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Networking
ISDN on iSeries

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Contents

Part 1. ISDN

You can connect your iSeries to an Integrated Services Digital Network (ISDN) that is faster and more accurate than using an analog connection. An ISDN is a public or private digital communications network that can support data, fax, image, and other services over the same physical interface. iSeries ISDN supports integrated data link control (IDLC), Point-to-Point Protocol (PPP), and fax protocols.

To configure and manage ISDN support on your iSeries, see the following information:

Print this topic

Understanding ISDN on the iSeries
This information discusses ISDN network management concerns, and performance and troubleshooting tips.

Planning ISDN Service
Know how to plan your ISDN connections and service.

Configuring your iSeries for ISDN
Know what protocols ISDN supports, such as PPP, fax, and IDLC.

Managing iSeries ISDN Support
This information will help you to manage your ISDN connections and and commands.

Troubleshooting ISDN
Understand error messages and find solutions to common problems.

If you have an existing ISDN installation, read Existing NWI's for important information about your configuration objects and the changes you may need to make before varying them on.

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Chapter 1. Print this topic

To view or download the PDF version, select ISDN (about 526 KB or 68 pages).

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Chapter 2. Integrated Services Digital Network (ISDN) on the iSeries

To improve your understanding of general ISDN concepts, features, and guidelines for configuring and managing your system's ISDN support, see the following information:

What is ISDN?
Learn about different types of ISDN services and connections as well as some basic telephone concepts.

ISDN hardware and **Supported Protocols**
Find out what types of protocols and hardware are supported by ISDN.

Network Management
This site provides information on connection management and considerations, call acceptance and rejection, and problem/troubleshooting tips.

What is ISDN?

Integrated services digital network (ISDN) makes a digital connection, rather than an analog connection, to your local telephone service provider. Compared to analog connections, digital networking increases your communications speed with less noise and distortion. Telephone companies have used ISDN technology since the 1960's for their internal networks. Digital equipment has almost entirely replaced analog equipment, with one exception: the connection to your business or home. To find out more about the exceptions and advantages of ISDN, see the following pages:

Basic telephone concepts
Find out about POTS and the difference between an analog and digital connection.

Advantages of using ISDN
Understand the versitility of ISDN and its advantages.

Switched and permanent B channel connections
This information discusses the difference between switched and permanent connections.

Types of ISDN service
Find out what types of connections and services ISDN supports, such as data over voice transmissions, integrated modems, and integrated data link control (IDLC).

Basic telephone concepts

Plain Old Telephone Service (POTS):

Most telephone line connections, from homes and businesses, to the local telephone company's local central office are analog. This is especially true of residential phone service. The analog connection, POTS, carries analog voice signals. This analog connection cannot carry computer data, video, or any other types of digital or non-voice information. That is why you need a modem to connect your system to the Internet, or to another computer or network. The modem converts your computer's digital information into an analog signal and transmits it over analog phone lines.

The analog ″Last-mile″ connection:

The connection from a business or home to the telephone company's local central office is known as the ″last-mile″ connection. Your telephone is an analog device, but the internal network of the telephone company is digital. Therefore, the switch at the telephone company's central office will convert your telephone's analog signal to a digital signal. From there, your telephone conversation is transmitted as a digital signal. When the digital signal leaves the internal network of the telephone company, the remote switch converts the digital signal back into an analog signal, and transmits it over the ″last mile″ to the telephone you dialed.

The digital connection:

Digital communication is simply a transmission of data in the form of digits. Digital equipment creates, stores, and processes data by way of two states: positive and non-positive. Positive is expressed or represented by the number 1 and non-positive by the number 0. Therefore, data transmitted or stored with digital technology is expressed as a string of 0's and 1's. This string is then broken down into packets of data and stored or transmitted to another location. Once it reaches the destination, the packets are reassembled into the original string.

Because a digital connection, such as ISDN, transmits data through packets of digits instead of a constant stream of data, there are less errors and information corruption. With this type of connection, you avoid having the signal switched between analog and digital during transmission. Digital services, therefore, eliminate the analog connection from your computer or network to the local telephone company's network (the ″last-mile″). This can even speed up the communication process.

Digital Modems, K56flex and V.90

Networks which support ISDN telephones have an 'interworking' capability, which allows someone using digital telephones to talk with someone using an analog telephone connected to a POTS line. This interworking capability also enables a computer connected to ISDN to send and receive data with a computer connected via analog modem to a POTS line. The computer connected to ISDN needs Digital Signal Processing (DSP) capability to perform a modem function, which is similar to what is taking place within the analog modem.

Because this configuration is more immune to signal loss, implementations have been made to modems, allowing them to achieve faster speeds. K56flex and V.90 modems can send data at speeds up to 56 kbps from the digital modem to a remote location analog modem. (Public networks currently limit this speed to 53 kbps. The maximum achievable speed depends on many factors and is often less than the theoretical maximum.) K56flex and V.90 can receive data from the remote analog modem, to the digital modem at a maximum rate of 33.6 kbps.

Types of ISDN service

Basic Rate Interface (BRI)
> Basic Rate Interface service consists of two data-bearing channels ('B' channels) and one signalling channel ('D' channel) to initiate connections. The B channels operate at 64 Kbps maximum; however, (in the U.S. it can be limited to 56 Kbps. The D channel operates at a maximum of 16 Kbps. The two channels can operate independently. For example, one channel can be used to send a fax to a remote location, while the other channel is used as a TCP/IP connection to a different location.

Note: ISDN service on the iSeries supports basic rate interface (BRI). You should keep in mind, however, that ISDN service may not be available in your location. See Planning ISDN Service for further information.

Primary Rate Interface (PRI)
> Primary Rate Interface service consists of a D channel and either 23 or 30 B channels (depending on the country you are in). PRI is not supported on the iSeries.

Attach a BRI device to the network

You can use either a U-interface or S/T interface with your BRI device. The S/T interface can also be used as a passive bus to attach multiple devices which use the BRI.

U-interface
> ISDN BRI uses the existing twisted wire pair between the telephone company's central office and your home or business; this is known as the U-interface. Only a few countries (mainly the United States and Canada) allow an ISDN device to attach directly to this interface.

S/T interface

Most countries require the insertion of a device known as a Network Terminator (NT-1) between the U-interface and the ISDN device. The NT-1 presents a 4–wire interface to the BRI device, which is called the S/T interface. Some countries, such as the United States, require the customer provide the NT-1, but others may require the network owner to provide the device.

There are several situations where it might be desireable to use an S/T interface attachment to the network via an NT-1 verses using an ISDN device to attach directly to the U-interface. The following is a list of scenario's where the S/T interface might be more desireable:

- The customer's building is already wired with NT-1 devices.
- The customer is attaching to a private branch exchange (PBX) or other device that only provides an S/T interface.
- The customer wants to use a 'passive bus' configuration.

Passive Bus configuration

The S/T interface can be used as a passive bus that allows up to eight devices to share a single BRI interface to the network. The devices may include iSeries systems, other computers, ISDN telephones, or ISDN fax machines. These devices all contend for the two available B channels of the BRI.

For more information, see 2751 PCI ISDN BRI S/T IOA Passive Bus Configuration.

Switched and permanent B channel connections

You can have either a switched or permanent connection on your ISDN B channels. Your choice will depend on what type is best suited to your needs.

Switched

The ISDN D channel (signalling channel) is used to establish and subsequently clear B channel (data channel) connections to remote devices. This connection is an ISDN telephone call. The cost of your switched ISDN connection will be based on the amount of time the call is active.

Permanent

A permanent connection is also referred to as non-switched or leased. The B channel connection is always available and requires no signalling or call initiation to be established. The network subscription specifies the destination of the call. Because this connection is always available, you are charged by the service provider whether or not data is transmitted.

Advantages of using ISDN

ISDN is fast and flexible.

ISDN eliminates restrictions and problems that are associated with converting digital signals to analog signals and transmitting them over an analog connection. This elimination results in faster connection establishment and faster data transfer. You can use ISDN as a high speed connection to the Internet, another computer, or to a network. You can send fax (regular telephone service), computer data, and video communications over the same ISDN line, and do it simultaneously.

ISDN has a low error rate.

The data transmitted over an ISDN connection suffers far less corruption from line noise than data transmitted over an analog connection. The difference is in the way the data is transmitted over the line. Analog devices send a constant stream of data, which can be interupted or corrupted by line noise. Digital devices send data in packets or groups, which are spaced out from one another. To find out more about how digital and analog communications differ, see the information on Basic telephone concepts.

In short, ISDN offers a large improvement in communications compared to using a modem over an analog telephone line.

ISDN hardware

iSeries communication technology enables the following services over ISDN:
- Multiple port BRI connections on one input/output adapter (IOA)
- Point-to-Point Protocol (PPP) over ISDN
- Fax over ISDN
- IDLC over ISDN

Also, your iSeries supports the analog remote access service.

For more information on ISDN-supported protocols, see Supported Protocols.

Hardware advances provide these services over multiple dial-in/dial-out connections per IOA. The hardware provides up to 8 connections per IOA, and the integrated modems eliminate the need for racks of modems and cabling. The table below shows supported hardware and protocols:

Protocol	2750 & 2751 ISDN data connection	2750 &2751 V.90 modem connection
IDLC	X	
PPP	X	X
Fax		X (V.17 14.4 kbps)

2750 and 2751 IOAs for ISDN BRI connections

The 2750 PCI ISDN IOA supports the U-bus, 2–wire interface used primarily within North America. The 2751 PCI ISDN IOA supports the S/T-bus, 4–wire interface, used primarily outside of North America. (The 2751 IOA may also be used in North America to support passive-bus and point-to-point connections.) Each BRI port supports 2 B channels and one D channel. In addition, each IOA contains an integrated modem for each B channel that can be used by PPP and Fax. Also, the integrated modems support V.90.

Each IOA has 4 BRI ports and can provide up to 8 simultaneous connections, either ISDN or remote non-ISDN.You can also use a combination of the two connection types, but are still limited to 8 connections. The figure below shows how you use the IOA's integrated modem to connect to a remote non-ISDN site over one B channel.
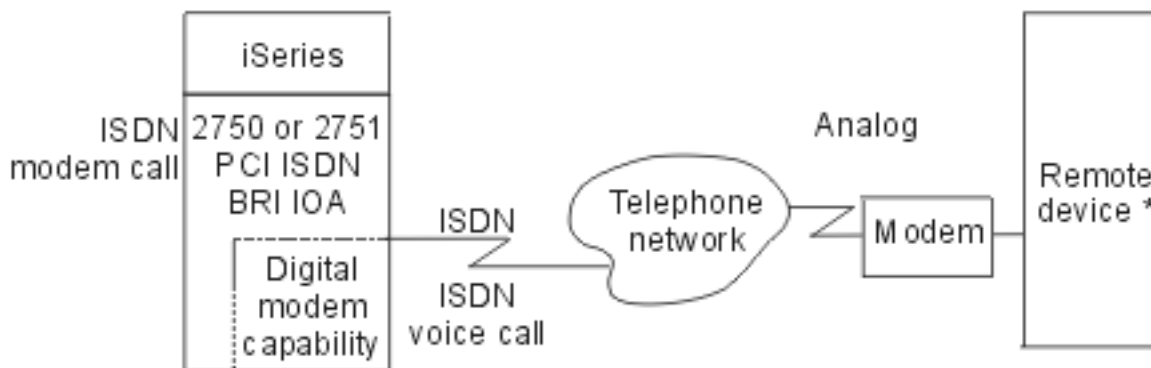
* (PC, laptop, workstation, server router, FAX machine, etc.)

RZAIM502-2

The remote device in the figure above connects to the telephone network through a modem. The IOAs give you modem speeds up to 56 Kbps with V.90 and K56flex. (Fax using V.17 is at 14.4 kbps.)

The figure below shows how the IOA is used for an ISDN-to-ISDN connection over one B channel.
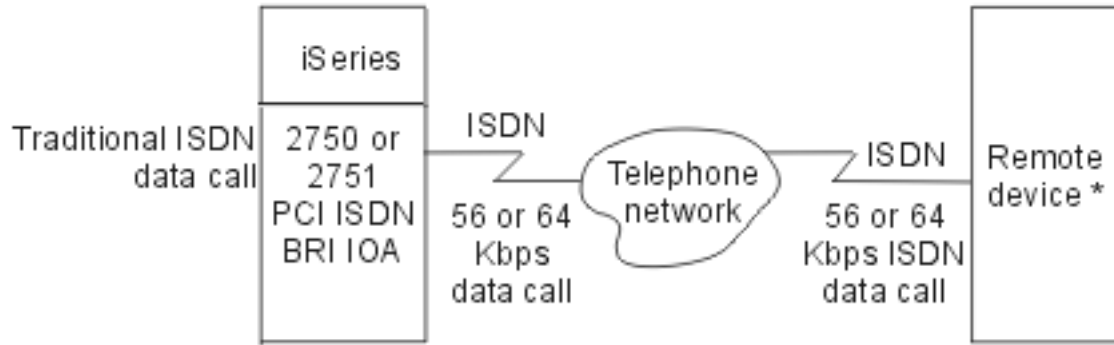
* (PC, workstation, server router, FAX machine, etc.)

The remote device in the figure above connects to ISDN either directly or indirectly through a terminal adapter.

2751 PCI ISDN BRI S/T IOA Passive Bus Configuration

This IOA can also be used in a passive bus configuration. The card has a module containing eight switches of the dual inline pin (DIP) variety. These control the enabling or disabling of line termination. This IOA is shipped from the factory in the 'ON' position (switches pushed down towards the printed circuit board). This enables line termination and is the required mode for all but one scenario.

The exception is when a BRI port on the 2751 is used in passive bus configuration, but the port is not the last device on the passive bus (farthest from the NT-1). To disable line termination for a port on the 2751, push the two switches associated with that port to the 'OFF' position (switches pushed up and away from the printed circuit board).

The association between switches and ports is as follows:
- Port 1: Switches 1 and 2
- Port 2: Switches 3 and 4
- Port 3: Switches 5 and 6
- Port 4: Switches 7 and 8

Alternative solutions to FC2750 and 2751 IOAs

For alternative solutions to using the 2750 and 2751 IOAs, see the iSeries Upgrade Planning page.

Supported protocols

Below is a list of the protocols supported by the 2750 and 2751 IOA's for BRI connections. These IOA's **do not** support X.25 or X.31. (For information on ISDN supported hardware, see ISDN hardware.)

Table 1. List of protocols supported by the 2740 and 2751 IOAs for BRI connections.

ISDN data connection:

ISDN data link control (IDLC)

PPP over ISDN

V.90 or K56flex connections using the Integrated Modem:

PPP over ISDN (Synchronous or Asynchronous modems)

Table 1. List of protocols supported by the 2740 and 2751 IOAs for BRI connections. (continued)

V.17 connection using the Integrated Modem (14.4 kbps)

Fax (over ISDN)

Integrated modem:

The 2750 and 2751 IOAs contain a separate integrated modem for each B channel. The integrated modems support:

Group 3 Fax

Fax data is transferred over an ISDN voice call at fax speeds (up to 14.4 Kbps). The remote site uses a fax device on an analog telephone line.

Asynchronous and Synchronous communications:

These communications transfer modem data over an ISDN voice call at 56 Kbps maximum from your system's digital connection to the remote analog device. They can receive data at 33.6 Kbps maximum from the remote analog device to the digital connection.

Data over voice:

The 2750 and 2751 IOA's also support data over voice, which transports data over an ISDN voice connection instead of over a data connection. (You can specify the use of data over voice in the connection list entry for switched connections and in the line description for nonswitched connections.) This would be advantagous when data connections are not available or when it is cheaper to transmit data over a voice connection. However, when transmitting data over voice you will see some performance loss (56 Kbps versus 64 Kbps). Data over voice can be used for IDLC or PPP in data mode (non-modem mode).

PPP over ISDN

Your iSeries supports Transmission Control Protocol/ Internet Protocol (TCP/IP) over Point to Point Protocol (PPP) on:
*   ISDN data connections
*   ISDN modem switched connections

You use the command line to manually start or stop PPP sessions, but you must use Operations Navigator to configure PPP. You should see Getting started with PPP for general information.

Fax over ISDN

Through the integrated modems, your system supports Group 3 fax over ISDN to send or receive faxes through a switched connection.

ISDN data link control (IDLC)

ISDN Data Link Control (IDLC) provides a reliable link, by way of ISDN, on the B channel between your iSeries and the remote system. Systems Network Architecture (SNA) uses IDLC to communicate with ISDN. The iSeries supports IDLC on ISDN data (or data over voice) calls at 64 kbps or 56 kbps.

The IDLC protocol is based on the data link control protocol that is defined in the CCITT Recommendations Q.922. IDLC provides a reliable link with another end user and can transmit data without waiting to be polled. For a detailed description of the IDLC protocol, refer to the *ISDN Data Link Control Architecture Reference,*(SC31–6826) book.

Chapter 3. Plan for ISDN service

There are multiple steps that you should take in planning for ISDN service. You will have to answer some questions regarding your service needs, talk with your local network service provider to verify what services are available to you, and make choices between the different types of services available. Below is a list of important steps that you should follow:

1. Verify that the telephone company provides supported types of ISDN BRI services and has an iSeries supported network type. Remember that ISDN service is not available for every location, so make certain to ask about your location, specifically.

   The network subscription must deliver all voice calls to the 2750 or 2751 IOA with ″3.1 kHz audio bearer capability.″ Other values of bearer capability might work, however, they are not supported.

2. Verify that you have the proper cards installed. You must have the 2750 or 2751 IOAs for a BRI connection. (PRI connections are not supported on ISDN with the iSeries.) You will also need to configure your iSeries for ISDN.

3. Your choice of ISDN connection data protocols depends on the higher layer protocols your application uses. If your applications use Transmission Control Protocol/Internet Protocol (TCP/IP), your connection protocol is PPP. If your applications use Systems Network Architecture (SNA), your connection protocol is ISDN Data Link Control (IDLC). For a list of protocols supported on the iSeries, see Supported protocols.

   Unless you have a particular reason for using SNA, PPP is your best choice because:
   * It works for both ISDN and analog interfaces.
   * All internet or web applications require it.
   * It interoperates with the greatest variety of remote devices.

   If the enterprise network is mandated to be SNA you *must* use it. You should consider using SNA:
   * If you need it to interoperate with existing applications.
   * For superior performance and efficiency.

4. You have multiple choices that you need to make regarding your network subscription. Therefore, the next step is to determine the capabilities that you need with your ISDN service. The following is a list of possible choices:

   a. Switched and permanent connections are both available with ISDN. On some networks it is possible to have one switched B-channel and one permanent B-channel on the same BRI. You need to decide which connection type(s) will best suit your needs. **Modem connections are not supported on permanent B-channels.**

   b. What type of bearer capability do you need?
      * Unrestricted digital information for ISDN data calls
      * Restricted digital information for ISDN data calls (This should only be used if unrestricted digital information is unavailable)
      * 3.1kHz audio for modem calls or for data over voice calls

      Note: You can request a subscription that has more than one bearer capability. This would be necessary if you are making a combination of ISDN data and modem calls.

5. There are special considerations for North american networks, which you should be aware of:
   * The iSeries is a type E terminal. It is important that you inform your network provider of this!
   * The network provider must tell you whether their switch runs National ISDN, AT&T Generic or Nortel Generic. For example, the switch may be AT&T, but could be running as either National ISDN or AT&T Generic. Therefore, you need to verify what the switch is and what it is running.
   * You need to find out what SPID values the network will provide for you. There can be either two, one or no SPID values. If there are no SPID values, this is known as ″default terminal service profile.″ If you have two SPID values, there will be two ISDN telephone numbers.

6. There are other useful services that might be available from your network service provider. These can include the following:

- **Multiple subscriber numbers:**
  This gives you a set of different local numbers to the subscribed BRI. These numbers are different from the multiple numbers that are in use because of multiple SPIDs on the BRI. Each separate device or function that needs to be addressed is then assigned its own unique local number.

- **Direct dial in:**
  The subscribed BRI is assigned multiple extensions that callers can address by appending the extension digits after the number.

- **Subaddressing:**
  You can use this option to individually access more devices or functions on a BRI without additional subscribed local numbers.

- **Calling line identification presentation (caller ID):**
  This causes the network to deliver the number of the caller, with some exceptions. The sender can block caller ID on either a call-by-call or subscription basis.

- **Multiline Hunt Group (MLHG):**
  With this service, you are able to have multiple BRI connections to the network, which all share the same phone numbers.

Chapter 4. Configure your iSeries for ISDN

Configuring an ISDN connection on the iSeries is not much different than configuring any other type of network connection. You first need to know the ISDN specifications that your telephone service provider uses. Those specifications depend primarily on your location and the terms of your network subscription.

Before you begin to configure your iSeries, you need some important information from your network service provider or ISDN administrator. For more details on what you need to know, see Planning ISDN service.

To successfully configure your iSeries with CL commands, complete the following steps:
1. Configure a network interface description on your iSeries.
2. Configure a connection list, if you have switched service.
3. Configure a line description.
4. Set the modem country ID.
5. Configure a controller description.
6. If you are using APPN support, iSeries configures device descriptions automatically. Otherwise, you need to create device descriptions.

To configure fax or PPP over ISDN, see the following:

     Configuring fax over ISDN

     Configuring PPP over ISDN

Note: Before you vary on existing network interface (NWI) descriptions, see Changing existing NWI descriptions.

iSeries unsupported network issues

If your preferred network type does not appear in the list of iSeries network types, ask your local network provider whether you can substitute one of the supported types.

Supported network types

A network type is your service provider's implementation of ISDN as identified by the iSeries. Your system supports the network types that are listed in the table below. For information specific to a network type, click on links in the table below to find out:
- What information your service provider needs from you.
- What information you need to get from your service provider to configure your iSeries.

The table also shows the current network types and network types they replace. The iSeries IOAs work with these network types:

Table 2. Current network types and the network types that they replace

Network type	iSeries NETTYPE parameter values	Replaced network types
AT&T Generic Interface	*ATT	• *ATT5E42 (AT&T 5ESS version 5E4.2) • *ATT5E5 (AT&T 5ESS version 5E5) • *ATT5E6 (AT&T 5ESS version 5E6)
European Telecommunications Standard Institute (ETSI) (also known as EuroISDN standard)	*ETSI	• *BTNR191 (British Telecom ISDN2) • *FTVN2 (France Telecom Numeris VN2) • *SWISSNET2 (Swiss PTT)

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Table 2. Current network types and the network types that they replace (continued)

Network type	iSeries NETTYPE parameter values	Replaced network types
Japan (Nippon Telegraph & Telephone (NTT))	*JAPAN	*INSNET64 (Nippon Telephone & Telegraph INS-NET64)
Nortel Generic (formerly Northern Telecom)	*NORTEL	*NT100B29 (Northern Telecom DMS100 switch, Versions BCS-29 and BCS-31)
National ISDN (or North American Interface)	*NISDN	
Use this if you specified a default network type in the system network attributes.	*NETATR	

In North America, you will need the additional information below from your provider:
- If you are connected to an AT&T switch, ask your service provider if the switch is running National ISDN or AT&T Generic.
- If you have a basic rate interface and your network type is AT&T Generic, Nortel Generic, or National ISDN (also called North American Interface), you need to know what the service profile identifiers (SPID's) are.

If your network type is not supported, see iSeries unsupported network issues.

Configure an ISDN network interface description

Once you have the information you need from your service provider, you are ready to set up the physical interface from your iSeries to the ISDN. To configure a network interface description, complete the following steps:
1. You need the resource name of the ISDN port to associate with this NWI description. To find out resource names, use the Work with Hardware Resources (WRKHDWRSC) command:
   a. On the iSeries command line, type **WRKHDWRSC TYPE(*CMN)** and press Enter.
   b. Locate an ISDN port by looking for the phrase ″ISDN basic port″ in the text column.
   c. Once found, move your cursor to the port's Option column, press 5, and then press Enter.
   d. Press 1 and press Enter.
2. Type in a name for your ISDN NWI description and press Enter to create a network interface description. Notice that parameter `Resource name` contains the name of the selected resource.
3. For parameter `Network type`, specify the correct network type or use the default *NETATR if you have used the Change Network Attributes (CHGNETA) command to specify a default ISDN network type. You can use the Display Network Attributes (DSPNETA) command to see what the current settings are.
4. Press F9 to display all parameters.
5. Use the `Channel entries` field to establish the characteristics for specific channels in your network interface. If you want one switched connection and one that is permanent, you can create two B-channel entries and one D-channel entry.
   Channel number field specifies the channel number. Possible values for this field are:
   *SWTALL
       Use this value if all your B channels are switched.
   Channel number value
       Specify the channel number (1 or 2) if you are not using *SWTALL. Use the + (more) field, following the channel fields, to specify values for the other channel.

   Channel connection field specifies the connection for a channel. You do not need to specify a value here if `Channel number` is *SWTALL. Possible values for this field are:
   *SWT
       Use this value for switched connections.

*NONSWT

    Use this value for nonswitched (permanent) connections.

Line description field

Line description name

    Use this field to specify an existing line description. If you have not configured the line description yet, leave this field empty. Your system fills in this field when you specify the name of this NWI description while creating the line description. Valid line descriptions include names of ISDN data link control (IDLC) and Point to Point Protocol (PPP) line descriptions.

6. Use parameter `Protocol entries` to specify your protocol (PPP or IDLC) and information specific to that protocol.
7. If you use this NWI description with BRI and your network type is *ATT, *NISDN, or *NORTEL, you must specify `Service profile identifiers` (which you get from your service provider). This parameter does not apply to other network types.
   a. To display parameter `Service profile identifiers`, press F9 (all parameters) and follow the rules below for each SPID:
   b. **`SPID number 1`**
      * If using a `SPID value` other than *NONE, you must specify a value for the `Local number` field.
   c. **`SPID number 2`**
      * Field `SPID value` must be *NONE, if the `SPID value` field of `SPID number` 1 has a value of *NONE.
      * If using a `SPID value` other than *NONE, then you must specify a second number for the `Local number` field.

All other parameters are optional and have default values. If you are configuring this NWI for fax support, return to Configuring fax over ISDN. If the NWI description is for a switched connection and you want iSeries to place outgoing calls or screen incoming calls, you need to configure a connection list next. Otherwise, the next step is to create a line description. You can also see a list of other commands that are available to work with network interface descriptions.

Configure ISDN connection lists

Information you supply in the connection list tells your iSeries when to accept incoming calls and what information to send with an outgoing call. iSeries uses this information for switched connection calls only.

Your system comes with a default connection list (QDCCNNLANY), which directs it to answer *all* incoming ISDN calls. You do not need a connection list:
* If you want your system to accept all incomming calls
* For permanent connections

For your system to place outgoing calls or screen incoming calls, you must create a connection list. To create a connection list, do one or more of the tasks below:

Your system comes with a default connection list (QDCCNNLANY), which directs it to answer all incoming ISDN calls. If this is all you want your iSeries to do with ISDN calls, you do not need to create and configure a connection list. However, for your system to place outgoing calls or screen incoming calls, you can do one or more of the tasks below:
* Create a connection list and add entries to it.
* Change the default connection list (QDCCNNLANY) by adding entries with remote numbers.

You can use one connection list for both answering and dialing, or create different connection lists. To use a connection list for incoming calls, you must specify the connection list in the line description.

To use a connection list for outgoing calls, you must specify it and one of its entries in the line description or controller description. The connection list entry contains the phone number to dial and the information transfer type to use for the call.

For more detailed information about connection lists, see Connection lists. You can also see a list of other commands that work with connection lists and their entries.

ISDN connection lists

Connection lists and connection list entries help your system handle incoming and outgoing calls from the ISDN by providing information to include in outgoing call setup messages:

- A number for both the local and remote system.
- Local and remote **subaddresses**, which are extensions of an ISDN number (telephone number). Your system uses these to identify individual users within a group of users that have a single telephone number.
- A number of additional **information elements (IEs)** that are used for such functions as describing transit networks crossed. An information element is a unique field that is encoded in messages sent over the D channel between iSeries and the ISDN.
- Information to collect about incoming calls.
- Network differences.

Not all networks support exchanging all the information provided by the ITU-T recommendations for ISDN, so information varies from network to network. In addition, some networks charge extra for providing special information about a call (for example, calling party identification). You may prefer not to subscribe to information for which there are special charges.

Create an ISDN connection list

If you have a switched connection and want your system to make outgoing calls or screen incoming calls, you need to either create a connection list or change the IBM-supplied default connection list (QDCCNNLANY) by adding entries. To create a connection list, you need *LIBCRTAUTH authority.

To create a connection list, use the Create Connection List (CRTCNNL) command:
1. On the iSeries command line, type **CRTCNNL**, and press F4.
2. Fill in the name for your connection list, and press Enter.
3. In parameter `Text 'description'`, type in any text you want to describe it.
4. Choose the correct Network type.

   To use this connection list with a particular NWI, their network types must be the same.
5. If you are configuring this connection list for fax support, return to Configuring fax over ISDN. Otherwise, continue to the next step.
6. You can make telephone numbers in this list more readable by adding extra characters (for example, parentheses or hyphens). Your system will use these characters unless you tell it to ignore them. What characters your iSeries ignores by default, depend on your network connection type. To see what characters your iSeries ignores, press F9 (all parameters). You can add to this list if you want.
7. Press Enter to create the connection list and exit the command.

Your next step is to add entries into the connection list you created.

Add ISDN connection list entries

To use a connection list that you have created or to change the default connection list (QDCCNNLANY) to allow your system to make outgoing calls, you must add one or more entries to the list. These entries identify information that this system can use to make outgoing calls and accept incoming calls.

You should see call acceptance performance for guidelines on configuring connection list entries.

To add entries to a connection list, follow the instructions below:
1. On the iSeries command line, type **ADDCNNLE**, and press F4.
2. For parameter `Connection list`, specify the name of the connection list to associate this entry with (either one you created or the default list [QDCCNNLANY]).
3. For parameter `Entry`, specify a name for the new entry. (Each entry in the connection list must have a unique name.)

4. Press F9 to display all parameters.
5. If your ISDN provider assigned a remote number for the remote system, specify it in the `Remote number` field.Your system uses this number to screen incoming calls and route outgoing calls. Enclose the number, which can be up to 32 characters, in apostrophes. (You can use extra characters, such as parentheses, to improve readability. You may need to direct your iSeries to ignore them, if you did not do this when you created the connection list (step 6). You can change the connection list after you have added the entries.

   If you leave the default ***ANY**, your system accepts calls from any remote number. Outgoing calls that attempt to use the default value fail because your system needs a specific remote number to initiate a call.
6. If this is a switched entry and you plan to use it with the integrated modem, configure the integrated modem.
7. All other parameters are optional and have default values.
8. Press Enter to save your description and exit the command.
9. Repeat steps 1 on page 16 through 8 to add more entries.
10. If you are configuring entries for fax support, return to Configuring fax over ISDN.

Next you need to create a line description.

Ignoring characters in remote telephone-numbers

iSeries ignores certain extra characters within numbers in your connection list; which ones depend on your network type. If you would like to add characters or see which ones your network ignores, use the Change connection list command (CHGCNNL):
1. On the iSeries command line, type **CHGCNNL CNNL(**_connection_list_**)** and press F4, where connection_list is the name of your connection list..
2. Press F9 to display the `Characters to remove` field (RMVCHR parameter). This parameter contains the list of characters that the iSeries ignores, by default, for the network type.
3. Specify up to 10 characters to ignore and press Enter.
4. Your iSeries ignores these extra characters when it uses numbers from this connection list.To see more information about these values, press F1.

Configure a line description for ISDN connections

After configuring a network interface description and, if appropriate, a connection list, you need to describe particular communication lines to your iSeries. You do this by creating a line description. Your method for doing this depends on which protocol you use:
- For Systems Network Architecture (SNA) over IDLC, create an IDLC line description.
- For fax over ISDN, create a PPP line description.
- For PPP, create a line description using Operations Navigator.

You can also see a list of other commands that are available to work with line descriptions.

Configure IDLC over ISDN

You need to describe the data-bearing B channel connection and the IDLC protocol that is to be used between your local iSeries and the remote system. You do this by creating a line description with the Create Line Description for IDLC (CRTLINIDLC) command. Take these steps:
1. On the iSeries command line, type **CRTLINIDLC** and press F4.
2. Use the `Line description` field to provide a name and press Enter.
3. For the `NWI connection type` parameter, the default value *SWT indicates that a switched connection can be established over any of the network interface descriptions that you will list in the `Switched NWI list` field. If you have a permanent connection, change the value for the `NWI connection type` parameter.
4. Press F10 (Additional parameters) to display other parameters that are associated with the connection type you have chosen.

5. For switched connections, use the `Switched NWI list` field to list up to 64 network interface descriptions to which this line can be connected. (Your iSeries places the name of this line description into the network interface description's `field Line description` field, of the `channel entries` parameter, if it is empty.)
6. To use data over voice (DOV) with non-switched lines, type *DOV into the `Information transfer type` field.
7. Press Enter twice to save your description and exit the command.

If you want to know which parameters affect your switched or permanent line descriptions, see the following information:

Parameters affecting ISDN switched connections
Parameters affecting ISDN permanent connections

When you have configured your line description, you are ready to configure a controller description.

Configure a PPP line description for fax support

After configuring a network interface description, creating a connection list, and then adding entries, you create a PPP line description to use with fax. Your system uses the line description to place the line into asynchronous mode. The PPP protocol is not used with fax.

The steps below are valid only if you are using the PPP line description with fax services:
1. On the iSeries command line, type **CRTLINPPP** and press F4.
2. In the `Line description` field, type a name for your PPP line description.
3. Specify *NWID for the `Resource name` parameter.
4. Use parameter `Connection type` to specify a switched or line.
5. Press F10 to display other parameters associated with the values you have chosen.
6. If you are constructing an outgoing connection list:
   - Specify the name of your connection list in the `Outgoing connection list` field (the CNNLSTOUT parameter). In the `Connection list entry` field, specify the outgoing connection list entry for the connection list. (This supplies the CNNLSTOUTE parameter).
   -

   If you are constructing an incoming connection list:

   - Specify the name of your connection list in the `Incoming connection list` field. (This sets the value for the CNNLSTIN parameter.)

If you want to know which parameters affect your switched line descriptions, see:
- Parameters affecting ISDN switched connections

Configure the ISDN integrated modem

The integrated modem on the 2750 and 2751 IOAs, can only be used with switched connections fax or PPP. The steps shown on this page associate the integrated modem with a connection list entry. The steps below will help you add an entry to the connection list.
1. Press F9 to display all parameters.
2. Locate parameter `Information transfer type` and specify the type of information to transfer through the modem. Select one of the values below:
   - *FAXMODEM
   - *ASYNCMODEM
   - *SYNCMODEM

   To see more information about these values, press F1.
3. IBM provides a default command string for the integrated modem. To specify your own Chapter 6, "AT command strings" on page 39, locate the `Modem init command string` field and type in your commands.

You should click your web navigator's back button to continue with the next step.

Parameters affecting ISDN switched connections

The parameters below affect switched line descriptions for the IDLC protocols. The parameter name (the name used on the command line) is shown in paraenthesis:
- Network interface connection type (CNN)
- Switched NWI list (SWTNWILST)
- Incoming connection list (CNNLSTIN)

For more information about these parametes, press the F1 key while your cursor is in the parameters field.

Parameters affecting ISDN permanent connections

The parameters below affect permanent line descriptions for the IDLC protocols. The parameter name (the name used on the command line) is shown in parenthesis:
- Network interface connection type (CNN)
- Attached nonswitched network interface (NWI)
- Information transfer type (INFTRFTYPE) —
- Network interface channel type (NWICHLTYPE)
- Network interface channel number (NWICHLNBR)

For more information about these parametes, press the F1 key while your cursor is in the parameters field.

Set the modem country ID

If you have NWI or PPP line descriptions associated with IOAs 2750 or2751 , you must set the modem country ID prior to varying on the descriptions. Otherwise the descriptions will fail to vary on.

To set the modem country ID:
1. On the command line type **CHGNETA** and press F4.
2. Locate parameter `Modem country ID` (MDMCNTRYID).
3. Place your cursor on the field and press F4.
4. Locate the two character country ID, type it into the field, and press Enter.

    Do not precede the ID with an asterisk.
5. Press Enter to save your changes and exit the command.

Configure a controller description

After you have configured your line description, you are ready to configure a controller description to ″describe″ communications characteristics of the remote system. Certain parameters on the commands determine how the local system treats the remote system. The command you use depends on what kind of controller you want to create.
- For advanced program-to-program communications, type **CRTCTLAPPC** on an iSeries command line.
- To make the remote system a host system, type **CRTCTLHOST** on an iSeries command line.
- TCP/IP over PPP automatically configures a controller description for you. If you do not have Advanced Peer-to-Peer Networking (APPN) enabled, you can create a network controller by typing **CRTCTLNET** on an iSeries command line.
- For a remote work station, type **CRTCTLRWS** on an iSeries command line.

The ISDN-related parameter for the CRTCTLAPPC command, CRTCTLHOST command, and the CRTCTLRWS command is the **Link type** parameter. It is a required parameter and has no default. Use *IDLC for ISDN data link connections.

To create an IDLC controller, use these parameters on the commands:

Outgoing connection list (CNNLSTOUT) parameter
    Use this parameter to supply your connection list name for outgoing calls. You need it only for
    switched controllers.

Connection list entry (CNNLSTOUTE) parameter
    When you specify a connection list, you can use this parameter to specify which entry name from the
    connection list provides the number for calling a remote system. This parameter is also for switched
    controllers only.

IDLC window size (IDLCWDWSIZ) parameter
    Specifies the maximum number of information frames that can be outstanding before an
    acknowledgment is required. The default *LIND takes the window size from the line description. You
    can specify a value from 1 to 31.

IDLC frame retry (IDLCFRMRTY) parameter
    Specifies maximum number of frame transmit attempts before reporting an error. If you use the default
    *LIND, iSeries retrieves the value from the line description. You can specify a value from 0 to 100.

IDLC response timer (IDLCRSPTMR) parameter
    Specifies the time, in tenths of seconds, to wait before retransmitting a frame when an
    acknowledgment has not been received. The default *LIND takes the response timer from the line
    description. You can specify a value from 10 to 100.

IDLC connect retry (IDLCCNNRTY) parameter
    Specifies the number of times to retry a transmission at connection time. If you use the default *LIND,
    iSeries retrieves the value from the line description. You can specify a value from 1 to 100. If you have
    a permanent connection, you can specify *NOMAX, which means try until successful.

You might want to see a list of other commands that are available to work with the controller descriptions
that you created.

APPN support automatically does the final configuration step, creating device descriptions for you. If you
are not using APPN support, you need to create device descriptions to finish configuring your iSeries for
ISDN.

Create device descriptions

APPN support automatically does the final configuration step, creating device descriptions for you. If you
are not using APPN support, you need to create device descriptions to finish configuring your iSeries for
ISDN. Which command you use depends on the type of controller description. The commands to create
device descriptions include:
* Create Device Description (APPC). To use this command, type **CRTDEVAPPC** on the iSeries command
  line.
* Create Device Description (SNA Host). To use this command, type **CRTDEVHOST** on the iSeries
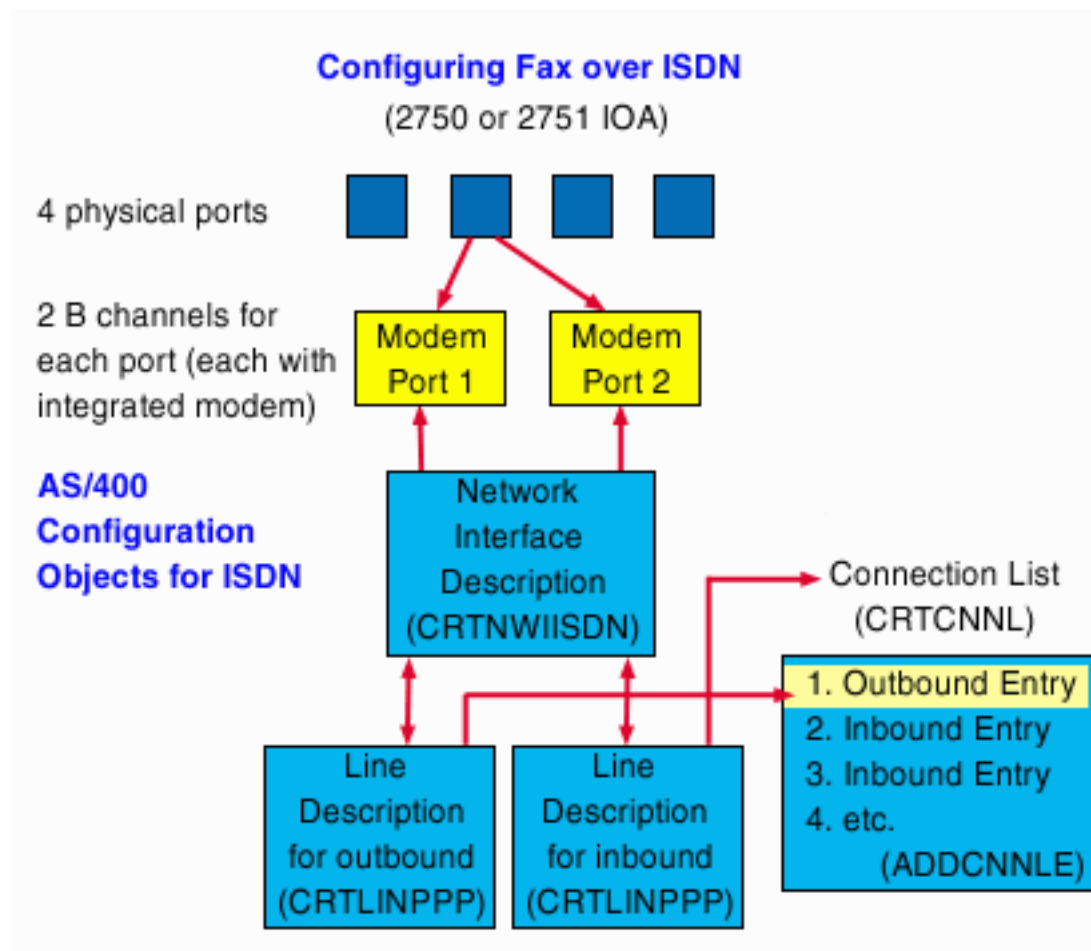 command line.
* Create Device Description (Display) To use this command, type **CRTDEVDSP** on theiSeries command
  line.
* Create Device Description (Network). To use this command for PPP, type **CRTDEVNET** on the iSeries
  command line.

These commands have no parameters with a unique meaning for ISDN.

Configure fax over ISDN

Overview

The following chart provides an overview of the necessary configuration for fax over ISDN. The arrows indicate where the various configuration objects contain links or pointers to other objects.

Configuring Fax over ISDN
(2750 or 2751 IOA)

4 physical ports

2 B channels for each port (each with integrated modem)

Modem Port 1   Modem Port 2

AS/400 Configuration Objects for ISDN

Network Interface Description (CRTNWIISDN)

Connection List (CRTCNNL)

1. Outbound Entry
2. Inbound Entry
3. Inbound Entry
4. etc.
(ADDCNNLE)

Line Description for outbound (CRTLINPPP)   Line Description for inbound (CRTLINPPP)

You will be directed to sources for more detailed instructions on properly configuring your iSeries for Facsimile Support/400 or Fax for Domino (FxD) for iSeries over ISDN. The configuration process will be easier if you first review these concepts:

- Each of the four physical ports have two B channels (each with an integrated modem), which enables the 2750 and 2751 IOAs to support up to 8 simultaneous fax connections.
- Each physical port that you intend to use for fax requires a Network Interface Description for ISDN (NWI), which you will create with the **CRTNWIISDN** command. A single NWI is used to describe both of the channels or modem ports associated with a single physical port.
- You will also create a connections list using the **CRTCNNL** command as well as add separate connection list entries for inbound and outbound routing using the **ADDCNNLE** command.
  - You can create one connection list to be shared by all of your modem ports or create multiple connections lists if you prefer.
  - You must create an outbound entry in the connection list, but you only need one, because all of your modem ports can share a single outbound connection list entry. You only need one entry for outbound calls because the system gets the entry's remote information from the application it is using, such as Facsimile Support for iSeries or FxD for iSeries. The outbound call entry can be used to make many simultaneous calls. However, the maximum number of simultaneous outbound calls in limited by the number of modem ports you have.
  - You must create a separate inbound entry in the connection list. You will only need one unless you want to screen incoming calls.

- For each of the channels on the physical port being used for fax, you will create a PPP line description using the **CRTLINPPP** command. When you create the line descriptions:
  - You must specify the network interface description they are associated with.
  - You do not need to specify the specific channel that each line description is associated with. If you specify ***CALC** as the NWI channel number, the system will automatically select one of the two channel numbers defined for the NWI based on availability.
  - You must specify whether the line description is used for inbound or outbound routing. You can create one line description for inbound routing and one for outbound routing or you may choose to use both for inbound or both for outbound, depending on your needs.
  - When you create a line description for outbound routing, you must specify the connection list and a specific outbound entry in the list.
  - When you create a line description for inbound routing, you only specify the connection list containing one or more inbound entries.
  - Although you use a PPP line description for Facsimile Support for iSeries, the PPP protocol is not used with fax. The system uses the line description to place the line in asynchronous mode.
  - The command initialization string for the integrated modems is created for you and placed in your PPP line description. It is highly recommended that you do not change this string.

For instructions on how to configure your system for fax over ISDN, see Configuration Instructions for fax over ISDN.

Configuration Instructions for fax over ISDN

The configuration instructions below apply to both Facsimile Support/400 over ISDN and FxD over ISDN. After completing these steps, see the bottom of this page for further configuration instructions on your particular fax application.

Note: You do not have to create all the objects or specify all fax-related values when you configure ISDN. Facsimile Support/400 creates some objects and values automatically when you use the Create fax description (**CRTFAXD**) command, and specify *IMISDN for Link Type. FxD for iSeries performs similar functions when you start your FxD server.

1. Set the country ID
2. Create an NWI for a switched PPP connection. Ensure that the parameters below are properly defined:
   - Set `Channel entries` for switched connections (for the appropriate channel). See step 5 on page 14 of "Configure an ISDN network interface description" on page 14.
   - Specify *PPPMAX (or PPP) in the `Protocol entries` field. See step 6 on page 15 of "Configure an ISDN network interface description" on page 14.
3. Create an ISDN connection list.
   For information about connection lists, you should see connection list.
4. Add entries to the connection list. You need separate entries for inbound and outbound calls. Before adding the entry, make sure you know the name of the PPP line description that will use the entry . Also, your connection list should have only one entry for outbound fax calls.

   Use these values for other fax-related parameters:
   - In the `Information transfer type` field (INFTRFTYPE parameter), specify *FAXMODEM.
   - In the `Modem init command string` field (MDMINZCMD parameter), specify *LIND.
   - In the `Local number` field, specify a value for the inbound connection list entry. (*ANY is a legal value.)
   - Specify *LIND in the `Modem init command string` field.
5. Create a PPP line description for inbound fax calls.
6. Create a PPP line description for outbound fax calls.

To complete the configuration process, see Completing fax configuration for ISDN for the instructions specific to your application.

Completing fax configuration for ISDN

If you are using Facsimile Support/400, see chapter 2 of *Facsimile Support for iSeries Installation Guide*, (SC41-0654) for further instructions.

If you are using Fax for Domino (FxD) for iSeries, see Fax for Domino for iSeries over ISDN for more instructions on configuration.

- For each of the line descriptions, you will be directed to create a fax device document. Use the Fax for Domino Administration database (nfxadmin.nsf) or the Domino Directory (Public Address Book, names.nsf) database, depending on whether you use separate or combined administration.
- A configuration example showing iSeries screen shots is included in an appendix of the Redbook, Lotus Fax for Domino for iSeries: Getting the Straight Facts , SG24-5941-00

Chapter 5. Manage iSeries ISDN support

After configuring your network interface (NWI), controller, line, and device descriptions, you are ready to enable your configuration objects and are able to maintain the ISDN service. For more information on these topics, refer to the following pages:

- iSeries unsupported network issues
- Network management
- Managing ISDN connections
- Verifying connection status
- Commands for ISDN configuration objects
- Existing NWI installations

For general management information about PPP or fax, see *Facsimile Support for iSeries Installation Guide*, (SC41-0654), or Getting started with PPP.

Network management

Network management involves multiple tasks and areas of involvement. Many problems that can and will arise are common with ISDN. The following information will help you to keep your system up and running at optimal performance:u

- **Configuration objects**
  Network interface, line, remote controller, and device descriptions all have characteristics defined by configuration objects. Review this topic for a list of objects that you will routinely be working with.
- **ISDN Connections**
  Making the proper object connection and varying on the objects you wish to use are important steps in establishing your ISDN connection. Learn which connections must be made for both permanent and switched connections.
- **Accepted or rejected calls**
  Your system will accept calls based on certain criteria. You should know which protocols are accepted or rejected and why.
- **iSeries unsupported network issues**
  If the network type you want is not available in your location, check the list of iSeries supported network types.
- **IDLC**
  Polling for a connection and disconnecting the controller are special considerations for IDLC. Find out how these options can be manipulated.
- **Performance issues**
  Use this information to maximize your ISDN connection's performance and increase the throughput of your connection.
- **Problem analysis**
  Know how to identify problems with your system and how to find and eliminate the causes. Find more information about the system tools for correcting problems.
- **Message management**
  Learn about message management and how to direct messages to specific queues.

Configuration objects

Your iSeries uses configuration objects to describe the characteristics of the local network interface, line, remote controllers, and devices. Another configuration object defines a connection list, which is an ISDN phone directory. In your routine work with the iSeries you will work with the following objects:
- Network interface (NWI) description
- Line description

- Connection lists and connection list entries
- Controller description
- Device description

ISDN connections

After creating or changing your configuration objects, either you or the system must enable each object (vary it on) before any connection can be established. The configuration instructions for each object explain how to vary it on.

Establishing a successful connection includes the proper attachment of each object to the other. (The configuration instructions will tell you how to attach the objects.) For example, if only one connection list contains an entry that matches an incoming call, but there is not a varied-on line description that refers to the list, the call will not be accepted.

With a permanent connection, you or the system must vary on the corresponding objects on both ends of the connection.

The information below discusses configuration guidelines for the automatic disconnect timers and a configuration status tool to view how the objects are attached and whether or not they are connected.

ISDN switched disconnect
For IDLC, iSeries ISDN support has the option of allowing the user to specify how long to wait following the completion of a job before clearing a switched ISDN call. This is controlled via the switched disconnect parameters in the APPC controller description. The reasons for not clearing a call emmediately after the completion of a job include the following:

- Another call to the same remote will be initiated
- The connect time of the job is less than the network's minimum charging time. Keeping the connection up for the minimum charging time would be worthwhile in the event that another job is initiated to that remote.

For more information about switched disconnect, see the Communications Configuration Guide.

For more information about what parameters to adjust, see Changing automatic disconnect timers.

PPP inactivity timer
The PPP line description contains an inactivity timer, which will clear a switched call if there has been no data transfered for the amount of time specified by this parameter. For more information regarding the PPP line description and inactivity timer settings, see PPP.

PPP dial on demand
The PPP capability known as dial on demand allows a connection to be automatically cleared when no data is being transferred. The call is then re-established when either side has data to send. Dial on demand is controlled via parameters in the PPP profile.

For more information, see PPP.

Configuration object status

You can view the status of all the configuration objects by using the Work with Configuration Status (WRKCFGSTS) command. This interactive command shows the following:
- Status of each configuration object
- Attachments of configuration objects
- Status of jobs
- Connection status

The WRKCFGSTS command shows a successful connection status as active (varied on). To ensure that your configuration objects are properly configured, you should review the network interface, line, controller, and device descriptions.

Accepted or rejected Calls

ISDN calls are accepted or rejected based on the information they provide and what type of calls they are. For example, if your system will only accept asynchronous calls, a synchronous call will be rejected because it is the wrong type. Another call might not provide enough information to be correctly identified, and will be rejected.The information below describes how your system accepts or rejects PPP, Fax, and IDLC calls.

- Call acceptance
- Call rejection
- Call information

Call acceptance

Connection lists provide the main method your system uses to determine how to accept calls on switched connections for PPP, Fax, and IDLC. A connection list contains entries that identify a system and its associated configuration. The incoming calls contain information that can precisely specify the appropriate line description to accept the call. An incoming call may specify the following information:

- Remote number (calling-party-number information element [IE])
- Local number (called-party-number IE)
- Remote subaddress (calling-party-subaddress IE)
- Local subaddress (called-party-subaddress IE)
- Information transfer type

Not all network types support each of these elements. The network types that support the NSF IEs may use these elements with different contents or formats for unique network type features. It is important to consult with your network provider about these items to ensure proper configuration of connection lists and accurate screening of incoming calls.

The system uses the information that an incoming call contains to search active connection lists for entries that match the incoming call. The system considers a connection list active only if at least one line description referring to the list is varied on. To be considered, a connection list entry must exactly match the items of the incoming call or generally match with the *ANY value. iSeries then orders the connection lists according to the number of exact matches they contain, so that those having an entry with the most exact matches are first.

The system then searches the line descriptions by referring to the ordered connection lists until it finds an available line description. A line description is considered available when it satisfies all of these conditions:

- Is in the connect-pending state and is not currently establishing a call.
- Has an SWTNWILST channel number entry for the NWI that specifies either *CALC or the channel number that the call specifies.
- Lists the network interface description that is receiving the call in its SWTNWILST parameter .

For more information on how to verify call acceptance, see Verifying connections.

Call rejection

Several factors can cause your system to reject a call on a switched connection for PPP, Fax, and IDLC. The table below shows possible rejection scenarios:

Table 3. Possible call rejection scenarios

Rejection Problem	Possible Cause
An error in the network configuration prevents reaching the desired system.	Specifically, if no active connection list contains a match of each number or element specified by the call, the system finds no appropriate line description to accept the call. This could also occur if a connection list entry matches the calling information, but the connection list is not referred to by the varied on line description. If the varied on line description does not refer to the connection list, the system does not recognize any of the entries in the connection list.
The information transfer capability differs between network types so that a remote system cannot support the call type of the local system.	The local and remote network interface descriptions uses different connection types (specified in parameter connection type [CNNTYPE]).
The call is rejected because the ISDN takes too long to contact the remote system and respond to the local system.	In this case, the local system reaches the time-out or retry limit specified by the corresponding parameters.

To find out why your system rejects a call to or to view rejected calls, see Verifying connections.

Call information

Application programs use the get attributes operation of the intersystem communications function (ICF) to access information that a system receives or sends when making a call using IDLC. Accessed information include:
- Call direction
- Remote number
- Remote number type
- Remote number plan
- Remote subaddress
- Remote subaddress type

Connection lists and their entries contain the same types of information necessary for the local system to process incoming calls. Once information about an incoming call has been retrieved, the application running on the local system can use calling party information and connection list information to process a particular call.

For example, an application might screen the incoming call and compare that information to the information in a file or list that contains security information. When the call information matches an entry in this list, the application grants security privileges to that call. Another example is when an identified call is routed to a specific application, based on the identifying information it provides. Screening a call and accessing its information gives an application the ability to process calls selectively.

For more information on writing application programs to access calling party information, see the following books:

- ICF Programming

- APPC Programming

- CPI Communications Reference for CPI communications.

IDLC considerations

Similar to other data link protocols, IDLC has special considerations for operation, which include polling for a connection and when you disconnect the controller. Click on the following links for more information on these considerations:

- IDLC connection request polling
- Disconnecting switched controllers

IDLC connection request polling

For permanent connections, if you are unsure when a remote site will respond to your IDLC request to connect, you can poll the remote site for as long as you want. Parameters `Connect retry count` (IDLCCNNRTY) and `Response timer` (IDLCRSPTMR) work together to control how often to poll and how long to wait between each poll. You can set values for these parameters when you create your IDLC line descriptions. You can also have the system supply values automatically. To find out how long the polling lasts, multiply these two parameter values together.

Disconnecting IDLC switched controllers

The switched disconnect feature allows a switched IDLC controller to be disconnected when it is not in use. When the controller disconnects, the associated switched line description, and the ISDN call also disconnect. However, there may be situations when you may not want the call terminated immediately. For example, when the connection time is very short and you are charged for a longer time whether it is used or not.

To change the disconnect time, use the controller description parameter DSCTMR.

Performance issues

You can maximize ISDN's performance three ways: increasing throughput after a connection is made, increasing how much data transfers in the channel, and increasing your call acceptance rate. See the following links for more information:

- Data throughput after connecting
- Channel throughput
- Call acceptance performance

Data throughput after connecting

Parameter settings that are used for making connections do not always allow you to have the best throughput after the connection is made. For example, you can increase your response wait time when the remote system is busy. However, the long response wait time causes unnecessarily long delays, which slows down throughput.

To improve performance, you can set up iSeries to use a larger initial parameter value when attempting to make a connection, and a smaller final value once the connection is made. You can define the larger value in the line description and the optional smaller value in the attached controller.

IDLC controller description parameters receive their initial connection values from an attached line description. If you define a value for the controller description parameter, iSeries uses that value after the connection is made. If you do not define a value, iSeries keeps the line description value. These controller parameters use (*LIND) as their default value:
- IDLC window size (IDLCWDWSIZ)
- IDLC frame retry (IDLCFRMRTY)
- IDLC response timer (IDLCRSPTMR)
- IDLC connect retry (IDLCCNNRTY)
- Maximum frame size (MAXFRAME)

Controller description value limit

A higher value for the IDLCRSPTMR parameter on the line description causes a longer wait time between retransmissions before establishing a permanent connection. Also, a higher value for the

IDLCCNNRTY parameter on the line description causes greater connection retries until the connection is established. However, once the connection is established, the controller description IDLCRSPTMR parameter's smaller value determines the time wait between transmissions.

Note: Specifying values in the controller description that are larger than those in the line description causes an error message to be generated during the connection process.

Channel throughput

You can maximize channel throughput by choosing the right frame size, window size, and request/response time limit (the maximum time between a request and response).

Frame Size

The MAXFRAME parameter in the line and controller descriptions specify the frame size for PPP or IDLC. Larger frame sizes and a higher number of frames that can be sent without waiting may provide better performance. However, large frame sizes do not perform well with error-prone lines or networks, or in electrically noisy environments because larger frames require longer transmit time.

Note: Frame sizes above 2064 are not allowed for the 2750 and 2751 IOAs.

IDLC Window Size

The window size refers to the maximum number of IDLC frames that can be sent before an acknowledgment is required. The IDLCWDWSIZ parameter in the line and controller descriptions specifies the window size. The iSeries support for IDLC allows a maximum window size of 31. In general, a larger window size and a greater number of frames that can be sent without waiting can provide better performance if the frame size is small or if transmission delay is long. Larger window sizes decrease the waiting time for an acknowledgment. However, as with larger frame sizes, a large window size does not perform well with error-prone lines or networks, or in electrically noisy environments.

Call acceptance performance

If your call acceptance times exceed those required by the network, changing your connection lists entries or the number of line descriptions can reduce the time your system processes incoming calls.

Connection list entries

Connection lists can be enhanced in a number of ways to increase call acceptance performance. These are:

- Using line numbers only once
- Avoiding duplicate connection list entries
- Limiting the use of *ANY for remote numbers

Use line numbers once

For PPP, fax or IDLC circuit-mode protocols, a line number should appear only once in any connection list for the fastest results. For example, if you have 3 connection lists, line number 1 should appear in only one of the lists. This way, the system finds only one exact match for a call. As soon as iSeries finds a match, it stops searching the connection lists for entries with identical information. Therefore, you only need to enter the line number one time in only one list.

Avoid duplicate connection list entries

Additionally, a connection list used for answering should not contain duplicate entries. Having a unique entry for each remote system reduces search time and avoids having several connection lists qualify as candidates for the same call. You should, if possible, avoid duplicate entries in the same connection list or in different connection lists.

Limit the use of *ANY for remote numbers

Using *ANY, for the remote number (RMTNBR) parameter in your connection list entries, increases the chances for call acceptance. However, *ANY may also decrease your system's performance because it

requires more processing. For example, the system-supplied connection list (QDCCNNLANY) specifies no restrictions on call acceptance. Spending valuable system resources on answering undesirable calls can degrade system performance. To process only calls that are targeted for the interface, you may want to configure an exact local number or local subaddress in the NWI description.

Number of line descriptions

For IDLC and PPP circuit-mode protocols, your system's performance decreases as you increase the number of line descriptions that are associated with a connection list. As the number of line descriptions increase, performance slows because the system must check more line descriptions.

Problem analysis and resolution

Problem analysis includes identifying the problem, finding the cause of the problem, and eliminating the cause. These tools are the system operator message queue, cause codes, and communication traces. For more details on these tools, see the following sites:

- System Messages
- Cause codes
- ISDN communication traces

Note: For information regarding iSeries first and second-level error recovery, see handling communication errors in Communications Management.

System messages

The most general error notification places an entry in the system operator message queue, QSYSOPR. Messages may also appear in other queues as defined by the person who created the PPP line or controller descriptions. The MSGQ parameter designates the message queue to which the message is sent.

The system displays messages to explain the problem and the appropriate solutions. Messages with an asterisk have additional problem analysis information. To view this information, press F14. These messages also display "Cause codes".

Cause codes

Cause codes indicate why network events occur and are usually used with switched lines. Cause codes appear in messages that are sent to QSYSOPR or the configured message queue. For ISDN, the cause code is one field in the cause information element (IE) that the local system may send or receive.

IE fields are:

- Source of generated code
- Coding standard used
- Cause code
- Diagnostic codes specific to the network or the terminal equipment (TE)

ISDN communication traces

Your iSeries collects trace data for ISDN on D channels and B channels. To collect D channel data, perform a trace on your network interface description. To collect B channel data, perform a trace on your line description.

The data on the D channel uses link access procedure D (LAPD) format and can help to determine call-in and call-out problems. LAPD, recommended by the ITU-T, is a duplex, asynchronous, symmetric procedure used to communicate control instructions, such as setting up and ending a connection, to the D channel of ISDN. For more information about interpreting collected data in LAPD or IDLC format, refer to ISDN Data Link Control Architecture Reference.

The system provides various tools to gather communications trace data. For more information, see Communications trace in the *Troubleshooting TCP/IP* topic.

Additional information about communications trace can be found Communications Management .

Message management

You can manage your system messages by determining which message queue a message should be sent to. Normally the system sends messages to the default system message queue (QSYSOPR). However, for controller and PPP line descriptions, you can determine the appropriate message queue through the parameter message queue (MSGQ).

Managing ISDN connections

To enable/disable connections, start or stop PPP sessions, or to change automatic disconnect timers, see the following information:

* Enabling switched connections
* Enabling permanent connections
* Disabling switched conncetions
* Diabling permanent connections
* Starting or stopping PPP sessions
* Changing automatic disconnect timers

Enabling ISDN switched connections

Note: If you have set your configuration objects to vary on after IPL, you do not need to enable the connections.

If your configuration objects are not set to vary on, follow the instructions below. These steps assume that you have created descriptions for the NWIs, lines, controllers, and devices, along with the necessary connection lists. They also assume that you have made the necessary attachments (referring one object to another). If you have not completed these tasks, refer to the information on configuring ISDN.

Before performing the steps below, make sure that you have the names of the objects you want to vary on. To enable switched connections, enter the following on the command line:
1. VRYCFG CFGOBJ(*your_nwi_object*) CFGTYPE (*NWI) STATUS (*ON)
2. VRYCFG CFGOBJ(*your_switched_line_description*) CFGTYPE (*LIN) STATUS (*ON)
3. VRYCFG CFGOBJ(*your_switched_controller_description*) CFGTYPE (*CTL) STATUS (*ON) RANGE (*NET)

Note: If you vary on a switched controller with RANGE set to (*NET), the system will vary on the attached device description for you.

The system is now ready to make switched connections. A switched connection is established only if an application requires it and becomes active when an application sends data or a command across the network.

Enabling ISDN permanent connections

Note: If you have set your configuration objects to vary on after IPL, you do not need to enable the connections.

You should use the instructions here if your objects are not varied on.

If your configuration objects are not set to vary on, follow the instructions below. These instructions assume that you have created descriptions for the NWI's, lines, controllers, and devices and that you have made the necessary attachments (referring one object to another). If you have not completed these tasks, see the information on configuring ISDN.

Before performing the steps below, make sure that you have the names of the objects you want to vary on. To enable permanent connections, type **VRYCFG CFGOBJ (your_nwi_object) CFGTYPE (*NWI) STATUS (*ON) RANGE (*NET)** on the command line, and press Enter.

This command enables all nonswitched lines, controllers, and devices associated with the NWI.

Disabling ISDN switched connections

To disable switched connections, type **VRYCFG CFGOBJ (your_configuration_object) CFGTYPE (*NWI) STATUS (*OFF)** on the command line, and press Enter.

Disabling permanent connections

Varying off configuration objects disables your permanent connection. You can vary off the objects one at a time or all at once. Varying off at least one of the configuration object disables the permanent connection. The steps below explain how to vary off individual objects:
1. To vary off your switched line description, type **VRYCFG CFGOBJ(descritpion_name) CFGTYPE (*LIN) STATUS (*OFF)** and press Enter.
2. To vary off your switched controller description, type **VRYCFG CFGOBJ(description_name) CFGTYPE (*CTL) STATUS (*OFF) RANGE (*NET)** and press Enter.

Note: Varying off a switched controller with RANGE set to (*NET) automatically varies off the associated device description

Starting or stopping PPP sessions

You do all PPP configuration and management through Operations Navigator. However, you can manually start or stop your PPP profiles only through the command line. Before you can use these commands, you need the name of your PPP profile.

Starting PPP:
After configuring PPP, you can manually start PPP. To do this, enter `STRTCPPTP CFGPRF (your_PPP_profile) RESTART (*NO)`.

Ending PPP:
To disable your PPP connection or end a session, enter `ENDTCPPTP CFGPRF (PPP_profile_name) OPRMODE (operating_mode)`, where *operating_mode* specifies what kind of profiles to work with:
• *ANY (any PPP profile whose name matches PPP_profile_name)
• *ANS (any PPP profile in answer mode)
• *DIAL (any PPP profile in dial mode)

Changing automatic disconnect timers

To change your automatic disconnect timers, follow the instructions below for the appropriate protocol. For more information about the disconnect timers, see ISDN connections.

Switched ISDN data link control (IDLC):

In your switched IDLC controller description, complete these steps to change parameters:
1. Run the appropriate command (CHGCTLAPPC, CHGCTLHOST, or CHGCTLRWS) to change your controller description.
2. Press F9 to show all parameters.
3. Press F11 to display the keywords.

4. Set parameter to SWTDSC to *YES (disconnect when the timer expires) or *NO (do not disconnect when the timer expires).
5. Locate parameter `Disconnect timers` and specify values for fields:
   - `Minimum connect timer`: The timer starts after the connection is established.
   - `Disconnection delay timer`: The period of time to wait, after the last communications, before disconnecting.

   The system disconnects when the minimum disconnect timer and disconnection delay timers expire.

Note: When the controller is varied off, you can change the disconnection timer value with the DSCTMR parameter of the appropriate command: CHGCTLAPPC, CHGCTLHOST, or CHGCTLRWS.

PPP:

If you used Operations Navigator to configure PPP, you should use it to change the disconnect timer. Otherwise, to change your PPP disconnect timer:
1. Run the Change Line (PPP) (CHGLINPPP) command.
2. Press F9 to show all parameters.
3. Press F11 to display the keywords.
4. Specify one of these values for the inactive timer (INACTTMR) parameter:
   - *SAME.
   - *NOMAX (do not disconnect).
   - Number of seconds to wait before disconnecting (15 to 65,535 seconds).

     Note: This is the number of seconds to wait between transfers of TCP/IP data. The transfer of TCP/IP data resets the timer. Transferring other types of data (such as LCP and asynchronous data) does not reset the inactivity timer.

Verifying connection status

You can use the commands below to view successful or unsuccessful connection attempts. To view the connection status of all your configuration objects, type **WRKCFGSTS CFGTYPE (*NWI)**, and press Enter:

Note: Switched lines that do not have a connection do not appear in the display.

Objects that are successfully connected show a status of varied on or active. If any objects do not show this status, the connection is broken.

Also, the hierarchy displayed shows how the objects are attached to each other. Use this display to verify that the association matches what you expected.

To view messages concerning your connections, type the command **DSPMSG MSGQ(queue_name)** (where queue_name is QSYSOPR or the configured message queue), and press Enter.

Note: For X.25 or PPP connections, the messages may be in another queue (see parameter `Message queue` of your line description).

Commands for ISDN configuration objects

You can use CL commands to manage your configuration objects and their entries.

Note: Your iSeries provides a command line with a lot of help information. To view commands according to tasks, press F4 (without typing anything on the command line), then select 2. For more details about the parameters for a specific command, type the command on iSeries and press F1 for each parameter.

See the following for more information on specific commands:
- NWI description commands
- Connection list commands
- Line description commands
- Controller description commands
- Device description commands

To rename a configuration object, use the Rename object (RNMOBJ) command (you can shorten it to REN or RNM).

Network interface description commands related to ISDN

Additional commands that you can use to work with network interface descriptions include:
- Work with Network Interface Description (WRKNWID), which shows you a list of all network interface descriptions on the system. From the list you can create, change, copy, delete, display, print, rename, or work with the status of network connections or retrieve a configuration source program.
- Change Network Interface Description for ISDN (CHGNWIISDN).
- Display Network Interface Description (DSPNWID).
- Delete Network Interface Description (DLTNWID).

Additional commands that support network interface descriptions include:
- Work with Configuration Status (WRKCFGSTS).
- Retrieve Configuration Status (RTVCFGSTS). Use this command within an interactive program, batch program, or REXX program.
- Retrieve Network Attributes (RTVNETA). Use this command within an interactive program, batch program, or REXX program.
- Retrieve Configuration Source (RTVCFGSRC).
- Vary Configuration (VRYCFG).
- Restore Configuration (RSTCFG).

Connection list and list-entry commands related to ISDN

Additional commands that you can use to work with connections lists include:
- Create connection list (CRTCNNL).
- Work with Connection Lists (WRKCNNL), which shows you a list of all connection lists on the system. From the list you can create, change, copy, delete, display, or print connection lists. You can also rename and work with the entries in a connection list or retrieve a configuration source program.
- Change Connection List (CHGCNNL).
- Display Connection List (DSPCNNL).
- Delete Connection List (DLTCNNL).
- Retrieve Configuration Source (RTVCFGSRC), which copies a connection list and all its entries.
- Restore Configuration (RSTCFG).

You can also use these commands to work with connection list entries:
- Work with Change Connection List Entries (WRKCNNLE), which shows you a list of all the entries in a specified connection list. From the list you can add, change, copy, remove, display details, or rename entries.
- Add Connection List Entry (ADDCNNLE).
- Change Connection List Entry (CHGCNNLE).
- Rename Connection List Entry (RNMCNNLE).
- Remove Connection List Entry (RMVCNNLE).

Line description commands related to ISDN

The line description commands are:
- Work with Line Descriptions (WRKLIND), which shows you a list of all line descriptions on the system. From the list you can change, copy, delete, display, print, rename or work with the status of line descriptions or retrieve a configuration source program.
- Change IDLC Line Description (CHGLINIDLC).

- Change X.25 Line Description (CHGLINX25).
- Change PPP Line Description (CHGLINPPP). You should use this only for descriptions used with fax.
- Change Line Description (Asynchronous) (CHGLINASC).
- Change Line Description (FAX) (CHGLINFAX).
- Change Line Description (Network) (CHGLINNET).
- Change Line Description (SDLC) (CHGLINSDLC).
- Display Line Description (DSPLIND).
- Retrieve Configuration Source (RTVCFGSRC), which copies a connection list and all its entries.
- Restore Configuration Status (RTVCFGSTS).
- Vary Configuration (VRYCFG).
- Restore Configuration (RSTCFG).
- Work with Configuration Status (WRKCFGSTS).
- Delete Line Description (DLTLIND).

Controller description commands related to ISDN

The controller description commands are:
- Work with Controller Descriptions (WRKCTLD): Shows you a list of all controller descriptions on the system. From the list you can change, copy, delete, display, print, rename, or work with the status of line descriptions, retrieve a configuration source program, or print device addresses.
- Display Controller Description (DSPCTLD).
- Change Controller Description (APPC) (CHGCTLAPPC).
- Change Controller Description (asynchronous) (CHGCTLASC).
- Change Controller Description (SNA host) (CHGCTLHOST).
- Change Controller Description (Remote Workstation) (CHGCTLRWS).
- Change Controller Description (Network) (CHGCTLNET).
- Retrieve Configuration Source (RTVCFGSRC).
- Retrieve Configuration Status (RTVCFGSTS). Use this command within an interactive program, batch program, or REXX program.
- Retrieve Network Attributes (RTVNETA). Use this command within an interactive program, batch program, or REXX program.
- Vary Configuration (VRYCFG).
- Restore Configuration (RSTCFG).
- Delete Controller Description (DLTCTLD).

Device description commands related to ISDN

The device descriptions commands are:
- Work with Device Descriptions (WRKDEVD)
- Display Device Description (DSPDEVD (display device description)
- Change Device Description (Asynchronous) (CHGDEVASC)
- Change Device Description (SNA host) (CHGDEVHOST)
- Change Device Description (Network) (CHGDEVNET)
- Change Device Description (APPC) (CHGDEVAPPC)
- Change Device Description (Display) (CHGDEVDSP)
- Delete Device Description (DLTDEVD)

Existing NWI installations

If your system has existing installations, you should be aware of two issues: mapping of old network types and changing network types.

Mapping:

To ease migration to your new operating system, the system maps your old network types to the new network types. You see this mapping occurs when you vary on or display the objects. For example, when you display an object that uses the old network type, the system displays the new network type in the `network type` field instead of the old type.

The system maps network types for your NWI descriptions and connection lists. To see what the new network type is replacing, see the table in Supported network types. If the system re-maps one of the network types below, you must provide SPID information in your NWI description if it does not have it:
- *ATT5E42
- *ATT5E5
- *ATT5E6
- *NISDN
- *NT100B29

See the steps in "Configure an ISDN network interface description" on page 14 for instructions on adding SPID information.

Changing network types:

If you are changing network types, you must delete and re-create NWI descriptions and connection lists that you created for the 2605 input/output adapter (IOA) before you can use them on the 2750 or 2751 IOAs. Complete the following steps:
1. Record non-default information from your existing NWI description:
   a. Typing **CHGNWIISDN** or **CHGCNNL** on the command line and pressing Enter.
   b. Type the name of your object and press Enter.
   c. Record the name of the description.
   d. Record your non-default and attachment information if any.
2. Delete the object by typing **DLTNWID object_name** or **DLTCNLL object_name** where object_name is the name of the object to delete.
3. Re-create your object and enter your non-default and attachment information into it. You must also replace the old network types with the current network types (see the table in supported network types for replacement values).

   To re-create your NWI description, see "Configure an ISDN network interface description" on page 14. To re-create your connection list, see "Create an ISDN connection list" on page 16.

Chapter 6. AT command strings

AT commands tell your modem to perform various functions. Your system supports a subset of the industry standard and assumes that you are very familiar with them.

iSeries supports these AT commands:
- Basic AT commands
- AT & commands
- AT % commands
- AT \ commands
- AT + commands
- AT commands for S registers

Basic AT commands

Your system supports these basic AT commands:

Bn (line modulation options)
Configures the modem for CCITT or Bell modulation with line speeds of 300 or 1200 bps.

```
Range: n = 0 or 1
Default: 1
```

P (set pulse dialing)
Instructs the modem to use pulse dialing, by default.

Sn (select S register)
Selects a specific S register and establishes it as the last- accessed S register.

```
Range: n = 0 to 99
```

T (enable tone dialing)
Instructs the modem to use tone dialing by default.

Yn (long space disconnect)
Enables or disables long space disconnect.

```
Range: n = 0 or
1
Default: 0
```

AT & commands

Your system supports these AT & (ampersand) commands:

&Fn (load factory settings)
Loads the configuration programmed at the factory.

```
Range:
n = 0 or 1
Default: 0
```

&Gn (guard tone operation)
Determines which guard tone, if any, to transmit.

```
Range:
n = 0 to 2
Default: 0
```

&Kn (set flow control)
Defines how the data terminal equipment (DTE) and Distributed Computing Environment (DCE) will handle flow control.

```
Range: n = 0, 3, 4, 5 or 6
Default: 3
```

&Pn (dial pulse ratio)
Determines the make or break ratio that is used during pulse dialing.

```
Range n = 0 to 3
Default: 0
```

&Qn (communications mode option)
Selects the connection modes that are permitted.

```
Range:
n = 0 to 6
Default: 5
```

AT % commands

Your system supports these AT % (percent) commands:

%Cn (data compression)
Enables or disables data compression negotiation.

```
Range:
n = 0 or 1
Default: 1
```

%En (enable/disable line quality monitor and auto-retrain fallback/ fall forward)
Determines whether the modem will automatically monitor the line quality and request a retrain or fall back when line quality is insufficient, or fall forward when line quality is sufficient.

```
Range n = 0 to 2
Default: 0
```

AT \ commands

Your system supports these AT \ (backslash) commands:

\An (block size for MNP)
An MNP error- corrected link will use the maximum block size specified by the parameter.

```
Range: n = 0 to 3
Default: 1
```

\Nn (modem protocol options)
Selects the error correction mode for subsequent connections.

```
Range:
n = 0 to 5
Default: 3
```

AT + command

Your system supports these AT + (plus) commands:

+MS (select modulation)
Selects the modulation. Optional parameters can be used to enable or disable automode and set lower and upper limits for connection rates.

Command format:

```
+MS=<mode> [,[<automode>][,[<minimum_rate>][,[<maximum_rate>]]]]
```

```
Ranges and defaults:
mode: 0, 1, 2, 3, 9, 10, 11, 56, 64, 69 (default: 56)
automode: 0, 1 (default: 1)
minimum_rate: 300 - 33600 (default: 300)
maximum_rate: 300 - 56000 (default: 56000)
```

AT commands for S registers

All bit-mapped registers are read-only. You should use the appropriate AT command that controls the relevant S-register bits to change the value.

The read-only memory (ROM) contains the factory default values and are loaded into the active configuration at power-up. All of the factory default values may be loaded at any time by entering the &F command.

Your system supports these S-register commands:

S0 (automatic answer ring count)
Sets the number rings required before the modem automatically answers a call. Setting this register to zero disables autoanswer mode.

```
Range:
0 to 255
Default: 0
Units: rings
```

S9 (carrier validation time)
Sets the time, in tenths of a second, that the carrier must be present before the modem considers it valid and turns on received line signal detector (RLSD).

```
Range:
1 to 255
Default: 6
Units: 0.1 seconds
```

S10 (lost carrier delay)
Sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier.

```
Range: 1 to 255
Default: 14
Units: 0.1 seconds
```

S11 (DTMF duration)
Sets the length, in milliseconds, of DTMF tones.

```
Range: 50
to 255
Default: 95
Units: 1 millisecond
```

S12 (guard time)
Defines the maximum period, in 20 millisecond intervals, allowed between consecutive asynchronous escape characters (+) for the escape sequence to be considered valid.

```
Range: 0 to 255
Default: 50
Units: 0.02 seconds
```

S29 (flash dial modifier time)
The length of time, in 10–millisecond units, that the modem stays on- hook when running a ! (flash) dial modifier. This may be limited by country restrictions.

```
Range: 0 to 255, 10- millisecond intervals
Default: 0
```

S30 (inactivity timer value)
The period of communications inactivity before the modem disconnects. In error-correcting mode, data that is transmitted or received resets the timer. In other modes, any data transmitted resets the timer. The timer is Inoperative in synchronous mode.

Range: 0 to 255, Default: 0, Units: 10-second intervals

S33 (XOFF character)

Defines the value of the XOFF character.

```
Range: 0 to 255
Default: 19 (13h)
```

S36 (LAPM failure control)

Action to take when LAPM failure occurs. Fallback options are initiated immediately at connection when S48 = 128. If you enter an invalid number, S36 accepts it into the register, but behaves as if you entered the default value. Bits 2, 1, 0 combine to indicate:

- 000 = Modem disconnects.
- 001 = Modem stays online, and Direct mode connection is established.
- 010 = Reserved
- 011 = Modem stays online, and Normal mode connection is established.
- 100 = MNP connection is attempted; failure results in disconnection.
- 101 = MNP connection is attempted; failure results in Direct mode connection.
- 110 = Reserved
- 111 = MNP connection is attempted; failure results in Normal mode connection.

Bits 7- 3: Reserved

Default: 7 (00000111b)

S38 (delay before forced hang up)

Specifies how long to wait after receiving the H command (or ON to OFF transition of DTR if the modem is set to follow the signal) before going on-hook. This command applies only to connections with error correction. You can use it to ensure that all data in the modem's buffer is sent before disconnection.

```
Range:
0 - 254: the number of seconds before disconnecting
255: no disconnect
```

S46 (data compression control)

```
Range: 136 or 138
Default: 138 (disabled)
136: Execute error correction protocol with no compression
138: Execute error correction protocol with compression.
```

S48 (V.42 negotiation action)

The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, you can bypass this process.

```
Range:
0, 7 or 128. Invalid numbers treated as if 128 were entered.
Default: 7
```

- 0: Disable negotiation; bypass the detection and negotiation phases; proceed with LAPM
- 7: Enable negotiation
- 128: Disable negotiation; bypass detection and negotiation phases; proceed at once with the fallback action that is specified in S36. You can use this to force MNP

S91 (public-switched telephone network [PSTN] transmit attenuation level)

Sets the level, in dBm, of attenuation of the transmitted signal in PSTN mode.

```
Default: 10
Range: 0 - 15
```

S92 (fax transmit attenuation level)

Sets the level, in dBm, of attenuation of the transmitted signal in FAX mode.

```
Default: 10
Range: 0 - 15
```

Chapter 7. Troubleshooting ISDN

Troubleshooting ISDN problems and errors can be done several ways. The links below provide more information on finding problems and viewing messages and error descriptions.

- Viewing system messages
- ISDN cause code descriptions
- Common ISDN problems
- Remote Access Services (PPP)

Once you have diagnosed the problem or error you are having, finding the solutions to fix them is the next priority. The following links provide helpful information regarding problem analysis, tools, and how to recover from errors:

- Problem analysis (and tools)
- Verifying connections
- Network management

Note: You are encouraged to use the default parameters for a specified network type. If you change parameters from the default values the results and problems that can occur become unpredictable.

Viewing system messages

To view messages or errors in a message queue, enter **DSPMSG MSGQ (***queue_name***)**, where *queue_name* is QSYSOPR or the message queue that your line description specifies.

ISDN cause code descriptions

The table below contains descriptions of Telecommunication Standardization Sector (ITU-T) standard cause codes. In general, a cause code will report an ISDN-specific error or indicate current ISDN activity. Network-specific cause codes are not translated to the ITU-T value that iSeries uses. However, the system does check the cause codes for normal and acceptable calling conditions. All other values are logged into the system error log (QSYSOPR or the configured message queue).

Table 4. ITU-T standard cause codes

Cause Code (decimal)	Description
1	Unallocated (unassigned number)
2	No route to specified transit network
3	No route to destination
6	Channel unacceptable
7	Call awarded and being delivered in an established channel
16	Normal call clearing
17	User busy
18	No user responding
19	No answer from user (user alerted)
21	Call rejected
22	Number changed
26	Non-selected user clearing
27	Destination out of order
28	Incorrect number format

Table 4. ITU-T standard cause codes (continued)

Cause Code (decimal)	Description
29	Facility rejected
30	Response to Status Enquiry
31	Normal, unspecified
34	No circuit/channel available
38	Network out of order
41	Temporary failure
41	Switching equipment congestion
43	Access information discarded
44	Requested circuit/channel not available
47	Resources unavailable, unspecified
49	Quality of service unavailable
50	Requested facility not subscribed
57	Bearer capability not authorized
58	Bearer capability not presently available
63	Service or option not available, unspecified
65	Bearer capability not implemented
66	Channel type not implemented
69	Requested facility not implemented
70	Only restricted digital information bearer capability is available
79	Service or option not implemented, unspecified
81	Call reference value not valid
82	Identified channel does not exist
83	A suspended call exists, but this call identity does not
84	Call identity in use
85	No call suspended
86	Call having the requested call identity has been cleared
88	Incompatible destination
91	Transit network selection not valid
95	Message not valid, unspecified
96	Mandatory information element is missing
97	Message type nonexistent or not implemented
98	Message not compatible with call state or message type nonexistent or not implemented
99	Information element nonexistent or not implemented
100	Information element contents not valid
101	Message not compatible with call state
102	Recovery on timer expiry
111	Protocol error, unspecified
127	Interworking, unspecified

Common ISDN Problems

Following the ISDN configuration guidelines should ensure that your iSeries system operates properly with ISDN. If a problem does occur, usually it is because a connection-related parameter is incorrectly set. The following table shows some common connection problems and possible solutions.

Table 5. Common connection problems and possible solutions

Problem	Solution or reason(s) for problem
Inability to connect to ISDN	The inability to connect to ISDN can be caused by an incorrectly configured NWI. For NWI problems, ensure that the `network type` (NETTYPE) parameter has the correct value.
Your system rejects incoming ISDN calls.	• No matching connection list entry exists for the call. • The line description that is associated with a connection list is not varied on. Check the local connection list parameter (CNNLSTIN). • No line description, that is varied on, refers to a connection list that can answer the call. Line description parameter incoming connection list (CNNLSTIN) defines the connection list to use to answer the incoming calls. • Line description parameter Connection type (CNNTYPE) is not set to either *BOTH or *ANS
Switched connection ends unexpectedly	Refer to the cause code in related messages. See the messages in the system operator message queue (QSYSOPR), the message queue defined by the controller, or line description message queue (MSGQ) parameter.
ISDN data link control (IDLC) fails to connect	If the remote system allows the data link control identifier (DLCI) to be configured, the remote system may have a DLCI value that is not compatible with the iSeries. Ensure that the remote system's data link control identifier value is 32 (10-bit format) or 256 (13-bit format). The use of the data link control identifier is based on CCITT Recommendation Q.922.
Cannot connect because a switched controller was not found for an IDLC line	iSeries uses information received from the remote system to select a switched controller to attach to the IDLC line. For example, the exchange identifier from the XID command Incorrect configuration on either the local or remote system can cause the connection to fail. The following IDLC-related controller parameter affect which controller is selected: • `Remote Control Point Name` (RMTCPNAME) Applies to both host and advanced program-to-program communications (APPC) controllers. • `Remote Network ID` (RMTNETID) Applies to both host and APPC controllers. • Exchange Identifier (EXCHID) This applies to APPC and remote work station controllers. • System Services Control Point Identifier (SSCPID) This applies only to host controllers.
IDLC permanent connection cannot connect to remote site	If your controller description remains at vary on pending, ensure that the remote system is ready for the permanent connection (the NWI description and associated line and controller descriptions are varied on).

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