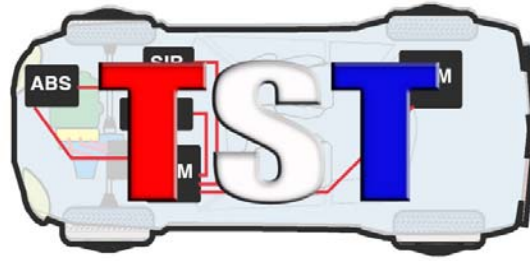


October 2014



Technicians Service Training

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Upcoming Seminars:

New Seminar in January 2015

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Editor

"G" Jerry Truglia
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"Random Misfire - 2001 New Flyer Bus"

I understand that most TST members don't work on diesels buses, but a misfire is a misfire. As you read through this article you will find a good deal of information that will help you diagnosis other misfires.

- The bus had a random misfire and black smoke on acceleration.
- The first thing I did was I checked for Engine codes and I had no codes.
- At this point the random misfire was gone when I had it in the shop.
- So the next test I decided to do was a cylinder cut-out test with Cummins Insite.

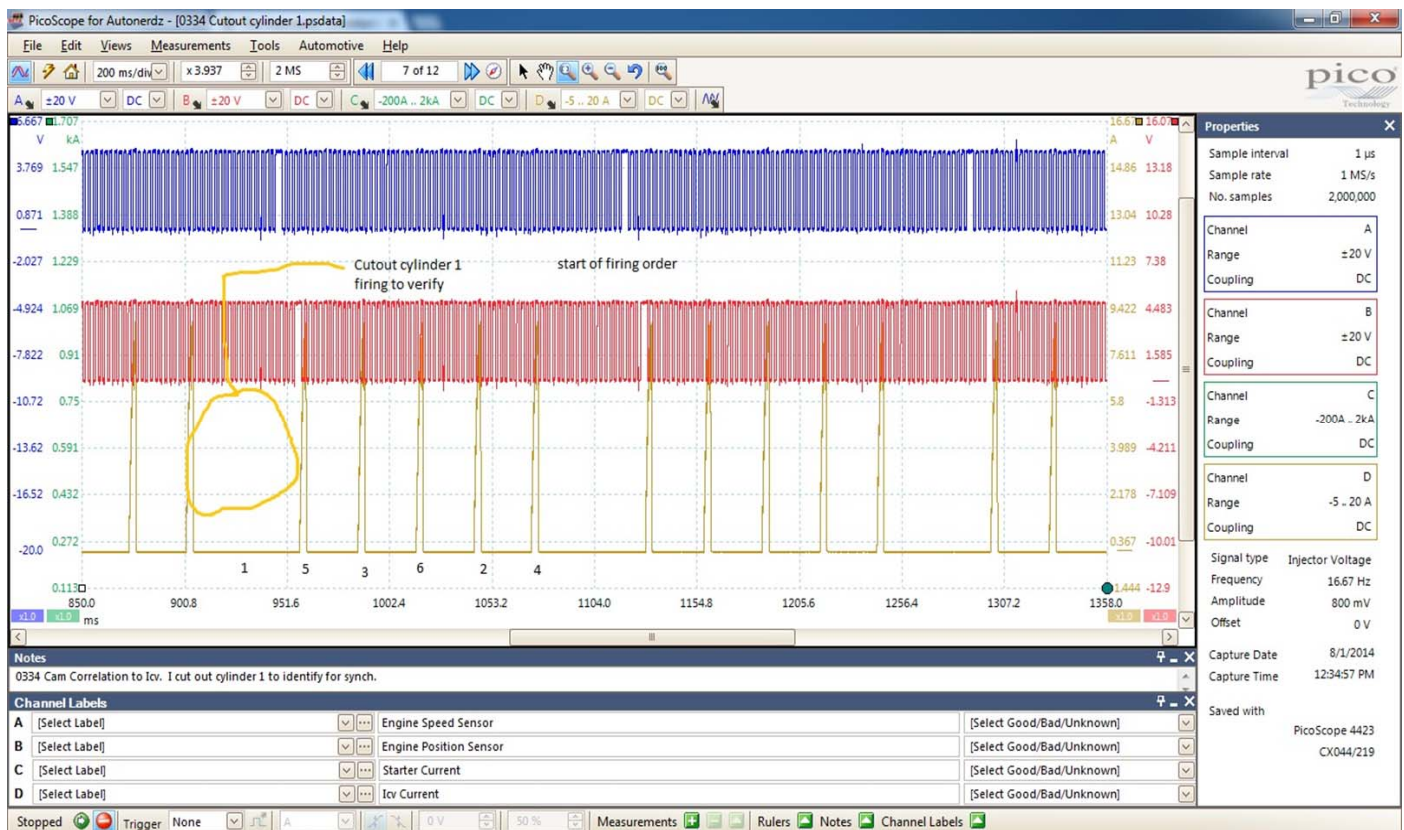
By using Insite you tell the computer when you want it to stop metering fuel with the Injection Control Valve.

The computer looks at Engine Position and Engine Speed and then stops fuel metering at the exact moment for the cylinder that you want to cut out. You then look at rpm drop and compare the rpm drops to other cylinders. Just like on a gas Engine.

(Con't on page 3)

"Random Misfire - 2001 New Flyer Bus" (con't from p. 1)

Here is an example showing me using Insite to cut out a cylinder so I can verify which cylinder is no.1 by looking at my Pico Scope.



Cylinder Cut Out test shown on Pico Scope

So after doing the cutout test I found two of the six cylinders not contributing evenly and the problem was intermittent when I did the cutout test. At this point my Foreman and I decided that we needed to do injectors on this bus. We made the decision to replace all six at this time so it wouldn't come back again any time soon. So while waiting on injectors I decided on my lunch break I would scope the accumulator pressure sensor signal wire and see if I could see the intermittent events with the pressure to the injectors.

(Con't on page 4)

What is TST?

TST is a group of dedicated technicians and instructors committed to the continuing education of our fellow technicians. We provide training seminars to technicians at a reasonable price. TST brings our members nationally known instructors and state of the art training.

Our Goal & Mission Statement

- *Keep our fellow technicians up to date with the latest technology.*
- *Provide training seminars for a reasonable price.*
- *Deliver information that the technician can use now.*
- *Keep technicians informed of information affecting our industry.*
- *Increase consumer awareness of what a good technician is.*

Why join TST?

TST membership includes special pricing on weekday night seminars and the occasional full Saturday seminar. With a **\$75.00 yearly membership**, the seminars are only **\$65.00**. **TST seminars are NOT sales or product seminars.** The instructors that TST brings in are all “hands-on” industry experts with up to date, cutting edge knowledge that you can use in your shop the next day. That’s 65 dollars for a seminar in which you are able to learn something useful, for fixing those tough jobs that we all see on a regular basis. Our instructors are masters at making the complex understandable. Membership also includes a newsletter full of real world technical articles, diagnostic case studies, and solutions to the kinds of problems you see in your bays each week.

The following are some of TST’s regular instructors:

Bernie Thompson of ATS

John Thornton of Autotrain Inc.

Wayne Colonna of ATSG

Jorge Menchu the “Labscope Guru,” AES Wave

John Anello of Auto Tech On Wheels

Mark Warren of Motor Magazine

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Information contained in this newsletter is intended for use by professional auto repair technicians familiar with approved vehicle repair procedures. The authors are not responsible for physical injury or property damage resulting from the incorrect application of information or procedures outlined in this volume.

Currently there are **TST chapters in Connecticut, Massachusetts, New Jersey, New York** and membership continues to grow. For more information you can call **TST** headquarters at:

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"Random Misfire - 2001 New Flyer Bus" (con't from p. 2)

Accumulator Pressure Sensor Signal with Pico Scope



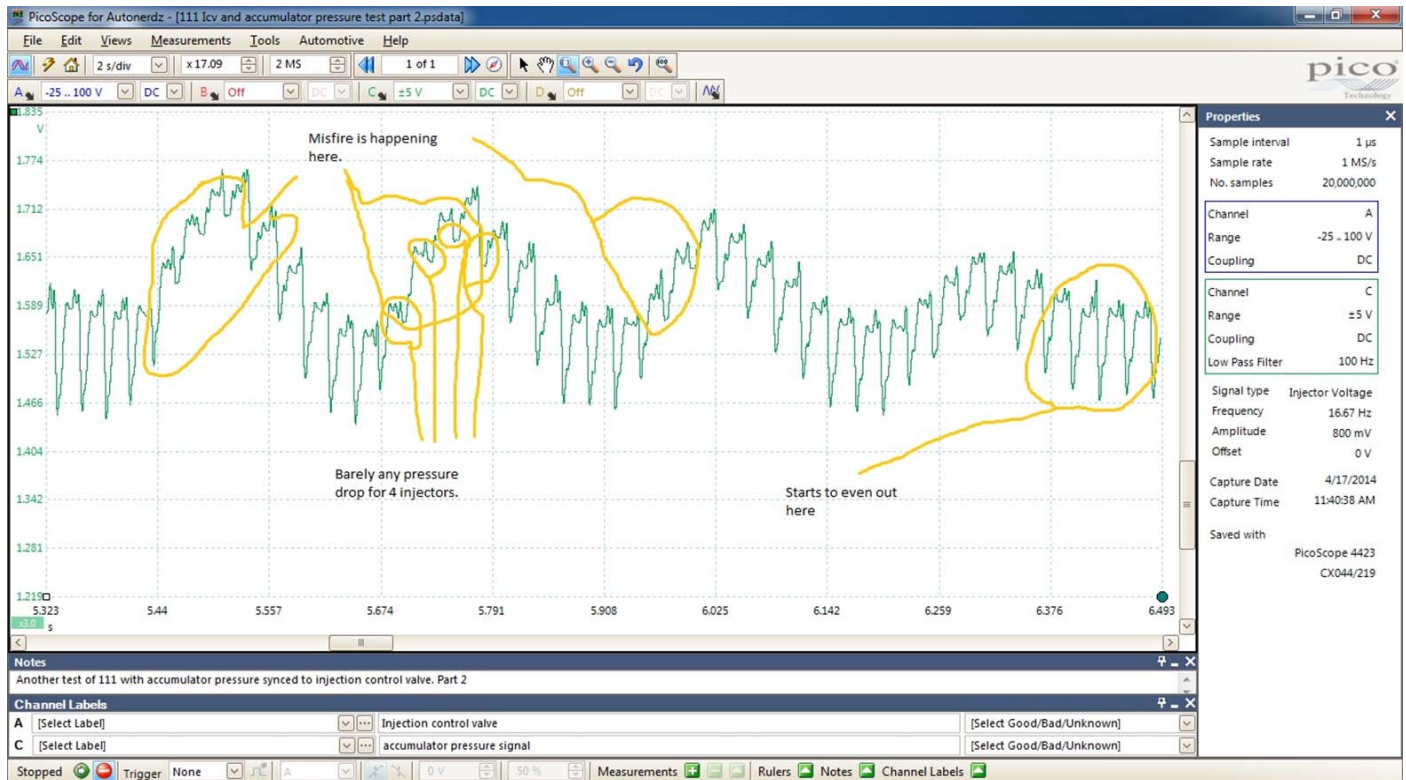
On the waveform, what do we see? The pattern does not look frequent. Supposedly 2 of the Injectors are bad because on the cutout they failed. The above labscope waveform picture is zoomed in.

Looking at the next waveform screen shot we see barely any pressure drop of the 4 Injectors

(Con't on page 4)

"Random Misfire - 2001 New Flyer Bus" (con't from p. 4)

Barely any pressure drop on 4 Injectors



What I see so far has made me a little skeptical to be honest. If I had injectors failing, you would think the misfire would be repeatable. However with this bus, it was not repeatable, the misfire seems to clear up after awhile.

I have seen injectors stick open intermittently and then stick closed, but nothing like this. With the information I collected my foreman and I decided to replace all six injectors. I left for the day and the bus was put back into service, time would tell if it was repaired or not. Well it seemed like it was repaired but by lunch break the bus returned with the same complaint, black smoke on acceleration. So at this point I'm trying to think what else could cause this problem, the air filter checked out good, and boost pressure as well along with being verified on scan data reading around 38 to 40 inches of mercury. There were no other visible problems could be seen on scan data, besides there were no codes. There is also a data PID for the injection control valve circuit that would display a fault if one was present. The circuit status displayed, normal.

(Con't on page 7)

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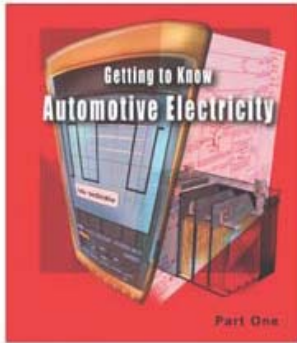
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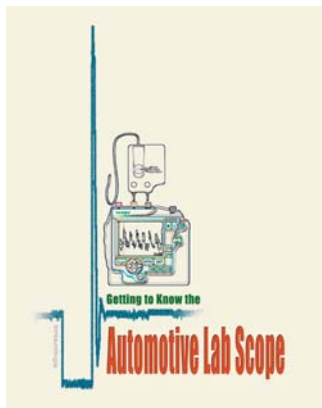
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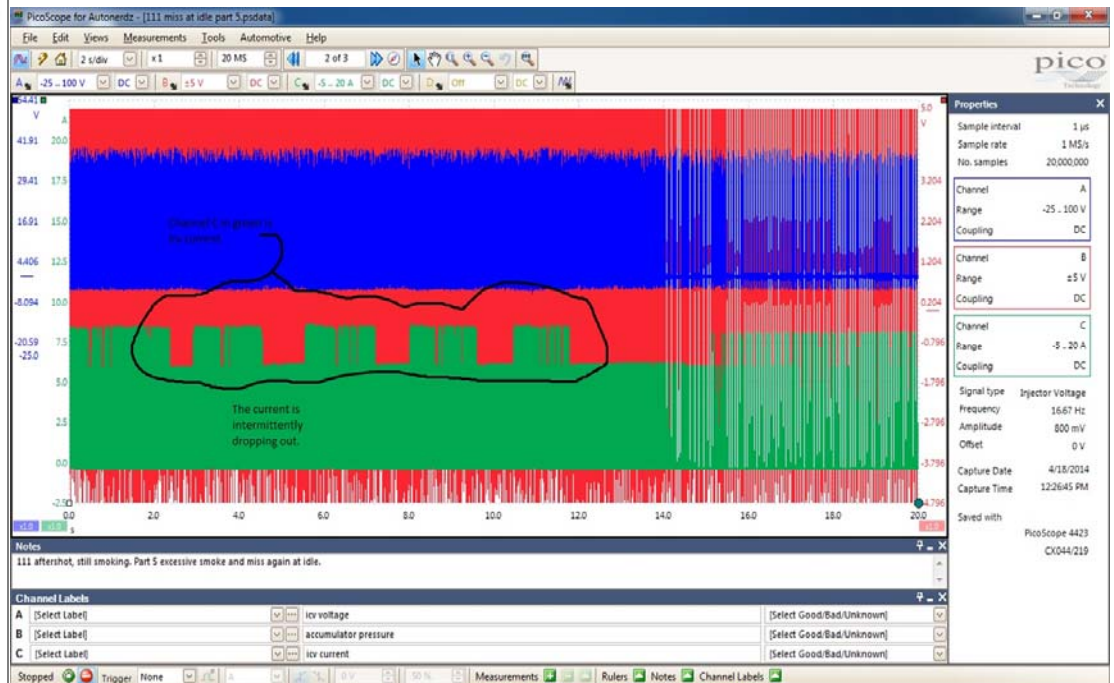
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"Random Misfire - 2001 New Flyer Bus" (con't from page 5)

Even though everything checked out ok, I decided to hook up my scope to the Injection Control Valve on the Caps Pump because this valve is the main output to control fuel metering to all the cylinders.



Bingo !

- Channel A is ICV Positive Voltage signal.
- Channel B is Accumulator Pressure.
- Channel C is ICV Current.
- The Current is dropping out intermittently.
- In the next slide I have zoomed in to show more detail

(Con't on page 9)

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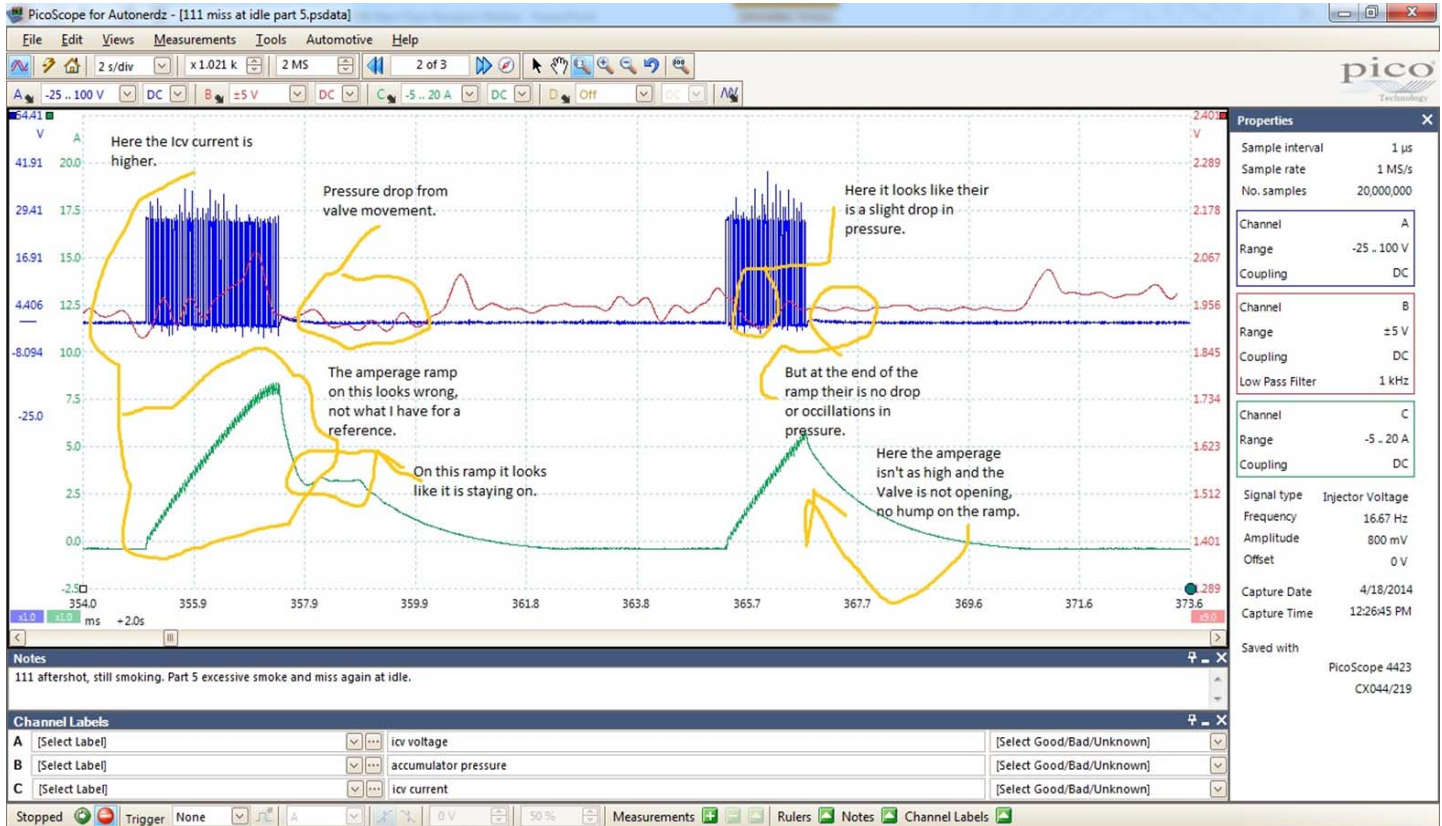


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"Random Misfire - 2001 New Flyer Bus" (con't from p. 7)

What is going on with the Amperage?

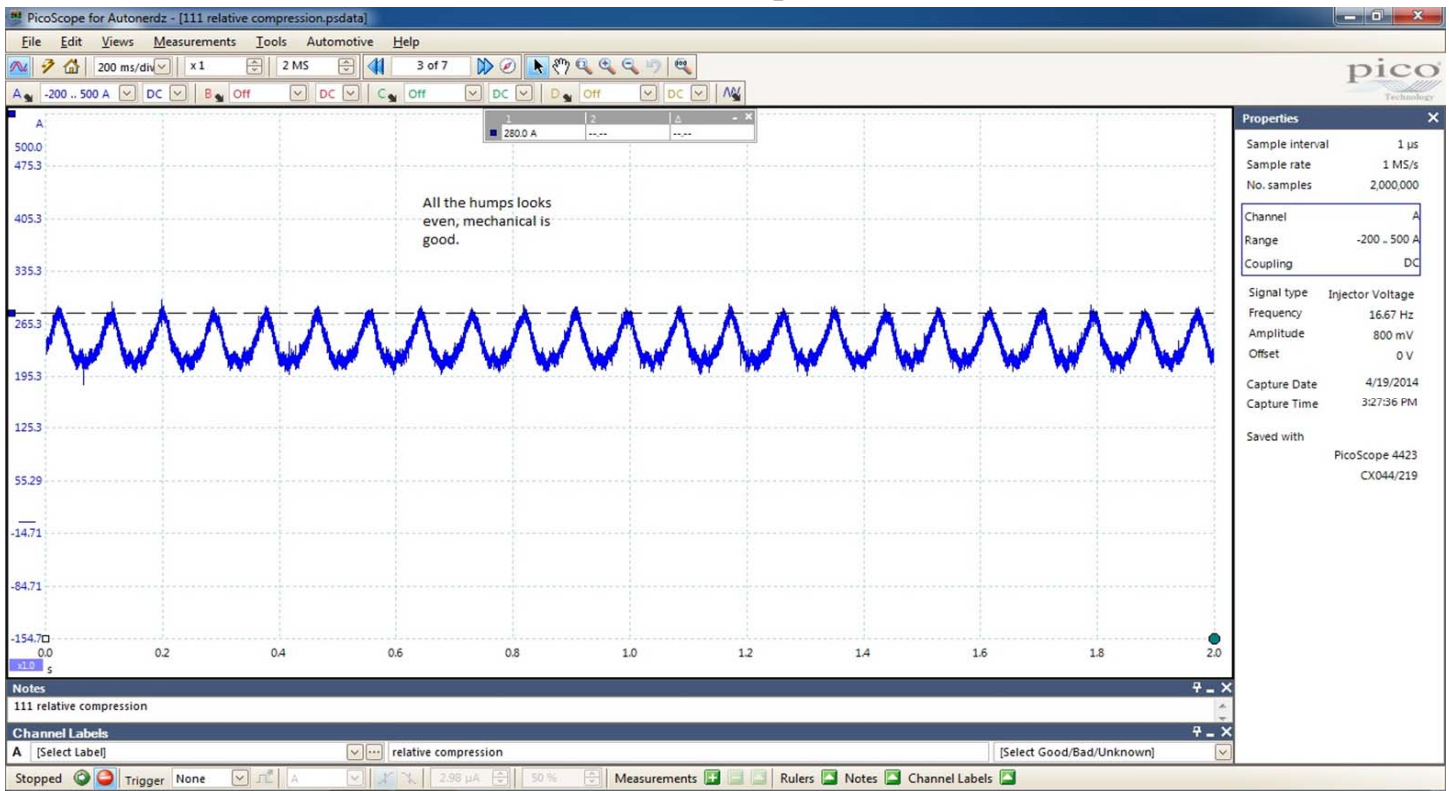


Now that I have captured this event, I have a direction where to check for the fault. It was the end of the day, so I told the next shift that the power and ground wires to the ICV needed to be checked. If they passed they needed to replace the ICV valve and the Transient Suppressor. I came in the next day and was told they replaced the ICV valve and the Transient Suppressor. My foreman told me it didn't fix the problem. Needless to say I was a little stumped, I proved something was wrong with either the control circuits to the valve or the valve itself was the problem. So I shifted away from the valve for awhile and did some other checks that my foreman wanted me to do. I rechecked some things that I already checked before. I checked for fuel leaks, pump timing, electrical connectors at the sensors, and fuel return line for blockage but they all checked out ok. After I completed these tests my foreman requested that I do a relative compression test. Take a look at the next waveform on page 10.

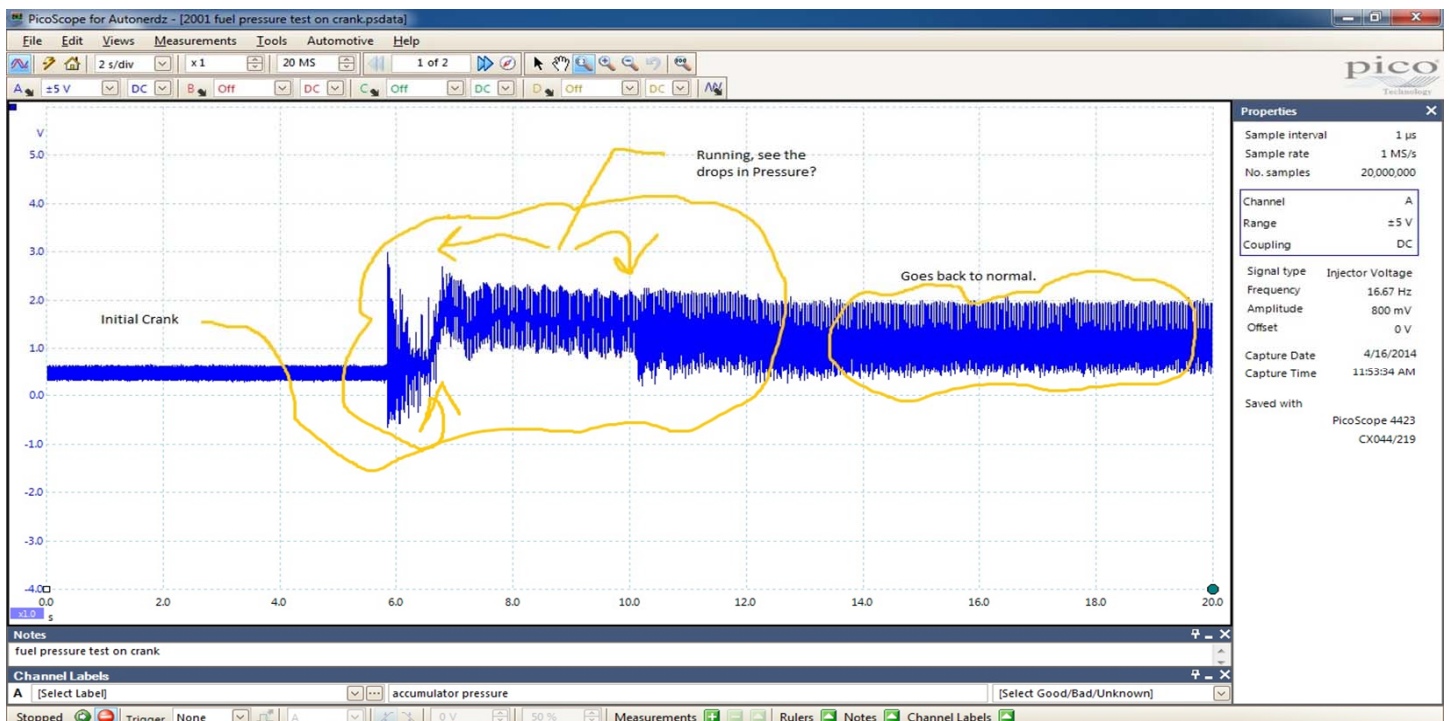
(Con't on page 10)

"Random Misfire - 2001 New Flyer Bus" (con't from p. 9)

Relative Compression



As you can see above the Relative Compression test passed. So I decided to look at the Low Side Gear Pump pressure to see if the pressure drops but they looked the same.

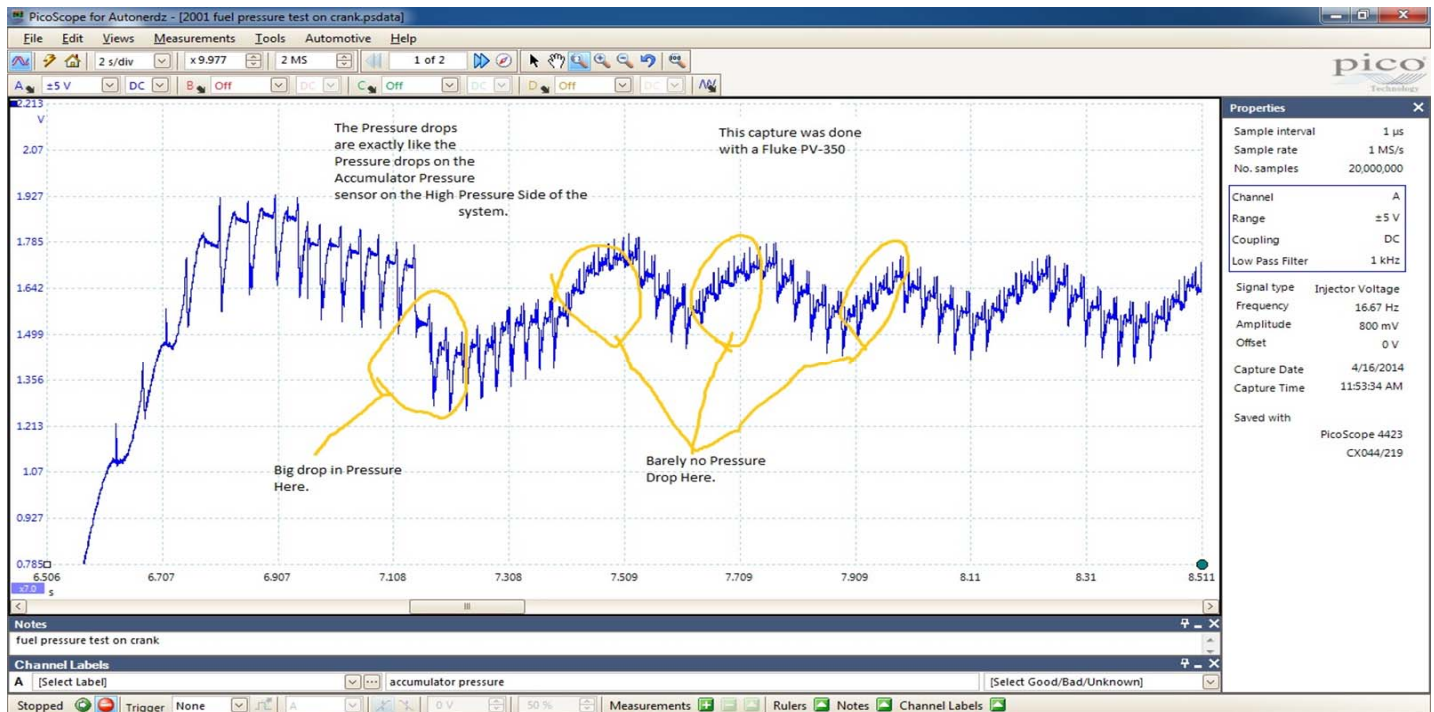


Injection Pump Low Side Pressure

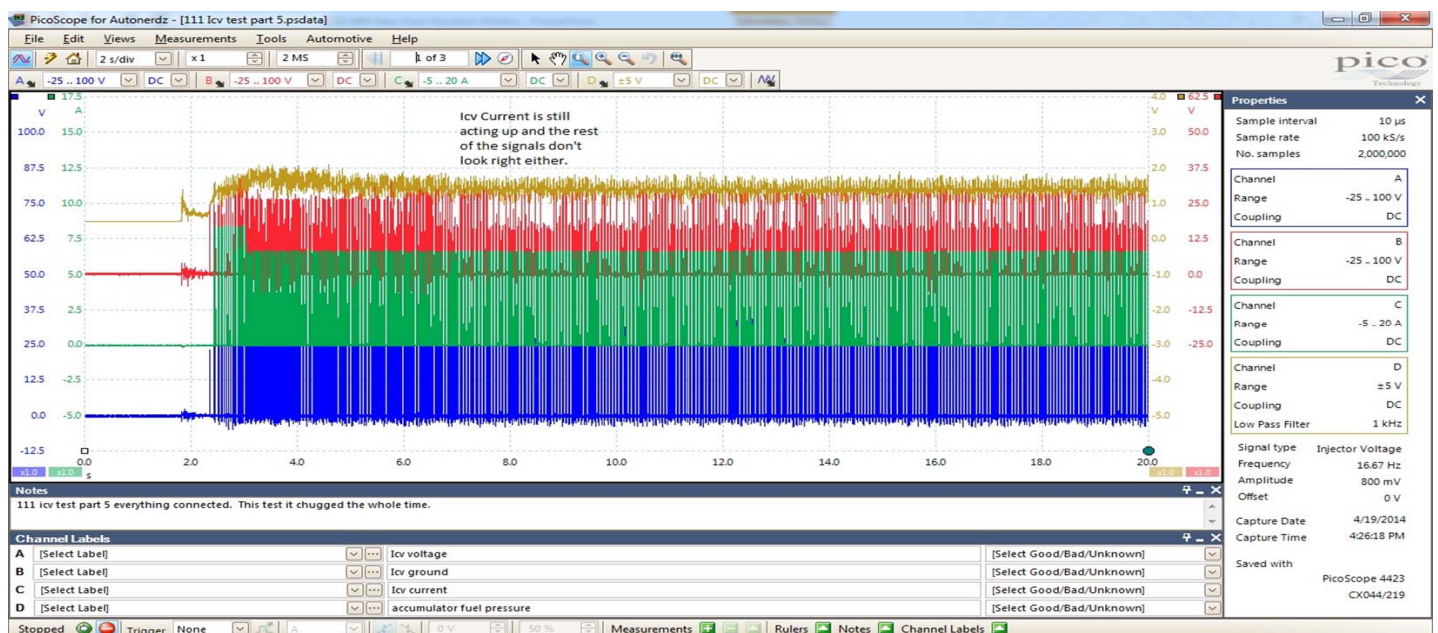
(Con't on page 11)

"Random Misfire - 2001 New Flyer Bus" (con't from p. 10)

Gear Pump Pressure Zoomed In



After seeing the Gear Pump Pressure I decided to go back to the ICV valve. I hooked up the scope to positive voltage, ground voltage, current, and the Accumulator Pressure sensor. I was very surprised to see what I saw, at least now I knew I was on the right path to begin my diagnosis.



(Con't on page 11)

"TST Information"



Sign up to our YouTube channel and checkout 145 video

Welcome to Automechanika Chicago April 24 – 26, 2015, Chicago, Illinois

Automechanika Chicago will be the largest U.S. trade show for automotive technicians and shop owners focused on high-end technical training and management, while showcasing the newest tools, equipment and products in the market. It is the premier platform for the automotive aftermarket arena.

Held every other year, Automechanika Chicago will be the 14th installation into Automechanika worldwide. Messe Frankfurt, producer of Automechanika, the leading international brand of automotive trade shows will join forces with Advanstar Communications, the largest U.S. tradeshow organizer, to create this extraordinary event. Set to take place April 24 – 26, 2015, Automechanika Chicago will be held at McCormick Place, Chicago, Illinois.

Offering a unique platform, Automechanika Chicago will focus specifically on an untapped niche within the automotive industry by connecting shop owners and technicians to wholesalers and distributors in the areas of collision and service repair and maintenance. In addition to the thousands of products and services showcased on the exhibit floor, Automechanika Chicago offers a dynamic educational program fully focused on high level training.

“Random Misfire - 2001 New Flyer Bus” (con’t from p. 11)

ICV Zoomed In



- The Accumulator Pressure has huge up and down dips when the ICV is trying to work.
- The ICV current stays on at 2.5 amps for awhile and the accumulator pressure drop accounts for this.
- The ground side voltage does not look right.
- At first I thought it should be around 3-400 millivolts at most.
- The positive signal from the computer looks good, it's trying to actuate the valve.
- This explains the black smoke on acceleration.

This was the last capture I did for the day and I went home. The next day I talked to my Foreman and told him what I found. We tried another boost sensor just to see if the problem would go away, it didn't. So at this point after discussing my capture on how the ground side looked, my Foreman and I decided to check and see if the Transient Suppressor was replaced. It was not replaced, it had the old one it! I replaced the Transient Suppressor, and the bus ran great!

(Con't on page 15)

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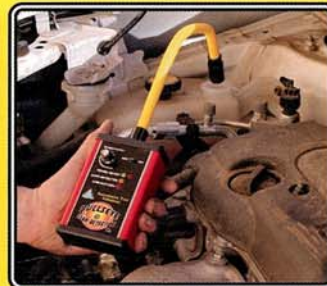
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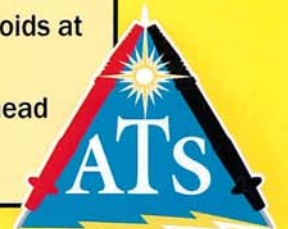


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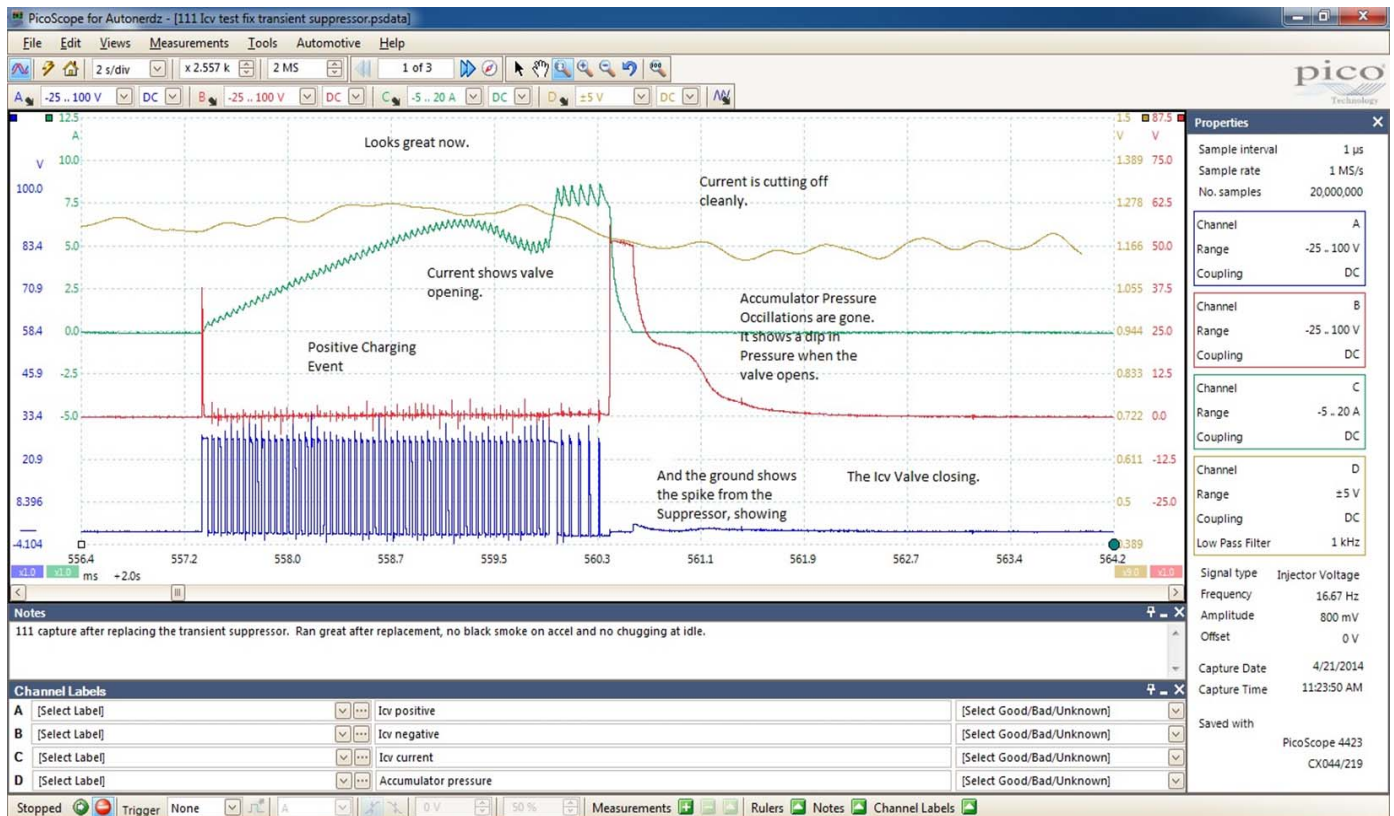
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"Random Misfire - 2001 New Flyer Bus" (con't from p. 13)

No more black smoke on acceleration and no more chugging at idle.

My foreman test drove the bus and parked it, I took a capture of the ICV on my lunch break to use the good waveform against the bad one.



Injection Control Valve-Good Capture

Accumulator Pressure: No more rapid ups and downs in pressure from the Injection Control Valve. When the valve opens it has a clean dip in pressure when the valve opens up.

- Injection Control Valve Current: The current has a clean cut off when the valve is turned off and it shows a dip in current when the valve is opening, this corresponds with the Accumulator Pressure dip.
- The ground side has good current flow during the Positive charging event from the Cummins ECM and when the Positive signal stops the Transient Suppressor, which acts like a capacitor,

(Con't on page 17)

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"Random Misfire - 2001 New Flyer Bus" (con't from p. 15)

discharges in reverse polarity, thus closing the Injection Control Valve as indicated by the positive spike and the hump on the capture.

- The Positive signal is Channel A in Blue, Channel B is Red the Ground, C in Green is Current, and Channel D is Yellow, the Accumulator Pressure.

Conclusion

- *This was an interesting problem for me.*
- *The Bus had no codes.*
- *The Injection Control Valve Circuit PID were normal on the OE scan tool.*
- *Now I have had experience before with Injection Control Valves failing before but not with this type of symptom. Normally when one fails you either have a no start or you have excessive fuel knock.*
- *I have only owned my scope now for a year but I'm glad I had it to find this problem.*
- *If I didn't have my scope, there would be no doubt in my mind that my foreman would want me to just replace the entire pump due to the nature of this problem.*
- *I was initially right in my diagnosis, it was just the second shift that forgot to replace the Transient Suppressor.*

Article by

Michael Eilbracht TST member in Illinois

9 of the Top 10* "Check Engine" DTCs can be diagnosed with a Smoke Wizard.

Maybe it should be called the "Smoke Wizard" Light

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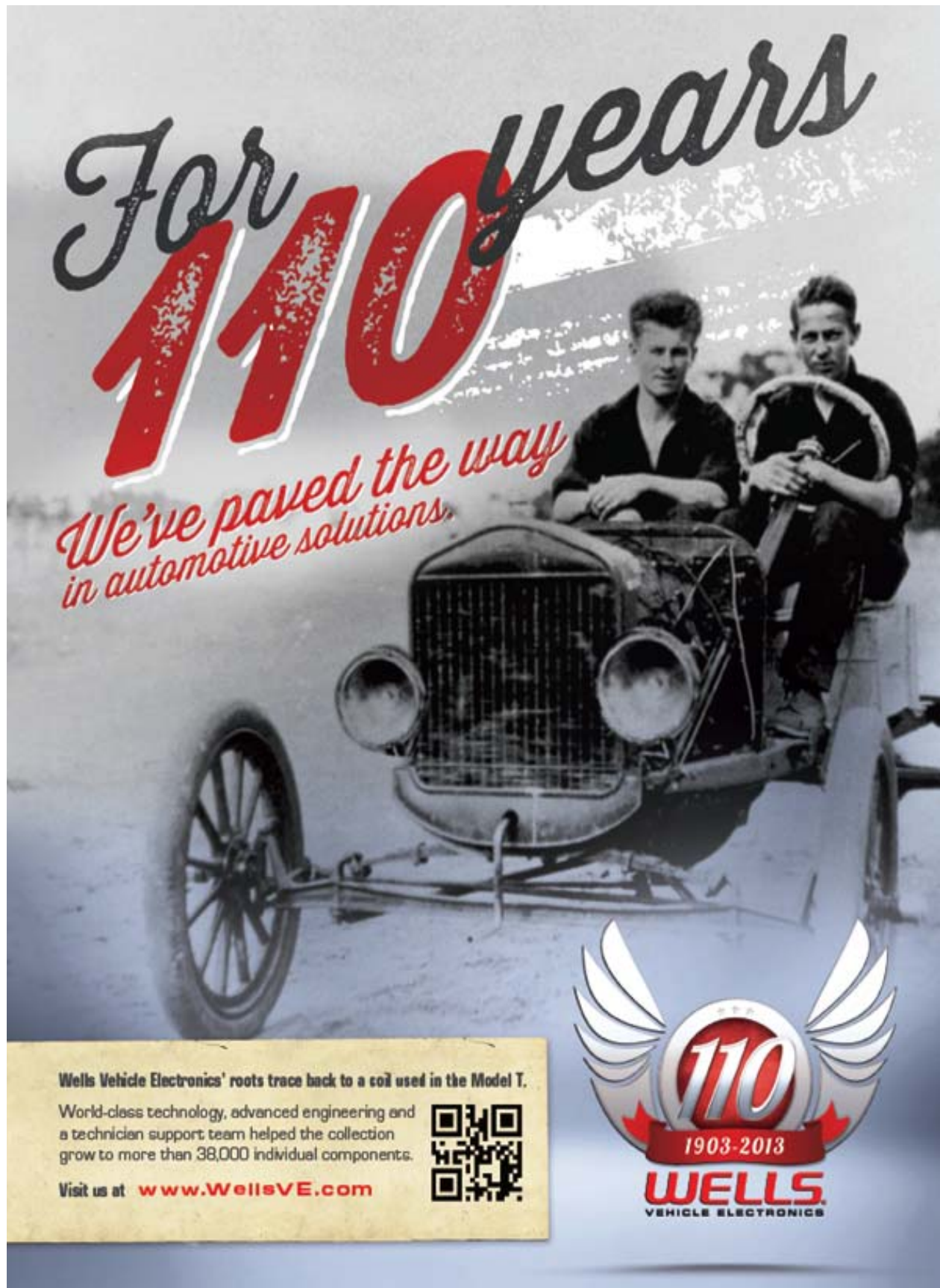
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