Nighthawk to VFD Integration

Cheat Sheet Guide

⚠ Safety Warning ⚠

Please read before proceeding!

This cheat sheet is designed for licensed electricians and/or competent electrical contractors who are familiar with VFDs and programming of VFDs. If you do not feel confident to change settings in your VFD then please seek advice from a licensed and/or competent person or agency. **THIS IS A GUIDE ONLY** and is not an exhaustive manual. 3rd party VFD manufacturers may change their firmware without notice and we cannot guarantee the efficacy of this guide in that case.

CNC3D Cannot provide any more VFD support other than what is in this guide

Never **perform a factory reset on your VFD unless absolutely necessary**

Performing a factory reset may cause extremely undesirable results if *ALL* settings are not set appropriately afterwards, The risks include the possibility that your VFD may physically explode if parameters are not set correctly or your spindle and/or VFD may be damaged as a result of changing the incorrect settings.

Liability / Indemnity

This guide is provided to you unequivocally without prejudice. By choosing to follow any or all of the steps, processes or diagrams in this guide, you accept the risks of following this guide. CNC3D PTY LTD is not and will not be liable or responsible for any damage of any kind caused by following this guide. This includes damage or injury to any person, appliance or Infrastructure of any kind. Damages caused as a result of changing any VFD settings are NOT covered under warranty. We cannot guarantee that settings/PD values will match all variations of particular VFDs so please confirm the setting name matches your user manual explicitly. YOU HAVE BEEN WARNED!!

General VFD Settings

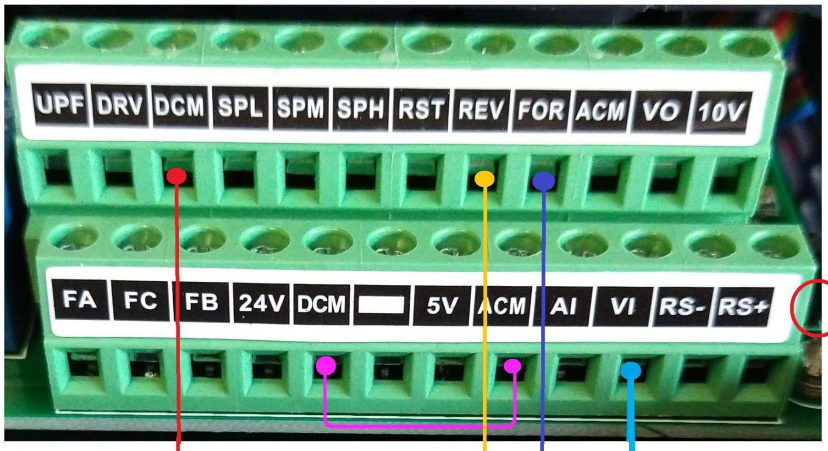
This guide assumes that your current VFD settings are correct for your spindle and that your spindle has been working as expected already with manual button/panel control on your VFD. If your VFD is new or has not previously worked correctly it is important to ensure that several settings in your VFD match the settings that should be stamped or stickered on your spindle.

Under Australian law all work involving mains wiring MUST be performed by a licensed electrician.

DO NOT ATTEMPT ANY MAINS WIRING WITHOUT AN ELECTRICAL LICENSE

Always ensure your VFD is Powered off and unplugged before performing any wiring!

Huanyang (HY) VFDs (Most Models)



VFD → VFD

Pink: DCM → ACM Bridge

Nighthawk → VFD

Light Blue: V0-10 → VI

Dark Blue: FOR → FOR

Yellow: REV → REV

Red: DCM/ACM → DCM

Huanyang (HY) PD Settings changes to allow control via the Nighthawk

Pro Tip: Record current settings before changing any values in case you wish to revert back to manual control of your VFD.

We have included the standard descriptions of each setting to change below. Please reference your manual provided with your VFD to ensure that the description of each respective setting closely matches the setting listed below to ensure the correct setting is changed. If you unsure then please discontinue following this procedure and seek advice from a licensed electrician or competent person.

These settings are only a guide. We cannot guarantee that changing to the provided values will work with very VFD in every scenario. These are tested and proven in our factory with a HY VFD.

PD / Setting	Description	Value required	Value description
PD01	Source of run commands	1	External terminal
PD02	Source of operating frequency	1	Simulation amount set
PD70	Analog input type	0	0-10V

On the next page is a full list of settings from both a 1.5kw and a 2.2kw VFD. These settings were pulled from an HY VFD currently being controlled by a Nighthawk.

They are listed here as a reference only. Some of the settings will be set to the unique spindle that is attached, such as maximum RPM, Frequency, Voltage and impedance.

You will need to tune these settings to match your spindle.

HY 1.5kw Model Number HY01D523B

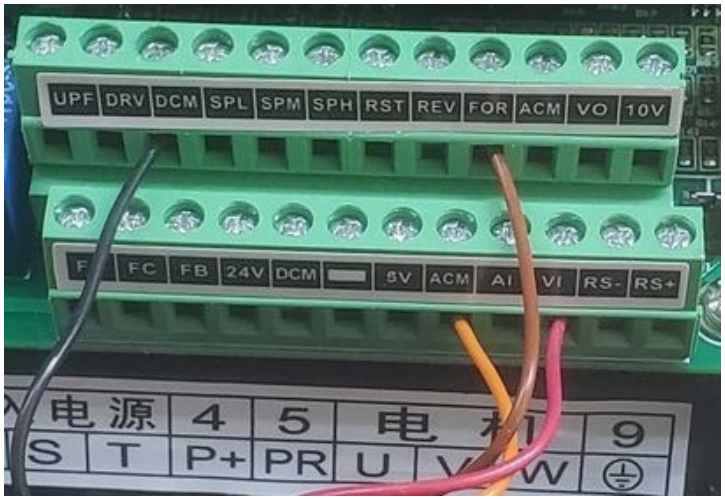
PD		PD		PD		PD		PD		PD		PD		PD	
0	0	**32**	5.0	**64**	001	**96**	25.00	**128**	null	**160**	0	**192**	null	**224**	null
1	1	**33**	150	**65**	00000	**97**	30.00	**129**	null	**161**	100	**193**	null	**225**	null
2	1	**34**	0.5	**66**	00000	**98**	35.00	**130**	0	**162**	000	**194**	null	**226**	null
3	400.00	**35**	null	**67**	null	**99**	40.00	**131**	006.0	**163**	000	**195**	null	**227**	null
4	400.00	**36**	null	**68**	null	**100**	45.00	**132**	005	**164**	1	**196**	null	**228**	null
5	400.00	**37**	null	**69**	null	**101**	10.0	**133**	060	**165**	0	**197**	null	**229**	null
6	2.50	**38**	null	**70**	0	**102**	10.0	**134**	060	**166**	0	**198**	null	**230**	null
7	0.50	**39**	null	**71**	20	**103**	0000.0	**135**	095	**167**	0	**199**	null	**231**	null
8	220.0	**40**	null	**72**	400.00	**104**	0000.0	**136**	030	**168**	0	**200**	00000	**232**	null
9	14.0	**41**	08	**73**	000.00	**105**	0000.0	**137**	080	**169**	null	**201**	null	**233**	null
10	7.0	**42**	5.00	**74**	0	**106**	0000.0	**138**	020.00	**170**	00	**202**	null	**234**	null
11	000.00	**43**	000.0	**75**	0	**107**	0000.0	**139**	020	**171**	7	**203**	null	**235**	null
12	null	**44**	01	**76**	0	**108**	0000.0	**140**	null	**172**	00	**204**	null	**236**	null
13	00	**45**	03	**77**	0	**109**	0000.0	**141**	220.0	**173**	255.0	**205**	null	**237**	null
14	5.0	**46**	14	**78**	0	**110**	0000.0	**142**	007.0	**174**	007.0	**206**	null	**238**	null
15	5.0	**47**	22	**79**	0.01	**111**	0000.0	**143**	04	**175**	0	**207**	null	**239**	null
16	20.0	**48**	24	**80**	0	**112**	0000.0	**144**	1440	**176**	0	**208**	null	**240**	null
17	20.0	**49**	23	**81**	0	**113**	0000.0	**145**	02.0	**177**	ELU.D	**209**	null	**241**	null
18	40.0	**50**	01	**82**	000	**114**	0000.0	**146**	040	**178**	ELU.A	**210**	null	**242**	null
19	40.0	**51**	05	**83**	000	**115**	0000.0	**147**	0000	**179**	ELU.N	**211**	null	**243**	null
20	80.0	**52**	03	**84**	00000	**116**	0000.0	**148**	null	**180**	ELU.A	**212**	null	**244**	null
21	80.0	**53**	00	**85**	00000	**117**	0	**149**	null	**181**	UR1.00	**213**	null	**245**	null
22	0	**54**	0	**86**	15.00	**118**	1	**150**	1	**182**	21111	**214**	null	**246**	null
23	1	**55**	100	**87**	20.00	**119**	150	**151**	00.0	**183**	65535	**215**	null	**247**	null
24	1	**56**	000.00	**88**	25.00	**120**	000	**152**	01.0	**184**	20	**216**	null	**248**	null
25	0	**57**	000.00	**89**	30.00	**121**	05.0	**153**	0	**185**	00	**217**	null	**249**	null
26	0	**58**	000.00	**90**	35.00	**122**	null	**154**	00.5	**186**	0	**218**	null	**250**	null
27	0.50	**59**	000.50	**91**	40.00	**123**	0	**155**	00	**187**	null	**219**	null		
28	0.50	**60**	000.00	**92**	000.50	**124**	000	**156**	100.0	**188**	null	**220**	null		
29	00.0	**61**	000.00	**93**	10.00	**125**	1.0	**157**	0005.0	**189**	null	**221**	null		
30	00.0	**62**	000.50	**94**	15.00	**126**	0	**158**	00.00	**190**	null	**222**	null		
31	2.0	**63**	00.1	**95**	20.00	**127**	null	**159**	000.0	**191**	null	**223**	null		

HY 2.2kw Model Number HY02D223B

PD		PD		PD		PD		PD		PD		PD		PD	
0	0	**33**	150	**66**	00000	**99**	040.00	**132**	005	**165**	0	**198**	NULL	**231**	NULL
1	1	**34**	00.5	**67**	NULL	**100**	045.00	**133**	060	**166**	0	**199**	NULL	**232**	NULL
2	1	**35**	NULL	**68**	NULL	**101**	0010.0	**134**	060	**167**	0	**200**	00000	**233**	NULL
3	400.00	**36**	NULL	**69**	NULL	**102**	0010.0	**135**	095	**168**	0	**201**	NULL	**234**	NULL
4	400.00	**37**	NULL	**70**	0	**103**	0000.0	**136**	030	**169**	NULL	**202**	NULL	**235**	NULL
5	400.00	**38**	NULL	**71**	20	**104**	0000.0	**137**	080	**170**	00	**203**	NULL	**236**	NULL
6	002.50	**39**	NULL	**72**	400.00	**105**	0000.0	**138**	020.00	**171**	0	**204**	NULL	**237**	NULL
7	000.50	**40**	NULL	**73**	000.00	**106**	0000.0	**139**	020	**172**	00	**205**	NULL	**238**	NULL
8	220.0	**41**	08	**74**	0	**107**	0000.0	**140**	NULL	**173**	255.0	**206**	NULL	**239**	NULL
9	013.0	**42**	005.00	**75**	0	**108**	0000.0	**141**	220.0	**174**	011.0	**207**	NULL	**240**	NULL
10	006.5	**43**	0000.0	**76**	0	**109**	0000.0	**142**	006.0	**175**	0	**208**	NULL	**241**	NULL
11	000.00	**44**	02	**77**	0	**110**	0000.0	**143**	04	**176**	0	**209**	NULL	**242**	NULL
12	NULL	**45**	03	**78**	0	**111**	0000.0	**144**	3000	**177**	ELU.N	**210**	NULL	**243**	NULL
13	00	**46**	14	**79**	0.01	**112**	0000.0	**145**	02.0	**178**	EOA.A	**211**	NULL	**244**	NULL
14	0005.0	**47**	22	**80**	0	**113**	0000.0	**146**	040	**179**	EOC.A	**212**	NULL	**245**	NULL
15	0003.0	**48**	24	**81**	0	**114**	0000.0	**147**	0000	**180**	EOA.A	**213**	NULL	**246**	NULL
16	0020.0	**49**	23	**82**	000	**115**	0000.0	**148**	NULL	**181**	UR1.00	**214**	NULL	**247**	NULL
17	0020.0	**50**	01	**83**	000	**116**	0000.0	**149**	NULL	**182**	21128	**215**	NULL	**248**	NULL
18	0040.0	**51**	05	**84**	00000	**117**	0	**150**	1	**183**	65535	**216**	NULL	**249**	NULL
19	0040.0	**52**	03	**85**	00000	**118**	1	**151**	00.0	**184**	20	**217**	NULL	**250**	NULL
20	0080.0	**53**	00	**86**	015.00	**119**	150	**152**	01.0	**185**	00	**218**	NULL		
21	0080.0	**54**	0	**87**	020.00	**120**	0000	**153**	0	**186**	0	**219**	NULL		
22	0	**55**	100	**88**	025.00	**121**	05.0	**154**	00.5	**187**	NULL	**220**	NULL		
23	1	**56**	000.00	**89**	030.00	**122**	NULL	**155**	00	**188**	NULL	**221**	NULL		
24	0	**57**	000.00	**90**	035.00	**123**	0	**156**	0100.0	**189**	NULL	**222**	NULL		
25	0	**58**	000.00	**91**	040.00	**124**	000	**157**	0005.0	**190**	NULL	**223**	NULL		
26	0	**59**	000.50	**92**	000.50	**125**	01.0	**158**	00.00	**191**	NULL	**224**	NULL		
27	000.50	**60**	000.0	**93**	010.00	**126**	0	**159**	000.0	**192**	NULL	**225**	NULL		
28	000.50	**61**	000.0	**94**	015.00	**127**	NULL	**160**	0	**193**	NULL	**226**	NULL		
29	00.0	**62**	000.50	**95**	020.00	**128**	NULL	**161**	100	**194**	NULL	**227**	NULL		
30	00.0	**63**	00.1	**96**	025.00	**129**	NULL	**162**	000	**195**	NULL	**228**	NULL		
31	02.0	**64**	001	**97**	030.00	**130**	0	**163**	000	**196**	NULL	**229**	NULL		
32	05.0	**65**	00000	**98**	035.00	**131**	0060	**164**	1	**197**	NULL	**230**	NULL		

HY 2.2kw VFD Known Issue

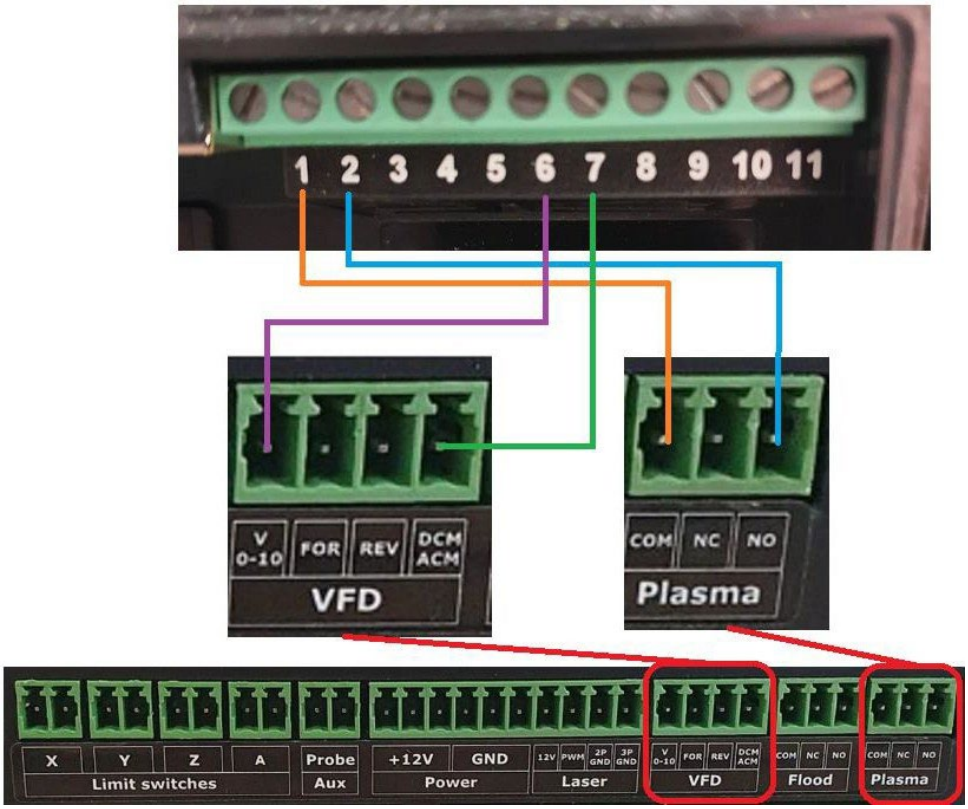
There is an issue we have seen with some users and their 2.2kw HY VFDs where the above wiring doesn't work. We have seen some success by wiring control from the Nighthawk using the Plasma relay, similar to how the Invertek drives are done.



Nighthawk	→	VFD
VFD 0-10v	→	VI
VFD DCM/ACM	→	ACM
Plasma COM	→	DCM
Plasma NO	→	FOR

Please Note: This will only allow your VFD to run in one direction, you will not have forward AND reverse spindle control. It's best to make sure when it runs, it's running in a clockwise direction.

Invertek VFDs (Most Models)



Invertek pins

Pin 1 = 24v Out
Pin 2 = Enable
Pin 7 = ACM
Pin 6 = 0-l0V

Nighthawk → VFD

Plasma COM → Pin 1
Plasma NO → Pin 2
0-10v → Pin 6
ACM/DCM → Pin 7

Invertek VFD Settings changes to allow control via the Nighthawk

Pro Tip: Record current settings before changing any values in case you wish to revert back to manual control of your VFD.

We have included the standard descriptions of each setting to change below. Please reference your manual provided with your VFD to ensure that the description of each respective setting closely matches the setting listed below to ensure the correct setting is changed. If you unsure then please discontinue following this procedure and seek advice from a licensed electrician or competent person.

These settings are only a guide. We cannot guarantee that changing to the provided values will work with very VFD in every scenario. These are tested and proven in our factory with an Invertek VFD.

Please Note: Only one direction can be used with a Nighthawk and Invertek VFD, typically FOR (Forward) is best to run the spindle clockwise.

Setting	Description	Value required	Value description
P12	Primary command source	0	Terminal control
P15	Digital input function select	0	-
P16	Analog input 1 signal format	0-10	Unidirectional 0-10V reference
P30	Start / Restart / Fire config	Edge-R NC	Following power on reset…
P39	Analogue input 1 offset	-4.0	-
P51	Motor control mode	1	V/F mode

Pro Tip: You will need to check P38 = 0 before attempting to change any other settings. This is a "Lock" function to prevent accidental changes to other settings.

P39 is the analogue input offset. You can use this value to tune the RPM to match what you're expecting. For example if you send an M3 s24000 from Commander but the VFD is showing 20000, you can use P39 to tune it.

Invertek have asked us to direct any technical support questions to their team. If you need help with programming or run into a problem, you can contact Invertek Australia on 1300 183 702

On the next page is a full list of settings from both a 1.5kw and a 2.2kw **INVERTEK** VFD. These settings were pulled from an Invertek VFD currently being controlled by a Nighthawk.

Parameters are the same for both 1.5kw and 2.2kw Invertek VFDs

These parameters are listed here as a reference only. Some of the settings will need to be set to the unique spindle that is attached, such as maximum RPM, Frequency, Voltage and impedance.

You will need to tune the spindle-specific settings to match your spindle.

Invertek 1.5kw AND 2.2kw Optidrive E3

PD		PD		PD	
01	**24000 rpm**	**25**	8: Motor Speed	**43**	0: Direct Operation (Wake up from 0%)
02	0 rpm	**26**	0 rpm	**44**	0: Digital
03	5.0 s	**27**	0 rpm	**45**	0.0 %
04	5.0 s	**28**	0 V	**46**	0: 2nd Analog Input (T4)
05	0: Ramp to Stop	**29**	0 rpm	**47**	0: 0-10V
06	0: Disable	**30**	0: EdgE-r	**48**	0.0 s
07	230 V	**30**	0: N.C. (Active on Open)	**49**	5.0 %
08	**SET TO SPINDLE CURRENT**	**30**	0: Input Not Latched	**50**	0.0 %
09	**SET TO SPINDLE FREQUENCY**	**31**	1: Previous Keypad Speed	**51**	**1: V/F Speed Control**
10	**SET TO SPINDLE RPM**	**32**	0.0 s	**52**	0: Disable
11	3.0 %	**32**	0: DC Injection on STOP	**53**	50.0 %
12	0: Terminal Mode	**33**	0: Disabled	**54**	150 %
13	0: Industrial Mode	**34**	0: Disabled	**55**	**SET TO SPINDLE IMPEDENCE**
14	**201**	**35**	100.0 %	**56**	120.0 mH
15	0	**36**	1	**57**	12.0 mH
16	0: 0-10V	**36**	6: 115.2kpbs	**58**	0 rpm
17	1: 8 kHz	**36**	4: t 3000ms	**59**	20.0 %
18	1: Drive Healthy	**37**	101	**60**	1: Enable
19	100.0 %	**38**	0: Unlocked	**60**	0: Disable
20	300 rpm	**39**	**-4.0 %**	**61**	0: Disabled
21	1500 rpm	**40**	0	**62**	0 Mins
22	2400 rpm	**40**	0: Motor Speed	**63**	0: Standard
23	**24000 rpm**	**41**	1	**64**	0
24	0.00 s	**42**	1.0 s	**65**	0

Parameters highlighted in blue are ones that have been changed from their defaults

Generic Chinese VFDs

Nighthawk	→	VFD
0-10v	→	10v IN
FOR	→	FWD
REV	→	REV
ACM/DCM	→	GND

Generic VFD Settings changes to allow control via the Nighthawk

Pro Tip: Record current settings before changing any values in case you wish to revert back to manual control of your VFD.

We have included the standard descriptions of each setting to change below. Please reference your manual provided with your VFD to ensure that the description of each respective setting closely matches the setting listed below to ensure the correct setting is changed. If you unsure then please discontinue following this procedure and seek advice from a licensed electrician or competent person.

These settings are only a guide. We cannot guarantee that changing to the provided values will work with very VFD in every scenario. These are tested and proven in our factory with a Generic VFD.

Please Note: The term "Generic" VFD is rather broad. As such, if your pins do not match explicitly the photo above and the settings below do not match your manual then do not proceed and refer to your VFD manufacturer if you are unsure.

Setting	Description	Value required	Value description
Pn03	Source of runtime frequency	4	External 0-10V signal
Pn04	Source of runtime command	2	External signal control
Pn07	Start again by external signal	2	Enable

On the next page is a full list of settings from both a 1.5kw and a 2.2kw VFD. These settings were pulled from an HY VFD currently being controlled by a Nighthawk.

They are listed here as a reference only. Some of the settings will be set to the unique spindle that is attached, such as maximum RPM, Frequency, Voltage and impedance.

You will need to tune these settings to match your spindle.

Generic Chinese VFD 2.2kw

PD		PD		PD		PD	
1	1	**11**	1.50	**21**	20.00	**31**	1.00
2	400.00	**12**	400.00	**22**	30.00	**32**	1
3	4	**13**	0.0	**23**	40.00	**33**	32U29
4	2	**14**	500.00	**24**	50.00	**34**	00
5	3	**15**	030	**25**	60.00	**35**	65535
6	2	**16**	000.00	**26**	70.00		
7	2	**17**	030	**27**	10.00		
8	6.00	**18**	000.00	**28**	3		
9	5.00	**19**	4	**29**	2.00		
10	400.00	**20**	10.00	**30**	2.00		