Spectrum24 CB 2000
For
IBM 4690 Terminals
User Guide

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Document Revisions

Version 1.0 Initial Version

Reference Documents

This user's guide refers to the following documents:

- Symbol Spectrum24 CB2000 Product Reference Guide INF-CB1000-01 72E-59814-01 Revision A October 2002
- Symbol Spectrum24 High Rate CB2000 Client Bridge Quick Install Guide 72-58573-01 Revision A
- Symbol Spectrum24 AP-4131 Access Point Product Reference Guide 72E-56316-01
- Symbol Spectrum24 AP-4121 HR Access Point Product Reference Guide 70E-20688-03 Revision A June 2000
- 4690WIRELESS.PDF – 4690 Wireless Terminal Tips. A support document on the IBM Retail Knowledgebase containing tips and information for installing 4690 Wireless Terminals of the 4694 family and SurePOS 7x0 family for use with the 4690 Operating System (4690 OS). November 2002.

Introduction

The Spectrum24 High Rate CB2000 Client Bridge from Symbol Technologies is a wireless network bridge allowing up to four devices to connect to a Wi-Fi IEEE 802.11b wireless local area network (LAN), or communicate with other mobile devices enabled for wireless LAN connectivity.

This document contains tips and recommendations for installing the CB2000 Client Bridge in an IBM 4690 POS environment. Use it as a supplement to the CB2000 Product Reference Guide and the CB2000 Client Bridge Quick Install Guide.

CB 2000 Specifications

CB 2000 Client Bridge

Spectrum24® Wireless LAN
IEEE 802.11b, 11 MBPS, Direct Sequence

Wi-Fi™ Wireless Connectivity for Printers, Cash Registers, PCs, Manufacturing and Medical Equipment and More

The Spectrum24 CB 2000 Client Bridge from Symbol Technologies connects Ethernet-enabled devices to your Spectrum24 802.11b or other Wi-Fi certified wireless LAN.

It plugs into the RJ-45 port of printers, scales, medical equipment, manufacturing machinery, time clocks, point-of-sale, and other devices without a PC or PCI card slot. You gain convenient, easy-to-deploy wireless network connectivity for your productivity and application critical devices. At the same time, you can move equipment without the cost and time associated with wired network drops, providing flexibility for seasonal requirements, line and staffing changes, and more.

Cost-Effective, Easy to Use and Manage

A single CB 2000 cost-effectively connects up to four client devices. Little or no configuration is required for true plug-and-play wireless connectivity right out of the box. An internal web server enables configuration and management from any standard Web browser. And a firmware upgrade utility enables new features to be added easily, protecting your investment.

The sleek and compact industrial design features an integrated radio and internal antenna. Data is transmitted up to a fast 11 Mbps with a range of 1,500 ft./450 m.

Secure Data Transmission

The CB 2000 supports security to meet your application and device requirements:

- WEP encryption at 40- and 128-bits
- Symbol's implementation of the industry-standard Kerberos V5 protocol, providing enhanced data protection. Kerberos is easy to implement, operating system and application independent, and provides maximum security for mobile environments.

A Wide Range of Applications—and Benefits

With the CB 2000, you can quickly and easily arrange assembly lines and shop floors. Retailers can wirelessly connect point-of-sale terminals, enabling quick and easy networking changes for seasonal and floor layout requirements—without the expense and time of re-wiring. Hospitals can provide connectivity for monitoring and other equipment placed on roving carts. And office environments can be configured to support changing work groups and staffing requirements.

End-to-End Wireless Mobility

Only Symbol offers a complete range of wireless networking products—access points, client connectivity cards, ruggedized mobile voice and data devices and network management software as well as wireless mobility planning and deployment services—delivering high-performance mobility solutions to companies across industries, around the world. Let Symbol help you realize your end-to-end wireless mobile computing strategy for the optimal capture, computing, and communication of data crucial to the success of your business.

The Spectrum24 CB 2000—the flexible, affordable solution for instant wireless connectivity for Ethernet devices throughout your enterprise. To learn more about Symbol's wireless solutions, visit www.symbol.com/wireless.

Features	Benefits
IEEE 802.11b compliant	Interoperable standards-based wireless networking
Easy configuration	The flexibility to meet changing application requirements

CB 2000 Client Bridge Specifications

Physical Characteristics	
Physical Dimensions:	4.29 in. L x 3.24 in. W x 1.52 in. D/109 mm L x 82 mm W x 39 mm D
Interfaces:	Ethernet Interface: RJ-45 10BASE-T; 802.11b (2.4 GHz DSSS)
Security:	Kerberos V5 open security standard; 40 and 128-bit WEP encryption
Protocol Support:	Protocol Support:
Network Management:	Embedded Web server; remote configuration (if required); visible by SNMP management tools

Network Management:	Embedded Web server; remote configuration (if required); visible by SNMP management tools
Standards:	IEEE 802.11b; IEEE 802.3; IEEE 802.1d; HTTP

Compatibility

Supported Devices:	Windows-based PCs equipped with Ethernet cards; point-of-sale devices; network printers; thin clients; Mac/Apple machines; Linux/Unix workstations; Ethernet-enabled appliances; and/or mix of all devices listed

Radio Characteristics

Frequency Range:	Worldwide product covering 2.4 to 2.5 GHz, programmable for different country regulations
Data Rate:	11 Mbps per Channel maximum; rate scaling to 1 Mbps, 2 Mbps, 5.5 Mbps for optimum throughput
Institute of Electronics and Engineering Standards:	IEEE 802.11b
Modulation:	Direct Sequence Spread Spectrum with BPSK (1 Mbps), QPSK (2 Mbps), and CCK (5.5 and 11 Mbps)
Range:	Up to 1,500 ft./450 m in open environment

Regulatory

Electrical Safety:	UL1950/CSA 22.2; CE
Radio:	FCC Part 15B

Specifications are subject to change without notice.

For system, product or services availability and specific information within your country, please contact your local Symbol Technologies office or Business Partner.
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CB-1000 vs. CB-2000

The CB-2000 is a more cost effective solution for connecting Ethernet-enabled devices to your Spectrum24 802.11b or other Wi-Fi certified LAN. In addition, the CB-1000 offers serial connectivity, and 802.11 FH or 802.11b support. Here's a comparison of CB-1000 and CB-2000 major features.

	CB-1000	**CB-2000**
Spectrum24 2 Mbps Frequency Hopping Support	Yes	No
Spectrum24 High Rate 11 Mbps Direct Sequence Support	Yes	Yes
IEEE 802.11b compliant	Yes	Yes
Kerberos V5 Open Security Standard based on the Network Authentication Protocol developed by MIT	Future	Yes
2.4 to 2.5 GHz band	Yes	Yes
Radio Format	PCMCIA Card	Integrated
IBM 4690 RPL Support	Yes	Yes
Number of client devices	1	1-4
Serial Support	Yes	No
Support for International Roaming	Yes	Yes
Size	6.20 in. L x 3.90 in. W x 1.00 in. H/ 157 mm x 99 mm x 25 mm	4.29 in. L x 3.24 in. W x 1.52 in. D/ 109 mm x 82 mm x 39 mm
Wide temperature range and robust mechanical design	Yes	Yes
Easy configuration	Yes	Yes
Configuration	Via Windows UI or Hyperterm or Telnet Server	Via Embedded Web

Supported Platforms

With 4694's and SurePOS 700 terminals, the CB-2000 is plug compatible with a CB-1000/11MB 802.11B radio. The CB-2000 works on any IBM 4690 OS platform that supports the CB-1000. In addition, the CB-2000 supports 1-4 terminals and the Kerberos Security Standard.

The CB-1000 is supported on the following levels of the 4690 Operating System:

- 4690 OS Version 2, Release 3, CSD 01B0, Generally Available May 28, 2001.
- 4690 OS Version 2, Release 4, CSD 01H0, Generally Available June 1, 2001.
- IBM's Distributed Data Services with the Controller Services Feature (DDS/CSF)
  - Version 2.0.1.0, Generally Available October 2001. Efix 2.0.1.1 is recommended. Note: A version of 4690 with CB-1000 support is a pre-requisite.
- 4690 OS Version 3, Release CSD 0200

The latest 4690 OS levels are available through IBM's web page http://www2.clearlake.ibm.com/store/. Contact IBM for more information.

The CB-1000 and CB-2000 were successfully tested with the following IBM Terminals:

- SurePOS 730 and 750
- 4694-1x4
- 4694-1x6
- 4694-2x5
- 4694-244
- 4694-2x6
- 4694-2x7
- 4694-3x7

The CB-2000 firmware version 1.31 or later supports loading IBM 4694 and SurePOS 700 terminals. If the IBM POS terminal loads via the IBM RPL protocol, the CB-2000 "POS Setup" option under advanced wireless network configuration must be set to ON.

If the IBM POS terminal loads via the PXE protocol, the CB-2000 "POS Setup" option under advanced wireless network configuration should be set to OFF.

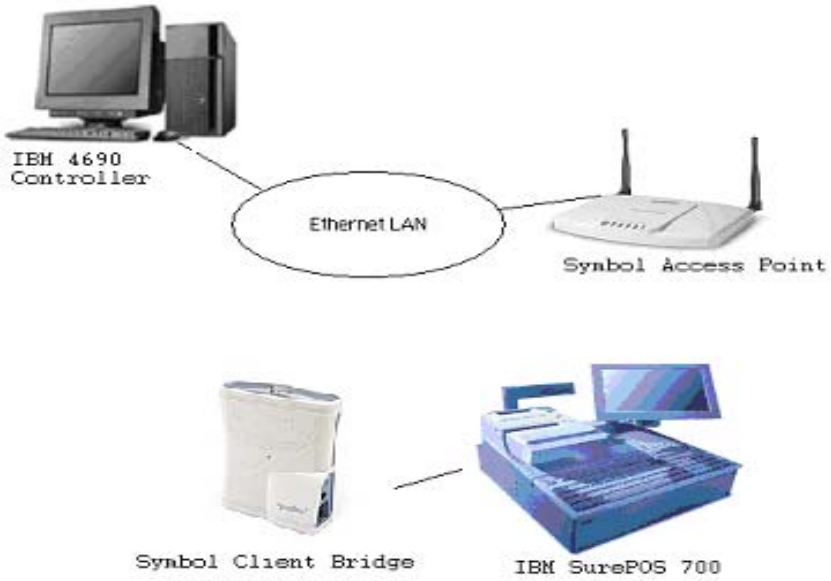
The CB-2000 was successfully tested with the following Access Point and operating modes:

- 802.11b 11 Mbps DS Network
  - Symbol Spectrum24 11 Mbps Ethernet Access Point (PN AP-4121)
  - Symbol Spectrum24 11 Mbps Ethernet Access Point (PN AP-4131)
- Operating Modes
  - Open System
  - Shared Key Enabled (128 bit keys) and Kerberos not active
  - Shared Key Enabled (128 bit keys) and Kerberos active
  - Shared Key Disabled and Kerberos active

NOTE: The SurePOS 300, 500, and 600's are Windows based terminals with the operating system installed on a hard disk. The CB-2000 or the CB-1000 will support these terminals. If the terminal has a PCMCIA slot, a Symbol S24 PCMCIA card with the correct drivers will work.

Token Ring environments are not officially supported. However, a CB-2000 will work in an IBM 4690 OS Token Ring environment if a translational (MAC level) TR-Ethernet bridge is used to connect an Ethernet LAN with the Symbol AP's to the POS Token Ring.

Diagram



In this diagram, the IBM SurePOS 700 connects to the Symbol CB-2000 through an Ethernet cable. The CB-2000 contains a WiFi 802.11b radio with an internal antenna. The CB-2000 transmits messages wirelessly to the Symbol Access Point, which forwards the messages to the IBM 4690 Controller over the Ethernet LAN.

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Configuration

Converting an Ethernet based 4694 or SurePOS terminal to a wireless terminal requires a few steps as described below.

- Access Point Setup - Configuring the Access Point
- Client Bridge Setup - Configuring the Adapter/radio
- Terminal Setup - Configuring the terminal for wireless communications
- Controller Setup - Configuring logical names for application and performance.

Access Point Setup

Both Symbol 802.11 and 802.11b Access Points are supported. The following fields must be configured prior to installation in the retail environment.

- The Net_ID (ESS) must be defined.
- The Multicast Mask (d) must be set to 03000004.
- Symbol strongly recommends enabling Kerberos or WEP (encryption).

This can be done through the Access Point's User Interface (UI). The UI is a maintenance tool integrated into the AP. It provides statistical displays, AP configuration options and firmware upgrades. Access to the UI requires one of the following:

- TCP/IP Telnet Client
- Direct Serial Connection
- Dial Up Access
- SNMP Using a MIB Browser
- Web Browser

Refer to the Access Point Reference Guide for more details. The instructions below describe Configuring the parameters using the Direct Serial Connection.

Assuming the UI and serial port are enabled on the AP:

1. Attach a null modem serial cable from the AP to the terminal or PC serial port.
2. From the terminal, start the communication program, such as HyperTerminal for Windows.
3. Select the correct COM port along with the following parameters.

emulation	ANSI
baud rate	19200 bps
data bits	8
stop bits	1
parity	none

flow control none
There is no password requirement to view the Main Menu or statistics.

4. Press ESC to refresh the display. The AP displays the Main Menu.
5. From the Main Menu, Select Enter Admin Mode and enter the password. The default password is Symbol.
   Note: The password is case-specific. The entry will change to Exit Admin Mode if successful.
6. Enter the Net_ID (ESS).
   a. From the UI Main Menu, select AP Installation.
   b. Tab to Net_ID (ESS).
   c. Enter a unique value (1-32 alphanumeric characters, case sensitive) and press Enter twice.
7. Enter the Multicast Mask (d).
   a. From the UI Main Menu, select "Set RF Configuration".
   b. Tab to Multicast Mask (d).
   c. Enter 03000004.
   d. Press Enter twice to enter the configuration value.
8. Save the configuration.
   a. From the UI Main Menu, select Special Functions
   b. Tab to Save Configuration and press Enter.
   c. At the prompt “Are you sure? yes no”, press y to save.
9. Power the Access Point off and then on to reset.
10. Connect the Access Point to the IBM 4690 Controller’s Ethernet LAN.

Client Bridge Setup

The following setup is required prior to installation in the retail environment.

- Set the Wireless LAN Service Area (ESSID) to match the Net_ID (ESS) on the AP. ESSID is case sensitive.
- Set “POS Setup” to “On” in the Client Bridge’s Advanced Wireless Network options.
  - Notes:
    - CB-2000 firmware version 1.31 or later is required.
    - Symbol 802.11b networks are supported.
    - The security selected on the CB2000 must match the security that is available on the AP. Symbol strongly recommends enabling WEP (encryption) or Kerberos for security.

The Spectrum24 CB2000 Device Manager is an administration tool to select Spectrum24 CB2000 devices and launch their configurations in the Web browser. To configure a CB2000, the Device Manager is required to be installed on a computer that has an Ethernet adapter and is running one of the Windows operation systems and a Web browser listed in the Symbol CB2000 Client Bridge Quick Install Guide.

If the IP address of the unit is known, the user can browse to it from another computer on the same subnet without use of the Device Manager.

The Device Manager can display multiple CB2000s on a subnet as well as the properties of each one. Click on the Configure button to open a Web browser used for device configuration.

For Device Manager installation, more CB2000 configuration details, or instructions on updating the CB firmware, refer to the Symbol CB2000 Client Bridge Quick Install Guide and the Symbol Spectrum24 CB2000 Client Bridge Product Reference Guide.

The instructions below describe configuring the parameters using the Device Manager and a Web browser.

1. Install the Device Manager on a Windows PC.
2. Connect the CB2000 directly to a Windows PC with an Ethernet Cable.
3. Power on the CB2000.
4. Start the Device Manager on the Windows PC.
5. In the Wireless Network Tree, select the device to configure.
    a. If more than one wireless LAN device appear in the tree, determine the right one by clicking Properties and checking the MAC address (serial number, located on the bottom of the device) to verify the correct device.
6. Click Configure.
7. If the selected device is on a different subnet, the Pre-IP Configuration Wizard is activated automatically. Use this wizard to configure the IP setting for the selected CB2000. It proposes IP address and subnet mask setting derived from the computer's settings, so the selected device resides on the same subnet as the computer. Accept the suggested settings or change them as required. For more information, see "Using the Pre-IP Configuration Wizard" in the Spectrum24 CB2000 Client Bridge Product Reference Guide.
8. The next window prompts for an administrative password to allow the new IP address to be set. When the units are shipped from the factory, there is no administration password. Set an administration password and click Next. The Configuration Management System main page appears in the Web browser.
9. Verify the CB2000 firmware is 1.31 or later. The System Summary option under System Status reports the Firmware Version. If not 1.31 or later, obtain the latest firmware from Symbol and update the unit. Go to the Symbol Technology Website at http://www.symbol.com/services/downloads/dwnload_spec24_select.html to download firmware updates, drivers, tools, and documentation. For details on updating the firmware, refer to the Spectrum24 CB2000 Client Bridge Product Reference Guide's section on Upgrade System.
10. Enter configuration parameters necessary for communicating with the network. See online help and the Spectrum24 CB2000 Client Bridge User Guide for additional information on setting and changing configuration settings.
    a. Under System Properties
        i. Enter a Device Name and Location to identify the CB2000.
        ii. Click "Apply All Changes" to save your settings.

b. Under Wireless Network
    i. Set Network Mode to “Access Point (Infrastructure)”
    ii. Set the Wireless LAN Service Area to match the Net_ID (ESS) on the AP.
    iii. Channel Selection: When the network mode is Access Point (Infrastructure), this option is set to “Automatically select the best channel”.
    iv. Antenna Selection: The Workgroup Bridge contains two internal antennas, used by default (the Diversity setting). Refer to the CB2000 Client Bridge Product Reference Guide for more information.
    v. Click “Apply All Changes”.
    vi. Select “advanced wireless network configuration”
        1. Network Traffic Accelerator
        2. Data Preamble
        3. POS Setup
            a. To load IBM terminals with the RPL protocol, set “POS Setup” to “On”.
            b. To load IBM terminals with the PXE protocol, set “POS Setup” to “Off”.
            c. To load IBM terminals with both the RPL and PXE protocols, set “POS Setup” to “On”.
        4. Click “Apply All Changes”.

11. After saving the configuration, disconnect the bridge from the computer and connect it to the IBM 4694 or SurePOS 7xx terminal.
12. The CB is now ready to connect to the 4694 or SurePOS 7xx terminal(s).
13. To support one POS terminal, plug an Ethernet cable in the CB2000 from the POS terminal.

IBM Terminal Setup

There are no configuration changes to convert an Ethernet based 4694/SurePOS terminal from wired to wireless. Plug the Ethernet cable from the terminal into the Client Bridge. Reboot the Client Bridge and the terminal will be wireless.

Multiple Terminal Support

The CB2000 supports 1-4 POS terminals. To support one terminal, plug an Ethernet cable from the terminal into the Client Bridge.

To support two to four terminals, plug an Ethernet cable from the Client Bridge into an uplink port on a hub. If the hub does not have an uplink port, plug a crossover Ethernet cable from the Client Bridge into any port on a hub. Plug up to four terminals into the hub.

The Client Bridge supports up to four clients/terminals and keeps track of the clients with a list of MAC addresses. After the client limit is reached, a user removes an existing client and resets the client in the client list to allow a new client to associate with the network.

To clear the Ethernet Client List on a CB2000:

1. Disconnect a client by unplugging its Ethernet cable from the hub or the bridge.

2. Use the Spectrum24 CB2000 Device Manager to select the CB2000 and launch its configuration manager, or locate the IP address and http directly to the device via a Web browser.
3. Under “System Status”, click “Ethernet Client List”.
4. In the Ethernet Client List page, select the radio button next to the client to be removed and click “Clear Client List”. The bridge erases the client list for the selected client.
5. Connect the new client by plugging its Ethernet cable into the hub or the bridge.
   Note: New clients are added automatically to the list during the next network interaction.

If the IBM 4690 POS terminals are configured with Locally Administered Addresses (LAA), each terminal uses two MAC addresses. This limits the number of terminals to two per Client Bridge.

IBM 4690 Controller Setup

Verify the 4690 OS level supports the CB-1000. To 4690 OS, the CB1000 and the CB2000 are functionally equivalent.

IBM 4690 Controller Setup – RPL Settings

This section describes the controller setup for loading terminals wirelessly with the RPL protocol. See the section on “PXE Loading” for setting up the controller for PXE loading.

There are no required changes to the controller configuration, but several parameters are available to optimize the performance of wireless systems and reduce terminal load times. These parameters are changed using User Logical Names. The User Logical Names are:

- ADXRPLWL - Selects Unicast vs. Multicast Remote Program Load
- ADXWLSPD - Speed-up terminal load.
- ADXSLLD4/ ADXLDLY4- Controller Throttle
- ADXWLNTO - Change the number of DLC retries.

ADXRPLWL - Unicast vs. Multicast Remote Program Load

In a 4690 OS environment, 4694 and SurePOS terminals load their terminal OS images from a store controller in a multi-stage process. First, the hardware adapter responsible for the network connection to the store controller sends a broadcast message in search of a store controller. For LAN based hardware adapters (for example, token-ring, Ethernet, and wireless) the store controller discovery is performed using the Remote Program Load (RPL) protocol messages.

When a store controller receives a load request from a hardware adapter, it first transmits a small piece of code, commonly referred to as a bootstrap, to the terminal. Once the bootstrap is loaded and control is transferred to it, the bootstrap requests the load of the 4690 terminal OS image from the store controller. When the 4690 terminal OS image is loaded, the bootstrap passes control to it and terminal IPL begins.

The 1st Stage, the bootstrap load, is always transmitted to wireless terminals in unicast, or point-to-point, mode. In Stage 2, the terminal Operating System load, the OS can be transmitted either in the unicast or multicast mode. The final stage, application load, is always transmitted in unicast mode.

Unicast mode means that the server transmits LAN data directly to the adapter, which issued the request. Multicast mode means that the server transmits LAN data to a group of adapters, which are all able to receive data addressed to a designated destination. Broadcast mode means that the server transmits LAN data to all adapters. Multicast is differentiated from broadcast as multicast data is sent to a certain group of adapters on the LAN (for example, all wireless adapters, but not Ethernet adapters).

On wireless LANs, unicast transmissions are acknowledged at various points and provide higher reliability compared with multicast transmissions, which have a higher rate of data loss. Therefore, it is usually desirable to use unicast communications for wireless LANs.

Although unicast transmissions are more reliable than multicast, the amount of data transmitted for a large number of terminals can be greater. In addition, unicast load time increases proportionally to the number of terminals being loaded. Conversely, in multicast mode load time increases only slightly with an increasing number of terminals; there is more of a leveling effect of load time as the number of terminals is increased.

The 4690 OS RPL server is designed to transmit either multicast or unicast loads to wireless POS terminals. By default, the 4690 OS RPL servers will transmit in multicast mode. To override the multicast default setting and set the store controller to unicast mode, a user logical file name must be defined on the store controller(s) enabled for the wireless LAN feature. This file name, ADXRPLWL, will select whether the controller operates in a unicast or multicast mode for wireless terminals.

Recommended Setting

Unicast is preferred. It's more reliable and loads a single terminal faster than multicast. However, multicast can load a large number of wireless terminals (15+) faster, especially in slower wireless networks. As the speed of the wireless network increases, the advantage of multicast goes down.

If a location has 1-15 terminals on a 2Mbit wireless network, define ADXRPLWL to enable unicast loading. With more than 15 wireless terminals, do not define ADXRPLWL, which will enable multicast loading. If there are problems loading terminals, unicast is a more reliable load protocol. The number 15 is only a recommended number. It is best to experiment with both modes to determine which one provides the shortest, most reliable terminal load time.

Notes:

- Multicast is the default.
- This option only affects the loading of 4690 OS into the terminal. During this load, the terminal displays U005.

- A single terminal loads faster unicast than multicast.
- On faster wireless networks, unicast can support a higher number of terminals.
- The value assigned to ADXRPLWL is meaningless. The existence of the logical name forces unicast loading.
- This option only applies to RPL loaded terminals and doesn't affect PXE loading.

To set Unicast Wireless RPL transmissions:

1. Sign on to the 4690 Master store controller.
2. At the main menu, select Installation and Update Aids.
3. Select Change Configuration
4. Select Controller Configuration.

   Note: Perform the following steps on all Master and Alternate Master controllers that have the wireless feature installed and selected.

5. Select User Defined Logical File names.
6. Define logical file name ADXRPLWL. (When asked if it is OK to define this name with an IBM reserved name, answer yes.)
7. Define ADXRPLWL to 1.
8. Exit configuration.
9. Select Activate Configuration.
10. Select Controller Configuration.
11. After successful configuration activation, re-IPL all store controllers.

The RPL server within the store controller(s) will now transmit the terminal operating system in unicast mode to wireless terminals. Wired Ethernet terminal loading will not be affected by this configuration change.

To set Multicast Wireless RPL transmissions:

1. Sign on to the 4690 Master store controller.
2. At the main menu, select Installation and Update Aids.
3. Select Change Configuration.
4. Select Controller Configuration.

   Note: Perform the following steps on all Master and Alternate Master controllers that have the wireless feature installed and selected.

5. Select User Defined Logical File names.
6. Erase logical file name ADXRPLWL. (When asked if it is OK to erase this name with an IBM reserved name, answer yes.)
7. Exit configuration.
8. Select Activate Configuration.
9. Select Controller Configuration.
10. After successful configuration activation, re-IPL all store controllers.

The RPL server within the store controller(s) will now transmit the terminal operating system in multicast mode to wireless terminals. Wired Ethernet terminal loading will not be affected by this configuration change.

ADXWLSPD - Speed-up wireless terminal loading

This parameter may be used with wireless networks faster than 1Mbps. The terminal load time can be reduced significantly when a proper value for this parameter is set.

When loading a wireless terminal, the controller delays about 60ms between each RPL load block to avoid overrunning the bandwidth of the wireless network. ADXWLSPD controls the number of load blocks sent per delay. The default is one block per delay. The default delay was designed for a dual controller system with a 1Mbps network.

Since the controller can't detect the speed of the wireless terminals, the user can configure ADXWLSPD to speed up the load.

Recommended Setting

Set this parameter based on the slowest wireless terminal in the network. Note that an 11Mbit radio may scale back to 5.5 or 2 or 1 Mbps based on the radio signal from the AP. The recommended setting is close to the speed of the slowest wireless terminal. This option only applies to RPL loaded terminals and doesn't affect PXE loading.

Speed of slowest wireless terminal	Recommended setting
1Mbit	ADXWLSPD = 1 (Default)
2Mbit	ADXWLSPD = 3
5Mbit	ADXWLSPD = 5
11Mbit	ADXWLSPD = 10

Warning: Setting this value too high will cause the controller to send blocks faster than the wireless network can transmit them. This causes load blocks to be thrown away and terminals will take a long time to load.

ADXWLSPD works by being defined to a value n. If ADXWLSPD is not defined, the default value is 1. Base 4690 OS does not define this Logical Name.

To define the User Logical Name ADXWLSPD:

1. Sign on to the 4690 Master store controller.
2. At the main menu, select Installation and Update Aids.
3. Select Change Configuration.

4. Select Controller Configuration.

Note: The following steps will have to be performed on all Master and Alternate controllers that have the wireless feature installed and selected.

5. Select User Defined Logical File names.
6. Define User logical file name ADXWLSPD. (When asked if it is OK to define this name with an IBM reserved name, answer yes.)
7. Define the logical name with a value between 1 and 15.
8. Exit configuration.
9. Select Activate Configuration.
10. Select Controller Configuration.
11. After successful configuration update, re-IPL all controllers.

To Change The DLC Retry and Time-out Values

Depending on the traffic on the network to which terminals or controllers are connected, data between controllers and terminals might be lost. In this case, the driver will retry transmission 4 times. Timers T1 and Ti determine the times between retry transmissions. If these numbers are set high, the chance that retry being successful is high but it may take longer to complete a transmission; If they are set low, the transmission will take less times but the chance of successful transmission is low (In this case, the terminals may go off-line).

Depending on the network environment, users may manually set these timers T1 and Ti to desired values. These timers can be set with logical name ADXWLNTO. The higher ADXWLNTO, the higher T1 and Ti. ADXWLNTO is defaulted to maximum delay.

Recommended Settings

Use the default setting by not defining the logical name ADXWLNTO.

To define the User Logical Name ADXWLNTO:

1. Sign on to the 4690 Master store controller.
2. At the main menu, select Installation and Update Aids.
3. Select Change Configuration.
4. Select Controller Configuration.

   Note: The following steps will have to be performed on all Master and Alternate controllers that have the wireless feature installed and selected.

5. Select User Defined Logical File names.
6. Define logical file name ADXWLNTO (When asked if it is OK to erase this name with an IBM reserved name, answer yes.) to a desired value.
7. Exit configuration.
8. Perform the above procedure for all other controllers.

9. Select Activate Configuration.
10. Select Controller Configuration.
11. After successful configuration activation, re-IPL all store controllers.

ADXSLLD4 - Controller Throttle for Terminal Loading

4690 OS doesn't use this user logical name. ADXSLLD4 was replaced with ADXLDLY4.

ADXLDLY4 – Controller Throttle for Terminal Loading

This option is for pacing wired LAN terminal loads and should not be used to throttle wireless loads.

IBM 4690 Controller Setup –PXE Settings

In 2001, IBM added PXE load support to the 4690 OS. Previously, 4690 OS only supported the RPL load protocol. The IBM documents 4690WIRELESS.PDF describes wireless configurations and has a section on PXE loading. From the IBM Retail Knowledgebase, http://www2.clearlake.ibm.com/store/support/html/knowledgebase.html, search using the keyword WIRELESS to find this document. The wireless PXE loading tips are summarized below:

With 4690 OS V2R4 a function to support terminals that have the ability to use PXE to load the operating system was incorporated. In order to take advantage of this new method of loading some of the configuration for the Symbol Client Bridge and Access Point had to be changed. If you are going to utilize loading then the following must be changed:

Access Point Setup

When configuring the Symbol Access Point, the entry for Multicast Mask (V) must be "01005E2E", without the quotes. You would locate this parameter on the "Set RF Configuration" screen for the Symbol Access Point.

Client Bridge Setup

When configuring the Symbol Client Bridge, the entry for **MAC ADDRESS** must be "**dynamic**", without the quotes. You would locate this parameter on the "Bridged Ethernet" screen for the Symbol Client Bridge.

IBM Terminal Setup

For 4694-2x7 and 4694-3x7 models using PXE, set the following:

1. From the Main Menu select "Boot Sequence" and set the following:
   - "1st Boot Source" to "Drive A"
   - "2nd Boot Source" to "System board 10/100 Ethernet"
   - "RPL Boot Protocol" to "PXE"
2. From the Main Menu select "ASIC Setup" and set the following:
   - "NVRAM start address" to "DD000"
   - "NVRAM 1st 4k" to "Enabled"

- "NVRAM 2nd 4k" to "Page 1"
- "SRAM Start Address" to "DC000"
- "SIO Interrupt" to "IRQ7"

3. From the Main Menu select "Advanced System Setup".
4. From this menu select "I/O Device Configuration".
5. Set Parallel Port to "Disabled".
6. Save the settings.
7. Exit System Setup and IPL the terminal.
8. The terminal will reload with the new parameters.

IBM 4690 Controller Setup

The 4690 OS file **ADXTRMDF.DAT** must include the following entry, "BRDCST=1", without the quotes and exact as shown. You must run terminal load shrink by typing **ADXRTCCL** from OS command prompt and re-IPL the controllers.

The remainder of the system configuration is the same as for Ethernet attached PXE loaded terminals.

Loading Both RPL and PXE Wireless Terminals

To support both RPL and PXE wireless terminals, the logical name ADXRPLWL needs to be defined to force the RPL wireless registers to load via Unicast frames. In Unicast mode, RPL terminals do not need the Multicast Mask of 03000004.

Also, set ADXWLSPD to a lower setting to avoid wireless overruns from transmitting both RPL and PXE simultaneously. Example, if the wireless network is 11MB, set ADXWLSPD to 5 instead of 10.

Converting a Wireless Terminal to a Wired Terminal

To a wireless terminal back to a wired terminal, perform the following step.

1. Remove Ethernet cable from the CB and plug it into the IBM 4690 Controller's Ethernet hub.

CB 1000 and CB 2000 vs. Symbol ISA Adapter

The CB 1000, CB 2000, and the Symbol ISA Adapters provide wireless capabilities for IBM POS terminals. All may be implemented in the same wireless network.

The CB 1000 and CB2000 solutions offer the following advantages:

- Support for 802.11b 11MB DS
- Support for IBM SurePOS 730 and 750 Terminals
- Easier configuration
- Support for more security

Symbol Wireless Support in IBM 4690 OS for Spectrum24 ISA adapters

	Pre-802.11: 1MB FH	802.11: 1MB FH	802.11: 2MB FH	802.11b: 11MB DS	Encryption
4694 (ISA)	Yes	Yes	Yes	No	No
SurePOS (PCI)	No	No	No	No	No

Symbol Wireless Support in IBM 4690 OS for the CB1000

	Pre-802.11: 1MB FH	802.11: 1MB FH	802.11: 2MB FH	802.11b: 11MB DS	Encryption
4694 (ISA)	No	Yes	Yes	Yes	WEP
SurePOS (PCI)	No	Yes	Yes	Yes	WEP

Symbol Wireless Support in IBM 4690 OS for the CB2000

	Pre-802.11: 1MB FH	802.11: 1MB FH	802.11: 2MB FH	802.11b: 11MB DS	Encryption
4694 (ISA)	No	No	No	Yes	WEP/Kerberos
SurePOS (PCI)	No	No	No	Yes	WEP/Kerberos

Notes: 4694 refers to all supported 4694 models.
SurePOS refers to SurePOS 730 and SurePOS 750 models.

Optional Power Cable

An optional power/Ethernet cable allows the CB2000 to draw power from the PS/2 port on a 4694 or SurePOS terminal. The Symbol part number is 50-16000-270. Cable lengths are 4 feet and cannot be changed. This cable is only certified for IBM 4694 and SurePOS usage.

At this time, customers should order the standard CB-2000 with power supply and add the custom cable to reduce the clutter. Symbol is not able to provide a special package with no power supply at this time. The customer should keep the original power supply to utilize the CB-2000 for other purposes or as a backup.

Problem Determination

Problem: Terminal can't load due to "Too Many Retries"
Diagnosis: Verify the CB-2000 firmware is 1.31 or later.
Verify the IBM RPL Support Option is selected in the CB-2000.
Verify ADXWLSPD is not set higher than the speed of the CB-2000's radio.

Problem: Terminal can't find an RPL server.
Diagnosis Verify the CB-2000's Power LED is on flashing.
Verify the CB-2000's Ethernet Link LED is lit. If not, verify the Ethernet cable is securely connected to the CB-2000 and the terminal.
Verify the terminal loads when directly connected to the LAN.
Verify the CB-2000 is associated with the correct Access Point and its wireless security settings are correct.
Verify the 4690 OS is V2R3 level 01B0, V2R4 level 01H0, V3R1, or later.

Problem: A trace indicates the terminal doesn't send any RPL frames.
Diagnosis: If the CB-2000 was connected to another terminal and hasn't been rebooted, reboot the CB-2000.

Problem: Multicast doesn't work. After the SENDFILE request from the terminal, the RPL server delays 10 seconds and then sends the load frames in unicast mode. Terminals load, but it's slower than if unicast mode is specified, due to the extra 10-second delays.
Diagnosis: The initial 4690 releases with CB support have a bug in the multicast logic. If multicast support is needed, contact IBM for a fix.

Problem: If LAA (Locally Administered Addresses) is configured, terminals hang at U005 during the load. At this time, the terminal has switched from using the Symbol card's MAC address to the LAA address.
Diagnosis: The CB-2000 supports up to 4 MAC addresses. On the CB-2000 HTML screen, view the Ethernet Client List to verify all 4 addresses are not used. Note that an LAA configured terminal uses 2 addresses. If appropriate, reboot the CB-2000 or use the Clear Client List to clear the associated MAC address table.

Problem: The terminal hangs at W008.
Diagnosis: The terminal is sending XID requests and the controller is ignoring them. Clear the NVRAM in the terminal, load the terminal wirelessly, and re-address the terminal. To clear the NVRAM on a 4694, boot to DOS and run the IBM utility ADRCLR94.EXE (available from the IBM web site). To clear the NVRAM on a

SurePOS7xx terminal, press the dump button as soon as U005 displays. The dump button is recessed and is located under the power on button.

Problem: The CB2000 works with one terminal, but when the CB2000 is moved to another terminal, the terminal hangs at "Looking for RPL Server" or no messages flow from the CB2000 to the wired LAN. The CB2000 was not powered off after it worked with the first terminal.

Diagnosis: The CB-2000 supports up to 4 MAC addresses. On the CB-2000 HTML screen, view the Ethernet Client List to verify all 4 addresses are not used. Note that an LAA configured terminal uses 2 addresses. If appropriate, reboot the CB-2000 or use the Clear Client List to clear the associated MAC address table. Note that a terminal

Problem: During a load of a wireless terminal, the terminal hangs at W008. The terminal loads successfully as a wired terminal.

Diagnosis: Check the size of the file ADX_SPGM:ADXRT8GF.DAT. In 4690 OS releases before December 2001, the 4690 OS wireless bootstrap doesn't correctly handle files larger than 3MB. Contact IBM for a fix.

Problem: Terminal hangs at U005 when upgrading a 4694-245 to wireless Ethernet.

Diagnosis: There is a known U005 problem on 4694-2X5 models that is resolved by upgrading the BIOS to at least level C12, however, it is recommended that you update to the latest current level.

Wireless Fixes from IBM

V1 K000 IR44707 IR44705 same 4858 Fixes for Symbol Wireless in Roanoke.

V1 K000 IR41206 Performance slowdown when using wireless terminals.

V2R2 0100 IR44705 same 4858 Fixes for Symbol Wireless in 4694-206/246.
V2R3 Original Release IR45687 Same TCP/IP will not work with wireless terminals.

V2R3 01D0 IR46093 Same W102 RC=80004007 Bad FNUM on Table Load with wireless TR adapt.

V2R3 01C0 IR46157 Same No dump of SurePOS 700 with Symbol Client Bridge.

V2R3 01B0 IR45687 TCP/IP will not work with wireless terminals.

V2R4 01K0 IR47053 Same Wireless terminals will not switch to multicast.

V2R4 01K0 IR47093 Same Add support for Java and TCP/IP in wireless terminals.

V2R4 01K0 R47073 Same SurePOS connected via Client Bridge has BIOS reset

V2R4 01H0 IR45769 IR45687 TCP/IP will not work with wireless terminals.

IR47666 Same Wireless term fails with NoClassDefFoundError or can't find property file in classpath

Comments

Please send any comments, suggestions, or problem determination suggestions to wbm@qvssoftware.com.