

**Information Sheet # 01**

Your Reliable Guide for Power Solutions

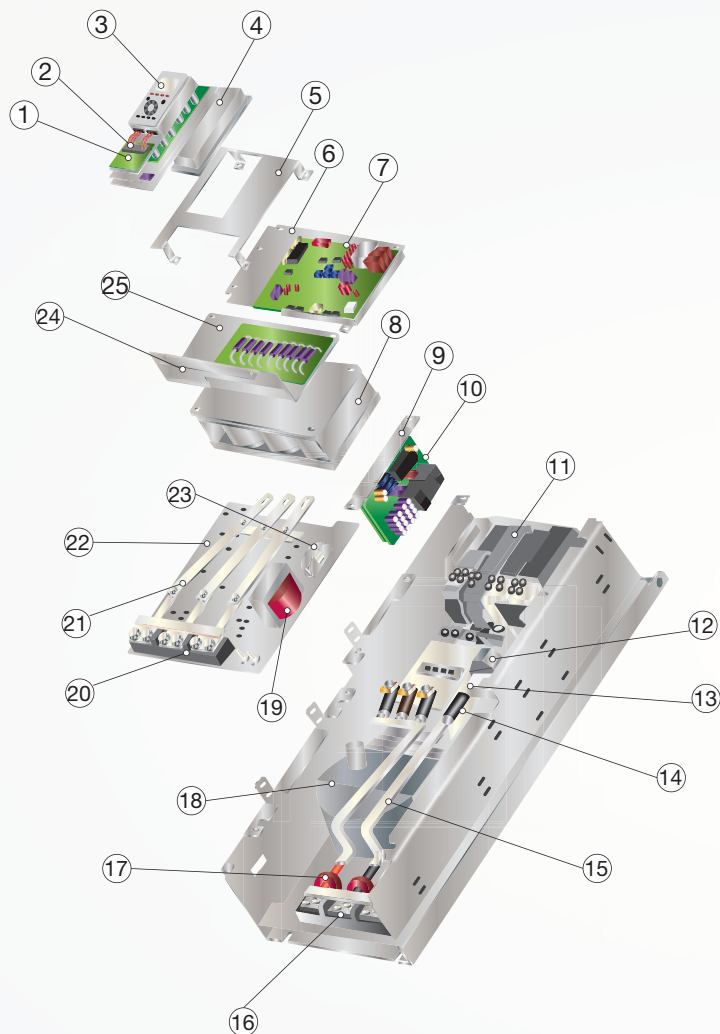
**DRIVE REPAIR  
A Summary Introduction**

**1.0 Introduction:**

One of many areas of LEI expertise is the maintenance of electric motor drive systems. While the term drive indicates mechanical, which is the case with electric motors connected to a gear arrangement, a high percentage of electric motors found in process and manufacturing facilities use a Variable Frequency Drive (VFD) system to control the electric motor. Whether the motor is a single unit or part of a coordinated chain of electric motors in a variable frequency production process, the critical component is the drive assembly.

*This information sheet discusses the components within a VFD system, the importance of planned maintenance, and components within the unit that require observation and maintenance to ensure trouble free reliable operation.*

**Exploded View of Electric Motor Drive Unit**



Key to Components of Drive Assembly	
#	Description
1	Control cord PCA1
2	Control input terminals
3	Keypad
4	Control card option
5	Mounting bracket
6	Power card mounting plate
7	Power card PCA3
8	Capacitor bank assembly
9	Soft charge fuses
10	Soft charge card PCA11
11	DC inductor L1
12	Soft charge module R1
13	IGBT module
14	SCR/Diode module SCR 1, 2, 3
15	IGBT output bus bar
16	Output motor terminals
17	Current sensors
18	Fan assembly
19	Fan transformer
20	Main AC power input terminals
21	AC input bus bar
22	Input terminal mounting plate assembly
23	Fan fuse
24	Capacitor bank cover plate
25	IGBT gate drive card

To fulfill our commitment to be the leading supplier, the Layco Electric Innovations team ensures they are always up-to-date with the current industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power and motor control industry.

## 2.0 Note the Important Aspects of the Drive Unit:

While drive units may undertake the same function and comprise similar components, they are all different from manufacturer to manufacturer. Before maintenance or repair, the manufacturer, serial number, reason for service, urgency of repair, and a visual inspection should be carried out.

## 3.0 Inspection of Drive Interior:

The frequency converter interior must be free of dirt, metal chips, moisture, and corrosion. Check for burnt or damaged power components or carbon deposits resulting from catastrophic component failure. Check for cracks or breaks in the housings of power semiconductors, or pieces of broken component housings loose inside the unit.

## 4.0 Drive Cooling:

Check the operational status of all cooling fans. Check the door filters on NEMA 12 (IP54) units. Check for blockage or constrained air passages. Make sure the bottom gland plate is installed. **See diagram fan assembly 18**

## 5.0 Insulated-Gate Bipolar Transistor (IGBT):

IGBT is a semiconductor with three terminals which work as a switch for moving electrical current. The term gate is used because it opens or "turns on" to create a path for current to flow between its layers. It's an electronic switch that combines high efficiency and fast switching. The fast switching enables a high degree of motor control in variable drive systems.

## 6.0 Conduct Diode and IGBT Tests:

There are a number of methods to test the input and output power section of a drive. This step is essential prior to applying power to the unit. If for any reason there is a short on the input side or output side of the drive, further damage can be caused to the unit if power is applied to it. **See diagram IGBT Module 13 and Diode 14**

A meter is used to properly test the input and output power sections of the drive prior to applying any power to the actual unit. If a short is found, quite often the unit can be disassembled and the cause of the short can be diagnosed and quoted for repair. If the repair is too costly, then a replacement is recommended.

## 7.0 Check Input and Output to Drive:

Before running, test the input (**See diagram input 20**) to verify connections are correct and also test the output (**See diagram output 16.**) If the input and output power sections of the AC Motor Speed Controller test healthy, then power the unit up to determine how it operates.

Depending on whether or not the drive gives a display will determine what further action will be taken. If no display is available, the next stage would be to disassemble and diagnosis the internal power supply of the control section of the drive. This is necessary to further evaluate the cause of failure.

## 8.0 Run the Motor:

Never apply power to a unit that is suspected of being faulty. Many faulty components within the frequency converter can cause damage to other components when power is applied.

If the IGBT, diodes, and input/output terminals have been checked and no issue is detected, the next stage is to run the motor. The unit will normally be checked against a test motor locally or within the service provider's facility. The technician will run a basic jog function of the drive with a simple template program. The technician will make a backup of whatever program is currently stored in the drive prior to inputting a template program and running a test procedure. This ensures a backup copy of the program is retained.

## 9.0 Running Backup:

The best method for backup depends on the brand of drive, but after it has been backed up, typically it will be reset to factory defaults through the keypad (**See diagram keypad 3**) and recommission a basic start, stop and job application or closed loop if an encoder is involved. If the motor will not run, it will be necessary to check the output voltages and current rating going to the motor to see if the AC motor speed controller is "firing" properly to move the motor.



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