

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 -----
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4 -----
5 ADC SOLUTIONS AUTO LLC
6 Petitioner

7 v.

8 THE NOCO COMPANY
9 Patent Owner
10 -----

11 IPR2024-00577
12 U.S. Patent No. 11,447,023
13 -----

14 IPR2024-00671
15 U.S. Patent No. 11,584,243
16 -----

17 ZOOM DEPOSITION OF C. ARTHUR MacCARLEY, Ph.D.,
18 P.E.,

19 (Reported Remotely via Web videoconference)

20 Nipomo, California (Deponent's location)

21 Monday, March 10, 2025

22 Volume 2

23 STENOGRAPHICALLY REPORTED BY:

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10 IPR2024-00577
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11 IPR2024-00671
12 U.S. Patent No. 11,584,243

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14
15 DEPOSITION OF C. ARTHUR MacCARLEY, Ph.D.,
16 P.E., taken on behalf of the Patent Owner, with the
17 deponent located in Nipomo, California, commencing
18 at 8:59 a.m., Monday, March 10, 2025, remotely
19 reported via Web videoconference before
20 REBECCA L. ROMANO, a Certified Shorthand Reporter,
21 Certified Court Reporter, Registered Professional
22 Reporter.
23
24
25

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(All parties appearing via Web videoconference)

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I N D E X

DEPONENT	EXAMINATION
DR. C. ARTHUR MacCARLEY, Ph.D., P.E.,	PAGE
VOLUME 2	
By Mr. Graves	6

PREMARKED EXHIBITS

NUMBER	DESCRIPTION	PAGE
Exhibit 1044	Declaration of C. Arthur MacCarley, Ph.D., P.E., in Support of Petitioner's Reply to Patent Owner's Response;	
Exhibit 1044	Declaration of C. Arthur MacCarley, Ph.D., P.E., in Support of Petitioner's Reply to Patent Owner's Response;	

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1 Nipomo, California; Monday, March 10, 2025

2 8:59 a.m.

3 ---000---

4
5 THE COURT REPORTER: My name is
6 Rebecca Romano. I am a California Certified
7 Court Reporter, License No. 12546. I will be
8 producing a transcript of this proceeding that is
9 automatically admissible in court.

10 If you could raise your right hand for
11 me, please.

12 THE DEPONENT: (Complies.)

13 THE COURT REPORTER: You do solemnly
14 state, under penalty of perjury, that the testimony
15 you are about to give in this deposition shall be
16 the truth, the whole truth and nothing but the
17 truth?

18 THE DEPONENT: I do.
19
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22
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1 C. ARTHUR MacCARLEY, PH.D.,
2 having been administered an oath, was examined and
3 testified as follows:

4 EXAMINATION

5 BY MR. GRAVES:

6 Q. Okay. Good morning, sir. Please state
7 and spell your name for the record.

8 A. My full legal name is Carl, C-A-R-L;
9 Arthur, A-R-T-H-U-R; MacCarley, M-A-C-C-A-R-L-E-Y.
10 But I go by Art, A-R-T.

11 Q. Is it all right if I call you
12 Dr. MacCarley today?

13 A. That's fine.

14 You can call me Art. You can call me
15 whatever is appropriate.

16 Q. Understood.

17 And you were previously deposed before in
18 connection with these IPR proceedings on
19 October 29th, 2024, correct?

20 A. Yes, sir.

21 Q. So you're likely already familiar with
22 how this goes, but I'd like to start by going over
23 a few ground rules.

24 A. Uh-huh.

25 Q. Do you understand that the testimony you

1 are providing today is under oath?

2 A. Yes, sir.

3 Q. Is there anything that would prevent you
4 from giving truthful and accurate testimony today,
5 such as medications that you might be taking or
6 anything else?

7 A. No.

8 Q. So that the court reporter can accurately
9 report what you're saying, can we agree not to
10 speak over one another so that we can have an
11 accurate record today?

12 A. Okay.

13 Q. And can you agree to give audible
14 responses instead of a gesture, head nod or any
15 other nonverbal answer?

16 A. Yes.

17 If I accidentally do gesture, bring it to
18 my attention, and I'll correct it.

19 Q. Understood, will do.

20 And will you agree to let me know if you
21 don't understand one of the questions that I ask
22 today?

23 A. Yes, sir.

24 Q. And we can take a break any time today as
25 needed, but I ask that you answer any pending

1 question before we go on a break.

2 Can you agree to that?

3 A. Yes, sir.

4 Q. Okay. Today we're discussing inter
5 partes review proceedings for U.S. Patent Nos.
6 11,477,023, and 11,584,243; is that your
7 understanding?

8 A. Yes.

9 Q. Is it okay if we refer to these patents
10 as the '023 patent and the '243 patent,
11 respectively?

12 A. Yes.

13 Q. And you submitted four declarations in
14 this case, one declaration in support of the
15 petition and one declaration in support of reply
16 for each of these two patents in these proceedings;
17 is that right?

18 A. That's correct.

19 Q. Do you agree that the two declarations in
20 support of the reply were very similar and repeated
21 many of the same points?

22 A. Yes, they were very close to being
23 identical.

24 Q. Okay. I'm going to ask questions today
25 with respect to the reply declaration for the

1 '023 patent, which I'll assume are applicable to
2 both declarations unless you tell me otherwise or
3 unless the question is specific to only one of the
4 declarations; is that fair?

5 A. Yes, sir.

6 Q. And ADC's counsel has agreed that this
7 deposition will cover your testimony in both of the
8 two IPR proceedings; is that your understanding?

9 A. Yes.

10 Q. And you mentioned before that you were
11 previously deposed in relation to these same
12 proceedings back on October 29th, 2024.

13 Between that date and today, have you
14 been deposed in any other cases?

15 A. No.

16 Q. Did you speak with anybody in preparation
17 for your deposition today, either in person or
18 telephonically?

19 A. Yes, of course.

20 Q. Who did you speak to?

21 A. I spoke with the attorney lead on ADC,
22 which is Paul Smelcer, who is here today. We -- we
23 met, I believe, via Zoom twice to go over key
24 points of the case.

25 Q. Did you speak with anybody else?

1 A. Not with regard to this case.

2 Q. Did you have any discussions in
3 preparation for your deposition today with anybody
4 who is not a lawyer?

5 A. No.

6 Q. Okay. And what did you do to prepare for
7 your deposition today besides those two discussions
8 with Mr. Smelcer?

9 A. I reviewed all four declarations that you
10 referred to, which are actually covered under only
11 two exhibit numbers. I reviewed the patents, the
12 two NOCO patents by Nook. I reviewed my prior
13 preparatory material for the last deposition. I
14 did a little bit further research on some of the
15 technical topics that became more relevant in my
16 last deposition.

17 I think that covers it though.

18 Q. And about how long in total time did you
19 spend preparing for today's deposition?

20 A. Oh, gosh.

21 20 hours.

22 That's inclusive.

23 Q. Okay. If you could reference your '023
24 reply declaration from IPR2024-00577, which is
25 marked as Exhibit 1044.

1 Could you please pull that out.

2 A. Yeah.

3 MR. GRAVES: And bear with me while I
4 upload the '023 reply declaration.

5 THE DEPONENT: Again, there's -- 1044
6 covers both the original declaration and the reply.
7 Which one are you referring to?

8 Q. (By Mr. Graves) So I'm referring to the
9 reply declaration for the case covering the
10 '023 patent.

11 A. Got it.

12 That's Exhibit 1044.

13 Q. Yes.

14 So I've uploaded Exhibit 1044 from IPR
15 Proceeding 2024-00577 for the '023 patent.

16 A. Okay.

17 Q. Is what you have in front of you a copy
18 of the '023 reply declaration in this case?

19 A. Yes.

20 Q. Can you please turn to page 14.

21 A. Okay.

22 Q. Is that your signature on page 14, signed
23 on February 14th, 2025?

24 A. It is a copy of my signature, yes.

25 Q. And when did you begin working on this

1 declaration?

2 A. Oh, gosh.

3 This case has been in progress for over a
4 year, so in bits and pieces probably over the
5 course of the year.

6 But most recently -- so in the period
7 prior to my first deposition in October, so I would
8 say maybe September/October time frame, and then
9 revisited now in preparation for this deposition.

10 Q. And about how many hours did you spend
11 working on this reply declaration?

12 A. Let's see.

13 This being the second one, I would have
14 to say -- excuse me.

15 Well, they actually both ran together in
16 parallel.

17 Because of the duplicate nature with the
18 '243 reply declaration, I can't say I spent a whole
19 lot of time on it. But I think the intent of your
20 question is, on both of them, if I were to, say,
21 just subdivide the time, maybe about, oh, 10 to
22 12 hours.

23 Q. So that's 10 to 12 hours for both the
24 '023 and the '243 reply declarations combined?

25 A. Yes, sir.

1 Q. And with respect to specifically the
2 '023 reply declaration, did you write this
3 declaration?

4 A. I did, but not in its entirety.

5 Q. So who else did you work with on this
6 declaration?

7 A. I worked with the attorney, Mr. Smelcer.
8 There are certain areas, those that deal with legal
9 questions, that I am not as well prepared to
10 answer, and he filled in the additional information
11 that I needed.

12 I can say that every word in all four of
13 these declarations is my responsibility.

14 Q. Are there any changes that you would like
15 to make to the '023 reply declaration at this time?

16 A. Not that I can think of now.

17 But if in the course of your discussion
18 you come up with something that I suddenly realize
19 maybe was either a typographic or even possibly a
20 technical error, I reserve the right to correct
21 that.

22 Q. Okay. Now if you could reference the
23 '243 reply declaration from IPR2024-00671, which is
24 also marked as Exhibit 1044.

25 Could you please pull that reply

1 declaration out.

2 A. I have it.

3 MR. GRAVES: Bear with me while I upload
4 the '243 reply declaration.

5 Q. (By Mr. Graves) Okay. I have uploaded
6 Exhibit 1044 from IPR Proceeding 2024-00671 for the
7 '243 patent.

8 Is what you have in front of you a copy
9 of the '243 reply declaration in this case?

10 A. Yes.

11 Q. And did you also prepare this reply
12 declaration?

13 A. Yes, the same comment as before.

14 Q. And did you prepare this reply
15 declaration in the same way that you prepared the
16 '023 reply declaration?

17 A. Yes, sir.

18 Q. And about how many hours did you spend
19 working on this declaration?

20 Did you say it was 10 to 12 hours total
21 between the two?

22 A. Yes.

23 Q. Are there any changes that you would like
24 to make to this reply declaration at this time?

25 A. Not that I can think of now, but same

1 comment: I reserve the right to make a correction
2 if I find one in the course of our discussion
3 today.

4 Q. Understood.

5 It's my understanding that you have a set
6 of printed documents with you today?

7 A. Yes, sir.

8 Q. Are there any notes, highlighting or any
9 other markings on these documents?

10 A. No, these are completely clean.

11 Mr. Smelcer emphasized the importance of
12 that and actually sent me clean copies with -- that
13 I printed locally, and they should exactly match
14 what all of you have.

15 Q. Do you have any other notes or materials
16 that you've personally prepared in front of you
17 today?

18 A. Not notes, but I anticipated that you
19 might want to -- you might be referring to the
20 Richardson patent, so I printed my own copy of
21 that. Again, it is clean. It is not marked.

22 I have no handwritten notes.

23 Q. Do you have any documents in front of you
24 that weren't an exhibit or paper that has been
25 filed in the case?

1 A. No.

2 Well, I better think about that.

3 No.

4 I want to add, I do have a copy of
5 Dr. Fayed's deposition transcript.

6 Q. Do you have any messaging or
7 communication applications running on your
8 computer?

9 A. No.

10 Q. Do you have a mobile phone visible in
11 front of you?

12 A. It is visible in front of me, but it is
13 inert.

14 Q. Okay. Could you again pull out the reply
15 declaration for the '023 patent.

16 A. I'm there.

17 Q. And can you turn to paragraph 7, which
18 starts on page 3. And let me know when you're
19 there.

20 A. I'm there.

21 Q. Here, you describe various example
22 applications of portable jump starters based on
23 your own experience, correct?

24 A. Among other things, yes.

25 Q. And as an expert in the field of

1 automotive electronics, are you familiar with the
2 operation and usage of portable jump starters?

3 A. Yes, sir.

4 Q. And have you personally used a portable
5 jump starter device to jump start a vehicle?

6 A. Yes.

7 Q. Did you personally own that portable jump
8 starter that was used?

9 A. Yes.

10 Q. What brand and what model?

11 A. The one -- I've used older ones that were
12 based on alkaline batteries, but the most recent
13 one that I use a lot is the Type S, which is
14 actually made by ADC, my client.

15 It was not provided by my client. I
16 owned it long before I was ever contacted by
17 Mr. Smelcer.

18 Q. So how long have you owned that Type S
19 ADC portable jump starter?

20 A. Let's see, I got it Christmas before last
21 as a gift, so whatever that is.

22 Q. About how many times have you used that
23 jump starter?

24 A. Twice.

25 Q. And what are the specifications

1 associated with that specific jump starter?

2 A. Oh, gosh.

3 You know, I haven't committed that to
4 memory. If it is important to you, I could get it
5 in front of me in about 15 seconds and recite those
6 to you, but --

7 Q. It's not necessary.

8 (Simultaneously speaking.)

9 A. -- of other products in the field, it's
10 pretty typical for an automotive jump starter.
11 Contains lithium batteries, has the capability of
12 providing more than enough current to probably do
13 up to three starts in series.

14 Q. And what kind of vehicles have you used
15 to jump start with that jump starter?

16 A. Well, most recently, my wife's Honda
17 Civic when she left the cabin lights on.

18 Prior to that, my 2005 Corvette, which is
19 a model that notoriously has a problem with dying
20 batteries.

21 Q. Okay. Next, can I have you turn to
22 page 7 of the '023 reply declaration. And let me
23 know when you're there.

24 A. I'm there.

25 Q. Do you see the first sentence that says,

1 "I have attached Appendix A to this declaration
2 which shows how various inputs to Equation 1 and
3 Equation 2 would have provided a PHOSITA with an
4 estimate of charging times"? [as written]

5 A. Yes, sir.

6 Q. Okay. Can we now turn to Appendix A, and
7 let me know when you're there.

8 A. I'm there.

9 Turn it sideways.

10 Q. Did you prepare the table in Appendix A?

11 A. I prepared the calculations for it.

12 I believe the table was formatted by
13 probably a legal aide at the law firm.

14 Q. But every calculated value in this table
15 was prepared by you?

16 A. Either prepared by me or checked by me
17 such that I take full responsibility for it.

18 Q. Okay. And were the values in the "Energy
19 Discharged" column calculated by multiplying the
20 values in the "Output Voltage," "Output Current"
21 and "Duration" columns together?

22 A. That would be a fair statement, in
23 consistent units of course.

24 Q. And do these calculations require
25 constant output voltage over the duration of the

1 jump-starting attempt?

2 A. No, they -- as a -- as a reasonable
3 approximation, these might refer to the arithmetic
4 mean of the current over the cranking time of the
5 engine.

6 Q. So the "Output Voltage" column, then,
7 you're assuming that that 12 volts or 48 volts is
8 the arithmetic mean during the duration of the
9 jump-start attempt?

10 A. That would be a fair statement.

11 But please consider that the batteries
12 that are used in these are fairly constant voltage
13 batteries. Not completely invariant with load, but
14 the typical output voltage of an automotive battery
15 during operation of the vehicle is -- is about
16 14 volts when it's being charged, and it drops down
17 to 13 volts when it is disconnected, and can pull
18 as low as 12 volts during operation.

19 So I would give it that same range.

20 Q. The "Output Voltage" here is referring to
21 the output voltage coming from the battery of the
22 portable jump starter, correct?

23 A. That's correct, yes.

24 Q. And that output voltage is not always
25 going to remain perfectly constant during a

1 jump-start attempt, correct?

2 A. No, it will droop during high-current
3 draw.

4 Q. And similarly, do these calculations
5 require constant current over the duration of the
6 jump-starting attempt?

7 A. No, that -- that would not be possible.

8 Q. So the calculations don't require that?

9 A. The calculations, again, are -- are based
10 on reasonable means, as -- that is, an arithmetic
11 mean or an average, in an effort to -- to generate
12 a number valid no more than two significant digits
13 that is reflective of the expected charging time
14 and the total energy discharge.

15 Q. Just to be clear, the output current is
16 not always going to remain perfectly constant
17 during a jump-start attempt?

18 A. Correct.

19 It -- let me add, though, that the output
20 current is usually limited by the battery. And if
21 it is in the car itself, the automotive SLI
22 battery, it would, say, on a cold morning be
23 limited by the cold-cranking amp rating of the
24 battery, or CCA.

25 In a jump starter, it would be the

1 maximum current that that lithium battery pack, or
2 possibly super -- I'll leave super capacitors out
3 for the moment -- but the lithium battery pack
4 could -- could maintain during -- during delivery
5 of current.

6 And higher current will, of course, lead
7 to some droop, because all batteries have internal
8 resistances and can be expected to decrease in
9 voltage as their current output increases.

10 Q. So are the values used in the "Output
11 Current" column in this table of Appendix A
12 intended to be the peak output current provided by
13 a jump-starter battery?

14 A. They -- they reflect the average current.

15 But in the case of the higher numbers,
16 again, they are limited by the capability of the
17 batteries. And you would be hard-pressed to find
18 batteries that could -- could source some of the
19 highest values.

20 A typical automotive battery, even for a
21 fairly large vehicle, can't source more than 1,000
22 amps CCA. In fact, I'm aware of only maybe one or
23 two, and they're military batteries, that can
24 exceed 1,000 CCA.

25 Q. And you mentioned that the output current

1 that a battery can provide is going to change
2 depending on the temperature that that battery is
3 operating at?

4 A. That's correct, and that's especially
5 true for lithium batteries.

6 Q. Do your calculated values in this table
7 account for changes in battery temperature?

8 A. No, these are nominal values -- I
9 believe, actually, in the text I point that out,
10 that it's a nominal value -- in an effort to
11 just -- to get -- to get across the point, this was
12 not intended to be scientifically precise to the
13 level that I -- I think you're asking about.

14 That would be difficult to do, especially
15 when you're talking about a range of different
16 vehicles with different starter configurations,
17 different engine sizes, et cetera.

18 Q. Okay. Were the values in the second
19 column from the right, labeled "Charging Time at
20 7.5 watts" --

21 A. Uh-huh.

22 Q. -- were those calculated by dividing the
23 "Energy Discharged" column values by 7.5 watts?

24 A. Yes, that would be -- that would be fair.
25 That would take energy and turn it back into power

1 over that particular period.

2 Q. So do these calculations require a
3 constant charging power of 7.5 watts over the
4 entire charging period?

5 A. No, no, that's not true for any battery
6 charger.

7 Q. I understand that that's not true for any
8 battery charger, but what I'm asking about is these
9 specific calculations.

10 A. The calculations assumed it is constant.
11 And that is consistent with industry practice in
12 which batteries have amp-hour ratings that are a
13 little bit -- call them conceivable ratings.

14 That is, a 20 amp-hour rating, which
15 standard for all SLI batteries, has the nearly
16 mythical assumption that you will be discharging
17 that battery continuously at the same current for
18 20 hours, and then it will suddenly drop dead.
19 That's a contrived situation, but it's the best you
20 can do in the battery business.

21 Q. Okay. So these calculations, though,
22 require a constant charging power of 7.5 watts over
23 that entire charging period as --

24 A. Yeah.

25 Q. -- you calculated those values in that

1 column, correct?

2 A. I would argue with the word "require"
3 of -- but the numerical calculation was based upon,
4 yes, a constant discharge rate, or charge rate in
5 this case, over that period of time.

6 And since we're talking about charge
7 accumulation, whether there are variations in it or
8 whether it is constant is irrelevant. Either way,
9 you'll come up with that same charging time. And
10 that's the point.

11 Q. Do all battery charge cycles apply the
12 same current and voltage to the battery over the
13 entire charging period?

14 A. No, it's -- I'm not aware of any that do,
15 actually. I mean...

16 Q. So, for example, do lithium-ion battery
17 charging cycles commonly include a constant current
18 stage and a constant voltage stage during charging?

19 A. Yes, that's -- that's certainly typical
20 for LFP batteries, lithium iron phosphate. LNMCs,
21 higher power batteries that I believe Nook was
22 referring to, have a greater droop curve, but
23 let's -- that is approximately so.

24 If you'd like to add detail to your
25 question, I could treat in a greater detail.

1 Q. Well, let me ask this.

2 So during a battery that's charged with a
3 constant current and a constant voltage stages,
4 will the charging power always be constant over
5 that entire charging period?

6 A. Given your premise, yes.

7 Q. So can you explain what is going on
8 during a constant current stage, then.

9 A. For, let's say, the -- the greater
10 duration of the charge, a constant electrical
11 current is being provided to and is being absorbed
12 by the battery.

13 And somewhere towards the end, the charge
14 is, of necessity, truncated. And there's usually
15 more than one criteria for truncating the charge.
16 Primary would be, say, the -- the terminal voltage,
17 which would indicate that the battery is nearing
18 full charge.

19 But in -- in smart chargers, temperature
20 and the battery history would also factor in, since
21 the battery does degrade over its life.

22 Q. During a constant current stage, is the
23 voltage always going to be constant?

24 A. It's -- well, again, it depends on the
25 type of battery. But I'm going to assume --

1 actually, I don't believe that in either of the
2 Nook patents they identified the particular type of
3 lithium-ion battery.

4 But from the voltages, it appeared as
5 though, during the charge cycle, it would vary
6 roughly from 3.9 to about 4.2 volts.

7 If you want to call that constant, that
8 would be fair, but it's not exactly constant.

9 Q. So if the current is constant and the
10 voltage is changing --

11 A. Slightly increasing, yes.

12 Q. -- will the charging power be changing as
13 well?

14 A. Being the power is always the product of
15 the current times the voltage, and if you -- the
16 way you asked the question, if the voltage is
17 increasing and the current is constant, then, yes
18 the power would be increasing proportional to the
19 increase in the voltage.

20 Q. So given that, will the charging power
21 that is provided to a jump-starter battery at a
22 specific time during charging depend on the
23 charging cycle that is being used?

24 A. If it is a tailored cycle, which it
25 usually is, actually, for lithium batteries,

1 because they all have battery management systems,
2 then the answer is yes.

3 Q. Do these charging time calculations in
4 Appendix A account for what kind of charging cycle
5 is being used to charge the portable jump-starter
6 battery?

7 A. No.

8 But again, I want to emphasize, the
9 average is a very good estimate of what you would
10 get if you had a constant current source. Whether
11 it's slightly more, slightly less over the -- over
12 the charge time duration, it -- it all evens out.

13 So it is standard practice. It is fair
14 to just multiply the average power times the amount
15 of energy -- divide the amount of energy you want
16 to put in by the average power to get the time.

17 Q. And here, the average power you are
18 assuming is 7.5 watts, correct?

19 A. That's correct.

20 Q. And --

21 A. In fact, I want -- that is -- the purpose
22 of this chart is to reflect the two USB maximum
23 current specifications applicable prior to the --
24 before the priority date of either of the patents.

25 Q. So the 7.5 watts represents a maximum

1 power output from USB charging?

2 A. That's consistent with the specification.

3 I can -- I can tell you in practice, it
4 varies quite a bit. But the specification referred
5 to by the 7.5-watt is based on 1.5 amps at 5 volts,
6 which yields 7.5 watts.

7 Q. And in this table for these calculations,
8 you have assumed that that 7.5-watt maximum is also
9 the average?

10 A. Yes, because either the -- the current or
11 the voltage or both were average.

12 I should point out, in electrical
13 engineering, we do a lot of things in macro sense,
14 that is, the average things all of the time,
15 because they do fluctuate.

16 But when you're talking about energy
17 accumulation, it's -- it's sort of like filling up
18 a bucket with water. You could increase the flow
19 rate and/or decrease it slightly, but as long as
20 the average water filling that bucket works out to
21 a particular value, that value is identical to the
22 amount of water you would end up with in the bucket
23 if it had been exactly constant at that average
24 value.

25 Q. Will the charging power that is provided

1 to a jump-starter battery depend on the starting
2 charge level of that battery?

3 A. Yes.

4 If the battery is fully depleted -- I
5 think -- I'm going to assume that's the scenario
6 you're thinking of -- it would probably have an
7 initial charge rate that is a little bit higher.

8 Q. Do these charging time calculations
9 account for the starting charge level of the
10 jump-starter battery?

11 A. These are determined by the USB power
12 specifications. We are assuming in all of these
13 cases that the batteries could easily absorb much
14 more power than either of these levels.

15 Allow me to add also that the only two
16 voltage test cases that are shown here are 12 and
17 48. These are the extremes defined by Dr. Fayed.
18 I do not consider the 48-volt input to be realistic
19 because, to the best of my knowledge, there's only
20 one vehicle in existence that uses a 48-volt
21 automotive power bus.

22 Q. Okay. During charging, will there be
23 energy losses in the form of heat?

24 A. Yes, of course.

25 Q. Do the calculations in Appendix A account

1 for energy losses?

2 A. The charging time, again, they're -- they
3 are not determined by the characteristics of the
4 battery, which it's safe to assume can always
5 assume a lot higher -- can accept higher power
6 during charging than the limitations of the USB
7 power source.

8 The numbers in the last two columns are
9 based strictly on the specifications of the USB
10 power source.

11 Q. And that USB power source is not going to
12 exceed 7.5 watts or 25 watts for those two columns,
13 correct?

14 That's the maximum?

15 A. That's the specified limit.

16 I could tell you from personal
17 experience, sometimes it does; sometimes it
18 doesn't. It depends on the interface circuit how
19 well the voltage is regulated.

20 But those are the specified values at two
21 particular moments in time for USB power delivery
22 specifications.

23 Q. And so if there's a maximum of, say,
24 7.5 watts, and some energy is lost during the
25 charging process due to heat, the actual power

1 that's being received by the battery is going to be
2 less than 7.5 watts, correct?

3 A. Conceptually, you're correct.

4 But it's still receiving the full
5 7.5 watts. The inefficiency due to -- due to heat
6 has to do with how much of that energy is actually
7 retained by the battery. Some is dissipated as
8 heat, and some causes the electrochemical
9 conversion of the materials in the battery to
10 their -- their predischARGE state.

11 Q. Will there be energy losses in the form
12 of heat during when a portable jump starter
13 transfers energy to a vehicle?

14 A. Uh-huh.

15 Q. I'm sorry, can you provide an affirmative
16 yes or no for the record.

17 A. Could you please repeat the question.

18 Q. Yes.

19 When -- will there be energy losses in
20 the form of heat during when a portable jump
21 starter transfers energy to a vehicle --

22 A. Yes.

23 Q. -- such as during a jump-start attempt?

24 A. Yes.

25 Q. Okay. Can you now turn to paragraph 8 on

1 page 5 of the '023 declaration. And let me know
2 when you're there.

3 A. I'm there.

4 Q. Okay. So looking at paragraph 9, can you
5 reread the first sentence of paragraph 9, and let
6 me know when you finish.

7 A. It's spans pages 5 and 6.

8 Q. That's correct.

9 A. And it begins, "To arrive at an
10 understanding of the battery capacity that would be
11 needed for a typical jump starter, as well as the
12 resulting charging times, a PHOSITA would have
13 calculated the amount of energy that would have
14 been needed for a typical jump starter for the
15 intended application." [as written]

16 Shall I continue?

17 Q. No, that's okay.

18 So here, you're talking about calculating
19 the battery capacity for a typical jump starter
20 using the energy needed for an intended
21 application, correct?

22 A. Yes, sir.

23 Q. And for the calculations in the table of
24 Appendix A that we were just discussing, have you
25 assumed that the intended application for each jump

1 starter is to provide only a single jump-start
2 attempt?

3 A. Oh, no, no.

4 I think most -- in my personal
5 experience, as I mentioned before, it depends on --
6 on the size, the type of batteries that are used,
7 and, of course, the engine that is being jump
8 started. But I -- in my own experience, it's
9 definitely more than one.

10 Q. But to be clear, the charging times in
11 Appendix A reflect the charging time required or
12 energy spent from only a single jump-start attempt,
13 correct?

14 A. Let me verify.

15 That is my understanding, yes.

16 Q. And you mentioned before that portable
17 jump starters typically provide -- can provide
18 multiple jump-start attempts, correct?

19 A. Yes, within the definition of the word
20 "multiple." It doesn't mean an infinite number or
21 a very large number, but it means more than one.

22 Q. So the charging times in Appendix A don't
23 actually reflect the charging time required to
24 fully recharge the depleted jump start?

25 A. If the jump-starter battery were fully

1 depleted, then, no, they would take a -- it would
2 take a lot longer, the equivalent of the number of
3 jump starts could be done with the energy capacity
4 in those batteries that was now fully depleted.

5 But that's -- that's a contrived
6 scenario. In fact, it would be potentially
7 damaging to the batteries if you actually drained
8 them below about 50 percent in -- in my experience.

9 Also, the -- the current source
10 capability of a half-depleted lithium battery is a
11 bit less than if it is fully charged. So you
12 wouldn't ever fully discharge a jump starter. You
13 would take it down to the point where it is weak at
14 doing its job, and you'd call that the -- the end
15 of the line.

16 Q. And if you take it to the point that it's
17 weak at doing its job, the charging time from that
18 point to reach 100 percent capacity again, that's
19 not what's presented in Appendix A, correct?

20 A. You're correct.

21 Q. What is the typical range for energy
22 capacity of batteries in portable jump starters in
23 watt hours?

24 A. Wow, it's all over the place.

25 I mean, if you were to -- if any of you

1 were to just pull up on Google, you know, "portable
2 jump starters," you would find them ranging from --
3 you know, the typical smallest I've seen has a
4 400-amp capacity. I know that NOCO makes a 400-amp
5 charger, as does ADC.

6 But there are at least 20 different
7 companies that make these, and I can't speak for
8 all of them.

9 I've seen output power ratings advertised
10 as high as 4,000 watts, which would be greatly
11 overkill -- excuse me, I apologize, 4,000 amps,
12 which would be greatly overkill for any of the
13 vehicles that I'm familiar with.

14 Q. Will the charge level on a portable jump
15 starter degrade over time if it is stored in the
16 trunk of a vehicle?

17 A. Yes, as would any battery. It has a
18 self-discharge rate, which is generally equal --
19 generally related to its internal resistance.

20 Q. And when an owner uses a portable jump
21 starter, will they be more likely to successfully
22 jump start a vehicle battery that is only slightly
23 drained or one that is completely dead?

24 MR. SMELCER: Object to form.

25 THE DEPONENT: I didn't hear

1 Mr. Smelcer's comment.

2 MR. SMELCER: It was --

3 MR. GRAVES: He objected to form.

4 MR. SMELCER: It was just an objection to
5 form.

6 THE DEPONENT: Okay.

7 Q. (By Mr. Graves) You can answer the
8 question.

9 THE DEPONENT: Your volume is quite low,
10 Paul.

11 Let's see.

12 Boy, now I've sort of distracted myself.
13 Could you repeat the question.

14 Q. (By Mr. Graves) Yeah.

15 So what I'm asking is, when an owner uses
16 a portable jump starter, will they be more likely
17 to successfully jump start a vehicle battery that
18 is only slightly drained or one that is completely
19 dead?

20 MR. SMELCER: Same objection.

21 THE DEPONENT: Of course it would
22 require -- it would be easier to start a battery
23 that is not completely -- to jump start an engine
24 with a vehicle battery that is not completely dead,
25 because it is potentially, I mean, the power output

1 of both batteries. But of course it depends
2 upon -- it's not a linear split.

3 If a battery is -- is sitting there at
4 only 10 volts, it's going to provide almost -- you
5 know, very little of the power, because the
6 power -- the voltage of the jump starter will have
7 to be pulled down below about 10 volts before any
8 energy at all would flow from a battery that has an
9 open circuit voltage of only 10 volts. That would
10 be a pretty dead battery.

11 Q. (By Mr. Graves) So does the charge state
12 of the vehicle battery affect the amount of energy
13 that will be needed to jump start a vehicle?

14 A. Yes.

15 Q. And do your calculations in Appendix A
16 account for the charge state of the vehicle
17 battery?

18 A. No.

19 Again, for the purposes of that chart,
20 which perhaps I didn't do an adequate job of
21 clarifying that, these are straightforward,
22 idealized calculations of the same type you would
23 find in any textbook.

24 Q. If an owner fails to jump start a vehicle
25 with a portable jump starter on their first

1 attempt, is it possible that they will be
2 successful if they attempt to jump start the
3 vehicle again?

4 A. Yes.

5 In fact, I have had that experience.

6 Q. And would each attempt to jump start a
7 vehicle deplete the battery of the jump starter?

8 A. Oh, no, no, I -- well, boy, that's a
9 pretty broad question.

10 It depends how long -- how long you crank
11 the battery and it fails to start. I'm thinking
12 maybe about a 5-second limit would not completely
13 drain the jump starter. It wouldn't even come
14 close to completely draining the jump starter.

15 Q. Would each jump-start attempt at least
16 partially deplete the battery of the jump starter?

17 A. Yes, of course.

18 Q. Okay. Now can you turn now to
19 paragraph 8, starting on page 4 of the '023 reply
20 declaration.

21 A. Okay. Go ahead.

22 Q. In the last full sentence on page 4, you
23 state that you have relied on "Revision 1.2 to
24 USB's Battery Charging Specification" as part of
25 the calculations in Appendix A, correct?

1 A. Give me a moment to reread it.

2 "I have relied upon the current limit
3 provided in Revision 1.2 to USB's Battery Charging
4 Specification."

5 That's correct, which is actually a 2010
6 BC1 specification. But they revised it two years
7 later with certain errata in UCN's engineering
8 change -- engineering changes. So those were the
9 current voltage levels that I used.

10 Q. And it states in your declaration here
11 that that Revision 1.2 was released on March 15th,
12 2012, correct?

13 A. That's correct.

14 Q. When did you first become aware of
15 Revision 1.2 to USB's Battery Charging
16 Specification?

17 A. Oh, I mean originally, probably already
18 knew about it before I started work on this case.

19 It became a bit more relevant when
20 Mr. Smelcer brought to my attention that
21 Mr. Stanfield had attached it to his deposition,
22 which was done some time ago.

23 Q. But you were already aware of
24 Revision 1.2 to USB's Battery Charging
25 Specification when you prepared your initial

1 declaration supporting the petitions in these
2 cases?

3 A. Honestly, I'd have to go back and check
4 whether I used the original 1.2 or the
5 errata-enhanced 1.2 which occurred two years later.

6 Q. So I'm not asking which -- I'm not asking
7 which versions were used in this case.

8 I'm just asking when you became aware of
9 Revision 1.2.

10 A. I answered the question that way because
11 they have different power output specifications.
12 And, yes, I was aware of -- I was -- I was aware
13 of, you know, BC1.2 as well as 1.0. But I can't
14 say that I previously had any reason to dig more
15 deeply into it.

16 So to answer your question, yeah, I was
17 aware of it, but that's about all.

18 Q. And you were aware of it prior to your
19 work on this case?

20 A. In the literal ocean of specifications
21 related to USB, I was aware of the battery charging
22 specifications, in addition to all of the other
23 branches of the specification tree.

24 So your answer is yes, but I'm answering
25 the question this way to emphasize the vast number

1 of variations that had to be considered.

2 MR. GRAVES: Okay. We've been going for
3 almost an hour now. I think now might be a good
4 time for a ten-minute break.

5 THE DEPONENT: Fine with me.

6 MR. GRAVES: Off the record.

7 (Recess taken.)

8 MR. GRAVES: Back on the record.

9 Q. (By Mr. Graves) Okay. Dr. MacCarley,
10 did you speak with anyone about the substance of
11 your testimony during the break?

12 A. No.

13 Q. Did you review any notes or other
14 materials relevant to the case during the break?

15 A. I think I partially reread the page you
16 just referred me to, but no.

17 Q. Okay.

18 MR. GRAVES: I'll pass the witness.

19 MR. SMELCER: I have no questions for the
20 witness. We'll reserve the right to read and sign.

21 THE COURT REPORTER: Can I get copy
22 orders for the record?

23 MR. SMELCER: No rough and regular
24 delivery.

25 MR. SAUER: We'll take a rough and

1 expedite.

2 THE COURT REPORTER: Thank you.

3 (TIME NOTED: 10:42 A.M.)

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1 I, Rebecca L. Romano, a Certified Shorthand
2 Reporter of the State of California, do hereby
3 certify:

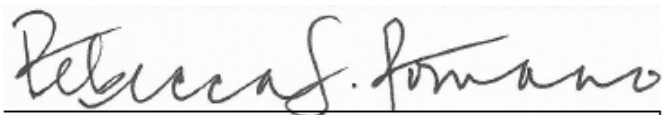
4 That the foregoing proceedings were taken
5 before me remotely at the time and place herein set
6 forth; that any deponents in the foregoing
7 proceedings, prior to testifying, were administered
8 an oath; that a record of the proceedings was made
9 by me using machine shorthand which was thereafter
10 transcribed under my direction; that the foregoing
11 transcript is true record of the testimony given.

12 Further, that if the foregoing pertains to the
13 original transcript of a deposition in a Federal
14 Case, before completion of the proceedings, review
15 of the transcript [X] was [] was not requested.

16 I further certify I am neither financially
17 interested in the action nor a relative or employee
18 of any attorney or any party to this action.

19 IN WITNESS WHEREOF, I have this date
20 subscribed my name.

21
22 Dated: March 17, 2025

23 
24

Rebecca L. Romano, RPR, CCR
CSR. No 12546

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March 17, 2025

To: Paul L. Smelcer, Esq.

Case Name: ADC Solutions Auto LLC v. The NOCO Company

Veritext Reference Number: 7211818

Witness: C. Arthur MacCarley , Ph.D., P.E. Deposition Date:
3/10/2025

Dear Sir/Madam:

Enclosed please find a deposition transcript. Please have the witness review the transcript and note any changes or corrections on the included errata sheet, indicating the page, line number, change, and the reason for the change. Have the witness' signature notarized and forward the completed page(s) back to us at the Production address shown

above, or email to production-midwest@veritext.com.

If the errata is not returned within thirty days of your receipt of this letter, the reading and signing will be deemed waived.

Sincerely,

Production Department

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NOCO Ex. 2016
ADC v. NOCO
IPR2024-00671

DEPOSITION REVIEW
CERTIFICATION OF WITNESS

ASSIGNMENT REFERENCE NO: 7211818

CASE NAME: ADC Solutions Auto LLC v. The NOCO Company

DATE OF DEPOSITION: 3/10/2025

WITNESS' NAME: C. Arthur MacCarley , Ph.D., P.E.

In accordance with the Rules of Civil
Procedure, I have read the entire transcript of
my testimony or it has been read to me.

I have made no changes to the testimony
as transcribed by the court reporter.

Date C. Arthur MacCarley , Ph.D., P.E.

Sworn to and subscribed before me, a
Notary Public in and for the State and County,
the referenced witness did personally appear
and acknowledge that:

They have read the transcript;
They signed the foregoing Sworn
Statement; and
Their execution of this Statement is of
their free act and deed.

I have affixed my name and official seal
this _____ day of _____, 20____.

Notary Public

Commission Expiration Date

DEPOSITION REVIEW
CERTIFICATION OF WITNESS

ASSIGNMENT REFERENCE NO: 7211818

CASE NAME: ADC Solutions Auto LLC v. The NOCO Company

DATE OF DEPOSITION: 3/10/2025

WITNESS' NAME: C. Arthur MacCarley , Ph.D., P.E.

In accordance with the Rules of Civil Procedure, I have read the entire transcript of my testimony or it has been read to me.

I have listed my changes on the attached Errata Sheet, listing page and line numbers as well as the reason(s) for the change(s).

I request that these changes be entered as part of the record of my testimony.

I have executed the Errata Sheet, as well as this Certificate, and request and authorize that both be appended to the transcript of my testimony and be incorporated therein

3/25/25

Date

C. Arthur MacCarley , Ph.D., P.E.

Sworn to and subscribed before me, a Notary Public in and for the State and County, the referenced witness did personally appear and acknowledge that:

They have read the transcript;
They have listed all of their corrections in the appended Errata Sheet;
They signed the foregoing Sworn Statement; and
Their execution of this Statement is of their free act and deed.

I have affixed my name and official seal this _____ day of _____, 20____.

Notary Public

Commission Expiration Date

ERRATA SHEET

VERITEXT LEGAL SOLUTIONS MIDWEST

ASSIGNMENT NO: 7211818

PAGE/LINE(S) /	CHANGE	/REASON
25:14	change "20 amp-hour" to "20 hour"	transcription
25:15	change "standard" to "is standard"	transcription
26:3	delete "of"	transcription
28:14	change "being the" to "being that"	transcription
30:14	change "the average" to "we average"	transcription
32:5	change "assume a lot" to "be a lot"	transcription
36:3	change "starts could" to "starts that could"	transcription
41:7	change "UCN's" to "ECNs"	transcription
41:9	change "current voltage" to "current and voltage"	transcription

3/25/25



Date C. Arthur MacCarley , Ph.D., P.E.

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____

DAY OF _____, 20____.

Notary Public_____
Commission Expiration Date

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