

HAMPTON

Installation, Operation and
Maintenance Manual

Cycletrol® C2000

Table of Contents

C2000 Specifications	
Operating Conditions	2
Control Data	2
Control Ratings Chart	2
Installation	
Hook-up Instructions	3
Mounting	4
Dimensions	4
Power and Logic Wiring Diagrams	5
Power Wiring Definition	6
Logic Definitions and Wiring	7-9
Common Applications	
Cycle on Demand Application	10
Typical C2000 Indexing Profile	11
Jog Operation and Front Cover Control	11
Start-up	
C2000 Operation	12
Adjustment Procedures	13-14
Troubleshooting Guide	15
Component Location Drawing	16



WARNING:

This equipment should be installed, adjusted and serviced by qualified electrical maintenance personnel familiar with the construction and operation of this type of equipment and the hazards involved. It is the responsibility of the equipment manufacturer or person installing the controller to take diligent care. Read all warnings and notes before proceeding to install or operate this control.

Operating Conditions

Elevation	Up to 3300 feet (1000 meters) without derating
Ambient Temperature	32°F to 104°F (0°C to 40°C)
AC Line Voltage Variation	Rated Voltage \pm 10%
AC Line Frequency	48 to 62 Hz

Control Data

Configuration	Chassis NEMA 12 with operator
Service factor	1.0
Overload Capability	150% for 1 minute
Output	0-90 VDC on 120 VAC 0-180 VDC on 240 VAC
Speed Regulation	Control: < than 5% base speed (for 95% load change) Motor: Depends on motor and applications
Speed Range	30:1 Full Torque
Potentiometer	5k ohm, 1 watt
Adjustments	Maximum Speed (50-110% of motor base speed) Current Limit (10-150% of control rating)
Control Logic Input	Start, Stop, Jog, RTN, Com
Indicator	Power ON

Control Ratings Chart

HP	VAC	Rated AC Line Amps	Duel Element Fuse Amps	DC* Armature Voltage	Rated* Armature Current (Amps)
0.5	120	8	10	0-90	6.1
1	120	15	20	0-90	12.2
0.5	240	4	5	0-180	3.6
1	240	8	10	0-180	6.1

* Nominal Ratings

Hook-up Instructions

1. Be sure that rated motor current and voltage do not exceed the ratings label on the control. Maximum horsepower of motor is not to exceed 1 HP.
2. A chassis ground terminal has been provided to facilitate grounding of the controller (see component location diagram).



WARNING

Be certain that a ground wire from the incoming AC power line is properly connected to the chassis ground terminal. Failure to do so could result in serious injury, equipment failure or both. The conduit to the enclosure cannot be used for grounding purposes since the enclosure is not metal.

3. Jog speed is determined by speed pot setting.
4. Run/Jog/Stop switch.



WARNING

The Run/Jog/Stop switch is for signal switching only. Be certain, before working on either the controller or the machine, that AC input power is disconnected from L1 and L2 terminals. Failure to do so could result in serious injury.

5. The speed potentiometer supplied is rated 5k ohm, 1 watt.



WARNING

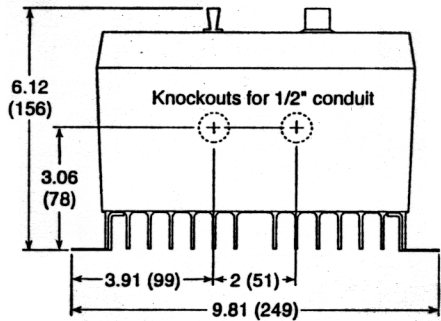
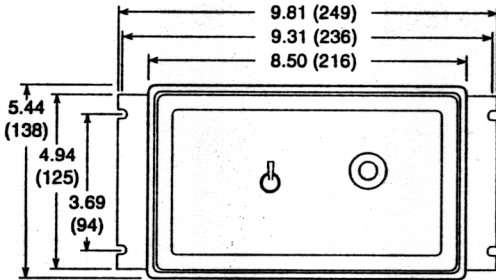
The speed potentiometer is non-isolated and at a high potential to ground.

6. For the control terminal strip TB3 and TB4, wire size must be between #16 and #24 AWG.
7. All digital logic terminals of the control terminal strip TB3 are isolated from line potential.
8. The speed logic inputs on terminal strip TB4 are non-isolated. Connection to ground will cause damage to the control's circuitry.
9. Both the Chassis and NEMA 12 units have a Power ON LED to indicate the AC power is applied and the internal power supply is functioning.

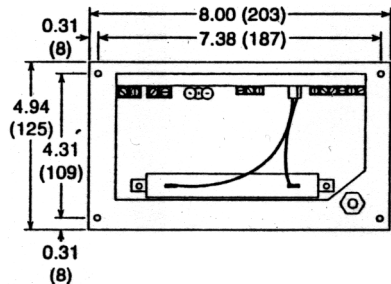
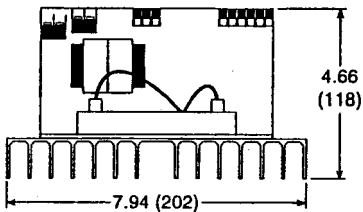
Mounting

The C2000 should be mounted horizontally in order to ensure maximum heatsink efficiency. Dimensions are in inches (mm).

NEMA 12



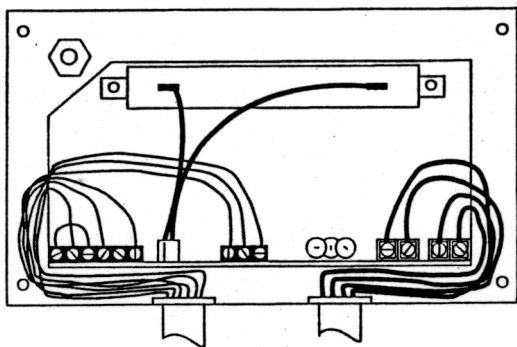
Chassis



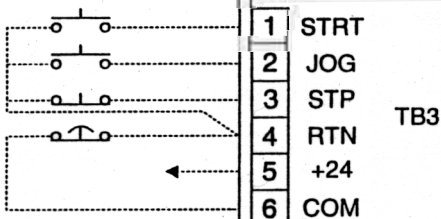
Power and Motor Connection Diagram

Caution:

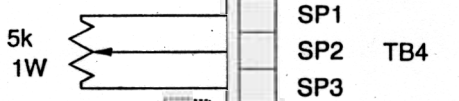
Route line, motor, and signal wiring around the heatsink and PCB.



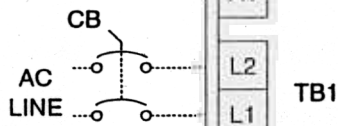
Customer wiring for units not using operator on cover



0-10 VDC Isolated Process Signal



For 240 VAC line operation both lines must be protected



Power and Wiring



WARNING

Improper installation of motor and controller may cause equipment failure or serious injury. Follow the instruction manual, local, state and national safety codes for proper installation. Always disconnect power to the controller before making any changes or inspecting the equipment.

It is the responsibility of the user or person installing the controller to provide branch circuit protection according to NEC and local codes. On controllers using 120 VAC input, be sure that the incoming hot lead is connected to L1 and common is connected to L2.

1. Be certain that a ground wire from the incoming AC power line is properly connected to the chassis ground screw provided. Failure to observe this precaution could result in serious personal injury.
2. The National Electrical Code requires a separate fused disconnect or circuit breaker be installed in series with the incoming AC power line.
3. All components on the printed circuited board are at line potential. Extreme caution should be exercised when working on the unit. Except where required for set-up, power should always be disconnected from the unit before any work is attempted.
4. Do not apply AC line voltage to any terminals except L1 and L2. Failure to comply will cause permanent damage to the control.
5. Automatic restart of control may occur if line power has been temporarily lost. Caution should be exercised under such circumstances.
6. When using a NEMA 12 unit, it is possible to disconnect any or all of the cover's operators (Speed Pot, Switch, power LED) if their operation is not desired. All connections are made using removable plugs on the circuit board. Refer to the Component Location diagram on page 16 for details.

LOGIC DEFINITIONS AND WIRING (TB3)

START: (Terminal 1, STRT)

A momentary contact closure between terminals STRT and RTN of terminal block TB3, latches the C2000 into a RUN mode. The closure must be present for no less than 50mSec. For logic precedence refer to Application Data, page 10.

JOG: (Terminal 2, JOG)

A contact closure between terminals JOG and RTN of TB3 causes the C2000 to go into the RUN mode. The drive will remain in the RUN mode for as long as the contact is closed. The C2000 will stop when this contact is opened, JOG does not latch. The contact on JOG may be maintained if continuous running is desired.

STOP: (Terminal 3, STP)

An open contact between terminals STP and RTN of TB3 activates the dynamic brake causing the C2000 to stop. Wire W5 determines the precedence a STOP command has over a START command, see page 10.

RETURN: (Terminal 4, RTN)

The RTN logic input on terminal 4 replaces the Override Stop input 2000 units. This input is jumpered to COM, terminal 6, when shipped from the factory so that it is in an inactive mode. Most applications do not require use of this function, so it is not necessary to remove the jumper.

+VDC SUPPLY: (Terminal 5, +24)

Terminal 5 provides 24 VDC @ 12mA output for use with an external load, such as one solid-state 3-wire proximity switch.

COMMON: (Terminal 6, COM)

Terminal 6 is circuit common, all logic commands are referenced to this terminal.

Logic Definitions and Wiring (continued)

Terminal Block 4 (TB4)

Terminal Block 4; TB4 is provided for the connection of an external potentiometer to control the C2000's speed. A 5Kohm; 1Watt potentiometer rating is recommended. However, any pot from 2.5K to 50Kohm with a minimum power rating of 1/10Watt may be used. Be aware that the higher the resistance, the greater the chances of interference from noise. For best noise suppression, all potentiometer leads should be shielded with the shield tied to ground on the controller side only.



WARNING

All terminals on TB4 are **NON-ISOLATED**, any connection to ground directly, or through peripheral equipment will cause circuit damage.

Following are the descriptions of the three terminals on TB4. For additional information refer to the figure on page 5.

SPEED POT; HIGH SIDE: (TERMINAL 1, SP1)

SP1 provides a positive (+) VDC signal during a RUN or JOG condition on the C2000. Normally the "high" or positive side of a potentiometer is connected here.

SPEED POT; INPUT: (TERMINAL 2, SP2)

SP2 is an analog input for the 0 to 10VDC speed reference signal. Typically the "wiper" of a potentiometer will be connected here.

SPEED POT; LOW SIDE: (TERMINAL 3, SP3)

SP3 is the common for the analog speed input.

An isolated 0 to 10VDC process signal may be used to provide a speed reference signal. The plus (+) should be tied to SP2, with the negative (-) to SP3. Note that the MAX speed adjustment will not be active when using a process signal and that 0 to 10VDC = 0 to 110% output. Refer to the figure on page 5.

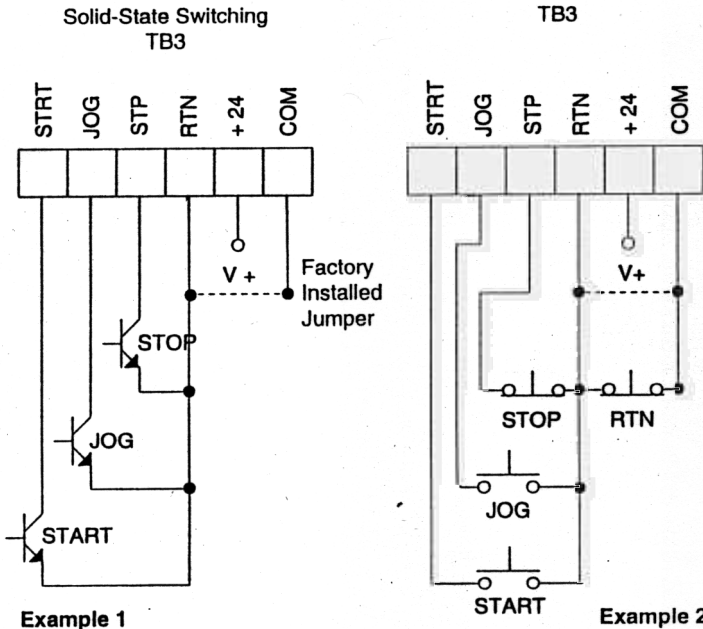
NOTE: Only the speed inputs on TB4 or the cover mounted speed pot (on enclosed units) should be connected at one time. If both are connected, a runaway condition may result.

Caution: Remember that terminals 4 and 6 (RTN & COM) must be jumpered together, as shipped from the factory.

An open condition between RTN and COM will cause the C2000 to ignore any START or JOG commands, if wire W4 is in place. If W4 has been clipped for a cycle on demand application DO NOT use the RTN terminal, keep the factory jumper between terminals 4 and 6 in place. The RTN is only a logic convenience and is NOT meant to operate as an Emergency Stop. An Emergency Stop can only be accomplished by removing the AC line from the L1 and L2 terminals. This may be accomplished by utilizing a circuit breaker, contactors or equivalent rated switching device appropriately sized.

EXAMPLE 1: Solid-state switching devices, such as NPN transistors or proximity switches may be used for logic commands if they are capable of switching 30 VDC, at 24 mA, with an off-state leakage current of less than 1 mA.

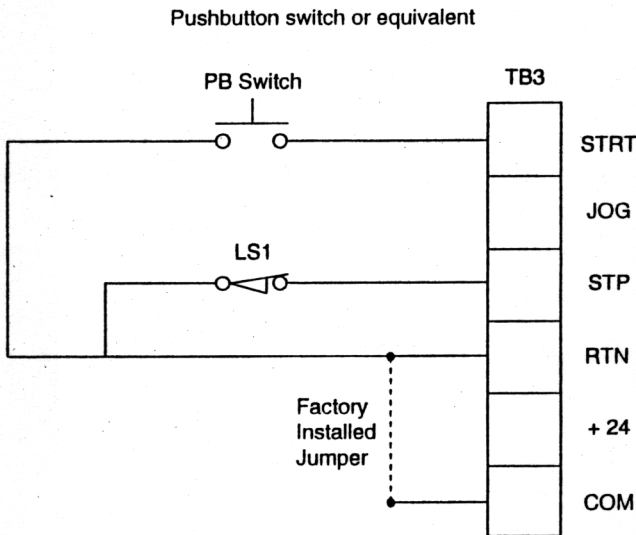
EXAMPLE 2: For optimum operation, contacts used on logic inputs should be rated for low-level logic switching (i.e. gold contacts).



Application Data

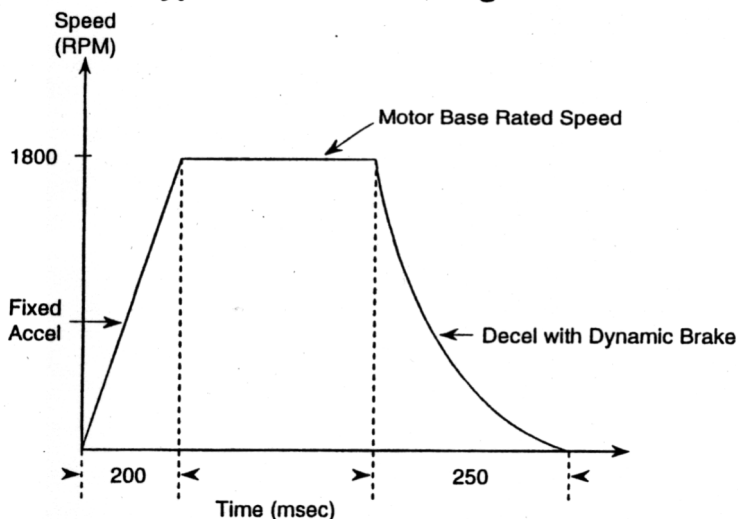
Cycle on Demand Application

In many cycling applications a specific start/stop sequence is desired, referred to as a cycle on demand operation. Basically a Cycle on Demand provides the following logic: Start overrides Stop, Stop is an "opening-edge-sensitive" momentary command, Start is a momentary, latching input. In order to operate correctly in this mode, Both wires W4 and W5, on the C2000 circuit board, must be cut. Refer to the component location drawing on page 16 for W4, W5 location and wiring diagram below for logic wiring.



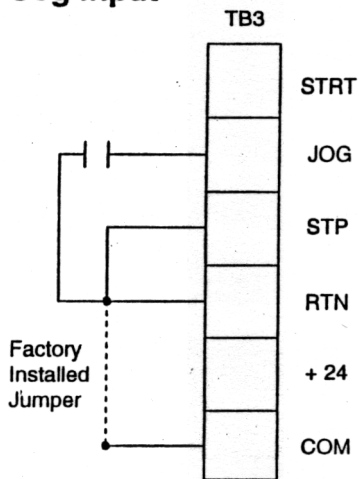
The diagram demonstrates a simple wiring configuration for a cycle on demand application. This example assumes W4 and W5 have been clipped. The push-button switch, is a normally open (NO) momentary closed switch. LS1 is a normally closed (NC) limit switch. The start switch initiates the cycle. When LS1 opens, the C2000 will dynamically brake to a stop. Cutting W4 allows the units to stop based on a momentary open condition on the STOP terminal. Even if LS1 is left in its open condition, initiating a start will take priority over the LS1 switch. Priority is accomplished by clipping W5. LS1 is typically riding on the cam lobe when opened. Once the PB switch initiates another cycle, LS1 will ride off the lobe (close) then open when the lobe is encountered. The Start/Stop cycle is then repeated.

Typical C2000 Indexing Profile



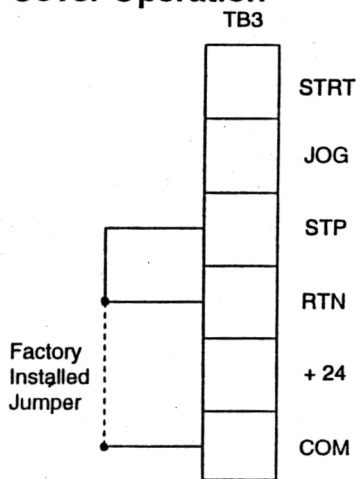
Maximum Cycle rate: 30 cycles per min. with typical 1 HP motor.
 Total reflected inertia not to exceed 20% of armature inertia.
 Acceleration (Fixed at 0.2 sec) may be extended when operating in Current Limit.

Jog Input



Using a single external command for control

Cover Operation



NOTE:
 W4, W5 do not matter

Start-up Procedures

C2000 Operation Test Using Front Cover



WARNING

When power is on, use caution during these procedures because line voltage will be present on the power and motor terminals as well as the printed circuit board.

NOTE: Verify that wires W4 and W5 are in the appropriate positions for your application. If, at any stage of the procedure, the control does not act as indicated, refer to the Troubleshooting Guide.

1. With AC power off, check to be sure that all power and control connections are properly secured and connected according to the Hook-up instructions.
2. Set the speed pot on the enclosure cover to minimum speed counter-clockwise (CCW).

NOTE: You must observe steps 3 and 4 below when using the C2000's front cover for operation.

3. Place a jumper across STP and RTN terminals 3 and 4.
4. Verify there is a temporary jumper across RTN and COM terminals 4 and 6 (factory installed jumper).
5. Apply power to the control, the Power ON LED should light.
6. Push the RUN/JOG/STOP switch to the START position.
The motor SHOULD NOT turn.
7. Slowly rotate the speed pot in a clockwise direction. The motor should begin turning. Continue to rotate speed pot until desired motor speed is achieved.
8. Push the RUN/JOG/STOP switch to STOP (or open terminals 3 and 4). The motor will brake to a stop.
9. Hold the RUN/JOG/STOP switch to the JOG position. The motor should run at the set speed.
10. Release the RUN/JOG/STOP switch and the C2000 should brake the motor to a stop.

Adjustment Procedures

The C2000 has been set up at the factory to satisfy most applications needs. You may, however, wish to tailor your control to your application requirements. If so, follow these instructions for proper set-up:

Factory Settings

MAX SPEED (SPD)	90 VDC output for 120 VAC line 180 VDC output for 240 VAC line
CURRENT LIMIT (CL)	100% of control rating

NOTE: It is recommended that before making any adjustments, the C2000 and machine should run for at least 30 minutes to allow the motor temperature to stabilize.

Maximum Speed adjustment (SPD) (Clockwise increases maximum speed)

SPD may be adjusted from 50% of motor base speed to approximately 110% of base speed. Caution should be taken not to exceed maximum speed rating on the motor nameplate.

With motor operating at full load and the front cover speed pot turned clockwise to maximum, adjust the SPD trimpot until desired speed is set.

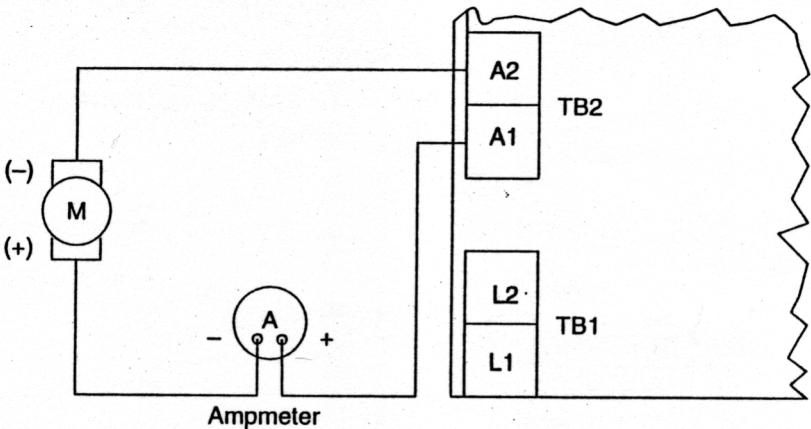
Current (Torque) Limit Adjust (CL)

CL may be adjusted from 10 to 150% of control rating. (Clockwise increases output current.)

Warning:

DO NOT set for current greater than either the motor or C2000 nameplate rating.

1. Turn AC power off.
2. Lock up motor shaft, taking care not to cause damage.
3. Connect a DC ammeter in series with the motor armature.
4. Turn CL trimpot fully counter-clockwise.
5. Turn front cover speed pot fully counter-clockwise.
6. Turn AC power and give the C2000 a RUN command.
7. Turn front cover speed pot clockwise to about 1/3 speed setting.
8. Adjust CL trimpot clockwise (observing ammeter) until desired motor current is reached (normally motor nameplate Amperage rating).
9. Turn off AC power, disconnect ammeter, and lock motor shaft.



NOTE: If your ammeter is reading negative, reverse it's lead polarity.

Troubleshooting Guide

Motor Will Not Run:

1. Make sure disconnect fuses or circuit breaker in line are okay.
2. Check line fuse on PC board and if open, replace.
3. Verify that the Power ON LED is lit.
4. Check logic. See Start-up Procedures and Application Section.
5. Be sure speed pot is not set to zero.
6. Unit is in current limit.
7. With power removed from unit and motor leads disconnected, check for worn or improperly seated brushes.
8. Check for locked motor shaft.
9. Defective control.

Fuse Blowing:

1. Improper wiring - check wiring for mis-routing, shorts and shorts to ground.
2. Motor brushes worn or improperly seated.
3. Motor load is too heavy. Check for machine "jam-up" or excessive load.
4. Defective control.

Braking Non-Functional (control may not stop):

1. Check wires W4 and W5.
2. Motor brushes worn or improperly seated.
3. W4 and W5 are cut, and a START/JOG is being maintained.
4. Defective control.

No Speed control:

1. Speed pot or wiring defective.
2. Control not set up properly (see Start-up Procedures).
3. Defective control.

Motor Will Not Run at 1725 RPM:

1. Improper setting of SPD trimpot - rotate pot clockwise to increase speed.
2. Unit is in current limit.
3. Low line voltage.
4. Verify motor nameplate voltage complies with control output voltage rating.
5. Defective control.

Component Location

