

# Synchronous Motor Control • Bulletin 1900 Measurement Requirements for Brush-Type Motors

## Product Data

### Introduction

A synchronous motor controller requires significant data about the motor to function properly. If the motor has been rewound, the original specifications listed on the nameplate may not apply. Data can only be obtained from:

- The user having accurate records
- The motor manufacturer records
- Rewind shop records
- Measurements made at the owner's location

If records are not available, refer to this document for techniques to help determine motor information that is necessary to ensure proper functioning of your Allen-Bradley Synchronous Motor Controller.

### Measuring for Motor Data

#### Motor Nameplate

The following information should be available from the motor nameplate:

- Stator volts
- Stator full-load current (Amps)
- Frequency (Hertz)
- Power factor
- Service factor
- Field DC volts
- Field DC current (Amps)
- Field discharge resistor size

## Measuring for Motor Data (cont.)

### Measurements

Use appropriate measuring techniques to obtain the following information:

- Field discharge resistance (Ohms)
- Induced Amps in the field at zero speed with load connected
- Induced Amps in the field at 50% speed with load connected
- Induced Amps in the field at 95% speed with load connected
- Acceleration time (in seconds) to 100% speed with load connected
- Locked rotor amperes at full voltage

1. Stop the motor and isolate all AC and DC power from the starter.



**ATTENTION:** To avoid shock hazard, lock out incoming power before working on the equipment. Verify that all circuits are voltage free using a hot stick or appropriate voltage measuring device. Failure to do so may result in severe burns, injury or death.

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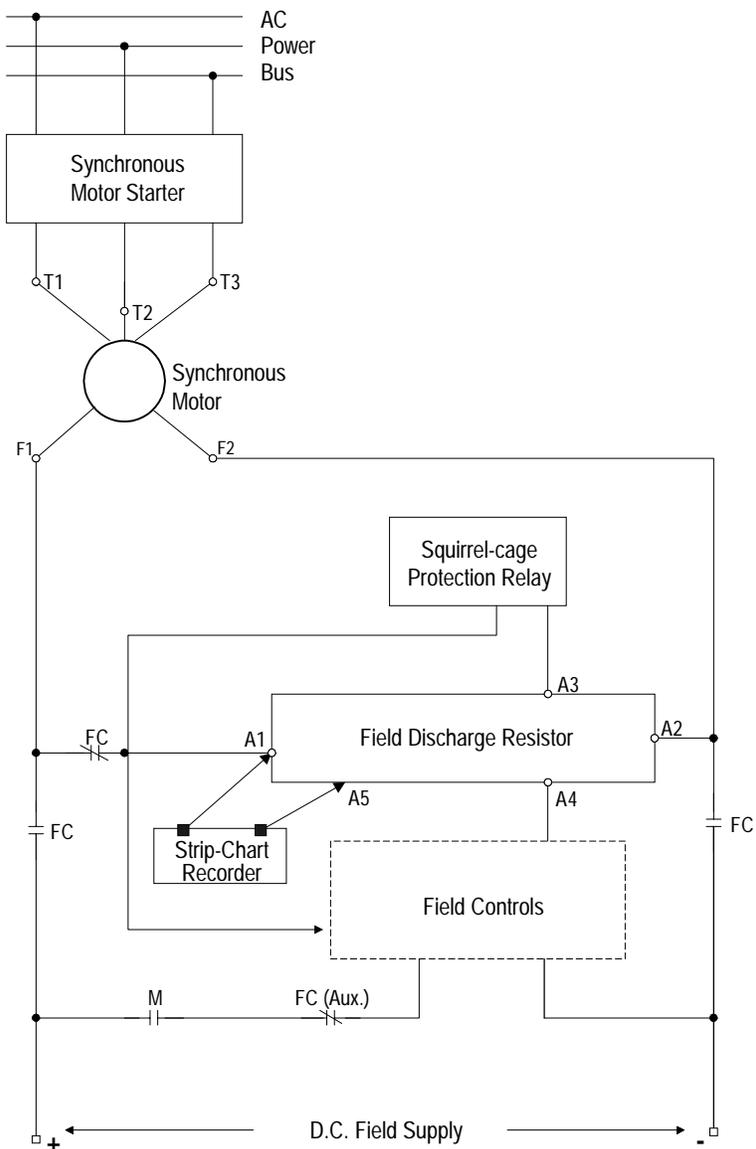
2. See Figure 1 for typical connections to the discharge resistor. Disconnect wires at A1, A2, A3, and A4, ensuring there are no parallel paths.
3. Accurately measure the resistance between A1 and A2 on the discharge resistor. Use a resistance-measuring device that is accurate to at least one decimal place. **Note:** The field discharge resistor value is central to the whole measurement process.
4. Select and tap point A5 on the discharge resistor to obtain a resistance of 1 ohm between point A1 and A5. (The selected value must be accurately measured and recorded.)
5. Reconnect all wires to the discharge resistor in their original arrangement (removed in Step 2). **Verify all wiring is correct as the motor will be damaged if the discharge resistor is not properly connected.**
6. Connect the strip-chart recorder to point A1 and A5 (the selected known value from Step 4). The recorder must be able to read 1000 volts AC, and is peak-to-peak indicating at frequencies of 1 Hz to 60 Hz, or is DC indicating.
7. With the load connected to the motor, start the motor using the controller.
8. An induced current, with an initial frequency of the line voltage supply, is generated in the field circuit when the motor is started. The induced current develops a voltage across points A1 to A5 during motor acceleration.
9. As the motor speed increases, the induced current will vary, as will the voltage readings across points A1 to A5. The frequency of the induced voltage will drop to about 3 Hz as the motor reaches near synchronous speed (95% speed). At this point the field contactor should close, providing DC current to the rotor.

## Measuring for Motor Data (cont.)

## Measurements (cont.)

- The strip-chart printout should show voltage readings between zero speed and the point of motor synchronization, and the time of acceleration with the load connected based on chart speed setting.  
**Note:** A few test runs may be necessary to determine the best use of chart width for accurate results (See Figure 2). Ensure that time and voltage scales are indicated on the printout.
- Locked rotor stator amperes can be measured using a clip-on pick-up for a strip-chart recorder.

Figure 1  
Simplified Synchronous Motor Control Circuit



Allen-Bradley PLCs

## Measuring for Motor Data (cont.)

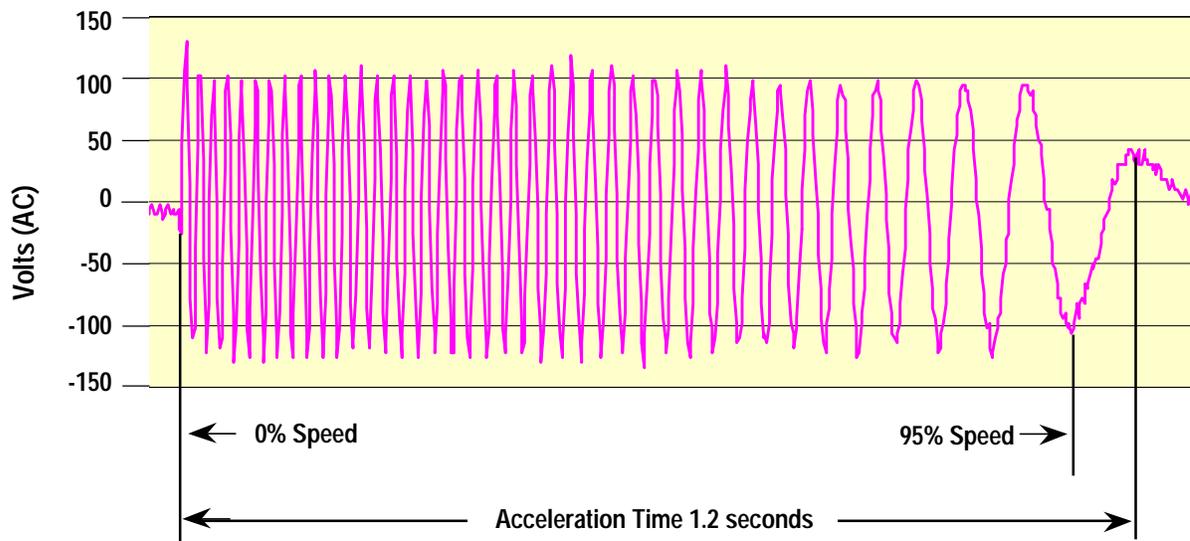
### Data from Owner or Motor Manufacturer

The following data can be obtained from the owner or manufacturer:

- Maximum allowable stall time (in seconds) at zero speed
- Maximum allowable acceleration time (in seconds) to 50% speed
- Maximum allowable acceleration time (in seconds) to 95% speed

A strip chart recording will provide the acceleration times above; however, the customer or motor manufacturer should acknowledge the data as measured data only. This data may not be indicative of the designed maximums of the motor.

**Figure 2**  
Induced Field Current Strip-Chart Recording Example



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