



## **Application Notes for Configuring Wesley Clover Solutions Trading Platform with Avaya IP Office using Q-SIG Trunks – Issue 1.0**

### **Abstract**

These Application Notes contain interoperability instructions for configuring Wesley Clover Solutions Trading Platform with Avaya IP Office. Compliance testing was conducted to verify the interoperability.

Testing was performed using Avaya IP Office 500 V2 R8.1, but it also applies to Avaya IP Office Server Edition R8.1 (single site configuration only).

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

# 1. Introduction

Wesley Clover Solutions Trading Platform consists of an IP PBX and IP Turrets. Wesley Clover Solutions IP PBX communicates to Avaya IP Office via a Q-SIG trunk. Wesley Clover Solutions IP turrets register with Wesley Clover Solutions IP PBX.

## 2. General Test Approach and Test Results

The compliance test focused on the interoperability between Avaya IP Office and Wesley Clover Solutions IP PBX.

DevConnect Compliance Testing is conducted jointly by Avaya and DevConnect members. The jointly-defined test plan focuses on exercising APIs and/or standards-based interfaces pertinent to the interoperability of the tested products and their functionalities. DevConnect Compliance Testing is not intended to substitute full product performance or feature testing performed by DevConnect members, nor is it to be construed as an endorsement by Avaya of the suitability or completeness of a DevConnect member's solution.

### 2.1 Interoperability Compliance Testing

Compliance testing focused on verifying call scenarios mentioned below:

- Call setup and termination
- Call Holds, Call Transfers and Conference calls

### 2.2 Test Results

All executed test cases were passed and all objectives were met with the observation noted below:

- For call scenarios related to Call Conferences and Call Forwards, Wesley Clover Solutions IP PBX holds onto a Q-SIG trunk member for each call leg.

### 2.3 Support

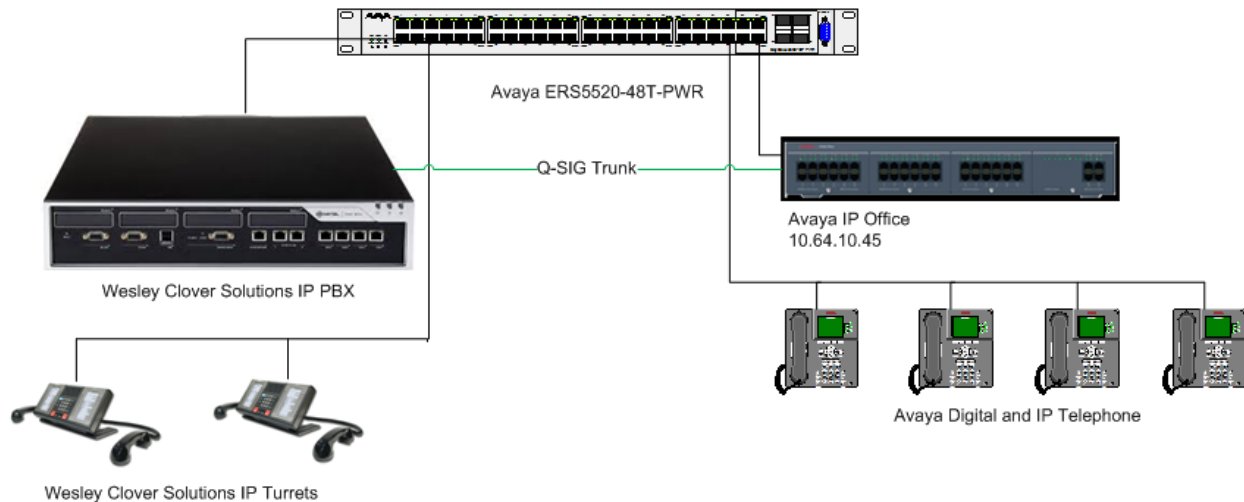
Support for Wesley Clover Solutions can be found at:

Web: [www.wesleycloversolutions.com](http://www.wesleycloversolutions.com)

E-mail: [service@wesleycloversolutions.com](mailto:service@wesleycloversolutions.com)

### 3. Reference Configuration

The following figure displays the configuration used during the compliance test. The configuration below displays Wesley Clover Solutions IP PBX connected to Avaya IP Office 500 V2 using a QSIG trunk. Endpoints for Wesley Clover Solutions IP PBX and Avaya IP Office are connected to a switch on the same network.



**Figure 1:** Reference Configuration for Wesley Clover Solutions IP PBX

### 4. Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Equipment/Software	Release/Version
Avaya IP Office 500 V2	8.1(69)
Avaya 96xx Series Deskphones – H.323	3.22
Avaya 12x0 Series Phones – SIP	4.3.18
Wesley Clover Solutions IP PBX	12.0.1.24
Wesley Clover Solutions IP Turrets	3.0.0.8

## 5. Configure Avaya IP Office

The configuration of Avaya IP Office system was performed using the Avaya IP Office Manager (from here on referred to as Manager) application. Once completed, the Avaya IP Office Manager Configuration must be saved and uploaded to the IP Office System. This process may sometimes force a system reboot.

The Avaya IP Office configuration includes following sections:

- Connect to IP Office using Manager
- Verify IP Office Control Unit
- Verify IP Office Licenses
- Configure IP Office PRI Line
- Configure Short Codes
  - Routing to Wesley Clover IP PBX
- Configure Incoming Call Routes
  - Calls Received on the PRI Line
- Saving IP Office Configuration

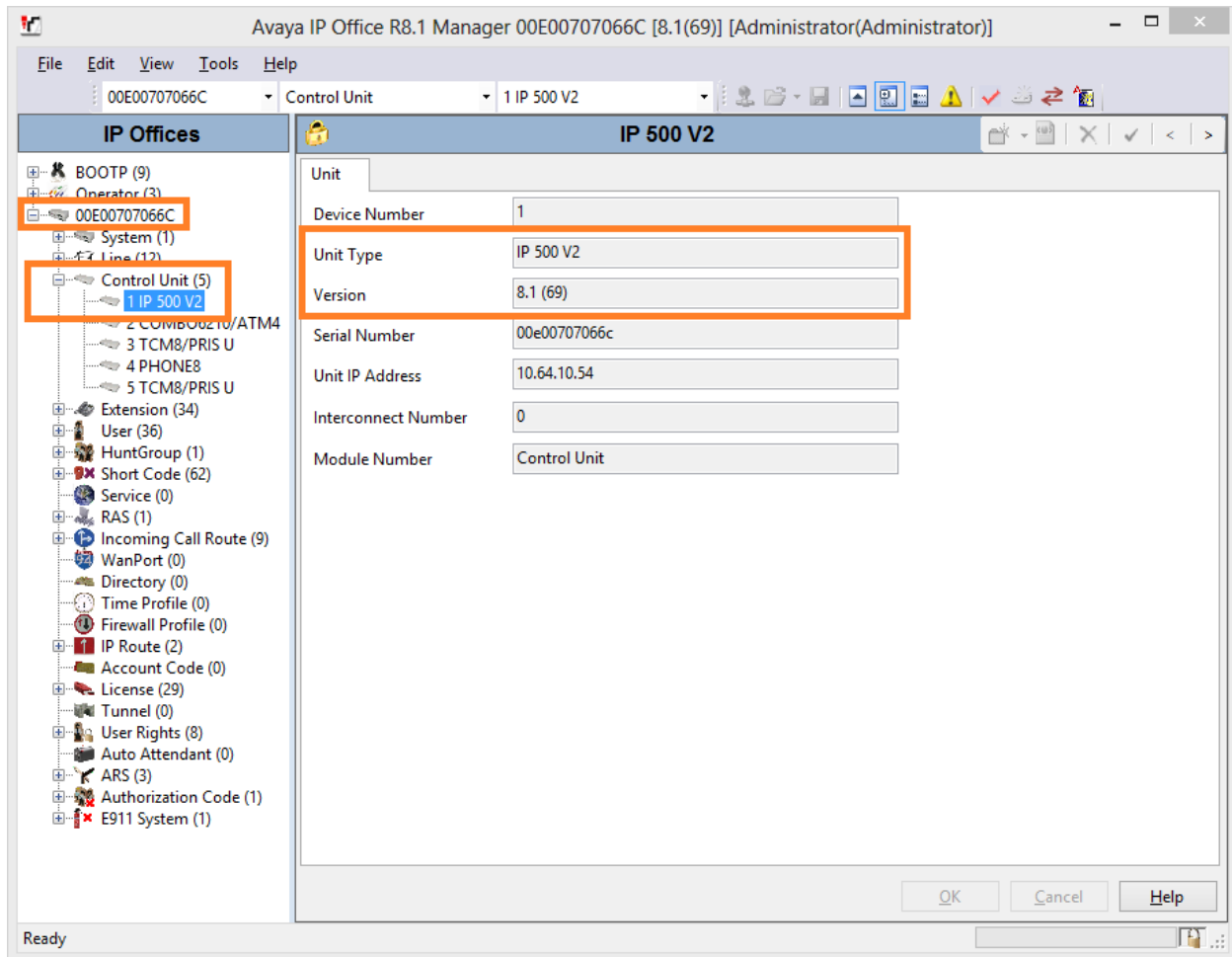
### 5.1 Connect to Avaya IP Office using Avaya IP Office Manager

From a Windows PC, open **Manager**. The location of the **Manager** will vary depending on the Windows Operating System. For Windows XP, navigate to **Start → All Programs → IP Office → Manager**. In the IP Office window expand the Configuration Tree and double-click **System**. For this compliance test the IP Office System was called 00E00707066C. All configuration is performed under this system.

## 5.2 Verify Avaya IP Office Control Unit

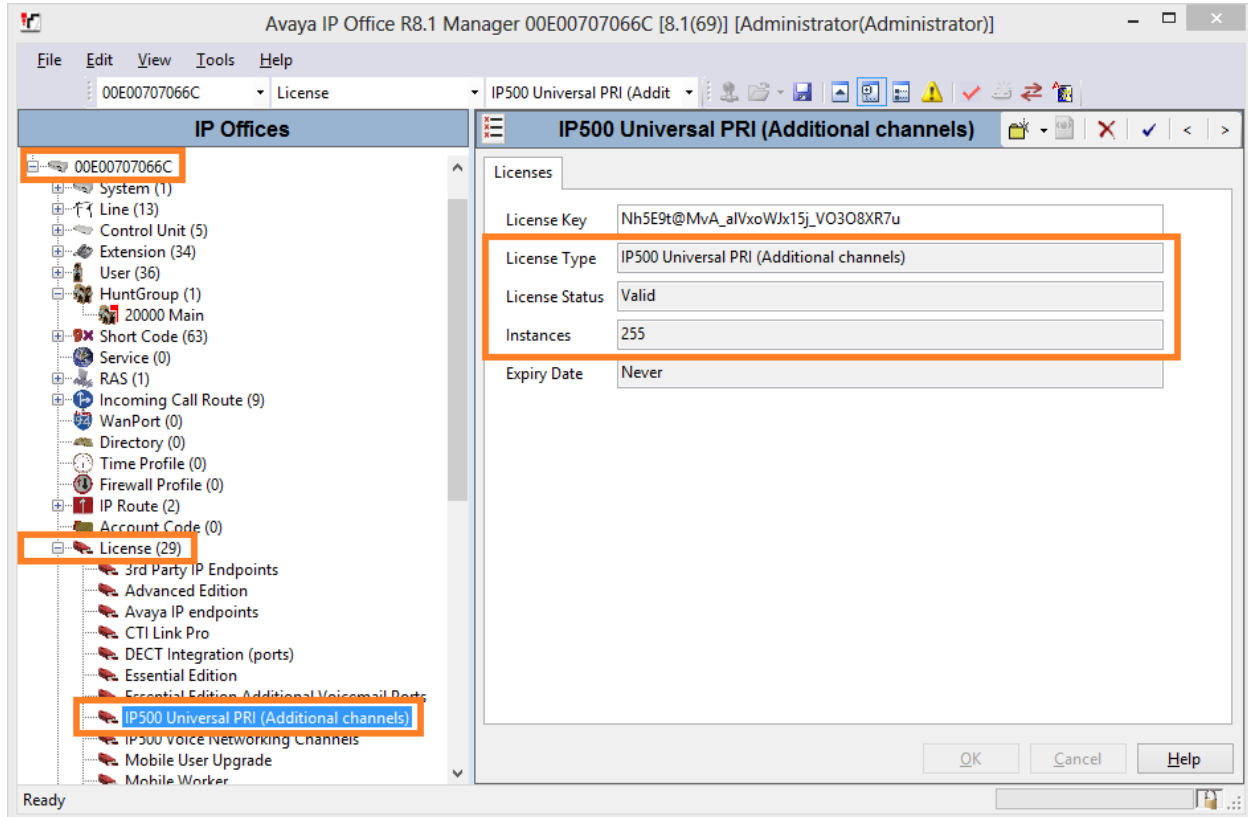
From the configuration tree in the navigation pane on the left, navigate to **IP 500 V2** as shown in the screen shot below.

Verify **Unit Type** and **Version**. During compliance test Avaya IP Office 500 V2 hardware with version 8.1 software was used.



### 5.3 Verify Avaya IP Office Licenses

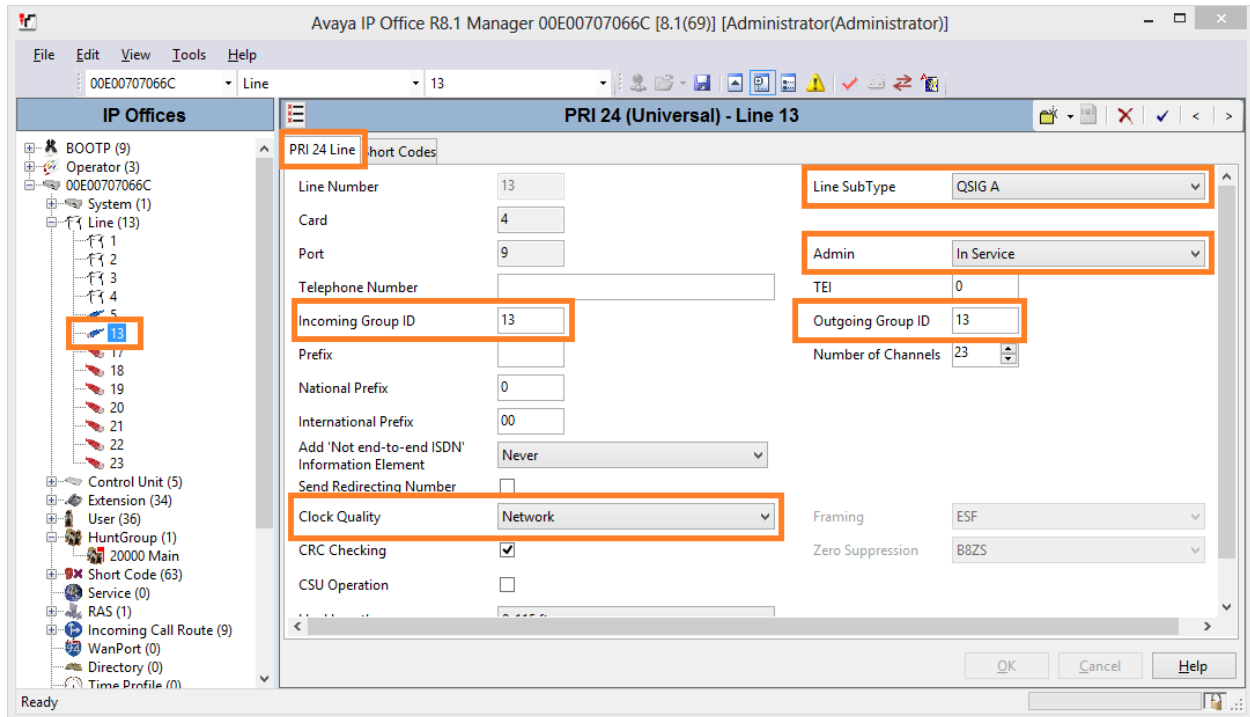
From the left pane, expand **License** and highlight **IP500 Universal PRI (Additional channels)**, as shown in the screen capture. Verify the **License Status** field displays **Valid**.



## 5.4 Configure Avaya IP Office PRI Line

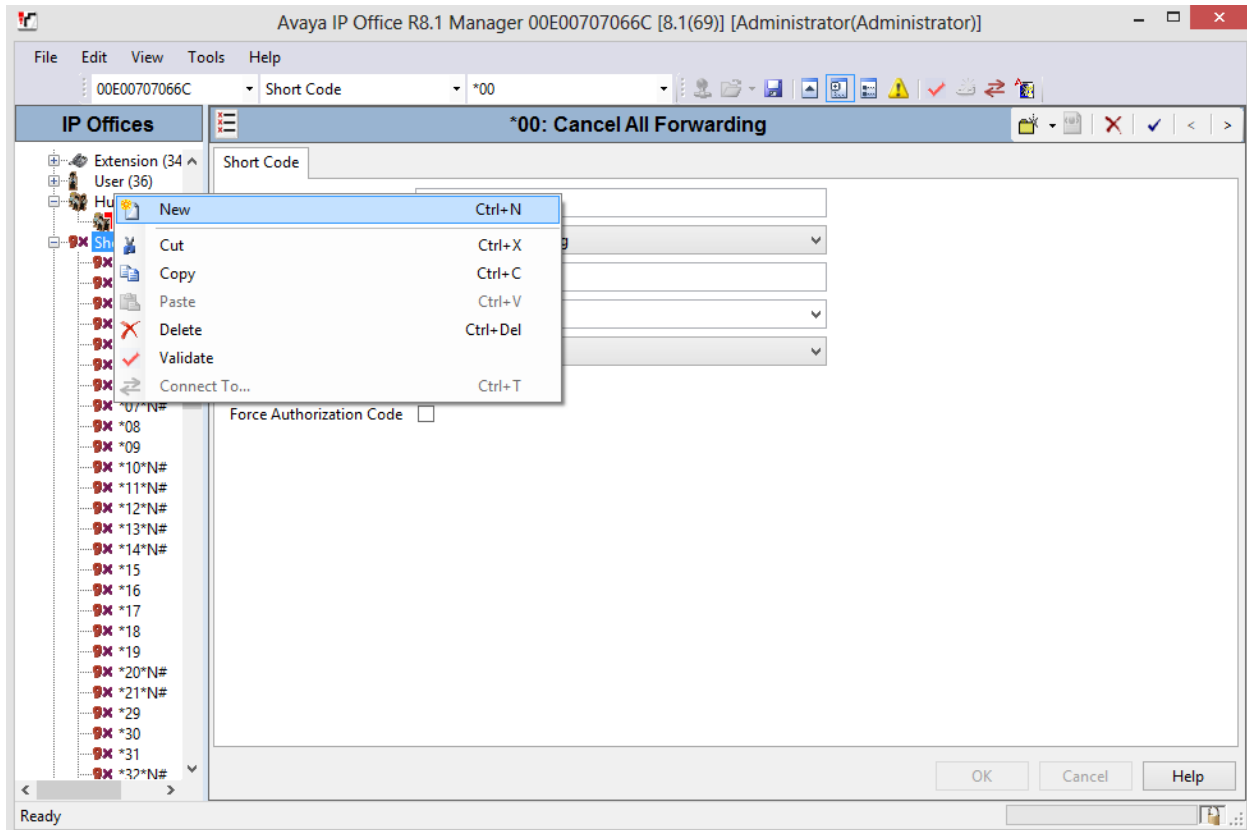
On the left pane, select the PRI line that was added. Under the **PRI 24 Line** tab, configure as follows:

- Set **Line SubType** to **QSIG A**
- Set **Admin** to **In Service**
- Set **Incoming Group ID** and **Outgoing Group ID** to the Line number of the line
- Set **Clock Quality** to **Network**



## 5.5 Configure Short Code for routing to Wesley Clover Solutions IP PBX

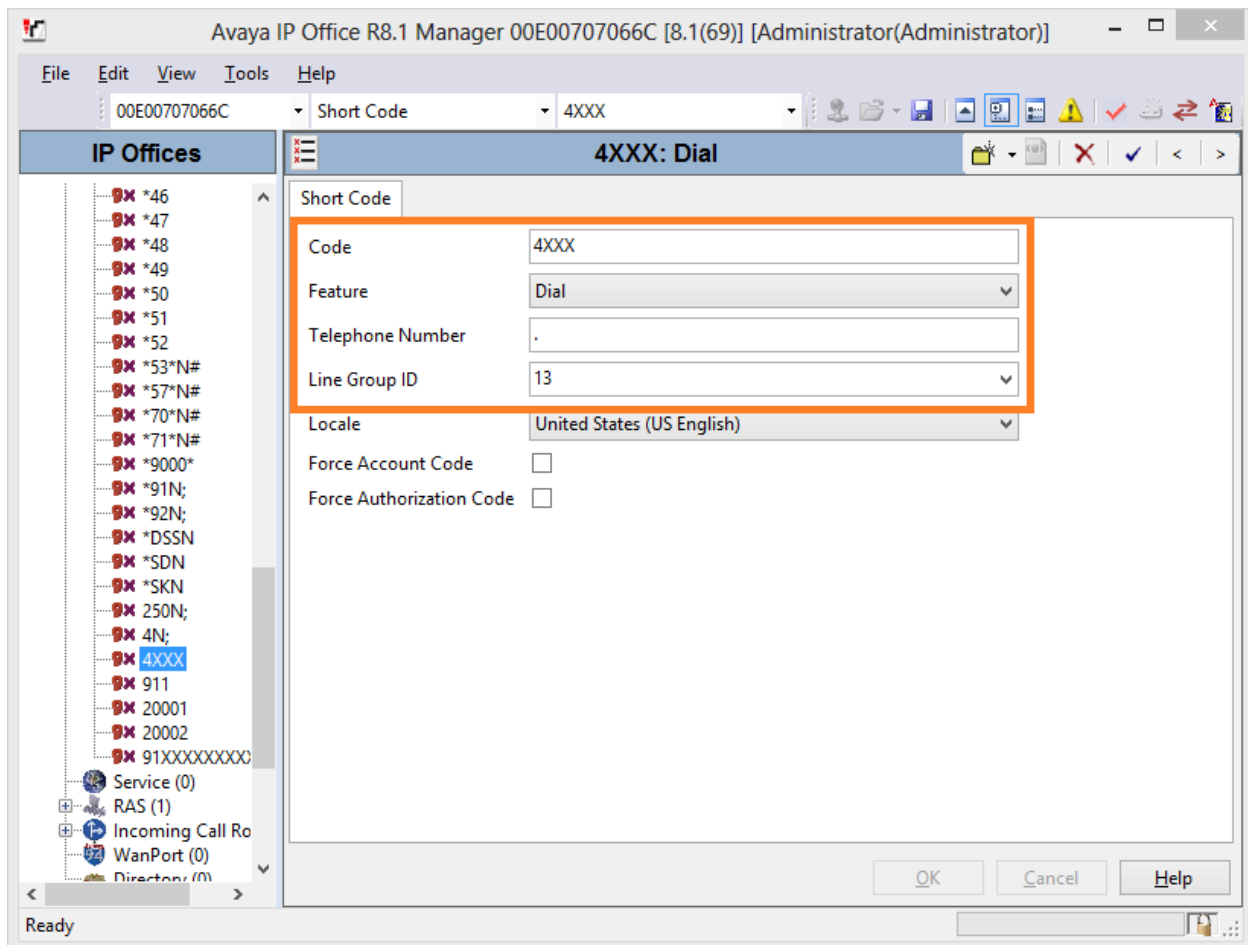
From the left pane, right click on **Short Code** and select **New**.





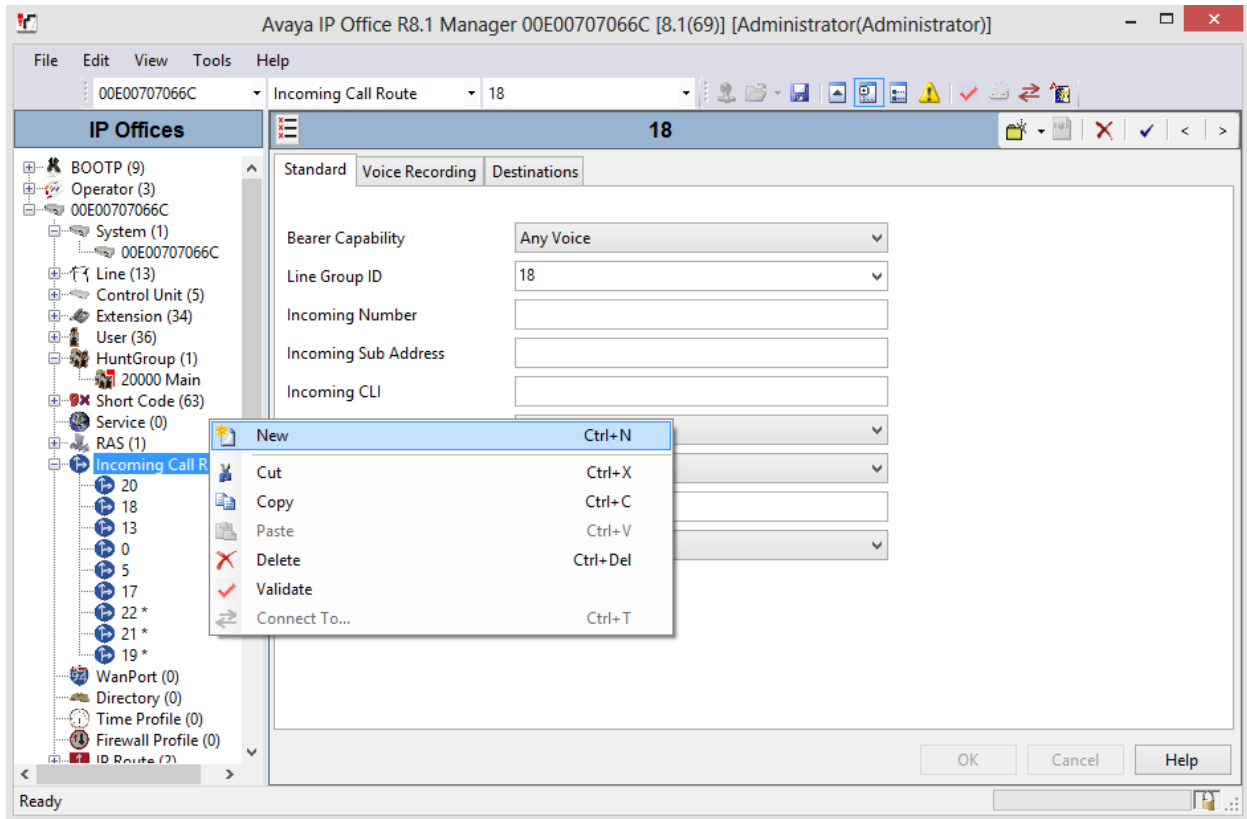
The configured short code will route calls to Wesley Clover Solutions IP PBX when any number starting with 4 is dialed:

- Type in **4XXX** in **Code** field.
- Set **Feature** to **Dial**
- Type in dot “.” for **Telephone Number**
- Type in the number of PRI Line that was configured **Section 5.4**, in **Line Group ID** field.



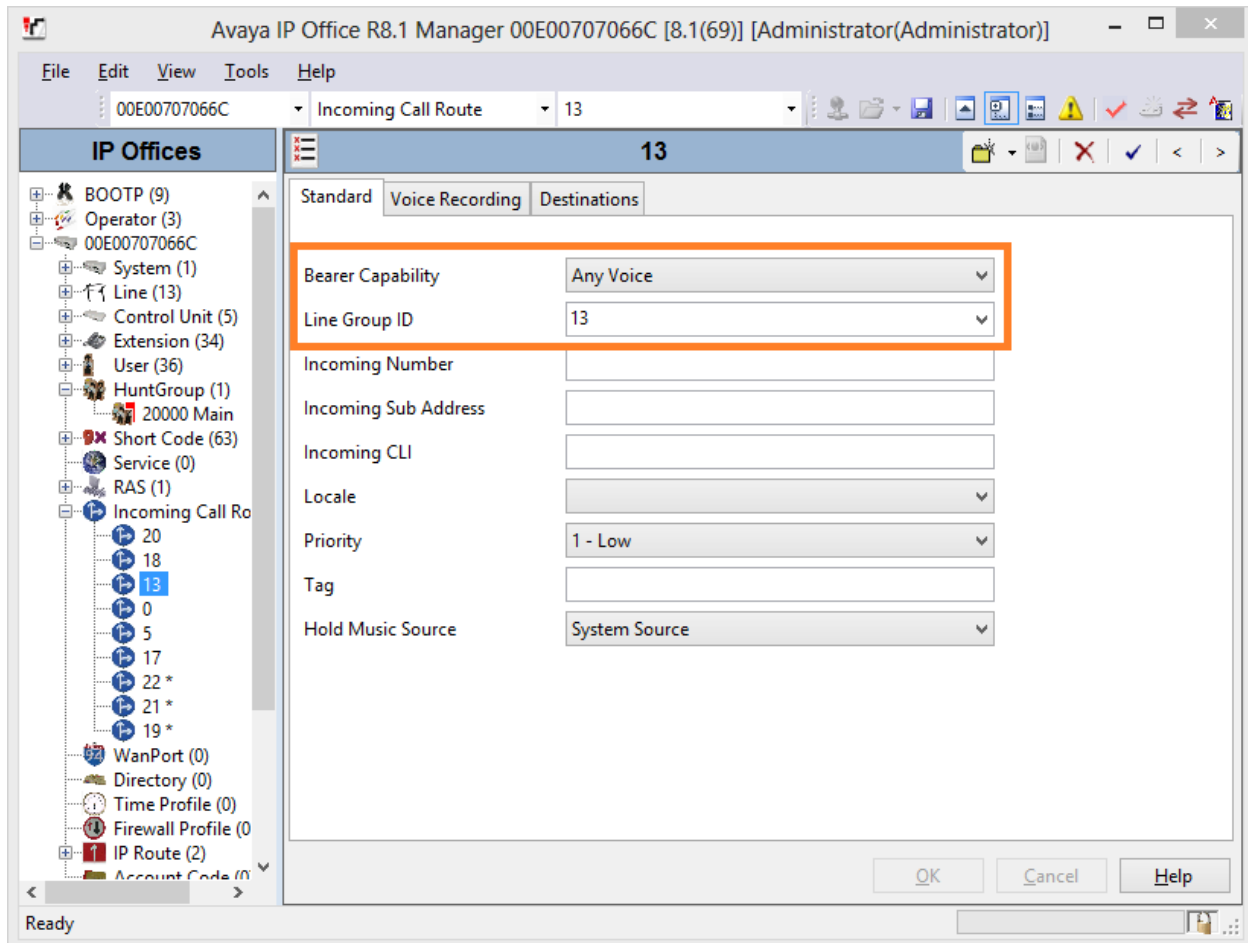
## 5.6 Configure Incoming Call Routes

From the left pane, right click on **Incoming Call Route**, and select **New**.



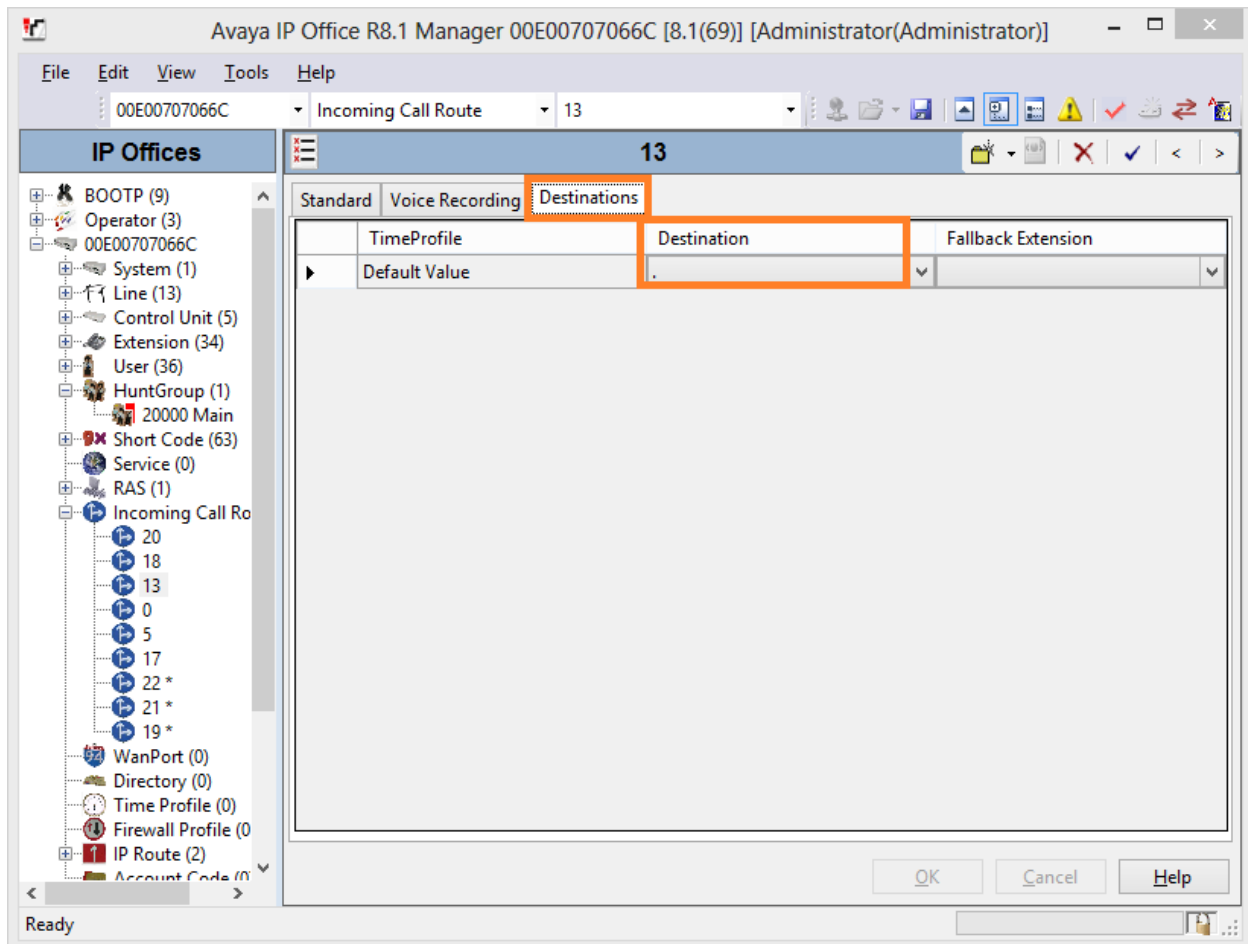
Under the **Standard** tab, configure the following:

- Set **Bearer Capability** to **Any Voice**
- Set **Line Group ID** to Line Group ID of the PRI Line defined earlier (13).



Under **Destinations** tab, configured the following:

- Under **Destination** column, type in a dot, “.” This will allow to route incoming call based on the number that was dialed.



## 5.7 Saving Avaya IP Office Configuration

Once the configuration changes have been completed, select the floppy disk icon to push the changes to the IP Office system.



**Note:** *Changes will not take effect until this step is completed. This may cause a reboot of Avaya IP Office causing service disruption.*

## 6. Configure Wesley Clover Solutions

Wesley Clover Solutions trading platform utilizes Wesley Clover Solutions IP PBX to allow for call routing via Q-SIQ trunks for inter-pbx and external call routing. The following information provides programming guidelines for Q-SIG connection between Wesley Clover Solutions IP PBX and Avaya IP Office.

### 6.1 Assumptions

- It is assumed for the purposes of this document that the appropriate number of digital link licenses and T1 modules have been installed in the Wesley Clover Solutions IP PBX. One Digital Link License, P/N 54000303, and one available RJ-45 port on a Dual T1/E1 Trunk MMC Module, P/N 50003560, is required for each Q-SIG T1.
- The dial-able Avaya extension numbers are 4 digits in length.
- There are no dial restrictions for calls routing to Avaya Aura Environment.

Note: Configuration is performed via a web browser, by navigating to <http://<ip-address>> , where **ip-address** is the IP address of Wesley Clover Solutions IP PBX.

## 6.2 Create Digital Link Descriptor

Navigate to **Trunks→Digital→Digital Link Descriptors** (not shown)

In this example 7 is used as a link descriptor.

- Set **Integrated Digital Access** to **ISDN Node**.
- Set **QSIG Private Network Access** to **Yes**.
- Set **B8ZS Zero Code Suppression** to **Yes**.
- Set **Operation Mode** to **CSU** and **Extended Super Frame** to **Yes**.

Digital Link Descriptors	
Number	7
Address for Message Control	A
BER - Maintenance Limit, 10**-n	4
BER - Service Limit, 10**-n	3
Data Call Alternate Digit Inversion	<input checked="" type="radio"/> No <input type="radio"/> Yes
Framing Losses in 24 hrs - Maintenance Limit	9000
Framing Losses in 24 hrs - Service Limit	9000
Integrated Digital Access	ISDN NODE
Vendor Inter-working Type	
Satellite Link Delay	<input checked="" type="radio"/> No <input type="radio"/> Yes
Slip Rate - Maintenance Limit (slips/24hr.)	9000
Slip Rate - Service Limit (slips/24hr.)	9000
Alarm Debounce Timer - Service Limit (millisec.)	500
Voice Encoding	Nil
Data Encoding	Nil
QSIG Private Network Access	<input type="radio"/> No <input checked="" type="radio"/> Yes
Digital Link Fault Delay Timer (sec.)	240
Termination Mode	<input type="radio"/> LT <input checked="" type="radio"/> NT
Send Malicious Call Indication to PSTN for Tagged Calls	<input checked="" type="radio"/> No <input type="radio"/> Yes
Inhibit sending Mitel Specific Info	<input type="radio"/> No <input checked="" type="radio"/> Yes
T1 Only	
B8ZS Zero Code Suppression	<input type="radio"/> No <input checked="" type="radio"/> Yes
Operation Mode	CSU
CSU Tx Line Build-Out (dB.)	0
DSX-1 Line Length (Ft.)	0-133
Extended Super Frame	<input type="radio"/> No <input checked="" type="radio"/> Yes
Inverted D channel ( DPNSS only )	<input checked="" type="radio"/> No <input type="radio"/> Yes
T1-619a Signalling ( MLPP only )	<input checked="" type="radio"/> No <input type="radio"/> Yes
E1 Only	
CRC-4 Enabled	<input type="radio"/> No <input checked="" type="radio"/> Yes
E1 Line Length (Ft.)	0-133
E1 Impedance (Ohms)	<input type="radio"/> 75 <input checked="" type="radio"/> 120

### 6.3 Set the ISDN Protocol

Navigate to **Trunks→Digital→ISDN→ISDN Protocol** (not shown)

In the ISDN Protocol form:

- Set **Protocol** to **Q.SIG**.
- Set **Protocol Variant** to **ISO**.
- Select **Fake Answer Supervision**.
- Select **Enable Prefix Insertion**.
- Type in a **Comment** for information purposes.

The screenshot shows the 'ISDN Protocol' configuration form. The fields are as follows:

ISDN Protocol	
Controller Module	1
Port	1
Link Number	1
Interface Type	T1
Protocol	Q.SIG
Protocol Variant	ISO
Network side/Q.SIG Master	<input type="checkbox"/>
Enbloc	<input type="checkbox"/>
Enable Unknown TON/NP	<input type="checkbox"/>
Enable NI2 Service Messages	<input type="checkbox"/>
Send NI2 Outgoing Name	<input type="checkbox"/>
Replace External CLID	<input type="checkbox"/>
Q.SIG Only	
Fake Answer Supervision	<input checked="" type="checkbox"/>
Enable Prefix Insertion	<input checked="" type="checkbox"/>
Comment	Avaya Q.SIG

Red boxes highlight the 'Protocol' and 'Protocol Variant' dropdowns, the 'Fake Answer Supervision' and 'Enable Prefix Insertion' checkboxes, and the 'Comment' text field.



## 6.4 Assign the Digital Link

Navigate to **Trunks→Digital→Digital Links** (not shown)

Apply the Digital Link Descriptor that was created in the **Section 6.2** to an available Digital Link port. This corresponds to the physical RJ-45 port on the Dual T1/E1 MMC module. For clarity it is recommended that the comment field be filled in.

Digital Links	
Controller Module	1
Port	1
Unit	6
Shelf	1
Slot	2
Link	1
Interface Type	UNIVERSAL T1
Digital Link Descriptor	7
Comment	Q.SIG
Resilient Link	<input type="checkbox"/>
Resilient Link ID	1
Primary Network Element	
Secondary Network Element	

Save Cancel

## 6.5 Create MSDN-DPNSS-DASSII Trunk Circuit Descriptor

Navigate to **Trunks→Digital→MSDN-DPNSS-DASSII Trunk Circuit Descriptor** (not shown)

In this example, Trunk Descriptor **2** is used.

- Select **Universal T1** from **Card Type** drop down menu.
- Select **Local Office** from **Far End Connection** drop down menu.

**MSDN-DPNSS-DASSII Trunk Circuit Descriptor**

Number: 2

Card Type: UNIVERSAL T1

Dual Seizure Priority: ☒ Incoming ☐ Outgoing

Far End Connection: Local Office

Signalling Protocol: ☒ MSDN-DPNSS ☐ DASS II

ISDN BRI Mode: [dropdown]

Save Cancel

## 6.6 Program Class Of Service (COS)

Navigate to **System Properties**→**System Feature Settings**→**Class of Service Options** (not shown)

Program a unique COS. In this example **7** is used. Add an identifier to the Comment field.

Class Of Service Number	7
Comment	QSIG

Set the following trunk options to **Yes**.

- ANI/DNIS/ISDN Number Delivery Trunk
- Public Network Access via DPNSS
- Public Network To Public Network Connection Allowed
- Trunk Calling Party Identification
- Trunk Flash Allowed
- Two B-Channel Transfer Allowed

Trunk	
ANI/DNIS/ISDN Number Delivery Trunk	<input type="radio"/> No <input checked="" type="radio"/> Yes
DASS II QLI/TLI Provided	<input checked="" type="radio"/> No <input type="radio"/> Yes
Public Network Access via DPNSS	<input type="radio"/> No <input checked="" type="radio"/> Yes
Public Network To Public Network Connection Allowed	<input type="radio"/> No <input checked="" type="radio"/> Yes
Public Trunk	<input checked="" type="radio"/> No <input type="radio"/> Yes
R2 Call Progress Tone	<input checked="" type="radio"/> No <input type="radio"/> Yes
Suppress Simulated CCM after ISDN Progress	<input checked="" type="radio"/> No <input type="radio"/> Yes
Trunk Calling Party Identification	<input type="radio"/> No <input checked="" type="radio"/> Yes
Trunk Flash Allowed	<input type="radio"/> No <input checked="" type="radio"/> Yes
Two B-Channel Transfer Allowed	<input type="radio"/> No <input checked="" type="radio"/> Yes

Verify **Conference Call** is set to **Yes**.

Conference	
Conference Call	<input type="radio"/> No <input checked="" type="radio"/> Yes
Disable Conference Join Tone	<input type="radio"/> No <input checked="" type="radio"/> Yes

## 6.7 Program Trunk Attributes

Navigate to **Trunks**→**Trunk Attributes** (not shown)

In this example, 7 is used as a Trunk Service Number.

- Set the **Class of Service** to the COS assigned in **Section 6.6**.
- Set **Class of Restriction** to 1.
- Set the **Dial-In Trunk Incoming Digit Modification – Absorb** to 0.
- Add a **Trunk Label**.

Trunk Attributes	
Trunk Service Number	7
Release Link Trunk	No
Call Recognition Service	Off
Class of Service	7
Class of Restriction	1
Baud Rate	9600
Intercept Number	1
Non-dial In Trunks Answer Point - Day	
Non-dial In Trunks Answer Point - Night 1	
Non-dial In Trunks Answer Point - Night 2	
Dial In Trunks Incoming Digit Modification - Absorb	0
Dial In Trunks Incoming Digit Modification - Insert	
Dial In Trunks Answer Point	
Dial In Trunks Insert Forwarding Information	<input checked="" type="radio"/> No <input type="radio"/> Yes
Trunk Label	Q.SIG

Save Cancel

## 6.8 Program Digital Trunks

Navigate to **Trunks→Digital→Digital Trunks** (not shown).

In the Digital Trunks form, configure as follows:

- Assign a unique trunk number to each circuit.
- Assign the Trunk Service Number created in **Section 6.7**.
- Assign the Circuit Descriptor Number created in **Section 6.1**.
- Interconnect Number and Tenant Number fields may be left as default of 1.

Cabinet	6
Shelf	1
Slot	2
Circuit	1
Card Type	UNIVERSAL T1
Trunk Number	7001
Trunk Service Number	7
DTS Service Number	
Circuit Descriptor Number	2
Interconnect Number	1
Tenant Number	1

## 6.9 Program Trunk Groups

Navigate to **Trunks→Digital→Trunk Groups** (not shown)

Create a new Trunk Group. In this example Trunk Group Number 7 is used.

- Select **Terminal** for **Hunt Mode**.
- Type in descriptive name in **Comments**.

**Add Range Programming - Trunk Groups** Help

This form allows you to add one or more records.

1. Enter the number of records to add:

2. Define the Add Range Programming Pattern:

Field Name	Value to Add	Increment by
Trunk Group Number	<input type="text" value="7"/>	<input type="text"/>
Hunt Mode	<input checked="" type="radio"/> Terminal <input type="radio"/> Circular	-
Trunk Group Busy RAD	<input type="text"/>	<input type="text"/>
Maximum Network Hop	<input type="text"/>	<input type="text"/>
Comments	<input type="text" value="Q-SIG"/>	-

Preview Save Cancel

Navigate to **Trunks→Digital→Trunk Groups→Trunk Group Members**. Add the 23 trunk members to the trunk created in **Section 6.8** to the newly created group.

**Add Range Programming - *Trunk Group Members***

Help

**This form allows you to add one or more records.**

1. Enter the number of records to add:

2. Define the Add Range Programming Pattern:

Field Name	Value to Add	Increment by
Trunk Number	<input type="text" value="7001"/>	<input type="text" value="1"/>

Preview

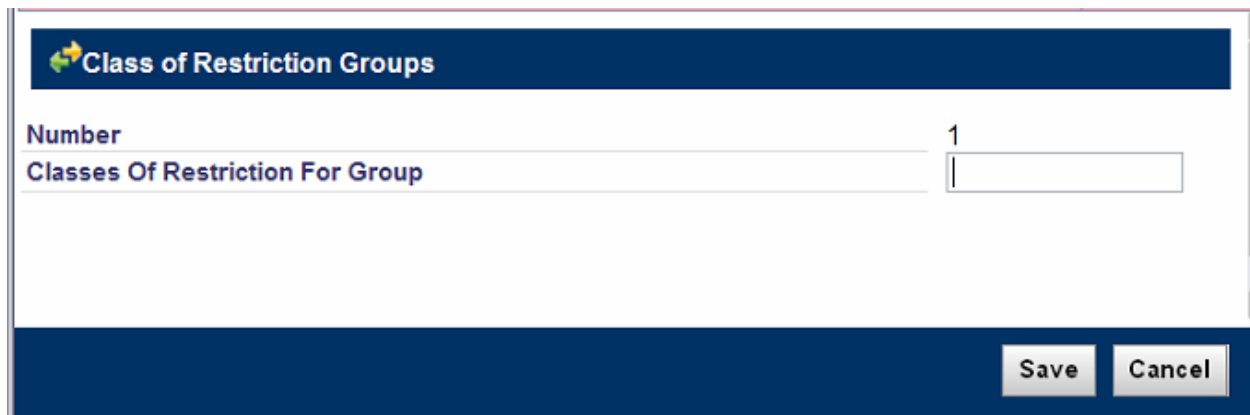
Save

Cancel

## 6.10 Program the Class of Restriction Group

Navigate to **System Properties→System Feature Settings→Class of Restriction Groups** (not shown).

Verify that the Class of Restriction has no restrictions. Choose an index number without any restrictions applied. In this example **Number 1** is used. Note that the **Classes of Restriction For Group** is blank indicating no restrictions.



The screenshot shows a configuration window titled "Class of Restriction Groups". It has a dark blue header bar with a green arrow icon and the title. Below the header, there are two input fields. The first field is labeled "Number" and contains the value "1". The second field is labeled "Classes Of Restriction For Group" and is empty. At the bottom right, there are two buttons: "Save" and "Cancel".

## 6.11 Program the Digit Modification Plan Form

Navigate to **Call Routing→Automatic Route Selections (ARS) →ARS Digit Modification Plans**

In this example **Digit Modification Number** of **1** is used. Set the **Number of Digits to Absorb** to **0**.



The screenshot shows a configuration window titled "ARS Digit Modification Plans". It has a dark blue header bar with a green arrow icon and the title. Below the header, there are four input fields. The first field is labeled "Digit Modification Number" and contains the value "1". The second field is labeled "Number of Digits to Absorb" and contains the value "0". The third field is labeled "Digits to be Inserted" and is empty. The fourth field is labeled "Final Tone Plan/Information Marker" and is empty. At the bottom right, there are two buttons: "Save" and "Cancel".



## 6.12 Program Route Assignment Form

Navigate to **Call Routing**→**Automatic Route Selection (ARS)**→**ARS Routes** (not shown)

In this example **Route Number** of **2** is used.

- Set the **Routing Medium** to **TDM Trunk Group**.
- Program the **Trunk Group Number** created in **Section 6.9**.
- Program the **COR Group Number** from **Section 6.10**.
- Program the **Digit Modification Number** from **Section 6.11**.

ARS Routes	
Route Number	2
Routing Medium	TDM Trunk Group
Trunk Group Number	7
SIP Peer Profile	
PBX Number / Cluster Element ID	
COR Group Number	1
Digit Modification Number	1
Digits Before Outpulsing	
Route Type	
Compression	Off

Save Cancel

## 6.13 Program Digits Dialed Form

Navigate to **Call Routing**→**Automatic Route Selection (ARS)**→**ARS Digits Dialed** (not shown).

In this example the Avaya extensions are 5 digits in length and begin with a 2.

- Program the **Digits Dialed** field with the 1<sup>st</sup> digit of the Avaya extensions.
- Program the **Number of Digits to Follow** field to be the number of digits in the Avaya extension, minus 1 digit.
- Select **Route** for the **Termination type**.

Program the **Termination Number** to match the route created in **Section 6.12**.

**Add Range Programming - ARS Digits Dialed** Help

This form allows you to add one or more records.

1. Enter the number of records to add:

2. Define the Add Range Programming Pattern:

Field Name	Value to Add	Increment by
Digits Dialed	<input type="text" value="2"/>	
Number of Digits to Follow	<input type="text" value="4"/>	
Termination Type	<input type="text" value="Route"/>	
Termination Number	<input type="text" value="2"/>	

Preview Save Cancel

## 7. Verification Steps

This section provides verification steps that may be performed in the field to verify that the solution is configured properly. This section also provides a list of useful troubleshooting tips that can be used for troubleshooting.

### 7.1 Avaya IP Office

The following steps may be used to verify the configuration:

Using IP Office Manager, navigate to **File→Advanced→System Status** (Not shown). The following screen will be displayed.

Enter the appropriate credentials and click **Logon**.



The screenshot shows the 'IP Office R8.1 System Status' window. The title bar includes the Avaya logo and the text 'IP Office R8.1 System Status'. The main window has a blue header with the 'AVAYA' logo and 'IP Office System Status'. Below the header is a menu bar with 'Help', 'Exit', and 'About'. The main content area features a 'Logon' dialog box. The dialog box has two tabs: 'Online' (selected) and 'Offline'. It contains the following fields: 'Control Unit IP Address' (10.64.10.54), 'Services Base TCP Port' (50804), 'Local IP Address' (Automatic), 'User Name' (Administrator), and 'Password' (masked with dots). There is an 'Auto reconnect' checkbox and a 'Logon' button. The footer of the window displays 'IP Office System Status Version 8.1(43)'.

Navigate to **Trunks** → **Line:  $n$**  in the left pane, where  $n$  is the line number of PRI line configured in this document. Select and verify the status of each trunk used in the configuration.

**Current State** of all **Channels** should be **idle**.

IP Office R8.1 System Status - 00E00707066C (10.64.10.54) - IP500 V2 8.1 (69)

**AVAYA** IP Office System Status

Help Snapshot LogOff Exit About

System  
Alarms (24)  
Extensions (33)  
Trunks (12)  
    Lines: 1 - 4  
    Line: 5  
    ▶ Line: 13  
    Line: 17  
    Line: 18  
    Line: 19  
    Line: 20  
    Line: 21  
    Line: 22  
Active Calls  
Resources  
Voicemail  
IP Networking

**Status** Utilization Summary Alarms Line Testing

**Digital Trunk Summary**

Line: 13 Slot: 4 Port: 1  
Line Type: T1Q931  
Line Subtype: QSIG A  
Number of Channels: 23  
Number of Administered Channels: 23  
Number of Channels in Use: 0  
Line Admin State: In Service

Channel Number	Call Ref	Current State	Time in State	Routing Digits	Caller ID or Dialed Digits	Other Party on Call	Direction of Call
1		Idle	32 days 00:29:18				
2		Idle	32 days 00:29:18				
3		Idle	32 days 00:29:18				
4		Idle	32 days 00:29:18				
5		Idle	32 days 00:29:18				
6		Idle	32 days 00:29:18				
7		Idle	32 days 00:29:18				
8		Idle	32 days 00:29:18				
9		Idle	32 days 00:29:18				
10		Idle	32 days 00:29:18				
11		Idle	32 days 00:29:18				
12		Idle	32 days 00:29:18				
13		Idle	32 days 00:29:18				
14		Idle	32 days 00:29:18				
15		Idle	32 days 00:29:18				

Trace Trace All Pause Call Details Print... Save As...

1:15:07 PM Online

## 7.2 Wesley Clover Solutions

Navigate to **Maintenance and Diagnostic** → **Maintenance Commands** (not shown)

The following maintenance commands may be useful for testing and validation. Please refer to the Wesley Clover Solutions IP PBX help files for additional commands and detailed descriptions.

DTSTAT READ <QSIG Link PLID> LAST 2

This command will show the link status of the QSIG trunks for the last 2 hours.

STAT TRUNK GROUP <trunk group number>

Use this command to view the status of the QSIG trunk. <trunk group number> qualifier is trunk group assigned to the QSIG trunks.

DGT TRACE <number>

This command is useful to validate outbound ARS routing.

LOGS READ SMDR NEWEST <number>

This command may be used to check call records for inbound or outbound calls. <number> is the number of records to read.

## 8. Conclusion

Wesley Clover Solutions Trading Platform passed compliance testing, with one observation mentioned in **Section 2.2**. These Application Notes describe the procedures required to configure Wesley Clover Solutions Trading Platform to interoperate with Avaya IP Office to support the network shown in **Figure 1**.

## 9. Additional References

Product documentation for Avaya products may be found at <http://support.avaya.com>.

*[1] Avaya IP Office 8.1 Installation, 15-601042 Issue 26i – (23 August 2013)*

*[2] Avaya IP Office R8.1 Manager, 10.115-601011 Issue 29o – (03 August 2013)*

Product documentation for Wesley Clover Solutions can be obtained from <http://www.wesleycloversolutions.com>

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