(esi) Esi-Link
Multi-site connectivity for ESI phone systems

Interconnect multiple ESI systems using voice-over-IP

Contents

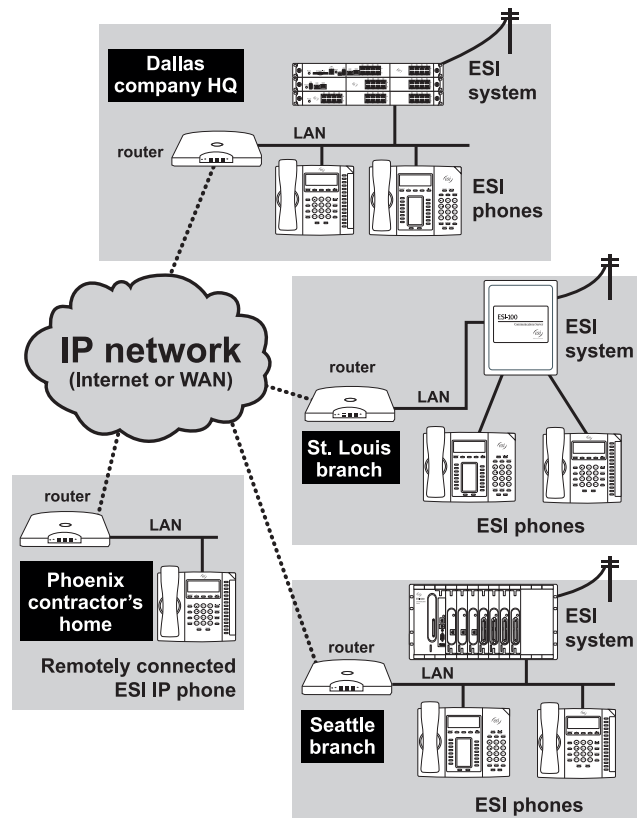## Benefits summary

- **Joins together multiple ESI systems** across a wide area network (WAN) or the Internet so they operate seamlessly as one system.

- **Simplifies and improves communications** among multiple sites.

- **Transmits status indications** across the network.

- **Enhances routing capabilities** to improve customer service capabilities.

- **Improves bottom line** through elimination of many long-distance charges and use of fewer local lines.

Available information

- **Color brochure**: ESI # 0450-0350. Available for purchase from ESI. Available from *www.esi-estech.com/brochures* or *www.esi-estech.com/Resellers/docs*.

- *User's Guides* (for current Esi-Link-compatible ESI systems):
  IP Server 900 — 0450-1306.
  ESI Communications Servers — 0450-1047.

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Introduction

Enterprises with multiple offices can gain significant benefits by combining all of their telephones at each location into **one** interconnected, IP-based system. This is accomplished by passing voice, messaging, and signaling data between multiple ESI systems across a WAN, letting all users communicate with one another as if they were in the same location. With the touch of a single key, users can originate or receive calls, transfer calls to other offices, receive held calls at other offices, initiate conference calls among workers in several offices, retrieve and move voice mail messages, and access many other features utilizing the WAN.

Esi-Link allows a multi-site enterprise to network any combination of up to 100 compatible ESI communications systems[1] — called *locations* — across an IP-based network. Using the latest voice-over-IP (VoIP) technologies, Esi-Link makes efficient use of shared data network resources while delivering a full set of ESI telephony features. This streamlines inter-office communications while simultaneously reducing overall long-distance toll charges. Esi-Link networks can extend across the street or across the country, using the same IP WAN technologies being used today for corporate data communications.

Advanced capabilities

Cross-platform integration

Esi-Link **integrates** compatible ESI systems with other such systems, sharing a full range of features. **Uniform feature operation** among systems allows users to quickly understand Esi-Link feature operation, using such features as moving voice messages, putting calls on hold and retrieving calls from hold, as well as many others. All Esi-Link systems are capable of supporting both local and remote IP phones. Remote IP phones can be controlled from any Esi-Link location and have complete access to Esi-Link network resources, such as outside lines, department calling, voice messaging, *etc.* ESI phone users have access to a full range of features and any location in the Esi-Link network.

Network numbering

Esi-Link **network numbering** provides "transparent," or uniform, dialing across Esi-Link. This means that, regardless of the location from which a user is dialing, the user can dial a number — *i.e.*, the *network number* — that matches the called person's three- or four-digit extension number, and the call will be routed appropriately through the Esi-Link network. In essence, the location number (*i.e.*, *7xx*) doesn't have to be dialed, unlike the case with earlier implementations of Esi-Link.[2]

Therefore, end users in a multi-site environment don't have to remember six- or seven-digit numbers to call co-workers. They can call anyone, at any other Esi-Link remote location, simply by dialing the person's regular extension number.

Network numbering provides seamless four-digit dialing between Esi-Link locations using a *network numbering plan*.

Toll bypass

A major advantage Esi-Link offers is **toll bypass**. Leveraging the available bandwidth on the enterprise's existing WAN communications between offices, Esi-Link can substantially reduce the need and cost of traditional telephone lines, whether voice tie-lines or dialup. In a multi-site example, a call between sites is carried by the WAN (not the PSTN), and provides the productivity gain of one-keystroke connection as opposed to placing a traditional long-distance call.

Additional reduction of toll costs can be realized by dialing what would be a long-distance call through outside lines at a remote location, effectively making it a local call. For instance: to speak to a customer located in Dallas, an employee in a corporation's Chicago office can use Esi-Link to access an outside line in the Dallas office, thus gaining the ability to dial the Dallas customer without going through a long-distance provider.

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[1] For an up-to-date list of Esi-Link-compatible ESI systems, visit *www.esi-estech.com/Esi-Link*.
[2] Network numbering works only on ESI Communications Servers (running compatible system software) or the IP Server 900. If an Esi-Link call involves any legacy systems (including ESI Communications Servers running earlier system software), users still must dial a location number prior to dialing a remote number.

One-button access

A **Location Key** is a programmable feature key used to provide one-button access to remote location resources. A user simply presses the Location Key to receive internal dial tone for dialing into a particular remote location. The user can then directly dial any outside-line-group access code at — as well as page to or even retrieve held calls from — that remote location. A good example is paging to a remote location. To page **locally**, the user presses the **PAGE** key and dials the desired page zone to initiate a page. To page to a **remote** location, the user presses **PAGE** followed by the appropriate Location Key, and then dials the desired page zone at the remote location to initiate a page. Alternately, the same principle applies if no Location Key is programmed, by dialing the location number in lieu of pressing the Location Key.

Other Esi-Link-related uses of programmable feature keys

One can also assign programmable feature keys to directly dial remote location extensions, mailboxes and outside lines. Also, the status of stations and mailboxes included in the list of published numbers (see "Published numbers," page 3) can be observed on the lamps of their respective, assigned keys.
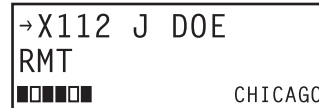
Location Dex

Specifically designed for Esi-Link networks, **Location Dex** complements ESI systems' existing **Esi-Dex** speed-dial directories. A station user can press **ESI-DEX** and select *LOCATION DEX*, and then use the ESI phone's scroll keys to select the remote location name and number. Users can also use the dial keys to "jump" to the first location name that begins with one of the letters on that dial key. Pressing **ESI-DEX** again will display the remote location's Station Dex, allowing users to select a station or department just as they would locally. Location Dex can also be used when assigning Location Keys and programmable feature keys to directly dial remote location extensions.

Display of dialed location

With each Esi-Link call, the ESI phone shows the location and extension name of who is calling or being called. Locations' short names and remote location extension names are displayed on both calling and called extensions.

```
→J DOE        CHI
■□■■□□        RMT
```
ESI phone with two-line display

```
→X112 J DOE
RMT
■□■□■□        CHICAGO
```
ESI phone with three-line display

Published numbers

The status of up to 30 stations or voice mailboxes per location can be "published" throughout an Esi-Link network. Each of these published extensions or mailboxes are called **published numbers**. Status information for each published number is sent to each location on the network. Visual lamp indication of the busy, do-not-disturb (DND) or idle status of a published number is, in turn, displayed on any station in the network that has a programmable feature key to which the published number is assigned. A published extension can be a member of a remote location department or ACD group and, when programmed on a programmable feature key, can be used in the same way as a standard station key. Features supported are:

- Station key operation (direct-station-select and busy lamp indication)
- Direct message to mailbox
- Quick Groups
- Quick Move
- Virtual Mailbox Key operation

Each published extension can also be programmed to appear on a feature key at any attendant console on the Esi-Link network, allowing the console attendant for that location to have both a lamp appearance and a one-button transfer for that remote-location station.

Technical overview

Multi-site connectivity

Multiple locations with ESI IP-enabled systems can be connected through the existing wide-area data network, as long as the network supports IP traffic. IP can be routed over frame relay, SMDS, wireless, ATM, or native IP networks. If the enterprise does not have a private or a managed wide-area data network, the public Internet is an alternative — although it offers no quality of service and little manageability. This lack of control may result in unacceptable latency or voice quality, as voice packets arrive out of order or packets are dropped. To minimize latency, ESI recommends that all sites have their Internet service provisioned by a service provider that uses a common backbone; examples include Sprint® and CenturyLink.™

Esi-Link-compatible ESI systems already have the necessary software for Esi-Link operation; but require additional **hardware** components to support the **remote network channels** (or "talk paths") involved.

Providing Esi-Link support on the IP Server 900 requires installation of an **IP Resource Module** (ESI # 5000-0607 or 5000-0606; the latter supports the G.729a codec) and appropriate licensing. When properly equipped and licensed, the IP Server 900 supports a maximum of 512 Esi-Link channels or 512 four-digit IP stations.

On the ESI Communications Server family[1], there are two models of port cards that support Esi-Link: the **IVC** *(Intelligent VoIP Card)* and the **CS-IVC** *(Communications Server Intelligent VoIP Card)*. The IVC can be installed directly in the ESI-100, and through the use of a Port Card Adapter[2] in the ESI-1000, ESI-600, and ESI-200. The CS-IVC can be installed in **only** the ESI-1000, ESI-600, and ESI-200, and **doesn't** require a Port Card Adapter.

> **Important:** For the remainder of this document, we will typically use the term *IVC* to refer to **both** types of IVCs (IVC and CS-IVC) described above.

An important note about the ESI-50:

The ESI-50 has a configurable IVC built into its main board. This IVC can be configured to support up to eight Esi-Link channels using the G.726 compression algorithm, or *codec* — the same codec used by ESI's desktop IP phones. Until April, 2008, all Esi-Link networks used G.729 codecs for Esi-Link calls. This means the ESI-50 cannot connect with those networks. (Fortunately, all ESI Communications Servers can easily have their system software upgraded to support the G.726 codec for Esi-Link, making them compatible with the ESI-50L for Esi-Link communications.)

Therefore, for Esi-Link purposes, the ESI-50 can be connected only to an Esi-Link network comprised of only ESI Communications Servers which support the G.726 codec for Esi-Link. For additional information about this subject, refer to "Inter-systems compatibility considerations," page 6.

The IVC supports standards-compliant IP telephony service and features, including VoIP to the desktop and Esi-Link. It features highly configurable DSP[3] technology that manages the flow of traffic among the port cards and converts IP packets into PCM[4] traffic for transmission over the PSTN. The physical connection is a 10/100Base-T, RJ-45 Ethernet® interface that allows the system to connect to an IP-based LAN.[5]

There are two types of IVCs that support Esi-Link: the IVC 24EL and the IVC 12R12EL. *Table 1* lists the capacities each IVC supports:

Table 1

Card types	Esi-Link channels	IP stations supported
IVC 24EL and **CS-IVC 24EL**	24	N/A
IVC 12R12EL and **CS-IVC 12R12EL**	12	12

(Continued)

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[1] ESI-1000, ESI-600, ESI-200, ESI-100, and ESI-50. The ESI-50 has integrated IVC functionality. (The ESI-50L lacks IP support.)
[2] Purchased separately.
[3] Digital signal processor.
[4] Pulse-code modulation.
[5] Local area network.

Each model of ESI Communications Server supports a number of Esi-Link-capable IVCs; this number is proportional to the number of stations each system can support, as shown in *Table 2*:

Table 2

System	Maximum Esi-Link-capable IVCs	Maximum Esi-Link channels
ESI-1000	4	96
ESI-600	2	48
ESI-200	1	24
ESI-100	1	24
ESI-50	n/a	8

Note that, on an ESI Communications Server, the **maximum** number of Esi-Link channels can be supported **only** by using IVC 24ELs.

Each system is programmed with the IP address of each of the other ESI systems in the Esi-Link network. This IP address is, in turn, associated with a three-digit location number (*700–799*). When a location number is dialed, the *short name* of the location will display on the user's ESI phone (*e.g.*, a location in Dallas might be assigned a short name of "DAL"). Location numbers can be dialed directly by the user or assigned as Location Keys on ESI phones for quick access to the remote location's CO lines, calls on hold, and page zones. Programmable feature keys can also be programmed to directly dial remote location station numbers, department numbers, local line access codes, or voice mailboxes.

Signaling between Esi-Link systems is managed via a dedicated IP communications stream. Information such as dialed digits, published number lamp information, Caller ID and location display are sent and received by each Esi-Link system, without using remote network channels. Bandwidth requirements for signaling are included in the overall bandwidth requirements. To further conserve remote network channel resources, multiple voice messages and recordings that are moved from a location to other remote locations use only one remote network channel at a time. When all voice messages are sent, the remote network channel is released and made available for new Esi-Link calls.

To optimize usage, remote network channels are dynamically assigned on a per-call basis. Thus, a channel in one location can connect to a channel in any other location in an Esi-Link network. To reduce contention for bandwidth on busy networks, bandwidth for VoIP traffic can be managed by programming the maximum number of remote network channels that can be used for outgoing calls simultaneously at any given location.

Network numbering

ESI's **network numbering** provides seamless four-digit dialing between Esi-Link locations, using a *network dialing plan*. This feature includes:

• The ability to dial just the number for an extension, mailbox, or department at a remote location **without** first having to dial a location number.

• The flexibility of assigning any four-digit dialed number to a resource at other Esi-Link locations. With a four-digit plan, network numbering ranges are confined to *1000–6999*.

This means that a station user on an Esi-Link network using a four-digit network dialing plan can reach **more than 2,900** remote location extensions, mailboxes, and departments over the Esi-Link network by dialing only four digits each time.

Network numbering also provides the flexibility of having four-digit dialed numbers that are **local**-only. That is, they may be reached by only stations, CO lines, auto attendant branch IDs, *etc.*, at their own location. Some examples for which this would be appropriate are door phones, lobby phones, special-purpose mailboxes, and ring assignments.

Network numbering and flexible numbering

Network numbering works in conjunction with *flexible numbering*. Therefore, an extension, mailbox, or department must be assigned with a flexible number that is unique in the Esi-Link network before it can be assigned a network number.

> **Example:** Location 701 has an extension 3456, and so does Location 702. Thus, those extensions can't be called from a remote site by dialing only four digits. **However**, they **can** still be reached using the traditional Esi-Link method of dialing the location number prefix first — either *7013456* or *7023456*.

Inter-system compatibility considerations

In an Esi-Link network, certain numbering templates can be incompatible with some ESI systems.
The following chart lists Esi-Link limitations regarding flexible numbering:

REMOTE site's ESI system	REMOTE site's system software version	LOCAL system's numbering plan template	Resulting Esi-Link compatibility
IP Server 900	[All]	Any	Complete
ESI-1000, **ESI-200**, **ESI-100**, or **ESI-50**	[All]	Any	Complete
ESI-600	Feature Set II (16.1.0 or higher)	Any	Complete
	Feature Set I (15.2.x or lower)	Any	Limited
IVX® X-Class	10.6.0 or higher	Any three-digit	Limited
		Any four-digit	None
	10.5.x or lower	Dial plan template 100	Limited
		Any other dial plan	None
IVX E-Class Generation II	2.5.2 or higher	Any three-digit	Limited
		Any four-digit	None
	2.5.1 or lower	Dial plan template 100	Limited
		Any other dial plan	None

In this chart, *limited compatibility* means that **all** of the following are true:

1. The system **cannot** be connected via Esi-Link to an ESI-50.

2. Network numbering is **not** supported.

3. If using Function 341 (flexible number assignment), you must keep the extension, mailbox, department, and speed-dial number reassignments within the ranges of their original numbering plan template.

> **Example:** Let's say your local system is an ESI-600 using numbering plan 100. If you swap extension 100 with mailbox 300 — *i.e.*, so that station 100 is now extension 300, and mailbox 300 is now mailbox 100 — an IVX X-Class system that dials station 300 over Esi-Link **won't** be able to process the call correctly, because that station is no longer within the numbering template. **However**, if you merely swap extensions 100 and 120 on that same ESI-600, an Esi-Linked IVX X-Class will be able to process a call to extension 120 (because the changed extension is still within the numbering template).

Network design

Site cabling

Proper data network cabling is an important component of a reliable IP telephony installation. All cabling components for the Communications Server and IP phones should meet IEEE 802.3 requirements or EIA/TIA 568B Commercial Building Telecommunications Cabling Standards. Note that the plugs, outlets, and cable termination, as well as the cable itself, must all conform to these standards. Per these standards, when the system and IP phones are to be connected to a 100Base-T Ethernet network, the cable length between each of them and the hub or switch cannot exceed 328 feet (*i.e.*, 100 meters). Note that the standard does allow up to two repeaters (Ethernet hubs or extenders) for extending the distance of an Ethernet device, such as an IP Server 900 or ESI Communications Server.

Segmenting

A *segmented* data network (also known as a *switched* network) reduces packet collisions, and thus packet loss, by separating traffic with a device such as an Ethernet switch. Packet loss on Esi-Link connections will cause audible noise (pops and clicks) on Esi-Link calls. To insure reliable, error-free operation, all Esi-Link connections must be connected either to dedicated network segments or directly to a router.

Quality of service (QoS)

Quality of service is a method to manage and prioritize delivery of time-sensitive data (such as voice traffic) over a data network. There are many methods of employing QoS; which is best will depend on the type of network and applications that the customer has or is planning.

Esi-Link is compatible with Differentiated Services (DiffServ). This protocol allows IP voice packets to be prioritized over data transmission in LAN/WAN environments whose routers provide prioritization. As with all QoS provisioning within a LAN or WAN, the network components — such as routers and switches — must be able to support, and be configured for, QoS. Some Internet connections may not be compatible with DiffServ; contact the customer's ISP to determine whether it supports DiffServ. Esi-Link is also compatible with QoS methods that utilize "type-of-service" (ToS) criteria. Information such as network utilization, bandwidth availability and other network performance criteria (see the next item) will determine whether a QoS solution is necessary or feasible. A qualified network design engineer should be involved with evaluating and implementing any QoS solution.

Network performance criteria

There are four main factors to consider when qualifying a data network for IP telephony:

• Bandwidth   • Latency   • Jitter   • Packet loss

These factors have a direct effect on the reliability and quality of VoIP calls. Measuring these factors is an important step in determining whether a data network is capable of supporting VoIP traffic. ESI offers *Esi-Check*™, an easy-to-use utility for measuring the performance of IP networks. It provides continuous monitoring, by an on-site PC, of IP link quality.

> **Note:** *ESI System Programmer* also has built-in *Esi-Check* (although it cannot be used to program ESI's IVX systems; *ESI System Programmer* may be used with **only** ESI Communications Servers).

Bandwidth requirements

Ethernet networks can support up to 30% bandwidth utilization on each segment before excessive packet loss, due to packet collisions, starts to occur. When this packet loss happens, VoIP calls begin to suffer degradation (see "Packet loss," page 8). Therefore, VoIP traffic should not be carried over any network segment that exceeds 30% utilization at any time. Esi-Link uses the industry-standard G.729 and G.726 audio compression algorithms:

• G.729 compresses 64 Kbps voice down to 8 Kbps. With the addition of IP headers, WAN bandwidth required for each voice channel is 22 Kbps in each direction (*i.e.,* transmit and receive), for a total of 44 Kbps per call.

• G.726 compresses 64 Kbps voice down to 32 Kbps. With the addition of IP headers, WAN bandwidth required for each voice channel is 45 Kbps in each direction (*i.e.,* transmit and receive), for a total of 90 Kbps per call.

For instance, if a customer had three Esi-Link calls in progress using G.729, Esi-Link would consume 66 Kbps of the upload bandwidth and 66 Kbps of the download bandwidth, for a total of 132 Kbps.

Latency

Latency is the time, in milliseconds, that it takes for a packet to travel from one end of the link to the other; it is one half the round-trip time to the link address. There are two reasons why latency must be minimized:

- **It adds delay to voice communication.** If the latency time is small enough, neither party will notice the resulting delay; but latency above a certain point will cause a noticeable delay that can be annoying. Even longer latency times can make an IP conversation difficult; each party must wait to take turns talking to avoid "talking over" each other.

- **High latency times** (*i.e.*, greater than 250 ms) **are often indicators of poor IP connections.**

The following table lists the voice quality levels that will result from various latency times. This table assumes that there is no degradation due to other effects, and is intended solely as a point of reference:

Latency (msec)	Voice quality
0–150	Excellent
151–250	Noticeable delay, but does not interfere with user communication
251+	Very noticeable delay; likely to induce frequent "talk-over"

Jitter

Jitter is the measure of the variation from packet-to-packet in transit time, expressed in milliseconds. This measure is calculated as the standard deviation of the individual packets' transit time. Ideally, the trip time and latency of all packets would be identical; but, in practice, this rarely occurs. Due to other data traffic or bandwidth constraints, some packets get delayed and take longer to make the trip. This variation is Jitter.

The ESI system's IVC or IP Resource Module (depending on the system) and an ESI IP phone can compensate for some jitter; but, past a certain point, the system component or IP phone can't wait any longer to play (decode) a packet. When it is time to play a late packet as part of the voice stream and that packet hasn't arrived, an audio anomaly occurs. The actual distortion depends on the specific data stream received, but it can vary from a slight warbling, to popping and clicking, or — in extreme cases — a crackling sound.

The following table lists the voice quality that can result from various levels of Jitter:

Jitter (in ms)	Voice quality
Less than 10	Excellent voice quality
10–20	Minor distortion, occasional warbling or minor pops
More than 20	Significant distortion; random modulation, pops, clicks and crackling

Packet loss

On poor or overloaded IP connections, the amount of data traffic — *i.e.*, the number of packets — may exceed the capacity of the connection. When this occurs, packets are discarded, or "lost," by the router or host computer at the point of congestion. Packet loss can occur also on wireless and microwave LAN and IP links, due to RF interference. On a high-quality IP connection, packet loss may occur only rarely; however, on a poor connection, packet loss can occur often.

Unlike IP *data* traffic, IP *voice* communication is very sensitive to packet loss. In IP data traffic, devices detect packet loss and simply retransmit the lost packets automatically; indeed, this process works so well for data traffic that users are likely to be unaware of significant packet loss on their IP connection. However, such retransmission of lost packets is not an option with voice over IP: the latency resulting from detecting and retransmitting a lost packet would cause the retransmitted packet to be unusable. Any lost voice packet is lost for good; so, if packet loss occurs during speech, distortion will occur. Even just one lost packet can result in an audible pop or click; significant packet loss will result in a crackling sound. Here are some typical packet loss scenarios and their results:

- Packet loss of less than 1% will be acceptable to most users. The user may only occasionally notice the distortion due to such minimal packet loss.

- With packet loss of between 1% and 2%, the user will become increasingly aware of the distortion or noise.

- Packet loss of 2% and higher will cause noticeable and definite distortion, which can disrupt echo canceller operation as well as introduce echo on some outside calls made over Esi-Link or from IP phones. This level of distortion will likely be unacceptable to most users.

Protocols and standards

To ensure that a full, robust feature set can be supported along with efficient use of network resources (such as bandwidth), Esi-Link uses an enhanced, standards-based signaling protocol to communicate between locations. Many current VoIP signaling methods, such as SIP, are still "emerging" standards and, although adopted by some vendors, are limited in their functionality. Others, such as H.323 are inefficient, and most resulting implementations are proprietary. **None of these protocols can currently provide the full feature set that Esi-Link supports.**

Security

Esi-Link implements a number of methods to prevent unauthorized tapping or "hacking" into VoIP traffic:

• Each remote location must be entered in the home location's database in order to establish Esi-Link calls with it.

• Esi-Link uses high-order (*i.e.,* not well-known) IP services ports.

• Proprietary protocol is used for VoIP communications (see "Protocols and standards," *above).*

• Supports network address translation (NAT); an Esi-Link PBX can be placed behind a corporate firewall.

• ESI's proprietary operating system lacks the vulnerabilities found in mass-marketed OSs.

Outside-line quality and its effect on VoIP calls

Noisy and otherwise poor-quality outside (CO) lines may affect audio quality when accessed or transferred over an Esi-Link channel. Due to network delays across a packetized communications system, the outside-line connection — whether digital (T1 or ISDN) or analog — has the potential to cause echo.

To compensate for this, each Esi-Link system includes enhanced, ITU-standard G.168 echo cancellers that adapt automatically to various outside-line conditions, eliminating or significantly reducing echo. However, certain outside-line conditions in some areas may cause degraded performance of the echo canceller (and of the packetized communications system's audio performance in general), even if line conditions of this type haven't previously caused such problems with traditional phone systems.

System reports

System reports and SMDR provide detailed information on outside line usage, extension usage and inbound and outbound calls for each system. Station-to-station calls across Esi-Link are considered intercom calls and, therefore, neither generate SMDR records nor are included in system report statistics.

Faxing and modem calls

Fax and modem transmissions are not supported over an Esi-Link channel, due to the nature of compressing and packetizing of voice.

Esi-Link features

A full set of integrated functions offers easy-to-use, transparent features between locations. This seamlessly extends the standard feature sets of Esi-Link-compatible ESI systems, to allow users to utilize resources across the Esi-Link network.

System features

Published numbers

Up to 30 extensions or mailboxes per system can be set to display lamp status on any remote location stations to which programmable feature keys are assigned. On-hook (idle), off-hook, DND and ringing status are indicated on a programmable feature key as they would be for a local extension. Virtual Mailbox Keys to which published remote location mailboxes are assigned indicate mailbox status (new message, urgent message, user access) in the same way as do standard Virtual Mailbox Keys.

Toll restriction across the network

- Toll-restricted stations in the home location have the same toll restriction rules applied when dialing out through remote location outside lines.
- Stations with local CO line access restriction (*i.e.,* dialing **9** or **8** doesn't reach an outside line) also are prevented from dialing the same CO line access in remote locations.

> **Example:** Extension 135 in the Dallas location is restricted from making long-distance calls, but allowed toll-free and local calling. The extension's user presses the Chicago Location Key and dials **9 1 2 1 2** (*i.e.*, 9 + 1 + 212). Because he is toll-restricted, the user only hears a prompt, and his call is not completed.

Location Dex

Specifically designed for Esi-Link networks, Location Dex complements the current Esi-Dex speed-dial directories. A station user can press the ESI phone's **ESI-DEX** key until *LOCATION DEX* appears in the display, and then use the scroll keys to select the remote location name and number. The user can also use the dial keys to "dial-by-name" to the first location name that begins with one to three of the letters dialed. Pressing **ESI-DEX** again displays the remote location's Station Dex, allowing the user to select a station or department, just as he would if using his own local Station Dex.

Station features

> **Note:** All "Station features" descriptions, beginning below, assume that network numbering (see "Network numbering," page 5) has been programmed, unless otherwise mentioned. If network numbering has **not** been programmed **or** if the system is running software that doesn't support network numbering, then — prior to dialing the remote-location extension, mailbox, or department — the user must either (1.) dial the remote location number or (2.) press the remote location key.

Transfer to remote location

Station users can transfer calls to other stations and mailboxes in any other location in the Esi-Link network just as they would with local extensions if using network numbering. **If not using network numbering:** while on a call, the user transfers the call by pressing **either** (a.) a preprogrammed remote-station key **or** (b.) the **TRANSFER** key followed by the Location Key and extension. The remote-location station will display the originating location's short name, along with the Caller ID,[1] on the ESI phone. Both supervised and blind transfers are supported. If a blind transferred call remains unanswered, it will forward to voice mail; otherwise, it will recall to the transferring station.

> **Note for legacy Esi-Link networks ONLY:**
>
> Due to multi-hop limitations, a call can't be "chain-transferred" (*i.e.*, from a user at the transferred-to location to someone at a third location); instead, the user at the transferred-to location places the call on hold — which places it on hold back at the original location — and the originating user then pages the person at the third location to retrieve the call. This preserves the call's audio quality.

Conferencing

Station users can conference up to 16 other local and remote location stations and outside-line calls.
A conference member station in a remote location can also add one or two members at that location to an existing conference by using the remote location conference bridge. Additional members can be included; but, because of multi-hop speech degradation, ESI recommends that conference bridges from no more than two locations be used for a conference call.

Location Key

Users can press a preprogrammed Location Key to receive internal dial tone for dialing numbers at that remote location. The user can then dial any extension, department, mailbox or outside-line-group-access code in the remote location.

One-button dialing (station key)

Feature keys can be programmed to provide one-touch access to a remote location station, mailbox or outside line, by assigning to the feature key the remote location number plus the station, mailbox, or outside line number. Station keys assigned with remote location extensions that are not included in the published numbers list won't light **but** can still be used for one-button dialing. One can also use Location Dex to assign station keys and Virtual Mailbox Keys.

---

[1] Caller ID must be provided by your telephone line service provider. All ESI phone systems support Caller ID.

Placing a call on hold . . .

- **From home location to remote location** — When a station user places a call on hold locally, he can initiate a page to a remote location, announcing the call and the line number on which it is placed on hold at the original location. The user presses **PAGE** (**#**), followed by the appropriate Location Key (and then dials the paging zone at the remote location). Upon hearing the page, the user at the remote location presses **HOLD** followed by the appropriate Location Key. The remote location station displays the location number and short name, as well as the line numbers currently on hold at that location. The remote location user dials the line number on which the call is on hold, and answers the call. (If no Location Key is programmed on the station, dialing the three-digit location number can be substituted for pressing the Location Key.)

- **From one remote location to another** — Once a call has been answered at a remote location, it can be placed on hold at that location. When the user from the remote location places the call on hold, that remote location user can initiate a page to any **other** remote location, announcing the location and line number where the call is on hold. The user at the extension at the other remote location presses **HOLD** followed by the Location Key for the location where the call is on hold. This user's station displays the location number and short name, as well as the line numbers currently on hold at that original location. The new remote location user then dials the line number on which the call is on hold, and answers the call. (If no Location Key is programmed on the station, dialing the three-digit location number can be substituted for pressing the Location Key.)

    Alternatively, the remote user can transfer the call directly to the other remote location. The user at the other remote location can then place the call on hold and initiate a page to another remote location.

Answer ring assignments

Esi-Link locations can be added to the ring lists in Function 21 programming. This will allow a CO line to ring directly across Esi-Link to a department, extension, or mailbox at a remote location, along with local extensions. You can add up to 10 extensions from one remote location into each ring cycle.

> **Example:** You could enter x701100, x701101, x701102, *etc.*, into the list — but you can't enter x701100, x702100, and x703100, because that would be three different remote locations.

Auto attendant branches

Remote

Branches 8700–8798 are special branches, for Esi-Link purposes only, which are used at remote locations that receive calls from the original location. Using one of these remote branches ensures that the caller will return to the original location if the called person doesn't answer.

Return

Branch 8799 is reserved as the return branch. When a call is sent to this branch, it will automatically be sent back to the no-response destination of the originating location branch ID.

Remote channel queuing

If all Esi-Link channels in the home location are currently in use, a station user is prompted to press **1** to be placed in a queue for the next available channel. If the user chooses to be placed in a queue, when a channel becomes available the user's phone rings. Upon answering, the user hears internal dial tone and is then able to redial the Esi-Link call.

```
NO RMT CHANNEL
1=QUE
```
ESI phone with two-line display

```
NO RMT CHANNEL
1=QUE
■■■■■■                    RMT
```
ESI phone with three-line display

Remote page

Paging a remote location can be accomplished by dialing **#** followed by the Location Key and the paging zone number. To access overhead paging in a remote location, a station user can **either** (a.) press a preprogrammed feature key **or** (b.) press a Location Key and enter an overhead paging code.

> **Note:** Esi-Link supports up to eight page zones and all-page at each location. Zones are numbered *1–6* and *8–9* (all-page is *0*).

Call forwarding

Call forwarding can be set to a remote location extension or department by **either** (a.) pressing a preprogrammed call-forwarding feature key and the appropriate preprogrammed station key **or** (b.) dialing the forwarding feature code and dialing the extension or department.

If a call is forwarded and the remote location is busy or unreachable, the call routes back to the user's mailbox.

Service observing — remote station

An authorized station user in a home location can monitor the conversations of both local stations and stations in remote locations. Each remote station must be entered in the service-observing list of the home location station prefixed with its location number *(7xx)*.

Voice mail features

Transfer to remote mailbox

Station users can transfer outside calls directly to a mailbox in a remote location by pressing the **VOICE MAIL** key **and** then **either** (a.) pressing a preprogrammed remote-station key **or** (b.) pressing **TRANSFER** and then dialing the mailbox (extension) number.

Move message to remote mailbox

Users can move messages to remote location mailboxes during playback by pressing **6** followed by the number of the desired destination mailbox.

Voice mail retrieval from remote location

Voice mail users can access their mailboxes from an ESI phone in a remote location using one of the following methods:

- Pressing a preprogrammed Virtual Mailbox Key.
- Pressing **VOICE MAIL**, dialing ✱**,** and dialing the mailbox number.

> **Note:** Each user should always program a voice mail password at the level for all calls to prevent unauthorized access to the user's mailbox.

Quick Groups/Quick move

Quick Groups can include local and remote extensions, departments and mailboxes.

Quick Move permits recorded conversations to be copied to both local and remote location mailboxes in the same fashion as is done normally.

Glossary

ADSL	Asymmetric digital subscriber line. A technology for providing high bandwidth data network connections to homes and businesses. ADSL is called "asymmetric" because it uses most of the channel to transmit downstream to the user and only a small part to receive information (upstream) from the user.
Channel	A remote network channel (or "talk path") used to transmit and receive G.729 or G.726 compressed voice to a remote location.
CO line	A telephone line between a phone company *central office* (CO) and one of the company's subscribers. There are many different types of CO lines, each serving a distinct purpose.
DND	*Do not disturb.* Appears on the **MUTE/DND** key which is used to prevent incoming calls from ringing or initiating call waiting to an extension. Incoming calls are automatically sent to the "busy" destination (typically, a voice mailbox).
IP	A group of data transmission protocols collectively referred to as *Internet Protocol.* Assembles data from one application into packets and transmits them from a device via various physical methods to another device, to be disassembled and handed off to another application.
G.168	An industry-standard adaptive echo-cancelling algorithm used in many telephony applications.
G.726	An industry-standard voice-compression algorithm that converts speech to digital information. It initially samples speech at 64 Kbps and compresses it to about 32 Kbps before transmitting.
G.729	An industry-standard voice-compression algorithm that converts speech to digital information. It initially samples speech at 64 Kbps and compresses it to about 8 Kbps before transmitting.
Home location	(Also called *local location.*) ESI system to which a phone is directly connected or that the Installer or System Administrator is currently programming.
Location Dex	An Esi-Link-specific function of ESI systems' Esi-Dex speed-dialing feature. Provides greater convenience in speed-dialing other Esi-Link locations.
Location Key	A pre-programmed feature key that provides single-button access to remote location extensions, outside lines, and mailboxes.
Location name	Name of an Esi-Link location. A location name can be up to 16 characters. Used for Location Dex.
Location number	(Also called *cabinet number.*) A three-digit number prefixed with *7* (such as *701*); is used to identify and route calls between locations via an Esi-Link channel.
Multi-hop	(Also called *tandem conversion.*) Two or more encoding/decoding processes of a voice path through an IP network. Due to the limitations (*i.e.,* reduced quality and increased latency) imposed by multiple encoding-decoding processes on a VoIP network, a call must not traverse through any more than two conversions (systems).
Remote location	(Also called *remote office.*) ESI system connected through Esi-Link to the local system.
Short name	Three-character location name, assigned by the Installer during system programming. For instance, *ATL* might be the short name for a location in Atlanta.
Station key	(Also called *DSS* [*direct station select*] *key*.) A programmable feature key to which an extension number (or Esi-Link extension number) has been assigned. If the extension (or mailbox) number is included in the Published Numbers list, the key will light appropriately, depending on the status of the extension or mailbox. See "Published Numbers" (page 10) for more information.
Virtual Mailbox Key	Programmable feature key assigned to access a voice mailbox remotely.
VoIP	Voice over IP. A technology used in IP telephony applications to convert voice calls to Internet protocol.
WAN	Wide-area network. A data network between geographically separated locations.

Technical and feature support chart

(See Notes at the end of this chart)

Feature	IP Server 900	ESI-1000	ESI-600	ESI-200	ESI-100	*ESI-50*	*Esi-Link support*
64 Kbps voice sampling	Yes	Yes — with IVC	Yes — with IVC	Yes — with IVC	Yes — with IVC	Yes — with IVC	*Yes*
911 alert	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 1)*
ACD (auto. call distribution)	Yes — up to 64 members	Yes — up to 64 members	Yes — up to 64 members	Yes — up to 48 members	Yes — up to 32 members	Yes — up to 32 members	*Limited (Note 2)*
ACD — admin. key programmable	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	*Limited (Note 2)*
ACD — log-on/log-off key	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/48-Key/ Cordless: Yes 12-Key: No	*Limited (Note 2)*
All call paging	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Alphanumeric display	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog stations supported w/ appropriate port card(s)	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — call forwarding	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — call hold	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — call pick-up	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — call transfer	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — call waiting	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Analog station — internal paging	Yes — can make but not receive paging calls	Yes — can make but not receive paging calls	Yes — can make but not receive paging calls	Yes — can make but not receive paging calls	Yes — can make but not receive paging calls	Yes — can make but not receive paging calls	*Yes*
Analog station — message waiting	Yes — verbal only	Yes — verbal only	Yes — verbal only	Yes — verbal only	Yes — verbal only	Yes — verbal only	*—*
Analog station — personal mailbox	Yes	Yes	Yes	Yes	Yes	Yes	*—*
ARS (automatic route selection)	Yes	Yes	Yes	Yes	Yes	Yes	*—*
Auto attendant branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	100 — eight main greetings (ID1–ID8), any combination of menu (six levels), go-to, and dir. for 92 other branches	*Yes*
AutoPage	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 2)*
Auto-record (*VIP Professional-* compatible applications only)	n/a	Yes — 32	Yes — 16	Yes — 8	Yes — 4	Yes — 4	*No*
Background announce (not from analog stns.)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 2)*
Call fwdg. — manually set — to ext., mbox., or dept.	Yes	Yes	Yes	Yes	Yes	Yes	*Can be set to remote ext. or dept.*
Call fwdg. — system set — to mbox., another ext./dept., or ID branch (auto attendant)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 3)*
Call-forward/no-answer	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	*Yes*
Call-forward/no-answer off-premises	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	*Limited (Note 4)*
Call pick-up — directed	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 2)*
Call waiting — CO lines answered then xfer'd call	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Call waiting — CO lines live ring	No	No	No	No	No	No	*—*
Call waiting — station-to-station	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*

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Technical and feature support chart   *(See Notes at the end of this chart)*

Feature	IP Server 900	ESI-1000	ESI-600	ESI-200	ESI-100	ESI-50	Esi-Link support
Caller ID — enhanced (if CID is provided by telco)	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	ESI 60/ESI 40 24-Key/Cordless/ 48-Key: Yes 12-Key: Name only	*Yes*
Conference calling	Yes — 64 conf.ports, 16 members max. per std. conf. (dynamic); 32 members max. per "meet-me" conf. (dynamic)	Yes — 64 conf.ports, 16 members max. per conf. (dynamic)	Yes — 64 conf.ports, 16 members max. per conf. (dynamic)	Yes — 24 conf.ports, 16 members max. per conf. (dynamic)	Yes — 16 conf.ports, 16 members max. per conf. (dynamic)	Yes — 16 conf.ports, 16 members max. per conf. (dynamic)	*Yes*
Conference calling — unsupervised	Yes	Yes	Yes	Yes	Yes	Yes	*Yes — local systems only*
Day/night mode	Yes — Day/Day2, Night/Night2	Yes — Day/Day2, Night/Night2	Yes — Day/Day2, Night/Night2	Yes — Day/Day2, Night/Night2	Yes — Day/Day2, Night/Night2	Yes — Day/Day2, Night/Night2	*Limited (Note 5)*
Departments	64 — up to 64 exts. (ESI) per dept.	128 — up to 64 exts. (ESI) per dept. (ring-all dept. has 48 max. members)	64 — up to 64 exts. (ESI) per dept. (ring-all dept. has 48 max. members)	20 — up to 48 exts. (ESI) per dept.	10 — up to 32 exts. (ESI) per dept.	10 — up to 32 exts. (ESI) per dept.	
Do not disturb	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Esi-Dex built-in directory	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/ 12-Key: No	*Yes — Location Dex*
Fax port — analog ext. w/ appropriate port card(s)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 2)*
Flash control	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Flash over CO (not analog)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Flexible assignment of CO rings	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 8)*
Flexible assignment of keys	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 9)*
Flexible numbering — set relocation, range reassignment	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (see page 5)*
Hands-free answer-back	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes 12-Key: No Cordless: Headset only	*Yes*
Help mode and help tutorial	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Hold — exclusive	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Hold — station-to-station	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 10)*
Hold — system-wide	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Holiday mode	Yes — on-site/remote activation and re-recording	Yes — on-site/remote activation and re-recording	Yes — on-site/remote activation and re-recording	Yes — on-site/remote activation and re-recording	Yes — on-site/remote activation and re-recording	Yes — on-site/remote activation and re-recording	*Yes*
IP Resource Module Esi-Link maximum	512 channels	n/a	n/a	n/a	n/a	n/a	*Yes*
IVC Esi-Link maximum	n/a	4 cards — 96 channels	2 cards — 48 channels	1 card — 24 channels	1 card — 24 channels	1 (built-in) card — 8 channels	*Yes*
Line appearances — CO line appearing in LCD	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	ESI 60/ESI 40/ 24-Key/48-Key/ 12-Key: Yes Cordless: No	*Limited (Note 4)*
Line appearances — programmable DSS key	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Line groups	9, 8, 71–76	9, 8, 71–76	9, 8, 71–76	9, 8, 71–76	9, 8, 71–76	9, 8, 71–76	*Limited (Note 7)*
Live recording	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	ESI 60/ESI 40/ 24-Key/Cordless/ 48-Key: Yes 12-Key: No	*Yes*
Mailbox — broadcast	Yes — 1 to all exts	Yes — 1 to all exts	Yes — 1 to all exts	Yes — 1 to all exts	Yes — 1 to all exts	Yes — 1 to all exts	*Yes — local system*
Mailbox — group	Yes — 32	Yes — 64	Yes — 32	Yes — 16	Yes — 16	Yes — 16	*No*
Mailbox — trunk-to-trunk transfer	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Menu levels — multiple	6	6	6	6	6	6	*Yes*
Message copy/move	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*

Technical and feature support chart *(See Notes at the end of this chart)*

Feature	IP Server 900	ESI-1000	ESI-600	ESI-200	ESI-100	*ESI-50*	*Esi-Link support*
Message move/delete	Yes	Yes	Yes	Yes	Yes	Yes	*Yes — incls. remote location mboxes*
Message — pick-up (remote)	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Message monitor	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Message notification — phone and pager	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Missed calls	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Multi-site capability	Yes — with IP Resource Module	Yes — with Esi-Link IVC	Yes — with Esi-Link IVC	Yes — with Esi-Link IVC	Yes — with Esi-Link IVC	Yes — with Esi-Link IVC	*Yes*
Multi-site transfer	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 10)*
Network numbering	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 10)*
Night service (auto and manual)	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Off-hook ring — live-answer	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Off-premises msg. retrieval	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Off-premises "reach-me"	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Off-premises transfer — auto attendant	Yes — with trunk-to-trunk or Centrex	Yes — with trunk-to-trunk or Centrex	Yes — with trunk-to-trunk or Centrex	Yes — with trunk-to-trunk or Centrex	Yes — with trunk-to-trunk or Centrex	Yes — with trunk-to-trunk or Centrex	*Limited (Note 4)*
On-hold dialing	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
On-hook dialing	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Operator station selection	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 6)*
Overflow (flexible)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 3)*
Page port — (external)	Yes	Yes	Yes	Yes (if IVC is **not** in slot 1 or 2)	Yes (if IVC is **not** in slot 1)	Yes (if IVC is **not** in slot 1)	*Yes*
Page zones — (internal)	Nine: 0 (all), *1–6, 8–9*	Nine: 0 (all), *1–6, 8–9*	Nine: 0 (all), *1–6, 8–9*	Nine: 0 (all), *1–6, 8–9*	Nine: 0 (all), *1–6, 8–9*	Nine: 0 (all), *1–6, 8–9*	*Limited (Note 5)*
Pager notification	Yes — new and urgent msgs.	Yes — new and urgent msgs.	Yes — new and urgent msgs.	Yes — new and urgent msgs.	Yes — new and urgent msgs.	Yes — new and urgent msgs.	*Limited (Note 4)*
Paging — external overhead	Yes — with DTMF throughput	Yes — with DTMF throughput	Yes — with DTMF throughput	Yes — with DTMF throughput	Yes — with DTMF throughput	Yes — with DTMF throughput	*Yes*
Paging — internal (through phones)	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Personal speed-dial — bins	100 per phone (0 on 12-Key)	100 per phone (0 on 12-Key)	100 per phone (0 on 12-Key)	100 per phone (0 on 12-Key)	100 per phone (0 on 12-Key)	100 per phone (0 on 12-Key)	*Yes*
PRI (ISDN)	Yes — 8 T1/PRI Modules max.	Yes — 10 T1/PRI cards max.	Yes — 6 T1/PRI cards max.	Yes — 3 T1/PRI cards max.	Yes — 1 T1/PRI card max.	Yes — 1 T1/PRI card max.	*Yes*
Private-line capability	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Queue — ACD	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Queue for available line	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Queue for available talk path	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Quick Groups	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Quick Move of recordings	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
QuickPage	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Remotely installed ESI IP phones supported	Up to 864	Up to 816	Up to 408	Up to 192	Up to 72	Up to 8	*Yes*
Remote talk paths (remote network chs.)	Up to 48	Up to 96	Up to 48	Up to 24	Up to 24	Up to 8	*Yes*
Service observe list members	Up to 64	Up to 64	Up to 64	Up to 48	Up to 32	Up to 32	*Yes — service observe incls. remote locations*
Shared-tenant service (max. tenants)	Yes (eight)	Yes (eight)	Yes (eight)	Yes (four)	Yes (two)	Yes (two)	*Limited (Note 6)*
SIP (Session Initiated Protocol) stations	Yes — each SIP license uses an IP port	Yes — each SIP license uses an IVC station port	Yes — each SIP license uses an IVC station port	Yes — each SIP license uses an IVC station port	Yes — each SIP license uses an IVC station port	No	*No*
SMDR	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 6)*
Speakerphone	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/ 24-Key/ 48-Key: Yes Cordless/12-Key: No	*Yes*

Technical and feature support chart

(See Notes at the end of this chart)

Feature	IP Server 900	ESI-1000	ESI-600	ESI-200	ESI-100	*ESI-50*	*Esi-Link support*
T1 lines (channels)	192 (with eight T1s)	240 with six DLC12s/DLC0s	144 with six DLC12s/DLC0s	72 with three DLC12s	24 with one DLC12	24 with one DLC12	*Yes*
Toll bypass with Esi-Link	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Toll restriction — station and system	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Transfer — station-to-station	Yes	Yes	Yes	Yes	Yes	Yes	*No*
Trunk-to-trunk xfer — auto attendant	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 4)*
Trunk-to-trunk xfer — manual	Yes	Yes	Yes	Yes	Yes	Yes	*No*
Twinning	Yes	Yes	Yes	Yes	Yes	Yes	*No*
Uniform call distribution (UCD)	Yes	Yes	Yes	Yes	Yes	Yes	*Limited (Note 2)*
Urgent-message delivery	Yes	Yes	Yes	Yes	Yes	Yes	—
Verbal User Guide™	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
VIP	n/a	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	*Yes*
VIP ACD Agent	n/a	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	*Yes*
VIP ACD Supervisor installations	n/a	Yes — max. 16	Yes — max. 8	Yes — max. 4	Yes — max. 2	Yes — max. 2	*Yes*
VIP PC Attendant Console installations	n/a	Yes — max. 16	Yes — max. 8	Yes — max. 4	Yes — max. 2	Yes — max. 2	*Yes*
VIP Professional	n/a	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	*Yes*
VIP Softphone — local and remote	n/a	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	*Yes*
VIP 7	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	*Yes*
VIP 7 ACD Agent	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	Yes (with ESI 60, ESI 40, or 48-Key)	*Yes*
VIP 7 ACD Supervisor installations	Yes — max. 8	Yes — max. 16	Yes — max. 8	Yes — max. 4	Yes — max. 2	Yes — max. 2	*Yes*
VIP 7 PC Attendant Console installations	Yes — max. 8	Yes — max. 16	Yes — max. 8	Yes — max. 4	Yes — max. 2	Yes — max. 2	*Yes*
VIP 7 Softphone — local and remote	Yes — each *Softphone* installation uses an IP port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	Yes — each *Softphone* installation uses an IVC station port	*Yes*
Virtual Answer Key (programmable)	Yes	Yes	Yes	Yes	Yes	Yes	*Yes*
Virtual Mailbox Keys (programmable)	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	ESI 60/ESI 40/24-Key/48-Key: Yes Cordless/12-Key: No	*Yes — published exts/mbxes only*
Voice codecs supported	G.711 — Local IP G.726 — Remote IP and Esi-Link G.729 — Esi-Link G.729a — SIP trunking	G.711 — Local IP G.726 — Remote IP and Esi-Link G.729 — Esi-Link G.729a — SIP trunking	G.711 — Local IP G.726 — Remote IP and Esi-Link G.729 — Esi-Link G.729a — SIP trunking	G.711 — Local IP G.726 — Remote IP and Esi-Link G.729 — Esi-Link G.729a — SIP trunking	G.711 — Local IP G.726 — Remote IP and Esi-Link G.729 — Esi-Link G.729a — SIP trunking	G.711 — Local IP G.726 — Remote IP and Esi-Link	—

Notes: 1. CO line must be connected to system.
2. Only local system stations supported.
3. Calls may be directed only to local system extensions, mailboxes, departments, or ID branches.
4. CO line on only local system.
5. Members must be of the same system.
6. Local system only.
7. Numbering plan codes 71, 72, 73, 74, 75 and 76 are individually selectable for either line group access codes or Esi-Link location number ranges. By default, all numbers 710–769, inclusive, are reserved for Esi-Link location numbers. For details, refer to table, "Location or line group numbering" *(below)*.
8. Local system and only one remote location.
9. Location Keys, remote location station, remote location mailbox.
10. Requires ESI Communications Servers (running compatible system software) or IP Server 900.

Location or line group numbering *(from Note 7)*

Esi-Link location number range (default)	Line group access (if selected)	Esi-Link location number range (default)	Line group access (if selected)
700–709	—	740–749	74
710–719	71	750–759	75
720–729	72	760–769	76
730–739	73	770–799	—

About ESI

ESI (Estech Systems, Inc.) designs and manufactures high-performance phone systems for businesses and organizations. ESI uses advanced technology to design IP and digital communications systems that integrate built-in capabilities, advanced features, and highly differentiated applications into flexible products that are easy to use and keep employees productive. ESI has sold over 250,000 business communications systems through hundreds of factory-trained Certified Resellers. Founded in 1987, ESI is a privately held corporation with headquarters in Plano, Texas.