

YASKAWA

Training VFD Trouble Shooting at Reva Industries Limited.



Service Department.

YASKAWA India Private Limited.,

Nov. 2019

Course content

Topics covered in this section –

- Parameterisation
- Trouble Shooting



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Parameterisation.



YASKAWA India Private Limited.,

Parameterisation.

With the Advent of Digital drives, Programming or Parameterisation plays an important role in tuning the drive for an specific application.

Unlike in earlier Analog Drives wherein the tuning was made by adjusting POTS to tune the drive, for example the current regulator tuning, But this had its own drawbacks and required tuning more often due to drift in the characteristics of the components because of Aging, Environmental conditions.

Where as while during the Digital drives all the electrical parameters are tuned by adjusting the parameters. Once these parameters are set this can be locked and even stored externally for future use, if in case there is a failure of VFD Hardware.



Parameterisation.

MH Parameter

Parameter	Description	Value	Remarks
A1-03	Initialization	2220	Resets the parameter to default settings
A1-02	Control Mode	2	'3' if close loop system is used
Give power recycle after this. Set H1-08 to "0F" if drive			
T1-01	Auto tuning Mode Selection	0	Rotational Auto tune
T1-02	Motor Rated Power	KW	
T1-03	Motor Rater Voltage	Voltage	
T1-04	Motor Rated Current	Amps	
T1-05	Motor Base Frequency	Hz	
T1-06	Number of Poles		
T1-07	Motor Base Speed	RPM	
Press up arrow key drive shows "RUN". Then press "RUN" key & wait until drive display shows "END"			
B1-01	Frequency Reference	0	From Display/Terminal
B1-02	Run Command Selection	1	From Terminal
C1-01	Acceleration Time-1	1.5	Sec.
C1-02	Deceleration Time-1	1.5	Sec.
D2-01	Lower Limit	10	%
E1-01	Input Voltage Setting	415	Generally 415
E1-04	Maximum Output Frequency	50	Hz
E1-05	Maximum Voltage	415	Motor Voltage
E1-06	Base Frequency	50	Hz (From Motor Name Plate)

Parameterisation.

MH Parameter

Parameter	Description	Value	Remarks
H1-05	Terminal S5 Function Selection	0	Break Release Check
H106	Terminal S6 Function Selection	10	Speed Increase
H1-07	Terminal S6 Function Selection	11	Speed Decrease
H2-01	M1-M2 Terminal Selection	21	Break Logic
L3-04	Stall Prevention During Deceleration	03	Stall Prevention Using DBR
L8-05	Input Phase Loss Protection	1	Enable
L8-07	Output Phase Loss Protection	1	Enable
Take test runs after this. If slip is observed during the operation, change the following Parameters			
Parameter	Default Value	Set Value	Remarks
S1-05	50	50	Increase Slowly if required
S1-06	30	30	Increase Slowly if required
S1-07	100	70	Increase Slowly if required
Parameter Backup In Operator Keypad			
O3-02	0	1	Read Function Allowed
O3-01	0	1	Save Parameter in Keypad
Upload the Parameter in Drive From Operator Keypad			
O3-02	0	1	Read Function Allowed
O3-01	0	2	Save Parameter from Keypad to drive.

Parameterisation.

CT & LT Parameter

Parameter	Description	Value	Remarks
A1-03	Initialization	2220	Resets the parameter to default settings
A1-02	Control Mode	2	'3' if close loop system is used
Give power recycle after this. Set H1-08 to "0F" if drive			
T1-01	Auto tuning Mode Selection	0	Rotational Auto tune
T1-02	Motor Rated Power	KW	
T1-03	Motor Rater Voltage	Voltage	
T1-04	Motor Rated Current	Amps	
T1-05	Motor Base Frequency	Hz	
T1-06	Number of Poles		
T1-07	Motor Base Speed	RPM	
Press up arrow key drive shows "RUN". Then press "RUN" key & wait until drive display shows "END"			
B1-01	Frequency Reference	0	From Display/Terminal
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E1-01	Input Voltage Setting	415	Generally 415
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Parameterisation.

CT & LT Parameters

Parameter	Description	Value	Remarks
H106	Terminal S6 Function Selection	10	Speed Increase
H1-07	Terminal S6 Function Selection	11	Speed Decrease
H2-01	M1-M2 Terminal Selection	0	Break Logic
L3-04	Stall Prevention During Deceleration	03	Stall Prevention Using DBR
L8-05	Input Phase Loss Protection	1	Enable
L8-07	Output Phase Loss Protection	1	Enable
Parameter Backup In Operator Keypad			
O3-02	0	1	Read Function Allowed
O3-01	0	1	Save Parameter in Keypad
Upload the Parameter in Drive From Operator Keypad			
O3-02	0	1	Read Function Allowed
O3-01	0	2	Save Parameter from Keypad to drive.

Preventive Maintenance of VFDs.

Preventive Maintenance plays a very important role in Extending the Life of VFD's. With Regular PM Practices which generally involves the effect of Temperature on the Power Equipment. With Modern Power Conductor Design and Compactness of Components and Equipment. Maintaining the Temperature with the Limits will help to extend the life of the VFD.

One of the Main Item which will help to remove the heat developed is,

1. Cooling Fans: Since these fans have limited Life generally 6 years or 50000 Hours of Operation. These Fans needs to be replaced as per intervals. Mentioned in the O&M manual.
2. Heat Sink: This is a place where exchange of heat takes Place. Any Clogged Heat since will reduce the heat exchange and in turn will reduce the life of the Power Semiconductors.
3. Providing Cool air at the Input. Pl avoid re circulation of Hot air, especially when Cabinet is used. Use ventilating system to prevent recirculation.

Another most important point is Capacitors. Most of the VFDs uses Electrolytic Capacitors and these Electrolytic Capacitors have limited Shelf and usage Life. In general as per Capacitor manufacturers specification 9 years or even the operating temperature and cycle plays an important role in the total life of any capacitor. Pl change the capacitors as per O&M Manual Schedule.

Pl Note: Serious Damages can happen due to Fault in the capacitors.

Preventive Maintenance of VFDs.

Apart From having a regular Preventive Maintenance Schedule, it is recommended to Store Hazardous substance like Acids, Alkalis, away from the VFD's, The Fumes from these Substances caused Oxidation of Electronic Components and will lead to Premature failure. Also Prevent condensation of Liquids.

Please Record the Vital Electrical Parameters regularly which in General Gives a very good health of the VFD

1. DC Voltage.
2. Output Current and Speed.
3. Input Voltage.
4. Temperature.
5. If Possible also measure the Torque.



Fault Codes

Yaskawa E7, F7, G7 and A1000 Drives can store up to ten (10) faults.

All Drives feature a fault trace that saves the drive status at the time of the last fault, and a fault history indicating elapsed time of the stored faults.

The fault codes can be grouped into three categories:



- **Major Fault** - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.
- **Minor Fault** - Operation continues and the fault flashes on the digital operator. The fault relay does not activate.
- **Parameter Setting Error** - Inverter can't run. The fault is displayed on the digital operator, and the fault relay is not activated.

FAULT CODES

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

UV2

CTL PS Undervolt

Under voltage of the control circuit when running.



Possible Cause(s): External load connected pulling down the inverter power supplies.

Corrective Action: Repair or replace the power/gate drive board.

Most likely if something is pulling down the internal power supply, the keypad will be blank and therefore will not show a UV2 fault code.

If the keypad is blank but the Drive's charge LED is lit, power down and try to remove all control wiring to see if the keypad comes back when power is returned. Another possibility is to disconnect the terminal board.

FAULT CODES

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

UV3

MC Answerback

The pre-charge contactor opened while the inverter is running.

Voltage drop on the pre-charge resistor while the unit is in ready condition.

Possible Cause(s): Contacts on contactor are dirty, contactor does not function mechanically.

Corrective Action: Check the contactor, check the ribbon cable from the control board to the gate drive board.

Remember: These Drives don't have answerback contacts

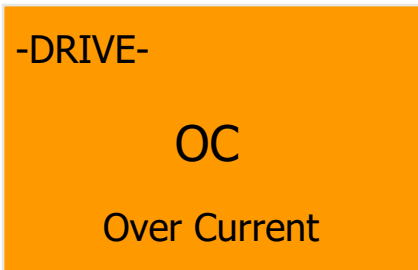
<i>E7 and F7</i>	<i>200 Vac</i>	<i>0.4kW through 30kW models</i>
	<i>400 Vac</i>	<i>0.4kW through 55kW models</i>

<i>G7</i>	<i>200 Vac</i>	<i>0.4kW through 22kW models</i>
	<i>400 Vac</i>	<i>0.4kW through 45kW models</i>

1000 Series have a voltage detection at the pre-charge resistor except the A 4A0930 and 4A41200

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Designed to protect the Drive.

Instantaneous output current has exceeded approximately 200% of (HD) Drive rated current.



Possible Cause(s): Shorted inverter output phase to phase, shorted motor, locked rotor.

Corrective Action: Remove the motor and run the inverter without the motor. Check the motor for a phase to phase short. Check the inverter for a phase to phase short at the output.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

GF

Ground Fault

Designed to protect the Drive.

Drive output grounding current has exceeded 50% of the inverter rated current.



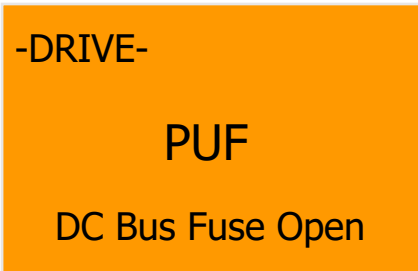
Possible Cause(s): Shorted inverter output phase to phase, shorted motor, locked rotor.

Corrective Action: Remove the motor and run the inverter without the motor. Check the motor for a phase to phase short. Check the inverter for a phase to phase short at the output.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

Units - E7, F7, G7



Detects if the DC bus fuse has opened.



Possible Cause(s): Shorted output transistor, shorted main circuit component.

Corrective Action: Remove power from the inverter and disconnect the motor. Perform the checks without power discussed earlier. Replace the shorted component(s), then replace the defective fuse.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

OL1

Motor Overloaded

Motor overload, designed to protect the motor.

Fully adjustable from parameter setting (E2-01, L1-01, and L1-02)

A pre-alarm can be selected as a minor fault by using the multi-function outputs.



Possible Cause(s): Motor is overloaded.

Corrective Action: Verify the program settings, reduce the load on the motor. Check if the correct motor rated current is selected. Adjust the U/F pattern to the motor data. Perform an auto tuning if possible.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Inverter overload, designed to protect the inverter.

E7 ~ 110% for 1 minute

F7 – 150% for 1 minute (HD), ~ 110% for 1 minute (ND)

G7 – 150% for 1 minute

A1000 – 150% for 1 minute (HD), ~ 110% for 1 minute (ND)

Possible Cause(s): Motor is overloaded.

Corrective Action: Verify the program settings, reduce the load on the motor.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

PF

Input Pha Loss

Inverter input power supply has an open phase.
Large imbalance of input voltage.
Can be disabled in F7, G7 and A1000 (L8-05).

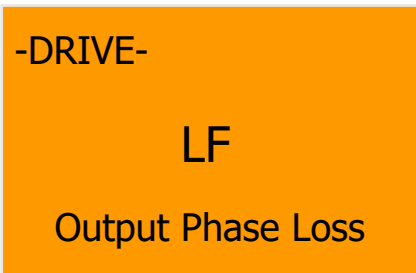


Possible Cause(s): Open phase on the input of the inverter. Loose terminal screws at terminals L1, L2, or L3. Sensitivity is adjustable in E7 (L8-06).

Corrective Action: Tighten the terminal screws, check the input voltage, verify the program settings.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Inverter output has an open phase.

Can be disabled in F7, G7 and A1000 (L8-07)



Possible Cause(s): Open phase on the output of the inverter. Loose terminal screws at terminals T1, T2, or T3.

Corrective Action: Tighten the terminal screws, check the output voltage, verify the program settings.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Feedback pulses are not received by the PG option board.



Possible Cause(s): The Pulse Generator feedback wires may be broken or not properly connected to the PG feedback option board.

Corrective Action: Check for a broken wire or a loose connection from the Pulse Generator, verify the program settings.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

OH1

Heatsink Max Temp

The transistor cooling fin temperature exceeded the allowable value. (105 ° C)

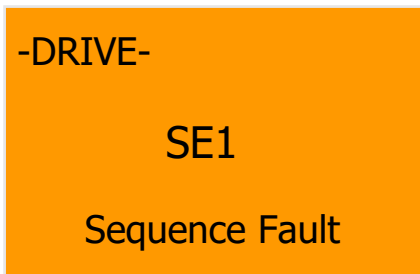
If the Drive has a 24Vdc internal fan, if the fan fails the Drive will suffer a OH1 fault regardless of heatsink temperature

Possible Cause(s): Cooling fan(s) are not working, high ambient temperature.

Corrective Action: Check for dirt build-up on the fans, reduce the ambient temperature around the inverter.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Relay for both forward and reverse commands are active at the same time.



Possible Cause(s): Forward and reverse command active.

Corrective Action: Check the forward and reverse command from operator. Educate the operator for correct operation.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

SE2

Sequence Fault

Break is not released even after receiving run command.



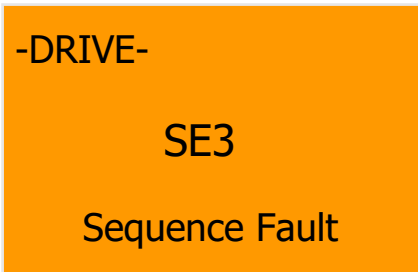
Possible Cause(s): Break release current or torque is set too high.

Corrective Action: Check the circuit for the motor.

Lower the parameter setting value so that it is appropriate for the load.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.



Break release check signal is open while break release command relay is close.



Possible Cause(s): Sequence error in the break circuit.

Corrective Action: Check the sequence circuit.

Fault Codes

Major Fault - Motor coasts to a stop, the fault is displayed on the digital operator, and the fault relay is activated.

-DRIVE-

SE4

Sequence Fault

Break release command relay is open, and break check signal is closed.

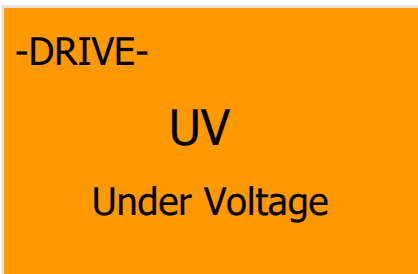


Possible Cause(s): There is a bad connection between the relay, contactor and break.

Corrective Action: Check the relay, contactor and break wiring.

Fault Codes

Minor Fault - Operation continues and the fault flashes on the digital operator. The fault relay does not activate.



Same specifications as the Major Fault UV1 except the condition occurs while the Drive is stopped.

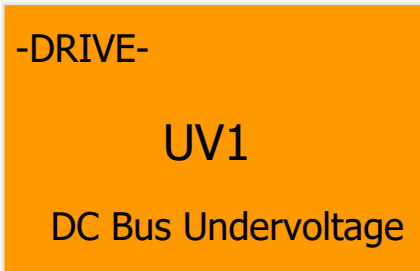


Possible Cause(s): Single phase condition on the input, low input voltage at L1, L2, and L3.

Corrective Action: Check the three phase input voltage, verify setting of L2-05.

FAULT CODES

Minor Fault - Operation continues and the fault flashes on the digital operator. The fault relay does not activate.



Voltage in the DC bus fell below the undervoltage detection level (L2-05).

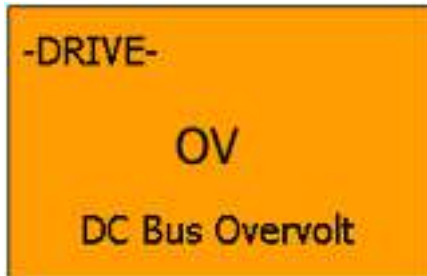


Possible Cause(s): Input power phase loss.

Corrective Action: Cycle power to the drive and see if the fault reoccurs.

Fault Codes

Minor Fault - Operation continues and the fault flashes on the digital operator. The fault relay does not activate.



Same specifications as the Major Fault OV except the condition occurs while the Drive is stopped. Parameter E1-01 affects the trip level



Possible Cause(s): High voltage from Regeneration condition on the output, High input voltage at L1, L2, and L3.

Corrective Action: Check the three phase input voltage, verify setting of E1-01.

Fault Codes – Parameter Setting Errors.

-DRIVE-
OPE01
kVA Selection

Inverter kVA setting error. Parameter setting is out of range.

-DRIVE-
OPE02
Limit

-DRIVE-
OPE03
Terminal

Multi-function input selection fault.

-DRIVE-
OPE04
Board mismatch

Initialization required.

-DRIVE-
OPE05
Sequence Select

Run command is selected through serial communication at 2CN but option board is not installed.

-DRIVE-
OPE08
Constant Selection

Multi-function input or multi-function output data setting error.

-DRIVE-
OPE10
V/F Ptrn Setting

V/F parameter setting error.

-Drive-
OFA / B / C
Option Card

An option card error on option card connector A, B or C detected

The Alarm will be displayed additional with a number. E.g. OFA01. The meaning is: Option Card Fault at connector A with code 01

YASKAWA

 Prithvi Power Engineers (P) Ltd.

THANKS