SmartFan® Stratus II
Variable Frequency Drive

SmartFan Stratus II is a microprocessor based variable frequency drive designed for OEM applications in HVAC, electronic and industrial control markets. Stratus II is designed to control single or three-phase fans, motors and pumps in AC motor speed control applications including environmental control (temperature, humidity, pressure, flow), clean room pressurization, equipment cooling, exhaust ventilation and heating/air conditioning systems. Stratus II allows easy set-up for motor control based on an analog control input or fixed speed settings. For added versatility, Stratus II can be programmed and controlled using ModBus. The ease of operation, small size and innovative microprocessor design make Stratus II the most cost effective variable frequency drive available for low power AC motor speed control applications.

**SPECIFICATIONS**
- **Input Power:** 115 & 230 VAC ±10%, 47-64 Hz
  Single Phase, 5.7 Amps
- **Output Power:** 115 & 230 VAC±10%, 0-400 Hz
  Single or Three Phase, 4.0 Amps
- **Programmable carrier frequency 2 - 20 kHz (default - 16 kHz)**
- **Controls fan/motor speed based on:**
  - Isolated Control Options
    - 4-20 mA, 0-5 or 0-10 VDC
    - Modbus interface
    - Potentiometer
    - Temperature (thermistor)
  - Non-Isolated Control Options
    - Contact closure
    - Fixed speed switch
    - Potentiometer
    - Temperature (thermistor)
- **Storage temperature:** -40°C to 125°C
- **Operating temperature:** -20°C to 40°C (full load)
- **Weight:** 1.2 lb. (544 grams)
- **Weight with cover:** 1.8 lb. (816 grams)
- **RoHS (6/6) compliant**
- **UL Recognized to UL508C, File E331664**

**FEATURES**
- Single phase input/single or three phase output
- Programmable control parameters including:
  - Motor speed and direction
  - Output frequency
  - Motor phase
  - Acceleration and deceleration rates
  - Motor startup speed and on/off at idle
  - Current trip limit
  - Fully configurable control slope
- Over current and over temperature protection
- On-board Status/Fault LEDs and remote alarm signal indicate loss of control signal, over temperature or over current conditions
- Contact closures allow on/off and 3 speed setting options
- Steel cover
- Fan Compatibility: For maximum motor life the use of an inverter grade motor is recommended.

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**PART NUMBERING**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Control Inputs</th>
<th>Enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFD400E-F</td>
<td><strong>Stock Product</strong> All Isolated and Non-isolated control options</td>
<td>Yes</td>
</tr>
<tr>
<td>VFD400-F</td>
<td>All Isolated and Non-isolated control options (50 piece minimum order)</td>
<td>No</td>
</tr>
<tr>
<td>VFD401EF</td>
<td>Non-isolated control options only (50 piece minimum order)</td>
<td>Yes</td>
</tr>
<tr>
<td>VFD401-F</td>
<td>Non-isolated control options only (50 piece minimum order)</td>
<td>No</td>
</tr>
</tbody>
</table>
drive will accept a 0-5VDC or 0-10VDC input signal and control motor speed as shown in figure 1.

MOTOR COMPATIBILITY
For maximum motor life without using a line filter, the use of an inverter duty motor is recommended.

CONTROL MODES

Default Control Mode: Stratus II is factory set to control single phase fans from an analog voltage signal. The drive will accept a 0-5VDC or 0-10VDC input signal and control motor speed as shown in figure 1.

Figure 1

Fixed Speed Mode: In default control mode, Stratus II can set motors to a fixed frequency using SW2. Set switch 7 to ON and use Table 1 for frequency settings.

<table>
<thead>
<tr>
<th>Output Frequency</th>
<th>DIP switch settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz</td>
<td>OFF OFF OFF OFF OFF</td>
</tr>
<tr>
<td>1 Hz</td>
<td>ON OFF OFF OFF OFF</td>
</tr>
<tr>
<td>2 Hz</td>
<td>OFF ON OFF OFF OFF</td>
</tr>
<tr>
<td>3 Hz</td>
<td>ON ON OFF OFF OFF</td>
</tr>
<tr>
<td>4 Hz</td>
<td>OFF OFF ON OFF OFF</td>
</tr>
<tr>
<td>5 Hz</td>
<td>ON OFF ON OFF OFF</td>
</tr>
<tr>
<td>6 Hz</td>
<td>OFF ON ON OFF OFF</td>
</tr>
<tr>
<td>7 Hz</td>
<td>ON ON ON OFF OFF</td>
</tr>
<tr>
<td>8 Hz</td>
<td>OFF OFF OFF ON OFF</td>
</tr>
<tr>
<td>9 Hz</td>
<td>ON OFF OFF ON OFF</td>
</tr>
<tr>
<td>10 Hz</td>
<td>OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>11 Hz</td>
<td>ON ON OFF ON OFF</td>
</tr>
<tr>
<td>12 Hz</td>
<td>OFF OFF ON ON OFF</td>
</tr>
<tr>
<td>13 Hz</td>
<td>ON OFF ON ON OFF</td>
</tr>
<tr>
<td>14 Hz</td>
<td>OFF ON ON ON OFF</td>
</tr>
<tr>
<td>15 Hz</td>
<td>ON ON ON ON OFF</td>
</tr>
<tr>
<td>16 Hz</td>
<td>OFF OFF OFF OFF ON</td>
</tr>
<tr>
<td>17 Hz</td>
<td>ON OFF OFF OFF ON</td>
</tr>
<tr>
<td>18 Hz</td>
<td>OFF ON OFF OFF ON</td>
</tr>
<tr>
<td>19 Hz</td>
<td>ON ON OFF OFF ON</td>
</tr>
<tr>
<td>20 Hz</td>
<td>OFF OFF ON OFF ON</td>
</tr>
<tr>
<td>21 Hz</td>
<td>ON OFF ON OFF ON</td>
</tr>
<tr>
<td>22 Hz</td>
<td>OFF ON ON OFF ON</td>
</tr>
</tbody>
</table>

STOP on Contact Closure to “GND”: In default control mode, Stratus II can turn motors off when a contact closure is present at the Non-Isolated I/O terminals, GND and Z. Refer to wiring diagram. Reference level of this connection is at VBUS - and is non-isolated Hi-Voltage. Consult factory before installation.

Using Single-Phase or Three-Phase Motors: Stratus II can control single or three-phase motors from a single-phase power source.

To control a 1PH motor set SW2, #8 to the OFF position.
To control a 3PH motor set SW2, #8 to the ON position.
Power must be cycled before this setting will take effect.
Programmable Control Modes: Stratus II must be programmed using a Modbus interface. If Modbus is not available, special versions of Stratus II can be programmed at the factory with the following control modes:

- Isolated Voltage Control (0–5V / 0–10V)
- Isolated Current Control (4–20mA)
- Isolated Potentiometer Control (1KΩ–100KΩ)
- Isolated Temperature Control (CRI Thermistor)
- Isolated Modbus Control (J1)
- Non-Isolated Fixed Speed Switch Control (SW2)
- Non-Isolated Potentiometer Control (A/B)
- Non-Isolated Temperature Control (A/B)
- Non-Isolated Contact Closure Control (Z)

Isolated Voltage Control Signal Connections (default)
The Stratus II will accept a signal from a process sensor producing an output of 0-5VDC or 0-10VDC. Connection is made at the Isolated I/O terminals with no programming required. Scaling and alarms can be adjusted using Modbus. Refer to wiring diagram for signal and alarm connections.

Isolated Current Control Signal Connections
The Stratus II will accept a signal from a process sensor producing an output of 4-20mADC. Connection is made at the Isolated I/O terminals. Configuration using Modbus is required for processing a current signal. Refer to wiring diagram for signal and alarm connections.

Isolated Potentiometer Control Signal Connections
The Stratus II will accept a signal from a 1KΩ to 100KΩ potentiometer. Connection is made at the Isolated I/O terminals. Configuration using Modbus is required for processing a potentiometer signal. Refer to wiring diagram for signal and alarm connections.

Isolated Temperature Sensor Selection and Connection
The Stratus II will accept a signal from a sensor and control fan speed based on temperature. Connection is made at the Isolated I/O terminals (Refer to wiring diagram). Configuration using Modbus is required for processing a temperature signal. When sensing air temperature, use CRI sensor P11-F. For sensing temperatures of liquids or surfaces, contact CRI customer service.

Isolated Modbus Control (J1)
The Stratus II can be fully configured using Modbus RTU protocol. See Modbus section for specifications.

Non-Isolated Fixed Speed Switch Control (SW2)
The Stratus II can control speed based on a fixed setting of SW2. In default control mode, Stratus II can set motors to a fixed frequency using SW2. Set switch 7 to ON and use Table 1 for frequency settings.

Non-Isolated Potentiometer Control (A/B)
The Stratus II will accept a signal from a 1KΩ to 100KΩ potentiometer using a non-isolated input. Connection is made at the Non-Isolated I/O terminals. Configuration using Modbus is required for processing this type of potentiometer signal. Refer to wiring diagram for signal and alarm connections. Reference level of this connection is at VBUS- and is non-isolated Hi-Voltage. Consult factory before installation.

Non-Isolated Temperature Control (A/B)
The Stratus II will accept a signal from a sensor and control fan speed based on temperature. Connection is made at the Non-Isolated I/O terminals (Refer to wiring diagram). Configuration using Modbus is required for processing a temperature signal. When sensing air temperature, use CRI sensor P10-F. For sensing temperatures of liquids or surfaces, contact CRI customer service. Refer to wiring diagram for signal and alarm connections. Reference level of this connection is at VBUS- and is non-isolated Hi-Voltage. Consult factory before installation.

Non-Isolated Contact Closure Control (Z)
The Stratus II can process a contact closure (Digital) function as a STOP or programmable set point. See Modbus section for Setup. Reference level of this connection is at VBUS- and is non-isolated Hi-Voltage. Consult factory before installation.

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. Alarm threshold can be configured using Modbus. See Wiring Diagram for alarm configurations.
**Isolated Voltage Control Mode:** Connection for the isolated voltage control mode is made on the Isolated I/O terminals using the COM pin for ground reference and either the 0–5 or 0–10 pins for the positive reference.

Set registers 40001 and 40017 to 129 (0x0081) for forward run isolated voltage control mode.
Set register 40014 to desired ramp up rate (1Hz/Sec)
Set register 40015 to desired ramp down rate (1Hz/Sec)
Set register 40030 to 1 to save to EEPROM.

The Isolated Voltage Control mode is split into the following three control modes:
- Positive Slope
- Negative Slope
- Two Speed

**Positive Slope:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point E
Set register 40023 to the control value where the minimum output will occur (0-100%) Point D
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
  - To disable alarm set to 0%
  - To Idle when in alarm set bit 4 in Register 40013
  - To alarm on over limit set bit 6 in Register 40013

**Negative Slope:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1 Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point D
Set register 40023 to the control value where the minimum output will occur (0-100%) Point E
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
  - To disable alarm set to 0%
  - To Idle when in alarm set bit 4 in Register 40013
  - To alarm on over limit set bit 6 in Register 40013

**Two Speed:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1 Hz resolution) Point B
Set register 40022 to the control value where the speed change will occur (0-100%) Point D
Set register 40023 to the same value as register 40022
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
  - To disable alarm set to 0%
  - To Idle when in alarm set bit 4 in Register 40013
  - To alarm on over limit set bit 6 in Register 40013
**Isolated Current Control Mode:** Connection for the isolated current control mode is made on the Isolated I/O terminals using the COM pin for negative reference and 4-20 pin for the positive reference.

Set registers 40001 and 40017 to 257 (0x0101) for forward run isolated current control mode.
Set register 40014 to desired ramp up rate (1Hz/Sec)
Set register 40015 to desired ramp down rate (1Hz/Sec)
Set register 40030 to 1 to save to EEPROM.

The Isolated Current Control mode is split into the following three control modes:
- Positive Slope
- Negative Slope
- Two Speed

**Positive Slope:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point D
Set register 40023 to the control value where the minimum output will occur (0-100%) Point E
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013

**Negative Slope:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point D
Set register 40023 to the control value where the minimum output will occur (0-100%) Point E
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013

**Two Speed:**
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40022 to the control value where the speed change will occur (0-100%) Point D
Set register 40023 to the same value as register 40022
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013

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**SPEED vs. CONTROL SIGNAL**

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**CONTROL RESOURCES INCORPORATED**

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Email: sales@controlres.com

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Isolated Potentiometer Control Mode:
Connection for the isolated 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.

Set registers 40001 and 40017 to 513 (0x0201) for forward run isolated potentiometer control mode.
Set register 40014 to desired ramp up rate (1Hz/Sec)
Set register 40015 to desired ramp down rate (1Hz/Sec)
Set register 40030 to 1 to save to EEPROM.

The Isolated Potentiometer Control mode is split into the following three control modes:
- Positive Slope
- Negative Slope
- Two Speed

Positive Slope:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point D
Set register 40023 to the control value where the minimum output will occur (0-100%) Point D
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013

Negative Slope:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1 Hz resolution) Point B
Set register 40022 to the control value where the maximum output will occur (0-100%) Point D
Set register 40023 to the control value where the minimum output will occur (0-100%) Point D
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013

Two Speed:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1 Hz resolution) Point B
Set register 40022 to the control value where the speed change will occur (0-100%) Point D
Set register 40023 to the same value as register 40022
Set register 40024 to the control value where the alarm condition will occur (0-100%) Point C on figure xx
- To disable alarm set to 0%
- To Idle when in alarm set bit 4 in Register 40013
- To alarm on over limit set bit 6 in Register 40013
Isolated Temperature Control Mode:
Connection for the isolated temperature control mode is made on the Isolated I/O terminals using the COM pin for negative reference and POT pin for the temperature control.

Set registers 40001 and 40017 to 1025 (0x0401) for forward run isolated Temperature control mode.
Set register 40014 to desired ramp up rate (1Hz/Sec)
Set register 40015 to desired ramp down rate (1Hz/Sec)
Set register 40030 to 1 to save to EEPROM.

The Isolated Temperature Control mode is split into the following three control modes:
- Positive Slope
- Negative Slope
- Two Speed

Positive Slope:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40025 to the temperature (-20-100°C) where the maximum output will occur. Point E
Set register 40026 to the temperature (-20-100°C) where the minimum output will occur. Point D
Set register 40027 to the temperature (-20-100°C) where the alarm will occur. Refer to register 40013 for alarms and configuration.

Negative Slope:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40025 to the temperature (-20-100°C) where the maximum output will occur. Point D
Set register 40026 to the temperature (-20-100°C) where the minimum output will occur. Point E
Set register 40027 to the temperature (-20-100°C) where the alarm will occur. Refer to register 40013 for alarms and configuration.

Two Speed:
Set register 40019 to the maximum output that the motor should receive (1Hz resolution) Point A
Set register 40020 to the minimum output that the motor should receive (1Hz resolution) Point B
Set register 40025 to the temperature (-20-100°C) where the maximum output will occur. Point D
Set register 40026 to the same value as register 40025.
Set register 40027 to the temperature (-20-100°C) where the alarm will occur. Refer to register 40013 for alarms and configuration.
Isolated Modbus Control Mode: Using an RS-485 2-wire Modbus communications link, Stratus II can control motor speed, acceleration, deceleration and direction.

Modbus RTU Protocol
Baud Rate: Settable (default is 9600)
Word Length: 8
Parity: None
Stop Bits: 1
MODBUS ID: 1-63

Setup for Modbus Control: Use switch SW2 to select a unique ID number between 1 and 63 on your Modbus network. To set an ID number, turn #7 OFF and turn ON any number of switches 1-6 on SW2 and add up their associated “Value” see chart below. Example: turning ON “2, 4 and 6” would set the ID number by 2+8+32=42.

<table>
<thead>
<tr>
<th>Switch#</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>7</td>
<td>OFF</td>
</tr>
<tr>
<td>8</td>
<td>PHASE</td>
</tr>
</tbody>
</table>

Connecting to a Modbus Network: Use an RS-485 2-wire twisted pair cable, connected to the Modbus network (refer to wiring diagram for proper pin out).

Register Definitions:

40001 – Run Control: Enter the desired control method. Only one control method may be selected at a time. Drive will use the 1st control bit set.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Run 0 = Stop</td>
</tr>
<tr>
<td>1</td>
<td>Forward 1 = Reverse (three phase only)</td>
</tr>
<tr>
<td>2</td>
<td>Non-Isolated Potentiometer1 Control “A”</td>
</tr>
<tr>
<td>3</td>
<td>Non-Isolated Potentiometer2 Control “B”</td>
</tr>
<tr>
<td>4</td>
<td>Non-Isolated Temperature Control “A/B”</td>
</tr>
<tr>
<td>5</td>
<td>Non-Isolated Fixed Speed Switch Control “SW2”</td>
</tr>
<tr>
<td>6</td>
<td>Non-Isolated 3 Speed Digital Control “A/B”</td>
</tr>
<tr>
<td>7</td>
<td>Isolated Voltage Control “0-5/0-10”</td>
</tr>
<tr>
<td>8</td>
<td>Isolated Current Control “4-20”</td>
</tr>
<tr>
<td>9</td>
<td>Isolated Potentiometer Control “POT”</td>
</tr>
<tr>
<td>10</td>
<td>Isolated Temperature Control “POT”</td>
</tr>
</tbody>
</table>

40002 – Target Frequency: Set the desired output frequency when in Modbus mode. In all other modes it is read only and displays target output frequency.

40003 – Target Speed: Set the desired output % when in Modbus mode. In all other modes it is read only and displays target output percentage.

40004 – Output Frequency: Displays the current output of the drive in Hertz.

40005 – Output Speed: Displays the current output of the drive in %.

40006 – Control Value: Displays a representation of the analog control in % full or Temp °C.

40007 – Alarms: Displays all active alarms.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Power Module Temperature Fault (100°C)</td>
</tr>
<tr>
<td>1</td>
<td>Soft Current Limit Fault (40016 set point)</td>
</tr>
<tr>
<td>2</td>
<td>10A Hard Current Limit Fault</td>
</tr>
<tr>
<td>3</td>
<td>Control Signal Fault</td>
</tr>
<tr>
<td>4</td>
<td>Alarm on Temp Low</td>
</tr>
<tr>
<td>5</td>
<td>Alarm on V/I/POT High</td>
</tr>
<tr>
<td>6</td>
<td>Contact Closure Enabled</td>
</tr>
<tr>
<td>7</td>
<td>CC polarity is NC</td>
</tr>
<tr>
<td>8</td>
<td>Motor frequency 50Hz 0 = 60Hz</td>
</tr>
</tbody>
</table>

40008 – Bus Voltage: Displays the DC bus voltage in Volts. (1V res)

40009 – Bus Current: Displays the DC bus current in Amps. (0.1A res)

40010 – Temperature: Displays the temperature of the inverter module in °C. (1°C res). 100°C shutdown.

40011 – Revision: Displays the firmware revision.

40012 – Modbus ID: Displays the Modbus ID.

40013 – Configuration: Used to configure specific control preferences.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Three Phase 0 = Single Phase (Read Only)</td>
</tr>
<tr>
<td>1</td>
<td>Not used</td>
</tr>
<tr>
<td>2</td>
<td>Idle on Temp Failure 0 = Max on Failure</td>
</tr>
<tr>
<td>3</td>
<td>Idle on Open Therm 0 = Max on Open</td>
</tr>
<tr>
<td>4</td>
<td>Idle on V/I/POT Failure 0 = Max on Failure</td>
</tr>
<tr>
<td>5</td>
<td>Alarm on Temp Low 0 = Alarm on Temp High</td>
</tr>
<tr>
<td>6</td>
<td>Alarm on V/I/POT High 0 = Alarm on Low</td>
</tr>
<tr>
<td>7</td>
<td>Contact Closure Enabled 0 = CC disabled</td>
</tr>
<tr>
<td>8</td>
<td>CC polarity is NC 0 = Normally open</td>
</tr>
<tr>
<td>9</td>
<td>Motor frequency 50Hz 0 = 60Hz</td>
</tr>
</tbody>
</table>

40014 – Ramp Up Rate: Enter the desired increase in output frequency rate. (1Hz/sec res)

40015 – Ramp Down Rate: Enter the desired decrease in output frequency rate. (1Hz/sec res)

40016 – Current Limit: Enter the desired output current fault level (0-100) (.1A res). Any current beyond this setting will cause Stratus II to lock-up and set an alarm. Power must be cycled to clear the alarm.
40017 – Startup Run: Enter the configuration to be loaded into Register 40001 (Run Control) at startup.

Table 6: Startup Run Control Description

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 = Run  0 = Stop</td>
</tr>
<tr>
<td>1</td>
<td>0 = Forward  1 = Reverse (three phase only)</td>
</tr>
<tr>
<td>2</td>
<td>1 = Non-Isolated Potentiometer1 Control “A”</td>
</tr>
<tr>
<td>3</td>
<td>1 = Non-Isolated Potentiometer2 Control “B”</td>
</tr>
<tr>
<td>4</td>
<td>1 = Non-Isolated Temperature Control “A/B”</td>
</tr>
<tr>
<td>5</td>
<td>1 = Non-Isolated Fixed Speed Switch Control “SW2”</td>
</tr>
<tr>
<td>6</td>
<td>1 = Non-Isolated 3 Speed Digital Control “A/B”</td>
</tr>
<tr>
<td>7</td>
<td>1 = Isolated Voltage Control “0-5/0-10”</td>
</tr>
<tr>
<td>8</td>
<td>1 = Isolated Current Control “4-20”</td>
</tr>
<tr>
<td>9</td>
<td>1 = Isolated Potentiometer Control “POT”</td>
</tr>
<tr>
<td>10</td>
<td>1 = Isolated Temperature Control “POT”</td>
</tr>
</tbody>
</table>

*Drive will use the 1st control bit set.

40018 – Startup Frequency: Enter the desired frequency output at startup. Modbus control only.

40019 – Max Frequency Output: Enter the desired maximum frequency output when in analog control modes.

40020 – Idle Frequency Output: Enter the desired Idle frequency output when in analog control modes.

40021 – Contact Closure Frequency: Enter the desired output frequency when CC is activated. Non-Isolated digital control.

40022 – Max Control %: Used in 0-5V, 0-10V, 4-20mA, and Pot control. It sets the analog control percentage point of where the Max Frequency output occurs.

40023 – Idle Control: The Idle control register is used in 0-5V, 0-10V, 4-20mA, and Pot control. It sets the Idle frequency control percentage. Refer to 40013.

40024 – Alarm Control: The alarm control register is used in 0-5V, 0-10V, 4-20mA, and Pot control. It sets the alarm control percentage. 0=Disabled. Refer to 40013.

40025 – Max Temperature: The max temperature register is used in Thermistor control. It sets the Temperature threshold for max frequency output. Refer to 40019 for setting Max Freq output value.

40026 – Idle Temperature: Used in thermistor control mode to set the temperature threshold for idle frequency. Refer to register 40020 for setting Idle Freq value.

40027 – Alarm Temperature: Used in thermistor control mode to set the temperature threshold for an alarm.

40028 – Baud Rate: Sets the Modbus communication Baud rate. Range from 2,400 – 500,000 (100 Baud Res).

40029 – PWM Frequency: Sets the sine wave modulation frequency. Range from 2,000 – 20,000 Hz. Default = 16,000Hz

40030 – EEPROM Save: Setting this register to a 1 saves the control variables into EEPROM. EEPROM Save is also used to set variables to default.

Table 7: Stratus II Modbus Memory Map

<table>
<thead>
<tr>
<th>Reg#</th>
<th>Description</th>
<th>Valid Entry</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Run Control</td>
<td>See Table 3</td>
<td>129</td>
</tr>
<tr>
<td>40002</td>
<td>Target Frequency (Hz)</td>
<td>0 – 400</td>
<td>0</td>
</tr>
<tr>
<td>40003</td>
<td>Target Speed (%)</td>
<td>0 – 100</td>
<td>0</td>
</tr>
<tr>
<td>40004</td>
<td>Actual Output Frequency (Hz)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40005</td>
<td>Actual Output Speed (%)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40006</td>
<td>Control Value (°C or %)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40007</td>
<td>Alarms Status</td>
<td>See Table 4</td>
<td>-</td>
</tr>
<tr>
<td>40008</td>
<td>Bus Voltage (VDC)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40009</td>
<td>Bus Current (0.1A)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40010</td>
<td>Module Temperature (°C)</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40011</td>
<td>Revision</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40012</td>
<td>Modbus ID</td>
<td>Read Only</td>
<td>-</td>
</tr>
<tr>
<td>40013</td>
<td>Configuration</td>
<td>See Table 5</td>
<td>129</td>
</tr>
<tr>
<td>40014</td>
<td>Ramp Up Rate (Hz/sec)</td>
<td>1 – 20</td>
<td>6</td>
</tr>
<tr>
<td>40015</td>
<td>Ramp Down Rate (Hz/sec)</td>
<td>1 – 20</td>
<td>12</td>
</tr>
<tr>
<td>40016</td>
<td>Soft Current Limit (0.1A res)</td>
<td>0 – 100</td>
<td>100</td>
</tr>
<tr>
<td>40017</td>
<td>Startup Run Control</td>
<td>See Table 6</td>
<td>129</td>
</tr>
<tr>
<td>40018</td>
<td>Startup Frequency (Hz)</td>
<td>0 – 400</td>
<td>0</td>
</tr>
<tr>
<td>40019</td>
<td>Max Frequency (Hz)</td>
<td>0 – 400</td>
<td>60</td>
</tr>
<tr>
<td>40020</td>
<td>Idle Frequency (Hz)</td>
<td>0 – 400</td>
<td>0</td>
</tr>
<tr>
<td>40021</td>
<td>CC Frequency (Hz)</td>
<td>0 – 400</td>
<td>0</td>
</tr>
<tr>
<td>40022</td>
<td>Max Control (%)</td>
<td>0 – 100</td>
<td>100</td>
</tr>
<tr>
<td>40023</td>
<td>Idle Control (%)</td>
<td>0 – 100</td>
<td>0</td>
</tr>
<tr>
<td>40024</td>
<td>Alarm Control (%)</td>
<td>0 – 100</td>
<td>0</td>
</tr>
<tr>
<td>40025</td>
<td>Max Temperature (°C)</td>
<td>-20 – 100</td>
<td>60</td>
</tr>
<tr>
<td>40026</td>
<td>Idle Temperature (°C)</td>
<td>-20 – 100</td>
<td>0</td>
</tr>
<tr>
<td>40027</td>
<td>Alarm Temperature (°C)</td>
<td>-20 – 100</td>
<td>100</td>
</tr>
<tr>
<td>40028</td>
<td>Baud Rate (100 Baud res)</td>
<td>0 – 5000</td>
<td>96</td>
</tr>
<tr>
<td>40029</td>
<td>PWM Carrier Frequency (Hz)</td>
<td>2000-20000</td>
<td>16000</td>
</tr>
<tr>
<td>40030</td>
<td>EEPROM Save / Recover</td>
<td>1 = SAVE</td>
<td>0</td>
</tr>
</tbody>
</table>
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 an inverter duty motor is recommended.

Mounting: 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.

To help reduce electrical noise emissions, use shielded cable or place motor wires in a grounded metal conduit.

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 SW2, #8 to the OFF position. To control a 3PH motor set SW2, #8 to the ON position. Power must be cycled before this setting will take effect.

SW2 Switch Settings for Fixed Speed, ModBus and Motor Phase

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Speed Setting or ModBus (Value 1 to 63)</td>
<td>ON = Fixed Speed</td>
<td>ON = 3Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12481632</td>
<td>OFF = ModBus ID</td>
<td>OFF = 1Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Communications & Isolated Control I/O Connections

- **MODBUS**: RJ-45 Jack for Modbus interface
- **USB**: For future USB interface
- **STAT1**: Isolated control status LED
- **SW1**: Future Feature
- **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.
- **5V**: Connection to power a remote transducer or potentiometer, 5VDC @ 50mA
- **RELAY**: Connection for a relay alarm output.

Non-Isolated Control & Power I/O Connections

- **3.3V**: Regulated 3.3VDC output
- **GND**: Non-isolated reference level
- **A**: Non-isolated programmable pin
- **B**: Non-isolated programmable pin
- **Z**: STOP on contact closure to “GND”

**STAT2**

- Switches to select single- or three-phase output power, fixed speed mode settings or Modbus address

**POWER**

- 115/230 VAC Power Source Input

**STAT1 LED Isolated Status**

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>No Fault</td>
</tr>
<tr>
<td>RED</td>
<td>Isolated Control Fault</td>
</tr>
</tbody>
</table>

**STAT2 LED Non-Isolated Status/Output Status**

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>No Faults</td>
</tr>
<tr>
<td>RED</td>
<td>Non-Isolated Control Fault, Module Temperature Fault, Over Current Fault</td>
</tr>
</tbody>
</table>

www.controlres.com
WIRING DIAGRAM

---NONISOLATED I/O---
"3.3V" = REGULATED 3.3 VOLT OUTPUT. 10mA limit
"GND" = NONISO REFERENCE LEVEL.
"A" = NONISO CONFIGURABLE PIN.
"B" = NONISO CONFIGURABLE PIN.
"Z" = STOP ON CONTACT CLOSEURE TO "GND"

---ISOLATED I/O---
5Vout @ 50mA
REGULATED

**LED ON FOR ALARM CONDITION TRUE.**

**Other Alarm Circuit Configurations.**

115 - 230VAC +/-10%
1PH 47-64HZ

---Future Feature---
AC MOTOR
1PH OR 3PH
1hp MAX

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

REMOTE CONTROL SWITCH
STAT2 Z B A GND 3.3V

 --- Future Feature ---
68k
2 Watt

---Future Feature---
230 V.A.C. MAX.
A.C. LAMP "OFF" FOR ALARM CONDITION PRESENT.

---Future Feature---
265 V.A.C. MAX.
DRIVING LED WITH A.C. "OFF" FOR ALARM CONDITION PRESENT.
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:

<table>
<thead>
<tr>
<th>EN55011/FCC class A:</th>
<th>EN55011/FCC class B:</th>
</tr>
</thead>
<tbody>
<tr>
<td>150KHz – 30mHz</td>
<td>10KHz-30mHz</td>
</tr>
</tbody>
</table>

Filter Concepts: LE series
www.filterconcepts.com
Filter Concepts: LX series
www.filterconcepts.com
Corcom S series,
www.cor.com
Corcom Q series,
www.cor.com

Controlling multiple motors: Multiple motors wired in parallel can be controlled from one Stratus II as long as maximum peak (startup) currents do not exceed 10 Amps.

Control Accuracy and Hysteresis: Control signal accuracy is as follows:

Voltage ± 0.38VDC
Current ± 0.4mA
Temperature ± 1.5°C

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

Voltage ± 2%
Current ± 1.5%
Temperature 1-2°C

RoHS compliance: Stratus II is RoHS (6/6) compliant

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:

![Current Derating VS Ambient Temperature](image)

Figure 6

Specifications:

- Input Power: 115 & 230 VAC +/-10% 47-64 Hz Single Phase, 5.7 Amps
- Output Power: 115 & 230 VAC +/-10% 0-400 Hz Single Phase, 4.0 Amps
- Maximum peak (startup) current: 10 Amps
- Storage Temperature: -40°C to 125°C
- Operating Temperature: -20°C to 40°C (full load)
- Thermal shutdown at 100°C
- Relative Humidity: 95% non-condensing
- Weight (with cover): 1.8 lb (816 grams)
- Weight (no cover): 1.2 lb (544 grams)