

TECH TIPS FOR JUNE 2021

VFD REPLACEMENTS ON COMMERCIAL UNITS

The Federal government has seen fit to force VFD'S into anything over 7.5 Tons whether you want them or not.

There is a growing problem, starting to gain momentum in the field and that is a general lack of knowledge of what is required to replace and program the new one.

Below is a sequence of events that must be followed in order for you to get the correct replacement drive and also the correct parameters that must be set up to make it operate correctly.

When the original drive was new, it was programmed at the factory and other than checking fan and compressor rotation, there wasn't a whole lot you had to do.

Well, as it turns out, the factory only sends the replacement drive with a boiler plate program and they leave it up to you to add the pertinent statistics on the motor that is actually in the unit.

We have already experienced factory programs that didn't match the published parameters and unfortunately you will have to look at all the parameters to verify that they are all correct. About 50 of them.

So don't start a replacement thinking you will get it done in a hurry. First couple you do will probably take about 3 hours if everything goes right. 6 Hours if you have to call for help.

Most important thing to provide tech support at the start is the serial number so we can look up the bill of materials and verify what was initially put into the unit. That can take a day or two sometimes before the factory supplies us the list.

Once we determine the correct drive to order, it will be about three days and \$1275.00 later before you get it. Unless you want to pay next or second day air. That adds \$50 to \$100 more. Standard 3 day freight is about \$25.00

Now that you finally have the replacement drive and open it, you will find a new digital readout display and ethernet cord to plug into the drive, so you can hold it and work the program keys. Should you do a lot of service on these units in the future , you can buy that control for about \$250. Or detach it when your done and take it with you. When the unit came from the factory originally, they did not include that hand held screen controller, only the 2 lights are visible for troubleshooting.

Next thing is to disconnect power and get the drive changed out, paying particular attention to the wiring you remove and replace. So far, it looks like they have done a good job marking them but remember to verify every wire is marked and you personally verified which hole it came out of with the same number. A lot of the wires are the same color. Pinks are hot 24 VDC and Blues are Common 24 VDC

Very critical that you understand there are two transformers involved in this process. 24 VAC in the main unit and 24 VDC inside the drive and never the two shall meet. The 24 VDC comes from the drive

itself and goes up through a small VFD Fan relay board in the main panel and then comes right back to the VFD to tell it what speed has been chosen by the thermostat.

A little bit about how things work before you start programming:

The VFD fan control board in the main unit has four relays on it that are controlled by 24 VAC run through the thermostat on the wall. Please install a 2 stg heat and 2 stg cool thermostat to operate these units. It will make your life a lot easier. I encountered one today running off a single stg and they had both stages jumpered together forcing the unit to run at high speed fan and 2 stages of cooling which negated any savings in electricity by forcing the fan right up to high speed.

The purpose of the VFD is to run the fan and compressor on low stage as long as possible and only kick it up when it gets really hot. Jumpering it out only defeats the purpose of the drive and increases the electric bill about 30% plus causes short cycling and compressor failures.

Remember, a lot of commercial buildings keep the fan running all the time and the VFD will recognize that there is only a call for fan and slow down to 66% capacity.

While you might be familiar with the inverter units found inside of the outdoor units in Residential heat pumps ramping up and down to a multitude of speeds or capacities, such is not the case with the VFD's that power the larger commercial evaporator fans.

Generally there are two preset limits for cooling and only full speed is chosen for most heating calls, because they found out that they start losing a lot of heat exchangers when they try to use two stage fan with heat.

So your dealing with 66% fan speed with first stage cooling, or fan only and 100% fan speed with second stage cooling or any stage of heat.

When you look at the VFD fan board that is connected to the wall stat, you will only see a G terminal that is activated by a call on Y1 automatically or a specific call for G only. That brings on low speed fan.

There is also a Y2 terminal and W1 and W2 on gas packs. They will ramp it up to high speed. Remember on a commercial heat pump W1 energizes the reversing valve to shift to heat and stays there until another call for cool happens.

OK, Now your ready to get this thing going. Don't be too hasty to wire everything up and turn it on.

First of all, do you know why the last one failed ? Instead of rushing through this all in one shot, I would approach the startup in a couple stages in an effort to keep from burning the new drive up.

Three or four things usually cause the drives to fail. One is the fan motor, another is the wiring harnesses, the VFD fan board, brownouts, High or wild legs on the incoming power. When you power the new drive up, you better keep a hand on the unit disconnect if a red light comes on. Steady green and your ok. Should you let that red light stay on very long you could be killing the new drive.

I would first bypass the three power wires going to the drive and connect them directly to the fan wires. Turn it on and see if it runs or the three small fuses blow. Should they blow then you know the fan motor took the drive out. Actually you could have left the unit running in bypass had you checked this when you condemned the drive to begin with. Also a running motor can still have a slow bleed to

ground causing a fault. The VFD will pick this up usually pretty quick but not always. There are three quick connect terminals to achieve the VFD bypass. All color coded wires.

Next thing I would do after the motor runs and amps are checked against the nameplate at full speed with a door over the fan section, would be to turn off power, disconnect the molex plug on the VFD fan board in the main unit and then before you hook up all the 24 volt DC wires onto the new VFD, do a grounding/shorting check on each wire. Shorting check would be wire to wire, Remember the pink hot wires are all connected anyway as are the blue common wires.

About the only thing at this point that could hurt the new drive would be a bad VFD Fan board that has a short on the printed circuits. Might be a good thing to visually inspect the back of the board and look for burn marks or water type stains.

All good? Hook everything up on the drive and disconnect all the thermostat wires in the main panel. Then with your hand on the unit disconnect, give it power. Look for the red light right away and shut it off it fast if it appears red. Green is good.

Now with the hand held display pad, hit the off button. The screen stays on and now you have access to change things without the unit coming on. Once you have completed changing and checking the parameters, all you will have to do is hit the AUTO button to activate the drive.

Changing the parameters is somewhat tricky as a lot of them are almost identical so you have to pay close attention to what you finally select. Example: DI1/DI2 versus DI2/DI3. Do not let anyone distract you at this point or you will have to redo the whole program. Never ever use the install wizard. It will immediately dump the existing factory program. There are about 6 inputs that concern the motor and a total of about 50 that you will have to look at to verify.

When you call tech support and give us the serial number, we will in turn supply you with a copy of the correct inputs. The inputs are grouped by numbers. The hand held will let you scroll down through the groups identified by 2 numbers. For example 21 Once you select that group you will scroll down through the numbers like 2101, 2102 etc. until you find the one your looking for. Once you pull up the correct number of the parameter, look at the description to verify you have a match then you can scroll up and down until you see the correct parameter value ex: Ref 1 minimum is 60 hz. You would then save it and move on to the next one. There are maybe two really critical ones that people most likely enter the wrong input. Immediately upon final start up you will get a red alarm. Parameters 1401 to 1403

Some of the inputs may have a minus symbol (-) keep scrolling until you find the same input description without a minus. Very important. One other problem is making sure you don't see the letters INV either. That is the inverse of what you want. Some but not all of the parameters may have a number in parenthesis in the lower left of the screen and that same number may be on the list we give you. That simply means you want choice (5) or whatever the number is and you'll find it corresponds to the selection you want.

Now to start the final checkout and startup, go ahead and press the Auto button. You are now ready to test low speed fan by jumping out R and G on the main control board. Watch the hand held and see if it comes up to 66% it should also say 40 HZ and a small rotating arrow at the upper left tells you the fan should be rotating forward. In the unlikely event the fan is turning the wrong direction, go back and hunt up the correct parameter to reverse it. Switching the 3 ph wires at the drive won't work. By the

way, before you leave the job, throw your gauges on the compressor and make sure the pressures come up normal and you don't have a compressor running backwards. You can change two of the incoming wires to straighten that problem out and the drive will take care of itself. I have seen the power company change pole transformers and somehow reverse the phases. Rare but a possibility.

One last check is to add another jumper to Y2 and watch the drive ramp up to 100% and 60 HZ

Put all the thermostat wires back, remove jumpers, watch pressures for a while and then smile.

Congratulations: You are now a VFD expert.