Input Diode and Output Transistor Check Procedure on a Variable Frequency Drive (VFD) with Short Video

Topic Description

The static tests indicated below should be performed in the following scenarios:

1. The VFD input fuses have failed.
2. The VFD is not turning on or won't turn on.
3. The VFD is not powering up the digital operator. Refer to the documents below for further troubleshooting:
   - Drive Operator is NOT Turning ON or the Keypad is Blank with the Charge LED ON
   - Drive Operator is NOT Turning ON or the Keypad is Blank with the Charge LED OFF
4. SC (short circuit), OC (overcurrent) or Output Phase Loss faults are present. Refer to the documents below for further troubleshooting:
   - Troubleshooting a SC (Short Circuit) Fault
   - Troubleshooting an OC (Overcurrent) Fault
   - Troubleshooting Output Phase Loss (LF)
5. Verifying the VFD is in working operation prior on powering up the drive for the first time.

All the static checks below are conducted using the Diode Test Mode of a Digital Multimeter to determine if the input or output power circuits of the **Variable Frequency Drive** (**VFD**) are defective without having to take the **VFD** apart.

Resolution

To perform the below static checks, locate the following terminals on the drive:

- The **+** and **-** terminals usually located between the input and output terminals.
- The **R/L1**, **S/ L2**, **T/L3** input and **U/T1**, **V/T2**, **W/T3** output terminals.

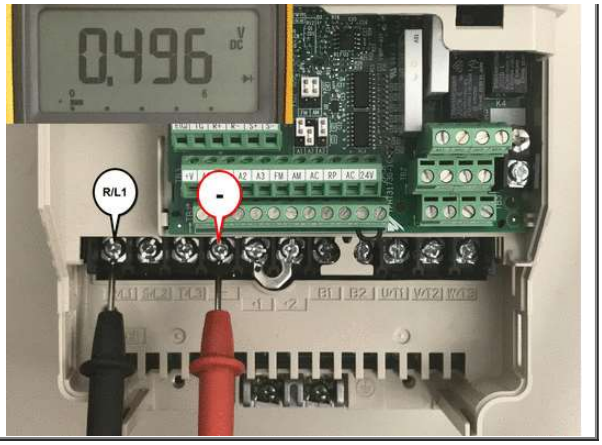
Important steps before starting the tests below:

1. Remove power to the VFD being tested.
2. Disconnect the input and output wires connected to the VFD terminals (make sure the wires are correctly labeled before removing them).
3. **Ensure the DC bus is completely discharged by measuring between the positive (+) and negative (-) bus terminals with a DC voltmeter set to the highest scale.**
4. Turn the multimeter dial to Diode Test Mode as shown below:

First Step:

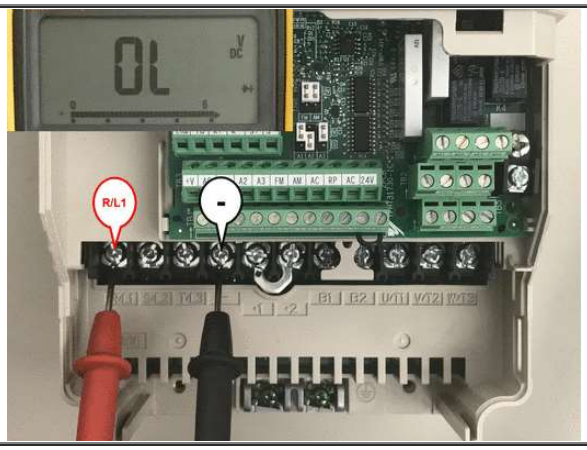
1. Take the **positive multimeter lead** and put it on the **- terminal** of the **VFD**.
2. Take the **negative multimeter lead** and put it on each **input** and **output terminal** of the **VFD** one at a time.
3. If a terminal is good, it should read a voltage drop from **0.299** to **0.675 vdc and consistent reading between all phases.**

Step	(+) Positive Multimeter Lead	(-) Negative Multimeter Lead	Multimeter Reading (Diode Test Mode)
1	**(-) Terminal**	R/L1 Terminal S/L2 Terminal T/L3 Terminal U/T1 Terminal V/T2 Terminal W/T3 Terminal	0.299 ~ 0.675 vdc

Second Step:

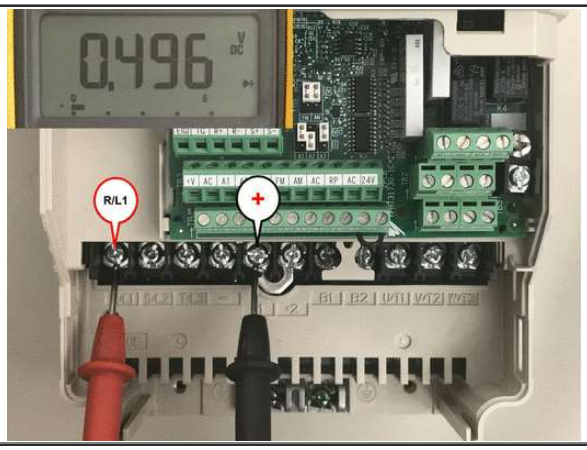
1. Take the **negative multimeter lead** and put it on the **- terminal** of the **VFD**.
2. Take the **positive multimeter lead** and put it on each **input** and **output terminal** of the **VFD** one at a time.
3. If a terminal is good, it should return with a **OL** (open) reading on the meter.

Step	**(+) Positive Multimeter Lead**	**(-) Negative Multimeter Lead**	Multimeter Reading (Diode Test mode)	
2	R/L1 Terminal S/L2 Terminal T/L3 Terminal U/T1 Terminal V/T2 Terminal W/T3 Terminal	**(-) Terminal**	OL *	

* ***Note****: On larger drives, the multimeter will take longer to reach OL. As long as the multimeter continues to escalate, the diode check is good.*

Third Step:

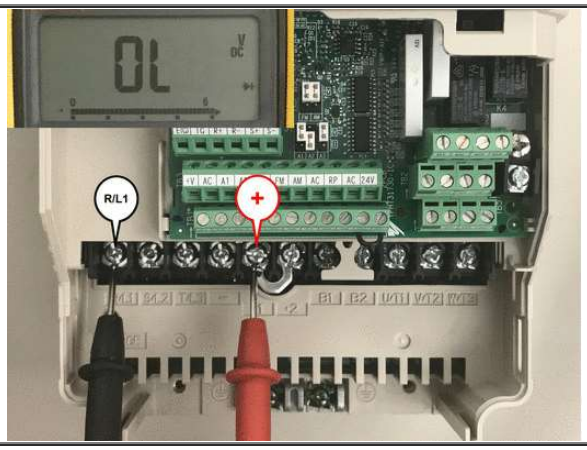
1. Take the **negative multimeter lead** and put it on the DC **+ terminal.**
2. Take the **positive multimeter lead** and put it on each **input** and **output terminal** of the **VFD.**
3. If a terminal is good, it should read a voltage drop from **0.299** to **0.675 vdc and consistent reading between all phases.**

Step	**(+) Positive Multimeter Lead**	**(-) Negative Multimeter Lead**	Multimeter Reading (Diode Test Mode)	
3	R/L1 Terminal S/L2 Terminal T/L3 Terminal U/T1 Terminal V/T2 Terminal W/T3 Terminal	**(+) Terminal**	0.299 ~ 0.675 vdc	

Fourth Step:

1. Take the **positive multimeter lead** and put it on the DC **+ terminal.**

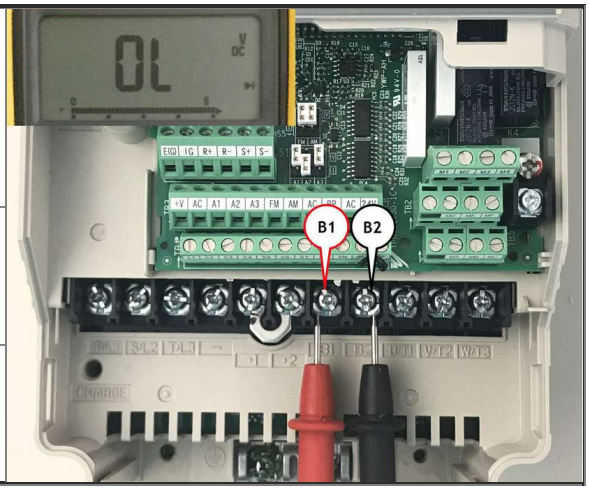
2. Take the **negative multimeter lead** and put it on each **input** and **output terminal** of the **VFD**.
3. If a terminal is good, it should return with a **OL** (open) reading on the meter.

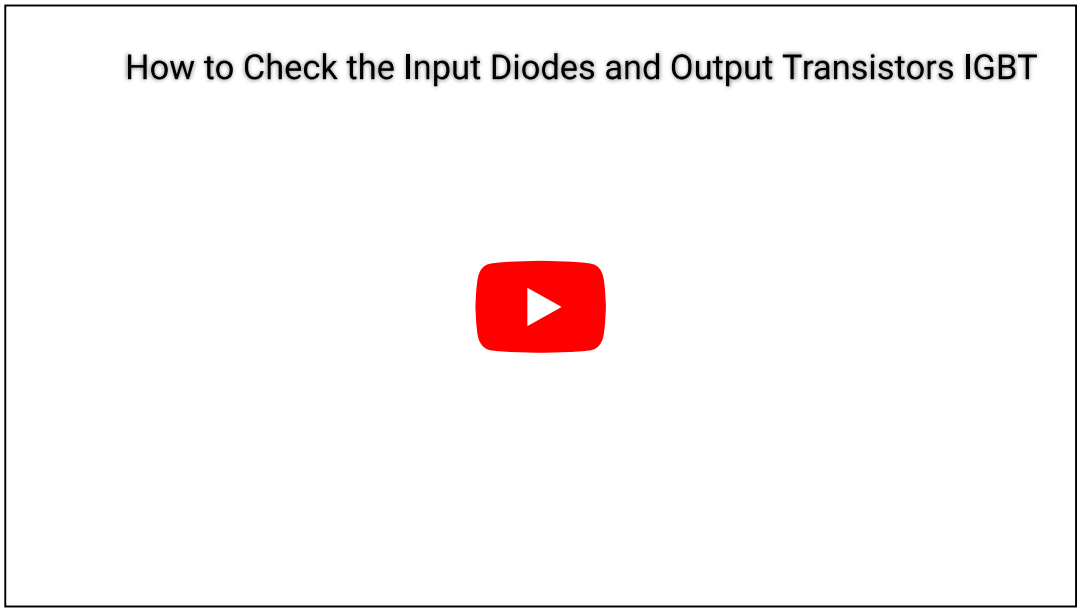
Step	**(+) Positive Multimeter Lead**	**(-) Negative Multimeter Lead**	Multimeter Reading (Diode Test mode)	
4	**(+) Terminal**	R/L1 Terminal S/L2 Terminal T/L3 Terminal U/T1 Terminal V/T2 Terminal W/T3 Terminal	OL *	

* ***Note**: On larger drives, the multimeter will take longer to reach OL. As long as the multimeter continues to escalate, the diode check is good.*

Fifth and Sixth Step (*Applicable on drives with built in braking transistor*)**:**

1. Take the **positive multimeter lead** and put it on the **B1 terminal.**
2. Take the **negative multimeter lead** and put it on the **B2 terminal**.
3. If a terminal is good, it should return with a **OL** (open) reading on the meter.
4. Take the **positive multimeter lead** and put it on the **B2 terminal.**
5. Take the **negative multimeter lead** and put it on the **B1 terminal**.
6. If a terminal is good, it should read a voltage drop from **0.299** to **0.675 vdc and consistent reading between all phases.**

Step	**(+) Positive Multimeter Lead**	**(-) Negative Multimeter Lead**	Multimeter Reading (Diode Test mode)	
5	B1	B2	OL	
6	B2	B1	0.299 ~ 0.675 vdc	



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Meter readings for a bad input diode or output transistor:

- If the meter returns a reading of **0.000 to 0.100**, the **IGBT** is shorted and should be replaced. These readings could result in blowing fuses or further damaging the unit.

  Notes:
  - Some units may have multiple internal input diodes and output IGBT modules. If one is found to be defective, all should be replaced at the same time.
  - When replacing IGBT's Yaskawa recommends also replacing the Gate Drive board.

- If the meter returns a reading of more than **0.750 or a OL** when expected to read **0.299 ~ 0.675 vdc**, this usually means the rectifier or the output transistor is **open** which could result in no display at the operator keypad, the loss of an input or output phase.

Related Documents

Drive is Blowing Input Fuses or Tripping Breaker when Power is Applied
Drive Keypad is NOT Turning ON, No Display or the Keypad is Blank with the Charge LED OFF
Drive Operator is NOT Turning ON, No Display or the Keypad is Blank with the Charge LED ON
Input Diode and Output Transistor Check Procedure on a Matrix Variable Frequency Drive (U1000, U1000 iQpump and Z1000U)
Performing an Insulation (Megohmmeter) Test on a Motor
Troubleshooting an oC (Overcurrent) Fault
Troubleshooting an rr (Dynamic Braking Transistor) Fault
Troubleshooting Input Phase Loss (PF)
Troubleshooting Output Phase Loss (LF)

Product Types

GA800, GA500, HV600, HV600 Bypass, HV600 Configured, FP605, G2, C01, H1, C11, A1000, E7, H2, P1, A1000 Configured, G3, MV1S, C21, G5, A1000 HHP, E7B Bypass, Lancer, MX1S, H3, E7BR, E1000, PB3, MV1000 NEMA 3R, G5 HHP, PC3, H1000, GL5, E7BR Bypass Nema 3R, iQpump VTC, iQpump Micro-4X, iQpump Micro, iQpump1000, H5, E7C Configured, R3, VCD723, P5, iQpump1000 Bypass, E7CR, VG3, E7E Engineered, P5B, E7L Bypass, VH3, PS5, E7N Bypass, SmartTrac, E7S Slim Configured, iQpump Micro Configured, F7, iQpump1000 Configured, iQrise, F7C Configured, J1000, FS7, G7, L1000, G7C Configured, P1000, iQpump 7 Series, P1000 Bypass, P1000 Configured, J7, L7, P7, P7BR, P7 Bypass, P7C Configured, V1000, P7CR, P7 Slim Configured, V1000-4X, Z1000, PPBB, Z1000 Bypass, PPBR, PPCB, Z1000 Configured, Z1000 Redundant Bypass, PPCR, V7, V74X, V7C Configured, V7CX Configured, V7N, V7N4X

All Applications

Advanced Random Rotary Knife with Cam Blend, Air Compressor, Blister pack Thermoformer, Cartoner, Centrifuge, Conveyor, Crane/Hoist, Dynamometer, Elevators and Escalators, Extrusion, Fans/Blowers, Feed To Length, General Machinery, HVAC, Irrigation, Labeler, Laundry, Linear Flying Shear, Machine Tool, Mixer,

Other, **Packaging**, **Palletizer**, **Precision Grinding**, **Pump**, **Punch Press**, **Rotary Knife**, **Rotary Placer**, **Rotary Table Indexer**, **Screw Feeder**, **Semiconductor**, **Solar Cell Tabbing and Bussing**, **Solar - Textured Etching**, **Synch-Belt**, **Textile**, **Winding**

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