, check for possible leakage at bead, valve, or foreign object in tire. Note in far right column any action taken.

### TIRE TREAD WEAR:

Each tire tread must be measured during service. This will help to not only identify a potential alignment problem, but aid in making sure that when tires are worn beyond serviceable condition, new tires can be on hand to avoid any service delays. All measurements are =  $x / 32''$ , note value of x:

Example:



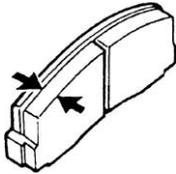
<i>FL:</i> 4	<i>FR:</i> 5		Tires wearing. Rotated to rear. Quoted.
<i>RL:</i> 7	<i>RR:</i> 7	OK	

In example above, both front tires indicate there may be a significant wear issue. The useful life of the tire ends when tread depth reaches below  $4/32''$ . Rotate worn tires to rear of vehicle. Check wheel alignment and inflation, as these are the leading causes of front tire wear. Provide quote to Columbia for replacement during next scheduled service.

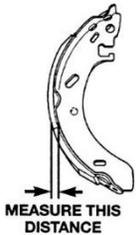
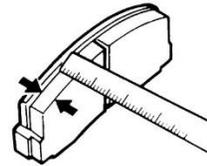
**BRAKE LINING THICKNESS:**

Brake pad/shoe lining thickness is critical for safety and performance of the vehicle. Lining must be measured to ensure sufficient material is serviceable in allowing the brakes to slow and/or stop the vehicle.

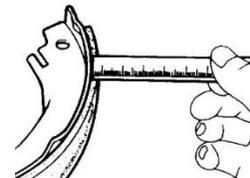
Examples:



PAD THICKNESS (Must be no less than 2mm)					
FL:		FR:		OK	
Inner	Outer	Inner	Outer		
5.2	5.1	5.2	5.1		



SHOE THICKNESS (Must be no less than 1.6mm)					
RL:		RR:			Shoes worn on RL. Quoted
Inner	Outer	Inner	Outer		
2.4	2.2	4.0	3.9		



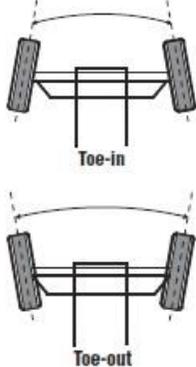
In examples above, both front pads appear to be wearing normally. The rear shoes on the left side are showing excessive wear. Check and adjust brake travel if needed on that side. Since shoes are nearing end of serviceable life, quote to Columbia for replacement during next scheduled service.

**WHEEL ALIGNMENT:**

Front wheels need to be properly aligned to minimize tire wear and for best handling of the vehicle. Excessive, abnormal or premature wear is an indicator of possible misalignment. The following table indicates proper specifications:

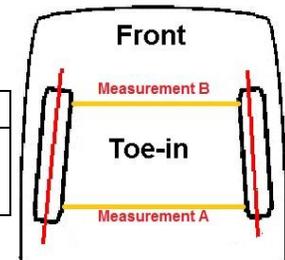
<i>Model</i>	<i>Toe-In</i>	<i>Camber</i>	<i>Caster</i>
<i>BC Payloader</i>	0"	0"	0"
<i>C6 Shuttle</i>	0" – 1/8"	0"	0"
<i>EU Utilitruck</i>	0" – 1/8"	0"	0"

Measurements to be taken on vehicle and recorded BEFORE performing any alignment. Measure distance between front inner wheels at the rear of the wheel, and compare to the same measurement at the front of the wheels. The rear distance (Measurement A) minus the front distance (Measurement B) is the toe-in measurement to record. If alignment was required, note on maintenance sheet and select OK if corrected. Alignment service is billed on a separate invoice to Columbia.



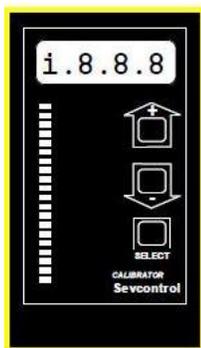
Example:

<i>Toe-In Prior to Service</i>		
1/4" out	OK	Realigned to 1/8" toe-in



**CONTROLLER DATA:**

The controller data is to be recorded. Hours and the programmed checksum are required for all DC Power System vehicles. This information may be easily obtained with the Handset/Calibrator tool (Columbia # CVG467256).



With vehicle power off, connect handset directly to controller. Turn on power to vehicle. The calibrator will default to display the Traction Drive Hours Counter. With no buttons pressed, the number displayed shows the number of minutes. Pressing the “-” button displays the number of hours under 1000. Record the hour reading.

Hours:	OK	
172		

To access the checksum of the controller, press the SELECT button until the TEST LED on the bottom right is on. Then using the “+” button, press and hold until the data stop changing. The checksum will be displayed. To verify you are at the correct location, press and hold the “+” and “-” buttons together and the display will indicate the location 19.15. Record the checksum.

Program (Checksum #)	OK	
197		