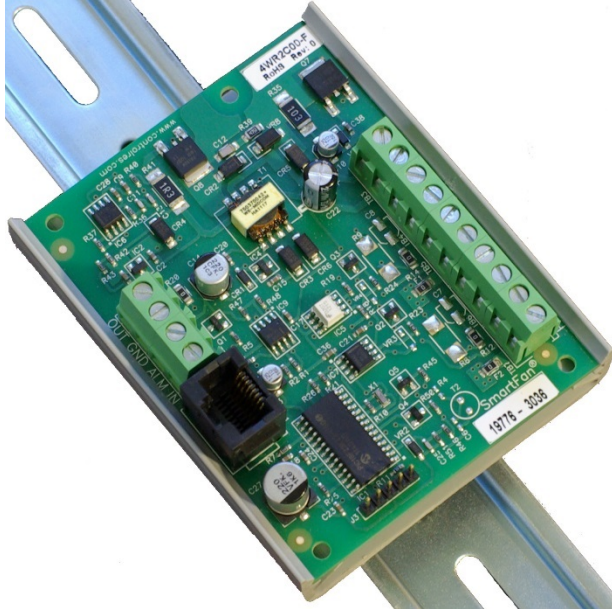


SmartFan® Cirrus-2

DC Controller for PWM Speed Controllable (4 wire) Fans



4WR2C00-F & DIN350-F (optional)



Navigator Programmer PRG00-F

SmartFan® Cirrus-2 is a customer programmable fan controller designed to manage and monitor one or two 12, 24 or 48VDC 4-wire speed controllable fans or blowers. The Cirrus-2 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 an up to 18VDC power supply to drive an external transducer or alarm. Simply plug the Navigator into a powered Cirrus-2 and scroll through the 13 variable menus, selecting the control inputs for your application. Programmed profiles can be saved and copied to multiple controllers with ease. Factory programming is also available for orders of 50 or more. To control more than 2 PWM fans, try the SmartFan Cirrus-6 or Cirrus-9.

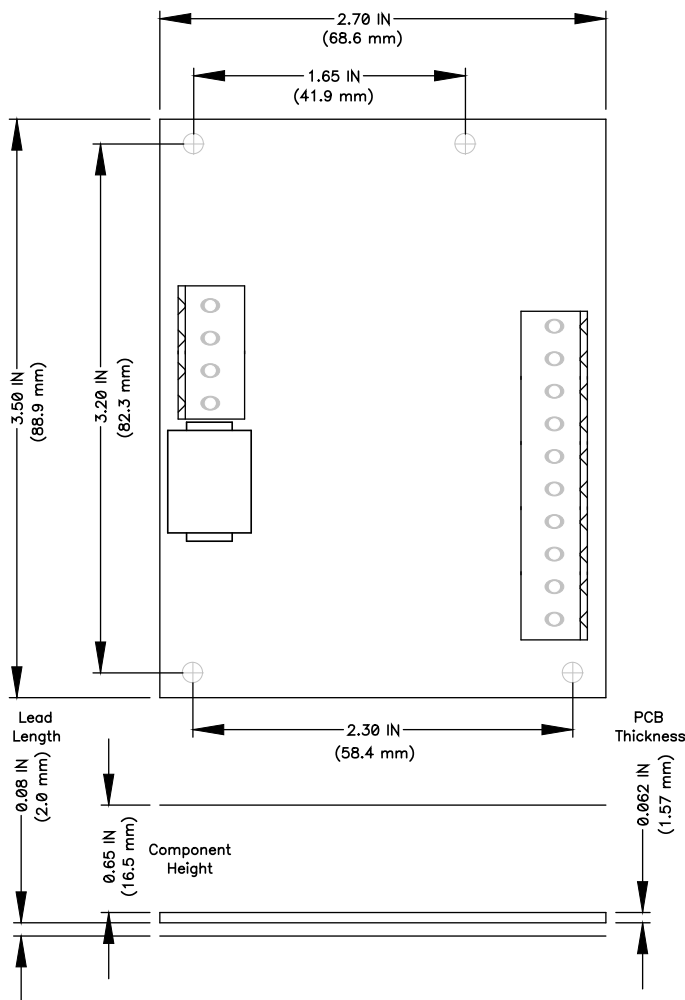
Part Number	Description
4WR2C00-F	Controller for an open collector PWM control signal fan/blower
4WR2V00-F	Controller for a 0-12VDC PWM control signal fan/blower
PRG00-F	Navigator Programmer (for purchase or rent)
DIN350-F	Optional Mount for DIN Rail
Temp Sensors	Choose a temperature sensor from www.controlresources.com/sensors

SPECIFICATIONS

- Power source: 10-60VDC (passed through to fan)
- Current Rating: 10Amps @ 70°C
- Fans: One or two 12, 24 or 48VDC 4-wire fans
- Programmable PWM frequencies: 2.5K, 5K, 10K, 20KHz
- Programmable control inputs
 - 0-20mA
 - 0-10VDC
 - Remote thermistor (sold separately)
- Max. terminal block torque 4.4 in-lbs
- Operating Temperature: -25°C to 70°C
- Storage Temperature: -40°C to 125°C
- Relative Humidity: 95% non-condensing
- Weight: 1.6 oz (46 grams)
- RoHS (6/6) compliant

FEATURES

- Compatible with open collector or 0-12VDC PWM speed controllable fans
- Mounting Options: DIN Rail or PCB
- Minimum fan speed alarm with 3 programmable settings
- Temperature & loss of control signal alarm
- Programming variables include:
 - Min and Max fan speed
 - Min and Max control signal
 - Fan on/off setting
 - Alarm trip points
 - Up to 18VDC programmable output to drive external transducer or alarm
- 2 Year Warranty
- Made in the USA



INSTALLATION

MOUNTING

PCB Mount: Using hardware of your choosing, mount the unit on a flat surface using the four .128" (3.3mm) Dia. mounting holes (ref. page 2). We recommend using a spacer of at least 0.22" (5.6mm) from any conductive surface.

DIN Rail Option: The Cirrus-2 may also be mounted on a DIN rail using DIN rail kit CRI part number DIN350-F.

CONNECTIONS (See Figure 1 & Table 1)

Power Connections (TB1: +, -)

Connect power + and -. **CAUTION: Polarity protection is provided for the controller only. Reversing + and - may damage fan.**

Fan Connections (TB1: F+, A, C, F-)

The Cirrus-2 is designed to control and accept tach signals from one or two 4-wire fans. Connect the fan + lead to F+, connect the fan - lead to F-, connect the PWM signal lead to C, connect the tach signal lead to A. **Note:** the tach lead need not be connected if the fan speed alarm feature is not to be used.

Thermistor Control (TB2: IN, GND)

When controlling from a temperature sensor, choose an air, surface or liquid temperature sensor from the CRI website at www.controlresources.com/sensors. Connect thermistor leads to IN and GND (polarity neutral).

Voltage or Current Control (TB2: IN, GND)

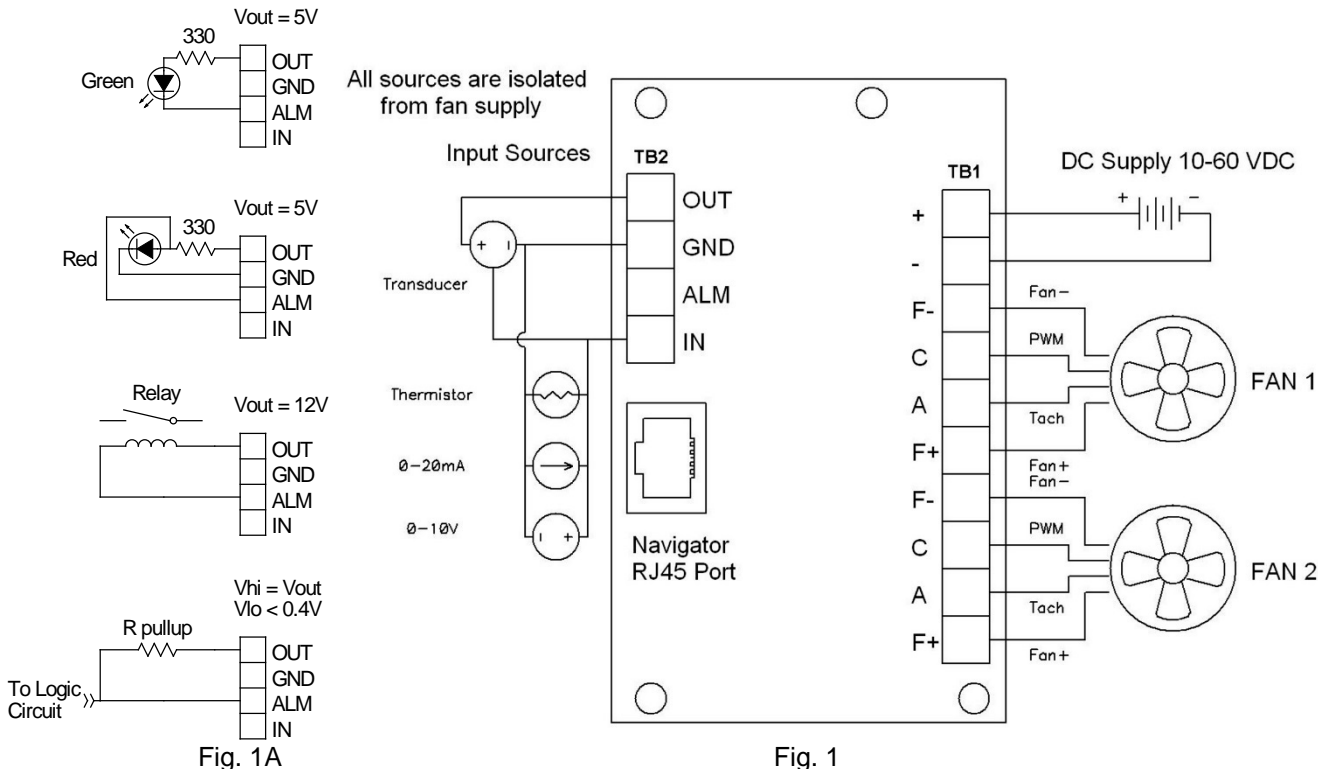
When controlling from a voltage or current signal, connect a 0 to 10 Vdc or 0 to 20 mAdc control signal + to IN and - to GND. **CAUTION: Reversing + and - may damage the control.**

Remote Transducer Control (TB2: OUT, GND, IN)

Cirrus-2 can control fan speed based on a remote transducer. Cirrus-2 can power transducers that require up to 18Vdc @ max. 20mA. To connect and power a transducer, attach the supply voltage lead to OUT, attach the output voltage lead to IN, attach ground lead to GND.

Alarm Conditions and Connections (Fig.1A)

When connected, the Cirrus II can trigger a remote alarm if the control signal is lost or if fan speed falls below the programmed "tach trip point" speed of 1,000, 2,000 or 4,000 ppm. The alarm output is a normally open (NO), open collector referenced to isolated ground. When no alarm condition is present, the relay is closed and conduct up to 100 mA DC of load current. When the alarm is triggered, the transistor opens and can support up to 100VDC across its terminals.



Terminal Block	Label	Description
TB1 12-26 awg 4.4 in-lbs. max. torque	+	Power Supply Positive
	-	Power Supply Negative
	F-	Fan Negative
	C	Fan Control Signal In
	A	Fan Tach Signal Out
	F+	Fan Positive
	F-	Fan Negative
	C	Fan Control Signal In
	A	Fan Tach Signal Out
	F+	Fan Positive
TB2 12-26 awg 4.4 in-lbs. max. torque	IN	Analog Control / Thermistor
	ALM	Alarm Output
	GND	Ground / Thermistor
	OUT	Transducer Supply Voltage

PROGRAMMING

Out of the box, the Cirrus II will be setup to control 2 fans using a 0-10Vdc control signal, ref. figure below.

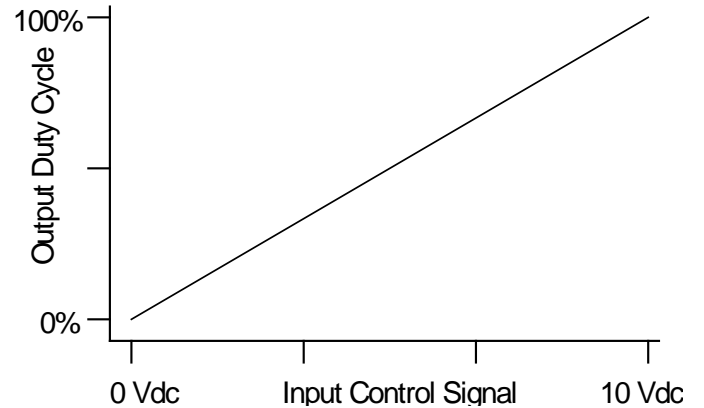


Figure 2: Default Analog 0-10 Vdc Control Curve

CONTROLLER PERFORMANCE

Control Accuracy and Hysteresis:

Temperature Mode:

- Temperature Alarm Hysteresis = $\pm 1^{\circ}\text{C}$
- Temperature Accuracy = $\pm 1^{\circ}\text{C}$ 0-50 $^{\circ}\text{C}$
= $\pm 2.5^{\circ}\text{C}$ -20-80 $^{\circ}\text{C}$

Voltage/Current/Transducer Mode:

- Signal Loss Alarm Hysteresis = $\pm 1\%$
- Idle Off Hysteresis = $\pm 3\%$
- Input Accuracy = $\pm 5\%$

Tachometer Hysteresis = ~ 100 PPM, Accuracy = $\pm 1\%$

Emissions:

Emissions are dominated by and dependent on the motor characteristics. Due to the wide variety of applications, the standard Cirrus-2 does not provide filtering on board. If your application requires filtering, CRI engineers can work with you on a custom design to meet your requirements. Call us at (978) 486-4160 for assistance.

Available Special Options:

- Hard coded operating parameters
- Can be modified to control virtually any speed controllable (4-wire) fan
- Custom control curves
- Fan speed control based on differential temperature
- Vout series resistor for pull-up or LED current limiting
- Individual fan fusing
- On-board thermistor

If your application requires more than 2 fans, use our Cirrus-6 for up to six 4-wire fans or Cirrus-9 for up to nine 4-wire fans.

To change the Cirrus II to control motor speed via temperature, current (up to 20mA) and to modify any of the 11 control parameter menus requires the use of the Navigator PRG00-F programmer. For volume applications, Control Resources can also preprogram the Cirrus II for your application.

The tables below combined with the control curve shown in figure 3 will give to an idea of the capabilities of the Cirrus II. For step by step programming instructions go to section "NAVIGATOR PROGRAMMING INSTRUCTIONS".

Menus	Default	Range
Set # of fans	2	2,1
Speed on signal loss	Idle	Idle, Full
Set PWM freq.	2.5kHz	2.5, 5, 10, 20kHz
Set tach trip point	2000ppm	1000, 2000, 4000ppm
Set Vout voltage	0.0Vdc	0.0 - 18.0Vdc
Set full speed	100%	0 - 100%
Set idle speed	0%	0 - 100%
Set idle input	0.0V	0.0 - 10.0V
Set full input	10.0V	0.0 - 10.0V
Set off input	Disabled	0.0 - 10.0V, Disabled
Set alarm trip	Disabled	0.0 - 9.9V, Disabled

Current Control Programming Menus		
Menus	Default	Range
Set # of fans	2	2,1
Speed on signal loss	Idle	Idle, Full
Set PWM freq.	2.5kHz	2.5, 5, 10, 20kHz
Set tach trip point	2000ppm	1000, 2000, 4000ppm
Set Vout voltage	0.0Vdc	0.0 - 18.0Vdc
Set full speed	100%	0 - 100%
Set idle speed	0%	0 - 100%
Set idle input	0.0mA	0.0 - 20.0mA
Set full input	20.0mA	0.0 - 20.0mA
Set off input	Disabled	0.0 - 20.0mA, Disabled
Set alarm trip	Disabled	0.0 - 19.9mA, Disabled

Temperature Control Programming Menus		
Menus	Default	Range
Set # of fans	2	2,1
Speed on signal loss	Idle	Idle, Full
Set PWM freq.	2.5kHz	2.5, 5, 10, 20kHz
Set tach trip point	2000ppm	1000, 2000, 4000ppm
Set Vout voltage	0.0Vdc	0.0 - 18.0Vdc
Set full speed	100%	0 - 100%
Set idle speed	0%	0 - 100%
Set idle input	-20°C	-20 to 80°C
Set full input	80°C	-20 to 80°C
Set off input	Disabled	-20 to 80°C, Disabled
Set alarm trip	Disabled	-20 to 79°C, Disabled
Select Probe	P-Series	P, S

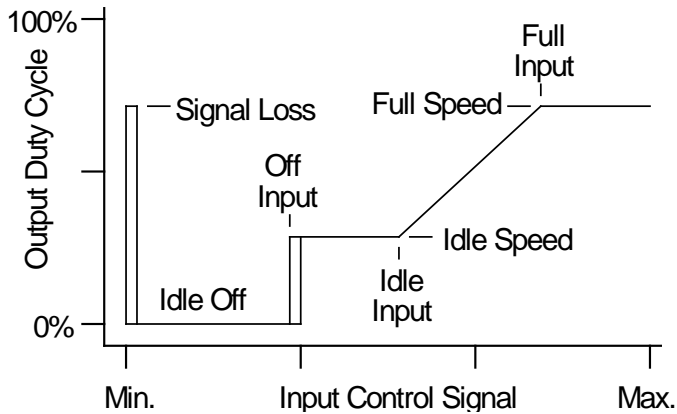


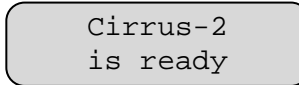
Figure 3: Fan Speed vs. Input Signal

NAVIGATOR PROGRAMMING INSTRUCTIONS

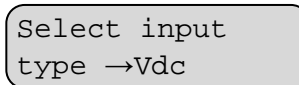
1) Connect Navigator to the Cirrus-2 through the RJ45 connectors using the Ethernet cable supplied with the Navigator. Apply power to the Cirrus-2 to enable

programming via the Navigator. See page 4 for a description of each operating parameter.

2) Navigator will display its current revision briefly then it will show the product type connected.



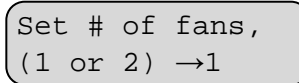
3) Press the **Next** key, then use the **▲** or **▼** keys to select which type of input source will be used.



Available options are: Vdc, mAdc, and °C for voltage, current, or temperature control respectively. Once the desired Input Type is displayed, press the **Next** key.

Note: At any time, the **Previous** key can be used to go back to the previous menu and the **Write Drive** key can be used to save all the settings in the Cirrus-2.

4) Select the number of fans connected. Again, the value is adjusted with the **▲** or **▼** keys and the **Next** key will bring you to the next parameter.



5) The Speed on signal loss menu is used to set a fail-safe motor speed in case the control signal is lost. At this point, it is highly recommended that you start drawing your control curve to help identify the programmable variables to follow (Refer to Figure 3 to model your control curve).

A setting of "Full" will simulate a Control Input setting equal to that programmed in the "Full Input" menu, (see "Full Input" programming below). A setting of "Idle" will simulate an "Idle Input" setting of -25°C in temp. mode, 0 VDC or 0 mAdc in voltage or current control mode (see "Idle Input" programming below). Use the **▲** or **▼** keys to select.

Note: When “Idle” is selected the motor will run at “Idle speed” when the “Off Input” is Disabled but will turn the motor off when the “Off Input” is Enabled.

Speed on signal
loss →Full

Once the desired speed is displayed, press the **Next** key.

6) Use the ▲ or ▼ keys to select the PWM frequency. The options are 2.5kHz, 5.0kHz, 10kHz, or 20kHz. Refer to the fan specification for the recommended frequency. Once the desired frequency is displayed, press the **Next** key.

Set PWM freq.
→2.50kHz

7) Use the ▲ or ▼ keys to select the tachometer alarm trip point. When the fan falls below the trip point, the alarm output will be activated and the PWM will be forced to full speed. The options are No Alarm, 1000PPM, 2000PPM, and 4000PPM (PPM = pulses per minute). “No Alarm” disables the tachometer alarm. Once the desired trip point is displayed, press the **Next** key.

Set tach trip
point →No Alarm

8) Use the ▲ or ▼ keys to select the Transducer / Alarm output voltage source. The voltage is settable from 0.0 Vdc to 18.0 Vdc in 0.1 volt increments. Once the desired voltage is displayed, press the **Next** key.

Set Vout voltage
→ 0.0 Vdc

9) Use the ▲ or ▼ keys to adjust the full speed for the fan or motor. This sets the PWM duty cycle in 0% to 100% in 1% increments. Once the desired output duty cycle is displayed, press the **Next** key.

Set full speed
→100%

10) Use the ▲ or ▼ keys to adjust the idle speed for the fan or motor. Note the idle can be set higher than the full speed for heating applications or to compensate for fans with reverse slope input control curves. This sets the PWM duty cycle in 0% to 100% in 1% increments. Once the desired output duty cycle is displayed, press the **Next** key.

Set idle speed
→ 55%

11) Use the ▲ or ▼ keys to adjust the upper limit of the input signal for idle speed. Note: the setting will scale depending on the input type setting. The ranges are 0.0 Vdc – 10.0 Vdc with 0.1 volt step for voltage mode, 0.0 mAdc – 20.0 mAdc with 0.1 mA step for current mode, and -20 °C – 80 °C with 1 ° step for temperature mode. Once the desired level is displayed, press the **Next** key.

Set idle input
→ 0.0 Vdc

12) Use the ▲ or ▼ keys to adjust the input signal point for reaching full speed. Note this point must be greater than the Idle input. The ▼ key will not allow the setting to decrease below the Idle input setting. The setting will scale depending on the input type setting, The ranges are 0.0 Vdc – 10.0 Vdc with 0.1 volt step for Voltage mode, 0.0 mAdc – 20.0 mAdc with 0.1 mA step for current mode, and -20 °C – 80 °C with 1 ° step for temperature mode. Once the desired level is displayed, press the **Next** key.

Set full input
→10.0 Vdc

13) Use the ▲ or ▼ keys to adjust the input signal point for turning off the output. Note selecting Disabled will leave the input at idle speed through the entire idle range. If the Idle Speed is greater than the Full Speed setting, the duty cycle will ramp to 100% - assuming the fan slope is reversed. The setting will scale depending on the input type setting. The ranges are 0.0 Vdc – 10.0 Vdc with 0.1 volt step for Voltage mode, 0.0 mAdc – 20.0 mAdc with 0.1 mA step for current mode, and -20 °C – 80 °C with 1 ° step for temperature mode. Once the desired level is displayed, press the **Next** key.

Set off input
→Disabled

14) Use the ▲ or ▼ keys to adjust the input signal level that will trip the alarm output and send the speed to the Full Speed Setting. **Note:** Selecting Disabled will leave the input alarm disabled. The setting will scale depending on the input type setting, the ranges are 0.0 Vdc – 10.0 Vdc with 0.1 volt step for Voltage mode, 0.0 mAdc – 20.0 mAdc with 0.1 mA step for current mode, and -20 °C – 80 °C with 1 ° step for temperature mode. Once the desired level is displayed, press the **Next** key.

Set alarm trip
→Disabled

15) For Rev:1.3 and above, when controlling fan/motor speed via temperature, the “Select Probe” menu will be available. Using the ▲ or ▼ keys, select the probe series (P or S) you have connected to TB2. Press the **Next** key to continue. **Note:** Older revisions must use the P-Series sensors only.

Select Probe
→ P-Series

16). Cirrus-2 will now cycle back to the “Select Input” screen. To review the existing parameters of a programmed Cirrus-2, scroll through parameters using the **Next** or **Previous** keys. Parameters can be changed at any time using the ▲ or ▼ keys.

17) Once all parameters are correct, press the **Write Drive** key to save the settings in the Cirrus-2. Disconnecting power from the Cirrus-2 before pressing **Write Drive** will discard any changes and reload the parameters from its previous memory.

Copy Program Operation

- 1) Connect Navigator to the Cirrus-2. Apply power to the Cirrus-2 to enable programming via the Navigator.
- 2) Navigator will display its current revision and product type it is connected to as shown below.

Cirrus-2
is ready

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

Drive parameters
read

- 4) Disconnect the Cirrus-2 and connect the next Cirrus-2 to program. When the Navigator recognizes this Cirrus-2, press **Write Drive**. Do not press any adjust keys or Navigator will upload the target Cirrus-2’s parameters instead of loading the previously saved program. Once the Cirrus-2 has been programmed the message below will appear.

Drive parameters
written

- 5) Step 4 can be repeated for any number of Cirrus-2 products.

Profile Memory Functions

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.

Saving a profile

To save a profile, connect Navigator to the Cirrus-2 and apply power. Then 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.

Custom Names for a Profile

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

1) To recall a previously saved profile, connect Navigator to the Cirrus-2 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.

2) 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 Cirrus-2.

Navigator automatically verifies the type and version of the connected Cirrus-2. 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 Cirrus-2 revision is not compatible with Navigator.

```
Please update  
programmer.
```

Indicates the Navigator has found a Cirrus-2, but the Cirrus-2 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 Cirrus-2 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 Cirrus-2, or it may be possible to update the Cirrus-2 to the newer version.

Control Resources has been a leading provider of off-the-shelf and custom fan controls and alarms since 1984. CRI provides AC Speed Controls, DC Speed Controls, Tach Alarms, Fan Trays, Lab Test Equipment and complete custom design and manufacturing services. With in-house design and manufacturing capabilities, CRI is the One-Stop-Shop for all your thermal design needs. For information on other CRI products, see our website at www.controlresources.com.