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Revision History

| Date	Author	Topics Updated	Version
02/22/2021	Pferdosa	• Initial draft	1.0
05/10/2021	Pferdosa	• VFD revision check	1.1

Purpose

This document shows you how to replace a PowerFlex 525 VFD.

Step 1 – Check the wiring diagram and jumpers

a. Take a picture: Using your phone, you can take a picture of the wire terminations of your VFD (both controls and power circuits). This will help later if you want to double check your wirings.

b. Check the electrical jumpers: In the terminal section, look at the state of the three jumpers state and take a note.

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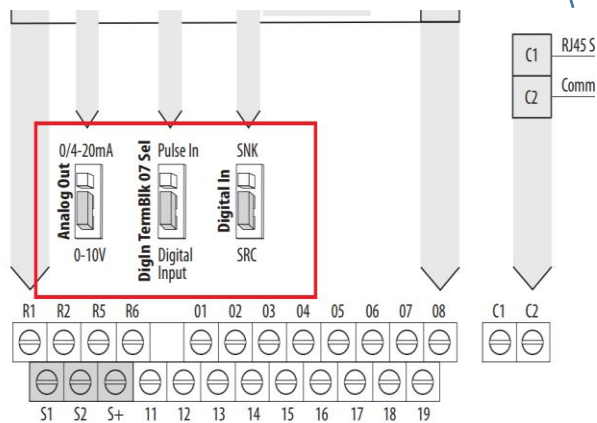
Step 2 - Validate / Create the backup of the VFD parameters

There are different ways to validate or create backup of the VFD parameters. Depends on the resources you have you can use one of the followings:

A: Using PLC

B: Using HIM Module

C: Manual Process

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A: Create Backup Using PLC

If you have an updated backup of your PLC (with VFD parameters) it can be used to restore the VFD parameters. To create such a backup, you can follow these steps:

a. Go online with the PLC: From Communications menu, select "Who Active" and from the opened window, select your PLC and click on "Go Online"
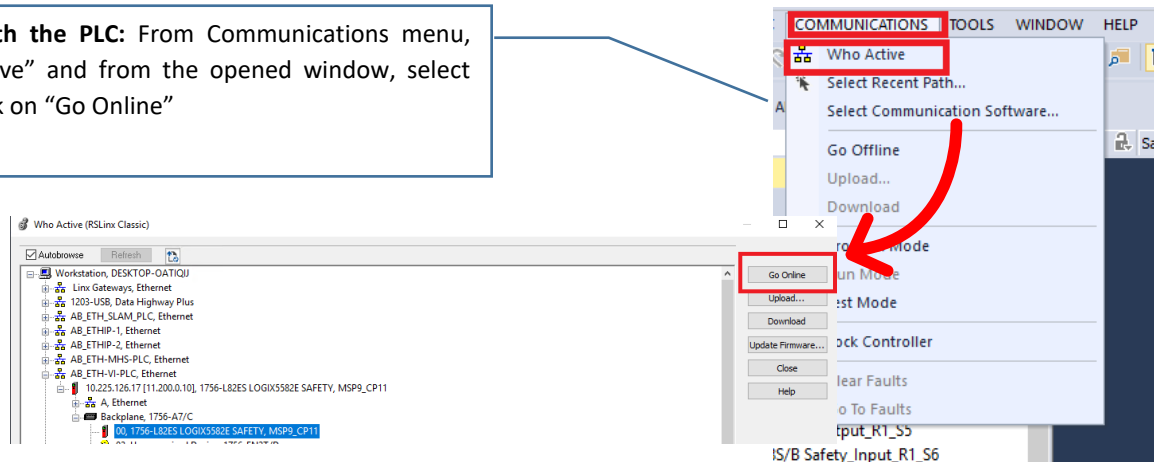
b. Make sure you are online: On top left corner you should see the status of your PLC. If all of the status sections are gray, it means you are not online!
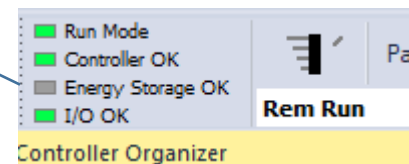
c. Upload the drive parameters: Double click on the drive in question from the left menu it may take a while for the device to get connected, you can confirm this when the blue bar on the top turns to green
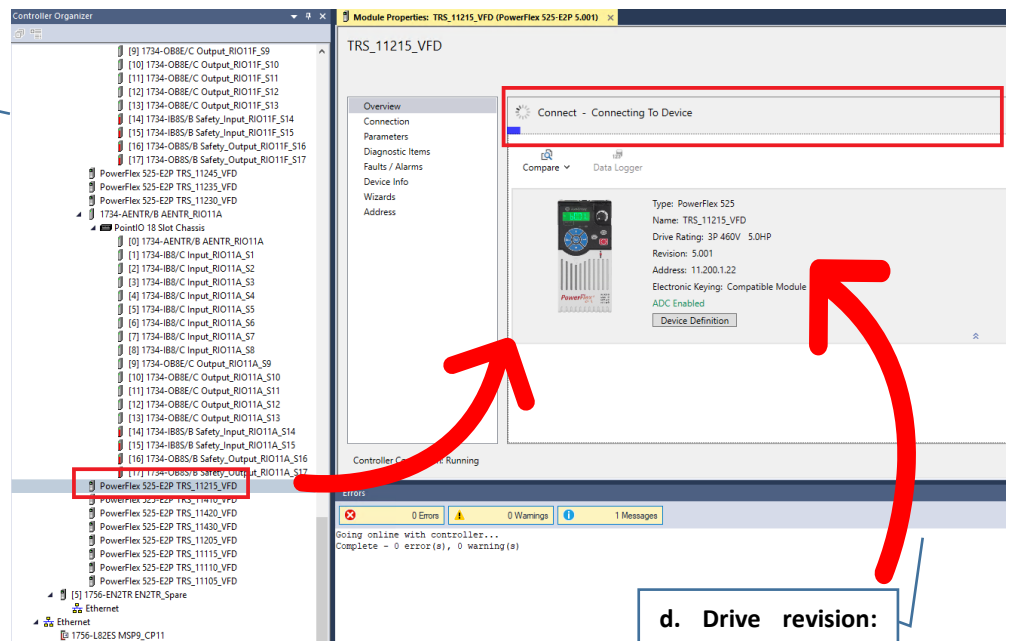
d. Drive revision: make a note of the existing drive's revision.

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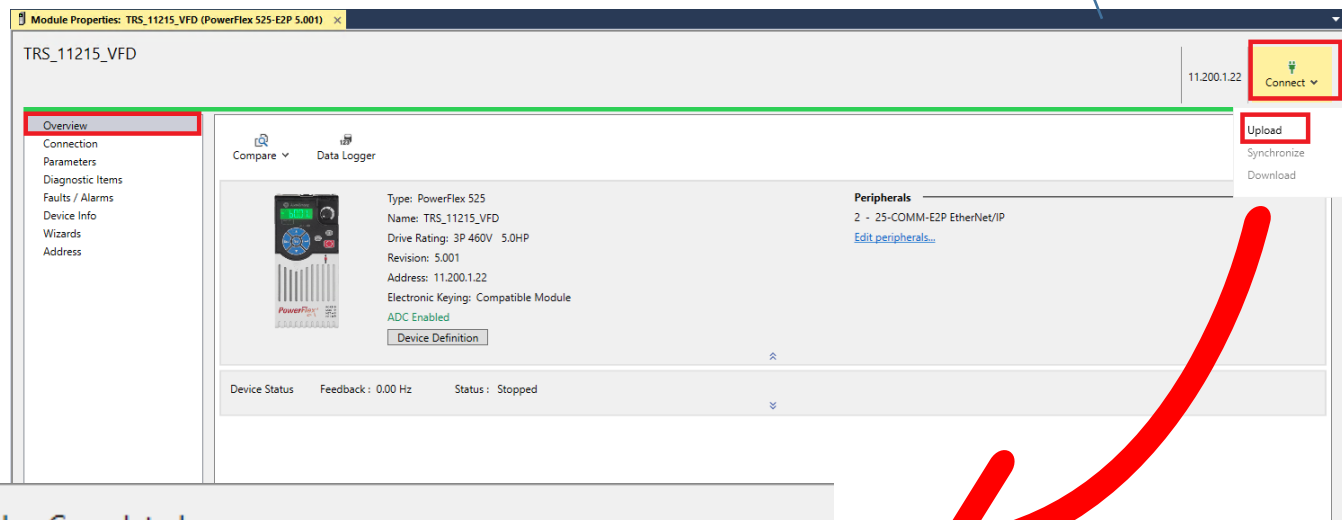**d. Upload the drive settings and parameters:** From the top right corner select Connect, and then Upload. Once the upload process is completed, you should see the confirmation message.

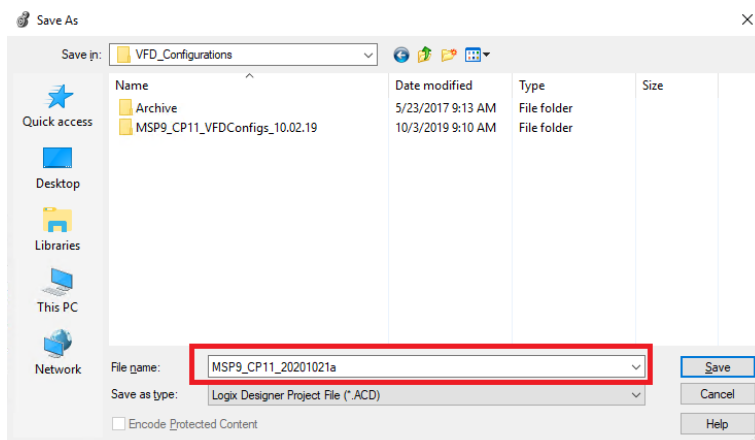**e. Save the backup file:** Select save as from File menu and save the file in your NACF-AE shared drive. A recommended naming is to have the name of the file to be a combination of Name of the building + panel number + date of the backup.

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B: Create Backup Using HIM Module

If you don't have the latest backup of your VFDs already, you can make a backup copy using Allen Bradley PowerFlex 4-Class HIM device.

a. Connect your HIM: Plug in your HIM device to DSI port of the VFD

b. Select HIM CopyCat: From the menu navigate to HIM CopyCat. This will allow you to transfer parameters to/from the VFD
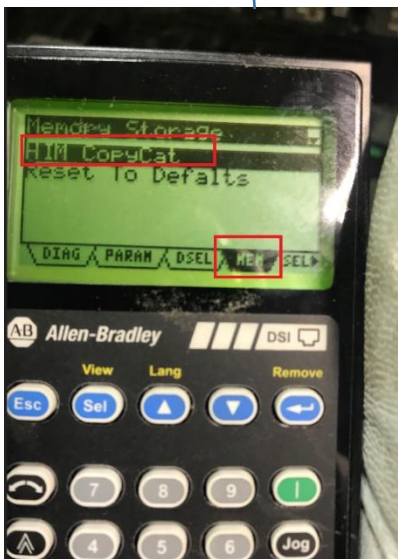
c. Select Device -> HIM: From HIM CopyCat menu, select Device -> HIM. This will upload the parameters from drive to

d. Upload the parameters: from the menu select the new file and upload the parameters
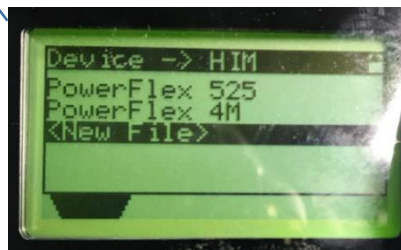
e. Confirmation: Wait until the process finishes uploading parameters from your Device to the HIM. Take a note of the name assigned to this VFD in your HIM.

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f. Check Revision: Follow these 4 steps on the drive display unit to identify the drives revision.

Step		Key(s)	Example Display
1.	When power is applied, the last user-selected Basic Display Group parameter number is briefly displayed with flashing characters. The display then defaults to that parameter's current value. (Example shows the value of b001 [Output Freq] with the drive stopped.)		FWD 0.00 HERTZ
2.	Press Esc to display the Basic Display Group parameter number shown on power-up. The parameter number will flash.	Esc	FWD b001
3.	Press the Up Arrow or Down Arrow to scroll to parameter b029 [Control SW Ver].	△ or ▽	FWD b029
4.	Press Enter to display the drive's firmware revision.	↵	FWD 2.003

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C: Manually verify the parameters

If you don't have access to the PLC or any of the other tools we mentioned earlier, you can still replace the VFD by manually taking a note of the important parameters of your drive. The most important parameters we need when we replace a drive are:

Communication parameters (like IP address, Port numbers etc.)

Speed parameters (like reference speed, set points etc.)

Control module parameters (like stop and start reference etc.)

The followings are the steps you need to take to make sure you have the right information to replace a drive:

> **a. Take a note of the communication parameters:** Look at your drawings to find your drive and see what communication protocols does it have and what are the addresses for that drive. Two common communication protocols at Amazon are Profibus or Ethernet. In either case, the module address should be noted in the electrical drawings. In the following pictures you can see both examples. Please note that for Profibus you need to set the deep switch settings accordingly on the new drive.
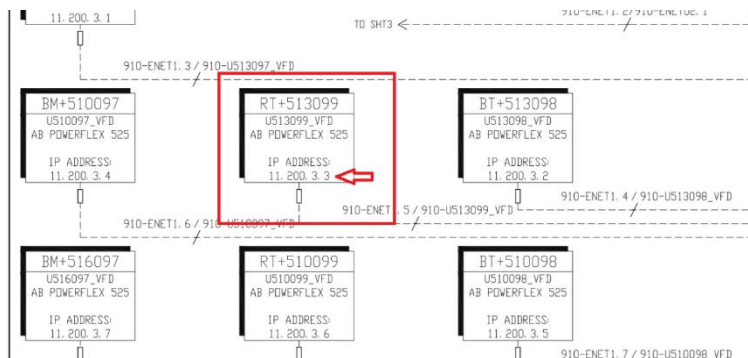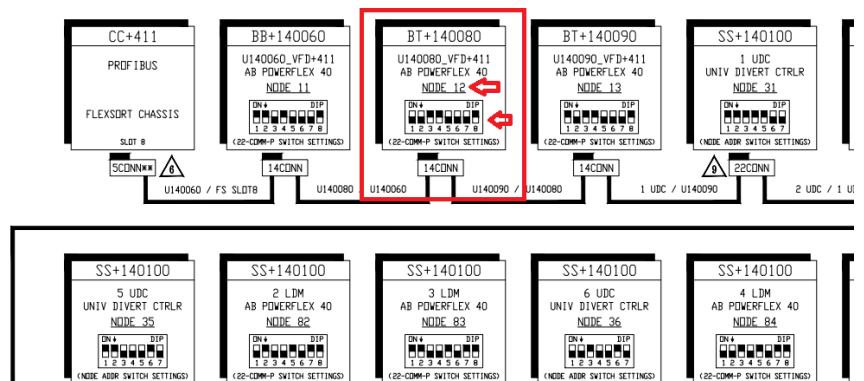
b. Take a note of drive settings: you can find the drive customized parameters on the print. The representation of that data could be different based on the OEM. The following picture shows the general parameters that need to be updated on the drive under "Actual Setting" as well as a separate table with a drive specific parameters list

NO.	NAME	DEFAULT SETTING	ACTUAL SETTING
P031	MOTOR NP VOLTS	DRIVE RATING	SEE MOTOR NAMEPLATE DATA NOTE C.1
P032	MOTOR NP HERTZ	60 Hz	
P033	MOTOR OL CURRENT	DRIVE RATING	
P034	MOTOR NP FLA	DRIVE RATING	
P035	MOTOR NP POLES	4	NOTE C.2
P036	MOTOR NP RPM	1750 RPM	SEE MOTOR NAMEPLATE DATA
P037	MOTOR NP POWER	DRIVE RATED POWER	NOTE C.3
P039	TORQUE PERF MODE	1 (SVC)	*
P041	ACCEL TIME 1	10.00 SEC	SEE CHART SHEET 3
P042	DECEL TIME 1	10.00 SEC	SEE CHART SHEET 3
P043	MINIMUM FREQ	0.00 Hz	*
P044	MAXIMUM FREQ	60.00 Hz	70.00 Hz
P045	STOP MODE	0 (RAMP, CF)	*
P046	START SOURCE 1	1 (KEYPAD)	5 (ETHERNET/IP)
P047	SPEED REFERENCE 1	1 (DRIVE POT)	15 (ETHERNET/IP)
T062	DigIn TermBlk 02	48 (2-WIRE FWD)	*
T063	DigIn TermBlk 03	50 (2-WIRE REV)	*
T064	2-WIRE MODE	0 (EDGE TRIGGER)	*
T065	DigIn TermBlk 05	7 (PRESET FREQ)	*
T066	DigIn TermBlk 06	7 (PRESET FREQ)	*
T067	DigIn TermBlk 07	5 (SPD + STRT 2)	*
T068	DigIn TermBlk 08	9 (JOG FORWARD)	*
T076	RELAY OUT1 SEL	0 (READY/FAULT)	*
T081	RELAY OUT2 SEL	2 (MOTOR RUNNING)	*
C123	RS485 DATA RATE	3 (9600)	*
C126	COMM LOSS TIME	5.0 SEC	1.0 SEC
C127	RS485 FORMAT	0 (RTU 8-N-1)	*
C128	ADDRESS SELECT	2 (BOOTP)	SEE NOTE C.4
A410	PRESET FREQ 0	0.00 Hz	*
A411	PRESET FREQ 1	5.00 Hz	*
A434	DC BRAKE TIME	0.0 SEC	*
A435	DC BRAKE LEVEL	DRIVE AMPS X 0.5	*
A437	DB RESISTOR SEL	0 (DISABLED)	SEE CHART SHEET 3
A544	REVERSE DISABLE	0 (REV ENABLED)	1 (REV DISABLED)
A545	FLYING START EN	0 (DISABLED)	*
A550	BUS REG ENABLE	1 (ENABLED)	* / NOTE C.5
A573	MOTOR OPT CONFIG	1 (ENABLED)	SEE CHART SHEET 3

A. POWERFLEX FREQ DRIVE SETUP FOR INSTALLATION/RUN-IN:
1. STOP DRIVE.
2. ALL MOTOR PARAMETERS MUST BE SET BEFORE RUNNING THE AUTOTUNE ROUTINE.
   SET PARAMETERS P031-037 & P039 PER PARAMETER CHARTS.
3. SET PARAMETER P046 = 1 – KEYPAD
4. SET PARAMETER P047 = 1 – DRIVE POT
5. SET PARAMETER P040 = 1 – STATIC TUNE
   IF A START COMMAND IS NOT GIVEN (OR A STOP COMMAND IS GIVEN) WITHIN 30 SECONDS,
   THE PARAMETER P040 AUTOMATICALLY RETURNS TO 0 AND AN AUTOTUNE FAULT OCCURS.
6. INITIATE A START. ⓘ THE DRIVE WILL NOT RUN BUT WILL PERFORM A
   STATIC TUNE. WHEN AUTOTUNE IS COMPLETE P040 WILL RETURN TO 0 AND THE DRIVE
   WILL BE READY TO RUN.
7. START AND STOP THE DRIVE USING THE GREEN ⓘ AND RED ◻ BUTTONS
   ON THE DRIVE KEYPAD.
8. ADJUST MOTOR SPEED USING THE POTENTIOMETER ON THE FRONT OF THE
   DRIVE.
9. RESTORE PARAMETERS P046 & P047 TO THEIR PARAMETER CHART SETTING.

B. EDITING PARAMETERS:

REFERENCE THE PF525 DRIVE USER MANUAL FOR DISPLAY AND CONTROL KEYS INFORMATION AS WELL AS
HOW TO VIEW AND EDIT PARAMETERS USING THE INTEGRAL KEYPAD.

C. PARAMETER NOTES:

1. PARAMETERS P033 & P034:
   A. SET TO MOTOR NAMEPLATE AMPS (NOT X 1.15)

2. PARAMETER P035:
   A. MOTOR NP POLES FORMULA IS:
      NUMBER OF POLES = (120*FREQUENCY) / RPM OF MOTOR.
   B. HERE ARE THE NUMBER OF POLES FOR COMMON MOTORS:
      120*60HZ / 1800 RPM = 4 POLES
      120*60HZ / 1200 RPM = 6 POLES
      120*60HZ / 3600 RPM = 2 POLES
      120*60HZ / 900 RPM = 8 POLES

3. PARAMETER P037:
   A. THIS PARAMETER SETS THE MOTOR NAMEPLATE POWER. THE UNIT OF MEASURE FOR THE
      VALUE IS IN kW.
   B. FORMULA TO CALCULATE THE kW IS:
      kW = HP * 0.746

4. IP CONFIGURATION PARAMETER C128:
   ADDRESS SELECT (1 PARAMETERS, 2 BOOTP)
   IF SET TO 1
   PARAMETERS 129 THROUGH 132 ARE THE IP
   PARAMETERS 133 THROUGH 136 ARE THE SUBNET
   PARAMETERS 137 THROUGH 140 ARE THE GATEWAY
   PARAMETER 141 ENABLE RATE CONFIG
      0 AUTODETECT
      1 10Mbps FULL
      2 10Mbps HALF
      3 100Mbps FULL
      4 100Mbps HALF
   REFER TO NETWORK DRAWINGS FOR IP SETTINGS

5. PARAMETER A550:
   WHEN A437 [DB RESISTOR SEL] IS SET TO A VALUE GREATER THAN "0", THE VALUE SET IN
   PARAMETER A550 [BUS REG ENABLE] WILL NOT TAKE EFFECT.

| NO.	NAME	U502347_VFD+910	U502350_VFD+910	U502352_VFD+910	U502354_VFD+910	U513097_VFD+910	U513098_VFD+910
P041	ACCEL TIME 1	1.0 SEC	1.0 SEC	1.0 SEC	1.0 SEC	1.0 SEC	0.6 SEC
P042	DECEL TIME 1	1.0 SEC	1.0 SEC	1.0 SEC	1.0 SEC	1.0 SEC	0.6 SEC
A437	DB RESISTOR SEL	0 (DISABLED)	0 (DISABLED	0 (DISABLED	0 (DISABLED	0 (DISABLED)	20 (20%)
A573	MTR OPTIONS CFG	3 (JERK ENBLD)	3 (JERK ENBLD)	3 (JERK ENBLD)	3 (JERK ENBLD)	3 (JERK ENBLD)	2 (JERK ENBLD)

Step 3 – Replace the VFD with a new one

a. Check Revision: Follow these 4 steps on the drive display unit to identify the drives revision. We recommend to replace the VFD with a similar or higher revision number than the old one. **If the revision of the new drive is lower than the old drive, you need to upgrade the firmware of the VFD using this document**:

https://literature.rockwellautomation.com/idc/groups/literature/documents/rn/520-rn001_-en-e.pdf

Step		Key(s)	Example Display
1.	When power is applied, the last user-selected Basic Display Group parameter number is briefly displayed with flashing characters. The display then defaults to that parameter's current value. (Example shows the value of b001 [Output Freq] with the drive stopped.)		FWD 0.00 HERTZ
2.	Press Esc to display the Basic Display Group parameter number shown on power-up. The parameter number will flash.	Esc	FWD b001
3.	Press the Up Arrow or Down Arrow to scroll to parameter b029 [Control SW Ver].	△ or ▽	FWD b029
4.	Press Enter to display the drive's firmware revision.	↵	FWD 2.003

b. visual check: Bring the new drive and open the front faceplate, so that you can see the electronics and wiring terminals. Drive might come with default wirings and jumpers. Using your notes from Step 1 – a and b, make sure you have the right jumpers on.

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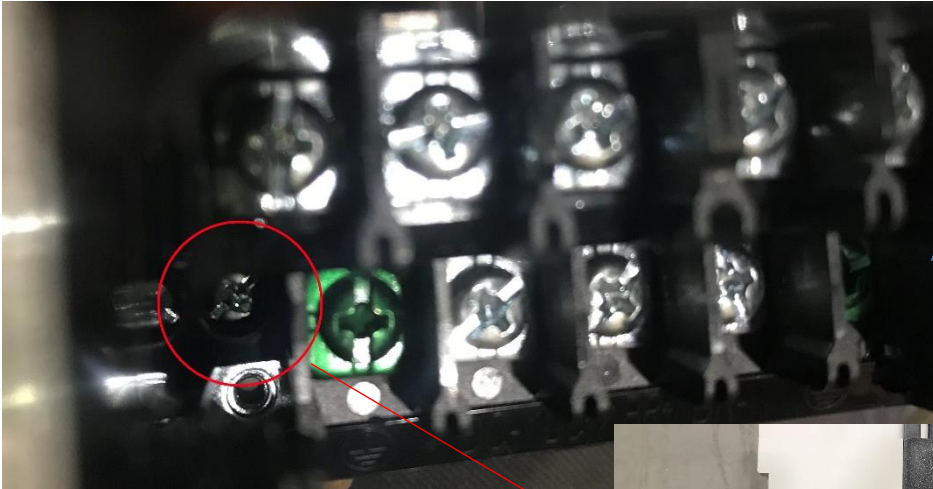
c. check the side jumper: Some drives come with side jumpers. Make sure the new drive reflects the same setup as the old one. In case you must remove the side jumper, you have to loosen the screw from the terminal section (see the red circle)

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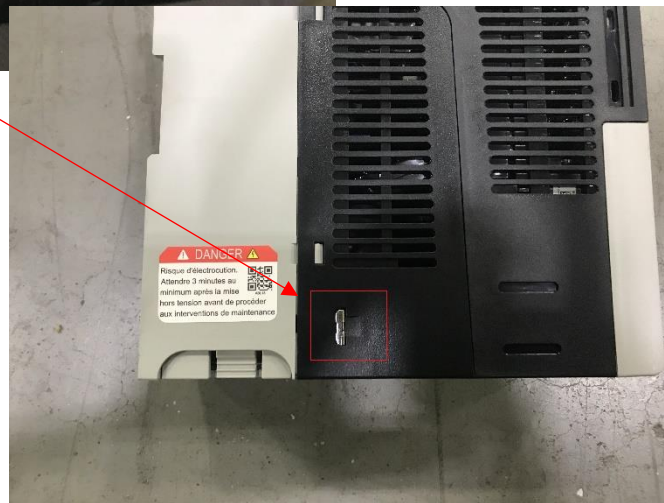
d. wiring the new drive: once putting the new drive in, you need to wire the power (120 V or 480 V) and controls circuit (24 V). It is recommended to do it based on your sites drawings and then checking the wiring against the pictures you took on step 1 -a and step 1-b. In case the wiring in the diagram don't match the pictures you took from step 1, wire the drive based on the pictures (the way the old drive wired) but also verify the wiring with your systems engineer if possible.
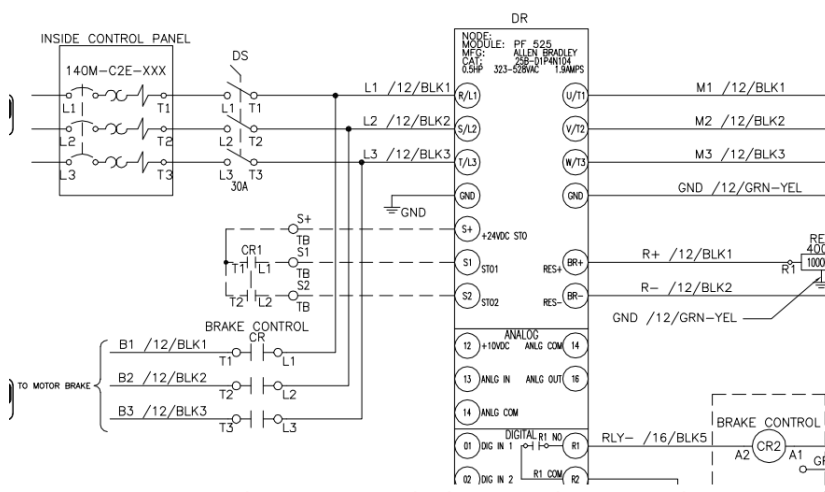
This is an example drawing. Please consult your site's drawings for the right wire termination.

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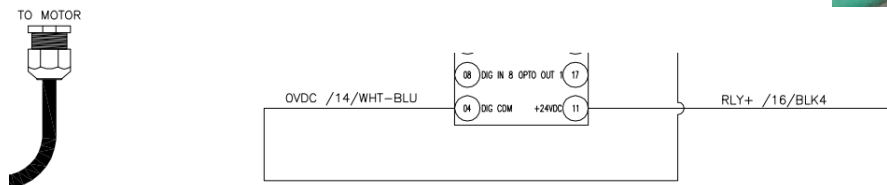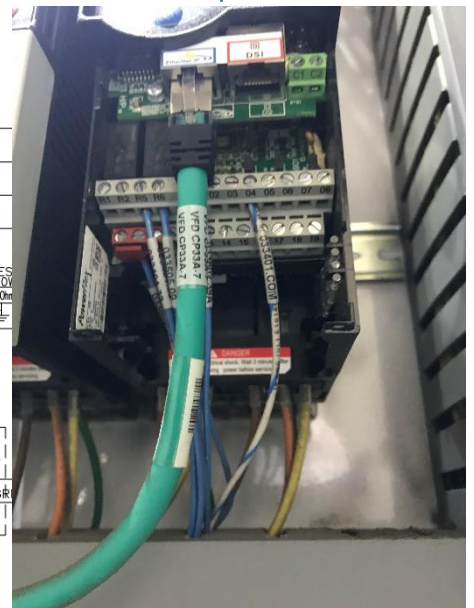
Step 4 – Restore the parameters

Depends on what option you chose in step 2 to verify or create your backup, you can use the following options:

A: Using PLC

B: Using HIM Module

C: Manual Process (if you don't have access to any of the A, B or C options)

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A: Restore Backups Using PLC

**a. Download the parameters: Go offline** with the controller and Make sure the **drive is not running**.

In the Drive Details window banner, from the Connect drop-down menu, click **Download**.

- If this is the first time connecting to a specific drive, the Download – Identifying Device dialog box opens. **Select the drive to which you want to download configuration settings and click Continue**.
- If there are difference in the configuration between the project and the physical drive, the Download - Downloading dialog box opens and identifies the differences. If you want to continue the download, click Continue.
- **If you have previously connected to the drive and there are no differences in the configuration between the project and the physical drive, the Download - Downloading dialog box opens.**
- When the download has completed, click **Finish**.

  Please note that it is recommended to replace the VFD with a revision similar to, or higher than the old one. **If the revision of the new drive is lower than the old drive, you need to upgrade the firmware of the VFD using this document**:

  https://literature.rockwellautomation.com/idc/groups/literature/documents/rn/520-rn001_-en-e.pdf
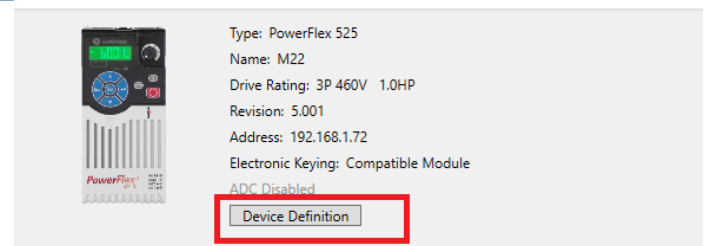
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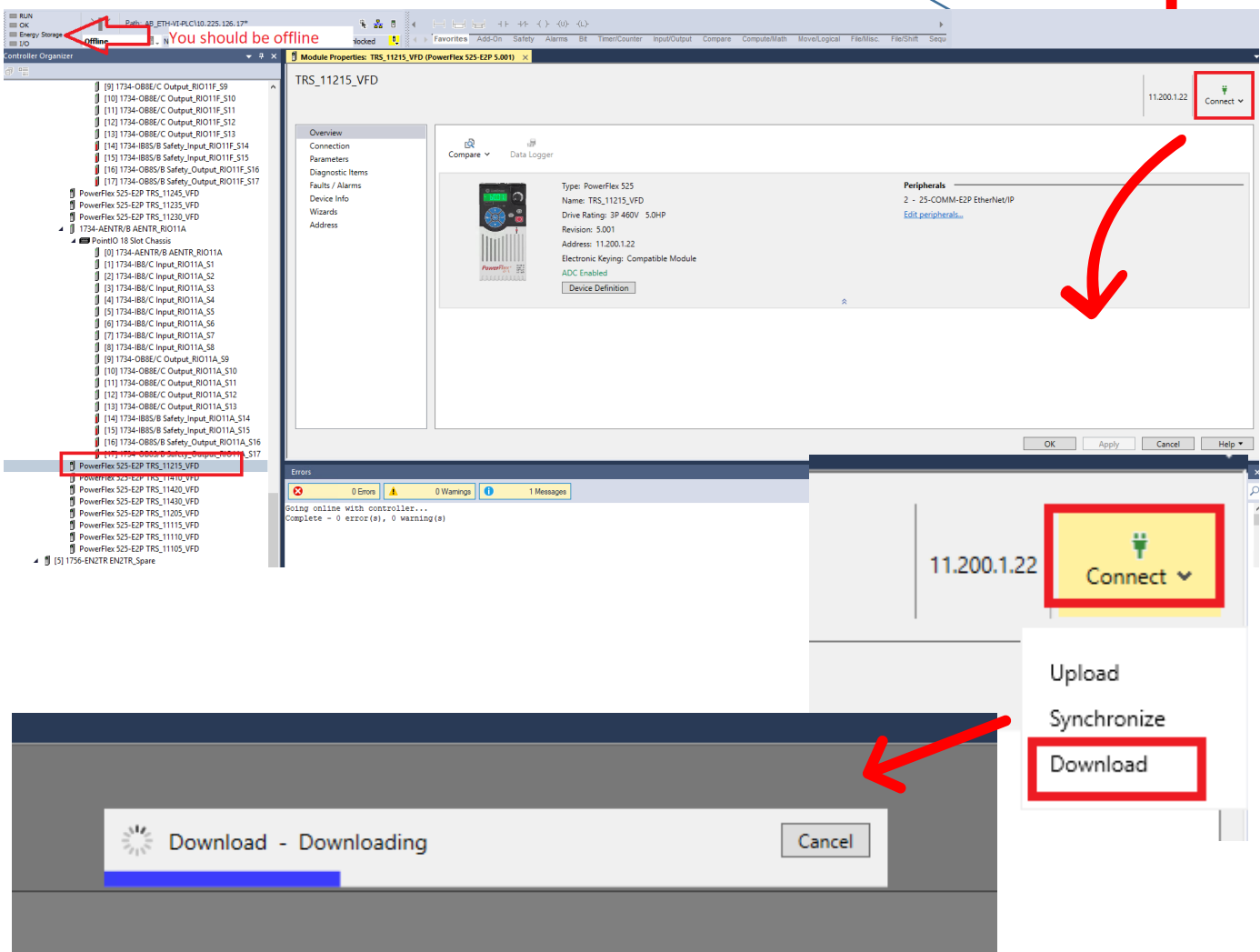
b. firmware correction: If your installed drive has the same or a higher revision than what is defined in the PLC, drive should communicate, but if it doesn't you can adjust the firmware to reflect the higher revision on the new drive by selecting "Device Definition" and update the firmware.

It is strongly recommended not to reduce the revision number on your PLC settings, instead upgrading the firmware on your device using this procedure:

https://literature.rockwellautomation.com/idc/groups/literature/documents/rn/520-rn001_-en-e.pdf

B: Restoring Parameters Using HIM Module

a. Connect your HIM: Plug in your HIM device to DSI port of the VFD

b. Select HIM CopyCat: From the menu navigate to HIM CopyCat. This will allow you to transfer parameters to/from the VFD
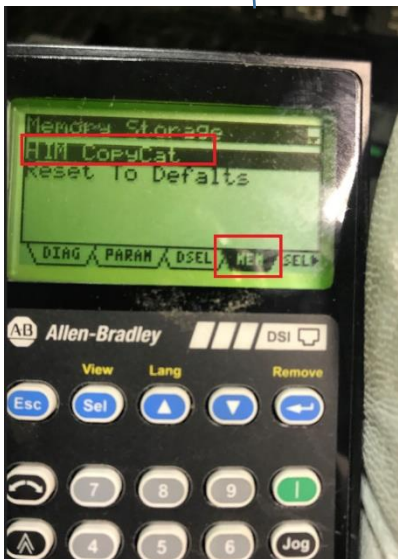
c. Select HIM -> Device: From HIM CopyCat menu, select HIM -> Device. This will download the parameters from HIM to your VFD

d. Download the parameters: from the menu select the file you created in step 2-e and download the parameters
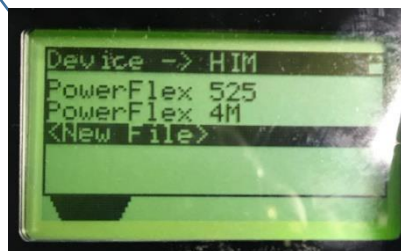
e. Confirmation: Wait until the process finishes downloading parameters to your Device.

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C: Restoring Parameters Using Manual Process

We assume you have followed all instructions from step 2-D to collect information to manually backup your parameters.

Verify the Parameters: On the VFD panel, go through all the parameters you have identified from the schematic and make sure all of them are set accordingly.

Control and Navigation Keys

Display		Display State	Description
ENET		Off	Adapter is not connected to the network.
		Steady	Adapter is connected to the network and drive is controlled through Ethernet.
		Flashing	Adapter is connected to the network but drive is not controlled through Ethernet.
LINK		Off	Adapter is not connected to the network.
		Steady	Adapter is connected to the network but not transmitting data.
		Flashing	Adapter is connected to the network and transmitting data.

LED		LED State	Description
FAULT		Flashing Red	Indicates drive is faulted.

Key		Name	Description
	△ ▽	Up Arrow	Scroll through user-selectable display parameters or groups.
		Down Arrow	Increment values.
	Esc	Escape	Back one step in programming menu. Cancel a change to a parameter value and exit Program Mode.
	Sel	Select	Advance one step in programming menu. Select a digit when viewing parameter value.
	↵	Enter	Advance one step in programming menu. Save a change to a parameter value.

NO	NAME	DEFAULT SETTING	ACTUAL SETTING
P031	MOTOR NP VOLTS	DRIVE RATING	SEE MOTOR NAMEPLATE DATA NOTE C.1
P032	MOTOR NP HERTZ	60 Hz	
P033	MOTOR OL CURRENT	DRIVE RATING	
P034	MOTOR NP FLA	DRIVE RATING	
P035	MOTOR NP POLES	4	NOTE C.2
P036	MOTOR NP RPM	1750 RPM	SEE MOTOR NAMEPLATE DATA
P037	MOTOR NP POWER	DRIVE RATED POWER	NOTE C.3
P039	TORQUE PERF MODE	1 (SVC)	*
P041	ACCEL TIME 1	10.00 SEC	SEE CHART SHEET 3
P042	DECEL TIME 1	10.00 SEC	SEE CHART SHEET 3
P043	MINIMUM FREQ	0.00 Hz	*
P044	MAXIMUM FREQ	60.00 Hz	70.00 Hz
P045	STOP MODE	(RAMP, CF)	*
P046	START SOURCE 1	(KEYPAD)	5 (ETHERNET/IP)
P047	SPEED REFERENCE 1	(DRIVE POT)	15 (ETHERNET/IP)
T062	DigIn TermBlk 02	(RE FWD)	*
T063	DigIn	(E REV)	*
T064	2-WIR	(GGER)	*
T065	DigIn	(EQ)	*
T066	DigIn		*
T067	DigIn	(2)	*
T068	DigIn	(RD)	*
T076	RELAY	(FAULT)	*
T081	RELAY	(RUNNING)	*
C123	RS485 DATA RATE	(600)	*
C126	COMM LOSS TIME	5 SEC	1.0 SEC
C127	RS485 FORMAT	(RTU 8-N-1)	*
C128	ADDRESS SELECT	2 (BOOTP)	SEE NOTE C.4
A410	PRESET FREQ 0	0.00 Hz	*
A411	PRESET FREQ 1	5.00 Hz	*
A434	DC BRAKE TIME	0.0 SEC	*
A435	DC BRAKE LEVEL	DRIVE AMPS X 0.5	*
A437	DB RESISTOR SEL	0 (DISABLED)	SEE CHART SHEET 3
A544	REVERSE DISABLE	0 (REV ENABLED)	1 (REV DISABLED)
A545	FLYING START EN	0 (DISABLED)	*
A550	BUS REG ENABLE	1 (ENABLED)	* / NOTE C.5
A573	MOTOR OPT CONFIG	1 (ENABLED)	SEE CHART SHEET 3 NOTE C.6

| NO	NAME	U502347_VFD+910	
P041	ACCEL TIME 1	1.0 SEC	
P042	DECEL TIM	1.0 SEC	
A437	DB	0 (DISABLED)	
A573	MT G	3 (JERK ENBLD)	

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At this point we need to check the network address / IP address on the drive to match the drawings based on your notes from step 2.

Profibus Network: If your VFD is communicating over Profibus, you may need to check the deep switches to reflect the correct address.
Ethernet Network: If your drive communicates over Ethernet, you can verify the correct address.

Profibus Network: If your VFD is communicating over Profibus, you may need to check the deep switches on the Profibus module on drive to reflect the correct address.
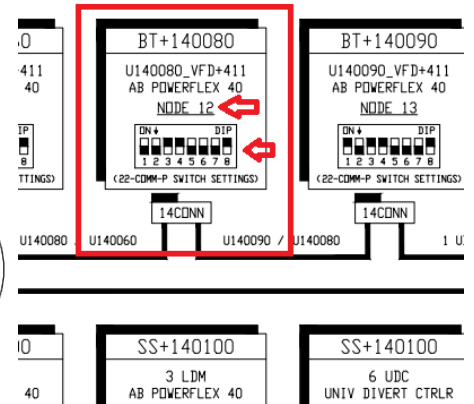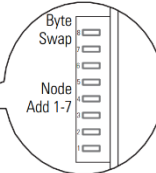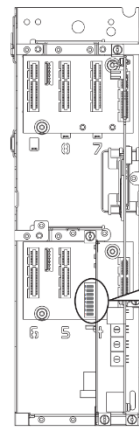
Ethernet Network: Most of the VFDs are configured to automatically set the correct IP address from Bootp. If you need to check the IP address set on your drive you use the VFD menu. For PowerFlex 525 you can use parameters C129 to C132 to check your IP addresses. For other models, please consult the manual document.

Communications		EN Addr Sel	C128	EN Gateway Cfg 3	C139
		EN IP Addr Cfg 1	C129	11.200.3.3	
		EN IP Addr Cfg 2	C130	C129=11 C130=200	
		EN IP Addr Cfg 3	C131	C131=3 C132=3	
Comm Write Mode	C121	EN IP Addr Cfg 4	C132		
Cmd Stat Select	C122	EN Subnet Cfg 1	C133	EN Flt Cfg Logic	C145
RS485 Data Rate	C123	This is an example IP		N Flt Cfg Ref	C146
RS485 Node Addr	C124	address. Do not use this		N Flt Cfg DL 1	C147
Comm Loss Action	C125	IP for your drive		N Flt Cfg DL 2	C148
Comm Loss Time	C126			N Flt Cfg DL 3	C149
RS485 Format	C127	EN Gateway Cfg 2	C138	N Flt Cfg DL 4	C150

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