

Summary: This study guide will serve as a supporting document for the “Level Applications” session of the ConsoliDator+ MasterClass. This will go over the exact same topics we reviewed but will go a bit deeper into the significance of each feature and why they make the ConsoliDator+ such a unique level accessory!

For visual guidance, please refer to the corresponding sections of the slide show that was included in the email you received immediately after the session ended.

Default Bar Graph Display: This type of screen is as basic as it gets for level monitoring. In fact, when you first power up a factory sealed ConsoliDator+, a default bar graph screen is precisely what will be displayed. All of the bar graphs will be scaled for 0-100% of full scale, and this actually allows a customer to get up and running without having to worry about configuring anything!

The default colors of the bar graphs are “Precision Digital Blue”, but they can be any color available on the 64-color “color pallet”. How to change/select colors will be covered in a future session.

Each “Channel” that corresponds with a bar graph can be labeled with a completely custom “Tag” and “Engineering Unit”. In the example we discussed during the session, the Channel “tags” are simply, “Tank 1, Tank 2, Tank 3, Tank 4” and you’ll notice that they each have a completely unique engineering unit.

Now, you’ll notice that the Channels are in the same order as the bar graphs. The bar graphs are read from left to right, and the channels are read from top to bottom. This is an intuitive way to easily match the bar graph with the channel.

That said, we can use colors and/or channel numbers to make it even easier for the user.

I purposely made the decision to not have the bar graphs and channels labeled with the “Channel Numbers”. The screen looks much neater that way.

However, you could label each bar graph and corresponding channel with the assigned “Channel Number”. Or, better yet, you could make each bar graph a completely unique color and use that same color for the “Channel”! Essentially, I am suggesting one could color code the ConsoliDator+ screen, and some customers do exactly that!

What about those buttons on the bottom of the screen? What do they do?

From this point forward, those will be referred to as “soft keys”, and sometimes folks also call them “hot keys”. The reason for this nomenclature is because the buttons are not permanently fixed. In other words, they can be customized on EACH screen to change their function.

On this screen, you see the default configuration of the soft keys.

Here is what they do:

Menu: Opens the programming menu (most of the time...)

Arrow Keys: If you have multiple screens configured on this unit, a user can manually scroll through each screen using these arrow keys.

Scan: Rather than manually scrolling through the screens, the ConsoliDator+ can be configured to automatically scroll through the screens for you! Once you press the “Scan” button, it will change to a “Stop” button which allows you to stop the scanning. Each screen can have a custom dwell time as the ConsoliDator+ automatically scrolls through the screens, and certain screens can be omitted from the automatic cycle!

Ack All: This button can be used to “acknowledge” every alarm that is currently “tripped”.

Five Zone Bar Graph Display: One of the features that really sets the ConsoliDator+ apart from most any legacy Precision Digital product is the ability to change colors of the channel (and bar graph) based on an alarm setpoint. Now, typically folks may use this feature to just turn a channel RED or YELLOW when an alarm is active, but we can get a bit fancier than that!

On this screen, we have just one tank being measured in Feet and Inches.

In this example, we want to maintain the level in the tank between roughly 40 feet and 10 feet. When the level is in this acceptable area, the bar graph and channel are green, and everything is fine!

When the level exceeds the “A2” alarm marker, the bar graph and channel are configured to turn YELLOW to draw attention to the fact that the level is rising and is now outside of our acceptable zone.

If the level continues to rise, and we surpass the “A1” alarm marker, the bar graph and channel will turn RED, and everything will begin to flash to really draw attention to the fact that the level is rising.

The same will happen if the level goes in the opposite direction, and we decrease down below the “A3” or “A4” alarm markers respectively.

Now, we are just discussing VISUAL alarms. The ConsoliDator+ can be configured so that an alarm forces a relay to close, which can then turn on a light/horn stack ([available from Precision Digital](#)) or could be sent back to a PLC to trigger other alarms in the plant!

So, why is this even important? Why would I bother mentioning this?

Well, there are a TON of older panel meters out there in the world that use this type of logic to display the level of a tank. They are simple panel meters that use different color LEDs to show the level of a tank from 0-100%.

In fact, I have personally been in plants where they have an ENTIRE WALL of these vertical 1/8 DIN panel meters.

So, if and when you see any of these out in the field, you can now replace them with a ConsoliDator+! As a reminder, if we are only talking about using 4-20 mA inputs, we can actually **replace 28 of those panel meters with just ONE ConsoliDator+ unit!**



But, what about the soft keys at the bottom of the screen? Are those different for this?

The answer is, not really. They will all function the same with the exception of the “Menu” key. You’ll notice when our bar graph turns YELLOW (or RED) the “Menu” button changes to a RED “Alert!” key. We will discuss what that means in more detail right now.

“Alerts!” Screen: When the “Alert!” button comes up, that is letting the operator know that an alarm is currently triggered. It is quite literally alerting them to the problem... get it?!

Now, you may be thinking, “Professor, the bar graph changed colors and it’s flashing! That should alert an operator, right? Why do they need that “Alert!” key?”

Well, that is because the Alerts! Screen will show you ALL of the current alarms regardless of which screen the operator happens to be viewing.

This is extremely useful if the operator is focused on just ONE level screen, and they don’t happen to notice the level creeping up on one of the other tanks they have displayed on another screen. The Alerts! Screen allows an operator to have complete visibility over their process without having to worry about looking in the wrong place!

The Alerts! Screen shows every active alarm, it shows the order in which they were triggered, and if you labeled your alarms “properly” (more on that in later weeks) you will be able to know exactly which alarms are triggered by simply looking at the list of triggered alarms.

Or, if you want to drill down a bit deeper on the active alarms, you can do that!

By pressing the “right arrow” key when an alarm is highlighted, it will dive deeper into the alarm. It can tell you the status of the alarm, it will show you the setpoint and reset point of the alarm, which analog input is associated with that alarm, and which channel that alarm is connected to, and the actual tank level of that channel!

From this screen, you can acknowledge the alarm, change the set and reset points of the alarm, and much more.

Again, regardless of which screen an operator is looking at, the “Alerts! Screen” will allow them to quickly look at all active alarms, and drill down to see exactly what is going on with that specific channel and/or analog input!

Duplex/Triplex Pump Control: As with many of our legacy products, like the [Trident](#) and [ProVu](#) series, [pump control with alternation](#) is one of our most popular applications, and it’s one that Precision Digital is certainly known for!

However, with the new Consolidator+ unit, we have actually expanded on this capability quite a bit.

For starters, you will notice on the first slide of this section, the screen is showing a bar graph, a sump level reading in Feet and Inches, and lastly, it is showing the status of our pumps 1 and 2.

That’s pretty cool right? Well, it gets even better.

Not only does the screen show us which pump is on, but it is also keeping track of the runtime and cycle count of each pump.

Since the pumps are alternating, a lot of customers like to make sure their pumps are truly running evenly and being able to see how many times the pumps have cycled on and off is a really great feature!

Now, you will also see the “pump runtime” for each pump. This is something that some customers do like to keep track of. This can be used to determine when it is time to schedule preventative maintenance, or it can be a redundant way to ensure the pumps are running/wearing evenly!

But it gets way better than THAT!

It’s probably no secret that pumps are typically triggered and alternated based on the level setpoints. When the level rises to the first setpoint, Pump 1 turns on and drains the sump. The next time the level

rises to the first setpoint, it will be Pump 2 which turns on to drain the sump. This process will happen over and over again until the level in the sump is maintained correctly.

However, the ConsoliDator+ can actually alternate the pumps based on the pump runtime!

For example, let's say a customer doesn't want a pump to run for longer than one hour at a time. So, when the pump turns on, it runs for an hour but still the level will not return to normal. Regardless of the level at that moment, the ConsoliDator+ will turn the running pump off, and will turn the idler pump on and let it run for an hour, or again, until the level returns to an acceptable height.

The last thing to look at in this section is the Soft Keys located at the bottom of the "Duplex Pump Controller" screen. You will notice that F3 and F4 are now labeled with, "Rset RY-1" and "Rset RY-2" respectively.

These softkeys will allow an operator to reset the pump runtime and cycle counts back to zero. This is usually done at the end of a shift, week, month, or period of time where this information needs to be tracked.

One feature that really makes the ConsoliDator+ an ideal pump controller is the ability to add more pumps to the sequence. For example, let's say the customer wants to add a third pump to the system, and they want the third pump to alternate with the other two pumps.

Well, with a PLC you may have to start an entirely new program. And, if you're displaying the pump information on an HMI, you'll have to resize the screen to fit all the new information.

With the ConsoliDator+, a third (or fourth) pump can be added to the sequence with roughly three clicks of a mouse, and the screen is intelligent enough to resize itself to compensate for the added information.

One Tank, Four Readings: One of the features that makes our ProVu series ideal for level applications is the ability to "dual-scale" a 4-20 mA input so that the level can be displayed in two unique... scales!

For example, you can scale the input to display 0-10,000 gallons, and have it display 0-100% all on the same meter with just one process input.

Of course, with the ConsoliDator+, we have completely changed things up and increased the capability of the dual-scale feature.

For example, on the ConsoliDator+, you can setup one 4-20 mA input, and can program 160 unique channels from that ONE input. That's right, you can quite literally use a single analog input and scale it in 160 different possible ways – if you wanted to, of course.

That's just to give you an idea of what's possible. A much more feasible use of this feature is to have one tank with several different readings based on the one level input.

As we see in the "One Tank 4 Readings" slide, we see just ONE bar graph since we are only measuring one tank, and we have four separate channels reading out in completely unique engineering units.

Annunciator Panel: With every other slide, we have configured the unit to show us channels with at least ONE bar graph. But bar graphs are not the ONLY way to communicate level to an operator. In this example, we are also not showing exactly how much is in each tank. Rather, we are just showing a "level status" using full words and phrases.

We are looking at four tanks on this slide. A Feed Tank, Oil Tank, Water Tank, and of course, an Unknown Tank (just to show you we can name a channel whatever we want).

You can also see that when the level in each tank is where it "should" be, the annunciator panel indicates this with phrases like, "All Good!", "Level is Ideal", or "All is Well". By the way, ALL of those statuses were made up by ME. They are fully customizable, and the only limitation is number of characters (16).

In this example, when the level gets to a certain point, the status of each tank can change the wording, and/or color. In this example, I kept all the colors the same, just to focus on the messaging!

In this case, our “Feed Tank” will go from “All Good!” to, “Needs Emptying” which lets the operator know that the tank is getting full!

The coolest part about this is that you can combine the “1 Tank 4 Readings” concept with the annunciator panel concept!

For example, let’s say the “Tanks 1 through 4” screen is what this annunciator screen is built from. We have a tank status for each of the four tanks, and we have words to give operators instruction. The 4 tanks can still be seen on that screen if they want, or the operator can just quickly look at this screen and instantly know what the status of each tank is!

The last thing to mention about this feature is that discrete inputs can be used for this as well! We talked a lot about 4-20 signals in this session, but level switches can certainly be used with the ConsoliDator+, especially on this type of color-changing annunciator screen!

Are there more features on the ConsoliDator+ that make it an ideal level monitor and controller? Yes, absolutely, and some of those will be covered in future sessions and you will see how all of these applications and features come together to make one rock-solid controller!

Some of those features we will explore in future sessions include:

1. Timers
2. Scheduling pump control
3. Data logging high/low level alarms
4. Modbus TCP/IP capability
5. AND/OR Alarming for added logic control... and more

Week 2 will continue on this theme but we will take a look at some flow applications, and introduce some other really unique features!

A final note, I am always available for any questions you may have, so don’t be shy!

Sincerely,

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