1. Operational Description

The electrical specifications for the Laufer Wind Pulse Doppler Radar are summarized in Table 1. The radar uses a commercially-available magnetron to generate X-band microwave power.[1] The peak radar microwave power is 16.1 kW (maximum) at pulse duration of 500 nsec at 9.4 GHz nominal frequency. The microwave pulse recurrent frequency is nominally 2000 pulses per second, for an average microwave power 16.1 W (maximum). The average power dissipated by the radar is less than 300W.

Table 1. Radar Electrical Specifications

Description	Specifications
AC input voltage	100-240 VAC, single phase, neutral with ground
AC line frequency	50/60 Hz nominal
AC input power	550VA/500W (maximum)
Microwave peak power	16.1 kW (maximum)
Microwave pulse duration	500 nanoseconds
Microwave pulse recurrent frequency	2000 pulses per second
Microwave average power	16.1 W A(maximum)
Microwave frequency	9.4 GHz nominal (X-Band)

2. Electrical and Control Signal Connections

The Pulse Doppler Radar is operated and controlled by a Central Controller computer through its graphical user interface (GUI). A CAT/6 (shielded) Ethernet communication cable connects the Radar to the Central Controller computer (typically a laptop). The Figure 1 block diagram shows how the Pulse Doppler Radar and Central Controller computer are connected via a CAT/6 (shielded) Ethernet communication cable. The Radar is connected to a single-phase (line-neutral-ground)100-240V AC power source through connector P1.

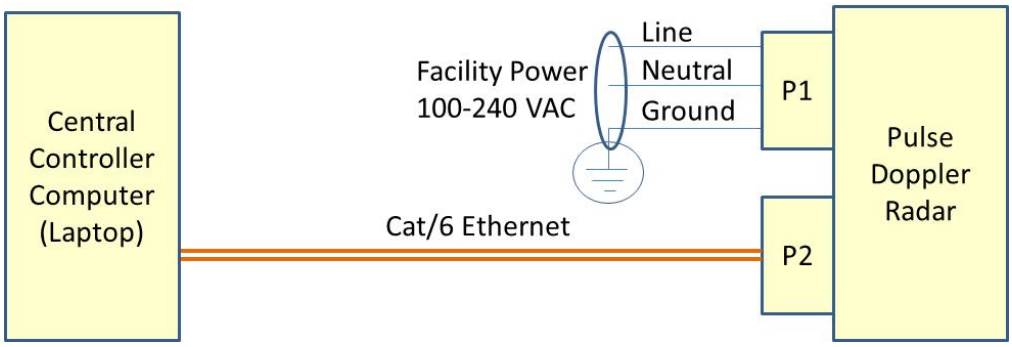

Figure 1. Block diagram showing AC power and Ethernet connections needed to operate the Pulse Doppler Radar with a Central Controller computer.

The radar chassis is a metal enclosure that serves as both a ground plane and faraday cage. This helps minimize electro-magnetic interference (EMI) from the radar.

[1] Magnetron model MG4010, E2V Corporation, Chelmsford, England.

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3. Pulse Magnetron Radar Operation

The Pulse Doppler Radar operates with input ac power between 100- 230VAC. The ac power is converted to +24 V dc through an ac-dc converter power supply internal to the radar. The +24V power bus is then conditioned to provide +5V and +12V bias power to the various radar sub-assemblies.

A magnetron is used to develop the requisite microwave power. The magnetron is a self-starting power oscillator device that operates at approximately 5.8kV peak voltage and 5 A peak current, at 500 nsec pulse duration at 2000 Hz pulse recurrent frequency. A pulse modulator circuit is used to convert +24V dc to the necessary high voltage power pulses to properly drive the magnetron microwave source. No attempt is made to modulate or stabilize the output microwave power pulse.

3. Antenna Description and Spurious Radiation Suppression

The radar antenna is a waveguide-fed, horn antenna that measures approximately 48.6 inches by 6 inches deep by 6 inches high. Figure 2 illustrates the Pulse Doppler Radar assembly drawing with its antenna. The antenna is driven through approximately 12 inches of WR-90 waveguide that effectively eliminates any spurious radiation below 6.7 GHz. The ground shielding provided by the radar chassis, along with the high Q nature of the antenna suppresses any high frequency spurious radiation above 9.5 GHz.

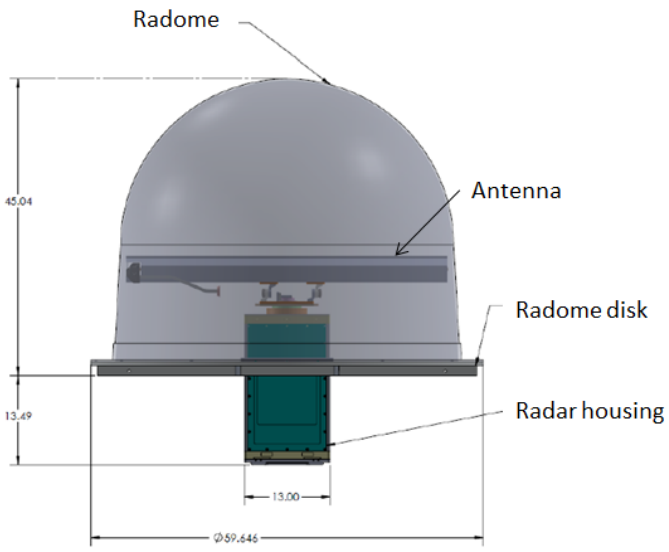

Figure 2. Pulse Doppler Radar assembly drawing.

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