ARCADIAN
Networks

AE11G OW
WIRELESS MODEM UNIT

User Guide

An Arcadian Networks Inc. Technical Document

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P/N: **3BRXXXX**

Copyright and Trademark Information:

FCC Compliance Statement

NOTE: This equipment is authorized under FCC ID:**V72AE11OW** to operate in the A Block of the Upper 700 MHz Band pursuant to Part 27 of the FCC's rules.

In addition, this equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning!
Changes or modifications to this equipment not expressly approved by Arcadian Networks, Inc. could void the user's authority to operate the equipment.

Installation and Safety Information

The following information is provided to ensure safe operation of this equipment. Arcadian Networks assumes no liability in the event that the customer fails to comply with the following safety precautions and warnings.

DC System Power-on

1- When connecting the DC power lines, make sure to connect the Ground line first.

2- When disconnecting the DC power lines, make sure to disconnect Ground last.

3- FUSE Replacement: Make sure to use a fuse of the same type and value!

4- EUT shall be powered from limited power source up to 100VA according UL 60950-1 requirements.

L'équipement sous tension doit être branché a une source limitée au maximum de100 VA conformément a UL 60950-1.

5- Voltage rating is 12 VDC

La tension d'opération est à 12 VDC.

Earthing

The minimum cross sectional area of the protective earthing should be 1mm^2.

La section du fil de terre doit être d'un minimum 1mm$^{2.}$

Cables

The power, Ethernet and RS232 cables shall be limited up to 140 Feet (42.6 meter).

Les branchements électriques, Ethernet & RS232 doivent être limités a un maximum de 140 pieds (42.6 mètres)

Repair Safety

Repairs of modem should take place only in Arcadian Networks service laboratories or in service laboratories of other Arcadian Networks formally approved distributors.

In case of field handling, disconnect the unit from power supply for safest repair.

Safety Summary

Warnings:

Carefully connect units to the supply circuit so that wiring is not overloaded. Connect the Ground first (and remove Ground last when disconnecting).

Read the installation instructions before connecting the system to its power source.

Secure all power cabling when installing this unit.

Do not touch the power supply when the power cord is connected. Line voltages are present within the power supply, even when the power switch is off and the power cord is connected.

Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects heat up when connected to the power and ground. This can cause serious burns or weld the metal object to the terminals.

CONTENTS

1 OVERVIEW AND PURPOSE

Welcome to the User's Guide for the **Arcadian Networks Inc. AE11G OW Modem**.

Figure 1-1: The Arcadian Networks AE11G OW Wireless Modem Unit

1.1 Purpose of This User's Guide

This guide is designed to be used as a tool in the initial installation and periodic maintenance of the AE11G OW. It contains information on how to perform the following tasks:

- Installing the AE11G OW

- Maintaining the AE11G OW

- Troubleshooting the AE11G OW

1.2 Target Audience

This guide is intended for service personnel required to install, configure or maintain the AE11G OW modem.

1.3　　Document Conventions

This guide is intended for service personnel required to install, configure or maintain the AE11G OW modem.

The following icons appear throughout this guide:

Note: This is a note. It provides additional information on the current topic.

Warning: This is a warning. It contains cautionary information on the current topic.

Tip: This is a tip. It provides time saving information to the reader.

1.4   Arcadian Networks

Arcadian Networks designs and delivers wireless broadband communication systems to the energy sector. The real-time, two-way communication networks provide the backbone of all "smart" energy solutions – delivering operating efficiencies, interoperability and security. Designed specifically for utility, oil and gas, and renewable energy industries, the IP converged networks are based on private, secured 700 MHz spectrum. Customized services range from blueprint to network deployment, systems integration, through customer service.
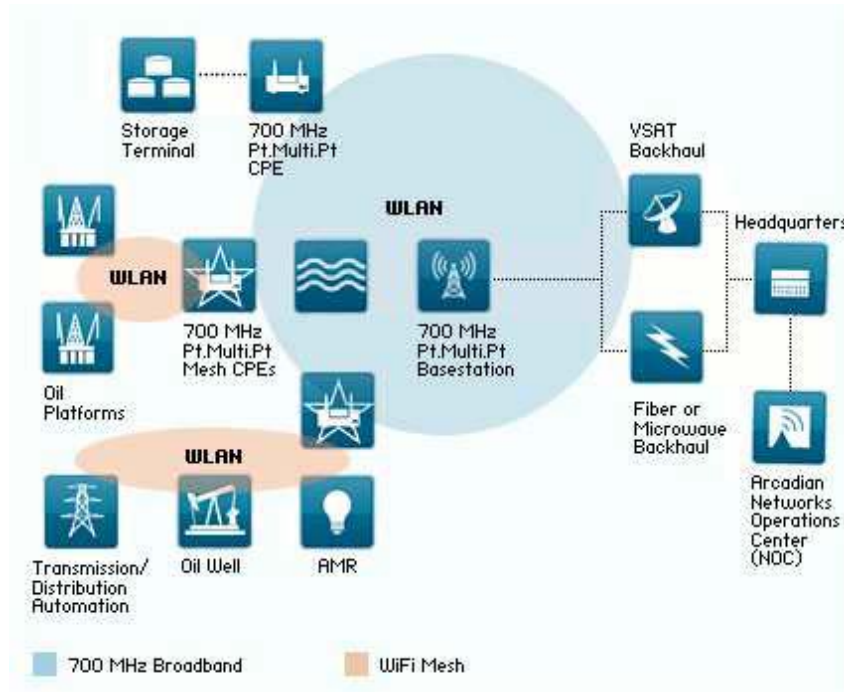
2 AE11G OW DESCRIPTION

2.1 Overview

The AE11G OW modem offers the following features:
- Suitable for outdoor environment: NEMA-4X certified
- Integrated product destined to Advance Metering Infrastructure (AMI) and SCADA applications that combines 3 sub-modules
  - Licensed 700MHz ANI Wireless Backhaul
  - Unlicensed 900 MHz Itron OpenWay ® Cell Relay
  - An optional licensed 900MHz Wireless Gateway

- On licensed 700 MHz ANI Wireless interface :
  - High data rate available per 1MHz sector: up to 1.2 Mbps downstream and 0.8 Mbps upstream
  - Point-to-multipoint technology with RF - coverage of up to a 20 mile radius
  - SCADA connection to support legacy systems with a serial and LAN interfaces
  - Adaptive modulation
  - End-to-End IPSec/IKE VPN Security
- On unlicensed 900 MHz (ISM band) Itron OpenWay® Cell Relay interface:
  - Delivers RF connectivity to up to 1000 Itron OpenWay® Centron meters in the field.
  - Provides IP encapsulation and monitoring with Itron OpenWay® Collection Engine
- On optional licensed 900 MHz Wireless Gateway interface:
  - Delivers RF connectivity to "Hard to Reach" Itron OpenWay® Centron meters in the field.
  - Delivers RF connectivity to DA (Data Automation) devices in the field.

The AE11G OW utilizes DOCSIS® like architecture for deployment in the rugged environment and harsh terrain common to the energy sector.
Leveraging Arcadian Networks' high performance 700 MHz radio, the AE11G OW has 10/100 BaseT Ethernet and Serial RS-232 interfaces. Its IP Encapsulation Bridge is ideal for use in a Supervisory, Control and Data Acquisition (SCADA) system. Arcadians Networks' AE11G OW provides secure IP communication for monitoring and controlling remote substations, AMI backhaul, distributed renewables, demand response and distribution automation applications. Video surveillance or other IP traffic is supported making it possible to deploy security systems and other real-time remote applications. The system provides Quality of Service (QoS) tools to prioritize mission critical data over other information. The AE11G OW

implements an IPSec-based VPN that provides End-to-End security between the remote location and the customer's data center. The embedded Security Appliance ensures secure data transmission along the entire communication path.

The AE11G OW sub-modules are integrated into a single housing. This housing is designed for easy mounting on a wall, shelf, or pole at the remote location. The modem has a NEMA-4X certified enclosure.

Used in conjunction with Arcadian Networks' ABSR-757 Base Station, the AE11V provides high-speed data services in large geographic areas. The Arcadian Networks product line has recently been rebranded.

2.2 IP Encapsulation Bridge

The IP Encapsulation Bridge enables Serial RS-232 traffic to be routed from the AE11V modem through the wireless/IP network. Although the IP Encapsulation Bridge and the modem are one physical component, logically, the modem and IP Encapsulation Bridge are considered separate and each have their own IP addresses and are managed separately. Refer to the NMS User Guide for configuration information

2.3 VPN module

The AE11V implements an IPSec-based VPN Module that provides End-to-End security between the CPE site and the customer's data center. Although the VPN Module and the modem are one physical component, logically, the modem and VPN Module are considered separate and each have their own IP addresses and are managed separately. Refer to the NMS User Guide for configuration information.

2.4 Housing

The AE11V is housed in a case designed to protect against moisture and extreme temperatures. It is designed to meet the ETS 300 019 part 2-4 class 4.1 environment standards for non-weather protected locations.
The AE11G OW is not designed for field servicing.
The housing is fully sealed, and uses a pressure valve to equalize pressure inside and outside the housing while holding out water molecules.
The housing is designed to provide a fully stable environment with the ability to resist moisture even in full immersion, and provides RF shielding for the internal modules.
The housing is constructed of a metallic NEMA 4X enclosure, and the exterior of the housing is painted. The housing provides natural air-convection in the allowed mounting positions to ensure the

appropriate thermal conditions. The housing is held in place by locking screws to maintain a proper seal. The AE11G OW withstands shocks and vibrations, and has been also designed to withstand dielectric strength and impulse voltage.
The Ethernet and Serial RS232 interfaces were designed to protect the interface pins.

2.5   Right Panel Connectors

There are two connectors located on the right panel of the AE11G OW modem.
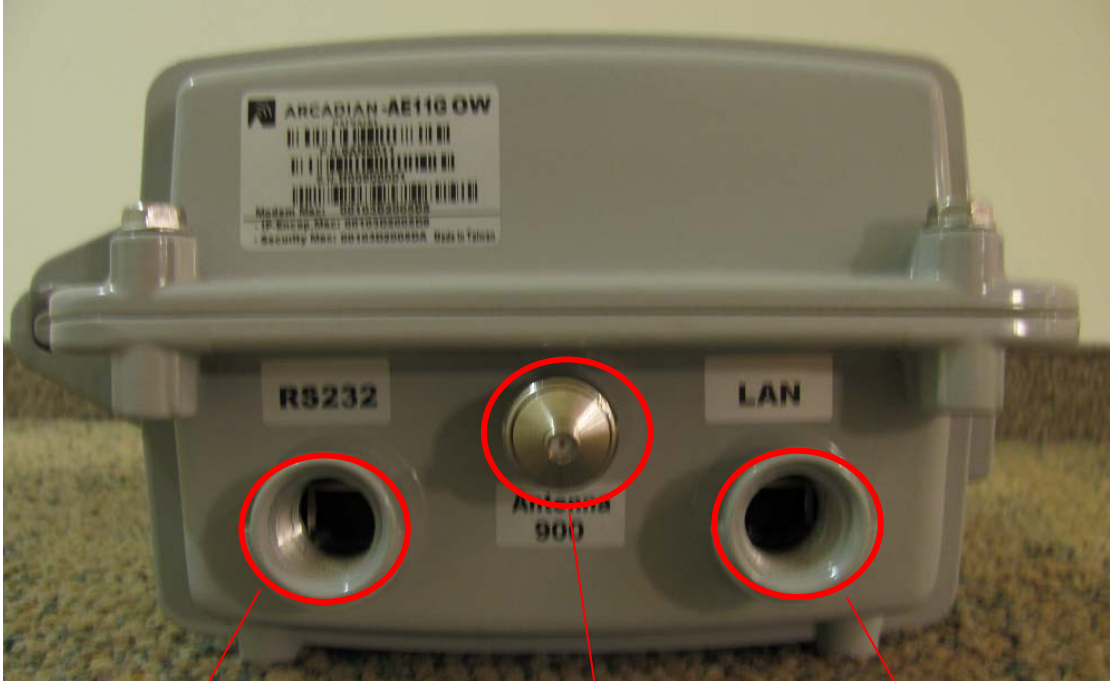
Figure 2-1A: AE11G OW

RS232   Antenna   LAN
                         900

Connector	Function
LAN	Connect an RJ-45 Ethernet cable to this port. The other end of the cable can be connected to the PC or IP-enabled device (RTU, Video surveillance etc…)
RS232	Connect a RS232 cable to this port. The other end of the cable can be connected to the subscriber's SCADA devices
Antenna 900	N-type Female connector for the external Antenna to licensed 900 MHz wireless gateway
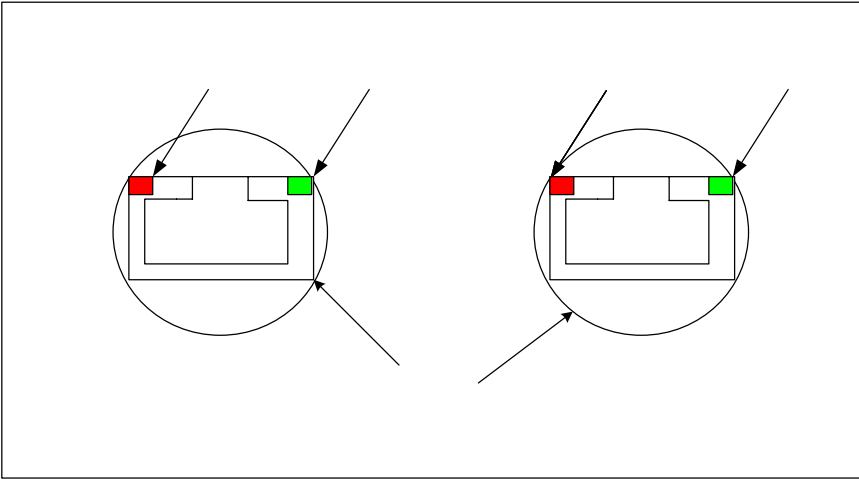
Figure 2-2B: AE11G OW LED indications

LED	indication
RF status (700 MHz)	On when the ANI 700 MHz Wireless Backhaul is registered. Off when the ANI 700 MHz Wireless Backhaul is not registered. Blinking when the ANI 700 MHz Wireless Backhaul is registration process
RF activity (700 MHz)	Blinking when data on the ANI 700 MHz Wireless Backhaul is transferring in either in the Upstream or Downstream direction.
RS232 acitivity	Blinking when data is being transmitted/received on RS232 port through IP encapsulation bridge
Ethernet activity	Blinking when data is being transmitted/received with the Ethernet device connected to LAN port

2.6   Left Panel Connectors

There are two connectors located on the left panel of the AE11G OW modem.

Antenna ISM

Antenna 700

Power
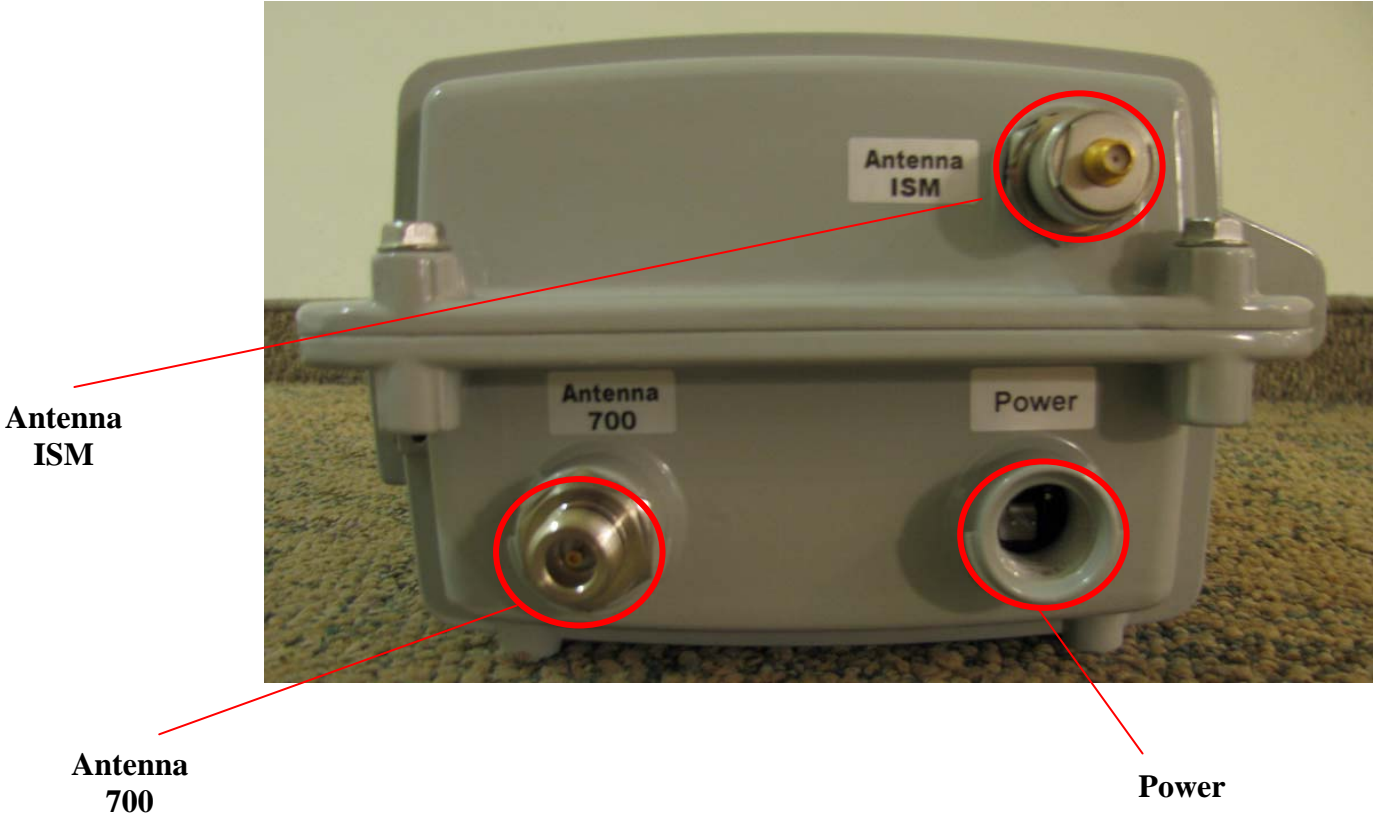
Figure 2-3: AE11G OW WMU Left side Panel Connectors

Connector	Function
Antenna ISM	N-type Female connector for the external antenna to the Itron Openway ® Cell Relay
Antenna 700	N-type Female connector for the external antenna to the 700 MHz ANI modem
POWER	Connect 12 VDC external power source here.

Table 2-1: AE11G OW Left side Panel Connectors

3   USING THE MODEM

Follow the steps below to use the modem properly.

1. Check that the computer with which you are using the AE11G OW modem contains a working Ethernet network card, and has the following software installed and operational:

   a. Microsoft Windows 95 operating system or later
   b. A standard Internet browser application
   c. The Telnet/SHH communications utility

2. Attach your computer to the modem's LAN port with the included RJ-45 Ethernet cable.

3. Connect the antenna cable to the **LAN** connector on the Left side of the modem.

4. Plug the 12VDC modem power supply jack into the **POWER** socket on the Left side of the modem.

*Note: As with any household electrical device, avoid the risk of accidental electrical shock. **Make sure that your hands are completely dry** and that there is no moisture on the floor or other surfaces in the immediate area of the electrical wall outlet.*

*Hazard: The RF antennas used for this modem must be installed to provide a separation distance of at least 60 cm from all persons and must not be
co-located or operated in conjunction with any other antenna or transmitter.*

4   TECHNICAL SPECIFICATIONS

General	
Power	12 VDC (±15 %)
Consumption	35 W max
Operating temperature	-33 to 60° C/ -27.4 to 140°F
Dimension	30x22x14 cm / 11.81''x8.66''x5.51''

Interface	Description
10/100 BaseT Ethernet Auto-MDIX Interface	Ethernet data connection to IP/Ethernet devices Alternatively, this LAN interface can be used for local management of the ANI, Itron and Microhard sub-modules (Refer to user manuals of each manufacturers).
RS-232 RJ45 DCE (Female Type)	Interface to encapsulation for serial SCADA RTU Baud rates – 1200 – 115,200 bps
N female connector	RF Antenna Interface (50 Ohm) for licensed 700 MHz communication
N female connector	RF Antenna interface (50 Ohm) connected to the unlicensed 900 MHz Itron OpenWay® Cell Relay
N female connector	RF Antenna interface (50 Ohm) connected to the licensed 900 MHz wireless gateway

Description	Licensed 700 MHz Wireless Backhaul Downstream (RX)		
RF Frequency range	From 757 to 758 MHz		
Modulation format	QPSK, 16QAM & 64QAM		
Channel Bandwidth	245 & 330 KHz		
Adaptive Modulation	Yes		
Data Rate (Raw)	0.55 – 1.65 Mbps		
RX sensitivity	Bandwidth (KHz)	64QAM	16QAM	QPSK
	245/330	-81 dBm	-87 dBm	-91 dBm

Licensed 700 MHz Wireless Backhaul Upstream (TX)	
RF Frequency range (A band)	From 787 to 788 MHz
Modulation formation	QPSK & 16QAM
RF Coverage	Up to 20 miles with ANI BTS
Channel Bandwidth	250 & 325 KHz
Adaptive Modulation	No
Data Rates (Raw)	0.52 – 1.04 Mbps @ 325 KHz 0.4 – 0.8 Mbps @ 250 KHz

Transmit Power Level	From -17 to 27 dBm

Description	Licensed 900 MHz Wireless Gateway		
Frequency range	896-902 and 935-960 MHz (licensed 900 MHz)		
Power	3.3 VDC, up to 8.5 Watts		
Occupied Bandwidth	6.25 kHz	12.5 kHz	25 kHz
Link Rate	4.8 kbps	9.6 kbps	19.2 kbps
Error Detection	32 bits of CRC, ARQ		
Encryption	128-bit WEP/WPA		
Sensitivity	-111dBm		
RF output power	100mW - 1W (20-30dBm)		
Adjacent Channel Rejection	- 25 dBc; one channel away (6.25Khz, 12.5Khz, 25Khz) – (TBD)		
Description	Unlicensed 900 MHz Itron OpenWay ® Cell Relay		
Frequency range	902- 928 MHz (unlicensed 900 MHz)		
Power	up to 7.8 Watts		
RF output power	Up to 250 mW (24dBm)		

Service		Licensed 700 MHz only
Network Management	Protocol	SNMP
	MIB	RFC1213, RFC1493, RFC2233, RFC2669, RFC2670, DOCSIS Privacy MIB
	Provisioning	As per DOCSIS
Security	Link Layer Encryption	DES CBC, 40 and 56 Bits per user
	Link Layer Key Distribution	Two-layer key distribution protocol, which includes DES-ECB and RSA public key encryption and HMAC-SHA1 authorization
IP Protocols	Network Protocols	IP, ICMP, ARP, IGMP
	Transport Protocols	TCP, UDP, RTP
	Application Protocols	SNMP, TFTP, DHCP, HTTP, TELNET, SSH
IP Security	Type	VPN tunnel
	Security protocol	IPSec
	Key Rotation Protocol	IKE
	Encryption level	DES, 3DES, AES-128 and AES-256

5 TROUBLESHOOTING

5.1 Local troubleshooting

If you encounter problems with your modem, try the following steps.

1. Check for damage to the external modem casing during shipping or installation. If you see visible damage, the modem may need replacement.

2. Verify that the 12 VDC modem power supply jack is connected to the modem **POWER** connector on the Left side of the modem, and that the modem power supply is correctly connected to a AC power outlet.

3. Verify that the RF coaxial cable is connected properly to the modem **N-type** connector.

4. Verify that the PC **LAN** LED is illuminated and that the LAN cable is connected to a working Ethernet network port on the PC.

If none of these steps help, the modem have to be replaced

5.2 Remote troubleshooting

TBD

6 REFERENCES

6.1 General documentation

For further information refer to Itron OpenWay ® Cell Relay user guides and operating manuals

6.2 FCC documentation

For further information refer to Itron OpenWay ® Cell Relay FCC Hardware Manual

7 WARRANTY INFORMATION

The Arcadian Networks Inc. Limited Warranty and related information can be found in the terms and conditions and/or other contracts under which this product was purchased.

CONTACTING ARCADIAN NETWORKS

For further information about the AE11G OW WMU or other Arcadian Networks products, visit the Arcadian Networks Website at:

www.arcadiannetworks.com .