**Training\_ High-Power EMC Testing with DSR400 -20241029\_110024-Meeting Recording**

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45m 49s

 **Leander Rabe** 0:09
Excellent. Well welcome everyone. As people continue to jump in on the call, we are excited to have our sales partners from all over the world joining us today.
I'm seeing names from the West Coast of the US to Europe to Asia and this is exciting.
So this is our first attempt at webinar-based training, but the response has been very significant. Thank you for taking the time to join us.
And we will probably learn some lessons on how to do this, but we are glad that you've joined today.
So today's format is going to be a mix of prerecorded and live elements.

 **Leander Rabe** 0:46
In addition to myself, we'll be joined by Patrick Andre and EMC consultant in the aerospace industry.
We'll also hear from Larry Shank, who's been instrumental in the development of our aviation EMC test systems and for the last 15 to 20 minutes of our training, we're going to have a live question and answer session.
You can write down your questions as we proceed through this session.
Or you're welcome to post them in the chat as well.
This training will be recorded and we're going to have the video plus the transcript of the training available later this week on the partner portal.
So we will notify you by e-mail when this video is posted, and we'll also be including an application note around this training as well that is useful for not only for yourself, but also something you can share with customers in the future.
To understand the feature of our DSR 400 test system you also will need to understand our earlier CIS 25 test system.
So our President, Larry Shank, is going to lay out those differences for us.
And so if you would mute your mics and please welcome Larry to the training, we will get started.

 **Larry Shank** 2:09
I want to start with a welcome and a thank you for each of the people participating in this training session. We appreciate all the work that you do introducing AE techron products to potential users in each of your territories. The purpose of training sessions like this one is to give you tools to help you increase your success rate.

So let's get started with AE Techron and complete EMC solutions.
To start with some history, AE Techron is first a maker of world class A/C DC power amplifiers, products that are low noise, wide bandwidth, rugged, well supported and a great value.

The problem? We were only one part of the solution. We often saw people considering our products only to purchase complete single vendor solutions that were often created from interior inferior parts and sold at breathtaking prices, and then only to be poorly supported.

It was out of this experience we created our first complete aviation test solution, the CIS 25. The CIS 25 system covers all test categories, all frequencies and all voltages. For DO160, Section 18 conducted susceptibility and for DO 160, Section 19 induced susceptibility, it covers all tests, all frequencies and all test cases. A happy side note is that it also covers the low voltage 14 Volt DC and 28 Volt DC portion of section 16 at low currents. And it does military standard 461 CS 101.

So where does the DSR 400 fit in? The power requirements of section 16 can get large quickly. The CIS 25 is limited to 25 amps continuous and 50-amp surge. If you look at section 16.7.5.2 inrush current requirements, there is a test that requires the test lab to verify maximum inrush test currents or inrush currents of the DUT and these are 9x steady state at 3 milliseconds, 4x steady state at 500 milliseconds and 2x steady state at 2 seconds.

This puts a huge requirement on the test system to be able to at least deliver these kinds of power levels to make sure that the limitation is not power supply, but it's the power being drawn by the device under task.

To be able to test a DUT to this portion of the standard, the test system must be able to deliver at least nine times the steady state power requirement. The DSR 400-80 and 160 had considerable power and increased voltages to what is possible with the CIS 25.

The DSR 400-60 has enough power to meet the 9x surge requirements for 14 Volt DC and 28 Volt DC. Devices under test up to 30 amps and for 115 Volt A/C products, steady state loads of up to 20 amps.

If your customer is testing products with higher current levels found in things like electric motors and flaps or fuel pumps, we can create systems able to handle this in rush current or systems with steady state currents of up to 60 amps and deliver surge currents of up to 600 amps.

Another important point to make with customers are the requirements found in section 16.5.1.7. This is the DC content in an A/C signal.

It's common to have slight DC offsets in the A/C, and so this particular portion of the standard makes sure that the device under test can operate under those conditions.
This test requires a ± .2 Volt DC to be applied to the A/C signal.

* The DSR 400 adds complete coverage of mill standard 704.
* The DSR 400-80 and 400-160 contain all single-phase A/C and DC test levels in mill standard 704G, as well as most test levels from prior standards. This includes single Phase 115 Volt, 270 Volt DC 28 Volt DC and frequencies from 360 to 800 Hertz.
* The pair of the CIS, 25 and DSR 400 also provide significant coverage of power quality standards for both Airbus AB D 0100.1.8.1 and Boeing D 636440 E category Z.

So there you have it.

The CIS, 25 and DSR 400 provide complete coverage of DL160 section 16.
1819 Mill standard 704. And significant coverage of power quality test standards for Airbus AB, D 0100.1.8.1 and Boeing D 636440 E category Z.

 **Leander Rabe** 7:57
All right.
Thanks for that overview, Larry.
It really helps to understand the scope of what the CIS, 25 and the DSR 400 can cover.
So now we're excited to have Patrick Andre join us as Larry interviews him regarding what is unique in DO 160 testing and what he sees in the industry.

 **Patrick Andre** 8:52
About the DO 160 standard in particular, and how it differs the aviation testing differs from other testing like either industrial or automotive, where you typically need to go to a test facility.

So welcome, Patrick. And could you talk a little bit about how these requirements test requirements are different?

Well, sure. Thanks for having me, Larry. The first thing that is important about D160 is to know is that it is a standard that allows you to self declare. In other words, you can perform all of your own testing at your own facility. You don't need to go to a certified testing laboratory or have ACC.

How did the testing performed?

This makes the ability to do testing in house very valuable.
There's many companies that I know who they own their own equipment. They qualify their own equipment for aircraft use and the nice thing about the type of equipment that AE techron carries is that it is performed.

The testing it performs is what we call bench testing. This is testing that does not require a chamber or very expensive anequoic room, or anything of that nature, but can be performed on a simple conductive bench.

These benches, they have certain dimensions, are supposed to be two and a quarter square meter or larger, essentially a 4x8 or a 3x10 sheet of metal can be used as a ground plane for these tests.

And as a result, a lot of testing can be performed just in a basic engineering laboratory, developmental type of laboratory, and done quickly, easily and on site without the use of any very fancy equipment beyond the AE Techron system.

What would be the benefit to the customer of having it on site versus going to a facility?

There are a lot of advantages to doing this. Not only is it the the expense of a laboratory that tends to go away. That's an expense that is pretty easy to capture. But some of the other aspects are that testing in-house keeps the engineer, the technician people of that nature, in house and and so you eliminate travel time. You eliminate time out of house where the person is not available.

But there's also issues of when there is a problem during testing. If there's a field failure out of the testing laboratory, that tends to create issues for the.
The the the engineer or the technician performing the test, do they have the right parts to fix it? Do they have the right tools? Sometimes they need specialized tools to open a unit. Do they have the engineering resources that are required?

Things like maybe the design engineer being available to help look at where the problem may have occurred, schematics, parts and other engineering support. All of those things are now unavailable at a testing laboratory, but are available at the customer’s location, the manufacturer's location.

Well, now you've got an ability to perform the testing very quickly, resolve problems easily because everything is there. And as a result, a lot of people will end up doing engineering work earlier on in the design and design in these fixes prior to going to a testing laboratory or prior to doing final testing.

They say that if you can design in an EMI fix, it’s 100th of the cost of catching it during testing, final testing and every time you delay one step in the process, the cost of fixing EMI problems tends to go up by a factor of 100.

And this is really true in the case of military and aerospace type testing, especially aerospace testing, where if you do have to do a recall off an aircraft, now you're looking at potentially millions of dollars of cost. In order to fix a problem that you should have caught, that's only gonna cost a few cents during design.

Who would be the candidates for this kind of equipment?

Anyone that's making electronics for an aircraft. Anyone that must have any type of testing performed, bench testing or EMI testing performed on their equipment prior to being installed on the aircraft.

These are the people are that are going to be able to use this type of equipment.
It it that type of work will pay for itself quickly because they will have to perform the test at one point or another. Doing it early, doing it in house, all of these things are going to save them a lot of money when we talk.

When I introduced you, I mentioned that you were on the Standards Committee, right? And there's been rumour that the do 160 is due for revision.

Yeah.

Is there anything officially or unofficially that you can share with us about the changes that are coming?

Sure, sure. I am on the SC135 committee that is updating the D160. We are looking for release of do 160H in December of 2025. I think we're pretty, pretty much on track to being able to do that.

There are going to be a lot of changes, however none of the changes will impact how the equipment is going to be used or set up.

In fact, there's one test, the chatter relay test from section 19 of DO 160, that they wanted to eliminate and use another type of equipment. And I was able to convince them, based on the equipment you sell, and on some other testing I had done in part of the development of that equipment to show that this is still a very valid test. And we left it in.

They have now opened up the standard quite a bit to say this is what the waveform should look like, and your equipment meets that waveform perfectly, and as long as that equipment is used, you're going to be able to perform the test. So with this upcoming standard none of this equipment is is going to be out of date as a result of the upcoming standard.

And I should also mention that a Mil-Standard 461H is coming out and this equipment is useful for CS101. And that test will not be changing. So again, in Mil-Standard 461H the future of this equipment is still there. It's not going to go out of date.

Is there anything else that you would like to share or you think it would be important for somebody?

Working with this equipment I have found that the flexibility of this equipment and the ease of how it can be, the test can be, modified and updated to maybe specific requirements a customer have imposed on them…the ability to make these changes is very simple. The equipment is easy to use. The transformers that have been designed for this system are excellent.

I am very impressed with how well they work, over what range they work, what sort of levels they can get out of them. I've been very, very happy with the performance of this whole system. And like I say, the easy use has been remarkable, and I commend you for the quality of the work you've done.

 **Leander Rabe** 18:15
Maybe you're already familiar with the software of the 3110A standards waveform generator, which is a part of the DSR 400 system, but I find there are some of our sales partners who have not personally experienced using that software, and they don't really know the ease of use that Patrick just talked about. So, here's a quick look at its approachability.

 **Leander Rabe** 18:46
One of the core components of both the CIS 25 and DSR 400 test systems is the 3110 standards waveform generator and one of the key advantages of that generator is the approach ability. Using the standards library. So I just want to share my screen.
With you for a moment and imagine if we were sitting with an engineer and showing them how usable this system really is.

You notice up here at the top right I've got the files button. I'm clicking on that right now and we have two options of standards library or user standards. We're going to the standards library and now we have a choice of automotive, aviation, and industry standards. Over 3400 tests from various standards are included in this library.

I click on aviation now you see that we have the option of several key aviation standards, including DO 160. I'm selecting, let's say section 18, because we're going to run a test there today and I'm going to select the Ripple voltage category B 28 Volt test and there…the test is loaded, and it really is that simple.

I was at a show yesterday and was able to just show some engineers how approachable this software is, and they literally gasped, “whoa, that is amazing!” All because of the ease of use, and that really is a great feature of this system.

You also are able to easily manipulate if you need to add some custom configurations to this waveform. Such as, for example, I can drag and drop that simply by dragging this over here, and click on one of these segments.

You notice that then down below I have different wave properties that I'm able to adjust. Because, again, sometimes with any aerospace standard, you may need to make some custom modifications for a customer. And so they're able to make that adjustment there.

And then in that case, they would save that waveform to their user standards library. The beauty of the user standards library is that then, a couple times a year, when we update the standards library and send that update to the customer, they're able to upload that update into their 3110A standards waveform generator and it will not override any of the user standards that they have in that user standards folder. So that is protected even while the standards library is updated for them.

So again, this is a very approachable system and very easy to use, and it's one of the great advantages of both the CIS 25 and DSR 400 test systems.

 **Leander Rabe** 21:31
So coming up, we have a deep dive on the 3110A. Watch out for that training coming up in the future. But now that we've looked at the ease of use of the DSR 400 test system, we want to take a look at its performance compared to the competition. And Patrick will help us do that.

 **Patrick Andre** 21:58
So Patrick, I received a print out oscilloscope observation of a piece of equipment that's used for aviation testing and you sent me a similar image from our equipment. Could you speak a little bit to the quality of the test signal? How important is that for a valid test?

Well, a lot of the methodologies used by some of the power supply manufacturers who have performed these waveforms is that they'll chop these things up and into small little bits. Instead of having a nice smooth transition from one point to another, you end up with these rather ragged lines that you see on the screen here.

Maybe some overshoot like the very bottom here as it reaches the bottom of the waveform, it kind of overshot a little bit and then again another stair step coming back up and the whole thing is a little bit noisy. It is not a, not a clean way to do it.

The beauty of the Techron system is that these waveforms are very precise and very clean. If you see the screen capture I've got from your your system here. It's coming in at 28 volts and it has a very clean ramp down to the minimum voltage. 0 volts goes across and very clean and precise ramp up. This has been typical of every waveform I have generated out of this system.

The 3110 has these beautiful ramps. They're very clean, they're very precise and they they produce wonderful waveforms that are going to be well accepted by any customers that the people who are going to be buying this equipment, they're going to look at these waveforms and they're going to say this is the type of testing we're looking for. So even though it's self-declared, if you provide equipment for someone like a Boeing or an Airbus, they'll want to see your test results. You need to report exactly the way you do these tests. You need to show what are the waveforms we are creating.

And you need to prove that when this testing was done, it was not only done correctly, but the better quality the work is done, the more likely the customer is going to say this looks great. Will we accept your data with no questions asked?

 **Leander Rabe** 24:52
Larry, I'm sure today's information has been helpful and at the same time, we're continuously improving our products at AE Techron. What are some of the new upgrades that people can look for with the DSR 400 test system?

 **Larry Shank** 25:13
Thank you, Leander.
We've got a couple of things coming soon that weren't quite ready for today's training. But they're close enough that we can talk about them.

The first one is that we've had several people present the DSR 400 to customers that that service that had military as a customer, and they said that we needed the system to be TAA compliant for them to be able to purchase it.

So, we're working on that and that involves slightly different keyboard and a mouse and a change to the signal generator which will move to a key site in our system and then that makes that brings us to TAA compliance. So if you have customers that are that sell into the military will have a solution for them.

 **Leander Rabe** 26:02
We also found that some in Asia also were looking for that same feature, even though they're not subjected to TAA compliance.

 **Larry Shank** 26:02
Correct. Yeah. The second. Another thing that we are working on is the DSR 400 is great for 14 volts and 28 volts DC and 115 volts A/C, which is the vast majority of the testing. But there are some that do 270 Volt DC and 2:30 Volt A/C.

We can already do all but one or two measurements in those two standards, but we're not quite complete yet. And we're working on and will be announcing soon a high voltage option for the DSR 400 so you can do those tests in that portion of the standard as well.

The final thing in the coming soon for the DSR 400, we recently received the helicopter standards for Airbus and have reviewed those and those look like we'll be able to add those to the DSR 400 as well and will be those will be available, we're hoping in the next several weeks.

So those are all new things that you'll be hearing about in upcoming SPi newsletters.

 **Leander Rabe** 27:16
Excellent, excellent, exciting upgrades and we just continue to build out the capacity of this powerful test system.

So, we wanted to make sure we had time to open it up for questions and discuss applications that any of you might be dealing with.

Again, we have people from all different parts of the world and different markets, so it's going to be exciting to hear from you, but I didn't see if Patrick had made it on the call. There's a lot of people on the call right now, so Larry, it might just be you and I fielding these, but let's just open it up.

I see Frank's got his hand up here. Frank, where did you have a question for us or if anyone else can you throw them into the chat or also just bring them here to the table right now?

 **Frank Krozel (EIA)** 28:01
I do. I've actually got two looking at the waveform.

 **Leander Rabe** 28:03
Yeah. OK.

 **Frank Krozel (EIA)** 28:06
I recently sold the the CIS to a customer locally over here. They have seen the AE Techron amplifiers in the past at every test lab, at least in my territory here. And so I kind of lead with that, that you've already tested out the toughest part of this, which is the the amplifier and now we're introducing new products.

You guys just shown a few seconds ago a waveform that shows the AE Techron waveform is a clean waveform and the competitors model has got some aberrations on it, which to me I'm thinking high frequency noise.

 **Larry Shank** 28:44
Mm hmm.

 **Frank Krozel (EIA)** 28:45
Does anybody look at the high frequency component? I mean, we're looking at the waveform as it's presented to us but are any of our customers smart enough to start looking at the harmonics on the waveforms or anything because of those aberrations on the transition, you know, introduced with the slew rate and what not.
So that's my first question.

 **Larry Shank** 29:09
Yeah. The thing that that would probably be the that I hear often is a concern about over test. And if you look at that waveform that was supposed to be a 1 millisecond, drop and a 2 millisecond or one in a one millisecond hold, and then a two millisecond rise. Clearly there's all kinds of things going on in that waveform other than the drop and the hold and the rise.

And so that's that is something that a lot of customers get really upset that their product fails because you've over tested so that that would be something. That would be a way to address it with your customer.

 **Frank Krozel (EIA)** 29:48
Mm hmm. OK.

 **Frank Krozel (EIA)** 29:50
My second question is understanding that D)160 and Mil 461 have many different compartments and what not internally, and you're not doing all these tests. You're doing certain tests that are related to transients, transients that we could actually do things that you know. Are our systems can work in there?
Is there going to be a small CHEAT SHEET that we can maybe send graft or whatever sent out to a customer that says are you interested in DL160 part or Mil-Std 461 part, or how are you doing this? Or would you like to see a solution for these?

 **Larry Shank** 30:22
Mm hmm.

 **Frank Krozel (EIA)** 30:24
Are we going to see some type of a a subset of those two standards?

 **Larry Shank** 30:25
Yeah. So, the kind of the magic of the DF, the CIS 25, the DSR 400.

* Is it does the entire 19.
* It does the entire 18.
* And it does the entire 16.

So it's there's no part of this or part of that it does, it does the whole thing.

 **Frank Krozel (EIA)** 30:54
OK. Thank you.

 **Larry Shank** 30:56
As well as it also does the entire Mil-Standard 704, which is a military equivalent to a DO 160…very similar.
There was one other thing that I talked about in give you guys a chance to come up, work up any of your additional questions. I started to talk about it. I did notice in the editing that the second half of my response got trimmed out.
Something about I talk too much, I'm not sure. We talked earlier about the DC offset test, but didn't talk about its significance.

Was working with, actually, it was Tom Klouda in Frank's territory where they their test systems, their amplifiers, at ripple voltages of several volts and they were trying to do this test that asked them to put a 2/10 of a Volt DC offset into the waveform and they couldn't find it.

They couldn't see it, so a big difference between stuff from, say, an Ametek or a similar provider like that, is instead of having ripples on their switch mode amplifiers measured in volts, ours are measured in millivolts.

These are much cleaner outputs, and you can see from the waveform the magnitude of difference between what our test signals look like, and what test signals from a competing equipment look like.

 **Leander Rabe** 32:18
Hmm. Well said.
Sam asks a question across the pond in the U.K., and he says for non-us based military aerospace companies are there ITAR restrictions or other export controls?

 **Larry Shank** 32:26
Mm hmm.

 **Leander Rabe** 32:35
And.

 **Larry Shank** 32:35
I believe we are an EDA. It's a 99 is the last two digits, which means that it is general equipment and so there's no no restrictions.

 **Leander Rabe** 32:48
And from the US government perspective, we must abide by those regulations.
We're able to export this system to many, many countries. If you had a question on your end if that would be restricted by the US government, you could always ask us in advance and could run that through the portal that we're using to make sure we have clearance to do so.

It's a government portal, so we'd be happy to pre-check that for you if you're exploring an opportunity with a certain customer. So just let us know.

Any other questions in the chat or in person? You can unmute and fire away. With this many people we really covered all the bases already? We'd hoped this would hit the spot, so if we've covered all of that, then that's great.

While you're thinking there again, we'll be sending out a copy of this training recording as well as having a link to our YouTube channel where the entire interview with Patrick will be available. He covers a couple of other things and we'll have that there. Also we'll have our application note for this particular area with DO 160 and our test systems and the other standards to you later this week and get you all that information.

Frank, you have another question.

 **Frank Krozel (EIA)** 34:27
The elephant in the room.

 **Leander Rabe** 34:29
That's right.

 **Frank Krozel (EIA)** 34:30
The specifications that you guys just showed a few minutes ago indicated low voltage DC.

 **Larry Shank** 34:33
Mm hmm.

 **Frank Krozel (EIA)** 34:37
Does that mean that we should keep our eyes and ears open for transients and things related to the automotive industry, for the electric vehicle industry?

 **Larry Shank** 34:52
There are things that are being developed for those markets, in particular the electric vehicle industry, that they're a little farther out. We can't quite talk in detail about them but rest assured that they're in development and you'll be hearing about them soon.

 **Frank Krozel (EIA)** 35:07
Thank you.

 **Larry Shank** 35:09
One thing that we didn't mention about Mil-Standards. We kind of brushed over MIL standard 704 quickly. I've noticed that there are a couple of companies that have added a mil standard, 704 is something that they're claiming to have a system for.

If you look at the standard, and I believe it's in standard 704-8. There are ripple frequencies that go up to 16 kilohertz, and so. That would be a question to ask. If you find yourself competing against someone like I'll be able to, I don't have the exact portion of the standard. I don't have the number, but I can get get with Leander and he can get that information to you.

What if they're claiming 704? They may not be able to cover the whole standard. Very likely they can't.

Saw some other questions.

 **Leander Rabe** 36:08
Yeah. There are a couple questions here.
Nicholas is asking, does the section 19 solution include all the wire radiators, safety resistor, et cetera?

 **Larry Shank** 36:20
Wires the chattering relay, the coupling, the high voltage, and I don't know if it has the resistor in it or not. Which resistors is he speaking of?

 **Leander Rabe** 36:39
Nicholas, you can feel free to add to your question.

 **Leander Rabe** 36:42
Nicholas described is as a safety resistor.

 **Larry Shank** 36:46
OK. What we do instead of a safety resistor is the the coupling transformer.
Or in this case it is the T3700 has a 1 amp fuse in it so that it opens if they're on the far side. If the current is greater than 137th of an amp. And so, we've chosen that versus a safety resistor where we actually have a fuse in the system.

 **Leander Rabe** 37:13
OK. And then he also asks what Abd tests are included in the library.

 **Larry Shank** 37:24
If I could share my screen. On our website there is a section that allows you to look at all the standards that are in 3110A complete standards library. And so, where we're at right now is we're looking at the Abd 0100.1.8.1 issue., C And this is the list of tests that are included. Figured this would be easier than me trying to say that.

 **Leander Rabe** 37:58
Absolutely.
An extensive list.

 **Larry Shank** 38:11
So products, test test systems or excuse me, standard waveform generator, there we go.

 **Leander Rabe** 38:17
1st.

 **Larry Shank** 38:22
Go to complete test list, pick out your standard and let'll see like Airbus which is that one and then all of the tests that are available will show up for you.
So that's available to you anytime you have a customer that asks you a question.

 **Leander Rabe** 38:40
Excellent. Until next month and then our new website will be launched and it will look a little different, but still very useful next next month as well.

 **Larry Shank** 38:47
Yeah, yeah.

 **Leander Rabe** 38:49
All right.
Other questions? These are great.

 **Ron Ahlquist** 38:56
Leander and Larry this is Ron Ahlquist here from Altamont.
First of all, yeah, great job on the presentation.

 **Leander Rabe** 39:00
Hello Ron.

 **Larry Shank** 39:01
Hi, Ron.

 **Ron Ahlquist** 39:04
I thought it was good overall presentation on DM interviews and stuff.
I did have a question as far as reference. Is there any reference sites you have that we can use? To say, hey, you know this customer is super happy with this product.

 **Larry Shank** 39:25
Mm hmm.

 **Ron Ahlquist** 39:26
And just wanted to see what what we have on that. You know I don't know if any of the big automotive guys have one already and are using it.
But just kind of wanted to get your feel on that.

 **Larry Shank** 39:42
That's that is a really good question. We've not done much of that. You mentioned automotive in as an example. Yeah.

Because most of the companies are large and so like I'll jump over because I had this experience in automotive in the last month or two. I ask they they have operations in Kokomo and operations in Noblesville, but I I don't believe I'm allowed to say who they are.

And so, I asked if I could take a picture of our equipment in your lab? But I would.
I would take the picture small enough so that all we would be able to do is see our equipment in the back wall. And it was a blank back wall. So, he says let me check with management and so he got an answer back in about 3 hours that said, no, you're not allowed to take a picture.

So, we've we have, I mean informally I can, I can mention, I mean for example, the facility that Patrick took pictures at was Astronics up in the Northeast.

Most of the companies have our power supplies. I mean, Cessna, De Havilland, Boeing. Airbus all have our products in their labs.

 **Leander Rabe** 41:02
You take the defense contractors. In addition to that, all of them, all of the big primes, yeah.

 **Larry Shank** 41:06
Yeah, yeah. We have products. I forget the official name of it, but the missile…submarine missile launch something or other department has one.

 **Leander Rabe** 41:27
Yeah. So that's that's something that we'll we'll try to work on, Rob. And we do have some NDA difficulties with how much we broadcast on that.

 **Larry Shank** 41:30
Would that be used? How important how important would that be for you on?

 **Ron Ahlquist** 41:41
I think since it's a new product, I think it's important for customers, especially with the Ametek name out there and you know, Frank was talking earlier, and you know he's familiar with that product as well. We worked together years ago on some of that.

 **Larry Shank** 41:55
Mm hmm.

 **Ron Ahlquist** 41:58
You know it's it's good to have that information just so people can get a feel because again, you know, working with vendors who are, you know, breaking in to certain things so.

 **Larry Shank** 42:01
Yeah.

 **Ron Ahlquist** 42:11
It’s an uphill battle and that tends to help.

 **Larry Shank** 42:15
Yeah. OK.

 **Leander Rabe** 42:17
Yeah. We'll work on that. That's helpful. Thank you, Ron.

 **Larry Shank** 42:22
Yeah. Appreciate it.

 **Leander Rabe** 42:25
Excellent. Let's see. Someone asked.
Nicholas has a couple more questions. What's the shortest duration interrupt that the system can apply?

 **Larry Shank** 42:37
OK. So that takes us outside of aviation. The rise and fall times in aviation typically are around one millisecond. And those kinds of rise and fall times are are no problem at all.

As you head into aviation the amplifiers in the CIS, 25 are capable of rise and fall times, let's say two milliseconds to two to three microseconds.

The amplifier that is in the DSR 400 is capable of about a 30 microsecond rise time and a fall time of the generator. The 3110A generator, that's a part of the system, can do rise and fall times in the one to two microsecond area and pulse durations, individual pulse durations of about 10 microseconds is about our lower limit. There's some buffering, so if you need to have a bunch of them in a row, then that gets a little bit longer, but those are those are some of the the that's kind of the lower end or the as quick as you can get. Does that help?

 **Leander Rabe** 43:47
That's good.
Nicholas also asks for section 18 and 19... the frequency sweep test. Is there an ability to add specific dwell frequencies?

 **Larry Shank** 44:00
Yeah. Section 18 and section 19 I believe are already segments and so it would just be adding another segment somewhere along the path. And then have it hold at that frequency. The other way that you can do that is in the and let's see if I might just go ahead and fire up the software.

 **Leander Rabe** 44:20
Mm hmm.

 **Larry Shank** 44:28
In the software, there's a trigger segment. And when you're in the trigger segment, if I can go ahead and share. In the trigger segment, one of the options is to continue with the previous wave. And so what it'll do is it'll play the wave, and then it'll just hang out there and it'll hold that until an external trigger and you've got a couple of choices for the trigger.

You can have a keyboard entry trigger or GPIO, so that would be a really, that'd be another really easy way to get it to to do what you just asked.

 **Leander Rabe** 45:10
Thanks for showing that, very helpful. Any more questions? Great stuff.

 **Frank Krozel (EIA)** 45:24
Good job guys. Thank you.

 **Leander Rabe** 45:27
Right. Well, going once, going twice if you have more, feel free later to send anything you, you know, suggestions or questions.

 **Larry Shank** 45:33
Yeah.

 **Leander Rabe** 45:35
We're all ears to that and we just really appreciate all of you and the time that you've taken to be here today. Thank you.

 **Larry Shank** 45:37
Yeah. Really appreciate it.