

This board provides an output frequency proportional to the input voltage. It outputs either a 5V voltage output that is CMOS and TTL compatible or a 24V unregulated relay drive output. It is available with either an 8-pin base, which outputs either 5V or 24V relay drive, or an 11-pin base, which outputs both 5V and 24V relay drive. Contact closure output (relay) is also available.

## Specifications

|                       |  |
|-----------------------|--|
| <b>Output:</b>        | 5V TTL and CMOS at 10mA (15mA current limited)<br>24V unregulated 30mA<br>Relay output SPST, 3.1Hz maximum output,<br>120VAC, 1-Amp contacts |
| <b>Pulse:</b>         | 1:1 ratio or selectable 90ms on-time   |
| <b>Frequencies:</b>   | Range Selector Switch (16 positions)<br>High Range: 0-0.763Hz to 0-50kHz<br>Low Range: 0-11PPH to 0-195Hz                                    |
| <b>Isolation:</b>     | 1500VDC or VAC peak  |
| <b>Response Time:</b> | 20ms   |
| <b>Linearity:</b>     | 0.2% of FS   |
| <b>Stability:</b>     | 0.05% of Span/°C   |

## Adjustments

|                       |                |
|-----------------------|----------------|
| <b>Output Offset:</b> | +10%           |
| <b>Low Cutoff:</b>    | 0-10% of input |

*For general Series 8000 specifications, see the Series 8000 manual, which provides general information for the entire series.*

## Setup Procedure

- I. Disassemble the Series 8000 unit as described on page 6 of the main manual.
- II. Remove the Frequency Output Board.
- III. Determine the configuration needed. If you require settings other than the standard, set up the board as described in Setup Instructions on page 70-2.
- IV. Calibrate as described on page 70-4.
- V. Reassemble the unit as described in the main manual, pages 4 to 6.

## Setup Instructions

### Output Type Selection

#### Pulse Output

The 1:1 ratio pulse output is the standard setting. For this setting, the SB6 and SB7 solder jumpers are set as follows:

|            |            |
|------------|------------|
| <u>SB6</u> | <u>SB7</u> |
| closed     | open       |

To select a 90msec on-time pulse, set the SB6 and SB7 solder jumpers as follows:

|            |            |
|------------|------------|
| <u>SB6</u> | <u>SB7</u> |
| open       | closed     |

For this pulse, on is low (0V) and off is high (5V).

#### Voltage Outputs

The 5V output is the standard setting for both 8-pin base and 11-pin base Series 8000 units. For this setting, the SB1-SB5 solder jumpers are set as follows:

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| <u>SB1</u> | <u>SB2</u> | <u>SB3</u> | <u>SB4</u> | <u>SB5</u> |
| closed     | open       | closed     | open       | closed     |

To select 24V relay drive for an 8-pin base, set the SB1-SB5 and SB12 solder jumpers as follows:

|            |            |            |            |            |             |
|------------|------------|------------|------------|------------|-------------|
| <u>SB1</u> | <u>SB2</u> | <u>SB3</u> | <u>SB4</u> | <u>SB5</u> | <u>SB12</u> |
| closed     | closed     | open       | open       | open       | closed      |

#### Contact Closure Output

To select contact closure output (on/off contact for 8-pin base, SPST contacts for 11-pin base), set the SB1-SB5 solder jumpers as follows:

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| <u>SB1</u> | <u>SB2</u> | <u>SB3</u> | <u>SB4</u> | <u>SB5</u> |
| open       | closed     | open       | closed     | open       |

## Output Frequency Range Selection

1. Determine the output frequency range required.
2. Set the SB8 and SB9 solder jumpers for low or high range as follows:

| Frequency Range | SB8    | SB9    |
|-----------------|--------|--------|
| High            | open   | closed |
| Low             | closed | open   |

3. Set the Range Selector Switch (16-position hexadecimal) as noted in the following table.

| Frequency Output      |                |                       |                |                 |
|-----------------------|----------------|-----------------------|----------------|-----------------|
| Range Switch Position | Scaling Factor | Closed Solder Jumpers | High Range     | Low Range       |
| 0                     | 1              | SB11                  | 40k-50kHz      | 156-195Hz       |
| 0                     | 1              | SB10                  | 30k-40kHz      | 117-156Hz       |
| 0                     | 1              | None                  | 25k-30kHz      | 97.7-117Hz      |
| 1                     | 2              | SB11                  | 20k-25kHz      | 78.1-97.7Hz     |
| 1                     | 2              | SB10                  | 15k-20kHz      | 58.6-78.1Hz     |
| 1                     | 2              | None                  | 12.5k-15kHz    | 48.8-58.6Hz     |
| 2                     | 4              | SB11                  | 10k-12.5kHz    | 39.1-48.8Hz     |
| 2                     | 4              | SB10                  | 7.5k-10kHz     | 29.3-39.1Hz     |
| 2                     | 4              | None                  | 6.25k-7.5kHz   | 24.4-29.3Hz     |
| 3                     | 8              | SB11                  | 5k-6.25kHz     | 19.5-24.4Hz     |
| 3                     | 8              | SB10                  | 3.75k-5kHz     | 14.6-19.5Hz     |
| 3                     | 8              | None                  | 3.13k-3.75kHz  | 12.2-14.6Hz     |
| 4                     | 16             | SB11                  | 2.5k-3.13kHz   | 9.77-12.2Hz     |
| 4                     | 16             | SB10                  | 1.88k-2.5kHz   | 7.32-9.77Hz     |
| 4                     | 16             | None                  | 1.56k-1.88kHz  | 6.10-7.32Hz     |
| 5                     | 32             | SB11                  | 1.25k-1.56kHz  | 4.88-6.10Hz     |
| 5                     | 32             | SB10                  | 934Hz-1.25kHz  | 3.66-4.88Hz     |
| 5                     | 32             | None                  | 781-934Hz      | 3.05-3.66Hz     |
| 6                     | 64             | SB11                  | 625-781Hz      | 2.44-3.05Hz     |
| 6                     | 64             | SB10                  | 469-625Hz      | 1.83-2.44Hz     |
| 6                     | 64             | None                  | 391-469Hz      | 1.53-1.83Hz     |
| 7                     | 128            | SB11                  | 313-391Hz      | 1.22-1.53Hz     |
| 7                     | 128            | SB10                  | 234-313Hz      | 54.9PPM-1.22Hz  |
| 7                     | 128            | None                  | 195-234Hz      | 45.8-54.9PPM    |
| 8                     | 256            | SB11                  | 156-195Hz      | 36.6-45.8PPM    |
| 8                     | 256            | SB10                  | 117-156Hz      | 27.5-36.6PPM    |
| 8                     | 256            | None                  | 97.7-117Hz     | 22.9-27.5PPM    |
| 9                     | 512            | SB11                  | 78.1-97.7Hz    | 18.0-22.9PPM    |
| 9                     | 512            | SB10                  | 58.6-78.1Hz    | 13.7-18.0PPM    |
| 9                     | 512            | None                  | 48.8-58.6Hz    | 11.4-13.7PPM    |
| A                     | 1,024          | SB11                  | 39.1-48.8Hz    | 9.16-11.4PPM    |
| A                     | 1,024          | SB10                  | 29.3-39.1Hz    | 6.87-9.16PPM    |
| A                     | 1,024          | None                  | 24.4-29.3Hz    | 5.72-6.87PPM    |
| B                     | 2,048          | SB11                  | 19.5-24.4Hz    | 4.58-5.72PPM    |
| B                     | 2,048          | SB10                  | 14.6-19.5Hz    | 3.43-4.58PPM    |
| B                     | 2,048          | None                  | 12.2-14.6Hz    | 2.86-3.43PPM    |
| C                     | 4,096          | SB11                  | 9.77-12.2Hz    | 2.29-2.86PPM    |
| C                     | 4,096          | SB10                  | 7.32-9.77Hz    | 1.72-2.29PPM    |
| C                     | 4,096          | None                  | 6.10-7.32Hz    | 1.43-1.72PPM    |
| D                     | 8,192          | SB11                  | 4.88-6.10Hz    | 1.14-1.43PPM    |
| D                     | 8,192          | SB10                  | 3.66-4.88Hz    | 51.5PPH-1.14PPM |
| D                     | 8,192          | None                  | 3.05-3.66Hz    | 42.9PPH-51.5PPH |
| E                     | 16,384         | SB11                  | 2.44-3.05Hz    | 34.3-42.9PPH    |
| E                     | 16,384         | SB10                  | 1.83-2.44Hz    | 25.7-34.3PPH    |
| E                     | 16,384         | None                  | 1.53-1.83Hz    | 21.5-25.7PPH    |
| F                     | 32,768         | SB11                  | 1.22-1.53Hz    | 17.2-21.5PPH    |
| F                     | 32,768         | SB10                  | 54.9PPM-1.22Hz | 12.9-17.2PPH    |
| F                     | 32,768         | None                  | 45.8-54.9PPM   | 10.7-12.9PPH    |

PPM=Pulses Per Minute; PPH=Pulses Per Hour

## Calibration

1. Set cutout adjustment fully CCW.
2. Set Fine Span Adjustment CCW.
3. Set Range Switch to desired output.
4. Set input to minimum.
5. Set Input Zero Adjustment until Zero LED lights.
6. Set input to 10% of span.
7. Adjust Output Zero for 10% output.
8. Set input to maximum. Set input span adjustment for maximum output.
9. If there is not enough adjustment in the input span adjustment, turn the fine span adjustment for maximum output.
10. Repeat steps 6 through 9 as required.
11. Set input for desired cutout frequency (max. 10% of span). Slowly adjust cutout until cutout LED lights. If no cutout is desired, leave fully CCW.

### Calibration for Very Low Outputs

Very low frequency are most easily calibrated using a multiplier or scaling factor. Using this method, the output is first calibrated at a higher frequency and then, through precise digital circuitry, is divided down to the required lower pulse rate. To calibrate these outputs, follow the steps below:

1. Find range for desired output.
2. Find scaling factor for that range (see Frequency Output table).
3. Multiply output by the scaling factor:  
(Output in Hz) x (Scaling Factor) = Calibration Frequency.
4. Set Range Switch to setting 0.
5. Use calibration frequency as you would standard calibration (see example below).
6. Set Range Switch to proper setting.

#### Example

For 0-15PPH:

$$\frac{15 \text{ Pulses}}{\text{hr.}} \times \frac{1 \text{ hr.}}{60 \text{ min.}} \times \frac{1 \text{ min.}}{60 \text{ sec.}} = 0.0041667\text{Hz}$$

Frequency in Hertz is multiplied by the scaling factor to calculate the calibration frequency:  $(0.0041667\text{Hz}) \times (32,768) = 136.533\text{Hz}$  at setting 0; 10% = 13.6533Hz; maximum = 136.533Hz.

# Frequency Output Board Part Locations

