The Application Note is pertinent to the Focus 3 Family

Eddy Current Drive Replacement
F3N2C-EC

The Eddy Current Clutch control system was a mechanical / electrical means of providing variable speed control of a machine. There were three components: an AC motor, an Eddy current clutch and an Eddy current speed controller. The ac motor ran directly across supply voltage and drove the “fan/pole” of the eddy clutch at a fixed speed. The output rotor assembly was coupled directly to the load (no mechanical connection to the rotating fan pole). Torque from the ac motor was “transmitted” to the load magnetically through the electric field coupling between the fan pole and the rotor. The level of torque is proportional to the dc current level flowing through the clutch coil. The drive controls this current by varying the voltage applied to the coil. The transmitted torque is therefore directly proportional to the applied voltage. The speed of the rotor is a function the applied torque and the load torque. Since the clutch coil only controls the amount of torque applied to the load by controlling the voltage across the coil, no speed information is available for the drive. A tachometer (ac or dc) mounted to the rotor (or load) is required for direct control of the speed of the load.
The beauty of the Eddy Current Clutch system was that it only took a controller capable of about 12-15A to control the output speed of a 200-300HP load. Cost of such controllers are only a couple hundred dollars where a 250HP AC Motor Drive can be several thousands of dollars. Unfortunately, over the years the eddy current clutch control system has pretty much gone by the wayside due to its inefficiency of operation (at less than full speed operation) and the maturity of the AC motor control. These days, the AC motor is controlled directly without the use of the eddy current clutch. The availability of the eddy current controllers, such as the Emerson 1235’s and the even older WER 367’s has ended. Since in many applications, the AC motor (which could be 20 HP or greater) and mechanical clutch are in good condition and only the low cost electronic clutch control has failed, it makes economical sense to replace only the electronics. The modified Focus 3 controller, F3N2C-EC, can be used to replace the older electronics in a majority of applications, but not all. The old system had some options that are not supported by the replacement drive. Some of these will be touched on in the document to follow.
Basic Focus 3 Power Connections

- Input Power 115VAC
- Clutch Coil
- AC / DC Tachometer
## Jumper Programming

### JP3 ------- Tach Feedback Range

<table>
<thead>
<tr>
<th>Mode</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo</td>
<td>5.6 to 13.7 vac</td>
</tr>
<tr>
<td>Hi</td>
<td>43 to 115 vac</td>
</tr>
</tbody>
</table>

### JP4 ------- Feedback Selector

- Tachometer ((Tach))
- Armature (Arm)

### JP8 ------- Armature Voltage

| Voltage | 90 vdc | 180 vdc |

### JP11 ------- Input Voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 VAC</td>
<td>A to E, A to B, B to D</td>
</tr>
</tbody>
</table>

| 240 VAC | A to C, A to B, B to C |

**Bold Fonts indicate Defaults**
Jumper Programming

**JP9 ------ Max Output Current (100%)**

- Removed - 2.7 amps
- A – 5.5 amps
- B – 6.4 amps
- C – 7.5 amps
- D – 10amps

Select based on clutch coil

**Bold Fonts indicate Defaults**

**JP6 & JP7 --- Remote Current Limit Pot Select**

- Local – Uses current Limit pot on Control Board
- Remote – Uses remote Current limit Potentiometer
Control Terminals (Basic Connections)

NOTE: Control Terminal Strip Connections must NOT be connected to earth ground. This controller circuit common is connected to the positive output voltage terminal and ANY connection to earth ground will damage the controller. Refer to page 7, note #5 for additional information.
Potentiometer Adjustments

VSTB – Velocity Stability
Adjust for best speed stability

Local Current Limit
Limits maximum Output Current

MAXSPD
Adjust for maximum Motor speed

MIN SPEED
Adjust for minimum Motor speed

Note: For all other potentiometer adjustments and their functions, refer to standard Focus 3 User Guide
Additional Notes and information

1. Refer to the Focus 3 User Guide for additional information on drive installation and safety as well as additional features / functions.

2. Option Information:
The old eddy current controllers had various optional functions; the Focus 3 version of the eddy current controller has many of these as standard.

   a. Jog or thread speed (maintained jog)
   b. Follower capability (4-20 ma or 0 to 200vdc) also see F3NSBD
   c. Auto/ Manual reference control
   d. Torque Control regulation
   e. Current limit – adjusts maximum clutch coil current (load torque on ac machine)
   f. Adjustable acceleration and deceleration

3. Other options such as Dancer position, Dancer trim, Differential speed trip and “mag “ pickup for feedback not supported. These functions may be implemented with other equipment. Consult factory.

4. Speed Meter Kits are also available;
   a. 2450-9021 (0 to 2000 RPM)
   b. 2450-9024 (0 to 100%)

5. For systems requiring earth grounded control connections (ie speed pot and start stop), below is a suggested solution.

   ![Diagram showing transformer and ground lug]

   **DO NOT CONNECT GROUND TO TRANSFORMER SECONDARY**

   Transformer KVA = 1.5 X Rated Coil Current X 120vac

   **Example:** 10-amp coil

   \[
   \text{KVA} = 1.5 \times 10\text{amps} \times 120 \text{ vac} = 1.8 \text{ KVA (use 2KVA)}
   \]

Questions: Ask the author ??
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