



ISDN Router Series
User's Guide Supplement
for RAS S/W Version 1.5

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RECYCLABLE

D-Link ISDN Router Series

User's Guide Supplement

for RAS S/W Version 1.5

This document contains information about the latest features and functions added to D-Link's ISDN Router series, including DI-105C/DI-105CM, DI-106/DI-106M, DI-300/DI-300M, and DI-301/DI-301M.

The user's guide supplement is divided into the following sections: New Product Features, Changes Not Compatible With Previous Versions, Enhancement Details, How To Upgrade Your ISDN Router Series Model, and a note on Call Waiting Support.

The New Product Features section lists the new features added to this release. Changes Not Compatible With Previous Versions also contains important material for users of earlier release versions, as does the section How To Upgrade Your ISDN Router Series Model. Detail information is included in the Enhancement Details section and a closing note offers useful information on Call Waiting Support.

New Product Features

SUA Enhancements

In the latest releases, SUA has been enhanced to support many popular applications: Microsoft's tracert under Windows 9x and Windows NT, CuSeeMe, IRC, RealAudio, VDOLive, Quake, and PPTP. Besides the above, multiple SUA servers are supported.

Advanced ISDN Features

ISDN Supplementary Services are now supported. These services work properly only if the needed functions are subscribed to from the telephone company or PTT.

B-channel, CLID, and WAN IP Address Shown on Menu 24.1

B-channel, CLID, and WAN IP addresses are shown on Menu 24.1. Due to space limitations, Menu 24.1 has been separated into two screens. The original static information displayed in Menu 24.1 has been moved to Menu 24.2.1. and Menu 24.1 now only lists the dynamic information.

Changes Not Compatible With Previous Versions

ISDN EPA Mechanism Moved to PC

The CI (Command Interpreter, menu 24.8) command, "isdn ana display", is disabled in this release. A new CI command "sys ealog" is added for displaying the ISDN raw trace data; "isdn ana display" could not work with Telnet before, but "sys ealog" works fine with Telnet. This means you no longer have to rely on the terminal emulator via serial port to capture the ISDN trace.

A new DOS tool is included in new releases - **epapc**. It will be used to decode the ISDN raw trace data into meaningful Q.921 and Q.931 fields. If you have difficulties to run **epapc**, please send the raw ISDN trace to D-Link support for decoding. The proper steps to take the raw ISDN trace are:

1. Type "isdn analyzer on".
2. Try to make your ISDN call.
3. After failed ISDN connection type "isdn analyzer off".
4. Type "sys ealog".
5. Start to capture the data displayed on the screen.
6. Type <CR> to show the raw ISDN trace on screen.
7. Press <space bar> to keep D-Link displaying the trace until hit end.
8. Stop the capturing mechanism.

Busy Tone Generated after Far-end Hanging up

In previous releases, D-Link ISDN routers remained silent after far-end hanging up of the phone. In this release, a busy tone occurs after far-end hanging up. A special situation arises for those answering machines based on silence to detect the end of the message. To work around this, issue a CI command and reboot your ISDN router.

- ◆ If the answering machine is on POTS port 1, the CI command is:
isdn set initstring s78.0=1
- ◆ If the answering machine is on POTS port 2, the CI command is:
isdn set initstring s78.1=1
- ◆ If the answering machines are on both POTS ports, the CI command is:
isdn set initstring s78.0=1s78.1=1

If you do not want to reboot your ISDN router after issuing the above CI command, you can issue another CI command to activate it:
isdn send initstring

You can reset the function to default by issuing:
isdn set initstring

Enhancement Details

SUA Enhancements

SUA has been enhanced to support additional popular Internet applications: MS tracert, CuSeeMe, IRC, RealAudio, VDOLive, Quake, and PPTP. There is no configuration needed for supporting these applications.

For multiple SUA server support, the **Server IP Addr** field in Menu 4 and 11.2 has been removed and a new Menu 15 is added.

Menu 15 - Multiple Server Configuration	
Port #	IP Address
-----	-----
1.Default	0.0.0.0
2. 0	0.0.0.0
3. 0	0.0.0.0
4. 0	0.0.0.0
5. 0	0.0.0.0
6. 0	0.0.0.0
7. 0	0.0.0.0
8. 0	0.0.0.0

Press ENTER to Confirm or ESC to Cancel:

There are up to eight SUA servers that can be configured in Menu 15. The first one is reserved for the default server, and it can not be changed. You only need to assign the IP address to this default server. For other SUA servers, you need to assign them both the Port number and the IP address.

If the default server has been configured properly, all unknown (the port number is neither configured in this Menu, nor in the SUA table) WAN incoming IP packets will be routed to this IP address. Otherwise, the ISDN router will discard them silently if they are neither Telnet (port number 23) nor Authentication (port number 113) packets. For Telnet packets, the

device will act as a Telnet server in this instance. For Authentication packets, the ISDN router will reject them.

The most often used port numbers are:

Table 1. Services with corresponding port numbers:

Service	Port number
FTP	21
telnet	23
SMTP	25
DNS (Domain Name Server)	53
www-http (Web)	80
PPTP	1723

Advanced ISDN Features

Supplemental Services are supported for North American and DSS-1 switches. The relationship among the advanced ISDN features and switch types is:

Table 2. Advanced ISDN features with ISDN variances:

Feature:	US	DSS-1
<i>Incoming Call Bumping (MP)*</i>	y	y
<i>Outgoing Call Bumping (MP)*</i>	y	y
<i>Call Waiting</i>	y	y
<i>Call Transfer</i>	y	n
<i>Call Forwarding</i>	y	n
<i>Three Way Calling (Conference Call)</i>	y	n
<i>Reminder Ring</i>	y	n

Notes:

* - feature supported since v1.42

y - feature supported in this release

n - feature not supported in this release

Before You Begin

Advanced ISDN Features refers to Call Waiting, Call Hold, Conference Calling, Call Transfer, and Reminder Ring on the POTS ports. To take advantage of these features, first establish cooperation with a Central Office switch. Once this has been done, the ISDN router software can be enabled. These services are usually extra charges to your regular monthly payment.

Additional Call Offering (ACO) (in Europe the same service is better known as "Call Waiting") must be subscribed to on your ISDN line in order to utilize the Call Waiting (CW) feature. Flexible Calling is required on your ISDN line in order to use Three Way Calling (Call

Conference), or Call Transfer features. You may want to check with your phone company to confirm if these services are available to you.

In some cases, your telephone company may enable the subscribed services on your first directory (phone) number only. If this happens, you have to request your telephone company to enable the services on your second directory number as well if you need the features on both of the POTS ports.

Advanced ISDN Features Supported by Northern American Version

Menu 2 – ISDN Setup

If the advanced ISDN features are enabled on both of your PORT ports, please follow the suggestions in this section to ensure proper operation on both of them. It is important to select **Phone 1** in **Incoming Analog Call** field under **1st Phone** field, and to select **Phone 2** in **Incoming Analog Call** field under **2nd Phone** field.

For example, if you have two telephone numbers, 5552000 and 5554000, and you want to assign 5552000 to POTS port 1, then configure it as:

```
Menu 2 - ISDN Setup

Switch Type= AT&T 5ESS NI-1

B Channel Usage= Switch/Switch
1st Phone #= 5552000
  SPID #= 0555200001
    Incoming Analog Call= Phone 1
2nd Phone #= 5554000
  SPID #= 0555400001
    Incoming Analog Call= Phone 2

Advanced Setup = No

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

[The figure above is for USA-type firmware.]

```
Menu 2 - ISDN Setup

Switch Type: DSS-1
B Channel Usage= Switch/Switch

ISDN Data      = 5552000          Subaddress=
A/B Adapter 1 = 5552000          Subaddress=
A/B Adapter 2 = 5554000          Subaddress=

Dial Prefix to Access Outside Line=
PABX Number (Include S/T Bus Number)=
Incoming Phone Number Matching= Multiple Subscriber Number(MSN)
  Analog Call Routing= N/A
  Global Analog Call= N/A

Advance Setup = No

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

[The figure above is for European-type firmware.]

If you want to assign 5554000 to POTS port 1, then configure it as:

```
Menu 2 - ISDN Setup

Switch Type= AT&T 5ESS NI-1
B Channel Usage= Switch/Switch
1st Phone #= 5554000
  SPID #= 0555400001
  Incoming Analog Call= Phone 1
2nd Phone #= 5552000
  SPID #= 0555200001
  Incoming Analog Call= Phone 2

Advanced Setup = No

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

[The figure above is for USA-type firmware.]

```
Menu 2 - ISDN Setup

Switch Type: DSS-1
B Channel Usage= Switch/Switch

ISDN Data      = 5552000          Subaddress=
A/B Adapter 1 = 5554000          Subaddress=
A/B Adapter 2 = 5552000          Subaddress=

Dial Prefix to Access Outside Line=
PABX Number (Include S/T Bus Number)=
Incoming Phone Number Matching= Multiple Subscriber Number(MSN)
  Analog Call Routing= N/A
  Global Analog Call= N/A

Advance Setup = No

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

[The figure above is for European-type firmware.]

Menu 2.1 -- ISDN Advanced Setup

In Menu 2, move cursor to the **Advanced Setup** field and select **Yes**, then press the “ENTER” key. The ISDN Advanced Setup menu will appear. This allows for configuring supplemental services and other options as shown below in Menu 2.1.

```
Menu 2.1 - ISDN Advanced Setup

ISDN Features Access Code:
  Conference Call= 60
  Call Transfer= 61
  Call Drop= 62
  Call Forwarding= 57

Phone 1 Call Waiting= Disable
Phone 2 Call Waiting= Disable
Preferred Phone # for 1st Out Data Call= None

Press ENTER to Confirm or ESC to Cancel:
```


Please note that the default values entered in the feature access code fields are the values that are specified by the NI-1 standard. Please ask your telephone company about the correct access code for your ISDN line provision. For certain RBOCs (e.g. Pacific Bell), or switches (e.g. Northern Telecom Custom), the values could be different from above. Use the access code provided by your telephone company; otherwise, our recommended values are:

Access Code	Feature
4	Conference Call
5	Call Transfer
6	Call Drop
57	Call Forwarding

By toggling the **Phone 1 Call Waiting** and **Phone 2 Call Waiting** fields, you can enable and disable the Call Waiting feature on the POTS port phones. Disable is the default setting for Call Waiting feature on both phones.

The purpose of adding the **Preferred Phone # for 1st Out Data Call** field is to allow users to reserve a Directory (Phone) number for incoming calls. When there is no active data or voice call, the first Directory (Phone) number (DN-1) will be used to place the out data call if **None** or

1st is selected, and DN-2 will be used if **2nd** is selected. The difference between **None** and **1st** is the B-channel requested in Setup message from ISDN router to switch. There is no B-channel preference set in the Setup message if **None** is selected. The B-channel preference is **B1** if **1st**

is selected, and the B-channel preference is **B2** if **2nd** is selected. Here is a brief description about the choices of this field:

- None: DN-1 is used to place the out data call.
- 1st: DN-1 is used to place the out data call, and the preferred B-channel is B1.
- 2nd: DN-2 is used to place the out data call, and the preferred B-channel is B2.

It must be emphasized that the above selection is only a preference. A switch may reject the B-channel request; and use a different DN because the desired Directory (Phone) number is being used by another call.

Call Waiting

ISDN Call Waiting allows you to place a call on hold while you answer another incoming call on the same phone (directory) number.

How to Use Call Waiting

- ◆ Put your current call on hold and answer the incoming call - after hearing the call waiting indicator tone, press and immediately release the flash hook button on your telephone.
- ◆ Put your current call on hold and switch to another call - press and immediately release the flash hook button on your telephone.
- ◆ Hang up your current call before answering the incoming call – hang up the phone and wait for the phone to ring. Then answer the incoming call.
- ◆ Hang up on the current active call and switch back to the other call – hang up the phone and wait for the phone to ring. Then pick up the phone to return to the other call.

Why Call Waiting Doesn't Work as Expected

1. An incoming caller will receive a busy signal if:
 - ◇ you have two calls (one active and one on hold; or both active by using Three Way Calling) on the Directory (Phone) number the incoming caller is attempting to reach.
 - ◇ you are dialing out by using the Directory (Phone) number the incoming caller is attempting to reach, but have not yet established a connection.
2. If no action is taken (call waiting indicator tone is ignored) to pickup the call, the call waiting tone will cease after about 20 seconds.
3. There exists a rollover call. Please take a look at the **Call Rollover Support** section for detailed information.

North American Call Waiting examples are included in the Note on Call Waiting Support at the end of this user's guide supplement.

Call Rollover Support

In previous releases, ISDN routers did not support Call Rollover. D-Link now supports this feature in version 1.5 or later. Unfortunately, this feature is switch dependent. That means Call Rollover works only if the Switch Type is AT&T NI-1.

Incoming Call Rollover

If the Directory (Phone) number, DN-1, associated with POTS port 1 is used by a data call (it might be another analog call to POTS port 2, a rare occurrence), the incoming analog call intended for DN-1 will be routed to POTS port 1. This is called incoming analog call rollover. None of the advanced ISDN features works for this incoming analog rollover call.

If the Directory (Phone) number, DN-1, associated with POTS port 1 is used by an analog call, the incoming data call intended for DN-1 will be answered. It is called incoming data call rollover. The advanced ISDN features do not work on the analog call if there is an incoming data rollover call at the same time.

Outgoing Call Rollover

For outgoing data calls, there is no problem for your ISDN router to obtain the unused Directory (Phone) number to place the call. So, there is no outgoing data rollover call problem. It is different for the outgoing call initiated by the POTS port.

If the Directory (Phone) number, DN-1, associated with POTS port 1 is used by a data call, the ISDN router will use DN-2 as the caller number to place the call from POTS port 1. It is called outgoing voice call rollover. Call Waiting does not work in this case even though other advanced ISDN features work without difficulty.

Three Way Calling (Call Conference)

The Three Way Calling feature allows you to add a third party to an existing call. The Flexible Calling service must be subscribed to from the telephone company.

How to Add a Third Party to an Existing Call

- ◆ If you wish to add a third party to an existing call, follow these steps:
 1. Press the flash hook button and immediately release it to put the existing call on hold and receive a dial tone.
 2. Dial the third party.
 3. Inform the third party about the conference.
 4. When you are ready to conference the call, press the flash hook button and immediately release it to establish a Three Way Conference Call.
- ◆ If you wish to cancel your attempt for some reason (the third party's line is busy, no one answers, etc.), just hang up the phone and pick it back up after the phone rings.

How to Remove a Party from Three Way Calling

- ◆ If you wish to drop the last party added to a Three Way Calling conversation, just press the flash key. The last caller that was added to the conference will be dropped.

- ◆ If you wish to drop yourself from the conference call, but allow the other two callers to remain connected, just hang up your phone. If the other two remain on the line, your exit from the conversation will not impact their connection.

Call Transfer

Call Transfer allows you to transfer an active call to a third party. The Flexible Calling service has to be subscribed to from the telephone company. In fact, Call Transfer is a variation of Three Way Calling.

If you wish to transfer an active call to a third party and inform him or her about the transferred call, the steps are as follows:

1. Press flash to immediately put the existing call on hold and receive a dial tone.
2. Dial the third party.
3. Inform the third party about the call transfer.
4. Press the flash hook button and immediately release it to establish a Three Way Conference Call.
5. Hang up the phone to complete the transfer.

If you wish to do a blind transfer to a third party, follow these steps:

1. Press flash to immediately put the existing call on hold and receive a dial tone.
2. Dial the third party.
3. Before the third party picks up the call, you can transfer the call by pressing flash and hanging up. The call will be automatically transferred.

Call Forwarding

The Call Forwarding feature is supported by the ISDN switch directly. The Call Forwarding feature of the POTS port can be activated and deactivated by using the phone set. Call Forwarding is a telephone feature and will not impact incoming data call. Please ask your phone company for instructions on how to activate or deactivate the Call Forwarding feature. Here are the instructions written in the Custom Calling Service section of Pacific Bell's White Pages:

To turn on, press 72#. At the dial tone, enter the number you want your calls forwarded to. If the line is busy or does not answer, repeat the above process and it will be activated even if the line is still busy. To turn off, press 73#.

Reminder Ring

The ISDN router will alert you every time a call has been forwarded by sending a single short ring to your telephone. This feature is just to let you know that your calls are being forwarded.

Call Waiting Support for DSS-1

In the current release, the only supplementary service supported is Call Waiting. Please move the cursor to the **Advanced Setup** fields in Menu 2 and select Yes, then press the “ENTER” key to access the ISDN Advanced Setup (see below).

```
Menu 2.1 - ISDN Advanced Setup

Phone 1 Call Waiting= Disable
Phone 2 Call Waiting= Disable
```

By toggling the **Phone 1 Call Waiting** and **Phone 2 Call Waiting** fields, you can enable and disable the Call Waiting feature on the POTS port phones. Disable is the default for the Call Waiting feature on both phones. Here is a brief description about the choices of this field:

Disable: disable the Call Waiting feature on the specific phone.

Enable: enable the Call Waiting feature on the specific phone.

B-channel, CLID, and WAN IP Address Shown on Menu 24.1

Menu 24.1 has been separated into two screens. The original static information in Menu 24.1 has been moved to Menu 24.2.1 (see below).

```
Menu 24.2.1 - System Maintenance - Information

Name:Router
RAS S/W Version: V1.50(B.00) | 10/8/98
ISDN F/W Version: V 07f
Country Code: 255

LAN
Ethernet Address: 00:80:c8:11:22:34
IP Address: 130.233.235.1
IP Mask: 255.255.255.0
DHCP: None
```

```
Press Any Key to Exit:
```

In the latest release, Menu 24.1 displays dynamic information only. The B-channel instead of the logical channel is now displayed under **CHAN**. Also, the CLID of the incoming data or voice call is located on this menu, as is the WAN IP address.

```

Menu 24.1 - System Maintenance - Status

CHAN   Link      Type      TXPkt      RXPkt      Error      CLU      ALU      Up Time
B1     ISP       64Kbps    25441      20166      0          12%     2%      0:15:10
B2     Voice     0Kbps     0          0          0          0%      0%      0:00:00

Total Outcall Time:      1:46:03

Ethernet (V 1.03)                WAN
Status: 10M/Half Duplex          B1 IP Addr: 202.230.158.112
TX Pkt: 59664                    B2 IP Addr:
RX Pkt: 140084                   B1 CLID:
Collision: 5                      B2 CLID:

LAN Packet Which Triggered Last Call:

45 00 00 38 7D 14 00 00 3F 11 C8 0B CA E7 BB 61 9D 16 01 06 05 24 ED F7
00 34 11 25 E7 5F 55 66 AA B5 6D 22 66 00 00 00 00 00 00 00 00 02

Press Command:
COMMANDS: 1-Drop B1  2-Drop B2  3-Reset Counters  4-Drop All  ESC-Exit

```

To Upgrade the D-Link ISDN Router Series

Get the latest firmware version from D-Link's Website or an authorized D-Link reseller. Upgrade your ISDN router by following the instructions for your model:

Versions:

RAS S/W Version - V1.5(B.00) | 10/8/98

ISDN F/W Version - DSS1: V 07f

USA: V 07f

RAS and ISDN firmware files:

di10a.bin, di1xa.bin, di30a.bin, di3xa.bin (for North America)

di10e.bin, di1xe.bin, di30e.bin, di3xe.bin (for DSS1)

NOTE:

Call Waiting Support, Version: 001

Setup: User sets DN1 (“**1st Phone #**” in Menu 2) to Phone 1 and sets DN2 (“**2nd Phone #**” in Menu 2) to Phone 2. In Menu 2.1, all Access Codes are set correctly according to the local Telco switch. The “**Preferred Phone # for 1st Out Data Call**” is set to use the first DN. Both POTS have subscribed supplemental service and ACO turned on. Northern Tel NI-1 is used in this example, however, in most cases, the switch type doesn’t make a difference. If the behavior of your ISDN router is different for another switch type, it will be described later in this section.

```
Menu 2 - ISDN Setup
Switch Type= Northern Tel NI-1
B Channel Usage= Switch/Switch
1st Phone #= xxx0101
    SPID #= 408xxx0101
    Analog Call= Phone 1
2nd Phone #= xxx0202
    SPID #= 408xxx0202
    Analog Call= Phone 2
Advanced Setup = No
```

```
Menu 2.1 -- ISDN Advanced Setup
ISDN Features Access Code:
Conference Call= 60
Call Transfer= 61
Call Drop= 62
Call Forwarding= 57

Phone 1 Call Waiting= Enable
Phone 2 Call Waiting= Enable
Preferred Phone # for 1st Out Data Call= 1st
```

The following is a brief description of different states of the ISDN router. Additionally, a table is used to display some actions that have happened in a specific state and what the user should hear from the phone set. The actions in the table include:

Offhook	: user picks up the phone, that is opens the line.
Call to DN1	: incoming voice call to DN1 (Phone 1).
Call to DN2	: incoming voice call to DN2 (Phone 2).

The responses after the action include:

Ring	: user can hear phone set ringing and is able to answer the call.
Dial tone	: user has opened the line (the phone is offhook)

or a single flash can hear the dial tone, and is able to make an outcall.

- Busy tone** : remote caller hears busy tone from switch or user picks up the phone and hears a busy tone from phone set.
- Call waiting tone** : user hears the tone and can single flash to answer it.

An incoming voice call may be received under three circumstances:

- ◆ Both B channels are idle.
- ◆ Both B channels are occupied by data calls.
- ◆ One channel is occupied by a data call.

The following sections describe each situation in detail.

1. Both B channels are idle - When both B channels are idle, each phone/DN can answer up to 2 voice calls.

	Action 1	Action 2	Action 3	Action 4
	<i>Call to DN1 / Offhook phone 1</i>	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1</i>	<i>Call to DN2</i>
Phone 1	Ring / Dial tone	--	Call waiting tone	--
Phone 2	--	Ring / Dial tone	--	Call waiting tone

2. Two data connections up - Two data connections can be to the same destination or to different destinations. Each case is discussed below.
 - 1) Both channels are connected to the user's ISP. If there is a voice incoming call to any DN, one data connect will be bumped, and the corresponding phone will ring. After the user answers the call, if there is another voice incoming call to that DN, the user will hear the call waiting tone and will be able to flash to answer the 2nd incoming call.

CASE 1: Call to DN1 first.

	Action 1	Action 2	Action 3
	<i>Call to DN1 / Offhook phone 1</i>	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1</i>
Phone 1	Ring / Dial tone	--	Call waiting tone
Phone 2	--	Caller gets busy tone / Busy tone	--

CASE2: Call to DN2 first

	Action 1	Action 2	Action 3
	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1 / Offhook phone 1</i>	<i>Call to DN1</i>
Phone 1	--	Caller gets busy tone / Busy tone	--
Phone 2	Ring / Dial tone	--	Call waiting tone

- 2) Two channels are connected to different Remote Nodes, such as one to an ISP and one to a user's office network. A voice incoming call to any DN will get a busy tone.

	Action 1	Action 2
	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1 / Offhook phone 1</i>
Phone 1	--	Caller gets busy tone / Busy tone
Phone 2	Caller gets busy tone / Busy tone	--

3. Data outcall (DN1) to ISP when both phones are on the hook (not in use). Since **"Preferred Phone # for 1st Out Data Call"** is selected as 1st, and both phones are not in use when the outcall takes place, therefore the data channel will use DN1. For incoming voice calls to DN2, the user will hear rings from Phone 2. For incoming voice call to DN1, the result will depend on the switch type. For AT&T NI-1, the call can be "rolled over", so Phone 1 will ring and the user can answer it. For other switch types, since the switch can't do rollover, therefore the switch won't allow the ISDN router to use DN2 to answer calls to DN1, and the caller will hear a busy tone. Below are tables for AT&T NI-1 and other switch types.

1) SWITCH TYPE: AT&T NI-1

CASE 1: An incoming voice call to the DN that's been used by a data connection can be rolled over and answered.

	Action 1	Action 2	Action 3
	<i>Call to DN1 / Offhook phone 1</i>	<i>Call to DN1</i>	<i>Call to DN2 / Offhook phone 2</i>
Phone 1	Ring / Dial tone	Caller gets busy tone	--
Phone 2	--	--	Caller get busy tone / Busy tone

CASE 2: An incoming voice call to the DN that's not used by a data connection can be answered. Additionally, if a second incoming voice call to the phone is received, a user can hear a call waiting tone and use a single flash to answer it.

	Action 1	Action 2	Action 3
	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1</i>	<i>Call to DN2</i>
Phone 1	--	Caller gets busy tone	--
Phone 2	Ring / Dial tone	--	Call waiting tone

2) OTHER SWITCH TYPE:

CASE 1: An incoming voice call to the DN that's been used by a data connection can not be rolled over, and therefore, the caller will hear busy tone.

	Action 1	Action 2	Action 3
	<i>Call to DN1</i>	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN2</i>
Phone 1	Busy tone	--	--
Phone 2	--	Ring / Dial tone	Call waiting tone

CASE 2: Offhook phone 1, which the DN is used by the data connection, user can dial out. At this moment, the call is rollover. Therefore, user will not get call waiting tone on phone 1 when a voice call comes into phone 1 when a rollover call occurs, and the caller will get busy tone.

	Action 1	Action 2	Action 3
	<i>Offhook phone 1</i>	<i>Call to DN1</i>	<i>Call to DN2</i>
Phone 1	Dial tone	Caller gets busy tone	--
Phone 2	--	--	Caller gets busy tone / Busy tone

4. Data outcall to ISP when one of the phones is in use

In this case, there is no call rollover. Therefore, for any incoming voice call to the phone that's in use, the user should be able to hear the call waiting tone and use single flash to answer the call.

- 1) Phone 1 (DN1) is used to connect to "peer", and then a data call is triggered to ISP (DN2).

	Action 1	Action 2
	<i>Call to DN2 / Offhook phone 2</i>	<i>Call to DN1 / Offhook phone 1</i>
Phone 1	--	Call waiting tone / Dial tone
Phone 2	Caller gets busy tone / Busy tone	--

- 2) phone 2 (DN2) is used to connect to "peer", and then a data call is triggered to ISP (DN1).

	Action 1	Action 2
	<i>Call to DN1 / Offhook phone 1</i>	<i>Call to DN2 / Offhook phone 2</i>
Phone 1	Caller gets busy tone / Busy tone	--
Phone 2	--	Call waiting tone / Dial tone