Fig. 1 — ACH550 Variable Frequency Drive (VFD)

Fig. 2 — ACS320 Variable Frequency Drive (VFD)

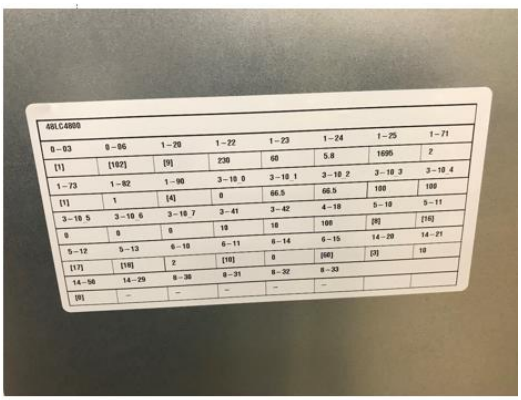
ABB Variable Frequency Drive

VFD 101

Variable Frequency Drives General Information

The VFD should never be used to balance air flow. A jumper is provided that allows the drive to operate at 60Hz. This Jumper should be used to place the drive at its maximum hertz and all other air flow adjustments should be done with the blower sheaves and pulleys. Failure to do so may cause erratic operation of the blower system.

The factory is currently rolling out a sticker that will be placed on the drive to provide the proper settings for the drive.



Until the factory fully implements this procedure it is recommended that anyone connecting a key pad to modify the settings please review one of the following manuals.

Cat. No. 04-53580014-01 Edition Date: 11/18 Form **No: IIVFD-07**

Catalog No. 04-53480228-01 Form **VFD-07SI** 11-18

513 06 2903 01 ICP VFD Manual

Wild Leg Power Supply

Check the power to the unit before startup. A better procedure would be to check power supply to the replacement unit before recommending a

VFD unit for replacement. Wild Leg Power Supply requires a field supplied Delta-WYE transformer

This is less common power supply today but does occur in older city areas. Voltage reading look like this.

L1 to ground 120 volts

L2 to ground 240 volts

L3 to ground 120 volts

Note: the higher voltage on one leg with normal voltages on the other 2 legs.

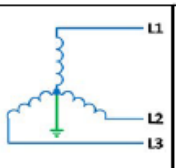
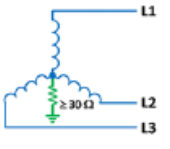
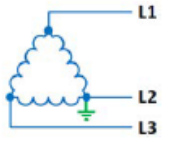
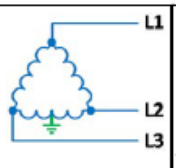
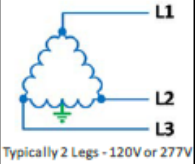
Wild Leg Power Supply

Requires the installation of a Delta-Wye transformer to operate the VFD.

VFD vs Power Supply

With new codes pushing the addition of VFDs to our light commercial rooftops, there is a stronger emphasis on determining the power supply of the system before installing the unit. Depending on the power supply, modifications may need to be made in the field to ensure proper operation of the VFD.

Please see the below information on types of power supplies and the changes made to the filter screws on the factory installed VFD or when an isolation transformer is required to be installed. Please also refer to TIC2018-0004 (found on HVACpartners) and to the VFD manufacturer's user manual for additional information.

Power Supply Image					
Power Supply Type	Wye Transformer, Symmetrically Grounded	Wye Transformer, High Resistance Ground	Delta Transformer, Corner Grounded (Unsymmetric)	Delta Transformer, Side Grounded (Unsymmetric)	High Leg Delta Transformer, Side Grounded (Unsymmetric)
ABB Drive Changes*	Optional, See Drive Chart	Yes, See Drive Chart	Yes, See Drive Chart[1]	Yes, See Drive Chart	Yes, See Highlight Below and Drive Chart
Danfoss Drive Changes*	No	Yes, See Drive Chart	Yes, See Drive Chart[1]	Yes, See Drive Chart	Yes, See Highlight Below and Drive Chart

*- When measuring voltage between phases of the power supply, the measurement must be within a 2% tolerance in order for the VFD to operate properly.

[1] - To help reduce noise an in-line reactor or isolation Delta-Wye transformer can be installed.

High Leg (Wild-Leg or Stinger-Leg) Power Supply - Installation of an isolation Delta-Wye transformer is required for proper operation of the VFD.

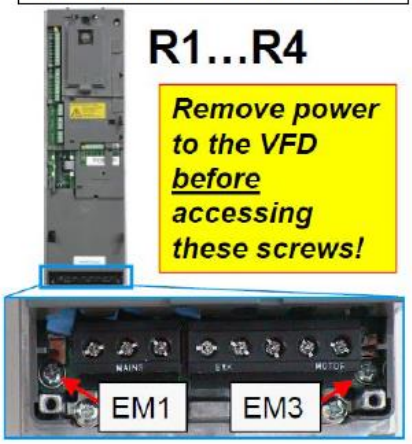
Drive Chart

VFD Drive and Frame Size	Filter Screw	Symmetrically Grounded	Unsymmetrically Grounded	High Resistance
ABB ACH550, Frames - R1 to R3	EM1	metal	metal*	install nylon
	EM3	install metal[1]	nylon*	nylon
ABB ACH550, Frame - R4	EM1	metal	metal*	remove
	EM3	install metal[1]	none*	none
ABB ACS320, Frames - R1 to R4	EMC	metal*	remove[2]	remove[2]
Danfoss VLT FC 101 Frames - H1 to H5	RFI	no change	remove	remove

* - Default configuration of the drive
[1] - optional, for greater noise filtering
[2] - When EMC filter is disconnected, the drive is not EMC compatible without an external filter (See ACS320 User Manual for more info.)

Below are the EMC/RFI filter screw locations for each drive provided on our light commercial rooftop units.

ABB ACH550 EM1/3 Screw Locations



Danfoss VLT RFI Screw Location

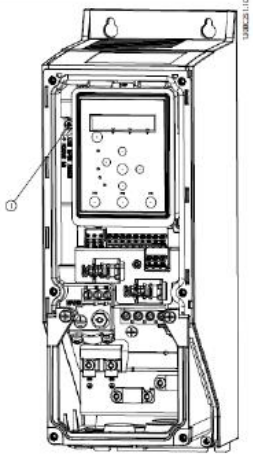
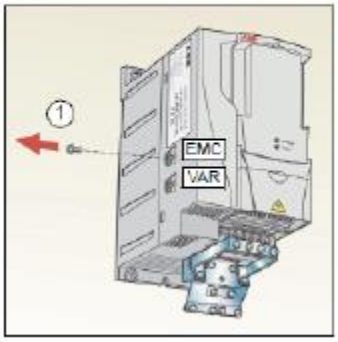
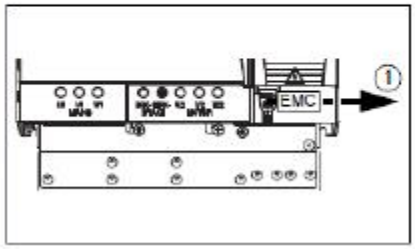


ABB ACS320 EMC Screw Location



Note: In frame size R4 the EMC screw is located to the right of terminal W2.



Parameters

Parameter	Description	Setting ACS320	Setting ACH550
9802	**COMM PROT Sel**	Not Selected	Not Selected
9902	**Application Macro**	(1) HVAC DEFAULT	(1) HVAC DEFAULT
9905	**Motor Nominal Voltage**	**See Motor Table**	**See Motor Table**
9906	**Motor Nominal Current**	**See Motor Table**	**See Motor Table**
9907	**Motor Nominal Frequency**	60 HZ	60 HZ
9908	**Motor Nominal Speed**	**See Motor Table**	**See Motor Table**
9909	**Motor Nominal Power**	**See Motor Table**	**See Motor Table**
1001	**EXT1 Commands**	(1) DI1	DI1
1003	**Direction**	(1) Forward	Forward
1102	**EXT1/EXT2 SEL**	(0) Not Sel	EXT1
1103	**REF 1 Select**	(1) AI1	AI1
1104	**REF 1 Minimum**	0 HZ	0.0 HZ 0 RPM
1105	**REF 1 Maximum**	60 HZ	60.0 HZ/1500 rpm
1201	**Constant Speed Select**	(8) DI2 and DI3 Make Sure this is NOT INV	(8) DI2 and DI3 Make Sure this is NOT INV
1202	**Constant Speed 1**	40HZ	40HZ
1203	**Constant Speed 2**	60HZ	60HZ
1204	**Constant Speed 3**	60HZ	60HZ
1205	**Constant Speed 4**	Not Selected	Not Selected
1301	**Minimum AI-1**	20.00%	20.00%
1302	**Maximum AI-1**	100.00%	100.00%
1401	**Relay Output 1**	(16) FLT/ALARM	Not Selected
1402	**Relay Output 2**	Not Selected	Not Selected
1403	**Relay Output 3**	Not Selected	(16) FLT/Alarm
1501	**AO1 Content**	Not Selected	Output Freq
1601	**RUN Enabled**	Not Selected	Not Selected
1604	**Fault Reset Sel**	(0) Keypad	Keypad
1608	**Start Enable 1**	(4) DI4	DI4

1611	**PARAMETER View**	(3) Long View	Default (0)
2003	**Maximum Current**	**See Motor Table**	**See Motor Table**
2007	**Minimum Frequency**	0.0 HZ	0.0 HZ
2008	**Maximum Frequency**	60HZ	60HZ
2101	**Start Function**	(1) Auto	(1) Auto
2102	**Stop Function**	(1) Coast	(0) Ramp
2109	**EM STOP Sel**	(0) Not Sel	Not Selected
2201	**ACCEL/DECEL**	(0) Not Sel	Not Selected
2202	**Accelerate Time**	30s	30s
2203	**Decelerate Time**	30s	30s
2603	**IR COMP Volt**	0 volts	0 Volts
2606	**Switching Freq**	4 HZ	4 kHz
2607	**Switching Freq Control**	(1) ON	On
3102	**Trial Time**	300.0s	30.0s
3103	**Delay Time**	6.0s	6.0s
3104	**AR Overcurrent**	(1) Enabled	(0) Disabled
3105	**AR Overvoltage**	(1) Enabled	(1) Enabled
3106	**AR Undervoltage**	(1) Enabled	(1) Enabled
5101	**FBA Type**	Not Selected	Not Selected
5201	**Station ID**	(1) Default	(1) Default
5202	**Baud Rate**	9.6 Kbits/s default	9.6 Kbits/s default
5203	**Parity**	(0) 8N1-8 default	(0) 8N1-8 default
5301	**EFB Protocol ID**	0000 hex default	0000 hex default
5302	**EFB Station ID**	1 Default	1 Default
5303	**EFB Baud Rate**	9.6 Kbits/s default	9.6 Kbits/s default
5304	**EFB Parity**	(0) 8 NONE 1	(0) 8 NONE 1
5305	**EFB CTRL Profile**	(0) Default	(0) Default

Please observe that under ACS320 there are only a few parameters that change those marked as **See Motor Table** all other parameters are the same for all Electro-Mechanical ACS320 drives. The same is true for the ACH550 Electro-Mechanical drives. These drives are also called Staged Air Volume (SAV). The RED parameters were updated by the factory and are now set in the production process.

Consult one of the Variable Frequency manual to get the SEE MOTOR TABLE Information.

Cat. No. 04-53580014-01 Edition Date: 11/18 Form **No: IIVFD-07**

Catalog No. 04-53480228-01 Form **VFD-07SI** 11-18

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See EXAMPLE Next Page.

Motor Part Number	VFD Carrier Part Number	Drive HP	Desc	Controls	VOLTAGE	N. AMPS	MOTOR NOM FREQ	N. RPM	N. HP
ABB ACS320 VFD Parameter ID :					**9905**	**9906**	**9907**	**9908**	**9909**
HD56FR233	HK30WA523	3	SRT 1.7 HP 230V	EM	230	5.6	60Hz	1725	1.7
HD56FR463	HK30WA530	3	SRT 1.7 HP 460V	EM	460	2.9	60Hz	1725	1.7
HD56FE653	HK30WA523	3	SRT 2.4 HP 230V	EM	230	6.8	60Hz	1725	2.4
HD56FE653	HK30WA530	3	SRT 2.4 HP 460V	EM	460	3.4	60Hz	1725	2.4
HD58FE654	HK30WA523	3	SRT 2.9 HP 230V	EM	230	7.8	60Hz	1725	2.9
HD58FE654	HK30WA530	3	SRT 2.9 HP 460V	EM	460	3.8	60Hz	1725	2.9
HD60FE656	HK30WA523	3	SRT 3.7 HP 230V	EM	230	9.8	60Hz	1725	3.7
HD60FE656	HK30WA534	5	SRT 3.7 HP 460V	EM	460	4.9	60Hz	1725	3.7
HD60FK658	HK30WA523	3	SRT 5.3 HP 230V	EM	230	12.7	60Hz	1740	5.3
HD60FK658	HK30WA532	7.5	SRT 5.3 HP 460V	EM	460	6.4	60Hz	1740	5.3
HD58FE654	HK30WA523	3	STR 2.9 HP 230V	EM	230	7.8	60Hz	1725	2.9
HD58FE654	HK30WA530	3	STR 2.9 HP 460V	EM	460	3.8	60Hz	1725	2.9
HD60FE656	HK30WA523	3	STR 3.7 HP 230V	EM	230	9.8	60Hz	1725	3.7
HD60FE656	HK30WA534	5	STR 3.7 HP 460V	EM	460	4.9	60Hz	1725	3.7
HD60FK657	HK30WA524	7.5	STR 5.0 HP 230V	EM	230	17.1	60Hz	1760	5
HD60FK657	HK30WA532	7.5	STR 5.0 HP 460V	EM	460	8.6	60Hz	1760	5
HD58FE654	HK30WA523	3	MRT 2.9 HP 230V	EM	230	7.8	60Hz	1725	2.9
HD58FE654	HK30WA530	3	MRT 2.9 HP 460V	EM	460	3.8	60Hz	1725	2.9
HD60FE656	HK30WA523	3	MRT 3.7 HP 230V	EM	230	9.8	60Hz	1725	3.7
HD60FE656	HK30WA534	5	MRT 3.7 HP 460V	EM	460	4.9	60Hz	1725	3.7
HD60FK657	HK30WA524	7.5	MRT 5.0 HP 230V	EM	230	20.4	60Hz	1760	5
HD60FK657	HK30WA532	7.5	MRT 5.0 HP 460V	EM	460	10.2	60Hz	1760	5
HD62FK654	HK30WA524	7.5	MRT 7.5 HP 230V	EM	230	28.5	60Hz	1760	7.5
HD62FK654	HK30WA532	7.5	MRT 7.5 HP 460V	EM	460	13.7	60Hz	1760	7.5
HD60FK658	HK30WA523	3	MRT 5.3 HP 230V	EM	230	12.7	60Hz	1740	5.3
HD60FK658	HK30WA532	7.5	MRT 5.3 HP 460V	EM	460	6.4	60Hz	1740	5.3
HD64FK654	HK30WA525	10	MRT 10.0 HP 230V	EM	230	30.4	60Hz	1755	10
HD64FK654	HK30WA533	10	MRT 10.0 HP 460V	EM	460	15.2	60Hz	1755	10

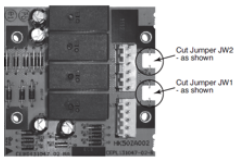
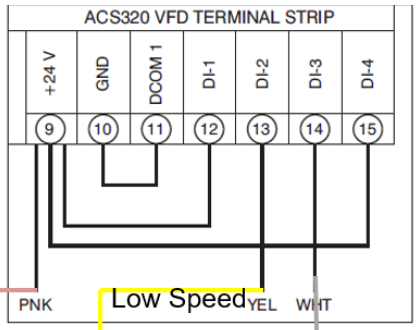


Fig. 23 — Jumpers JW1 and JW2 Cut for Two-Speed Fan Board Configuration

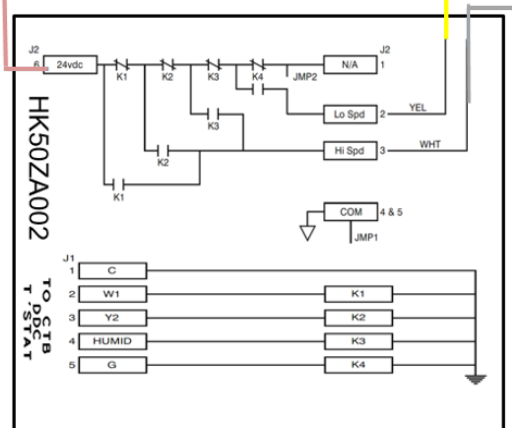


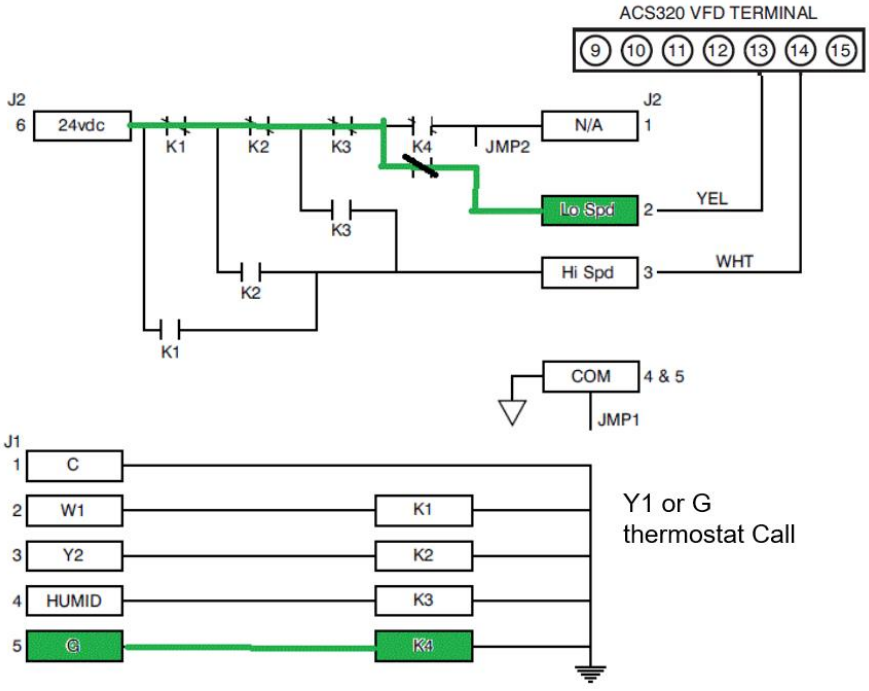
24 VDC

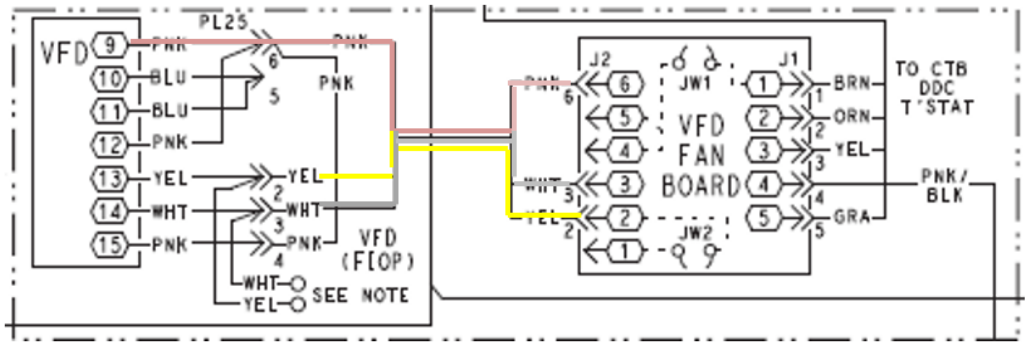
Low Speed

Fig. 25 — ACS320 VFD Wiring

High Speed

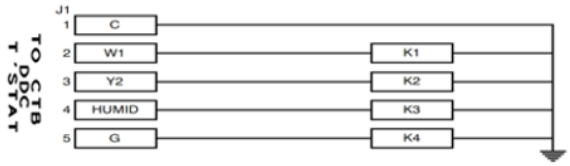






J2 Terminals From VFD Drive
J2-6 24VDC
J2-3 High Speed
J2-2 Low Speed

J1 Terminals From Input from Thermostat
J1-1 Common to Transformer
J1-2 W1 Makes K1
J1-3 Y2 Makes K2
J1-4 Humid Makes K3
J1-5 G/Y1 Makes K4



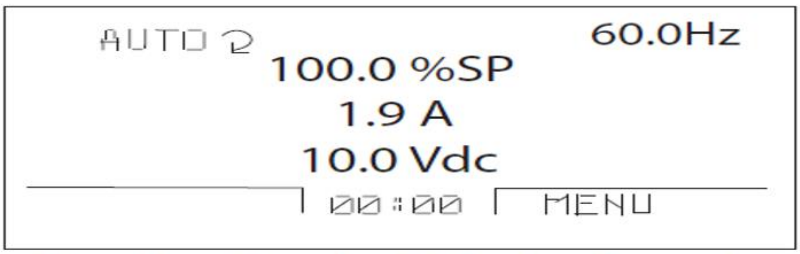


Fig. 40 — Standard Display Example

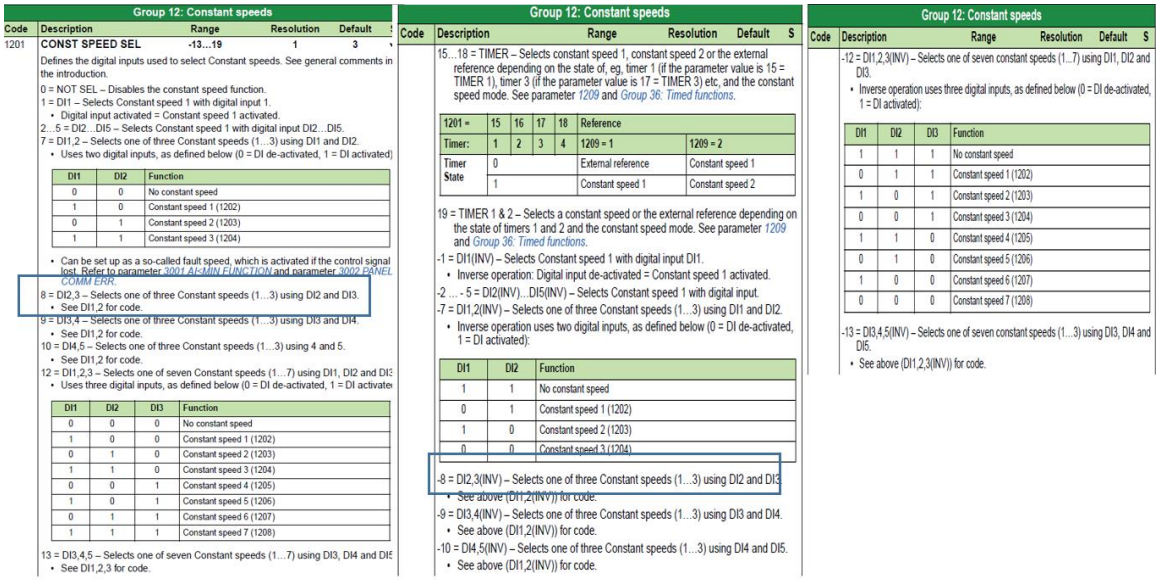
The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain.

Parameter 1201

Parameter 1201 seems to be a parameter that is often set incorrectly in the field when field programming the drive.



Group 12: Constant speeds

Code	Description	Range	Resolution	Default
1201	**CONST SPEED SEL**	-13…19	1	3

Defines the digital inputs used to select Constant speeds. See general comments in the introduction.

0 = NOT SEL – Disables the constant speed function.

1 = DI1 – Selects Constant speed 1 with digital input 1.
- Digital input activated = Constant speed 1 activated.

2…5 = DI2…DI5 – Selects Constant speed 1 with digital input DI2…DI5.

7 = DI1,2 – Selects one of three Constant speeds (1…3) using DI1 and DI2.
- Uses two digital inputs, as defined below (0 = DI de-activated, 1 = DI activated)

DI1	DI2	Function
0	0	No constant speed
1	0	Constant speed 1 (1202)
0	1	Constant speed 2 (1203)
1	1	Constant speed 3 (1204)

- Can be set up as a so-called fault speed, which is activated if the control signal lost. Refer to parameter *3001 AI<MIN FUNCTION* and parameter *3002 PANEL COMM ERR*.

8 = DI2,3 – Selects one of three Constant speeds (1…3) using DI2 and DI3.
- See DI1,2 for code.

9 = DI3,4 – Selects one of three Constant speeds (1…3) using DI3 and DI4.
- See DI1,2 for code.

10 = DI4,5 – Selects one of three Constant speeds (1…3) using 4 and 5.
- See DI1,2 for code.

12 = DI1,2,3 – Selects one of seven Constant speeds (1…7) using DI1, DI2 and DI3
- Uses three digital inputs, as defined below (0 = DI de-activated, 1 = DI activate

DI1	DI2	DI3	Function
0	0	0	No constant speed
1	0	0	Constant speed 1 (1202)
0	1	0	Constant speed 2 (1203)
1	1	0	Constant speed 3 (1204)
0	0	1	Constant speed 4 (1205)
1	0	1	Constant speed 5 (1206)
0	1	1	Constant speed 6 (1207)
1	1	1	Constant speed 7 (1208)

13 = DI3,4,5 – Selects one of seven Constant speeds (1…7) using DI3, DI4 and DI5
- See DI1,2,3 for code.

Group 12: Constant speeds

Code	Description	Range	Resolution	Default	S

15…18 = TIMER – Selects constant speed 1, constant speed 2 or the external reference depending on the state of, eg, timer 1 (if the parameter value is 15 = TIMER 1), timer 3 (if the parameter value is 17 = TIMER 3) etc, and the constant speed mode. See parameter *1209* and *Group 36: Timed functions*.

1201 =	15	16	17	18	Reference	
Timer:	1	2	3	4	1209 = 1	1209 = 2
Timer State	0				External reference	Constant speed 1
	1				Constant speed 1	Constant speed 2

19 = TIMER 1 & 2 – Selects a constant speed or the external reference depending on the state of timers 1 and 2 and the constant speed mode. See parameter *1209* and *Group 36: Timed functions*.

-1 = DI1(INV) – Selects Constant speed 1 with digital input DI1.
- Inverse operation: Digital input de-activated = Constant speed 1 activated.

-2 … - 5 = DI2(INV)…DI5(INV) – Selects Constant speed 1 with digital input.

-7 = DI1,2(INV) – Selects one of three Constant speeds (1…3) using DI1 and DI2.
- Inverse operation uses two digital inputs, as defined below (0 = DI de-activated, 1 = DI activated):

DI1	DI2	Function
1	1	No constant speed
0	1	Constant speed 1 (1202)
1	0	Constant speed 2 (1203)
0	0	Constant speed 3 (1204)

-8 = DI2,3(INV) – Selects one of three Constant speeds (1…3) using DI2 and DI3
- See above (DI1,2(INV)) for code.

-9 = DI3,4(INV) – Selects one of three Constant speeds (1…3) using DI3 and DI4.
- See above (DI1,2(INV)) for code.

-10 = DI4,5(INV) – Selects one of three Constant speeds (1…3) using DI4 and DI5.
- See above (DI1,2(INV)) for code.

Group 12: Constant speeds

Code	Description	Range	Resolution	Default	S

-12 = DI1,2,3(INV) – Selects one of seven constant speeds (1…7) using DI1, DI2 and DI3.
- Inverse operation uses three digital inputs, as defined below (0 = DI de-activated, 1 = DI activated):

DI1	DI2	DI3	Function
1	1	1	No constant speed
0	1	1	Constant speed 1 (1202)
1	0	1	Constant speed 2 (1203)
0	0	1	Constant speed 3 (1204)
1	1	0	Constant speed 4 (1205)
0	1	0	Constant speed 5 (1206)
1	0	0	Constant speed 6 (1207)
0	0	0	Constant speed 7 (1208)

-13 = DI3,4,5(INV) – Selects one of seven constant speeds (1…3) using DI3, DI4 and DI5.
- See above (DI1,2,3(INV)) for code.

As you can see there are a lot of different choices. The drive should be set for:

8 = DI2,3 – Selects one of three Constant speeds (1…3) using DI2 and DI3.
- See DI1,2 for code.

If the -8 is selected then the drive will run with not call from the thermostat when you turn on the power to the unit and the drive will shut down when it receives a call from the thermostat. INV=Inverse works just the opposite as expected.

-8 = DI2,3(INV) – Selects one of three Constant speeds (1…3) using DI2 and DI3.
- See above (DI1,2(INV)) for code.

Always check to ensure that INV has not been selected.

TECHNICAL INFORMATION COMMUNICATION

Quality and Continuous Improvement

Number: TIC2019-0016 **Date:** 8/7/2019

Title: ABB VFD Updates

Product Category: Light Commercial

Products Affected
All ABB ACS320 Drives

Technical Information
Parameters Updated to help prevent nuisance VFD shut down.
1611 set to (3)
2603 set to (0)
3102 set to (300.0s)
3103 set to (6)
3104 set to (1 Enable)
2102 set to (1 coast)

Fuses upgraded from the drive minimum current to a current representing the various field reported issues. The changes are reflected in the drive service manuals.

Catalog Number:
Carrier VFD-07SI
Bryant IIVFD-07

Note all of the above changes have been correct at the factory 5018

Useful ABB Drive information:

DO NOT USE THE ASSIST FUNCTION!

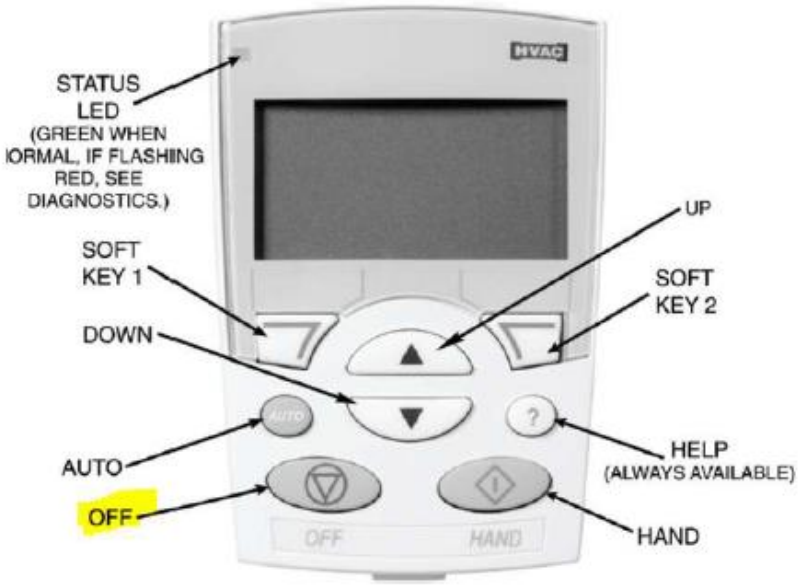
DO NOT USE THE DRIVE TO BALANCE THE AIR (CFM)!

Key pads do not come with the OEM drive
1. Before condemning the drive use a key pad to reprogram using factory supplied parameters.

Before programming with the key pad
1. Turn the key pad off to allow programming of the drive. Programming is not possible if left on.

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.

TECHNICAL INFORMATION COMMUNICATION



Wild Leg (Stinger Leg) power supply

1. Need to add a transformer to correct for leg to leg imbalance.

RC Replacement drives

1. Will only have a basic ABB program only, but parameters are not pre-programmed.
2. All parameters will need to be field programmed follow direction in one of the above manuals.

Reset after someone has used the assist function.

1. Parameter 9902 change from HVAC Default to any other Macro
2. Save the changes
3. Parameter 9902 change back to HVAC Default
4. Save the changes
5. Program the other parameters

Before condemning the drive do the above procedure and reprogram the drive.

When you bypass the drive to get temporary functionality this bypasses the fire shutdown and the drive should never be left in a bypassed condition permanently!!!

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