# Wind Turbine Speed Sensing Circuit Operator's Manual

***WARNING: up to 600 VAC from THE WIND TURBINE GENERATOR IS APPLIED TO THE Wind Speed Sensing circuit board.***

## Introduction

As the speed of the wind turbine increases, both the generated voltage and the frequency of the generator's output increases.

The Wind Turbine Speed Sensing (WTSS) Circuit uses the alternating current waveform of Voltage, generated by the turbine, and develops a series of 5 Volt pulses proportional to the turbines speed. The WTSS Circuit uses the voltage from one phase of the turbine generator. The WTCC starts to sense speed when the generator output exceeds 25 Volts. The WTSS Circuit provides 5,000 Volts of electrical isolation between the; input 600 V from the turbine generator; and the output speed signal to data logging equipment.

## How the Wind Turbine Speed Sensing Circuit works

You will need to know: the number of magnetic poles in the turbine generator,
the maximum speed of the turbine and
the maximum voltage generated.

Please review the following Table of Wind Turbine Characteristics.

**Table of Wind Turbine Characteristics**

| Number of Generator Magnetic Poles | Pulses per Generator Revolution | frequency, Hertz (pulses/sec) at the following wind turbine speeds in rpm | | | | | | | | | | f = P/2 * RPM/60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 50 | 100 | 150 | 200 | **250** | 300 | 350 | 400 | 450 | 500 |
| 8 | 4 | 0.0 | 3.3 | 6.7 | 10.0 | 13.3 | 16.7 | 20.0 | 23.3 | 26.7 | 30.0 | 33.3 |
| 10 | 5 | 0.0 | 4.2 | 8.3 | 12.5 | 16.7 | 20.8 | 25.0 | 29.2 | 33.3 | 37.5 | 41.7 |
| 12 | 6 | 0.0 | 5.0 | 10.0 | 15.0 | 20.0 | 25.0 | 30.0 | 35.0 | 40.0 | 45.0 | 50.0 |
| 14 | 7 | 0.0 | 5.8 | 11.7 | 17.5 | 23.3 | 29.2 | 35.0 | 40.8 | 46.7 | 52.5 | 58.3 |
| 16 | 8 | 0.0 | 6.7 | 13.3 | 20.0 | 26.7 | 33.3 | 40.0 | 46.7 | 53.3 | 60.0 | 66.7 |
| 18 | 9 | 0.0 | 7.5 | 15.0 | 22.5 | 30.0 | 37.5 | 45.0 | 52.5 | 60.0 | 67.5 | 75.0 |
| 20 | 10 | 0.0 | 8.3 | 16.7 | 25.0 | 33.3 | 41.7 | 50.0 | 58.3 | 66.7 | 75.0 | |
| 22 | 11 | 0.0 | 9.2 | 18.3 | 27.5 | 36.7 | 45.8 | 55.0 | 64.2 | 73.3 | | |
| 24 | 12 | 0.0 | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 | 70.0 | | | |
| 26 | 13 | 0.0 | 10.8 | 21.7 | 32.5 | 43.3 | 54.2 | 65.0 | 75.8 | | | |
| 28 | 14 | 0.0 | 11.7 | 23.3 | 35.0 | 46.7 | 58.3 | 70.0 | | | | |
| 30 | 15 | 0.0 | 12.5 | 25.0 | 37.5 | 50.0 | 62.5 | 75.0 | | | | |
| **32** | **16** | 0.0 | 13.3 | 26.7 | 40.0 | 53.3 | **66.7** | ** | | | | |
| 34 | 17 | 0.0 | 14.2 | 28.3 | 42.5 | 56.7 | 70.8 | | | | | |
| 36 | 18 | 0.0 | 15.0 | 30.0 | 45.0 | 60.0 | 75.0 | | | | | |
| 38 | 19 | 0.0 | 15.8 | 31.7 | 47.5 | 63.3 | | | | | | |
| 40 | 20 | 0.0 | 16.7 | 33.3 | 50.0 | 66.7 | | | | | | |

**Example: A 32 pole generator operating at a rated speed of 250 rpm will generate 66.7 Hz.
The WTSS Circuit will output falling edge pulses at a rate of 66.7 Hertz.
The upper frequency limit of the WTSS Circuit is 750 Hz or more.

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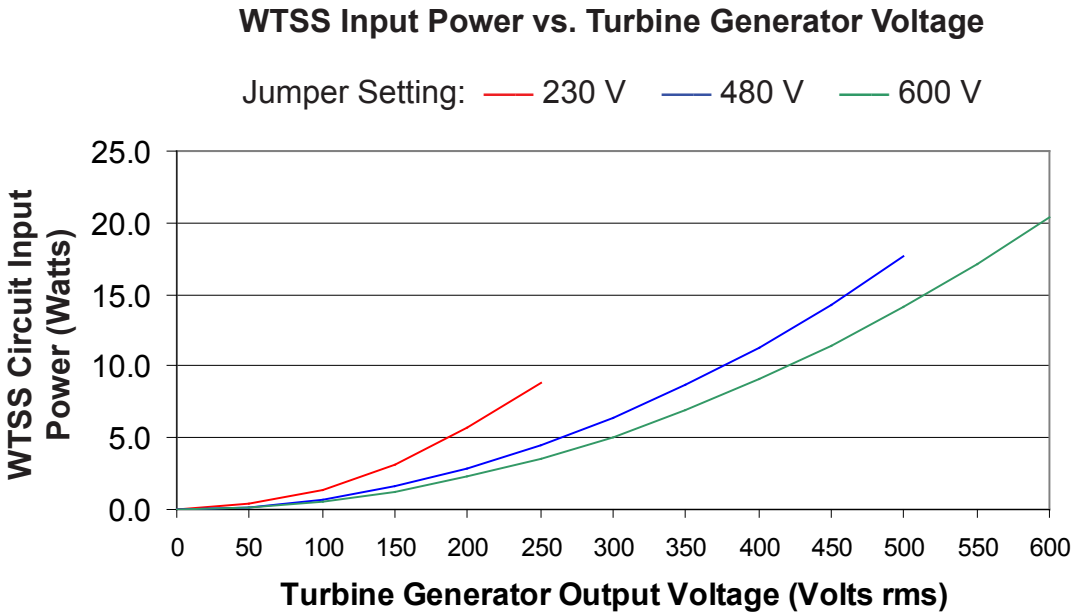
The Data Logging equipment, using the **Pulses per Revolution** values found in the second column of the table, will convert the frequency from the WTSS Circuit into an rpm speed signal for display. The **Pulses per Revolution** value is required to be entered during the Data Logger set-up. If your generator is not covered by the table, use the follow formula to determine frequency:

f = P/2 x rpm/60 where f is the frequency of the turbine generator
P is the number of poles in the generator and
rpm is the speed of the turbine.

The WTSS Circuit uses a small amount of turbine generator power for operation. When the WTSS Circuit is used on a very small wind turbine, the amount may become significant. The following graph of **Input Power versus Turbine Generator Voltage** can be used to estimate the WTSS Circuit power usage. No generator power is used at zero speed.




## Jumpers

To ensure correct operation, you will need to use a pair of jumpers to set the maximum expected voltage. Use the following chart as a guide.

| Expected Voltage Range | Jumper Location |
|---|---|
| 0 to 600 volts | No Jumper Needed |
| 0 to 480 volts | 600 to 480 |
| 0 to 230 volts | 600 to 230 |