

PRELIMINARY

Q2 Odometer Functions

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Q2 firmware supports a locomotive on-board odometer.

All locomotives have a BEMF driven on-board odometer. The average BEMF reading each second is converted to Scale Miles Per Hour (SMPH) and added to a total stored in long term memory (LTM). The BEMF driven odometer is the basis for the one of the three speed calibration procedures described in the “BEMF to SMPH Calibration” document.

Q2 steam locomotives may be equipped with a Chuff CAM. This CAM signals the decoder processor at each of 4 positions of a wheel revolution, thus providing 4 chuffs per revolution. This CAM can also be used as an on-board odometer, given that the diameter of the wheel (CV56.24.0) and the locomotive scale (CV56.25.0-1) are known.

BEMF Odometer mode is the default. If your locomotive has a Chuff CAM, you can select the CAM Odometer mode, by setting CV56.0 bit 5 to “1” (add 32 to the current CV56.0 value).

Odometer Reset

The odometer is reset to “0” by writing to CV58.1.0.

Set CV49 to “1”
Set CV50 to “0”
Set CV58 to “0”

Actually, a write of any value to CV58.1.0 will reset the odometer to “0”.

In Ops Mode, the locomotive will respond by saying “Reset”.

The odometer is also reset to “0” when all CV’s are reset to factory default values.

Ops Mode Odometer Read Out

In Ops mode you can have the locomotive verbally read out the odometer value. There are two ways to do this:

(1) Make the odometer reading part of the F10 status report. To do this set CV55.128.0 bit 4 to “1” (add 16 to the current CV55.128.0 value). Then whenever you press F10, the locomotive will speak out the odometer value. In Analog DC, you can get the status report by pressing the Quantum Engineer “Status Report” button.

(2) Write “58” to CV64.1.0. (CV64 is the CV Numeric Verbal Readout).

Set CV49 to “1”
Set CV50 to “0”
Set CV64 to “58”

The locomotive speaks out either the scale miles or the scale kilometers traveled, to the nearest 0.01 of a scale mile or scale kilometer. The default is “miles”. If you want the locomotive to speak out the scale kilometers traveled, set CV56.0 bit 1 to “1” (add 2 to the current CV56.0 value).

Service Mode Odometer Read Back

The odometer value can be read back in DCC Service Mode. These three CV’s contain the raw odometer value:

CV58.1.0 byte_0 (low order byte)
CV58.1.1 byte_1
CV58.1.2 byte_2 (high order byte)

The raw odometer value is thus

$$\text{Raw Odometer Value} = \text{byte_0} + (\text{byte_1} * 256) + (\text{byte_2} * 256 * 256)$$

The number of scale miles this represents depends on the Odometer Mode (CV56.0 bit 5).

BEMF Odometer (CV56.0 bit 5 = “0”)

For BEMF Odometer mode, the number of scale miles is

$$\text{Miles} = \text{Raw Odometer Value} / 3600$$

From this we can calculate the maximum number of scale miles before the odometer rolls over.

$$\text{Max_Miles} = 16777215 / 3600 = 4660.33$$

To convert to kilometers, multiply the miles by 1.609

$$\text{Kilometers} = \text{Miles} * 1.609$$

CAM Odometer (CV56.0 bit 5 = “1”)

For CAM Odometer mode, the number of scale miles is

$$\text{Miles} = (\text{Raw Odometer Value} * \text{Diameter} * \text{Scale} * \text{PI}) / (4 * 12 * 5280)$$

The “4” is because there are 4 CAM ticks per wheel revolution. The “12” is because there are 12 inches per foot. The “5280” is because there are 5280 feet per mile. “PI” is 3.1415926.

Diameter is the Wheel Diameter read back from CV56.24.0. In CV56.24.0, a value of “128” represents a diameter of 1.0 inches.

Scale is the Locomotive Scale read back from CV56.25.0 (low byte) and CV56.25.1 (high byte). The scale is thus Scale = low byte + (high byte * 256). This number represents the locomotive scale in units of 0.01. For example, a value of 2900 represents a scale of 29.00.

Thus, we have

$$\begin{aligned} \text{Diameter} &= \text{CV56.24.0 value} / 128 \\ \text{Scale} &= (\text{CV56.25.0 value} + (\text{CV56.25.1 value} * 256)) / 100 \\ \text{Miles} &= (\text{Raw Odometer Value} * \text{Diameter} * \text{Scale} * \text{PI}) / (4 * 12 * 5280) \end{aligned}$$

The maximum number of scale miles before the odometer rolls over depends on the wheel diameter and the locomotive scale.

$$\text{Max_Miles} = (16777215 * \text{Diameter} * \text{Scale} * \text{PI}) / (4 * 12 * 5280)$$

To convert to kilometers, multiply the miles by 1.609

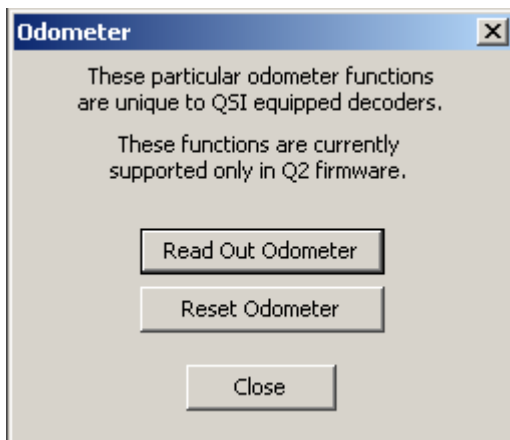
$$\text{Kilometers} = \text{Miles} * 1.609$$

QuantumCVManager Odometer Support

QuantumCVManager version 1.1.0.3 and later supports both Ops Mode Odometer Read Out and Service Mode Odometer Read Back.

Click on the menu item “Decoder | Odometer...”.

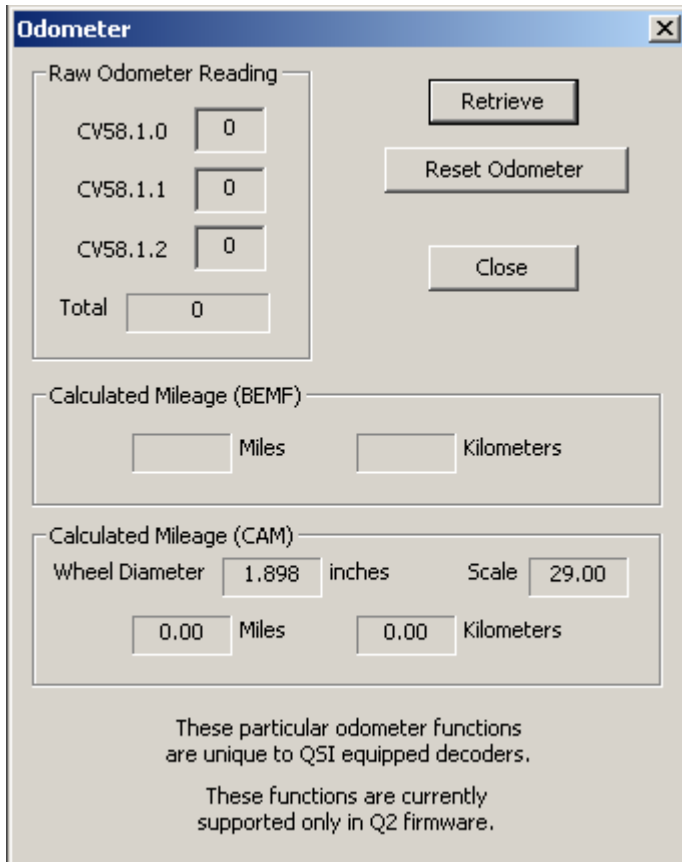
In Ops Mode, the following dialog box is displayed.



Click on the “Read Out Odometer” button to have the locomotive speak out the scale miles or scale kilometers traveled.

Click on “Reset Odometer” to reset the locomotive’s odometer to “0”. The locomotive will respond by saying “Reset”.

In Service Mode, the following dialog box is displayed.



Odometer

Raw Odometer Reading

CV58.1.0

CV58.1.1

CV58.1.2

Total

Calculated Mileage (BEMF)

Miles Kilometers

Calculated Mileage (CAM)

Wheel Diameter inches Scale

Miles Kilometers

These particular odometer functions are unique to QSI equipped decoders.
These functions are currently supported only in Q2 firmware.

Click on “Retrieve” to retrieve the Raw Odometer Reading.

Click on “Reset Odometer” to reset the odometer to “0”.

The above image shows that the locomotive’s odometer has been reset to “0”, that it’s Odometer mode has been set to “CAM Odometer”, that it’s CV56.24.0 value is equivalent to “1.898 inches”, and that its CV56.25.0-1 value is equivalent to a scale of “29.0”.