Integra-IP
Installation Manual

Dataradio Integra-IP
Installation Manual

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December 2006

About Dataradio

Dataradio is the leading designer and manufacturer of trusted wireless products and systems for critical infrastructure applications. Our products have been found at the heart of mobile and SCADA data networks around the world for over 25 years. Dataradio products include mobile data products and systems, telemetry devices, integrated wireless modems for fixed point-to-point and point to multi-point applications and OEM solutions. Our product line is one of the broadest and most trusted in the industry.

Product Warranty

The manufacturer's warranty statement for this product is available in our manuals or by contacting Dataradio COR Ltd. 299 Johnson Avenue, Suite 110, Waseca, MN 56093-0833. Phone (507) 833-8819.

www.dataradio.com

Dataradio provides product brochures, case studies software downloads and product information on our website.

Every effort is taken to provide accurate, timely product information in this installation manual. Product updates may result in differences between the information provided herein and the product shipped. The information in this document is subject to change without notice.

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Revision History

January 2004
Revision 000

Manual release

February 2004
Revision 001

Change product name to Private Wireless IP Gateway

June 2004
Revision 002

Providing clearer setup information, add Section 5

February 2005
Revision 003

Replace manual cover with new design

October 2005
Revision 004

Replace pictures with slim version, add mounting option information

February 2006
Revision 005

Change product name to Integra-IP

December 2006
Revision 006

Add power connection information - Section 1.5.1

SECTION 1

PRODUCT OVERVIEW

1.1 PRODUCT OVERVIEW

This installation manual provides information to guide the user through the installation and use of the Dataradio Integra-IP. The Integra-IP consists of an OIP Router and an Integra-IP unit. The system is best suited for SCADA and telemetry applications and supports any protocol running over IPv4 (including ICMP, IPinIP, IPSec, RSVP, TCP and UDP protocols). It provides MAC layer bridging and HTTP, ARP and static routing packet forwarding. The OIP and Integra-IP wireless modem operate as one to form the Integra-IP.

The information in this manual makes the assumption that the user's PC has an NIC (Network Interface Card) with TCP/IP implemented. Setup requires the knowledge and authorization to modify the TCP/IP settings for the NIC.

Caution: Changing or installing new IP addresses in a network can cause serious network problems. If you have any questions or concerns, contact the Network Administrator for your system.

1.2 UNIT DESCRIPTION

Dataradio's Integra-IP provides any IP-enabled device with connectivity to transmit narrowband data. The Dataradio OIP Router is shown in Figure 1-1. The OIP Router has three ports, one Ethernet 10Base-T RJ 45 connection and two RS-232 DB-9 connections. The Ethernet port is designed to work in half-duplex mode. If the unit is connected to a hub, a crossover Ethernet cable is used. If it is connected to a PC, a standard Ethernet cable is used. The top left DTE port is used to connect to the Integra-IP wireless modem. The bottom left DCE port is used to connect to a laptop or hyper-terminal console session to configure the unit or to enter user commands. This manual uses the following principles:

- An Integra-IP system connected to a remote location (i.e. RTU) is called OIP Client
- An Integra-IP system connected to local location (i.e. Host) is called OIP Server

1.2.1 FRONT PANEL

Figure 1-1 OIP Router

Designed for easy installation and configuration, the Integra-IP features:

- Two bi-color (RED/GREEN) LEDs. The right LED is a general status indicator and the left LED is the Ethernet activity indicator which is GREEN for status and RED for activity (it blinks when Ethernet frames are sent or received). The general status indicator LED is GREEN when the unit is in router mode. It is AMBER when the unit is in bridge mode and is RED if the unit fails or when the units starts
- One power supply connector (10VDC to 16VDC, 1 A minimum) DO NOT EXCEED 16 VDC
- One Ethernet 10Base-T RJ-45 connector. Note: When the unit is connected to a hub, a crossover cable is necessary. When it is directly connected to a PC, a standard cable is used. This Ethernet port is designed to work in half duplex mode
- Two serial ports: the lower port (DCE) is connected to a PC to configure the unit or to enter user commands. The upper port (DTE) is connected to the COM port of the Integra-IP modem
- Two mounting options - the units may be mounted side-by-side or stacked with the included links

These features provide system benefits that give users:

- Long Range - narrowband configurations allow better coverage over harsh terrain (dependent on antenna attributes
- Rugged Industrial Product - the Integra-IP system operates over extended temperature ranges and provide worry-free operation in the roughest environments
- Network Security - system configuration guards against intrusion
- Easy deployment - Bridge mode option is virtually “plug-and-play”
- Configurable for either Server or Client - no need to order a special unit; the Integra-IP is software configurable for either

1.3 INTEGRA-IP PART NUMBER BREAKDOWN

The following table provides a breakdown of the Integra-IP part number.

Table 1-1 Integra-IP Part Number Breakdown

250-40W8-XYZ*			
W	**X**	**Y**	**Z (UHF units)**
1 VHF	0 406-422 MHz		0 406-422 MHz
4 UHF	1 380-403 MHz	1 12.5 kHz	1 414-430 MHz
	2 403-419 MHz	3 25 kHz	
	3 419-435 MHz		
	4 132-150 MHz (VHF), 435-451 MHz (UHF)		
	5 450-470 MHz (UHF),		
	6 150-174 MHz (VHF), 464-480 MHz (UHF)		
	7 480-496 MHz		
	8 496-512 MHz		

*An F should follow any part number to designate a system with the cooling fan option.

1.4 MOUNTING OPTIONS

1.4.1 SIDE-BY-SIDE MOUNTING

The OIP and Intgera IP units may be mounted in their traditional a side-by-side configuration (as shown in the system diagrams in Section 1.8).

1.4.2 STACKED MOUNTING

The new slim OIP and Integra-IP units may be stacked to better fit into enclosures (see Figure 1-2 and 1-3). Remove the OIP mounting plate, the two bottom black front-panel screws from the OIP Router and the top black front panel screws from the Integra-IP unit. Use two of the gold links (included in the shipping box) to connect the two units. Tighten screws. Remove the right bottom black screw from the OIP Router and the right top screw from the OIP Router. Use one link to connect the two units. Tighten the screws. Your stacked Integra-IP is ready for installation.

1.5 SYSTEM SETUP AND CONFIGURATION

1.5.1 SERIAL SETUP

Figure 1-2 illustrates serial connections for unit configuration with the Integra-IP Programming Software. The inset shows a close-up of the stacked unit connection using the gold link.

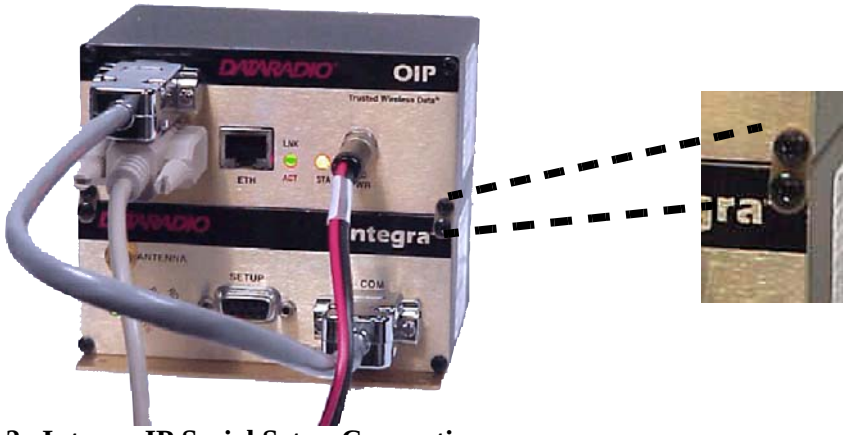


Figure 1-2 Integra-IP Serial Setup Connections

1.5.2 ETHERNET/IP CONFIGURATION

Figure 1-3 Integra-IP Network Connections - Link Mounted

Figure 1-3 illustrates the Integra-IP's Ethernet/IP connections for network communications.

1.5.3 INTEGRA OIP WIRELESS MODEMS

Integra-OIP modems nust be powered by an external power supply using the power cables supplied with the Integra-IP. Connect the Modem and OIP module to a 13.3 VDC (10-16 VDC) 3 amp (recommended) power supply. Connect RED leads to (+) positive and BLACK leads to (-) negative connections.

The Integra-IP wireless modems need to be configured with the proper frequency pair for transmit and receive. RF power output levels must be set as required by the operation. Serial data rates (DTE) should be set to 19200 bps regardless of the RF network speed, which may be set at 9600 bps as required by the channel width of the unit selected (half channel: 12.5 kHz - 9600 bps or full-channel: 25 kHz - 19200 bps). The modem ID number is assigned at the factory and should not be changed. This ID is used by the OIP Router module for addressing purposes.

1.5.4 OIP OPERATING MODES

Bridge Mode

Bridge mode requires less setup than the Router mode. In Bridge mode the OIP Routers do not contain IP/ network properties that are accessible through the network (they are transparent to the network). Only the Server and the Remote Client network properties need to be setup. The Server's Gateway will direct the Server to all remote Clients on the network. The Server will essentially broadcast to all the remote Clients that are bridged to the Server. The Bridge mode configuration is used when the Remote Clients could be connected to the Server through a hub if the OIP Router/Integra-IP were removed. The Server and the Clients would still contain the network information required to connect with each other. This configuration is recommended for users who do not have IT/ network support readily available to them. Online diagnostics information is not available in Bridge Mode since the OIP Routers are transparent to the network.

Router Mode

Router mode provides flexibility in Network configuration and adds RF diagnostics capability for the Integra-IP wireless modems. Router mode also allows greater flexibility in using different protocols. A larger selection of compression techniques can be implemented in Router mode. Router mode requires not only the Server and Remote Client Networks properties be setup but the OIP Router's Network properties as well. Router mode offers the ability to use the Ethernet port to read and write the parameters in the Dataradio OIP Router and in the interconnecting Integra-IP wireless modem. The diagnostics from the Server Integra-IP and the Client Integra-IP can also be retrieved through the Ethernet Port. This configuration is recommended for users who have IT/Network support readily available to them and the authorization required to make changes in the network.

1.6 ACCESSORIES

Table 1-2 Dataradio Integra-IP Accessories

Integra-IP Field Programming Kit (includes software and Installation manual on CD ROM)	250-4009-001
SMA Male - BNC Female adapter cable	697-5000-098
*Cooling fan - factory option (For extended duty-cycle transmit applications)	Catalog number plus “F” suffix.
Switching Power Converter (SPC)	250-0300-133
Power Demo Power Kit - VHF	250-0015-100
Power Demo Power Kit - UHF	250-0045-100
Antenna Kit: 138-143 MHz 6.5 dB	250-0211-007
Antenna Kit: 138-143 MHz 9.5 dB	250-0211-010
Antenna Kit: 143-148 MHz 6.5 dB	250-0211-107
Antenna Kit: 143-138 MHz 9.5 dB	250-0211-110
Antenna Kit: 148-152 MHz 6.5 dB	250-0211-207
Antenna Kit: 148-152 MHz 9.5 dB	250-0211-210
Antenna Kit: 152-157 MHz 6.5 dB	250-0211-307
Antenna Kit: 152-157 MHz 9.5 dB	250-0211-310
Antenna Kit: 157-163 MHz 6.5 dB	250-0211-407
Antenna Kit: 157-163 MHz 9.5 dB	250-0211-410
Antenna Kit: 163-169 MHz 6.5 dB	250-0211-507
Antenna Kit: 163-169 MHz 9.5 dB	250-0211-510
Antenna Kit: 169-174 MHz 6.5 dB	250-0211-607
Antenna Kit: 169-174 MHz 9.5 dB	250-0211-610
Antenna Kit: 450-470 MHz, 7 dB	250-0241-507
Antenna Kit: Antenna Kit: 450-470 MHz, 10 dB	250-0241-510
OIP Power Cable	697-5100-001
Integra-IP Power cable	697-4008-001
OIP/ Integra-IP Data Interconnect	697-5300-001

1.7 SYSTEM CONSIDERATIONS

1.7.1 RF PATH AND COMMUNICATIONS RANGE

Dataradio’s Integra-IP system is designed for use over distances up to 50 miles or greater (+80 km) dependent on terrain and antenna system. To assure reliable communications, the RF (radio frequency) path between stations should be studied by a competent professional who can determine antenna requirements and whether or not a repeater is needed. Your Dataradio Sales Representative can assist you.

1.7.2 SUPPORTED PROTOCOLS

The Integra-IP provides IP traffic over a half-duplex radio channel. It supports any protocol running over IPv4 (including ICMP, IPinIP, IPSec, RSVP, TCP and UDP protocols) by providing a MAC layer bridge utilizing TCP/IP and UDP/IP header compression.

Note: Dataradio does not recommend using the Integra-IP to extend a corporate LAN.

1.7.3 BASIC CONNECTIONS

Integra-IP basic connections are shown in Figure 1-2.

While an RTU or PLC is shown in the diagram, master stations often use a PC running an application designed to communicate with remote RTUs or PLCs. The Setup PC is used for both configuration and local/remote diagnostics. It may be left connected at all times but is not required for normal operation once the units are configured.

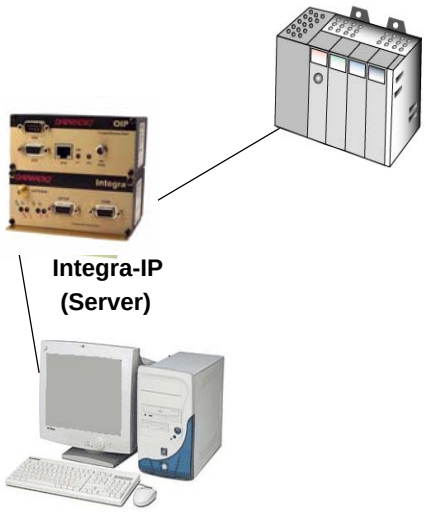


Figure 1-4 Basic Connections

1.7.4 COMMON CHARACTERISTICS

The networks described in this section share common characteristics:

1. The network speed must be the same for all stations in a network.

2. Transmission of online diagnostics may be enabled or disabled at any station or stations without affecting their ability to communicate with other stations.

1.8 INTEGRA-IP NETWORK CONFIGURATIONS

1.8.1 POINT-TO-POINT SYSTEM

A simple point-to-point connection is shown in Figure 1-3.

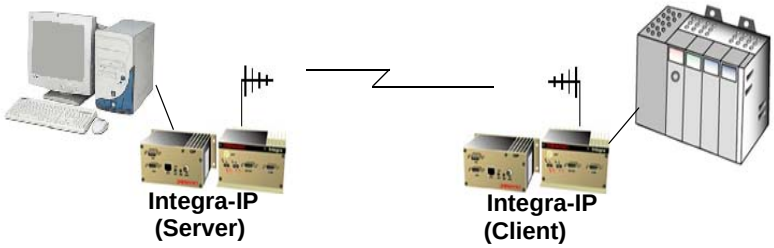


Figure 1-5 Point-to-Point System

In this system, the user's equipment (DTE) may be set up in either a peer-to-peer or a Master (Server)-Remote (Client) configuration.

1.8.2 POINT-MULTIPOINT SYSTEM

Basic point-multipoint systems are shown in Figure 1-4

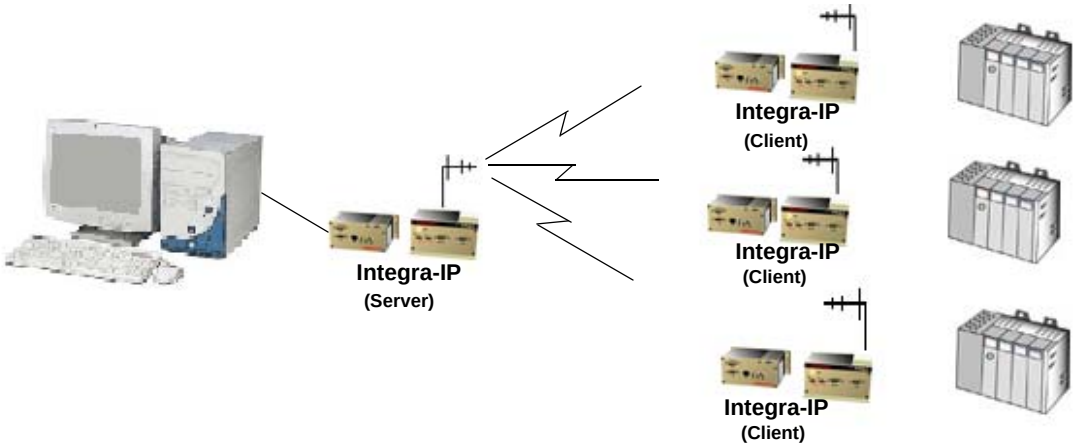


Figure 1-6 Point-Multipoint System (half-duplex)

Once the frequency pairs are programmed into the Integra-IP, the IP network (Ethernet connection) behaves as a standard Ethernet connection. When used in a point-to-multi-point setup, Dataradio recommends polling because it limits the possibility of collisions among messages generated by the client programs running on the RTU or PLC.

1.8.3 STORE AND FORWARD SYSTEM

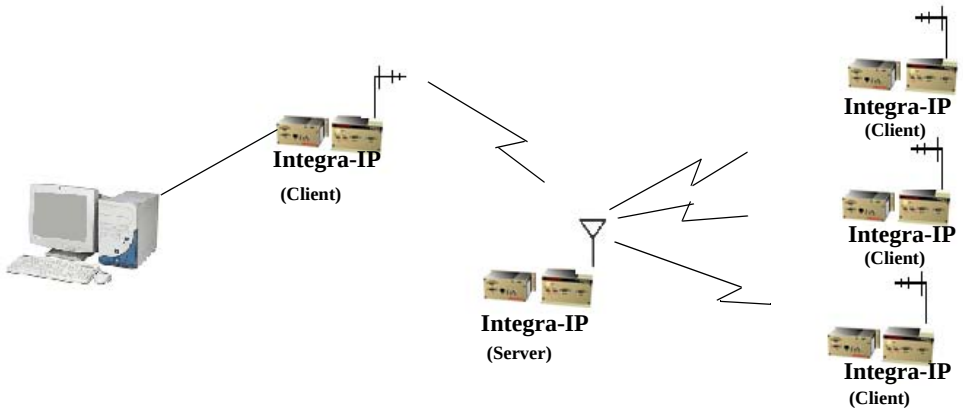


Figure 1-7 Store and Forward System

The Integra-IP may be used in a store-and-forward configuration with the Integra-IP Server acting as a repeater (see Section 1.6.4).

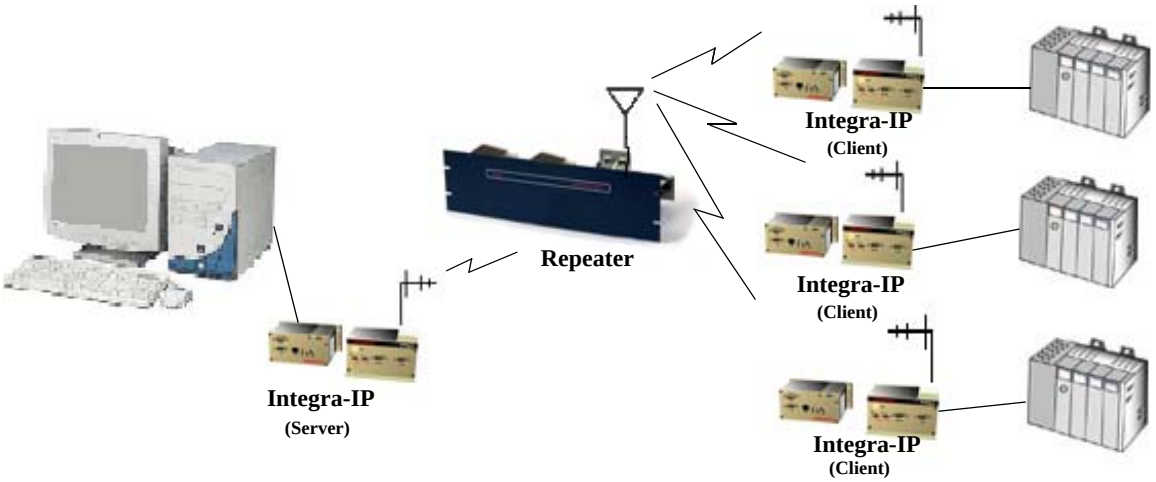


Figure 1-8 Point-Multipoint System (Full-duplex Repeater)

1.8.4 NETWORK COVERAGE WITH A REPEATER

A repeater re-transmits data from a Master (Server) site to a Remote site and from a Remote (Client) site back to a Master (Server) site. The repeater adds a transmission delay but assures a greater coverage distance. Repeaters also can make communications possible in harsh geographical (mountainous, hilly or densely populated) areas. Repeater location is important. The repeater site must have good communication with both the Master (Server) and Remote (Client) sites. Sites for consideration are hill, building or tower tops.

1.9 FACTORY TECHNICAL SERVICE

The Factory Service Department provides customer assistance on installation problems and serves as an interface with factory repair facilities. They can be reached in the following ways:

Dataradio COR Ltd.
299 Johnson Avenue, Suite 110
Waseca, MN 56093
Technical Service hours are: Monday to Friday 7:30 AM to 4:30 PM, Central Time Phone: 800-992-7774
or 507-833-8819
Fax: 507-833-6758
General Fax: 507-833-6748
Email address: support@dataradio.com

1.10 PRODUCT WARRANTY

The product warranty is located in Appendix B.

1.11 REPLACEMENT PARTS

This product is normally not field-serviceable, except by the replacement of complete units. Specialized equipment and training is required to repair logic boards and radio modules.

Contact Technical Service for information before returning equipment. A Technical Service representative may suggest a solution eliminating the need to return equipment.

1.12 IF A PROBLEM ARISES...

1.12.1 FACTORY REPAIR

Dataradio products are designed for long life and failure-free operation. If a problem arises, factory service is available. A Return Material Authorization (RMA) is required when returning equipment to Dataradio for repair. Contact the Technical Service Department at 800-992-7774, extension 6707 to request an RMA number. Be prepared to give the equipment model and serial number, your account number (if known), and billing and shipping addresses. Contact information to obtain an RMA is also available on our website at www.dataradio.com/support.shtml.

Include the RMA number, a complete description of the problem, and the name and phone number of a contact person with the returned units. This information is important. The technician may have questions that need to be answered to identify the problem and repair the equipment. The RMA number helps locate your equipment in depot repair if there is a need to contact Dataradio concerning the equipment. Units sent in for repair will be returned to the customer retuned to the current Dataradio Test and Tune Procedure and will conform to all specifications noted in this section

Customers are responsible for shipping charges (to Dataradio) for returned units in warranty. Units in warranty are repaired free of charge unless there is evidence of abuse or damage beyond the terms of the warranty. Dataradio covers return shipping costs for equipment repaired while under warranty.

Units out of warranty are subject to repair service charges. Customers are responsible for shipping charges (to and from Dataradio) on units out of warranty. Return shipping instructions are the responsibility of the customer.

GENERAL SPECIFICATIONS

These specifications are subject to change without notice.

GENERAL	VHF	UHF
Frequency	132-174 MHz	380-403 MHz* 403-512 MHz
Channels	One channel	
Channel Bandwidth	12.5 or 25 kHz models	
Operating Temperature	-30° to + 60° C	
Supply voltage	10 - 16 VDC maximum (nominal 13.3) Fuse protected against reverse voltage (internal surface mount 3A fuse: not field replaceable)	
Rx Current Drain at 13.3 VDC	<220 mA (with a terminal connected to Integra-TR COM port)	
Tx Current Drain at 13.3 VDC	<2.6 A	
Power Saving Mode Current Drain	<20 mA	
Cold start [1]	4 sec (typical)	
Warm Start Rx [2]	45 to 60 msec (depending on radio model and temperature)	
Warm Start Tx [3]	55 to 70 msec (depending on radio model and temperature)	
Tx Turnon Time [4]	15 ms (typical)	
Rx/Tx Bandwidth, without tuning	18 MHz (132-150) 24 MHz (150-174)	16 MHz except 20 MHz (450-470)
Nominal Dimensions	OIP -4.5” x 2.0” x 4.75” (11.4cm x 5.0cm x 12.1cm) OIP/Integra - 4.5” x 2.4“ x 4.75” (11.4cm x 5.6cm x 12.1cm)	
Shipping Weight[+]	3.12 lbs	

*380 to 403 MHz frequency band is not FCC or IC type approved

[+]Includes 102 cm power cable.

General RF Specifications (RF Specifications are measured per TIA/EIA-603 with a psophometric baseband filter.)

RECEIVER	VHF	UHF
Sensitivity	0.35 µV for 12 dB SINAD	
Selectivity (25 kHz)	>70 dB minimum	
Selectivity (12.5 kHz)	>60 dB minimum	
Intermodulation	>70 dB minimum	
Spurious Rejection	>70 dB minimum	
FM Hum and Noise	<-45 dB max (25 kHz)	<-45 dB max (25 kHz)
Conducted Spurious	< -57 dBm	

TRANSMITTER	VHF	UHF
RF Power Output	1 to 5 Watts, software adjustable	
Spurious and Harmonics	<-73 dBc (-36 dBm)	<-73 dBc (-36 dBm)
Frequency Tolerance (12.5 & 25 kHz)	2.5 PPM	1.5 PPM
FM Hum and Noise	<-45 dB (25 kHz)	<-45 dB (25 kHz)
Tx Duty Cycle	50%, max. Tx time 30 seconds, extended Tx time with the cooling fan option	

[1] Cold Start: time from DC power applied until unit is fully ready to receive or transmit data

[2] Warm Start Rx: in power saving modes (sleep or suspend), wake-up time for full receiver recovery

Modem / Logic	
Operation	Simplex / half duplex
Data Bit Rates	25 kHz channel: 4800 b/s, 9600 b/s, 19200 b/s
	12.5 kHz channel: 4800 b/s, 9600 b/s
Modulation Type	DRCMSK (Differential Raise-Cosine Minimum Shift Keying)
RTS/CTS Delay (RTS mode)	4 ms
Addressing	10 bit station address, 1 bit station type (master / remote)
Bit Error Rate (BER) 9600 b/s, 12.5 kHz 4800, 9600 b/s, 25 kHz 19200 b/s, 25 kHz	 1 x 10 -6 at 1.4 µV minimum /-104 dBm 1 x 10 -6 at 1.0 µV minimum / -107 dBm 1 x 10 -6 at 2.3 µV minimum / -100 dBm

Physical Interface	
Ethernet	10 Base T, RJ-45
Data Rate	1200 - 19200 b/s
Protocol	IP
Transmit Control	RTS or DOX (data operated transmit)
RF	SMA Female
Power - I/O	Snap & Lock 4-Pin DC Power Jack

Serial	
DTE (Interface to Integra: DE-9F)	RS-232/V2.4 19,200 bps
DCE (Setup: DE-9F)	RS-232/V2.4 1200 - 19,200 bps

Analog Inputs	
Interface	Two inputs, 0-10 VDC, 8 bits. May be read only via Offline Diagnostics. Absolute maximum input voltage < 20 Vdc. Inputs are reverse-voltage protected.

Display	
OIP: 2 bi-color (Red/Green) LEDs	Right LED: general status indicator (green = router mode, Amber = bridge mode, red = startup or unit failure Left LED: Ethernet activity indicator (green = status, red = activity)
OIP/Integra: 4 Bi-color status LEDs	RUN/PWR/ CS/SYN, RX/TX, RD/TD

Diagnostics	
Online	Short ID, temperature, B+ voltage, local RSSI, remote RSSI, fwd and rev power, Rx Quality
Offline	As for Online plus: Demodulated Signal Voltage, Analog Input Levels, Digital Outputs

SECTION 2

INTEGRA-IP SETUP GUIDE

2.1 NETWORK DIAGRAM WORKSHEET

The information gathered for the network diagram worksheet is used to set up the Integra-IP network. Input these values into the appropriate fields of the Integra-IP Field Programming Software. IP Addresses used in this example are for reference only. Check with your system administrator for valid IP addressing.
Caution: Changing or installing new IP addresses in a network can cause serious network problems. If you have questions or concerns, contact your Network Administrator.

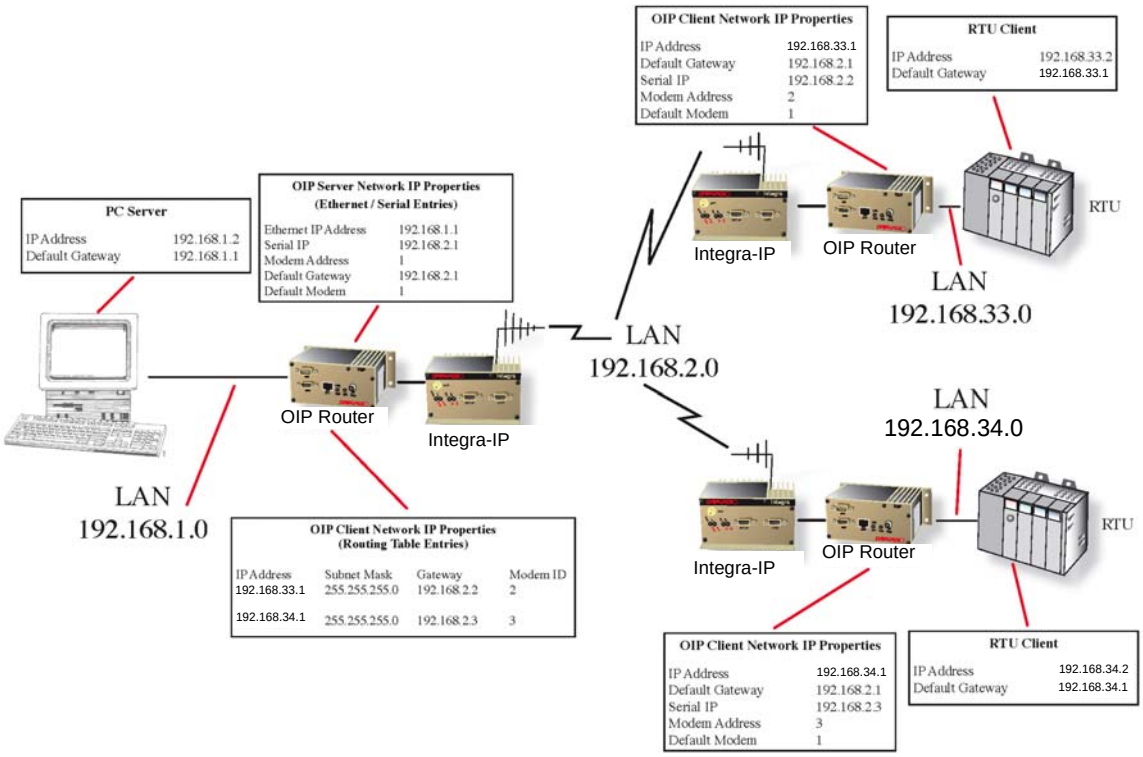


Figure 2-1 Completed Network Design Worksheet (for reference only)

Match the color code to the appropriate field. Network diagram worksheets are provided to configure your system design. The parameters provided in the examples are for reference only.

1. Insert IP addressing for the PC Server and all RTU clients.
2. Insert Ethernet IP addressing for OIP Routers.
3. Insert serial IP addressing and modem ID's for OIP Routers.
4. Insert default gateways for PC Server and RTU clients.
5. Insert default Gateways for OIP Routers.
6. Complete Routing Tables for the OIP Server.
7. Verify network information is correct.

2.1.1 1. INSERT IP ADDRESSING FOR THE PC SERVER AND ALL RTU CLIENTS.

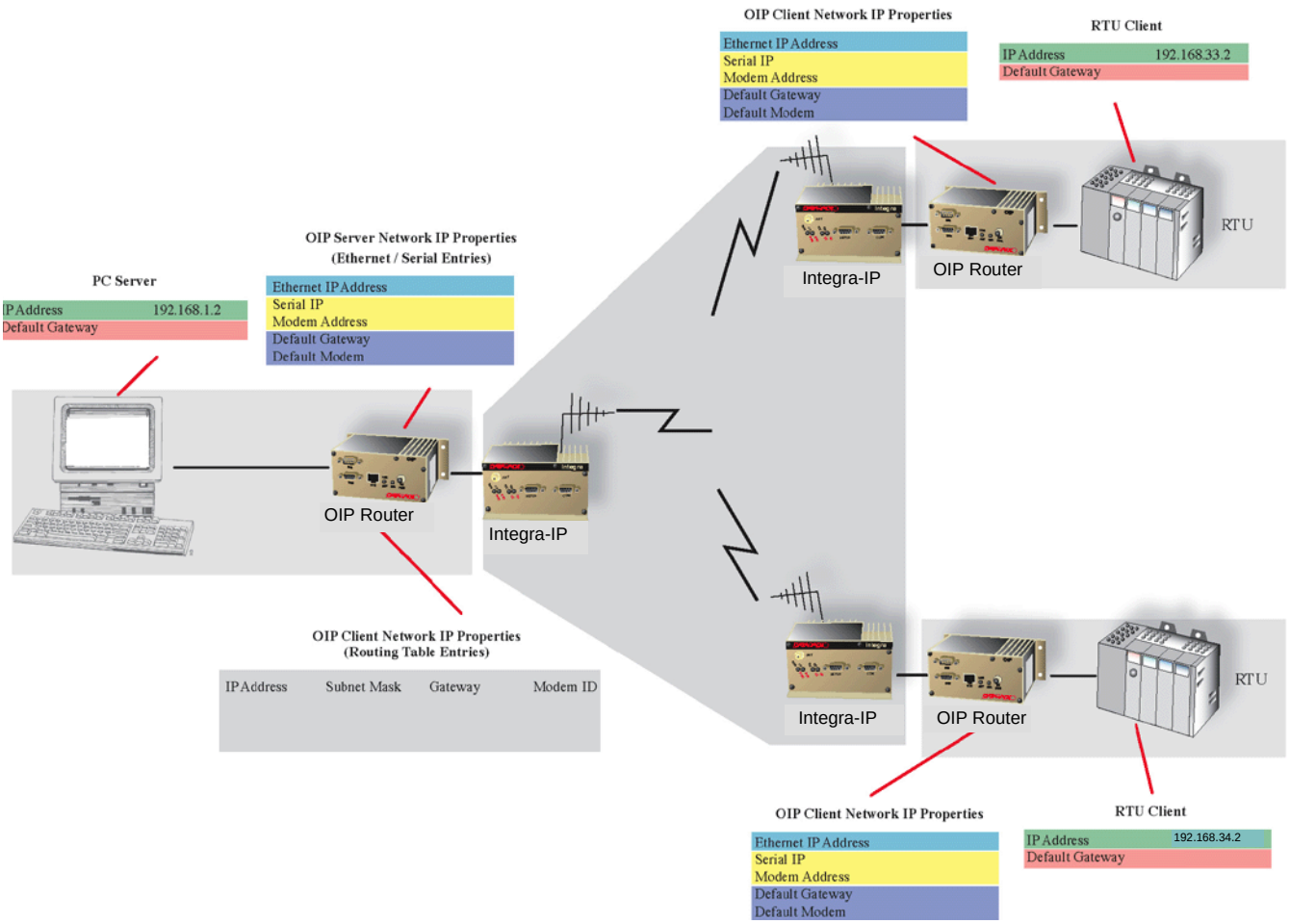


Figure 2-2 IP Addressing for PC Server and all RTU Clients

A detailed IP address must be provided for all devices in the network.

In our example:

PC Server	192.168.1.2
RTU Client 1	192.168.33.2
RTU Client 2	192.168.34.2

2.1.2 2. INSERT ETHERNET IP ADDRESSING FOR OIP ROUTERS

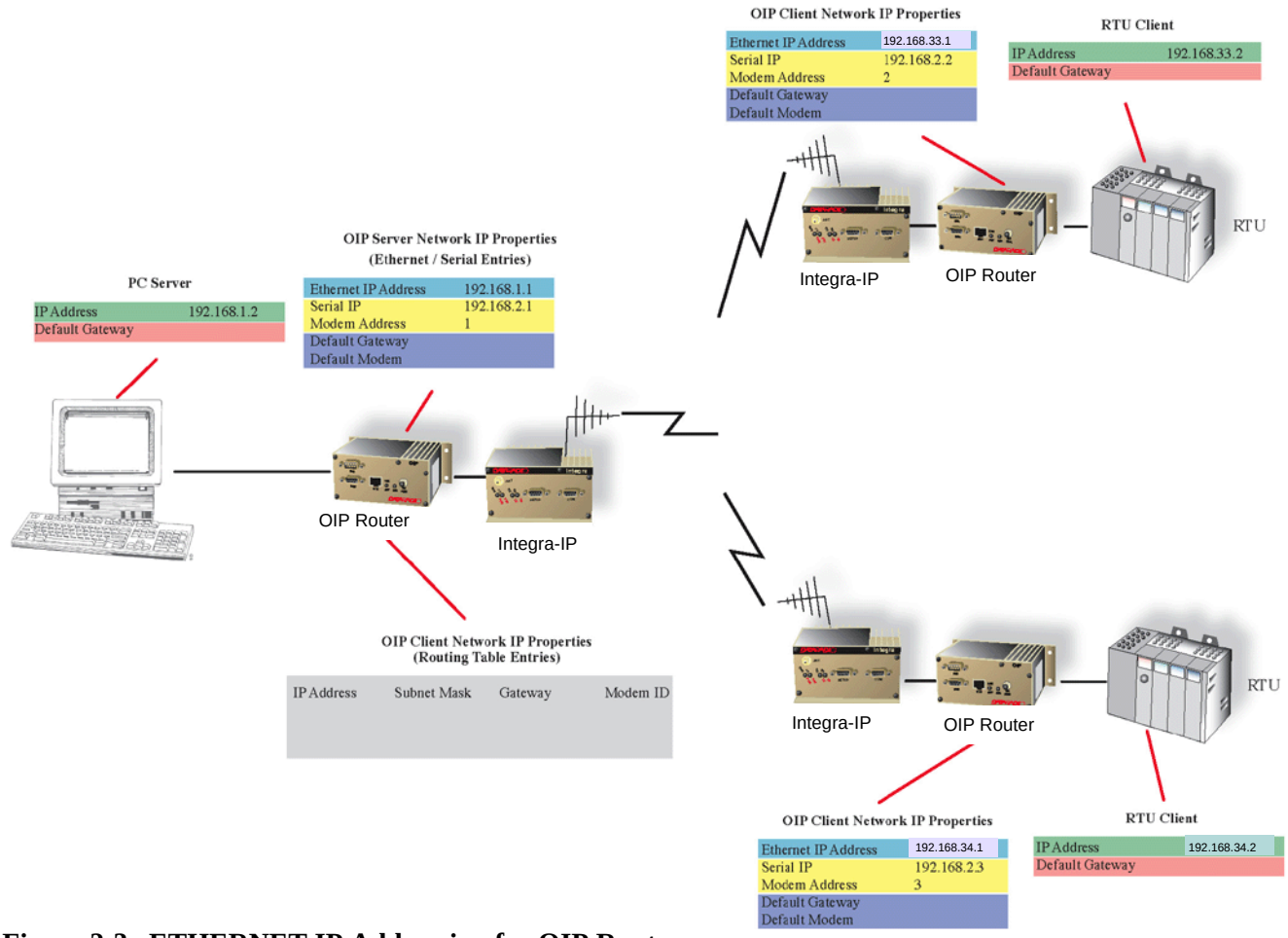


Figure 2-3 ETHERNET IP Addressing for OIP Routers

The Ethernet/IP addresses for the OIP Routers must be on the same LAN as the device to which they are connected.

In our example:

LAN 1	192.168.1.0
OIP Server IP	192.168.1.1
LAN 2	192.168.33.0
OIP Client 1	192.168.33.1
LAN 3	192.138.34.0
OIP Client 2	192.168.34.1

2.1.3 3. INSERT SERIAL IP ADDRESSING AND MODEM ID's FOR OIP ROUTERS.

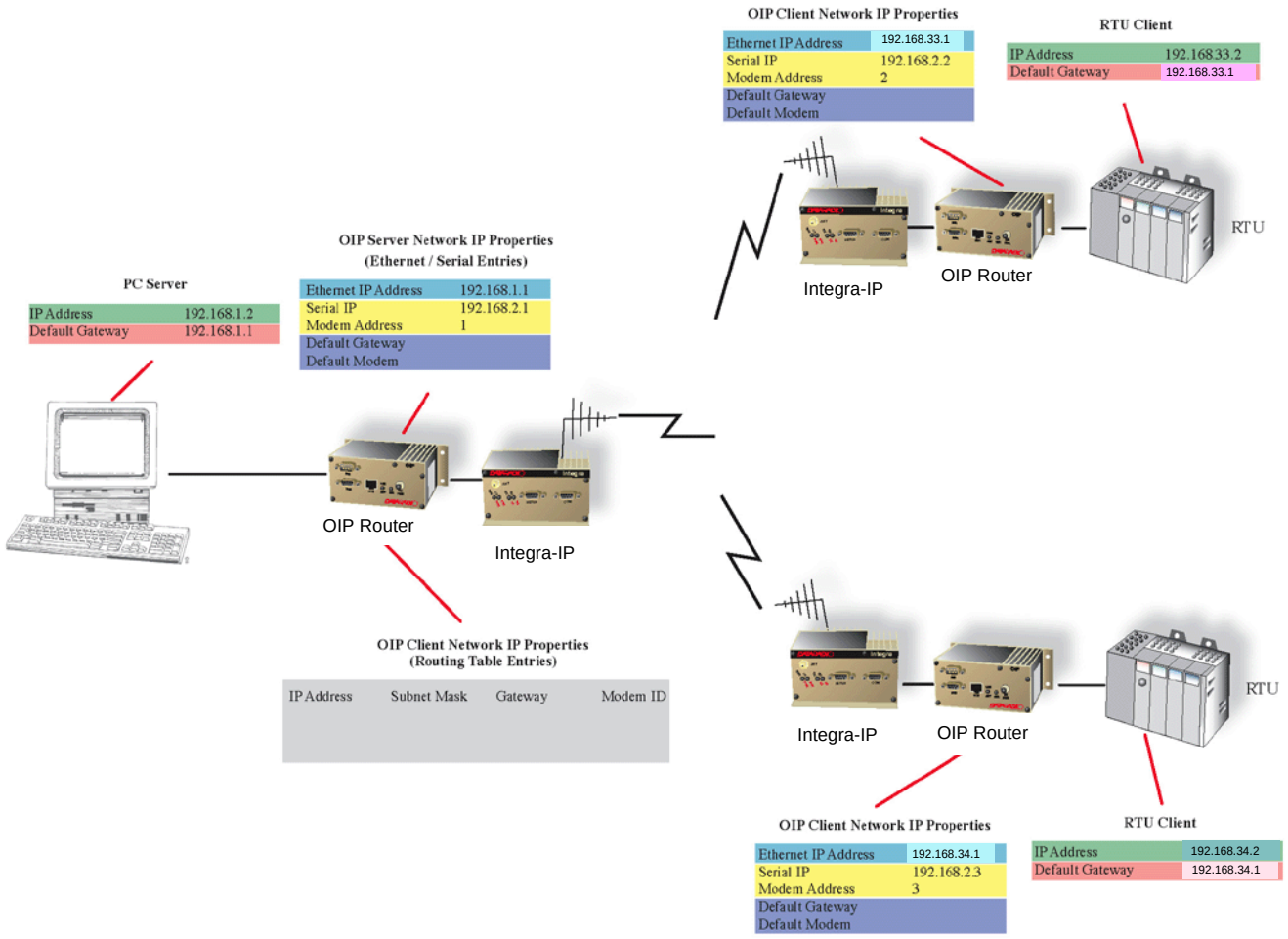


Figure 2-4 Serial IP Addressing and Modem ID's for OIP Routers

The Modem ID should always be the last digit of the Serial IP address. The OIP Clients will then be sequentially assigned IP Addresses and Modem ID's.

In our example:

Serial IP Network	192.168.2.0
OIP Server	192.168.2.1
Modem ID	1
OIP Router 2	192.168.2.2
Modem ID	2
OIP Router 2	192.168.2.3
Modem ID	3

2.1.4 4. INSERT DEFAULT GATEWAYS FOR PC SERVER AND RTU CLIENTS.

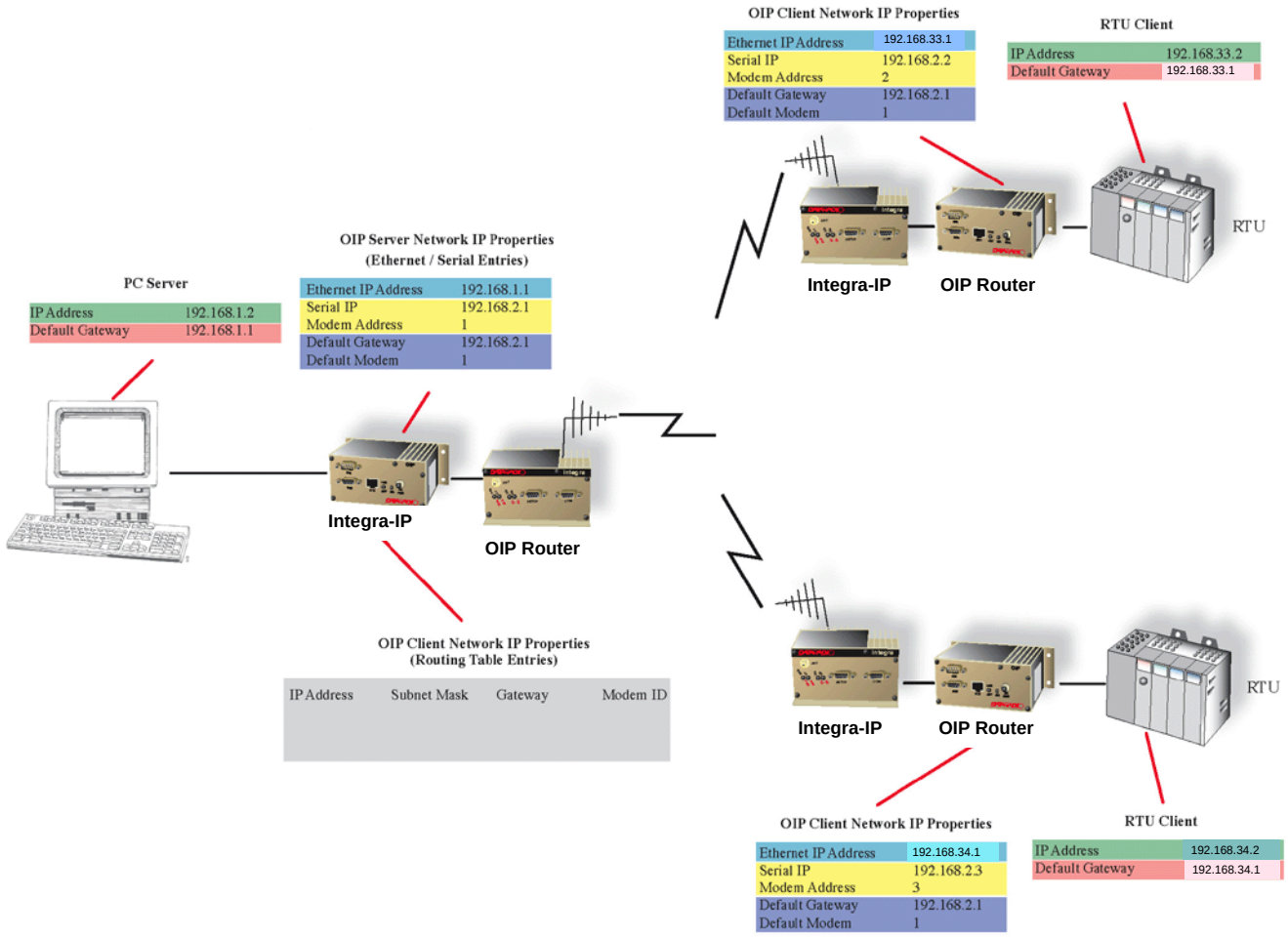


Figure 2-5 Default Gateways for PC Server and RTU Clients

The default Gateway for the PC Server and the RTU Clients must have the same IP Address as the OIP Routers to which they are connected.

In our example:

LAN 1	192.168.1.0
PC Server Default Gateway	192.168.1.1
OIP Router 1	192.168.1.1
LAN 2	192.168.33.0
RTU Client 1	192.168.33.2
OIP Router 2	192.168.33.1
LAN 3	192.168.34.0
RTU Client 2	192.168.34.2
OIP Router 3	192.168.34.1

2.1.5 5. INSERT DEFAULT GATEWAYS FOR OIP RouterS.

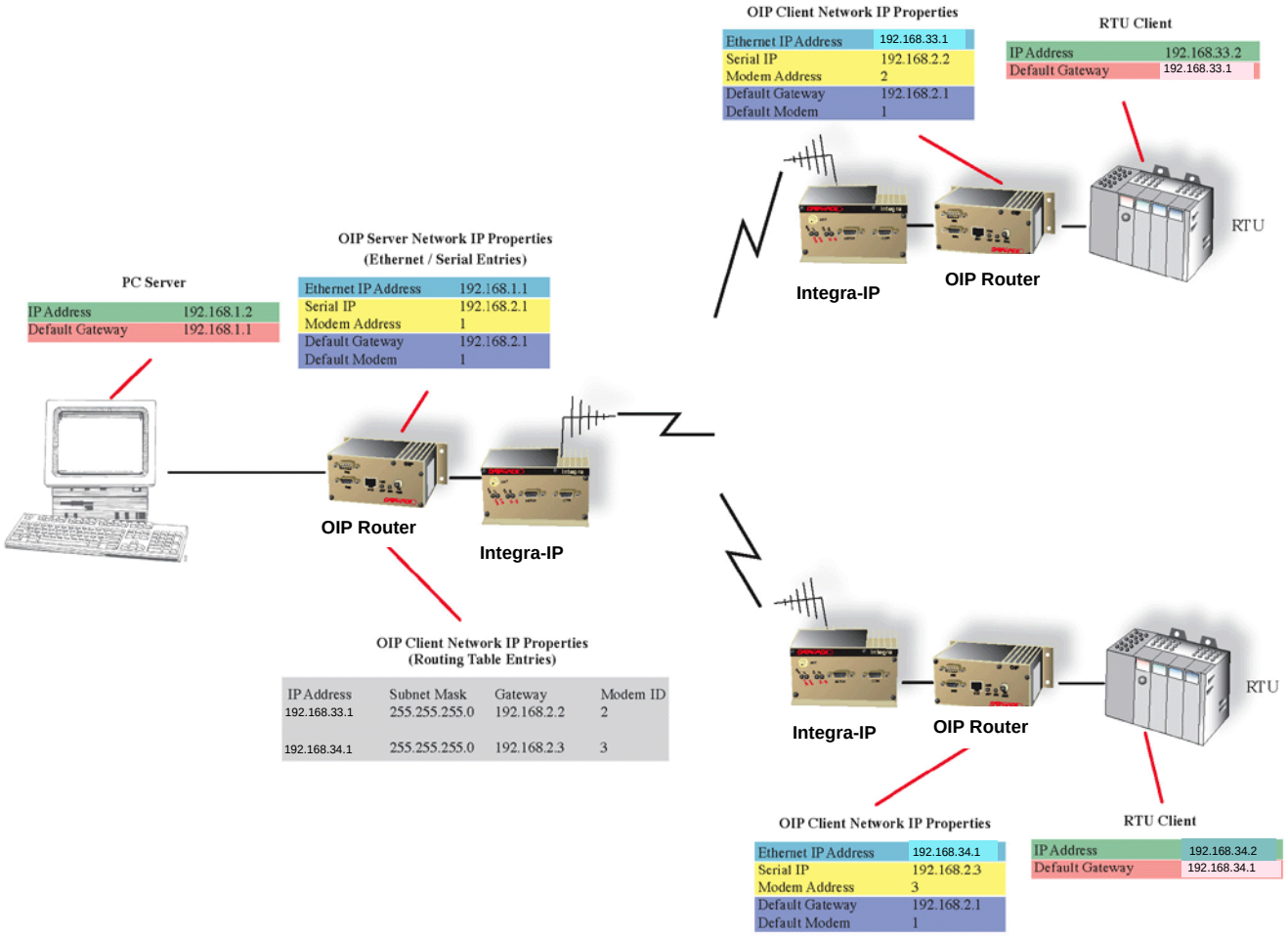


Figure 2-6 Default Gateways for OIP Routers

The default Gateway in the OIP Routers will always be the OIP Server Serial IP address including the OIP Server unit.

In our example:

Default Gateway	192.168.2.1
Default Modem	1

Note: Does not apply if the OIP Server is on the LAN.

2.1.6 6. COMPLETE ROUTING TABLES FOR THE OIP SERVER.

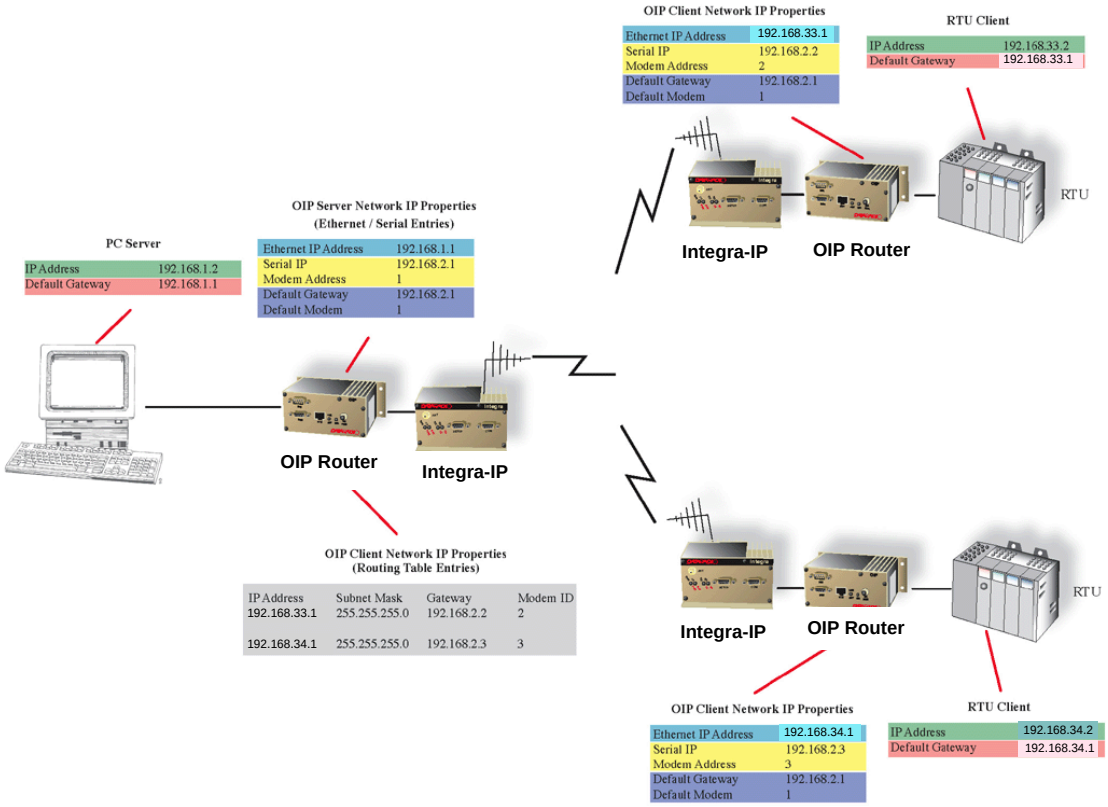


Figure 2-7 Routing Tables for the OIP Server

Fill out the routing tab in the OIP server.

In our example:

Network Address	192.168.33.0
Serial IP Address	192.168.2.2
Modem ID	2
Client Network	192.168.34.0
Serial IP Address	192.168.2.3
Modem ID	3

Note: OIP Clients do not require routing table entries. OIP Client routing information is automatically generated from the default Modem ID and default gateway entries.

2.1.7 7. VERIFY NETWORK INFORMATION IS CORRECT.

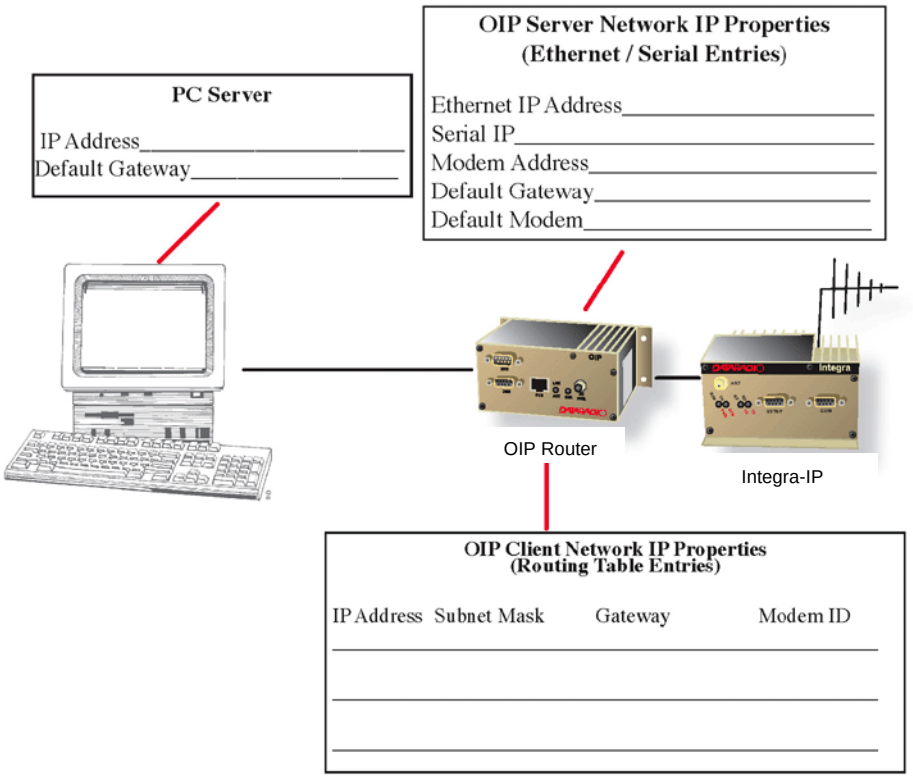
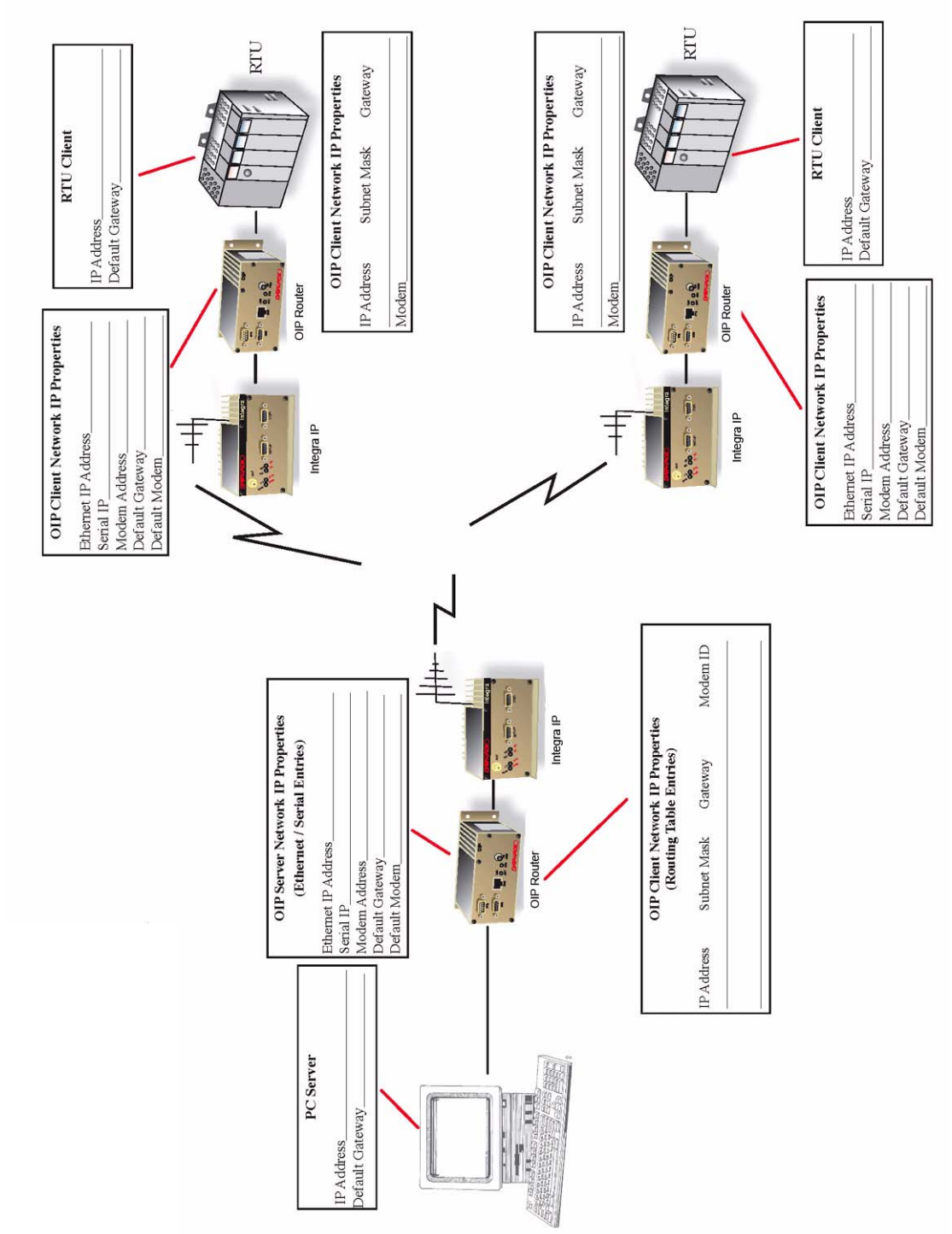


Figure 2-8 Verify Network Information

Confirm completed network diagram worksheet information is configured correctly.



Typical SCADA System OIP Router Mode
PC Server and Multiple Clients
Note: All Ethernet cables are SPCAT 5
All serial cables are straight 9 pin

Figure 2-9 Blank Network Diagram

SECTION 3

INTEGRA IP-FIELD PROGRAMMING SOFTWARE (FPS)

3.1 GENERAL

This section provides an explanation of the Dataradio Integra-IP Field Programming Software (FPS). The FPS allows the user to view and edit the programmable parameters of the Integra-IP system. Programmable parameters can be stored as a .dat file. These programmable parameters are used by the Read/Write commands to program the non-volatile memory of the Integra-IP system. Only the Integra-IP Field Programming Software should be used with the Integra-IP system.

3.1.1 SETUP INTEGRA-IP PARAMETERS

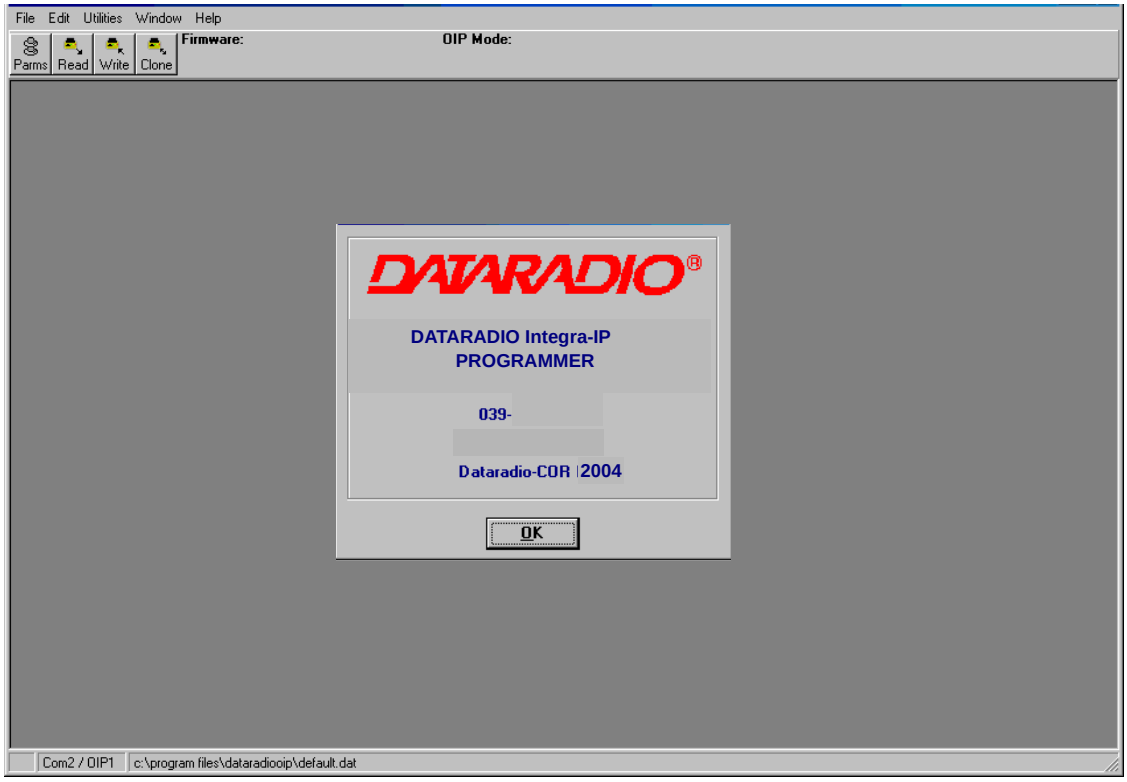


Figure 3-1 Integra-IP Parameters: About Screen

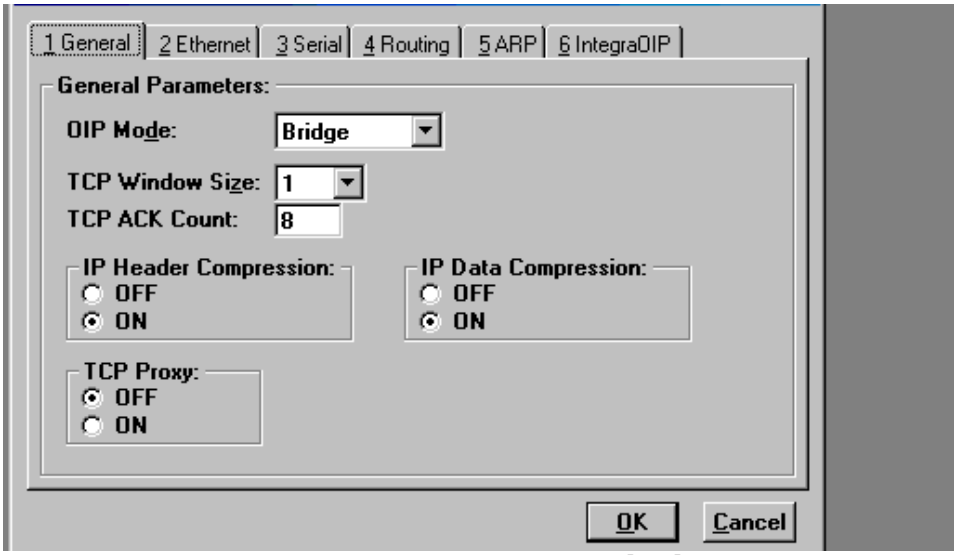


Figure 3-2 Setup Integra-IP Parameters: General Tab

3.1.1.1 Setup Integra-IP Parameters: General Tab

The Setup Integra-IP Parameters screen allows the user to view and edit the programmable parameters of the Dataradio OIP/Integra system. The programmable parameters can be stored in a data file with the *.DAT file extension. These programmable parameters are used by the Read/Write Parameters screens for programming into the nonvolatile memory of the Integra-IP system.

OIP Router Units Mode

OIP Routers can be configured for either Bridge mode or Router mode from the General Tab/OIP Mode of the Field Programming Software.

Bridge Mode

In Bridge mode, the OIP Router does not contain IP/Network properties that are accessible through the network; they are transparent to the network. Only the PC Server and the RTU Client's Network properties need configuration. The PC Server will broadcast to all the RTU Clients that are bridged to the PC Server. The Bridge mode configuration is used when RTU Clients are located on the same Local Area Network (LAN) as the PC Server. This configuration is recommended for users who do not have IT/Network support readily available to them.

Router Mode

Router mode provides flexibility in network configuration and adds diagnostics capability for the Integra-IP wireless modems. Router mode also allows greater flexibility for various protocols. A larger selection of compression techniques can be implemented in Router mode. Router mode requires setup of the PC Server and RTU Client Networks properties and the Integra-IP Server unit's Network properties as well. Router mode offers the ability to use the Ethernet port to read and write the parameters in the OIP Router and the interconnecting Integra-IP wireless modem. Diagnostics from the Server Integra-IP and remote Client Integra-IP can be retrieved through the Ethernet Port. This configuration is recommended for users who have IT/Network support readily available to them and the authorization required to make changes in the network.

Router mode requires set up of IP/Ethernet and Serial IP addresses (see Section 4).

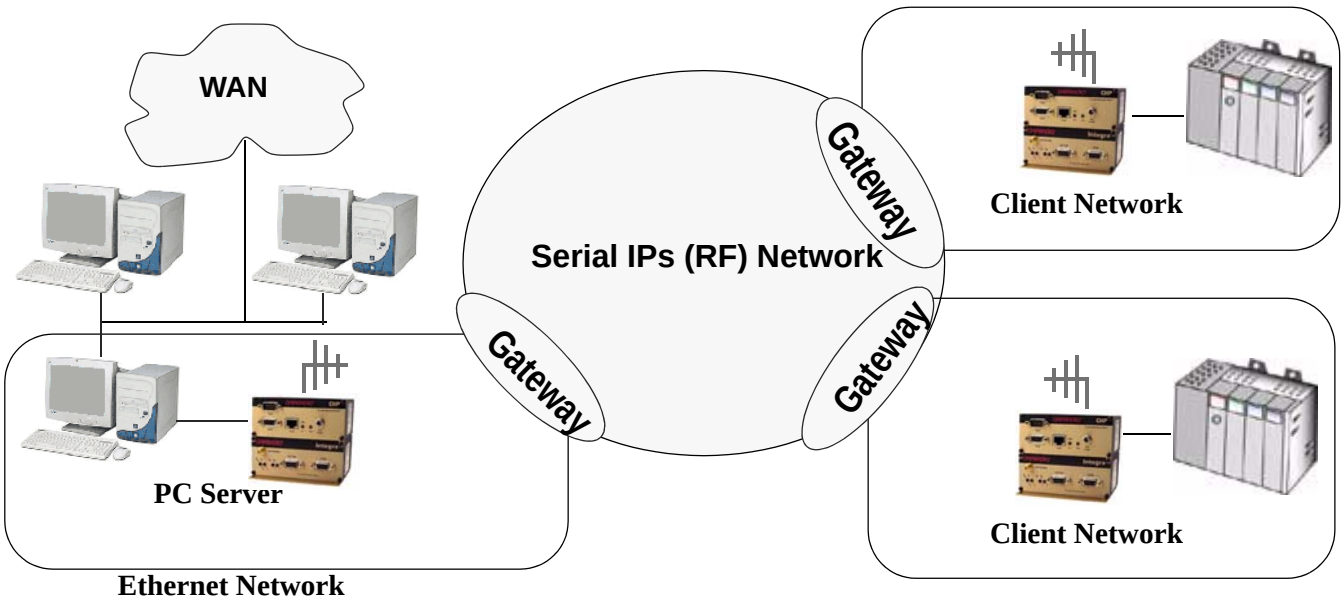


Figure 3-3 Integra-IP Network Visualization

TCP Window Size

TCP Window Size selects the size of the TCP received window. The window size is the number of packets sent before an acknowledgement of an outstanding packet is returned.

TCP ACK Count

TCP ACK Count is the number of pseudo TCP ACKs generated by the TCP Proxy before waiting for an end-to-end TCP.

IP Header Compression

IP Header Compression allows the user to compress IP Header data during transmission over a Serial Link (RF).

IP Data Compression

IP Data Compression allows the user to compress IP data during transmission over a Serial Link (RF).

TCP Proxy

TCP Proxy allows the user to select TCP ACK spoofing.

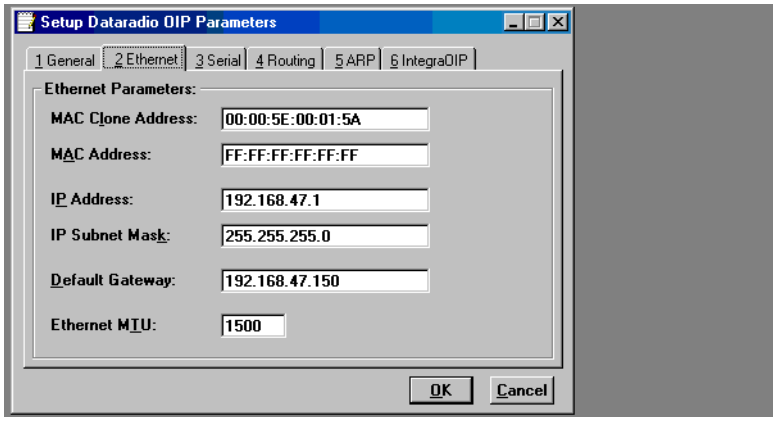


Figure 3-4 Setup Integra-IP Parameters: Ethernet Tab

3.1.1.2 Setup Integra-IP Parameters: Ethernet Tab

The Ethernet Tab provides the interface to program various Ethernet related parameters.

MAC Clone Address

A MAC Clone Address is the cloneable Physical Address of the Ethernet Port. This address is used if any field has a non-zero value.

MAC Address

MAC Address is the physical address of the Ethernet Port (factory set).

IP Address

IP Address displays the IP Address of the Ethernet Port.

IP Subnet Mask

IP Subnet Mask is the Subnet Mask IP Address of the Ethernet Port. This address is typically set to 255.255.255.0 (for Class C IP Addresses).

Default Gateway

Default Gateway displays the IP Address of the Default Gateway.

Ethernet MTU

Ethernet MTU allows the user to select the maximum transmission unit for the Ethernet Port.

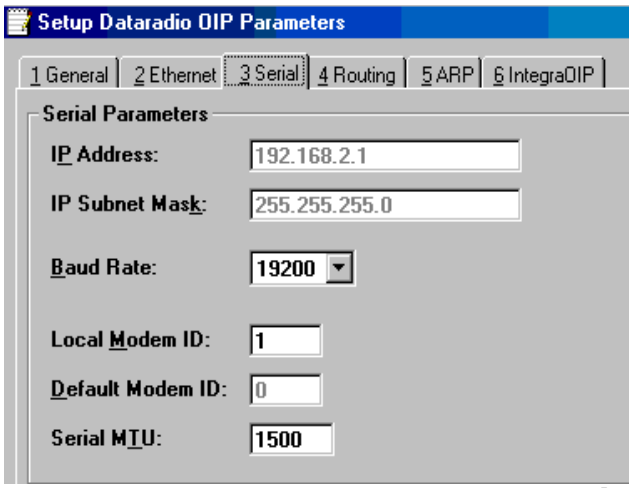


Figure 3-5 Setup Integra-IP Parameters: Serial Tab

3.1.1.3 Setup Integra-IP Parameters: Serial Tab

The Serial Tab provides the interface to program various Serial Port (RF) parameters.

IP Address

IP Address allows the user to program the IP Address of the Serial Port.

IP Subnet Mask

Subnet Mask allows the user to program the IP Subnet Mask for the Serial Port. Typically the subnet mask is 255.255.255.0 (for Class C Addresses).

Baud Rate

Baud Rate allows the user to select the OIP system baud rate (19200 or 9600). (Dataradio recommends the baud rate be set to 19200.)

Local Modem ID

Local Modem ID allows the user to identify an Integra-IP unit connected to the OIP Router in the system. This number must uniquely identify an individual Integra-IP in the system. The Local Modem ID range is 1 to 1023 (excluding 255).

Default Modem ID

Default Modem ID lists the Local Modem ID of the modem connected to the Integra-IP Server.

Serial MTU

Serial MTU allows the user to select the maximum Transmission Unit for the Serial Port.

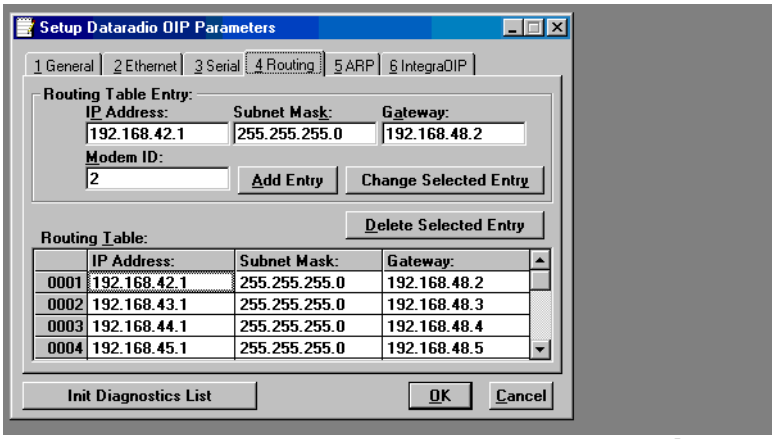


Figure 3-6 Setup Integra-IP Parameters: Routing Tab

3.1.1.4 Setup Dataradio-IP Parameters: Routing Tab

The Routing tab provides the user interface to program the Integra-IP system routing parameters.

IP Address

IP Address allows the user to set the IP Address for the routing entry.

Subnet Mask

Subnet Mask allows the user to set the Subnet Mask for the routing entry. This is typically set to 255.255.255.0 for a Class C address.

Gateway

Gateway allows the user to set the Gateway for the routing entry.

Modem ID

Modem ID allows the user to choose the Modem being referenced. The modem must be connected to the OIP Router. If the entry is not a route to another OIP device, set the Modem ID to zero.

Routing Table

The Routing Table is built from the entries added to the IP Address, Subnet Mask and Gateway. This table is automatically populated when “add entry” is clicked.

Init Diagnostics List

Init Diagnostics List initializes the Diagnostic IDs, IP Addresses and Alarms defined in the Diagnostic IDs and Alarms screen.

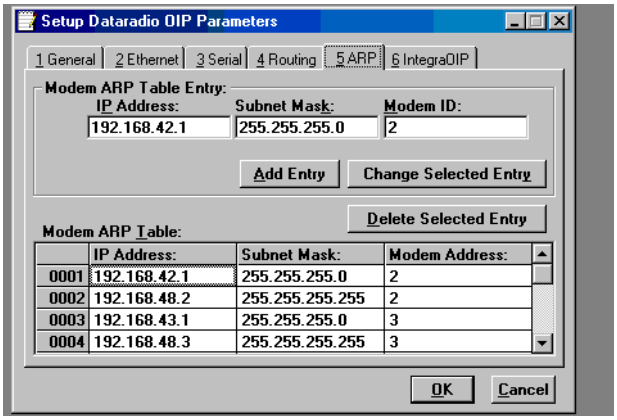


Figure 3-7 Setup Dataradio-IP Parameters: ARP Tab

3.1.1.5 Setup Dataradio-IP Parameters: ARP Tab

The ARP Tab allows user programming of the ARP IP Address for the OIP/Integra system. These addresses are automatically generated from the "Add Entry" from the Routing Tab. Adding IP Addresses in this screen may cause interrupted communications in your system.

IP Address

IP Address allows the user to program the IP address of the ARP entry.

IP Subnet Mask

IP Subnet Mask allows the user to program the Subnet Mask for the IP Address of the ARP entry. Typically, this number is 255.255.255.0 for Class C IP Addresses.

Modem ID

Modem ID allows the user to program the Modem ID for the modem connected to the Integra-IP referenced.

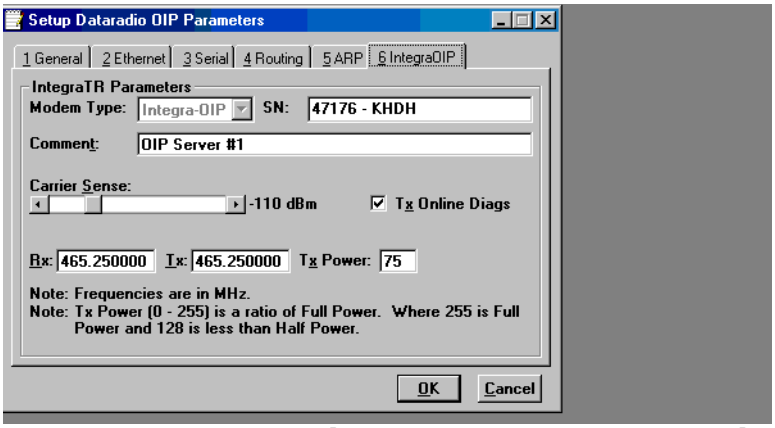


Figure 3-8 Setup Dataradio-IP Parameters: Integra-IP Tab

3.1.1.6 Setup Dataradio-IP Parameters: Integra-IP Tab

The Integra-IP Tab provides the user interface to modify the Integra-IP parameters.

Modem Type

Modem Type shows the modem type of the wireless modem connected to the OIP Router. This field is non-programmable.

SN

SN shows the serial number of the radio connected to the OIP Router.

Comment

The Comment field provides a user-convenient field for description (s) i.e., customer name, location, technical information. Comments can be up to 24 characters of text (including spaces).

Carrier Sense

Carrier Sense shows the RSSI (received signal strength indicator) level when a radio carrier is found. Carrier Sense is used for data recovery, in the interpretation of diagnostics and to turn on the front panel CS LED. The threshold may be raised to prevent false Carrier Sense operation in the presence of noise, intermodulation or other interference (i.e., ambient noise at -100 dBm: set the Carrier Sense for -95 dBm).

Tx Online Diags

Tx Online Diags allows the user to enable or disable the transmission of online diagnostics for any Integra-IP without affecting communications with other Integra-IP Routers in a network.

Rx Frequency

Rx Frequency allows programming of the Rx Frequency (in MHz) for the channel pair. Confirm the Rx frequency listed shows your licensed receive frequency.

Tx Frequency

Tx Frequency allows programming of the Tx Frequency (in MHz) for the channel pair. Confirm the Tx frequency listed shows your licensed transmit frequency.

Tx Power

Tx Power allows the user to program the Power Output value for the channel pair. The default value is 255 (at 5 watts). This value is typically left at the default value unless lower power is required to meet regulatory requirements, to increase the allowable transmit duty cycle or the user desires a saving on current consumption.

Note: Power does not vary linearly with this parameter. Some experimentation may be required to determine the correct power setting.

3.1.2 PORT SETTINGS

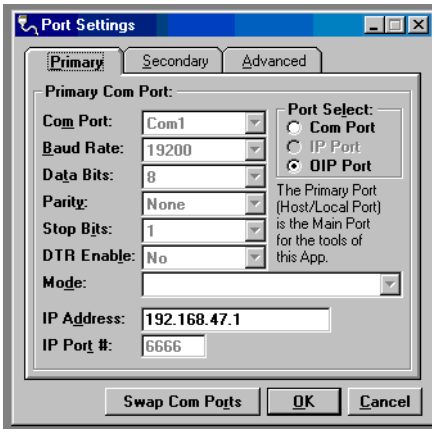


Figure 3-9 Setup Integra-IP Parameters: Port Settings/Primary Port

3.1.2.1 Setup Integra-IP Parameters: Port Settings/Primary Port

The Port Settings Screen displays the parameters the Field Programming Software uses in the PC system's communications. The COM Port and Port Select are user programmable. The remaining parameters are set at the factory and should not be altered. Changing these parameters may interrupt your system's communications.

COM Port

COM Port allows the user to select the COM Port for use as the Primary and Secondary COM Ports.

Port Select

Port Select allows the user to choose between communications over the Ethernet via the OIP Router (OIP Port) and/or over the specified RS-232 COM (DCE) port utilizing the Integra unit interfaced with the OIP Router (allows RS-232 serial communication).

Baud Rate

Baud Rate displays the baud rate for the communication speed of the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Data Bits

Data Bits displays the Data Bits (7 - 8) that will be transmitted or received by the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Parity

Parity displays the Parity Bits (None/Odd/Even) transmitted or received by the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Stop Bits

Stop Bits displays the number of Stop Bits (1 or 2) transmitted or received by the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

DTR Enable

DTR Enable displays whether the DTR (Data Terminal Ready) line of the RS-232 Port is asserted when the Port is open for the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Mode

The Mode is factory set.

IP Address

IP Address allows the user to choose the IP Address when Port Select has OIP selected. The destination of the selected IP Address should have a TCP server enabled.

IP Port #

IP Port Number allows the user to select the IP Port Number used if Port Select has OIP selected. This Port Number will be used to attempt a TCP connection.

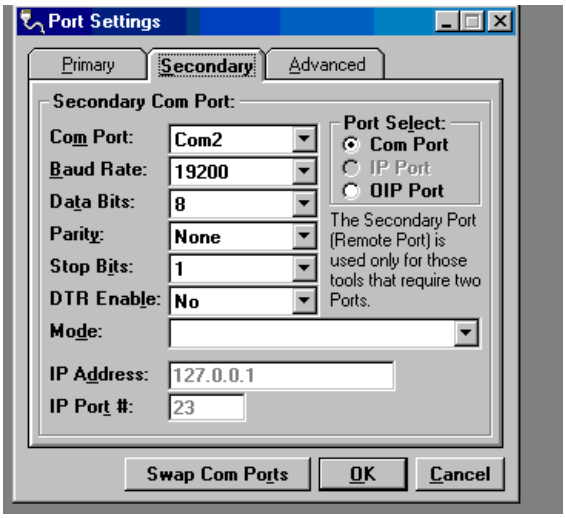


Figure 3-10 Setup Integra-IP Parameters: Port Settings/Secondary

3.1.2.2 Setup Integra-IP Parameters: Port Settings/Secondary Port

The Port Settings Screen displays the parameters the Field Programming Software uses in the system's communications. The COM Port and Port Select are user programmable. The remaining parameters are set at the factory and should not be altered. Changing these parameters may interrupt your system's communications.

COM Port

COM Port allows the user to select the COM Port for use as the Primary and Secondary COM Ports.

Port Select

Port Select allows the user to choose between the OIP Router (OIP Port) and the Integra unit interfaced with the OIP Router (allows RS-232 serial communication).

Baud Rate

Baud Rate displays the baud rate for the communication speed of the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Data Bits

Data Bits displays the Data Bits (7 - 8) that will be transmitted or received by the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Parity

Parity displays the Parity Bits (None/Odd/Even) transmitted or received by the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Stop Bits

Stop Bits displays the number of Stop Bits (1 or 2) transmitted or received by the Primary and Secondary COM Ports. This parameter is factory set.

DTR Enable

DTR Enable displays whether the DTR (Data Terminal Ready) line of the RS-232 Port is asserted when the Port is open for the Primary and Secondary COM Ports. This parameter is selectable only if Com Port is selected.

Mode

The Mode is factory set.

IP Address

IP Address allows the user to choose the IP Address when Port Select has OIP selected. The destination of the selected IP Address should have a TCP server enabled.

IP Port #

IP Port Number allows the user to select the IP Port Number used if Port Select has OIP selected. This Port Number will be used to attempt a TCP connection.

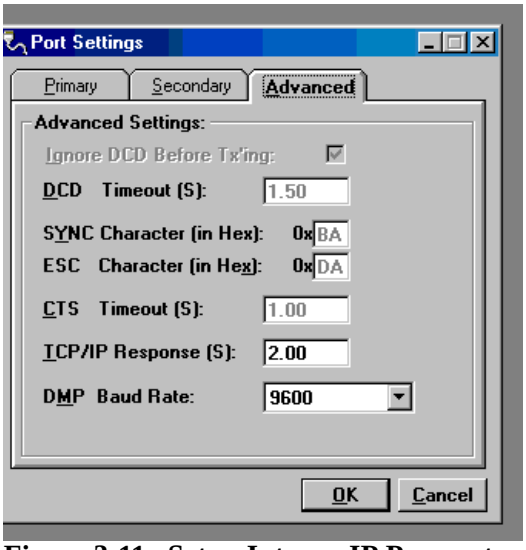


Figure 3-11 Setup Integra-IP Parameters: Port Settings/Advanced

3.1.2.3 Setup Integra-IP Parameters: Port Settings/Advanced

The Port Settings Screen displays the parameters the Field Programming Software uses in the system's communications. The COM Port and Port Select are user programmable in the Primary and Secondary Tabs. The remaining parameters are set at the factory and should not be altered. Changing these parameters may interrupt your system's communications.

Ignore DCD Before Tx'ing

Ignore DCD Before Tx'ing allows the unit to check for an inactive DCD before transmitting.

DCD Timeout

DCD Timeout determines how long (in seconds) to wait for the DCD to become inactive before data is sent. If DCD does not become active during the time noted, data is not sent.

SYNC Character

Sync Character provides the character (in HEX) used in a Sync/Esc (Framing) Mode. The SYNC character is the first character of a frame sent.

ESC Character

ESC Character provides the character (in HEX) used in a Sync/Esc (Framing) Mode. The ESC character precedes any embedded SYNC or ESC characters that follow the initial SYNC character.

CTS Timeout

The CTS Timeout is the amount of time (in 50 mS increments) the software allows for the CTS line to become active after asserting the RTS line.

TCP/IP Response

The TCP/IP Response is the amount of time the Field Programming Software waits for a response from the TCP/IP Protocol. If a response is not received, the system times out.

DMP Baud Rate

DMP Baud Rate is the communication speed used by the Primary and Secondary COM Ports using a DMP Protocol to talk to the Integra-IP modems through the Setup Ports.

3.1.3 PORT STATISTICS

Port Statistics displays statistics for the Primary and Secondary COM Ports.

3.1.3.1 Primary Port Statistics

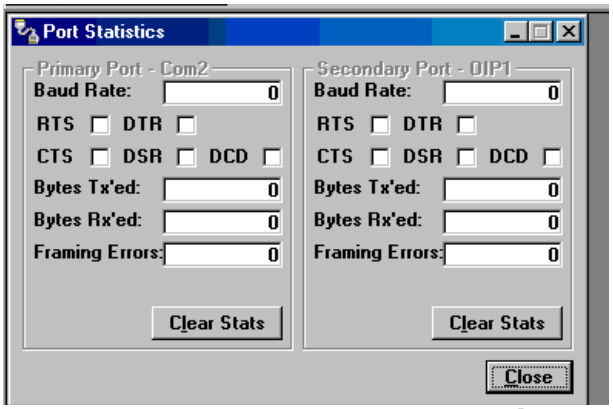


Figure 3-12 Integra-IP Programmer/Utilities/Port Statistics Screen

Baud Rate

Baud Rate displays the current Baud Rate for the COM Port.

RTS/DTR/CTS/DSR/DCD

RTS/DTR/CTS/DSR/and DCD display the state of the respective check box. RTS & DTR are outputs from the PC in the OIP system. CTS, DSR and DCD are inputs to the PC in the OIP system.

Bytes Tx'ed

Bytes Tx'ed displays the number of bytes (characters) transmitted since communications to the port were last opened.

Bytes Rx'ed

Bytes Rx'ed displays the number of bytes (characters) received since communications to the port were last opened.

Framing Errors

Framing Errors displays the number of framing errors received since communications to the port were last opened.

Clear Stats

Clear Stats resets the displays for the Primary COM Port.

3.1.3.2 Secondary Port Statistics

Baud Rate

Baud Rate displays the current Baud Rate for the COM Port.

RTS/DTR/CTS/DSR/DCD

RTS/DTR/CTS/DSR/and DCD display the state of the respective check box. RTS & DTR are outputs from the PC in the Integra-IP system. CTS, DSR and DCD are inputs to the PC in the Integra-IP system.

Bytes Tx'ed

Bytes Tx'ed displays the number of bytes (characters) transmitted since communications to the port were last opened.

Bytes Rx'ed

Bytes Rx'ed displays the number of bytes (characters) received since communications to the port were last opened.

Framing Errors

Framing Errors displays the number of framing errors received since communications to the port were last opened.

Clear Stats

Clear Stats resets the displays for the Secondary COM Port

3.1.4 DATARADIO OIP: PING TEST

For user convenience, the PING Test was added to the OIP FPS as a utility and is used to simulate a Host/Remote polling environment. The Master sends out a packet to the Remote and the Remote replies to the Master with the same packet information. This utility is useful for testing Ethernet and modem links.

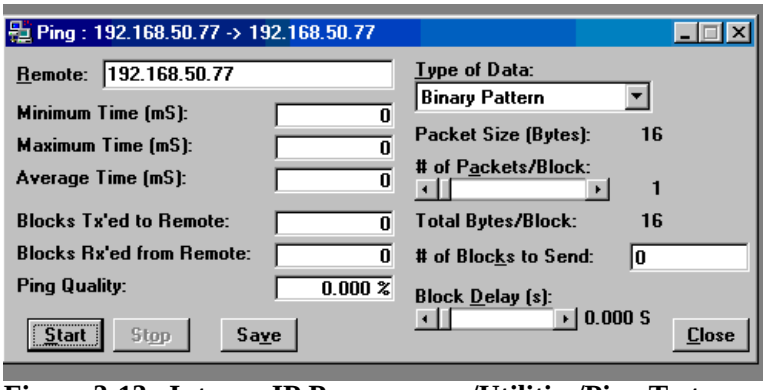


Figure 3-13 Integra-IP Programmer/Utilities/Ping Test

Remote

Remote displays the IP Address of the device under test.

Minimum Time

Minimum Time displays the minimum amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Maximum Time

Maximum Time displays the maximum amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Average Time

Average Time displays the average amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Blocks Tx'ed to Remote

Blocks Tx'ed to Remote displays the number of data packets sent to the Remote device.

Blocks Rx'ed from Remote

Blocks Rx'ed from Remote displays the number of data packets received from the Remote device.

Ping Quality

Ping Quality displays the overall percentage of data packets sent vs. data packets received during the Ping Test.

Type of Data

Type of Data displays the type of Data Pattern to be used for each packet. The size for each Data Pattern is shown below in Packet Size. The following lists the formats of the Data Patterns:

ASCII Pattern

The packets will be 52 characters in length. The pattern used to build the packets will have the following format (in ASCII):

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

ASCII Number Pattern

The packets will be 48 characters in length. The pattern used to build the packets will have the following format (in ASCII):

00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
---
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Binary Pattern

The packets will be 16 characters in length. The pattern used to build the packets will have the following format (in Hex):

00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
---
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Random Binary Pattern

The packets will be 16 characters in length and contain random binary data.

Packet Size

Packet Size displays the number of bytes in each packet (described in Type of Data).

# of Packets/Block

# of Packets/Block displays the number of packets in each transmission block (described in Type of Data).

Total Bytes/Block

Total Bytes/Block displays the total number of blocks in each transmission block.

# of Blocks to Send

# of Blocks to Send displays the number of blocks to be sent to the Remote device (after selected number has been sent, transmission automatically stops).

Block Delay

Block Delay displays the amount of time (in seconds) of delay between each block transmission (range is from 0.000 to 5.000 seconds in 0.125 second intervals). Block Delay is user programmable.

3.1.5 INTEGRA-IP: P-LINK TEST

The P-Link Test is used to simulate a Host/Remote polling environment. The Master sends out a packet to the Remote and the Remote replies to the Master with the same packet information. This utility is useful for testing the Ethernet and modem links.

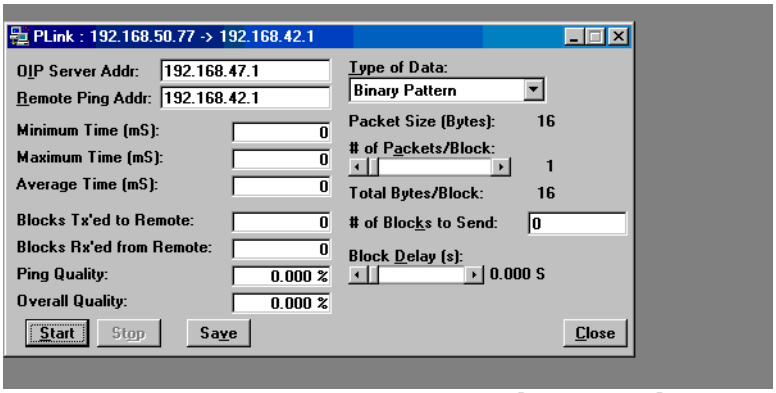


Figure 3-14 Integra-IP Programmer/Utilities/P-Link Test

OIP Server Addr

OIP Server Addr displays the IP Address of the device the test is initiating the test.

Remote Ping Addr

Remote Ping Addr displays the IP Address of the Remote device receiving the data packets from the device initiating the test.

Minimum Time

Minimum Time displays the minimum amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Maximum Time

Maximum Time displays the maximum amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Average Time

Average Time displays the average amount of time taken for the Ping Packet to echo back from the Remote device (in milliseconds).

Blocks Tx'ed to Remote

Blocks Tx'ed to Remote displays the number of data packets sent to the Remote device.

Blocks Rx'ed from Remote

Blocks Rx'ed from Remote displays the number of data packets received from the Remote device.

Ping Quality

Ping Quality displays the overall percentage of data packets sent vs. data packets received during the Ping Test.

Type of Data

Type of Data displays the type of Data Pattern to be used for each packet. The size for each Data Pattern is shown below in Packet Size. The following lists the formats of the Data Patterns:

ASCII Pattern

The packets will be 52 characters in length. The pattern used to build the packets will have the following format (in ASCII):

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz

ASCII Number Pattern

The packets will be 48 characters in length. The pattern used to build the packets will have the following format (in ASCII):

00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
---
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Binary Pattern

The packets will be 16 characters in length. The pattern used to build the packets will have the following format (in Hex):

00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF
---
00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Random Binary Pattern

The packets will be 16 characters in length and contain random binary data.

Packet Size

Packet Size displays the number of bytes in each packet (described in Type of Data).

# of Packets/Block

# of Packets/Block displays the number of packets in each transmission block (described in Type of Data).

Total Bytes/Block

Total Bytes/Block displays the total number of blocks in each transmission block.

# of Blocks to Send

# of Blocks to Send displays the number of blocks to be sent to the Remote device (after selected number has been sent, transmission automatically stops).

Block Delay

Block Delay displays the amount of time (in seconds) of delay between each block transmission (range is from 0.000 to 5.000 seconds in 0.125 second intervals).

3.1.6 INTEGRA-IP UTILITIES: OFFLINE DIAGNOSTICS

Offline Diagnostics are returned from a local or remote unit in response to a Get Diags request. Using Offline Diagnostics requires suspension of network operation.

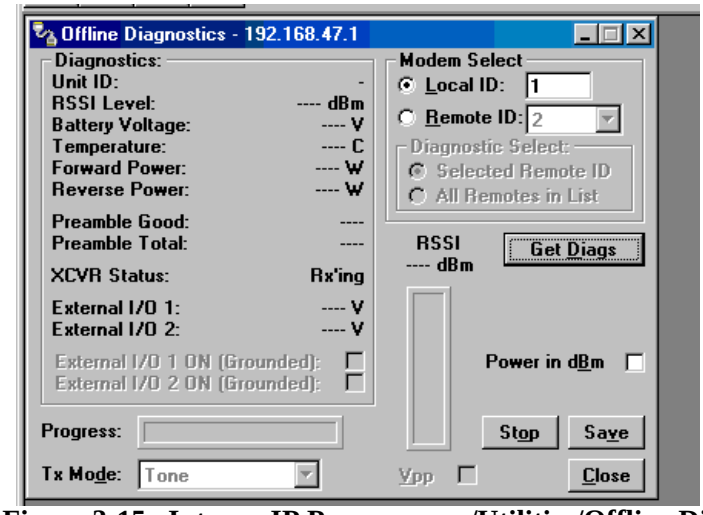


Figure 3-15 Integra-IP Programmer/Utilities/Offline Diagnostics

Diagnostic parameters include:

Unit ID

Short ID of the unit sending the requested diagnostics.

RSSI Level

Received Signal Strength Indication (in dBm) as measured by the connected receiver.

Battery Voltage

Supply Voltage to the Integra-IP system.

Temperature

Internal case temperature of the Integra-IP Router (in Celsius).

Forward Power

Forward RF Power (in Watts)

Reverse Power

Reverse RF Power (in Watts)

Preamble Good

The number of correctly decoded transmissions received in the last 15. Used with Preamble Total, this serves as an indication of how well the unit is receiving data.

Preamble Total

The number of total transmissions detected, maximum is 15. Used with Preamble Good, this serves as an indication of how well the unit is receiving data.

XCVR Status

Displays the status of the Transceiver (Rx'ing / Tx'ing).

Local ID

This radio button allows sending commands to the unit connected to the test computer. The Short ID for this unit is displayed.

Get Diags

This button is used to send the Command to acquire Offline Diagnostics. The Command is sent to the unit that is connected to the test computer if the COM Port is used. The Command is sent to the unit that is connected to the OIP Router via TCP/IP if the OIP Port is used.

Stop

This button stops any more Commands for Offline Diagnostics.

Save

This button saves the current Offline Diagnostics to a text file.

RSSI / Pwr

This panel shows the current RSSI level (in dBm) while the local unit is receiving and the current Power level (in Watts) while the local unit is transmitting.

3.1.7 INTEGRA-IP UTILITIES: ONLINE DIAGNOSTICS

Online Diagnostics are transmitted by each Integra-IP modem in the network before user data is transmitted. All Integra-IP modems must be programmed with the Online Diagnostics parameter found on the Setup Integra-IP Parameters screen. The Integra-IP connected to the computer will output Online Diagnostics as they are received. Using the Integra Online Diagnostics does not require suspension of network operation.

Online Diagnostics are subject to alarm conditions, defined in the Diagnostic IDs and Alarms screen. When Online Diagnostics are received and a diagnostic field falls outside the Alarm Limits, a '<' character will designate a value less than the Low Alarm and a '>' character will designate a value greater than the High Alarm.

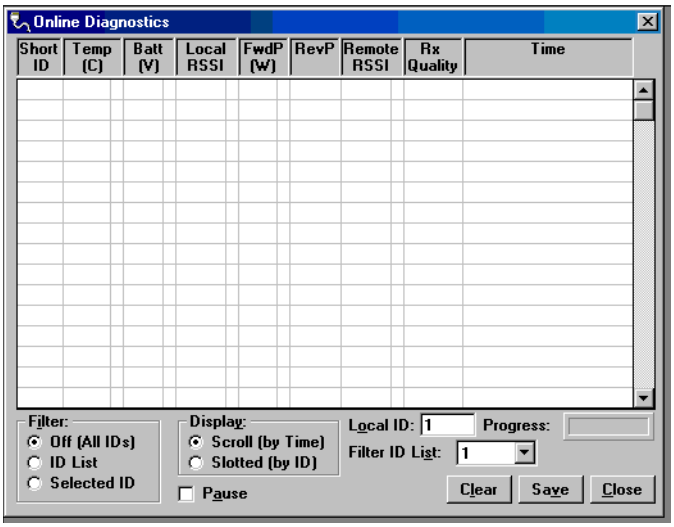


Figure 3-16 Integra-IP Programmer/Utilities/Online Diagnostics

The following are the Online Diagnostics that are available:

Short ID

Displays the Short ID of the Integra-IP transmitting the diagnostics.

Temp (C)

Displays the internal case temperature (in Celsius) of the Integra-IP transmitting the diagnostics.

Batt (V)

Displays the supply voltage (in Volts) of the Integra-IP transmitting the diagnostics.

Local RSSI

When the diagnostics are from a Remote Station, Local RSSI indicates the RSSI level of the Local Station from the Remote Station transmitting these diagnostics.

If these are the diagnostics from the Local Station, it indicates the RSSI level of the Local Station from the last transmission of a Remote Station.

FwdP (W)

Displays the forward power (in Watts) of the Integra-IP transmitting the diagnostics.

RevP

Displays the approximate measure of reverse (reflected) power of the Integra-IP transmitting the diagnostics. This is represented as 'Good' if the reverse power is within acceptable limits and is represented as 'Bad' if the reverse power is too high. (Bad represents 25% of Forward Power.)

Remote RSSI

If the diagnostics are from a Remote Station, Remote RSSI indicates the RSSI level of the Remote Station from the last transmission it received.

If these are the diagnostics from the Local Station, Remote RSSI indicates the RSSI level of the Remote Station that the Local Station last received from.

Rx Quality

Displays the receive quality (in %) of the Remote Integra-IP. This is the number of correctly decoded transmissions received by the Integra-IP (in the last 15) divided by the number of total transmissions detected by the Integra-IP.

Time

Time stamp when the diagnostics were received. The time stamp is derived from the test computer's internal clock.

Filter ID List

The list of Remote IDs that are setup in the Diagnostic IDs and Alarms Screen. This list is used for selecting a previously defined filter.

Filter

Allows the filtering of IDs. The following options are available:

Off (All IDs)
: No IDs are filtered out.

ID List
: Only the IDs in the Filter ID List are shown.

Selected ID
: Only the selected ID in the Filter ID List are shown.

Display

Allows formatting of the data on the screen. The following options are available:

Scroll (by time)
: Displays the diagnostics as they are received.

Slotted (by ID)
: Sorts the diagnostics by Short ID. Using this option, each Short ID will have only one row of diagnostics, showing the most recent.

Progress

This panel shows the sorting progress of the diagnostics if a filter was changed.

Pause

This button is used to pause the reception of diagnostics for scrolling through the grid.

Clear

This button clears the display and current Online Diagnostics.

Save

This button saves current Online Diagnostics to a text file.

3.1.8 INTEGRA-IP UTILITIES: DIAGNOSTIC IDS AND ALARMS

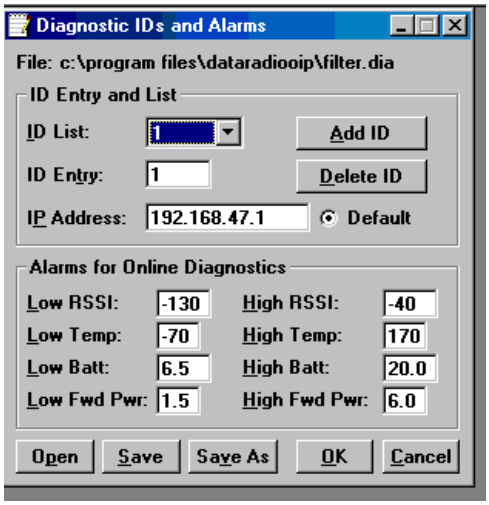


Figure 3-17 Integra-IP Programmer/Utilities: Diagnostic IDs and Alarms

This screen sets up the ID List for use with the Integra Online Diagnostics screen. This also sets up the Alarms for use with the Integra Online Diagnostics.

ID Entry and List

ID List

Allows the selection of a Short ID to be deleted. A Short ID is deleted from the ID List by pressing the Delete ID Button.

ID Entry

Allows the addition of a Short ID to the ID List. The range of this field is 1 to 1023, excluding 255. A Short ID is added to the ID List by hitting Enter or by pressing the Add ID Button.

IP Address

Allows programming of the IP Address for the ID Entry. This IP Address is used for retrieving Remote Offline Diagnostics.

Default

Default allows the user to select the displayed IP Address as the assigned Default Diagnostics IP Address. This IP Address is used as the default Dataradio OIP Router for retrieving Remote Offline Diagnostics.

Alarms for Online Diagnostics

The Alarms are used with the Online Diagnostics.

When Online Diagnostics are received and a diagnostic field falls outside the Alarm Limits, a '<' character will designate a value less than the Low Alarm and a '>' character will designate a value greater than the High Alarm.

Low / High RSSI

Low/High RSSI represent the low and high limits for the RSSI diagnostics (in dBm).

Low / High Temp

Low/High Temp represent the low and high limits for the Temperature diagnostics (in degrees C).

Low / High Batt

Low/High Batt represent the low and high limits for the Battery Voltage diagnostics (in Volts).

Low / High Fwd Pwr

Low/High Fwd Pwr represent the low and high limits for the Forward Power diagnostics (in Watts).

Open Button

This button allows restoring of Diagnostic IDs and Alarms from a previously saved file.

Save Button

This button allows saving of the Current Diagnostic IDs and Alarms to the current file.

Save As Button

This button allows saving of the Current Diagnostic IDs and Alarms to a different file other than the current file.

3.1.9 INTEGRA-IP UTILITIES: ASCII / HEX TERMINAL

The Terminal Screens allow the user to select an ASCII or Hexadecimal Terminal Screen for the Primary and Secondary COM ports that were configured in the Port Settings screen. The data is sent according to the port configuration that was setup in the Port Settings screen.

ASCII Terminal

Primary

Selects an ASCII Terminal screen to send and receive ASCII data on the primary COM port that was setup in the Port Settings screen.

Secondary

Selects an ASCII Terminal screen to send and receive ASCII data on the secondary COM port that was setup in the Port Settings screen.

Hex Terminal

Primary

Selects a Hexadecimal Terminal screen to send and receive Hexadecimal data on the primary COM port that was setup in the Port Settings screen.

Secondary

Selects a Hexadecimal Terminal screen to send and receive Hexadecimal data on the secondary COM port that was setup in the Port Settings screen.

Common Fields

Pause

A checkbox to pause any Rx Data from being displayed.

Send

A button to transmit the Data in the bottom Text Box.

Clear Rx

A button to clear the Rx Data Text Box.

Clear Tx

A button to clear the Tx Data Text Box.

Close

A button to Close the screen.

TCP Fields

Local Address

The Local IP Address of the PC running this Software.

Local Port

The Local TCP Port being used by the PC running this Software. When not connected to a Telnet Server, this is the Port the PC is listening on while waiting for a Telnet Client to connect.

Remote Address

The Remote IP Address (or Network Address) of the Remote Telnet Device connected to the PC (or the Remote Telnet Device yet to be connected).

Remote Port

The Remote TCP Port of the Remote Telnet Device connected to the PC (or the Remote Telent Device yet to be connected).

Connect / Disconnect

A button used to Connect to a Remote Telnet Server or Disconnect from a Remote Telnet Device.

3.2 DATARADIO INTEGRA-IP PROGRAMMER/HELP FILES

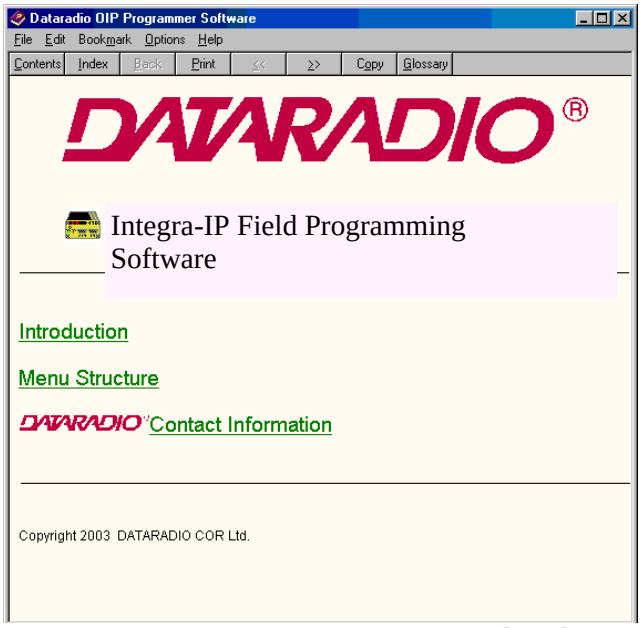
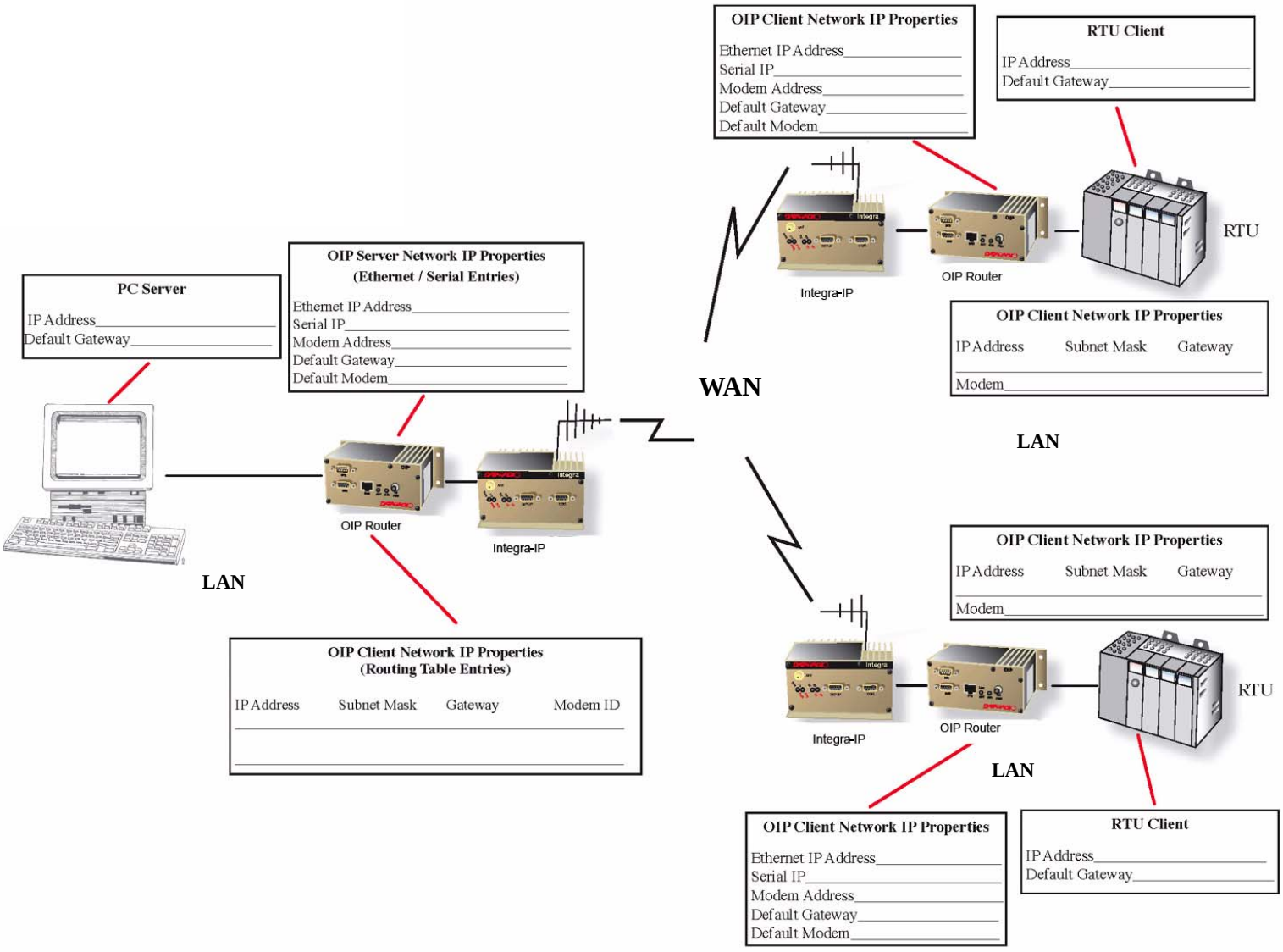


Figure 3-18 Integra-IP Programmer: Help Files Screen

The Integra-IP Field Programming Software provides online Help Files. The Help Files may be accessed by selecting Help from the Field Programming tool bar.


OIP Client Network IP Properties
Ethernet IP Address
Serial IP
Modem Address
Default Gateway
Default Modem
RTU Client
IP Address
Default Gateway
RTU
Integra-IP
OIP Router
OIP Client Network IP Properties
IP Address Subnet Mask Gateway
Modem
WAN
LAN
PC Server
IP Address
Default Gateway
OIP Server Network IP Properties
(Ethernet / Serial Entries)
Ethernet IP Address
Serial IP
Modem Address
Default Gateway
Default Modem
OIP Router
Integra-IP
LAN
OIP Client Network IP Properties
(Routing Table Entries)
IP Address Subnet Mask Gateway Modem ID
OIP Client Network IP Properties
IP Address Subnet Mask Gateway
Modem
Integra-IP
OIP Router
RTU
LAN
OIP Client Network IP Properties
Ethernet IP Address
Serial IP
Modem Address
Default Gateway
Default Modem
RTU Client
IP Address
Default Gateway

SECTION 4

INTEGRA-IP SETUP AND CONFIGURATION

4.1 GENERAL ETHERNET/IP ADDRESSING INFORMATION

IP addresses 192.168.0.1 to 192.168.254.254 with a Subnet mask 255.255.255.0 are set aside for private networks. This is the starting point in developing the IP addressing scheme for the illustrated configurations. An IP address must be unique in the network and represent a single node in the network. The IP address should not end with a "0". (An address ending with "0" refers to a network of computers not a single node.) The example in Figure 4-1 illustrates a local network with 192.168.98.0 referring to all computers in that network.

Changing or installing new IP addresses in a network can cause serious network problems. If you have questions or concerns, contact the Network Administrator for your system.

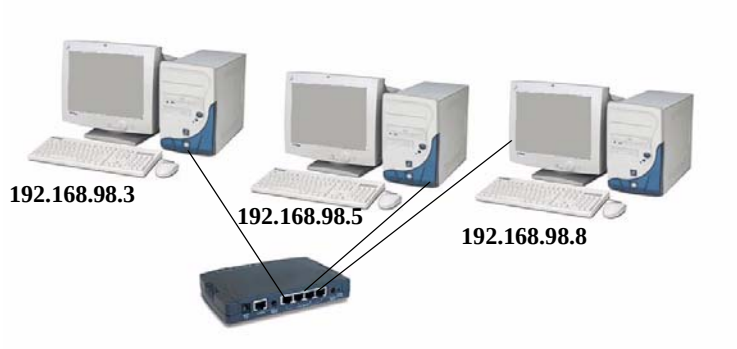


Figure 4-1 Local Network 192.168.98.0

4.2 THE OIP ROUTER AND THE INTEGRA-IP WIRELESS MODEM

4.2.1 OIP ROUTER AND INTEGRA-IP CONVENTIONS

Follow these conventions to configure your Integra-IP system:

- An OIP Router must be used with an Integra-IP wireless modem. The Integra-IP wireless modem can not be used in a standard Integra-TR or Integra-H system; they are not compatible
- The DB9 ports on the Integra-IP and the OIP Router will not output ASCII or HEX information
- Only the Integra-IP Field Programming Software should be used to program the Integra-IP

4.3 TYPICAL SCADA NETWORK SYSTEM

A typical SCADA Network system is discussed and the Network IP Properties configured for four basic configurations (as examples) to help the user determine if one of these modes of operation might work best for their system's configuration. Network IP Properties are provided for the examples illustrated. Dataradio recommends network diagrams be filled out to help develop Network IP properties. Blank network diagrams are located at the end of Section 4.

NOTE: There are a large variety of possible configurations in a Network SCADA system. Four of the basic configurations will be presented. If your SCADA system needs a different configuration, consult your IT department for assistance.

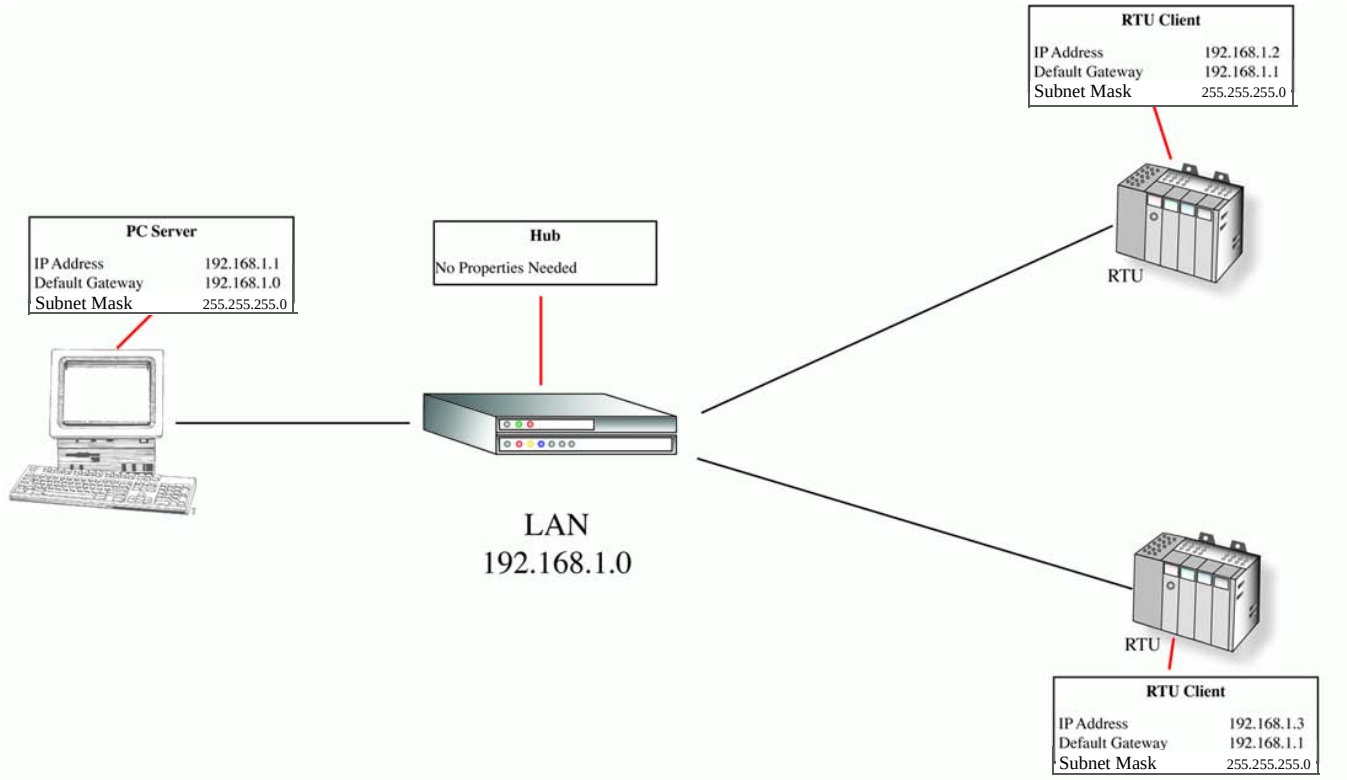


Figure 4-2 Typical SCADA System - PC Server and Multiple Clients

The typical SCADA system consists of a Master and at least one Remote Terminal Unit (RTU). Figure 4-2 shows how these devices would be connected as a non-wireless Local Area Network (LAN) configuration. In our examples, a PC is used for the Master and an RTU using Modbus TCP/IP will be used for the RTUs. The PC must have a Network Internet Card (NIC) and the RTUs must have an Ethernet port. A hub must be used to connect more than two devices. A hub does not contain IP Properties, it is a connection device. Each device that is connected to the LAN must be programmed with Network Properties. Network Properties contain a unique IP Address, a Subnet Mask and a default Gateway for each device connected to the LAN.

Figure 4-2 shows Network Properties (IP Address, Subnet Mask, Default gateway) for each device. Each device located on a LAN must have an IP Address belonging to that LAN. The IP Address for the LAN shown in Figure 4-2 is 192.168.1.0. Each device must have an IP Address of the form 192.168.1.X. A Subnet Mask of 255.255.255.0 is used. This is a Class C network and allows 254 Hosts or devices to be located on the LAN. The default Gateway contains the IP Address of the Network or device that is to locate other devices.

The PC Master is referred to as the PC Server and the RTUs are referred to as RTU Clients. Each Ethernet device has a different procedure for setting the IP Properties for that particular device. The PC Server uses Window98™ as the Operating System (and contains Network Properties) which must be modified. Window98 must have TCP/IP implemented in the Network Properties. The RTU Clients uses their proprietary program to modify the Network IP Properties.

4.3.1 PC SERVER NETWORK PROPERTIES SETUP PROCEDURE

Figure 4-2 shows the IP Address for the PC Server as 192.168.1.1. The PC Server has a Subnet Mask of 255.255.255.0. The Default Gateway is the LAN (IP address: 192.168.1.0). This Default Gateway will allow the PC Server to communicate with all devices on the LAN.

Note: a Gateway is not needed when all devices are on the same LAN such as 192.168.1.X. A Gateway is required when a Host or Device needs to talk to another Host or Device located on a different Network. A Gateway is used here so the user is familiar with the Gateway properties.

To setup the Network Properties for the PC Server, choose the “Network” icon in the “Control Panel” folder (see Figure 4-3).

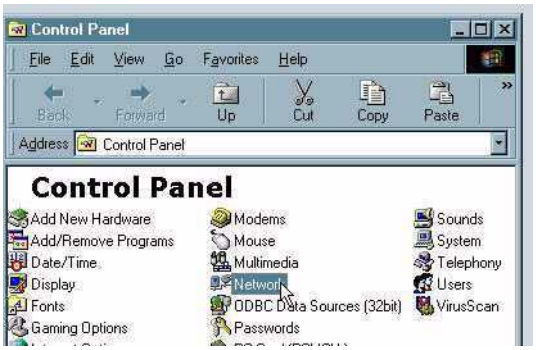


Figure 4-3 Network Properties Setup

To modify the IP Address for the PC Server, choose the TCP/IP selection for your NIC in the “Network” Window (see Figure 4-4).

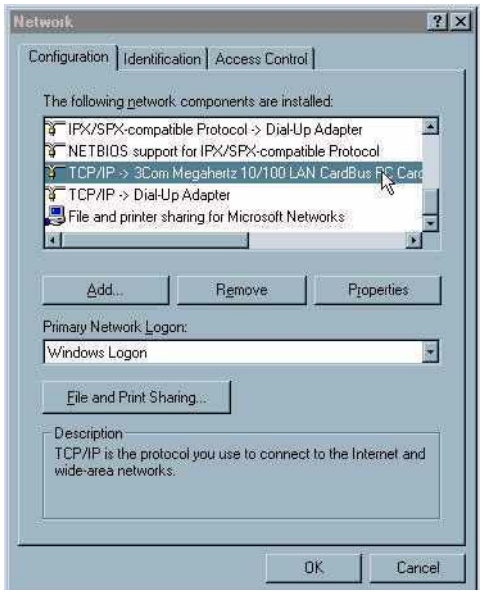


Figure 4-4 Network Window: TCP/IP

Click on the IP Address tab in the “TCP/IP Properties” Window. Enter 192.168.1.1 for the IP Address and 255.255.255.0 for the Subnet Mask (See Figure 4-5).

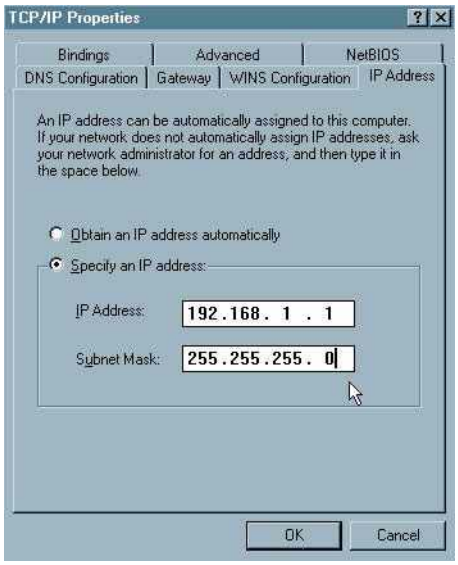


Figure 4-5 TCP/IP Properties

Click on the “Gateway” Tab and enter the default Gateway shown in Figure 4-6. Click on the “Add” button to install the Gateway.

NOTE: Although Windows98 allows the user to enter more than one Gateway, only the first Gateway will be used. Additional listings will not function as Gateways. Other Operating Systems may behave differently. Consult your operating system’s documentation for more information.

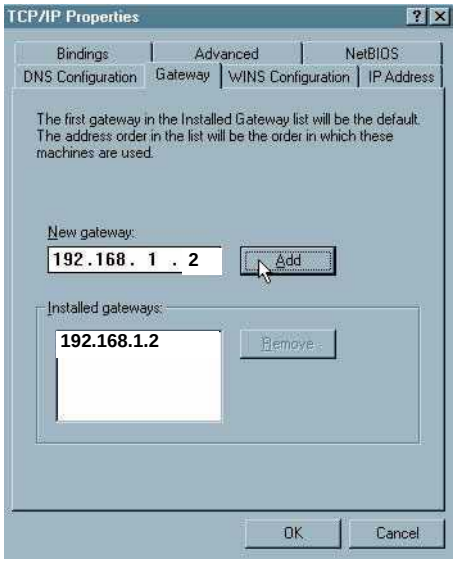


Figure 4-6 TCP/IP Properties: Gateway Setup

Once the Gateway address has been added to the TCP/IP Properties, your operating system may require a re-start on the PC Server for Network Properties to take effect. After the PC Server has been re-started, check the addresses for proper settings in the Network Properties.

4.3.2 RTU CLIENT NETWORK PROPERTIES SETUP PROCEDURE

The RTU Client with Modbus TCP/IP Network Properties also requires configuration of an IP Address, Subnet Mask and Gateway. Refer to the network manual for your specific RTU Client or device for instruction on setting these addresses.

An IP Address of 192.168.1.2 was selected for one of the RTU Clients. The RTU Client Subnet Mask is 255.255.255.0. The Default Gateway of the RTU Client is not needed since each RTU Client and PC Server will have IP Addresses on the same LAN (192.168.1.X). However an IP Address of 192.168.1.1 can be selected for the Default Gateway. This will point the RTU Clients to the PC Server. This is the final step in programming IP Properties for the first RTU Client.

NOTE: The RTU Node Address is a MODBUS Unit Identifier and is not part of the Network IP Properties.

Follow the same procedure to enter the Network IP Properties for the second RTU Client with an IP Address of 192.168.1.3.

4.3.3 USING THE PING COMMAND

The PC Server and two RTU Clients have been setup with the proper Network IP Properties and can be connected together with a hub to form the LAN 192.168.1.0 as shown in Figure 4-2. To check for connectivity, the user should be familiar with the PING (Packet InterNet Groper) utility. The PING command is a universally used Internet troubleshooting tool. PING uses an ICMP (Internet Control Message Protocol) echo and echo reply to verify connectivity between a source to a destination IP Address. The PING repeatedly transmits part of the alphabet from the source to the destination IP Address. At the destination, the device replies to the ICMP with an echo reply. As the data travels back to the source, it gathers various information along the way. The PING reply will contain the destination IP Address and the time it took for the round trip. The PING command can be used from the Command Line utility located in the Run menu from the Start button (in Windows98 -see Figure 4-7) or from the Ping Utility in the Integra-IP Field Programming Software (see Section 3.1.4).

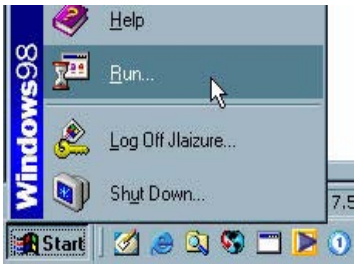


Figure 4-7 Start Menu: Run Utility

Enter the PING command followed by the destination IP Address as shown in Figure 4-8.

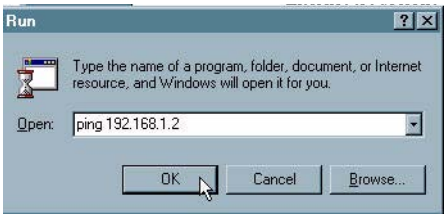


Figure 4-8 Run Utility: Ping Command

The PING command will send a message from the source to the destination IP Address of 192.168.1.2 requesting a reply. If the destination device is connected and has the proper IP Addressing it will send back a reply. This utility is embedded in all Network devices. The reply from the PING 192.168.1.2 command is:

C;\ >ping 192.1681.2

Ping 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<10ms TTL=128
Reply from 192.168.1.2: bytes=32 time<10ms TTL=128
Reply from 192.168.1.2: bytes=32 time<10ms TTL=128
Reply from 192.168.1.2: bytes=32 time<10ms TTL=128

PING statistics for 192.168.1.2:
Packets: Sent = 4, Received =4, Lost = 0 (0X loss),
Approximate round trip times in milliseconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

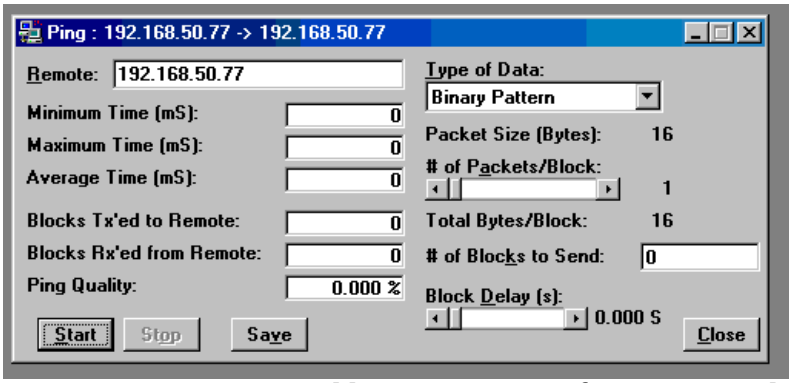


Figure 4-9 Integra-IP Field Programming Software Ping Utility

Check all Devices located on the LAN with the PING command to ensure proper IP Addressing and connectivity.

NOTE: The PING command will always utilize an Ethernet Port and not a COM (Serial) port.

4.4 CONFIGURING THE OIP ROUTER FOR BRIDGE MODE OPERATION

Systems utilizing the Integra-IP in Bridge Mode will be setup as shown in Figure 4-10. Since the OIP Routers will be operating in Bridge Mode, Network IP Properties for the PC Server and the RTU Clients will remain the same. In Bridge mode, the devices must be on the same LAN. OIP Routers do not contain Network IP Properties in Bridge Mode.

If the system will utilize the OIP Routers in Router Mode, go to Section: “Configuring the OIP Router for Router Mode Operation.”

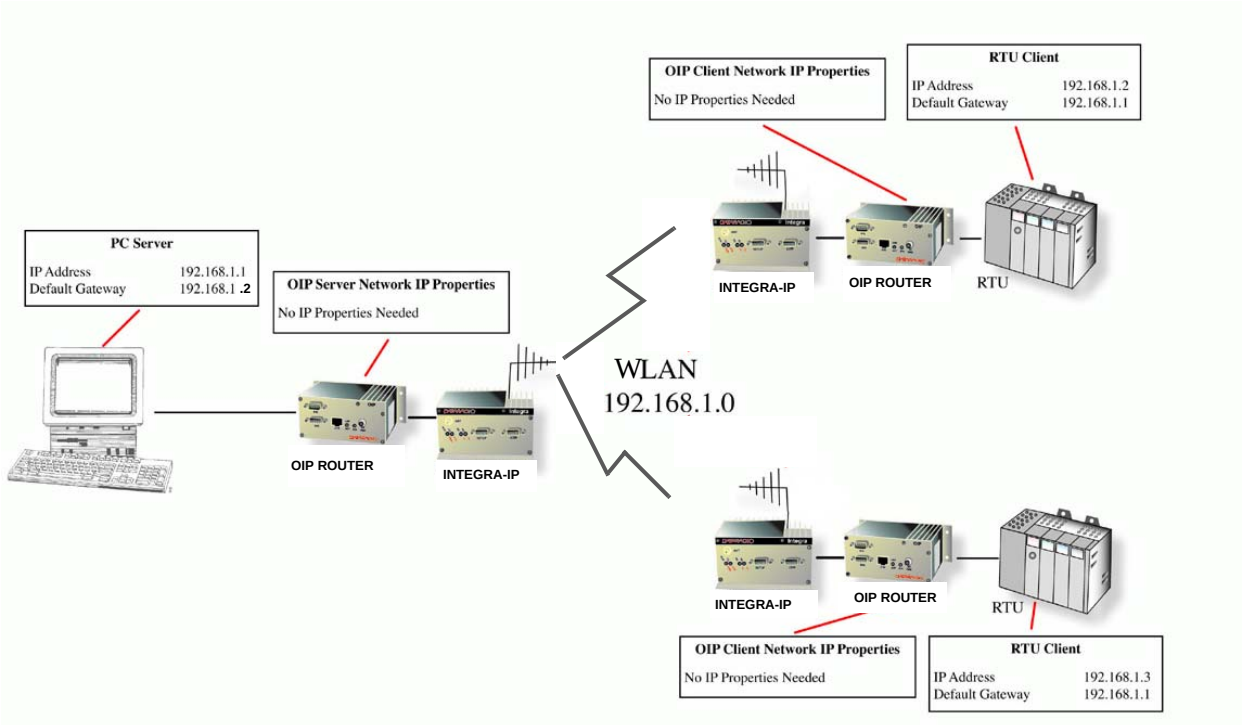


Figure 4-10 Typical SCADA System: Integra-IP in Bridge Mode - PC Server and Multiple Clients

4.4.1 USING THE INTEGRA-IP FIELD PROGRAMMING SOFTWARE

Load the Integra-IP Field Programming Software on the PC Server to set the Network IP properties in the OIP Router.

1. Start the Field Programming Software by clicking on the Integra OIP icon.

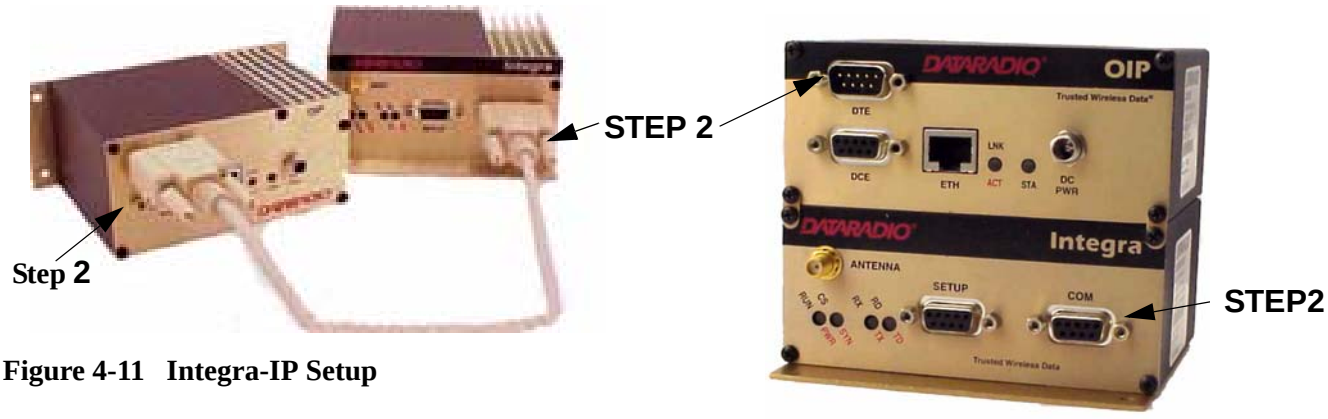


Figure 4-11 Integra-IP Setup

2. The top left DTE port of the OIP Router is connected to the right COM port of the Integra-IP wireless modem with a standard 9 pin communication cable (see Figure 4-11). Once the OIP Router has been connected to the Integra-IP wireless modem, power must be cycled.

3. Under the “Utilities” menu, choose “Port Setting”.

4. In the Port Setting window, choose COM 1 for the programming PC. Confirm “COM Port” button is selected under “Port Select” in the “Port Settings” window (see Figure 4-12). (The “IP Port” and the “COR OIP” Port have no affect when the unit is in Bridge mode.)

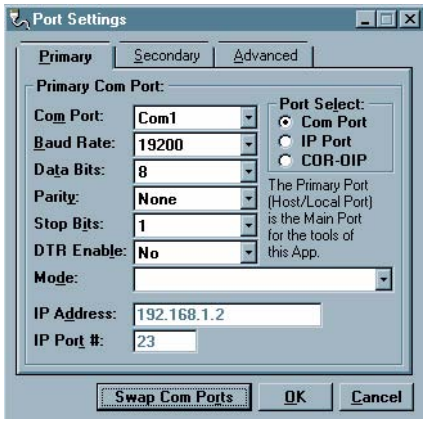


Figure 4-12 Integra-IP Field Programming Software: Port Settings Window

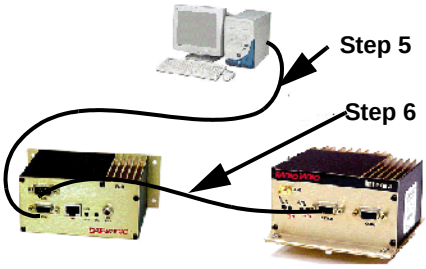


Figure 4-13 Integra-IP: Programming Setup for Bridge Mode

5. Close the “Port Settings” window and click the “Read” button on the tool bar menu. (The Integra-IP Field Programming Software will read the parameters in the OIP Router, pause, and prompt the user for permission to read the Integra-IP wireless modem parameters (see Figure 4-14). Clicking on “OK” will allow the Field Programming Software to read the parameters in the Integra-IP wireless modem.

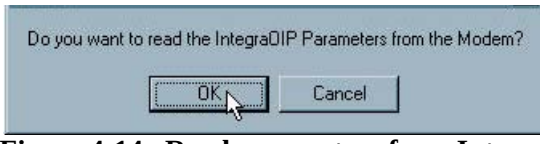


Figure 4-14 Read parameters from Integra-IP Modem Prompt

6. Click on the “Parms” button on the tool bar menu to display the parameters for the OIP Router and the Integra-IP wireless modem.

7. Click on the “General” tab to display the current mode of the OIP Router (See Figure 4-15). In the “General” tab window select “Bridge” mode.

NOTE: The Ethernet, Serial, Routing and ARP tabs are not used in Bridge Mode. Changing values in these tabs have no effect in Bridge Mode.

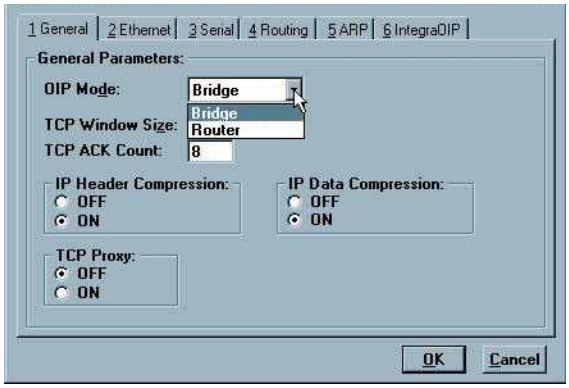


Figure 4-15 Setup OIP Parameters Screen: General Tab

8. The Integra-IP units must be setup with a properly configured RF path. Click on the Integra-IP tab to display the Integra-IP parameters as shown in Figure 4-16. Modify necessary parameters for proper system operation. Click OK to close the screen.

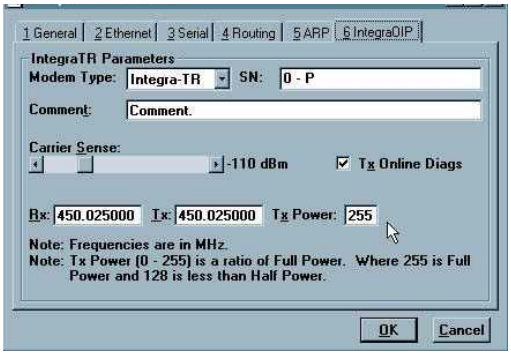


Figure 4-16 Setup OIP Parameters: Integra-IP Tab

9. Click on the Write button located in the tool bar menu. This will write the parameters to the OIP Router. The program will prompt the user for permission to program parameters to the Integra OIP Wireless Modem (see Figure 4-17). Click on "OK" to complete the writing of the operating parameters. After all the screens have closed or completed the unit is programmed with the operating parameters.

Figure 4-17 Setup OIP Router: Program Integra-IP Parameters Prompt

10. After operating parameters are written, cycle power on the units. After power is cycled, check the Integra-IP status STA LED. An amber LED indicates the unit is in Bridge mode.

Follow the same procedure for each of the OIP units to be used in the Network.

4.4.2 PING TEST

After the cables have been connected to the units and power applied, a PING test should be done. A PING test will check for proper IP Addressing and will verify the RF link between the wireless modems. For your convenience, Dataradio incorporated a PING utility in the Integra-IP Field Programming Software.

1. Under the Utilities menu select “PING Test”. The PC Server IP address will be displayed in the top left hand portion of the pop up screen. It will also contain a default destination IP Address. Enter in the Client RTU IP Address of the system in the remote location as shown in Figure 4-18.

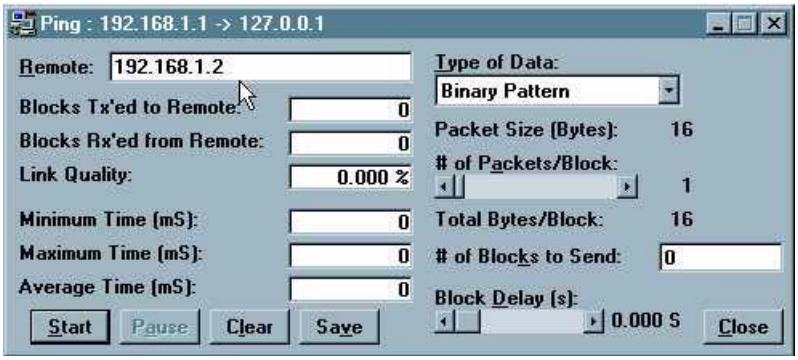


Figure 4-18 Integra-IP Field Programming Software: PING Test Screen

2. Click on the start button. The Field Programming Software will PING the destination IP Address of the device and display the destination address in the top left corner of the screen. If the connection is established, the transmitted blocks will match the received blocks or if the link is poor quality only a percentage will make it through as shown in Figure 4-19.

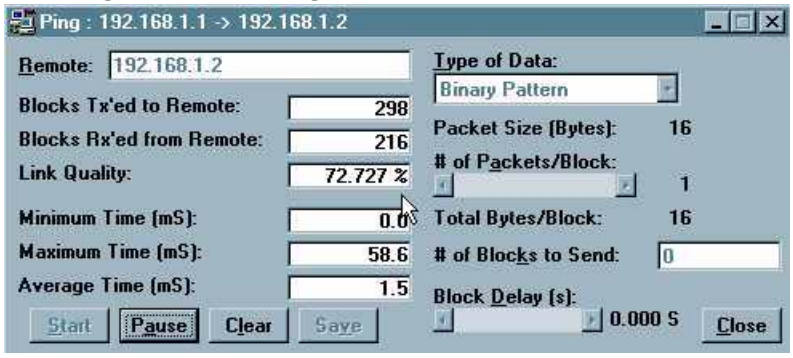


Figure 4-19 Integra-IP Field Programming Software: PING Test Result

The wireless modem should be set for the highest quality link that can be established. Once a high quality link PING test is accomplished, the system can be put into full operation. If poor link quality is detected during the PING test, further investigate the problem by:

- Checking all connections and cables for proper installation. If the PING test indicated zero blocks received from the remote, check the TCP/IP Network Properties in the PC Server and RTU Clients.

- If the RTU Client transmitted some blocks but the PC Server OIP unit is registering a poor link quality, it could be the RF path. The Integra OIP Unit has RF diagnostic capabilities built in. Refer to the Offline Link Test Section and the Offline Diagnostics Section to help establish a high quality RF link before proceeding. Once the Offline Link Test and the Offline Diagnostic have been utilized, re-test with the PING test. After a successful PING test, the Bridge mode configuration procedure is complete. The SCADA Network system has been checked for proper IP properties, cable connectivity and RF path quality. The SCADA OIP Network system is ready to be used.

4.5 CONFIGURING THE OIP ROUTER FOR ROUTER MODE OPERATION

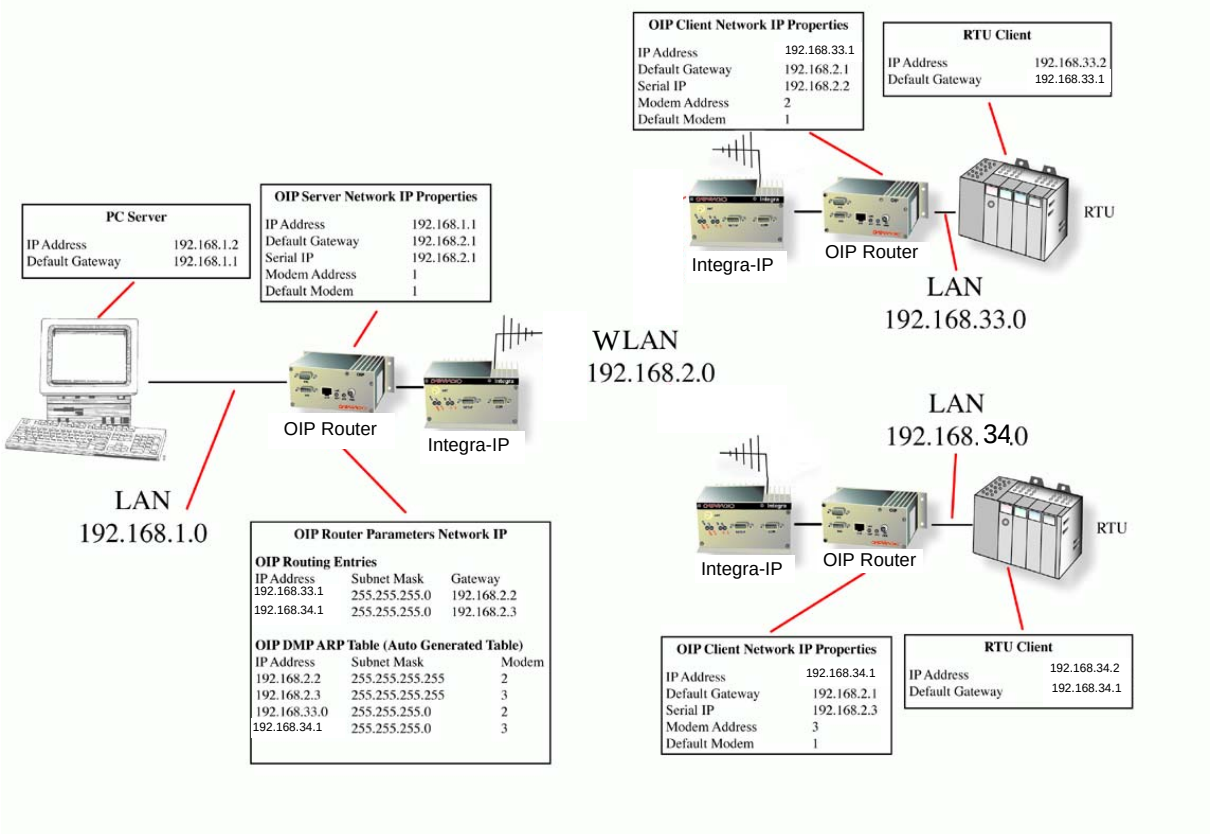


Figure 4-20 Typical SCADA System: OIP in Router Mode - PC Server and Multiple Clients

OIP Routers can be configured in Router mode. Figure 4-20 shows the typical SCADA system configured in Router Mode. Notice the IP Addresses for the PC Server and RTU Clients are different. Sometimes it is not possible to have all the Hosts or devices located on the same LAN. When different networks are needed in a configuration, the OIP Router must be used in Router mode configuration. Figure 4.20 shows the PC Server (192.168.1.2) is on the same Network (LAN 192.168.1.0) as the OIP Server (192.168.1.1) however, the RTU Clients 192.168.33.2 and 192.168.34.2 are on two different networks. The first RTU Client and the corresponding RTU OIP Client form the LAN of 192.168.33.0 as shown in Figure 4-20. The second RTU Client and the corresponding RTU OIP Client form the LAN of 192.168.34.0. Because the OIP Router is in Router mode, it will form a Serial LAN of 192.168.2.0

Note: The IP Addresses are typical addresses one might encounter when setting up a Network. The LAN Addresses were arbitrarily chosen and are for shown for example only.

When the OIP Router is configured in the Router Mode, additional Network IP Properties must be configured. Since the RTU Clients and the PC Server will be located on different networks, Gateways and routing information must be added to the Network IP Properties for the OIP Units. This information will allow the PC Server to locate each of the RTU Clients Network and pass information to those Networks.

4.5.1 SETUP PC SERVER AND RTU CLIENT IN OIP ROUTER MODE

Refer to Figure 4.20 for Network IP properties to configure the PC Server and the RTU Clients. Follow the procedures outlined in the previous PC Server Setup (see Section 4.3.1). Figure 4-21 shows an IP Address of 192.168.1.2 for the PC Server with a subnet mask for a Class C network.

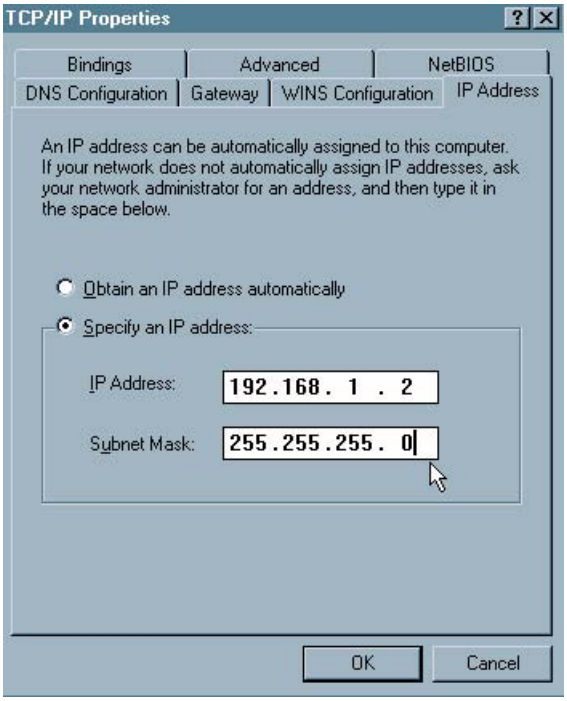


Figure 4-21 TCP/IP Properties: PC Server IP Address for Router Mode

Figure 4-22 shows the Default Gateway as 192.169.1.1. This will be the OIP Server's IP Address.

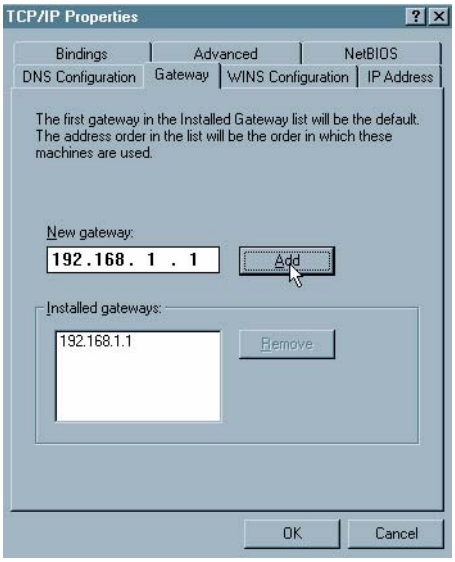


Figure 4-22 TCP/IP Properties: Default Gateway -OIP Server IP Address for Router Mode

4.5.2 RTU CLIENT SETUP - ROUTER MODE

Refer to Figure 4-20 for Network IP properties to configure the PC Server and the RTU Clients. Follow the procedures outlined in the previous RTU Client Setup (See Section 4.3.2). Figure 4-21 shows the IP Address for the first RTU Client as 192.168.33.2 with a Default Gateway of 192.168.33.1. The Default Gateway address is the IP Address of the RTU OIP Client interfaced with the RTU Client.

Figure 4-21 shows the an IP Address for the second RTU Client of 192.168.34.2 with a Default Gateway of 192.168.34.1. The Default Gateway address is the IP Address of the RTU OIP Client interfaced with the RTU Client.

4.5.3 USING THE Integra-IP FIELD PROGRAMMING SOFTWARE IN ROUTER MODE

Once the Integra-IP Field Programming Software (FPS) has been installed on the PC Server, the Network IP Properties in the OIP units can be set.

1. Start the Integra-IP FPS by clicking on the Integra-IP icon.

Figure 4-23 Integra-IP Setup for Router Mode

2. The top left DTE port of the OIP Router is connected to the right COM port of the Integra-IP wireless modem with a standard 9 pin communication cable. (The OIP Router should be connected to the Integra-IP as shown in Figure 4-23.) After the OIP Router has been connected to the Integra-IP wireless modem, power must be cycled.

3. Under the “Utilities” menu, choose “Port Setting”.

4. Connect a straight-thru 9-pin communication cable to the PC’s programming COM 1 port. Connect the other end to the DCE port on the OIP Router.

5. In the Port Setting window, choose COM 1 for the programming PC. Confirm “COM Port” button is selected under “Port Select” in the “Port Settings” window (See Figure 4-24).

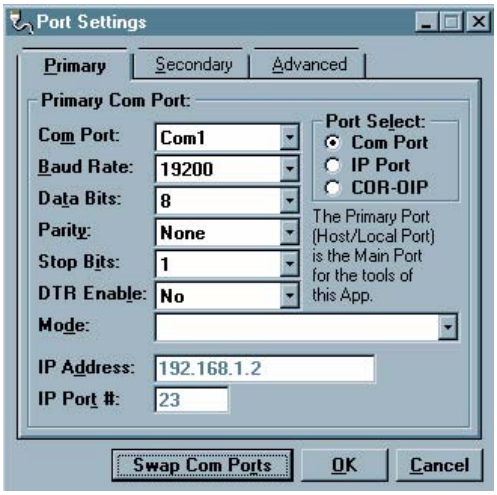


Figure 4-24 Port Settings for Router Mode

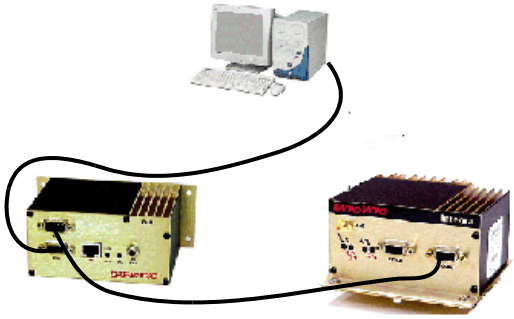


Figure 4-25 Integra-IP: Programming Setup for Router Mode

6. Close the “Port Settings” window and click the “Read” button on the tool bar menu. The Integra-IP Field Programming Software will read the parameters in the OIP Router, pause, and prompt the user for permission to read the Integra-IP wireless modem parameters (See Figure 4-26). Clicking on “OK” will allow the Field Programming Software to read the parameters in the Integra-IP wireless modem.

Figure 4-26 Read parameters from Integra-IP Modem Prompt

6. Click on the “Parms” button on the tool bar menu to display the parameters for the OIP Router and the Integra-IP wireless modem.

4.5.4 SETTING UP THE INTEGRA-IP SERVER UNIT IN ROUTER MODE

From the “General” tab choose “Router” Mode from the “OIP Mode” drop-down list (see Figure 2-27).

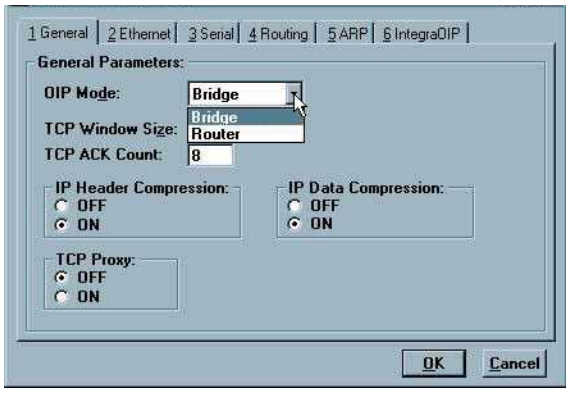


Figure 4-27 Setup Integra-IP Parameters: Router Mode

4.5.5 SETTING UP THE INTEGRA-IP SERVER ETHERNET TAB IN ROUTER MODE

Click on the “Ethernet” tab. Enter the IP Address, IP Subnet Mask and the Default Gateway from the your network diagram worksheet (for reference, see Figure 4-28).

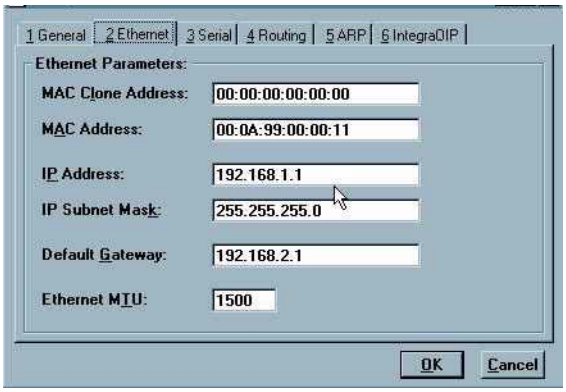


Figure 4-28 Setup Integra-IP Parameters: Integra-IP Server Network Properties for Router Mode

The Default Gateway for all OIP Routers must be the Server “Serial IP” address of 192.168.2.1. The MAC Address is the hardware address assigned at the factory for the Ethernet device. The MAC Address is passed to other Ethernet devices when an “Address Resolution Protocol” (ARP) is requested by a device. The Ethernet MTU (Maximum Transfer Units) is set to 1500. It can be adjusted if the configuration requires it.

4.5.6 SETTING UP THE INTEGRA-IP SERVER SERIAL TAB IN ROUTER MODE

1. Enter the OIP Server's Serial IP address (192.168.2.1 as shown in Figure 4-29).

2. Enter the IP Subnet Mask as Class C (255.255.255.0).

3. Set the Baud Rate for 19200.

4. The Modem Short ID is 1. Since this OIP unit is the Server, the Default Modem will also be 1. The Default Modem routes the RF Network to the Serial Network.

5. The Serial MTU (Maximum transfer Units) is set to 1500.

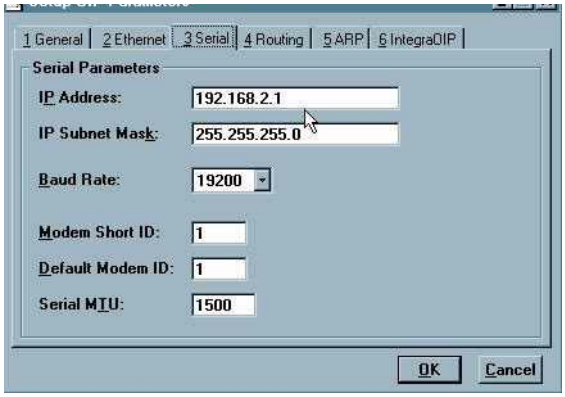


Figure 4-29 Setup Integra-IP Parameters: Serial Server Tab for Router Mode

4.5.7 SETTING UP THE OIP SERVER ROUTING AND ARP TAB IN ROUTER MODE

1. Click on the "Routing" tab. Enter the IP Address for the first RTU Client and the OIP Client unit Network (192.168.33.1 see Figure 4-30).

2. Enter the Subnet Mask as Class C (255.255.255.0).

3. The Default Gateway is the Serial IP address for the first RTU OIP Client (192.168.2.2).

4. Enter the Modem ID of the first RTU Client (to utilize unit as router only, set Modem ID to 2).

Note: by adding these entries to the OIP Server's routing table, the OIP Server is configured to send information destined for the RTU Client's IP Address of 192.168.33.2

5. Click on "Add Entry" (see Figure 4-30).

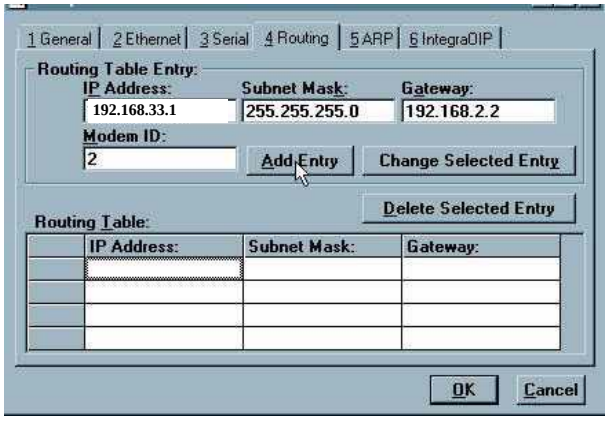


Figure 4-30 Setup Integra-IP Server Parameters: OIP Server Routing Tab for Router Mode

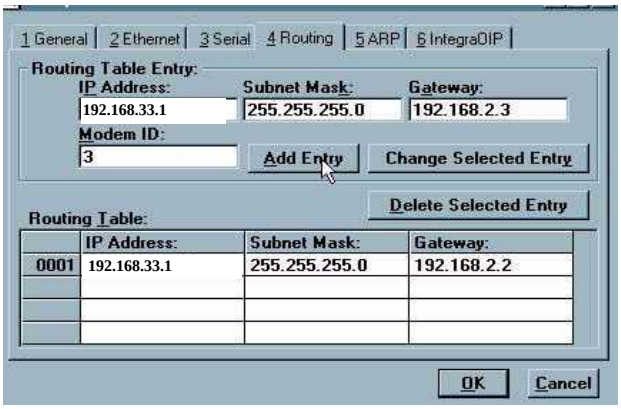


Figure 4-31 Setup Integra-IP Server Parameters: Routing Table List Updated for Router Mode

The “Add Entry” does two things; it adds the values to the routing table list (see Figure 4-31) and it automatically generates the “ARP” table entries located in the “ARP” tab as shown in Figure 4-32. Two entries are automatically generated, the Serial IP address with the Modem Address and the RTU Clients network IP Address with the Modem Address. The Serial IP entry will associate the OIP Serial Client with the Modem Address. The other entry will associate the RTU OIP Client IP Network with the Modem Address. The Modem Address helps route the Serial IP Network and the RTU Client Network to the Modem RF Network.

Note: The RTU OIP Client Unit and the RTU Client must be located on the same network. The Ethernet IP Address for both OIP Client and RTU Client will be in this example on the LAN 192.168.33.0 which would have the form of 192.168.33.X.

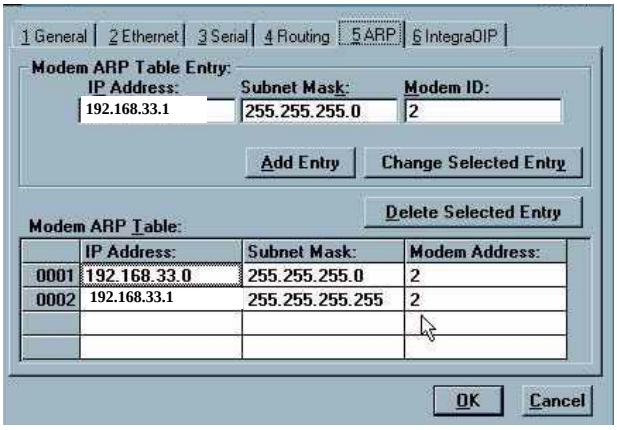


Figure 4-32 Setup Integra-IP Server Parameters: Automatically Generated ARP Table Entries

6. Click on the "Routing" tab again. Enter the IP Address for the Network of the second RTU Client and the RTU OIP Client unit (192.168.34.1 - see Figure 4-32)

7. Enter the Subnet Mask as Class C (255.255.255.0.)

8. Enter the Default Gateway of the Serial IP address for the second RTU OIP Client 192.168.2.3. The Modem ID will be the Modem ID of the second RTU Client. (See Figure 4-33)

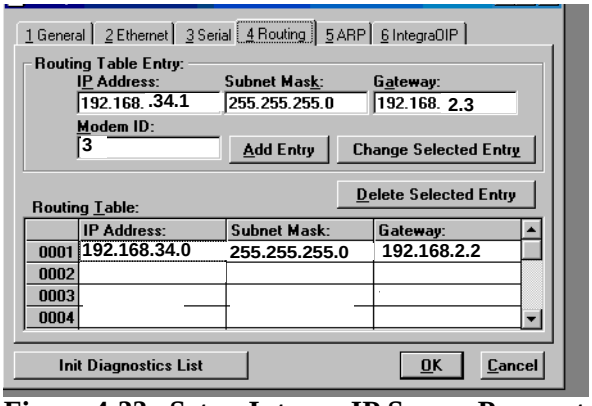


Figure 4-33 Setup Integra-IP Server Parameters: Routing Table List Updated for Second RTU Integra-IP Client (Router Mode)

9. Click on "Add Entry" (See Figure 4-33).

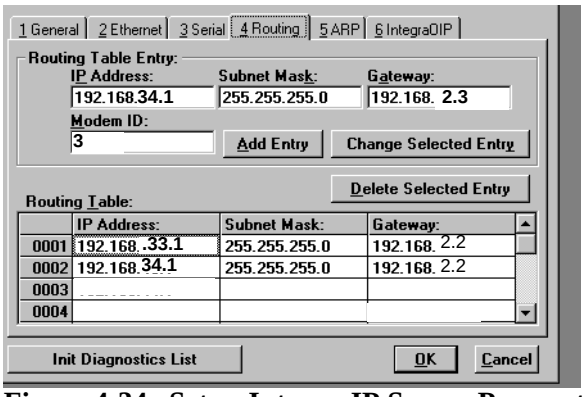


Figure 4-34 Setup Integra-IP Server Parameters: Automatically Generated ARP Table Entries for Second RTU OIP Client (Router Mode)

After clicking “Add Entry” the routing table is updated with the new information and the “ARP” entries are automatically generated and listed in the ARP tables as shown (see Figure 4-35). The OIP Server Routers have been programmed with the required routing information.

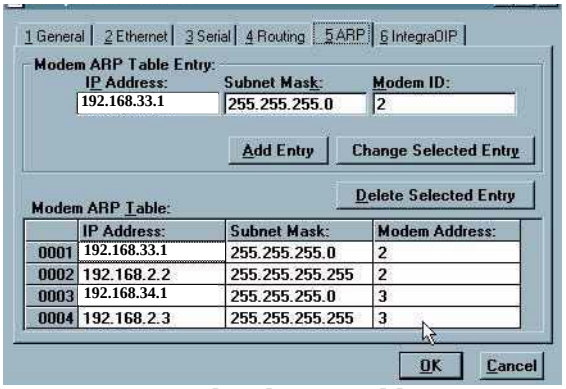


Figure 4-35 Updated ARP Tables: Router Mode

4.5.8 THE INTEGRA-IP TAB / PROGRAMMING THE OIP SERVER UNIT

The Integra-IP units must be programmed with properly configured RF properties.

1. Click on the Integra-IP tab to display the Integra-IP parameters (see Figure 4-36).

2. Modify the necessary parameters for proper system operation.

3. Click OK to close the screen. These entries complete the information for the OIP Server and the Integra-IP.

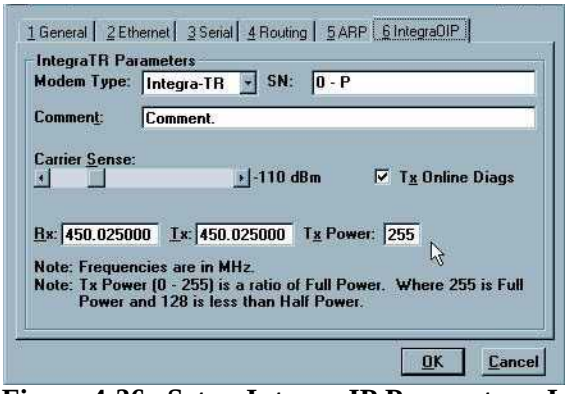


Figure 4-36 Setup Integra-IP Parameters: Integra-IP

4. Click on the “Write” button located on the menu. The program will prompt the user to “Make Sure the Cables are connected”.

5. Ensure the cables are properly connected and click “OK”.

6. The program will write to the PC Server OIP Router and then pause. It will then prompt the user for permission to write to the Integra OIP unit as shown in Figure 4-37.

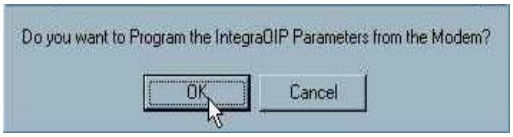


Figure 4-37 Integra-IP Prompt: Program OIP Parameters to Modem

7. Click the “OK” button to program the chosen parameters to the units. This completes programming of the Dataradio OIP units.

8. Disconnect the serial communication cable from the DCE port and connect the OIP Data Interconnect cable (part number 697-5300-001). Cycle power to the Dataradio OIP units with a minimum of 3 seconds off time.

4.5.9 SETTING UP THE RTU INTEGRA-IP CLIENT IN ROUTER MODE

1. Start the Integra-IP FPS by clicking on the Integra OIP icon.

Figure 4-38 Integra-IP Setup for Router Mode

2. The top left DTE port of the OIP Router is connected to the right COM port of the Integra-IP wireless modem with a standard 9 pin communication cable as shown in Figure 4-38. After the OIP Router has been connected to the Integra-IP wireless modem, power must be cycled.

3. Under the “Utilities” menu, choose “Port Setting”.

4. In the Port Setting window, choose COM 1 for the programming PC. Confirm “COM Port” button is selected under “Port Select” in the “Port Settings” window (See Figure 4-39).

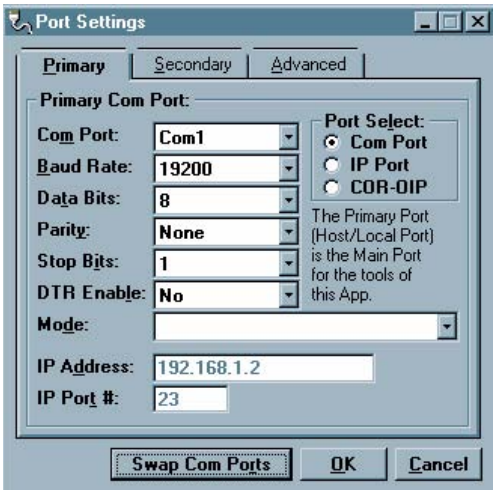


Figure 4-39 Port Settings for Router Mode

5. Connect a straight-thru 9-pin communication cable to the PC's programming COM 1 port. Connect the other end to the DCE port on the OIP Router.

6. From the "General" tab, choose "Router" Mode from the "OIP Mode" drop-down list (see Figure 4-40).

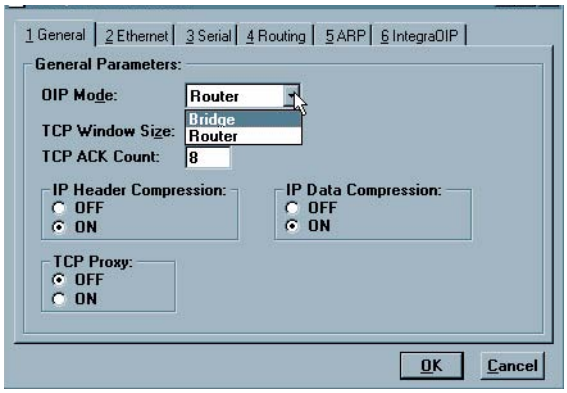


Figure 4-40 Setup Integra-IP Parameters: General Parameters Router Mode Select for RTU OIP Client

4.5.10 SETTING UP THE RTU INTEGRA-IP CLIENT ETHERNET TAB

1. Click on the "Ethernet" tab.

2. Enter the IP Address (192.168.33.1), IP Subnet Mask (Class C - 255.255.255.0) and the Default Gateway (192.168.2.1) from the configuration shown in Figure 4-41 for the first RTU Client in the Setup Integra-IP Parameters / Ethernet Tab.

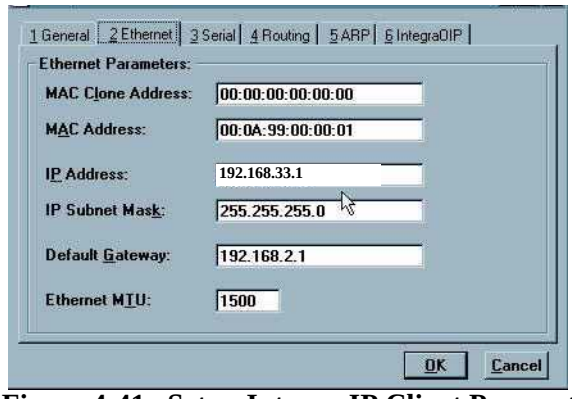


Figure 4-41 Setup Integra-IP Client Parameters: Ethernet Tab - RTU Integra-IP Client in Router Mode

Note: The Default Gateway for all the Client OIP Routers must be the Server "Serial IP" address. The MAC Address is the hardware address assigned at the factory for the Ethernet device. The MAC address is passed to other Ethernet devices when an "Address Resolution Protocol" (ARP) is requested by a device.

3. Set the Ethernet MTU (Maximum Transfer Units) to 1500. It can be adjusted if the configuration requires it.

4.5.11 SETTING UP THE RTU INTEGRA-IP CLIENT SERIAL TAB IN ROUTER MODE

1. Enter the Serial IP address as 192.168.2.1 for the Integra-IP Server as shown in Figure 4-41.

2. Enter the RTU Client IP address on the same Serial Network (192.162.2.2).

3. Enter the IP Subnet Mask as Class C (255.255.255.0).

4. Set the Baud Rate to 19200.

5. Enter the Modem Short ID (it must be unique. Since this Integra-IP Router is a Client, the Modem Short ID will be 2)

6. Enter the Default Modem ID. It must be that of the Server which is 1. The Default Modem routes the RF Network to the Serial Network.

7. Set the Serial MTU (Maximum transfer Units) to 1500 (see Figure 4-42).

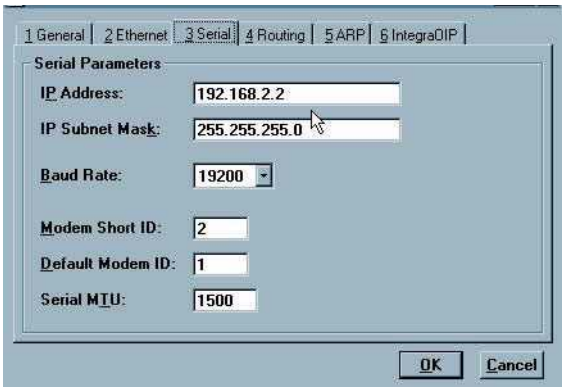


Figure 4-42 Setup Integra-IP Client Parameters: OIP Serial Tab in Router Mode

4.5.12 SETTING UP THE RTU INTEGRA-IP CLIENT ROUTING AND ARP TABS IN ROUTER MODE

1. Click on the “Routing” tab. Enter the IP Address for the Network of the PC Server OIP which is 192.168.1.0 in the IP address.

2. Enter the Subnet Mask as Class C (255.255.255.0).

3. Enter the Default Gateway - the Serial IP address for the RTU OIP Server. The Modem ID is the Modem ID of the PC Server Integra-IP.

4. Click on “Add Entry”. (See Figure 4-43).

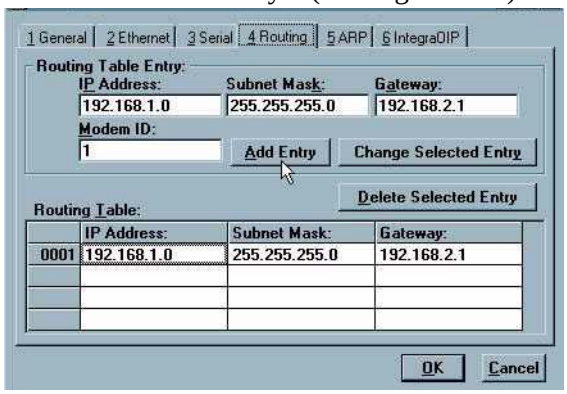


Figure 4-43 Setup Integra-IP Client Parameters: RTU OIP Routing Tab

The “Add Entry” does two things; it adds the values to the routing table list (see Figure 4-44) and it automatically generates the “ARP” table entries located in the “ARP” tab (see Figure 4-45). Two entries are automatically generated, the Serial IP address with the Modem Address and the RTU Clients network IP Address with the Modem Address. The Serial IP entry associates the OIP Serial Client with the Modem Address. The other entry associates the RTU OIP Client IP Network with the Modem Address. The Modem Address helps route the Serial IP Network and the RTU Client Network to the Modem RF Network.

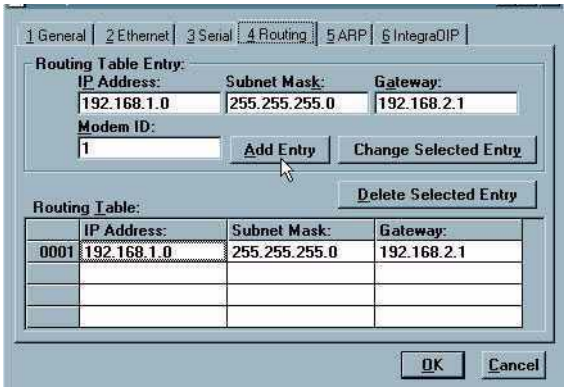


Figure 4-44 Setup Integra-IP Client Parameters: Routing Table List

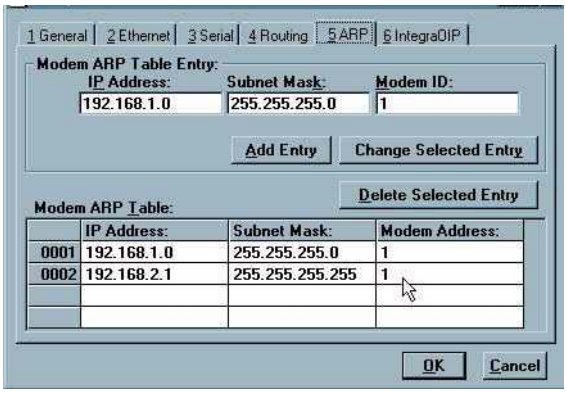


Figure 4-45 Setup Integra-IP Client Parameters: ARP Table List

Note: The PC Server OIP Router and the PC server must be located on the same network. The Ethernet IP Address for both the PC Server OIP Router and the PC Server are (in this example) on LAN 192.168.1.0 (which would have the form of 192.168.1.X).

4.5.13 THE INTEGRA-IP TAB / WRITING TO THE INTEGRA-IP CLIENT

The Integra-IP units must be setup with properly configured RF properties.

1. Click on the Integra-IP tab to display the Integra-IP parameters (see Figure 4-46). Modify the necessary parameters for proper system operation.

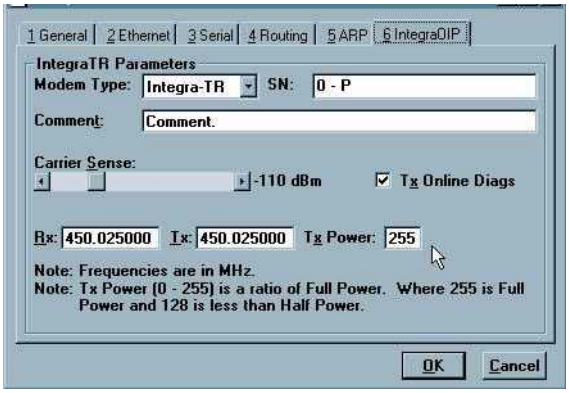


Figure 4-46 Setup Integra-IP Parameters: Integra-IP Tab

2. Click “OK” to close the screen. These entries complete the information for the OIP Router Client and the Integra-IP.

3. Click on the “Write” button located on the menu. The program will prompt the user to “Make Sure the Cables are connected”.

4. Ensure the cables are connected and Click “OK”.

5. The program will write to the OIP Router Client and pause. It will then prompt the user for permission to write to the Integra-IP unit (see Figure 4-47).

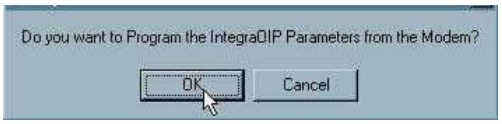


Figure 4-47 Integra-IP Prompt: Program the Integra-IP Parameters From the Modem

5. Click the "OK" button. The program will configure the chosen parameters in the units. This completes programming of the OIP Client Routers.

6. Disconnect the communication cable from the DCE port and complete the connections. Cycle power to the OIP Routers with a minimum of a 3 second delay.

4.5.14 SETUP OF ADDITIONAL RTU INTEGRA-IP CLIENT(S)

Follow previous procedures to set up additional RTU OIP Routers. Refer to Figure 4-42 for values to configure Network properties.

After all RTU Integra-IP Clients have been configured, a PING test should be performed to check the connectivity and IP addressing of all devices. Refer to Section 2.4.2 for the PING test procedure. Also follow the trouble shooting procedure mentioned in the PING test (page 4-11) to help establish a high quality RF link. Once a high quality RF link is established, the SCADA network is ready for use.

4.6 PC SERVER CONNECTED TO A ROUTER

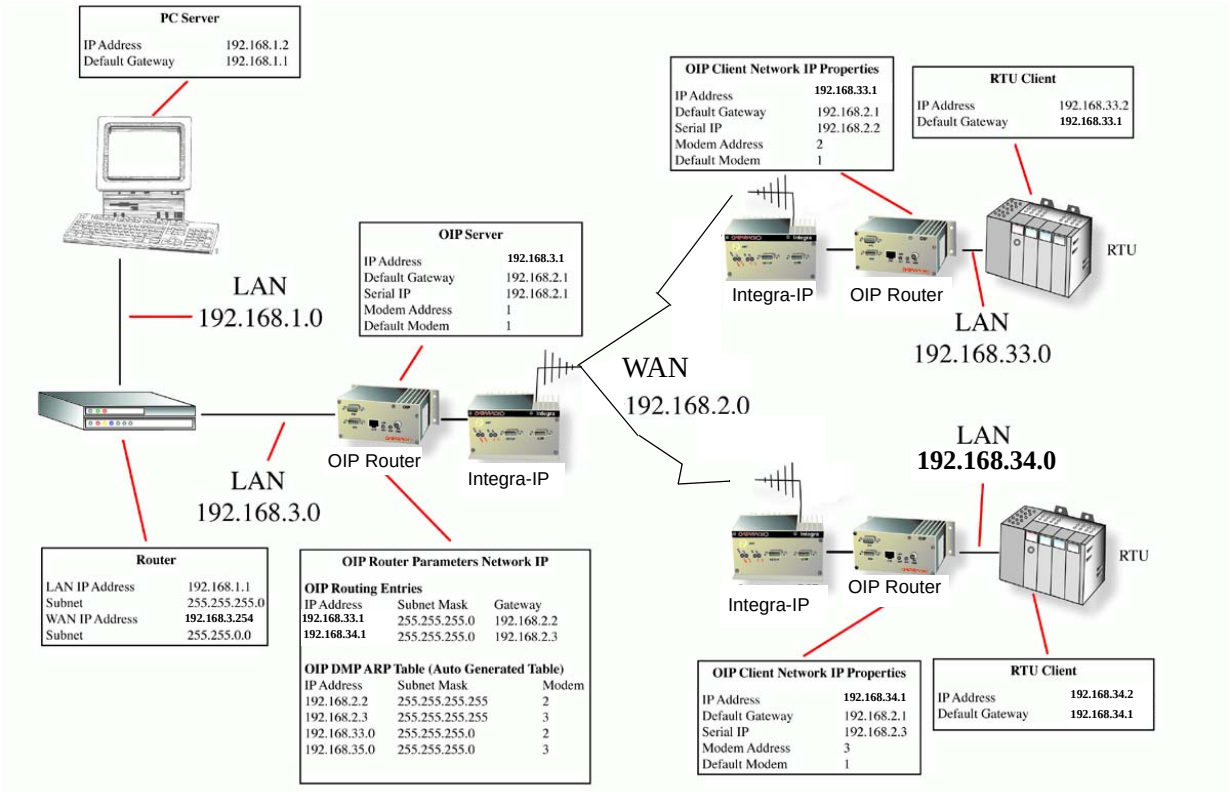


Figure 4-48 Typical SCADA System: OIP Router Mode - PC Server, Router and Multiple Clients

It is not unusual for a PC Server to be connected to a router. The addition of a router to the PC Server will allow for other networks to connect to the OIP Server. Figure 4-48 shows how a router might be configured to work in the typical SCADA system configuration. Most routers have a “Router Utility Program” to modify internal Network IP properties to configure the router for the network. Consult your IT department or the router manual to modify the Network IP properties for the router.

Most routers have a LAN side and a Wide Area Network (Wan) side. Figure 4-48 shows the PC Server connected to the LAN side of the router. The LAN side of the router generally has multiple Ethernet ports, while the WAN side has one port. This allows several devices located on the LAN side to be routed to another Network such as the WAN. Figure 4-48 shows the OIP Server connected to the WAN side. When the OIP Server is connected to a router in this type of configuration, more than one PC Server can have access to the OIP Server. One PC Server may be the polling Master Server while another PC Server may be used for diagnostic information capture.

4.6.1 SETUP FOR ROUTER ON THE PC SERVER

Refer to the router’s documentation to configure the Network IP properties utilizing the router’s “Utility Program” to modify the Network IP properties. Refer to Figure 4-49 and the network diagram worksheet for your system as references to configure the Network IP properties.

Figure 4-49 shows the LAN IP Address as 192.168.1.1 and the WAN IP Address as 192.168.3.254 for the router. The Subnet Mask is Class C (255.255.255.0). The Default Gateway will be the IP Address for the OIP Server (192.168.3.3).

4.6.2 INTEGRA-IP SERVER SETUP FOR TYPICAL SYSTEM WITH ROUTER

The only other Network IP property that needs to change is the Integra-IP Server IP Address. Refer to previous procedures (see Section 4.5.5) to change the IP Address in the Integra-IP Server. Figure 4-49 shows the values to configure the Integra-IP Server. Enter the values in as shown in Figure 4-49.

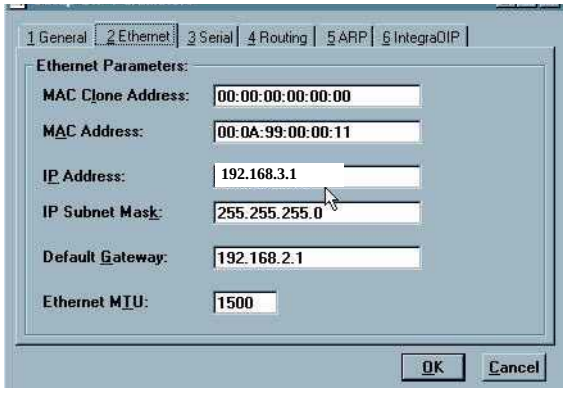


Figure 4-49 Setup Integra-IP Parameters: IP Address for OIP Server

Once these values have been changed, the SCADA Network system with the router added can be tested for IP Network configuration, RF quality and cable connectivity. Perform a PING test to all IP Addresses in a sequential order. Starting from the PC Server, go to the next sequential IP address (the router LAN IP address) and continue until all addresses are tested. We recommend network diagrams (such as the blank ones at the end of Section 2) be used to document the IP addresses to avoid errors and create proper network documentation. Once all of the test have passed, the SCADA network is ready.

4.7 ROUTE/ARP UTILITY AND CLONE UTILITY NETWORK CONFIGURATION

4.7.1 INTRODUCTION

The Route/ARP Utility and Clone Utility feature of the Integra-IP Field Programming Software can be used to automatically generate IP addressing for an entire wireless network if IP addressing for the network is open to user configuration.

Note: The Route/ARP Utility assumes network configuration consists of 1 Integra-IP Server with multiple Integra-IP Clients. All Integra-IP Client to Integra-IP Client connectivity is routed through the Integra-IP Server, i.e., Integra-IP Client 1 is routed to Integra-IP Client 2 through the Integra-IP Server.

The Route/ARP Utility automatically generates IP addressing for the network utilizing Integra-IP Server addresses to generate all addresses and routings for Integra-IP Clients. Once the base addresses are selected for the Integra-IP Server, the Route/ARP Utility generates Integra-IP Client addresses and modifies the Integra-IP Server's Routing and ARP tables. After all Integra-IP Client addresses are configured, Routing and ARP tables are downloadable to the Integra-IP Server unit by completing a "Write" command. The IP Addresses, Routing and ARP tables for each Integra-IP Client may be downloaded to each Integra-IP Client using the Clone Utility.

4.7.2 ROUTE/ARP UTILITY

4.7.2.1 Integra-IP Server Base Address

Note: Refer to Section 4.4.1: Using Integra-IP Field Programming Software. A programming cable must be connected to the unit (part number 697-4008-408).

1. Select "Route/ARP Entry" from the Edit drop-down menu (see Figure 4-50). This starts the Route/ARP Utility.

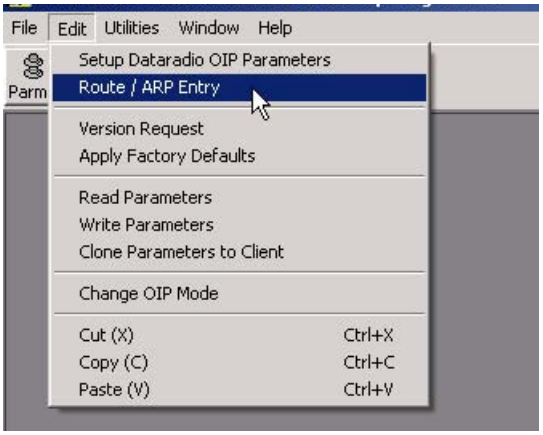


Figure 4-50 Route/ARP Utility Selection

A "Bridge Mode" error message window may be generated (see Figure 4-51).

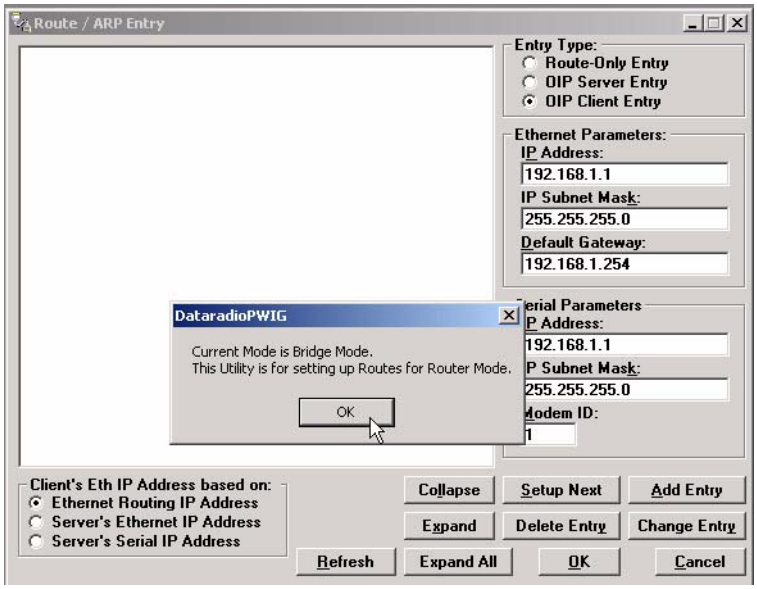


Figure 4-51 Bridge Mode Error Message

2. Click on "OK" to close the windows. Click on the "Parms" button in the tool bar to display the Parameters Tab for the unit and select "Router Mode" (the Integra-IP unit must be in Router Mode to use the Route/ARP Utility (see Figure 4-52).

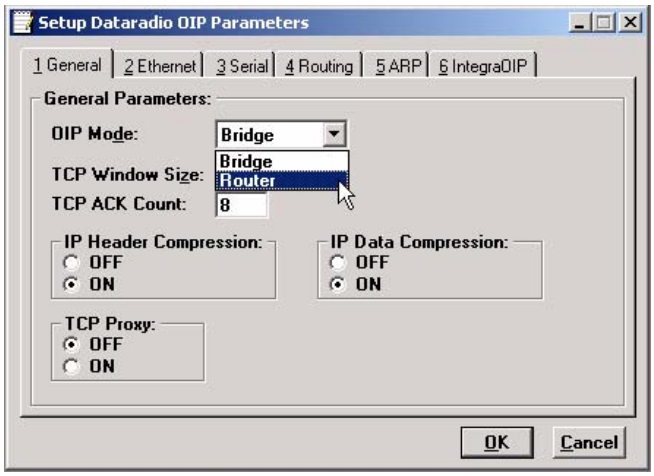


Figure 4-52 Router Mode Selection for Route/ARP Utility

Note: Before the "Route/ARP Entry" Utility can be used, the Base IP Addresses must be downloaded to the Integra-IP Server unit and a "Read" performed with the Integra-IP Field Programming Software.

3. Click on the "Ethernet" tab (see Figure 4-53) to display the default value or the present Ethernet IP address.

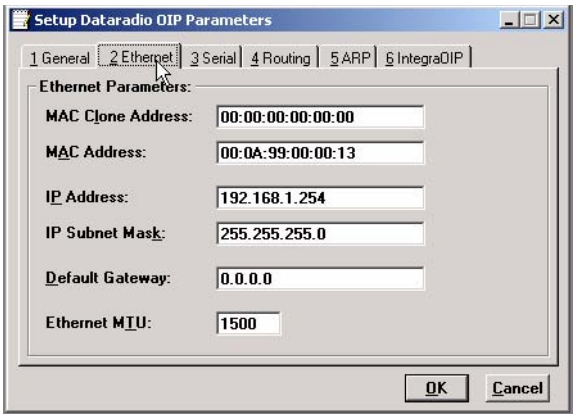


Figure 4-53 Ethernet Tab

4. Change the Ethernet IP Address to 192.168.1.1, Subnet Mask to 255.255.255.0 and the Default Gateway to 192.168.2.1 (see Figure 4-54). The base Integra-IP Server IP Address value was arbitrarily selected since the IP address is open to user configuration.

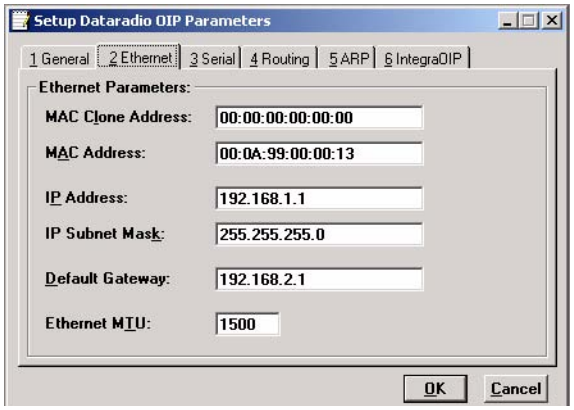


Figure 4-54 Ethernet Tab/ IP Address

5. The Default Gateway value is the Serial IP Address (see Figure 4-55). Change the Serial IP Address to 192.168.2.1, the Local Modem ID to 1 and the Default Modem ID to 1 (see Figure 4-55). The Serial IP Address was arbitrarily chosen for the base address of the Serial RF Network.

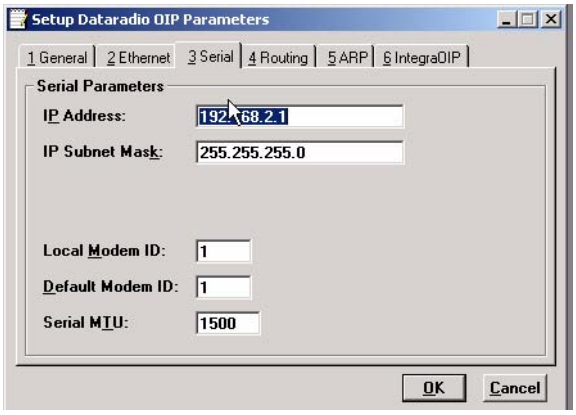


Figure 4-55 Serial Tab/ IP Address

6. Click “OK” to close the Parameters window. Click the “Write” button on the tool bar (see Figure 4-56) to download the base address parameters to the unit. Click “OK” to initiate download of parameters to Integra-IP Server.

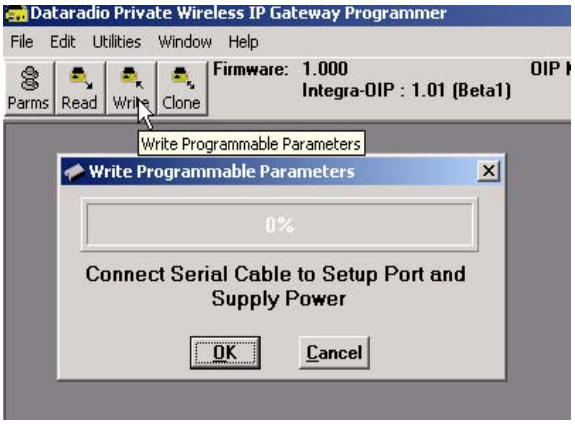


Figure 4-56 Write Programmable Parameters Prompt (downloads parameters to Integra-IP Server)

7. Integra-IP Server parameters must be "Read" before parameters can be uploaded back to the Integra-IP Field Programming Software Route/ARP Entry utility. Click on the "Read" button and select the Route/ARP Entry utility from the Edit menu (see Figure 4-50). The Routing Table and IP Addresses are displayed (see Figure 4-57). The Integra-IP Server is the only unit configured in the system.

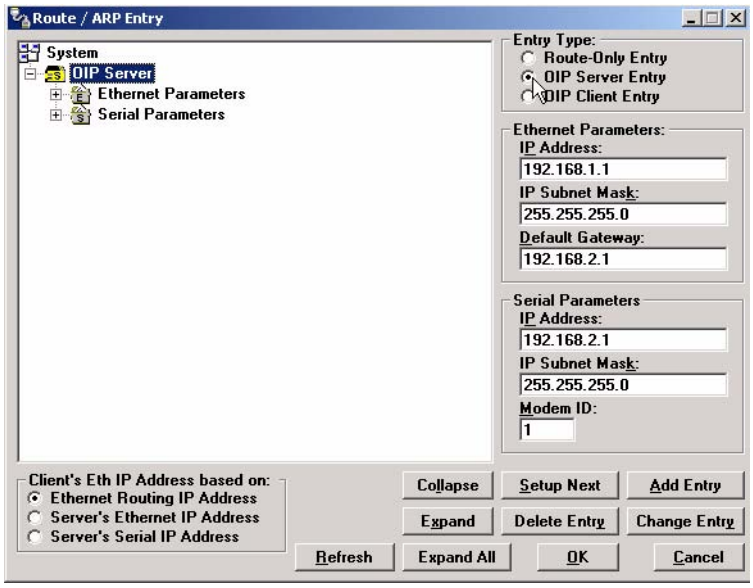


Figure 4-57 Route/ARP Entry/Integra-IP Server Parameters

8. Add an Integra-IP Client by clicking the radio button next to "OIP Client Entry" in the upper right hand corner of the screen (see Figure 4-58).

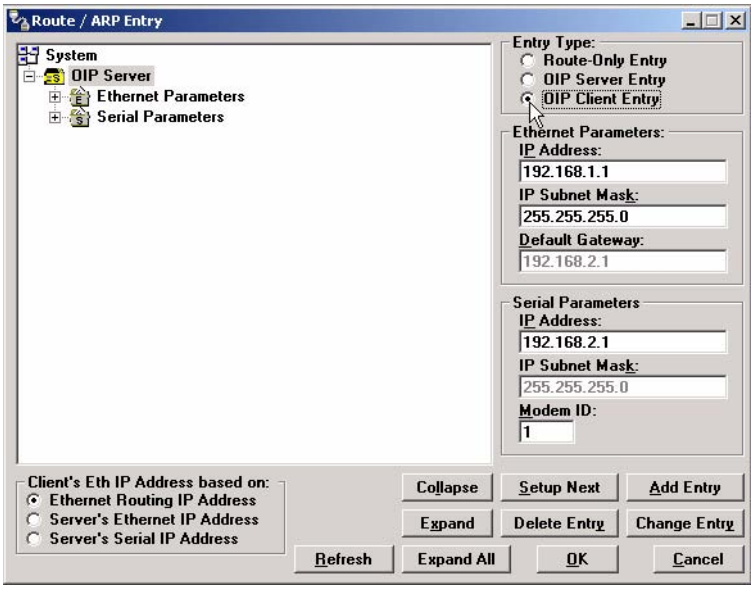


Figure 4-58 Route/ARP Entry/ OIP Client Entry

9. Choose "Setup Next" from the middle of the top row of buttons in the lower right of the screen (see Figure 4-58). The "Setup Next" button generates new IP Addresses for the Integra-IP Client in the Ethernet Parameters and Serial Parameters registers (see Figure 4-59).

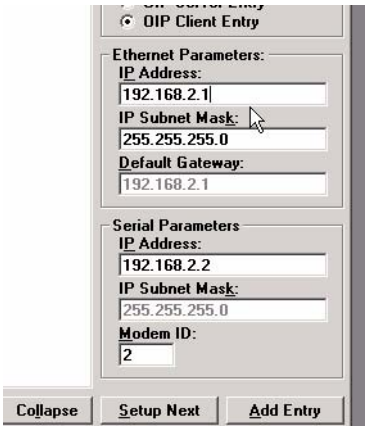


Figure 4-59 New Client Integra-IP IP Addresses for Ethernet IP and Serial IP

The Client Integra-IP's Ethernet Address - third octet was incremented by 1 to 192.168.2.1; the Serial IP's address - fourth octet was incremented by 1 to 192.168.2.2 and the Modem ID was incremented by 1 to 2. Since the Serial RF Network is located on the 192.168.2.0 network, an OIP Client cannot have an Ethernet IP Address of 192.168.2.1. The 192.168.2.0 network is reserved for the Serial RF Network nodes.

10. Change the Ethernet IP Address by clicking on the Ethernet IP Address and editing the third octet to another network not already used in the scheme (i.e., 192.168.33.1 - see Figure 4-60)

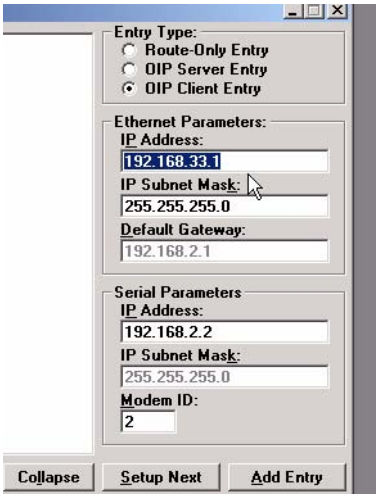


Figure 4-60 Client Integra-IP Ethernet Address Edit

11. Click on the "Add Entry" button. Integra-IP Client 1 will be added to the system configuration. To add the next Integra-IP Client, click on the "Setup Next" button. The third octet of the Ethernet IP Address, the Modem ID and the fourth octet of the Serial IP Address are incremented by 1 (see Figure 4-61).

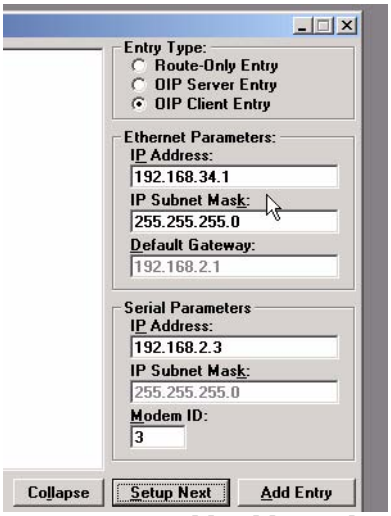


Figure 4-61 Add Additional Integra-IP Clients to System

12. Click on the "Add Entry" button to add Integra-IP Client 2 to the system configuration (see Figure 4-62).

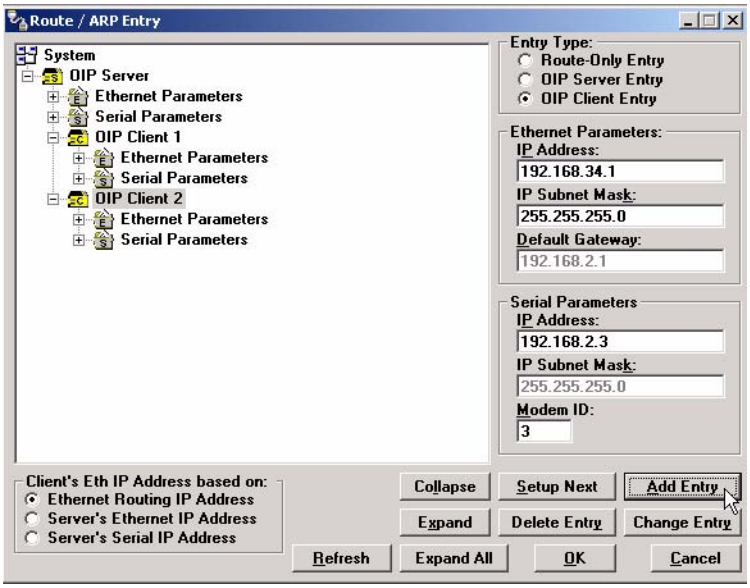


Figure 4-62 System Configuration with Integra-IP Clients

13. The “Setup Next” and “Add Entry” buttons may be used to add up to 254 Integra-IP Clients. Close the “Route/ ARP Entry” window by clicking “OK”.

Note: The user must click the “OK” button before Integra-IP Client values are loaded into the Routing and ARP tables. Integra-IP Client values must be loaded into the Routing and ARP tables before the values can be downloaded to the Integra-IP Server.

4.7.2.2 Programming Integra-IP Server with Routing/ARP Table Values

Check the Routing/ARP tables before the values are downloaded to the Integra-IP Server.

1. Click on the “Parms” button at the top of the Integra-IP Field Programming screen. Select the “Routing” tab to display the Routing Table (see Figure 4-63).

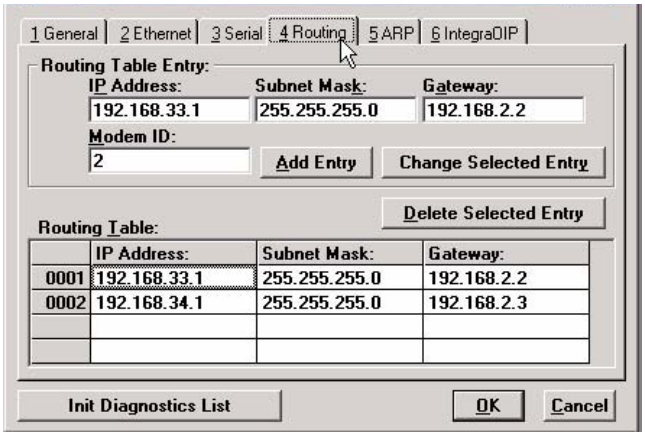


Figure 4-63 Routing Table

2. Verify each Integra-IP Client has a unique IP Address and Gateway.

3. Click on the “ARP” tab to display the ARP Table (see Figure 4-64).

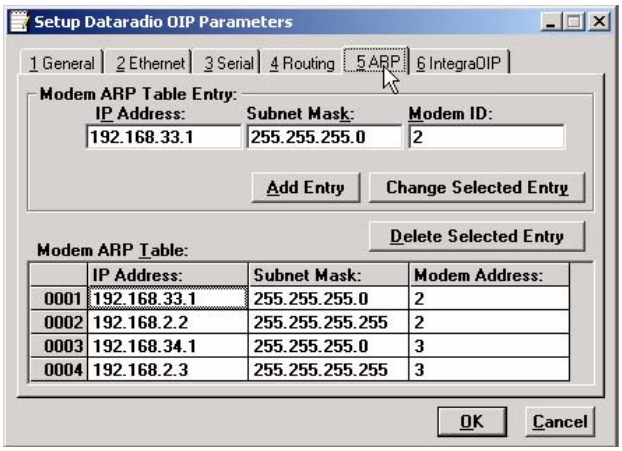


Figure 4-64 ARP Table

4. Verify each Integra-IP Client has an entry for the Ethernet IP Address and an entry for the Serial IP Address. Click "OK" to close the window.

Note: Refer to Section 4.1.1 for Integra-IP tab programming information. Take care to insure the proper frequency or frequency pairs are used for Server/Client operation. Transmit and receive frequencies must be opposite if used in pairs for Integra-IP Server/Client operation.

5. Click the "Write" button on the tool bar menu to write the Routing and ARP table values to the Integra-IP Server.

4.7.2.3 Programming the Integra-IP Client with the Clone Utility

IP Addresses, Routing and ARP Table information required by each Integra-IP Client to network with the Integra-IP Server may be downloaded to each Integra-IP Client using the Clone Utility in the Integra-IPField Programming Software.

1. Click on the "Clone" button in the tool bar to display the Clone Utility (see Figure 4-65). (The window will display the IP properties to program to the first Integra-IP Client.)

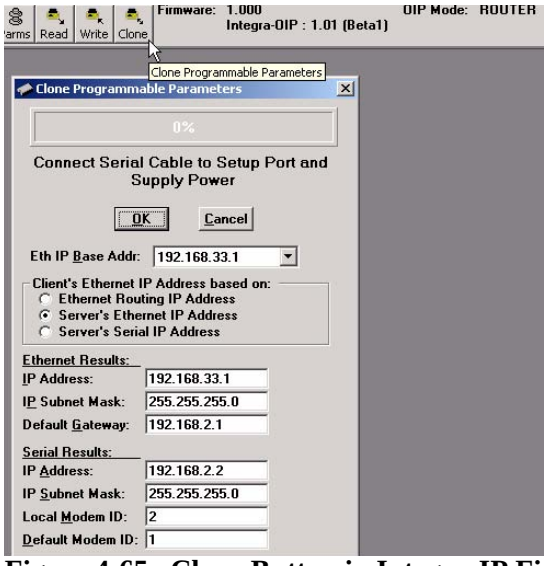


Figure 4-65 Clone Button in Integra-IP Field Programming Software

Note: Each Integra-IP Client should be labeled with its IP Address for identification during installation.

2. Connect the programming cable to the first Integra-IP Client. Click “OK” to start downloading IP parameters. The displayed parameters will be downloaded to the Integra-IP Client. When the download is completed, the Integra-IP Client properties will increment for the next Integra-IP Client (see Figure 4-66).

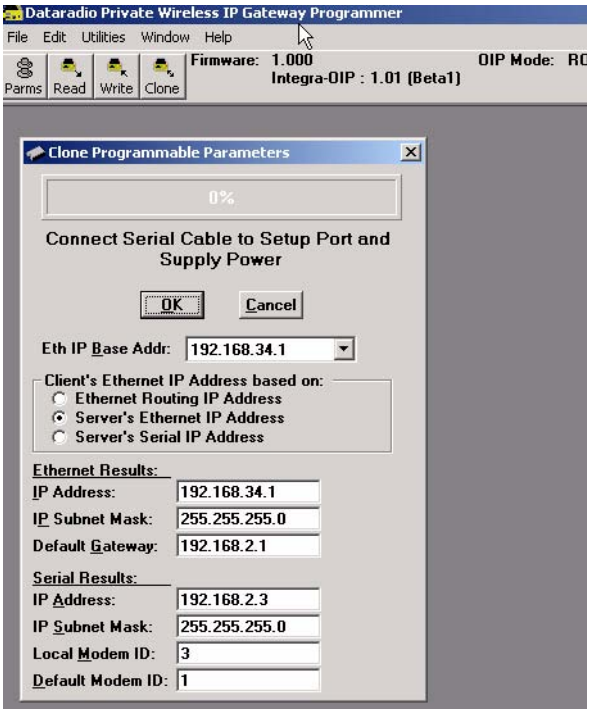


Figure 4-66 Incremented Clone Parameters

3. Disconnect the programming cable from the first Integra-IP Client and connect to the next Integra-IP Client for programming. Click “OK” to begin downloading the displayed parameters.

4. When all Integra-IP Clients have been programmed, reconnect the programming cable to each Integra-IP Client, click on the “Parms” button and verify each Ethernet IP address and Serial IP address is unique in the network. Label each unit with its IP address for installation.

NOTE: Integra-IP Clients will not have entries in the Routing or ARP tables. The Default Modem ID located on the Serial tab provides network routing for the Integra-IP Clients back to the Integra-IP Server as well as other Integra-IP Clients.

4.8 INTEGRA-IP OFFLINE DIAGNOSTICS

Offline Diagnostics are returned from a local or remote unit in response to a Get Diags request (see Figure 4-67). An Offline Diagnostics request requires suspension of user network operation.

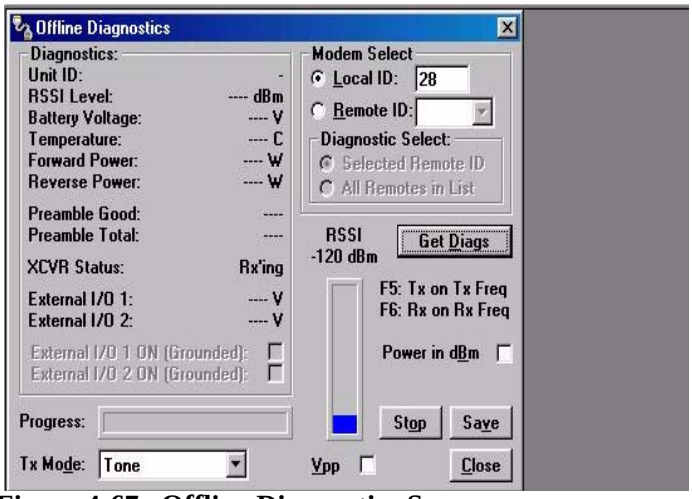


Figure 4-67 Offline Diagnostics Screen

Offline Diagnostics parameters include the following:

- Unit ID: the Short ID of the unit sending diagnostics
- RSSI Level: Received Signal Strength Indication (in dBm)
- Battery Voltage: supply voltage
- Temperature: internal case temperature (in Celsius)
- Forward Power: Forward Power (in watts or dBm)
- Reverse Power: Reverse Power (in watts or dBm)
- Preamble Good: the number of correctly decoded transmissions received in the last 15. Used with Preamble Total, this serves as an indication of how well the unit is receiving data
- Preamble Total: the number of total transmissions detected, maximum is 15. Used with Preamble Good, this serves as an indication of how well the unit is receiving data.

Local ID

The Local ID button allows the user to send commands to the local unit (the unit interfaced to the computer). The Short ID for this unit is shown.

Remote ID

The Remote ID button allows the user to send diagnostic commands to any specific remote unit and obtain its diagnostic information. The Remote ID is selected from the list of Remote IDs set up in the Diagnostic IDs and Alarms screen.

Modem Select / Selected Remote ID

This button allows the user to gather Offline Diagnostics from the selected Remote ID only.

Modem Select / All Remotes in List

This button allows the user to gather Offline Diagnostics from all the IDs in the list of Remote IDs (including the local unit).

Get Diags

The Get Diags button allows the user to send the command for Offline Diagnostics. The command is sent to the unit connected to the computer if the Local ID button is selected. The command is sent to the selected Remote ID if the Remote ID and Selected Remote ID buttons are selected. The command is sent to the list of Remote IDs if the Remote ID and Remote ID List buttons are selected.

Stop

The Stop button allows the user to stop any commands for Offline Diagnostics from being sent.

Save

The Save button allows the user to save the current Offline Diagnostics to a text file.

RSSI/Pwr

The RSSI/Pwr panel shows the current RSSI level (in dBm) while the local unit is receiving and the current Power Level (in watts or dBm) while the local unit is transmitting.

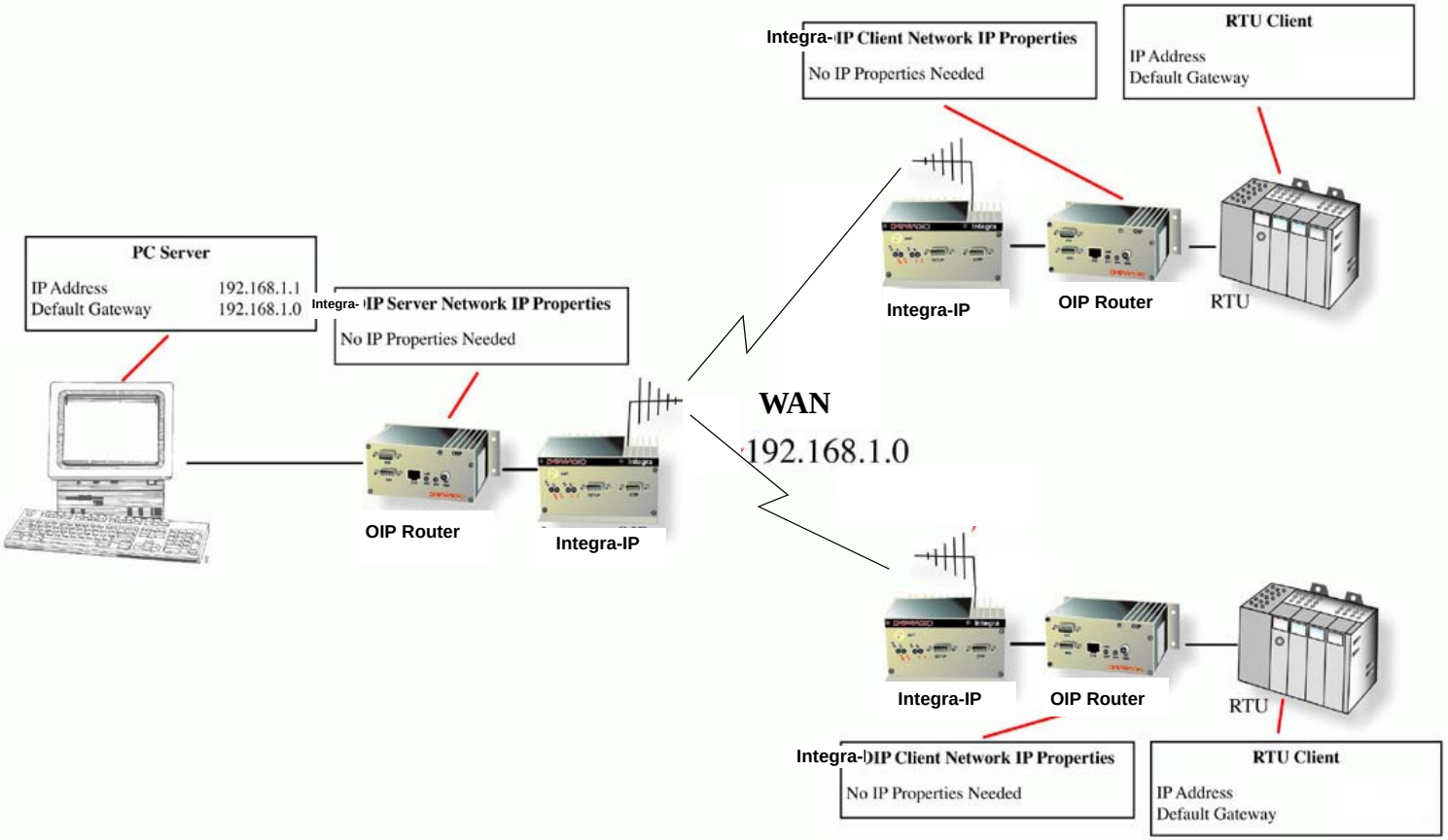
Power in dBm

This check box allow the user to view the Fwd/Rev Power in dBm (instead of watts).

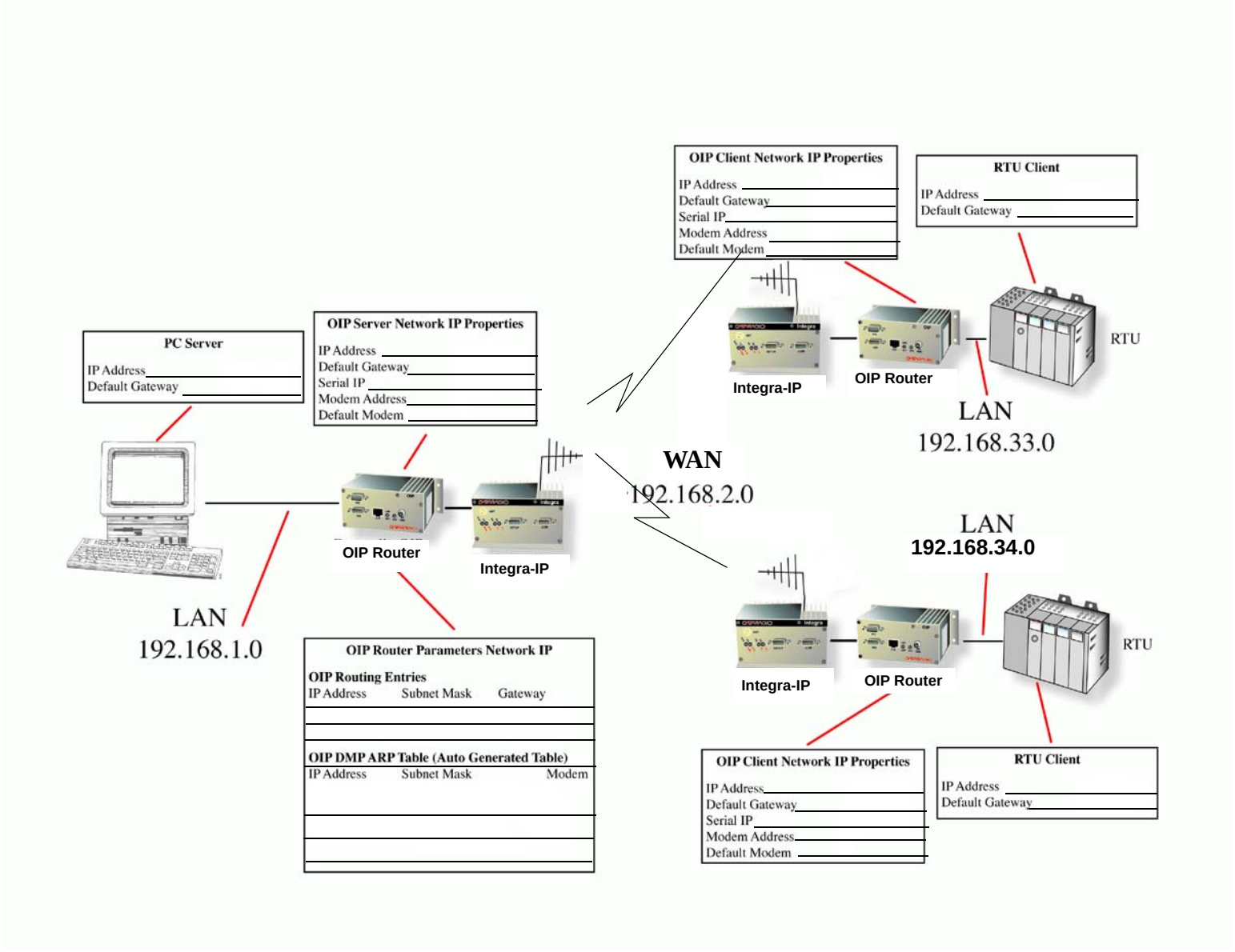
Progress

The Progress panel shows the progress of the Get Diags request.

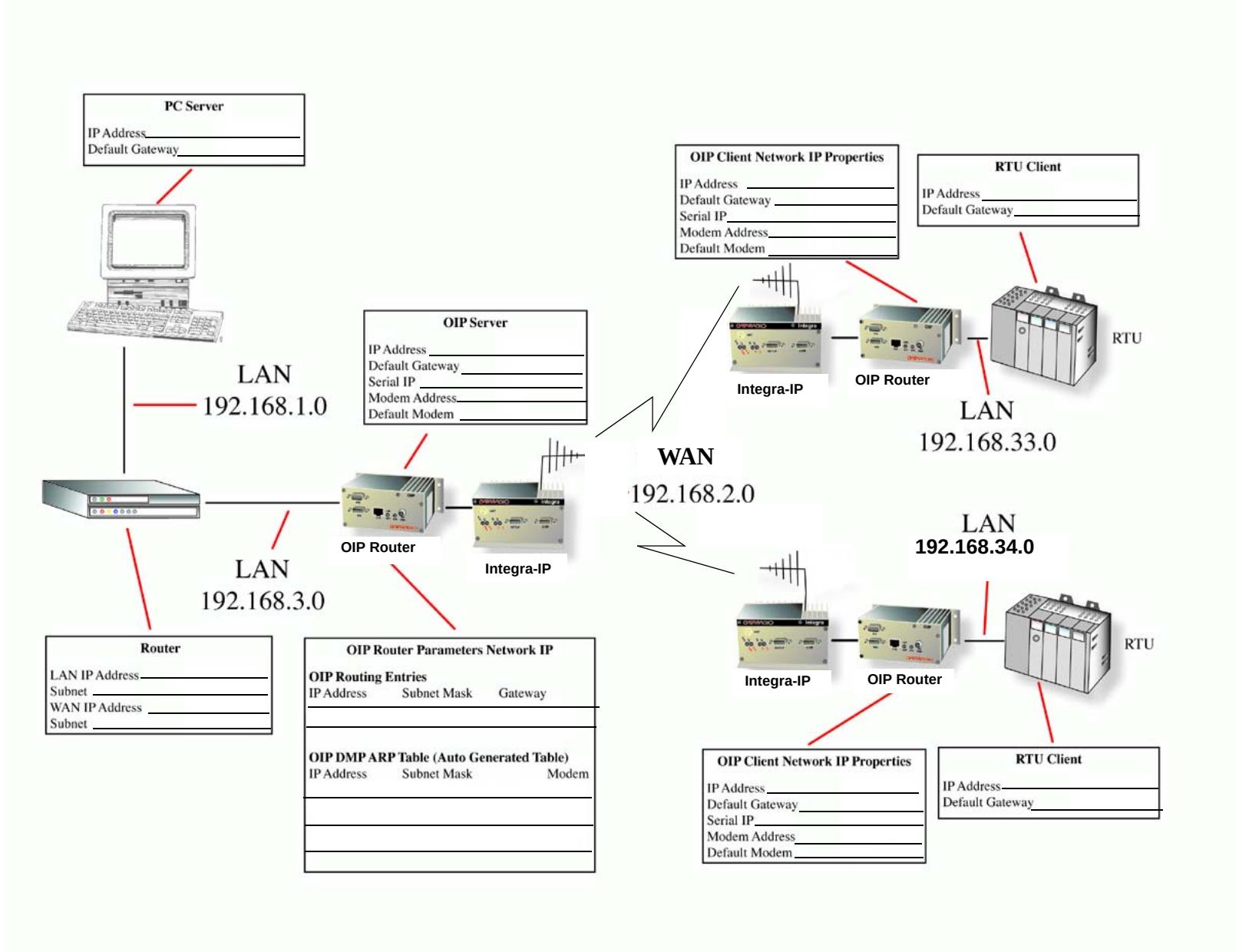
Blank Network Diagrams
Appendix A



Blank Network 1



Blank Network 2



Blank Network 3