General

The True Speed Calibration Unit (TSCU) is a module that is inserted between the axle speed pickup and the locomotive speed indicator (or other equipment). The TSCU utilizes The Global Positioning System (GPS) signals to generate a true speed signal to generate a correction factor that automatically corrects the speed indicator signal to yield correct speed indication regardless of wheel wear.

The GPS signals don't need to be present at all times to obtain an accurate signal. The GPS signal is used to calculate a correction factor. This data is stored in a memory and used until the next calculation.

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Specification:

Input supply:	45 to 120Vdc
Backup time in power outage:	10 seconds
Input pulse maximum frequency:	4kHz
40 or 42po wheel size selection (Speedometer)	
Output pulse voltage selection:	5V, 10V and 15V
Operating temperature:	-40 to +70ºC
Shock:	±80g any axis
Input pulse minimum voltage:	±1.0Vpp
Input pulse maximum voltage:	±15Vpp
Radio:	
Frequency:	2.4GHz
Sensibility:	-100 dBm
Output power:	3 dBm
GPS:	
Sensibility:	-161 dBm
Maximum acquisition time:	26 Seconds
CPU:	
Frequency:	32 MHz
Flash:	32K
Ram:	10K
External memory:	256K

Installation:

This document is a general guide line for the TSCU installation; which can vary, depending of locomotive type.

Install the TSCU module under the locomotive walkway near the axle generator, the connectors should be facing up and the LED facing out. (see attached drawing)
Use bracket P/N 1071050100.

For the installation It's require 3 spare terminals, some locomotive have spare terminal on the terminal board located near the axle generator, otherwise, a new terminal board needs to be installed. Use cable assembly P1 P/N 1046050000 and P2 P/N 1046050100

- Disconnect axle generator signal going to the Isolation amplifier or speedometer (white or Sig,) and relocate to a spare terminal.

- Connect wire P1-A to the terminal with the wire from the axle generator (white or Sig)

- Connect wire P1-B and P2-D to the terminal with the wire from the axle generator (Black or Com)

- Connect Wire P2-C to the spare terminal with the wire going to the Isolation amplifier or the speedometer (white or Sig.)

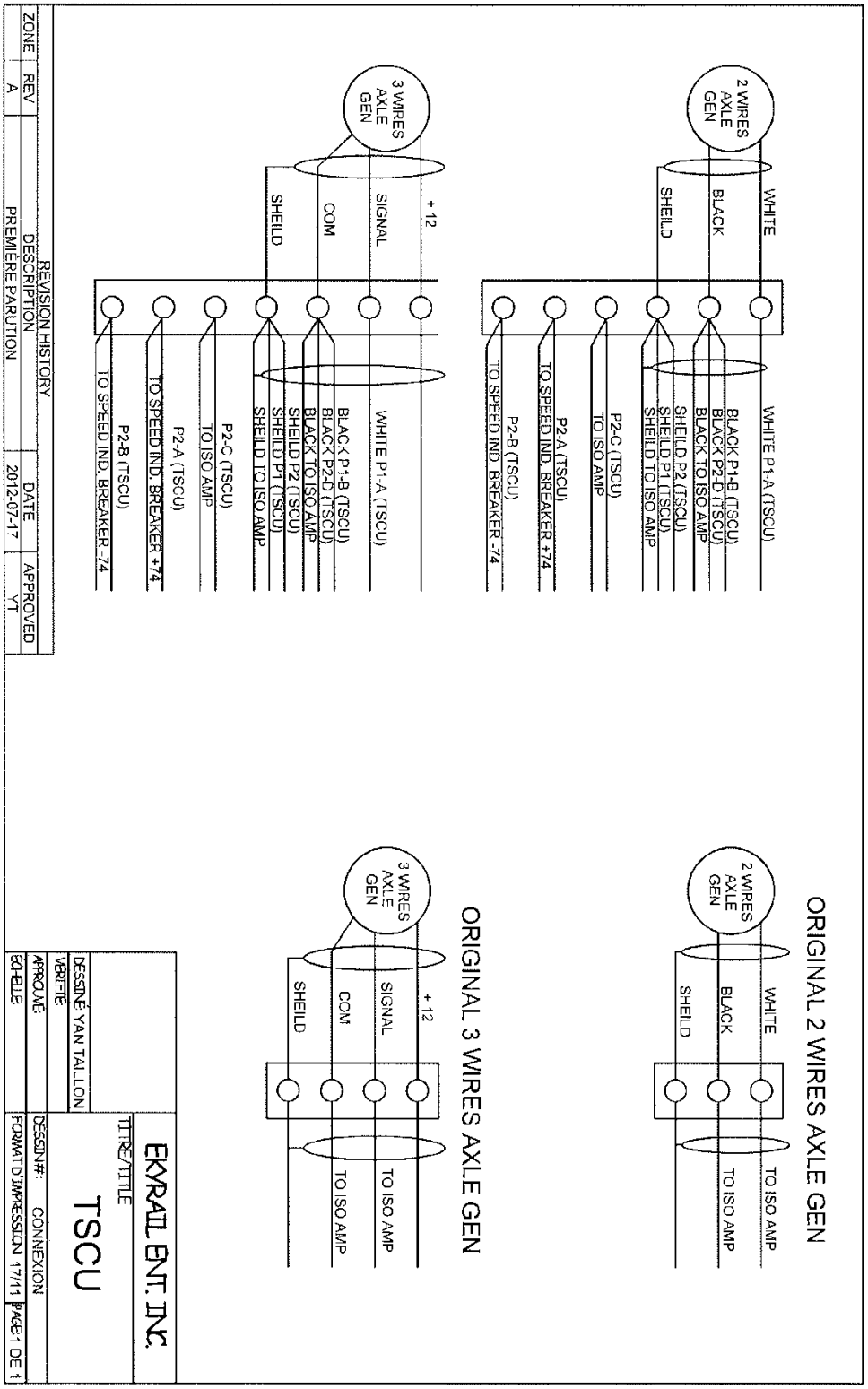
- Connect shield wire from P1 and P2 with the axle generator shield terminal.

- Connect wire P2-A to a spare terminal and from that terminal, run a new wire to the speedometer circuit breaker +74v

- Connect wire P2-B to a spare terminal and from that terminal, run a new wire to the speedometer circuit breaker 0v (BN)

- If the locomotive is equipped with a 42'' wheel speedometer, add a jumper between pin E and F on connector P2.The Cable assembly can be order with the jumper installed.

Note: If the locomotive is equipped with an adjustable wheel size on the speedometer. The adjustment need to be set to 40'', a test may need to be performed for verified the accuracy of the speedometer.


2 WIRES AXLE GEN
WHITE
BLACK
SHEILD
WHITE P1-A (TSCU)
BLACK P1-B (TSCU)
BLACK P2-D (TSCU)
BLACK TO ISO AMP
SHEILD P2 (TSCU)
SHEILD P1 (TSCU)
SHEILD TO ISO AMP
P2-C (TSCU)
TO ISO AMP
P2-A (TSCU)
TO SPEED IND. BREAKER +74
P2-B (TSCU)
TO SPEED IND. BREAKER -74
3 WIRES AXLE GEN
+ 12
SIGNAL
COM
SHEILD
WHITE P1-A (TSCU)
BLACK P1-B (TSCU)
BLACK P2-D (TSCU)
BLACK TO ISO AMP
SHEILD P2 (TSCU)
SHEILD P1 (TSCU)
SHEILD TO ISO AMP
P2-C (TSCU)
TO ISO AMP
P2-A (TSCU)
TO SPEED IND. BREAKER +74
P2-B (TSCU)
TO SPEED IND. BREAKER -74
ORIGINAL 2 WIRES AXLE GEN
2 WIRES AXLE GEN
WHITE
BLACK
SHEILD
TO ISO AMP
TO ISO AMP
ORIGINAL 3 WIRES AXLE GEN
3 WIRES AXLE GEN
+ 12
SIGNAL
COM
SHEILD
TO ISO AMP
TO ISO AMP
REVISION HISTORY
ZONE
REV
DESCRIPTION
DATE
APPROVED
A
PREMIÈRE PARUTION
2012-07-17
YT
EKYRAIL ENT. INC.
TITRE/TITLE
TSCU
DESSINÉ YAN TAILLON
VÉRIFIÉ:
APPROUVÉ:
ÉCHELLE:
DESSIN #:
CONNEXION
FORMAT D'IMPRESSION 17/11
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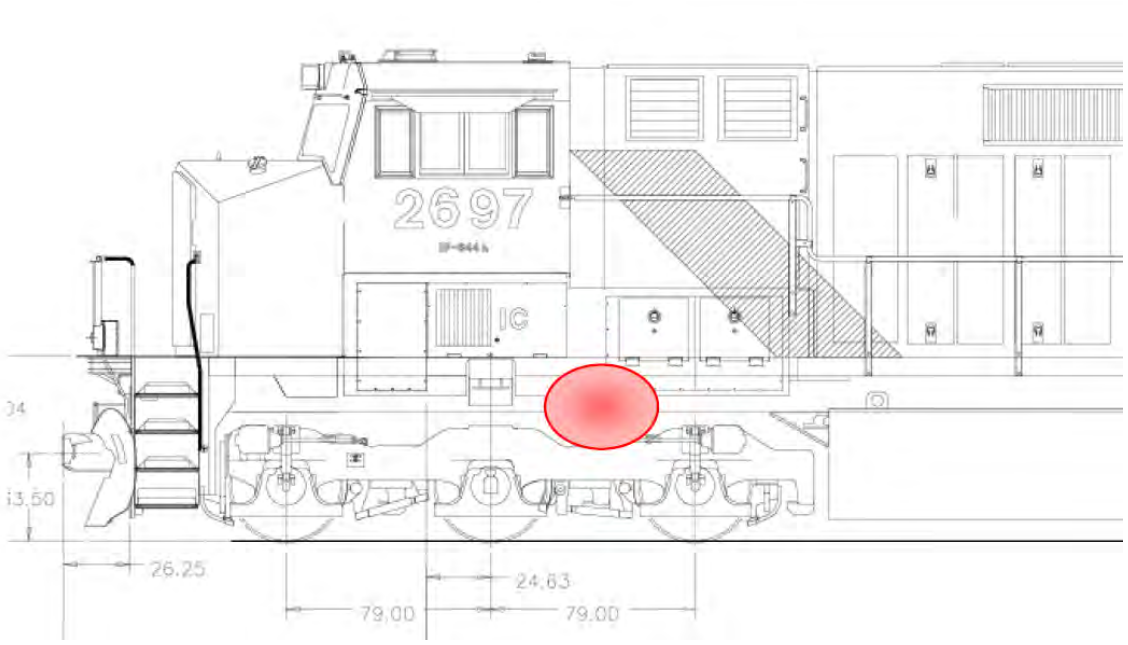
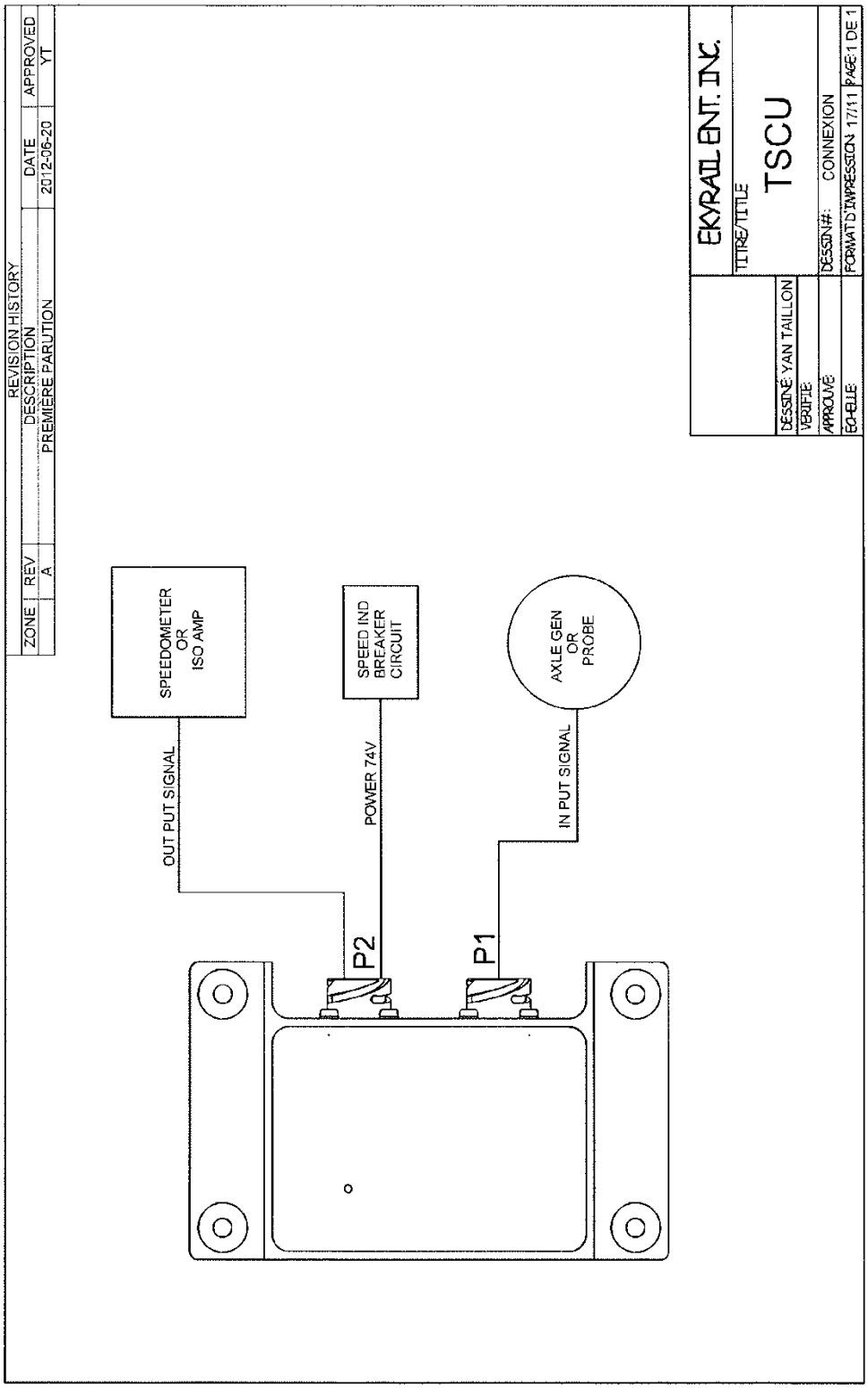
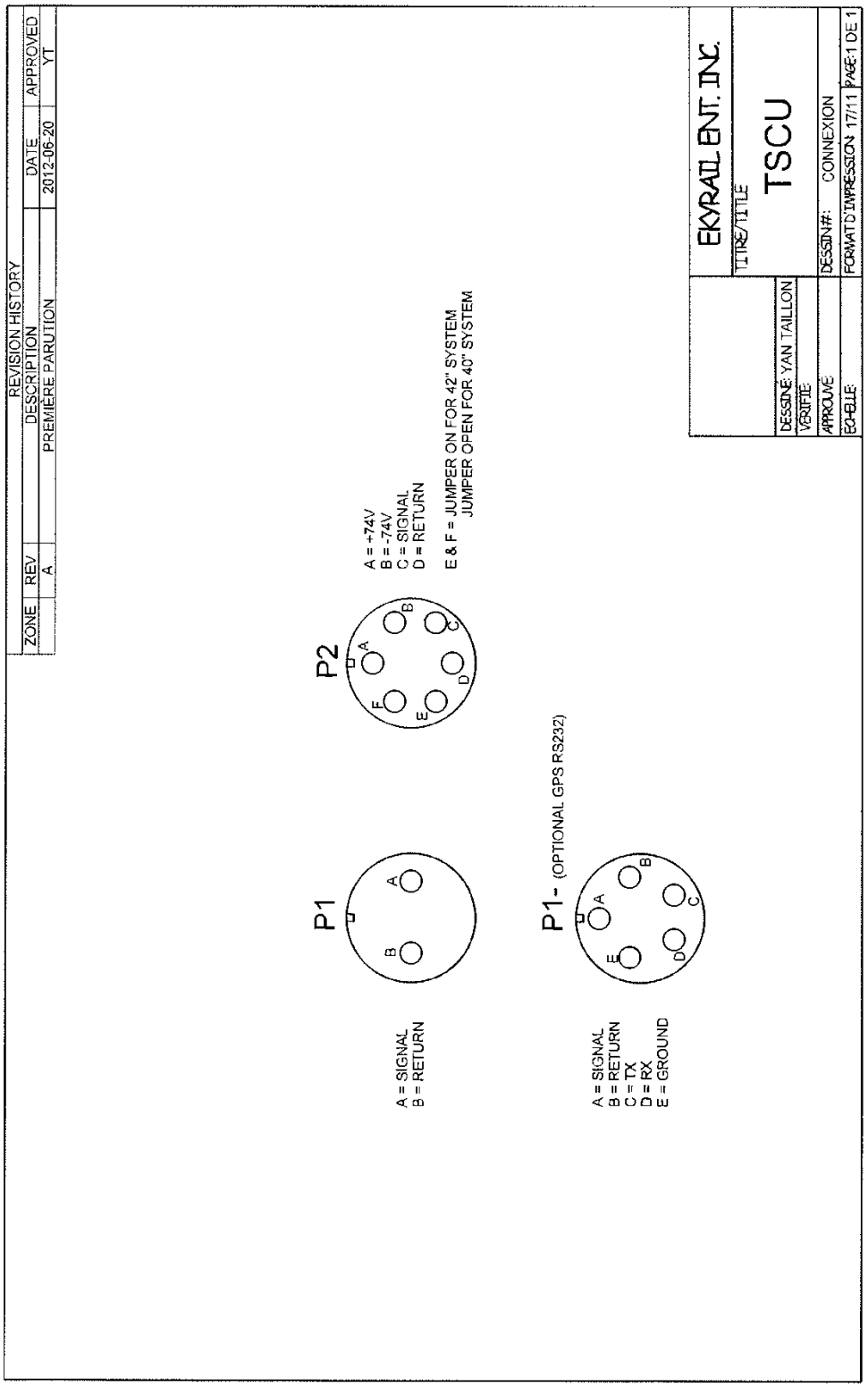
TSCU location on locomotive




REVISION HISTORY
ZONE
REV
DESCRIPTION
DATE
APPROVED
A
PREMIERE PARUTION
2012-06-20
YT
EKYRAIL ENT. INC.
TITRE/TITLE
TSCU
DESSINÉ: YAN TAILLON
VÉRIFIÉ:
APPROUVÉ:
ÉCHELLE:
DESSIN#: CONNEXION
FORMAT D'IMPRESSION 17/11
PAGE 1 DE 1
SPEEDOMETER OR ISO AMP
SPEED IND BREAKER CIRCUIT
AXLE GEN OR PROBE
OUT PUT SIGNAL
POWER 74V
IN PUT SIGNAL
P2
P1


REVISION HISTORY
ZONE
REV
DESCRIPTION
DATE
APPROVED
A
PREMIÈRE PARUTION
2012-06-20
YT
P2
A = +74V
B = -74V
C = SIGNAL
D = RETURN
E & F = JUMPER ON FOR 42" SYSTEM
JUMPER OPEN FOR 40" SYSTEM
P1
A = SIGNAL
B = RETURN
P1- (OPTIONAL GPS RS232)
A = SIGNAL
B = RETURN
C = TX
D = RX
E = GROUND
EKYRAIL ENT. INC.
TITRE/TITLE
TSCU
DESSINÉ: YAN TAILLON
VÉRIFIÉ:
APPROUVÉ:
ÉCHELLE:
DESSIN #: CONNEXION
FORMAT D'IMPRESSION 17/11
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Operation:

When the power is apply, the LED on the TSCU will turn amber for few second, at this time the TSCU is in boot mode,
When this action is done, the LED flashes red and green, this mean the system is working properly.

Move the locomotive outside the shop, and link the laptop computer to the TSCU.(see instruction on next page).

Before to go on the next step, make sure there is a fix on the GPS statue (10). Referred to page 10 for the identification marker.

Move the locomotive over 5mph for 30 to 60 seconds, this action will identify the type of axle generator on the locomotive and show on the computer screen (7).

By moving the locomotive over 8mph, the system will start to calculate the wheel size and change the value on the screen (16), this action can take a few minutes.

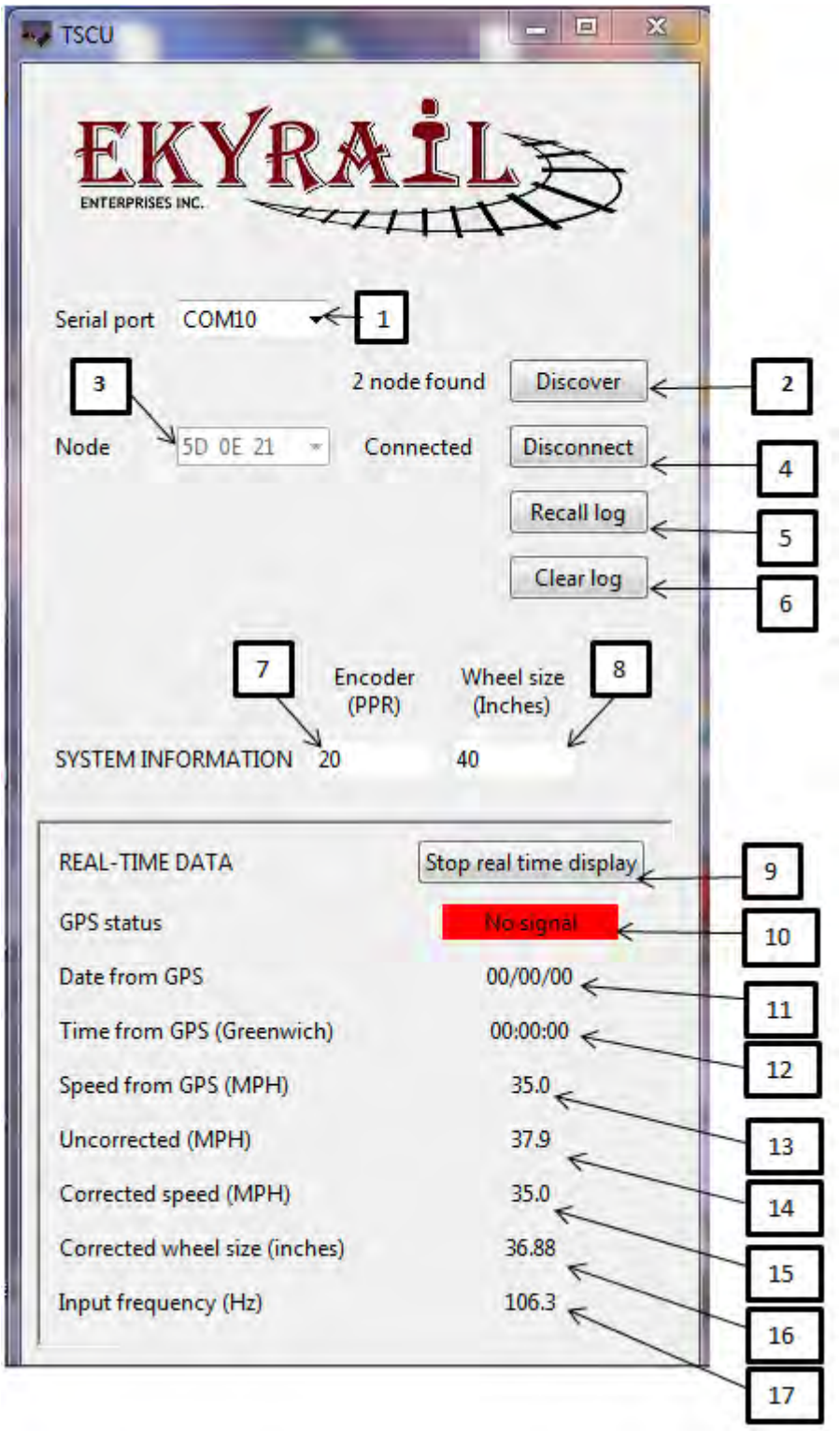
After the wheel size is adjusted, the GPS speed (13) and the corrected speed (15) should be close.

Because it’s need 64 counts average to have a precise wheel size, it’s will take several miles to have the exact wheel size (16). When the exact wheel size is achieved, the GPS speed (13) will match the corrected speed (15).

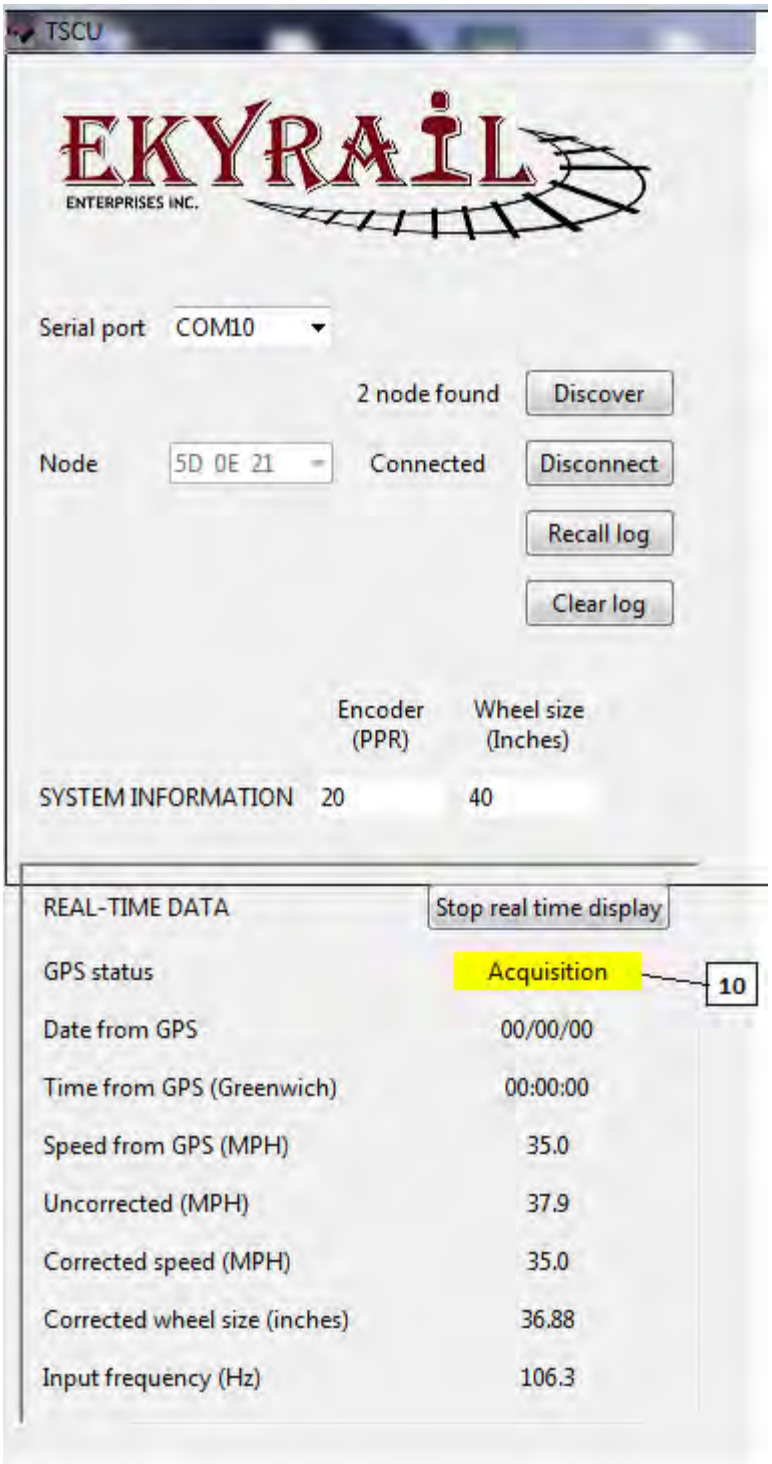
Interface Program.

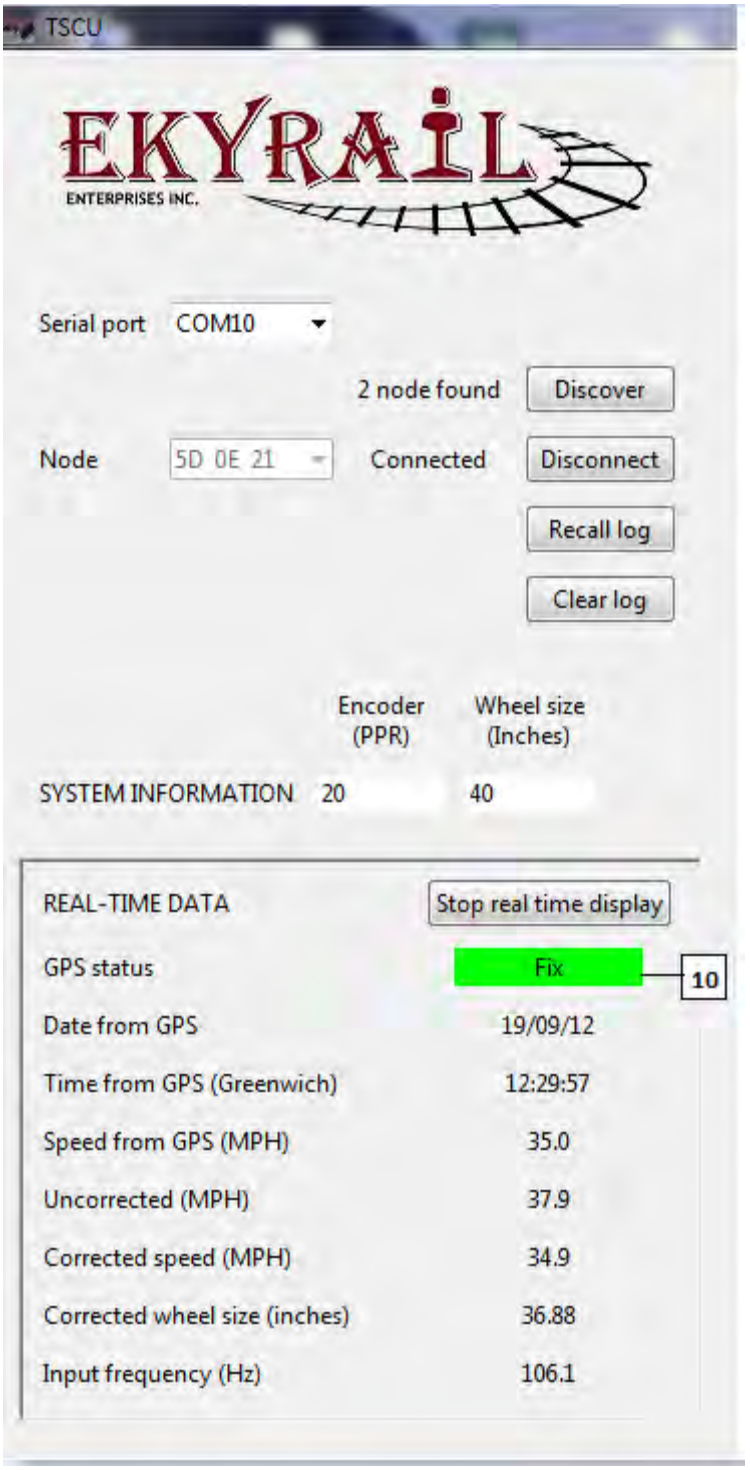
This section will explain the interface program used with the Laptop Computer.
See the screenshot on next page with the identification marker. Install the radio stick in an USB port.

- Communication port on computer, pulling down the menu, chooses the port connected to the radio stick. If more than 1 com, remove the radio stick and restart the program, note the com missing. Reinstall the radio stick, restart the program and chose the com identified previously.
- This button will find all TSCU in radio range, and will show the number of the systems reached. In this example the computer finds two (2) systems.
- By pulling down the bar, 1 of the two, TSCU can be linked, for choosing the right one, the TSCU radio number is punched on the side of the housing and also written on the serial number tag.
- This will connect or disconnect the TSCU from the computer.
- For downloading the stored data from the TSCU to a file. (see procedure below)
- Will erase the TSCU internal log in the memory, this action will not affected the data used for the correction factor.
- Show the Axle generator type on the locomotive, the axle type is automatically detected by the TSCU when the locomotive is moving more than 5 mph for 30 seconds. The GPS signal needs to be present for this action. The system can detect the 20, 60,120,192 and 240ppr axle type.
- Speedometer type, 40 or 42'', this function is set by the Power cable P2. Jumper between pin E and F set the system at 42'' wheel size, no Jumper set at 40''.
- Stop and start real time display
  GPS status, they are tree level (see other display below)
  No Signal = system can't reach any satellite, possible causes: locomotive in the shop, tunnel or a dead location,
  Acquisition = system sees 1 or 2 satellites or not enough for validate a location.
  Fix = system see 3 or more satellites.
- Date from GPS system
- Time from GPS system (Greenwich)
- Speed from GPS, the system will use that value to calculate the correction factor.
- This is the speed calculated from the frequency out of the axle generator. This is the speed that will be displayed on the speedometer if the locomotive is not equipped with a TSCU or if the TSCU is not power up.
- The corrected speed is after the system applies the correction factor to the frequency from the axle generator, in normal condition the GPS speed signal (13) will be identical to the corrected speed and this reading will be the same on the locomotive speedometer.
- The system calculates the exact wheel size.
- Frequency out of the axle generator, this frequency is used for the speed signal combined with the correction factor.


TSCU
EKYRAIL
ENTERPRISES INC.
Serial port
COM10
1
2 node found
Discover
2
3
Node
5D 0E 21
Connected
Disconnect
4
Recall log
5
Clear log
6
7
Encoder (PPR)
Wheel size (Inches)
8
SYSTEM INFORMATION
20
40
REAL-TIME DATA
Stop real time display
9
GPS status
No signal
10
Date from GPS
00/00/00
11
Time from GPS (Greenwich)
00:00:00
12
Speed from GPS (MPH)
35.0
13
Uncorrected (MPH)
37.9
14
Corrected speed (MPH)
35.0
15
Corrected wheel size (inches)
36.88
16
Input frequency (Hz)
106.3
17

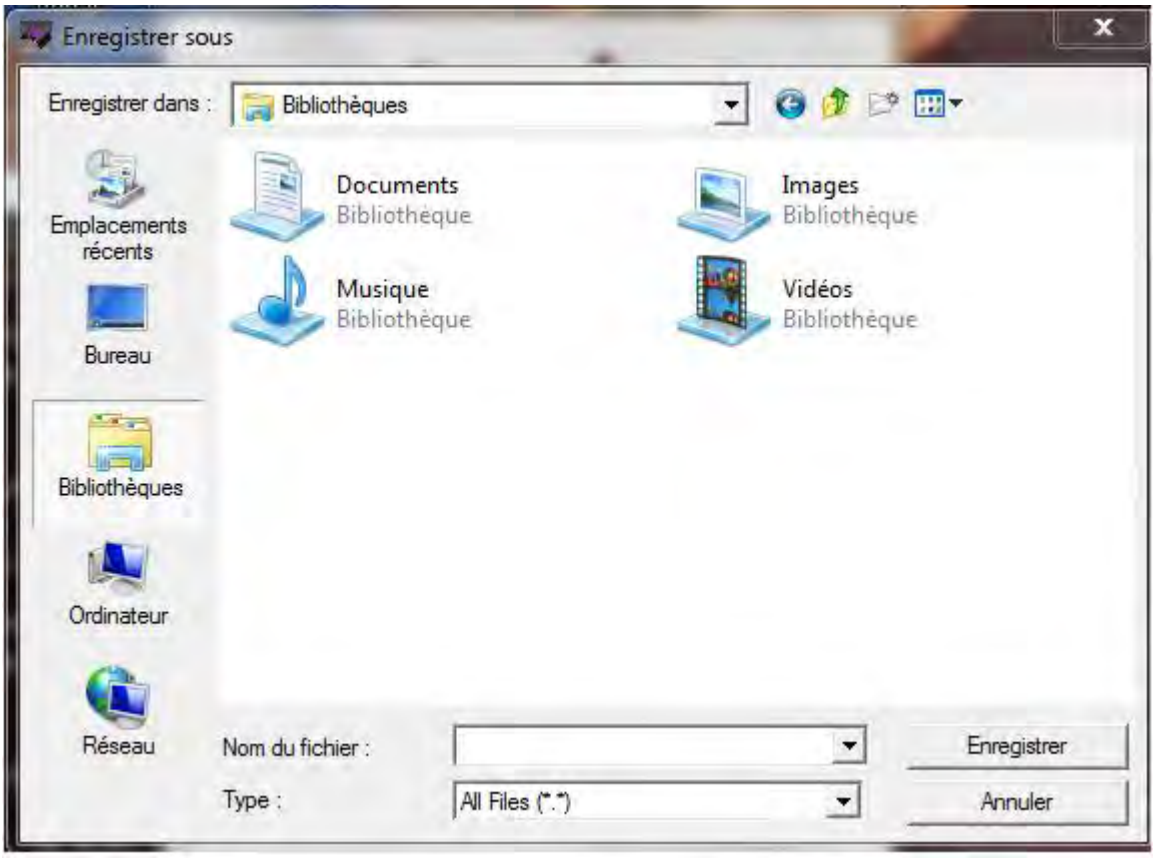
GPS Status


TSCU
EKYRAIL
ENTERPRISES INC.
Serial port COM10
2 node found
Discover
Node 5D 0E 21
Connected
Disconnect
Recall log
Clear log
Encoder (PPR)
Wheel size (Inches)
SYSTEM INFORMATION 20 40
REAL-TIME DATA
Stop real time display
GPS status Acquisition 10
Date from GPS 00/00/00
Time from GPS (Greenwich) 00:00:00
Speed from GPS (MPH) 35.0
Uncorrected (MPH) 37.9
Corrected speed (MPH) 35.0
Corrected wheel size (inches) 36.88
Input frequency (Hz) 106.3


TSCU
EKYRAIL
ENTERPRISES INC.
Serial port COM10
2 node found
Discover
Node 5D 0E 21
Connected
Disconnect
Recall log
Clear log
Encoder (PPR)
Wheel size (Inches)
SYSTEM INFORMATION 20 40
REAL-TIME DATA
Stop real time display
GPS status Fix 10
Date from GPS 19/09/12
Time from GPS (Greenwich) 12:29:57
Speed from GPS (MPH) 35.0
Uncorrected (MPH) 37.9
Corrected speed (MPH) 34.9
Corrected wheel size (inches) 36.88
Input frequency (Hz) 106.1

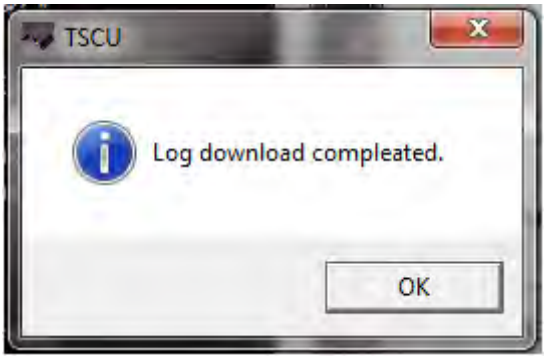
Download log from TSCU

Press recall log (5)



Choose name and location for saving the file,

When the action is done press OK



Maintenance;

There is no required maintenance on this unit other than to confirm it is operational (LED flashing) and not suffering from mechanical damage during the routine inspection and maintenance of the associated equipment.

Chateauguay, Quebec
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