How to Determine the Reason for Disconnect from ISDN PRI

**ANSWER**

If a call disconnects for a reason beyond a standard hangup by either party, you can find the reason by capturing the call in real time via a PRI trace and decoding the disconnect message.

First, login to the ISDN switch and run the commands:

pri\_trace=4

pri\_log=4

From here, data will display for all inbound or outbound calls on the Telco PRI circuit connected to the switch. You will want to be able to identify all the pertinent information about your call, so ensure that your console/telnet session has a large enough screen buffer to capture everything. (If from a standard Windows telnet page, right click on the window, select "Properties->Layout" and then adjust the screen buffer height to 999 lines, or set up your Telnet/SSH client, such as *Putty*, to log all output to a file.)

You may want to mark a location in the switch output by typing in something identifiable and unique before you place the test call (i.e. "xxxxxxxxx\_call\_started\_here\_xxxxxxxxxxxxxx"). This will give you a starting point to search for when reviewing the trace output.

The information will scroll rapidly across the screen as the call progresses. It is virtually impossible to read it as it occurs in real-time, so gather the call trace data when it is completed.
You may want to type in another identifier at the end (i.e. "call\_ended\_here"), or simply turn the logging off by entering the commands "pri\_trace=0" and "pri\_log=0").

Capture all of the data on the buffer and copy it into a text editor, or open the log file where you captured the output. Search for your identifier and try to find the test call origination. To find for the particular call, search for the phone number that was dialed as follows:

38 30 30 37 32 34 32 33 34 38 (the number dialed in this example is 8007242348 -- note the second digit in each pair matches the phone number)

The digits are in ASCII format, in which the ASCII characters 0-9 are conveniently encoded as Hexadecimal 30-39, so 1 = 31, 4 = 34, 8 = 38 etc.

**NOTE 1:**The number could be broken across multiple lines, so if you can't find the whole string, try searching for the last 4 digits, first 4, etc.

**NOTE 2:** If searching for an inbound call, you should only search for the amount of digits being sent from the carrier!

The first occurrence of this after your identifier in the text file should be the start of your call. Look for the SETUP message (the example below is for an outbound call):

CC -> L3  00 NL\_DATA\_REQ        001 8603                    0000 CC\_SETUP\_REQ

400 300 00 340  00 00 00 00   08 02 00 00 80 04 03 80 90 a3 18 03 a9 83 85 6c

                              0c 00 80 35 31 32 34 38 36 38 34 36 39 70 0b 80 38 30 30 37 32 34 32 33 34 38

L3 -> L2  00 DL\_DATA\_REQ        001 8603                    0**603** SETUP

300 20a 00 240  00 00 00 00   08 02 06 03 05 04 03 80 90 a3 18 03 a9 83 85 6c

                              0c 00 80 35 31 32 34 38 36 38 34 36 39 70 0b 80 38 30 30 37 32 34 32 33 34 38

If the called number is not easy to identify, you can also try to search for the caller ID in the same manner. In this example, the caller ID is 5124868469, again in ASCII Hex format.

The number "**603**" seen before the SETUP is the identifier for this call, so you can track it throughout the trace. To find the disconnect reason, open your search window again and search for:

603 DISCONNECT

This will bring up the disconnect portion of the call, and from here we can determine the reason.

L3 -> L2  02 DL\_DATA\_REQ        001 8603                    0**603 DISCONNECT**

 300 20a 02 240  00 00 00 00   08 02 06 03 **45 08 02 80 90**

Disconnect codes are captured as a hex value and are written after the code "**45 08**". The next hex value indicates the number of codes in the disconnect reason, which in this example is 2. Immediately after this value is code indicating the actual reason(s) for disconnect.
In the above PRI trace, we see the codes 80 and 90. In the additional information included below, these are listed as "0x80 - Normal Disconnect" and "0x90 Normal Call Clearing", which generally indicates that one party hung up the phone.

There are many possible codes that can be used; the most common ones are listed below.

**NOTE:** At the beginning of each call segment is information indicating the direction the PRI messages are being sent. You can determine this by comparing to the OSI model, where the carrier switch is CC (Layer 4) and proceeds down towards the physical layer.

The order(from switch to physical layer/carrier) is CC->L3->L2->L2D. For instance, a DISCONNECT message that starts with L2 -> L3 is a message sent from the carrier to the switch, and one that starts with L3 -> L2 is from the switch to the carrier.

**Disconnect Cause codes:**
0x80 Normal Disconnect
The call disconnects normally.

0x81 Unallocated or unassigned number
The switch receives the ISDN number in the correct format. However, the number does
not belong to destination equipment.

0x82 No route to specified network
The ISDN exchange receives a request to route the call through an unrecognized
intermediate network.
This cause indicates that the equipment receives a request to route the call through a
particular transit network. However, the equipment does not recognize the network.
The equipment that sends this cause does not recognize the transit network due to one of
these reasons:
The transit network does not exist.
The transit network exists, but does not serve the equipment that sends this cause.
This cause is supported on a network-dependent basis.

0x83 No route to destination
The call routes through an intermediate network that does not serve the destination
address.
This cause indicates that the called user is not reachable. A user is not reachable when the
network used to route the call does not serve the required destination.
This cause is supported on a network-dependent basis.

0x84 Send special information tone
The remote number you dialed is not reachable.
Check the number you dial. Verify if you need any prefixes to access the network. For
example, you need to dial 9 for outbound calls through a PBX. Contact your telco/PBX
administrator for details.

0x85 Misdialled trunk prefix.
The remote number you dialed is not reachable.
Check the number you dial. Verify if you need any prefixes to access the network. For
example, you need to dial 9 for outbound calls through a PBX. Contact your telco/PBX
administrator for details.

0x86 Channel unacceptable
The service quality of the specified channel is insufficient to accept the connection. The
call attempt fails because the channel is unusable.
If you use a PBX, check the configuration of the PBX. For a PRI, find out how many
channels your telco provides.

0x87 Call awarded and delivered in established channel
The user assigns an incoming call that connects to an already established call channel.
This cause indicates that the user receives an incoming call, which connects to a channel
already in use for similar calls (for example, packet-mode X.25 virtual calls).

0x88 Preemption
Your call is blocked. Calls are sometimes blocked if another call has a higher priority
than your call. This situation is common with voice calls. Wait and call again later.
If you use a PBX (or the remote site to which you connect uses a PBX), check the
configuration of the PBX. If the condition persists, contact your telco.

0x89 Preemption, circuit reserved for re-use
Your call is blocked. Calls are sometimes blocked if another call has a higher priority
than your call. This situation is common with voice calls. Wait and call again later.
If either side uses a PBX, check the configuration of the PBX. If the condition persists,
contact your telco.

0x90 Normal call clearing
Normal call clearing occurs. You do not need to perform any action.
This cause indicates that the call disconnects because one of the users involved in the call
has made a request to clear the call. Under normal situations, the network is not the
source of this cause.
If the call fails with this Disconnect Cause Code, the call most likely fails at a higher
layer protocol such as PPP, authentication or idle timeout related issues. Verify the router
configuration.
Also, if you have requested a callback, the remote device disconnects the call, generates
this code, and then calls you back.

0x91 User busy
The called system acknowledges the connection request. However, the system cannot
accept the call because all B-channels are in use. The user equipment is compatible with
the call in this situation.
Note: If you have multiple ISDN circuits, the telco can configure them in a "hunt-group",
in which calls switch to the next available circuit.

0x92 No user response
The connection fails because the destination does not respond to the call.
This cause indicates that a user does not respond to a call establishment message within
the prescribed period. The user must respond with either an alert or connect indication
according to ITU-T Q.931, when either timer T303 or T310 expires.

0x93 No answer from user
The destination responds to the connection request but fails to complete the connection
within the prescribed time. This cause indicates that a user has provided an alert
indication, but has not provided a connect indication within a prescribed period. Q.931
procedures do not necessarily generate this cause. Internal network timers sometimes
generate this cause.
The problem is at the remote end of the connection.

0x94 Subscriber absent
The remote device you attempt to reach is unavailable and is disconnected from the ISDN
network.
Contact the person responsible for that device.

0x95 Call rejected
The destination is able to accept the call but rejects the call for an unknown reason.
This cause indicates that the equipment that sends this cause does not want to accept this
call.
Note: The equipment is able to accept the call because the equipment that sends this
cause is neither busy nor incompatible. However, the equipment rejects the call.

0x96 Number changed
The ISDN number used to set up the call does not belong to a system.
A caller receives this cause when the called party number is no longer assigned. You can
optionally include the new called party number in the diagnostic field. If a network does
not support this capability, the caller receives cause No. 81, unassigned (unallocated)
number.

0x97 Redirection to new destination
Your call is routed to a different ISDN number.
Check the number you call. Also verify the PBX configuration (if you use PBX).

0x99 Exchange routing error
Your call cannot be successfully routed to the remote party.
Check the number you call. Also verify the PBX configuration (if you use PBX).

0x9A Non-selected user clearing
The destination is able to accept the call. However, the destination rejects the call because
the call is not assigned to a user.

0x9B Destination out of order
The destination is not reachable because of an interface malfunction. In addition, a
signaling message cannot be delivered. This condition can be temporary. However, the
condition can last for an extended period in some cases.
This cause indicates that a signaling message could not be delivered to the remote user.
For example, a physical layer or data link layer fails at the remote user end, and the user
equipment is off-line (turned off).

0x9C Invalid number format
The connection fails because the destination address is in an unrecognizable format, or is
incomplete.
Verify whether the format of the number is correct. This includes any appropriate digits
for a PBX, and long distance.

0x9D Facility rejected
The network cannot provide the facility that the user requests.

0x9E Response to STATUS ENQUIRY
The status message appears in direct response to the receipt of a status inquiry message.

0x9F Normal, unspecified
This message reports the occurrence of a normal event when no standard cause applies.
No action is required.

0xA1 Circuit out of order
The call cannot go through due to some problem in the ISDN network.

0xA2 No channel available
The connection fails because no appropriate channel is available to take the call.

0xA3 Destination unattainable
The destination is not reachable through the Telco network. Contact the Telco.

0xA4 Out of order
Some part of the network necessary to route the call is out of order.
The destination is not reachable because of a network malfunction. The condition can last
for an extended period. An immediate attempt to reconnect will probably fail.
If you use a long distance carrier, try to use a Presubscribed Inter-exchange Carrier (PIC).
For example, you can use a 10-10-xyz carrier. A PIC enables you to verify whether the
problem lies with the long distance carrier.

0xA6 Network out of order
The destination is not reachable because of a network malfunction. The condition can last
for an extended period. An immediate attempt to reconnect will probably fail.
If you use a long distance carrier, try to use a Presubscribed Inter-exchange Carrier (PIC).
For example, you can use a 10-10-xyz carrier. A PIC enables you to verify whether the
problem lies with the long distance carrier.

0xA7 Permanent frame mode connection out of service
This message indicates that equipment failure probably terminates the permanent
connection.
If the problem persists, contact your telco

0xA8 Permanent frame mode connection operational
This message occurs when the permanent connection is fully operational again after a
termination. Equipment failure probably terminated the connection previously.

0xA9 Temporary failure
An error occurs because of a network malfunction. Contact the telco if the problem
persists.

0xAA Switching equipment congestion
The destination is not reachable because of a temporary overload on the network
switching equipment. Try again later.

0xAB Access information discarded
The network cannot provide the access information that the user requests.
This cause indicates that the network is unable to deliver access information to the remote
user. For example, user-to-user information, low layer compatibility, high layer
compatibility, or a sub-address as the diagnostic indicates.
Note: You have the option to include the particular type of discarded access information
in the diagnostic.

0xAC Requested channel not available
The remote equipment cannot provide the channel that the user requests, due to an
unknown reason. This problem is usually temporary.

0xAF Resources unavailable, unspecified
The channel or service that the user requests is unavailable for an unknown reason. This
problem is usually temporary.

0xB1 Quality of service (QoS) unavailable
The network cannot provide the quality of service that the user requests. This issue can
occur due to a subscription problem.
This cause reports that the network cannot provide the QoS as defined in
Recommendation X.213. For example, this cause code appears when the network cannot
support throughput or transit delay.

0xB2 Requested facility not subscribed
The remote equipment supports the supplementary service by subscription only.
This cause indicates that the network cannot provide the supplementary service that the
user requests. The user has probably not completed the necessary administrative
arrangements with the supporting networks.
The ISDN network can also return this cause code when a user makes a call attempt, but
does not enter the SPIDs, or enters the SPIDs incorrectly. Ensure that your SPIDs are
correct, or contact your telco to verify your SPIDs.
Also verify the speed of the outgoing call that the ISDN network supports (56k or 64k).

0xB4 Outgoing calls barred
There is some restriction on outgoing calls. The ISDN network does not allow you to
make outgoing calls.

0xB5 Outgoing calls barred within CUG1
There is some restriction on outgoing calls. The ISDN network does not allow you to
make outgoing calls.

0xB6 Incoming calls barred
The ISDN network does not allow you to receive calls.
Contact your telco.

0xB7 Incoming calls barred within CUG1
The ISDN network does not allow you to receive calls.
Contact your telco.

0xB9 Bearer capability not authorized
A subscription problem usually causes this issue.
This cause indicates that the user requests a bearer capability that the equipment
implements, but the user does not have the authorization to use the capability.

0xBA Bearer capability not presently available
The network normally provides the bearer capability that the user requests. However, if
the capability is unavailable currently, this cause appears. A temporary network problem
or a subscription problem can cause this issue.
If the incoming call is Analog (modem call), verify whether you have an ISDN incoming
voice-modem under the PRI or BRI physical interface.

0xBF Service/option not available, unspecified
The network or remote equipment cannot provide the service option that the user
requests, due to an unspecified reason. A subscription problem can cause this issue.

0xC1 Bearer capability not implemented
The network cannot provide the bearer capability that the user requests.
Contact the telco to troubleshoot further.

0xC2 Channel type not implemented
The network or the destination equipment does not support the channel type that the user
requests.

0xC5 Requested facility not implemented
The remote equipment does not support the supplementary service that the user requests.

0xC6 Only restricted digital info bearer capability available
The network cannot provide unrestricted digital information bearer capability.
This cause indicates that a device requests an unrestricted bearer service. However, the
equipment only supports the restricted version of the bearer capability.

0xCF Service/option not implemented, unspecified
The network or remote equipment cannot provide the service option that the user
requests, due to an unspecified reason. A subscription problem can cause this issue.

0xD1 Invalid call reference value
The remote equipment receives a call with a call reference that is not currently in use on
the user-network interface.

0xD2 Identified channel does not exist
The user requests the receiving equipment to use a channel that is not activate on the
interface for calls.
This cause indicates that the equipment receives a request to use an inactive channel on
the interface for a call. For example, if a user subscribes to those channels on a primary
rate interface numbered from 1 to 12 and the user equipment or the network attempts to
assign a call to channels 13 through 23, this cause code appears.

0xD3 Suspended call exists, but call id does not
The network receives a call resume request. The call resume request contains a Call
Identify (ID) information element that indicates the call ID that represents a suspended
call.
This cause indicates that a user attempts to resume a call with a call ID which differs
from the ID in use for any currently suspended call(s).

0xD4 Call id in use
The network receives a call resume request. The call resume request contains a Call ID
information element that indicates the resume request is for a suspended call.
This cause indicates that the network receives a call suspend request. The call suspend
request contains a call ID (including the null call ID). This ID is already in use for a
suspended call within the domain of interfaces over which the call can be resumed.

0xD5 No call suspended
The network receives a call resume request when there is no suspended call pending. You
can resolve this transient error through successive call retries.
This cause code indicates that the network receives a call resume request. The call
resume request contains a call ID information element that currently does not indicate
any suspended call within the domain interfaces over which calls can be resumed.

0xD6 Call with requested call id has been cleared
This cause indicates that the network receives a call resume request. The call resume
request contains a call ID information element that originally indicated a suspended call.
However, either a network timeout or a remote user clears the suspended call.

0xD7 User not member of CUG1
Your call does not go through, probably due to one of these reasons:
You dial an incorrect ISDN number.
You request a service that you are not authorized to use (you have not subscribed to this
service).
The remote device is not authorized to use a service that you use.
Check the number you call. If the problem persists, contact your telco.

0xD8 Incompatible destination
This cause indicates an attempt to connect to non-ISDN equipment. For example, an
analog line.
This cause indicates that the equipment receives a request to establish a call that has a
low layer compatibility, high layer compatibility, or other compatibility attributes (for
example, data rate) that the equipment cannot accommodate.
This code often appears when the calling device dials the wrong number, and reaches a
non-ISDN device. Therefore, ensure that you dial the correct number.
This cause can also occur when a a data call is made to a voice number, or a voice call is
made to a number that only supports data. If the number is correct, check whether the
telco has configured their switch incorrectly.

0xDA Non-existent CUG1
Your call does not go through, probably due to one of these reasons:
You dial an incorrect ISDN number.
You request a service that you are not authorized to use (you have not subscribed to this
service).
The remote device is not authorized to use a service that you use.
Check the number you dial. If the problem persists, contact your telco.

0xDB Invalid transit network selection
The device requests the ISDN exchange to route the call through an unrecognized
intermediate network.
This cause indicates that the ISDN exchange receives a transit network identification of
an incorrect format. Annex C of ITU-T Q.931 provides this definition.

0xDF Invalid message, unspecified
An invalid message appears with no standard cause. This problem usually occurs due to a
D-channel error. If the error occurs systematically, report the error to your ISDN service
provider.

0xE0 Mandatory IE missing
The receiving equipment receives a message that does not include one of the mandatory
information elements.
This cause indicates that the equipment receives a message that does not contain an
information element that is necessary for the equipment to process the message.
This problem occurs due to a D-channel error. Ensure that you configure the switch type
correctly.

0xE1 Message type not implemented
The receiving equipment receives an unrecognized message, because either the message
type is invalid, or the equipment does not support the message type. A problem with the
remote configuration or with the local D-channel causes this issue.

0xE2 Message not compatible with call state or not implemented
The remote equipment receives an invalid message with no standard cause.
This cause indicates that the equipment receives a message that is not permissible in the
call state according to the procedures. This cause can also indicate that the equipment
receives a STATUS message to indicate an incompatible call state.
The issue occurs due to a D-channel error. If the error recurs, report the error to your
ISDN service provider.

0xE3 IE not implemented
The remote equipment receives a message that includes information elements that the
equipment cannot recognize.
This cause indicates that the equipment receives a message that includes information
elements that the device cannot recognize. This problem can occur when the equipment
does not define or implement the information element identifier. However, the message
does not need to contain the information element in order for the equipment to process
the message.
This issue occurs due to a D-channel error. If the error recurs, report the error to your
ISDN service provider.

0xE4 The remote equipment receives a message that includes invalid information in
the information element.
This cause indicates that the equipment receives an information element that is
implemented, but one or more of the fields in the information element are coded
differently.
This issue occurs due to a D-channel error.

0xE5 Message not compatible with call state
The remote equipment receives an expected message that does not correspond to the
current state of the connection.
This issue occurs due to a D-channel error.

0xE6 Recovery on time expiry
Your call does not go through, probably because an error occurs. For example, a state
synchronization error.
Wait and try again later. If the problem persists, contact your ISDN service provider.

0xE7 Parameter not implemented
Your call does not go through because the ISDN network does not support a service you
need to use.
Contact your ISDN service provider.

0xEF Protocol error, unspecified
This cause indicates an unspecified D-channel error with no other standard cause.

0xFF Interworking, unspecified
This cause indicates that an event occurs, but the network does not provide causes for the
action. The precise problem is unknown.

0x??
Unknown Cause value
The cause value is unknown.