

# Compact 1000 Circuit Description

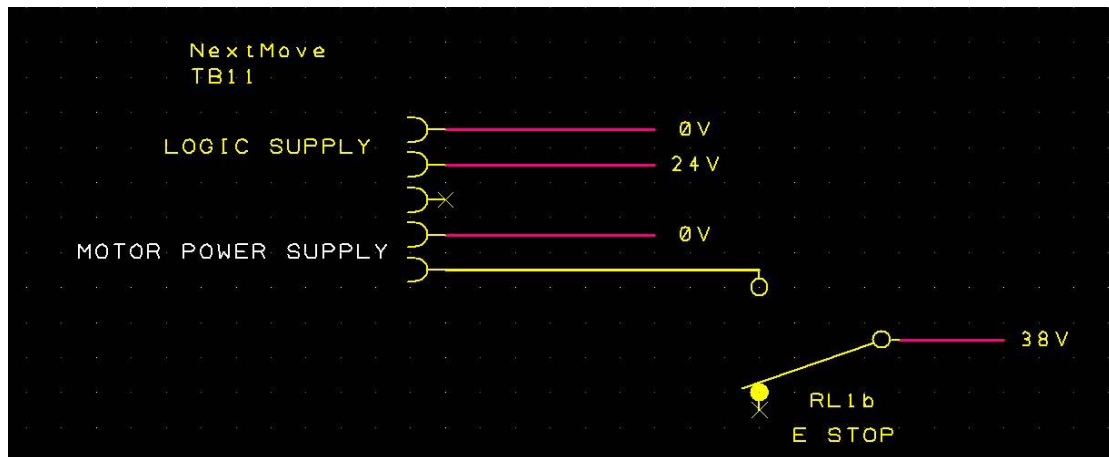
## Power Supply

The compact 1000 is designed to run from 115V or 230V ac at 50 or 60Hz. The voltage selection is made at the factory by wiring links to Conn5 on the distribution PCB,

The mains supply is connected to the machine through a switched and fused inlet unit. The fuse is located in a draw located below the socket for the mains lead. (a spare fuse is also located in the draw)

The power passes through a mains filter then into the distribution PCB on Conn1.

The mains then supplies a transformer (protected by FS1) which then creates a 24V dc Control output and a 38V axis motor supply.



### 24V dc Supply

The 18Vac secondary winding from the transformer is protected by FS3. The 18V is rectified and smoothed to give 24V dc. When the 24V is present LED1 on the distribution PCB is illuminated.

This supply is used to control all the machine logic and control relays. This supply is present when ever the machine is connected to the power.

When the 24V is present the 7 segment display on the NextMove controller will be illuminated.

### 38V DC Supply

The 38V supply is created by rectifying the 28V secondary of the transformer.

When the 38V is present and the machine is not in E-Stop LED 2 is lit. When the E-Stop is pressed the LED goes out.

The 38V is connected directly to the Nextmove controller on TB-10.

### Power Supply Checks

Power on the machine

- Check LED 1 is lit
- Check the 7 segment display on the next move is lit
- Release the E-Stop and check LED 2 is lit
- Measure the voltages on TB11 of the NextMove
- Measure the 5V, +12V and – 12V on the NextMove TB10

Simple checks if you do not have a meter

If the 7 segment display is lit on the Nextmove the 24V supply is probably OK

Try to turn any of the leadscrews with the E-Stop pressed and they should turn, release the E-stop and the motor power should hold the screw so it cannot be turned. If this is the case the 38V supply should be OK.

## The Emergency Stop Circuit

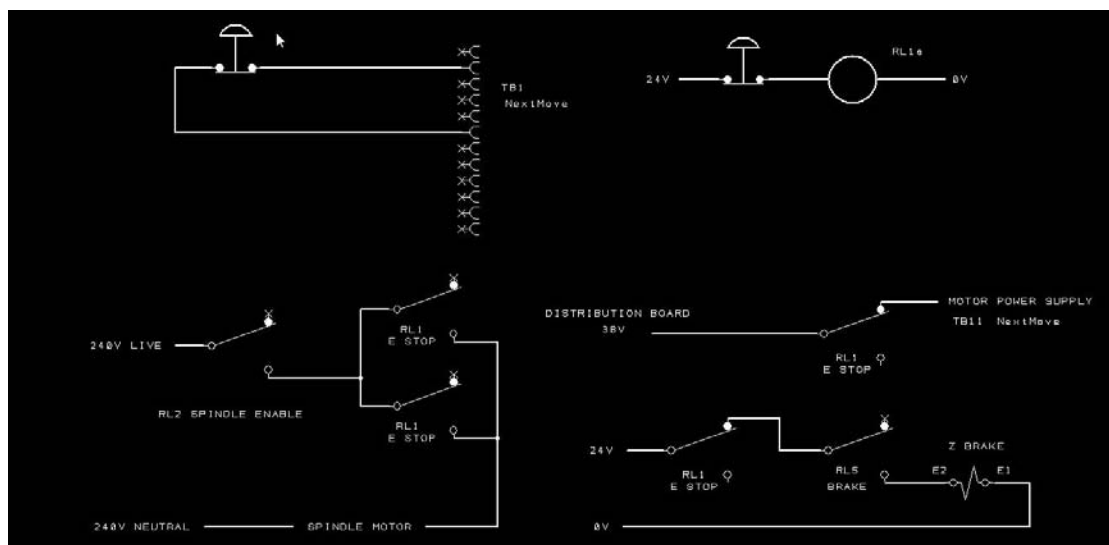
The emergency stop circuit is a failsafe system that ensures the machine cannot run in a dangerous state.

The emergency stop push button has two contacts either of which will make the machine go into a safe mode. The first contact signals to the microprocessor that the machine should stop. The microprocessor will instantly stop the spindle and axes and prevent the machine restarting until the button is released.

The second contact is used to drive the Emergency stop relay. This also prevents spindle operation and axis motion as well as applying the brake to the Z axis motor.

The first contact of the E-Stop button is wired directly to TB1 on the NextMove. This signal is used to create all the software interlocks but also to display the E-Stop message in the control panel.

The second contact is wired directly to Conn 8 on the distribution PCB. This switches 24V to the coil of RL1. If the button is pressed the 24V is removed and the relay de-energises (as it would in the case of power failure). Only when RL 1 is energised can the spindle or axes motors receive power. RL 1 also supplies power to release the Z axis brake. So if the E-Stop is Pressed or the power fails the Z brake will lock and prevent motion.



### E-Stop Checks

With the machine powered up and the software connected to the machine press the E-Stop Button. A red message will appear in the control panel.

Look at the 7 segment display of the NextMove control card and when the E-STOP is pressed the letters: E . S t O P scroll round on the display

Press and release the E-Stop button and check the E-Stop relay (RL 1) energises and de-energises.

If the 24V supply is failed the above tests will not function.

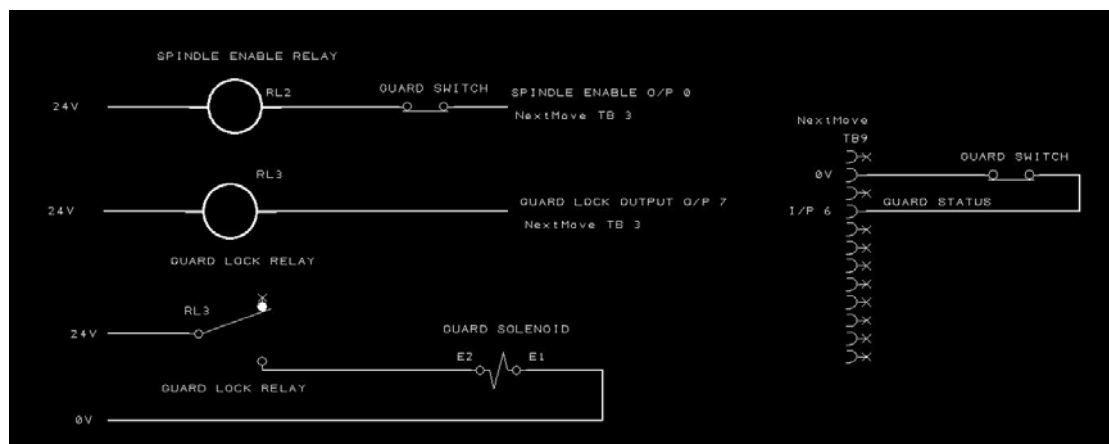
## The Guard Circuit

The guard switch electrically and mechanically interlocks the machine door. There are two sets of normally closed contacts on the switch.

One contact is used to let the NextMove know the guard status by connecting Input 6 to 0V when the switch is closed (this allows the software logic to limit the speed of axis travel, disable the spindle and display a warning message in the control panel).

The second contact is in series with the spindle enable relay coil and prevents the spindle starting even if there is a logic failure.

There is also an electro magnetic solenoid which locks the guard when the E-stop is pressed, the power is removed or the spindle is running. The solenoid is energised to unlock the guard. There is a software time delay on the guard release to allow the spindle motor time to stop before allowing the door to be opened.



## Guard Checks

If the Guard cannot be opened check the following

- The 24V logic supply
- The E-Stop button is released
- The spindle is not running
- The machine is powered on and connected to the software

## Spindle Circuit

The spindle circuit on the Compact 1000 is very simple as the motor is either on or off and is connected directly to the mains supply switched through the E-stop Relay and the Spindle enable Relay.

Relay 2 is the Spindle enable Relay. The coil of this relay is energised when Output 0 turns on provided that the guard interlock contact is closed.

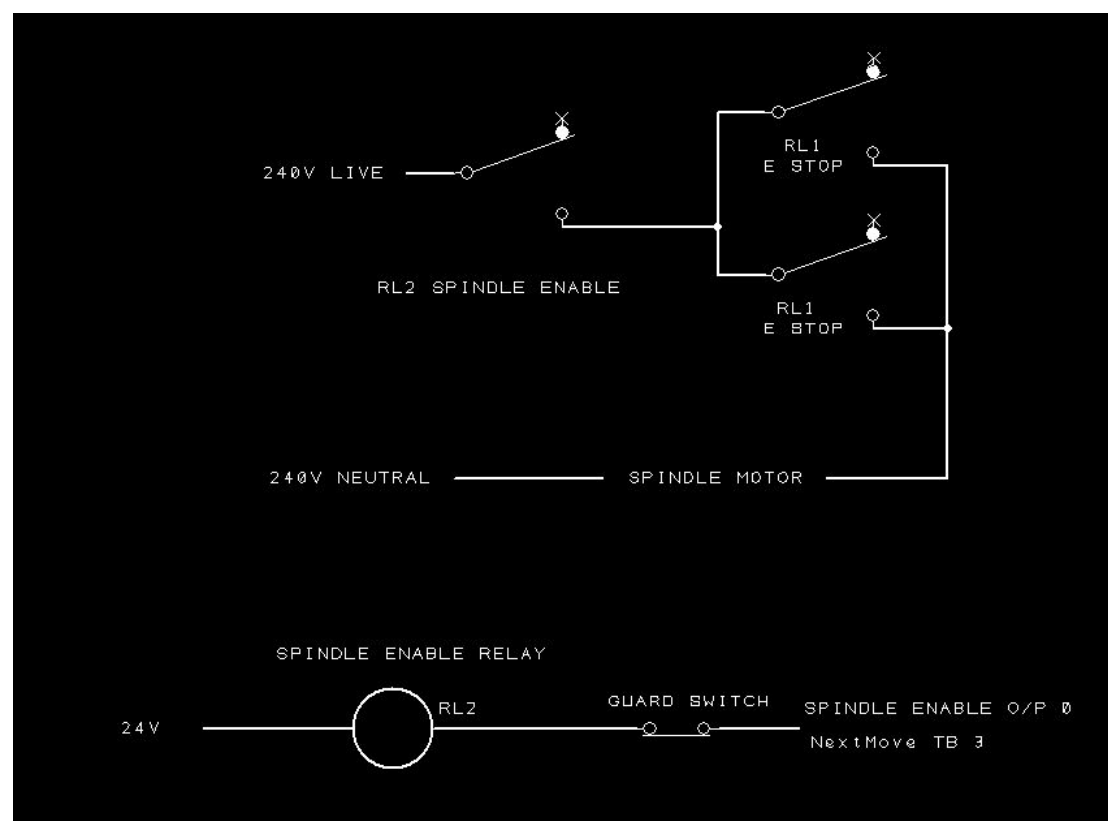
Then provided the E-Stop relay is energised (which it would have to be otherwise the logic would not let output 0 turn on) the 240V is connected to the motor.

The Mint logic checks that the machine is not in E-Stop, the Guard is closed and that there is a demand for the spindle to start before letting Output 0 turn on.

Pressing E-stop would cause the E-Stop and Enable relays to de-energise and disconnect the spindle motor.

Relay 3 will de-energise when either the spindle is running or the E-stop is pressed or the power is removed from the machine. This locks the guard to ensure the machine is safe. The relay re-energises (unlocking the guard) after a time delay once the spindle has stopped or the power has been applied.

**Note:** There is a switch on the spindle motor. This should be left in the on position!  
FS2 a 10A F rated fuse protects the spindle.



## **Axes Motors**

The axes motors are powered from the 38V DC supply that is connected to TB 11 of the NextMove.

The axes are energised whenever the machine is powered on and the E-Stop is not pressed.

The Z axis motor is fitted with a brake to prevent the axis moving downward if the power fails or E-stop is pressed.

The motors are controlled by stepper motor drive chips mounted on the Nextmove base board.

There is a fuse fitted on the NextMove board to protect the stepper drives.

### Fault Finding

- Check LED 2 is lit when the machine is not in E-Stop
- Check the 38V supply on TB11 of the NextMove
- Check the fuse on the NextMove
- Check the Feed override is not at Zero
- Open the guard and check the motors are energised by trying to turn a screw, then Press E-stop and see the resistance disappears.
- If only one drive fails to move, press E-Stop or power off the machine and switch stepper motor outputs on the NextMove card.

## **Home Sequence and Switches**

The homing switches on the machine are mechanical. The switch sense is normally closed (opening when the machine is home).

When an axis home request is sensed the axis first looks at the switch, and then if the switch is not open (the axis is not at home) the axis drives at a medium feedrate towards the home switch. Once the switch is opened by the axis it slows to a stop then reverses back slowly until the contact of the switch is made again. This is the home position.

If when the homing request is made the axis is on the home switch (the contacts are open), then the axis just drives slowly away and stops as soon as the switch closes.

## Fault Finding

There are two things that could happen when homing fails.

If the axes do not move at all check the motor power and that the drives are energised (the ball screws have resistance when e-stop is released)

The NextMove control card should display h when homing has been requested.

The machine could travel towards the switch then stall. The machine will make a noise but never home. Eventually a time out warning message will appear.

This could be because of several things:

- There could be a debris or a component blocking the axis travel so the axis never reaches the switch
- The switch could be faulty and permanently short circuit
- The switch could be miss positioned so that it never actuates
- There could be a mechanical problem stalling the axis

You can check the home switch function by pressing the switch manually. From VR Milling 5.23 onwards a green indicator shows in the control panel window when the switch is activated.

You can use the secret home button to allow the axis to be jogged in the opposite direction so you can clear any obstruction from the travel

Check the switch is being activated by the axis

The second homing failure will result in the axis jogging slowly away from the home switch eventually stalling at the opposite end of axis travel.

Again pressing ESC will abort homing.

This would be caused by the home switch being permanently open circuit

- Check the switch by manually pressing and watching the icon on the control panel.
- Vacuum the switch while manually clicking it to release any debris trapped between the contacts
- The switch could be broken
- The wiring of the switch could be open circuit

## ***General Test Procedure***

1. Measure the power supply at the site. The voltage should be between 220 and 250Vac
2. Check the machine serial number label to see the voltage matches the supply
3. Power on the machine. Check the neon illuminates in the switch and the machine light comes on in the cabinet.
4. Check LED 1 and 2 are lit on the distribution board
5. Check the 7 segment display is lit. The link below shows the meaning of the display. <http://www.denfordata.com/bb/files/NextStepLEDSWEB.htm>
6. Press the E-Stop button and release it. Ensure Relay 1 the E-Stop relay energises and de energises.
7. Measure both power supplies on TB 11 of the next move. 24V DC and 38V DC
8. Check the guard has unlocked and can be opened.
9. Connect the computer to the machine and ensure it communicates.
10. Home all 3 axes in turn.
11. jog each axis and ensure that they travel smoothly
12. Check the spindle starts.
13. Check the guard locks when the spindle is running, or the E-Stop is pressed.
14. Jog the axes and check the feedrate override functions correctly
15. Open the guard and check there is a warning message on the control panel
16. E-Stop the machine and check there is a warning message on the control panel.

## **I/O and Relay designation**

### **Inputs**

The inputs are activated by connecting them to ground. They have an internal pull up on the NextMove card that connects them to 5Vdc when not operating.

The readings on the input can be measured with a meter and will read either 5V or 0V.

#### **TB1**

STOP	Emergency stop Input
X DATUM	X Datum switch
Y Datum	Y Datum switch
Z Datum	Z Datum switch

#### **TB9**

I/P 6	Guard Status
I/P 1	Vacuum Pump push button

## **Digital Outputs**

#### **TB3**

Out 0	Spindle Enable
Out 6	Vacuum Pump Enable
Out 7	Guard Un-Lock

#### **TB2**

Out 15	Z axis brake release
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## **Relays**

RL1	Emergency stop relay
RL2	Spindle Enable
RL3	Guard Lock Relay
RL4	Vacuum Pump Relay
RL5	Z Brake Relay

## Tips and passwords

- Double clicking on the banner of the flash screen at start up loads the software without having to wait for the timer
- Password for VR Milling functions is denny
- Easy upgrader has several hidden features:
  - Double clicking in the banner launches an option to force firmware
  - Right clicking on the banner gives two options: Advanced and Card Test. The passwords are “dave” and “tristar”
- Secret home button activated by double clicking between home all and home X.  
<http://www.denfordata.com/bb/viewtopic.php?t=53&highlight=secret>
- Technical forum <http://www.denfordata.com/bb/index.php>
- My e-mail address: [soddy@denford.coi.uk](mailto:soddy@denford.coi.uk)