

USER MANUAL

MODEL IM1/I4 Ethernet Bridge with Integral 4-Port Hub QuikConnect™ Module



PA PATTON
IE Electronics Co.



An ISO-9001
Certified Company

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1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model IM1/I4 components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall Patton Electronics be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product.

Patton Electronics specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

1.1 RADIO AND TV INTERFERENCE

The Model IM1/I4 generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model IM1/I4 has been tested and complies with the limits for a Class A computing device in accordance with the specification in Subpart J of Part 15 of FCC rules, that are designed to provide reasonable protection from such interference in a commercial installation. However, this is no guarantee that interference will not occur in a particular installation. If the Model IM1/I4 does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, reorienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches). In the event the user detects intermittent or continuous product malfunction due to nearby high power transmitting radio frequency equipment, the user is strongly advised to use only a shielded twisted pair data cable that is bonded to metalized external outer shield plugs at both ends. The use of a shielded cable satisfies compliance with the Electromagnetic Compatibility (EMC) directive.

1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Patton Technical Support.

1.3 SERVICE

All warranty and nonwarranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Support at: **(301) 975-1007**, <http://www.patton.com>; support@patton.com.

NOTE: Packages received without an RMA number will not be accepted.

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model IM 1/I4. Technical Support hours: **8AM to 5PM EST, Monday through Friday.**

WARNING!  This device is not intended to be connected to the public telephone network.

2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact us at: **(301) 975-1007**, <http://www.patton.com>; **support@patton.com**.

2.1 FEATURES

- Standard interface module for use in QuikConnect platform
- Integral 4-Port HUB
- Industry standard RJ-45 10Base-T connections (four)
- Transparent LAN bridging
- PPP (Point to Point Protocol RFC 1661) with Bridging Control Protocol (RFC 1638)
- 4096 MAC address table
- 1 MB RAM; 128 KB FLASH
- Throughput latency of 1 frame
- Automatic LAN MAC address aging

2.2 DESCRIPTION

The Patton **Model IM1/I4 QuikConnect™** is an Ethernet Bridge with built-in four (4) port hub. The IM1/I4 interface module provides LAN extension when used in conjunction with either the IM1/I, IM2RC/IA, or IM1/I4 modules. The module performs transparent Ethernet bridging and functions at the MAC level. As such, the module, and its communications infrastructure, is transparent to higher level protocols such as TCP/IP, DECnet, NETBIOS and IPX network protocols. Only broadcasts, multicasts, or frames destined for peered LAN are forwarded. The Model IM1/I4 is 802.3 compliant and supports PPP (RFC 1661) with Bridging Control Protocol (RFC 1638).

Once installed in the local Patton base unit, the Patton IM1/I4 works in a “plug and play” manner to forward LAN broadcasts, multicasts and frames destined for the peered Ethernet LAN at the remote end (the Patton base unit at the remote end must be equipped with an IM1/I, IM1/I4 or IM2RC/I module). Using the Patton IM1/I4, Ethernet LANs can be linked over leased 2-wire/4-wire, DDS, PCM and campus fiber circuits.

2.3 TYPICAL APPLICATION

The Model IM1/I4 QuikConnect™ is designed to plug directly into the rear of a Patton Electronics baseband modem (e.g. Model 1092A or 1095). The Model IM1/I4 is designed to be used as one of a pair of units. Figure 1 (below) illustrates a typical Model IM1/I4 installation.

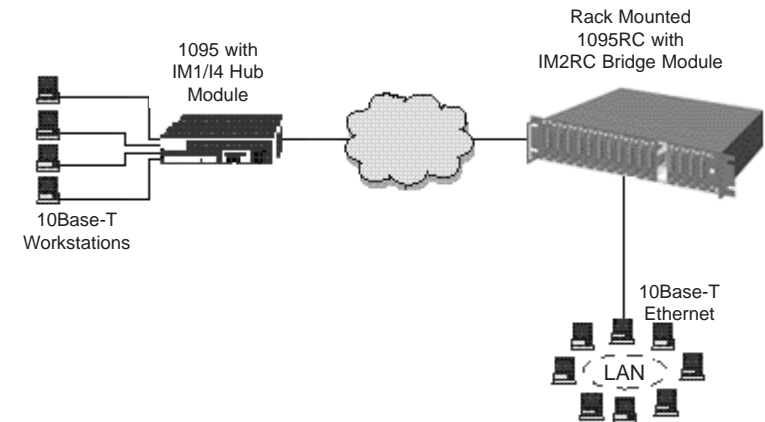


Figure 1. Typical Model IM1/I4 application

3.0 PPP OPERATIONAL BACKGROUND

PPP is a protocol used for multi-plexed transport over a point-to-point link. PPP operates on all full duplex media, and is a symmetric peer-to-peer protocol, which can be broken into three main components: 1. A standard method to encapsulate datagrams over serial links; 2. A Link Control Protocol (LCP) to establish, configure, and test the data-link connection; 3. A family of Network Control Protocols (NCPs) to establish and configure different network layer protocols.

In order to establish communications over a point-to-point link, each end of the PPP link must first announce its capabilities and agree on the parameters of the link's operation. This exchange is facilitated through LCP Configure-Request packets.

Once the link has been established and optional facilities have been negotiated, PPP will attempt to establish a network protocol. PPP will use Network Control Protocol (NCP) to choose and configure one or more network layer protocols. Once each of the network layer protocols have been configured, datagrams from the established network layer protocol can be sent over the link. The link will remain configured for these communications until explicit LCP or NCP packets close the link down, or until some external event occurs.

The PPP Bridging Control Protocol (BCP), defined in RFC 1638, configures and enables/disables the bridge protocol on both ends of the point-to-point link. BCP uses the same packet exchange mechanism as the Link Control Protocol (LCP). BCP is a Network Control Protocol of PPP, bridge packets may not be exchanged until PPP has reached the network layer protocol phase.

3.1 Applications

In situations where a routed network requires connectivity to a remote Ethernet network, the interface on a router can be configured as a PPP IP Half Bridge. The serial line to the remote bridge functions as a Virtual Ethernet interface, effectively extending the routers serial port connection to the remote network. The bridge device sends bridge packets (BPDU's) to the router's serial interface. The router will receive the layer three address information and will forward these packets based on its IP address.

Figure 2 shows a typical Cisco router with a serial interface configured as a PPP Half Bridge. The router serial interface uses a remote device that supports PPP bridging to function as a node on the remote Ethernet network. The serial interface on the Cisco will have an IP address on the same Ethernet subnet as the bridge.

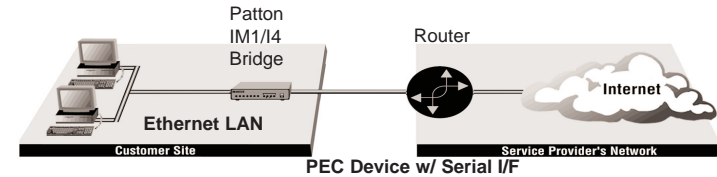


Figure 2. Cisco router with serial interface, configured as PPP Half Bridge.

For example, the customer site is assigned the addresses 192.168.1.0/24 through 192.168.1.1/24. The address 192.168.1.1/24 is also the default gateway for the remote network. The above settings remove any routing/forwarding intelligence from the CPE. The associated Cisco configuration will set serial interface (s0) to accommodate half bridging for the above example.

Authentication is optional under PPP. In a point-to-point leased-line link, incoming customer facilities are usually fixed in nature, therefore authentication is generally not required. If the foreign device requires authentication via PAP or CHAP, the PPP software will respond with default Peer-ID consisting of the units Ethernet MAC address and a password which consists of the unit's Ethernet MAC address.

Some networking systems do not define network numbers in packets sent out over a network. If a packet does not have a specific destination network number, a router will assume that the packet is set up for the local segment and will not forward it to any other sub-network. However, in cases where two devices need to communicate over the wide-area, bridging can be used to transport non-routable protocols.

Figure 3 illustrates transparent bridging between two routers over a serial interface (s0). Bridging will occur between the two Ethernet Interfaces on Router A (e0 and e1) and the two Ethernet Interfaces on Router B (e0 and e1).

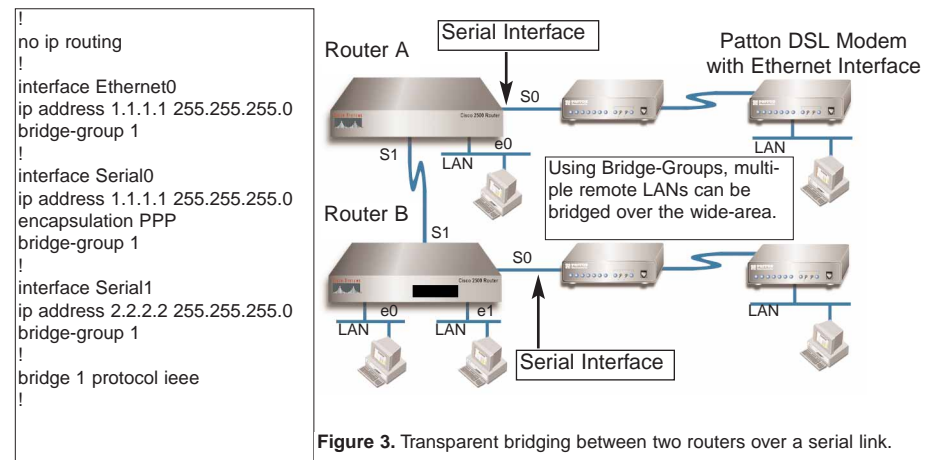


Figure 3. Transparent bridging between two routers over a serial link.

3.0 CONFIGURATION

The Model IM1/14 module plugs into Patton's fiber and copper baseband modems to provide Ethernet LAN extension. The IM1/14 has no switches or jumpers and does not need to be configured. However, factors such as type of medium, throughput across the link and clocking mode must be determined by the settings of the baseband modems. Please refer to your baseband modem (i.e. 1092A, 1095, etc) to make the following settings.

- 1) **Bit Rate:** The DTE rate setting of your base unit corresponds to the throughput of your IM1/14 bridge module. Use higher speeds to allow maximum throughput to your extended LAN.

NOTE: The IM1/14 only supports synchronous speeds.

- 2) **Clocking Mode:** Set the clocking modes on the base units so that one unit is configured for Internal clocking mode and the other unit is set for Receive Recover clocking mode.

BASE UNIT CLOCK MODES	
Unit "A"	Unit "B"
Internal Clock Setting	Receive Recover Clock Setting
NOTE: Unit "A" and Unit "B" are arbitrarily chosen. It does not matter which unit is "A", and which is "B".	

- 3) All other base unit settings depend upon your application and on the application medium (twisted pair or coaxial cable)

4.0 INSTALLATION

The Model IM1/I4 is completely plug and play. This section tells you how to make the connections.

4.1 INSTALLING THE QUICKCONNECT™ MODULE

Each Quick Connect Module™ has a 50-pin card edge connector on one side and an ethernet interface on the other. The instructions below describe how to remove the existing QuickConnect™ Module and how to install the new IM1/I4 module. If your base unit does not have an existing QuickConnect™ already installed, please skip to section 4.1.2.

4.1.1 Removing the Existing QuickConnect™ Module

- 1) Turn the power switch off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.
- 2) Loosen the two thumbscrews on the module by turning them counterclockwise.
- 3) Grasp the two thumbscrews and gently pull the module from the unit. Apply equal force to the thumbscrews to keep the module straight during the removal process

4.1.2 Installing the New QuickConnect™ Module

- 1) Make sure the power switch on the base unit is off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.
- 2) Hold the module with the faceplate toward you and align the module with the guide slots in the rear panel of the base unit.
- 3) While keeping the module's faceplate parallel with the base unit rear panel, slide the module straight in—so that the card edge contacts line up with the socket inside the chassis. Figure 4 (below) shows how a Quick Connect Module plugs into the rear of the base unit.

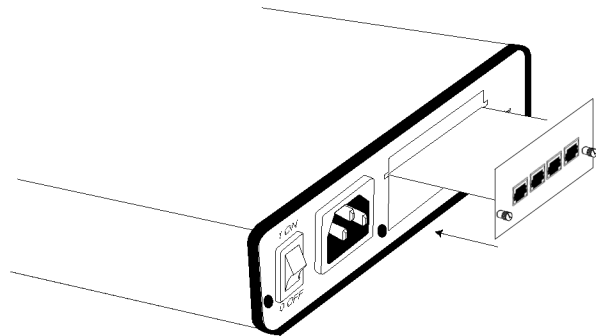


Figure 4. Installation of Model IM1/I4 Plug-in Serial Interface Module

NOTE: The card edge connector should meet the socket when it is almost all the way into the chassis. If you encounter a lot of resistance, remove the module and repeat steps 2 & 3.

- 4) With the card edge contacts aligned with the socket, firmly seat the module by using your thumbs to apply pressure directly to the right and left edges of the module faceplate. Applying moderate and *even* pressure should be sufficient to seat the module. You should hear it “click” into place.
- 5) To secure the module in place, push the thumbscrews into the chassis and turn the screws clockwise to tighten.

4.2 CONNECTING TO THE 10BASE-T ETHERNET PORT

The RJ-45 Ethernet port on Model IM1/I4 is designed to connect directly to a 10BaseT network. Figure 5, below, shows the 10BaseT RJ-45 port pin description. You may make connections up to 330 feet using Type 4 or 5 cable.

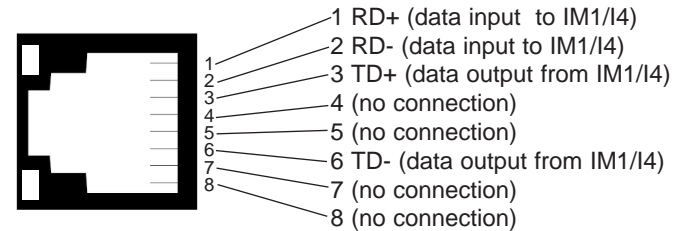
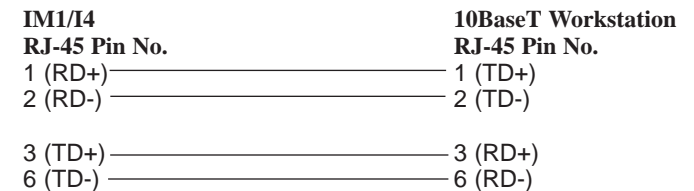


Figure 5. 10BaseT RJ-45 Port Pin Description

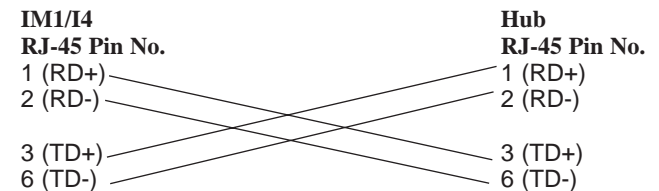
4.2.1 Connecting the Hub Ports to Workstations

The Model IM1/I4 10Base-T hub interfaces are configured as DCE (Data Circuit Terminating Equipment). Therefore, it “expects” to connect to a 10Base-T workstation using a straight-through RJ-45 cable. Use the diagram below to construct a cable to connect the IM1/I4 to a workstation.



4.2.2 Connecting the Hub Ports to a Hub (DCE)

The Model IM1/I4 10Base-T interface is configured as DCE (Data Circuit Terminating Equipment). If you wish to connect the IM1/I4 10Base-T ports to another hub (or a 10Base-T port that “looks like” a hub), refer to the diagram below to construct a 10Base-T “crossover” cable.



4.3 CONNECTION TO THE LINE INTERFACE MEDIA

Instructions for connecting the line interface media (twisted pair, or fiber optic cable) are contained within the base unit user manual. Please refer to the base unit manual for connection details.

4.4 CONNECTING TO AC OR DC POWER

Instructions for connecting the power supply (**Universal Interface AC Power Supply** and **DC Power Supply** option) are contained within the base unit user manual. Please refer to the base unit manual for connection details.

WARNING! The Model IM1/I4 interface card has been specifically designed to work with UI and DC versions of Patton Electronics base units. Use with 120/230VAC versions could result in damage to the unit. If you are unsure of your base unit power supply, please contact Patton Electronics technical support at (301) 975-1007 or at support@patton.com.

5.0 OPERATION

Once the Model IM1/14 is installed, it should operate transparently. This sections describes power-up, general operating instructions, and the LED status monitors.

5.1 OPERATING INSTRUCTIONS

In order to operate, the Model IM1/I4 must be installed in the base unit. It also requires a 10Base-T connection. After power is applied, the IM1/I4 automatically starts performing the bridging function without further user intervention. MAC addresses discovered are automatically loaded into the MAC address table. They are automatically deleted from the MAC address table if they experience an inactivity of 8 minutes.

5.2 POWER-UP

Before applying power to the IM1/I4, please be sure it is properly installed in the base unit. Then make sure that unit is connected to the appropriate power source (**Universal Interface AC Power Supply** or **DC Power Supply**). Then power-up the base unit using the rear power switch .

5.3 LED STATUS MONITORS

The Model IM1/I4 features two LEDs that monitor general operating status and the 10Base-T twisted pair link integrity. Figure 6 (below) shows the LEDs located directly beneath the RJ-45 jack. Following Figure 6 is a description of each LEDs function.

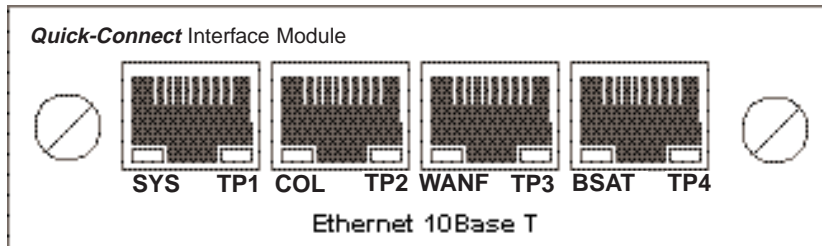


Figure 6. Model IM1/I4 Panel Showing RJ45 Jacks and LEDs

SYS [Yellow] - Pulses on to indicate one of eleven conditions. They are as follows:

- 1 Pulse = Status OK
- 2 Pulses = Detected No LAN Source MAC Addresses
- 3 Pulses = Detected No WAN CTS or DCD Signal
- 4 Pulses = Detected Buffer Saturation
- 5 Pulses = Detected WAN Receive Frame(s) Too Large
- 6 Pulses = Detected WAN Receive Frame(s) Not Octet Aligned
- 7 Pulses = Detected WAN Receive Frame(s) Aborted
- 8 Pulses = Detected WAN Receive Frame(s) With Bad CRC
- 9 Pulses = Detected LAN Receive Frame(s) Too Large
- 10 Pulses = Detected LAN Receive Frame(s) Not Octet Aligned
- 11 Pulses = Detected LAN Receive Frame(s) With Bad CRC

A given status code will be displayed 8 times until another status code will be displayed. The unit will check all status conditions attempting to indicate as many status codes as possible in sequential order. After a status code is displayed 8 times and the associated condition is removed the status code will no longer appear.

TP1 [Green] - On indicates that port 1 is receiving link integrity or a packet.

COL [Yellow] - On pulse indicates that collisions are detected in the LAN.

TP2 [Green] - On indicates that port 2 is receiving link integrity or a packet.

WANF [Yellow] - On indicates that a WAN failure has occurred. A WAN failure is defined to be any of the following:

- No WAN CTS or DCD Signal
- WAN Receive Frame(s) Too Large
- WAN Receive Frame(s) Not Octet Aligned
- WAN Receive Frame(s) Aborted
- WAN Receive Frame(s) With Bad CRC

The **WANF** LED is on while the condition(s) persist. After all conditions are removed the **WANF** LED continues to be on for 60 seconds after the failure condition(s) are represented on the **SYS** LED.

TP3 [Green] - On indicates that port 3 is receiving link integrity or a packet.

BSAT [Yellow] - On indicates that all buffer memory reserved for user data has been saturated (used up). This condition may exist for only a brief moment and is completely recoverable. After the buffer saturation condition is removed the **BSAT** LED continues to be on for 60 seconds after the buffer saturation condition is represented on the **SYS** LED.

TP4 [Green] - On indicates that port 4 is receiving link integrity or a packet.

**APPENDIX A
PATTON MODEL IM1/I4 SPECIFICATIONS**

LAN Connection:	RJ-45, 10Base-T, 802.3 Ethernet
Protocol:	PPP (RFC 1661) with Bridging Control Protocol (RFC 1638)
MAC Address Table Size:	4096 entries
MAC Address Aging:	MAC addresses deleted after 8 minutes inactivity
On-board Memory:	1 MB RAM; 128 KB FLASH
Frame Latency:	1 frame
Interface:	card-edge connection to QuikConnect™ port on Patton base unit
Base Unit Compatibility:	1092, 1092A, 1093, 1094, 1094A, 1095, 1184, and 1185
LED Indicators:	SYS, TP1, COL, TP2, WANF, TP3, BSAT, and TP4
Power Supply:	+5 Volts @ 510 mA supplied to module by connection to Patton QuikConnect interface
Temperature Range:	32 to 122°F (0 to 50° C)
Dimensions:	2.9" x 3.2" (7.4 cm x 8.1 cm)
Weight:	0.25 lb (0.11 kg)

**APPENDIX B
IM1/I4 INTERFACE PIN ASSIGNMENT**

**10BASE-T Interface Pin Description
(RJ-45 Female Connector)
(Hub Configuration)**

<u>Pin #</u>	<u>Signal</u>
1	RD + (data input to IM1/I4)
2	RD - (data input to IM1/I4)
3	TD + (data output from IM1/I4)
4	no connection
5	no connection
6	TD - (data output from IM1/I4)
7	no connection
8	no connection

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