

**Summary:** This study guide will serve as a supporting document for the “Misc. Applications” session. For visual guidance, please refer to the corresponding Slide Deck which was included in the same email from which you downloaded this document.

As always, if you have any questions about this Study Guide, please do not hesitate to reach out at any time!

**Pressure Monitoring Screen:** On this screen, we are monitoring the “Inlet” and “Outlet” pressure in PSI (pounds per square inch). As I have pointed out before, you will notice how much larger and clearer the numbers appear on the screen when there are less “Objects” being shown. As a reminder, up to 8 objects can be on one screen, but I personally feel as though it gets a little busy with that many objects.

The third channel we are seeing on this screen is actually the average reading between the inlet and outlet pressure! “Averaging” is just one of SEVERAL math functions the Consolidator+ is capable of performing, and we will go into much greater detail about math functions in a later class.

For now, just know that the Consolidator+ is capable of performing basic arithmetic (addition, subtraction, multiplication and division) and can actually be used to do trigonometry (no, seriously. It can do trig!).

The last thing to notice about this screen is that I have THREE channels being displayed, but there’s only ONE bar graph. That is because each channel can be programmed to have a bar graph associated with it, or not. The default is to ALWAYS have a bar graph.

In this scenario, let’s say the customer only cares about the average pressure reading. In that case, they wouldn’t really need or WANT to have three bar graphs on the screen. It could get quite confusing for them, so I programmed it to have ONE bar graph, and I even color-coded which channel it is meant to represent!

**Leak Detection Screen:** This screen is rather similar to the last screen because we are monitoring pressure, but you’ll notice that the engineering units are in “Bar” now. That is NOT a custom unit, it is actually stored in the unit’s library.

However, on this screen we are reading 4 different pressures and we don’t have ANY bar graphs on the screen. Now, if you take a look back at the previous screen, you’ll see how much larger and clearer the numbers are when there are less objects on the screen. You can see here that they are still clear and fairly large, but they are noticeably smaller.

The fourth Object on this screen is actually an alarm that I turned into a channel (details on what that means and why will be covered in future sessions) so that I could have the screen display full words and phrases. If I had just put the alarm object on the screen, the only thing it would say is the name of the alarm, “ON/OFF” and the set and reset points of the alarm.

I personally think it looks much slicker when all you see is words, so that’s how I programmed this display.

Just like we saw in the Gas Detection session last week, this “Leak Detected” channel is actually a common alarm that is monitoring Sections A through D. If the pressure reading on ANY of those channels gets to a certain threshold, that could mean a possible leak in the system. So, when that happens, regardless of WHICH section goes into alarm, our “Leak Detected” will turn from a solid GREEN with the word “NO” to “YES” with a yellow background and pink text (just to show, once again, that you can pick ANY color you want for channels or alarms).

**NOTE:** *if more than one “Section” goes into alarm, nothing special will happen. The alarm will still change colors and say “YES”.*

Not only that, but the “Section” that is causing the alarm will also turn RED and flash to let an operator know exactly which section they should go inspect!

Now, each Section is being read in the same exact engineering unit. But, as mentioned previously, since the Consolidator+ can do automatic unit conversions, we could have had all 4 sections reading in different (unique) engineering units, and the common alarm would STILL work.

**Temperature Readings:** Temperature is actually the most widely measured process on the planet. From taking your child’s temperature when they are sick, to making sure your Thanksgiving turkey is cooked all the way through, temperature measurement is extremely important.

Now, the most important thing to remember when we talk about temperature is that the Consolidator+ CANNOT accept direct temperature inputs (RTDs, Thermocouples, etc.). The temperature signal will have to be converted to a 4-20 mA signal, or even Modbus – although that is really not common.

However, Precision Digital DOES have plenty of meters which will accept a direct temperature input, and our most popular temperature meter, by far, is our [Trident X2 Series!](#)

That said, temperature engineering units are built into the Consolidator+, so it’s good for you to be aware that it CAN be used for temperature monitoring.

On this screen we are just looking at temperatures of a Pizza Oven, a Bacon Oven (my favorite, of course) and Outer Space!

**WHY** would I choose to make “Outer Space” a channel on here?

Well, there are two reasons! The first reason is to show you that K (degrees Kelvin) is actually an engineering unit that is in the unit’s library. For the first time in a while, I did NOT make that a custom unit! The second reason is to show you just how many decimal places can be shown on a screen.

Technically speaking, we are able to display up to FIFTEEN decimal places. Now, using that many decimal places with an analog signal doesn’t make much sense because the readings will look extremely unstable, even though they are not! It’s just too high of a resolution for a simple analog signal.

**NOTE:** *Although I am not sure of the exact number, Outer Space (beyond our solar system, and outside of a “habitable zone” of any star) is measured AROUND 4 degrees Kelvin which is really close to “Absolute Zero”!*

**pH Measurements:** One application type that has certainly not received as much recognition in this class as it should is pH, or any analytical measurement for that matter.

If you sell pH sensors, then you know how critical it is to make sure the sensors are cleaned, calibrated, and in working order. So, that means the Consolidator+ should be able to display more than JUST the pH reading from the probe, right?

So, on this screen we are monitoring the pH of something, and we are also keeping track of how long the probe has been in service, and that is directly correlated to the “Sensor Life”.

**NOTE:** *A lot of these types of parameters are actually going to come through over Modbus as opposed to an analog signal. And yes, the Consolidator+ can act as a Client (formerly known as “Master”) to poll the information and display it like you see on the screen.*

That means that if you sell pH sensors, the Consolidator+ may actually become your new best friend!

**Why is that, exactly?!**

Well, we can have the ConsoliDator+ throw an alarm right around the time the probe is due for replacing or calibration. From what I have heard in the field, a lot of the time the probes are actually just replaced with a new one.

You will notice the GREEN bar graph on the left side of the screen has an “Alarm Marker” (A2) toward the bottom of the graph. That graph is actually representing the “Sensor Life”. When the “Sensor Life” gets to be around 30%, the Bar Graph and channel can be programmed to turn a different color to draw attention to the sensor nearing end of life.

Guess what?!

That means the customer calls YOU for a new sensor before it's a dire emergency where they need a probe immediately. In fact, we could even program an “Object” on this screen that instructs the customer to call your company when the sensor life gets to a certain point!

So, that is just ONE way the ConsoliDator+ will become your best friend if you sell pH probes.

How else can it become your best friend? Well, if your customer is using Modbus for this type of analytical application, then they could actually plug in over 100 pH probes with just ONE “Base Model”. As a reminder, **the Base Model is only \$1,700 USD... that's not bad for a device that can monitor over 100 probes!**

**Speed Measurements:** As you learned during our “Flow Applications” sessions during week 2, the ConsoliDator+ is able to accept pulse inputs from various flow meters.

Wait a minute, why are we talking about flow meters now?

We aren't! We are talking about speed applications. Let me explain.

Typically when someone says “Pulse Output” or just “Pulse”, we automatically think of flow applications, right? We typically think of a positive displacement (oval gear), or turbine flow meter that is sending out X amount of pulses per unit of measure.

However, pulsed signals can come from a variety of different objects. For example, a rotary encoder is going to communicate using pulsed signals. Or, what about some sort of rotating equipment, like a motor?

In this example, we are going to use the PULSE INPUTS on the ConsoliDator+ to monitor the speed of rotating equipment – sort of like a tachometer (before I get called out on it, when we measure rotating equipment we are not actually monitoring the SPEED, rather, it's a measure of frequency that can be THOUGHT OF as speed).

So, we can scale a channel to show us “Revolutions Per Minute” as opposed to VOLUME per minute that you would find in a flow application.

In fact, we can even totalize based on RPM if you really wanted to! I'm honestly not sure of a reason to do such a thing, but if you know of one, I'd love to hear it!

Lastly, just like we can create an alarm for a flow rate channel, we can create an alarm if the “speed” of our fan or motor becomes too high! We can also use a “Soft Key” to reset our “Total Fan Revs”!

**Timers / Scheduling:** Timers and the ability to schedule is probably THE feature that really lets the ConsoliDator+ shine. In fact, this is the very first Precision Digital product that has a real-time clock that can be used to schedule events!

We will go into much more detail about the timers and schedules in a future class, but for now just know that we can schedule events, and we can also use timers to perform MANY different functions.

The first channel on this screen is literally just the Real-Time Clock. I created a “Channel” and the “Input” to that channel is the “System Clock”. You now see exactly how the clock will be displayed on a screen.

Most of the time, nobody would want to display it on a screen, but for the purposes of this class, I wanted you to see how it appears on a screen.

As mentioned before, the system clock can be used to schedule events, and more recently, it is used to timestamp the data logs! Other than those two things, that’s basically what it’s for!

So, what can we actually schedule?

Again, we will go into more detail in a later class, but here are just a few examples of the types of events we can schedule with the Real-Time Clock:

- Force a relay on at a specific day and time (pumps, fans, alarms, etc.)
- Reset a total at a specific day and time
- Start/Stop/Pause a programmed timer
- Test the unit’s internal horn/alarm
- Activate and deactivate digital outputs
- And MUCH MORE...

As well as a clock, the Consolidator+ is able to keep track of elapsed time. Now, we saw this happen on our “Duplex Pump Control Screen” during week 1 where the unit is keeping track of the pump run time, but this is a different object entirely.

The timers can be programmed to start at 0 and count up to infinity (or, close to..) or they can be programmed to start at, say, ten minutes, and count down to 0.

The timers can be used as a “Stopwatch” and you can have multiple “Laps” – just like you would on a traditional stop watch.

On this particular screen, that timer is actually triggered by the “Leak Detected?” alarm on one of the previous screens. Here’s the idea:

When that alarm is triggered, our “Alarm Timer” will start counting from 0. Now let’s say one of the operators decides to ignore the alarm, or they get too busy with something and forget to go back to it. Well, if that alarm remains active for 30 seconds, we can have that set off ANOTHER alarm. Maybe that alarm goes to their boss to let them know the plant floor isn’t being attended to properly.

Or, we could even take it a step further...

We could actually data log that timer every time it starts. Then, at the end of the week or month, someone can look through it and see how long it has been taking for someone to address an alarm and fix it! The possibilities are almost endless!

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As you have seen, the Consolidator+ is extremely versatile, and can be used in almost any application your customers may have. The reason I decided to put all of these application types into one session is simply because there is not enough for me to make an entire session out of any ONE of them.

Plus, some of the clever features we have gone over only make sense in certain contexts, like the 15 decimal places. Measuring Outer Space temperature is the only thing I can fathom that would even use that many decimal places, and even though it’s a bit of a silly example, it got the point across.

Next week will be our FINAL applications-based session, and we are going to discuss COMBINING multiple application types on one unit! For example, you learned that the same unit can be used for flow or level control, but it can be used for BOTH of those applications at the same time!

Your participation in this class has been greatly appreciated thus far, and I look forward to getting into the programming side of things with you in the next couple weeks!

Sincerely,

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