AF91 EXTERNAL DYNAMIC BRAKE KIT OPERATI0N and SERVICE MANUAL

INTRODUCTION

The Dynamic Brake kit consists of a compact externally mounted dynamic brake module that monitors the DC bus voltage and AC line voltage of a variable frequency drive. The theoretical DC bus voltage should never exceed 1.414 times the AC line voltage. Should the DC bus voltage exceed this value, the dynamic brake module will bleed energy off of the DC bus by placing a resistor across the bus at a variable duty cycle. As the DC bus level increases above the threshold level, the width of the pulses increases to bleed more energy per second off of the DC bus. As the AC line voltage changes, the dynamic brake module threshold level will automatically change to keep the threshold level at 1.41 times 1.1 times the AC line voltage.

WARNING: Do not service equipment with either AC and/or DC voltage applied. Unit can be the source of fatal electrical shocks! To avoid shock hazard, disconnect AC and DC power and allow DC bus to decay completely before working on controller. Warning labels (not supplied) must be attached to terminals, enclosure and control panel.

INSTALLATION

Proper location of the dynamic brake unit is necessary to achieve specified performance and normal lifetime operation. The dynamic brake unit should always be installed in an area where the following conditions exist.

- Ambient operating temperature.
  - Enclosed Unit: -10 to 40°C
  - Chassis Unit: -10 to 50°C
- Protected from rain and moisture.
- Shielded from direct sunshine.
- Free from metallic particles and corrosive gas.
- Free from oil, grease and liquid.
- Free from massive vibration.
- Free from high electromagnetic radiation.
- Free from radioactive material.
- Free from flammable material.
- Installation of the dynamic brake unit must be oriented so that the front side of the unit faces front and the top of the unit is directed upward for maximum heat dissipation.
- Mounting of the dynamic brake unit must be to a non-combustible panel.

  Note: The heatsink may heat up to above 100°C during maximum braking. Warning labels (not included) should be installed warning personnel of the high temperature of the heatsink.

WIRING

This section deals with the recommended wiring practices for the dynamic brake unit. Please remember that you must always conform to the National Electrical Code and any applicable local codes. Always make sure that the AC and DC power supplies are completely discharged prior to making any connections to the unit.

WARNING: The remainder of this manual involves working with potentially lethal voltage levels Caution must be used to prevent personal harm.

- Never connect the AC power to the DC terminal (TB2) or connect DC power to the AC terminal (TB1) in the dynamic brake unit. Swapping these connections will destroy the unit.
- Never use a megger to check the integrity of the unit. The high transient voltage will destroy the semiconductor module.
- Always connect a contactor on the line side of the AF91 that is supplying power to the dynamic brake unit and wire TB4 in the unit (thermostat trip) in series with the coil of the contactor. See Figure 1 for the recommended wiring.
- Always use UL/CSA approved wire and listed field wiring lug kits or listed ring terminals where appropriate.
- Physically separate power wiring from other control wiring. If they must cross, do so at 90° angles.
- Install a fuse rated for the DC amperage and DC voltage as required for the application between P1 of the dynamic brake unit and the DC bus of the AF91.
- Use copper conductor only. Size field wiring based on 75°C only.
- Always be sure to make a positive ground connection to the heat sink of the dynamic brake unit. This is necessary for both protection of personnel and for reliable, trouble free operation. The following are additional guidelines for proper grounding:

  Wire size must be a minimum of #8 AWG and its length must be kept as short as possible.

  Resistance to ground should be 100 ohms or less.

  Never ground the dynamic brake unit with welding or other high current machines.

  When several units are used together, they should all be grounded to a common pole. Alternately, connecting of the heatsinks together and running a single wire to the ground pole is acceptable. Be sure that you do not form a ground loop with the ground wires.

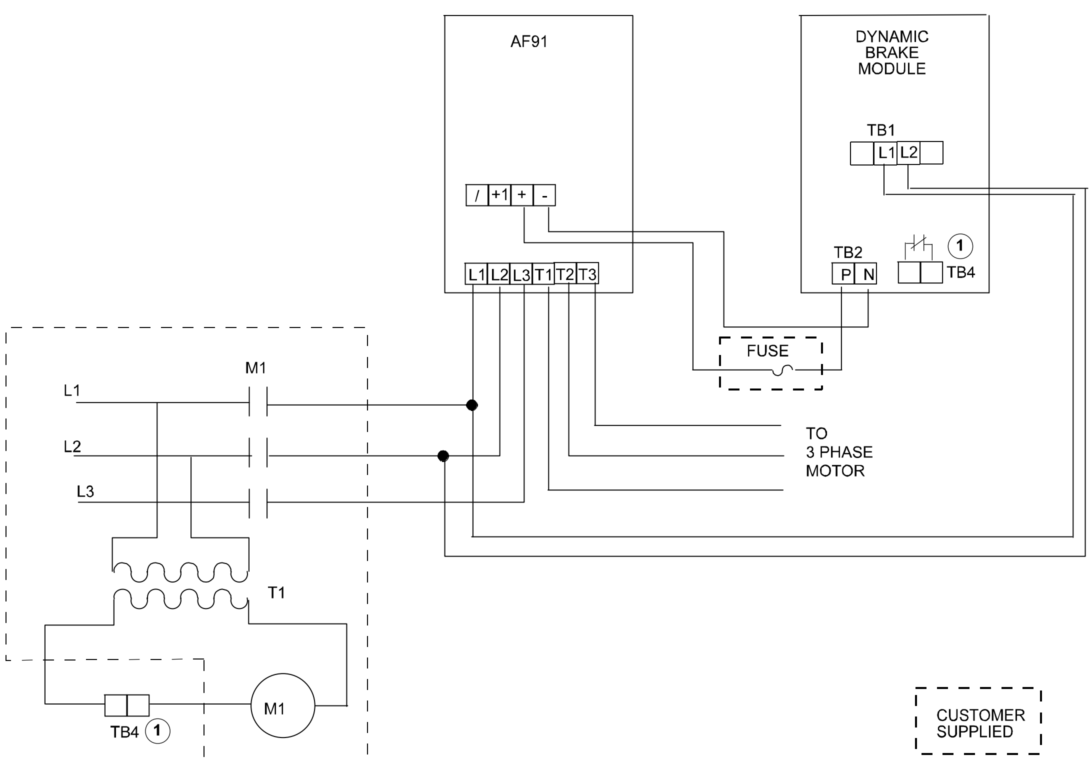

Figure 1: Wiring Diagram

ADJUSTMENTS

The dynamic brake unit is factory set to begin braking at a value of 1.414 × 1.1 × VAC, and it reaches 100% pulse width at 1.414 × 1.2 × VAC. Under normal conditions these values should be satisfactory. If required, the unit can be adjusted by the following procedure.

- Connect an oscilloscope to TP1 using an isolated probe. Set the time base on the scope to 1mS and set the coupling of the scope to DC. The waveform at TP1 is a saw tooth waveform. Adjust P1 to set the value of the threshold voltage (V^{th}). Adjust P2 to set the value of the 100% duty cycle voltage (V^{max}). See Figure 2 for a visual description of the waveform and adjustment points.

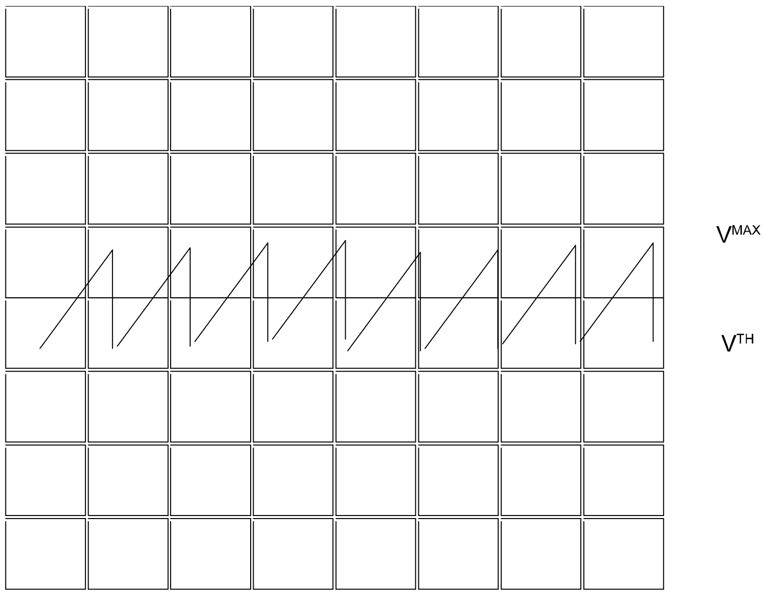

Figure 2: TPI Waveform

- Define the threshold level at which the brake begins to brake as a percentage above nominal voltage. For example, a level of 10% over nominal DC bus voltage would be expressed as TL = 1.10

- Define the maximum level at which the brake would produce a 100% duty cycle waveform. For example, a level of 20% over nominal dc bus voltage would be expressed as ML = 1.20

For 240 vac units:

$V^{th} = [(240 \times 1.414 - .6) \div 52] \times TL$
$V^{max} = [(240 \times 1.414 - .6) \div 52] \times ML$

For 480 vac units:

$V^{th} = [(480 \times 1.414 - .6) \div 101] \times TL$
$V^{max} = [(480 \times 1.414 - .6) \div 101] \times ML$

- For factory settings of 10% threshold level and 20% maximum duty cycle level, the following describe the factory setpoints.

For 240 vac units:

$V^{th} = [(240 * 1.414 - .6) \div 52] \times 1.1 = 7.2$
$V^{max} = [(240 * 1.414 - .6) \div 52] \times 1.2 = 7.8$

For 480 vac units:

$V^{th} = [(480 * 1.414 - .6) \div 101] \times 1.1 = 7.4$
$V^{max} = [(480 * 1.414 - .6) \div 101] \times 1.2 = 8.1$

SPECIFICATIONS

Model No.	K13-000034-0621	K13-000034-0622	K13-000034-0623
Power Supply	240VAC ±10%, 50/60 Hz		
AMP Ratings	5A	10A	20A
Power Resistor	200 ohm, 60W	100 ohm, 120W	None Provided
Height	6.4 In.	8.5 In.	6.4 In.
Width	4.2 In.	7.3 In.	4.2 In.
Depth	5.3 In.	6.5 In.	5.3 In.

Model No.	K13-000034-0641	K13-000034-0642	K13-000034-0643
Power Supply	480VAC ±10%, 50/60 Hz		
AMP Rattings	2.5A	5A	10A
Power Resistor	750 ohm, 60W	375 ohm, 120W	None Provided
Height	6.4 In.	8.5 In.	6.4 In.
Width	4.2 In.	7.3 In.	4.2 In.
Depth	5.3 In.	6.5 In.	5.3 In.

Duty Cycle	0-100% Adjustable
Threshold Level	0 and 100% Setpoints Adjustable on PCB
AC Voltage Compensation	Unit Compensates for Changing VAC Levels
Fin Overheat	K13-000034-0643 Thermostat Trips Unit at 120°F For All Other Units, Thermostat Opens Contact for Customer Interlock at 210°F
LED Indications	Green: AC Power ON Green: DC Power ON Red: Fault Overtemp Yellow: Transistor Gated
Ambient Temp.	-10 to 40°C Enclosed -10 to 50°C Open Panel
Storage Temp.	-10 to 50°C
Humidity	90% RH (Non-Condensing)
Vibration	1/2 G Maximum

WARRANTY POLICY

The manufacturer warrants its products to be free from defects in material and/or workmanship for a period of one year from date of installation, to a maximum of 18 months from the date of shipment as indicated by the units date code. The company reserves the right to repair or replace any malfunctioning units under warranty at their option. All warranty repairs must be performed by the company factory, or on site by a factory authorized service form or personnel approved by the company.

Solid state controls have different operation characteristics from those of electro-mechanical equipment. Because of these differences and the wide variety of applications for solid state controls, each application designer must verify that the solid state equipment is acceptable for his or her application. In no event will the manufacturer be responsible or liable for the indirect or consequential damages resulting from the use or application of this equipment. The diagrams and illustrations in this document are included solely for illustrative purposes. Because of the number of different applications, the manufacturer can not be responsible or liable for actual use based on the examples or diagrams.