

Kofax Communication Server

Line Server Model 305 Manual

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The KOFAX logo is displayed in a bold, blue, sans-serif typeface. The letters are thick and closely spaced, with a modern, clean design.

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Preface

This manual describes the Line Server Model 305.

We assume that you have knowledge of the installation and functionality of the User Module for ISDN Fax (UIF) (see *TCOSS System Manual* and *TCOSS Configuration Manual*) and of Voice servers (see *TC/VoiceAccess User Manual*)

Up to TC/SP 7.70.00, the Line Server Model 305 supported GSM connectivity. This feature has been discontinued and therefore removed from this manual. For further information, refer to the documentation of TC/SP 7.70.00.

Important The Kofax Communication Server and its components formerly used the name TOPCALL. Some screen shots and text in this manual may still use the former name.

Product Names

The redesigned hardware of the Line Server Model 305 has been available since 2006. The following naming conventions and corresponding abbreviations indicated in brackets are used in this document:

- **Line Server Model 305 v1 (LS1V1)**: This is the old Line Server Model 305. It contains a TC16 main board and up to four TC22 modules with a DSP processing power.
- **Line Server Model 305 v2 (LS1V2)**: This is the new generation of the Line Server Model 305. It contains a TC18 main board that already includes the DSP processing power.
- **Line Server Model 305 (LS1)**: This name/abbreviation is used whenever the description applies to both LS1V1 and LS1V2.

You can determine if LS1V1 or LS1V2 is used using the following methods.

Method	LS1V1	LS1V2
Look at the device description on the type plate at the back of the cabinet.	Model: 305	Model: 305 v2
Check the EPROM revision during power-on of LS1.	EPROM revision: 2.xx.yy	EPROM revision: 3.xx.yy
During the operation of LS1, check the version info 5 (see On Device Controls and Display for details).	Version info 5: TC16: x.yy.zz	Version info 5: TC18: x.yy.zz
Remove the cover of the cabinet and check the main board type.	Main board type: TC16	Main board type: TC18

Related Documentation

The following TCOSS manuals are available in the Kofax Communication Server document set:

- *TCOSS System Manual*: System Overview. Basic functionality.
- *TCOSS Configuration Manual*: Configuration parameters of all modules (channel types) and the system.
- *TCOSS Application Module Manual* : Description of the TCOSS directory structure and ".."-interface commands.
- *TCOSS ISDN Technical Manual*
: Description of the ISDN configuration and operation.
- *ASP Installation Manual*: Installation guide for Application Service Providers.
- *Line Server Model 305* (this document): Manual of the Model 305 Line Server (LS1).

In addition to the TCOSS manuals, this document refers to the following documents:

- *TC/VoiceAccess User Manual*
- *tcpMeter Technical Manual*
- *TC Player User Manual*
- *Branch Box Hardware Documentation*

The full documentation set for Kofax Communication Server is available at the following location:

https://docshield.kofax.com/Portal/Products/en_US/KCS/10.3.0-SihMvq5oti/KCS.htm

Chapter 1

Positioning, Advantages, Strengths

The LS1 is a state of the art, high performance and universal communications hardware. It makes the communication hardware independent of the TCOSS server.

The following new features are supported with LS1.

- Universal Port solution: Fax and Voice can share the same physical ISDN line, where fax and voice have to use different inbound numbers.
- High density, scalable solution: 19 inch Rack mountable cabinet (1 HU) supports up to 32 channels (full E1 ISDN primary rate) for Fax and Voice applications.
- The LS1 communicates via 10/100 Mbit LAN connection. This means that it can be replaced/repared without interrupting the message server (hot pluggable solution).
- The LS1 can be connected via WAN. It can be used instead of the existing Branchbox solution with TC15+TC20.
- Very powerful trace options.
- Both Voice Servers and TCOSS Servers can use multiple LS1.
- Analog module to support analog telephone lines for Fax. It can be used instead of existing TC20 based solutions.
All telephone line characteristics (like impedance) fully configurable per software, no jumper settings on the analog module anymore.
- Remote LS1 administration via the web interface for LS1V2, providing the possibility to change any LS1 related configuration parameters (such as IP address) or to upgrade LS1 firmware remotely.

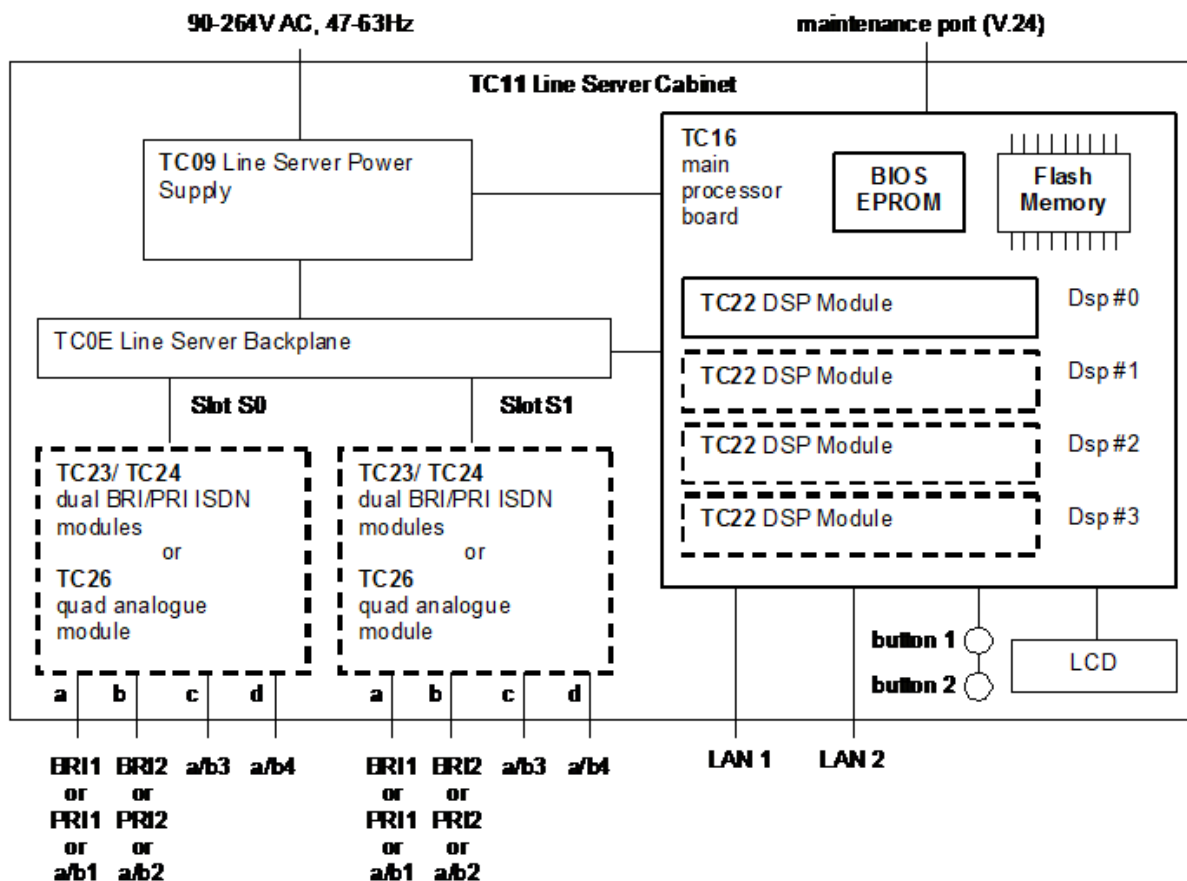
Chapter 2

Structure of the Product

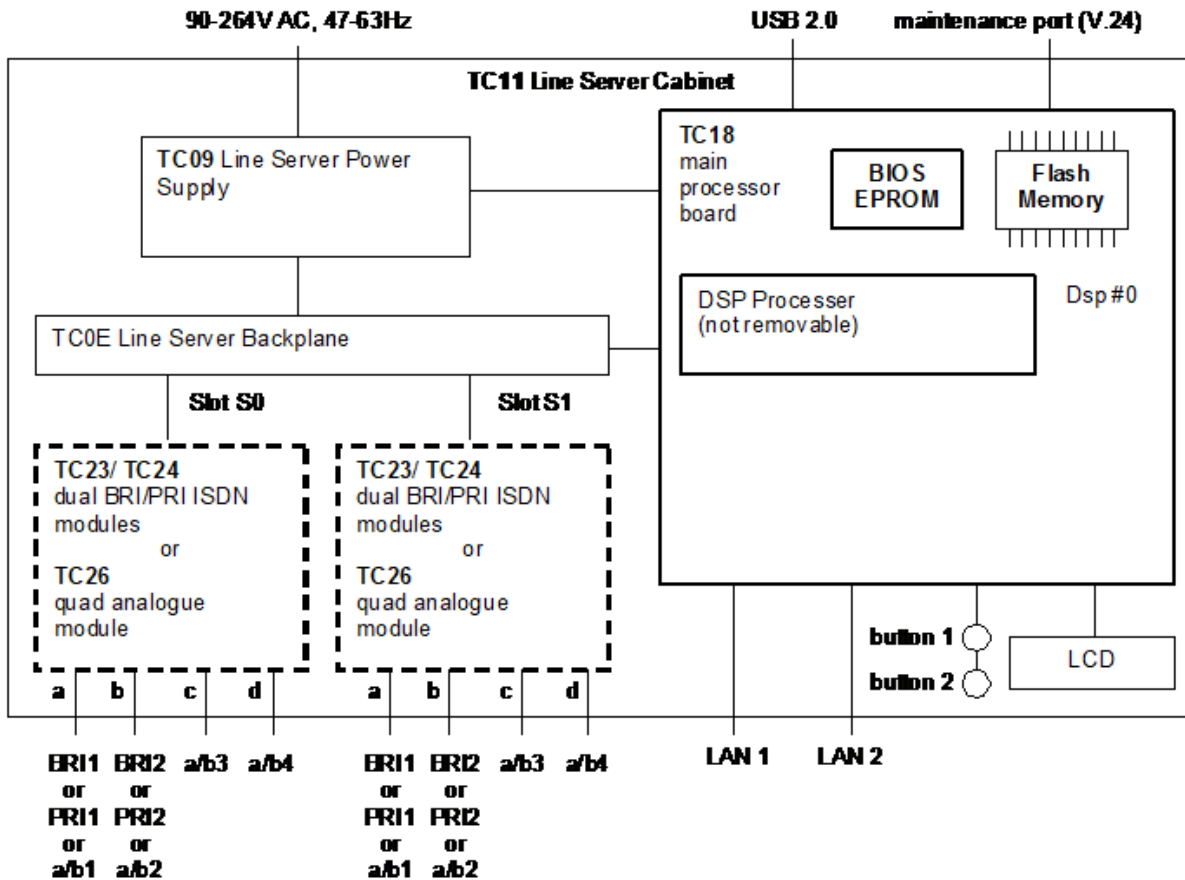
This section describes the structure of LS1.

LS1 Hardware Overview

The LS1 has a flexible module-based design. An overview of all hardware components and connections is shown in the graphics below.



Picture 1 LS1V1 Hardware Overview



Picture 2 LS1V2 Hardware Overview

The LS1 has its own power supply (TC09). The central part of the LS1 is the main processor board (TC16/18). It consists of a power PC based microcomputer system with a solid state, not removable permanent storage (Flash Memory). It provides the following external connectivity:

- A serial maintenance port for initial installation, basic setup and hardware diagnostic functions.
- Two 10/100 MBit Ethernet LAN connections
- An internal bus that connects the line modules (TC26, TC23 or TC24) via passive Backplane (TC0E). Any combination of TC26/TC23/24 is supported. The maximum number of channels is indicated in the table below.

Slot 1	Slot 2	Max. Fax or Voice channels	Max. Fax channels
TC26	-		4(*)
TC26	TC26		8(*)
TC23	-	4	
TC23	TC23	8	
TC24	-	30	

Slot 1	Slot 2	Max. Fax or Voice channels	Max. Fax channels
TC24	TC23	32	
TC24	TC24	32	
TC24	TC26	30	2(*)
TC23	TC26	4	4(*)

(*) TC26 supports fax channels only

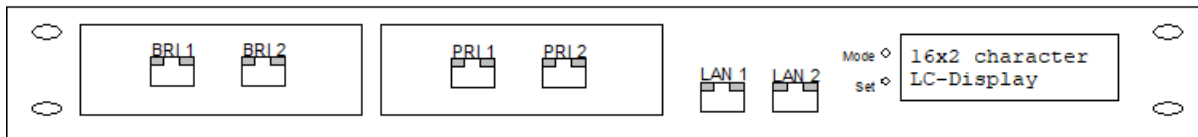
The following additional connections are available on TC16/18 board:

- Socket for an EPROM with an LS1 BIOS.
- The TC16 has four slots for DSP modules (TC22).

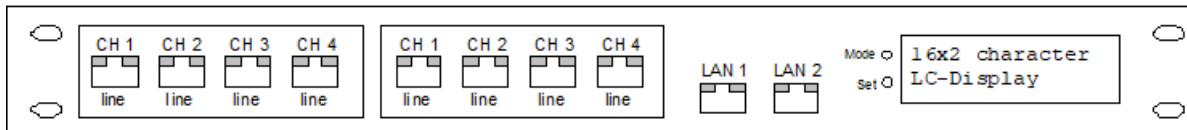
Note Only DSP Module #0 may control line module slots (S0 and S1). Therefore, DSP Module #0 is mandatory. All other modules are optionally used in case more processing power is required.

- The TC18 does not have slots for DSP modules. Instead, it includes one DSP that provides enough processing power to support up to 32 channels.

Front View of LS1 with TC23/TC24 modules





Front View of LS1 with TC16 modules






On the front side of LS1 there are connectors to analog, BRI/PRI and LAN lines. Each plug has 2 LEDs that indicate status and activity as shown in the table below. General status information (version, IP address, active lines...) is shown on an LCD. Two buttons are available to reset LS1 and set up the IP addresses.

Description of LAN LEDs on LS1V1

Connection	Left LED	Right LED	Example
No LAN signal detected	Off	Off	






Connection	Left LED	Right LED	Example
10 Mbps LAN connection	Steadily green	Flickering green to indicate activity on LAN	
100 Mbps LAN connection	Steadily green	Flickering yellow to indicate activity on LAN	

Description of LAN LEDs on LS1V2

Connection	Left LED	Right LED	Example
No LAN signal detected	Off	Off	
10 Mbps LAN connection	Blinking green 1 sec on/off	Flickering yellow to indicate activity on LAN	
100 Mbps LAN connection	Steadily green	Flickering yellow to indicate activity on LAN	

Note The left LED will blink only with a 10 Mbps connection if the TCLinux operating system is running. If TCBios is running, which is the case during startup, installation, configuration and test with the Line Server Diagnostic tool, the left LED will be constantly green with a 10 Mbps connection.

Description of TC23/TC24/TC26 LEDs

LED status			TC23.3	TC24	TC26
Example	Left	Right			
	Off	Yellow	Interface reset, not yet booted, or not configured at all		
	Steadily red	Off	Interface initialized, but the line not active (line disconnected or out of order)		
	Steadily red	Steadily green	Interface initialized, the line is connected but not functioning properly TC24: not synchronous TC23/TC26: not used		
	Off	Steadily green	Interface initialized, line connected and active		
	Flickering green	Steadily green	Active transmission via this line TC26 interface only		

USB Port

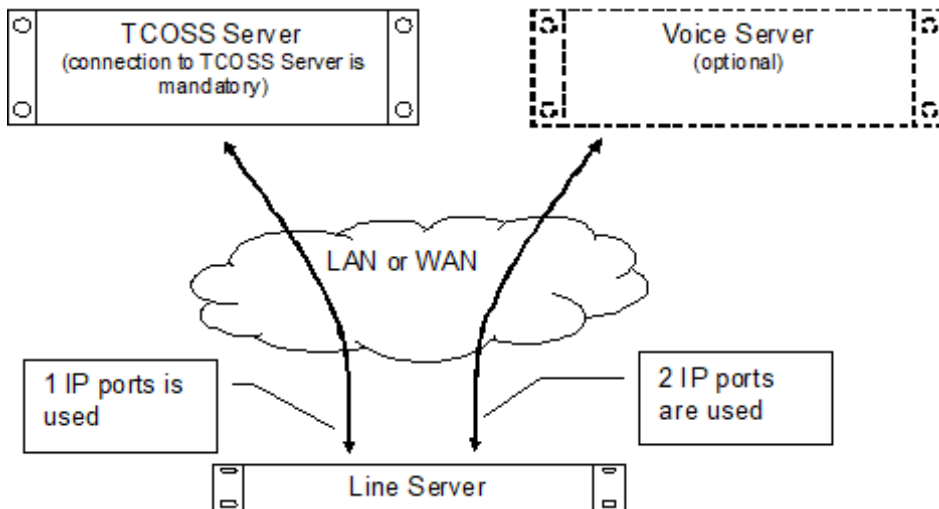
The final version of LS1V2 has a USB 2.0 port on the rear side of the cabinet.

Note This connector is reserved for future use. It is currently not supported by the LS1V2 software.

The first shipped versions may use the existing LS1V1 cabinet. In that case the USB port is not available on the rear side of the cabinet.

LAN Connectivity

The LS1 must be connected via LAN to TCOSS and optionally a KCS Voice Server if voice support is required. The following figure shows the used TCP/IP connections.



The TCOSS server is responsible for loading the software and configuration to LS1. It provides status information via TC/MON or TCfW line statistic.

Optionally a single Voice Server can use the LS1, where, the TCOSS server and the voice server can be the same or separate- physical servers.

The following ports are used by default.

Port	Use for	Protocol
5000	Connection between TCOSS and DSP Modules in LS1	TCP/IP with KCS internal DotDot interface.
5001	Message connection between Voice Server and LS1	TCP/IP with KCS internal voice messages
5002	Data connection between Voice Server and LS1	TCP/IP with KCS internal voice data stream.

Note You can only use the above mentioned default ports on LS1V1. Do not try to configure anything else in the registry on the TCOSS server with “PorttoConnect” because it is not configurable on the LS1V1 side. On the other hand, you can change these ports on LS1V2 using the Remote Lineserver Administration (RLA) Web GUI (refer to [Web-based Remote LS1V2 Administration \(RLA\)](#)) and you can also change them accordingly in the registry on the TCOSS server if LS1V2 is being used.

You must configure at least the IP address (or host name) of LS1 both in TCOSS and the Voice Servers.

The LS1 uses a static IP address. IP addresses via DHCP servers are not supported.

The connection is established from TCOSS/TCECP to LS1. The LS1 itself never tries to initiate a TCP/IP connection.

The fax/telex branch box (TC15+TC20/TS0D) uses port 5000 with the same protocol as LS1. Ports 5001 and 5002 are not used by fax/telex branch box.

Chapter 3

Functionality

This section describes the functionality of LS1.

Fax Module for LS1

The LS1 runs TCOSS ISDN fax (UIF) or analog fax (UTF) channels. These channels are based on the same functionality as UIF/UTF channels on other fax hardware (such as TC20). In addition to these fax features, voice features similar to the existing voice hardware are available, but for ISDN (UIF) channels only.

Note Any reference to the voice functionality in this manual apply for ISDN modules only.

Fax and Voice Mode Switch

Incoming calls are handled as fax or voice calls according to their DDI (or DTMF) number as described below:

- The received DDI/DTMF number will be converted using the number conversion table (config lines 254 to 283) as with UIF on TC20. If no DDI/DTMF information is available you can optionally convert the empty number with the number conversion table.
- If the resulting number starts with "V", the call will be detected as voice call where the remaining part of the converted number (after "V") is used as called number.
- If the resulting number does not start with "V", it will be handled as fax call as with TC20 fax cards.
- If required, automatic detection of Fax/Voice calls can be configured. In this case an incoming call starts in Voice mode. If the CNG tone (which is generated by the sending fax machine) is detected, the mode will be switched to Fax. For more details, please refer to the section "Unique Single Number for Fax and Voice (USN)" in the TCOSS System Manual.

For outgoing calls, each channel can be separately configured:

- Dedicated fax channel: This means that the channel is not available for outgoing voice calls.
- Dedicated voice channel: The channel is not used for outgoing fax calls.
- Shared Fax and voice channel: The channel is used both for fax and voice. If both an outgoing fax and outgoing voice call has to be handled at the same time, the fax call is cleared with error code IA (call collision) similar to call collision with an incoming call. Already initiated fax calls are neither aborted by outgoing voice call requests nor incoming call requests.

The operation mode for incoming and outgoing calls can be switched independently.

Note You always have to use a UIF channel, even if this channel is configured for voice only.

If the channel is used for voice an appropriate status is shown in the TCfW line statistics windows (or TCfW) and no further send attempts are made until the voice call is finished.

If the reception on a channel is disabled (TCOSS file structure gets full or reception is disabled in 3rd position of config line 3), it is disabled both for fax and voice.

Fax Support

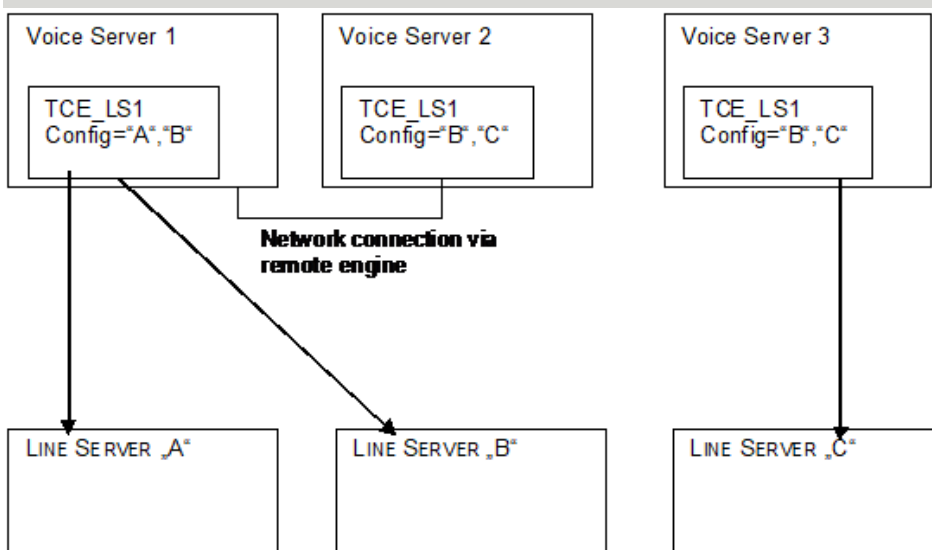
The fax support is equivalent to fax support on TC20 fax card.

Voice Support

The LS1 can be used by each voice server that runs a LS1 Engine (TCE_LS1). The LS1 engine handles all communication between the voice application and the LS1 hardware. Separate engines are available for the Dialogic voice hardware and Cisco Call Manager.

The LS1 engine has a configured list of LS1 boxes and creates a permanent TCP/IP connection to all boxes.

Example: Permanent connections



Each LS1 can handle one Voice-Server. If a connection breaks down, all active calls are immediately cleared. If a LS1 has to be shared by different Voice Servers, additional voice servers (Server 2 in the example) may connect via remote engine to a permanent connected Voice Server.

Outgoing Voice Call

If a Voice Server has to make an outgoing call (play message via TC/Player on telephone), it selects one of its permanent connections to LS1 and sends the call request to it. Selection of a specific LS1 is currently not supported. If the selected one is not working or if it has no free channel available, the voice server will try another one until a line server with a free channel is found. If after some retries, no channel is found, the outgoing call request is cancelled.

After the channel is found, the connection to the dialed telephone number is established like outgoing fax calls, with the exception that the values for higher layer compatibility (indicates server such as Fax G3, 3.1 kHz audio) is taken from configuration line 297 instead of config line 251 (HLC values for outgoing fax calls).

All further functionality is 100 % compatible with the existing Dialogic engine.

Note The configured PABX prefix, send mode switch "I" and the outgoing number conversion facility are not used for outgoing voice calls. This means it is compatible with Dialogic, but not with Kofax Communication Server Fax.

Incoming Voice Call

Incoming voice calls are forwarded to the voice server, keeping a permanent connection to the LS1. If the voice server is not ready, the incoming call will be cleared without any prompt to the distant user. If the voice server is working, the call will be handled as with the existing telephone engine.

Supported Voice Codecs

G.711 is the international standard for encoding telephone audio streams on a 64 kbps channel. It is a pulse code modulation (PCM) scheme operating at 8 kHz sample rate, using 8 bits per sample. There are two different variants of G.711: A-law and u-law. The former is used in the USA and Japan, and the latter in the rest of the world and on international circuits.

Each of these encoding schemes is designed to use a roughly logarithmic quantization. Lower signal values are encoded using more bits in order to reduce the quantization noise, while higher signal values require fewer bits. This ensures that low amplitude signals will be well-represented, while maintaining enough range to encode high amplitudes. In this way, the signal-to-noise ratio (SNR) does not depend on the amplitude of an incoming signal: it is a more uniform quantization noise.

On the other hand, if using the most natural linear quantization scheme (linear PCM), the signal-to-noise ratio varies with the amplitude of the incoming signal: the smaller the amplitude, the smaller the SNR. Therefore, signals encoded using linear PCM scheme are much more noisy especially in their silent parts.

How It Works

So far, Kofax Communication Server voice solution has been using the linear 8kHz 8 bit PCM encoding scheme internally. It means that all pre-recorded voice prompts but also recorded voice mails, personal greetings, and others, are stored in this format. The conversion to/from G.711 u-law/A-law (being used in the ISDN B channels) was performed by the LS1 server's hardware. As a result, the better signal-to-noise ratio (SNR) of G.711 encoded signals was definitely lost.

With TCSP 7.49.00, the LS1 was extended to support three voice encoding schemes:

1. linear PCM (8kHz 8 bit)
2. G.711 u-law (8kHz 8 bit)
3. G.711 A-law (8kHz 8 bit)

From the LS1 server's perspective, the voice application (such as TC/VoiceAccess, TC/VoiceLink) must request the proper encoding scheme for the played and recorded voice data.

How the selection of encoding scheme works:

1. Playing of the voice data (voice prompts, voice mails):

The voice application checks whether the (source) format of the voice data to be played matches with one of the encoding schemes supported by LS1.

- If the format matches, the voice data is being played transparently via LS1.
- If the format does not match, the voice application must perform the appropriate format conversion (via the resource engine – part of the voice application).

2. Recording of the voice data (voice mails, personal greetings): The destination format for recorded voice messages is configured during the voice applications' setup (refer to the *TC/VoiceAccess User Manual*).

- If the configured destination format matches one of the encoding schemes supported by the LS1, the voice data received from LS1 is being transparently stored.
- If the configured destination format does not match, voice application must perform the appropriate format conversion.

Advantage: If all pre-recorded voice prompts and also recorded voice data would be stored/recorded in the G.711 u-law or A-law format, the overall quality of Kofax Communication Server voice data streams would achieve better signal-to-noise ratio (SNR) and thus subjectively better quality.

Compatibility Issues

Format conversions between A-law and u-law G.711 variants

If the G.711 variant to be used Kofax Communication Server internally differs from the one used in the country's telephone network, the A-law/u-law conversion is being performed by the LS1 transparently without loss of quality. Therefore, a set of voice prompts recorded in A-law may be used in countries using the u-law standard, and vice versa.

For example, this may occur if Kofax Communication Server voice prompts are recorded in the u-law format but the voice server is used in Europe (using A-law format in the telephone network).

Playing of previously recorded personal greetings and voice mails

If previous messages were recorded in 8kHz 8 bit linear PCM format and they can be played via LS1 server as usual. However, if user would like to benefit from the better G.711 encoding quality, they should re-record their own personal greetings/names.

Playing of voice messages using A-law or u-law encoding scheme

If a voice message recorded in the G.711 A-law or u-law format is to be played by TC/Player via telephone on a workstation using TCCP older than 5.05.00, the G.711 encoded voice data stream is at first converted to PCM 8kHz 8 bit format and played afterwards. The consequence of this conversion is a slightly worse quality of the playback.

This drawback is caused by the resource engine (TCE_RES.DLL) older than 2.06.00 that does not recognize all 3 audio destination formats supported by the LS1. It "sees" only the first of supported formats, the PCM 8kHz 8 bit and therefore converts G.711 encoded data to this format at first. On the other hand, this drawback does not occur if playing messages via TUI interface.

To reach a better G.711 quality also for the TC/Player playback, the client side should be upgraded to TCCP 5.05.05 or later.

Lines Statistics

Both voice and fax calls are shown up-to-date in the TCfW line statistics windows or in TCMON. The actual service (voice or fax) is provided on the TCSI interface, but currently is not shown on the TCfW/TCMON User interface.

The line usage in TC/Report is based on the received/transmitted faxes. It does not consider line usage by voice.

LS1 Software Updates

Important parts of the LS1 software are kept in a flash memory. Since Flash updates are currently not supported, the following update method is used:

1. Upon each reboot the LS1 starts with the software from its flash memory.
2. After TCOSS connects to LS1, it checks if the current application program matches with the version expected by TCOSS.
3. If the match fails, TCOSS downloads the application program. This program (about 3MByte) is then used by LS1 until restart. Since such a download may take a long time on a slow WAN connection, there is a higher startup time of the LS1 in that case. Node reboots or TCOSS restarts without release update are very fast, because no download is required in that case.

Tip If startup-time on a very slow WAN connection is critical in every case, an up-to-date image must be installed locally on the LS1.

LS1V2 ignores the downloaded files from TCOSS 7.69.01 or lower because these versions do not support LS1V2. In that case, the program files in the flash of LS1V2 are always used. This allows you to use an LS1V2 with a TCOSS release that does not provide the binary files that support LS1V2.

Reference Clock Synchronization Error Detection

Each LS1 has a reference clock for all lines. This reference clock has to be synchronized with the connected exchange (=global ISDN reference clock). Position 8 in configuration line 291 can be used to change the reference clock priority of each line. See the LS1 Manual for more details.

If the LS1 reference clock is not synchronized with the clock used by any ISDN line, there will be an increased bit error rate on this line, which may lead to fax communication problems when sending/receiving without error correction mode. This may happen in the following cases:

1. The reference clock priority of a connection to a public line (either direct or via PBX) is set to 0.
2. The hardware TC16/18/23/24 is defect.

Since TCOSS 7.46.16 this problem is detected and an error message as shown below is created.

ID:	16044
TCOSS Level:	2 (means Warning)

Description:	Reference Clock on Line Server %1 is not synchronized with %3 on %4. The current reference clock source is set to %5. This problem may be caused by wrong reference clock priority configuration or defective hardware (TC16/23/24). It may reduce the quality of received and transmitted faxes without error correction mode.
Parameters:	%1 = location – identifies the Line Server %3 = Line Type (BRI or PRI) %4 = Line port (S0a, S0b, S1a or S1b) that is not synchronized %5 = Current reference clock source

This error message is repeated once a day and whenever the L1 is reactivated.

If the problem disappears after it has been reported with the error message described above, the following Info message will be created.

ID:	16045
TCOSS Level:	1 (means Info)
Description:	Reference Clock on Line Server %1 could be synchronized with %3 on %4. The current reference clock source is set to %5. This message indicates that a previously detected synchronization error does not exist anymore.
Parameters:	%1 = location – identifies the Line Server %3 = Line Type (BRI or PRI) %4 = Line port (S0a, S0b, S1a or S1b) that is not synchronized %5 = Current reference clock source

An error message that indicates this problem should be implemented.

Note Detection of synchronization problems may take up 10 minutes. Detection of correct reference clock may take up to 20 minutes.

On Device Controls and Display

LS1 features a 16x2 character display and two push buttons on the front panel. The LCD displays status information. The buttons are used to navigate through menus, to set IP address, netmask and gateway of LAN1, and to reboot the device.

On the LS1V2 it is additionally possible to remotely control administration settings using these buttons.

Startup Display

On startup, LS1 displays following information:

- TC16/TC18 BIOS Version + IP-Address
- TC/LINUX Version

Afterwards, you will see on the display that LS1 is waiting for the Kofax Communication Server server. As soon as TCOSS connects to LS1, you will get two more display screens for updating the software and for initializing the DSPs.

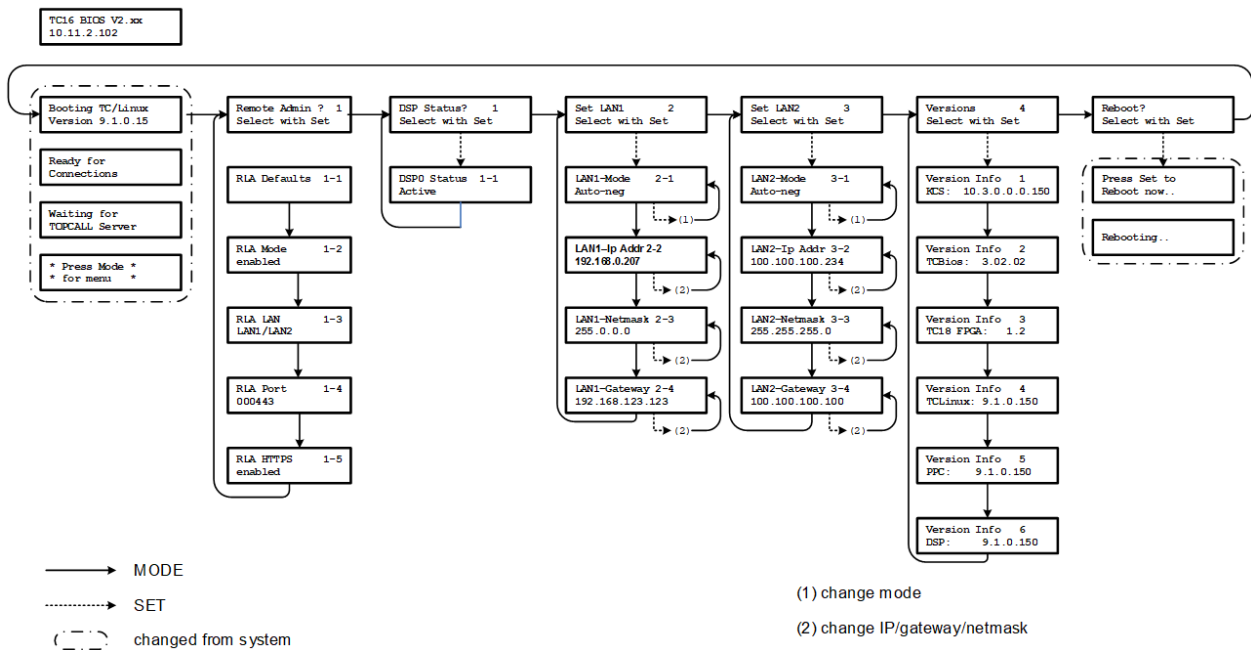
Standard Display

By default LS1 displays either "Not connected" followed by the IP address, or the current line statistics. Line statistics are displayed in the form "<no of active lines>/<no of total lines>", such as "12/32 lines" means that out of a total of 32 configured lines, 12 are active.

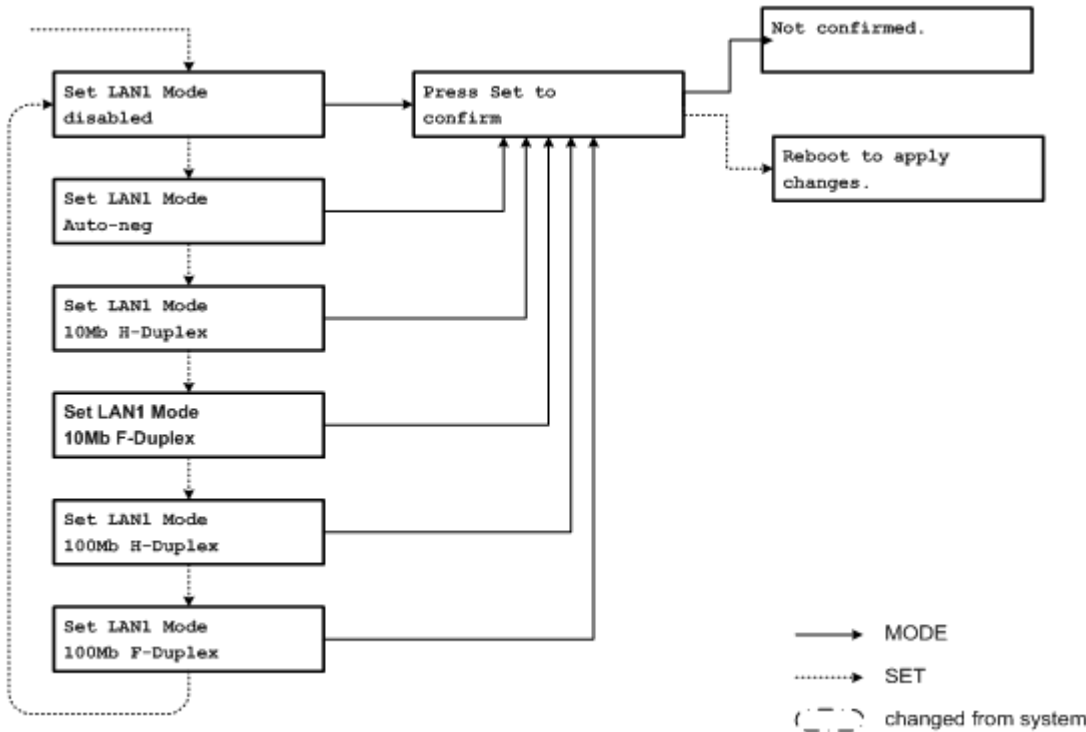
After a certain time of no button press, LS1 returns to the standard display automatically.

Menu

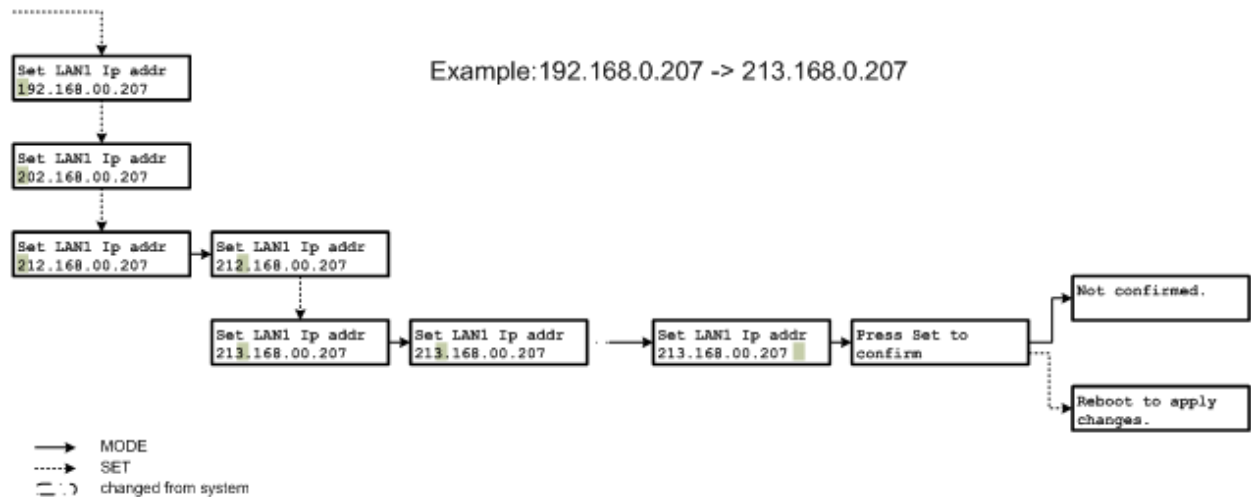
Pressing Mode at any time (except directly after booting) brings up the menu. Pressing Mode again cycles through the menu items, pressing Set selects a menu item. Pressing Mode after the last menu item returns to standard display. The menu structure is outlined below, where the left column shows the default display text without pressing any key.



Set LAN Mode



Change IP address for LAN1 (for LAN2 is the same)



Now, we describe each menu in greater detail.

Remote LS1 Admin (RLA)

Displays RLA Defaults, RLA Mode, RLA LAN, RLA Port and RLA HTTPS.

Press the Mode button to cycle through the parameters, press the Set button to change the parameter.

Description and possible values of RLA parameters are given in the following table.

Parameter	Possible values	Description
RLA Defaults		Sets all RLA parameters to their default values
RLA Mode	<ul style="list-style-type: none"> enable (default) read-only disable 	<ul style="list-style-type: none"> RLA fully enabled RLA enabled in read-only mode RLA disabled
RLA LAN	<ul style="list-style-type: none"> Lan1/Lan2 (default) Lan1 Lan2 	<ul style="list-style-type: none"> RLA may be used through both LAN interfaces RLA may be used through LAN1 interface only RLA may be used through LAN2 interface only
RLA Port	<p><nnnnn></p> <p>where <nnnnn> stands for a 5 digit decimal number in the range 1-65535 (default=00443)</p> <p>Port numbers greater than 65535 (outside the scope of valid port numbers) are accepted but then reset to 65535 without any warning during the Line server reboot.</p>	<p>TCP port number where the RLA listens for an incoming connection</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p>Note</p> <p>The port number must be a 5-digit number. If the port number is less than 5 digits, enter leading zeroes. For example, for port 80, enter 00080.</p> </div>
RLA HTTPS	<ul style="list-style-type: none"> enable (default) disable 	Enables or disables secure HTTPS connection using SSL encryption

Setting the RLA port number

1. Press the Set button to cycle the digits from 0 to 9 in the current cursor position.
2. Press the Mode button to proceed to the next position.
3. In the last, the 5th position, press the Mode button. The Confirm dialog box is displayed.
4. Press the Set button. The changes are acknowledged.

DSP Status

For each DSP, displays the current status. Status can be one of the following:

- **Not installed:** There is no DSP in the corresponding slot.
- **Idle:** The DSP is currently not in use. This is the status before TCOSS connects to LS1.
- **Booted:** The DSP is loaded and running, but does not process any data yet.
- **Active:** The DSP is active.
- **Shut down:** The DSP has been shut down, for example when TCOSS was disconnected.

With LS1V1, DSP0 is the innermost TC22 module. Press either mode or set to cycle through DSP0-DSP3. After DSP3, you return to the main menu.

With LS1V2, only DSP0 is available.

Set LAN1 / Set LAN2

Displays LAN Mode, IP address, Netmask and default gateway.

By pressing Mode you can cycle through the parameters, by pressing Set parameters can be changed.

Possible values for LAN Mode:

- "disabled",
- "Auto-neg",
- "10Mb H-Duplex"
- "10Mb F-Duplex"
- "100Mb H-Duplex"
- "100Mb F-Duplex"

Between this, values can be chosen with SET.

For IP address and gateway address, the setting starts at the ten-position of the first quad. Pressing Set changes the value, pressing Mode moves onto the next value. After the last position, you are asked to press Set to confirm. If you press Mode instead, the setting is not changed.

For the netmask, pressing Set adds one-bits to the netmask, until mode is pressed. Again, you are asked to confirm the change.

Changes apply only after LS1 is rebooted. You can reboot LS1 from the Reboot menu (see below).

Versions

This menu displays version numbers of various software components of LS1.

Reboot

When selecting reboot, you are asked to press set to confirm the choice. All ongoing activities are abandoned immediately. That implies that ongoing calls are interrupted.

It is recommended to reboot LS1 only if either some setting (IP address, netmask, and the like) has changed or if the Line Server Diagnostic tool is run. Rebooting brings LS1 into maintenance mode automatically.

With LS1V2 there is an alternate method to reboot the LS1. If you press both the Set and Mode button at least 1 second, LS1V2 will get a hardware reset. This reset will work in all situations even if LS1V2 is unresponsive or not booted.

Chapter 4

Prerequisites

- TCOSS and optionally TC/VoiceAccess from TC/SP 7.46.01 or higher for any type of ISDN connectivity (TC23 and TC24 modules).
- TCOSS from TC/SP 7.67.02 for analog fax lines (TC26 and/or TC27 module).
- The LAN connection between KCS server for each LS1 has to ensure at least the following network performance:
 - 30kBits/s of available bandwidth for each channel that is used for fax sending/reception only.
 - 70kBits/s of available bandwidth for each channel that is used for voice only.
 - 70kBits/s of available bandwidth for each channel that is used for voice and fax.
 - The average packet turnaround time with 260 byte block size must be less than 200ms (for up to 30 channels) or less than 400ms (for up to 4 channels). Single interruptions are tolerated up to 2000ms. Longer interruptions may lead to a break in the current transmission. If the network is interrupted for more than 9 seconds, the Kofax Communication Server system may restarts the Line Server Model 305.

Note This 9s time-out can be increased. Refer to the "Network interruptions to LS1 and FoIP" section in the *TCOSS Configuration Manual*.

- A static IP address for each LS1. (DHCP is not supported)
- LS1V2 firmware installed by the LSD tool from TC/SP 7.80.00 or higher for remote LS1V2 administration via the web interface.

It is neither necessary to upgrade the TCOSS server nor to restart it in order to activate the web based remote administration. However, the tc18.elf module upgrade from TC/SP 7.80.00 or higher on the TCOSS server is recommended (TCOSS restart is not necessary).

During installation only:

- A computer with Windows XP/2003 or later
- Free serial port
- Serial cable with SW or HW handshake

Chapter 5

Installation and Maintenance

This section describes the installation and maintenance of LS1.

Basic Installation

Complete the given steps to install LS1 (Step 4 is optional).

Note Start the next step only, if the previous step is completed successfully!

1. Investigate the required network quality.
2. Setup network connection to LS1.
3. Install ISDN fax channels on the LS1.
4. Optionally, configure voice servers.

Step 1: Investigate Required Network Quality

Measure the existing network bandwidth, especially if a WAN connection is used. We recommend that you use TCP/Meter (as already described for the Branchbox). See [Performance](#) for the required values.

If the required network quality is available, continue installation with step 2.

Step 2: LS1 Configuration

LS1 has a flash memory where the application software and configuration parameters are stored. As the application software is usually pre-installed at Kofax you must set up at least the mandatory configuration parameters as described below.

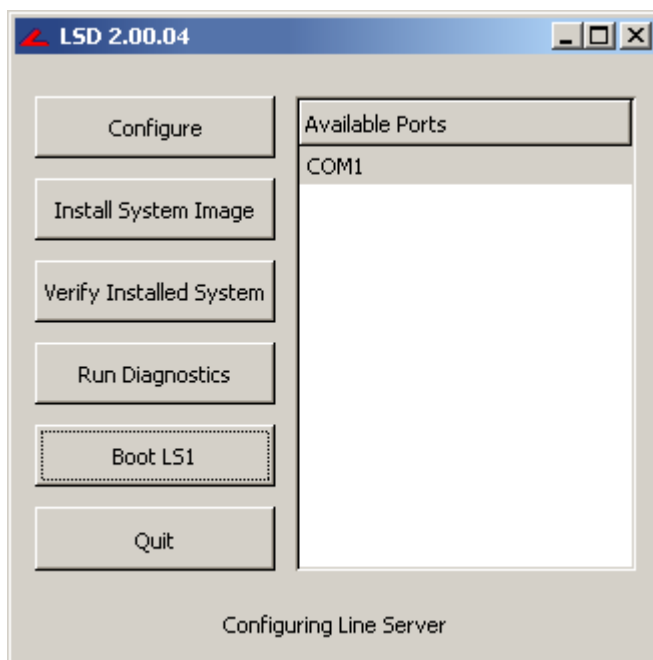
- Starting with LS1V2 and TCSP 7.80.00 or higher, LS1 servers is shipped by Kofax with pre-installed web-based remote administration support. For all other LS1V2 servers that were shipped earlier, upgrade the LS1V2 firmware with the LSD tool through serial cable only once to enable web-based remote maintenance support.
- Web-based remote maintenance replaces the functionalities of the LSD tool except for the LS1 diagnostics, which can be run only by means of the LSD tool. See [Web-based Remote LS1V2 Administration \(RLA\)](#) for details.
- Installation of the application software is optional as long as the installed version is compatible with the used TCOS release. The minimum required application software release can be taken from the release description of each TCOS version.

- During the boot process parts of the application software are updated via network. If LS1 is connected over a slow WAN link, the boot process might be delayed for some time. Consider updating software images that are installed on the server.

Line Server Diagnostics (LSD)

Line Server Diagnostics is used to install and configure LS1 and to diagnose hardware errors. It is part of the KCS Server Package where it can be selected for installation under Administrative Tools.

The system where Line Server Diagnostics is installed must be connected to the maintenance port on the backside of LS1 using a serial V.24 null modem cable. When Line Server Diagnostics is started all controls except the port selection list are disabled until a connection to LS1 in maintenance mode is detected on the selected port. To start LS1 in maintenance mode, reset the server either by power off/on or via software menu using the buttons on the front panel while LSD is running and LS1 is connected to the selected serial port.



Note The captions of the buttons in the LSD windows are generated automatically at runtime, while the descriptive texts are hard-coded. For this reason it can happen that the buttons, which have the language of the machines OS, are not in the same language as the descriptive texts.

Configuration

Select **Configure** from the main menu. The current configuration is retrieved from LS1 and following input mask is shown.

Note Settings for LAN2 are optional.

	LAN1	LAN2
LAN Mode	auto negotiation	auto negotiation
IP Address	10.0.0.10	192.168.0.207
Network Mask	255.255.255.255	255.255.0.0
Default Gateway	10.0.0.1	192.168.0.1
Password	*****	
Confirm Password	*****	
TCOSS Connect Timeout [s]	0	
Network MTU Size		
Serial Number	21	
<input type="checkbox"/> enable TcpMeter Support		

Lan Mode: Set-up speed and duplex mode. The default setting is auto-negotiation. TC/Linux 1.10.00 (part of TC/SP 7.59.06) or higher must be installed on LS1. Otherwise, the LAN mode settings are not supported. See [Recommendation for LAN Mode Configuration](#) for appropriate settings.

IP Address: Needed for network communication.

Network Mask: Required when TCOSS server is in another network segment.

Default Gateway: Required when TCOSS server is in another network segment.

Password: The password used by TCOSS to connect to LS1.

TCOSS Connect timeout(s): Defines the maximum number of seconds LS1 waits for a connection from TCOSS to DSP 0. If this time-out expires, a reboot is initiated in order to set LS1 in a well-defined state. During the restart, program files are updated and therefore LS1 cannot be reached for about 20 seconds. This should be taken into account when setting the time-out to small values. A large value increases the recovery time in case of network problems.

If the field is not set, the default value of 1800s (30 min) is used. For typical installations, this value need not to be changed. Only on slow WAN connections is a higher time-out recommended.

If the value is set to 0, an infinite TCOSS Connection time-out is used.

Network MTU Size: Defines the maximum size of network packets. By default (if the field is empty) the standard size for Ethernet (1500 Bytes) is used. If a router cannot deliver packets of this size (such as if it has to insert an additional packet header), the MTU can be reduced.

Serial Number: Must be set during first installation; cannot be changed afterwards.

You can then load any previously saved configuration from a file or once you have filled in the mandatory fields save the configuration to Line Server or a file.

Note IP Address, Network Mask and Default gateway can also be configured directly on LS1. See [On Device Controls and Display](#) for details.

Enable TcpMeter Support: TCPMeter - Server on LS1 can be enabled and disabled by configuration. If enabled, you can measure the network bandwidth quality or network bandwidth availability between a Line Server (LS1) and TCOSS Server by running TCPMeter on the TCOSS Server. For details, refer to the *tcpMeter Technical Manual*. TCPMeter - Server on LS1 used the fix port number: 5011.

Recommendation for LAN Mode Configuration

The LAN mode of the Line Server network interface should always be configured in the same way as the LAN switch that it is connected to. For example, if the switch is configured to Auto Negotiation, the LS1 should also be configured to Auto Negotiation. This will be true in most cases. However, if the switch is configured to 100 Mbps, full duplex fixed, the LS1 LAN mode should also be set to 100 Mbps, full duplex.

Auto negotiation is not the same as *auto detection*. Auto negotiation means that the possible speed and duplex mode are negotiated between both devices at the end of the cable. If one of the devices is not capable of the auto negotiation algorithm, or if it is configured to a fixed speed and duplex mode, the other device will use the so-called *parallel detection algorithm* (see IEEE 802.3-2002). In this case the device which is configured to auto negotiation automatically detects the speed of the other device. The duplex mode will be set to *half duplex* by default – it cannot be detected. This may lead to a so-called *duplex mismatch* situation, in which one device operates in full duplex mode and the other device operates in half duplex mode. A duplex mismatch situation can cause severe network performance problems and may even lead to a network interface being stuck (LS1V1 with TC/Linux older than 1.12.01). Therefore, the LAN mode of an LS1 and the switch that it is connected to should always be the same.

In TC/Linux version 1.12.01 (TC/SP 7.64.03) a workaround was introduced for LS1V1, which prevents a duplex mismatch if the switch is configured fixed to 10 Mbps / 100 Mbps, full duplex. In this case the Linux kernel automatically reconfigures the PHY chip of the LAN port for the time that the LAN link is up (without changing the LAN mode configuration entered by the user). If this workaround is applicable, the following line will appear in the COM trace:

```
eth0: PPC405 EMAC: Duplex detection workaround. Changing LAN mode to 100Mbit Full Duplex.
```

With LS1V2, this workaround is not implemented. A duplex mismatch will result when the Line Server LAN mode is configured to Auto Negotiation and if the switch is configured fixed to 10 Mbps / 100 Mbps, full duplex. Also with LS1V1 using TC/Linux versions older than 1.12.01, a duplex mismatch will occur in this situation.

The following table gives an overview of what will happen at different configuration combinations. The last column indicates the recommended configurations.

Switch configuration	Line Server configuration	Duplex mismatch with LS1V1 See Note 1.	Duplex mismatch with LS1V2	Supported
Auto Negotiation	Auto Negotiation	No	No	Yes
Auto Negotiation	100 Mbps, Full duplex	Yes	Yes	No
Auto Negotiation	100 Mbps, Half duplex	No	No	No
100 Mbps, Full duplex	100 Mbps, Full duplex	No	No	Yes
100 Mbps, Full duplex	Auto Negotiation	No	Yes See Note 2.	No See Note 2.
100 Mbps, Half duplex	100 Mbps, Half duplex	No	No	Yes
100 Mbps, Half duplex	Auto Negotiation	Yes	No	No

Note

1. Only in combination with TC/Linux 1.12.01 or higher. With older TC/Linux versions the LS1V1 will behave like LS1V2.
2. A duplex mismatch can be detected if "Speed: 100, Half duplex" can be found in the serial trace when auto negotiation mode is configured. **Warning:** A duplex mismatch can cause a link failure.

Because of the version-dependency, it is not recommended to rely on the workaround in TC/Linux 1.12.01 and higher. Instead, configure the LS1 LAN mode in the same way as the LAN mode of the switch that it is connected to.

Application Software Installation

To install the application software to LS1, select **Install System Image** from the main menu. When connected to an LS1V1, the bus configuration (epld.hex) is automatically loaded and installed. Thereafter, the software images are installed to LS1. A system image and an application image are installed to an LS1V1. Two additional files for FPGA programming and two files for hardware diagnostics are installed to the newer version of the server (LS1V2).

Application Software Verification

Select **Verify Installed System** from the main menu. The bus setup (epld.hex) is loaded and compared to the installed configuration. Thereafter, the checksum of the installed software images is verified and their description is displayed.

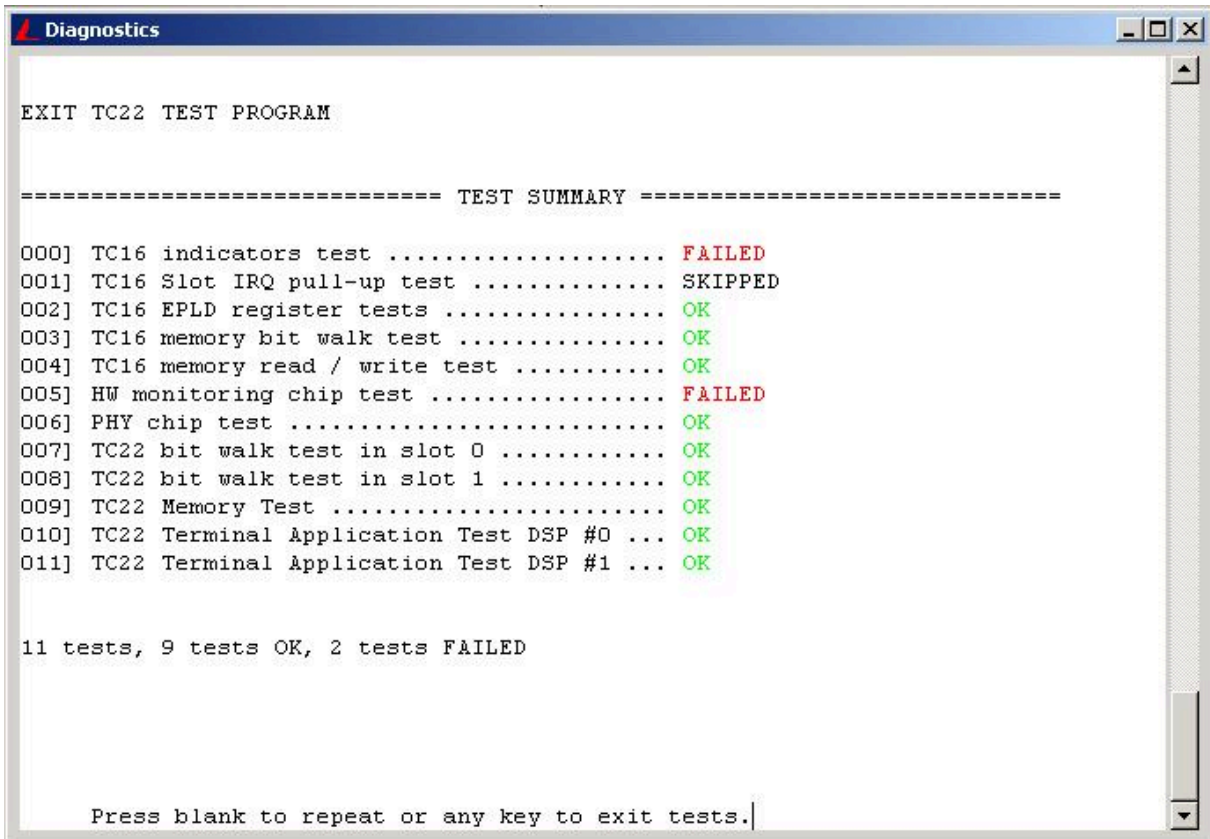
Hardware Diagnostics

Select **Run Diagnostics** from the main menu. A terminal windows is shown and the diagnostics application from the diag.sre file is loaded and automatically started. During the test, the LS1 LCD displays which part of the test is currently performed. See the following examples.

TT04: TC16 test Automatic test If you can read this, LCD is ok! TT04: TC22 test Load DSP program TT04: TC22 test Run DSP program TT04: Test ready

In the TT04 part of the test program, testing the interface modules TC23 or TC24 is part of the TC22 test. Therefore, the LCD will display "TT04: TC22 test; Run DSP program" during these tests.

By default the diagnostics application is run in non-interactive mode where all available tests are performed automatically and the results are shown in the terminal window. At the end of the test, a test summary is displayed in the terminal window (see figure below).



```

Diagnostics

EXIT TC22 TEST PROGRAM

===== TEST SUMMARY =====

000] TC16 indicators test ..... FAILED
001] TC16 Slot IRQ pull-up test ..... SKIPPED
002] TC16 EPLD register tests ..... OK
003] TC16 memory bit walk test ..... OK
004] TC16 memory read / write test ..... OK
005] HW monitoring chip test ..... FAILED
006] PHY chip test ..... OK
007] TC22 bit walk test in slot 0 ..... OK
008] TC22 bit walk test in slot 1 ..... OK
009] TC22 Memory Test ..... OK
010] TC22 Terminal Application Test DSP #0 ... OK
011] TC22 Terminal Application Test DSP #1 ... OK

11 tests, 9 tests OK, 2 tests FAILED

Press blank to repeat or any key to exit tests.

```

The test summary displays the result as follows:

- **OK** in green for every test that was performed successfully.
- **FAILED** in red for every test that failed.
- **SKIPPED** in black if a test was not performed. These tests are not executed per default (such as the TC16 Slot IRQ pull-up test) or they were deactivated by advanced start options and can be ignored if you started the Line Server Diagnostics tool as described in the paragraph "Line Server Diagnostics (LSD)" of this section.

If Line Server Diagnostics is running in advanced mode (with command line option `-a`), the diagnostics application is started in interactive mode where single tests can be performed.

After the LS1 tests are finished, it is possible to save the result of the test in an ASCII text file.

Compatibility

Generally the new LSD tool (versions 2.xx.xx) is compatible with old LSD tool (versions 1.xx.xx). But if an LS1 has been installed with LSD 1.xx.xx, and the LS1 will be verified with LSD 2.xx.xx (or vice versa), the verify function will report a bad application image. You can ignore this error because it is a known restriction.

Verify LS1 Configuration

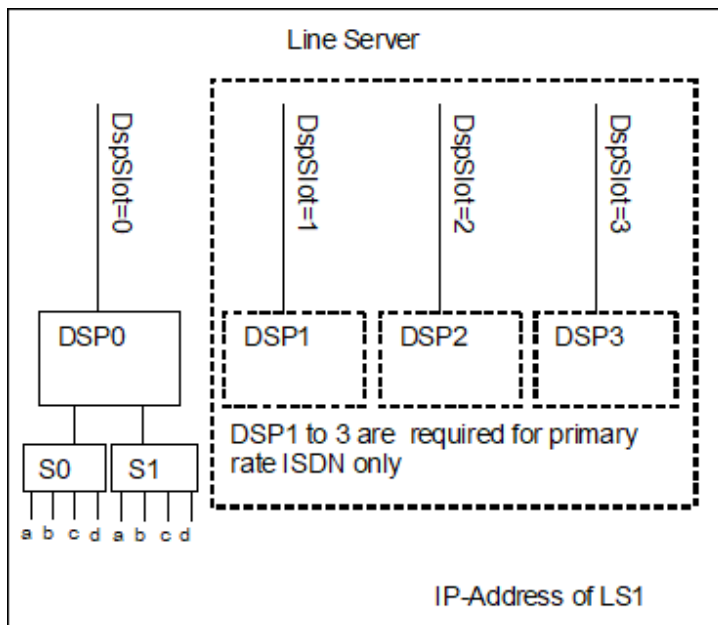
After configuration is completed, connect the LS1 to LAN (note that only LAN 1 is supported and LAN2 connector is reserved for future use) and then exit LSD to restart it. If the LAN connection is established, the left LED on the LAN connector will be green. You should then try to ping the Line server both from the TCOSS and the Voice Server to check correct IP configuration.

Example: Ping command

```
C:\TCOSS\System>ping 10.11.2.25
Pinging 10.11.2.25 with 32 bytes of data:
Reply from 10.11.2.25: bytes=32 time<10ms TTL=255
Reply from 10.11.2.25: bytes=32 time<10ms TTL=255
Reply from 10.11.2.25: bytes=32 time<10ms TTL=255
Reply from 10.11.2.25: bytes=32 time<10ms TTL=255
```

Step 3: Fax Module on LS1

The LS1V1 has up to 4 DSP modules as shown below:



The LS1 has 2 S-Slots (S0 and S1) where an ISDN (TC23 or TC24) or analog module (TC26) can be inserted. Each of the ISDN modules currently supports 2 physical ISDN lines (referred to as a and b) with 2 channels per line for basic rate ISDN (TC23) or 30 channels per line for primary rate ISDN (TC24).

The analog module (TC26) supports 4 physical analog telephone lines (referred to as a, b, c and d).

Note Only DSP module #0 has a connection to the S-Slots and is therefore mandatory. Additional DSP modules are required only if more than 8 channels have to be used on the LS1V1. With LS1V2 you have to configure all channels (up to 32 are supported) on DSP #0.

Each DSP module must be configured as an own Lanlink (L-Slave) in TCOSS. The configured IP address defines the used LS1 and the configured DspSlot defines the used DSP module. If more than one DSP module (TC22) is used, multiple LanLinks (L-Slaves) with the same IP address, port number and password settings but different DspSlot values must be configured.

To make the LS1 available for Fax or Voice operation, you must configure Fax channels. This configuration can be split into the following major steps.

1. Configuration of Lanlinks
2. Configuration of ISDN reference channels
3. Configuration of additional (non-reference) ISDN channels
4. Configuration of analog fax channels

For better understanding, see [Configuration Examples](#).

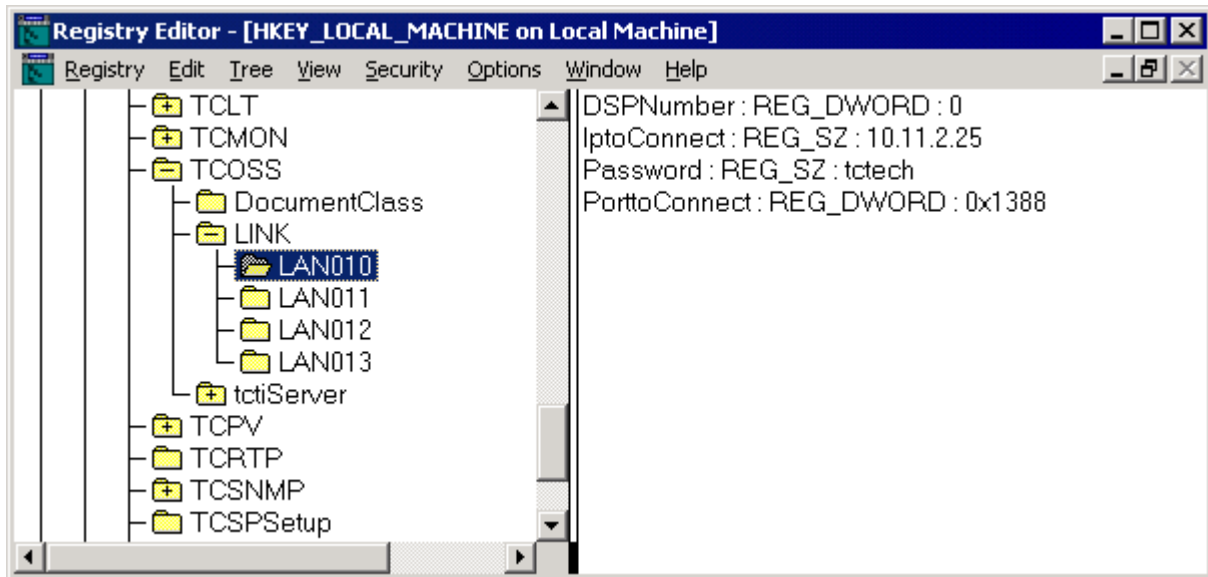
Configuration of Lanlinks in the Registry

Lanlinks (L.xxx slaves) are required for communication between TCOSS and the LS1. They have to be configured in the registry as with Branchbox installations with the exception that each installed DSP module needs its own Lanlink.

For each DSP module you must do the following:

- Find an unused Lanlink number (such as L.10) in the Wconfig HW/SW assignment. The number can be any (unused) number from 1 to 176.
- Enter IP address and authorization password into the registry key for that link (as described for Branchbox – see TCOSS release description 7.40.00).
- The used DSP module is defined by the new registry value DSPNumber. By default DSP #0 is used. If the link is used for any other DSP module you have to change to registry value DSPNumber (0=DSP #0, 1=DSP #1, ...).

A possible configuration with 4 DSP modules could look like this.



Configuration of Basic Rate ISDN Lines

By now BRI ISDN lines are only supported on DSP #0

1. Start WCONFIG, open the configure menu and then enter the SW/HW assignment sub-menu.
2. Select a free Channel.
3. Select "IF ISDN Fax" as Software Module.
4. Enter a Lanlink number for DSP module 0 of the LS1. Lanlink number can be any number from 1 to 176 corresponding to an existing registry key (such as L.10 see previous section).
5. Select Slot and Part of the Module according to the used physical line. The table below lists all supported combinations.

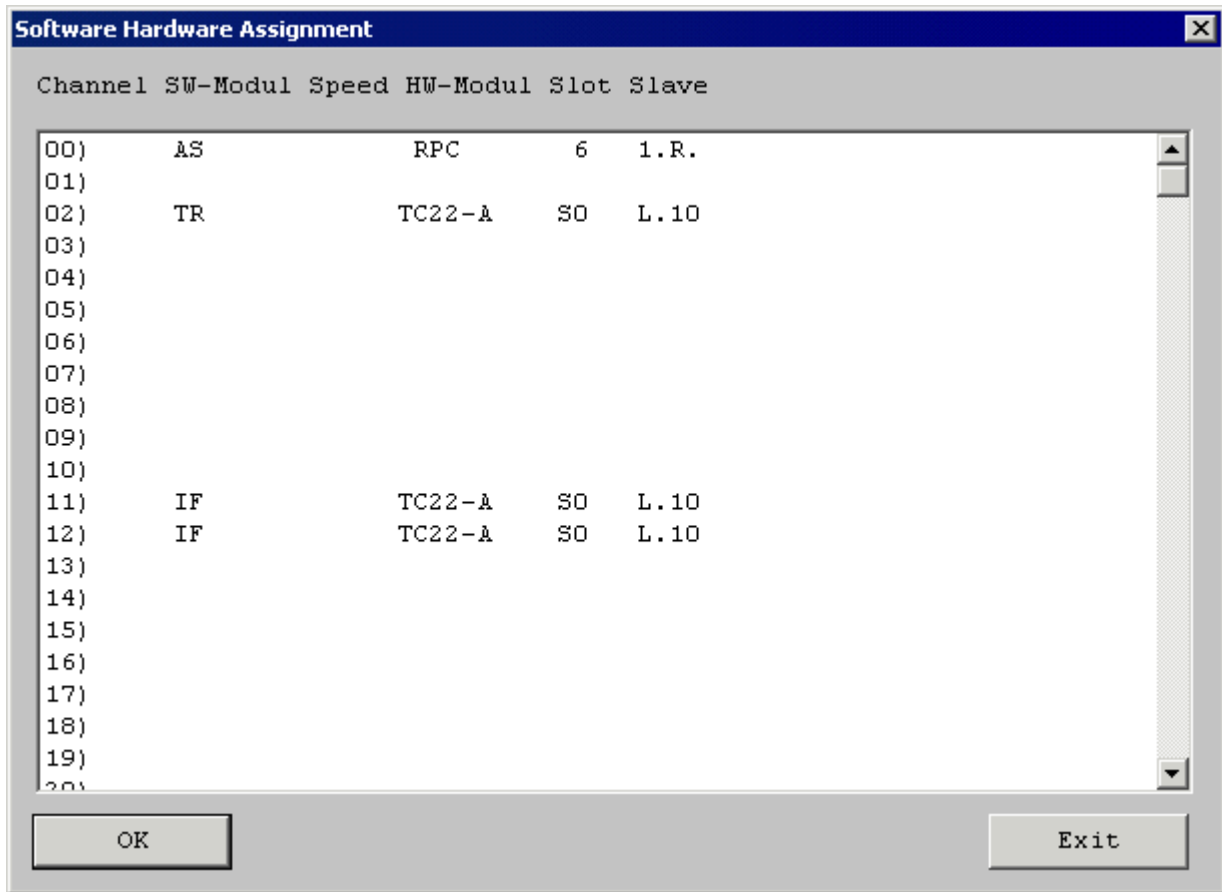
Slot and Part number	Physical line
S0a	1st Line of TC23 in Slot 0
S0b	2nd Line of TC23 in Slot 0
S1a	1st Line of TC23 in Slot 1
S1b	2nd Line of TC23 in Slot 1

6. Select Hardware: TC22.

Note Even with LS1V2 you always have to select TC22.

7. Leave the reference channel blank.
8. Make further channel specific changes from standard configuration with WCONFIG as with an UIF on TC20.

A possible configuration with 2 channels on a basic rate ISDN line on S0a could look like this:



Configuration of Primary Rate ISDN Reference Channels

You have to configure one UIF reference channel for each used physical primary rate ISDN line. It defines the physical location of the ISDN line and **must be located on DSP 0**. Follow the description below:

1. Start WCONFIG, open the configure menu and then enter the SW/HW assignment sub-menu.
2. Select a free Channel.
3. Select "IF ISDN Fax" as Software Module.
4. Enter a Lanlink number for DSP module 0 of the LS1. Lanlink number can be any number from 1 to 176 corresponding to an existing registry key (such as L.10. See previous sections).
5. Select Slot and Part of the Module according to the used physical line. The table below lists all supported combinations.

Slot and Part number	Physical line
S0a	1st Line of TC24 in Slot 0
S0b	2nd Line of TC24 in Slot 0
S1a	1st Line of TC24 in Slot 1
S1b	2nd Line of TC24 in Slot 1

6. Select Hardware: TC22.
7. Enter the own channel number as reference Channel.
8. Make further channel specific changes from standard configuration with WCONFIG as with an UIF on TC20.

At this point it is possible to test all lines with a single channel. (Install configuration and start TCOSS)

Configuration of Primary Rate ISDN Additional (Non-Reference) Channels

An additional channel must refer to any existing reference channel by its channel number. It is used to provide additional channel resource for a primary rate ISDN line.

It may be configured on any DSP module within the LS1 that is used by the referred reference channel.

With LS1V1, up to 8 channels may be configured for each DSP. With LS1V2 all channels must be configured on DSP 0. Each channel has to use the Slot and part value of the reference channel.

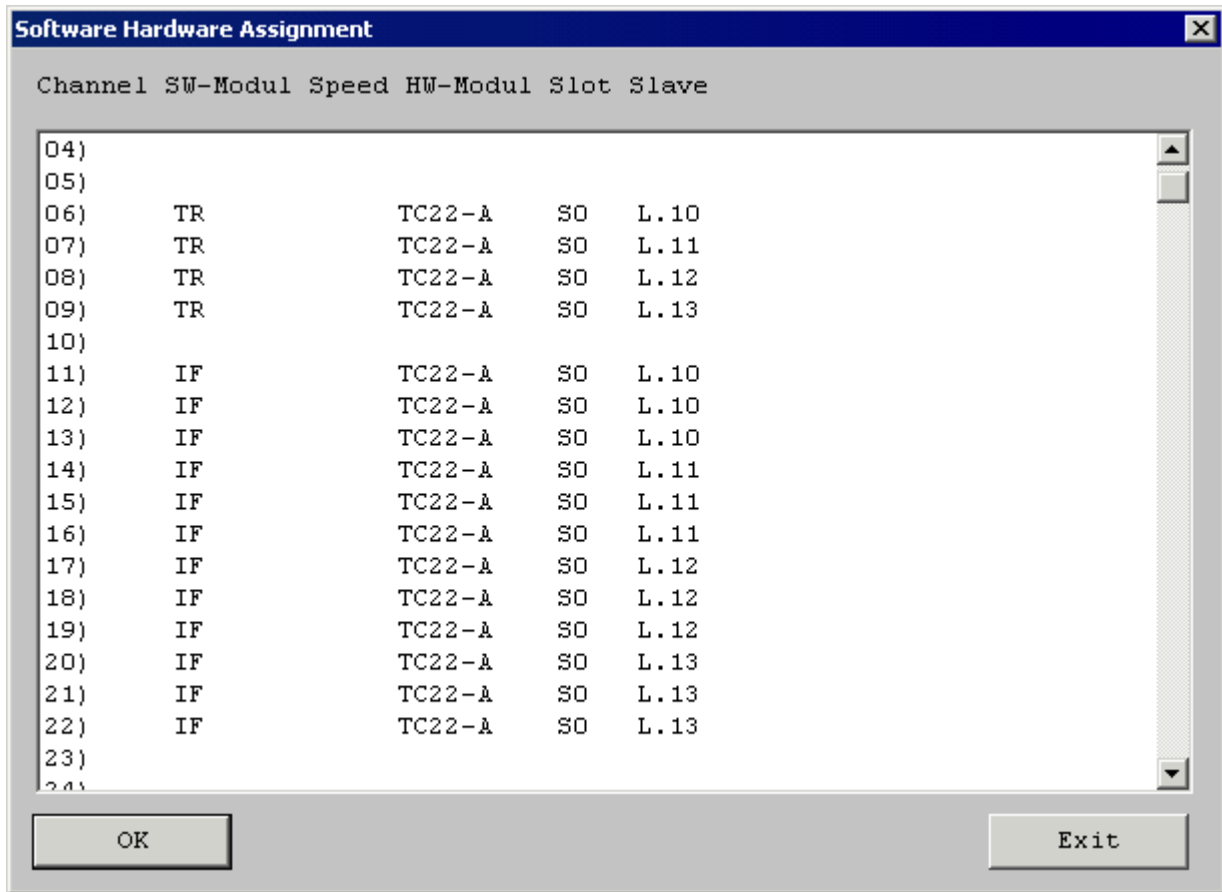
Note For LS1V1: One reference channel for each primary rate ISDN line must be configured on DSP 0 and basic rate lines must even be completely configured on DSP 0. Please be careful to **leave enough space free on DSP 0** for further primary rate ISDN reference or basic rate ISDN channels when you add primary rate ISDN non-reference channels.

Channels which belong to one primary rate ISDN line must not be interrupted by channels which belong to other lines in the SW/HW assignment. If, for example, channel 11, 12 and 14 belong to a primary rate line on S0a while channel 13 belongs to any other line the configuration won't work as expected.

Perform the following steps to configure a non reference channel:

1. Start WCONFIG, open the configure menu and then enter the SW/HW assignment sub-menu.
2. Select a free channel.
3. Select "IF ISDN Fax" as Software Module.
4. Enter a Lanlink to the used DSP module.
5. Enter the Slot and Part of the Module according to the used physical line.
6. Select Hardware: TC22.
7. Enter the channel number of the reference Channel.
8. Repeat steps 2 to 7 with all other channels.
9. Do update channel specific changes done in the reference, in all other channels you should go into the single configuration menu item of the reference channel.

A possible configuration with 12 channels (3 on every DSP) on a primary rate ISDN line for LS1V1 could look like this:



Configuration of Analog Fax Module

Analog telephone lines are only supported on DSP #0.

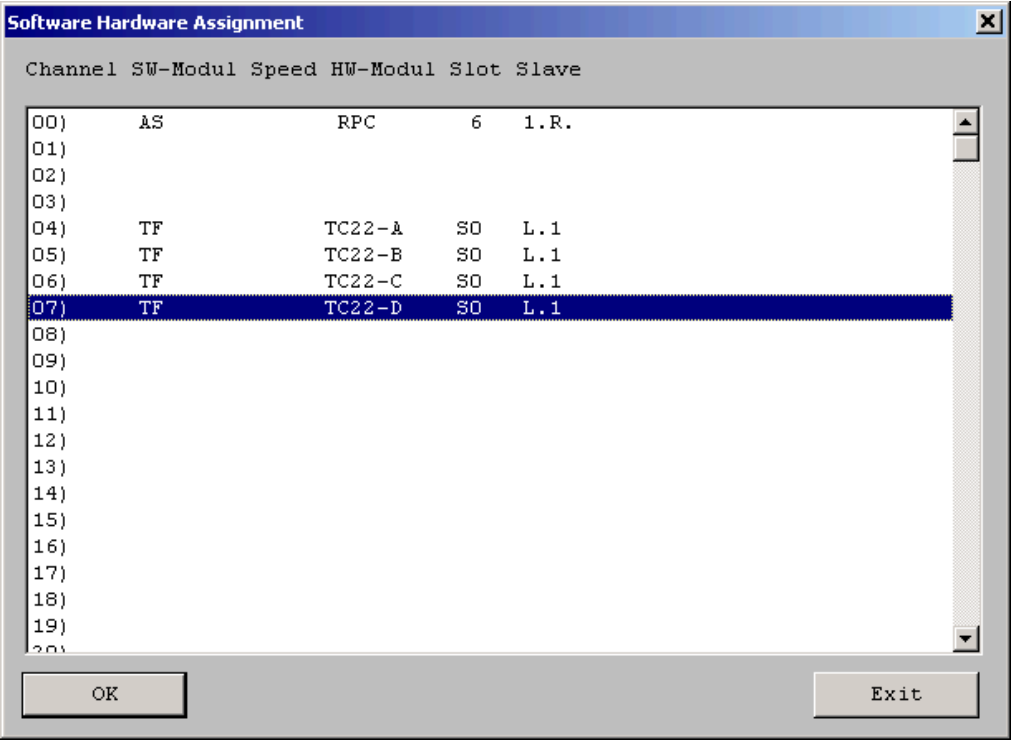
1. Start WCONFIG, open the configure menu and then enter the SW/HW assignment sub-menu.
2. Select a free Channel.
3. Select "TF Transputer Fax" as Software Module.
4. Enter a Lanlink number for DSP module 0 of the LS1. Lanlink number can be any number from 1 to 176 corresponding to an existing registry key (such as L.10 see previous section).
5. Select Slot and Part of the Module according to the used physical line. The table below lists all supported combinations.

Slot and Part number	Physical line
S0a	1st Line of TC26 in Slot 0
S0b	2nd Line of TC26 in Slot 0
S0c	3rd Line of TC26 in Slot 0
S0d	4th Line of TC26 in Slot 0
S1a	1st Line of TC26 in Slot 1

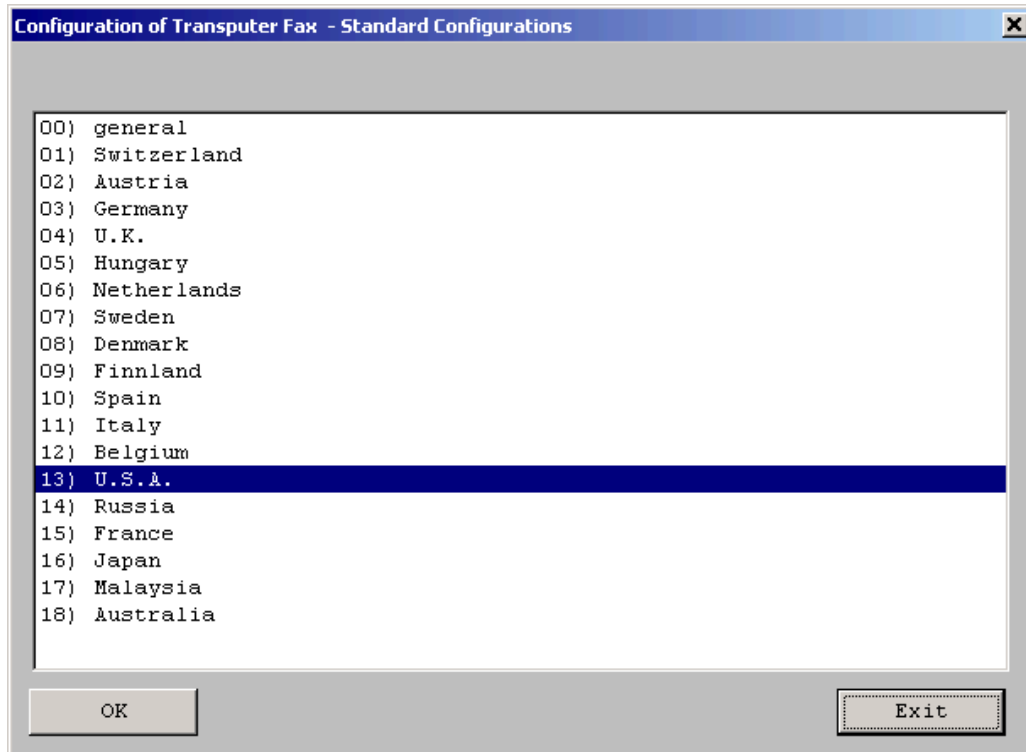
Slot and Part number	Physical line
S1b	2nd Line of TC26 in Slot 1
S1c	3rd Line of TC26 in Slot 1
S1d	4th Line of TC26 in Slot 1

6. Select Hardware: TC22.

A possible configuration with 4 analog fax channels in the slot S0 could look like this:



7. Select desired country-specific configuration (via menu "All Transputer Fax channels" and then "Standard Configurations"):



Configuration of Analog Fax Module with Bell-DID Support

The standard module for analog fax (TC26) can be extended by means of up to four TC27 modules. TC27 is a single channel analog DID module for TC26 that supports the U.S. *Direct Inward Dialing* (DID) protocol, informally known as Bell-DID. In other words, this protocol makes it possible to receive the dialed number or extension also through analog lines.

Any combinations of Bell-DID and standard analog lines on the TC26 module are supported. However, as the TC27 modules have to be soldered onto the TC26 module during the production process, please order TC26 modules with exact information on which of its four channels have to be equipped with the TC27 modules (please see TC27 Hardware Documentation for details).

In the U.S., this protocol runs on so called "*inbound analog DID trunks*". These trunks support only incoming calls.

Order an inbound analog trunk from your local telephone company with the following characteristics:

1. **Trunk type:** Two-wire loop start which works with reverse-battery signaling

(This means that the terminal equipment puts the voltage/battery on the line, not the telephone company, and the Central Office dials the DID digits into the terminal equipment.)

Service Type: Wink start protocol.

Digit Length: Number of digits to be dialed by the Central Office towards interface, usually 4.

Signaling type: DTMF.

From the configuration point of view, Bell-DID lines are configured in the same way as standard analog lines:

2. Start WCONFIG, open the configure menu and then enter the SW/HW assignment sub-menu.
 - a. Select a free channel.
 - b. Select "TF Transputer Fax" as Software Module.
 - c. Enter a Lanlink number for DSP module 0 of the LS1.

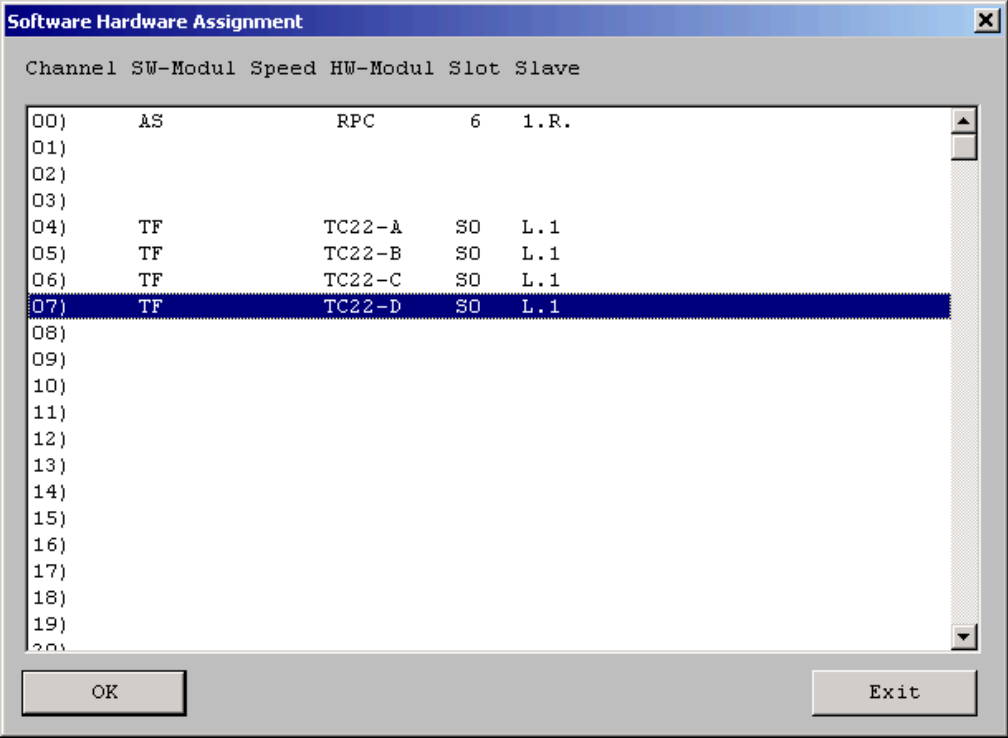
The Lanlink number can be any number from 1 to 176 corresponding to an existing registry key (such as. L.10, see previous section).
3. Select Slot and Part of the Module according to the used physical line.

The table below lists all supported combinations.

Slot and Part number	Physical line
S0a	1st Line of TC26/TC27 in Slot 0
S0b	2nd Line of TC26/TC27 in Slot 0
S0c	3rd Line of TC26/TC27 in Slot 0
S0d	4th Line of TC26/TC27 in Slot 0
S1a	1st Line of TC26/TC27 in Slot 1
S1b	2nd Line of TC26/TC27 in Slot 1
S1c	3rd Line of TC26/TC27 in Slot 1
S1d	4th Line of TC26/TC27 in Slot 1

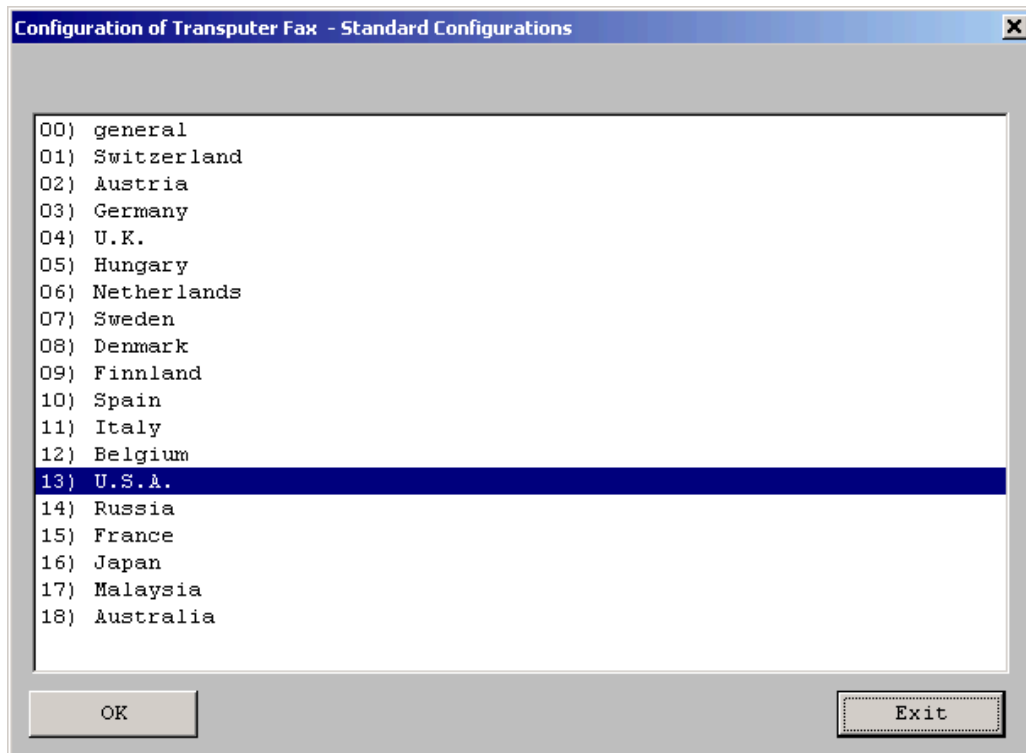
4. Select Hardware: TC22.

A possible configuration with 4 analog fax channels in the slot S0 could look like this.

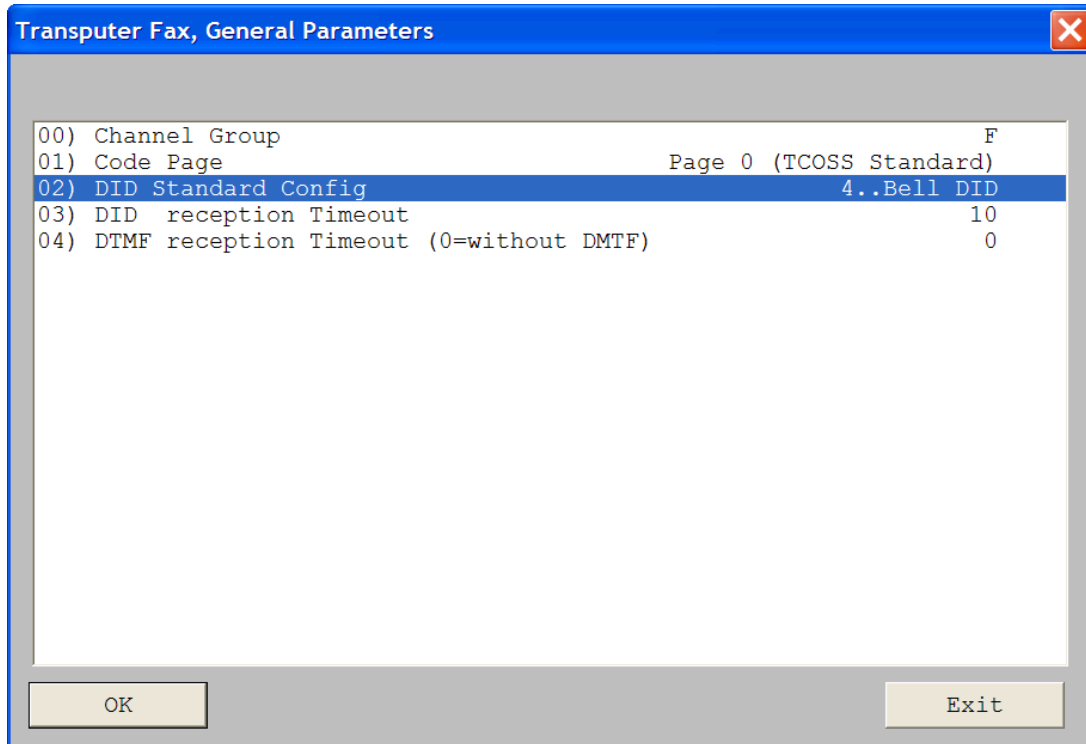


5. Select country-specific configuration for U.S. (via menu "All Transputer Fax channels" and then "Standard Configurations").

Note Only relevant option is U.S.A as the Bell-DID protocol is supported by telephone companies in the U.S. only.



6. Set DID Standard Config to Bell DID (via menu "All Transputer Fax channels or Single Channel" and then "General Parameters")



Reference Clock Selection

The LS1 uses a central clock for all connected lines. In order to avoid a slip errors on the ISDN line it is required that both the LS1 and all connected ISDN devices (usually a PABX or public exchange) are derived from the same clock source. A slip error may result in slightly reduced analog signal quality (sometimes samples are lost or doubled).

The Lines server selects the reference clock from an active line that is configured as clock slave (position 1 of config line 291 is set to 00 with PRI, BRI line are always clock slave) with a none zero reference clock priority. If more lines are active those with the highest reference clock priority is selected. If no reference clock is selected, the LS1 is using an internal reference clock.

Config line 291, 8th Position (reference clock priority)

00	Never use this line as reference clock. Recommended for PRI test loop channels.
01	You may use this line as reference clock if the layer 1 is active and configured as clock slave (default value).
02	Same as "01" but prefer this line as reference clock even if any other line with priority 1 is currently used as reference clock.

Note Change the reference clock priority to “00” if a primary rate test-loop configuration is used together with lines that are connected to a PABX or local exchange. In all other cases, use the default reference clock priority.

Configuration Examples

The configuration examples describe the registry settings and HW/SW assignment only.

ISDN channel specific configuration parameters, such as PRI configuration and Inbound routing, are fully compatible with UIF on TC20 and therefore not described here. The reference channels are bold.

The analog line country dependent settings (as for TC26 analog module) are also being automatically set by the WCONFIG for the desired country.

Quad Basic Rate ISDN

Registry settings

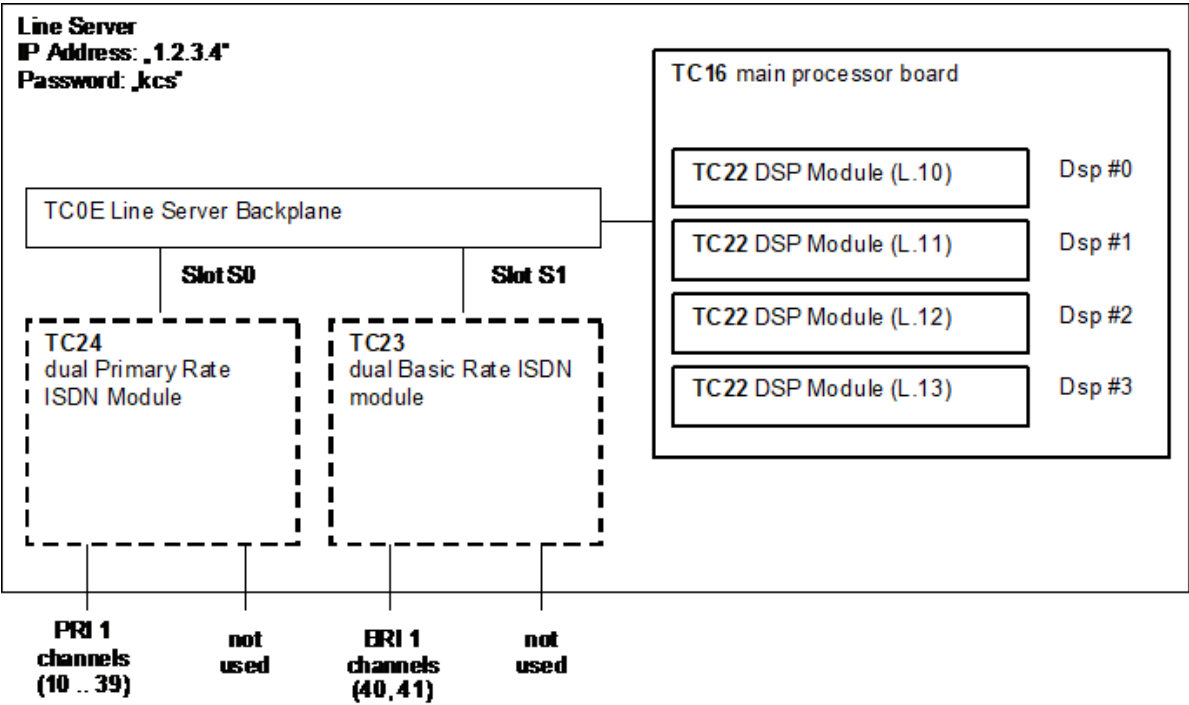
Slave	Reg. Key	IpToConnect	Password	DspNumber
L.10	LINK/LAN010	“1.2.3.4”	“kcs”	0 (=default)

HW/SW Assignment

Channel	Slave	Slot/Part	ref. Channel
10	L.10	S0a	10
11	L.10	S0a	10
12	L.10	S0b	12
13	L.10	S0b	12
14	L.10	S1a	14
15	L.10	S1a	14
16	L.10	S1b	16
17	L.10	S1b	16

Single E1 Primary Rate ISDN and Single Basic Rate ISDN Using LS1V1

Overview



Registry settings

Slave	Reg. Key	IpToConnect	Password	DspNumber
L.10	LINK\LAN010	“1.2.3.4”	“kcs”	0 (=default)
L.11	LINK\LAN011	“1.2.3.4”	“kcs”	1
L.12	LINK\LAN012	“1.2.3.4”	“kcs”	2
L.13	LINK\LAN013	“1.2.3.4”	“kcs”	3

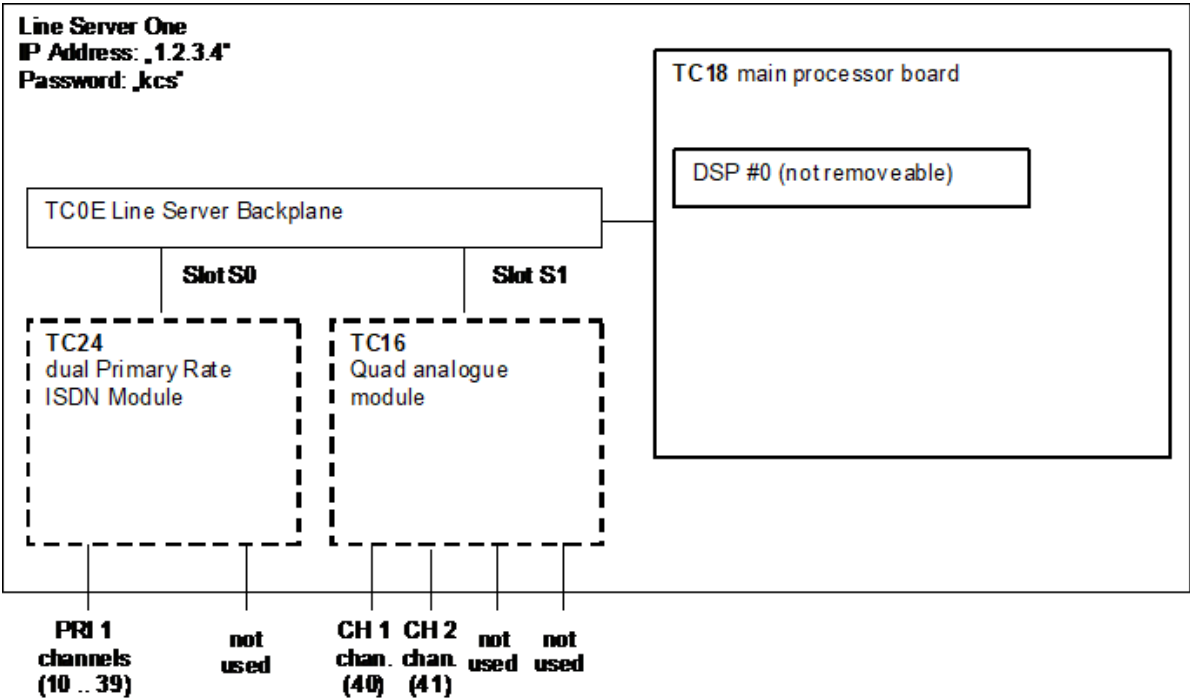
HW/SW Assignment

Channel	Slave	Slot/Part	ref. Channel
10	L.10	S0a	10
11	L.10	S0a	10
12	L.10	S0a	10
13	L.10	S0a	10
14	L.10	S0a	10
15	L.10	S0a	10
16	L.11	S0a	10
17	L.11	S0a	10
18	L.11	S0a	10

Channel	Slave	Slot/Part	ref. Channel
19	L.11	S0a	10
20	L.11	S0a	10
21	L.11	S0a	10
22	L.11	S0a	10
23	L.11	S0a	10
24	L.12	S0a	10
25	L.12	S0a	10
26	L.12	S0a	10
27	L.12	S0a	10
28	L.12	S0a	10
29	L.12	S0a	10
30	L.12	S0a	10
31	L.12	S0a	10
32	L.13	S0a	10
33	L.13	S0a	10
34	L.13	S0a	10
35	L.13	S0a	10
36	L.13	S0a	10
37	L.13	S0a	10
38	L.13	S0a	10
39	L.13	S0a	10
40	L.10	S1a	40
41	L.10	S1a	40

Single E1 Primary Rate ISDN and Two Analog Fax Lines Using LS1V2

Overview



Registry settings

Slave	Reg. Key	IpToConnect	Password	DspNumber
L.10	LINK\LAN010	"1.2.3.4"	"kcs"	0 (=default)

HW/SW Assignment

Channel	Slave	Slot/Part	ref. Channel
10	L.10	S0a	10
11	L.10	S0a	10
12	L.10	S0a	10
13	L.10	S0a	10
14	L.10	S0a	10
15	L.10	S0a	10
16	L.10	S0a	10
17	L.10	S0a	10
18	L.10	S0a	10
19	L.10	S0a	10
20	L.10	S0a	10
21	L.10	S0a	10

Channel	Slave	Slot/Part	ref. Channel
22	L.10	S0a	10
23	L.10	S0a	10
24	L.10	S0a	10
25	L.10	S0a	10
26	L.10	S0a	10
27	L.10	S0a	10
28	L.10	S0a	10
29	L.10	S0a	10
30	L.10	S0a	10
31	L.10	S0a	10
32	L.10	S0a	10
33	L.10	S0a	10
34	L.10	S0a	10
35	L.10	S0a	10
36	L.10	S0a	10
37	L.10	S0a	10
38	L.10	S0a	10
39	L.10	S0a	10
40	L.10	S1a	
41	L.10	S1b	

New Configuration Parameters for ISDN Channels

The following configuration parameters were added to the configuration of UIF and UTF.

- Configuration line 242 has been extended from 4 to 12 hex positions. It is used for various trace options.
- Configuration line 292, 293 and 294 are reserved (as comment line) for future ISDN features.
- Configuration line 295 (8 HEX position) is used to enable outgoing Voice support on that channel. If position 1 is set to "01", the channel is available for IP/Voice and can be used for outgoing voice calls.
- Configuration line 296 (8 Hex positions) is reserved for status/logging options of incoming and outgoing voice calls.
- Configuration line 297 (6 Hex positions) is used for HLC (High Layer Compatibility) for outgoing voice calls.
- Configuration line 298 (16 Hex positions) is reserved for incoming voice codec configuration.
- Configuration line 299 (16 Hex positions) is reserved for outgoing voice codec configuration.
- Position 8 of configuration line 291 is used as reference clock priority. This position was unused with prior releases. The default value (both standard config and after update) has been changed from 00 to 01.

The new standard values are shown below.

Line	default value
242	:00 00 00 00 00 00 00 00 00 00 00 00,
292	,
293	,
294	,
295	:00 00 00 00 00 00 00 00,
296	:00 00 00 00 00 00 00 00,
297	:00 00 00 00 00 00,
298	:00 00 00 00 00 00 00 00 00 00 00 00 00 00 00,
299	:00 00 00 00 00 00 00 00 01 00 00 00 00 00 00 00,

Line	default value
242	:00 00 00 00 00 00 00 00 00 00 00 00,
292	,
293	,
294	,
295	:00 00 00 00 00 00 00 00,
296	:00 00 00 00 00 00 00 00,
297	:00 00 00 00 00 00,
298	:00 00 00 00 00 00 00 00 00 00 00 00 00 00,
299	:00 00 00 00 00 00 00 00 01 00 00 00 00 00 00 00,

New Configuration Parameters for Analog Fax Channels

The following configuration parameters are being used now for the configuration of the analog module TC26. Note that these configuration lines have been used for ISDN modules before and were not relevant for analog Fax (UTF) configurations:

- Configuration line 289, (16 Hex positions). It is used for incoming call ring detector configuration.
- Configuration line 291, (16 Hex positions). It is used for analog telephone line parameters configuration.
- Configuration line 298, (8 Hex positions). It is used for call progress analysis configuration.
- Configuration line 299, (16 Hex positions). It is used for call progress tone detector filter configuration. Note that this configuration line replaces configuration lines 126-129 which are being used for tone detector configuration for the TC20 based analog fax modules (TC32, ...).

The new standard values are shown below:

Line	default value
289	:00 01 00 00 00 19 16 02 03 01 00 00 00 00 00 00,
291	:02 08 00 01 00 00 03 00 00 00 00 00 00 00 00 00,

Line	default value
298	:50 1E 14 00 08 34 00 00 00 00 00 00 00 00 00,
299	:01 63 01 90 01 BD 01 EA 00 00 00 00 00 00 00 00,

Line	default value
289	:00 01 00 00 00 19 16 02 03 01 00 00 00 00 00,
291	:02 08 00 01 00 00 03 00 00 00 00 00 00 00 00,
298	:50 1E 14 00 08 34 00 00 00 00 00 00 00 00 00,
299	:01 63 01 90 01 BD 01 EA 00 00 00 00 00 00 00 00,

There is no need to setup any of the parameters listed above manually in the field. As the most of analog telephone line parameters are country-dependant (typical example is the line AC impedance), they are properly set for desired country through WCONFIG's country-dependant standard configurations.

Detailed Description

Config line 289 : 00 01 00 00 00 19 16 02 03 01 ,

Usage: 10 hex positions, Parameters for the Incoming call ring detector in the TC26 module (6 last positions reserved)

Position 1	Ring detector full wave mode disabled/enabled
00	1 byte, full wave mode disabled (default)
01	1 byte, full wave mode enabled

Position 2	Ring validation disabled/enabled
00	1 byte, ring validation disabled
01	1 byte, ring validation enabled (default)

Position 3	CallerID operation mode
00	1 byte, reserved for future use

Position 4	Ringer Impedance
00	1 byte, maximum (high) ringer impedance (default)
01	1 byte, synthesized ringer impedance to satisfy a max. ringer impedance in countries like Poland, South Africa, and Slovenia

Position 5	Ring detector threshold
Defines the minimum and maximum level of acceptable ring signal. Signals below the lower level do not generate a ring detection, but the signals above the upper level are guaranteed to generate a ring detection anyway.	
00	1 byte, 13.5 Vrms<=RingLevel<=16.5Vrms (default)
01	1 byte, 19.35 Vrms<=RingLevel<=23.65Vrms

Position 5	Ring detector threshold
02	1 byte, reserved
03	1 byte, $40.5 \text{ Vrms} \leq \text{RingLevel} \leq 49.5 \text{ Vrms}$

Position 6	Minimum Ringer Frequency
19	1 byte, sets the minimum ringer tone frequency to 10Hz, computed according to the formula: $\text{Pos5} \geq 1/(2 \times \text{Fmin} \times 2\text{ms})$, where Fmin is the min. ringer freq. in Herz

Position 7	Maximum Ringer Frequency
16	1 byte, sets the maximum ringer tone frequency to 83Hz, computed according to the formula: $\text{Pos6} \geq \text{Pos5} - 1/(2 \times \text{Fmax} \times 2\text{ms})$, where Fmax is the max. ringer freq. in Hertz Additionally relation $\text{Pos6} \leq \text{Pos5}$ must apply.

Position 8	Minimum Ring Duration
1 byte, sets the amount of time the ring frequency must be within tolerances set by upper positions 5 and 6 to be classified as a valid ring signal, following values are possible.	
00	1 byte, Ring confirmation time 100ms
01	1 byte, Ring confirmation time 150ms
02	1 byte, Ring confirmation time 200ms (default)
03	1 byte, Ring confirmation time 256ms
04	1 byte, Ring confirmation time 384ms
05	1 byte, Ring confirmation time 512ms
06	1 byte, Ring confirmation time 640ms
07	1 byte, Ring confirmation time 1024ms

Position 9	Ring Timeout (minimum pause between two subsequent rings)
1 byte, sets the point when a ring signal is determined to be over after the most recent ring threshold crossing. In other words, it sets the minimum pause between to subsequent ring signals.	
00	1 byte, reserved
01	1 byte, Ring confirmation time 128ms
02	1 byte, Ring confirmation time 256ms
03	1 byte, Ring confirmation time 384ms (default)
04	1 byte, Ring confirmation time 512ms
05	1 byte, Ring confirmation time 640ms

0F	1 byte, Ring confirmation time 1920ms

Position 10	Ring Delay
1 byte, sets the amount of time between when a the ring signal is validated and when a valid ring signal is indicated. If the ring delay expires before the ring timeout (Position 8 above), a valid ring is indicated.	
00	1 byte, 0ms
01	1 byte, Ring confirmation time 256ms (default)
02	1 byte, Ring confirmation time 256ms
03	1 byte, Ring confirmation time 384ms
04	1 byte, Ring confirmation time 512ms
05	1 byte, Ring confirmation time 640ms

0F	1 byte, Ring confirmation time 1920ms

Config line 291 : 02 08 00 01 00 00 03 00 00 00 00 00 00 00 00 ,

Usage: 9 hex positions, analog telephone line parameters
(7 last positions reserved)

Position 1	Off-hook AC Impedance Selection
00	1 byte, 600 Ohm (USA, Japan)
02	1 byte, 270 Ohm + (750 Ohm 150nF) (TBR21, Europe)
03	1 byte, 220 Ohm + (820 Ohm 120nF) Australia
05	1 byte, 320 Ohm + (1050 Ohm 230nF) United Kingdom

Position 2	Transmitter Gain/Attenuation Control
The four LSB bits set (bits 0-3) the gain/attenuation level in 1dB steps, in the range +12/-15 dB The 4th bit selects the gain or attenuation mode: 4th bit = 0 Gain 4th bit = 1 Attenuation	
00	1 byte, 0dB gain applied to the transmit path
01	1 byte, 1dB gain applied to the transmit path

08	1 byte, 8dB gain applied to the transmit path (default)

0C	1 byte, 12dB gain applied to the transmit path

11	1 byte, -1dB attenuation applied to the transmit path

1F	1 byte, -15dB attenuation applied to the transmit path

Position 3	Receiver Gain/Attenuation Control
The four LSB bits set (bits 0-3) the gain/attenuation level in 1dB steps, in the range +12/-15 dB The 4th bit selects the gain or attenuation mode: 4th bit = 0 Gain 4th bit = 1 Attenuation	
00	1 byte, 0dB gain applied to the receiver path (default)
01	1 byte, 1dB gain applied to the receiver path

08	1 byte, 8dB gain applied to the receiver path

0C	1 byte, 12dB gain applied to the receiver path

11	1 byte, -1dB attenuation applied to the receiver path

1F	1 byte, -15dB attenuation applied to the receiver path

Position 4	Current Limiting disabled/enabled
00	1 byte, current limiting disabled
01	1 byte, current limiting enabled. This setting limits loop current to a maximum of 60mA (per the TBR21 standard) (default)

Position 5	DC Impedance
00	1 byte, 50 Ohm DC impedance (default)
01	1 byte, 800 Ohm DC impedance

Position 6	Minimum Operational Loop Current
Adjusts the minimum loop current at which the TC26 can operate.	
00	1 byte, 10mA (default)
01	1 byte, 12mA
02	1 byte, 14mA
03	1 byte, 16mA

Position 7	TIP/RING Voltage Adjust
Adjusts the voltage on the line-side of the TC26, which affects the TIP/RING voltage on the line.	
00	1 byte, 3.1V
01	1 byte, 3.2V
02	1 byte, 3.35V

Position 7	TIP/RING Voltage Adjust
03	1 byte, 3.5V (default)

Position 8	On-Hook Speed
	Adjusts how quickly line loop current equals zero (mA) after the TC26 has changed the state from Off-Hook to On-Hook.
00	1 byte, less than 0.5ms (default)
04	1 byte, 3ms +- 10%
0B	1 byte, 26ms +- 10% (Australia)

Position 9	Activate Auto-calibration of the A/D converter:
	Chooses the method to be used for the calibration of the TC26 A/D converter (analog to digital converter used for digitalization of the analog telephone signals). This calibration is necessary to adjust the A/D circuitry to the exact line conditions present at the time of going off-hook. The manual A/D calibration is the preferred method to be used.
00	1 byte, manual A/D calibration is being used (default)
01	1 byte, auto-A/D calibration is being used

Position 10	Line voltage detection disabled/enabled
	Prior to each outgoing call attempt TC26 interface checks whether the analogue telephone line is connected and operational by the line voltage detection facility. If no line voltage is detected it is assumed that no line is connected and the outgoing call will break with the error code "XH". But rarely there were situations observed in the field where the line voltage detection was not working reliably (no line voltage detected even if a working telephone lines was properly connected to the TC26). Therefore it is possible to disable the line voltage detection using this position. Note that in the case line voltage detection would be disabled, and the line is not connected, the outgoing call would break either with error "XJ" or "XL".
00	1 byte, line voltage detection enabled (default)
01	1 byte, line voltage detection disabled

Config line 298 : 50 23 14 00 08 34 00 00 00 00 00 00 00 00 00 00,

Usage: 8 hex positions, Call progress detector parameters (8 last positions reserved)

Position 1	Call progress tones detector relative sensitivity
	It is expressed in percent of the total signal energy, according to the formula: $\text{Sensitivity} = (\text{CallProgressTonesEnergy} * 100) / \text{TotalSignalEnergy}$
50	1 byte, corresponds with sensitivity 80% (default) If the call progress tone energy lies below this relative sensitivity, the call progress tone will be not recognized.

Position 2	Call progress tones detector minimum energy level
It is in the range from -10dBm to -35dBm	
23	1 byte, corresponds with minimum level -35dBm (default) If the call progress tone energy lies below this level, the signal is considered being pure noise and thus call progress tone will be not recognized.

Position 3	Block size for the Call progress tones analysis in milliseconds
Three values are possible: 10ms, 20ms, and 30ms	
14	1 byte, corresponds with block size 20ms (default)

Position 4	Reserved
------------	----------

Position 5-8	2 CED fax tone detector coefficients that deploy a notch or band-pass filter
<p>They detect the frequency range of the CED tone.</p> <p>Each coefficient is an integer value occupying 2 byte positions, the MSB byte the first.</p> <p>The default configuration deploys the notch filter in the frequency range 2100Hz ($\pm 5\%$) that detects the CED tone being generated by the terminating fax machine during an outgoing fax call.</p> <p>This setting activates the detection of the CED fax tone being generated by the terminating fax machine during an outgoing fax call.</p>	

Config line 299 : 01 63 01 90 01 BD 01 EA 00 00 00 00 00 00 00 00,

Usage: 16 hex positions, Call progress detector parameters

Position 1-16	8 Call progress tone detector coefficients that deploy a band-pass filter
<p>They detect the frequency range of the call progress tone. Each coefficient is an integer value occupying 2 byte positions, the MSB byte the first.</p> <p>The default configuration deploys the band-pass filter in the frequency range 340Hz–500Hz according to the international standard ITU E.180/Q.35, which states that the accepted frequency for the dial, busy and ringing tones should be not less than 340Hz and not more than 500 Hz.</p>	

Step 4: Use the LS1 by Voice Servers

This step is optional if the channel should be used for voice.

Note It is strongly recommended to make an incoming/outgoing fax test call at end of step 3, even if it will be configured as dedicated voice channel in this step.

Changes on the TCOSS Server

The UIF module on LS1 integrates the voice functionality. By default all channels are activated for fax and disabled for voice. Therefore the following configuration changes are possible.

Action	Description
Enable incoming voice support	To handle incoming calls, the received DDI/DMTF number must be converted into a number started with "V" in the UIF number conversion table. You must use different DDI numbers for incoming Fax and Voice message. Example: Set configuration line 254 to "11~=V~" to forward all incoming calls with DDI numbers that starts with "1" to any VoiceMail server.
Disable incoming fax support	Fax reception is disabled if all DDI numbers are converted to "V..." in the number conversion table. (All incoming calls including fax calls are routed to the voice server instead) Example: Set configuration line 254 to "3~=V~".
Enable outgoing voice support	Set the position of configuration line 295 from "1" to "01" to make the channel available for outgoing voice calls.
Disable outgoing fax support	Assign different channel group, such as G on those channels which should be disabled for fax and do not send any faxes via this group.

No other changes are required on TCOSS and the LS1.

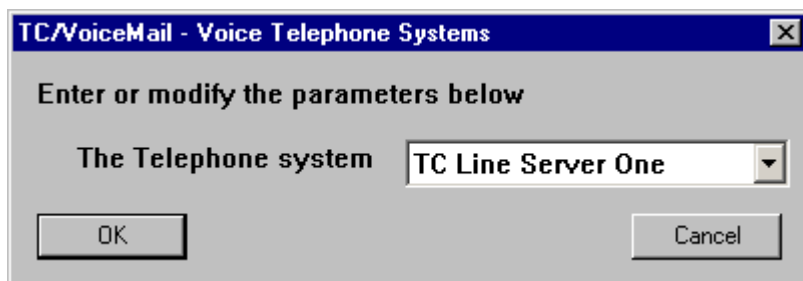
Changes on Voice Server

This section describes the changes required on voice server.

Installation

LS1 installation as a telephone system for TC/VoiceMail via setup is implemented with TC/SP 7.44.06. Make sure that you have selected TC/VoiceMail to be installed.

1. Select "TC Line Server One" as telephone system for TC/VoiceMail in the TC/SP setup. Other telephone systems installed before are removed by selecting LS1.



2. Enter the IP address or hostname of the LS1 and a Password for the connection. IP address or hostname is mandatory for LS1 installation. If no password was set yet (first installation) and no password was entered by the user either, "tctech" is used as default.

Note The setup of TC/SP 7.44.06 does not store which telephone system was selected, so that on every further installation it has to be selected again manually. Otherwise CT/Media, which is selected by default, would be installed and replace the LS1 as telephone system. This error is corrected within the TC/SP following to TC/SP 7.44.06.

Connection (LS1)

Registry keys used by TCE_LS1:

HKEY_LOCAL_MACHINE\Software\Topcall\TCECP\TCRT\TCE_LS1

Registry Key	Type	Description
Tracelevel	DWORD	0 Errors only (default), 1 Messages, 2 Data, 4 TCP , 8 details, 0x10 handles

HKEY_LOCAL_MACHINE\Software\Topcall\TCECP\TCRT\TCE_LS1\LAN000

Registry Key	Type	Description
IPtoConnect	String	IP Address or Host name of LS1
Password	String	LS1 password. If is not already encrypted it will be encrypted by the voice server.
PorttoConnect	DWORD	Optionally required if message port 5001 cannot be used.
Cs1TraceLevel	DWORD	0 Errors only (default), 1 Messages, 2 Data, 4 TCP, 8 everything
IPTimeout	DWORD	Timeout for TCP/IP operations (Default: 5000 ms)
Priority	DWORD	Priority of this session in a fault tolerant system (Default: 1)

When TCECP is loading TCE_LS1 for the first time these registry keys will be created automatically.

Note At the moment only one LS1 is allowed per voice server and vice versa.

If "IPtoConnect" is set to the hostname make sure that this name is defined in the HOST file (c:\winnt\system32\drives\ect\HOST). At the moment it is not possible to change the connection-port on the

LS1 side. So it is not allowed to change the "PorttoConnect" – value from its default. This port will be used for messages only. Data will be sent to the next port (5002).

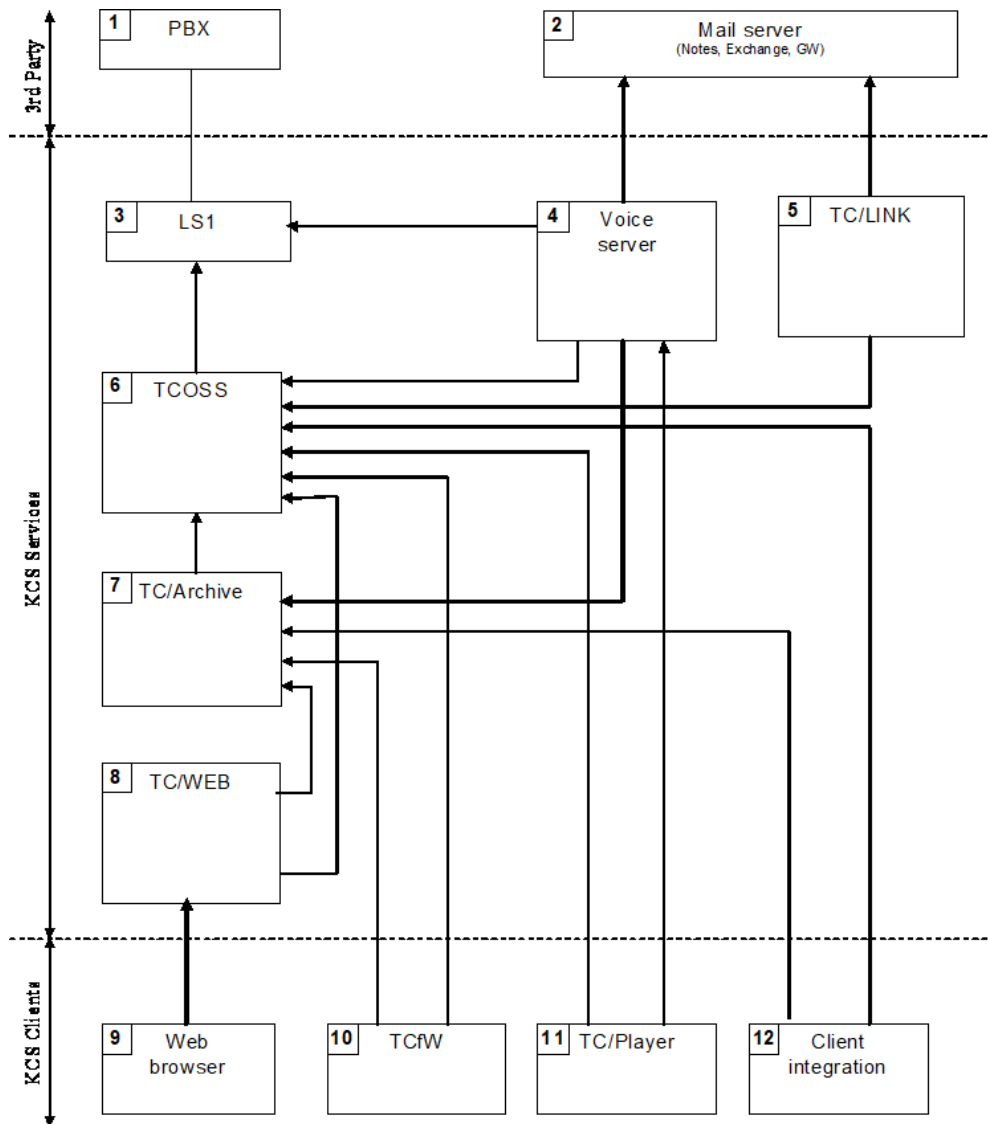
The priority of the session is used for fault tolerant systems. A priority of "1" is lower than "2", "3" and so on. If a session with a higher priority tries to connect to a LS1 the old session is closed and the new one becomes active.

Fault Tolerant Installation

This section describes the fault tolerant installation.

KCS Fault Tolerance Overview

This section gives an overview about KCS fault tolerance strategies. As a basic rule the fault tolerance ensures that KCS communication services are available even if any single component fails (single fault) without the need of manual intervention. In some cases, a single fault may lead to a short down time or/and reduced performance. If multiple faults occur, operation cannot be guaranteed.



Typical KCS messaging structure overview

The fault tolerance strategy for each component described above is shown in the table below. The fail-over handling for line / LAN errors is described for the server component of the connection (=target of arrow in the drawing above).

Ref	Application(s)	Description of fault tolerance
1	PBX	<p>Fault tolerance of BPX must be provided its manufacturer. If fault tolerance is required for a PABX extension, incoming calls to this extension must be distributed to multiple LS1. It's the responsibility of the PBX the select an active line for incoming calls.</p> <p>If any line to the PBX fails, KCS will arbitrary retry until it gets working line. To avoid unnecessary retries the fax failure counter can be used to stop the fax channel upon line problems.</p>

Ref	Application(s)	Description of fault tolerance
2	Mail server	Fault tolerance must be provided by 3rd party company.
3	Line Server Model 305	At least two independent LS1 are required. TCOSS must be configured to use both LS1. Since Voice Servers can be connected to one LS1 only, multiple Voice Servers are required for fault tolerance with voice. The line servers must be connected to two independent LANs in order to be fault tolerant against a LAN failure. If the primary LAN fails both TCOSS and Voice Server try to re-connected to LS1 on a 2nd fail-over LAN connection. (See Failover LAN for Line Server for details.)
4	Voice Server	For each used LS1 two independent Voice Servers are required with different resource names and connection priorities. TC/Player must be configured to first try the Voice Server with the highest priority. If this server does not work it retries with a resource of a fallback voice server with lower priority.
5	KCS Links	At least two independent Link Applications are required. Both Links can run parallel during normal operation. If one application fails, the remaining TC/Link continues exchange data between TCOSS und the mail system.
6	TCOSS	TCOSS Tandem Server is required. In that case all clients (4, 5, 7, 8, 10, 11, 12) must use an alternative path to the secondary TCOSS server in order to access the server after the primary master fails.
7	TC/Archive	At least two independent TC/Archive servers are required. All clients (4, 10, 12) must use an alternative path to the archive server in order access the archive any archive server fails
8	TC/Web	At least two independent IIS with TC/Web are required. Transparent Fail-over of TC/Web for clients has to be provided by ISS.
9, 10, 11, 12	KCS Clients	Fault tolerance for client applications is not required. If any client computer fails, the user has to repair it or has to use any other client computer. Since relevant data is stored on servers only, the user will not lose its communication data.

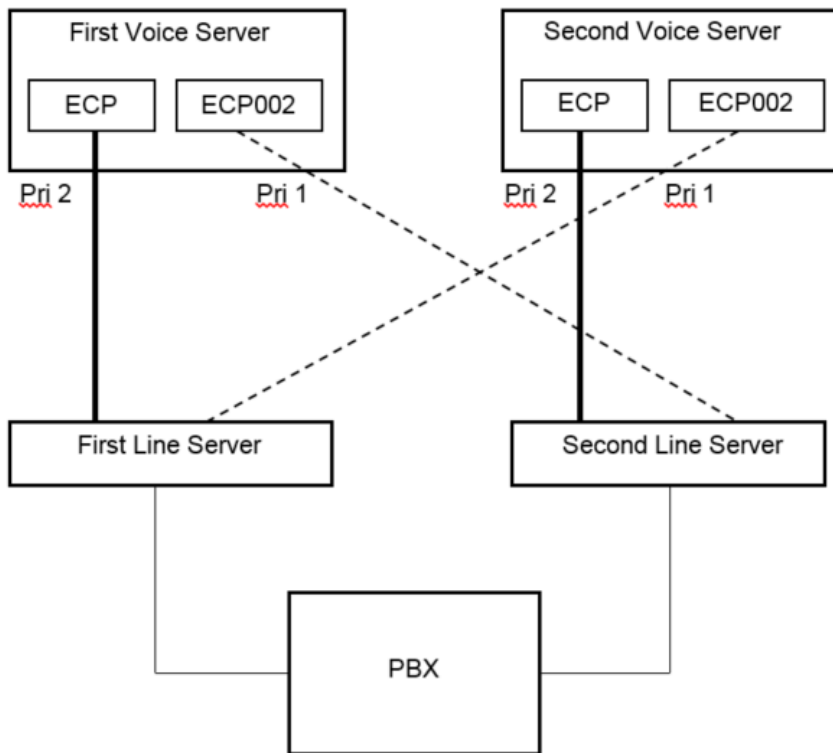
The following sections describe in detail about fault tolerance for voice systems and fail-over LAN support for LS1.

Fault Tolerant Voice System

The fault tolerance of the voice server is achieved by running multiple instances of TC/ECP on the same machine connecting to different LS1 with different priorities. The LS1 Engine has a new parameter for its connection to a LS1, which is called connection priority. The software on the LS1 was changed to disconnect a connection with lower priority, if another connection with a higher priority is attempted. A connection attempt is refused, if the LS1 already has a connection with a higher priority. How this works is illustrated in the following example.

Configuration Example

Overview and Concept

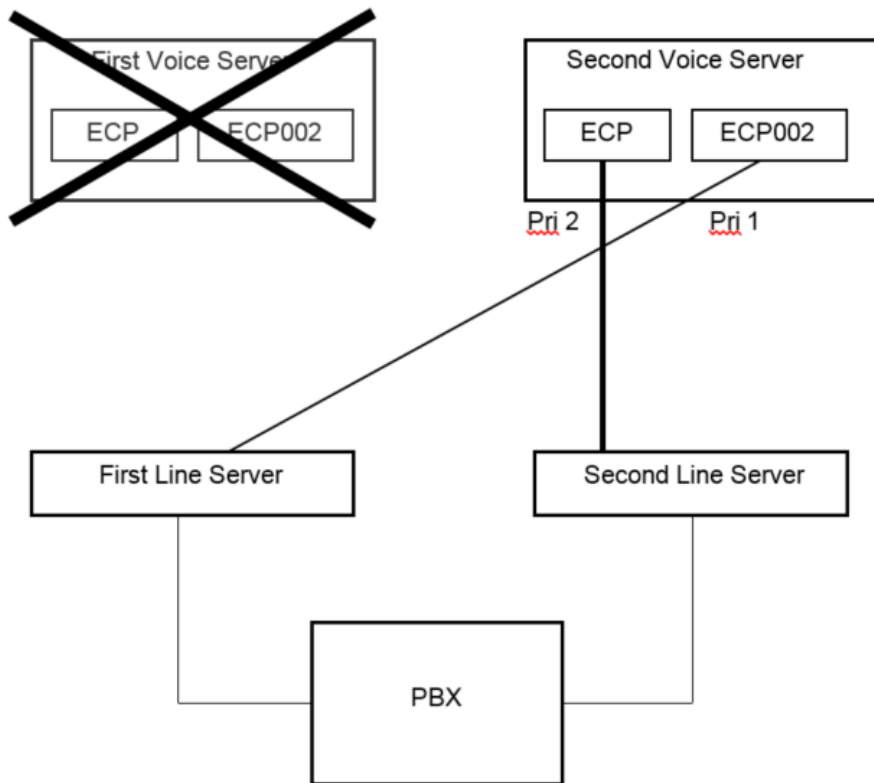


System in full fault tolerant state. Both voice servers are running

Note First server and second server here do not necessarily mean a TCOSS Model 22x Tandem systems hardware, since it is not recommended to install TC/ECP on the same machine as the TCOSS. Consider this as two independent voice servers accessing the same KCS Server running on a different hardware, which can be a Model 22x Tandem system. The KCS Server itself is not shown in this drawing, since its fault tolerance has not been changed. It is handled by the Model 22x (Tandem System) as described in the TCOSS Configuration Manual.

Priority 2 is the higher priority. The line server accepts no priority 1 connection, if it is already connected with priority 2. On the other hand it disconnects from an already existing priority 1 connection, if a connection with priority 2 is attempted. If a connection is closed all active calls are disconnected before.

If now the first server becomes unavailable, the instance ECP on the second server will connect to the first line server.

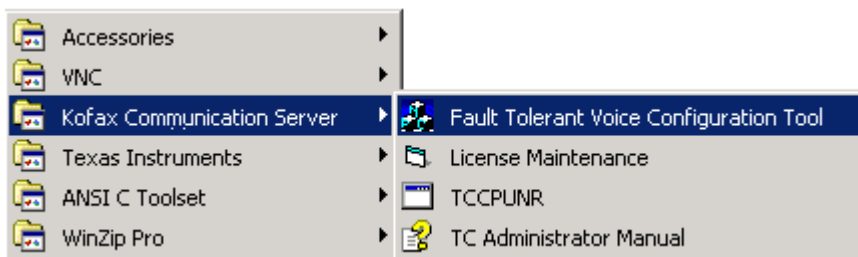


Primary Voice Server became unavailable (that is, Power off)

When the primary server is available again, its instance ECP it will attempt to connect to the first line server and the instance of ECP on the second server will be disconnected again. The system will return to the state shown in the first drawing. The same scenario can be applied with the second voice server becoming unavailable.

Installation on the Voice Server

1. Install a TC/VoiceAccess as usual with a LS1 as telephone system with TC/SP setup. The Fault Tolerant Voice Configuration Tool will be installed in the Kofax Communication Server group in the start menu Programs.



2. Assume that you have installed a LS1 with the IP address 10.11.2.1 as telephone system with TC/SP setup. Start the Tool. The following screen will appear.

The screenshot shows a window titled "fail_over_setup" with a standard Windows-style title bar. The window is divided into three sections:

- 1. Step:** Contains two input fields. The first is labeled "How many instances would you like to install ?" and has the value "2" entered. The second is labeled "Name of these instances" and has "TCECP0" entered. To the right of these fields is a note: "Note: this IP Address is set by the TC/SP setup" and "IP of first Line Server" with the value "10.11.2.1" entered in a field below it.
- 2. Step:** Contains five rows of input fields. Each row has a label for a LineServer (second through sixth), an IP Address field (with a dotted pattern), and a password field.
- 3. Step:** Contains two buttons: "Copy config" and "Close".

You can now add (up to 6) ECP instances, which will inherit all settings from the first instance installed by TC/SP setup. If a TC/VoiceLink is installed on the first instance it will not be installed on

further instances (see section Restrictions for more information). To create a second instance enter the IP address and password of a second LS1 and press Copy config.

Note If the voice system is an xSP installation, the TCECP instances are named TCECPxx in the registry where xx is the instance number. If you copy the registry key TCECP to TCECP01 on such a system you would destroy TCECP01 which is an independent xSP-instance of TCECP. To avoid this you can specify the name of the name for the fault-tolerance instances in the field *Name of these instances*. If you enter "TCECP"0, the fault-tolerance instances will be named then named TCECP002, TCECP003 and so on.

The screenshot shows a Windows-style dialog box titled "fail_over_setup". It is divided into three sections:

- 1. Step**: Contains two input fields. The first is labeled "How many instances would you like to install?" with the value "2" entered. The second is labeled "Name of these instances" with the value "TCECP0" entered. To the right, there is a note: "Note: this IP Address is set by the TC/SP setup" and a field for "IP of first Line Server" with the value "10.11.2.1".
- 2. Step**: Contains five rows of input fields. Each row has a label for a LineServer (second, third, fourth, fifth, sixth) and a corresponding "password" field. The "IP Address of second LineServer" is filled with "10 . 11 . 2 . 2". The other IP addresses are empty, and all passwords are masked with "x".
- 3. Step**: Contains two buttons: "Copy config" and "Close".

All necessary registry entries for the second instance of TCECP (TCECP002) are created.

- Run TC/SP setup on the second machine to install TC/VoiceAccess with an LS1 as telephone system. Take care to swap the IP addresses of the LS1s here. So you have to enter 10.11.2.2 as IP address for the LS1 in setup.

In the Fault Tolerant Voice Configuration Tool, enter 10.11.2.1 as IP address of the second LS1 and press Copy config.

The screenshot shows a Windows-style dialog box titled "fail_over_setup". It contains three steps for configuration:

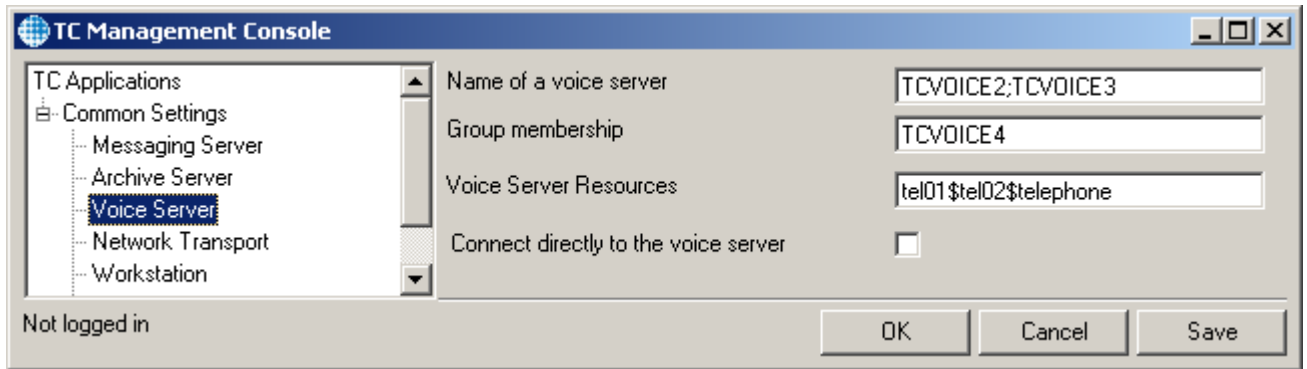
- 1. Step:**
 - How many instances would you like to install?:
 - Name of these instances:
 - Note: this IP Address is set by the TC/SP setup
 - IP of first Line Server:
- 2. Step:**
 - IP Address of second LineServer: password:
 - IP Address of third LineServer: password:
 - IP Address of fourth LineServer: password:
 - IP Address of fifth LineServer: password:
 - IP Address of sixth LineServer: password:
- 3. Step:**
 -
 -

Configuration on the server side is complete. Now start the KCS service (TCSRVR) on both servers. The instance ECP on the primary server connects to the first LS1 and the instance ECP on the second server connects to the second LS1. The system behaves fault tolerant as mentioned before in the overview.

Specifying a Definite LS1 on the Client

If you want to play your message on your telephone, the TC/Player has to know on which LS1 you would like to play it. Let's assume the first LS1 is connected to another PBX than the second and your telephone is connected to the second LS1's PBX. In this case you would not like your message to be played on a telephone with the same number but connected to the PBX of the first LS1.

Therefore syntax for specifying multiple resources and servers was defined for TC/Player (version 4.03.00). These resources and servers can be entered in the TC/MC – Common Settings – Voice Server.



1. **Name of a voice server:** Specifies a list of voice servers to try separated by semicolons.
2. **Group membership:** Specifies a group of voice servers to try. All voice servers assigned to this group are attempted additionally.
3. **Voice Server Resources:** Specifies a list of resources separated by '\$'. These resources are the TC/ECP instances "Tel01" and "Tel02" from our example. On failures the resources are attempted on all servers specified in the first two fields. The order is first resource on first server, first resource on second server, second resource on first server, second resource on second server. If no resources are specified, TC/Player will use "telephone" by default.

Set these values for every client machine where the TC/Player is installed.

Alternatively you can specify the same directly when calling the TC/Player from the command line within the /output parameter. Refer to the *TC Player User Manual* for further details.

Tip It is suggested to configure **only the half of the users** to access **server 1** by default. The **other half of the users** should be configured to access **server 2** by default. This leads to less load for each server when many users access then at the same time.

Involved Registry Values on the Server

TC/ECP registry key (must be copied and renamed manually)

Position	HKLM\Software\Topcall\
Name	TCECP0NN (0 = indicates that this is a fault-tolerance instance, noting for first instance; NN = instance number, nothing for first instance)
Type	Key
Meaning	Each instance of TC/ECP has its own key. NN can be a number.

LS1 Engine connection priority

Position	HKLM\Software\Topcall\TCECP0NN\TCRT\TCE_LS1\LanNNN (NNN = Lanlink number)
Name	Priority
Type	REG_DW
Default	1

Meaning	Priority that the LS1 Engine uses to connect to the LS1. Higher value means higher priority.
----------------	--

LS1 connection information

Position	HKLM\Software\Topcall\TCECP0NN\TCRT\TCE_LS1\LanNNN (NNN = Lanlink number)
Name	IPToConnect, Password
Type	REG_SZ
Default	none
Meaning	IP address, password and port (optional) for each connected LS1.

TC/ECP instance command line

Position	HKLM\Software\Topcall\TCECP0NN
Name	Commandline
Type	REG_SZ
Default	none
Meaning	The command that is executed, to start the instance of TC/ECP. Format: <code>Filename [Parameter]</code> . The optional parameter specifies the name of the own TC/ECP instance (which registry key to use).

TC/Srv command line parameter

Position	HKLM\Software\Topcall\Boot
Name	Commandline
Type	REG_SZ
Default	none
Meaning	The applications to start by KCS service on startup. If "TCECP002" is added here, TCSRVR will look for a value HKLM\Software\Topcall\TCECP002\Commandline and execute it. The file tcecp.exe is not required to be copied to tcecp002.exe.

Remote engine fake resources

Position	HKLM\Software\Topcall\TCECP0NN\TCRT
Name	RemFakeResouces
Type	REG_STRING
Default	none
Meaning	Defines "aliases" which can be used to access the TC/ECP instance via TC/Player. Separated by ";".

Requirements

- TTS engines need to be used by more than one process. Both instances of TC/ECP running on one machine initialize and use the TTS engines. The TTS engines must allow that.

- The double number of TTS licenses is required. Since the TTS engines are used a second time, the double number of TTS channel licenses must be provided.

Restrictions

- If TC/VoiceLink is running on the second ECP instance, messages polled by this instance cannot be sent out and will go to "ACTIVE". Therefore the fault tolerant voice installation tool will remove the VoiceLink for all instances but the first one.

Hints

- If a configuration change is made in the TC/ECP registry key it is recommended to make the configuration change on the first instance (key "TCECP") at first. Then use the Fault Tolerant Voice Configuration Tool to copy the changes to the other instances with "Copy config".
- It is recommended that the involved LS1s have the same number on the PBX to make the system more symmetric.

Failover LAN for Line Server

The Line server Model 305 now supports both LAN connections to allow fail-over LAN connections between TCOSS/Voice Server and LS1. The description starts with general information about TCP/IP. This information is not LS1 specific, but it is very helpful for understanding the Fail-over LAN configuration with an LS1.

IP Fundamentals

This section describes the IP fundamentals.

Overview of IP Address Assignment

Each computer on a TCP/IP network must be identified by a unique 32-bit IP address to be able to communicate on a private network or the Internet. IP addresses can be grouped into two classes of IP addresses, public IP addresses and private IP addresses. These address classes are assigned by the Internet Assigned Numbers Authority (IANA), which is responsible for the management and assignment of IP addresses on the Internet and to private organizations.

Public IP Addresses

On the Internet, the IANA assigns groups of IP addresses to organizations. The organizations can then assign IP addresses within those groups to individual computers. This prevents multiple computers from having the same IP address. For a computer to be visible on the Internet, it must be reachable through a public IP address.

The public IP address based computer can be assigned through a Dynamic Host Configuration Protocol (DHCP) server available in your enterprise network, configured manually, or provided by an Internet service provider (ISP) through a dial-up connection.

Private IP Addresses

The IANA has reserved a certain number of IP addresses that are never used on the global Internet. These private IP addresses are used for networks that do not want to directly connect to the Internet, but require IP connectivity. For example, a user wanting to connect multiple computers in a home network you can use the Automatic Private IP Addressing (APIPA) feature to allow each computer to automatically

assign itself a private IP address. The user does not need to configure an IP address for each computer, nor is a DHCP server needed.

Internet connectivity can be obtained in a network by using private IP addressing through the use of a computer with proxy or network address translator (NAT) capabilities. Windows operating systems include the Internet Connection Sharing (ICS) feature that provides NAT services to clients in a private network.

Dynamic Host Configuration Protocol (DHCP): A configured DHCP server provides a database of available IP addresses. The server can also be set up to provide configuration options for DHCP clients, including addresses of DNS and WINS servers, gateway addresses, and other information. At start-up, each DHCP client requests configuration data from the server, permitting automatic configuration of the IP address, subnet mask and other options. The IP address is assigned to each client for an amount of time determined at the server, called a lease, which can be periodically renewed. At conclusion of the lease, the client attempts to renew the lease, or the IP address is returned to the database and is made available to other DHCP clients. DHCP provides an efficient IP configuration option for larger networks, providing simplified client configuration, and reuse of IP addresses.

Automatic Private IP Addressing

Automatic Private IP Addressing (APIPA) is appropriate for simple networks that have only one subnet. With APIPA, if no DHCP server is available, the computer automatically assigns itself a private IP address. If a DHCP server later becomes available, the computer changes its IP address to one obtained from a DHCP server. Computers using APIPA addresses can communicate only with other computers using APIPA addresses, on the same subnet. They are not directly reachable from the Internet.

Static IP Addressing

With static IP addressing, you must manually configure the IP address.

Overview of IP Routing

Multiple TCP/IP networks are interconnected by routers, devices that forward IP packets from one subnet to another.

When IP prepares to send a packet, it inserts the local (source) IP address and the destination address of the packet in the IP header. It then examines the destination address, compares it to a locally maintained route table, and takes appropriate action based on what it finds. There are three possible actions:

1. IP can pass the packet up to a protocol layer above IP on the local host.
2. The packet can be forwarded through one of the locally attached network adapters.
3. The packet can be discarded.

IP finds a match of the destination address in the routing table from the specific to the general in the following order:

- An exact match (host route).
- A match for the locally attached subnet (subnet route).
- A match for the default gateway (default route)

If a default gateway has not been specified, the packet is discarded.

Because the default gateway contains information about the network IDs of the other networks in the internetwork, it can forward the packet to other routers until the packet is eventually delivered to a router connected to the subnet of the destination.

Private Addresses

Each IP node requires an IP address that is globally unique to the IP internetwork. In the case of the Internet, each IP node on a network connected to the Internet requires an IP address that is globally unique to the Internet. As the Internet grew, organizations connecting to the Internet required a public address for each node on their intranets. This requirement placed a huge demand on the pool of available public addresses.

When analyzing the addressing needs of organizations, the designers of the Internet noted that, for many organizations, most of the hosts on the organization's intranet did not require direct connectivity to Internet hosts. Those hosts that did require a specific set of Internet services, such as the World Wide Web access and e-mail, typically access the Internet services through application layer gateways, such as proxy servers and e-mail servers. The result is that most organizations only required a small amount of public addresses for those nodes (such as proxies, routers, firewalls, and translators) that were directly connected to the Internet.

For the hosts within the organization that do not require direct access to the Internet, IP addresses that do not duplicate already-assigned public addresses are required. To solve this addressing problem, the Internet designers reserved a portion of the IP address space and named this space the private address space. An IP address in the private address space is never assigned as a public address. IP addresses within the private address space are known as private addresses. Because the public and private address spaces do not overlap, private addresses never duplicate public addresses.

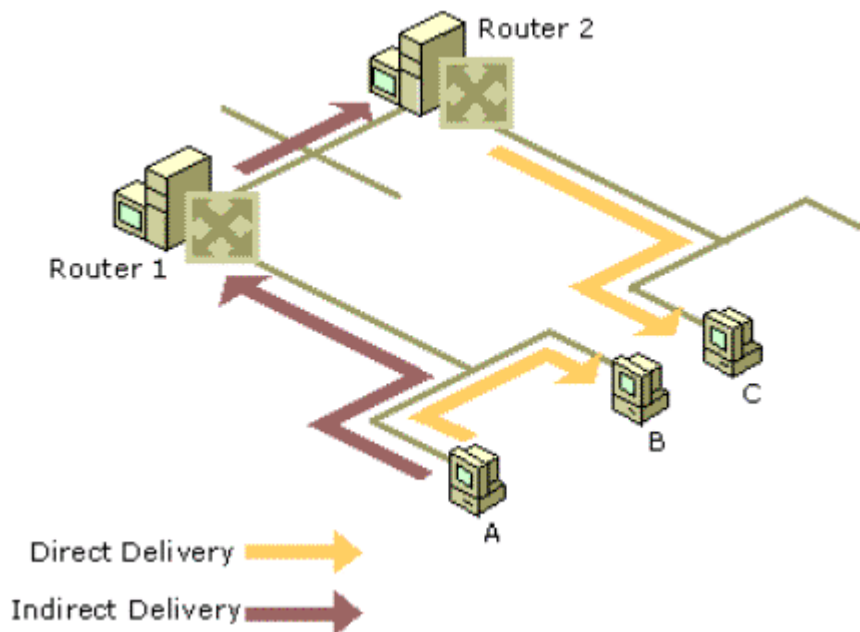
The private address space specified in RFC 1597 is defined by the following three address blocks:

10.0.0.0/8	The 10.0.0.0/8 private network is a class A network ID that allows the following range of valid IP addresses: 10.0.0.1 to 10.255.255.254. The 10.0.0.0/8 private network has 24 host bits which can be used for any subnetting scheme within the private organization.
172.16.0.0/12	The 172.16.0.0/12 private network can be interpreted either as a block of 16 class B network IDs or as a 20-bit assignable address space (20 host bits) which can be used for any subnetting scheme within the private organization. The 172.16.0.0/12 private network allows the following range of valid IP addresses: 172.16.0.1 to 172.31.255.254.
192.168.0.0/16	The 192.168.0.0/16 private network can be interpreted either as a block of 256 class C network IDs or as a 16-bit assignable address space (16 host bits), which can be used for any subnetting scheme within the private organization. The 192.168.0.0/16 private network allows the following range of valid IP addresses: 192.168.0.1 to 192.168.255.254.

The result of many organizations using private addresses is that the private address space is reused, helping to prevent the depletion of public addresses.

Since the IP addresses in the private address space will never be assigned by the InterNIC as public addresses, there will never exist routes in the Internet routers for private addresses. Traffic to destination private addresses are not reachable on the Internet. Therefore, Internet traffic from a host that has a private address must either send its requests to an application layer gateway (such as a proxy server),

which has a valid public address, or have its private address translated into a valid public address by a network address translator (NAT) before it is sent on the Internet.



Picture taken from Microsoft MSDN

IP Routing

Some examples for a network setup are given in the following table.

Network Address	Netmask	Gateway Address	Interface	Metric	Purpose
127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1	1	Loopback Network
157.55.16.0	255.255.240.0	157.55.27.90	157.55.27.90	1	Directly Attached Network
157.55.27.90	255.255.255.255	127.0.0.1	127.0.0.1	1	Local Host
157.55.255.255	255.255.255.255	157.55.27.90	157.55.27.90	1	Network Broadcast
255.255.255.255	255.255.255.255	157.55.27.90	157.55.27.90	1	Limited Broadcast

- **Loopback Network:** The loopback network entry is designed to take any IP address of the form 127.x.y.z and forward it to the special loopback address of 127.0.0.1.
- **Directly Attached Network:** The local network entry corresponds to the directly attached network. IP packets destined for the directly attached network are not forwarded to a router but sent directly to the destination. Note that the Gateway Address and Interface column are the IP address of the node.

This indicates that the packet will be sent out the network interface card corresponding to the node's IP address.

- **Local Host:** The local host entry is a host route (subnet mask of 255.255.255.255) corresponding to the IP address of the host. All IP datagrams to the IP address of the host are forwarded to the loopback address.
- **Network Broadcast :** The network broadcast entry is a host route (subnet mask of 255.255.255.255) corresponding to the all-subnets directed broadcast address (all subnets of class B network ID 157.55.0.0). Packets addressed to the all-subnets directed broadcast will be sent out the network interface card corresponding to the node's IP address.
- **Limited Broadcast :** The limited broadcast address is a host route (subnet mask of 255.255.255.255). Packets addressed to the limited broadcast are sent out the network interface card corresponding to the node's IP address.

Physical Address Resolution

Based on the destination IP address and the route determination process, IP determines the forwarding IP address and interface to be used to forward the packet. IP then hands the IP packet, the forwarding IP address, and the interface to ARP.

If the forwarding IP address is the same as the destination IP address, then ARP performs a direct delivery. In a direct delivery, the MAC address corresponding to the destination IP address must be resolved.

If the forwarding IP address is not the same as the destination IP address, then ARP performs an indirect delivery. The forwarding IP address is the IP address of a router between the current IP node and the final destination. In an indirect delivery, the MAC address corresponding to the IP address of the router must be resolved.

To resolve a forwarding IP address to its MAC address, ARP uses the broadcasting facility on shared access networking technologies (such as Ethernet or Token Ring) to send out a broadcast ARP Request frame. An ARP Reply, containing the MAC address corresponding to the desired forwarding IP address, is sent back to the sender of the ARP Request.

The ARP Cache

To keep the number of broadcast ARP Request frames to a minimum, many TCP/IP protocol stacks incorporate an ARP cache, a table of recently resolved IP addresses and their corresponding MAC addresses. The ARP cache is checked first before sending an ARP Request frame. Each interface has its own ARP cache.

Depending on the vendor implementation, the ARP cache entries can be dynamic (based on ARP Replies) or static:

- **Static ARP cache entries:** These entries are permanent and are manually added using a TCP/IP utility such as the ARP utility provided with Windows. They are used to prevent ARP Requests for commonly used local IP addresses, such as routers and servers. The problem with static ARP entries is that they have to be manually updated when network interface equipment changes.
- **Dynamic ARP cache entries:** These entries have a time-out value associated with them to remove entries in the cache after a specified period of time. Dynamic ARP cache entries for Windows TCP/IP are given a maximum time of ten minutes before being removed.

To view the ARP cache on a Windows computer, type `arp -a` at a Windows command prompt.

The ARP Process

IP sends information to ARP. ARP receives the IP packet, the forwarding IP address, and the interface to be used to forward the packet.

Based on the interface and the forwarding IP address, ARP consults the appropriate ARP cache for an entry for the forwarding IP address.

If the mapping is not found, ARP builds an ARP Request frame containing the MAC Address of the interface sending the ARP Request, the IP address of the interface sending the ARP Request, and the forwarding IP address. ARP then broadcasts the ARP Request using the appropriate interface.

All hosts receive the broadcast frame and the ARP Request is processed. If the receiving host's IP address matches the requested IP address (the forwarding IP address), its ARP cache is updated with the address mapping of the sender of the ARP Request.

If the receiving host's IP address does not match the requested IP address, the ARP request is silently discarded.

An ARP Reply is formulated containing the requested MAC address and sent directly to the sender of the ARP Request.

When the ARP Reply is received by the sender of the ARP Request, it updates its ARP cache with the address mapping.

Between the ARP Request and the ARP Reply, both hosts have each other's address mappings in their ARP caches.

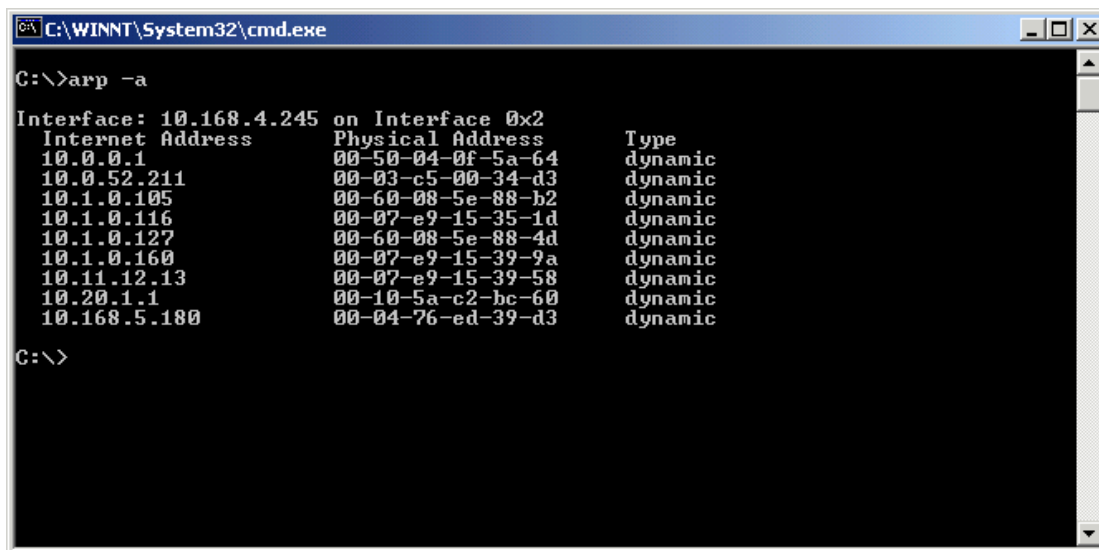
The IP packet is sent to the MAC address of the forwarding host by addressing it to the resolved MAC address.

ARP Commands

In the command prompt type the following command:

```
"arp -a"
```

You will get a list of known IP addresses with the corresponding MAC addresses as shown in the image below.



As the IP addresses can change, it is useful to clear this ARP cache by typing the following command:

```
"arp -d *"
```

Ping Commands

As described above, packages from one subnet to another can only be routed by a router.

If a computer (or line server) has two or more network cards configured in the same subnet, the package may arrive on the first interface and could be sent out on the *second* one. Windows can handle this problem, but line server cannot. **Therefore, it is absolutely necessary that the two interfaces are in separate subnets.** See line server setup section for more information.

Installation

This section describes installation of a Line Server with Failover LAN. We assume that the reader is familiar with installing Line Server for a single LAN connection and hence describe the differences only.

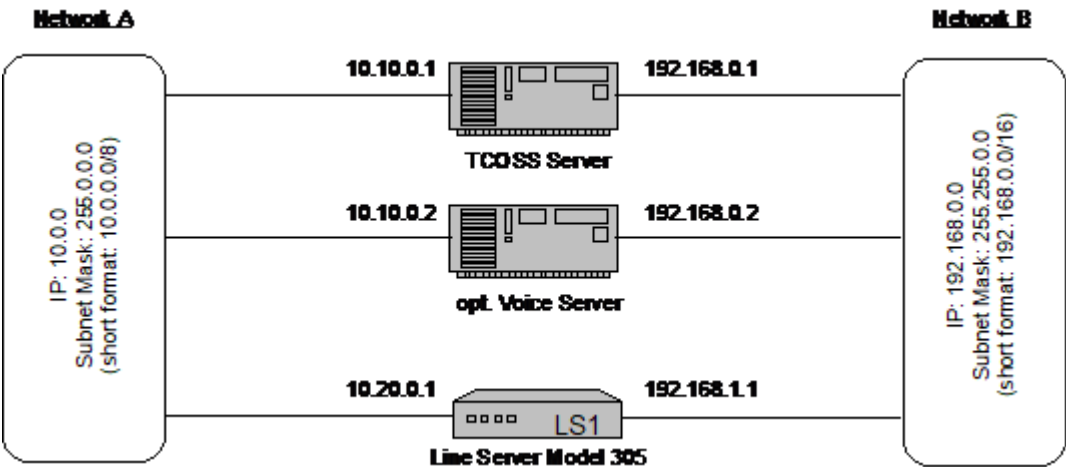
The installation is described with the following steps:

1. Define the network architecture and IP addresses
2. Configure the network settings on LS1
3. Configure the network settings on the TCOSS and Voice Server
4. Test Network configuration
5. Configuration on TCOSS and Voice Server

Step 1: Define the Network Architecture and IP Addresses

In order to leverage a second LAN connection between TCOSS/Voice Servers and Line Servers, you will need to have separate subnets for both connections. Therefore you will need some private IP address ranges. See [Overview of IP Address Assignment](#) for more details.

Sample network architecture is shown below. It is recommended to make a similar drawing with the IP addresses and network masks used in you installation.



Note

- Fail-over LAN will not work if you just take another cable to connect Line Server to the same subnet (network) again.
- Depending on security policies and bandwidth requirements, you can either use dedicated networks or share the network with, such as Client Server connection, TCOSS Tandem Server connection, and others.
- If you are using dynamically IP addresses the IP range of the DNS Server must be considered.
- If any server does not have 2 LAN ports a router that connects both networks is required.
- If multiple TCOSS servers are trying to connect to the same Line Server, the first will get the connection. The LAN link priority will not be used for the connection between TCOSS and Line Server. This problem is known as error 8688.
- If TCOSS/TCECP and LS1 are in different subnets, these networks must be connected via routers, where at least one of these routers must support Network Address Translation (NAT) for TCP/IP connections to LS1. See [Installation Examples](#) for more details.

Verification of this step:

- Mask "network mask A" with "network mask B" to get a common network mask. Some values are shown below.

Network Mask A	Network Mask B	Common Network Mask
255.0.0.0	255.255.255.0	255.0.0.0

Network Mask A	Network Mask B	Common Network Mask
255.255.0.0	255.255.255.0	255.255.0.0
255.255.255.0	255.0.0.0	255.0.0.0
255.255.0.0	255.255.0.0	255.255.0.0

- Mask the "IP address of network A" and "IP address of network B" with the "common network mask". If the resulting IP address is the same, then both networks overlap. Some examples are shown below.

Network A: IP/Mask	Network B: IP/Mask	Common Mask	Overlap?
10.30.1.103/255.0.0.0	10.40.1.104/255.0.0.0	255.0.0.0	yes
10.30.1.103/255.255.0.0	10.40.1.104/255.255.0.0	255.255.0.0	no
10.30.1.103/255.255.0.0	10.30.2.103/255.255.0.0	255.255.0.0	yes
10.30.1.103/255.0.0.0	192.168.0.0/255.255.0.0	255.0.0.0	no

- If networks overlap, the network mask or IP address must be changed.

Step 2: Configuring Line Server

On Line Server, in the LSD configuration panel, assign an additional IP address and subnet mask for LAN2.

The screenshot shows a 'Configure' window with two columns for LAN1 and LAN2. The settings are as follows:

	LAN1	LAN2
LAN Mode	auto negotiation	auto negotiation
IP Address	192.168.0.207	100.100.100.234
Network Mask	255.0.0.0	255.255.255.0
Default Gateway	192.168.123.123	100.100.100.100
Password	*****	
Confirm Password	*****	
TCOSS Connect Timeout [s]	9999	
Serial Number	1234	
<input type="checkbox"/> enable TcpMeter Support <input type="checkbox"/> enable GSM Encryption		
<input type="button" value="Load Configuration from File"/> <input type="button" value="Save Configuration to File"/> <input type="button" value="Save Configuration to Line Server"/>		

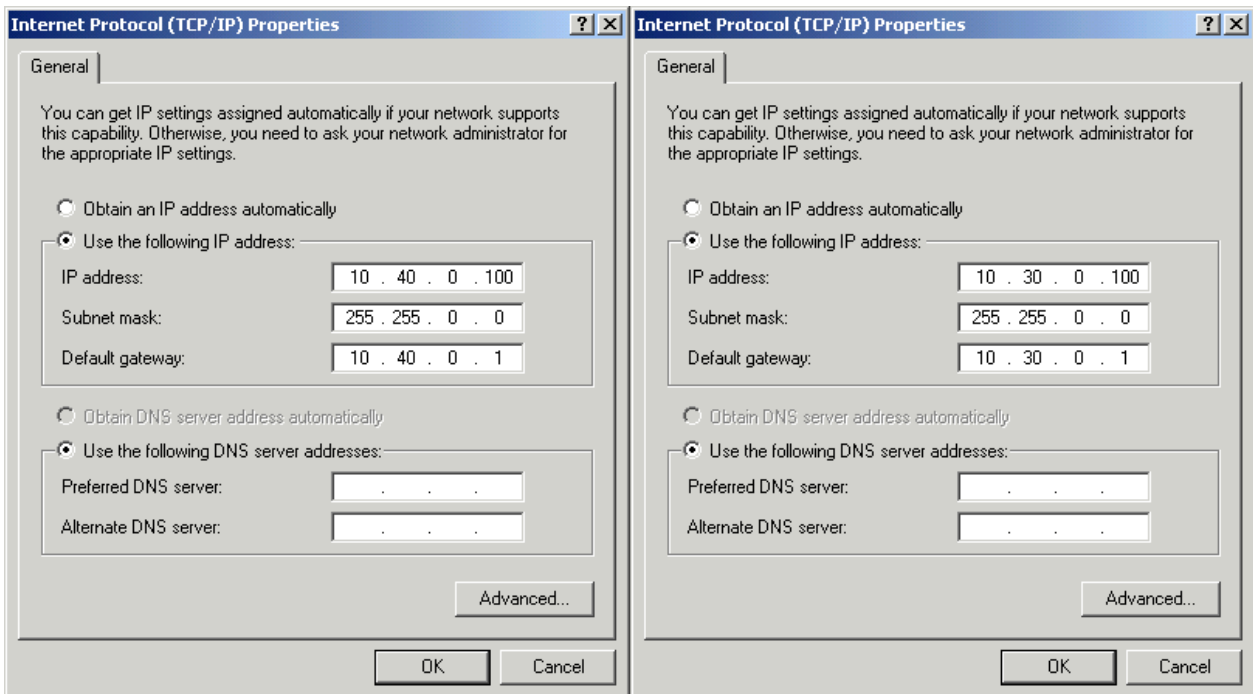
Note

- The IP address of the second LAN interface is not visible on the display and cannot be set with the buttons on the LS1.
- It is only possible to set one gateway on LS1. Therefore, you cannot open a connection on the second interface if the first one is down. This is not a serious problem as the Line Server is only a server.

Step 3: Configuring Application Server

It is assumed that the TCROSS and Voice server has at least LAN interfaces. (Otherwise, an external router is required).

Use Windows Control Panel to configure the Network address of second LAN connection on servers that are using the LS1.



Note The default Gateway is required if an IP Connection should be established to another network (such as the internet or any other customer LAN).

Step 4: Test Network Configuration

This step is recommended to verify both the configuration changes in the previous steps and network hardware with simple Windows utilities.

- Verify that all network ports are connected and LS1 is running ("waiting for TCROSS" or "x/y active" on LCD).

- Open a command prompt on the TCOSS Server and try to ping both IP addresses of LS1.

Example:

```
C:\>ping 10.20.0.1
...
C:\>ping 192.168.1.1
...
```

- If the ping was successful, the correct network configuration should be checked with an “arp -a” command. See the screens below:

Sample 1: Bad configuration

```
Select C:\WINNT\System32\cmd.exe
C:\>arp -a

Interface: 10.168.4.245 on Interface 0x2
Internet Address      Physical Address      Type
10.0.0.1              00-50-04-0f-5a-64    dynamic
10.0.52.211          00-03-c5-00-34-d3    dynamic
10.20.1.1            00-10-5a-c2-bc-60    dynamic
10.30.1.103          00-07-57-00-01-35    dynamic
10.40.1.104          00-07-57-00-01-35    dynamic
10.168.5.180         00-04-76-ed-39-d3    dynamic

C:\>
```

Wrong configuration, because both IP addresses are connected with the network port (physical address)

Sample 2: Good configuration: (IP addresses 10.30.1.103 and 10.30.1.104 have different physical addresses)

```
Select C:\WINNT\System32\cmd.exe
C:\>arp -a

Interface: 10.168.5.180 on Interface 0x1000003
Internet Address      Physical Address      Type
10.0.0.1              00-50-04-0f-5a-64    dynamic
10.0.0.8              00-10-4b-dc-93-9d    dynamic
10.1.0.100            00-e0-81-21-b0-b3    dynamic
10.1.0.105            00-60-08-5e-88-b2    dynamic
10.168.3.99           00-04-76-e4-4d-b3    dynamic

Interface: 10.40.0.100 on Interface 0x1000004
Internet Address      Physical Address      Type
10.40.1.104          00-07-57-00-01-35    dynamic

Interface: 10.30.0.100 on Interface 0x1000005
Internet Address      Physical Address      Type
10.30.1.103          00-07-57-00-01-34    dynamic

C:\>
```

- If all previous tests were successful, you can make the a final test with the ping command to both IP addresses where one of both LANs are disconnected:

Network A	Network B	Ping to IP Address of Network A	Ping to IP Address of Network B
OK	OK	OK	OK
disconnected	OK	failed	OK
OK	disconnected	OK	must fail
disconnected	disconnected	must fail	must fail

- The tests described above should also be done with all Voice Servers.

Step 5: Configuration on TCOSS and Voice Server

Configuring LanLink (TCOSS)

The meaning of the registry key "IpToConnect" in HKLM/Software/Topcall/Tcoss/Link/LAN000-LAN999 subkeys has been extended to the following syntax:

```
<ip-lan1> [ '|' <ip-lan2>]
```

That is, the IP address of the Line Server over the Failover connection can be optionally specified, separated by the pipe character. Example:

```
192.168.0.3 | 10.0.1.3
```

The spaces between the addresses and the pipe symbol are optional.

Configuring TC/Voicemail

Similar to the TCOSS registry key, the IpToConnect value under HKLM/Software/Topcall/Tcecp/Tcrt/Tce_ls1/LAN000 has been extended in syntax.

Testing

To test the installation, just send messages (FAX or Voice) as usual. Then, unplug one cable of LAN1. After one minute, LS1 must reboot and a new connection must be established on the second network interface. Re-plug the cable and try the same by unplugging LAN2.

Hint

After a failover to the secondary LAN connection, the line server keeps using this secondary connection, even if the primary connection is available again. In case of a reboot or a further connection problem, TCOSS will again try to connect to the LS1, starting with the first address being specified.

Installation Examples

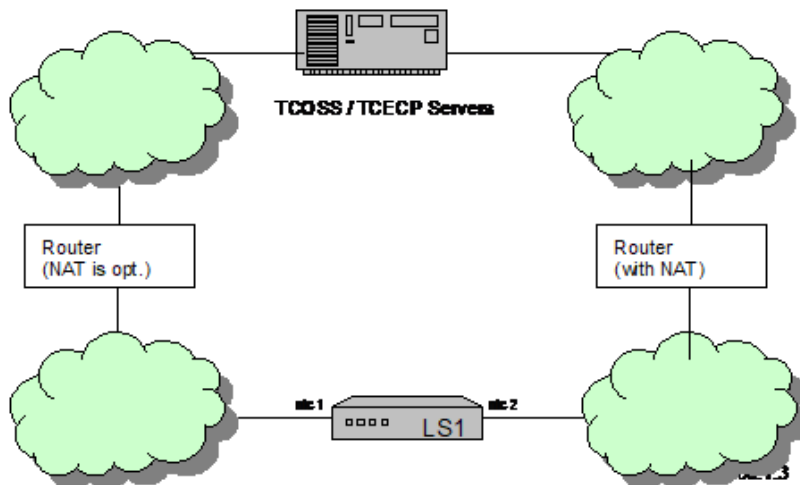
The simplest example is shown in the previous section, [Define the Network Architecture and IP Addresses](#). This section gives you an overview about some more complex network connections.

Due to implementation restrictions (only one default gateway can be configured, refer to error 10426) there are the following restrictions when using different sub-nets between TCOSS/TCECP and LS1.

NIC 2 of LS1 must either be in the same sub-net as TCOSS/TCECP or it must be connected with a router that supports Network Address Translation (NAT) for TCP/IP connections to NIC 2 on LS1.

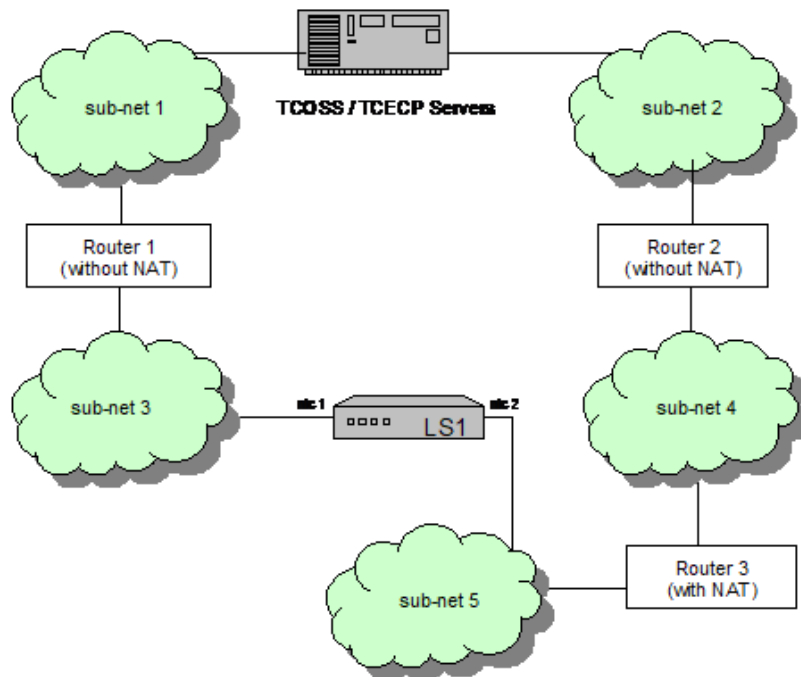
TCOSS/Voice Server and LS1 Are in Different Subnets

NIC 1 is connected via router. NIC 2 is connected with any router that supports NAT.



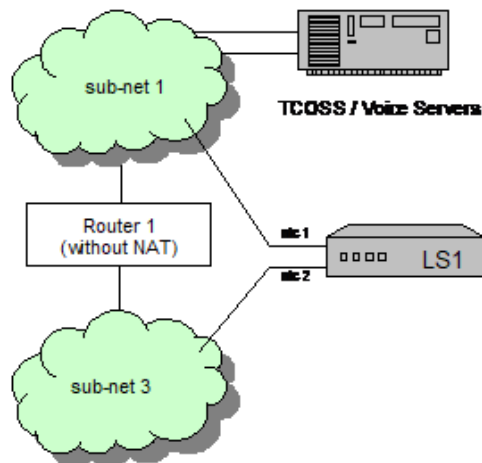
Routers Between TCOSS/Voice Server and LS1 Do Not Support NAT

If the network infrastructure is like shown in example 1, but both routers do not support (or have enabled) NAT, then you can use an extra router (router 5) that provides NAT as shown in the example below.



TCOSS/Voice Server Use Only One Subnet

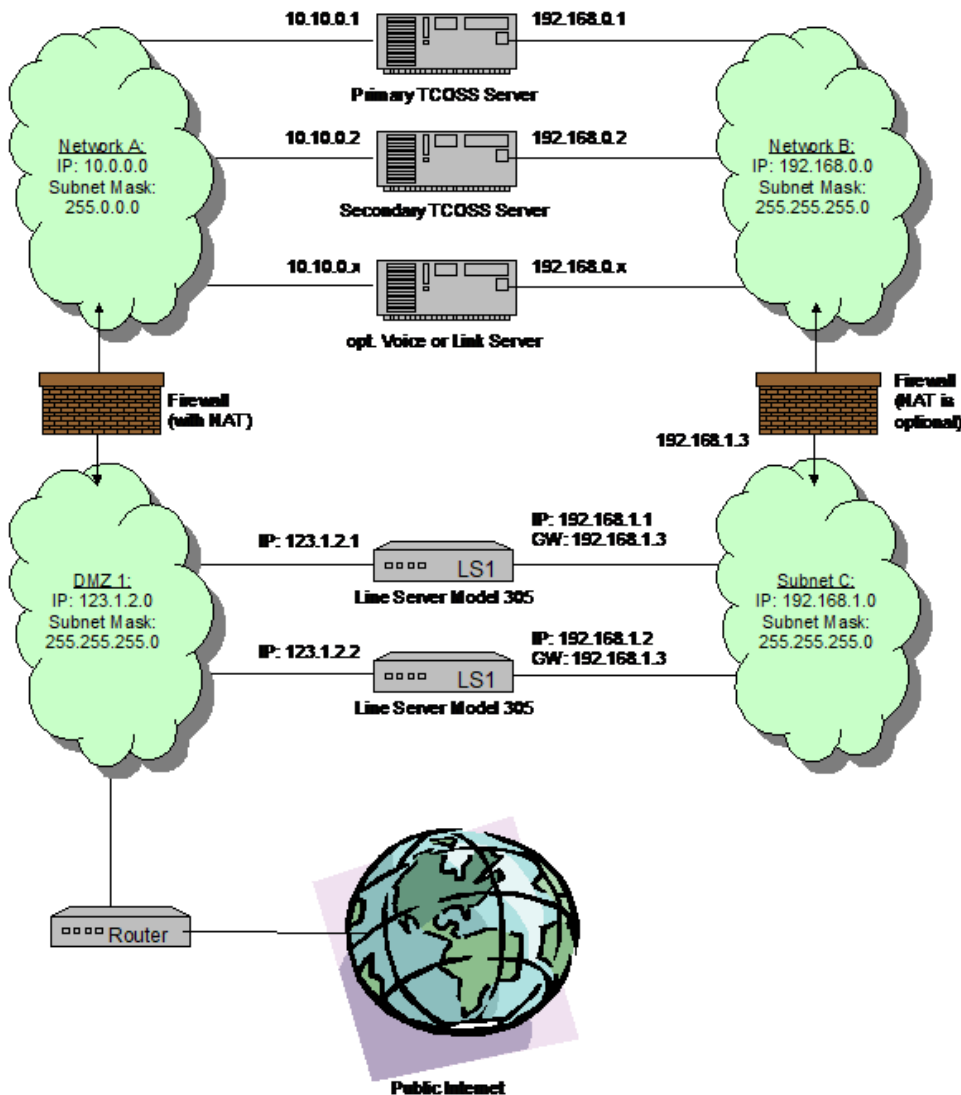
If the TCOSS/Voice Server is connected to a single subnet, then you have to use a router with NAT for fault tolerant LAN with LS1 as shown in the example below.



A configuration example is shown in the next section.

Fault Tolerant System with Firewalls

Assume that you want to have both a fault tolerant message and line server where a firewall is required (due to customers security policies) between the message server and line server.



Backward Compatibility

Failover LAN is backward compatible to existing installations. That is, you can use a FailoverLan-enabled version of Line Server with a non-failover-enabled version of TCOSS, and vice versa. Of course if not both modules are FailoverLan-enabled, the second LAN cannot be used as failover line.

Remote Upgrade of Firmware

It is possible to maintain the Line Server Model 305 (LS1) remote over an IP connection by using a device server.

Device servers are also called COM servers because they have a COM port and an Ethernet adapter with an assigned IP address. They can connect a device on the COM port to an IP network by using the telnet protocol.

The device server can accept telnet sessions on the Ethernet adapter. The data that is received within the telnet session is written to the device on the COM port. In the other direction the device server sends data it reads from the device on the COM port to the target of the telnet session.

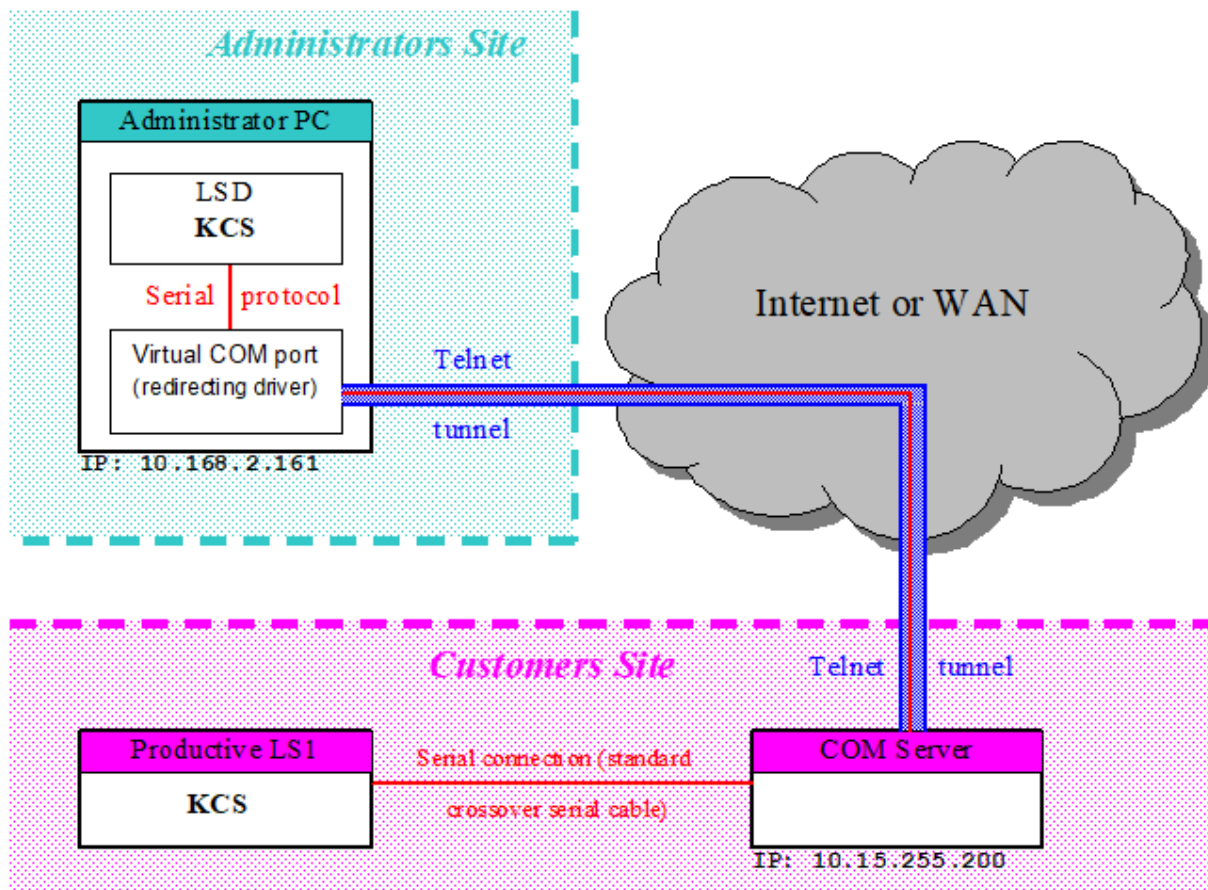
Connecting the LS1 to the COM port of a device server makes it possible to configure the LS1 over an IP network using KCS Line Server Diagnostic Tool (LSD).

Since LSD cannot make a telnet session to the device server on its own, a COM redirecting driver has to be installed on the same machine that does this task. The COM redirecting driver simulates a virtual COM port. LSD can use this virtual COM port as usual. See the picture below in Installation.

What You Need

- Device server near the LS1 (recommended is one which can do 115200 baud)
- COM port redirecting driver (virtual COM port). Available on the website of the device server vendor. Following redirecting driver is tested with LSD:
`http://www.tacticalsoftware.com/site/html/products/serialip.htm`
- Possibility to connect to device server via telnet from your administrator PC (for testing the connection). TCP destination port 10001 is used for the LANTRONIX device server used in our example. The ports used is stated in the device server documentation.
- LS1 system and application image and LSD from TC/SP 7.64.03 or higher

Installation



Step 1: Preparing LS1

First you have to make your LS1 ready to be configured over device servers. This must be done with the LS1 connected directly to a serial COM port as usual.

1. Install the LS1 system and application images from TC/SP 7.59.05 or higher as usual with LSD. The important component is CS1 (tc16.elf). This must be version 1.03.01 or higher.
2. Optional: If your device server is able to handle 115200 baud then skip this. Otherwise, configure the LS1 to operate at lower speed.

Note

- It is not recommended to use a device server that cannot operate at 115200 baud on the COM port. LS1 application and system image download takes 47 minutes at 19200 baud.
- Also, if you do this step, you must also configure LSD to operate with the same speed. See [Step 4: connect to LS1 with LSD](#).

3. Start a terminal program (such as Hyperterminal) on the PC connected to LS1 via serial cable, and set the terminal to 115200 baud (LS1 default speed).
4. Reset the LS1 via buttons or power off and press enter in the terminal application until you catch the LS1 bios command line. If it does not work or you only see strange characters, terminal settings, such as speed, databits, and others may be wrong.

```
Hit any key to stop autoboot: 3
=>
```

5. At the bios command line, set the baud rate to use with your device server (such as 19200 baud).

```
=> setenv baudrate 19200
## Switch baudrate to 19200 bps and press ENTER ...
```

6. Now change your terminal speed to the new speed and press enter. You must see the LS1 bios command line again.

```
=>
```

7. If so, save your change to flash and reset LS1.

```
=> saveenv
Un-Protected 1 sectors
Erasing Flash...
Erasing sector 40400000
Done
Erased 1 sectors on bank #1
Saving Environment to Flash...
Protected 1 sectors
=>
```

Step 2: Setting Up Device Server

Note Since the device server is provided by a third-party vendor, Kofax does not provide technical support for it.

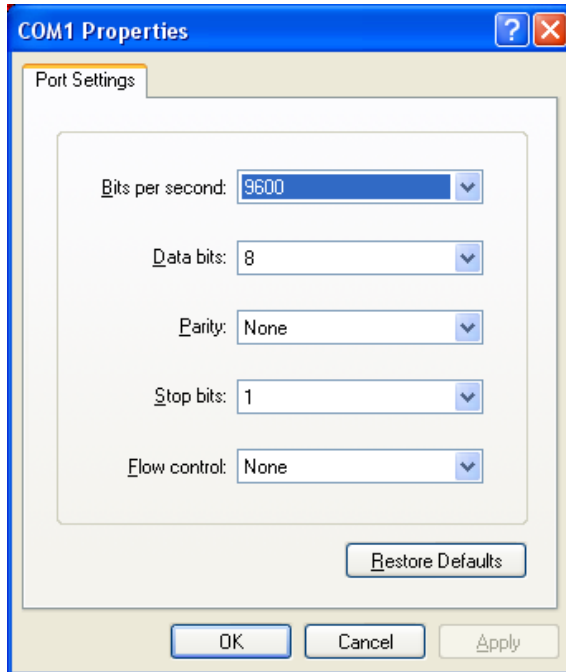
The following screens and associated steps only apply to the LANTRONIX device server. If you use any other device server, this description is only an example.

The device server is not shipped with KCS LS1, it is a third-party product. A device server from the manufacturer W&T is used in the TC55 (KCS GSM box).

Setting it up

1. As shown in the picture above, the device server COM port must be connected to the LS1 to be administered over it. The Ethernet adapter of the device server must be able to receive IP connections from the administrator machine (where LSD is intended to run later).
2. Usually the device server comes with some kind of management tool that is used to configure it over IP, or it is configured via telnet on a definite port. You must check the basic parameters of the device server. The baud rate must match with the baud rate of LS1. Other terminal settings are 8 data bits, no parity, 1 stop bit, no flow control. You can also set the IP address of the device server.

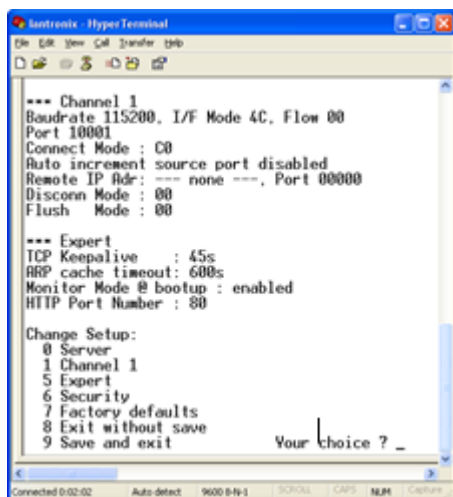
3. The Lantronix device server can be configured with a terminal, such as Hyperterminal. The terminal settings for configuration are shown below.



4. Connect the Lantronix device server to a COM port on the PC. Use a standard modem cable (Rx/Tx not crossed). Start Hyperterminal. Unplug the power cable from the device server. Plug the power cable again on and type 3 "x". Then press Enter for Setup mode (in the next 2 seconds).



5.

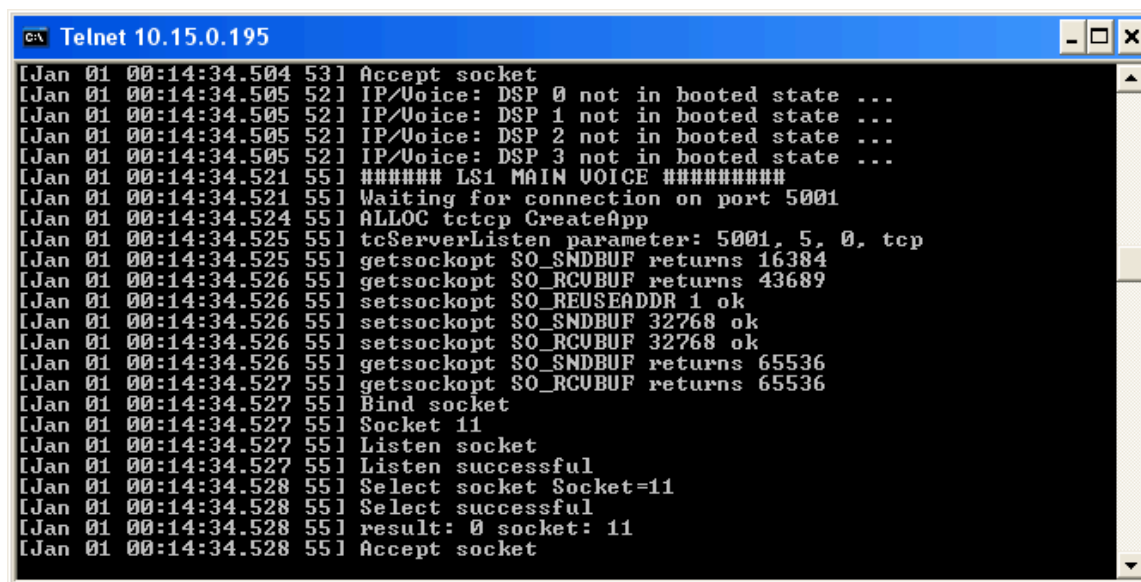


Select "0" for changing server settings. Set IP address and correct Netmask for the device server. Select "1" for changing baud rate to 115200 and IP port to 10001. Do not forget to save your changes.

Testing the connection to LS1 over telnet tunnel

Once you configure the device server and connect it to the LS1, you can open a telnet session to it (ideally on the administrator PC where LSD is intended to run later).

```
C:\WINDOWS>telnet 10.15.0.195 10001
```



This opens a connection to my LS1 connected on the device server over what is called a "telnet tunnel" (see picture above).

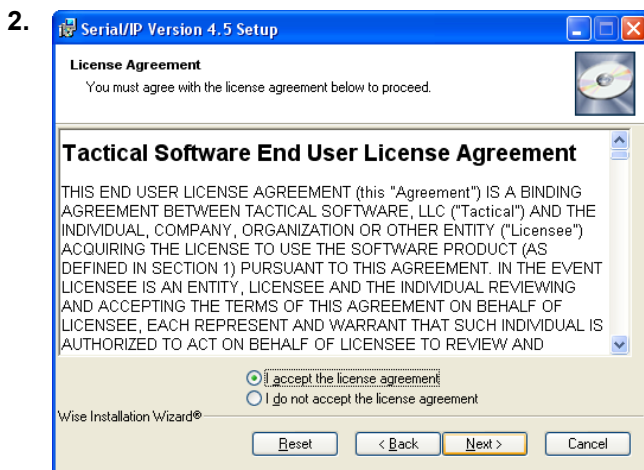
Step 3: Installing COM Redirecting Driver

Note Since the device server is provided by a third-party vendor, Kofax does not provide technical support for it.

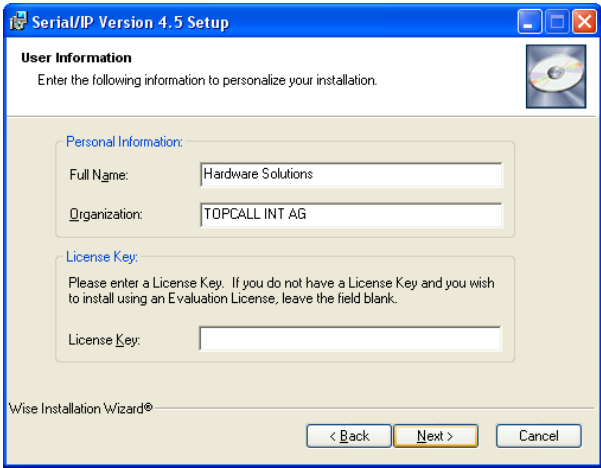
The device server vendor should supply you with a COM redirecting driver for Windows. It generates a virtual COM port that can be used by applications (like LSD) just like a physical COM port. The virtual COM port is associated with a device server in the IP network. The virtual COM port sends the data it receives from the application to the device server over telnet and, in the other direction, sends everything received from the device server to the application. It is the counterpart of your device server.

The COM redirecting driver that is used to access the Lantronix device server is from Tactical Software. You can download a trial version using the following link: <http://www.tacticalsoftware.com/site/html/products/serialip.htm>.

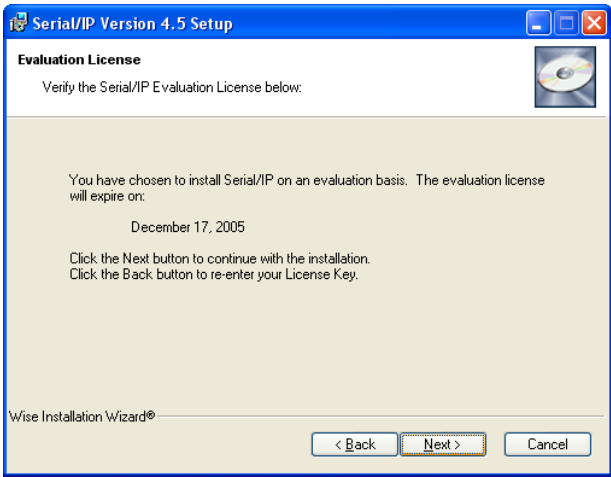
Setting it up



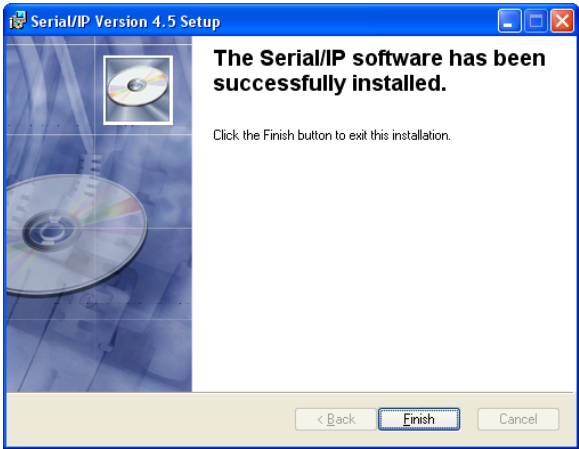
3. Enter the License Key or blank for trial version.

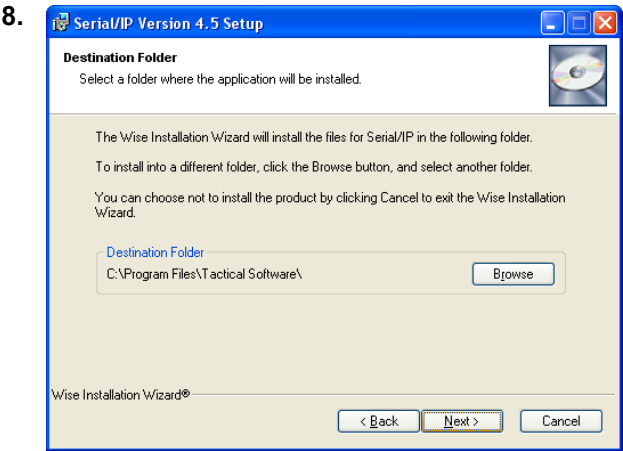
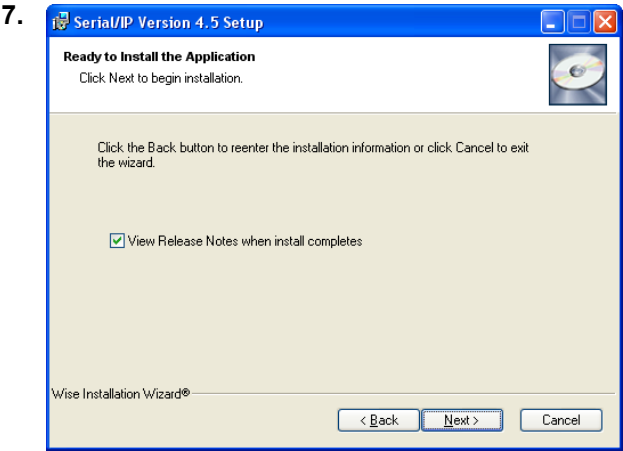
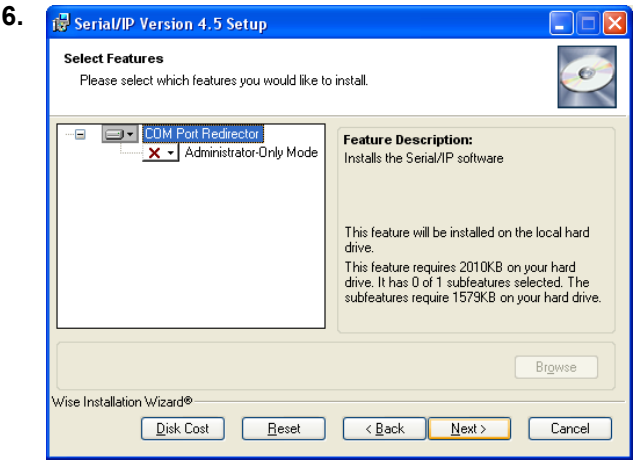


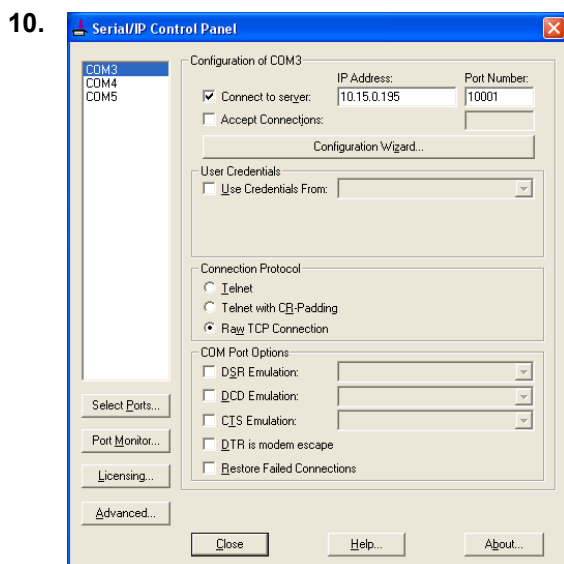
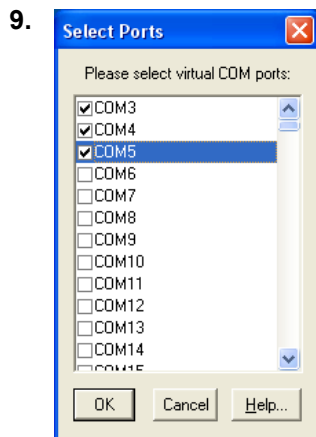
4.



5.







11. Select the virtual COM ports, such as COM3.
12. Enter **IP Address** and the **Port Number**.
13. Be sure that the connection protocol is **Raw TCP Connection**.

Testing the connection to LS1 over telnet tunnel with virtual COM port

Open a terminal application (such as Hyperterminal) and select the just created virtual COM port COM 3. You should see the output of the running LS1 software.

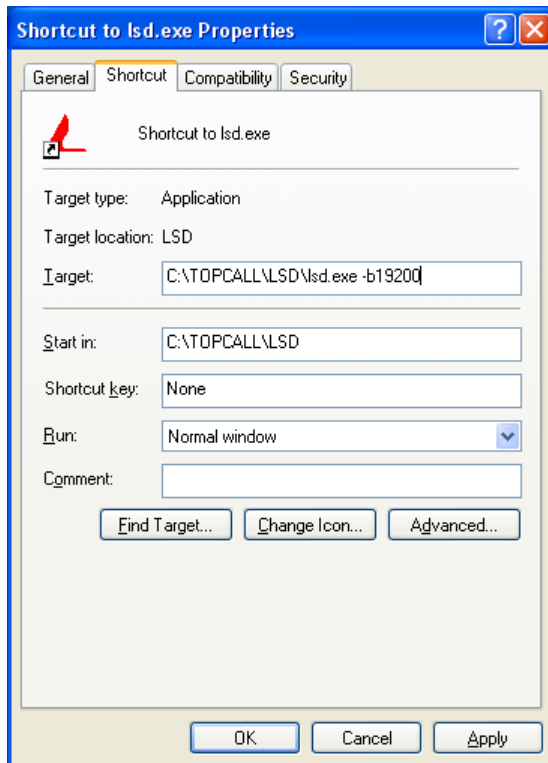
Step 4: Connect to LS1 with LSD

1. Install LSD from TC/SP 7.59.05 or higher on the administrator PC. LSD is installed with the Kofax Communication Server package.

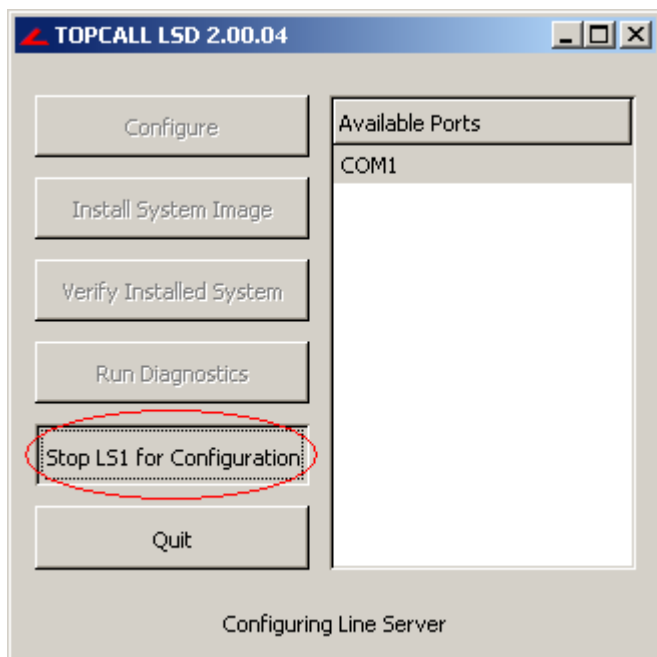
2. Optionally, configure lower speed (command line -b) if device server cannot do 115200.

Note It is not recommended to use a device server that cannot operate at 115200 baud on the COM port. LS1 application and system image download takes 47 minutes at 19200 baud.

3. TC/SP installation creates a shortcut to LSD in your Kofax Communication Server start menu group. If your LS1 operates at another speed than 115200 baud, edit this shortcut that LSD uses the same baud rate as your LS1.



4. Start LSD with the shortcut, select the virtual COM port COM 3 and reset the LS1 via the button “Stop LS1 for configuration”.



5. If any other application accesses COM 3, LSD will not work. Make sure that the terminal application from [Step 3: installing COM redirecting driver](#) is not running anymore.
6. After the LS1 rebooted the other buttons in LSD are available. You can configure and troubleshoot your LS1 now as usual.

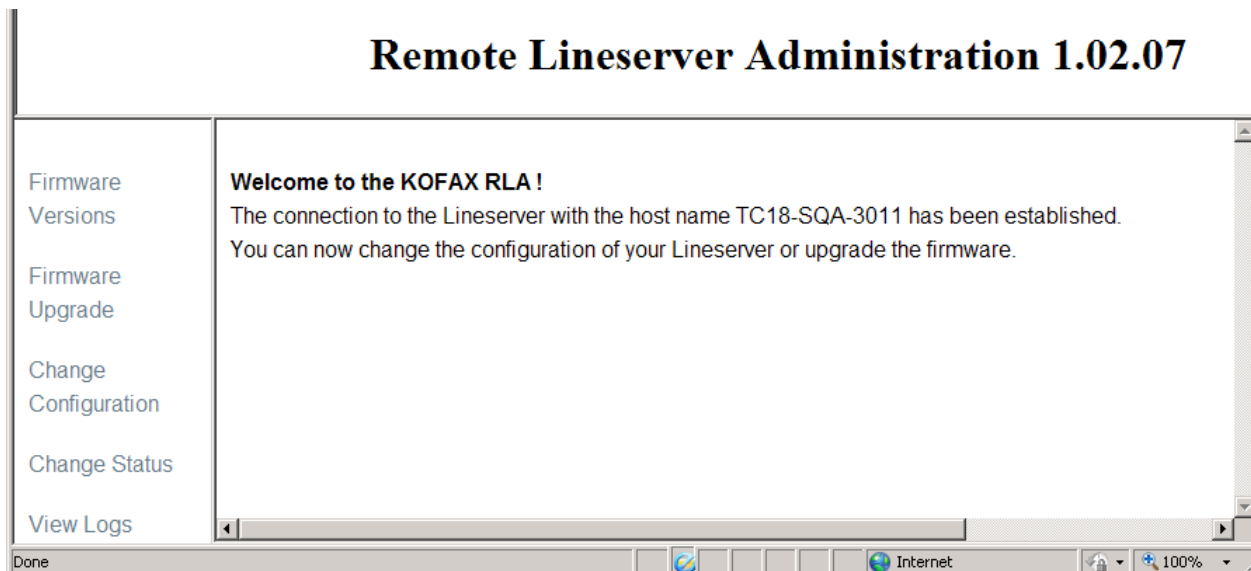
Known Problem with TC22 Test Program Download

During tests, the test program stalled when downloading the TC22 test program. The reason is unclear. In the tests some keystrokes in the test programs window solved the problem and the program continued.

Note Do not rely too much on the remote maintenance possibility described here. If the test program gets stuck or fails and you cannot solve the problem remotely, the LS1 can also not be restarted with the button in LSD or by a terminal application any more. **You must always have someone at the customer's site who you can call to reset the LS1 manually for you.**

Web-based Remote LS1V2 Administration (RLA)

LS1V2 supports the remote administration facility that enables remote LS1 firmware upgrades and configuration changes via any standard web browser.



The LS1V2 maintenance facility supports two main functions:

- Changing the LS1V2 configuration parameters (those parameters that previously could be configured only by the LSD tool)
- LS1V2 firmware upgrade

Note Each of these functions must be performed separately, followed by an LS1V2 reboot to activate the changes. **It is not possible to change the configuration and upgrade the firmware at the same time.**

Transactional Roll-Back Mechanism

Since the system administrator is often at a different location than the LS1V2 to be controlled, the remote maintenance facility provides a unique transactional safe roll-back mechanism that reverts back to the previous configuration or firmware without any human interaction on the LS1V2 side in case of any problems.

Working with the Roll-Back Mechanism

V2 iAfter having applied any configuration changes or firmware upgrades, the system administrator can activate these changes by rebooting the LS1n a TestRun mode. The TestRun mode of LS1V2 is fully operational but limited to a maximum duration of 10 minutes.

Having rebooted the LS1V2 in the TestRun mode, the administrator should reconnect via the web browser after approximately 1 minute and check the applied configuration or firmware changes. Optionally, also the overall LS1V2 functionality may be checked (its connection to the TCROSS server).

If the LS1V2 works properly, the administrator has to explicitly make the TestRun permanent via the web interface if he/she wants to keep the changes. If this is not done or in case the connection to the LS1V2 cannot be established via the web browser any more due to any configuration errors (like wrong IP address), the LS1V2 will automatically reboot with the previous configuration or firmware after the TestRun

timeout (10 minutes) has expired. In this case, the administrator may reconnect via the web browser using the previous configuration.

With the LS1V2 in the TestRun mode, the administrator may easily revert to the previous configuration or firmware by rebooting the LS1V2 via the web browser or by manually restarting LS1V2.

If the LS1V2 has been started in the TestRun mode, the following conditions may lead to a fallback to the previous configuration or firmware:

- The administrator forgets to make the TestRun permanent.
The LS1V2 reboots with the old configuration/firmware due to TestRun timeout expiration (10 minutes).
- The administrator cannot reach the LS1V2 through the web interface anymore
(for example, the IP address has been changed to a wrong value).
The LS1V2 reboots with the old configuration/firmware due to TestRun timeout expiration (10 minutes).
- Any fatal error condition occurs during LS1V2 startup
(for example, firmware incompatibility causing the startup crash).
The LS1V2 reboots with the old configuration/firmware due to the hardware watchdog expiration.

Working Without the Roll-Back Mechanism

Although it is recommended to use the roll-back mechanism for controlling LS1V2 servers across long distances, it is also possible not to use it at all, which may be more convenient if the administrator and the LS1V2 are working at the same location.

After having applied any configuration changes or firmware upgrades, the system administrator has to activate changes by simply rebooting the LS1V2 (and not to use the TestMode).

After the LS1V2 has rebooted, its configuration or firmware changes automatically assume a permanent status, and the administrator does not have to reconnect via the web interface.

However, if any fatal error like firmware crash occurred during the startup procedure, the LS1V2 would automatically revert to the previous configuration or firmware.

Therefore, it is always recommended to verify the configuration changes or firmware upgrades via the web interface.

Installation

This section describes the installation.

Prerequisites

- LS1V2 with installed firmware from TCSP 7.80.00 or higher and enabled Remote Lineserver Administration (RLA) function.
LS1V2 servers shipped by Kofax in April, 2007 or later will be equipped with pre-installed firmware from TCSP 7.80.00 or higher and enabled RLA function with default settings.

In case of LS1V2 servers that were shipped earlier, the firmware of TC/SP 7.80.00 or higher must be installed by the LSD tool first, which enables RLA function with default settings.

It is neither necessary to upgrade the TCOSS server for TC/SP 7.80.00 nor to restart it in case the TCOSS server is running a version earlier than TCSP 7.72.02.

However, in case of TCOSS from TCSP 7.72.02, the TCOSS auto-update function will install the older tc18.elf application on the LS1V2, with several consequences (see below).

- State-of-the-art web browser (IE6, IE7 or Firefox 2) with enabled Javascript support and disabled pop-up blocker.

Consequences if using TCOSS version from TC/SP 7.72.02:

- RLA will continue working but the Remote Admin menu will not be visible on the LS1V2 display in case LS1V2 has an active connection to its TCOSS server. Consequently, there will be no possibility to control RLA with buttons on the LS1V2 (for example, enable or disable RLA function).
- The older tc18.elf may issue LS1V2 reboots due to TCOSS connection timeout expiration or after a number of lost TCOSS connections. This behavior is rather unpredictable and may lead to LS1V2 reboots while the administrator is performing any action via RLA (for example, firmware upgrade).

How to avoid problems if using TCOSS from TC/SP 7.72.02:

- Perform full TCOSS upgrade to TC/SP 7.80.00 or higher (with TCOSS restart)
- Or perform at least the tc18.elf module update from TCSP 7.80.00 or higher (without TCOSS restart) so that TCOSS will not replace the current tc18.elf program with any older version.

Initial RLA Settings/Network Requirements

After the initial installation of the appropriate firmware with the LSD tool, the RLA function is enabled to be used through both LAN interfaces using **HTTPS protocol via TCP/IP on Port 443**.

There are two options to change these settings:

- With RLA function itself through web browser (preferred method)
See [Remote Configuration Changes](#) for more details.
- Via Mode and Set buttons on the LS1V2

This method is necessary only if it is not possible to use standard settings due to networking issues (for example, it is not possible to use HTTPS connection on port 443, but the customer wants to use HTTP on port 10000 for any reason).

For more details, see [Menu](#).

Client User Authentication

The RLA can be configured to use either standard HTTP or HTTPS connections. However, it is recommended to use HTTPS. Otherwise, the user credentials (password) might be easily hacked on the network.

There are two hard-coded users that can be used for the RLA function:

- "admin": Used with the TCOSS password
(TCOSS password is the same password TCOSS uses to log onto the LS1)
full rights (change configuration and firmware upgrades as well)
- "read": Used with empty password
"read-only" user, dedicated to verify the configuration and status only

The following table summarizes different access rights based on the user and RLA mode parameter.

User/Password	RLA Mode Parameter
---------------	--------------------

	Enable	Read-only	Disable
admin/TCOSS password	full access	read-only	no access
read/empty password	read-only	read-only	no access

Remote Configuration Changes

This section describes the remote configuration changes.

Step 1: Connect to the LS1V2 via Its IP Address

Enter one of the following URLs into you browser depending on whether HTTPS is enabled or disabled on the LS1V2:

- If HTTPS is enabled, enter **`https://ls1v2_ip_address[:portNumber]`**
- If HTTPS is disabled, enter **`http://ls1v2_ip_address[:portNumber]`**

Note There is a known HTTPS redirection problem with the Firefox 2.x browser. Therefore, with Firefox 2.x or IE7 and an HTTPS connection, use the following URL:

`https://ls1v2_ip_address[:portNumber]/file/index.html`

where `ls1v2_ip_address` is the IP address of the LS1V2 to be controlled.

The optional parameter `portNumber` is necessary only in case a non-standard port number has been configured for the RLA access (standard port numbers are 443 for HTTPS and 80 for HTTP).

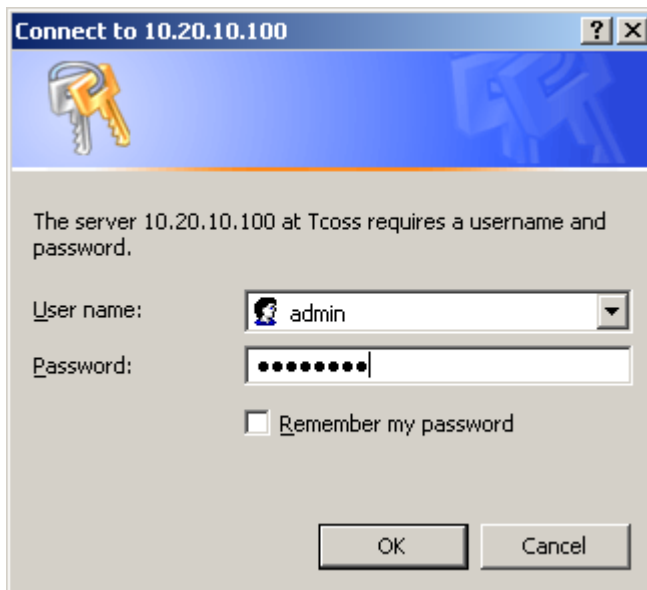
Step 2: Authentication

In case of the HTTPS connection, the browser will display a warning indicating a problem with the site's security certificate.



The reason is that the LS1V2 uses a built-in certificate that has not been assigned by any certifying authority (by clicking **View Certificate** you can verify that this certificate was issued to Line Server Mod305).

Click **Yes**, and the following authentication screen will be displayed.



Enter the user name and TCROSS password and click **OK**. The first status screen is displayed.

Remote Lineserver Administration 1.02.07

Firmware Versions	Welcome to the KOFAX RLA ! The connection to the Lineserver with the host name TC18-SQA-3011 has been established. You can now change the configuration of your Lineserver or upgrade the firmware.
----------------------	--

Step 3: Change Configuration

Click **Change Configuration**. The Line Server Configuration Parameters screen is displayed.

	LAN1	LAN2
LAN Mode	Auto Negotiation	Auto Negotiation
IP Address	10.20.10.100	192.168.1.8
Network Mask	255.255.0.0	255.255.255.0
Default Gateway	10.20.0.1	

Host Name	TC18-SQA-3011
TCOSS Password
Confirm TCOSS Password
TCOSS Connection Timeout[s]	1200
Network MTU Size	1499
Serial Number	153
TCOSS TCP Port	5000
TcpMeter TCP Port	5011
Enable TcpMeter Support	<input checked="" type="checkbox"/>

RLA Mode	Enabled
LAN Interface for RLA	All
Enable Https for RLA	<input checked="" type="checkbox"/>
RLA TCP Port	443

Save and Reboot as TestRun

Save and Reboot

Cancel Changes

LAN Mode

Set up speed and duplex mode (default: Auto Negotiation). See [Recommendation for LAN Mode Configuration](#) for appropriate setting.

IP Address

Required for network communication.

Network Mask

Required if TCOSS server is in another network segment.

Default Gateway

Required if TCOSS server is in another network segment.

Host Name

The host name of the LS1V2 server.

TCOSS Password

The password used by TCOSS to connect to LS1 and for the remote maintenance.

Note the following aspects when changing the password via the web interface:

- Change the password on the TCOSS server also, otherwise it will not be able to connect to LS1.
- Always reboot the LS1 in the TestRun mode to be able to verify the password afterwards. If there are any (typing) errors and you cannot reconnect via the web interface, the LS1 will reboot after 10 minutes and you can reconnect using the previous password.
But if you change the password and reboot in the normal (permanent) mode, you might not be able to reconnect via the web interface in case of an (typing) error.
As a consequence, it is inevitable to go on site and change the password with the LSD tool.
- If "*****" (6 asterisks) is entered as new password, the current password will remain unchanged. Consequently, "*****" cannot be used as password.

TCOSS Connection Timeout(s)

Defines the time (seconds) that LS1 waits for a connection from TCOSS to DSP 0. If this timeout expires, a reboot will be initiated in order to set LS1 to a well-defined state. During the restart, program files are updated, and therefore LS1 cannot be reached for about 20 seconds. This should be taken into account when setting the timeout to small values. A large value increases the recovery time in case of network problems.

If the field is not set, the default value of 1800s (30min) will be used. For standard installations this value does not have to be changed. Only with slow WAN connections a higher timeout is recommended.

If the value is set to 0, an infinite TCOSS connection time-out will be used.

Network MTU Size

Defines the maximum size of network packets. By default, the standard size for Ethernet (1500 Bytes) is used. If a router cannot deliver packets of this size (for example, if it has to insert an additional packet header), the MTU size can be reduced.

Serial Number

Serial number of the LS1V2 (read-only value).

You can load any previously saved configuration from a file or save the configuration to the Line Server or a file once you have filled in the mandatory fields.

Note IP address, network mask and default gateway can also be configured directly on LS1. See [On Device Controls and Display](#) for details.

TCOSS TCP Port

Defines the starting TCP port number of a range of 3 TCP ports that the LS1V2 uses for the incoming connection from:

- the TCOSS server, default value is 5000.
- the Voice server, default values are 5001 and 5002

For example, changing this value to 10000 would cause the following TCP port numbers: 10000 for incoming connection from the TCOSS server, and

10001 and 10002 for incoming connection from the Voice server

TcpMeter TCP Port

Defines the TCP port number the TcpMeter used for the incoming connection, default value is 5011.

Enable TcpMeter Support

TCPMeter-Server on LS1 can be enabled and disabled via the configuration. If enabled, you can measure the network bandwidth quality or network bandwidth availability between a Line Server (LS1) and TCOSS Server by running TCPMeter on the TCOSS server. For more details, please refer to the *tcpMeter Technical Manual*.

RLA Mode

Defines the RLA access rights. The following values are possible:

- enable: Enables full RLA access (including configuration changes and firmware upgrades).
- read-only: Only RLA read-access possible.
- disable: RLA web access is disabled.

LAN Interface for RLA

Defines the LAN interface(s) for RLA access:

- All: enables RLA on both LAN interfaces
- LAN1: enables RLA on LAN1 interface only
- LAN2: enables RLA on LAN2 interface only

Enable HTTPS for RLA

Enables/disables an HTTPS connection using SSL for RLA.

RLA TCP Port

TCP port number for the RLA web access (default values are 80 for HTTP connection and 443 for HTTPS connection)

There are the following saving options:

- **Save and Reboot as TestRun:** The configuration changes will be saved to the LS1V2, which will then reboot in the TestRun mode (limited to 10 minutes).
The following information will be displayed shortly before the reboot of LS1V2.

Remote Lineserver Administration 1.01.05

<div>Firmware Versions</div> <div>Firmware Upgrade</div> <div>Change Configuration</div> <div>Change Status</div>	<div>The configuration has been saved. The Lineserver will reboot with the new configuration in the TestRun mode in a few seconds. To make your configuration changes permanent or to cancel them, you have to reconnect to the Lineserver and select Change Status. If no action is taken, the Lineserver will reboot with the previous configuration/firmware in 10 minutes and your changes will be lost.</div> <div>Close</div>
---	--

Continue with **Step 4**.

- **Save and Reboot:** The configuration changes will be saved to the LS1V2, which will reboot in the normal (permanent) mode (without any limitations).

The following information will be displayed shortly before the reboot of LS1V2.

Remote Lineserver Administration 1.01.05

Firmware Versions	The configuration has been saved. The Lineserver will reboot with the new configuration in a few seconds.
Firmware Upgrade	<input type="button" value="Close"/>
Change Configuration	
Change Status	

Step 4: Make Changes Permanent

If you have clicked Save and Reboot as TestRun, the following screen will be displayed when you log in again. It indicates that the LS1V2 is running in the limited TestRun mode.

Remote Lineserver Administration 1.01.05

Firmware Versions	Your Lineserver with the host name MyLS1 has successfully rebooted and is currently running in the TestRun mode.
Firmware Upgrade	You can now save or cancel your configuration or firmware changes.
Change Configuration	<input type="button" value="Make TestRun Permanent"/> <input type="button" value="Reboot to Cancel Changes"/>
Change Status	

You can either accept your changes or cancel them explicitly.

Note If no action is taken for more than 10 minutes, LS1V2 will revert to the previous configuration or firmware.

- If you want to keep your changes and make them permanent, click **Make TestRun Permanent**. The LS1V2 keeps running, only the temporary TestRun mode will be changed to permanent.

Remote Lineserver Administration 1.01.05

Firmware Versions	The TestRun mode has been changed to Permanent mode.
Firmware Upgrade	The Lineserver continues running with changed configuration or firmware.
Change Configuration	
Change Status	

- If you want to cancel your changes, click **Reboot to Cancel Changes**. The LS1V2 reboots immediately with the previous configuration. (This step is not necessary if you have pressed the Save and Reboot button before).

Note You cannot make any configuration changes in the TestRun mode. If you click Change Configuration, you will not be allowed to change anything except for the status from TestRun mode to normal (permanent) mode.

Remote Lineserver Administration 1.01.05

Firmware Versions	Your Lineserver is running in the temporary TestRun mode. It is not possible to change any parameters while running in the TestRun mode. Please select Change Status to change the TestRun mode to Permanent mode or to cancel your configuration changes. If no action is taken, the Lineserver will reboot with the previous configuration/firmware in 10 minutes and your changes will be lost.
Firmware Upgrade	
Change Configuration	
Change Status	

	LAN1	LAN2
LAN Mode	Auto Negotiation, FullDuplex	Auto Negotiation, FullDuplex
IP Address	10.11.255.213	172.16.0.2
Network Mask	255.255.255.0	255.255.255.0
Default Gateway	10.11.0.1	10.11.11.1

Host Name	MyLS1
TCOSS Password	*****
Confirm TCOSS Password	*****
TCOSS Connection Timeout[s]	1000
Network MTU Size	1000
Serial Number	123
TCOSS TCP Port	5000
TcpMeter TCP Port	5011
Enable TcpMeter Support	<input checked="" type="checkbox"/>

RLA Mode	Enabled
LAN Interface for RLA	All
Enable Https for RLA	<input checked="" type="checkbox"/>
RLA TCP Port	443

Remote Firmware Upgrade

This section describes the remote firmware upgrade.

Step 1 and 2: Connect to the LS1V2 and Authentication

The procedure for steps 1 and 2 is the same as [Step 1](#) and [Step 2](#) of "Remote Configuration Changes".

Step 3: Upload the Firmware

Firmware on the LS1V2 consists of as much as 6 different modules, and the versions currently running on the LS1V2 can be checked by clicking on Firmware Versions:

Remote Lineserver Administration 1.01.05

Firmware Versions	Lineserver with the host name MyLS1 is running with firmware versions:
Firmware Upgrade	
Change Configuration	
Change Status	

System Image	Linux-2.6.12-TOPCALL-2.02.01
Application Image	ls1app-tc18 V1.00.13
FPGA Image	TC18 FPGA V1.2
FPGA Loader	FPGA Loader V1.04.01
PPC Test Program	TT06 test V1.02.04
DSP Test Program	TT06 DSP test V1.05.02

All the modules will be upgraded by means of a single firmware upgrade file named "image18.img". Full TC/SP upgrades will consist of all modules listed in the screen above, but it is also possible (for any

technical reason) that only some of them are provided within the "image18.img" upgrade file (especially for patch purposes).

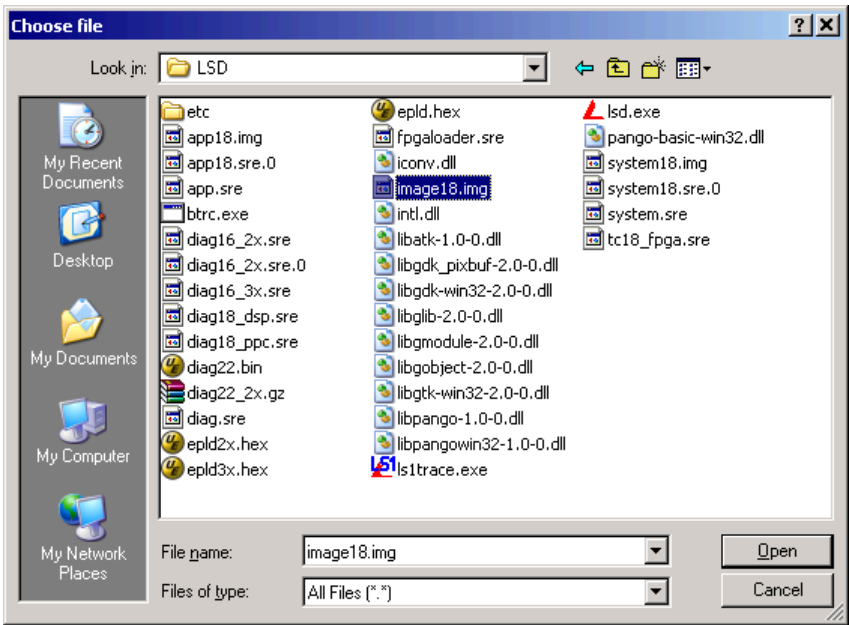
To upgrade the firmware, do the following:

1. Click **Firmware Upgrade**.

Remote Lineserver Administration 1.01.05

<div>Firmware Versions</div> <div>Firmware Upgrade</div> <div>Change Configuration</div> <div>Change Status</div>	<div>Lineserver Firmware Upgrade</div> <div>Please enter the file image18.img:</div> <div>Firmware File: <input type="text"/> <input type="button" value="Browse..."/></div> <div><input type="button" value="Start Upload"/></div>
---	---

2. Click the Browse button, locate the file image18.img and click Open.



3. Click **Start Upload**.

Remote Lineserver Administration 1.01.05

<div>Firmware Versions</div> <div>Firmware Upgrade</div> <div>Change Configuration</div> <div>Change Status</div>	<div>Lineserver Firmware Upgrade</div> <div>Please enter the file image18.img:</div> <div>Firmware File: <input type="text" value="Z:\Develop\Home\EREB\ir"/> <input type="button" value="Browse..."/></div> <div><input type="button" value="Start Upload"/></div>
---	---

4. During the upgrade, the following screen will be displayed. Please follow the instructions on the screen, do not navigate to another page, do not close the browser or reboot the Line Server. The "Uploading ..." bar indicates the overall progress of the firmware upload process.

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

Lineserver Firmware Upgrade

Please enter the file image18.img:

Firmware File:

Uploading...

The firmware is being uploaded, which may take several minutes.
Do not navigate to another page, close the browser, or reboot the Lineserver until the Lineserver responds.

5. After the file upload has been completed, the following screen will be displayed:

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

Firmware Versions:

	Current Versions	Upgrade Versions
System Image	Linux-2.6.12-TOPCALL-2.02.01	Linux-2.6.12-TOPCALL-2.02.01
Application Image	ls1app-tc18 V7.73.02	ls1app-tc18 V7.73.04
FPGA Image	TC18 FPGA V1.2	TC18 FPGA V1.2
FPGA Loader	FPGA Loader V1.04.01	FPGA Loader V1.04.01
PPC Test Program	TT06 test V1.02.01	TT06 test V1.02.04
DSP Test Program	TT06 DSP test V1.05.02	TT06 DSP test V1.05.02

In the **Current Versions** and **Upgrade Versions** columns, the list of currently running and uploaded firmware modules can be verified.

In the example screen above, only the application image has been uploaded, all other modules remain unchanged.

6. Select one of the following options:
- **Save & Reboot as TestRun:** Click this option if you want to perform the indicated upgrade and test it first by means of the TestRun mode.

Applied upgrade modules are written into the flash memory (which may last for about 3-4 minutes) . The overall progress of the flash writing process is indicated by the "Flashing ..."
progress bar on the following screen.

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

Firmware Versions:

	Current Versions	Upgrade Versions
System Image	Linux-2.6.12-TOPCALL-2.02.02	Linux-2.6.12-TOPCALL-2.02.02
Application Image	ls1app-tc18 V22.11.07.02	ls1app-tc18 V22.11.07.02
FPGA Image	TC18 FPGA V1.2	TC18 FPGA V1.2
FPGA Loader	FPGA Loader V1.05.04	FPGA Loader V1.05.04
PPC Test Program	TT06 test V1.02.05	TT06 test V1.02.05
DSP Test Program	TT06 DSP test V1.05.02	TT06 DSP test V1.05.02

Save & Reboot as TestRun

Save & Reboot

Cancel Changes

Flashing...

The firmware is being written to the flash memory, which may take several minutes.
Do not navigate to another page, close the browser, or reboot the Lineserver until the Lineserver responds.

As soon as the firmware has been written to the flash memory, the following information will be displayed and LS1V2 reboots immediately in the TestRun mode (up to 10 minutes).

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

The firmware upgrade has been saved to the flash memory.
The Lineserver will reboot in the TestRun mode in a few seconds.
To make your firmware upgrade permanent or to cancel it,
you have to reconnect to the Lineserver and select [Change Status](#).
If no action is taken, the Lineserver will reboot with the previous configuration/firmware in 10 minutes
and your changes will be lost.

Please proceed with [Step 4](#) of the "Remote Configuration Changes" section.

- **Save & Reboot:** Click this option if you want to perform the indicated upgrade and make this change permanent.

Applied upgrade modules are written into the flash memory (which may last for about 3-4 minutes) and the LS1V2 reboots in normal (permanent) mode. The overall progress of the flash writing process is indicated by the "Flashing ..." progress bar on the following screen.

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

Firmware Versions:

	Current Versions	Upgrade Versions
System Image	Linux-2.6.12-TOPCALL-2.02.02	Linux-2.6.12-TOPCALL-2.02.02
Application Image	ls1app-tc18 V22.11.07.02	ls1app-tc18 V22.11.07.02
FPGA Image	TC18 FPGA V1.2	TC18 FPGA V1.2
FPGA Loader	FPGA Loader V1.05.04	FPGA Loader V1.05.04
PPC Test Program	TT06 test V1.02.05	TT06 test V1.02.05
DSP Test Program	TT06 DSP test V1.05.02	TT06 DSP test V1.05.02

Save & Reboot as TestRun

Save & Reboot

Cancel Changes

Flashing...

The firmware is being written to the flash memory, which may take several minutes.
Do not navigate to another page, close the browser, or reboot the Lineserver until the Lineserver responds.

As soon as the firmware has been written to the flash memory, The following screen will display and the LS1V2 reboots immediately.

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

The firmware upgrade has been saved to the flash memory.
The Lineserver will reboot with the new firmware in a few seconds.

- **Cancel Changes:** Click this option if you want to cancel your changes.

Note You cannot perform any firmware upgrades in the TestRun mode. If you press Firmware Upgrade, you will be able to upload the firmware to the LS1V2, but then a warning message will be displayed indicating that you cannot perform any changes except for the status from TestRun mode to normal (permanent) mode.

Remote Lineserver Administration 1.01.05

Firmware Versions

Firmware Upgrade

Change Configuration

Change Status

Your Lineserver is running in the temporary TestRun mode.
It is not possible to upgrade the firmware while running in the TestRun mode.
Please select Change Status to change the TestRun mode to Permanent mode
or to cancel your configuration changes.
**If no action is taken, the Lineserver will reboot with the previous
configuration/firmware in 10 minutes and your changes will be lost.**

Compatibility Issues with the LSD Tool

- One prerequisite for the web-based remote maintenance is that the LS1V2 firmware must be installed first by the LSD tool of the TC/SP 7.80.00 or higher.
- Remote maintenance and the LSD tool do not exclude each other. Therefore, any changes on the LS1V2 can be done either via web-based maintenance or with the LSD tool of the TC/SP 7.80.00 or higher.
However, the restriction is that several new RLA-related parameters are not displayed on and cannot be changed by the LSD tool, they simply remain unchanged throughout any LSD (TC/SP 7.80.00 or higher) operation.
- In case any firmware upgrades are done by an LSD tool older than TC/SP 7.80.00, the web-based RLA support on this LS1V2 will be disabled.
- It is not allowed to make only configuration changes (but no firmware upgrades) by an LSD tool older than TC/SP 7.80.00, which would cause an inconsistent state of the LS1V2 and, most probably, severe problems.

In this case the RLA support has to be re-installed by the LSD tool of the TC/SP 7.80.00 or higher.

Licensing

No additional licenses are necessary for web-based remote maintenance of the LS1V2.

Performance

The following table summarizes worst case key performance values of the Remote Lineserver Administration of TCSP 7.80.00 or higher. Two sets of performance values are provided, depending on the TCOS release running on the TCOS server to which the particular Line Server is connected.

All values were measured on the Line Server with heavy 30-channels fax operation.

Remote Lineserver Administration Performance Summary		
	TCOS 7.80.01 or higher	TCOS older than 7.80.01
Changing configuration	6 sec.	12 sec.
Reading firmware	3 sec.	6 sec.
Uploading firmware	30 sec. (100MBit/s LAN) 3 min. 30 sec. (256kBit/s)	2 min. (100MBit/s LAN)
Saving firmware to the flash memory	2 min.	5 min.

Viewing Log Files

Remote Lineserver Administration tool can be used to view traces of the line server.

Click **View Logs** and then select one of the following options:

- **Live Logs:** Use live log to monitor the current activity on the Line Server.

Remote Lineserver Administration 1.02.07

Firmware Versions	Live log Saved logs
Firmware Upgrade	Maximum number of lines: <input type="text" value="80"/> Start position: <input type="text"/>
Change Configuration	[Jun 01 13:00:31.837 128] DSP 0 -> active calls: 0
Change Status	[Jun 01 13:01:01.839 128] DSP 0 -> active calls: 0
View Logs	[Jun 01 13:01:31.840 128] DSP 0 -> active calls: 0
	[Jun 01 13:02:01.841 128] DSP 0 -> active calls: 0
	[Jun 01 13:02:31.843 128] DSP 0 -> active calls: 0
	[Jun 01 13:03:01.844 128] DSP 0 -> active calls: 0
	[Jun 01 13:03:31.846 128] DSP 0 -> active calls: 0
	[Jun 01 13:04:01.847 128] DSP 0 -> active calls: 0
	[Jun 01 13:04:31.849 128] DSP 0 -> active calls: 0
	[Jun 01 13:05:01.850 128] DSP 0 -> active calls: 0
	[Jun 01 13:05:31.852 128] DSP 0 -> active calls: 0
	[Jun 01 13:06:01.853 128] DSP 0 -> active calls: 0
	[Jun 01 13:06:31.854 128] DSP 0 -> active calls: 0

- **Saved Logs**

Remote Lineserver Administration 1.02.07

Firmware Versions Firmware Upgrade Change Configuration	<div>Live log</div> <div>Saved logs</div>					
	Number	Time Saved	Start Position	Lines	Size	Action
	1	2011-01-24 10:13:04	54516	1110	65439	[Open]
	2	00:20:37	0	222	13196	[Open]
	3	2011-01-25 10:26:39	0	851	49802	[Open]
	4	2011-02-14 09:24:37	113943	1094	65419	[Open]
	5	2011-03-14 14:38:33	265153	1075	65412	[Open]
	6	2011-04-07 15:52:33	261518	844	65453	[Open]

When Line Server is restarting, it automatically saves traces of its final actions before restart to a log file. Up to 14 logs can be saved to Line Server's internal flash memory. Click **Open** to view the log.

Restrictions

- There is no possibility to backup and restore the LS1V2 configuration to/from the local file (as it was possible with the LSD tool buttons SaveConfig and LoadConfig). As a workaround, the configuration may be saved by making a screenshot of the configuration panel.
- During the first RLA installation by the LSD tool from TC/SP 7.80.00 or higher, not only the firmware has to be installed but also the configuration has to be saved on the LS1V2, even though there were no obvious configuration changes. The other possibility is to install only the firmware with the LSD tool, but then to change the configuration on the LS1V2 via the web interface at least once.
If the configuration is not saved neither by the LSD tool nor via the web interface, the Remote Administration settings will not work with the buttons on the LS1V2.

- Even though uploading firmware via the web interface with a fast LAN interface may take more than 30 seconds and saving firmware may take up to 5 minutes, there is no progress bar on the web interface. Please be patient!
- The initial installation of the RLA with the LSD tool takes approximately 40 minutes (in comparison, full installation of the previous Line Server firmware without RLA support takes about 20 minutes).

Version Information

This chapter provides an overview about LS1 version info and how it may be displayed:

Name	File name	LSD verify	Remote Line-server (RLA)	LS1 display (version info menu)
Hardware				
BIOS Version	n/a	BIOS version ... TCBIOS V3.02.02	n/a	Version Info 2 TCBios 3.02.02
LS1 Firmware Installed via LSD or RLA (image18.img)				
Linux Kernel	system18.sre	system image ... Linux-2.6.12- TOPCALL-9.1.0.134	Linux-2.6.12- TOPCALL-9.1.0.134	Version Info 4 TCLinux 9.1.0.134
Application Image	app18.sre	application image .. Ls1app-tc18 V10.3.0.0.0.134	Ls1app-tc18 V10.3.0.0.0.134	Version Info 1 KCS 10.3.0.0.0.134
FPGA Loader	Fpgaloader.sre	fpgaloader image ... FPGA Loader V1.05.04	FPGA Loader V1.05.04	n/a
FPGA Image	Epld3x.hex	fpgaimage ... TC18 FPGA V1.3	TC18 FPGA V1.3	Version Info 3 TC18 FPGA 1.3
PPC Test program	Diag18_ppc.sre	diagnostics image ... TT06 DSP test V9.1.0.0.0.134	TT06 test V9.1.0.0.0.134	n/a
DSP Test program	Diag18_dsp.sre	DSP diagnostics image ... TT06 DSP test V1.05.02	TT06 DSP test V1.05.02	n/a
The following files are by default updated by TCOSS				
PowerPC program	tc18dsp.bin	n/a	n/a	Version Info 5 PPC 9.1.0.134
DSP program	Tc18dsp.bin	n/a	n/a	Version Info 6 DSP 9.1.0.134

The BIOS is stored on a hardware chip and cannot be updated locally. Version 3.02.02 is used since 2006, so you can expect this release on all line servers.

A set of binaries will be installed as firmware either by LSD (via serial port) or RLA (via network). In the second case, these binaries are packed into the RLA image file "image18.img". In both cases, the included application image version (highlighted) should be used as indicator of the installed LS1 firmware, because it shows the related KCS product version. All other modules either include the related file version number (such as 9.1.0.x for KCS 10.3.0.0.0.x) or have any other version number that is not changed frequently.

The PowerPC and DSP programs are the main binaries for fax and voice operation. They are part of the installed application image and they are by default also automatically updated by TCOSS in volatile memory (RAM) if they do not match with files ATC18DSPPROG and ATC18DSPPROG in +TECH folder. Therefore, the highlighted DSP program version is a good indicator for the (file-) version of the connected TCOSS system unless TCOSS registry value LAN<LanLinkNumber>\AutoUpdate is explicitly set to zero to disable this update. Note that the DSP version is shown as "???" if there is no connection to TCOSS.

Trace Possibilities

This section describes the trace possibilities.

User Fax Module (on LS1)

This section describes the trace possibilities for user fax module.

Binary Trace Capability

This section describes the binary trace capability.

Activating the Binary Trace

A binary trace can be activated on all fax/voice channels (incl. analog fax channels) running on a LS1 as described below:

1. Make sure that the TCOSS trace flag for binary trace is set on the LS1 node where you want to activate a binary trace. This is done in the registry under

HKLM\Software\TOPCALL\TCOSS\TraceFlags\Node_xxx, where xxx describes the node. Refer to the *Trace Possibilities - Enable Traces on LS1 without TCOSS Restart* section in the *TCOSS System Manual* for details.

2. Set the binary trace level in position 5 and 6 of config line 242 according to the following table.

Trace flag	Activate trace of
0x01	Messages to data pumps
0x02	Messages from data pumps
0x04	Transmitted PCM data (analog signal)
0x08	Received PCM data (analog signal)

Trace flag	Activate trace of
0x10	Record transferred voice calls (valid for position 5 only)
0x80	Record call establishment

Position 5 is used for the primary datapump (Fax/Voice Data)

Position 6 is used for the secondary datapump (DTMF detection, read only)

By default the binary trace starts after the connection to the distant fax machine or telephone has been established.

If bit 4 (=0x10) of position 5 in configuration line 242 is set, then binary trace records transferred voice calls. A voice call transfer happens if, for example, call-operator or call-sender function is used with TC/VoiceAccess. Note that this bit is ignored on LS1v1.

If bit 7 (=0x80) of position 5 or 6 in configuration line 242 is set, then binary trace starts immediately upon call initiation. In this case the line will be recorded already during call establishment phase, which make recording of different call progress tones (like dial, ringing) possible.

Recommended levels for troubleshooting ISDN lines are pos 5 to 0x0F and pos 6 to 0x03.

Recommended levels for troubleshooting analog fax lines are pos 5 to 0x8F and pos 6 to 0x03.

Specifying Output Directory, Max Files and Max File Size

The binary trace creates a single file for each call. These files are stored in directory `C:\tcoss\trace` on the TCOSS server connected to the LS1 by default. By specifying a path in the registry value **BinaryTracePath [REG_SZ]**, the trace can be written to any other directory. The maximum number of files can be set by registry value **BinaryTraceMaxTraceFiles [REG_DWORD]**. The default value is set to 50. The size of the files can be limited by the registry value **BinaryTraceMaxTraceFileSize [REG_DWORD]**. The value defines the maximum size for one file in kilobytes. The default is 10000.

Format of the Binary Trace Files

Since binary trace is a whole new feature it requires a different handling than usual trace output. The binary trace produces files with the extension `.btr` in the specified directory (`C:\tcoss\system` by default) on the TCOSS server. These files are binary and require to be converted to analyze them.

Therefore the tool `BtrConv (c:\topcall\sd\btrc.exe)` on the TCOSS server can be used. Under Windows the file extension `.btr` can be associated with that program. If then a binary trace file is double clicked in explorer it gets converted.

Depending on the used binary trace level the output of the conversion can be two files: a file with the same name as the binary trace file and the extension `.asc` and a file with the extension `.wav` which is a standard windows PCM wavefile (8 KHz 16 bit stereo).

The `.asc` file is a text file which can be viewed with a text editor. It contains the messages that are exchanged between TCOSS and the datapump software running in the LS1 depending on the used binary trace level.

The `.wav` file can be played/viewed with any audio software that supports the standard windows PCM wave format. It contains the signal, which the LS1 sends out (right channel) and receives from (left channel) the line depending on the used binary trace level. If, for example, only trace level 08 is activated, the output will be a stereo wave file containing the received signal in the right channel and silence in the left channel.

Restrictions

- You must not activate PCM trace on primary and secondary datapump at the same time. This would result in unusable binary trace files.
- The binary trace should only be activated for one single channel at a time if PCM trace is used. Since binary trace with PCM produces a large amount of data transfer over the network between the LS1 and the TCOSS server for each channel, activating it with PCM on multiple channels on the same LS1 leads to problems.
- If binary trace is configured on multiple channels, the difference between the lowest and the highest channel number must be less than 256.

DSP Performance Counter Trace

It is possible to dump a complete list of all threads with their current CPU usage since thread creation and the peak active time without de-scheduling since last dump.

This dump will be created at begin and end of a call if position 7 of config line 242 is set to 01.

DSP Memory Dump Option

For troubleshooting, it is possible to dump the whole DSP memory into a file. This dump must be activated by configuration independently for each LAN link.

Configuration of Memory Dump includes the following registry values:

1. Registry Value: `Link\xxx\EnableMemoryDump`, type DWORD (xxx specifies the LAN-Link number) .

0	Memory Dump is disabled (default).
1	Memory Dump is always created when booting LS1 even after TCOSS restart or if the Dump is corrupted.
Other	Memory Dump is created if the LS1 reboot was not caused by a TCOSS restart, the Dump is not corrupted and the minimum active time of DSP in seconds exceeds this value.

2. Registry Value: `HLKL\Software\Topcall\tcoss\MemoryDumpFiles`, type DWORD
Specifies the number of Dump Files that should be created. Dumps are stored as file names `C:\tcoss\trace\MemDump_xxx.bin`, where xxx is counting from 000 to MemoryDumpFiles-1. The behavior is similar to binary trace files and standard trace with `AppendTrace=0`. The first dump after TCOSS restart is always stored in the `MemDump_000.bin` file. If more dumps are created than configured dump files are overwritten.

Important Be careful when using this feature!

Each Dump file has a size of up to 32MByte (or up to 128MByte with LS1V2). All data is transmitted from LS1 to TCOSS via LAN connection. This leads to the following side effects:

1. Reboot of Node is slowed down if a dump is created (about 1 min if the Line Server is connected via LAN, 2 hours(!) on a 64kB ISDN connection). Reboot of other nodes is not possible during dump download.
2. Dumps consume very much disk space.

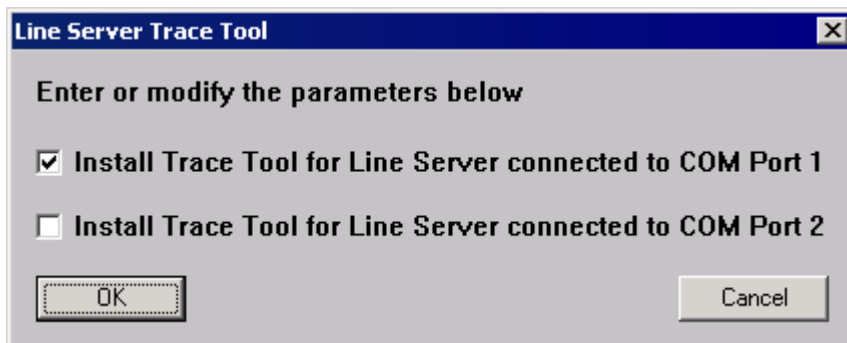
LS1 Trace Tool

Since TC/SP 7.55.05 the server package a Tool which is used to capture the trace output from a Line Server over its serial interface. Use this Tool to report errors, because so the TC-support and development get additional information to isolate errors.

Installation

The LS1 Trace Tool can be selected in the TC/SP setup application group Administrative Tools.

If it is selected, a setup screen will appear, which offers to select up to 2 instances of the Trace Tool.



All selected instances are started by TCSRv from now on. The instances appear as Com1Trace and Com2Trace in the TC/Mon process list.

Note

1. If selected, the shortcut to the Line Server Trace Tool in the Kofax Communication Server group in the start menu of Windows **becomes obsolete and should not be used any more**.
2. If you have the Trace Tool already installed and added it to your startup folder (that Windows starts automatically upon reboots), it may conflict with an instance started by TCSRVS which wants to access the same COM port that is already occupied by the instance started by Windows. **Remove the Trace Tool from the Windows startup folder if you have it there.**
3. If an instance of the Trace Tool is installed once, it will be started by TCSRVS. It cannot be removed from TCSRVS application list by not selecting it the next time running setup. **If you don't want it to be started by TCSRVS any more, you will have to remove it manually from the Startup registry value of TCSRVS** (see the *TCSRVS* documentation for details).

Usage

Connect the PC's COM Port of the instance you have installed with TC/SP setup through a crossed serial cable (SubD9 connector: Pin2 – Pin3, Pin3 – Pin2, Pin5 - Pin5) with the Line Server. Start the TC/SRV on the machine. You will notice, that one or two new processes appear in TC/Mon named Com1Trace or Com2Trace, depending on the instances you have selected.

Every trace output from LS1 will be stored now until you exit the program by pressing any key in its window. The trace files, named Com1TraceX.trc or Com2TraceX.trc (X=0,1,2...), are written to directory `c:\tcoss\trace`.

Note If you want to access an LS1 on COM port 1 with LSD you have to stop the LS1 Trace Tool instance that uses COM 1 before. The same applies for COM 2. Only one application can use a PC's COM port exclusively.

Configuration Settings

TCLS1TRACE uses the registry key `HKLM\Software\Topcall\Com1Trace` or `HKLM\Software\Topcall\Com2Trace` to configure the tools parameters. Similar to other KCS applications, TCLIB is used to generate the trace output. The most important values are created by TC/SP setup. A description of these values is given below.

Value: CommandLine (REG_SZ)

Specifies the command line that is used when TC/SRV starts the instance of the tools. Manually call the tool from `c:\tcoss\tcls1trace.exe` ? for details on the command line parameters.

Value: MaxTraceFileSize (REG_DW)

Specifies the maximum size in Kilobyte of a single trace file for a process. Trace data gets added to the current file until the file size reaches the max. value. In this case the current file gets closed and a new one gets opened. Setup default is 1000.

Value: MaxTraceFiles (REG_DW)

Specifies the maximum number of trace files generated for one process. The generated trace files are numbered from 0 to *MaxTraceFiles*-1. This value only restricts the number of trace files (that is, the

amount of trace data) kept on disk and not the total number of files generated while the process is active. When the max. trace file number is reached, the next file generated gets number 0. Setup default is 10.

Value: AppendTrace (REG_DW)

If this value is zero, the corresponding process starts writing trace files at trace file number 0. Any previously stored data gets deleted before the first line of new trace data is written to the file.

If this value is non-zero, the corresponding process starts writing trace files at trace file number *AppendTrace*-1. But, the previously stored trace data is preserved. Any new data gets appended to the current file until it reaches *MaxFileSize*.

Specifying 0 or 1 is equal, but in the first case the trace file gets truncated when the process starts. If this value is non-zero, it automatically changes during run-time to store the number of current trace file. Setup default is 1.

TCE_LS1 Engine

Trace Levels (TraceLevel)

Trace Value	Activate trace of
00	Errors only
01	Message trace
02	Data trace
04	TCP trace
08	All

Error trace is always activated. TCP trace only shows the number of bytes read or written to a connection. It cannot show the data itself. Message trace shows all messages coming from TC/ECP or IP/Voice (REQ-messages and DTMF tones). Data trace shows all data (only the number of bytes) sent to TC/ECP or received from it. ALL traces show additional information (during polling ...)

Troubleshooting

This section contains same more technical information that may assist during troubleshooting.

Assignment of Ethernet Addresses

Ethernet addresses are assigned according the serial number of TC16/18 according to the table below.

Model	Ethernet address
LS1V1	00:07:57:00:xx:xx
LS1V2	00:07:57:01:xx:xx
Where xx:xx is calculated as follows:	
<ul style="list-style-type: none">• LAN1: xxxx = 2*<Serial Number>• LAN2: xxxx = 2*<Serial Number>+1	

Example:

If you have network access (without switch between host and LS1) you can find out the LS1 model and serial number as described in the example below.

Make a Ping and Arp command to the line server as shown in the example to get the Ethernet address. It is assumed that the LS1 has IP address 192.168.0.207

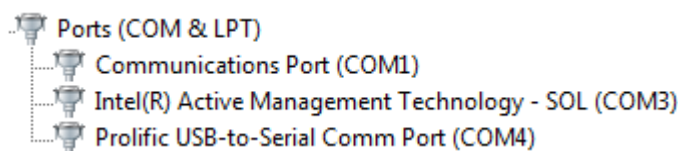
```
D:\src\server\Lineserver\ls1trace\latest>ping 192.168.0.207
Pinging 192.168.0.207 with 32 bytes of data:
Reply from 192.168.0.207: bytes=32 time<1ms TTL=64
Reply from 192.168.0.207: bytes=32 time<1ms TTL=64
Reply from 192.168.0.207: bytes=32 time<1ms TTL=64
Reply from 192.168.0.207: bytes=32 time<1ms TTL=64
Ping statistics for 192.168.0.207:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
D:\src\server\Lineserver\ls1trace\latest>arp -a 192.168.0.207
Interface: 192.168.0.1 --- 0x10003
    Internet Address      Physical Address      Type
    192.168.0.207         00-07-57-01-00-d8     dynamic
```

The Ethernet address in the example above is 00-07-57-01-00-d8. This means that LAN 1 of LS1V2 with serial number 108 (0x00d8/2) is used.

Serial Connection Between COM Port via USB

If the serial connection between LSD and LS1 via USB to COM port converter does not work, do the following:

1. Identify the COM port in use. To get an overview of all available COM ports, open **Control panel -> Device Manager -> Ports (COM & LPT)**.



In the above screen-shot, COM1 is native COM port, COM3 is used internally and COM4 is an external USB to COM port converter (Logilink AU0002E).

2. Open the used port and verify the status as shown in the following table.

Good status	Bad status

Note A bad status indicates a problem with the device or driver that must be fixed.

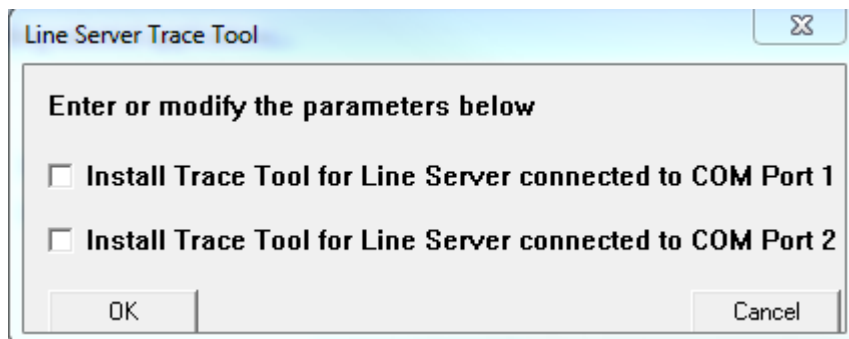
3. Update the COM Port drivers.

Such devices are usually shipped with very old driver versions and updates are usually not provided automatically. If you do not find drivers on the web page of the device manufacturer, than it is recommended to search drivers from the chip vender.

Example: Logilink does not provide updated drivers for converter “AU0002E USB” but the datasheet disclosed that it uses chipset PL2303TA. This chip is manufactured by Prolific which provides drivers at <http://www.prolific.com.tw/US/ShowProduct.aspx?pcid=41&showlevel=0017-0037-0041>.

4. Test the serial connection with the Line Server Trace Tool (LS1Trace.exe)

You can install this tool with Kofax Communication Server setup. In the setup, browse **Common -> Administrative Tools -> LineServer Trace Tool**. You can also choose the option to use it without selecting any of COM ports; if both COM 1 and COM 2 are not available.



After installation, you can start it from C:\tcoss\system with "ls1trace.exe /c {com-port-number}". Following example with COM4 shows the expected LS1 COM output after power on.

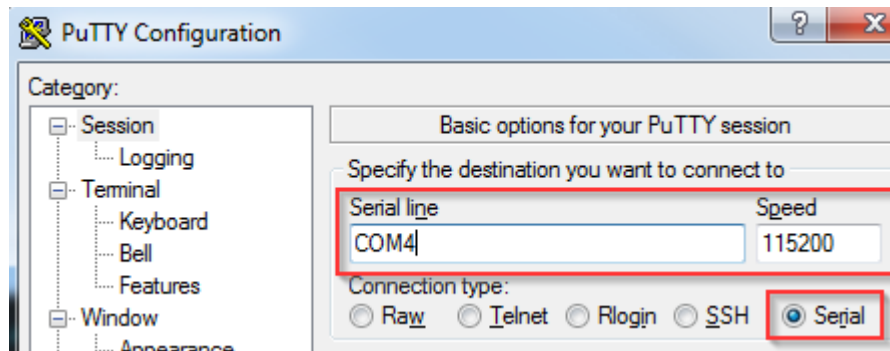
```
C:\TCOSS\SYSTEM>ls1trace.exe /c 4
TCLS1TRACE on ComPort: 4, BaudRate: 115200

*****
** Windows 7 Enterprise (Version 6.1, Build 7601), No Service Pack
** Computer name: S4H02315
** TCLS1TRACE ***** Thursday, 24-Oct-2019
** Timezone: W. Europe Standard Time [W. Europe Standard Time] +01.00 [DST = 1]
** C:\TCOSS\SYSTEM\ls1trace.exe (2858)
** created: 24/19:11:58.892 Thursday, 24-Oct-2019
** kernel mode:      0:00:00.031
** user mode:        0:00:00.031

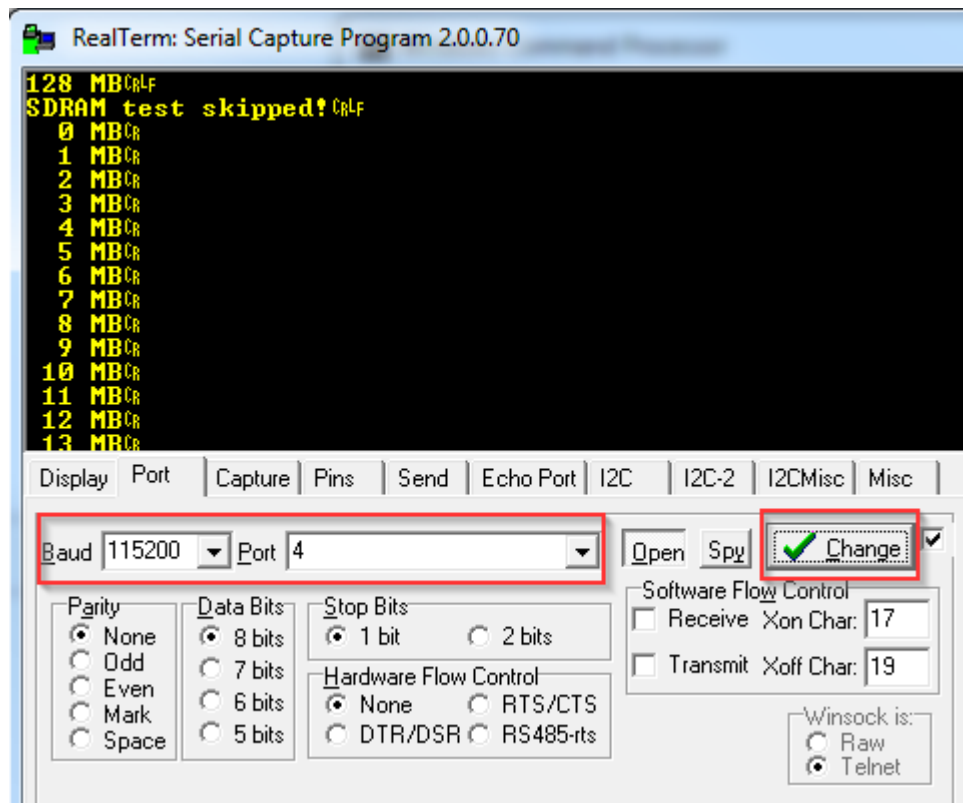
24/19:11:58.970 (2858/313c) TCLS1TRACE 9.1.0.34 started
24/19:12:03.539 (2858/1d94) ??A
24/19:12:03.539 (2858/1d94) DBSR:0x30000001
24/19:12:03.539 (2858/1d94) TSR :0xec000000
24/19:12:03.882 (2858/1d94) Environment found in FLASH:
24/19:12:03.882 (2858/1d94) at 0x90000000 - 0033.F
24/19:12:03.882 (2858/1d94) at 0x90002000 - 0030.P
24/19:12:03.882 (2858/1d94) at 0x90004000 - 0031.P
24/19:12:03.882 (2858/1d94) at 0x90006000 - 0032.P
24/19:12:03.882 (2858/1d94) Used environment from 0x90006000
24/19:12:03.882 (2858/1d94)
```

5. You can also get the LS1 COM output with a standard terminal program. Windows is not shipped with terminal program (such as HyperTerminal). Following are basic hints for the following free tools (with COM4):

- **PuTTY**: Download PuTTY from <https://www.putty.org/>. Use the following configuration.



- **RealTerm**: Download RealTerm from <https://realterm.sourceforge.io/>. Do the following configuration.



Chapter 6

Compatibility

LS1V2 is backward compatible with the existing Model/2xx product functionality. See [Restrictions](#) for more information about restrictions for features that have not been implemented yet.

The LS1 can be used with an existing Model 2xx TCOSS and voice servers.

Hardware Revisions

This section lists the possible combinations of hardware components of the LS1. If the component includes any programmable device (such as EPROM or EPLD) that is programmed only during production, it is mentioned in parentheses.

If you are using any hardware component with a revision that is not listed below, it is recommended to review the hardware documentation of this component. In many cases, older versions are working but it may lack some bug fixes. Outdated hardware should be upgraded.

LS1V1 HW Components

Component	Supported Revisions
TC09 (power supply)	TC09.0
TC11 (cabinet)	TC11.0b – TC11.0f
TC0E (backplane)	TC0E.1, TC0E.1a TC0E.2
TC0E (backplane)	TC0E.1, TC0E.1a TC0E.2
TC16 (main board)	TC16.1F (EPROM 2.07) TC16.2d (EPROM 2.07) TC16.3d (EPROM 2.07) TC16.4c (EPROM 2.07) TC16.5a (EPROM 2.07)
TC22 (DSP module)	TC22.1a TC22.2

Component	Supported Revisions
TC23 (BRI interface)	TC23.1a (EPLD 1.4) TC23.2 (EPLD 2.4) Note 1) TC23.3a (EPLD 2.4) Note 1) TC23.4 (EPLD 3.0)
TC24 (PRI interface)	TC24.0c (EPLD 1.3) TC24.1 (EPLD 1.3) TC24.2 (EPLD 2.0)
TC26 (analog interface)	TC26.2 (EPLD 1.4)
TC27 (Bell DID interface)	TC26.2 (ELPD 1.4) + TC27.1

Note TCOSS 7.50.00 or higher is required!

LS1V2 HW Components

Component	Supported Revisions
TC09 (power supply)	TC09.0
TC11 (cabinet)	TC11.0f
TC0E (backplane)	TC0E.1a TC0E.2
TC18 (main board)	TC18.1d (EPROM 3.02.01) TC18.2 (EPROM 3.02.01)
TC23 (BRI interface)	see LS1V1
TC24 (PRI interface)	see LS1V1
TC26 (analog interface)	see LS1V1
TC27 (Bell DID interface)	see LS1V1

Differences Between LS1V1 and LS1V2

Although the hardware of LS1V1 has been changed fundamentally, both LS1V1 and LS1V2 currently support the same set of features. The main difference is that LS1V1 has up to four DSP modules (TC22), each supporting up to 8 channels. LS1V2 has only one DSP, which is part of the TC18 main board. This DSP supports up to 32 channels.

Migration from LS1V1 to LS1V2

If a system is running with LS1V1 and for any reason (such as HW fault) the LS1V1 needs to be replaced with LS1V2, the following issues have to be considered:

1. If PRI (TC24) is used and more than one DSP is configured on LS1V1, the LANLINK number of all channels on DSP 1, 2 and 3 will have to be changed to those used on DSP 0. After TCOSS 7.69.00, a new function was added to the HW/SW assignment menu to simplify this task. If the configuration

remains unchanged, only the channels configured on DSP 0 will be usable after replacing the LS1V1 with LS1V2. This means that even though the configuration has not been changed, the LS1V2 will work with a limited number of channels (there will be some error messages that DSP 1, 2 and 3 cannot be booted).

2. With TCOSS 7.69.01 or lower, it is recommended to upgrade TCOSS before using an LS1V2.
3. If an upgrade to TCOSS 7.69.02 or higher is not possible, LS1V2 will use a compatibility mode that ignores program file updates by TCOSS. This means that the TC18PPCPROGRAM and the TC18DSPPROGRAM delivered within the application image are used, which allows a change to LS1V2 without TCOSS upgrade, even if the current TCOSS release does not support LS1V2.

Migration from LS1V2 to LS1V1

If a system is running with LS1V2 and for any reason (such as HW fault) the LS1V2 has to be replaced with LS1V1, then if more than 8 channels are used on LS1V2, the configuration will have to be changed to use multiple DSP modules during the update.

Compatibility Between the LS1 System and the TCOSS/Voice Server

Each Line Server will be installed using LSD with a system of a specific TC/SP version. The first setup is done during the production, but the installed system can be updated very simply with LSD. The current system can be verified by using the buttons of LSD.

The table below provides an overview of the compatibility of the LS1 system version and the used TCOSS and voice server versions. A “+” suffix means that future versions are planned to be compatible.

LS1 Hardware	Installed System on LS1	Compatible Voice Server	Compatible TCOSS Versions	Note
LS1V1	TC/SP 7.46.10 – 7.48.00	TC/SP 7.46.10 – 7.71.06+	TC/SP 7.46.10 – 7.70.00 TCOSS 7.46.10 – 7.66.05	
	TC/SP 7.49.00 – 7.71.06+	TC/SP 7.46.10 – 7.71.06+	TC/SP 7.46.10 – 7.80.04+ TCOSS 7.46.10 – 7.80.04+	
LS1V2	TC/SP 7.71.06+	TC/SP 7.46.10 – 7.71.06+	TC/SP 7.49.00 – 7.62.10 TCOSS 7.49.00 – 7.61.05	1 and 2
			TC/SP 7.62.11 – 7.71.05 TCOSS 7.62.00 – 7.69.01	1
			TC/SP 7.71.06+ TCOSS 7.69.02+	

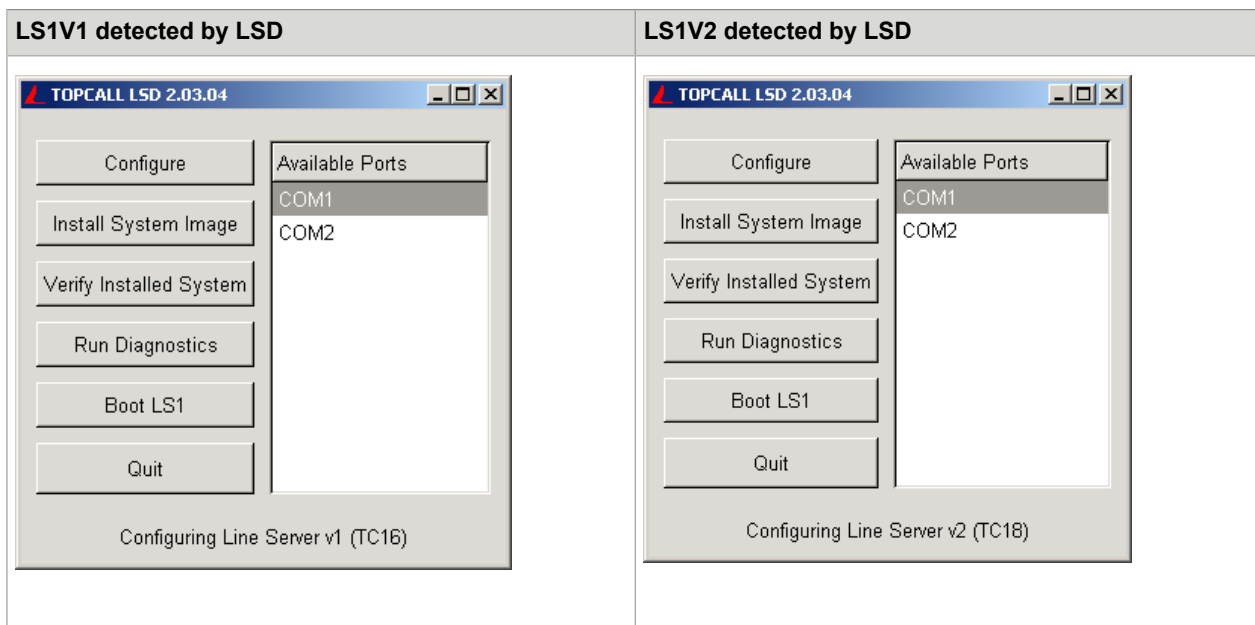
Note

1. The program files (TC18PPCPROGRAM and TC18DSPPROGRAM) of LS1V2 are not downloaded from TCOSS. This means that the version installed on the LS1 system (which is newer) is used and not the version provided by TCOSS. New features and error corrections of the LS1 system may not be available in this case.
2. Traces on LS1V2 are not supported

Compatibility of the LSD Tool and LS1V1/LS1V2

When configuring an LS1V2, LSD 2.04.00 (or higher) of TC/SP 7.71.09 is required. If the installation of an LS1V2 is done with an older LSD tool, there will be an error message, and the current installation of LS1V2 remains unchanged. If you change the configuration with an older LSD tool, the changes are stored and even the old LSD will pop-up an error message. But nevertheless it is strongly recommended to use LSD 2.04.00 (or higher) if the configuration of LS1V2 has to be changed.

LSD 2.04.00 (or higher) supports both LS1V1 and LS1V2. The Line Server that is currently connected will be detected by LSD during the connection to LS1, which will then be indicated on the bottom of the LSD window, as can be seen in the screen shots below.



The file format of the configuration backup is compatible with all Line Server versions (LS1V1 or LS1V2) and all LSD versions. Here are some examples:

- The user can backup a configuration of LS1V1 and restore it to LS1V2
- The user can backup a configuration with an old version of LSD and restore it with a new version of LSD and vice versa.

Note for TC18.1 (Hint 13542):

If you have an LS1V1 using TC16.1 with a smaller Flash chip (they have a serial number up to 135), you must start LSD.exe with the `--sys-address 40604000` parameters. Otherwise, the installation of the system image will fail, and the following error will be displayed.



Chapter 7

Performance

The maximum number of channels is restricted due to following limits:

- The LS1 supports a maximum of 2 Line Modules, where each Line modules supports either dual BRI, dual PRI or four analog telephone lines.
- The maximum number of channels per LS1 is restricted to 32.
- The following network bandwidth must be guaranteed:
 - 20kBits/s of available bandwidth for each channel that is used for fax sending/reception only.
 - 70kBits/s of available bandwidth for each channel that is used for voice only.
 - 70kBits/s of available bandwidth for each channel that is used for voice and fax. The required bandwidth must be available in both directions.
- The average packet turnaround time with 260 byte block size must be less than 200ms (for up to 30 channels) or less than 400ms (for up to 4 channels). Single interrupts are tolerated up to 2000ms. Longer interruptions may lead to a break in the current transmission. If the network is interrupted for more than 20sec the KCS system restarts the LS1.

When using the voice server on a LAN connection with high turnaround trip time the response time is increased significantly.

Idle Bandwidth Usage

The following bandwidth is typically used in idle state (if channels are inactive).

Connection	Required bandwidth	Average packet size
From TCOSS to LS1	384 Bit/s per configured channel	24 Bytes
From LS1 to TCOSS	384 Bit/s per configured channel	24 Bytes
From Voice Server to LS1	40 Bit/s per connected Voice Server	48 Bytes
From LS1 to Voice Server	40 Bit/s per connected Voice Server	48 Bytes

Note The TCP/IP protocol overhead is not considered for required bandwidth and average packet size.

Configuration Examples

Hardware Configuration			Used Channels for		Required LAN Bandwidth
Line Modules (used Lines)		Required TC22 Modules (See the Note below.)	Fax only	Fax and/or Voice	
Slot 0	Slot 1				
TC26 (a/b)	-	1	4	-	120 kBit/s
TC26 (a/b)	TC26 (a/b)	1	8	-	240 kBit/s
TC23 (1BRI)	-	1	2	-	60 kBit/s
TC23 (1BRI)	-	1	-	2	140 kBit/s
TC23 (1BRI)	-	1	2	-	60 kBit/s
TC23 (2BRI)	TC23 (2BRI)	1	8	-	240 kBit/s
TC23 (2BRI)	TC23 (2BRI)	1	-	8	560 kBit/s
TC24 (1T1)	-	3	23	-	690 kBit/s
TC24 (1T1)	TC23 (2BRI)	4	-	27	1890 kBit/s
TC24 (1E1)	-	4	-	30	2100 kBit/s
TC24 (1E1)	TC23 (1BRI)	4	-	32	2240 kBit/s
TC24 (1E1)	TC23 (1BRI)	4	20	12	1440 kBit/s

Further configuration examples are possible when using partial E1 and T1 lines. In that case up to 4 PRI lines can be used, but the total number of channels is still restricted to 32.

Note The TC22 Modules are only required when using LS1V1; they are not required when using LS1V2.

Chapter 8

Conformance to Laws and Directives

CE and UL (FCC) approvals as with 2xx models and cards.

Any locally needed approvals have to be done separately (such as with Japan).

The following ISDN protocols are supported.

Standard	Supported by TC23 (BRI)	Supported by TC24 (PRI)
EDSS1 (European Digital Subscriber Signaling N0. 1), known as EURO-ISDN	yes	yes
ECMA Q.SIG (according to ETS 300 172), supported for BRI and PRI	yes	yes
1TR6	yes	no
AT&T (4ESS switch)	no	yes

The following analog telephone line protocols are supported:

Standard	Supported by TC26
Standard analog (two-wire) line with loop start signaling	yes
TBR21	yes
E.180/Q.35	yes

Refer to the *TCOSS System Manual* for more details.

The voice extension currently supports only 8bit linear coded voice data with 8000 samples per second.

Note The following ISDN PRI protocols (supported by the Dialogic hardware), are currently NOT supported by LS1 hardware:

- AT&T 5ESS switch
- Northern Telecom custom switch A211-1 and A211-4
- Japanese National ISDN (INS-Net 1500)

Chapter 9

Security Issues

This section describes possible security leaks. It is indented for internal information only and may be reduced (or removed) in the final documentation.

Maintenance Port

All configuration parameters can be read or changed via maintenance port, with the exception that the password can be read in encrypted format (=hash) only. A hacker may store the password hash via maintenance port and therefore re-use it in any other CS1.

The LS1 does not provide any kind of protection when it is accessed over the serial maintenance port. Therefore, it must be physically protected from unauthorized access.

The Linux Kernel

The Linux kernel is only exposed to the public by means of its TCP/IP implementation which has been very well tested for security holes. Although it is therefore very unlikely that a new exploit will be found in the near future, still almost nobody would know that LS1 is affected by a security hole in the Linux network stack. Security bugs found in the Linux kernel are usually being fixed within 24 hours so an updated LS1 System Image could be made available shortly.

Backdoors

There should not be any back doors as we have access to the entire source code for the software being run on LS1. The Linux source code itself has been audited for security many times and is even used by the NSA and the NASA.

Data Integrity and Confidentiality

Data is transmitted over the network using the TCP/IP protocol which takes care that data received is complete and in the correct order. It is transmitted in plain with checksum mechanism being used to detect random corruption.

Unauthorized Use

LS1 is protected from unauthorized use in that the connection from a TCOSS server must be authenticated with a password. All passwords are stored encrypted. This means that a stored password cannot be entered anywhere. But it is possible to bypass the encryption (both on TCOSS/Voice Server and on LS1) when storing an already encrypted password.

During authorization a challenge/response protocol is used. This means that no plain or encrypted passwords are transferred via network.

DOS (Denial of service) security issue

With the current implementation it is easy to attack a LS1 by hackers in a way that now connections (from TCOSS or Voice Servers) are not accepted until LS1 is rebooted. Existing connections between to LS1

are not affected by DOS attacks as long as the required network bandwidth is still available. Connections to LS1 will be re-established in the following cases:

- Node reboot or TCOSS restart
- Voice Server will be restarted
- LS1 itself is restarted.
- LAN connection to LS1 fails for any reason.

Restrictions

The following restrictions apply to LS1 compared with the existing TC20 hardware:

- Each DSP module must be configured to use the same voice coding standard. They have to use either A-law or u-Law. But, it is possible to use another coding standard on a different DSP module.
- E&M lines (except Bell DID) are not supported. The LS1 currently supports only ISDN basic rate, ISDN primary rate and standard analog telephone lines. Use a Branchbox (for Fax) or Dialogic hardware for voice in this case.
- Analog Module (TC26) supports only DTMF dialing, and pulse dialing is not supported.
- Analog Module (TC26) currently does not support voice connectivity.
- Token Ring LAN is not supported. Use black box (converts between Token Ring and Ethernet) instead. Refer to the *Branch Box Hardware Documentation* for more details.

The following features are currently not implemented:

- Configuration of port number. Currently standard port numbers have to be used.
- Remote configuration or changing the authentication password via network is not supported.
- Automatic update of operating system in LS1 Software is not supported.
- Appropriate error code if fax transmission fails due to insufficient LAN bandwidth (“WAN out of spec”). All transmission breaks that are caused by bad WAN performance are logged by the KCS system.
- A voice server may use multiple LS1 servers. The actual LS1 is selected with a simple load balance algorithm. It is not supported to connect to a specific LS1.
- CallerID for analog module (TC26).