



Variable Frequency Drive For use with Block Machines

Columbia Machine, Inc.
Vancouver, Washington

This manual provides installation and operation information applicable to the Columbia Variable Frequency Drive.

TABLE OF CONTENTS

Control Pod	2
Display Mode	5
Edit Mode	6
Warning Mode	7
Warning Codes	7
Trip Mode	7
Compression Test	8
Fill Test	10
Trip Codes	12
Installation Tips	15
Maintenance Tips	16
Troubleshooting Tips	17



Columbia Concrete Products - Variable Frequency Drive



WARNING

Always warm-up vibrator shaft before start of shift. Warm-up vibrator shaft by running vibrator at fill speed for a couple of minutes or until the vibrator motor amp draw falls well below the motor rated Full Load Amps shown on the motor nameplate. To monitor vibrator motor amp draw go to parameter 4.01. If the VFD trips when first started due to over current condition (AI.AC) with an extremely cold vibrator shaft, slow down fill speed for vibrator warm-up.

Control Pod



The Control Pod is a device consisting of a display and keypad used for the following:

- Reading and changing the values of software parameters that are used to configure, control, and monitor the (VFD) Variable Frequency Drive
- Displaying the operating status of the VFD
- Displaying fault and trip codes

A VFD parameter is similar to a PLC address (N10;7 - "Feed Drawer Dwell Time", etc.). VFD parameters for block machines can be found in the block machine schematics.

The display has three display modes:






- Basic Mode - used to indicate the status of the VFD
- Display Mode - used for selecting a parameter to edit
- Edit Mode - used for editing the selected parameter

The programming keys are used for:




- Changing the mode of operation of the display
- Selecting a parameter to edit
- Editing the selected parameter
- Saving new values given to parameters

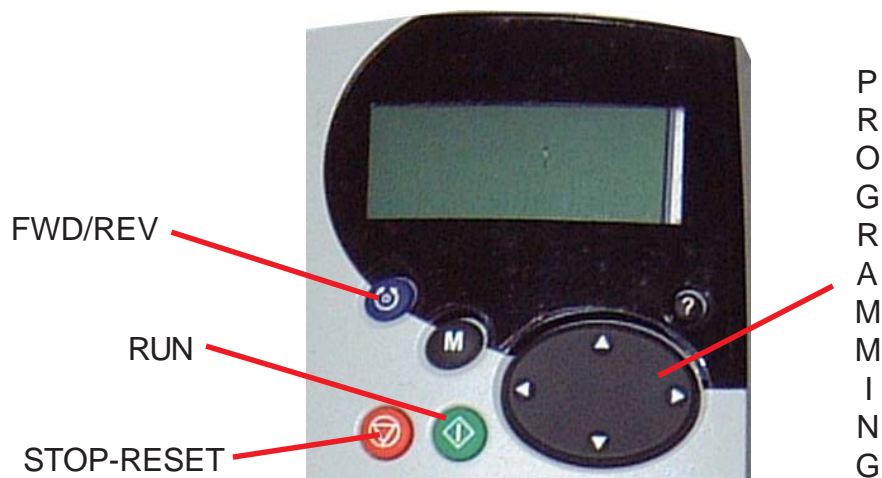
Columbia Concrete Products - Variable Frequency Drive

The five (5) programming keys perform the following functions:

-  • changes the VFD mode from display to Edit mode and also acts as a save key after edit has been made.
-  • selects a parameter
• increases the value of a digit
-  • selects a parameter
• decrease the value of a digit
-  • displays a parameter number
• selects the next left display digit
• selects another menu
-  • displays the parameter number
• selects the next right display digit
• selects another menu

The three (3) Control keys perform the following functions:

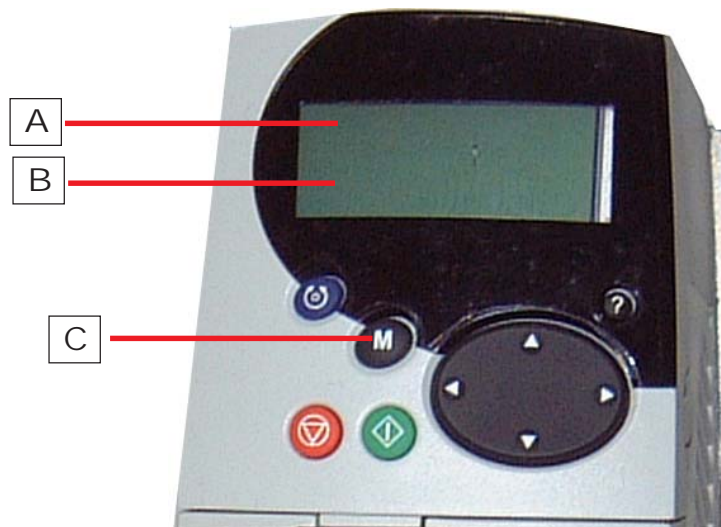
-  The RUN key activates the Drive. The RUN key is active only when the Drive is operating in the keypad mode.
-  The STOP-RESET button performs three functions:
 - stop the Drive
 - reset the Drive after it has tripped
 - saves new parameters after edits are made
-  The FWD/REV key changes the direction of the rotation of the motor. (This is not enabled by default)



Columbia Concrete Products - Variable Frequency Drive

In order to access various Control Pod modes, use the following steps:

- 1) Turn the unit on. The unit begins in the “Basic” mode. In the Basic mode, line 1 displays the parameter value (see “A” in the illustration below). Line 2 displays the status of the VFD (see “B” in the illustration below).
- 2) Press the **M** key (see “C” in the illustration) to change from the Basic mode to the Display mode.

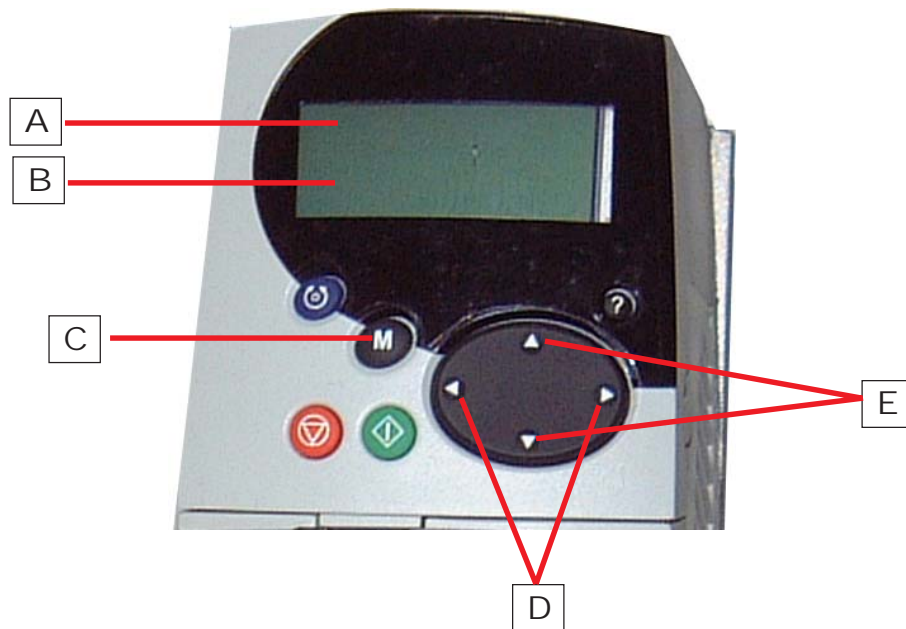


Columbia Concrete Products - Variable Frequency Drive

Display Mode

In the Display mode:





- 1) Line 1 (see "A" in the illustration below) displays the parameter value.
- 2) Line 2 (see "B" in the illustration below) displays the menu item number in the first two digits.
- 3) Line 2 (see "B" in the illustration below) displays the parameter number in the last two digits.
- 4) The **M** key (see "C" in the illustration below) allows the operator to change from the Display mode to the Edit mode. The Control Pod returns to the Basic Mode 8 seconds after the last keystroke.
- 5) The **◀ ▶** keys (see "D" in the illustration below) allows the operator to change to the desired menu, which appears in the first two digit places of line 2 of the digital display (see "B" in the illustration below).
- 6) The **▲ ▼** keys (see "E" in the illustration on the below) allows the operator to change to the desired parameter number in the last two digits of line 2 of the digital display (see "B" in the illustration below).

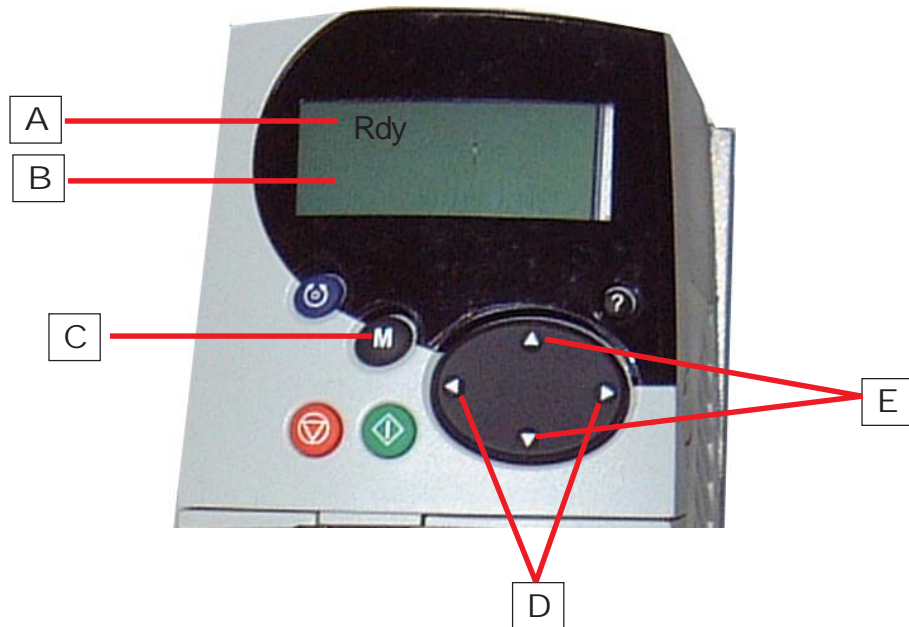


Columbia Concrete Products - Variable Frequency Drive

Edit Mode

In the Edit mode:

- 1) Line 1 (see "A" in the illustration below) displays the parameter value.
- 2) Line 2 (see "B" in the illustration below) displays the menu item number in the first two digits.
- 3) Line 2 (see "B" in the illustration below) displays the parameter number in the last two digits.
- 4) The **M** key (see "C" in the illustration below) allows the operator to change from the Edit mode back to the Display mode. The Control Pod returns to the Basic Mode 8 seconds after the last keystroke. To save edits:
 - 1) Enter 1000 in the 00.00 parameter
 - 2) Page to the Display mode
 - 3) Push the Stop-Reset button
- 5) The   keys (see "D" in the illustration below) allow the operator to select and edit the value of the digit on line 1. The selected digit will flash.
- 6) The   keys (see "E" in the illustration below) allow the operator to increase or decrease the value of the selected digit.



Columbia Concrete Products - Variable Frequency Drive

Warning Mode

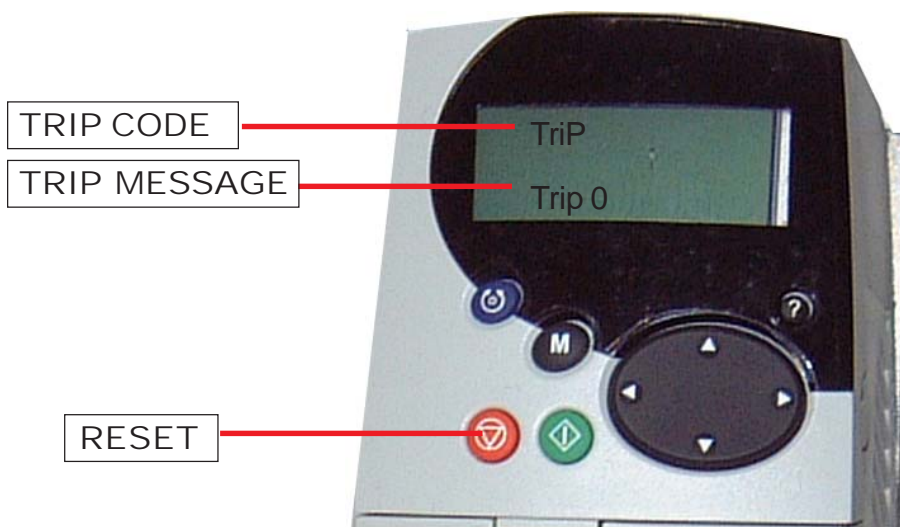
In the warning mode, the VFD flashes a warning code on line 2 of the LED display (see “B” in the illustration). The VFD remains enabled, but may trip if the fault indicated by the warning code is not corrected. The warning codes are as follows:

Warning Codes

DISPLAY	FAULT
br.rs	Braking resistor overload
Ovld	1 x t - motor overload The VFD generates this indication when the output current of the converter is higher than the rated motor current and the overload accumulator value has reached 75%. This indication is a warning that the motor will trip because of overload when there is no load reduction.
hot	Heatsink over-temperature This indicates that the heatsink has reached a temperature of 95°C and that the drive is still overloaded.
Air	Ambient over-temperature

Trip Mode

The VFD is disabled in the Trip Mode, resulting in the motor decelerating to a stop. The LED display shows trip code information (see the illustration below). Push the reset button to re-enable the VFD.



See the following page 12 for Trip Codes.

Columbia Concrete Products - Variable Frequency Drive

COMPRESSION TEST

- OBJECTIVE:** To determine the optimum vibrator compression speed for shortest compression time on a given product.
- THEORY:** The proper fill speed and feed drawer dwell time have, from previous tests, been determined. This will assure that, with these variables set as determined, the proper amount of material has been deposited into the mold. We must now vary the compression speed on the vibrator motor to determine which compression speed results in the shortest compression time.
- PROCEDURE:**
- 1) Record product description and date on compression test data sheet.
 - 2) Set fill speed and feed drawer dwell at optimum settings as determined in fill test. Retain these settings for the duration of this test.
 - 3) Set compression speed at 3000 RPM and record compression time.
 - 4) Repeat Step 3 for successively lower compression speeds (2800, 2600, etc.) as indicated on the data sheet.
 - 5) Plot results on the data sheet graph.
 - 6) Determine optimum compression speed. This speed will be at the lowest point on the graph. If this point is not obvious, run additional tests at compressing speeds between the lowest points on the graph (recording each compression speed and compressing time) until satisfied that the optimum compression speed has been determined. Record this speed on the data sheet.



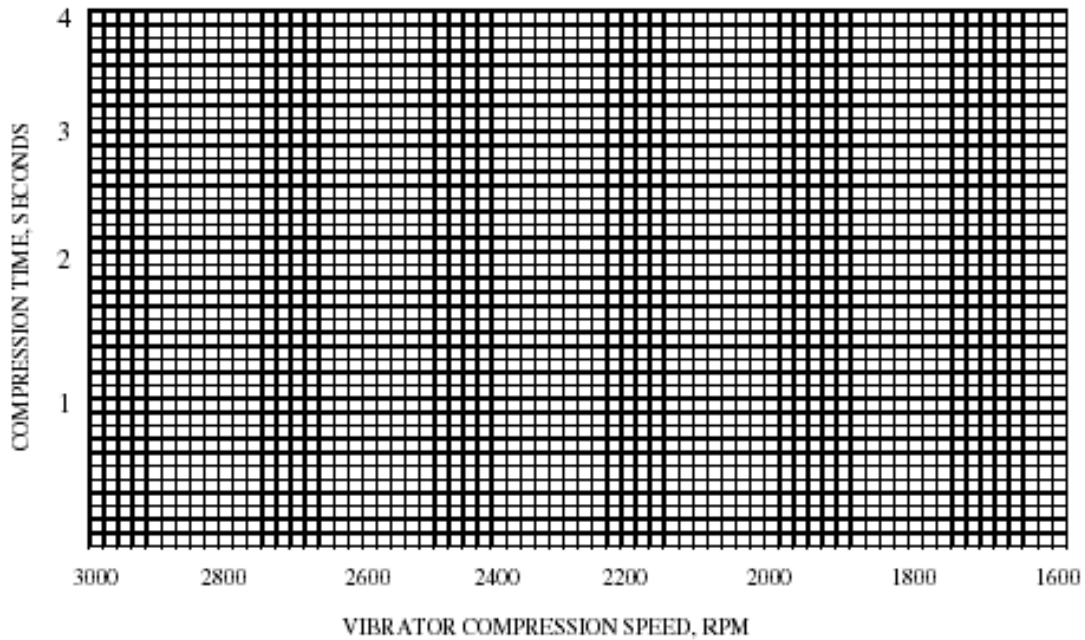
Optimum fill and compression speeds are likely to vary with product dimensions and between cored and solid products of the same dimensions. Therefore, these tests should be performed on each product category. This test procedure assumes that the vibrator continued to run when fill is complete, continuing right on into compression (no double start). In the event that double start is being used (for pavers for example), use the duration of the first vibrator instead of feed drawer dwell in the fill test.

Columbia Concrete Products - Variable Frequency Drive

COMPRESSION TEST

Variable Speed Drive Test

Date: _____



PRODUCT DESCRIPTION _____

<u>COMPRESSION SPEED</u>	<u>COMPRESSION TIME</u>	CONCLUDED OPTIMUM
3000	_____	COMPRESSION SPEED _____
2800	_____	COMMENTS: _____ _____ _____ _____ _____ _____ _____
2600	_____	
2400	_____	
2200	_____	
2000	_____	
1800	_____	
1600	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	

VARIABLE SPEED DRIVE TEST PROCEDURE

FILL TEST

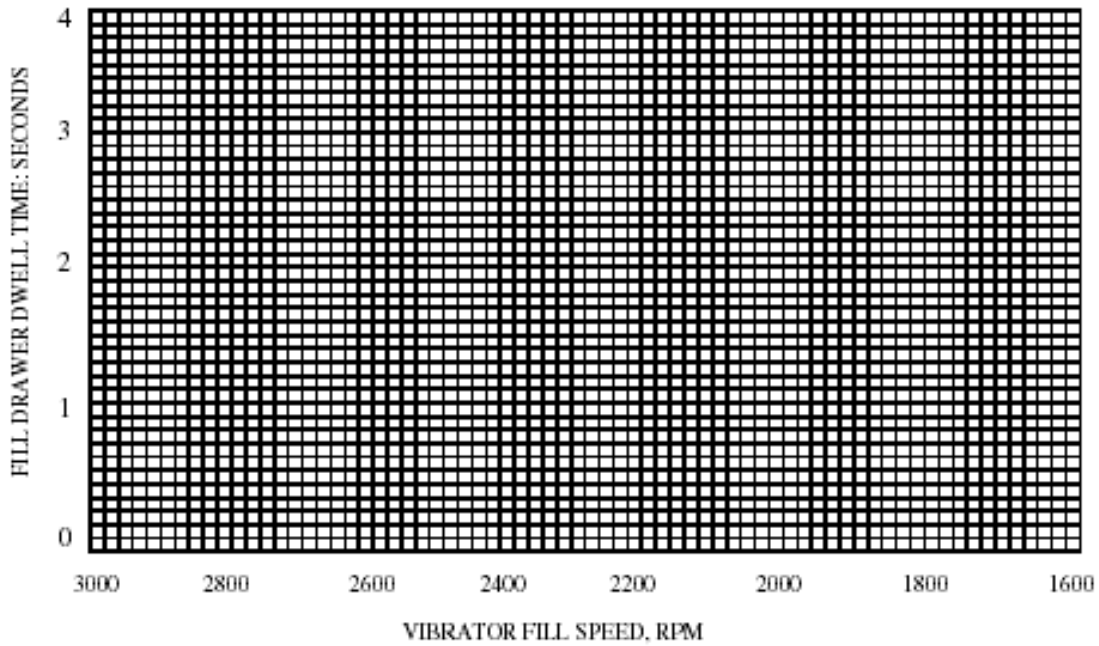
- OBJECTIVE:** To determine optimum vibrator motor speed for quickest mold fill on a given product.
- THEORY:** There are many combinations of vibrator fill speed and feed drawer dwell which will result in the proper amount of material being deposited into the mold. Proper mold fill is attained when the compression time matches the established standard for the particular product being produced. Since the established standard compression time is based on a variable speed of 3000 RPM, this fill test should be run at 3000 RPM compression speed.
- PROCEDURE:**
- 1) Record product description and date on fill test data sheet.
 - 2) Set compression speed at 3000 RPM for the duration of this test.
 - 3) Set fill speed at 3000 RPM and find feed drawer dwell time which results in desired compression time. Record this feed drawer dwell time on the data sheet.
 - 4) Repeat Step 3 for successily lower fill speeds (2800, 2600, etc.) as indicated on the data sheet.
 - 5) Plot results on the data sheet graph.
 - 6) Determine optimum fill speed. This speed will be at the lowest point on the graph. If this point is not obvious, run additional tests at fill speeds between the lowest points on the graph (recording each fill speed and feed drawer dwell) until satisfied that the optimum fill speed has been determined. Record this speed on the data sheet.

Columbia Concrete Products - Variable Frequency Drive

FILL TEST

Variable Speed Drive Test

Date: _____



PRODUCT DESCRIPTION _____

<u>FILL SPEED</u>	<u>F.D. DWELL</u>	
3000	_____	CONCLUDED
2800	_____	OPTIMUM FILL SPEED _____
2600	_____	COMMENTS: _____
2400	_____	_____
2200	_____	_____
2000	_____	_____
1800	_____	_____
1600	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Columbia Concrete Products - Variable Frequency Drive

Trip Codes

Display	Trip Code	Fault Description	Reason(s)	Help
UU	1	DC link undervoltage	Normal main switch off	
OU	2	DC link overload	Braking torque to high	Use braking resistor Extend braking ramp
OLAC	3	Over-current at converter output	Acceleration/Braking ramp too short P-term of the current controller (#4.13) too small Short circuit at the output (at the converter output or motor) Faulty motor cable Motor cable too long Resistor value too small	Extend ramps Optimize current control Check converter output Check motor cable Check motor terminal block
OLbr	4	Overcurrent in braking; Faulty braking resistor; Resistor (low resistance)	Resistor value too small	Check braking resistor
PS	5	Internal power supply fault		Switch main on and off If trip code persists, consult with supplier
OV.SPd	7	Overspeed	Speed overshoot Load Drop (sudden load removal at high torque)	Activate s-ramp Increase #3.08 Use braking resistor

Columbia Concrete Products - Variable Frequency Drive

Trip codes

In the event of a trip occurring, the drive will be immediately disabled and the motor will slowly come to a standstill. In addition the display will show a trip code, which will help to locate the cause of the trip. The trip code can be transmitted via a serial interface and the Large Applications module. The following trip codes are possible:

Display	Trip code	Fault description	Reason	Help
UU	1	DC link undervoltage	normal mains switch off	
OU	2	DC link overload	braking torque too high	use braking resistor, extend braking ramp
OLAC	3	Over-current at converter output Possible reasons:	Acceleration or braking ramp too short, P-term of the current controller (# 4.13) too small, short circuit at output (at the converter output or motor), faulty motor cable, motor cable too long	extend ramps, optimise current control, check converter output, motor cable, motor terminal block
Ol.br	4	Overcurrent in braking faulty braking resistor resistor (low resistance),	resistor value too small (see section 2.3.1.2).	check braking resistor
PS	5	Fault in internal power supply		Switch mains on and off. If trip code persists, consult supplier.
Et	6	Fault in external fault chain	Fault in ext. fault chain, terminal 30 open (in basic mode)	check ext. fault chain, check terminal 30
OV.SPd	7	Overspeed	Speed overshoot Load drop (Sudden load removal at high torque)	Activate s - ramp, increase # 3.08 Use braking resistor, increase # 3.08
Prc2	8	Fault in Application module		Remove large option module, if fault persists: converter is faulty; if no fault: module is faulty
SEP	9	Fault in Small Option Module		Remove small option module, if fault persists: converter is faulty; if no fault: module is faulty
ENC.OVL	10	Incremental encoder fault	Missing / faulty encoder faulty frequency or direction output	Check wiring and connections
ENC.PH1	11	Comm. signal U missing		Check wiring, connections & encoder
ENC.PH2	12	Comm. signal V missing		Check wiring, connections & encoder
ENC.PH3	13	Comm. signal W missing		Check wiring, connections & encoder
ENC.PH4	14	Incorrect connection of the incremental encoder signals U, V, W		Check wiring, connections & encoder
ENC.PH5	15	Incremental encoder signal A missing		Check wiring, connections & encoder
ENC.PH6	16	Incremental encoder signal B missing		Check wiring, connections & encoder
ENC.PH7	17	Incorrect connection of the encoder signals A, B		
ENC.PH8	18	Incremental encoder error detected after enable signal given.		Commutation offset not set Encoder cable fault

Columbia Concrete Products - Variable Frequency Drive

Display	Trip code	Fault description	Reason	Help
It.br	19	Braking resistor overload		Increase deceleration ramp
It.AC	20	Motor overload (I x t)		Reduce load or use larger drive (motor and converter)
Oh1	21	Heatsink over-temperature, Overloaded drive	calculated from I x t ambient temperature too high	Check ambient temperature use enclosure cooling if necessary reduce switching frequency (# 0.41) use larger converter
Oh2	22	Heatsink over-temperature, tripped by thermistor	Overloaded drive ambient temperature too high	Check ambient temperature use enclosure cooling if necessary reduce switching frequency (# 0.41) use larger converter
OA	23	Ambient temperature too high		Check ambient temperature use enclosure cooling if necessary
th	24	Motor over-temperature (triggered by NTC thermistor)	Overloaded motor faulty NTC thermistor or wire NTC thermistor open at converter	Check NTC thermistor input at converter electronic terminal check NTC thermistor and input wire for break, reduce load
thS	25	Short circuit at motor NTC surmistor		Check NTC surmistor and line
OP.OVLd	26	+24V-supply overload	+24V short circuit, connected to 0V or digital output, digital output connected to 0V, digital input and output incorrectly connected	Unclip electronic terminal rail and trace fault
cl1	27	Current loop loss analog input 1		Check parameter setting (# 7.06), check current loop
cL2	28	Current loop loss analog input 2		Check parameter setting (# 7.11), check current loop
cL3	29	Current loop loss analog input 3		Check parameter setting (# 7.15), check current loop
SCL	30	Serial communication time-out(only when interface in slave-mode)		Check hardware connections of serial interface, check software
EEF	31	EEPROM fault, parameter loss		Load default values (via zero parameter,see section) then enter application values
Ph	32	Mains voltage phase loss Check mains voltage, mains fuses (drive trips before trip code is displayed)		
rS	33	Faulty measurement of stator resistance in vector mode	interrupted motor line, motor performance too small in comparison to converter performance	Check motor line, manually enter values for stator resistance (values available from supplier) and set # 0.07 to 'Vr'
trXX	40 to 69	Trip codes which can be defined by the user. XX shows the trip code number		

Columbia Concrete Products - Variable Frequency Drive

Installation Tips

During installation make sure all VFD panel conduit entries are dust tight. Cement dust can travel long distances through the inside of conduit so after installation monitor the VFD panel to make sure cement dust is not entering the VFD panel through the various conduits. Cement dust damages a VFD in a couple ways:

1. The keys in the keypad become sticky
2. When enough cement dust accumulates on the electronic components overheating of the components occurs causing damage

THE VFD WARRANTY WILL NOT BE HONORED IF VFD FAILS DUE TO EXCESSIVE CEMENT DUST BUILD UP ON VFD COMPONENTS.

Columbia Concrete Products - Variable Frequency Drive

Maintenance Tips

If cement dust build up inside the VFD panel is observed take corrective action, (see installation tip above) then blow the cement dust out of the panel.

Always keep the VFD panel door shut with door clips tightened to keep out dust.

If cement dust accumulates on the VFD heat sinks on the back of the VFD panel blow off heat sinks. If cement dust build up occurs fairly quickly (within one month) take measures to reduce VFD panel exposure to cement dust if possible. Excessive cement dust exposure may cause the cooling fans in the heat sinks to fail prematurely.

Columbia Concrete Products - Variable Frequency Drive

Troubleshooting Tips (USED ON CPM & BLOCK MACHINES)

Most service calls on the VFD problems usually fall under the following categories, the first two being the most common:

1. **SLOW ACCELERATION AT BEGINNING OF SHIFT** - Typically this happens in cold weather. To solve the problem reduce vibrator speed to roughly 1,000 RPM and run for one to two minutes to warm up the vibrator shaft grease or oil.
2. **DECELERATION TIME TO SHORT** - Sometimes customer wants to extend deceleration time to help strip product. Add more time to parameter 0.04 as required. Also the strip delay time in the PLC can be increased to give the vibrator more time to come to a stop if necessary.
3. **SLOW ACCELERATION** - This happens when there is a drop in plant voltage.
4. **O1.AC FAULT CODE** - This an Over Current Fault. This is the VFD giving warning that an excessive amount of current is being required by the motor and motor damage may result. This is often caused by bad vibrator shaft bearings. The procedure to verify it's the vibrator bearings' causing the fault is to do the following:
 - A. Get the motor nameplate full load amps (FLA), then use an amp probe or go to parameter 0-12 to see what vibrator motor running amps are, then compare. If the running amps are more than nameplate FLA something is putting an excessive load on the VFD.
 - B. Disconnect the drive belt and check the vibrator motor running amps. Running amps should be about half of nameplate FLA with belt disconnected.

If the running amps are high with belt disconnected the fault is most likely caused by a vibrator motor problem (see step 8). If the running amps return to normal with the belt disconnected the fault is most likely caused be bad vibrator bearings. The problem may also be improper grease or excessive pallet table air pressure settings or a new vibrator shaft has been installed and need to be broke in.

5. **OU FAULT CODE** - This is a DC buss over voltage fault typically caused by an overheated braking resistor. This could be caused by the braking resistor having an accumulation of cement dust.
6. **AO2 FAULT CODE** - This is an heat sink over temperature fault typically caused by a build up of cement dust in the VFD heat sink or cooling fins.
7. **VIBRATOR COG BELT BREAKS** - Lengthen S ramp time (parameter 0.19) to .2 seconds, replace cog belt with Kraft belt.

Columbia Concrete Products - Variable Frequency Drive

8. **VFD GOES DEAD BUT COMES BACK TO LIFE IF YOU CYCLE POWER** - If you encounter this problem and you have verified it's not a problem with the 3 phase contactor supplying power to the VFD, order a new VFD because it is about to fail, be sure to include the serial # of the bad drive on the CSA and return to Columbia.
9. **ON A DUAL MOTOR, SINGLE VFD PANEL THE MANUAL MOTOR PROTECTOR FOR ONE OF THE MOTORS TRIPS** - A motor coupler has failed so the vibrator motor with the good coupling is doing all the work or one of the motors may be defective.
10. **VIBRATOR MOTOR RUNS AT A MUCH LOWER RPM THAN CALLED FOR, TWO OF THE MOTOR LEADS SHOW VERY HIGH AMP DRAW AND ONE LEAD SHOWS NO AMP DRAW** - Bad vibrator motor.
11. **VFD DISPLAYS THE "RUN" MESSAGE BUT NO OUTPUT TO MOTOR** is given (RPM display stays at 0) there may be a problem with the speed reference wiring which comes from either potentiometers on the VFD panel or a PLC analog signal. If the wiring appears to be OK and a bad VFD is suspected do the following: Change parameter 1.14 from 0 to 4 which put the VFD in keypad mode. Now use the keypad on the front of the VFD to operate the VFD. With the VFD in the "Rdy" mode push the green button then push the up arrow until the desired speed is reached. If the VFD operates correctly the problem is in the speed reference wiring. If the VFD fails to operate from the keypad the VFD may be defective.
12. **THE PLC GIVES THE COMMAND TO START THE VIBRATOR BUT THE VFD DOESN'T DISPLAY THE "RUN" MESSAGE.** Verify the PLC output is on for either Fill or Compression speed. If the output is on, check that the Fill or Compression relay is latching. If the relays are latching check wiring between relays and VFD terminals (push up on VFD signal wire terminals to make sure they are snapped in place).

If the above measures fail to isolate a vibration system problem a more extreme technique is to bypass the VFD and operate the vibrator motor with an appropriately sized across the line starter to determine if the fault lies with the VFD or vibrator bearings (or motor). An across the line starter can also be used to operate the block machine at a slower cycle rate if a VFD failure is encountered in a location where shipping a replacement VFD across a border causes delays.

Be sure and give the Columbia Service Department the serial # (found on top, right cover of the VFD) when requesting a replacement VFD under warranty.

VFD TROUBLE SHOOTING MANUAL:

INITIAL VFD DIAGNOSTICS

VFD Status	Page 2
VFD Trip Codes	Page 2
Common VFD Terminology	Page 2
Initial VFD Diagnostics	Pages 3
Process of elimination – VFD, Motor, vibrator shaft	Pages 3 & 4
VFD Trip Codes (Troubleshooting)	Pages 4 & 5
VFD Alarm Warning Codes (Troubleshooting)	Page 5 & 6
Common VFD Issues	Page 6 & 7
UN-Common VFD Conditions	Page 7
Returning a Drive	Page 8

VFD STATUS

Display	Description
inh	Inhibit Mode VFD waiting for "Drive Enable" signal (power flow at terminal B4)
rdy	Ready Mode VFD waiting for "Run Enable" signal (power flow terminals B3 & B5)
run	Run Mode VFD running if "Speed Reference" received (power flow at terminals B5)

VFD TRIP CODES

Display	Description	Possible Solutions
<u>O1.AC</u>	VFD Over Current	Extend Accel ramp or check for bad vibrator shaft bearings.
<u>OH2</u>	Heat Sink Over Temp	Clean Heat Sinks
<u>OA</u>	VFD Over Temp	Check enclosure temp
<u>r.S.</u>	Loose Wire	Check Wiring
<u>lt.AC</u>	Motor Overload	Extend Accel time (parameter 0.03)
<u>th</u>	Motor Over Temp	Check motor temp
<u>OU</u>	DC Buss Over Voltage	Extend decal ramp.

COMMON VFD TERMINOLOGY

Display	Description
---------	-------------

HOT BRAKING RESISTOR

Braking resistor should only get hot on deceleration of motor. Bleed off from motor decelerating is discharged thru the braking resistor .If Resistor is heating up but motor is not running – VFD has probably failed. If resistor is too hot resistor’s thermistor will trip and cut off power to VFD.

DARK DISPLAY - If display is dark – and motor is running, only the display has failed. If motor is not running, and has 480volts at input to drive, then VFD is probably dead. Check incoming voltage – if 480volts not present – determine why voltage is not 480. Tripped brake resistor??

SHELF LIFE: Capacitors run “dry” after a year. You need to hook your spare VFD to 3 phase (380-460) at least once a year. The dryer the capacitor, the greater the chance for the VFD to fail when power is applied.

VFD: Variable frequency drive.

INITIAL VFD DIAGNOSTICS

Try to determine if the problem is really with the VFD or is it the motor or vibrator shaft.

- 1_ Is the incoming voltage correct? (Check all three legs for equal voltage)
- 2_ What is the amp output to the vibrator motor under load (during compression)?

Process of elimination – VFD, Motor, vibrator shaft:

- A. If vibrator fails to achieve the desired RPM, and the Amp output is **above** motor nameplate Full Load Amps -
 - >> Then the VFD is OK and the problem is the motor or vibrator shaft.
 - If the vibrator belt is disconnected, and the amps remain high,
 - >> the motor is the problem. **Motor bearings??**
 - If the vibrator belt is disconnected, and the amps within motor name plate,
 - >> the motor is okay, so the vibrator shaft is the problem.
- B. If the vibrator fails to achieve the desired RPM, and the Amp output is **below** motor nameplate Full Load Amps –
 - >> The VFD is the problem.
 - At this point verify the VFD is getting the speed reference for compression speed.
 - This is done by observing the VFD display. It should display the compression speed called for. If not, check the potentiometer or analog signal. (CPM uses analog signal from the PLC, Block machine uses a set of Potentiometers)
 - If the correct speed is being displayed but not achieved, Reset the VFD parameters back to factory presets load (U.S.A into parameter 29) and reprogram the VFD as shown on parameter sheet of machine wiring schematics.

Listed below are the most common VFD problems encountered:

1_ Slow acceleration at beginning of shift –

- Typically this happens in cold weather. To solve the problem reduce vibrator speed to roughly 1,000 RPM and run for a minute or two to warm up the vibrator shaft grease or oil at the beginning of the shift.

2_ Deceleration time too short –

Sometimes customers want to extend Deceleration time to help strip product. Add more time to parameter 0.04 as required. Also the strip delay time in the PLC can be increased to give the vibrator more time to come to a stop if necessary.

3_ Slow acceleration at install –

- A. lower than expected plant voltage (if present check isolation transformers tap settings).
- B. less than ideal sheave ratio.

- Because the easiest change to make in the field is changing sheave ratio. This has been the solution at some plants. With a 1 to 1 sheave ratio Motor torque falls off above 1800 RPM making it difficult to achieve 3,000RPM if the plant voltage is lower than expected. The 1 to 1.6 ratio we used on older machines works better at high RPM than the 1 to 1 ratio but has reduced pull up torque. At present new equipment has been designed to 1 to 1.36 sheave ratio. The 1 to 1.36 sheave ratio has been found to be the ideal ratio for this application. Columbia Machine Typically oversize's our VFD's enough so any ratio will work.
- Another possible solution is to provide an isolation transformer to boost voltage to 460V. A higher voltage into the VFD gives a higher VFD voltage output to the motor increasing the vibrator motors ability to develop the power needed at RPM's above 1,800RPM.

VFD TRIP CODES

O1.AC fault code – **over current fault.**

POSSIBLE CAUSES

1. Bad vibrator shaft bearings.
2. Vibrator motor has bad bearings.
3. Improper or excessively thick shaft grease.
4. Excessive pallet table air pressure.
5. Short circuit in motor winding's.

TROUBLESHOOTING

Step 1: Compare nameplate & actual running amps.

Get the motor nameplate FLA from motor nameplate or refer to schematic.

Then use an amp probe to see what the vibrator motor running amps are.

This can also be done by holding the 'M' key for two seconds on the Drive's display.

Drive will then display amps in place of RPM's.

Step 2: If the running amps are more than nameplate FLA something is putting an excessive load on the motor, in most cases it is bad bearings either in the motor or vibrator shaft (GO TO STEP 3). If fault code occurs while powering up VFD panel. (GO TO STEP 6).

Step 3: Remove belt from vibrator shaft and run vibrator motor on compression speed simulating an automatic function for several cycles. If amps continue to be higher than motor FLA the motor has probably failed. (GO TO STEP 5) if amps are lower than motor name plate (GO TO STEP 4)

Step 4: After completing step 3 and the motor amps are not above the motor nameplate you probably have bad vibrator shaft bearings. This can be confirmed by using a temperature gun to measure the temperature of the Vibrator shaft bearing housing. Temperature should not exceed 155 degrees Fahrenheit or 68 degrees Celsius on a forced lube shaft. On a greased shaft the bearing temperatures should not exceed 200 degrees Fahrenheit or 94 degrees Celsius. In either case if the bearing temperatures exceed the listed limits the bearings need replacement.

Step 5: Power down the VFD panel **lock out and tag out** the VFD disconnect. Wait for VFD Capacitors to bleed down (approximately 20 minutes). Disconnect wires leading to VFD motor/motors and safely secure them in such a way that the leads cannot touch output of VFD drive in any way.

(step 5 continued) Power the VFD panel up and once again jog the Compression speed simulating the automatic function of the machine. If the Drive fault has stopped then the Motor has failed and needs replacement. If drive fault persists the Drive has failed and needs replacement.

Step 6: If the O1.AC fault code is displayed at power up the VFD has detected a direct short, most likely in the motor windings (GO TO STEP 5).

OV fault code – (may appear as OU) **dc buss over over voltage fault.**

POSSIBLE CAUSES

1. Accumulation of cement dust on braking resistor
2. Open circuit in braking resistor wiring

TROUBLESHOOTING

Step 1: Power down VFD **lock out and tag out** the VFD disconnect. Blow Cement dust off of braking resistor. If problem persists (GO TO STEP 2).

Step 2: Power down VFD **lock out and tag out** the VFD disconnect. Check for open circuit in braking resistor. If problem persists (GO TO STEP 3).

Step 3: Extend time in VFD parameter 04 to continue operating.

OH2 or OHT2 fault code – **heat sink over temperature fault**

The heat sink over temperature fault is caused by typically caused by a build up of cement dust in the VFD heat sink or cooling fins.

Note: See OV fault code – (may appear as OU) step 1 thru 3.

VFD ALARM WARNING CODES

OVL.D warning code – (may appear as OUL.D) **motor overload warning.**

POSSIBLE CAUSES

1. Motor is at 105 percent of rated current.
2. Worn vibrator shaft bearings.
3. Vibrator motor has worn bearings.

TROUBLESHOOTING

Step 1: See trouble shooting O1.AC steps 1 thru 6.

Step 2: Extend time in parameter 03 or 62 to continue operation.

HOT warning code – ***Heat sink over temp***

POSSIBLE CAUSES

1. Accumulation of cement dust on VFD heat sinks.

TROUBLESHOOTING

Step 1: Blow dust off of heat sinks.

Step 2: Remove from direct sunlight.

BR.RS warning code – ***Braking resistor overload***

POSSIBLE CAUSES

1. Accumulation of cement dust on braking resistor.

TROUBLESHOOTING

Step 1: Blow dust off of resistor.

Ac.It warning code – ***Drive is in current limit***

POSSIBLE CAUSES

1. Worn vibrator shaft bearings.
2. Vibrator motor has worn bearings.
3. Ratios are less than ideal.

TROUBLESHOOTING

Step 1: Extend time in parameter 03 or 62 to continue operation.

Step 2: See trouble shooting O1.AC steps 1 thru 6.

COMMON VFD ISSUES

The VFD goes dead but comes back to life if you cycle power –

If you encounter this problem and you have verified it's not a problem with the 3 phase contactor supplying power to the VFD, get a new VFD in the mail. The one you have isn't healthy. Contact Columbia Machine. Be sure and include the serial # of the bad drive.

On a CPM VFD panel the Manual Motor Protector for one of the motors trips, or the vibrator runs at a much lower RPM than is called for

POSSIBLE CAUSES

1. A motor coupler has failed so the vibrator motor with the good coupling is doing all the work.

TROUBLESHOOTING

Step 1: Power down VFD and lock out any CPM controls. **lock out and tag out** the VFD disconnect. Raise stripper beam and begin inspecting the couplings in the Vibrator assembly. Replace bad coupler or (GO TO STEP 2).

Step 2: An Amp probe can be placed on all three legs of suspected motor (one leg at a time). One leg will typically indicate no current on one leg. No current on any leg indicates a failed vibrator motor. Replace Motor.

VFD supply fuses blow or trips Drive Motor Starter Protector with no load on VFD –

Defective VFD, Contact Columbia Machine. Be sure and include the serial # of the bad drive.

VFD suddenly operates differently.

POSSIBLE CAUSES

1. Someone has altered the drive parameters in advertently.
2. Drive parameter has been change but not recorded since last power cycle.

TROUBLESHOOTING

Step 1: Reenter drive parameters from Schematic.
(GO TO STEP 2).

Step 2: Default drive at parameter 29 and reenter parameters.

VFD fails to operate and displays “inh”

This indicates a problem with the wiring to the VFD enable input (B3) (B5).

This circuit typically contains motor starter overload and auxiliary contacts and may also include a lube pump interlock. These items may be bypassed temporarily in order to isolate a field wiring problem. Also sometimes that VFD control wire terminal strip comes loose and needs to be reseated

UNCOMMON VFD CONDITIONS

With VFD problems that don't fit the above examples, often times the problem is either cement dust builds up in the VFD or someone has accidentally made an unwanted parameter change.

If cement dust build up is noted blow off the VFD inside and out.

Typically the cement enters the panel through conduit entries in the top of the panel.

If a parameter error is suspected, clear the VFD parameters and reprogram as shown on the parameter sheet provided with the block equipment.

RETURNING A DRIVE

Get PO Number. _____

Get Serial Number or old drive _____

Get Model Type _____

Contact names _____

Swap for new drive model –

_ need adaptor plate?? _____

_ Drawings ?

part numbers ----

NOTES: