SmartFan® *Stratus II*

Variable Frequency Drive

P/N VFD400E-F

P/N VFD400-F
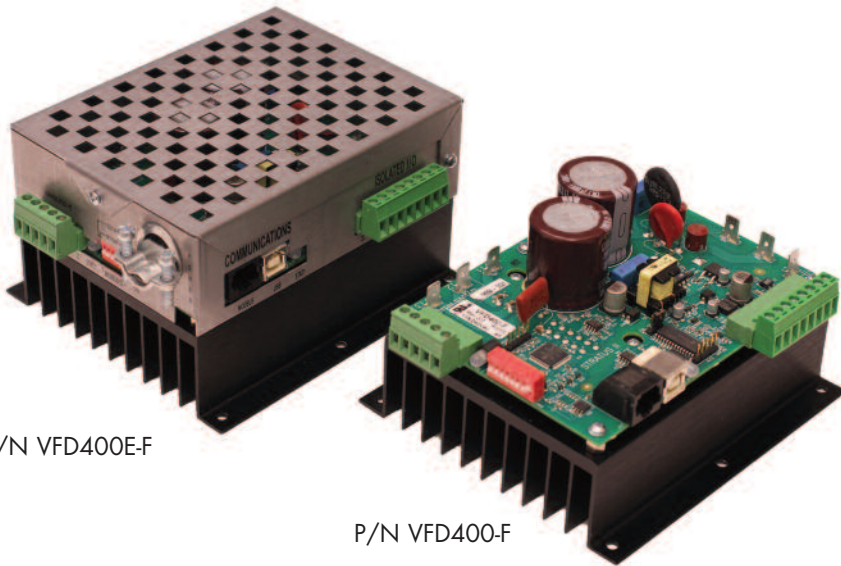
Navigator Programmer
P/N PRG02-F

SmartFan Stratus II VFD (Variable Frequency Drive) is designed to control single or three-phase fractional HP, inverter grade motors via a transducer (voltage or current signal), building automation system (voltage, current signal, MODBUS), thermistor, potentiometer, contact closure or Modbus RTU network. Each unit can be customized in minutes using the menu driven SmartFan Navigator hand-held remote programmer or through the MODBUS communications port.

SPECIFICATIONS (Rev:6)

- Input Power: 115 & 240 VAC ±10%, 47-64 Hz
  Single Phase, 5.7 Amps
- Output Power: 115 & 240 VAC±10%, 0-400 Hz
  Single or Three Phase, 4.0 Amps
- For use with inverter grade motor
- Accessory Output: 5 VDC @ 50 mA
- Control Modes (*VFD400-F / VFD400E-F only)
  - *0-5 VDC or 0-10 VDC
  - *4-20 mA
  - *PID Plus (constant pressure, constant flow...)
  - *Potentiometer
  - *Temperature (thermistor)
  - MODBUS
  - Fixed speed
- Operating temperature: -20°C to 40°C (full load)
- Storage temperature: -40°C to 125°C
- Relative humidity: 95% non-condensing
- Weight:
  - VFD400E-F, 32 oz (905g)
  - VFD400-F, 22 oz (625g)
- RoHS compliant
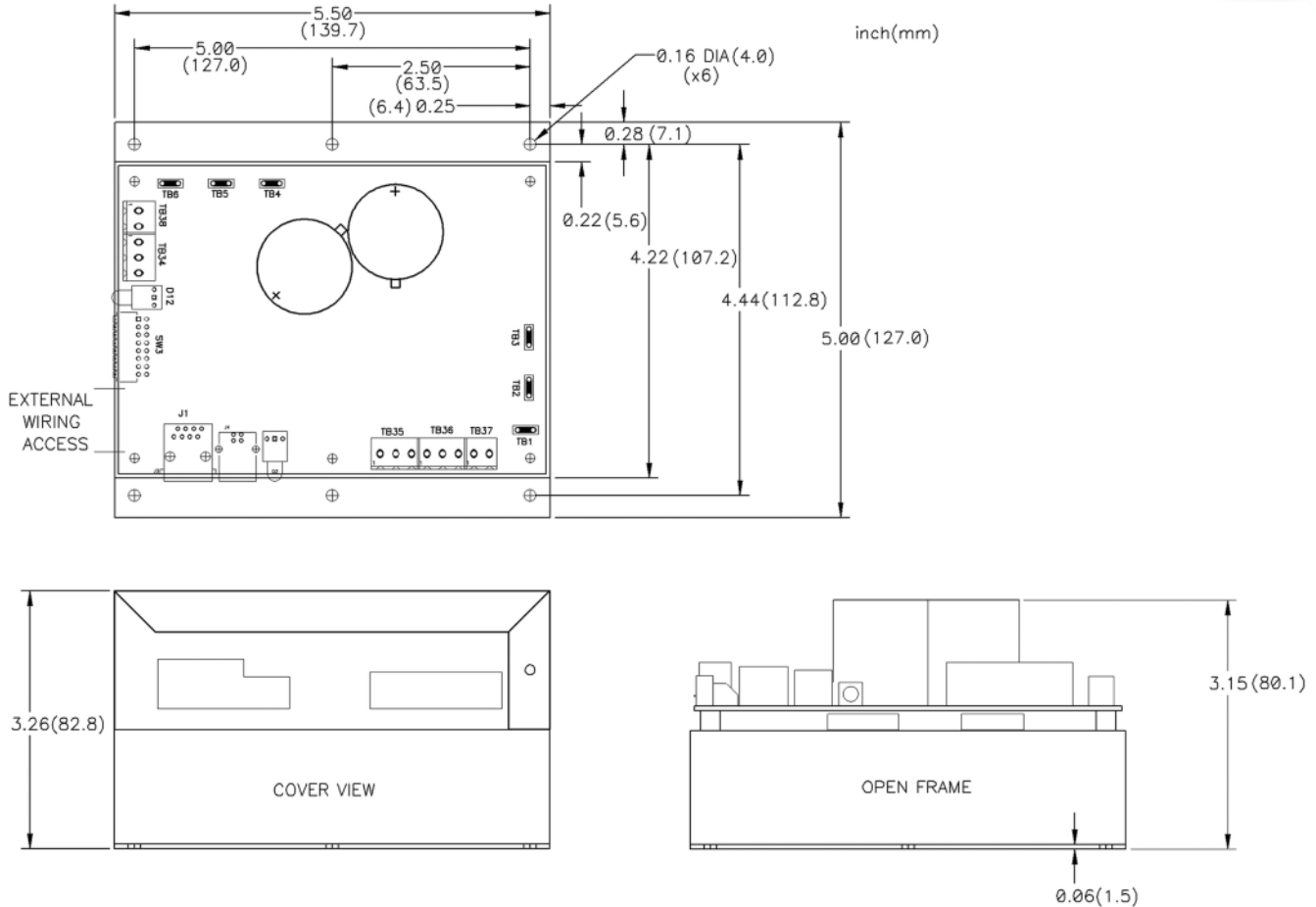- UL Recognized to UL508C, File E331664

FEATURES

- Three programming options:
  - SmartFan Navigator PRG02-F hand-held remote
  - Windows PC USB port using a Modbus master application
  - Factory customization and programming for orders as small as 50 pieces
- Programmable variables include:
  - Control slope: 4 variables including on/off at idle
  - Alarm trigger point and direction
  - Ramp up and ramp down rates
  - Programmable current limit up to 10 Amps
  - PWM frequency
  - Motor frequency and direction
  - Contact closure polarity and frequency
- Over temperature protection
- Available with or without metal safety enclosure
- Contact closure allows settable on/off override option
- On-board Status LEDs
- Warranty: 2 years
- Made in the USA

c(UL)us

For complete product details visit: www.controlresources.com

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Dimensions

COVER VIEW

OPEN FRAME

PART NUMBERING

Part No.	Control Inputs
VFD400E-F	**Stock Product** Includes metal safety enclosure
VFD400-F	No enclosure (10 piece minimum order)
VFD401E-F	MODBUS, Contact Closure and Fixed speed inputs only, includes metal safety enclosure (10 piece minimum order)
VFD401-F	MODBUS, Contact Closure and Fixed speed inputs only, no enclosure (10 piece minimum order)
PRG02-F	Stratus II Navigator remote hand-held programmer (for purchase or rent)
VFD4KIT-F	Evaluation kit includes: (1) Stratus II VFD400E-F, (1) Navigator remote programmer PRG02-F, power and motor connection hardware

*Can be used to program Stratus II VFD Rev.4 and higher

For complete product details visit: **www.controlresources.com**

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CONNECTIONS

⚠️ **WARNING: Dangerous voltages are present when connected to the power line and for some time after power is removed. Power must be removed for 30 seconds before making any connections or adjustments to avoid electrical shock or damage.**

Motor Compatibility: For maximum motor life without using a line filter, the use of <u>an inverter duty motor is recommended</u>.

Mounting: It is recommended that the Stratus 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. Stratus II is supplied with six 0.16"D mounting holes suitable for #6 screws. Use at least 4 screws to mount Stratus II.

Power Connections: It is recommended that an adequately sized circuit breaker be connected between the power service and Stratus II to permit fail-safe removal of power before making adjustments or connections. Using .250" female spade type terminals, connect L1 power (white) to location N, connect L2 power (black) to location L, connect Earth ground (green) to location G. Refer to wiring diagram for connections.

Motor Connections: For motor connections, use .250" female spade type terminals. For single-phase motors, connect motor to positions marked W/T3 and V/T2. For three-phase motors connect to locations W/T3, V/T2 and U/T1. If a three-phase motor runs backwards, disconnect power and switch any 2 of the three wires. Any number of motors may be controlled in parallel from one unit as long as the total current does not exceed the current rating. <u>To reduce electrical noise emissions</u>, use VFD shielded cable such as VFD Lean TR Cable, Item No 08611804 from www.sabcable.com.

Using Single-Phase or Three-Phase Motors: Stratus II can control single- or three-phase motors from a single-phase power source. Refer to wiring diagram for motor connections.
To control a 1PH motor set switch #8 to OFF.
To control a 3PH motor set switch #8 to ON.
Power must be cycled before this setting will take effect.

Control Signal & Alarm Connections: 0-5VDC, 0-10VDC, 4-20mA, potentiometer, thermistor (sold separately), contact closure control signals and alarm relay outputs are made through detachable terminal blocks. It is recommended that power be turned off before making these connections, reference page 3 and 4 for wiring locations. Maximum wire size 12 AWG.

Relay Alarm: The RELAY alarm output is a normally open, optically isolated MOS Relay. When no alarm condition is present, the relay is closed and can conduct up to 100mA, of load current. When the alarm is triggered, the relay opens, and can support up to 300 Volts AC or DC across its terminals. Refer to wiring diagram for alarm configurations.

Communications & Isolated Control I/O Connections
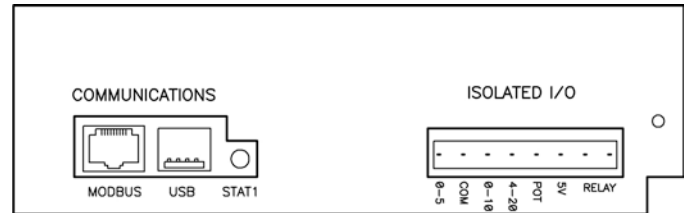
MODBUS – RJ-45 Jack for Modbus or Navigator interface
USB – USB interface for Modbus programming
STAT1 – Isolated control status LED
    Green – No Fault
    Red – Isolated Control Fault
0-5 – Connection for 0-5 VDC control input
COM – Common connection for all input signals
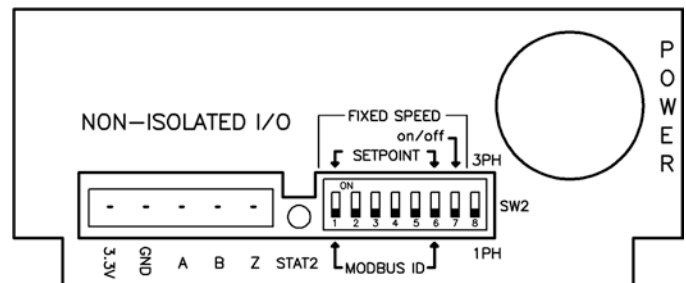**0-10** – Connection for 0-10 VDC control input
4-20 – Connection for 4-20 mA control input
POT – Connection for a potentiometer or thermistor control input.
5 V – Connection to power a remote transducer or potentiometer, 5VDC @ 50mA
RELAY – Connection for a relay alarm output. See relay alarm description above.

Non-Isolated Control & Power I/O Connections

3.3V – Special functions
GND – Non-isolated (not earth ground) reference level
A – Special functions
B – Special functions
Z – STOP on contact closure to "GND"
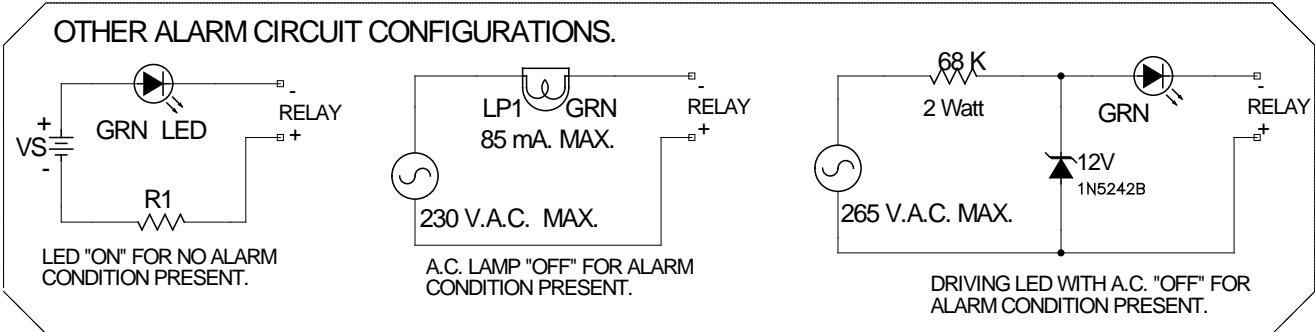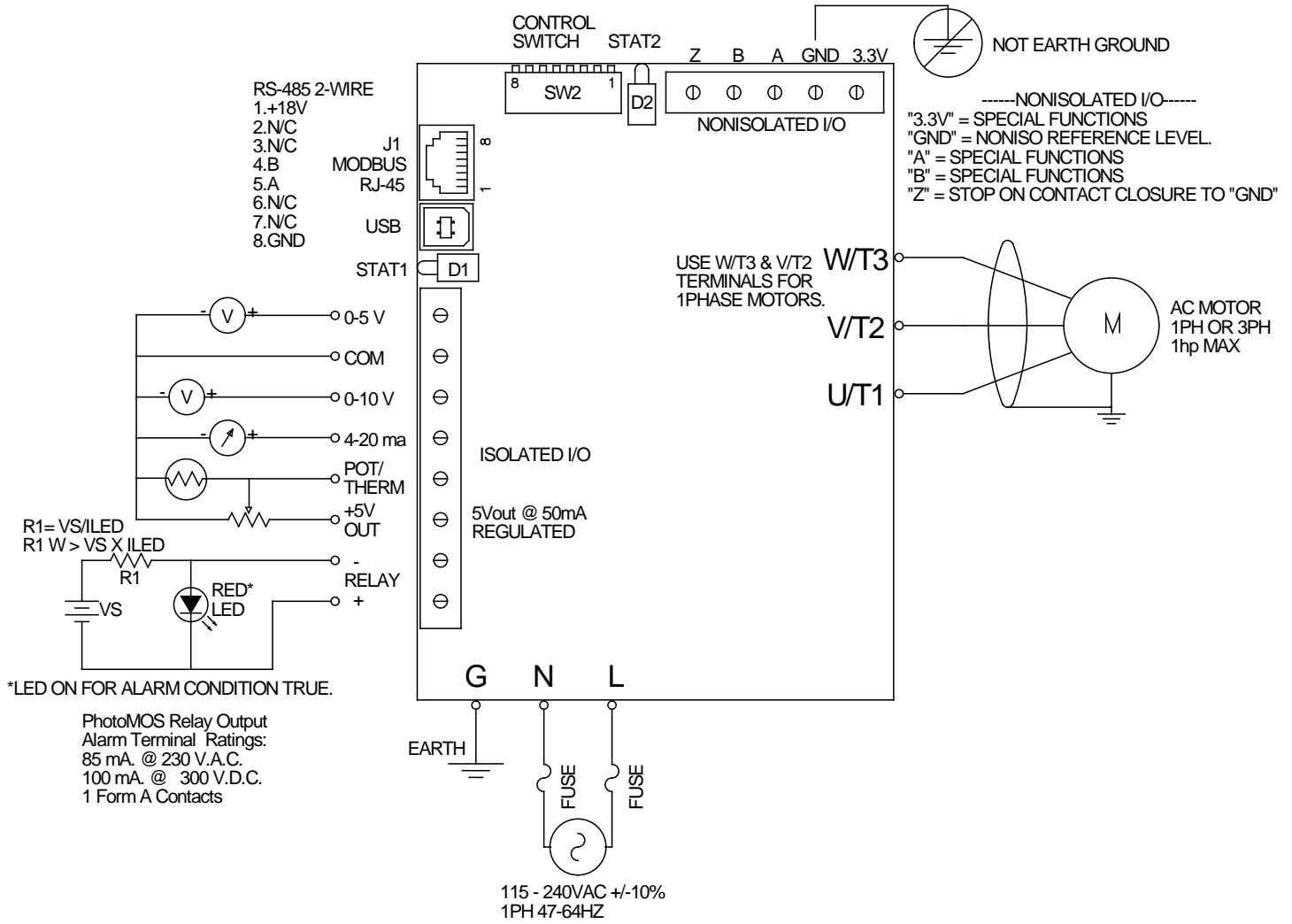**STAT2** – Non-Isolated control status LED
    Green – No Fault
    Red – Module Temp / Current Faults
    Red Blinking – Output Current Limited
SW2 – Switches to select single- or three-phase output power, fixed speed mode settings.

WIRING DIAGRAM

RS-485 2-WIRE
1.+18V
2.N/C
3.N/C
4.B
5.A
6.N/C
7.N/C
8.GND

J1
MODBUS
RJ-45

USB

STAT1

CONTROL SWITCH   STAT2

SW2   8   1

D2

Z   B   A   GND   3.3V

NONISOLATED I/O

NOT EARTH GROUND

------NONISOLATED I/O------
"3.3V" = SPECIAL FUNCTIONS
"GND" = NONISO REFERENCE LEVEL.
"A" = SPECIAL FUNCTIONS
"B" = SPECIAL FUNCTIONS
"Z" = STOP ON CONTACT CLOSURE TO "GND"

D1

USE W/T3 & V/T2 TERMINALS FOR 1PHASE MOTORS.

W/T3

V/T2

U/T1

AC MOTOR
1PH OR 3PH
1hp MAX

0-5 V

COM

0-10 V

4-20 ma

POT/ THERM

+5V OUT

ISOLATED I/O

5Vout @ 50mA REGULATED

R1= VS/ILED
R1 W > VS X ILED

R1

VS

RED* LED

-    RELAY

+

*LED ON FOR ALARM CONDITION TRUE.

PhotoMOS Relay Output
Alarm Terminal Ratings:
85 mA. @ 230 V.A.C.
100 mA. @   300 V.D.C.
1 Form A Contacts

G   N   L

EARTH

FUSE   FUSE

115 - 240VAC +/-10%
1PH 47-64HZ

OTHER ALARM CIRCUIT CONFIGURATIONS.

GRN LED

VS

RELAY
-
+

R1

LED "ON" FOR NO ALARM
CONDITION PRESENT.

LP1   GRN
85 mA. MAX.

230 V.A.C. MAX.

RELAY
-
+

A.C. LAMP "OFF" FOR ALARM
CONDITION PRESENT.

68 K
2 Watt

GRN

RELAY
-
+

12V
1N5242B

265 V.A.C. MAX.

DRIVING LED WITH A.C. "OFF" FOR
ALARM CONDITION PRESENT.

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CONTROL MODES

To setup the Stratus II to control via;

- Voltage Control (0-5V / 0-10V)
- Fixed Speed (one selected speed)
- Contact Closure (ON/OFF control only)

no additional programing is required, see "Out of the Box Operation" below. To setup the Stratus II for;

- Temperature Control (CRI supplied thermistor)
- Potentiometer Control (1KΩ – 100KΩ)
- Current Control (4-20mA)
- Voltage Control (custom control slopes)
- PID Plus™ Control Loop (Voltage or Current)
- Custom Alarm settings
- Custom Contact Closure settings
- Monitoring attributes real-time
- Modbus control

the SmartFan Navigator handheld programmer PRG02-F or a connection to a Modbus network is required. For programming with MODBUS, refer to www.controlresources.com/stratus2.

OUT OF THE BOX OPERATION

Voltage Control: Stratus II will accept a 0-5VDC or 0-10VDC input signal and control motor speed as shown below. Refer to **Wiring Diagram** for connections. To modify the control slope or add alarm points, see NAVIGATOR PROGRAMMING instructions below.

SPEED vs. CONTROL SIGNAL
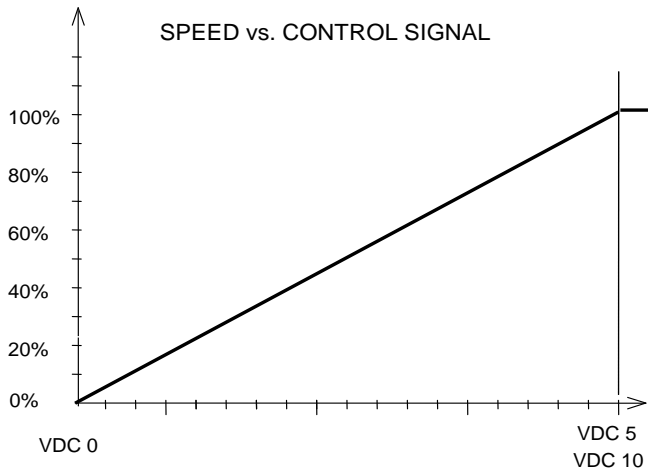
Relay Alarm: When using voltage control, this alarm is triggered for loss of control signal. In an alarm condition the STAT1 LED will turn red, the alarm RELAY output opens and the motor automatically switches to full speed. Alarm settings and triggers can be programmed

using the Navigator remote handheld programmer, PRG02-F, see NAVIGATOR PROGRAMMING instructions below.

<u>**Turning Motors ON and OFF with a Contact Closure:**</u>
Stratus II can turn motors on and off when controlling via a Modbus signal plugged into the RJ-45 connector or through a contact closure connected to Non-Isolated I/O terminals, **GND** (not earth ground) and **Z**. **CAUTION: This connection is non-isolated Hi-Voltage.**

<u>**Fixed Speed Control:**</u> To operate a motor at a single fixed frequency / speed, set DIP switch 7 to ON and use Table 1 for frequency settings.

Table 1: Fixed Speed Settings						
Output Frequency	DIP switch settings					
	1	2	3	4	5	6
0 Hz	OFF	OFF	OFF	OFF	OFF	OFF
1 Hz	ON	OFF	OFF	OFF	OFF	OFF
2 Hz	OFF	ON	OFF	OFF	OFF	OFF
3 Hz	ON	ON	OFF	OFF	OFF	OFF
4 Hz	OFF	OFF	ON	OFF	OFF	OFF
5 Hz	ON	OFF	ON	OFF	OFF	OFF
6 Hz	OFF	ON	ON	OFF	OFF	OFF
7 Hz	ON	ON	ON	OFF	OFF	OFF
8 Hz	OFF	OFF	OFF	ON	OFF	OFF
9 Hz	ON	OFF	OFF	ON	OFF	OFF
10 Hz	OFF	ON	OFF	ON	OFF	OFF
11 Hz	ON	ON	OFF	ON	OFF	OFF
12 Hz	OFF	OFF	ON	ON	OFF	OFF
13 Hz	ON	OFF	ON	ON	OFF	OFF
14 Hz	OFF	ON	ON	ON	OFF	OFF
15 Hz	ON	ON	ON	ON	OFF	OFF
16 Hz	OFF	OFF	OFF	OFF	ON	OFF
17 Hz	ON	OFF	OFF	OFF	ON	OFF
18 Hz	OFF	ON	OFF	OFF	ON	OFF
19 Hz	ON	ON	OFF	OFF	ON	OFF
20 Hz	OFF	OFF	ON	OFF	ON	OFF
21 Hz	ON	OFF	ON	OFF	ON	OFF
22 Hz	OFF	ON	ON	OFF	ON	OFF
23 Hz	ON	ON	ON	OFF	ON	OFF
24 Hz	OFF	OFF	OFF	ON	ON	OFF
25 Hz	ON	OFF	OFF	ON	ON	OFF
26 Hz	OFF	ON	OFF	ON	ON	OFF
27 Hz	ON	ON	OFF	ON	ON	OFF
28 Hz	OFF	OFF	ON	ON	ON	OFF
29 Hz	ON	OFF	ON	ON	ON	OFF
30 Hz	OFF	ON	ON	ON	ON	OFF
31 Hz	ON	ON	ON	ON	ON	OFF
32 Hz	OFF	OFF	OFF	OFF	OFF	ON
33 Hz	ON	OFF	OFF	OFF	OFF	ON
34 Hz	OFF	ON	OFF	OFF	OFF	ON
35 Hz	ON	ON	OFF	OFF	OFF	ON
36 Hz	OFF	OFF	ON	OFF	OFF	ON
37 Hz	ON	OFF	ON	OFF	OFF	ON
38 Hz	OFF	ON	ON	OFF	OFF	ON
39 Hz	ON	ON	ON	OFF	OFF	ON
40 Hz	OFF	OFF	OFF	ON	OFF	ON

SmartFan Stratus II – Navigator Datasheet

Table 1: Fixed Speed Settings (continued)						
Output Frequency	DIP switch settings					
	1	2	3	4	5	6
41 Hz	ON	OFF	OFF	ON	OFF	ON
42 Hz	OFF	ON	OFF	ON	OFF	ON
43 Hz	ON	ON	OFF	ON	OFF	ON
44 Hz	OFF	OFF	ON	ON	OFF	ON
45 Hz	ON	OFF	ON	ON	OFF	ON
46 Hz	OFF	ON	ON	ON	OFF	ON
47 Hz	ON	ON	ON	ON	OFF	ON
48 Hz	OFF	OFF	OFF	OFF	ON	ON
49 Hz	ON	OFF	OFF	OFF	ON	ON
50 Hz	OFF	ON	OFF	OFF	ON	ON
51 Hz	ON	ON	OFF	OFF	ON	ON
52 Hz	OFF	OFF	ON	OFF	ON	ON
53 Hz	ON	OFF	ON	OFF	ON	ON
54 Hz	OFF	ON	ON	OFF	ON	ON
55 Hz	ON	ON	ON	OFF	ON	ON
56 Hz	OFF	OFF	OFF	ON	ON	ON
57 Hz	ON	OFF	OFF	ON	ON	ON
58 Hz	OFF	ON	OFF	ON	ON	ON
59 Hz	ON	ON	OFF	ON	ON	ON
60 Hz	OFF	OFF	ON	ON	ON	ON
61 Hz	ON	OFF	ON	ON	ON	ON
62 Hz	OFF	ON	ON	ON	ON	ON
63 Hz	ON	ON	ON	ON	ON	ON

NAVIGATOR PROGRAMMING

The SmartFan Navigator PRG02-F can be used to switch control modes, customize setting of control modes, save and copy custom settings, or monitor the drive attributes in real-time.

To start using, plug the Navigator into the RJ-45 connector on the Stratus II (Rev: 4 or above) using the Ethernet cable provided. Connect the Stratus II to the motor, control signal, alarm connection (if any), AC power source and apply power. The Navigator will display its Part Number and Revision briefly then it will show the product type connected.

```
   Stratus II
    READY
```

Pressing the **Next** key will advance to the next menu selection, the **Previous** key will retreat to the previous menu selection. Use the ▲ or ▼ keys to enter the menu or change the programming selections in each menu. There are 5 top level programming menus each with a series of submenus.

```
  READ ONLY
    MENU
```

Press **Next** or **Previous** to change

Press ▲ or ▼ to access or change

Menu Selection	Description
READ ONLY	Use to read various controller attributes
SELECT MODE	Use to select control mode: Temperature, Potentiometer, Current, Voltage or PID Plus™
PROGRAM MODE	Use to customize the control mode selected in the SELECT MODE.
CC ADJUST	Use to customize contact closure control options.
MOTOR ADJUST	Use to customize motor responses

READ ONLY OPTIONS

To enter the read only submenu, press ▼ key when the READ ONLY MENU is selected. The following attributes can be monitored (but not changed) in this menu:

READ ONLY SUBMENU	
Selections	Description
TARGET FREQ	Output frequency setting
ACTUAL FREQ	Actual output frequency
TARGET SPEED	Output frequency setting as a %
ACTUAL SPEED	Actual output frequency as a %
CONTROL VALUE	Control input reading as a %
ALARM STATUS	Fault type; temp, current, signal
BUS VOLTAGE	DC power supply voltage
BUS CURRENT	Motor current draw
MODULE TEMP	Temperature of Power Module
REVISION	Revision of current firmware
MODBUS ID	Set with MODBUS network only
PHASE	AC output (1PH or 3PH)
RETURN	Press ▲ to exit this submenu

To navigate between selections, use the **Next** or **Previous** keys.

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SELECTING CONTROL MODES

To select control modes go to the SELECT MODE Menu and use the ▲ or ▼ keys to select between control modes. Note: The Navigator cannot be used to change MODBUS control variables, the use of a MODBUS network is required to change MODBUS control variables, ref: www.controlresources.com/stratus2.

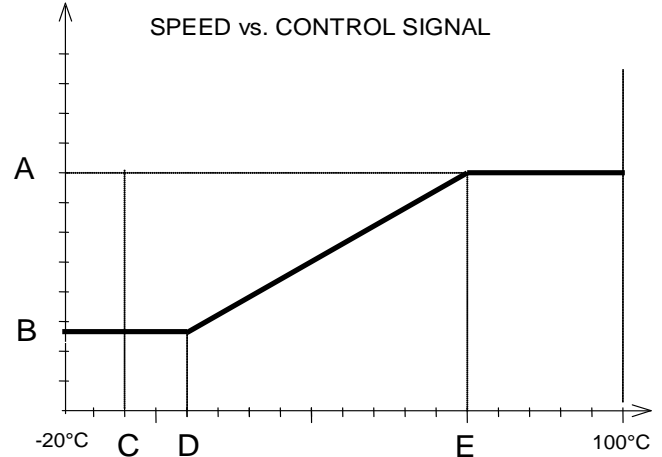| Select Mode Submenu	
Selections	**Description**
VOLT CONTROL	Varies speed with DC voltage
MODBUS CONTROL	Varies speed via a MODBUS network
S TEMP CONTROL	Varies speed with temp. (S sensor)
PID+ CURR	When connected to a transducer, unit varies speed to maintain constant current or voltage (pressure, flow…).
PID+ 10VDC	
PID+ 5VDC	
P TEMP CONTROL	Varies speed with temp. (P sensor)
POT CONTROL	Select speed with potentiometer.
CURR CONTROL	Varies speed with current

TEMP CONTROL PROGRAMMING

Stratus II can be controlled via an air, surface or liquid thermistor sensor found at the CRI website www.controlresources.com. Refer to **Wiring Diagram** for connections. To setup temperature control using the Navigator PRG02-F, refer to the instructions below.

Use the "SELECT MODE" menu to select "S TEMP CTRL ON" when using an S-series thermistor or "P TEMP CTRL ON" when using an P-series thermistor, reference instructions above. (Note: Stratus II Rev:6 and older can only use the P-series thermistor) Use the **Next** key to select the PROGRAM MODE and enter the TEMP CTRL submenu by using the ▼ key:
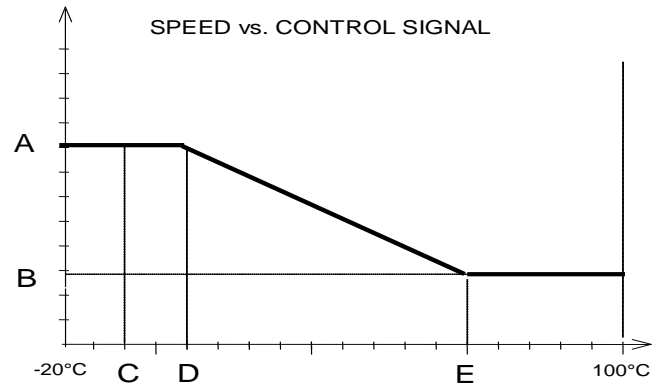
Temperature Control Submenu	
Selection	**Description**
MAXIMUM FREQ	A, see graphs
IDLE FREQ	B, see graphs
IDLE TEMP	D, see graphs
MAXIMUM TEMP	E, see graphs
ALARM	Turns alarm feature ON or OFF
ALARM TRGR PT	C, see graphs
ALARM STATE	Alarm is triggered below point C when set to "LOW", above point C when set to "HIGH"
ALARM RESPONSE	Sets motor speed to point A when alarm is triggered if set to "Max" and point B if set to "Idle".
SENSOR OPEN	Sets motor speed to point A on open sensor if set to "Max" and point B if set to "Idle".
RETURN	Press ▲ to exit this submenu

There are 3 basic types of control graphs that the Stratus II can emulate: positive slope, negative slope and two speed, (see graphs below). It may be helpful to choose one of the control graphs to fill in your preferred variables, A, B, C, D and E before programming.
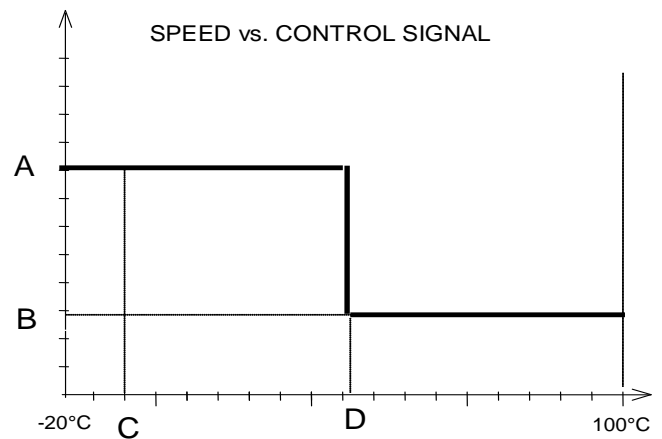
Positive Slope:

Negative Slope:

Two Speed:

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POTENTIOMETER, CURRENT & VOLTAGE CONTROL PROGRAMMING

Potentiometer Control Programming: Connection for potentiometer control mode is made on the Isolated I/O terminals using the COM pin for negative reference, 5V pin for positive reference and POT for the wiper control. Refer to **Wiring Diagram** for connections. Refer to SELECTING CONTROL MODES section above and select "POT CONTROL ON", then advance to the PROGRM MODE menu using the **Next** key and enter the submenu by using the ▼ key. Skip to the table below for list and description of programming options.
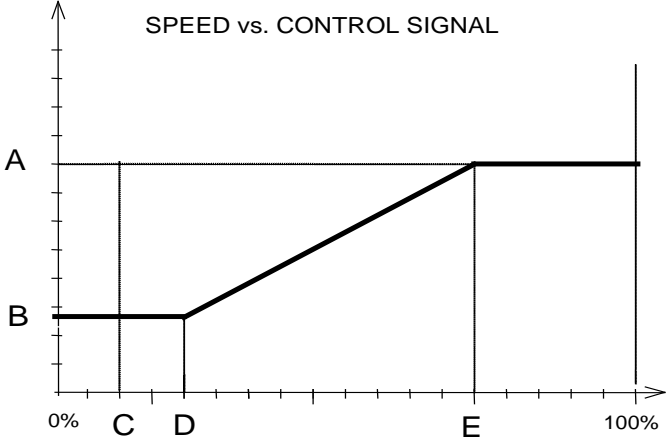
Current Control Programming: Stratus II can control via a 4-20mA input signal. Refer to **Wiring Diagram** for connections. Refer to SELECTING CONTROL MODES section above to select "CURR CONTROL ON", then advance to the PROGRM MODE menu using the **Next** key and enter the submenu by using the ▼ key. Skip to the table below for list and description of programming options. Note: 4mA = 0% and 20mA = 100% in the charts below and when programming via the Navigator.

Voltage Control Programming: Stratus II will accept a 0-5VDC or 0-10VDC input signal and control motor speed as shown on page 5 without any programming. Refer to **Wiring Diagram** for connections. To modify the control slope or add alarm trigger points using the Navigator remote handheld programmer, refer to SELECTING CONTROL MODES section above to select "VOLT CONTROL ON", then advance to the PROGRM MODE menu using the **Next** key and enter the submenu by using the ▼ key. Note: 0 VDC = 0% and 5 VDC or 10 VDC = 100% in the charts below and when programming via the Navigator.

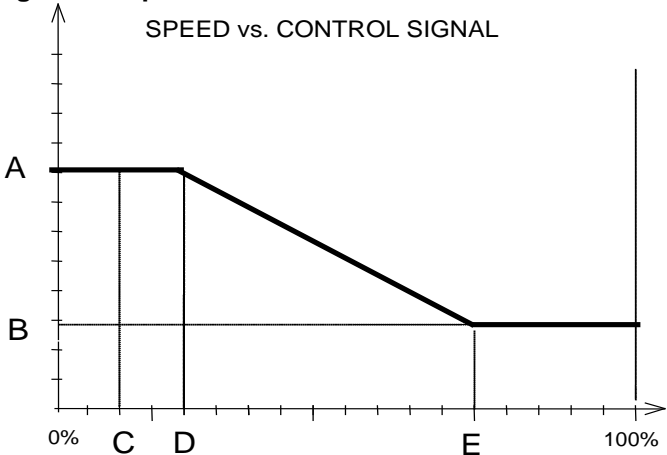| Pot., Current and Voltage Control Submenu	
Selection	**Description**
MAXIMUM FREQ	A, see graphs
IDLE FREQ	B, see graphs
IDLE INPUT	D, see graphs
MAX INPUT	E, see graphs
ALARM	Turns alarm ON or OFF
ALARM TRGR PT	C, see graphs
ALARM STATE	Alarm is triggered below point C when set to "LOW", above point C when set to "HIGH"
ALARM RESPONSE	Sets motor speed to point A when alarm is triggered if set to "Max" and point B if set to "Idle".
RETURN	Press ▲ to exit this submenu

There are 3 basic types of control graphs that the Stratus II can emulate: positive slope, negative slope and two speed, (see graphs below). It may be helpful to choose one of the control graphs and fill in your preferred variables, A, B, C, D and E before programming. Note that the X axis is labeled as a % of the control signal. The table below can be used to help match the actual control inputs with that displayed on the X axis and in the Navigator programmer..

X-Axis Equivalents		
Navigator Selectable Values	0%	100%
Potentiometer Mode	0%	100%
4-20mA Control Signal	4mA	20mA
0-5VDC Control Signal	0VDC	5VDC
0-10VDC Control Signal	0VDC	10VDC

Positive Slope:

Negative Slope

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Two Speed:

SPEED vs. CONTROL SIGNAL
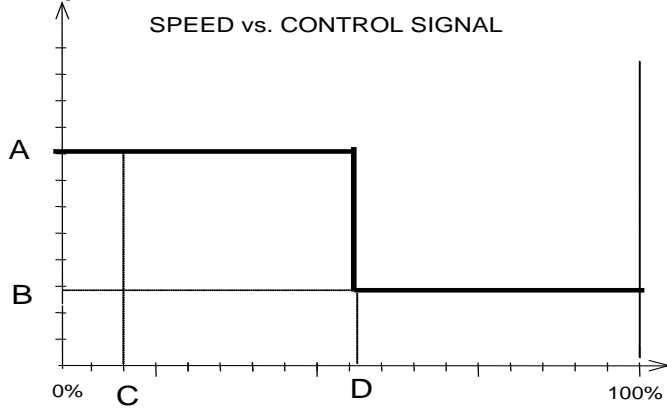
MAINTANING A CONSTANT PRESURE, FLOW OR OTHER TRANSDUCER INPUT WITH *PID Plus™*

Starting with revision 5, Stratus II can be used to maintain a selected pressure, flow or other selected control point from a 20mA, 5VDC or 10VDC transducer. Using the proprietary **PID Plus™** programming menus in the Navigator hand held remote programmer, one can select:

- 0-20mA, 0-10VDC or 0-5VDC control point
- Vary setpoint dampening
- Alarm trigger points

To begin:

1. Select a transducer with control outputs up to 10Vdc or 20mA.
2. Connect transducer outputs to ISOLATED I/O (TB35). If using an alarm, connect it to RELAY. Refer to wiring diagram on page 4.
3. Connect Navigator PRG02-F (Rev:2 or higher) to RJ45 (J1).
4. Connect motor and power to Stratus II. Refer to wiring diagram on page 4. Apply power to transducer and Stratus II.
5. Navigator will read: Stratus II READY. To start real-time programming with the Navigator press the **Next** key until window reads SELECT MODE. Press the ▼ key to enter SELECT MODE and continue pressing the ▼ to select PID+ CURR, PID+ 10VDC or PID+ 5VDC depending on your transducer. Enter the **Next** key to go to PROGRAM MODE and press.▼ key to enter PID Plus™ submenu.

PID Plus™ Submenu			
	Selection	Range	Default
SYSTEM SETTINGS	MAXIMUM FREQ	0 – 400Hz	60Hz
	IDLE FREQ	0 - 400Hz	0 Hz
	SPEED VS INPUT	CORRELATED or INVERTED	INVERTED
	MIN INPUT	0-20mA, 0-5V, 0-10V	0mA, 0V
	MAX INPUT	0-20mA, 0-5V, 0-10V	20mA, 5V, 10V
CONTROL SETTINGS	SETPOINT	0-20mA, 0-5V, 0-10V	10mA, 2.5V, 5V
	CONTROL POINT	(read only)	
	SENSOR READING	(read only)	
	DAMPEN TIME	0.4 – 10.2 sec	4.2 sec
	SWITCH LOCKOUT	ON / OFF	OFF
ALARM SETTINGS	LOW ALARM DELAY	20 – 240 sec	60 sec
	HIGH ALARM DELAY	20 – 240 sec	60 sec
	MIN ALARM	ON / OFF	OFF
	MAX ALARM	ON / OFF	OFF
RETURN		Press ▲ to exit Submenu	

System Settings:

MAXIMUM FREQ – Limits the maximum motor speed. Set to no more than the maximum published frequency for your motor. Note: the motor frequency must also be set using the MOTOR ADJUST submenu (see MOTOR RESPONSE PROGRAMING section below).

IDLE FREQ – Limits the minimum motor speed.

SPEED VS INPUT – Set to CORRELATED if as motor speed increases (all other variables constant), transducer current or transducer voltage output increases. Set to INVERTED if as motor speed increases (all other variables constant), transducer current or transducer voltage output decreases.

MIN INPUT – Enter the minimum input value. If signal falls below this value an alarm can be triggered and latched. Use to detect a faulty sensor / transducer.

MAX INPUT – Enter the maximum input value. If signal goes beyond this value an alarm can be triggered and latched. Use to detect a faulty sensor / transducer.

Control Settings:

SETPOINT – Use this variable to select the control point in mA or Vdc that you want to maintain, refer to your transducer specification for help in selecting the desired value.

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CONTROL POINT – When SWITCH LOCKOUT is ON, the control point will always be equal to the SETPOINT. When SWITCH LOCKOUT is OFF, the control point will be the SETPOINT ± the values determined by the settings of DIP switches 1-6. See SWITCH LOCKOUT below.

SENSOR READING – Is the actual reading in mA or Vdc being reported from the transducer in real-time.

DAMPEN TIME – The delay between the times the control point reading is checked and the speed is modified. Adjust to fine tune your system to prevent oscillation.

SWITCH LOCKOUT – When set to ON, DIP switches 1-6 are disabled. When set to OFF, DIP switches 1-6 can be used to shift the control point without a Navigator programmer. The control point can be adjusted up (DIP switch 6 OFF) or down (DIP switch 6 ON) from this number using DIP switches 1-5, see table below.

DIP Switch Control Point Adjustments							
DIP Switch Settings					PID+ 5V	PID+ 10V	PID+ CURR
1	2	3	4	5			
OFF	OFF	OFF	OFF	OFF	0.00	0.0	0.0
ON	OFF	OFF	OFF	OFF	0.05	0.1	0.2
OFF	ON	OFF	OFF	OFF	0.10	0.2	0.4
ON	ON	OFF	OFF	OFF	0.15	0.3	0.6
OFF	OFF	ON	OFF	OFF	0.20	0.4	0.8
ON	OFF	ON	OFF	OFF	0.25	0.5	1.0
OFF	ON	ON	OFF	OFF	0.30	0.6	1.2
ON	ON	ON	OFF	OFF	0.35	0.7	1.4
OFF	OFF	OFF	ON	OFF	0.40	0.8	1.6
ON	OFF	OFF	ON	OFF	0.45	0.9	1.8
OFF	ON	OFF	ON	OFF	0.50	1.0	2.0
ON	ON	OFF	ON	OFF	0.55	1.1	2.2
OFF	OFF	ON	ON	OFF	0.60	1.2	2.4
ON	OFF	ON	ON	OFF	0.65	1.3	2.6
OFF	ON	ON	ON	OFF	0.70	1.4	2.8
ON	ON	ON	ON	OFF	0.75	1.5	3.0
OFF	OFF	OFF	OFF	ON	0.80	1.6	3.2
ON	OFF	OFF	OFF	ON	0.85	1.7	3.4
OFF	ON	OFF	OFF	ON	0.90	1.8	3.6
ON	ON	OFF	OFF	ON	0.95	1.9	3.8
OFF	OFF	ON	OFF	ON	1.00	2.0	4.0
ON	OFF	ON	OFF	ON	1.05	2.1	4.2
OFF	ON	ON	OFF	ON	1.10	2.2	4.4
ON	ON	ON	OFF	ON	1.15	2.3	4.6
OFF	OFF	OFF	ON	ON	1.20	2.4	4.8
ON	OFF	OFF	ON	ON	1.25	2.5	5.0
OFF	ON	OFF	ON	ON	1.30	2.6	5.2
ON	ON	OFF	ON	ON	1.35	2.7	5.4
OFF	OFF	ON	ON	ON	1.40	2.8	5.6
ON	OFF	ON	ON	ON	1.45	2.9	5.8
OFF	ON	ON	ON	ON	1.50	3.0	6.0
ON	ON	ON	ON	ON	1.55	3.1	6.2

EXAMPLE: You would like your installers to have the capability to fine tune a system in the field, but you do not want to give them full access to all Navigator variables. You have determined that a _typical_ control point setting for your chosen transducer would be 12.5mA. With SWITCH LOCKOUT set to OFF you program the SETPOINT to 12.5mA. The Stratus II will constantly increase or decrease motor speed to hold the 12.5mA control point constant. If the installer decides that a control point of 11.3mA would be more appropriate for this application, setting the DIP switches to:

1	2	3	4	5	6
OFF	ON	ON	OFF	OFF	ON

would make the new control point 12.5 – 1.2 = 11.3mA. Changing switch 6 to OFF would make the new control point 12.5 +1.2 = 13.7mA.

Alarm Settings:

The Stratus II will hold the CONTROL POINT to within ± 0.2mA in PID+ CURR mode, ±0.1VDC in PID+ 10VDC mode and ±.05VDC in PID+ 5VDC mode if the system will allow. When the system will not allow these tolerances to be maintained, an alarm will be triggered.

When the alarm is triggered the RELAY will open and the LED STAT1 will turn amber. An alarm can be cleared by cycling power or activating the contact closure when CC is ENABLED, ref. CONTACT CLOSURE PROGRAMMING (next page). See below for alarm programming options.

LOW ALARM DELAY – The number of seconds the SENSOR READING must be below the CONTROL POINT before an alarm is triggered.

HIGH ALARM DELAY – The number of seconds the SENSOR READING must be above the CONTROL POINT before an alarm is triggered.

MIN ALARM – When ON an alarm is triggered at the MIN INPUT set above.

MAX ALARM – When ON an alarm is triggered at the MAX INPUT set above.

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SENSOR READING

Max Input

Min Input

0% Under Alarm Over Alarm 100%
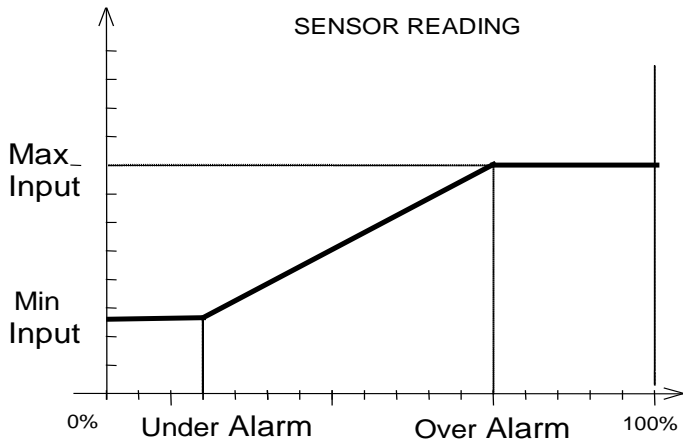
CONTACT CLOSURE PROGRAMMING

Out of the box, the Stratus II can stop the motor when closing a normally open contact connected to the Non-Isolated (high voltage) terminals **GND** and **Z**. Using the Navigator, one can program the Stratus II so that the contact is normally open or normally closed and select a fixed motor speed anywhere from stopped to full when the contact closure is activated.

CC Adjust Submenu	
Selection	**Default**
CC	Enabled
CC POLARITY	NO (normally open)
CC FREQUENCY	0 Hz (motor off)
RETURN	Press ▲ to exit this submenu

CC – Enables or disables contact closure feature.

CC POLARITY – Changes contact closure to normally open (NO) or normally closed (NC).

CC FREQUENCY – Sets motor speed between 0 – 400Hz when contact closure is activated.

MOTOR RESPONSE PROGRAMMING

Motor Adjust Submenu	
Selection	**Default**
MOTOR OUPUT	ON
DIR	FORWARD
MOTOR FREQ	60Hz
RAMP UP	6HZ/Sec
RAMP DOWN	12HZ/Sec
CURRENT LIMIT	10 Amps
PWM FREQUENCY	16,000Hz
RETURN	Press ▲ to exit this submenu

MOTOR OUTPUT – Turns motor ON or OFF

DIR – Changes motor direction (3 phase only)

MOTOR FREQ – Set to 60Hz, 50Hz or 400Hz, ref. motor specs.

RAMP UP – Controls how rapidly motor will respond to an increase in control signal. Useful for a conveyor.

RAMP DOWN – Controls how rapidly motor will respond to a decrease in control signal. Useful for a conveyor.

CURRENT LIMIT – Setting a current limit can protect the motor from excessive current draw. The current limit can be set between 0.1 – 10 Amps. When the current limit setting is exceeded, STAT2 (D2) will blink red. Settings between 4.1 – 10 Amps will also shut off and latch the motor output (T1,T2,T3) if the current limit is exceeded for more than 60 seconds. A power cycle is required to clear this fault.

PWM FREQUENCY – Carrier frequency of drive output. Allows adjustment to remove audible motor noise.

SAVING YOUR PROGRAM TO STRATUS II

When programing the Stratus II, you will note that your changes take effect in real-time. To save these changes, press the **Write Drive** key. Without pressing **Write Drive**, the Stratus II will revert back to the last program saved in its memory when the power is cycled. The **Write Drive** key can be used at any time during programing.

COPYING STRATUS II SETTINGS, SAVING, NAMING AND RECALLING NAVIGATOR PROGRAMS

Refer to the Navigator Datasheet at www.controlresources.com/pdf/navigator.pdf.

RECALLING STRATUS II DEFAULTS

Connect the Navigator to the Stratus II and apply power. Press **Recall Program** key and use the ▲ or ▼keys to select VFD400 (the default program). Press the **Write Program** key to install all the default values.

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TROUBLESHOOTING

Navigator automatically verifies the type and version of the connected Stratus II. 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 Stratus II revision is older than Rev:4 and is therefore not compatible with the Navigator.

```
Please update
programmer.
```

Indicates the Navigator has found a Stratus II, but the Stratus II revision is newer than the Navigator firmware supports. Navigator includes an upgrade port for future updates. Contact Control Resources at (978) 486-4160.

```
Older drive need
previous codes
```

Indicates the Navigator has found an older version of the Stratus 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 Stratus II, or it may be possible to update the Stratus II to the newer version. Contact Control Resources at (978) 486- 4160.

TECHNICAL DATA

Motor Compatibility: For maximum motor life without using a line filter, the use of an inverter duty motor is recommended.

Electrical Noise Emissions and filtering: Electrical noise emissions (EMI) are highly dependent on load and environment.   For many applications no additional filtering is required to meet EN55011/FCC class A emissions standards. For applications requiring additional filtering CRI recommends the following filters or equivalents:

EN55011/FCC class A: 150KHz – 30mHz	EN55011/FCC class B: 10KHz-30mHz
Filter Concepts: LE series	Filter Concepts: LX series
Corcom S series	Corcom Q series

Controlling multiple motors: A single Stratus II can control multiple motors wired in parallel as long as the maximum peak (startup) current doesn't exceed 10 Amps.

Control Accuracy and Hysteresis: Control signal accuracy for each control mode is as follows:

> TEMP CONTROL: $\pm 1.5C^o$
> CURR CONTROL: $\pm 0.4mA$
> VOLT CONTROL: $\pm 0.38VDC$
> PID+ CURR: $\pm 0.2mA$
> PID+ 10VDC: $\pm 0.1VDC$
> PID+ 5VDC: $\pm 0.05VDC$

In alarm conditions, loss of signal and ON/OFF feature, hysteresis is added to eliminate cycling. Hysteresis is as follows:

> Voltage $\pm 2\%$
> Current $\pm 1.5\%$
> Temperature $1-2C^o$

Maximum Fan Current: Some motors draw higher current at less than maximum voltage. Contact motor manufacturer for details.

HiPot Testing: Stratus II is designed to withstand HiPot testing to 1500Vrms, line input to analog input, motor output to analog input.

CURRENT DERATING VS AMBIENT TEMP.

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