



# ***PRIAS***<sup>®</sup>

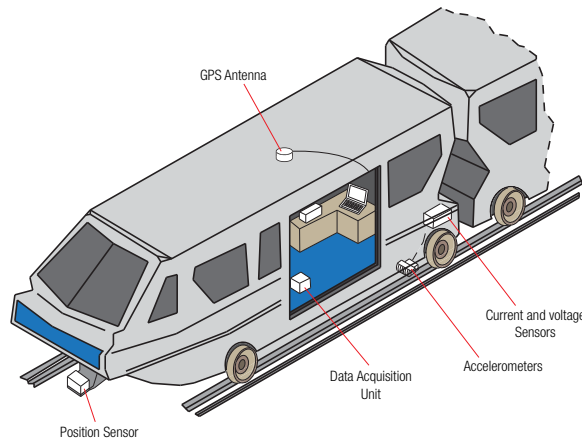
## **Power Rail Intelligent Analysis System**



# Conductix Wampfler *PRIAS*®

## Analysis of 3<sup>rd</sup>, 4<sup>th</sup> and AC Rail Systems

- **Anticipate** critical power rail failures before they occur.
- **Locate** power rail conditions that adversely affect collector shoe gear.
- **Prioritize** limited power rail maintenance resources more effectively.



- **Utilize** maintenance windows by creating an effective power rail PM program.
- **Verify** the condition of new power rail systems with pinpoint accuracy at commissioning while establishing a baseline for system condition over time.

## 200 KHz Possible Sampling Provides a Detailed Analysis of These Critical Factors

### Collector/Shoe Gear Impacts

Collector/shoe gear is the critical link between the trains and the power rail. PRIAS monitors collector impact, bounce, and arcing to provide an accurate assessment of the power rail contact surface.



### System Voltage at All Points on the Line and at Feed Points

Voltage loss can have a detrimental effect on available power to your trains. PRIAS can measure system voltage variations due to high resistance at splices or cable connections or current leakage at failing insulators. With simultaneous voltage measurement at substations/feedpoints, PRIAS provides a complete system assessment.



### Individual & Total Collector Current at All Points on the Line

In an ideal world, collector currents are steady and balanced. In the real world, current imbalances can affect train performance and power rail condition. PRIAS identifies locations of excessive current demand and potential power rail damage.



### System Trend Analysis to Guide Preventive Maintenance Programs

All power rail systems suffer from wear and tear. Periodic PRIAS evaluations can identify trends of wear and system decay. This enables you to focus your maintenance resources on specific, critical areas of concern and make the most of limited maintenance time windows.





# Conductix Wampfler *PRIAS*®

## Collector Shoe Impact Event Logging and Mapping

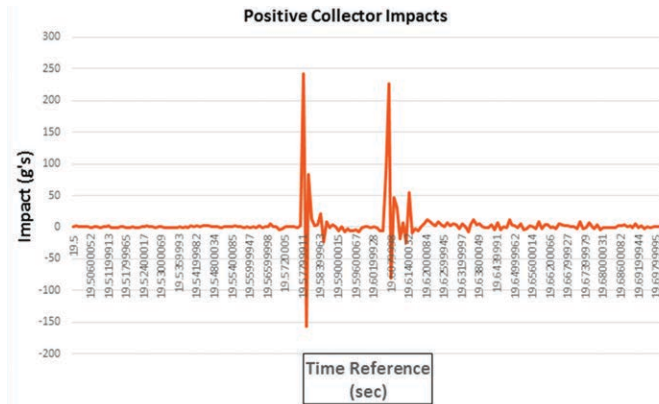
PRIAS can capture rapid, short duration collector bounce, impact, and arc flash. Collector impacts increase wear and tear on shoe gear. Collector bounce interrupts current flow (power loss) while producing electrical arcs damaging to power rail and collector shoes.

The table and graph below show actual collector impact data. When merged with precise positioning information, critical collector impacts can be mapped (shown below), directing maintenance teams to problem areas.

### PRIAS Generated System Data

Running Time	Negative Accelerometer	Postive Accelerometer	Current_1	Current_2	Current_3	Voltage_2	gps_Time_Sec	gps_Time_Min	gps_Time_Hr	gps_Lat	gps_Long	gps_Speed	Calculated_Power	Current_Sum	Voltage_Moving Avg
19.578	0	242.7402039	172.85156	51.391602	140.99121	769.4633	23.48	33	15	19.02749	72.87733	47.839844	281034.438	365.2344	764.1523438
19.579	-0.723737001	-157.0809174	172.9126	51.635742	141.54053	769.4633	23.49	33	15	19.02749	72.87733	47.839844	281691.938	366.0889	764.0487671
19.58	0.482491344	83.79205322	173.03467	52.001953	141.90674	767.6127	23.5	33	15	19.02749	72.87733	47.839844	281670.375	366.9434	763.9574585
19.581	-0.482491344	13.77083874	173.03467	52.246094	142.54761	771.6223	23.5	33	15	19.02749	72.87733	47.839844	283824.563	367.8284	763.8692017
19.582	0	2.800848484	173.0957	52.490234	142.91382	771.9307	23.5	33	15	19.02749	72.87733	47.839844	284456.281	368.4998	763.7157593
19.605	-0.482491344	-6.06850481	175.84229	59.570313	153.9917	765.1451	23.5	33	15	19.02749	72.87732	48.007813	297950.813	389.4043	763.8431396
19.606	-0.241245672	87.29311371	175.96436	59.997559	154.81567	761.7524	23.5	33	15	19.02749	72.87732	48.007813	297675.75	390.7776	763.9075928
19.607	-0.964982688	226.4019165	176.26953	60.241699	155.18188	762.215	23.5	33	15	19.02749	72.87732	48.007813	298554.375	391.6931	763.9697266
19.608	-0.723737001	-80.05758667	176.3916	60.48584	155.82275	762.0608	23.5	33	15	19.02749	72.87732	48.007813	299261.406	392.7002	764.0733032
19.609	0	46.44740295	176.3916	60.668945	156.28052	759.9018	23.5	33	15	19.02749	72.87732	48.007813	298900.594	393.3411	764.175354

### Positive Collector Impact



### Collector Impact Map





# Conductix Wampfler *PRIAS*® System Voltage Logging and Mapping

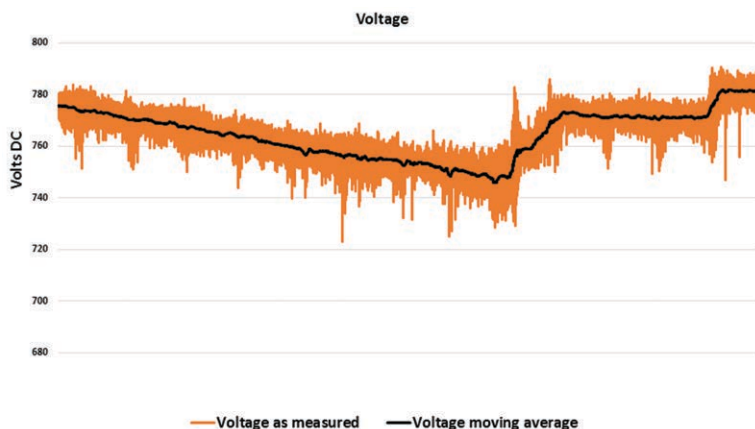


Voltage variation due to location and vehicle demand is common along power rail systems. PRIAS helps identify out-of-specification voltage variations. Comparison of raw voltage data with moving average data discriminates between noise and spurious signals from prolonged voltage events. Customer specified thresholds ensure accurate voltage assessment.

Mapping system voltage to predicted voltage can identify areas of excessive resistance due to loose power rail splices or excessive current leakage at insulators. Directing maintenance teams to specific problem areas before critical failures occur maximizes the effectiveness of your limited maintenance resources and time windows.

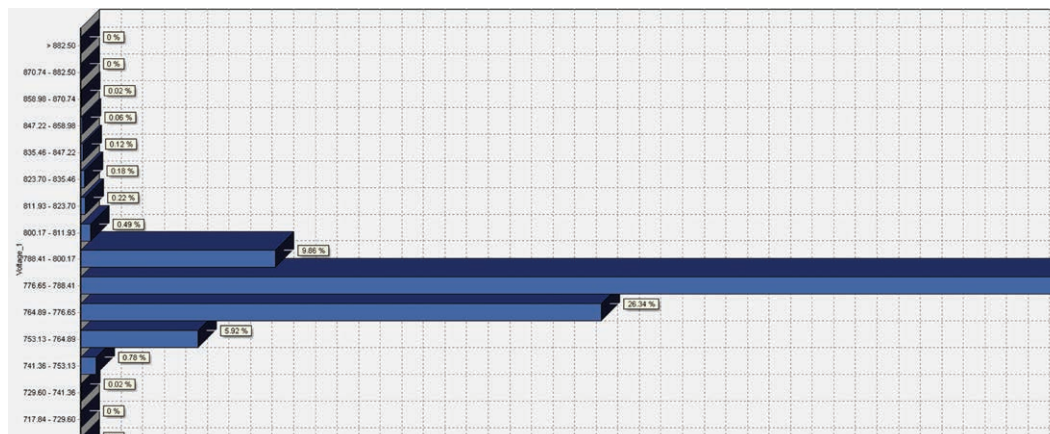
## PRIAS Generated System Data

time	Negative	Positive	A	Current_1	Current_2	Current_3	Voltage_1	gps_Time	gps_Time	gps_Time	gps_Lat	gps_Long	gps_Speed	Calculate	Current_5	Voltage_1
70.348	-1.20623	1.16702	394.165	198.4253	567.7185	737.2318	45.2	23	15	19.03077	72.87793	51.59766	855416.5	1160.309	747.5229	
70.349	-0.24125	0.466808	393.6157	198.9746	567.3523	745.4053	45.2	23	15	19.03077	72.87793	51.59766	864627.4	1159.943	747.5237	
70.35	0.241246	1.16702	393.0664	199.646	566.8945	746.639	45.2	23	15	19.03077	72.87793	51.59766	865807.8	1159.607	747.5106	
70.351	0.482491	-1.16702	392.7612	200.3784	566.803	743.2463	45.2	23	15	19.03077	72.87793	51.59766	862123.1	1159.943	747.503	
70.352	-0.24125	0	392.2119	201.1108	566.2537	747.5643	45.2	23	15	19.03077	72.87793	51.59766	866857.9	1159.576	747.4976	
70.353	-0.48249	-0.2334	391.6626	201.7212	565.979	737.5402	45.2	23	15	19.03077	72.87793	51.59766	855076.7	1159.363	747.4961	
70.354	-0.48249	0.700212	391.2354	202.5757	565.6128	746.3306	45.2	23	15	19.03077	72.87793	51.59766	865313.5	1159.424	747.4815	
70.355	-0.24125	0.466808	390.7471	203.3691	565.2466	743.2463	45.2	23	15	19.03077	72.87793	51.59766	861692.1	1159.363	747.4807	
70.356	0.723737	1.633828	390.1978	204.0405	564.7888	747.5643	45.2	23	15	19.03077	72.87793	51.59766	866447.3	1159.027	747.4915	
70.357	0.241246	0.933616	389.8315	204.895	564.5142	736.1522	45.2	23	15	19.03077	72.87793	51.59766	853377.6	1159.241	747.447	
70.358	1.447474	0.466808	389.2212	205.5664	564.1479	731.5257	45.2	23	15	19.03077	72.87793	51.59766	847791.1	1158.936	747.4393	
70.359	0.723737	0.466808	388.6108	206.2378	563.6902	741.2414	45.2	23	15	19.03077	72.87793	51.59766	858756.9	1158.539	747.4102	



## Voltage Histogram

## Voltage Segment Map



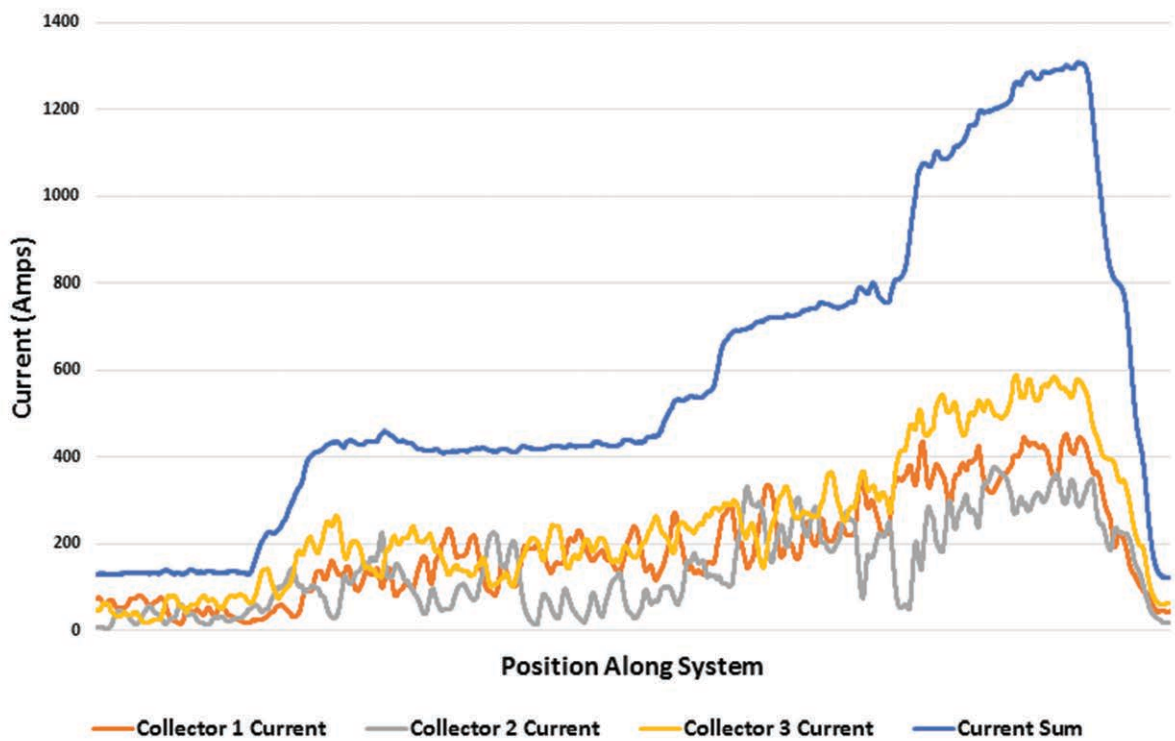


# Conductix Wampfler *PRIAS*<sup>®</sup> System Current Logging and Mapping

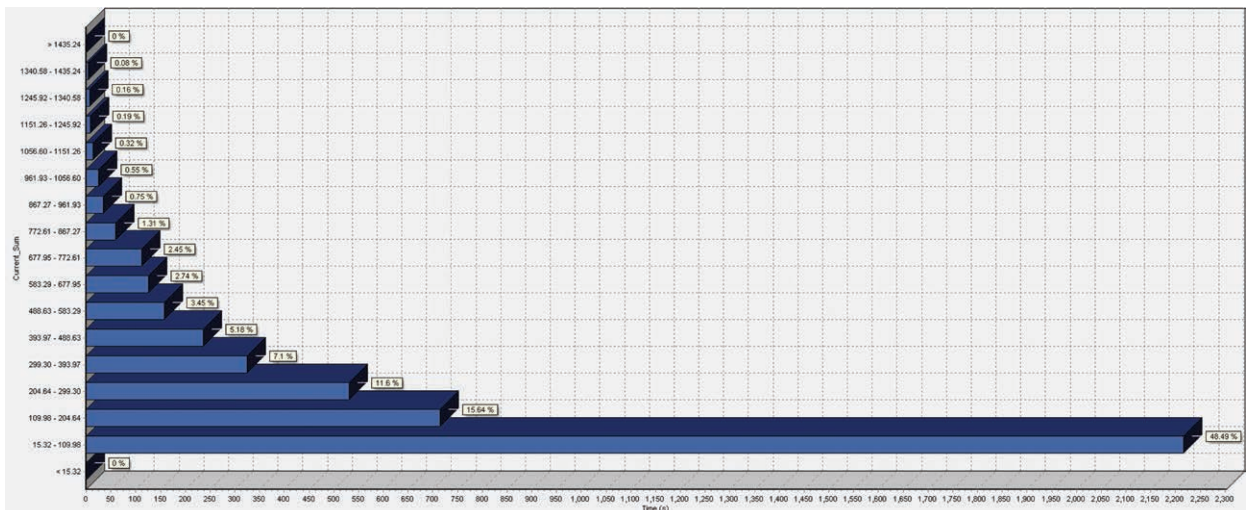
PRIAS provides individual collector and complete vehicle current. This indicates current balance between collectors, as well as individual collector current load, and total vehicle current demand. Mapping excessive current demand to position may

direct maintenance personnel to areas of excessive electrical erosion of the 3rd rail. Current histograms provide insight to current demand on a system loop or specific area of track.

Current Collector Map: Current Versus Location



Current Histogram





# Conductix Wamplfer *PRIAS*®

## The PRIAS Analysis Process



- Step 1:** Conductix coordinates with the customer to ensure vehicle availability for set-up, data collection and return to service.
- Step 2:** Conductix technicians temporarily configure the vehicle with sensors and the data acquisition and processing module.
- Step 3:** The vehicle is operated in the revenue service profile for 2 to 4 runs along the system. This ensures data integrity and verification of significant events.
- Step 4:** Equipment is removed and the vehicle is returned to revenue service.
- Step 5:** Conductix engineers analyze, and review the data to identify locations of high collector

impact, significant voltage events and trends of excessive current demand or imbalance.

- Step 6:** A complete report with raw data, filtered data, and mapping of significant events is provided to the customer.
- Step 7:** Data is reviewed with the client and may include a system walk-through to assist with correlation of events to specific power rail conditions on the system.

The complete PRIAS evaluation typically takes two to four days, depending on system length.

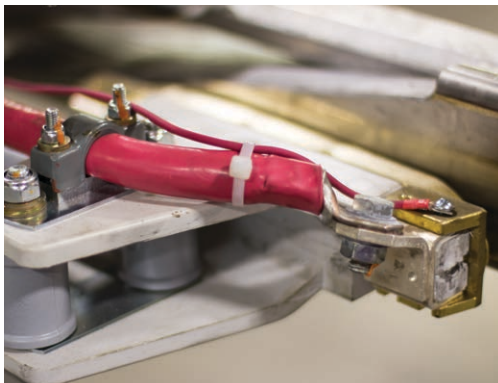
**PRIAS compact unit** (11" x 11" x 6"/280mm x 280mm x 150mm)



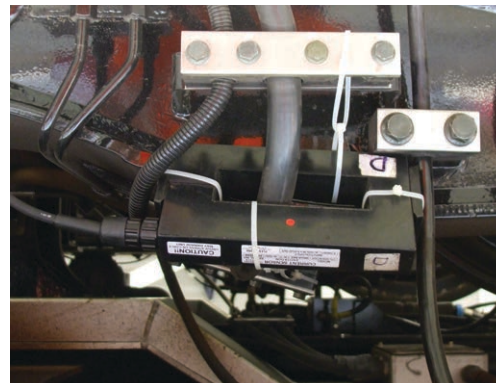
**Collector arms with accelerometers attached**



**Voltage Sensor**



**Current Sensor**



# Conductix Wampfler *PRIAS*®

## PRIAS Evaluation Case Studies

### Case Study #1

**Problem:** Power rail had become severely and prematurely damaged in several locations due to electrical erosion.

**A *PRIAS* evaluation revealed:**

- Too few collectors for current demand.  
**Solution:** The customer added the necessary collectors.
- Severe electrical erosion on the downtrack side of a power rail isolating gap due to vehicle acceleration.  
**Solution:** The power isolating gap was repositioned to a location of vehicle deceleration.
- Overall peak current demand of the vehicle exceeded the power rail specification.  
**Solution:** The vehicle speed/acceleration profile was modified to bring peak current within specifications without affecting revenue timing/headways.



### Case Study #2

**Problem:** Collectors were severely damaged during system operation.

**A *PRIAS* evaluation revealed:**

- Switch elements had worn causing misalignment of the power rail across the switch gaps. Collectors were unable to negotiate the misalignment and were becoming damaged.

**Solution:** Switch elements were realigned and switch inspection and alignment were included in the system Preventive Maintenance schedule.

**Solution:** Quarterly *PRIAS* evaluations assist the customer with their Preventive Maintenance Program.

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