

## Railroad Wheel Sensors and Amplifiers

- True 0 to 150 mph detection
- Unique, Non-Magnetic
- No-Touch Sensing of Wheels
- Can Determine Direction
- Compact Design



### General

### Rail Wheel Sensor

Our railroad wheel sensors and amplifiers are used in main line and yard applications. Dual head (directional) and single head (non-directional) sensors are available for axle counting, speed determination and presence detection. Other uses include actuation of scales, car identification systems, diesel washers, etc.

In rapid transit or commuter railroad applications the sensors can be used as a speed monitor or as backup for setting of signals. If installed at defined intervals, these devices can be used for position control in a master flow control system.

A variety of high and low speed amplifiers are available; contact Western-Cullen-Hayes for the product that is right for your application.

### Principle of Operation

Coils inside the railroad wheel sensor are connected by two wires to a remote amplifier. When the wheel flange of the railroad car enters the high-frequency field of the electronic sensors, the sensor oscillators are dampened, resulting in a change of amplitude. This frequency shift is reflected back to the amplifier, which generates an optical coupler output.

Non-metallic materials such as oil, water, snow, ice, glass, plastic, rubber, etc., do not affect the operation of the internal sensors. Because the sensors are not magnetic, metal shavings will not accumulate on the housing.

## Wheel Sensor Specifications

Single Head Sensor	WCH Part No: 60-1009 Tiefenbach Part No: N59-1R-200-45
Dual Head Sensor	WCH Part No: 50-0902 Tiefenbach Part No: 2N59-1R-200-45

### Operation:

Mounting:	Mounted inside of the rail, 45 mm under the lower edge of the rail. Mounted by bolting to the rail web, or by a rail base clamp type mounting claw.
Actuation:	The sensor is a NAMUR Proximity sensing type device which is actuated by the flange of the wheel passing over the sensor.
Rail Applications:	90RA, 100RE, 100RA, 100ASCE, 115RE, 119RE, 132RE, 136RE & 140RE.
Wheel Diameter Sensed:	300 to 1000 mm.
Wheel Flange Sensed:	20 to 36 mm.
Lateral Wheel Offset:	Up to 50 mm.
Allowable Rail Wear:	18 mm total. After rail wear of 8 mm, the sensor is moved from the lower mounting holes to the upper mounting holes, or re-adjustment of the mounting claw is necessary.

### Specifications:

The wheel sensor must be coupled with an external amplifier and power supply to achieve usable output. Contact Western-Cullen-Hayes with your output requirements and we will determine the proper amplifier for the application.

Sensing Speed:	0 to 150 mph depending on wheel diameter and amplifier type.
Static Sensing Distance:	47 mm, +2mm/-1mm
Hysteresis:	=<2mm in direction of travel.
Repeat Precision:	=<0.5mm nominal. =<0.1mm with constant temperature.
Supply Voltage:	8.2 vdc

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**Specifications Continued:**

Load Un-Dampened:	=>2.65ma
Load Dampened:	=<1.45ma
Admissable Line Resistance:	=<50 Ohm total out and back length of wire run
Tested Breakdown Voltage:	2KV
Lightning Protection:	1.5KW @ 1ms
Operating Temperature:	-40C to +80C

Starting Distance from Center of Sensor:  
Single Head Sensor and  
Dual Head Sensor System I

300mm wheel = 120mm left, 50mm right  
600mm wheel = 140mm left, 70mm right  
1000mm wheel = 160mm left, 100mm right

Starting Distance from Center of Sensor:  
Dual Head Sensor System II

300mm wheel = 120mm right, 50mm left  
600mm wheel = 140mm right, 70mm left  
1000mm wheel = 160mm right, 100mm left

Overlapping Distance from Center of Sensor:  
Dual Head Sensor

300mm wheel = 50mm left, right  
600mm wheel = 70mm left, right  
1000mm wheel = 100mm left, right

**Physical Description:**

Overall Dimensions: 7.25"L x 3"H x 3.5"D

Weight: 5.5 lbs.

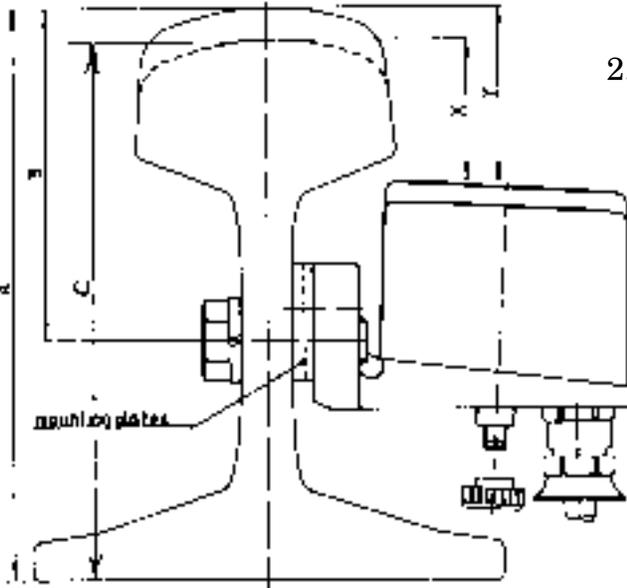
The sensor housing is constructed of polycarbonate synthetics and is resistant to ultra-violet, grease, oil, salt and certain acids, as well as being resistant to lightning strikes to the rail. The base of the sensor is constructed of brass. The standard cable supplied is 16 feet long, 18ga. Sitoflex and is encapsulated into the sensor.

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### Mounting To Used Rail



1. Grind all overflow from the top and side of the rail head.
2. To determine dimension "B", measure the height of the rail in millimeters at the location the sensor is to be placed. This will become dimension "C". Compare "C" to "A" as listed in the chart below.
  - a. If "C" is from 1 to 5 millimeters less than "A", deduct the difference from dimension "B". Drill holes and install proper spacer plates.
  - b. If "C" is from 6 to 10 millimeters less than "A", deduct 5 millimeters from dimension "B". Drill holes and install proper spacer plates.
  - c. If "C" is more than 10 millimeters less than "A", do not attempt to mount the sensor. The rail is worn too far for sensor operation.

MOUNTING TO NEW RAIL								
Rail Size	New Rail Height (A) In mm	Mounting On New Rail		Measured Rail Wear In mm		Mounting Holes	Distance Plates	Distance Plate Thickness
		(Y)	(B)	(X)	(B)			
90 RA	142.9	45 mm	86 mm	>37 =<37	>80 =<80	Lower Mounting Not Possible	None	
100 RE	152.4	45 mm	86 mm	>37 =<37	>80 =<80	Lower Mounting Not Possible	Blue	1.5 mm
100 RA	152.4	45 mm	86 mm	>37 =<37	>80 =<80	Lower Mounting Not Possible	Orange	1.0 mm
115 RE	168.3	45 mm	86 mm	>37 =<37	>80 =<80	Lower Mounting Not Possible	None	
119 RE	173.0	45 mm	86 mm	>37 =<37	>80 =<80	Lower Mounting Not Possible	Orange	1.0 mm
132 RE	181.0	45 mm	86 mm	>37 =<37	>80 =<80	Lower Upper	Green None	3.6 mm
136 RE	185.7	45 mm	86 mm	>37 =<37	>80 =<80	Lower Upper	Orange/Gray Blue	4.3+1.3mm 1.5 mm
140 RE	185.7	45 mm	86 mm	>37 =<37	>80 =<80	Lower Upper mm	Orange/Orange Brown	4.3+1.0mm 2.0

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## **Wheel Sensor Products and Accessories**

Single head rail wheel sensor.

WCH Part No: 60-1009  
Tiefenbach Part No: N59-1R-200-45

Dual head rail wheel sensor.

WCH Part No: 50-0902  
Tiefenbach Part No: 2N59-1R-200-45

Wheel sensor marking template. Center punches drilling location for single or dual head sensors on all rail sizes.

WCH Part No: 60-3010

Wheel sensor mounting claw. Clamps to rail base. 4-way adjustable. Brass construction.

WCH Part No: 60-1100  
Tiefenbach Part No: SSK-6

Terminal housing with 18" riser, terminal blocks and 3 ft. piece of 1/2" sealtite and fittings for connection of 1 wheel sensor to the field run.

WCH Part No: 1155-161-E

Other configurations of field terminal housings available upon request.

Electronic sensing range adjustment device. For use with dual head sensor Part No. 2N59-1R-200-45 and single head sensor Part No. N59-1R-200-45.

WCH Part No: 60-3042  
Tiefenbach Part No: R58/37

Requires sensing range measurement device Part No. 60-3020, and battery charger Part No. 60-3059-1, purchased separately.

Sensing range measurement device. For use with dual head sensor,  
Part No. 2N59-1R-200-45 and single head sensor Part No. N59-1R-200-45.

WCH Part No: 60-3020  
Tiefenbach Part No: SSPV-1

Battery charger for sensing range adjustment device.

WCH Part No: 60-3059-1

Wheel Sensor Adjusting Tool.

WCH Part No: 60-3060  
Tiefenbach Part No: EW-1

## Wheel Sensor Amplifier Specifications

Non-Directional, High-Speed Amplifier

WCH Part No: 60-2004

Tiefenbach Part No: 4AB10/1105/3

Switching Speed: 0 - 150 mph

Sensor Application: 4 - 60-1009 single head sensors  
or 2 - 50-0902 dual head sensors

### Specifications:

Supply Voltage: 12VDC -10/+20%  
24VDC (special order)

Load: Normal operation: 80ma  
Open condition: 170ma  
Short condition and operation of test  
button: 280ma

### Sensor Input:

Lightning Suppression: 1.5kw/1ms

No-Load Sensor Voltage: 8.0VDC  $\pm 2.5\%$

Voltage at Un-Dampened Sensor: <5.35V

Voltage at Dampened Sensor: >6.7V

Internal Resistance: 2500 ohm  $\pm 5\%$

Voltage at Make: 1.55V +5, -1%

Voltage at Break: 1.75V +1, -5%

**Amplifier Outputs:** 2 AZ and 2 AK outputs per sensor system.  
1 fault output per 2 sensor systems.

**Output Description:**

AZ: Output starts 2ms after wheel sensed and ends 2ms after wheel passes.  
AK: Output starts when wheel is sensed and ends 85ms after wheel passes.  
Fault: Output on anytime a cable open or short is present. Red LED indication  
Minimum AZ output time = 8ms  $\pm$ 5%  
Minimum AK output time = 8ms  $\pm$ 5% + 85ms  $\pm$ 30%

All AZ and AK outputs activate when system test button is depressed.  
Amber LED illuminates when wheel is sensed and output is on.

**Optocoupler Output Specifications:** Electrically isolated between sensor inputs and supply voltage.

**Switching Voltage:** 0 - 80VDC with ICEO < 50 $\mu$ A

**Switching Load:** 100ma

**Voltage Drop:** <1.5V at 100 ma

**Temperature:** -40 to 65 $^{\circ}$ c  
<70% relative humidity

**Dimensions:** Eurocard standard  
160 x 100 mm. front plate width = 5 hp.

**Connections:** 48 pin connector. Type F DIN41612

Requires single mounting box, WCH Part No: 60-2102, or mounting rack. Consult Western-Cullen-Hayes for information.

**Over 50 different transducer amplifiers are available.  
Please call to discuss your special requirements.**

## Wheel Sensor Amplifier Specifications

Directional, Low-Speed Amplifier  
WCH Part No: 60-2040  
Tiefenbach Part No: 2ARB4/1204

Switching Speed: 0 - 37 mph  
Sensor Application: 1 - 50-0902 dual head sensor

### Specifications:

Supply Voltage: 12VDC -10/+20%  
24VDC (special order)  
Load: Normal operation: 40ma  
Short condition and operation of test  
button: 90ma

### Sensor Input:

Lightning Suppression: 1.5kw/1ms  
No-Load Sensor Voltage: 8.0VDC  $\pm 2.5\%$   
Current at Un-Dampened Sensor:  $>2.5\text{ma}$   
Current at Dampened Sensor:  $<1.45\text{ma}$   
Internal Resistance: 1000 - 2000 ohm  $\pm 5\%$   
Current at Make: 1.55ma +5, -1%  
Current at Break: 1.75ma +1, -5%

### Amplifier Outputs:

1 for sensor system I  
1 for sensor system II  
1 for direction I - II  
1 for direction II - I  
1 fault output

## Amplifier Outputs Continued

### Output Description:

System Outputs: Starts 2ms after wheel is sensed and ends 2ms after wheel passes.  
Minimum output time 18ms  $\pm 2\%$

Directional 1 Output: Pulses at 50ms  $\pm 15\%$   
After the following sequence occurs.

1. Wheel covers system I
  2. Wheel covers system I and II
  3. Wheel un-covers system I
  4. Wheel un-covers system II
- Reverse sequence for opposite direction  
Fault output: Output on anytime a cable short or open is present. Red LED indication.

An amber LED illuminates when wheel is sensed and output is on. System test buttons located on front panel.

Optocoupler Output Specifications: Electrically isolated between sensor inputs and supply voltage.

Switching Voltage: 0 - 80VDC with  $ICEO < 50\mu A$

Switching Load: 100ma

Voltage Drop:  $< 1.5V$  at 100 ma

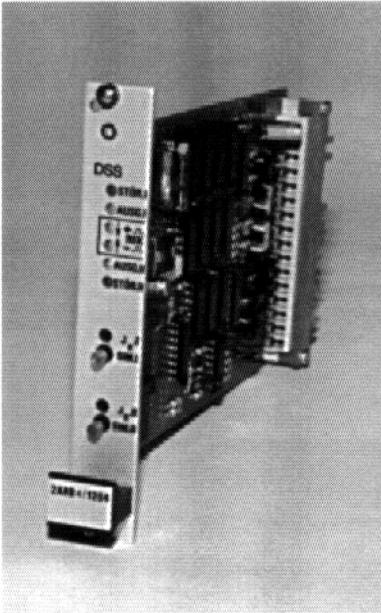
Temperature: -40 to 65°c  
 $< 70\%$  relative humidity

Dimensions: Eurocard standard  
160 x 100 mm. front plate width = 4 hp.

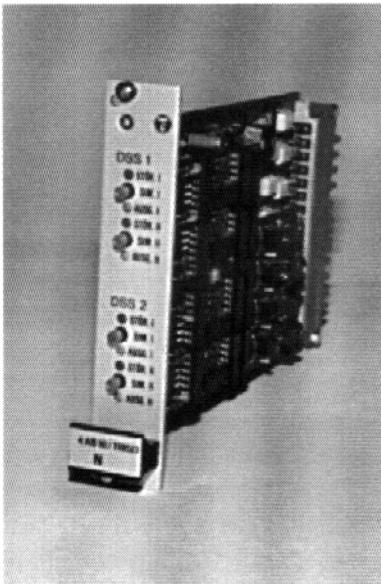
Connections: 48 pin connector. Type F DIN41612

Requires single mounting box, WCH Part No: 60-2102, or mounting rack. Consult Western-Cullen-Hayes for information.

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**Directional  
Low-Speed Amplifier  
60-2040**



**Non-Directional  
High-Speed Amplifier  
60-2004**