

SmartFan® Nimbus II

Programmable AC Fan & Motor Controller



Nimbus II is our 5th generation off-the-shelf 120/240VAC single phase controller compatible with TRIAC controllable fans and motors rated up to 7 Amps. The Nimbus II can be customized for your application using the **Navigator** hand-held programmer (pictured above). The Navigator can be used to create fan/motor speed control curves based on a control input such as a thermistor (temperature control), a variable voltage source (up to 10Vdc) or current source (up to 20mA). Other programming variables include: on/off set points, alarm trigger points and startup voltage options. Simply plug the Navigator into a powered Nimbus II and scroll through the 12 variable menus, selecting the control inputs for your application. Programmed profiles can be saved and copied to multiple controllers with ease. Other features added to the Nimbus II include on-board fusing, improved electrical noise immunity, 10X improvement in control loop response and isolated control inputs.

Part Number	Current Rating (40°C)*	Description
TRC0300	0.08 - 3A	Board Only w/o EMI filter
TRCE600	0.15 - 6A	Board Only with EMI filter
TRCE700	0.15 - 7A	Board with EMI filter & mounting plate / heat sink
TRCC600	0.15 - 6A	TRCE700 & Cover
PRG00-F	n/a	Navigator Hand Held Programmer
TRC3KIT	0.08 - 3A	Includes TRC0300 & PRG00-F & mounting standoffs
TRC7KIT	0.15 - 7A	Includes TRCE700 & Cover & PRG00-F

*See fig. 1 for derating above 40°C

Specifications

- Power Source: 65-277VAC, 50-60Hz automatically detected
- Approved Motors: TRIAC controllable PSC or Shaded Pole rated up to 7A
- Dimensions See Fig. 2
- Weight:
 - TRC0300 = 2.1 oz. (58 grams)
 - TRCE600 = 3.0 oz. (84 grams)
 - TRCE700 = 4.4 oz. (123 grams)
 - TRCC600 = 6.5 oz. (183 grams)
- Operating Environment: -20 to 40°C,
- 0-95% RH (see fig. 1 above 40°C)
- Control Input:
 - S-series or P-series thermistor
 - Up to 10Vdc input
 - Up to 20mA input

- Lower voltage drop at full speed (approx. 1%)
- Compatible with temp. sensors with tighter tolerance at lower cost
- 10X improvement in control loop response
- On board Power/Fault LED
- All isolated inputs = added safety
- Programmable Soft start or full voltage startup
- Enclosure option

Advantages over first generation Nimbus controller

- Easy menu driven digital programming
- Wider & more detailed programming options for increased accuracy and flexibility
- Save and copy control variables from unit to unit.
- Improved electrical noise immunity (TRCEx00 and TRCC700 only)
- On-board fusing

Other Features

- Navigator Programmable variables
 - Control Input: Temp, VDC, mA
 - Min. & Max. motor speed
 - Min. & Max. control signal
 - Motor ON/OFF set points
 - Speed on signal loss
 - Alarm trip points
 - Control stability
 - Startup mode
 - Temp. sensor series
- Accepts up to 3 or'd temp. sensors
- RoHS compliant
- Factory programming for orders of 50 units and up
- 2-year warranty
- Made in the USA
- UL recognized, file E100344

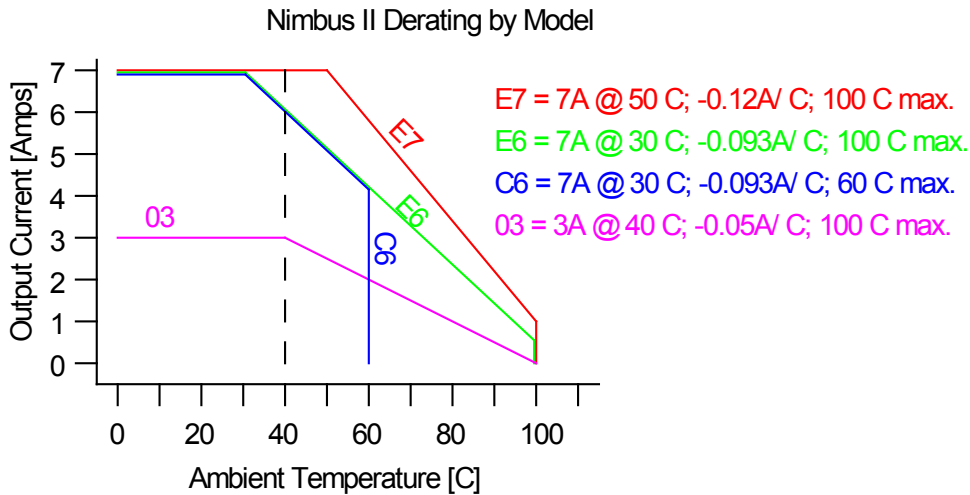
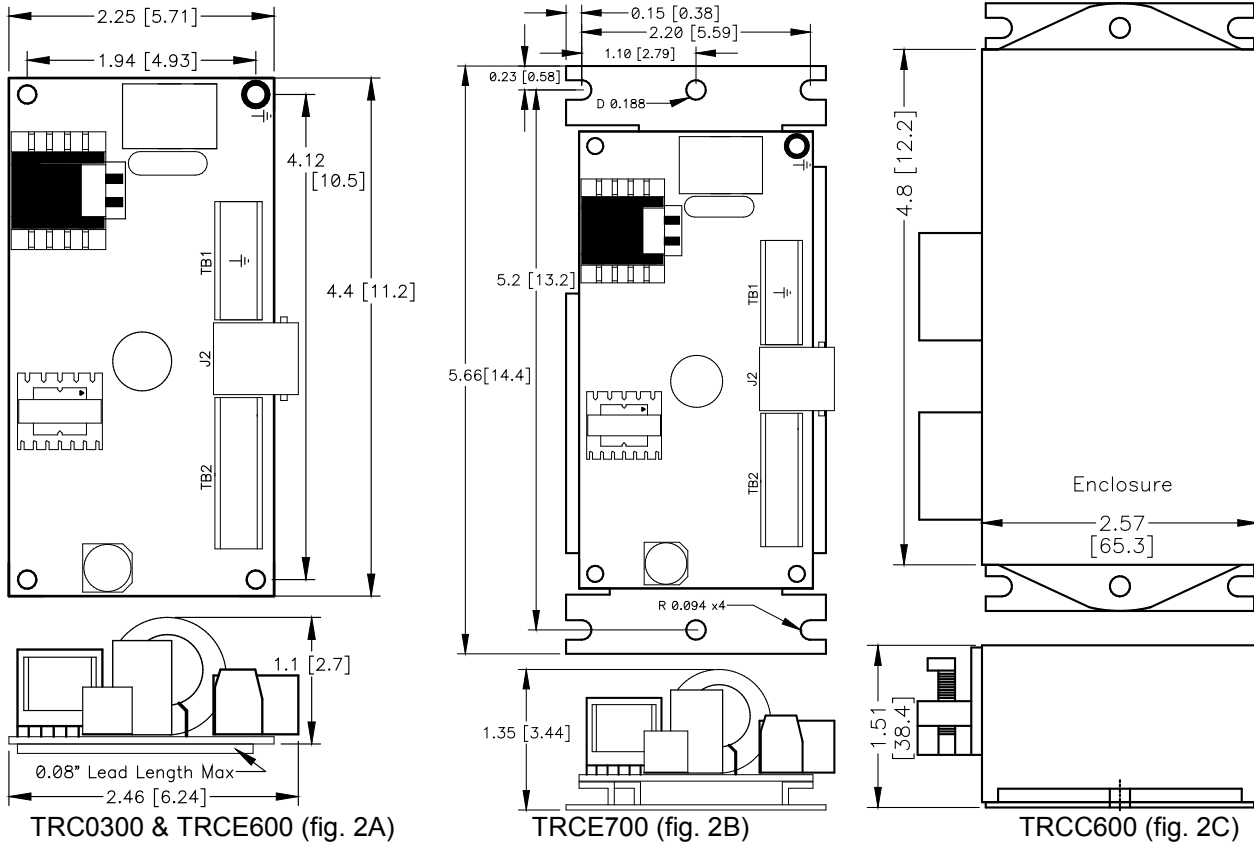


Fig. 1



TRIAC COMPATIBILITY



WARNING: Before connecting your motor, contact the manufacturer to confirm it is compatible with TRIAC control. Attempting to control a motor that is not compatible could cause excessive heating and permanent damage.

INSTALLATION

MOUNTING



WARNING: The **SmartFan Nimbus II** is a high voltage product and does generate heat. To maintain safety and reliability, mount in a ventilated enclosure so as to maintain an operating temperature of 40°C or less. See Fig. 1 for derating above 40°C. It is recommended that the Nimbus II be mounted to minimize the connection to the motor to 40" (1 meter) or less. Configurations over this distance should be tested and verified before deployment.

Models TRC0300 & TRCE600

Using hardware of your choosing, mount the unit on a flat surface using the four .156" (4.0mm) mounting holes. The Nimbus II must be connected to earth ground through the grounding pad or terminal block (ref. fig. 2A,3) **Note:** To meet UL safety recommendations without using an insulator, the unit must be mounted using spacers of a least 0.22" (5.6mm) from a conductive surface.

Models TRCE700 & TRCC600

The TRCE700 can be mounted using any of the six .188" (4.8mm) Dia. holes/mouse-holes found in the aluminum mounting plate/heat sink. When mounting the TRCC600 (TRCE700 & cover) refrain from using the two .188"D holes to fasten the aluminum plate/heat sink until after the cover is in place. The Nimbus II must be connected to earth ground through the aluminum plate/heat sink or terminal block (ref. fig.2B,3).



WARNING: Under full load, the aluminum plate/heat sink can rise to 35°C above ambient (55°C (131°F) at room temperature) when not mounted to a thermally nonconductive surface.

CONNECTIONS

All permanent connections are made through terminal blocks and are inserted from the in-board side. Multiple wires can be attached to each connection, but when using a single wire, the maximum wire size is 12 awg. Maximum torque is 4.4 in-lbs. For model TRCC600 (TRCE700 & cover), run all wires through the strain relief in the cover before attaching to the terminal block. Run motor & power wires through the strain relief closest to the motor/power terminal block. Run all other connections through the second strain relief.

Fan/Motor (TB1, F/N)

The Nimbus II can control multiple fans when connected in parallel if the total current rating does not exceed the rating of the controller. Connect fans to TB1, F and N. **WARNING:** Fans often draw a startup current exceeding the run current. Startup current must be limited to twice the current rating of the SmartFan Nimbus II model chosen.

Power (TB1, N/L)

Make sure power is turned off before connecting to the Nimbus II. Connect power 95-265VAC, 47-63Hz to TB1 connections N (neutral) and L (line). Nimbus II will automatically detect voltage and frequency. Keep power off until mounting and connections are completed.

Earth Ground (TB1)

A connection to earth ground must be made through TB1 or the grounded mounting hole found on models TRC0300 & TRCE600 or the aluminum plate/heat sink for models TRCE700 & TRCC600.

Thermistor (TB2, RTN/T1/T2/T3)

When controlling motor speed via temperature, connect up to 3 Control Resources temperature sensors, (ref. fig.3) found at www.controlresources.com/sensors. The Nimbus II will automatically control motor speed according to the hottest thermistor reading. Note: When using more than one sensor, make sure they are all from the same series (S-series or P-series).

Connecting a Voltage or Current control source (TB2, RTN/T1)

When controlling from a voltage source up to 10Vdc or a current source up to 20mA, connect – to RTN and + to T1 (ref fig. 3).

Alarm Connection, optional (TB2, -ALM+)

The Nimbus II can trigger a remote alarm when the control signal is lost or when the control signal (temperature, voltage or current) reaches a threshold programmed by the user. An on-board Status LED will also turn from green to red in an alarm condition. The alarm is a normally open, optically isolated MOS Relay. When no alarm is present, the relay is closed and can conduct up to 100mA AC or DC. When the alarm is triggered, the relay opens, supporting up to 300 Volts AC or DC across the terminals. Ref. Fig. 3 showing 4 alarm connection options.

Installation & Operation Manual – Nimbus II

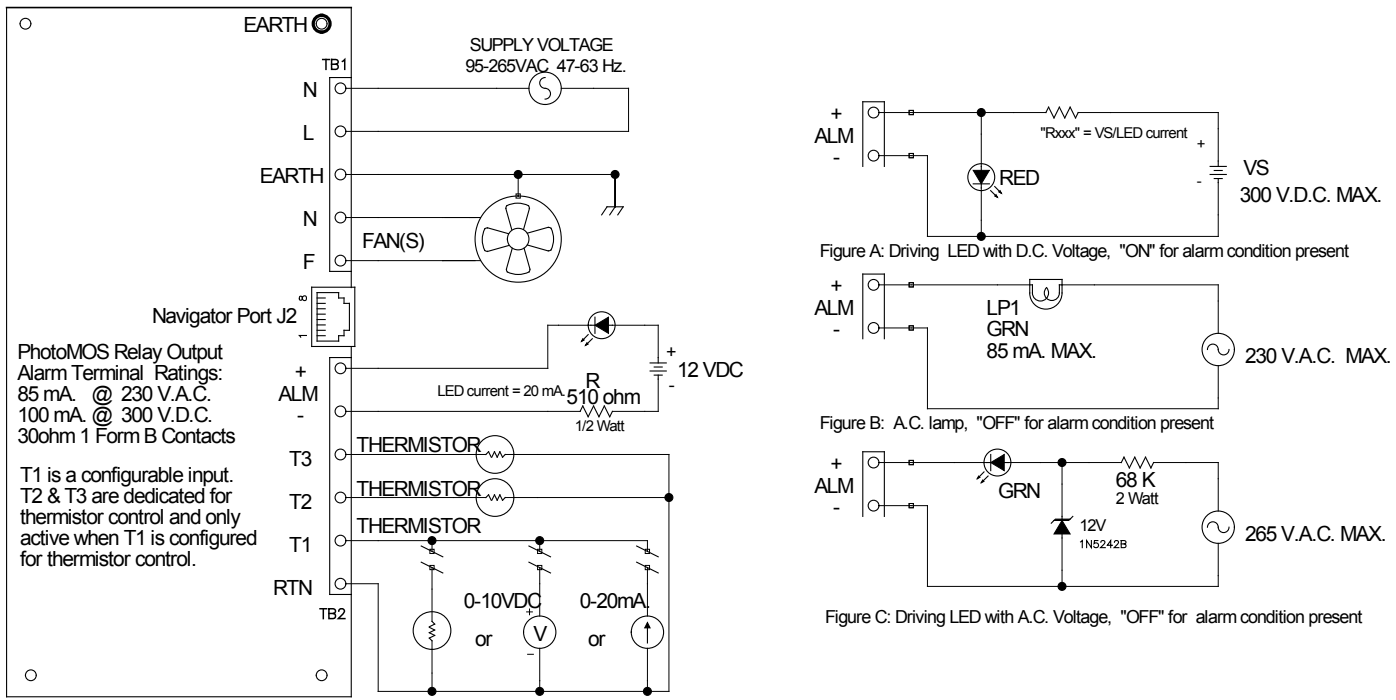


Fig. 3

Nimbus II / Navigator Menu (Table 1)						
Select Input Type	°C		Vdc		mAdc	
	Default	Range	Default	Range	Default	Range
Speed on Signal Loss	Full	Full, Idle	Full	Full, Idle	Full	Full, Idle
Full Speed	100%	30 – 100%	100%	30 – 100%	100%	30 – 100%
Idle Speed	50%	30 – 100%	50%	30 – 100%	50%	30 – 100%
Full Input	40°C	-20 - 80°C	6.0V	0.0 – 10.0V	12.0mA	0.0 – 20.0mA
Idle Input	35°C	-20 - 80°C	5.5V	0.0 – 10.0V	11.0mA	0.0 – 20.0mA
On Input	Disabled	-19 - 80°C, Disabled	Disabled	0.1 – 10.0V, Disabled	Disabled	0.1 – 20.0mA, Disabled
Off Input	Disabled	-19 - 80°C, Disabled	Disabled	0.1 – 10.0V, Disabled	Disabled	0.1 – 20.0mA, Disabled
Alarm Trip	Disabled	-20 - 79°C, Disabled	Disabled	0.0 – 9.9V, Disabled	Disabled	0.0 – 19.9mA, Disabled
Stability	2	2,4,8,16,32	2	2,4,8,16,32	2	2,4,8,16,32
Start Pulse Mode	Soft Start	Soft Start, Full	Soft Start	Soft Start, Full	Soft Start	Soft Start, Full
Select Probe	S - Series	S, P	n/a	n/a	n/a	n/a

PROGRAMMING

Initial Setup:

Connect Navigator to the Nimbus II through the RJ45 connectors using the CAT5 cable supplied with the Navigator. Apply power to the Nimbus II to enable programming via the Navigator. Navigator will display its current revision briefly then show it is ready for programming.

Nimbus II
is ready

Pressing any of the four bottom keys will enter the Programming Menus.

- ❖ **Next:** Advances to the next menu
- ❖ **Previous:** Goes back to the previous menu
- ❖ **▲ or ▼:** Selects choices within a menu
- ❖ **Write Drive:** Saves all the settings currently programmed in the Nimbus II. All programmed settings will be lost if power is removed before the write drive key is set.
- ❖ **Read Drive:** Reads the settings from the connected Nimbus II.
- ❖ **Save and Recall Program:** Stores and retrieves profiles stored in the Navigator's internal memory.

Input Type:

Input Type
→ °C

The first menu is used to select the control input type. Use the ▲ or ▼ keys to select °C (temperature control), Vdc (voltage control) or mAdc (current control). The Nimbus II will automatically switch to the control type selected in real time. **Note:** All programming menus will automatically adjust in real time, but will be lost during a power cycle unless the **Write Drive** key is selected. Press the **Next** key to continue.

Speed on Signal Loss:

Speed on Signal
Loss → Full

The speed on signal loss menu is used to set a fail-safe motor speed in case the control signal is lost. Options are "Full" (simulating the programmed motor speed at "Full Input") or "Idle" (simulating a control input of -25°C (in temperature mode), 0Vdc or 0 mAdc in voltage or current mode), Ref. Fig. 4. You may want to consider coming back to this menu after the variables in the

control curve (Fig. 4) have been set. Press the **Next** key to continue.

Set Full Speed:

Set Full Speed
→ 100%

The Set Full Speed menu is used to select the voltage (as a percentage of line voltage) your motor will see at the full control input. Example 1: If you are controlling fan speed via temperature, your supply voltage is 110VAC and you want to run your fan at 93VAC when your system temperature reached 45°C and above. You would choose $93/110 = 85\%$ as the "Full Speed" setting and 45°C for the Full Input setting, Ref. fig. 4. Example 2: If you are controlling motor speed with a 2 – 8Vdc control signal, your supply voltage is 208VAC and you wanted your motor to see 114VAC at 8Vdc, you would set the Full Speed at $114/208 = 55\%$. **Note:** You can create a negative slope control curve by making your "Idle Speed" greater than your "Full Speed".

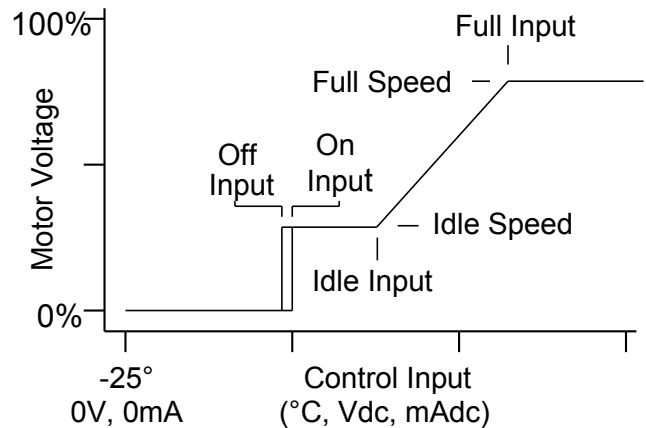


Fig. 4

Set Idle Speed:

Set Idle Speed
→ 50%

Select the voltage (as a percent of Line voltage) your motor will see (not less than 30%) at the "Idle Input" point. Ref. Fig. 4. **Note:** Some AC motors do not run consistently at or below 30% of line voltage, be sure you motor will run at the voltage you select here.

Installation & Operation Manual – Nimbus II

Set Full Input:

```
Set Full Input  
→ 40°C
```

When controlling temperature, set the Full Input to the temperature at and above you want the fan/motor to run full speed.

When controlling via a voltage or current signal, set the full input to the maximum input for your voltage or current control. Ref. Fig 4.

Note: The Full Input cannot be set below the Idle Input.

Idle Input:

```
Set Idle Input  
→ 35°C
```

When controlling temperature, set the Idle Input to the temperature at and below you want your fan/motor to idle. **Note:** In a closed loop system (controlling exhaust air), the difference between the Full and Idle temperature can often be as small as 3° - 5°C.

When controlling via a voltage or current signal, set the Idle Input to the minimum input for your voltage or current control. Ref. Fig 4.

Set On Input:

```
Set On Input  
→ Disabled
```

The Nimbus II can be programmed to turn the motor on and off at a certain input temperature (temperature control only), voltage or current. In the default setting, this feature is disabled. When disabled, the motor will always run at the "Idle Speed" at or below the "Idle Input" setting. Use the ▲ or ▼ keys to select the temperature, voltage or current at which you want your motor to turn on. **Note:** When enabled, the On input must always be set at or below the Idle Input and above the Off Input. Ref. Fig. 4

Set Off Input:

```
Set Off Input  
→ Disabled
```

To turn your motor off at a certain temperature, voltage or current, use the Off Input menu. **Note:** The Off input must always be set below the On input. In a closed loop system, avoid oscillation by increasing the separation between the On and Off inputs. Ref. Fig. 3.

Set Alarm Trip:

```
Set Alarm Trip  
→ Disabled
```

The Nimbus II has a programmable alarm that will trigger a signal at TB2 output -ALM+. In an alarm condition, the "Status" LED will turn red and your motor will switch to "Full Speed". The default status of the Alarm Trip point is Disabled. Use the ▲ or ▼ keys to select the temperature, voltage or current at which you want to trigger an alarm. The alarm will automatically clear once the alarm condition is removed

Stability:

```
Stability  
→ 2
```

After completing your programming, if you find that your motor is hunting/oscillating, you can slow the response time down by increasing the number in the "Stability" menu. If your control system is working as you like, leave the "Stability" number at 2.

Start Pulse Mode:

```
Start Pulse Mode  
→ Soft Start
```

The Nimbus II can be programmed to apply a high voltage start pulse or a soft start voltage to your motor during power up. Some AC fans will run fine at low voltage, but will not start consistently at this same voltage. If this is the case and the voltage applied to the motor is normally low when starting your system, set the "Start Pulse Mode" to Full. If your motor starts consistently with your programmed settings, it is recommended to keep the "Start Pulse Mode" at Soft Start to reduce startup currents and acoustic noise.

Installation & Operation Manual – Nimbus II

Select Probe:

```
Select Probe  
→ S-Series
```

When controlling fan/motor speed via temperature, the “Select Probe” menu will be available. Using the ▲ or ▼ keys, select the probe series (S or P) you have connected to TB2. All SmartFan compatible sensors can be found at www.controlresources.com/sensors.

NAVIGATOR FEATURES

Copy Program Operation:

Connect Navigator PRG00-F to the Nimbus II. Apply power to the Nimbus II to enable programming via the Navigator. Navigator will display its current revision and product type it is connected to as shown below.

```
Nimbus II  
is ready
```

Press **Read Drive** and the display will indicate when it is ready with the screen below.

```
Drive parameters  
read
```

Disconnect the Nimbus II and connect the next Nimbus II to program. When the Navigator recognizes this unit, press **Write Drive**. Do not press any adjust keys or Navigator will upload the target Nimbus II parameters instead of loading the previously saved program. Once the Nimbus II has been programmed, the message below will appear.

```
Drive parameters  
written
```

Write Drive step above can be repeated for any number of units.

Profile Memory Functions:

The Navigator can save up to 16 separate profiles for each product type it supports for later use. Each profile can be named with a 12-character label.

To save a profile, connect Navigator PRG00-F to the Nimbus II and apply power, adjust the parameters to the desired settings and press **Save Program**.

```
Select program  
→Profile A
```

Navigator will ask which profile to save the settings in. Use the ▲ or ▼ keys to select which profile name to use. If custom names have been previously set, they will also display as such in this list. Press **Next** to continue or **Previous** to quit the save operation.

Navigator will allow the profile names to be customized. Use the **Previous** and **Next** keys to select which character to modify and use the ▲ or ▼ keys to change the characters value. Once the label is correct, press **Save Program** again and Navigator will store the profile to its memory.

```
Set label  
→Profile A
```

Note: A blank character is between the ← and ! characters.

Recalling a profile:

To recall a previously saved profile, connect the Navigator PRG00-F to the Nimbus II and apply power. Then press **Recall Program**.

```
Select program  
→Profile A
```

Navigator will ask which profile to recall the settings from. Use the ▲ or ▼ keys to select which profile to use. Press **Next** to recall the profile listed or **Previous** to quit the recall operation.

Navigator is now ready to write to a drive or modify the recalled profile's parameters. Once all parameters are correct, press the **Write Drive** key to save the settings in the Nimbus II.

Navigator Troubleshooting:

The Navigator automatically verifies the type and version of the connected product. It can display prompts to help the user identify possible problems.

```
Can't connect  
Pls check wiring
```

Indicates the Navigator cannot receive any valid data. It is possible some wires or contacts are damaged, or the revision of the Navigator is not compatible.

Please update programmer.

Indicates the Navigator has found a Nimbus II, but the Nimbus II revision is newer than the Navigator firmware supports. Navigator includes an upgrade port for future updates.

Older drive need previous codes

indicates the Navigator has found an older version of the Nimbus II that is no longer compatible with its current firmware. The upgrade port can be used to load an older version of firmware to update the Nimbus II, or it may be possible to update the Nimbus II to the newer version.

PERFORMANCE TROUBLESHOOTING

Symptom	Solutions
Motor fails to start	1) Increase the "Idle Speed" or change the "Start Pulse Mode" to Full. 2) Contact the motor manufacturer to make sure that the motor is TRIAC compatible.
Motor stalls or stops	1) Increase the "Idle Speed". 2) Check setting of "Off Input" menu 3) Check for open fuses, F1, F2, F3, F4. 4) Check power and all connections.
Motor is running at full or Idle speed and is not responding to a control signal	If Status LED is Red, the Nimbus II is in an alarm condition. 1) Check connection of the control input. 2) Check the programmed "Alarm Trip" point.
Motor speed oscillates	1) Widen "Full Input" and "Idle Input" set points 2) Increase "Stability" setting
Settings don't save	1) Press <u>Write Drive</u> before cycling power.
At ½ line voltage my fan is not running at ½ speed	1) Make sure voltage is being measured with a true RMS meter. 2) Unlike DC fans, many AC fans do not have a linear relationship between speed and voltage.
I measure a large voltage drop between line voltage and 100% Full speed setting.	Check that you are measuring AC voltage with a True RMS meter.