

Summary: As opposed to looking at a series of applications and explaining different features that are unique for that particular application, we are just going to look at some definitions, and explain how the ConsoliDator+ can be used for any Modbus application.

This session is not intended to be a lesson in serial communications, and is to serve as a foundation on which your Modbus knowledge can be built – as it relates to the ConsoliDator+.

Modbus TCP/IP: Let's start this section off by stating which protocol this device is NOT using to communicate with field instruments.

You will often hear the words, “Modbus TCP/IP”, “Modbus TCP over Ethernet”, or “Ethernet I/P” used interchangeably, but they each have very specific definitions.

More specifically, the ConsoliDator+ does NOT support the “EtherNet I/P” protocol developed by Rockwell Automation. “EtherNet I/P” (notice the capital, ‘N’ in the word) is a brand name for a communications protocol and it is very often confused for basic “Modbus TCP I/P”.

So, how do we properly describe what the ConsoliDator+ can do?

Using Ethernet as the “information highway”, the ConsoliDator+ is capable of supporting two major types of Modbus protocols.

1. “Modbus TCP/IP”
2. “Modbus UDP/IP”

However, in my experience with this product, “Modbus TCP/IP” is definitely the crowd favorite.

Now that we have our definitions cleared up, what exactly can the ConsoliDator+ do with the Ethernet output option?

Well, the first thing to note is that the Ethernet output is exactly that... an OUTPUT.

When using the ConsoliDator+'s Ethernet capabilities, the device can only operate in “Server” mode.

NOTE: “Server” mode is the new standard nomenclature for “Slave” device. The two words are different, but the physical operation is the same.

Now, that may seem like a limitation at first, but it actually serves a very clever function that we will get to later on in this session.

Modbus RTU: Now, on our legacy products, like the [ProVu Modbus Scanner](#), we utilize the Modbus RTU protocol which is typically done using RS-485 (either half or full duplex). The same can be said for the ConsoliDator+, except this device can actually be programmed in several different modes, and unlike any other Precision Digital product, it can operate in several modes SIMULTANEOUSLY!

For example, the basic Modbus “modes” are; Client (Master), Server (Slave), *Snooper** and *Spoofeer**

**These modes were actually developed by Precision Digital engineers.*

Below is a brief description of each mode:

1. **Client** – Requests information FROM a Server or sends commands TO a Server
2. **Server** – Responds to requests or commands from a Client
3. **Snooper** – Neither requests info from a Server nor responds to requests from a Client.

4. **Spoofers** – This mode is a completely new mode and I will dedicate an entire section of this Study Guide to it. For now, just know that the “Spoofer” tricks the Client into thinking it’s requesting information from old Server devices that are no longer installed...

Couple more things to add about the Modbus over RS-485.

1. Unlike Ethernet, the RS-485 connections are STANDARD, and they come with every ConsoliDator+ unit.
2. The Client, Snooper, and Spoofer “modes” are not included and MUST be purchased and unlocked with a unique code provided by the factory. Yes, these modes can be unlocked on units that are already in the field (assuming they have up to date hardware).
3. As well as “Modbus RTU”, over RS-485 the ConsoliDator+ supports “Modbus Enron” and “Modbus ASCII”.

Snooper Mode: So, what exactly is this “Snooper” mode all about? You may have heard this term from Precision Digital before, and you may have also heard the more commonly used term, “packet sniffer”.

I will explain what “Snooper” mode does, and then I will provide you with a clever analogy to help you remember what’s happening.

A device that is in Snooper mode is just sitting on the bus, and none of the other “nodes” are even aware of its presence. What it does is listen for the registers you want to see, and it will display those readings and NOTHING else. For example, let’s say a Client is requesting the pressure, temperature and level of a bunch of tanks and displaying that in the central control room. But, an operator on the floor ONLY cares about the overall level of each tank. A meter in Snooper mode will sit on the bus and ONLY show the operator the level readings of each tank while the central control room still gets all the information they requested.

Here’s my analogy:

A meter in Snooper mode pretty much eavesdrops on conversations between a Client and Server device. Neither of those nodes are aware that their conversation is being heard, and the Snooper is listening to the entire conversation but only telling YOU all the juicy stuff from the conversation.

It’s... Snooping – Quite literally.

This mode is especially helpful for operators in the scenario given above. Typically, a Client is requesting all sorts of information that may not be valuable to everyone. Some folks may care more about the temperature of the material in the tank, or some may only care about the pressure.

So, without having to disrupt any of the communications, a Snooper allows an operator to have clear visibility over the process variables they care about the most!

Spoofers Mode: Spoofer mode is a completely brand-new concept in Modbus, and as far as I can tell, the ConsoliDator+ is the only device on the market with this capability. However, if you find evidence to the contrary, I would love to see it!

So, what exactly is Spoofer mode? Well, it’s sort of tricky to put a definition to it, but I’ll try my best!

Let’s say you have a customer who has a bunch of tanks at their plant, and all of those tanks have a level sensor on it which is communicating to a central control room using Modbus RTU (over RS-485). Well, as luck would have it, their level sensors start dying out on them and it’s time to get some replacements.

UH OH, it just got even worse! The level sensors they have are discontinued and have been replaced with a newer model which is not a 100% drop-in replacement.

Maybe they fit the tank perfectly, but their register tables are different, and maybe the old baud rate they used isn’t available on the newer models.

Well, the customer has limited options here, and it seems that no matter what, if they want to continue using the Modbus RTU outputs, they will have to make some changes to the programming in the PLC so that the Client is requesting the correct information from the correct Server.

Needless to say, that could be an extremely stressful job. This is especially true if the customer got their equipment programmed by an outside contractor, and now they don't even have access to the programming file for the PLC (I've heard of this happening A LOT).

That is where Spoofer mode comes in and saves the day/week/month or year!

Spoof mode pretty much allows us to assign TWO register numbers and TWO Modbus addresses for ONE ConsoliDator+ register.

One register number is to the actual register on the ConsoliDator+. One Modbus address is for the ConsoliDator+ itself.

The other register number is the register number from the old target unit (level sensor) and the other address is the Modbus address from the old target unit (level sensor).

So, let's say we set it up that way so that the PLC is requesting the same information as it was before.

As far as the PLC is concerned, it's the same old level sensor that is reporting back information. The PLC has no idea that the old level sensor isn't even physically there. Instead, the PLC is actually requesting that information from the ConsoliDator+ itself, and we are "Spoofing" the PLC into thinking that it is getting information from the OLD register at the OLD address.

That is a REALLY long way of saying, "Spoof mode allows you to replace Modbus RTU field equipment without having to make ANY programming changes to the PLC".

Modbus RTU Over Ethernet: So, if the ConsoliDator+ hasn't already impressed you with its really unique Modbus modes, then get ready for it to come full circle and knock your socks off!

So far, we took a look at how the ConsoliDator+ can request information and send commands through RS-485, and can respond to requests and take commands from a Client over Ethernet.

But, what if we could combine BOTH of those functions at the same time?!

Spoiler Alert: We CAN do exactly that with the ConsoliDator+!

Let's take the example we used in the previous section as a base for this example.

Your customer has a bunch of tanks out in the field with level sensors that are outputting Modbus RTU using RS-485. But, the new plant manager wants to upgrade the control system, and really wants to start using Ethernet almost exclusively.

Well, they COULD just replace all those sensors with devices that have an Ethernet output, but that's just added cost. They could also buy some serial converters, but that can be a rather tedious job depending on how many tanks they have out there.

So, one way they could solve this problem is by using the ConsoliDator+!

They can wire all of those sensors into the ConsoliDator+ instead, and then the ConsoliDator+ will be the one requesting the information from the sensors and displaying it locally. So, the ConsoliDator+ is operating in "Client" mode over RS-485.

To get all of that information back to the NEW PLC with Ethernet, the ConsoliDator+ can act as a Server device to the PLC using the Ethernet output!

To recap:

The level sensors are connected to the Consolidator+ using RS-485, and now the Consolidator+ is acting as the Client.

The Consolidator+ is connected to the new PLC using Ethernet, and now the Consolidator+ is acting as a server to the PLC.

The Consolidator+ is running in two different modes simultaneously, over two separate information highways!

Although there are a ton of newer, fancier protocols in the world, Modbus is still one of the most widely used protocols in our industry. It's easy to use, easy to figure out, and it just works!

The applications are basically endless when it comes to Modbus. We didn't focus on specific applications on this session because they are irrelevant. Now that you know the different modes in which the Consolidator+ can operate, figuring out WHERE to use them is as simple as figuring out which 4-20 mA applications would work well with this unit!

One last note is that Precision Digital does manufacture [other products that can act as either a Modbus Master, Slave, or Snooper](#). However, our legacy products can only operate in ONE mode at a time. Once you make a meter a Master, it CANNOT be used as a Snooper or Slave as well – unless you reprogram the meter to operate in a different mode.

Starting next week, we will begin speaking exclusively about the [Consolidator+ Configuration Software](#) and some “best practices” for making the configuration simple and effective!

Sincerely,

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