V290iA User Guide

Version 1.0

Copyright and Compliance

Copyright Information

FCC Compliance Information

NOTE: This equipment is authorized under FCC ID PBJ290-IA to operate in the A block of the Upper 700 MHz Guard 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 B digital device pursuant to Part 15 of the FCC's rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generated, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver was connected.

Consult the dealer or an experienced radio/TV technician for assistance.

NOTE: This equipment is authorized under FCC ID No. LDK102052P and complies with **15C.**

User installation is prohibited. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

⚠ *Warning! Changes or modifications to this equipment not expressly approved by Vyyo Inc. could void the user's authority to operate the equipment.*

This product was tested with shielded coaxial cable (not provided by Vyyo) and Category 5 Ethernet cable (optional) equipped with a shielded RJ-45 connector. These types of cables must be used with the unit to ensure compliance.

Table of Contents

About This Guide

The V290iA User Guide is part of the documentation package for the Vyyo wireless access system. The guide describes the V290iA device, and how to install, configure and maintain the V290iA.

☑ For instructions on installing the antenna, refer to the appropriate guide. An antenna must be installed by a professional following all safety precautions.

Intended Audience

This guide is intended for service personnel required to install, configure or maintain the V290iA.

Document Objectives

This guide is designed to be used as a tool in the initial installation and periodic maintenance of the V290iA. It contains information on how to perform the following tasks:

- Installing the V290iA
- Configuring the V290iA
- Maintaining the V290iA
- Troubleshooting the V290iA

Document Conventions

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.

How This Guide is Organized

This guide is organized into the following chapters and appendices:

Chapter 1: Overview

This chapter provides an overview of the V290iA and the Vyyo wireless access system.

Chapter 2: Physical and Functional Description

This chapter includes a physical and functional description of the V290iA and its components, as well as an overview of the process of modem initialization.

Chapter 3: Installing the V290iA

This chapter details installation prerequisites, explains the various mounting options and how to connect the cables, and describes initial operation.

Chapter 4: Configuring the V290iA

This chapter explains how to configure the V290iA components.

Chapter 5: Maintaining the V290iA

This chapter details the normal operation of the V290iA LEDs and describes how to upgrade the V290iA software.

Chapter 6: Troubleshooting

This chapter provides troubleshooting information to help solve common problems.

Appendix A: V290iA Technical Specifications

This appendix provides technical specifications for the V290iA.

Appendix B: Antennas Technical Specifications

This appendix provides technical specifications for the two optional antennas.

Appendix C: Power Cable Specifications

This appendix provides technical specifications for the power cable.

Appendix D: Antenna Cable Specifications

This appendix provides technical specifications for the antenna cable.

Appendix E: Serial Cable Specifications

This appendix provides technical specifications for the two optional serial cables.

Appendix F: Ethernet Cable Specifications

This appendix provides technical specifications for the Ethernet cable.

Appendix G: FCC Declaration of Conformity

This appendix displays Vyyo's FCC Declaration of Conformity.

Related Documentation

For information on other Vyyo wireless system topics, see the following guides:

- *NMS User Guide*
- *Base Station User Guide*
- *V290iA Quick Reference Guide*

Obtaining Documentation

To obtain additional documentation, please contact info@vyyo.com.

Documentation Feedback

We welcome your comments about this guide. Please send comments to:

Address: 6625 The Corners Parkway, Suite 210, Norcross, GA 30092

Tel: 678.282.8000

Fax: 770.447.2405

Email address: info@vyyo.com

Please include in the comment the name and version number of the guide.

List of Abbreviations

Following is a list of the abbreviations used in the guide.

Abbreviation	Meaning
BPI	Baseline Privacy Interface
BSR	Base Station Rack
BTS	Base Stations
BW	bandwidth
CLI	Command Line Interface
WMTS	Wireless Modem Termination System
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check
dB	Decibels
dBmV	Decibel-Millivolt
DES	Digital Encryption Standard
DHCP	Dynamic Host Configuration Protocol
DOCSIS	Data-Over-Cable Service Interface Specifications
DS	Downstream
DSCP	Differentiated Services Code Point
FDD	Frequency Division Duplexing
FEC	Forward Error Correction
FTP	File Transfer Protocol
GHz	Gigahertz
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IP	Internet Protocol
ISO	International Standards Organization
ITU	International Telecommunications Union
ITU-T	Telecommunication Standardization Sector of the International Telecommunication Union

Abbreviation	Meaning
Kbps	Kilobits per second
kHz	Kilohertz
LAN	Local Area Network
LOS	Line of Sight
LLC	Logical Link Control procedure
MAC	Media Access Control
Mbps	Megabits per second
MHz	Megahertz
MIB	Management Information Base
MPEG	Moving Picture Experts Group
Ms	Millisecond
MTU	Maximum Transmission Unit
NLOS	Non Line of Sight
NMS	Network Management System
Ns	Nanosecond
PHY	Physical Layer
PPP	Point-to-Point Protocol
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
RFC	Request For Comments
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
TCP	Transmission Control Protocol
TFTP	Trivial File-Transfer Protocol
US	Upstream

1 Overview

The V290iA is a Customer Premises Equipment (CPE) device used to provide wireless communications at remote locations as part of a Vyyo wireless network. The V290iA provides remote connectivity for SCADA and IP devices.

The V290iA consists of three major components, integrated into a single chassis:

- A Vyyo wireless modem, used for communicating over the Vyyo wireless network.
- A Cisco 3200-series router, providing IP routing capability for the Vyyo wireless network and integration into an enterprise network. Ethernet ports provide connectivity to IP devices located at the CPE site. Serial ports provide connectivity to SCADA devices.
- A manageable Power and Control Card.

The V290iA connects to an external antenna. Two optional antennas are available. Refer to *Appendix B: Antennas Technical Specifications* for the antennas' technical specifications.

V290iA and the Vyyo BWA System

The V290iA is the CPE component of the Vyyo Broadband Wireless Access (BWA) system, which resides at the Sub Station. The BWA system is designed to provide end-to-end wireless connectivity for SCADA and IP devices, and to interconnect seamlessly with your enterprise network. The V290iA communicates on the 700MHz wireless band.

The following figure shows the Vyyo BWA network topology:

Error! Not a valid link.

Figure 1: Vyyo BWA Network Topology

2   Physical and Functional Description

The V290iA is comprised of a Vyyo V284 RF modem and a Cisco 3200-series router, integrated into a single housing. This housing is designed for easy mounting on a wall or pole in the remote location.

V290iA Basic Description

The following is a general block diagram of the V290iA.

Error! Not a valid link.

Figure 2: V290iA General Block Diagram

The V290iA includes the following main components:

- **V284+A board** – a UHF FDD radio modem operating in the 746-777 MHz frequency range.
- **Cisco cards** – these include the following:
  - **Mobile Access Router Card (MARC)** – The routing engine includes the host processor and memory. It is connected to the V284+A through a Fast Ethernet interface.
  - **4-Port Fast Ethernet Switch Mobile Interface Card (FESMIC)** – The 4-port FESMIC provides four sets of Fast Ethernet signals. One of these is connected to the WMIC.
  - **4-Port Serial Mobile Interface Card (SMIC)** – The 4-port SMIC provides four sets of serial signals.
  - **Wireless Mobile Interface Card (WMIC)** – The 2.4-GHz WMIC can be optionally configured as an access point (AP), a root bridge, or a non-root bridge. The WMIC is connected to a Fast Ethernet port on the FESMIC.
  - **Mobile Router Power Card (MPRC)**
- **Vyyo Power Supply Controller (PSC) card** – The PSC provides power management of the V290iA units: the V284+A, the Cisco cards, and the temperature control system.

The following is a physical view of the V290iA device:

2 Physical and Functional Description
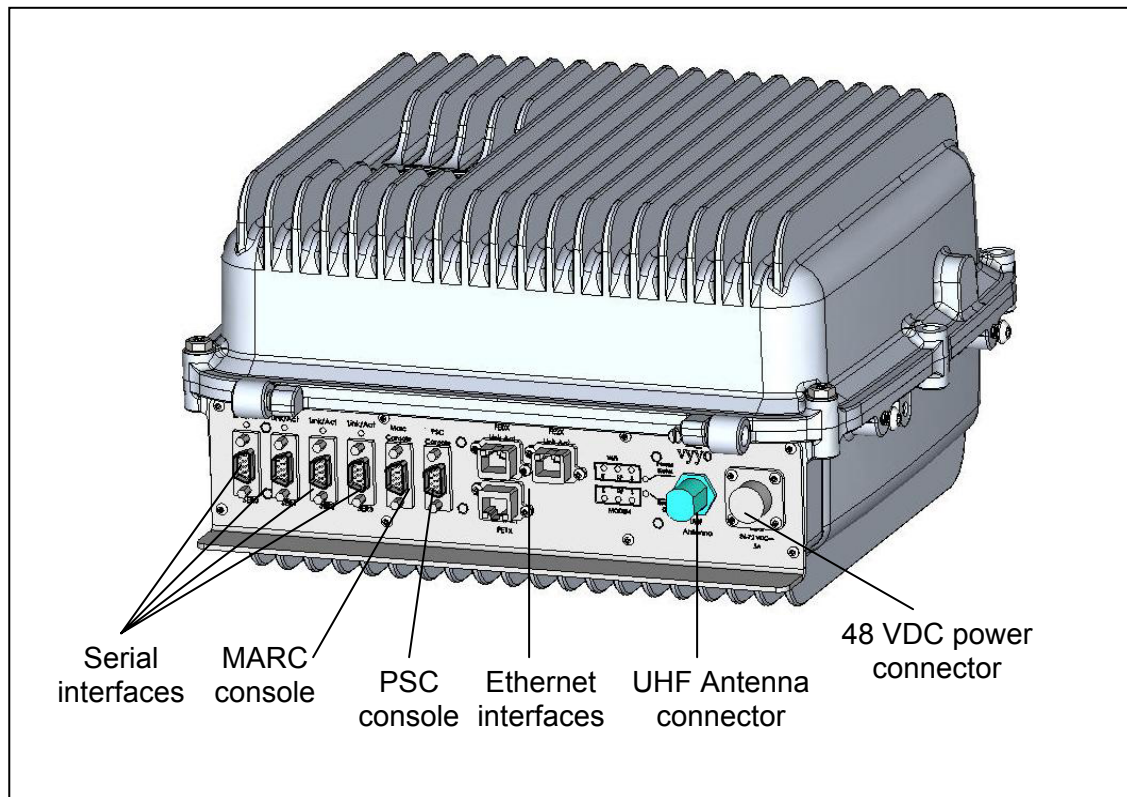
Figure 3: Vyyo V290iA bottom view

Interfaces

The following interfaces are available in the V290iA:

- Six DB-9 serial ports – Four serial ports are available to connect serial devices such as SCADA devices. Two ports serve as console ports: one for the Cisco router (MARC), and one for the Power and Control Card. Refer to *Appendix E: Serial Cable Specifications* for cable specifications.

- Three RJ-45 Ethernet ports – The Ethernet ports are available to connect IP devices such as remote cameras and security devices. Refer to *Appendix 0: Ethernet Cable Specifications* for cable specifications.

- UHF RF antenna connector – Use for connecting to the Vyyo wireless network. Refer to *Appendix D: UHF Antenna Cable* Specifications for cable specifications.

- Two WiFi antenna connectors – the Cisco router has wireless routing capabilities to connect WiFi devices to the enterprise network. For more information on WiFi antennas, see the [Cisco antenna guide](#).

WiFi antenna
connectors
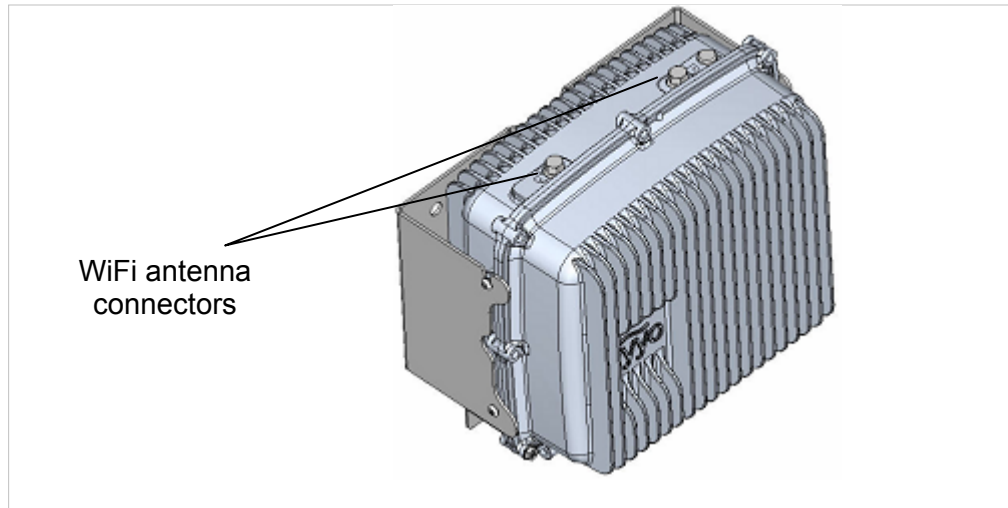
Figure 4: Vyyo V290iA top view

Housing

The V290iA is housed in a case designed to be resistant to pressure, moisture, and extremes in temperature. The V290iA is not intended 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 provides a fully stable environment with the ability to resist moisture even in full immersion. The housing is held in place by locking screws to maintain a proper seal.

The Ethernet and Serial interfaces use a rugged design to protect the interface pins. The interface panel is located on the bottom of the V290iA when it is mounted in the standard way, and the RF antenna connection is on the top.

A 100° cable is attached to both halves of the housing to permit ease of service for a field technician. A console port for the Cisco router is available on the interface panel.

Heating and Cooling

In order to maintain the proper working temperature, the V290iA has a temperature control system included inside the housing. This temperature control system allows the V290iA to operate in outdoor installations, maintaining a temperature range between -30° C and 60° C.

Power

The V290iA supports an input voltage of 48VDC (36-72 VDC), with 5A input current protection. The V290iA has a manageable Power and Control Card, providing power to the different units, such as the Cisco cards, the V284+A card, and the temperature control system

Modem V290iA Initialization Process

Upon power up, the V290iA performs the following:

1. **Scans for a UHF downstream channel** – The modem always stores the last set of parameters it was able to work with. It therefore first tries to reacquire the last working downstream channel.

2. **Synchronizes to the downstream channel** – The downstream signal is valid when the modem has the following:

   - QAM synchronization.

   - FEC synchronization.

   - MPEG frames synchronization.

   - Recognition of a MAC synchronization message.

3. **Receives upstream parameters** – The WMTS periodically transmits on the downstream channel a broadcast information message to all modems on the sector regarding upstream channels in the sector. The upstream information includes symbol rate, modulation, FEC, preamble and scrambling.

4. **Receives bandwidth allocation MAP** – The WMTS periodically transmits on the downstream channel a broadcast message to all modems on the sector regarding the upstream bandwidth access opportunities of a coming time interval.

5. **Performs ranging and adjustments** – The modem synchronizes with the WMTS on the upstream timing, frequency and transmission power.

6. **Establishes IP connectivity** – The modem acquires the network setting (IP address, subnet mask and more) from the DHCP server. The modem entry in the DHCP server is configured through the Vyyo Web NMS (refer to the *NMS User Guide*).

7. **Establishes Time of Day** – The modem acquires the date and time from a time server, for proper messaging.

8. **Acquires configuration** – The modem downloads its configuration file from a TFTP server. The TFTP file name is provided by the DHCP server, and is configured through the Vyyo Web NMS (refer to the *NMS User Guide*). The modem configuration file includes information about downstream and upstream channels, available services, service classifiers and priorities, etc.

9. **Registers with the WMTS**.

10. **The Cisco Router establishes IP connectivity** – The router acquires the network setting (IP address, subnet mask and more) from the DHCP server.

> ☑ **Note:** The description of how the Cisco router establishes IP connectivity, applies to the V290iA default Cisco setting. The customer may change the Cisco setting to a fixed IP address, or any other IP addressing method supported by the Cisco IOS. The Cisco addressing is not managed by the Vyyo NMS, and should be configured by the system administrator.

3 Installing the V290iA

The V290iA is designed to be installed on a wall, pole, or shelf. This section describes all the steps required for installation.

☑ For instructions on installing the antenna, refer to the appropriate guide. An antenna must be installed by a professional following all safety precautions.

Prerequisites to Installation

Before installing the V290iA:

1. Make sure the antenna is installed and adjusted.

2. It is recommended to have a PC available, for connecting to one of the Console ports.

3. Provision the V290iA in the NMS (refer to the *NMS User Guide*). You need the V290iA's MAC address, which is displayed on the V290iA label, as shown in Figure 5.

Figure 5: V290iA MAC Address

4. Check the installation environment to ensure compliance with the following requirements:

    ■ Operating temperature: -22°F to +158°F, -30°C to +60°C.

    ■ Storage temperature: 40°F to +185°F, -40°C to +85°C.

- Relative humidity: 95% (non-condensing).
- Vibration: *IEEE 1613,* Class V.S.2.
- Shock: *IEEE 1613,* 100 mm.

5. Make sure you have the following cables:

- Power cable (for cable specifications, refer to *Appendix C: Power Cable Specifications*).
- Antenna cable (for cable specifications, refer to *Appendix D: UHF Antenna Cable* Specifications).
- Serial cable (for cable specifications, refer to *Appendix E: Serial Cable Specifications*).
- Ethernet cable (for cable specifications, refer to *Appendix F: Ethernet Cable Specifications*).

6. Make sure you have the necessary tools.

Verifying Package Contents

Make sure the package contains the following:

- One pole mounting bracket.
- One main mounting bracket.
- Four HEX HD SST 1/4-20 NC x 5/8" screws.
- Four SST FLAT-RU #1/4 washers.
- Four HEX HD SST 3/8-16 UNC x 3.5" FULL THREAD screws.
- Four SST LOCK 1/4 washers.
- Four SST LOCK 3/8 washers.

Mounting the V290iA

The V290iA can be mounted on a wall, a pole, or a shelf.

- In wall mounting, the interface panel faces down, and the main mounting bracket faces to the rear.
- In pole mounting, pole mounting brackets attach to the main mounting bracket.
- In shelf mounting, the main mounting bracket faces forward, and the interface panel faces to the rear.

The following sections provide detailed instructions for each type of mounting.

Wall Mounting

To mount the V290iA on a wall:

1. Orient the device so that the main mounting bracket (refer to Figure 3) faces the wall and the interface panel faces down.

2. Attach the device to the wall using the enclosed mounting screws.

3. Attach the interface cables for the SCADA devices at the site to the DB-9 serial interfaces on the interface panel.

4. Attach the interface cables for any Ethernet-connected devices, such as sensors or cameras, to the Ethernet ports on the interface panel.

5. Attach the RF antenna to the antenna connectors on the top of the device housing (assuming the device is oriented properly).

6. Attach the power cable to the power outlet on the interface panel. The device powers up.

7. Monitor the Modem RF LED on the interface panel to verify that the modem is functional. For more information on the Modem RF LED, refer to *Interface Panel LEDs* on page 29.

Pole Mounting

To mount the V290iA on a pole:

1. Orient the device so the main mounting bracket (refer to Figure 3) faces the wall and the interface panel faces down.

2. Place the provided pole mounting bracket around the pole at the desired height.

3. Attach the pole mounting bracket to the main mounting bracket of the device using the enclosed self-locking press nuts.

4. Verify that the device is secure on the pole before proceeding.

5. Attach the interface cables for the SCADA devices at the site to the DB-9 serial interfaces on the interface panel.

6. Attach the interface cables for any Ethernet-connected devices, such as sensors or cameras, to the Ethernet ports on the interface panel.

7. Attach the RF antenna to the antenna connectors on the top of the device housing (assuming the device is oriented properly).

8. Attach the power cable to the power outlet on the interface panel. The device powers up.

9. Monitor the Modem RF LED on the interface panel to verify that the modem is functional. For more information on the Modem RF LED, refer to *Interface Panel LEDs* on page 29.

Shelf Mounting

To mount the V290iA on a shelf:

1. Orient the device so the main mounting bracket (refer to Figure 3) faces the front and the interface panel faces back.

2. Attach the device to the shelf using the enclosed mounting screws.

3. Attach the interface cables for the SCADA devices at the site to the DB-9 serial interfaces on the interface panel.

4. Attach the interface cables for any Ethernet-connected devices, such as sensors or cameras, to the Ethernet ports on the interface panel.

5. Attach the RF antenna to the antenna connectors in the front of the device housing (assuming the device is oriented properly).

6. Attach the power cable to the power outlet on the interface panel. The device powers up.

7. Monitor the Modem RF LED on the interface panel to verify that the modem is functional. For more information on the Modem RF LED, refer to *Interface Panel LEDs* on page 29.

Cable Connections

The following figure displays the V290iA front panel connectors.
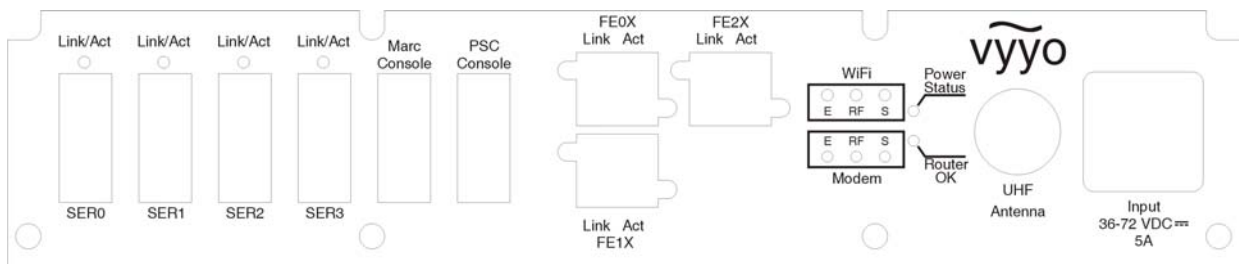
Figure 6: V290iA Front Panel Connectors

Perform the following cable connections (refer to Figure 6):

1. Connect the Flat Panel or Yagi antenna to the V290iA UHF connector.

2. Optionally connect the WiFi antenna to the V290iA's WiFi connector, located on the top of the V290iA chassis.

3. Optionally connect serial devices (e.g., SCADA) to the DB-9 serial ports: SER0, SER1, SER2, and SER3.

4. Optionally connect IP devices (e.g., remote cameras) to the Ethernet ports: RE0X, FE1X, and FE2X.

5. Connect the Power cable to the power connector, as follows:

a. Before connecting the Power cable, verify that the voltage is between 36 - 72Vdc.

b. Before connecting the Power cable, if an external power switch exists, turn it OFF.

c. Connect the Power cable.

Initial Operation

The V290iA starts operating as soon as power is connected. If you turned off the external power switch prior to connecting the power cable, turn it ON.

The front panel LEDs behave as described in *Interface Panel LEDs* on page 29. If the behavior of the LEDs deviates from standard, refer to *Troubleshooting* on page 33.

4   Configuring the V290iA

The V290iA comes with a standard configuration on delivery, and requires minimal, if any, additional configuration to operate normally. The V290iA uses the embedded Cisco 3200-series router to enable IP routing and bridging functionality, and can be configured to provide additional services beyond those provided by the standard configuration. The Vyyo V284 modem is configured to work as delivered. For advanced modifications to modem settings, refer to the *Vyyo NMS User Guide*.

The standard configuration includes default IP address and Netmask information for the V284 modem and the Cisco router. The default IP information is as follows:

Table 1: Default IP Settings

Parameter	Value
Modem IP Address	192.168.100.1
Modem Netmask	255.255.255.0
Router Ethernet IP Address	192.168.100.10
Router Ethernet Netmask	255.255.255.240
Router VLAN Loopback IP	10.0.0.254
Router VLAN Loopback Netmask	255.255.255.0

☑ The Modem IP settings are used only for local management. The modem passes no IP information over the network. The Modem IP settings cannot be changed.

Configuring V290iA Components

The V290iA contains two configurable components:

- **V284 Modem** – All V284 configuration is performed using the NMS (refer to the *NMS User Guide*).
- **Cisco Router** – detailed in the following section.

Configuring the Cisco Router

This section describes the Cisco default configuration, and an example of SCADA traffic configuration.

V290iA Cisco 3200 Default Configuration

The V290iA Cisco 3200 component default configuration enables the following operations:

■ Local Telnet connectivity to the UHF modem via the FESMIC LAN interfaces for management and monitoring purpose.

■ Local Telnet connectivity to the WMIC card via the FESMIC LAN interfaces for management purpose.

■ WiFi client's connectivity.

■ Serial ports connectivity by Telnet tunneling. In this configuration, data can be received or transmitted using Telnet to the router IP address with the relevant TCP port.

The default configuration disables all the dynamic routing protocols and the Cisco discovery protocol.

Default Configuration Parameters

■ MARC IP address via the RF (UHF) link is acquired by DHCP and is 192.168.100.10 when the UHF modem is not registered to the WMTS

■ MARC IP address via the FESMIC LAN interface is 10.0.0.30

■ WMIC IP address is 10.0.0.1

Default Configuration CLI Commands

The following displays the V290iA Cisco 3200 default values' running configuration.

service timestamps debug datetime msec service timestamps log datetime msec no service password-encryption no service config ! hostname Router ! boot-start-marker boot-end-marker ! ! no aaa new-model !	interface Serial1/3 physical-layer async no ip address ! interface FastEthernet2/0 ! interface FastEthernet2/1 ! interface FastEthernet2/2 ! interface FastEthernet2/3 ! interface Vlan1

```
    resource policy                              ip address 10.0.0.30 255.255.255.224
    !                                             no shutdown
ip subnet-zero                                   !
ip cef                                          ip classless
    !                                            !
    !                                            !
no ip dhcp use vrf connected                    no ip http server
    !                                           no ip http secure-server
    !                                            !
no ip ips deny-action ips-interface             !
    !                                            !
    !                                           control-plane
    !                                            !
interface FastEthernet0/0                        !
    ip address dhcp                             line con 0
    no shutdown                                  exec-timeout 0 0
    duplex auto                                  stopbits 1
    speed auto                                  line 1 4
    !                                            exec-timeout 0 0
interface Serial1/0                              session-limit 1
    physical-layer async                         modem InOut
    no ip address                                no exec
    !                                            transport input telnet
interface Serial1/1                              transport output telnet
    physical-layer async                         escape-character NONE
    no ip address                                telnet break-on-ip
    !                                            stopbits 1
interface Serial1/2                             line aux 0
    physical-layer async                        line vty 0 4
    no ip address                                password vyyo
    !                                            login
                                                 !
                                                end

                                                Router#
```

SCADA Traffic Configuration

The V290iA optionally interfaces with asynchronous SCADA devices via serial ports Ser0 – Ser3. This section illustrates how to transmit SCADA traffic using TCP encapsulation over Telnet tunneling.

Telnet Tunneling

Telnet Tunneling protocol uses the TCP protocol to deliver raw data between serial ports. In this method, the router directs the Telnet packets to the desired serial port according to the destination TCP port of the Telnet connection (4001 is the default port for Serial Port 1 Raw Data, 4002 for port 2, and so on). The SCADA master is the

Telnet caller and the SCADA device is the called. Once the caller receives serial data, it initiates a permanent TCP connection.

Telnet Tunneling Configuration

This configuration uses the following network setup.
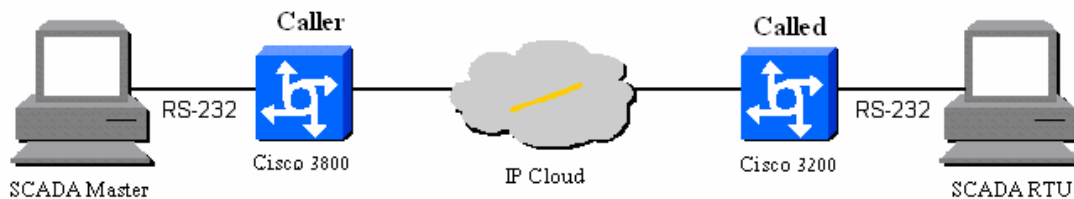
Figure 7: SCADA Traffic Tunneling

Caller Side Configuration

The following displays the caller-side configuration.

```
!
version 12.4
service tcp-keepalives-out
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
no service config
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
!
resource policy
!
ip subnet-zero
ip cef
!
!
no ip dhcp use vrf connected
!
```

```
!
ip host SER1 4001 10.1.1.2
ip host SER2 4002 10.1.1.2
ip host SER3 4003 10.1.1.2
ip host SER4 4004 10.1.1.2
no ip ips deny-action ips-interface
!
!
!
!
!
no spanning-tree vlan 1
!
!
!
interface FastEthernet0/0
 ip address 10.1.1.1 255.255.255.0
 no shutdown
 duplex auto
 speed auto
!
interface Serial1/0
 physical-layer async
 no ip address
```

```
!
interface Serial1/1
 physical-layer async
 no ip address
!
interface Serial1/2
 physical-layer async
 no ip address
!
interface Serial1/3
 physical-layer async
 no ip address
!
interface FastEthernet2/0
!
interface FastEthernet2/1
!
interface FastEthernet2/2
!
interface FastEthernet2/3
!
interface Vlan1
 ip address 10.0.0.30 255.255.255.224
 no shutdown
!
ip classless
ip route 0.0.0.0 0.0.0.0 FastEthernet0/0
!
!
no ip http server
no ip http secure-server
!
no cdp run
busy-message SER1 ^C ^C
busy-message SER2 ^C ^C
busy-message SER3 ^C ^C
busy-message SER4 ^C ^C
!
!
control-plane
!
!
line con 0
 stopbits 1
 flowcontrol NONE
line 1
 no motd-banner
 no exec-banner
 exec-timeout 0 0
 session-timeout 0 0
 no flush-at-activation
 no vacant-message
 no modem inout
 autocommand  telnet SER1 /stream
 no activation-character
 special-character-bits 8
 escape-character NONE
 autohangup
 stopbits 1
 exec
 no autobaud
 speed 9600
 flowcontrol NONE
 transport input NONE
line 2
 no motd-banner
 no exec-banner
 exec-timeout 0 0
 session-timeout 0 0
 no flush-at-activation
 no vacant-message
 no modem inout
 autocommand  telnet SER2 /stream
 no activation-character
 special-character-bits 8
 escape-character NONE
 autohangup
 stopbits 1
 exec
 no autobaud
 speed 9600
 flowcontrol NONE
 transport input NONE
line 3
 no motd-banner
 no exec-banner
 exec-timeout 0 0
 session-timeout 0 0
 no flush-at-activation
 no vacant-message
 no modem inout
```

autocommand telnet SER3 /stream	*no vacant-message*
no activation-character	*no modem inout*
special-character-bits 8	*autocommand telnet SER4 /stream*
escape-character NONE	*no activation-character*
autohangup	*special-character-bits 8*
stopbits 1	*escape-character NONE*
exec	*autohangup*
no autobaud	*stopbits 1*
speed 9600	*exec*
flowcontrol NONE	*no autobaud*
transport input NONE	*speed 9600*
line 4	*flowcontrol NONE*
no motd-banner	*transport input NONE*
no exec-banner	*line aux 0*
exec-timeout 0 0	*line vty 0 4*
session-timeout 0 0	*!*
no flush-at-activation	`end`

V290iA (Called side) Configuration

The following displays the called-side configuration.

Current configuration : 1719 bytes	*no ip dhcp use vrf connected*
!	*!*
version 12.4	*!*
service tcp-keepalives-in	*no ip ips deny-action ips-interface*
no banner incoming	*!*
service timestamps debug datetime msec	*!*
service timestamps log datetime msec	*no spanning-tree vlan 1*
no service password-encryption	*!*
no service config	*!*
!	*!*
hostname Router	*interface FastEthernet0/0*
!	*ip address 10.1.1.2 255.255.255.0*
boot-start-marker	*no shutdown*
boot-end-marker	*duplex auto*
!	*speed auto*
!	*!*
no aaa new-model	*interface Serial1/0*
!	*physical-layer async*
resource policy	*no ip address*
!	*!*
ip subnet-zero	*interface Serial1/1*
ip cef	*physical-layer async*
!	*no ip address*
!	*!*

```
interface Serial1/2                                    !
 physical-layer async                                  no cdp run
 no ip address                                         !
!                                                      !
interface Serial1/3                                    control-plane
 physical-layer async                                  !
 no ip address                                         !
!                                                      line con 0
interface FastEthernet2/0                               stopbits 1
!                                                      line 1 4
interface FastEthernet2/1                               no exec-banner
!                                                       no vacant-message
interface FastEthernet2/2                               modem DTR-active
!                                                       special-character-bits 8
interface FastEthernet2/3                               no autobaud
!                                                       speed 9600
interface Vlan1                                         no exec
 ip address 10.0.0.62 255.255.255.224                  flowcontrol NONE
 no shutdown                                            transport input telnet
!                                                       escape-character NONE
ip classless                                           dispatch-character 5
ip route 0.0.0.0 0.0.0.0 FastEthernet0/0               stopbits 1
!                                                      line aux 0
!                                                      line vty 0 4
no ip http server                                      !
no ip http secure-server                               end


                                                      Router#
```

5   Maintenance

The V290iA is designed for high reliability and requires only limited maintenance. This chapter describes the behavior of the V290iA LEDs during normal operation. In the event of device functionality issues, refer to *Troubleshooting* on page 33.

Interface Panel LEDs

The following figure shows the LEDs on the V290iA's interface panel. These LEDs provide performance indications for the V290iA.
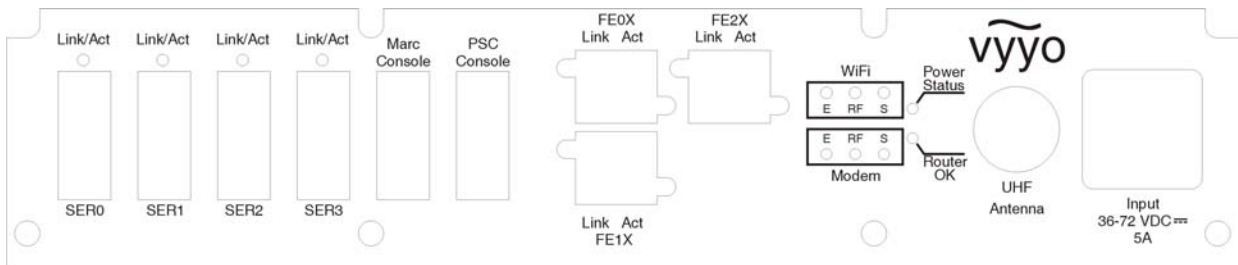
Figure 8: V290iA Front Panel LEDs

The following table describes the LEDs and their functions.

Table 2: V290iA LEDs

LED	Function
Power Status	• Amber when power is supplied to both the V284 and the Cisco router. • Green when power is supplied only to the V284. • Red when power is supplied only to the Cisco router. • Blinks green when a power fault is detected in the V284. • Blinks red when a power fault is detected in the Cisco router. • Blinks amber when a power fault is detected in both the V284 and the Cisco router.
Router OK	Blinks green during router boot-up sequence. Green when the router is operational.
WiFi Ethernet (E)	• Blinks green when transmitting/receiving Ethernet packets. • Green when Ethernet link operational.

LED	Function
WiFi RF (RF)	• Blinks green when transmitting/receiving radio packets. • Green when RF link is operational.
WiFi Status (S)	• Blinks green when no devices are associated with the WiFi interface. • Green when at least one device is associated with the WiFi interface.
Modem Ethernet (E)	• On when the Ethernet link is operational. • Off when the Ethernet link is not operational. • Flashing when data is transmitting/receiving.
Modem Status (S)	• On when the V284 is registered. • Off when the V284 is not registered.

Modem RF (RF)	*When **Status** LED is Off:*
	    • On when the downstream link is operational.
	    • Off when the modem has not yet begun downstream acquisition, the downstream link is idle, or there is a problem with data reception.
	    • Flashing when the downstream link is being acquired.
	
	*When **Status** LED is On:*
	    • Flashing when data is transferring in either in the Upstream or Downstream direction.

Link/Act (for each Serial port)	Green when the serial port is operational. Blinks red when packets are transmitted or received.
Link (for each Ethernet port)	Green when the Ethernet port is connected to a device.
Act (for each Ethernet port)	Blinks green when packets are transmitted or received.

WiFi LEDs Operation

As shown in Figure 8, the V290iA front panel includes three WiFi LEDs: Ethernet (E), Status (S), and Radio (RF). These LEDs are used in combination to determine overall V290iA device status.

If any of the WiFi LEDs is Red or Amber (steady or blinking) this indicates an initialization state, warning or a failure state. Refer to *Troubleshooting* on page 33 for details.

Upgrading Software

The V290iA has two upgradeable software elements:

- The V284 UHF modem. The software upgrade is detailed below.
- The Cisco IOS software. The software upgrade is performed by Cisco tools. Refer to the Cisco 3200 release notes:
  http://www.cisco.com/univercd/cc/td/doc/product/access/mar_3200/mar_rlsn/index.htm

Upgrading the V284 Software

To upgrade the V284:

1. Ensure that the latest release of the V290iA software is loaded on a laptop which is running a TFTF server (pumpkin).

2. Make sure the TFTP server (pumpkin) is activated, and set to permit access to the directory in which the software package is located.

3. Connect a serial cable from the serial port on the laptop to the Modem Console port on the interface panel.

4. Open terminal emulation software on the laptop and verify the connection with the V290iA.

5. Type **cd d** to go to the docsis directory.

6. Type **docsis_ctl**.

7. Type **dload *<ipaddress> <image_name>***, where:

   - *ipaddress* is the IP address of the laptop running the TFTP server.
   - *image_name* is the filename of the software package.

The download process takes a few moments. When download is complete, the V284 resets itself.

6   Troubleshooting

{?TBD}

A   V290iA Technical Specifications

This appendix lists the V290iA technical specifications.

When installing the V290iA, you must ensure that the physical environment and RF configuration meet these requirements. For example, the pole must be able to support the device's weight, and the antenna must be compatible with the listed frequency ranges.

V290iA General Characteristics

Parameter	Specification
Physical	
Height	13.4', 340 mm
Width	12.2', 310 mm
Depth	7.1', 180 mm
Max. Weight	26.5 lbs, 12 Kg.
Environmental	
Operating temperature	-22°F to +158°F, 30°C to +60°C
Storage temperature	-40°F to +185°F, -40°C to +85°C
Relative humidity	95% (non-condensing)
Vibration	IEEE 1613, Class V.S.2
Shock	IEEE 1613, 100 mm
Ingress Protection	IP40 (1 mm objects)
Regulations	
IEEE	std-1613-2003 compliance
FCC	C.F.R 47 - Part 15B and part 27
FCC	C.F.R 47 - part 27
Power	
Power supply range	36 to 72 VDC
Power Polarity	±
Rated voltage	48V
Maximum consumption	125W

UHF Radio Characteristics

	Parameter	Specification		
Downstream				
	Frequency	746-747 MHz		
	Channel bandwidth	330 KHz		
	Modulations	64QAM	16QAM	QPSK
	SNR for BER < 10E6	24 dB	19 dB	13 dB
	Minimum signal level	-87 dBm		
	Maximal signal level	-49 dBm		
	Frequency tolerance	± 50 KHz		
	Adjacent channels for BER < 10E6	10 dB		
	FEC	ITU-T J.83 Reed Solomon/Trellis Decoder		
Upstream				
	Frequency	776-777 MHz		
	Channel bandwidth	325 KHz		
	Modulation	16QAM or QPSK		
	Transmit level	-17 to +27 dBm		
	PA output power P1dB	32 dBm		
	FEC	Reed Solomon, with optional training		

B Antennas Technical Specifications

This appendix lists the technical specifications of the two optional UHF antennas.

Shrouded Yagi Antenna

Following are the specifications for the 4RF0054-A model of the 746 -777 MHz shrouded Yagi antenna.

Yagi Electrical and Mechanical Specifications

Parameter	Specification
Frequency range	746-777 MHz
Input Impedance	50 Ohms
Return Loss	>15 dB
Front to Back Ratio	20 dB
Maximum Input Power	250 Watts
Polarization	Vertical & Horizontal
Forward Gain	11.5dBd
3 dB Beamwidth	E Plane 37°, H Plane 41°
Connection	N socket
Radiator	ptfe Printed Circuit
Elements	Aluminium Alloy
Radiator Feed	Sucoform 141
Antenna Base	Sandcast Aluminium Alloy Grade LM25
Radome	Fire retardant Polyurethane Moulding
Fasteners	Stainless Steel Grade A2-70
Lightning protection	Direct Grounded
Mounting Brackets	Hot Dip Galvanized Steel to suit 38 - 60mm. dia.

Parameter	Specification
Typical Weight	6 kg (inc. clamp)
Typical Length	1.3 m
Typical Wind loading @ 45m/s	285N, with 1/2" radial ice 306N
Survival Wind Speed	300km/h with 1/2" radial ice
Operational Temperature Range	-50ºC to +80ºC

Mounting Options

Error! Not a valid link.

Figure 9: Mounting for Vertical Polarization of the Yagi Antenna

Error! Not a valid link.

Figure 10: Mounting for Horizontal Polarization of the Yagi Antenna

Flat Panel Subscriber Antenna

Following are the specifications for the 746-777 MHz, 9.5 dBi flat panel subscriber antenna.

Flat Panel – Electrical and Mechanical Specifications

Parameter	Specification
Regulatory Compliance	RoHS, CE 0682
Electrical	
Frequency range	746-777 MHz
Gain	9.5 dBi (min)
VSWR	2 : 1 (max)
S dB beamwidth	AZ: 43º(typ)
	EL: 55º(typ)
Polarization	Linear (Vertical or Horizontal)
Cross polarization	AZ: -26 dB (max)
	EL: -26 dB (max)
F/B ration	-25 dB (max)
Input impedance	50 (ohm)
Input power	6 W (max)
Lightning protection	DC Grounded
Mechanical	
Dimensions (L x W x D)	450 x 450 x 30 mm (max)
Weight	3 Kg (max)
Connector	N type Female
Radome	Plastic
Base plate	Aluminum with chemical conversion coating
Outline drawing	
Mounting Kit	

Flat Panel – Environmental Specifications

Test	Standard	Duration	Temperature	Notes
Low temperature	IEC 68-2-1	72 h	-55ºC	–
High temperature	IEC 68-2-2	72 h	+71ºC	–
Temp. cycling	IEC 68-2-14	1 h	-45ºC + 70ºC	3 Cycles
Vibration	IEC 60721-3-4	30 min/axis	–	Random 4M5
Shock Mechanical	IEC 60721-3-4	–	–	4M5
Humidity	ESTI EN300-2-4 T4.1 E	144 h	–	95%
Water Tightness	IEC 529	–	–	IP63
Solar Radiation	ASTAM G53	1000 h	–	–
Flammability	UL 94	–	–	Class HB
Salt Spray	IEC 68-2-11 Ka	500 h	–	–
Ice and Snow	–	–	–	25 mm Radial
Wind Speed Survival Operation	–	–	–	220 Km/h 160 Km/h
Wind Load (Survival): Front Thrust Side Thrust	– –	– –	–	39.6 kg 4.3 kg

C   Power Cable Specifications

This appendix lists the technical specifications of the power cable.

Power Connector Requirements

The following items are required for the V290iA power inlet matching connector:

- Cable – CABLE SHIELDED 4 X 22AWG
- Plug sealed – Manufactured by Tyco, MFG: 796094-2.
- Pin – Sock pins 15u gold 16-18awg, manufactured by Tyco, MFG: 66101-3.
- Boot #11 – Manufactured by Tyco, MFG: 207489-1.
- This connector is same as the one used for the Cisco 3230.

## External Cables Requirements

- Use cables suitable for the environmental required specification.
- Do not exceed the allowed cable length according to the common STD (Serial and Ethernet).
- Use the pin out description (refer to *Internal Connectors Description* below) to prepare the proper cable wiring according to the specific SCADA device or communication equipment you intend to attach to the V290iA.

Internal Connectors Description

Item	V290i Name	Connector Description	Pin Number
1	SER 0 to SER3	Connector D-Type 9pins Male	Pin1 = DCD
			Pin2 = RxD
			Pin3 = TxD
			Pin4 = DTR
			Pin5 = GND
			Pin6 = DSR
			Pin7 = RTS
			Pin8 = CTS
			Pin9 = NC
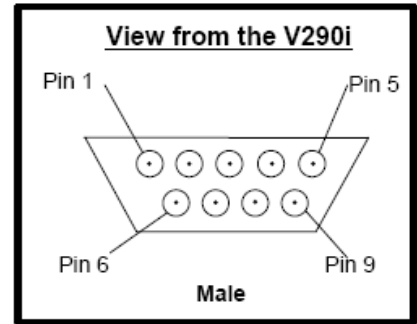
Item	V290i Name	Connector Description	Pin Number
2	PSC console	Connector D-Type 9pins Female	Pin2 = TxD
			Pin3 = RxD
			Pin5 = GND
			Pin1,4,6,7,8,9=NC
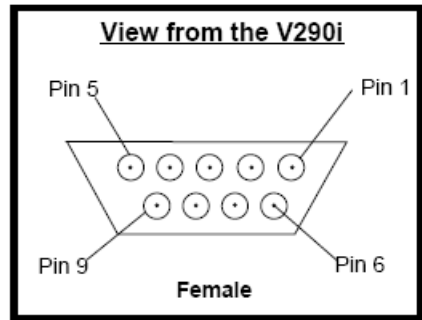
Item	V290i Name	Connector Description	Pin Number
3	MARC console	Connector D-Type 9pins Female	Pin1,9 = NC
			Pin2 = TxD out
			Pin3 = RxD in
			Pin4 = DSR in
			Pin5 = GND
			Pin6 = DTR out
			Pin7 = CTS in
			Pin8 = RTS out

Item	V290i Name	Connector Description	Pin Number
4	FE0X to FE2X	Connector RJ45 Female	Pin1 = RxPO
			Pin2 = RxNO
			Pin3 = TxPO
			Pin4 & 5 = TxC
			Pin6 = TxNO
			Pin7 & 8= RxC
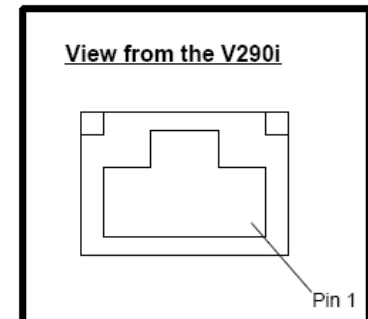
Item	V290i Name	Connector Description	Pin Number
5	UHF antenna	Connector N-Type female 50 ohm	Standard

Item	V290i Name	Connector Description	Pin Number
6	DC Input	Circular plastic connector 4 pins male	Pin1 = Negative
			Pin2 = Positive
			Pin3 = Negative
			Pin4 = Positive
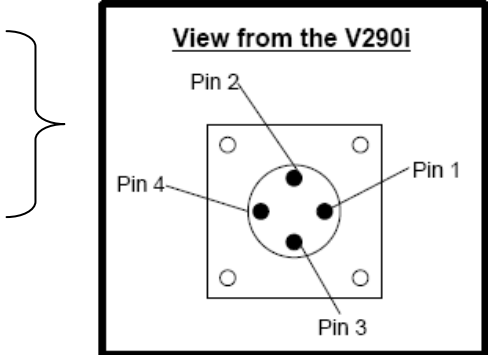
View from the V290i

D   UHF Antenna Cable Specifications

This appendix lists the technical specifications of the antenna cable. {?TBD}

E Serial Cable Specifications

This appendix lists the technical specifications of the EIA/TIA−232 serial cables. Two optional serial cables can be used: CAB−232MT or CAB−232FC.

EIA/TIA−232 Speed and Distance Limitations

As with all signaling systems, EIA/TIA−232 signals can travel a limited distance at any given bit rate; generally, the slower the data rate, the greater the distance. The table below gives the EIA/TIA−232 speed and distance limitations.

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	200	60
4800	100	30
9600	50	15
19200	50	15
38400	50	15
57600	25	7.6
115200	12	3.7

F Ethernet Cable Specifications

This appendix lists the technical specifications of the Ethernet cable.

Ethernet (AUI) Port Pinout (DB−15)

The table below lists the different pins and their appropriate signals.

Pin[1]	Ethernet Circuit	Signal
3	DO−A	Data Out Circuit A
10	DO−B	Data Out Circuit B
11	DO−S	Data Out Circuit Shield
5	DI−A	Data In Circuit A
12	DI−B	Data In Circuit B
4	DI−S	Data In Circuit Shield
2	CI−A	Control In Circuit A
9	CI−B	Control In Circuit B
1	CI−S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus
14	VS	Voltage Shield (L25 and M25)
Shell	PG	Protective Ground

[1] Any pin not referenced is not connected.

Ethernet Version 2 and IEEE 802.3 Physical Characteristics

The table below lists the Ethernet Version 2 and IEEE 802.3 physical characteristics of the Ethernet cable.

	Ethernet	IEEE 802.3		
		10Base5	10Base2	10BaseT
Data rate (Mbps)	10	10	10	10
Signaling method	Baseband	Baseband	Baseband	Baseband
Maximum segment length (in meters)	500	500	185	100 (Unshielded twisted pair −UTP)
Media	50−ohm coax (thick)	50−ohm coax (thick)	50−ohm coax (thin)	UTP
Topology	Bus	Bus	Bus	Star

Ethernet Coaxial−type Connection Limits for 10−Mbps Transmission

The following table lists the Ethernet coaxial−type connection limits for 10−Mbps transmission.

Parameter	10Base5	10Base2
Cable diameter	1 cm (0.4 in)	0.6 cm (0.25in)
Maximum segment length	500 m (1640ft.)	152 m (500ft.)
Maximum network length (with four repeaters)	2500 m (8200ft.)	762 m (2500ft.)
Maximum connections (taps per segment)	100	30
Minimum connection (tap) spacing	2.5 m (8.2 ft.)	0.5 m (1.64ft.)

G FCC Declaration of Conformity

We, the undersigned,

Company: VYYO Inc.

Address: 4015 Miranda Avenue, Palo Alto, Ca.

Country: USA

Telephone number: 001-650-3194037

Fax number: 001-650-3194066

Are the Responsible Party for this Declaration, certify and declare under our sole responsibility that the following equipment:

Brand	Type	Product description
VYYO	V290iA	UHF INDUSTRIAL MODEM WITH WiFi ACCESS POINT

Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Drawn up at: On May 8, 2006

VYYO Inc

4015 Miranda Avenue

Palo Alto, Ca.

USA

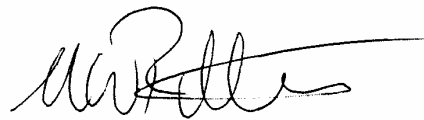VYYO Inc.   Dr. Mike Ritter

                                             VP. Marketing