Summary: Starting with this week, the MasterClass will be geared toward programming the ConsoliDator+ with the FREE ConsoliDator+ Configuration Software.

It is strongly recommended to follow along with the recorded video session from this week, or to at least have the Slide Deck at your side. Ideally, you would also be able to follow along with the software and a ConsoliDator+ Demo Unit of your own!

Setting Up an Input: Now, the word, "Input" is going to be used quite frequently when we talk about programming this device. However, for **this particular section**, "Input" will be defined as the physical electrical input wired to the ConsoliDator+.

The very first thing to do when setting up an input is to actually wire it to the back of the unit. Now, this class is not going to cover how to wire every type of input, but if that is something you would like to review, I'd be more than happy to explain during a one-on-one phone or video call!

For simplicity's sake, let's just start with a basic 4-20 mA signal.

Step one is to quite literally land the wires in the "appropriate" terminal. What do I mean by appropriate?

All I mean is to make sure you are landing the signal wires in the correct slot, and the correct input within that slot (analog input cards have four inputs) with the first input being all the way to the left. They are also labeled accordingly.

After you have wired it correctly, you will want to open the software, and look for "Inputs" on the left hand side of the screen. From there, you want to look for "mA Input" and select the very first one - AI-1.2a (mA)

The MOST IMPORTANT thing you can do here (and trust me, I will be repeating this quite a bit, so you don't have to worry about forgetting this step) is to name or label your inputs with something meaningful.

What do I mean by that?

Well, just look at the list of mA inputs you have listed there. All you have is a bunch of letters and numbers. Now, those letters and numbers tell us physically where the input is in the back of the unit (tells us the slot location, and the input being selected in the slot) but that's not going to do us any good when we are trying to wire up and program 12 different level sensors, yeah?

So, I STRONGLY recommend that folks label their inputs with something meaningful. What that is would be totally up to the user, but here are some suggestions I have, for best practice:

1. Serial number of the sensor being wired
2. Name of the tank being monitored on that input
3. Simply, "Level Sensor A"

You will see, especially in later sessions, how critical this step really is, even though it may sound trivial to you at the moment.

After you name or label your input, there are a few other options you have available to you!

Below are the different parameters that can be adjusted, and a brief description of what they do:

a. **Filter**: filters out any possible signal noise, makes the signal less "jumpy"
b. **Bypass**: This helps make sure the filtering you set up isn't ignoring REAL signal fluctuations
c. **Glitch Filter**: Again, this helps with filtering out signal noise
d. **Break Below**: This allows you to report a low or lack of signal to the system. The default is .01 mA. That means if my signal goes to ZERO mA, that would be a signal break, and we can alarm based on that!
e. **Disable Input Channel**: This allows you to disable the input channel! You are probably wondering why this is an option. Well, it's because each INPUT has a power supply. So, to conserve power, you can disable the channel all together!

And that is it! That's how you setup a 4-20 mA input on a ConsoliDator+.

But, wait a minute… we didn't scale anything…. Yet…

Creating a Channel From our Input: Once we have our input wired correctly, labeled with something meaningful, and our filters have been adjusted, we need to do something with this input. This input on its own won't do us any good without it being turned into a "Channel".

To do this, click on the "Channels" icon on the left side of the software window and press "New".

When you do this, the very first thing I would suggest is to name or label your channel! You'll notice a common theme here. I am ALL ABOUT labeling everything you possibly can. Trust me, it does help you out as the ConsoliDator+ gets busier and busier.

When you create a new channel, the following screen will appear.

New Channel ✕

Channel: 19. ▼

Display Tag: 19. [Enter a name...]
Name for the Channel, 15 characters max.

Color Scheme: ■ Default

Function: None

☑ **Bargraph**   0%   0.00
               100%   100.00

Input: None

Units: None

Decimals: 2 + −

[Save]   [Cancel]

Everything you see on the screen that is inside a white rectangle (box) is adjustable. Yes, even the channel number can be changed from its original assignment if need be.

You'll notice the very first thing to be edited here (aside from the channel number, of course) is the "Display Tag". This is where you name or label your channel! Again, very important step here!

So, what should you name a "Channel"?

Well, I typically tell folks to name the channel after what is being measured. Not necessarily the product being measured, but where the measurement is taking place. For example, if this were a tank farm application, I would label them with "Tank XYZ". If this were a flow application, then yes, maybe it would be wise to label them with the product being measured.

Either way, it is critical to name EVERYTHING you can on this unit, including the "Channels".

Now, after you choose the name of your channel, there are a few other fields to configure before we are done. Below is the field name with a brief description of what they are:

Function: This is quite literally the function of the channel. Do we want a simple 2-point scale? Do we want to configure a K-factor for a flow application? Do we need to do unit conversions? How about just programming a simple constant number on the screen? Regardless of what you need, there is a function for it, and they are broken up into different "categories".

- Scale
- Math
- Flow
- Compare
- Measure
- Filter
- Control
- Relays
- Modbus
- None

Each of these categories has their set of functions from which you can choose. To keep it simple for this exercise, just remember that if you want to scale a 4-20 mA signal, you'll choose an item in the "Scale" category. Or, if you'd like to setup an open channel flow channel, you will use the "Flow" category and pick the correct weir or flume within that category.

Input: After you choose your "Function", you must now choose your "Input". Now, remember how I said the word input is going to be used quite a bit with the software? Well, in this case, the input will be our 4-20 mA input that we setup in the previous section. However, an input can be quite literally anything. You could make the input to a channel a relay! Or it could be an alarm you configured!

So, when you open this text box, you will notice another list of categories. They are as follows:

- None
- Analog Inputs
- Pulse Inputs
- Digital Inputs
- Modbus Inputs
- Channels (yes, a channel can be the input to another channel)
- Totals
- Timers
- Alarms
- Analog Outputs
- Relay Outputs
- Digital Outputs
- Modbus Outputs
- Real-Time Clock (yes, the real-time clock can be an input to a channel!)

To keep things simple here, we will just look at using the "Analog Inputs" category.
When you highlight that option, a list of COMPATIBLE inputs will be shown (for example, if you choose "K-Factor" as your function, then "Analog Inputs" will not appear in your list of compatible inputs).
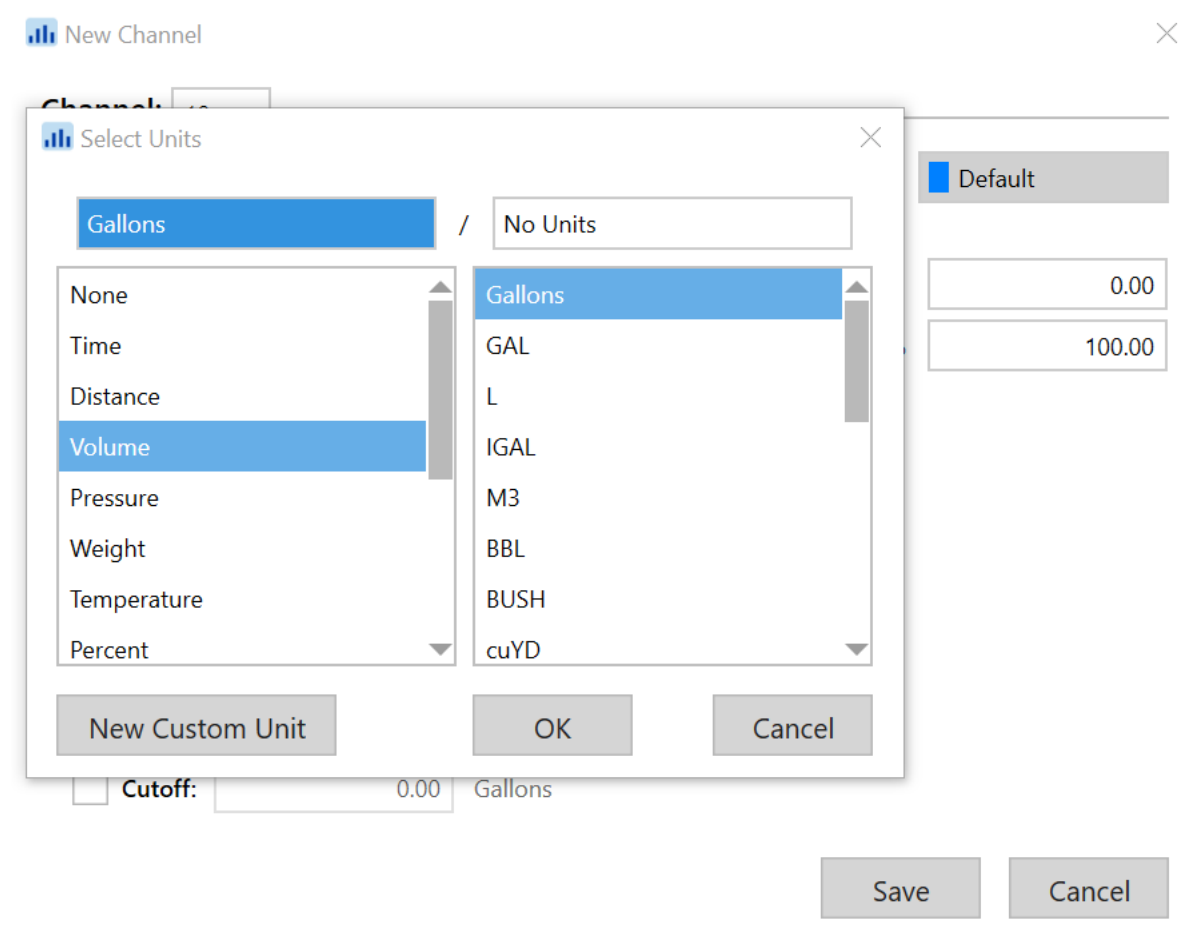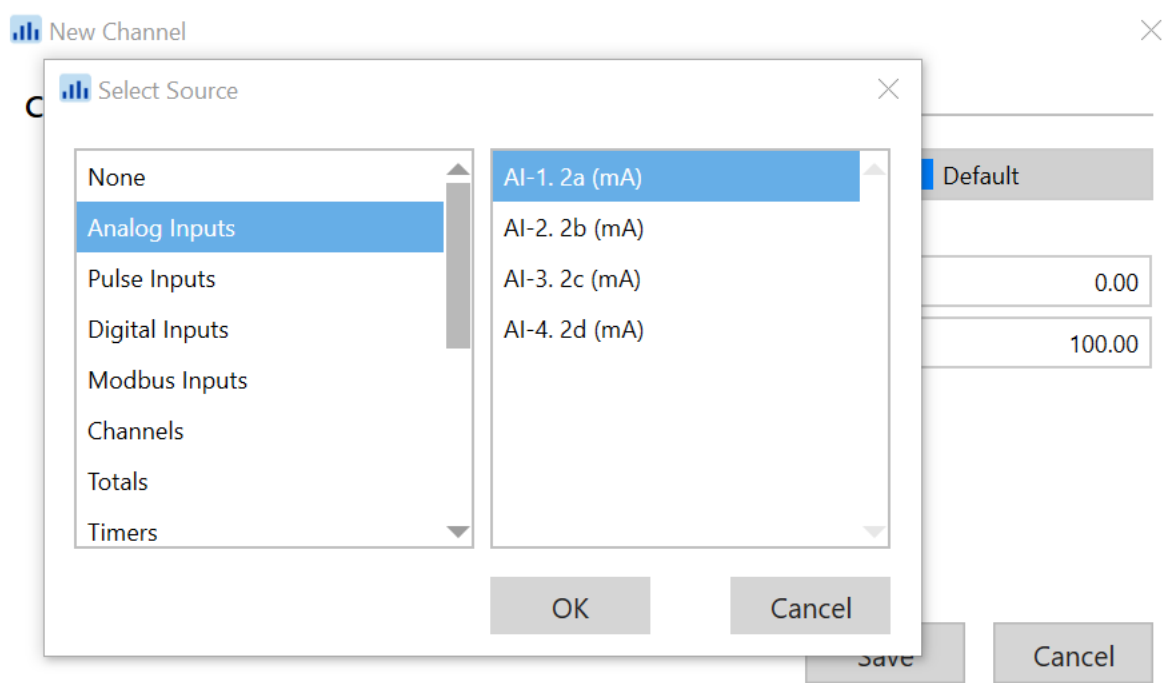

As you can see here, we only have 4 inputs available. However, if this were a fully populated ConsoliDator+ with 28 analog inputs, you can hopefully see why I suggest you LABEL YOUR INPUTS at the start of this. Like I said, it will make things much easier for you later down the road!

Units: After you name the channel, select the function, and then add the appropriate input, we need to choose our unit of measure to display on the screen. The default is typically "Gallons" as you will see in the screen shot. However, as I've mentioned several times during our previous sessions, the ConsoliDator+ has a "library" of units from which you can choose, and you can even make up your own custom units (more on that in later sessions).

Just like with the previous two fields, this field is also divided into several categories from which a user can choose. Each category has a library of engineering units. The Unit categories are as follows:

- None
- Time
- Distance
- Volume
- Pressure
- Weight
- Temperature
- Percent
- Amps
- Volts
- Counts
- Logic
- Custom

Decimals: Simply choose how many decimal places the reading will have. Simply click the "+" or "-"symbol to adjust accordingly. You may have a maximum of 15 decimal places!

Scale: Rather straight forward, but this is where you scale your input! The default is to have the range be 4-20 mA, but even that can be changed to whichever range you want!

Color Scheme: You've seen all the different colors the ConsoliDator+ can display, right? Well, this is where the magic happens. Each channel can be configured to have their own "Color Scheme". The default scheme is a grey background with black text and a blue bar graph. As the user, you can change the color of each of those, and make that a completely new "Color Scheme" that you can save and use for another channel!

You will notice in the screen shot below that I have three custom color schemes that I created! And you can easily see how simple it is to change the colors of the three adjustable fields!
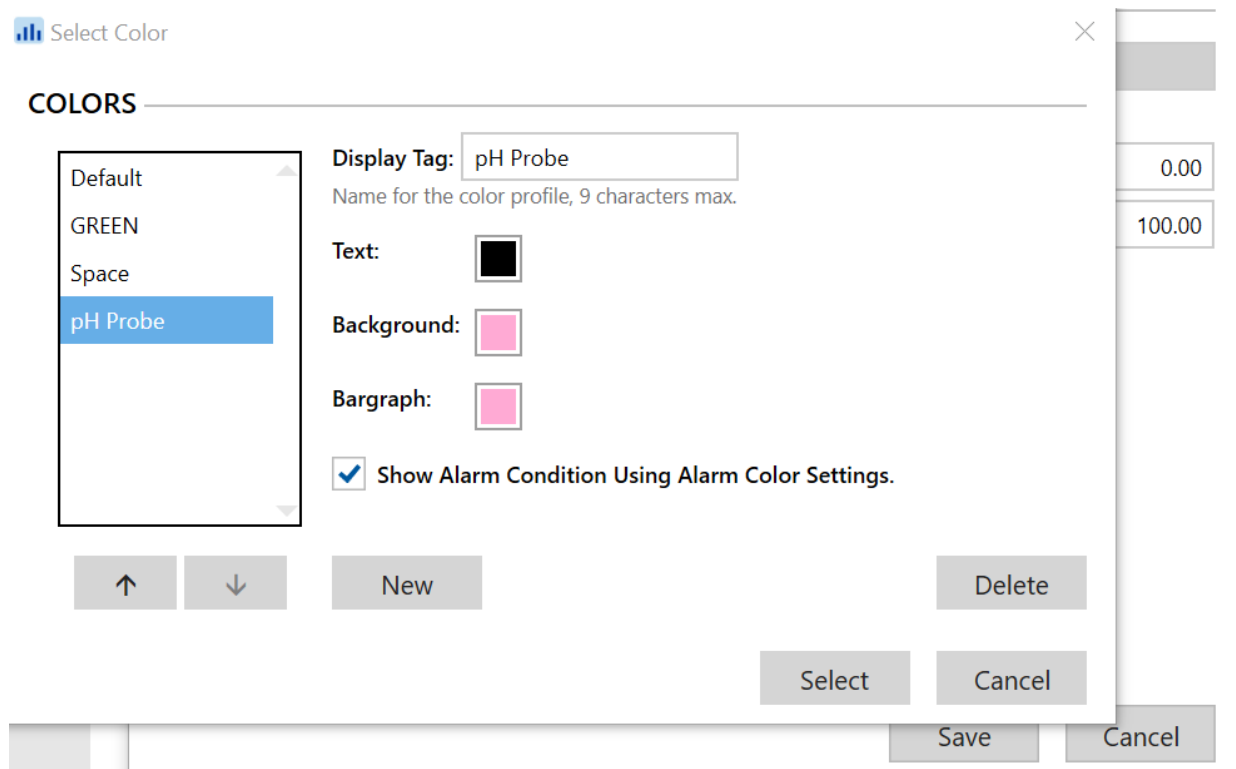
Bar Graph: There are two things to do here. First, if you want to have the bar graph displayed on a screen, you need to make sure the check box is checked (it will be by default) and that the bottom number of the bar graph (the 100%) matches the "Output" of your 20 mA (the top end of your scale).

If you would NOT like the bar graph to be shown on a screen, then all you have to do is uncheck the box.

NOTE*: if you forget to do that here, don't worry, you'll have another opportunity later*

Turning a Channel into a Screen: Now that we have setup our input and turned that input into a useable channel, now we must be able to DISPLAY our channel! To do this, we must first configure what's called a "Screen".

To do that, just look on the left hand of the software window and look for "Screens". Then, just like before, create a NEW screen!

You will see a very similar looking window appear with a bunch of check boxes and rectangular fields that we can edit!

The very first thing I suggest is…. You guessed it….

NAME YOUR SCREEN! (Hey, I told you that I'd repeat it a bunch, didn't I?)

After we name the screen, now we have to add stuff to it to display for the user! Practically any object on the ConsoliDator+ can be added to a screen. You can add relay information, output values, channels, clocks, timers etc. Anything you can configure on the device itself can be shown on a screen!

The list of possible items that can be added to the screen are as follows:

- None
- Analog Inputs
- Pulse Inputs
- Digital Inputs
- Modbus Inputs
- Channels
- Totals
- Timers
- Alarms
- Analog Outputs
- Digital Outputs
- Modbus Outputs
- Real-Time Clock

Soft Keys (F1 – F4): Once you add your "Objects", you can change the order of how they appear on the screen.

After that, you can choose to program different "Soft Keys" at the bottom of the screen. Each of these keys will have very specific functions, and we will not cover every possible option in this session. This will be covered in more detail later.

As a brief example, they can be used to reset totals, force on relays, skip to different screens, force an alarm, and much more!

After that, we have several checkboxes on the right side of the window
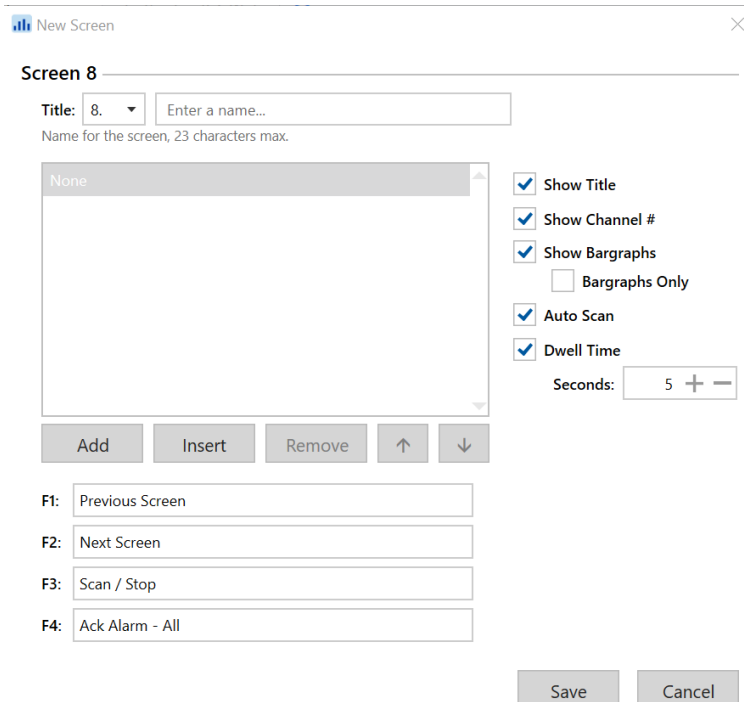
Show Title: Leaving this box active (checked) will allow the title of the screen to be displayed on the ConsoliDator+ unit (HIGHLY recommended).

Show Channel #: Leaving this box active will have each channel display its channel number (Example: AI-1 for "Analog Input 1"). My personal opinion is that the screen looks much cleaner, and much better with this box INACTIVE (unchecked), and that is what I have done for ALL the screens during the MasterClass. Again, there is no right or wrong way, I just think it looks best without the channel numbers on the screen!

Show Bargraphs: Much like turning the bar graphs on or off on the channel creation screen, we can also choose whether or not the bar graphs will be displayed on our screen. Now, for a channel to show bar graphs on a screen, the bar graph box MUST be checked on BOTH the channel creation screen, and the screen creation screen.

Or, you could program the screens to ONLY show bar graphs by checking the "Bargraphs Only" box.

Auto Scan / Dwell Time: The ConsoliDator+ can be configured to scan through every screen that is configured on the unit. The default setting is 5 seconds. So, if you had four screens programmed, the ConsoliDator+ would show each screen for 5 seconds before it goes to the next one.

However, you can make it so that certain screens are NOT included in the automatic rotation, and each screen can have a completely independent dwell time.

Now, a user can stop the scanning at any time by pressing the "STOP" (F3) which is the default operation for that "Soft Key".

Again, you can have the ConsoliDator+ auto scan through several screens, and omit certain screens. If you omit any screen from the auto scan, they can be accessed by simply using the arrow buttons at the bottom of the screen. The screens still exist, they are still accessible, they just won't be shown automatically!

Setting Up an Output: Setting up our outputs is going to be VERY similar to how we setup our inputs! Again, the first step here is to LABEL THE OUTPUTS as well. This is done for the same reasons. Once you have a fully populated unit, it will get confusing to keep track of which relay goes to which piece of equipment unless they are properly labeled.

There are three main types of outputs that can come from the ConsoliDator+. Relays, analog outputs, and digital (discrete) outputs.

For this example, we will stick with our basic relay outputs!

So, the first thing to do is find the "Outputs" section on the left side of the software window, and just look for "Relay Output". You will notice that there is a list of relays that are located in the back of the unit, and they will be named with a default name, much like our inputs' default name.

Select any of the relays, CHANGE THE NAME TO SOMETHING MEANINGFUL, and continue down to the "Input" field (see? There's that pesky "input" word again!)

Just like a Channel, almost any object on the ConsoliDator+ can be an input to a relay. Quite literally, almost anything! The items from which you can choose are as follows:

- Digital Inputs
- Modbus Inputs
- Channels
- Totals
- Timers
- Alarms
- Other (more on that in another session)

Next, we have a few other check boxes and fields that we can fill out. Below are some descriptions of what these fields mean, and how they can be used.

6a : Relay Output

Display Tag: RY-1. | 6a (Relay)
Name for the relay output channel, 15 characters max.

Input: 1. Inlet Pressure

☐ **Enable Alternation**

Set (On):	80.0	**On Delay:**	0.0	sec
Reset (Off):	70.0	**Off Delay:**	0.0	sec

☐ **Pulse Output**

Break: Stay As Is ▾ | **On Time:** 1.0 sec
☐ **Fail-Safe** | **Off Time:** 1.0 sec

Enable Alternation: this option is how we set the ConsoliDator+ up for duplex/triplex pump control. We will not go into that in this lesson, but just keep that in your mind for now.

Set/Reset (on/off): This is simply where you configure the relay and tell it when to turn on and off. Now, this does get a little tricky because you'll notice there are no units labeled there. So, you have to make sure you choose the right channel and be sure to use the correct set and reset points.

For example, let's say I have a signal scaled 0-100% for tank level. When the tank is 90% full, I want a relay to turn a pump on until it pumps it down to 50% capacity.

My "Set" would be 90 and my "Reset" would 50. It's as simple as that.

Break: This means, if there is signal loss (on the relay's Input – as in, if the 4-20 mA signal on your channel breaks) the relay can be programmed to stay in its current state, turn on, or turn off. Most folks just use the "Stay as Is" and just have a visual alarm letting them know there is a signal issue.

Fail-Safe: Okay, so this one is sort of trickly to explain. It has to do with protecting equipment that is tied to relays in case of power loss to the device. That way, if power comes back on to the unit, it won't just slam a valve open because the relay was stuck closed when the power went out.

So, the best way to explain this is… "Fail-safe will invert the relay operation". Meaning, if I wired the relay to be "Normally Open", when I turn the fail-safe ON, the relay will actually behave in the opposite way and it's "normal state" would be closed.

So, let's say you had a customer who wired a relay incorrectly. Well, instead of rewiring everything, they could literally just turn the fail-safe on, and the relay will be wired "correctly". Or, at least it will operate as if it were wired correctly!

On/Off Delay: Very simple. This can delay when a relay changes state. This is typically used to avoid false alarms in case of sloshing in a tank, as just a small example. Or let's say you want a pump to run for 1 minute after it has drained a tank out. Then, you would set the "Off Delay" to "60".

Pulse Output: Quite literally what it says. You can program the relay to mimic a square wave output by editing how long it stays on, and how long it stays off.

Making Your Output a Channel: The last thing to look at is turning the relay output into a channel. As I've mentioned a few times, almost anything configurable on the ConsoliDator+ is able to be the "Input" to a channel.

So, if you create a channel with the relay as the input, that channel can be placed on a screen.

Now, if you remember back to the first session where I showed you the duplex and triplex pump control and had the pump status and run time….

Well, all I did was NAME my relay, "Pump 1" and I turned that into a channel, and then added that channel to the screen!

You can do the same with ANY input you want. Or, you could also just link the relay itself to a screen to display it, but the downfall of that is it will not show the cycle counts or run times!

There are a ton of other ways to configure stuff on the device, and we will cover most of them in upcoming sessions.

There are also a few different ways to configure things on the ConsoliDator+, and no one way is right or wrong. In my opinion, there are logical ways to configure the device, and that is what we are doing with these sessions. We will take a look at the BEST WAYS to configure the ConsoliDator+

As a small example, there are 3 or 4 different ways to configure an alarm so that when a tank gets too high, we turn a relay on. There are quite literally 3 or 4 different ways to do that because of how flexible this device is. However, there is only ONE way that REALLY makes sense!

See you next week as we take it a step further and go over some intermediate configurations!

You can look forward to learning how to actually program the soft keys we learned so much about. How to configure the alarm the BEST way, how to make new color pallets and apply them, and much more!

Sincerely,

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