Installing and Using System-to-System Networking
on Impact FXS, Impact FXT, DXP, and DXP Plus Systems
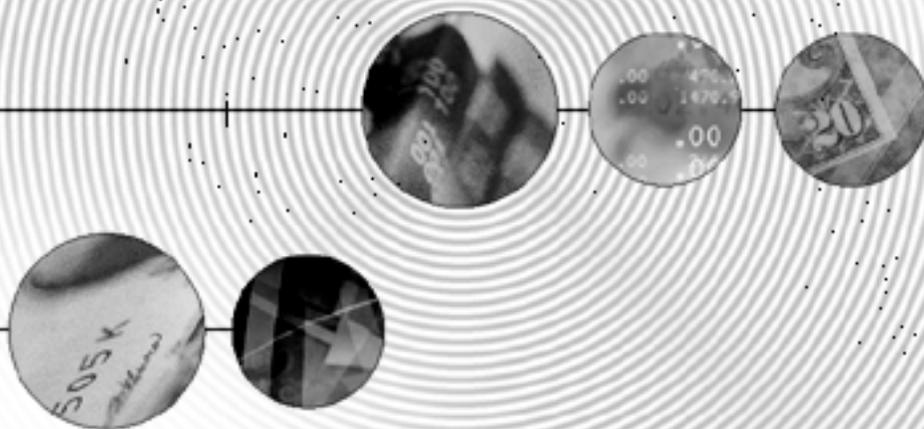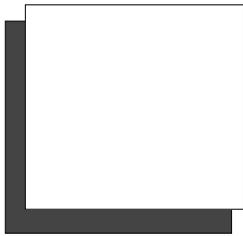
COMDIAL®

The Rising Star™

Comdial® strives to design the features in our communications systems to be fully interactive with one another. However, this is not always possible, as the combinations of accessories and features are too varied and extensive to insure total feature compatibility.

Accordingly, some features identified in this publication will not operate if some other feature is activated. Comdial disclaims all liability relating to feature non-compatibility or associated in any way with problems which may be encountered by incompatible features. Notwithstanding anything contained in this publication to the contrary, Comdial makes no representation herein as to the compatibility of features.

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Comdial installation specialists strongly suggest that you temporarily install the equipment and test its operation at your facility before you take it to the permanent installation site. When you do this, you ensure that the equipment is operational, and if it is not operational, you give yourself an opportunity to correct any problems that exist.

Refer closely to the installation details that you can find in this and other accompanying technical literature, and double-check your work for mistakes. If you cannot resolve any operating failures, you may need the technical assistance that Comdial makes available.

Contents

1   *Introducing System-to-System Networking*

System-to-system networking connects several DXP, DXP Plus, or Impact FXS/FXT systems together in an arrangement that allows unified communications through the systems. Appendix A contains a list of features supported by System-to-System Networking.

A signaling protocol based on Integrated Services Digital Network (ISDN) controls the network interface between the systems. The interfacing hardware consists of a T1 or E1 line board equipped with a primary rate interface (PRI) circuit card. The T1 boards are designated with the product codes DXNET for DXP and DXP Plus systems, and FXNET for Impact FXS/FXT systems. E1 boards are designated with the product codes DXPE1 for DXP and DXP Plus systems, and FXE1 for Impact FXS/FXT systems.

In addition to the network interface board required at each system in the network, **each node requires a synchronization card (DXOPT-SYN)**. (The hub system does not require a DXOPT-SYN card to perform on-site network functions.) The hub requires a network interface board for each node on the network; each node requires a minimum of one DXNET or FXNET network interface board for every link to the hub.

NOTE: If you also have the hub connected to the service provider through regular T1/E1 or PRI boards for normal outbound call traffic, you will need to install a DXOPT-SYN card in the hub system for that application. The PRI Flash revision should be upgraded to the most recent.

The communications network consists of one system acting as the hub and the remaining systems serving as nodes. The network allows up to ten nodes in addition to the serving hub making a total of eleven systems combined into the network. The hub can be DXP, DXP Plus, or Impact FXS/FXT common equipment; however, a DXP Plus or Impact FXS/FXT provides the best results due to the possible heavy network traffic through the hub.

NOTE: The hub and all nodes MUST be using the same software release and the same feature sets. For example you cannot use feature set 15A release 171 software on the hub and feature set 15A release 172 on any of the nodes.

The network can be an intra-network joining several systems located at the same site, or an inter-network joining several systems across a geographic area. When a service provider supplies the communication connections between the hub and the nodes, these connections must be PRI Clear Channel dedicated access lines for network use.

NOTE: With digital service, there is always confusion about what the term **line** *denotes. Since there are actually multiple lines in one digital* **line***, the more encompassing term for this connection is span, or in the case of this networking document, link. A link (or span) usually refers to the single 4-wire T1/E1 or PRI connection from the service provider. A link (or span) could consist of as many as twenty-three individual lines depending upon the type of T1/E1 or PRI service. To define the term line* **further** *when used with T1/E1 or PRI service, this networking document uses the term channel to refer to the individual lines in a link.*

To restate these terms:
Link (or Span) = single 4-wire T1/E1 or PRI connection consisting of as many as twenty-three channels.
Channel = individual lines in a link.

Detailing the Related Publications

Operating the various systems in the network means that you need fully to understand these systems and the network interface board requirements that comprise the network interface. The following chart shows the publications that documents the network components. If you do not already have copies of this documentation, you can download them by using your internet browser to connect to Comdial's bulletin board at http://bbs.comdial.com. Alternately, you can obtain product literature through Comdial's Inside Sales Department (1-800-347-1432); however, there may be a charge associated with this service.

System	Documentation			
	Cabinet Installation		Board	ISDN-PRI Interface
	Main Cabinet	Expansion Cabinet		
DXP Plus	IMI66–105	IMI66–106	IMI66–193	IMI66–255
DXP	IMI66–001	IMI66–002	IMI66–214	IMI66–255
Impact FXS	IMI66–134	IMI66–140	IMI89–274	IMI89–279
Impact FXT	IMI66–141			

Node System Station   Hub System Station   Node System Station

Voice Mail System

Node System   Hub System   Node System

Node System Station   Node System Station

Node System   Node System

Node System Station   Node System Station

Node System   Node System
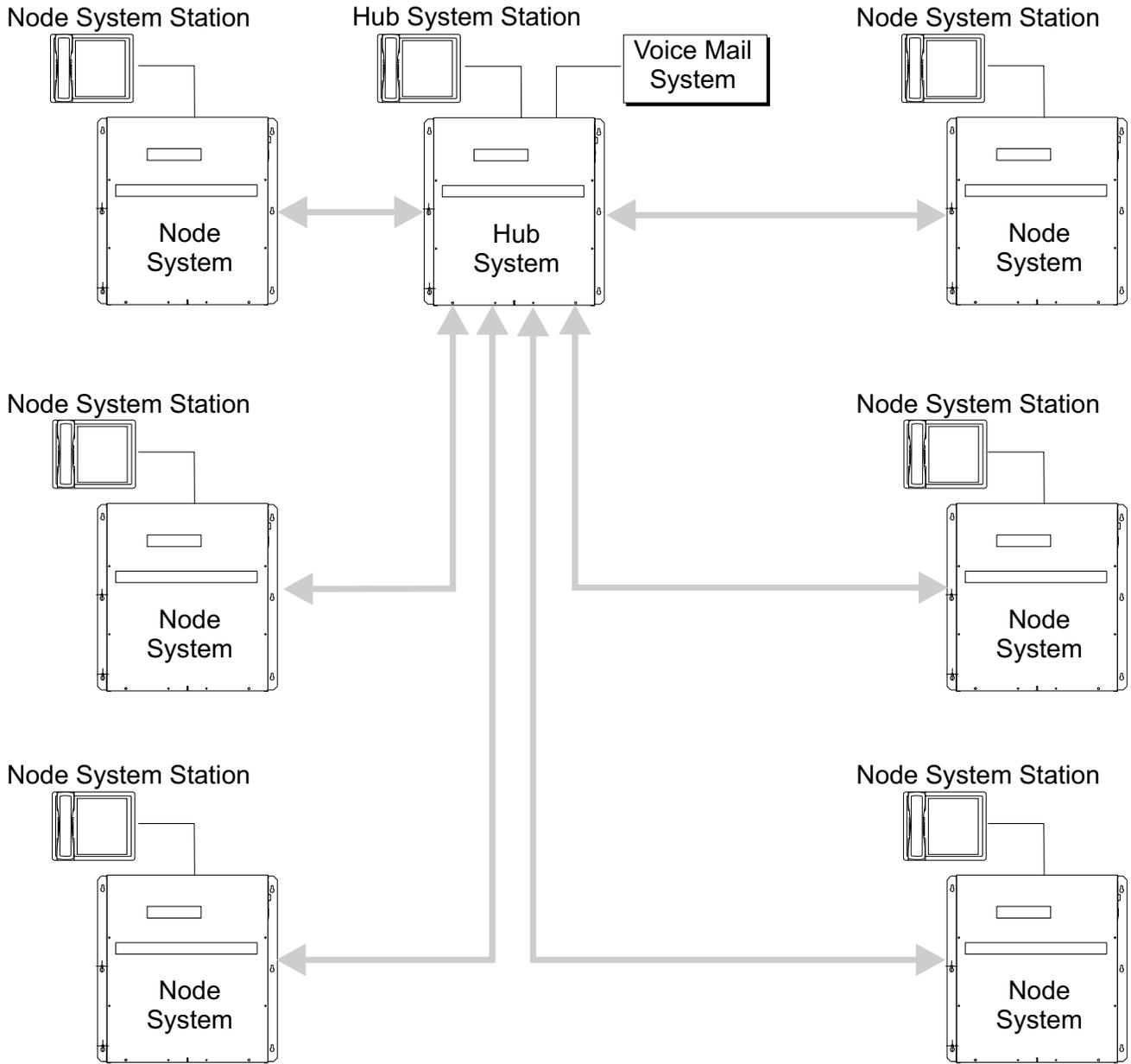
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Typical Network Configuration

<u>Notes</u>

2 *Understanding System-to-System Networking Features*

Currently, system-to-system networking provides the following joint activities with the hub and all connecting nodes:*

- unified intercom dialing with name display,

- cross-platform call handling,

- outside calling across the network,

- centralized voice mail.

*Refer to Appendix A for a complete list of supported features.

Performing Unified Intercom Dialing

A user at a station connected at one node can make an intercom call to any station connected to the local node, to the hub, or to any other node. Of course, normal intercom calling at the local node system is available as well. It also means that while the intercom numbers can be three or four digits long, they must be the same length through the network. **Further there can be no conflict between intercom number and feature code assignments at the various nodes.**

CAUTION

Should one node have the same intercom number assignment as another node, intercom callers at that node will call stations in their system but cannot call stations in another node with the same intercom number range.

Using Features from Hub to Node

As well as intercom calling, users can engage other cross-platform call handling features. Refer to Appendix A for a complete list of cross-platform and local features. The illustration below shows how the system routes a call from one node to another node.

Typical Example:

Hub has two DXNET boards
in slots 1 and 2 providing
channels 1-23 that are linked
to node 1 and channels 24-46
that are linked to node 2.

Ext. 2000   Ext. 1000   Ext. 3000

Node
System
1

Link

Hub
System

Link

Node
System
2

Node 1 has one DXNET board
in slot 1 providing channels 1-23
that are linked to the hub.

Node 2 has one DXNET board
in slot 1 providing channels 1-23
that are linked to the hub.

Node Preparation
Route 23 connecting link channels between the node and the hub.

Hub Preparation
Connect node 1 channels to hub channels 1-23.
Connect node 2 channels to hub channels 24-46.

Intercom Calls
When extension 2000 calls extension 3000, node 1 sends the call out over
one of the 23 channels that is connected to the hub. The hub processes
the call, and sends it out over one of the channels that is connected to
node 2. Node 2 receives the call and routes it to extension 3000.
The network handles intercom calls from station 3000 in the same way.

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Routing Intercom Calls

Making Outside Calls Across the Network

Routing Outside Calls in the Same Locality

Installers can provision the network with outside lines connected only between the hub and the service provider. Often this is the orientation used when the networked systems are all at the same site or in the same geographic location or calling area. Outside calls that users make from both the hub and the nodes route through the hub and onto the service provider's lines connected to it.

Whenever outside line calling is involved, the line pooling aspect of system-to-system networking comes into play. Refer to the paragraph titled *Understanding the Pooled Lines Network Feature* on page 16 in this publication for a detailed discussion of this feature.

Typical Example:

Hub has two DXNET boards in slots 1 and 2 providing channels 1-23 that are linked to node 1 and channels 24-46 that are linked to node 2.

Ext. 2000
Area Code
804

Ext. 1000
Area Code
804

Ext. 3000
Area Code
804

Node System 1 ←Link→ Hub System ←Link→ Node System 2

Node 1 has one DXNET board in slot 1 providing channels 1-23 that are linked to hub.

Toll Lines

Local Lines

Node 2 has one DXNET board in slot 1 providing channels 1-23 that are linked to hub.

Service Provider Central Office (CO)

Hub has two line groups connected to the CO. Line group 1 for toll calls and line group 2 for local calls.
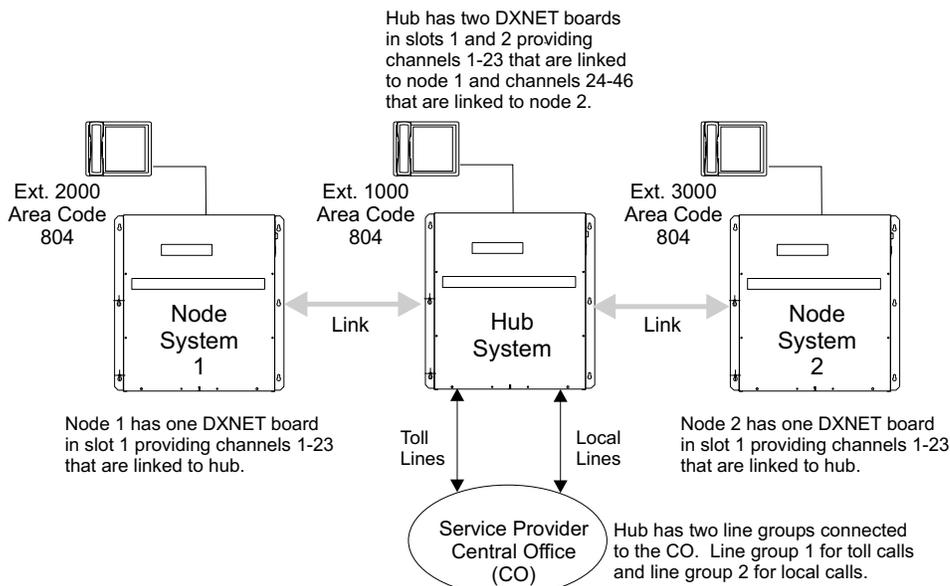
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Node Preparation
• Group connecting link channels 1-23 into line group 15.
• Enter **@** (match any) symbol in ARS restriction table.
• Assign @ entry to ARS route table 2.
• Define ARS route table 2 to use to use line group 15.

Hub Preparation
• Connect node 1 channels to hub channels 1-23.
• Connect node 2 channels to hub channels 24-46.
• Group CO toll lines in line group 1.
• Group CO local lines in line group 2.
• Enter **1@** in ARS restriction table.
• Assign 1@ entry to ARS route table 2.
• Define ARS route table 2 to use line group 1.
• Enter **@** in ARS restriction table.
• Assign @ entry to ARS route table 3.
• Define ARS route table 3 to use line group 2.

Note:
The entry in the ARS tables should match entire telephone numbers.
Examples: 1@@@@@@@@@@
  1411
  911
  0P (operator)
  2@@@@@@ (local)

Local Calls
When extension 2000 dials 9 for ARS and then dials local call 978-2200, node 1 sends the call out over one of the 23 channels in its line group 15 that is connected to the hub. The hub receives, processes, and sends the call out over its line group 2 that contains local lines from the CO.
The network handles outside local calls made from extension 3000 in the same way.

Toll Calls
When extension 2000 dials 9 for ARS and then dials toll call 1-804-978-2200, node 1 sends the call out over one of the 23 channels in its line group 15 that is connected to the hub. The hub receives, processes, and sends the call out over its line group 1 that contains toll lines from the CO.
The network handles toll calls from extension 3000 in the same way.

Routing Outside Calls in the Same Locality

Restriction Tables—Nodes				
Dialed Number	**Restriction Level**	**Exception Number**	**Route Table**	**Toll Group**
@	Allow All		2	

Route Table 2, Route 1—Nodes	
Specification	**Default**
Line Group (1–16)	15
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.n)	
Active Without Tone	X
Active With Tone	
Not Active	

Routing Outside Calls In Same Locality—Example Node System ARS Table Entries

Restriction Tables—Hub				
Dialed Number	**Restriction Level**	**Exception Number**	**Route Table**	**Toll Group**
1@	Allow All		2	
@	Allow All		3	

Route Table 2, Route 1—Hub	
Specification	**Default**
Line Group (1–16)	1
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.n)	
Active Without Tone	X
Active With Tone	
Not Active	

Route Table 3, Route 1—Hub	
Specification	**Default**
Line Group (1–16)	2
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.n)	
Active Without Tone	X
Active With Tone	
Not Active	

Routing Outside Calls In Same Locality—Example Hub System ARS Table Entries

Routing Outside Calls from Different Localities

If the networked systems are separated by a wide geographic distance, usually installers arrange to have each system connected to its own set of the local service provider's lines. Local outside calls that users make from their home systems go out the local service provider's lines. Long distance calls from one system that are local calls to another system in the network usually route through the hub and go out over service provider lines connected to the system where the call would be local.

Again, whenever outside line calling is involved, the line pooling aspect of system-to-system networking comes into play. Refer to the paragraph titled *Understanding the Pooled Lines Network Feature* on page 16 for a detailed discussion of this feature.

Typical Example:

Node 1 has one DXNET board in slot 1 providing channels 1-23 that are linked to hub.
Node 1 has one connection to local CO for both toll and local calls.

Hub has two DXNET boards in slots 1 and 2 providing channels 1-23 that are linked to node 1 and channels 24-46 that are linked to node 2.
Hub has one connection to local CO for both toll and local calls.

Node 2 has one DXNET board in slot 1 providing channels 1-23 that are linked to hub.
Node 2 has one connection to local CO for both toll and local calls.

Ext. 2000 Area Code 404

Ext. 1000 Area Code 804

Ext. 3000 Area Code 213

Node System 1 — Link — Hub System — Link — Node System 2

Toll And Local Lines

Service Provider Central Office (CO)

Service Provider Central Office (CO)

Service Provider Central Office (CO)

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Routing Outside Calls from Different Places—Connections

Node Preparation
At Both Nodes,
• Group channels 1-23 (contained in connecting link) into line group 15, and group CO lines in line group 1.
• Enter **@** in ARS restriction table.
• Assign @ entry to ARS route table 2.
• Define ARS route 2 to use line group 1
At Node 1,
• Enter **1804@** in ARS restriction table.
• Assign 1804@ entry to ARS route table 3.
• Define ARS route table 3 to use line group 15.
• Enter **1213@** in ARS restriction table.
• Assign 1213@ entry to ARS route table 3.
• Define ARS route table 3 to use line group15.
At Node 2,
• Enter **1804@** in ARS restriction table.
• Assign 1804@ entry to ARS route table 3.
• Define ARS route table 3 to use line group 15.
• Enter **1404@** in ARS restriction table.
• Assign 1404@ entry to ARS route table 3.
• Define ARS route table 3 to use line group 15.

Network Calls
When extension 2000 dials 9 for ARS and then dials 1 804 978 2200, node 1sends the call out over one of the 23 channels in its line group 15 that is connected to the hub. The hub receives, processes, delete's four digits, and sends the call out over its line group 1 that contains lines from its local CO.
The network handles 1 804 nnn nnnn calls made from extension 3000 in the same way.

When extension 2000 dials 9 for ARS and then dials 1 213 555 1212, node 1 sends the call out over one of the 23 channels in its line group 15 that is connected to the hub. The hub receives, processes, deletes four digits, and sends the call out over one of the channels in its line group 14 that is connected to node 2. Node 2 receives the call and sends the call out over its line group 1 that contains lines from its local CO.
The network handles 1 404 nnn nnnn calls made from extension 3000 in the same way.

Hub Preparation
• Group channels 1-23 (contained in node 1 connecting link) into line group 14.
• Group channels 24-46 (contained in node 2 connecting link) into line group 13.
• Group CO lines in line group 1.
• Enter **@** in ARS restriction table.
• Assign @ entry to ARS route table 2.
• Define ARS route table 2 to use line group 14.
• Enter **1404@** in ARS restriction table.
• Assign 1404@ entry to ARS route table 3.
• Define ARS route table 3 to use line group 14.
• Enter 4 digit delete in modify digits table 1
• Define ARS route table to use modify digits table 1.
• Enter **1213@** in ARS restriction table.
• Assign 1213@ entry to ARS route table 4.
• Define ARS route table 4 to use line group 13.
• Enter 4 digit delete in modify digits table 1
• Define ARS route table to use modify digits table 1.

Note:
The entry in the ARS tables should match entire telephone numbers.
Examples: 1@@@@@@@@@@
                     1411
                     911
                     0P (operator)
                     2@@@@@@ (local)

Note:
In order for the Automatic Route Selection (ARS) feature to operate properly across the network, restrictions in the class of service must be the same in all nodes as it is in the hub.

Example:
Assume a station in a node has a class of service 3 and is allowed 1 + dialing. If that station makes a 1 + dialing call that is routed to the hub, the class of service 3 in the hub must also allow 1 + dialing calls.

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Routing Outside Calls from Different Places—Preparation

Restriction Tables—Node 1				
Dialed Number	**Restriction Level**	**Exception Number**	**Route Table**	**Toll Group**
@@@@@@@@	Allow All		2	
1804@@@@@@	Allow All		3	
1213@@@@@@	Allow All		3	

Route Table 2, Route 1—Node 1	
Specification	**Default**
Line Group (1–16)	15
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.n)	
Active Without Tone	X
Active With Tone	
Not Active	

Restriction Tables—Node 2				
Dialed Number	**Restriction Level**	**Exception Number**	**Route Table**	**Toll Group**
@@@@@@@@	Allow All		2	
1804@@@@@@	Allow All		3	
1404@@@@@@	Allow All		3	

Route Table 2, Route 1—Node 2	
Specification	**Default**
Line Group (1–16)	1
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.n)	
Active Without Tone	X
Active With Tone	
Not Active	

Routing Outside Calls from Different Places—Example Node System ARS Table Entries

Restriction Tables—Hub				
Dialed Number	**Restriction Level**	**Exception Number**	**Route Table**	**Toll Group**
@@@@@@@@	Allow All		2	
1404@@@@@@	Allow All		3	
1213@@@@@@	Allow All		4	

Route Table 2, Route 1—Hub	
Specification	**Default**
Line Group (1–16)	1
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.nn)	

Route Table 3, Route 1—Hub	
Specification	**Default**
Line Group (1–16)	14
Access Level (1–4)	4
Modify Digit Table (1–16)	
Surcharge ($nn.nn)	
Tier 1 Cost ($nn.nn)	
Tier 1 Time (sec.)	
Tier 2 Cost ($nn.nn)	
Active without Tone	X
Active with Tone	
Not Active	

Modify Digits Table 1—for Hub ARS Table 3 and 4																	
Number Sequences of Added Digits (0–20)																	
Quantity of Deleted Digits (0–10)	4																

Routing Outside Calls from Different Places—Example Node System ARS Table Entries

Using Centralized Voice Mail

One voice mail system connected to the hub provides voice mail boxes to stations connected to the hub and to all the node systems. Operation with centralized voice mail involves intercom calling that occurs between stations in the same system and intercom calling between stations across the network. Because of this, it is very important when programming the voice mail system that you carefully match the mail box assignments to the proper node extensions.
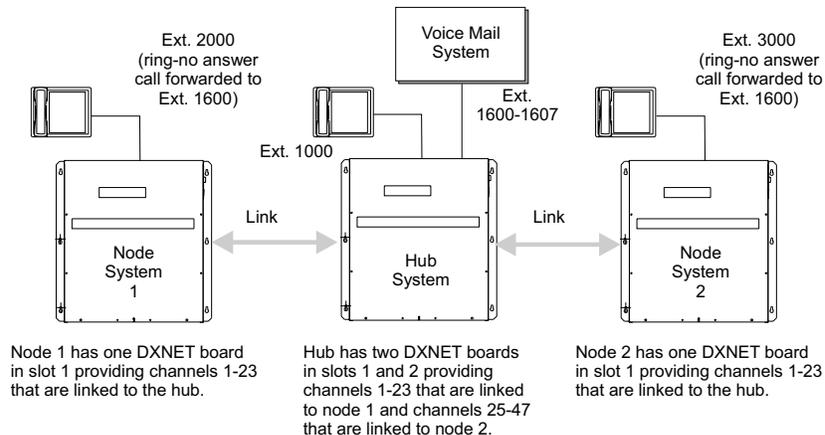
A programmer can map up to 128 different voice mail access buttons (XVM01 through XVM064) on system stations; however, the network software reserves mapped button XVM064 as the button for accessing centralized voice mail on the hub. The remaining index numbers (01 through 127) are available for access buttons to be used with local voice mail systems at the nodes.

NOTE: On local voice mail systems, both the telephone extension and that extension's voice mailbox must be on the same node.

Serial integration provides both visual displays and interactive buttons that make VVP very effective and easy to use. Serial integration provided by the centralized voice mail system to stations connected to the hub is also available to stations connected to node systems. When there are separate voice mail systems connected to the nodes, every station on a node uses serial integration provided by its local voice mail system. If a local voice mail system does not exist, the node stations then use the serial integration provided by the centralized voice mail system connected to the hub.

NOTE: In networked environments with CTI applications, the transfer to voice mail feature will only work in conjunction with centralized voice mail.

Typical Example:

Ext. 2000
(ring-no answer
call forwarded to
Ext. 1600)

Voice Mail
System

Ext.
1600-1607

Ext. 3000
(ring-no answer
call forwarded to
Ext. 1600)

Ext. 1000

Link — Link

Node
System
1

Hub
System

Node
System
2

Node 1 has one DXNET board in slot 1 providing channels 1-23 that are linked to the hub.

Hub has two DXNET boards in slots 1 and 2 providing channels 1-23 that are linked to node 1 and channels 25-47 that are linked to node 2.

Node 2 has one DXNET board in slot 1 providing channels 1-23 that are linked to the hub.

Node Preparation
Group channels 1-23 (contained in connecting link) into line group 15.
Set the stations to call forward their ring-no answer calls to extension 1600.

Hub Preparation
Group channels 1-23 (contained in node 1 connecting link) into group 14.
Group channels 24-46 (contained in node 2 connecting link) into group 13.

Making Intercom Calls
When extension 2000 calls extension 3000, node 1 sends the call out over one of the 23 channels in its line group 15 that is connected to the hub. The hub processes the call, and sends it out over one of the channels in its line group 13 that is connected to node 2. Node 2 receives the call and routes it to extension 3000. The network handles intercom call from station 3000 in the same way.

Leaving Voice Mail Messages
Should extension 3000 be busy or is a ring-no answer, the extension 2000 caller can leave a voice mail message. The network stores the message at the hub-installed voice mail system. The extension 3000 user retrieves the voice mail message by simply calling his or her mail box extension. The hub retrieves the message from the voice mail system and sends it to extension 3000.

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Routing Voice Mail Messages

Understanding the Pooled Lines Network Feature

Detailing the Line Pooling Feature

The network line pooling feature is a variation of the traditional line group access feature that is available with stand-alone communications systems. With line pooling, a caller from one node can make outbound calls over lines connected to other nodes in the network. The line pooling feature operates with the Automatic Route Selection (ARS) feature to make line selections for callers' outbound calls. ARS may route calls in any of the following ways:

- from a node and terminate them at the hub,

- from one node through the hub to another node,

- internally through one node without passing them through the hub.

The system allows a maximum of two passes, or hops, through the hub. Some examples of this are listed below:

- A call that originates at node 1, passes through the hub, routes to node 2, passes through node 2 and back to the hub, passes through the hub again, and terminates at node 3.

- A call that originates from a node, passes through the hub, and returns to the originating node also. (This situation exists when ARS is centralized at the hub.)

Calls that route through the network have their digits translated and/or modified at the originating node, again at the hub, and again at the terminating node before they route out of the network to the service provider.

The Station Message Detail Accounting (SMDA) feature at the originating and terminating nodes records the intercom number of the call originating station and marks the call with the alphabetic letters NT to denote the call as a network call. In this report, both the ALL and LINE listings show the intercom number of remote stations.

The station class of service that sets the parameters for a calling station determines the level of call access and call restriction at that station's node. The local node applies toll restriction to calls that originate at that node. These toll restriction limitations are based upon the programmed class of service for that station. When a call passes through the hub or other nodes, each location imposes the same toll restriction limitations that the originating node imposed on the call.

The network defaults to a dial-9, for line pool access, but any other digit will function equally well as an ARS access digit when programmed to do so. The line pooling feature also supports line group selection buttons for local line groups on individual node stations.

Explaining the Line Pooling Call Handling

Calls made through the pooled line feature are in the following sequence (should an internal error occur during call routing, the system reports that error to the system error log):

- callers take their stations off hook,

- they dial the ARS access code,

- they then hear an internal dial tone that prompts them to dial the number they want to call,

- the local node applies any call restrictions determined by the local class of service parameter,

- ARS routes the calls to a local or a remote route determined by the particular number dialed.

The controlling software enables a local node to save the last number that a user dials through the ARS. This enables them to redial the last number dialed into the line pooling environment. Also, users can store at an autodial location an ARS preselect plus a line group preselect enabled for ARS along with a desired number. Pressing this autodial button, causes the system to route the stored number through the line pooling feature. When the lines in a line group are all network channels, the installer may map a button on the system stations that automatically selects an ARS-enabled line group when users press it.

Arranging for Line Pooling

Gather the network channels that connect a node to a hub into one of the available line groups. The system **will not** allow you to mix network channels and non-channel lines in the same line group.

Program the line groups that contain network channels into ARS route tables in the same manner as you would program any normal line group into the ARS tables.

Network ARS Programming with Line Pooling

When programming Automatic Route Selection on a networked system, follow these guidelines:

- Program toll restriction for a specific extension from that extension's node.
  For example: If you want to prevent node #1, extension 334 from making long distance calls, apply the restriction in the Toll/ARS programming of node #1.

- All extensions that have their calls processed on a separate node are dependent on the remote COS.
  For example: Node #1, extension 334 is dialing a local number which will use a line on the hub. The remote class of service programmed for this extension under **Stations/Station Programming/General** is the class of service the system uses to determine the appropriate restrictions and class of service on the hub. If extension 334 has Remote COS 22 assigned to it, and COS 22 in the hub has a restriction level of 1, with no lines programmed in the **Originated On Lines** menu, then the system prevents extension 334 from dialing out. The reverse is also true if hub extensions are dialing out on the node's lines.

- You should assign each network card its own line group.
  For example: If hub has 2 networking cards in it, assign each card its own line group. Verify each one of these network line groups has the networking box checked under **Lines/Line Group Programming**.

- All digits need to be buffered; please follow the example of the default Toll/ARS table on the next page.

- Always program the Modify Digits table at the system where the calls access the service provider.
  For example: Node extension 334 dials a local telephone number. The system routes the outbound call through the hub; therefore, it is the hub, not the node, that will add or delete digits as necessary before releasing the number to the service provider.

- Assign toll group 1 to all lines for which you are programming Toll/ARS, whether they be on the hub or one of the nodes.

In the example on the next four pages, all nodes have their own lines for local 7-digit dialing. The system will route all "0" and "1+" calls over the PRI located at the hub, along with any local calling overflow. This example will not be exact to your application, however, it should help you to understand how the pooling feature works in both simple and complex environments.

Hub Toll/ARS Programming

	Number	Restriction Level	Exception Number	Route Table	Toll Group
1.	0	Allow all	0	4	1
2.	1@@@@@@@@@	Allow all	0	4	1
3.	911	Allow all	0	1	1
4.	222@@@@	Allow all	0	2	1
5.	223@@@@	Allow all	0	2	1
6.	333@@@@	Allow all	0	3	1
7.	334@@@@	Allow all	0	1	1
8.	888@@@@	Allow all	0	1	1
9.	889@@@@	Allow all	0	1	1

NOTE: The modify table will have an entry of 2 of 984, this being the in-state long distance.
If all node lines are busy, the system routes the call over the hub's local telephone lines.

	Route Table 1							
	Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1.	2	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2.	3	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

	Route Table 2							
	Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1.	11	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2.	3	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6.	1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Route Table 3							
Line Group	**Route Access**	**Modify Table**	**Surcharge**	**Tier 1 Cost**	**Tier 1 Time**	**Tier 2 Cost**	**Route Status**
1. 12	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 3	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Route Table 4							
Line Group	**Route Access**	**Modify Table**	**Surcharge**	**Tier 1 Cost**	**Tier 1 Time**	**Tier 2 Cost**	**Route Status**
1. 16	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 3	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Node 1 Toll/ARS Programming

	Number	Restriction Level	Exception Number	Route Table	Toll Group
1.	0	Allow all	0	1	1
2.	1@@@@@@@@@	Allow all	0	1	1
3.	911	Allow all	0	1	1
4.	222@@@@	Allow all	0	2	1
5.	223@@@@	Allow all	0	2	1
6.	333@@@@	Allow all	0	1	1
7.	334@@@@	Allow all	0	1	1
8.	888@@@@	Allow all	0	1	1
9.	889@@@@	Allow all	0	1	1

Route Table 1							
Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1. 2	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 16	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Route Table 2							
Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1. 16	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 1	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Node 2 Toll/ARS Programming

	Number	Restriction Level	Exception Number	Route Table	Toll Group
1.	0	Allow all	0	1	1
2.	1@@@@@@@@@	Allow all	0	1	1
3.	911	Allow all	0	1	1
4.	222@@@@	Allow all	0	2	1
5.	223@@@@	Allow all	0	2	1
6.	333@@@@	Allow all	0	1	1
7.	334@@@@	Allow all	0	1	1
8.	888@@@@	Allow all	0	1	1
9.	889@@@@	Allow all	0	1	1

Route Table 1							
Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1. 2	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 16	1	2	$0.00	$0.00	0 Sec	$0.00	Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Route Table 2							
Line Group	Route Access	Modify Table	Surcharge	Tier 1 Cost	Tier 1 Time	Tier 2 Cost	Route Status
1. 16	1	1	$0.00	$0.00	0 Sec	$0.00	Active
2. 1	1	2	$0.00	$0.00	0 Sec	$0.00	Not Active
3. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
4. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
5. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active
6. 1	1	1	$0.00	$0.00	0 Sec	$0.00	Not Active

Using DID, DNIS, and ANI Features through the Network

The DXP, DXP Plus, and FX Series systems provide the DID, DNIS, and ANI support as part of their basic software package. A typical application is to service the hub location with analog DID lines or digital service offering DNIS and ANI. An application such as this centralizes the service to the hub and allows the system to transparently route callers to the appropriate node. With such an arrangement, all DID block programming is confined to the hub system.

Direct Inward Dialing (DID) is an analog service that allows callers to dial directly to a system station without going through the system's attendant. Dialed Number Identification Service (DNIS) is a feature provided by T1/E1 service. DNIS supplies the system with the number that the caller dialed. Automatic Number Identification (ANI) is also a feature often provide by T1/E1 service. ANI supplies the system with the number of the calling party. Do not confuse ANI with any Caller ID feature.

NOTE: Release 16A supports Caller ID across the network.

When the system detects analog DID information or digital DNIS information, it compares the received digits to information programmed into an appropriate DID Block Table assigned to the incoming line. If the received digits match a local extension number, that local station will ring. If the received digits match a remote extension, the system seizes a network channel to the appropriate node and sends the call to ring at the remote station.

If the incoming call is to a local station and provides ANI information, that information gets processed at the local system. If the incoming call is to a remote station and provides ANI information, that information gets processed at the remote system. The network software supports the following ANI services: DID, DNIS, R2 MF, R2 DTMF, and ISDN-PRI. The network software does not support the E&M service.

In the case of Feature Group D INFO digits delivered over a Feature Group D line, the network system processes the INFO digits locally and does not deliver them to a remote extension when it routes a call there.

Network Incoming Call Routing

Direct, Delay, Day1, Day2, Night, Enhanced Holiday, and Enhanced Day of Week are ringing modes currently supported by existing software. Each mode allows the system to route incoming calls to one or more local extensions. With Release 180, Feature Set 16A, the system supports routing to remote extensions connected to different nodes. The remote extensions can be any stations, centralized attendants, hunt group pilot numbers, or group intercoms. Installers can assign every remote extension to each supported ringing mode that the installation requires. The system supports routing to a remote extension for the following incoming line types: loop start, ground start, PRI, and BRI.

A key difference in the call routing behavior of remote ringing assignments versus local ringing assignments, is that while an incoming call can ring at several local stations, that call can ring at only one remote station. They system checks the remote station ringing assignments before it checks the local station assignments. This means that if installers have provided a remote extension, that station is the one to which the system routes the call. Further, once the incoming call routes to a remote station, no other station (local or remote) will ring for the same call. These same routing rules apply when an incoming call goes unanswered and the delay timer expires. If installers programmed a remote delay extension, the system cancels the current ringing (local or remote) and rings the remote delay extension. If installers provide no remote delay extensions, the system routes calls by the local delay assignments. If installers do not provide either remote or local delay extensions, the system uses the current ringing assignments for call routing.

To illustrate how the system routes incoming calls across the network in conjunction with system direct and delayed ringing, examine the following tabular example.

Remote Extension		Local Extension		Expected Results
Direct	**Delay**	**Direct**	**Delay**	
Remote routing one at a time with local assignments ignored				
501	502	401	402	Only 501 rings initially, after delay only 502 rings
501	502	401	None	Only 501 rings initially, after delay only 502 rings
501	502	None	402	Only 501 rings initially, after delay only 502 rings
501	502	None	None	Only 501 rings initially, after delay only 502 rings
Ring only direct remote first then use local assignments				
501	None	401	402	Only 501 rings initially then after delay, only 401 and 402 rings
501	None	401	None	Only 501 rings initially and continues after delay
501	None	None	402	Only 501 rings initially then after delay, only 402 rings
501	None	None	None	Only 501 rings initially and continues after delay
Ring local assignments first then ring only delay remote				
None	502	401	402	401 rings initially then after delay, only 502 rings
None	502	401	None	401 rings initially then after delay, only 502 rings
None	502	None	402	401 rings initially then after delay, only 502 rings
None	502	None	None	401 rings initially then after delay, only 502 rings
Use local assignments only—no remote ringing				
None	None	401	402	401 rings initially then after delay, both 401 and 402 rings
None	None	401	None	401 rings initially then after delay, nothing rings
None	None	None	402	Northing rings initially then after delay, only 402 rings
None	None	None	None	Nothing rings

Network Incoming Call Routing

Feature Limitations

To avoid race conditions and routing complexity, the following limitations are necessary with the network incoming call routing feature.

1. Once a call is routed to a remote extension, local extensions assigned to the incoming line will stop ringing.

2. An incoming call can route to only one remote extension at a time.

3. The system uses the order of importance set by ringing mode programming to decide which single remote extension will ring first. The order of importance is arranged from highest to lowest:

   a. Enhanced Holiday Remote

   b. Enhanced Day of Week-Night Remote

   c. Enhanced Day of Week-Day2 Remote

   d. Enhanced Day of Week-Day1 Remote

   e. Enhanced Day of Week-Direct Remote

   f. Night Remote

   g. Day2 Remote

   h. Day1 Remote

   i. Direct Remote

   j. Local Ringing Assignments

4. If an enhanced holiday or day of week ringing mode is in effect and the installers have not programmed a remote extension for the enhanced ringing, the system considers any normal ring assignment at the remote site before it considers any local ringing assignments.

If the installer has programmed any delay ringing assignments, they preempt any current ringing assignment.

Network Station State Query

A Networking Station State Query (SSQ) allows a station or Impact Attendant to query the status of another station on a remote node. Station users can activate this feature by first pressing the SSQ button on their system telephone and then dialing the extension of the station they wish to query.

Notes

3

Installing System-to-System Networking

Installing the network requires a complete understanding of the elements discussed in the following paragraphs. Further, you should refer to the system manuals listed in *Detailing the Related Publications* on page 4 for installation details about the various system components.

Ensure the system is properly grounded and then place the CPU board in the appropriate cabinet. Ensure that the latest bootloader on the memory card is attached to the CPU board. Remove all boards from the cabinet.

Detailing Equipment Needs

1. The network requires a DXP, DXP Plus, or Impact FXS/FXT system installed at the hub site and additional systems at the node site(s).

2. Every node requires a minimum of four meg nob and two meg scratch.

3. Every node site requires a minimum of one DXNET or FXNET network interface board for every link to the hub.

NOTE: *The call traffic volume determines the number of links needed to connect each node to the hub. Some sites may require only one link while others may require more. Keep in mind that each link can support up to twenty-three channels carrying twenty-three simultaneous calls. If the System-to-System expected network load is higher, you must arrange for multiple links. When you do this, you have certain system maximums that you must consider. These considerations include: the maximum channel capacity and the maximum number of T1/E1 boards that the hub supports. Remember that the hub must make a channel available to match every node channel.*

A DXP supports a maximum of 128 channels and six T1/E1 boards; however, since the full T1/E1 capacity equals 138 channels, which exceeds the system's 128 channel maximum, one T1/E1 board must be fractional.

The DXP Plus supports a maximum of 240 channels and 10 T1/E1 boards. In this case DXP Plus systems can make all 240 channels available over the maximum of 10 T1/E1 boards.

An Impact FX 112 supports 112 channels and 4 T1 boards or 3 E1 boards.

An Impact FX 224 system supports 224 channels and 9 T1 boards or 7 E1 boards.

An Impact FX 464 supports 240 channels and 10 T1 boards or 8 E1 boards.

Remember, the total channel capacity available for network links at both the hub and the nodes is reduced by however many CO lines you connect at these systems.

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4. Each node site requires a synchronization card (DXOPT-SYN); however, this is not a requirement at the hub site.

NOTE: If you also have the hub connected to the service provider through regular T1/E1 boards for normal outbound call traffic, you will need to install a DXOPT-SYN card in the hub system for that application.

5. The hub and every node system must be running special networking software with a revision of 12A or later.

6. A network can contain a maximum of 10 nodes and one hub. While the hub can serve stations and act as another node in the network, there could be network situations that require you to dedicate the hub as the network server without station connections of its own.

Disabling a Node System

To disable networking, use VMMI to turn off networking at both the hub and the node. To disable the hub, select **Programming/System/Networking/Network Properties** and set the Network Database Status to **DISABLED**. To disable the node, select **Programming/System/Networking/Node Configuration** and set the node status to **DISABLED**.

NOTE: If you do not disable the hub and node, the system will not function properly.

Arranging the Links

The network can be an intra-network joining several systems at a common site or an inter-network joining several systems across a geographic area. Intra-network installations are on-site installations and use house wiring. Therefore, these installations do not require any service provider connections except the CO line terminations.

With inter-network installations, nodes and hubs are separated by some geographic distance. In these cases a service provider supplies the connections between the hub and the nodes, and these connections must be T1.5 dedicated access lines for network use.
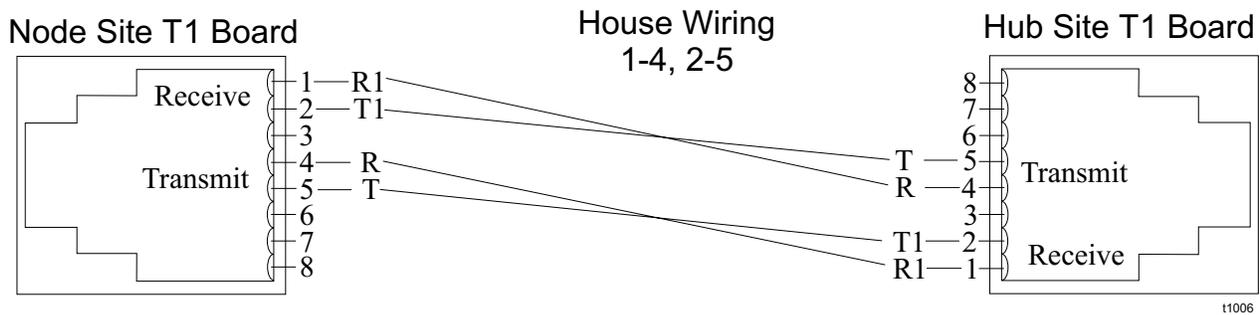
1. For intra-network installations, make the two-pair, four-wire house wiring connections between the nodes and the hub. In-house connections between the node and hub systems are per the schematic shown on the next page.

2. For inter-network installations, arrange with the service provider to supply the proper links to the hub and node sites. The DXNET or FXNET boards always use the 4ESS protocol (NET5 for E1 boards). Service demarcation is at a network interface box (also known as a smart jack). In-house connections between the demarcation point and the local system are per the schematic shown on the next page.

NOTE: Making arrangements for these connections involves meeting with the applicable service providers. This is because there are economic considerations as well as technical details that vary from location to location.
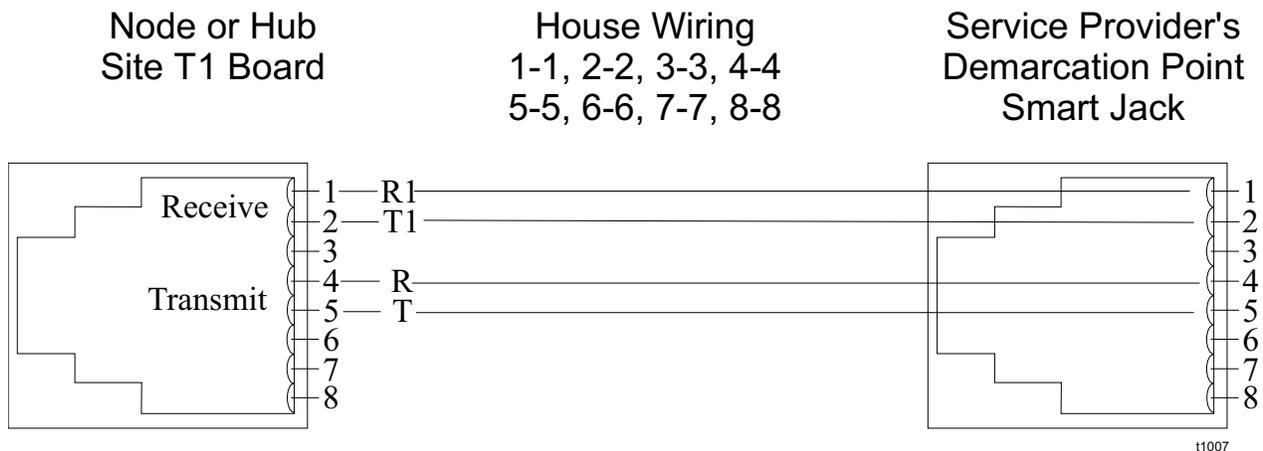
3. At both the hub and nodes, locate the board slots where you plan to install the boards, and record those slots for later reference. At the hub, note which boards slot is dedicated to which node and record that information for later reference. Remember that several board slots at the hub may be dedicated to the same node depending upon the number of links required to handle the call traffic.

continued . . .

4. Determine all the extension numbers for each node and the hub, and determine which extension numbers are to be accessible through the network.

5. Isolate the link channels from any CO lines that the systems may include, and gather those link channels into their own line group. Record this arrangement for later reference.

6. Determine which node is to be node 1, node 2, node 3, and so forth then name each node. Record the location and name of each node for later reference.

Node Site T1 Board   **House Wiring 1-4, 2-5**   **Hub Site T1 Board**

Detailing the Intra-Network House Wiring

Node or Hub Site T1 Board   **House Wiring 1-1, 2-2, 3-3, 4-4 5-5, 6-6, 7-7, 8-8**   **Service Provider's Demarcation Point Smart Jack**

Detailing the Inter-Network House Wiring

Configuring the DXNET or FXNET Board

The DXNET or FXNET boards require unique strap switch settings for network operation. Depending upon whether the installation is on a node or on the hub, the strapping differs.

Setting the Strapping Switches on the Node's DXNET or FXNET Board

DIP Switch Location	Individual Switch Settings							
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
LIU	0	1	0	0				
Diag.	0	0	1	0	0	0	0	0

Setting the Strapping Switches on the Hub's DXNET or FXNET Board

DIP Switch Location	Individual Switch Settings							
	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0
LIU	0	1	0	0				
Diag.	0	0	1	0	0	0	0	0
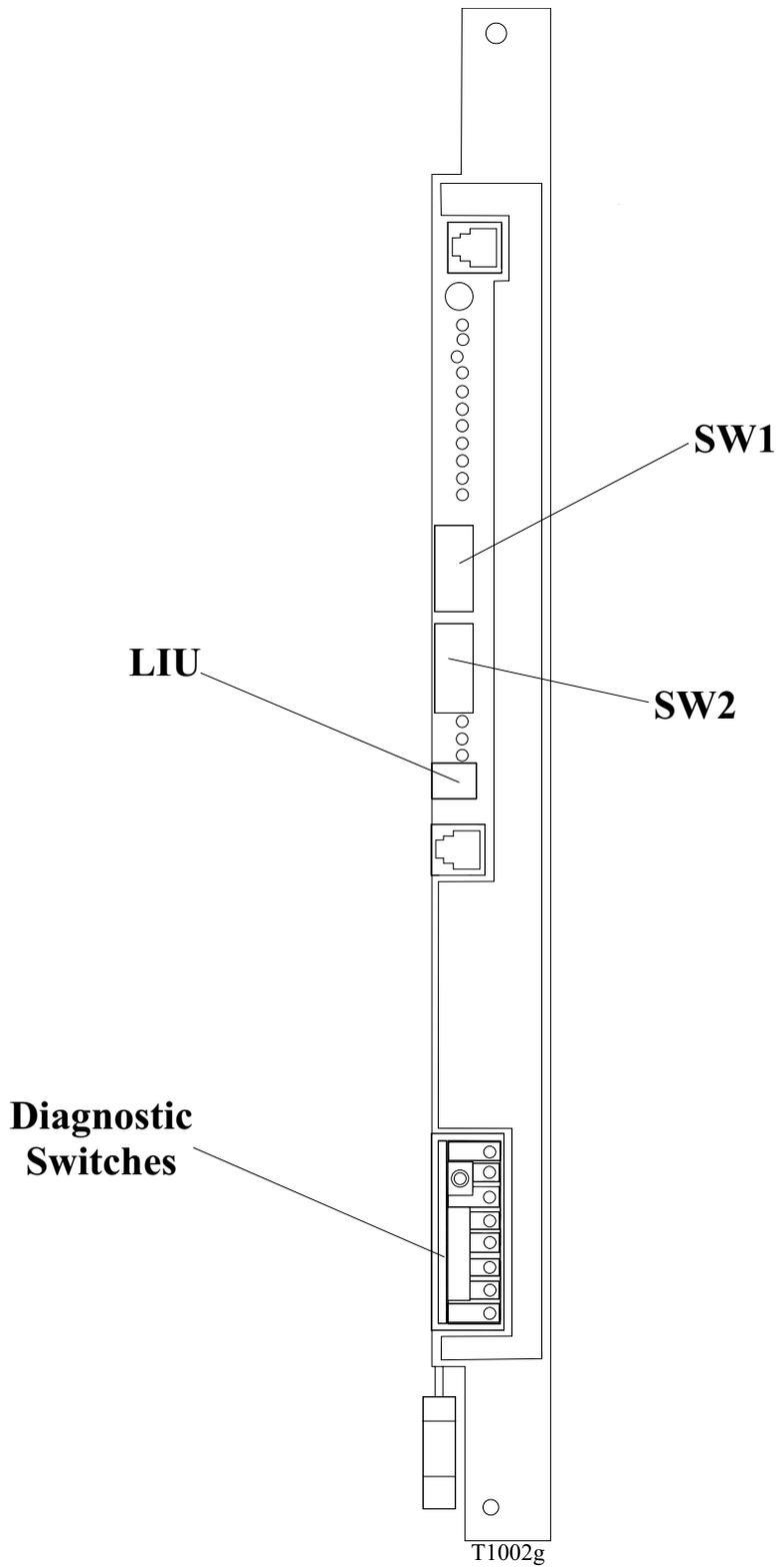
Locating the DIP Switches
(DXNET Board Shown—FXNET Board Similar)

Notes

4 Programing System-to-System Networking

Using the Visual Man-Machine Interface (VMMI), program the network features at the hub system. You cannot program the network features at the nodes; however, you can use VMMI at any node system to view (read only) the programmed network parameters.

NOTE: If you are upgrading an existing system to use networking software, you can archive the database from the existing system and restore it to the upgraded networking system by using VMMI's Archive and Restore features.

Programming the Node System

You must program the node extensions before programming the hub. Make sure you are using the latest version of the VMMI software. We recommend that you do a Master Clear 3 before you start programming.

1. Make the necessary programming changes that only affect local operation.

2. Program the board configuration to match DXNET or FXNET boards to their assigned slots, and inspect the installation.

   Verify that the boards are operational, and that there are no alarms present after you have connected the node to the hub. Resolve any alarm problems before proceeding.

3. Verify that the synchronization card is operating properly (green LED on).

4. Using VMMI's Board Menu, set the operating protocol for DXNET or FXNET boards to 4ESS, and leave all other program settings to their default values.

5. Determine the node designation (node 1, node 2, and so forth), and assign a unique name to each node. Record this information, as you will use it when you program the network properties at the hub system.

6. To ensure there is no confusion in line identification when transferring incoming calls across the network, give each line in the network a unique name. Do not duplicate any line names or numbers anywhere on the network.

7. Assign the extension numbers for network operation. Remember, use a different block of intercom numbers at each node.

8. If you plan to use the Pooled Lines network feature with ARS, program the link channels into their own line group. Be sure to isolate the link channels from any other lines connected to the local system.

9. Remove any direct line appearance for network channels from the individual stations.

10. Remove any direct or delayed ringing assignments for the network channels.

11. From VMMI's Networking sub-menu, enable the node.

12. If you are planning for voice announce intercom calls, enable Call Announce on a per-channel basis.

Programming the Hub System

NOTE: The nodes will synchronize 3 to 5 minutes after you disconnect VMMI from the hub system.

1. Make the necessary programming changes that only affect local operation.

2. Program the board configuration to match DXNET or FXNET boards to their assigned slots, and inspect the installation.

   a. Verify that the system recognizes these boards as DXNET or FXNET boards, that the boards are operational, and that there are no alarms present on the installed boards. Resolve any alarm problems before proceeding.

   b. Using the board programming menu, set the operating protocol for DXNET or FXNET boards to 4ESS, and leave all other program settings to their default values.

3. Assign the hub's extension numbers that are to be associated with network operation. Remember, use a different block of intercom numbers than those used at each node.

4. If you plan for voice announce intercom calls, enable call announce on a per channel basis.

At the hub, use network programming to set the networking parameters. This programming subsection is available as a selection item under System Programming.

Network Properties

Use this option to enable or disable the hub operation. Since the hub controls the system-to-system of the nodes, the system grants each node access to a particular block of intercom numbers (also called extension numbers) through the hub database.

Network Disable Status

Enable or disable the network database status as a hub.

Network Extension Length

Set the extension length for the hub and each node's stations to be either three or four digits.

Node Configuration

Use this option to define the hub and the nodes that the network will use.

Enabled

Enable or disable the hub at each node for networking operation.

Node ID

Every node or hub system in the network requires an identification number (0–999).

Node Name

Name the hub and each node with an alphanumeric name of up to thirty-two characters.

Node System Type

Define the system type for the hub and each node.

Network Links

This option allows you to program the physical links between the hub and the nodes.

Modify Links

This entry selects all valid board slots that can accept DXNET or FXNET interface boards for network linking, and adds or removes board slots in a preselected node. There can be several links between the hub and a node with a maximum of ten links allowed.

Add Network Extensions

This option allows the system to provide intercom numbers for validation and routing purposes and allow you to assign these numbers to a node or remove numbers that you have previously assigned.

NOTE: This screen only maps the allowed numbers. You must use intercom number programming at the hub and each node to actually assign station names and port numbers to intercom numbers. Further, to ensure that the network feature operates properly, you must assign unique extension numbers at each system. For example, assign 1000 series intercom numbers at the hub, 2000 series numbers at node one, 3000 series at node two, 4000 series at node three, and so forth. While the intercom numbers can be three or four digits in length, you must use the same digit length throughout the networked systems.

Arranging for Line Pooling

1. Program the link channels for each node into their own line group. Be sure to isolate the link channels from any other lines that may be connected to the local system. Remember that several board slots at the hub may be dedicated to the same node depending upon the number of links required to handle the call traffic. The system **will not** allow you to mix network channels and non-channel lines in the same line group.

2. Program the line groups that contain network channels into ARS route tables in the same manner as you would program any normal line group into the ARS tables.

3. Do all necessary ARS programming at the hub and at each node.

Supporting DSS/BLF Operation

Any station in a networked arrangement can Direct Station Select (DSS) and have Busy Lamp Field (BLF) status light appearance for remote network stations. Each node is allowed up to 30 remote DSS/BLF appearances for each remote node. This limit is shared by all stations on the node. This feature is available to Impact Attendant as well as telephone stations.

For each node (but not the hub), VMMI configures two extension lists. The *Send* list, identifies the extensions on that node that users elsewhere on the network can monitor. The *Receive* list identifies extensions elsewhere on the network that users on that node can monitor. While both the *Send* and *Receive* lists each accept up to 30 entries, the combined total of both lists cannot exceed 30 entries.

An extension must either be on the hub or on a *Send* list of another node for the system to accept its addition to a *Receive* list. The hub system automatically monitors the *Send* lists of all nodes.

Under **PERIPHERALS/PC ATTENDANT/BUTTON MAPPING**, select the station to receive remote DSS/BLF appearance. Under the appropriate button map LKEY, type the **R###** mnemonic, for an extension on the far node (for example, type R2002 if 2002 is a far node extension). You can select the **Browse** button to view a list of valid far-node extensions from which to choose. Once the per-node limit of 30 remote DSS/BLF appearances is reached, VMMI prevents the addition of further remote appearances.

NOTE: Network DSS/BLF does not support ring monitoring. DSS/BLF buttons for stations on other nodes will not flash when the station is ringing—they will, however, light steady when the station is in use.

Directed call pickup does not require ring monitoring or station monitoring, and will function across nodes.

Supporting QSIG Networking Protocol

With software 15A and later, system-to-system networking supports QSIG networking protocol. With QSIG support, Comdial systems can network with non-Comdial switches that are QSIG compliant. This means that telephones behind Comdial systems can communicate via an intercom with telephones behind non-Comdial QSIG-compliant switches when the systems are combined in a networking arrangement. Other features available with QSIG support include calling line and called line identification.

NOTE: Comdial networking is not available when QSIG is activated. Also, with QSIG active, the Comdial system can only operate as a node.

Enabling QSIG

Under **SYSTEM/NETWORKING/NETWORK PROPERTIES**, select QSIG node to enable the node as a QSIG network node.

Connected Line ID Restriction

Under **SYSTEM/NETWORKING/NETWORK PROPERTIES**, select Connected Line ID Restriction to enable/disable the presentation of the call identification display. When you check this control, the system restricts the identification display of the connected state for all calls. With this control unchecked, all calls provided line identification display.

Calling Line ID Restriction

Under **SYSTEM/NETWORKING/NETWORK PROPERTIES**, select Calling Line ID Restriction to enable/disable the presentation of the call identification display during calling. When you check this control, the system restricts the identification display for all calls. When this control is unchecked, all calls provide line identification during the calling state.

Display Presentation

Under **SYSTEM/NETWORKING/NETWORK PROPERTIES**, select Display Presentation to enable / disable the name display information. When installers enable name display, the system displays the name of the calling party on the called party's telephone. When you disable name display, the system causes only the calling number to display (according to the programmed settings for the Connected Line ID Restriction and the Calling Line ID Restriction).

Dial Zero Extension

It is possible to disable the local node's operator station and program a network station as the dial zero extension. If you do not select a network station as the dial zero extension, dial zero calls on a local node will route to that system's operator station if one is available.

Under **SYSTEM/PARAMETERS**, set the node's operator extension to none.

Under **SYSTEM/NETWORKING/NETWORK PROPERTIES**, select **Dial Zero Extension** to launch a pop-up dialog box. From this dialog, you can select the extension that will ring when users dial zero.

Programming for Network Incoming Call Routing

While installers use the **PROGRAMMING/STATIONS** menu to program local ringing modes, they program remote ringing on a line-by-line basis by specifying at what remote extension an incoming call should ring. For each line, installers may choose one remote extension for each ringing mode from the **PROGRAMMING/ LINES** menu. From this programming dialog box, installers select the line for programming, then assign one remote extension for each of the desired ringing modes. The following ringing choices are available:

     1. Remote Direct Ring

     2. Remote Delay Ring

     3. Remote Day1 Ring

     4. Remote Day2 Ring

     5. Remote Night Ring

     6. Remote Enhanced Direct Ring

     7. Remote Enhanced Delay Ring

     8. Remote Enhanced Day1 Ring

     9. Remote Enhanced Day2 Ring

   10. Remote Enhanced Night Ring

   11. Remote Enhanced Holiday Ring

Programming for Network Station State Query

Installers assign an SSQ button to any station's L-key position using the **PROGRAMMING/STATIONS** button mapping feature.

Installers define, on an individual station basis, whether SSQ presents a ringing station as either idle or busy. Using the **PROGRAMMING/STATIONS** menu, they can configure the Station State Query Presentation feature as either *Ringing as Idle* or *Ringing as Busy.*

TI_PRI Flash Upgrade

Place the two T1 boards in DXP, DXP Plus or in a FX cabinet. However, when placing T1 boards in a DXP cabinet there are a couple of restrictions involved. They are;

1. T1 boards can only be placed in slots 3, 5, and 8 of a DXP system.

2. In a DXP cabinet, no boards should be placed in the immediate right slots of the slots holding T1 boards. In other words if slots 5 and 8 have T1 boards, slots 6 and 9 should be empty.

The DXP Plus and FX series cabinets have no restrictions, as such. After you place the two TI boards, connect the two T1 boards in a loop and follow these instructions:

1. Log onto the system using VMMI software.

2. Master clear the system.

3. Set **SW1** bit **8** to **OFF** position on the T1 board to upgrade.

4. Reset the T1 board.

5. Log onto the system again and select **Switch/PRI Card Software Upgrade**.

6. VMMI prompts for you to set the download bit on the T1 board.

7. Click **OK** as it is already set earlier.

8. Select the **slot number** where the board is placed.

9. Locate the bin file and begin downloading.

10. Upon completion, VMMI prompts you to set the **8** bit back to **ON** position.

11. Ensure bit **6** is in the **OFF** position if the T1 board is placed in designated as the hub.

12. Label the board with the proper revision number, numbers for PRI Flash, PRI bootload, firmware, and the current date.

E1 Upgrade

For an E1 upgrade repeat the T1_PRI Flash upgrade with the following changes:

1. Use **E1** boards.

2. Use **E1** upgrade bin file.

3. Set bit **3** to **OFF** position of SW1 on the E1 board when downloading software.

4. Set bit **1** to **OFF** position of SW1 on the E1 board when placing that particular board in a cabinet designed as the hub.

Using System-to-System Networking

This section discusses the following features:

- release link transfer,

- conferencing,

- intercom calling,

- call forwarding,

- RNA, DND, and busy station call back,

- message waiting lights,

- call transfer.

An integral part of system-to-system networking action involves the use of the channel resources between the hub and the node systems. For example, should users transfer a call from node A to node B, then transfer it again from node B to node C, and finally transfer it a third time from node C back to node A, channels among all three nodes are employed. A feature of the networking software allows the system to remember where the transferred call originated and free all of the unneeded channels when the call gets transferred back to the originating node. This channel freeing action is known as **Release Link Transfer**.

Release Link Transfer

Release Link Transfer applies to any intra-node or inter-node call handling situation that leaves unnecessary channels in its wake: such as: supervised and unsupervised transfer, call forwarding, and line pooling calls that traverse multiple nodes.

Release Link Transfer applies to call handling situations that involve one node to the hub, multiple nodes to the hub, one node to another node, and multiple nodes to multiple nodes.

NOTE: Release Link Transfer is not intended for centralized attendant service, which is not supported by the system-to-system networking feature.

Conferencing Stations Together

Station users can set up conferences between their station and up to three other parties (either lines or stations as needed) across the network nodes; however, the system does not support the display of the network extension names during conferencing arrangements.

Dialing Intercom Numbers

Intercom dialing is the same for both intra- and inter-node systems. The network system verifies the number as valid and returns an error tone to the caller if the number is invalid. When the called station starts ringing, the distant node returns ring-back tone to the calling station.

1. When encountering a Ring, No-Answer (RNA) condition, the caller can do any of the following actions:

   - terminate the call,

   - set a message waiting light on the called station by dialing the appropriate code or by pressing the appropriate button,

   - set a call-back feature by dialing the appropriate code or by pressing the appropriate button,

   - leave a voice mail message if the system is configured for voice mail,
     (If the calling station detects the presence of a voice mail port, its display provides an interactive button for users to select the voice mail option. When pressed, the display directs users to the appropriate voice mail box.)

2. When encountering a busy signal (the busy signal is generated at the local node), the caller can do the following actions:

   - terminate the call,

   - set a message waiting light on the called station by dialing the appropriate code or by pressing the appropriate button.

NOTE: When calling another node on the network, you can neither camp-on at another station and remain off-hook waiting for an answer, nor can you employ the Do Not Override feature.

Station users answer intercom calls in the same manner whether the calls are intra-network or inter-network. Further, they can press the Do Not Disturb (DND) button to reject these calls if they wish.

Inter-node voice announce intercom calling is available if programmers have enabled the feature at both the originating and receiving systems and if the receiving stations do not have the voice announce block feature enabled.

Forwarding Calls

The inter-node call forwarding scheme can be of any type where the originator dials the call forwarding code followed by the extension number of the destination station. The network returns an error tone if the remote extension does not exist, or if more than three forwarding hops are set.

The station user can set RNA call forwarding by dialing the RNA forwarding code followed by an extension number. In the case of RNA call forwarding, a looped forwarding scheme is acceptable.

The user at the station that sets a call forwarding configuration can clear it by dialing the appropriate code.

NOTE: If the system forwards a call to another node, the call ceases to ring on the original node. The recall feature does not work with calls forwarded to another node.

Setting Call Back

During network intercom calls, if a calling station encounters DND, RNA, or busy signals at the called station, the caller can activate a call back operation by dialing the appropriate code or pressing the appropriate button.

The network system then automatically calls back the calling station from the called station whenever the called station becomes idle (in the case of busy) or makes and ends a call to someone else (in the case of RNA). Alternately, the user at the calling station can cancel the call back operation by dialing the appropriate code or pressing the appropriate button anytime before the network system activates the feature.

Setting Message Waiting Lights

Callers from one node to another that encounter DND, RNA, or busy signals at the called station can turn on the message waiting light at the called station by dialing a message waiting code or by pressing a button designated for that purpose.

They also can set the message waiting light at another station anytime by pressing their intercom button and dialing the appropriate code followed by the other station's extension number.

Recipients of a message waiting action can press the appropriate buttons to call the message depositing station. Alternately, recipients of message waiting action can clear the message wait action by dialing the appropriate code or pressing the appropriate button.

Transferring Calls

Station users can transfer intercom calls from one node to another in either a supervised or unsupervised manner.

1. In the supervised manner, the user of a transferring station calls the receiving station and announces the call to its user before hanging up.

2. In an unsupervised manner, the user merely hangs up after calling the receiving station. While a transfer is pending, originators can retrieve a transferred call if they wish.

NOTE: Users cannot retrieve intercom calls transferred to another node.
       The transfer recall feature does not work with calls transferred to another node.

Transferring Voice Mail Calls

While you can map up to thirty-two different voice mail access buttons (XVM1 through XVM128) on system stations, the network software reserves mapped button XVM128 as the button for accessing centralized voice mail on the hub. The remaining index numbers (01 through 127) are available for access buttons that you can use with local voice mail systems at the nodes.

NOTE: In networked environments, CTI applications that use the transfer to voice mail feature must be used
       in conjunction with centralized voice mail.

Using the Impact SCS Large Screen Display Speakerphone

Networking software extends functionally to the Impact model 8412F and 8412S large screen display speakerphones. Usually, this functionally is generic. This means the large screen display speakerphone makes, conferences, forwards, and transfer calls to remote extensions, and sets call back and message waiting lights or accesses the network voice mail in both intra-node and inter-node environments in the manner described in GCA70–349, *Impact SCS Large Screen Reference Manual* and amplified upon in the previous paragraphs.

A
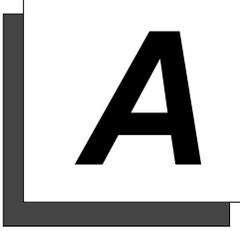
Appendix A— Feature Networking Support

| Feature Name	Type Originating/ Terminating/Both	Remote Networking Support	Feature Parameters	Program Feature
Abandoned Hold Release	Terminating	None	Across Network	
Account Code	Both	None	Across Network	Node/COS
Alarms			Local	Node
A-lead			Local	Node
Alternate Attendant	Terminating	Comdial	Local	Node
ANI (passed across the network but must be enabled per node)	Terminating	Comdial/QSIG	Local (display telephones)	Node
ANI DNIS (passed across the network but must be enabled per node)	Originating	Comdial/QSIG	Local (display telephones)	Node
ANS Detect	Originating	Comdial	Across Network	
ARS	Both	Comdial	Across Network	Node
ASR	N/A	None	Local	Node
Attendant Programing	Both	Comdial	Local	Node
Authorization Code	Originating	None	Local	Node
Auto Hold	Terminating	None	Across Network	Node
Auto Pause	Terminating	None	Across Network	Node
Auto Redial	Originating	None	Across Network	Node
Aux Line			Across Network	Node
Aux Ring			Local	Node
Block Program			Across Network	Incoming DID Node
Button, Programable	Both	Comdial	Across Network (with limitations)	Node/Station
Call Costing	Originating	None	Across Network (with limitations)	Node/Station
Call Divert	Terminating	Comdial	Local	Node/Station
Call Forward Default Forward	Terminating	Comdial	Across Network	Node/Station

Feature Name	Type Originating/ Terminating/Both	Remote Networking Support	Feature Parameters	Program Feature
Call Forward All Immediate	Terminating	Comdial	Across Network	Node/Station
Call Forward All RNA	Terminating	Comdial	Across Network	Node/Station
Call Pickup Directed	Terminating	Comdial	Across Network	Node/Station
Call Pickup Group	Terminating	None	Local	Node/Station
Call Time	Originating	None	Across Network	Node/Station
Call Transfer	Both	Comdial	Across Network	Node/Station
Call Waiting Tone	Terminating	None	Local	Node/Station
Camp On	Terminating	None	Local	Node/Station
CFOS	Both	None	Local	Node/Station
Clock Set			Local	Node
Conference	Both	Comdial/QSIG	Across Network (with limitations)	Station
COS			Local	Node
Day Night Class of Service	Both	Comdial	Local	Node
Delay Hot Line	Terminating	None	Local	Node/Station
Dist Ring	Terminating	None	Local	Node/Station
Dial by Name	Originating	None	Local	Node/Station
Directed Station Hold	Both	None	Local	Node/Station
Disable Station			Local	Node/Station
Disconnect Notification	Both	None	Across Network	
DND/inhibit/override	Terminating	Comdial/QSIG	Local	Node
DNIS (passed across the Network but must be enabled per node)	Both	Comdial	Local (display phones)	Node
DSS/BLF	Both	Comdial	Across Network (with limitations)	Node/Station
DTMF Signaling	Both	None	Across Network	
Enhanced Night Mode	Terminating	None	Across Network	Node
Enhanced Ringing	Terminating	None	Across Network	Node
Executive Override	Both	None		
Extended DTMF				
Feature Numbering			Local	Node
Group Listen	Terminating	None	Across Network	Node/Station
Hands Free	Both	None	Across Network	Node/Station
Hold	Terminating	Comdial/QSIG	Across Network	Node/Station

Feature Name	Type Originating/ Terminating/Both	Remote Networking Support	Feature Parameters	Program Feature
Hunt Group (can access Hunt group across Network but members must be local to each other)	Terminating	Comdial	Across Network	Node
Hunt List	Terminating	None	Local	Node/Station
Idle Line	Both	None	Local	Node
Incoming Call Routing	Both	Comdial	Across Network	Node
Intercom Numbering			Local	Node
Intercom Speed Dial Last Number Dialed	Originating	None	Across Network	Node/Station
LCD Contrast	Both	None	Local Station Only	Node/Station
LCD Messaging	Both	None	Local	Node
Line Group	Both	None	Local or Network Channels	Node
Line Monitoring	Both	Comdial	Local	Node
Line Names	Both	Comdial/QSIG	Across Network	Node
Line Queue	Both	None		
Lock	Both	None	Local	Node/Station
Location Codes	Both	None	Local	Node
Mark	Both	None	Local	Node/Station
Message Deposit	Both	Comdial	Local	Node/Station
Message Waiting	Terminating	Comdial	Across Network	Node/Station
Music, Background	Both	None	Local	
Music, On Hold	Both	None	Local	
Mute	Both	None	Across Network	Node/Station
Operator/Network	Both	Comdial	Across Network	Hub
Operator/Node	Both	Comdial	Local	Node
Page	Both	None	Local	Node
Park Orbit	Terminating	None	Local	Node
Personal Ring Tone	Terminating	None	Local Station Only	Node/Station
Prime Line	Originating	None	Local	Node/Station
Privacy	Terminating	None	Local	Node/Station
Pulse Set On	Originating	None	Local	Node
Query (button)	Originating	None	Local	Node/Station
Queue	Terminating	Comdial	Local	Node/Station

Feature Name	Type Originating/ Terminating/Both	Remote Networking Support	Feature Parameters	Program Feature
Quick Transfer	Terminating	Comdial	Across Network (with limitations)	Node/COS
Recall Call Forward			Across Network (with limitations)	Node/Station
Recall Timing (Hunt Group)	Terminating	Comdial/QSIG	Across Network	Node
Record	Both	Comdial	Across Network	Node/Station
Response Message	Both	None	Local	
Ring Monitoring	Terminating	Comdial	Local	Node/Station
Serial Transfer	Terminating	Comdial/QSIG	Local	
Service Observe	Originating	None	Local	Node/Station
Shift for Speed Dials	Both	None	Across Network	Node/Station
Silent for Ringing	Both	None	Local	Node/Station
SLPS—Brokers Mode	Both	None	Local	
SLPS—Dial Saved Number	Originating	None	Across Network	
SLPS—Pick Up Last Line	Terminating	None	Across Network	
SLPS—Save Number	Originating	None	Across Network	
SLPS—TAP	Both	None	Across Network	
SMDA/SMDR	Both	Comdial	Across Network (with limitations)	Node
Softkey	Both	Comdial	Across Network (with limitations)	
SOHVA	Terminating	Comdial	Local	Node/Station
SOHVA Service Observe	Originating	None	Local	Node/Station
Speed Dial	Originating	None	Across Network	Node/Station
System Speed Dial	Both	None	Across Network	Node
Station Monitoring (DSS/BLF)	Both	Comdial	Across Network (with limitations)	Hub only
Station Names	Both	None	Across Network	Node/Station
Station State Query	Originating	Comdial	Across Network	Node/Station
Subdue Ringing	Terminating	Comdial	Local	Node/Station
System Manager Prog	Both	None	Local	
System Parameters	Both	None	Local	Node
TAFAS (line answer from any station)	Both	None	Local	Node/Station
Toll Restriction	Both	None	Across Network	Node/COS
Tracker	Both	Comdial	Local	
Transfer to Voice Mail	Both	Comdial	Across Network	Node/Station

Feature Name	Type Originating/ Terminating/Both	Remote Networking Support	Feature Parameters	Program Feature
Trunk to Trunk Transfer	Both	Comdial	Across Network	
Voice Announce BLock	Terminating	Comdial	Across Network	Node/Station
Serial WP Integration			Across Network	Hub and VM
VVP			Across Network	Hub and VM

Notes
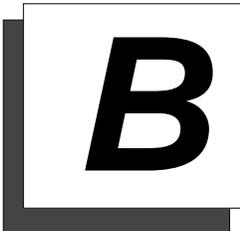
B Appendix B— Maintenance Checklist

System Software	HUB	ENG Node	FLR Node	PUR Node
Unzip new software in the storage directory.				
Keep zip file - as insurance for a period of time.				
Ensure proper system software file naming convention.				
Create lbin_001 directory and copy and label bin files w/0000000001.				

CPU Complex	HUB	ENG Node	FLR Node	PUR Node
Ensure proper hardware rev. levels.				
Ensure latest bootloader on memory card w/0000000001.				
Clearly label all boards … include software-firmware revisions and dates.				
Keep the sets of CPU complexes in accessible areas.				
Keep balanced rotation sets.				

Network Cards	HUB	ENG Node	FLR Node	PUR Node
Ensure proper hardware rev. levels.				
Ensure latest (T1/E1) firmware.				
Ensure latest (T1/E1-PRI) firmware.				
Ensure latest (E1) firmware.				
Ensure latest (E1-PRI) firmware.				
Ensure latest (E1-PRI) flash.				
Clearly label all boards—include software-firmware revisions and dates.				
Keep balanced rotation sets.				
Check dip switch (hub/node) settings prior to any new installation.				

Databases	HUB	ENG Node	FLR Node	PUR Node
Create a storage directory in the appropriate disk area, using the appropriate naming convention.				
Archive the database prior to any significant changes (software or hardware) to the alpha systems.				
Storage area should be accessible.				
Store the archived databases and include a date in file name and store.				

System / CPU Upgrade	HUB	ENG Node	FLR Node	PUR Node
Install appropriate system software.				
Ensure no other boards in the cabinet.				
Master Clear level-3.				
Clear Black Box.				
Clear LLog.				
Clear ILob.				
Set Time.				
Restore an appropriate database.				
Verify time, database, ilog, and llog.				

Installation	HUB	ENG Node	FLR Node	PUR Node
Ensure the system has the required revisions of hardware and firmware.				
Disconnect external battery.				
Power down system.				
Using a static strap . . . replace CPU complex.				
Power up system.				
Verify Network database synchronization.				
Reconnect external battery.				
Reset Modem.				
Make sure Tracker is enabled.				
Rest Voice Mail Message Waiting Lamps at HUB (Ctrl+F1).				

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