

USERS MANUAL

Model CF21000

**Current Following
DC Motor Speed Control**

SPECIFICATIONS

Input voltage	115 VAC, 60 Hz, single phase
Max input current, without aux heatsink.....	7A AC
Max input current, with aux heatsink.....	13A AC
Output voltage range	0-90 VDC
Max armature current, without aux heatsink	5 A DC
Max armature current, with aux heatsink	10 A DC
Output field voltage	100 VDC
Max output field current	1 A DC
Ambient temperature range	0° to 55°C



INSTALLATION

General Considerations

Install the control in an area that is protected from dirt, moisture, and accidental contact. Provide adequate clearance to permit access for connecting wires and for adjustment of the control. Do not mount the control near other heat-producing objects nor in an area subject to excessive cold or vibration. Allow for adequate ventilation to maintain ambient temperature within the range of 10°–55°C.

Heat Sinking and Mounting

If the Model CF21000 control must handle continuous DC loads in excess of 5 amperes, mount it on an auxiliary heatsink (Minarik kit Part No. 223-0217). Use a thin layer of high-quality silicone heatsink compound between the mating surfaces.

Connections

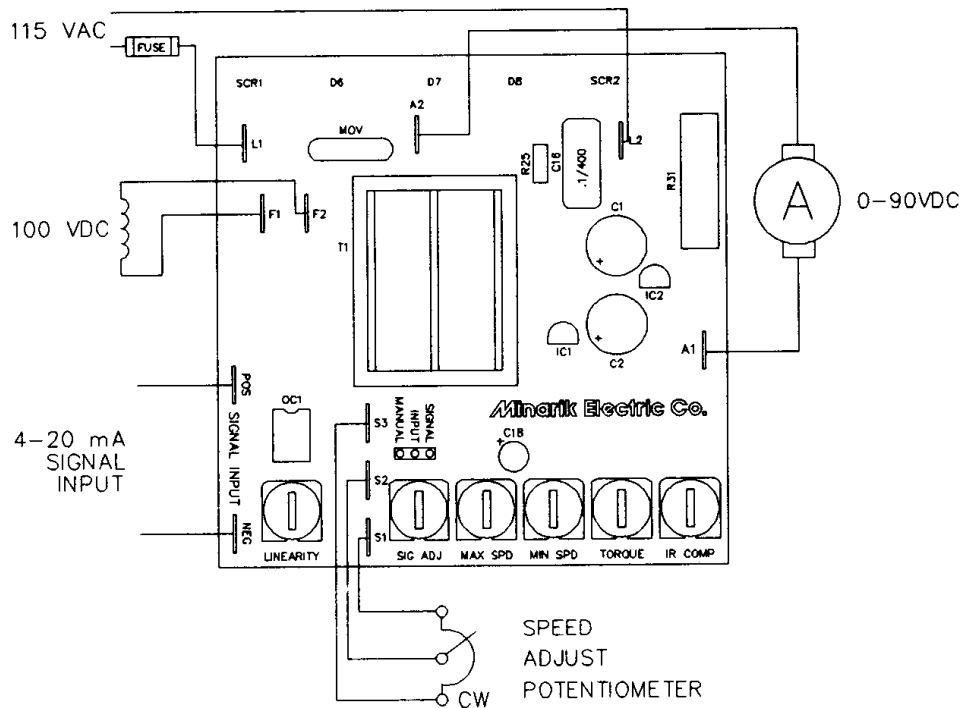
Use 16 gauge or larger stranded wire for connections to: (1) the AC input terminals, (2) the armature output terminals, and (3), if driving a shunt wound motor, the field output terminals. Use 18 gauge or larger stranded wire for connections to the Signal Input terminals and, if manual control is to be provided, to the Speed Adjust Pot also.

Line Starting and Line Stopping

Model CF21000 is designed for speed control applications that depend upon following an external current signal. Line starting and line stopping, while technically feasible, are not expected to be common application requirements. The control can be line started.

When AC power is applied to the control, the motor will accelerate to a speed that is determined by the signal current or by the speed adjust pot setting, depending upon which operating mode is in effect. When AC power is removed, the motor will coast to a stop.

Hookup to Model CF21000



NOTE: If motor is permanent magnet-type, make no connections to Terminals F1 and F2. If motor is shuntwound field-type requiring a 50 VDC field input, wire the field connections to Terminals F1 and L1.

Always wait at least 5 seconds after line stopping a motor before restarting it. This will avoid a jolting restart of the motor. This 5-sec delay allows time for the CF21000 acceleration circuit to return to its null condition.

SIGNAL Operating Mode – External Current Signal Hookup

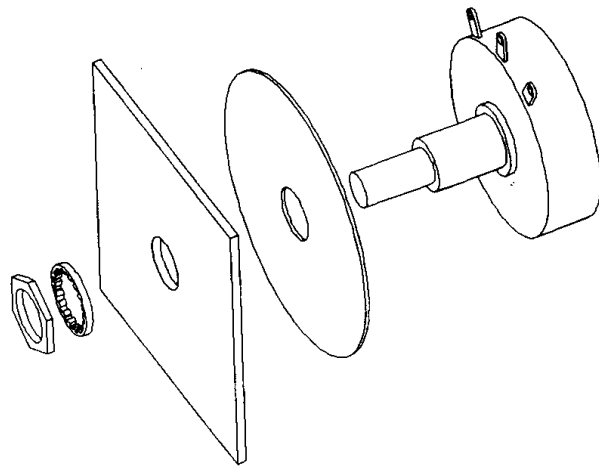
The normal operation of this control is in SIGNAL mode. The control is put into SIGNAL mode when the program plug is placed on Pins marked SIGNAL and INPUT. In this mode, only the current signal level will control the speed of the motor; the speed adjust pot will be out of the circuit.

Connect the DC signal lead to the terminal marked POS and the DC common lead to the terminal marked NEG. Leads longer than 18-in. should be twisted pair or shielded conductor cable.

MANUAL Operating Mode – Speed Adjust Pot Hookup

In MANUAL mode, the speed of the motor will be determined by the speed adjust pot setting; it will not be affected by the external signal. The program plug has to be placed on Pins marked MANUAL and INPUT.

Do not bundle the Speed Adjust Pot leads with any other wiring. Use shielded cable, with the shield connected to ground only at the control itself, if these leads must be longer than approximately 18 inches. Mount the potentiometer with its insulator disk placed between the pot and the panel surface, as shown below.



OPERATION

Before operating the control, carefully check that all connections are correct. Also check that there are no wire chips or other foreign material on the printed circuit board.

First Time Startup

In SIGNAL mode, verify that the input signal is at 4 mA. In MANUAL mode, verify that the speed adjust pot is fully counterclockwise. Slowly increase the signal input, or slowly increase the pot setting.

The motor must start slowly and increase its speed in approximate proportion to the increasing speed setting. If the motor rotates opposite to the intended direction, shut down the control and reverse the connections made to Terminals A1 and A2. Restore power to the control.

Input Signal Scaling

Two adjustments must be made to calibrate the CF21000 to follow its signal source. First, apply the maximum signal into the control and adjust the SIG ADJ trimpot to bring the motor to the speed desired at that signal. Then, apply the minimum signal to the control and adjust the LINEARITY trimpot to bring the motor to the speed desired at that low signal.

Adjustments

This control is factory calibrated for its rated maximum horsepower. The following procedures are included here to permit field adjustment of the units without requiring the use of electronic instrumentation. The results generally will be adequate for most applications. However, should these procedures prove insufficient, ask your Minarik Electric distributor for assistance.

All adjustments increase with clockwise rotation and decrease with counter-clockwise rotation. Be sure to use a non-metallic screwdriver when making any adjustments, to avoid the risk of shorting out the control circuitry.

Minimum Speed Adjustment

The MIN SPD adjustment sets the speed that the motor will attain when the Speed Adjust Pot is set fully CCW. Minimum speed is set at the factory to zero.

To adjust minimum speed to another speed, set the Speed Adjust Pot to full CCW and advance the MIN SPD adjustment until the desired speed is achieved. The range is 0% to approximately 50% of the control rated output voltage.

This adjustment should be made before setting the MAX SPD adjustment. There is some interaction between the settings.

Maximum Speed Adjustment

This sets the speed that the motor will attain when the Speed Adjust Pot is turned fully CW. Maximum speed is set at the factory for motor rated speed. The setting of the MAX SPD adjustment has no effect when operating in the SIGNAL mode.

To set a different maximum speed, turn the Speed Adjust Pot to maximum and adjust the MAX SPD adjustment to achieve the desired speed. The maximum speed may be set as low as 50% of the control rated output voltage.

IR Comp Adjustment

This adjustment controls the degree to which the CF21000 compensates for changes in motor load to maintain essentially constant motor speed over the load range. It is factory set with the rated horsepower motor.

If you are using a smaller motor or are operating over a narrow speed/load range, you may improve slightly on the standard calibration. However, do not recalibrate the IR Comp adjustment unless you have confirmed that the motor speed does vary unacceptably with load changes.

Should you happen to set the IR Comp Adjustment too high, motor speed will become unstable and you will observe rapid oscillations. Gradually turn the IR Comp Adjustment CCW until the motor speed just regains stability. This setting will put the IR Comp Adjustment close to its optimum position.

Torque Adjustment

This sets the maximum current that the CF21000 control will deliver to the motor on demand. It is set at the factory to 150% of the control rated output current, to protect the control. *This adjustment should not be advanced beyond the factory setting.*

The Torque Adjustment may be set to a *lower* value to protect the motor from overload. Do this with a DC ammeter monitoring armature output current. Terminal A1 is positive with respect to Terminal A2. Set the TORQUE adjustment fully CCW. Bring the maximum current signal into the CF21000, or turn its speed adjust pot fully clockwise if in MANUAL mode.

Load the armature shaft until it stalls. Maintain the stall while you turn the TORQUE adjustment clockwise until the armature current reaches approximately 120% of the motor nameplate rating for continuous duty. At this point, remove the stall and disconnect AC power.

TROUBLESHOOTING

WARNING

Dangerous voltages exist at various points on a powered speed control. Disconnect AC power before troubleshooting. When this is impossible, you must exercise extreme caution while working on the control. Contact with live circuitry can cause serious injury or fatality.

Before attempting any of the troubleshooting procedures below, do the following:

1. Remove AC power from the unit.
2. Check the control for damaged or charred components.
3. Check that no wire chips or other foreign material have become lodged in the printed circuit board.
4. Check that all connections to the control are correct and in good condition. Check for short circuits and grounds on all wiring.
5. Check that the speed control is rated for the correct armature voltage, field voltage and power required by the motor.

If the above items check OK, proceed with the troubleshooting procedures described below.

Motor Does Not Run

1. Check that the control is receiving AC line power. Check all fuses or circuit breakers in the power line. Make sure that the main power switch is on. Verify that the mode selector plug is in place on the correct pins. Verify that the DC signal is at least 4mA, or that the speed adjust pot is not fully CCW if operating in MANUAL mode.

2. The control may be in Current Limit. Check the motor and load to make sure that the motor is not jammed. It may be necessary to reset the TORQUE adjustment.
3. Speed Adjust Pot may be open.

Fuses or Circuit Breakers Blow

1. Check all wiring for shorts, grounds, and misconnections to the control and motor.
2. Check that the control ratings match the motor nameplate ratings.
3. The motor may be overloaded. Check that the motor load is not jammed or motor movement otherwise restricted.
4. Check that the fuse or circuit breaker is large enough for the size of motor being used.

Motor Won't Stop at Zero Speed Setting

1. The MIN SPD adjustment may be set too high.

Motor Runs Opposite to Desired Direction

1. Disconnect from AC power. Reverse the connections made from Terminals A1 and A2 to the armature. Reconnect to AC power and repeat test.

Motor Slows Down Under Load

1. The control may be in Current Limit. Check that motor is not overloaded.
2. The IR COMP adjustment may be set too low. Increase the setting until the motor speed stabilizes under load.

Motor Speed is Unstable Under Load

1. The IR Comp Adjustment may be set too high. Decrease the setting until the motor speed stabilizes under load.

Motor Runs Only at Full Speed

1. In MANUAL mode, this may be caused by an open speed adjust pot, or by open connections to the pot CCW or wiper tabs.

Limited Warranty

A. Warranty - Minarik Electric Company (referred to as "the Company") warrants that its products will be free from defects in material and workmanship for a period of five (5) years from date of shipment thereof. Within the warranty period, the Company will repair or replace such products that (1) are returned to Minarik Electric Company, 901 East Thompson Avenue, Glendale, CA 91201-2011 or to the nearest Minarik Authorized Service Station and (2) are determined by the Company to be defective. This warranty shall not apply to any product that has been subjected to misuse, negligence, or accident; or misapplied; or repaired by unauthorized persons; or improperly installed. The Company is not responsible for removal, installation, or any other incidental expenses incurred in shipping the product to or from the repair point.

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Any action against the Company based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment or the use thereof must be commenced within one year after the cause of such action arises.

DISCLAIMER

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