# Table of Contents

Table of Contents ............................................................................................................................ 2
Document Revisions........................................................................................................................... 3
Reference Documents .......................................................................................................................... 3
Introduction ..................................................................................................................................... 3
Supported Platforms .......................................................................................................................... 3
Configuration .................................................................................................................................. 5
  Access Point/Wireless Switch Setup .......................................................................................... 5
  Client Bridge Setup ..................................................................................................................... 5
    Multiple Terminal Support ........................................................................................................ 6
IBM Terminal Setup ......................................................................................................................... 6
IBM 4690 Controller Setup .............................................................................................................. 6
  IBM 4690 Controller Setup – RPL Settings ............................................................................. 6
    ADXRPLWL - Unicast vs. Multicast Remote Program Load ............................................ 6
    ADXWLSPD - Speed-up wireless terminal loading .............................................................. 9
  IBM 4690 Controller Setup – PXE Settings .......................................................................... 10
    ADXTRMU.F.DAT Change .............................................................................................. 10
  IBM 4690 Controller Setup – Simultaneous RPL and PXE ................................................. 11
    Converting a Wireless Terminal to a Wired Terminal ......................................................... 11
Problem Determination ................................................................................................................. 12
Wireless Fixes from IBM .............................................................................................................. 13
Comments ..................................................................................................................................... 13
Reference Documents

This user’s guide refers to the following documents:


Introduction

The CB3000 Client Bridge from Symbol Technologies is a wireless network bridge allowing one IBM 4690 OS POS terminal to connect to a Wi-Fi IEEE 802.11b, 802.11g, or 802.11a wireless local area network (LAN).

This document contains tips and recommendations for installing the CB3000 Client Bridge in an IBM 4690 OS POS environment. Use it as a supplement to the Symbol CB3000 product guides.

Supported Platforms

With 4694’s and SurePOS 700 terminals, the CB3000 is plug compatible with a CB-1000/11MB 802.11B radio. The CB3000 works on any IBM 4690 OS platform that supports the CB-1000. In addition, the CB3000 supports 802.11g, 802.11a and more encryption options.

Symbol Client Bridges are supported on the following levels of the IBM 4690 Operating System:

- 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 1 CSD 0200

The CB-1000 and CB3000 were successfully tested with the following IBM Terminals:

- SurePOS 700
- 4694-1x4
- 4694-1x6
NOTE: The SurePOS 300, 500, and 600’s are Windows based terminals with the operating system installed on a hard disk. The CB3000 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 CB3000 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.
Configuration

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

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

Access Point/Wireless Switch Setup

802.11b, 802.11g, and 802.11a networks are supported. The following fields must be configured prior to installation in the retail environment.

- The ESSID must be defined.
- Multicast Mask/Address
  - For Multicast RPL Loading
    - In the AP, Multicast Mask (data) must be set to 03000004.
    - In the Wireless Switch, Multicast Address (1) must be set to 03:00:00:04:00:00. Only the first four numbers are used.
  - For PXE Loading,
    - In the AP, Multicast Mask (data) must be set to 01005E2E and the Multicast Mask (voice) must be set to 01005E00.
    - In the Wireless Switch, Multicast Address (1) must be set to 01:00:5E:2E:00:00 and the Multicast Address (2) must be set to 01:00:5E:00:00:00.
- Symbol strongly recommends enabling encryption.

Client Bridge Setup

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

- Set the ESSID (Wireless LAN Service Area) to match the ESS_ID on the AP or WS. ESS_ID is case sensitive.
- Set Network Mode to Infrastructure(AP)
- Set the encryption to match the AP/WS.
- Note: Unlike the CB1000, the CB3000 supports IBM RPL by default. No settings are required.
Multiple Terminal Support
The CB3000 only supports one IBM POS terminal per CB3000 at this time.

**IBM Terminal Setup**
There are no configuration changes to convert an Ethernet based 4694/SurePOS terminal from wired to wireless.

1. Unplug the POS terminal’s Ethernet cable from the hub/switch.
2. Wait ten seconds.
3. Plug the Ethernet cable into the Client Bridge.

The terminal is now wireless.

*Note: When switching a live POS terminal between wired and wireless modes, unplug the Ethernet cable, wait ten seconds, then plug the Ethernet cable in to the hub or CB3000. Not waiting ten seconds may cause a Duplicate Terminal error which requires a reload of the POS terminal.*

**IBM 4690 Controller Setup**
Verify the 4690 OS level supports Symbol Client Bridges. Support was added in the following versions and is included in newer releases.


IBM 4690 Controller Setup – RPL Settings

If all wireless POS terminals will load via PXE, skip to the **IBM 4690 Controller Setup – PXE Settings** section.

This section describes the controller setup for loading terminals wirelessly with the RPL protocol.

There are no required changes to the controller configuration, but several parameters are available and recommended 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.

*ADXRPLWL - Unicast vs. Multicast Remote Program Load*
It is highly recommended to define the logical name ADXRPLWL to 1 and enable Unicast loading.

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**

It is recommended to define the logical name ADXWLSPD and set it to the speed of the wireless network. Example: for an 11Mbs speed wireless network, set ADXWLSPD to 11. For any speed higher than 15, the logical name ADXWLSPD should be set to 15 which is the highest setting.

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.

<table>
<thead>
<tr>
<th>Speed of slowest wireless terminal</th>
<th>Recommended setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Mbit</td>
<td>ADXWLSPD = 1 (Default)</td>
</tr>
</tbody>
</table>
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.

IBM 4690 Controller Setup –PXEl Settings
In 2001, IBM added PXE load support to the 4690 OS. Previously, 4690 OS only supported the RPL load protocol. The IBM document 4690WIRELESS.PDF describes wireless configurations and has a section on PXE loading. From the IBM Retail Knowledgebase, http://www.ibm.com/support/us, search using the keywords WIRELESS TERMINAL TIPS to find this document.

ADXTRMUF.DAT Change

With 4690 OS V2R4 and up, a function to support terminals that have the ability to use PXE to load the operating system was incorporated. Since you are going to utilize PXE loading, then the following must be changed:

• On the 4690 controller:
• The file \ADX_SPGM\ADXTRMDF.DAT must include the following entry: 
  BRDCST=1
  The entry must be exactly as shown (BRDCST must be in uppercase).
  Then, you must run terminal load shrink by typing ADXRTCCL from OS command
  prompt and re-ipl the controllers.

  • Note: After OS 4690 V3R1, CSD 0210 a change was made to the use of
    ADXTRMDF.DAT for logical filenames. If you are at OS 4690 V3R1, CSD
    0210 or later you must use ADXTRMUF.DAT in place of
    ADXTRMDF.DAT.

  • The file \ADX_IDT1\ADXTRMUF.DAT must include the following entry:
    BRDCST=1
    The entry must be exactly as shown (BRDCST must be in uppercase).
    Then, 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.

IBM 4690 Controller Setup – Simultaneous RPL and PXE

To support both RPL and PXE wireless terminals,
  1. Follow the controller setup instruction for PXE.
  2. Per the RPL instructions, define the logical name ADXRPLWL to 1 on all controllers.
     This will force the RPL wireless registers to load via Unicast frames.
  3. Set ADXWLSPD to a lower setting to avoid wireless overruns from transmitting both
     RPL and PXE simultaneously. Example: if the wireless network is 11MB, define the
     logical name ADXWLSPD equal 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 POS Terminal’s Ethernet cable from the CB
  2. Wait 10 seconds
  3. Plug it into the IBM 4690 Controller’s Ethernet hub/switch.

  Note: Not waiting for 10 seconds may cause a Duplicate Terminal Address error and
  require a reload of the POS terminal.
Problem Determination

Problem: Terminal can’t load due to “Too Many Retries”
Diagnosis: Verify ADXWLSPD is not set higher than the speed of the CB3000’s radio.

Problem: Terminal can’t find an RPL server.
Diagnosis: Verify the CB3000’s Status LED is on.
Verify the CB3000’s Ethernet 10 or 100 Link LED is lit. If not, verify the Ethernet cable is securely connected to the CB3000 and the terminal.
Verify the terminal loads when directly connected to the LAN.
Verify the CB3000 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: 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. See the list of IBM fixes below. If multicast support is needed, contact IBM for a fix.

Problem: The terminal hangs at W008.
Diagnosis: If the terminal is configured for PXE, verify the file \ADX_IDT\ADXTRMUF.DAT includes the following entry: BRDCST=1.
Refer to the section IBM 4690 Controller Setup –PXE Settings.

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: 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.

Problem: Terminal hangs at U005 with numbers changing, but loading never completes.
Diagnosis: Check the size of the file ADX_SPGM:ADXRT8GF.DAT. In 4690 OS releases as of July 2005, the 4690 OS RPL wireless bootstrap doesn’t correctly handle files larger than 20MB if any frames are missed. Contact IBM to fix the problem.

Problem: Duplicate Address Error when switching to or from wireless mode.
Diagnosis: Reload the terminal to resolve the problem. When switching to or from wireless, wait 10 seconds for the controller to clear the terminal number from internal tables.

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.