



# **ST-510 Network Switch System Overview**

**Revision 1**

**March 1, 2002**

---

---

**SmarTrunk Systems, Inc.**  
401 W. 35th Street, #B  
National City, CA 91950-7909  
Phone: (619) 426-3781 • Toll Free (866) 870-9052 • Fax: (619) 426-3788  
Email: salesinfo@smartunk.com • www.smarttrunk.com

---

---

# ST-510 SMARTRUNK II NETWORK SWITCH SYSTEM OVERVIEW

## TABLE OF CONTENTS

<b>Section 1 •</b>	Introduction .....	4
<b>Section 2 •</b>	Key System Features .....	4
<b>Section 3 •</b>	ST-510 System Components .....	5
<b>Section 4 •</b>	System Operation (Brief Example) .....	5
<b>Section 5 •</b>	System Requirements .....	6
<b>Section 6 •</b>	Features and Services Provided .....	6
<b>Section 7 •</b>	SmarTrunk II Upgrades .....	13
<b>Section 8 •</b>	Networking Interconnection .....	14
<b>Section 9 •</b>	Network Topology .....	16
<b>Section 10 •</b>	Linking Remote Areas .....	17
<b>Appendices</b>	.....	<b>18</b>
<b>Appendix A -</b>	System Design Questionnaire .....	19
<b>Appendix B -</b>	ST-510 Technical Specifications .....	20
<b>Appendix C -</b>	Optional Features .....	22

## ST-510 SMARTRUNK II NETWORK SWITCH SYSTEM OVERVIEW

The ST-510 is a computerized modular telephony switch designed exclusively for use with the SmarTrunk II™ Digital Trunking System. The ST-510 allows system operators to offer advanced features and services using a low cost trunking protocol compatible with most popular two-way radios. In addition to providing multi-site, wide area coverage, the ST-510 offers voice prompts, digital voice mail, call forwarding, DID (Direct Inward Dialing), and many other advanced features.

Because of its modular design, the ST-510 can be used in any kind of network topology (bus, ring, star, or mixed) and will support large shared public networks as well as private or governmental communications systems.

The ST-510 Network Switch is compatible with both the ST-852 and ST-853 SmarTrunk II controllers and all SmarTrunk II Omni™ logic boards. This makes it possible for SmarTrunk II system operators to expand their existing systems without having to add new controllers, repeaters, or subscriber radios. The only modification required to existing SmarTrunk II controllers is the replacement of the firmware EPROM.

## Section 2 • KEY SYSTEM FEATURES

The ST-510 allows SmarTrunk II system operators to add the following high performance features and services. Please note that many of these features may require optional hardware, software and/or operating firmware, as described in Appendix C.

- Wide Area Roaming
- Voice Mail
- Call Forwarding
- Call Transfer
- Toll Restriction
- Emergency Routines
- Complete Management Reporting
- Critical information for subscribers (e.g., traffic and weather reports)
- Call queuing
- Dispatch Consoles
- Voice logging for security purposes
- Voice prompts
- Operator assistance for lost calls
- Remote system access
- DID (Direct Inward Dialing) Interface
- Comprehensive Billing Software

The ST-510 also adds valuable features to the basic SmarTrunk II protocol:

- Over the air activation of new subscribers
- Automatic Routing Code selection
- Sharing of PSTN Resources

- Larger Call Record database
- More customer profiles available
- More Subscriber ID codes
- Local & remote system management

## Section 3 • ST-510 SYSTEM COMPONENTS

**3.1 Computer Telephony Switch:** The heart of the ST-510 is a rugged, fault tolerant industrial PC with DSP (digital signal processing) resources. The PC runs all the software routines required for the switch control and the services supported. The switch also assumes many functions normally supported by the SmarTrunk II controller, such as data base maintenance, subscriber validation and call record accounting.

**3.2 Switch Rack & Power Supply:** The ST-510 system components are mounted in a standard 19" rack panel with twelve slots to accommodate the switching components. Additional rack panels may be added to the system as required.

Each rack panel includes a power supply that provides the required system voltages and supervises the overall system performance. A redundant 1+1 power supply is available for special applications

**3.3 ST-420 Switch Board:** All system switching and interface functions are performed by the ST-420 Switch Board. The ST-420 contains a micro-controller, an analog matrix switching structure, plus a highly versatile analog input/output with adjustable levels for each incoming or outgoing path. The ST-420 also has an RS-232 data port for digital interconnection with any external device, plus a powerful auxiliary port for future applications.

By use of an on-board DIP switch, the ST-420 can be easily configured for several different system functions:

- ST-852/853 controller switch gate
- Voice prompt/voice mail DSP switch gate
- PSTN/PBX switch gate
- Roaming Bus switch gate
- Inter-site link switch gate
- Dispatch console switch gate

## Section 4 • SYSTEM OPERATION (BRIEF EXAMPLE)

When a call request arrives at a SmarTrunk II controller, a short data packet will be sent from the controller's RS-232 data port to the ST-420 board which serves as the switch gate for that controller. Immediately, this packet is processed by the main ST-510 CPU and software, which decodes all information such as subscriber number, required service, etc. Once the subscriber name is decoded, the program will access the main database, looking for the subscriber profile and checking if the service request is valid for that particular subscriber.

If the requested service was a mobile-to-mobile call, the system software will search for the profile and status of the called party, checking if the party is busy or free and if this type of call is valid for the called party. If so, the ST-510 will send a new data packet (via a 4800 baud Roaming Bus) to each site in the network where the called party is authorized to roam. The ST-510 at the remote site(s) will then direct a free SmarTrunk II controller to page the called party.

At this moment, the SmarTrunk II controller will look for the acknowledgment signal from the called party. If the called party is out of range or his/her radio is turned off, the main ST-510 computer will immediately transfer the caller to Voice Mail.

If the called party is within range, the main ST-510 CPU opens an audio path from the original controller (calling party) to the second controller (called party) in a process which requires no more than one-half second beyond the normal SmarTrunk II signaling time. If the called party answers, the conversation takes place as normal. If the called party does not answer within a programmed time, the calling party is directed to Voice Mail. When either party ends the call, all resources are set free and the call information is reported to the call record account file.

## Section 5 • SYSTEM REQUIREMENTS

Operators considering a ST-510 Network Switch should first be thoroughly familiar with the SmarTrunk II signaling protocol and basic operation. The ST-510 system operates with the SmarTrunk II protocol using the same ST-852 or ST-853 controllers as a conventional SmarTrunk System; however, a new firmware EPROM is required for each controller.

Each SmarTrunk II controller is connected to the ST-510 switch by two links: an RS-232 data cable and an audio link from the controller's TELCO port to the audio port of the ST-420 board assigned to that controller.

If the system has more than one site, a RS-232 low speed data link(4800 baud) must be installed, plus an audio link for each simultaneous call between sites. The number of audio paths required depends on the anticipated volume of traffic between the various sites at peak times. For PSTN or PBX interconnection, the ST-510 has a conventional line termination for an analog TELCO line (2 wire, loop start).

The system power supply is available in 110 or 220 VAC (50/60 Hz) versions.

## Section 6 • FEATURES & SERVICES PROVIDED

**Note:** Some features are optional. Please see Appendix C.

### 6.1 Wide Area Roaming

The ST-510 supports two basic configurations for roaming (see Figure 1 below).

- **Single ST-510 Switch (Figure 1, Solution 1)**

In smaller networks, it is often possible to have a single ST-510 Network Switch support multiple repeater sites. In this example of a ten channel system, the ST-510 and the SmarTrunk controllers are all located at Site B, with the remote repeaters at Sites A and C connected only by

audio links (i.e., no data link is required). Different roaming areas may be defined which correspond to the different repeater sites.

For many applications, this may be the most economical scenario because only one ST-510 switch is required to support the entire network. However, there must be a separate audio link for each repeater at the remote site(s), which increases the cost of the linking equipment.

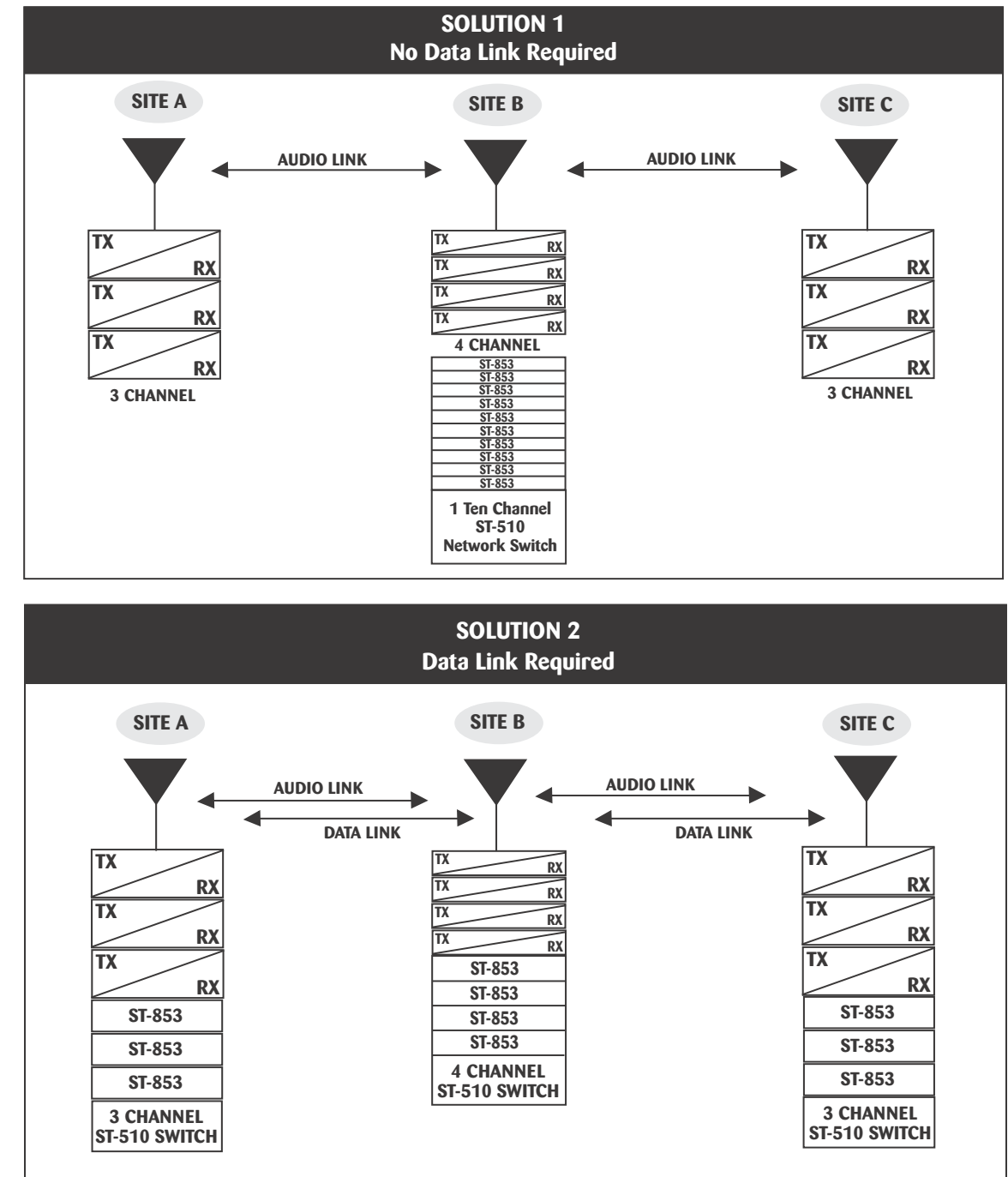


Figure 1 – Configuration Options

- **Multiple ST-510 Switches (Figure 1, Solution 2)**

Larger networks may use multiple ST-510 switches, requiring a low speed data bus (4800 baud) to link the switches. In the above example (Solution 2), a ten channel system consists of three sites: Sites A and C each have three channels (with repeaters and ST-853 controllers) and a ST-510 switch, while Site B has four channels and a ST-510 switch. Note that the ST-853 controllers are co-located with the repeaters at each site, requiring a real time data channel connecting the three sites. However, this configuration does not require a separate audio path for each remote channel, which may reduce the cost of linking equipment.

In this scenario, the number of audio links required depends on the anticipated traffic among the various sites. If most of the traffic is local (intrasite), then perhaps only one or two audio links may be required between sites. If so, it is possible that the lower cost of linking equipment would offset the additional cost of ST-510 switches at the remote sites.

Another factor requiring multiple ST-510 switches is whether telephone interconnect (PSTN or PABX) is required at the remote sites. If so, a remote switch may be required to manage the telco interface functions.

As with the single switch scenario, this service allows customers to locate any subscriber in the entire network simply by dialing the subscriber's number. For this searching process, the system will use only one free channel in each roaming area, and only the two channels supporting the call (one at each site) will remain in use until the call ends. The entire searching process requires only a half second more than the standard SmarTrunk II signaling time.

The definition of the roaming areas and the associated subscriber profiles will be automatically edited using the comprehensive management software included with the system. For more details on the multi-switch scenario, refer to Section 9 – Network Topology.

## 6.2 Voice Mail

If a subscriber is unable receive a call, the ST-510 will connect the calling party to an audio file containing the subscriber's voice prompt messages. The system maintains three different voice mail greetings for each subscriber for the following situations:

- Mobile is powered off or is out of range
- Mobile is in range but the subscriber does not answer the call
- All incoming calls automatically forwarded to voice mail service

After the system plays the appropriate greeting message, it will record the caller's message. The length of the message is programmable for each subscriber.

All subscriber messages are digitally recorded on the hard disk of any computer in the network. When a subscriber wishes to listen to his/her messages, he/she will dial 111\* from the radio and the system will play back the number of messages in memory and will indicate the date and time of each message.

During message playback, the subscriber can command the system to request a new message, repeat the last message, delete messages, etc., using the radio keypad. The quantity of messages in memory for each subscriber will depend of the hard disk capacity of the system. If necessary, a hard disk array can be added to the system.

## 6.3 Call Forwarding

If a mobile subscriber is out of range or away from his radio, he may choose to have incoming calls forwarded to another radio, a PABX extension, or to any PSTN number. When an incoming call arrives for the subscriber, the ST-510 automatically intercepts the call and re-directs it according to the subscriber's instructions.

In order to program the call forwarding service, the subscriber dials 211\* from the radio. A friendly voice prompt will guide the subscriber to enter all required parameters, such as the telephone number or SmarTrunk extension to be called, and how long the current parameters are to remain active (optional).

There are three ways to forward a call:

- To any PSTN number or PABX line extension
- To another radio or group of radios in the network
- To the voice mail service (do not disturb service)

## 6.4 Call Transfer

When a subscriber receives an incoming call from the PBX or PSTN, the subscriber can transfer the call to another radio in the network. The external call will remain on hold until the new radio is on line. After the transfer, the first radio will return to standby mode while the second radio receives the call. One new entry in the call records account will be added for each partial call.

## 6.5 Subscriber Toll Restriction

The ST-510 maintains a full profile in memory for each subscriber radio. One of the fields of this profile is used for toll restriction, which can be implemented in one of two ways:

- List the restricted numbers
- List the allowed numbers

In the first case, the system operator may enter a list of restricted numbers or prefixes (up to 100). If the subscriber dials any of the restricted numbers or prefixes, the system will deny access.

In the second case, the system operator enters only the allowed (valid) numbers. All other numbers will be denied access to the system.

Access to the toll restriction parameters is password protected.

### 6.6 Emergency Routines

With the normal SmarTrunk II Omni™ feature set, it is possible to arrange a structure of groups and sub-groups for special security applications. With the addition of the ST-510 Network Switch, the system operator may define a dynamic (virtual) group number for critical emergency situations.

For example, in an airport communications system, it may be necessary to make an emergency call between all the supervisors of different forces (firefighters, police, ambulance, traffic control, etc.). When the emergency begins, the dispatcher or one of the qualified subscribers will place a call to a virtual number which represents the pre-defined emergency group. The ST-510 will then gather all the group members on one free channel in all coverage areas in the network.

In order to do this, the system will automatically terminate any call in progress by any member of the emergency group so they will be able to participate in the emergency call. The emergency call will remain on the air until terminated by the dispatcher or a qualified subscriber. In this virtual call, some PSTN or PABX resources may also be included. If desired, the special call may be recorded for security purposes.

### 6.7 Subscriber Usage information

In a shared public network, the system operator may allow each subscriber to periodically check certain usage data so that there are no surprises at the end of the billing period. By dialing 311\*, the system will dictate, by voice response, all the usage for any radio, including details such as air time used, telephone pulses, minutes of international calls, and the amount of the subscriber's credit balance.

If this service is active, any subscriber may also program a usage alarm so that when a pre-defined target has been reached (e.g., air time minutes, remaining credit balance, etc.), the system will automatically call the subscriber to report this information.

### 6.8 Critical Messages

For special applications, the ST-510 provides 90 message boxes for the system operator to record important information of interest to all subscribers. For example, by dialing 611\* plus a message box number, a subscriber could hear the latest highway conditions, weather forecast, or financial reports. If desired, these messages could be recorded and updated by a commercial sponsor who would compensate the system operator for providing this service. Access to these message boxes may be made through the PSTN, PABX, or radio.

### 6.9 Queued Traffic

In peak traffic periods, subscribers may often not be able to access a free channel when they attempt to make a call. With the addition of a simplex management channel to the system, the ST-510 will add the attempted call to a queue, so that when a channel becomes available, the subscriber will automatically be called and given access to the free channel.

A priority subscriber analyzer module of the ST-510 software will process the queued traffic by priority of the subscribers. If any emergency call arrives in the queue, the system automatically drops the lowest priority and oldest active call and places the emergency call immediately.

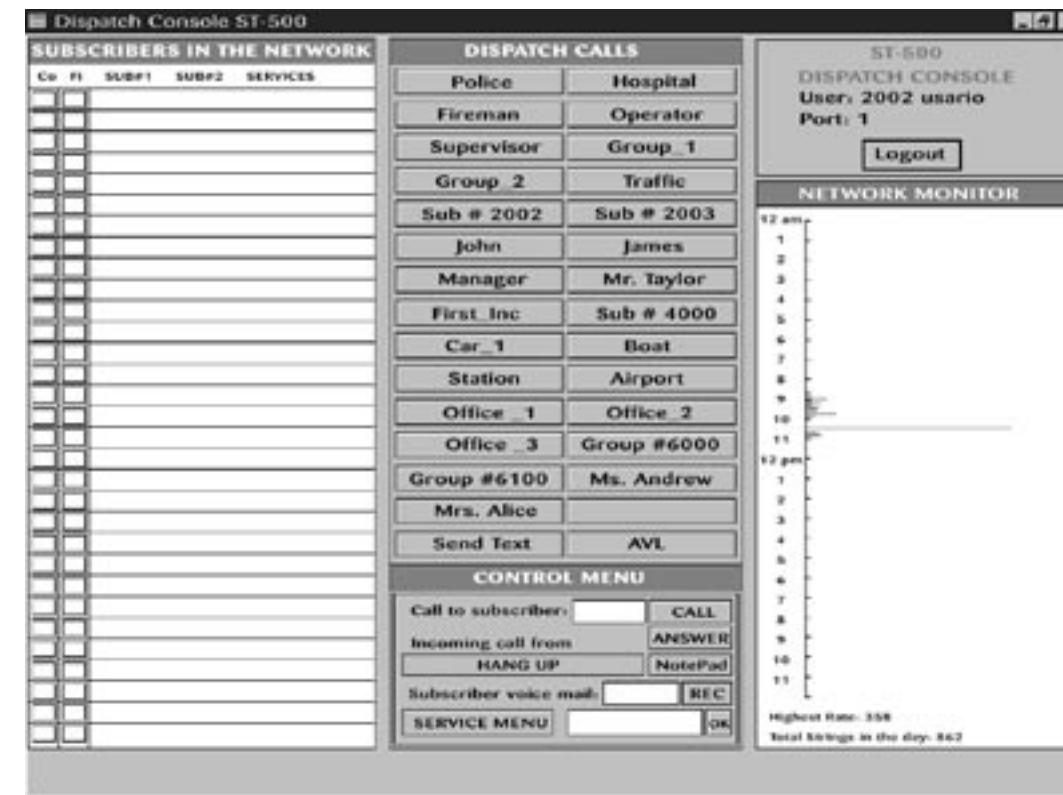
By the use of this feature, the system loading may be increased significantly in accordance with the queued traffic model of Erlang C.

### 6.10 Dispatch Consoles

The dispatch console is a common PC connected to the Roaming Bus at any point of the network where the ST-500 dispatch software will run. With this software, the dispatcher can see all system traffic on-line and can make high-speed calls, monitor calls, receive calls, etc. All this activity will be performed from the screen of the dispatch terminal, and the audio will be linked by an FXO/FXS line from/to any ST-510 switch in the network. This audio can be connected to a multimedia PC using a hands-free phone on the dispatch position. Any type of call may be made from the dispatch console.

The dispatch software offers several security levels and accessibility layers for different dispatchers. For example, one dispatcher may work only with his/her fleet, while the dispatch supervisor may work with any subscriber or group in the network.

If the system requires more than one dispatch console in one site, dispatch server software is available which will support multiple dispatch positions. The following is an example of the dispatch screen:



**6. 11 Security Recording**

For some security applications it is very important to keep a log of all calls into the system. If this option is desired, an additional package is available which includes extra DSP ports and the ST-REC software. Any call into the network will be recorded and a database will be created with a register of each call, including:

- Date of the call
- Time of the call
- Originating subscriber
- Second subscriber involved
- Call length
- Audio of the call

These records are managed from the ST-REC (play back software). This software works under a J-JET Database Engine and has all tools required for filtering and play back of any recorded call. The software runs on any multimedia PC and uses a telephone set to listen to the recorded calls.

The audio files may be backed up using any data storage media. A special file restore utility is included in the software package to restore archived files into the system in order to listen to a specific call or call sequence.

**6.12 Voice prompts**

When an incoming call is received, a friendly voice prompt will attend the call and direct the caller to dial the desired subscriber number. If a subscriber forgets how to use a particular service or feature, he/she may dial 01\* which will activate an interactive voice response system to reach the desired service.

**6.13 Operator services for lost calls**

If somebody wishes to call to a subscriber but has lost the subscriber's number or does not have a DTMF radio or telephone, the call will automatically be transferred to a radio in the network designated as the Operator. When the Operator picks up the call, it will then be transferred to the called subscriber. Any number in the network, including a PSTN or PABX number or the dispatcher, may be designated as the Operator.

**6.14 Remote system access**

All the services and features of the ST-510 Network Switch can also be accessed from the PSTN or PABX. So for example, if a subscriber's radio has a dead battery, he or she may place an incoming call from the PSTN or any PABX extension and program the call forwarding service. The system operator provides a confidential password for each subscriber to remotely access the system.

**6.15 DID (Direct Inward Dialing) interface**

DID service allows incoming calls from the PSTN to be directly connected to subscribers without the need to over-dial the subscriber ID number. Typically, each subscriber will be assigned a seven digit number, of which the first three digits represent the system exchange, while the last four digits represent the unique subscriber ID. DID service normally requires special trunk lines from the local telephone company, e.g., 4 wire E&M, E1, T1, or ISDN.

As a lower cost alternative to DID service, the ST-510 offers a special Caller ID Routing feature. When an incoming call is received from the PSTN, the ST-510 can be programmed to recognize a unique caller ID number and automatically route the call to a specific subscriber or group. In order to use this feature, caller ID service must be available from the local telephone company.

**6.16 Comprehensive billing software package**

An optional billing software package is available for the ST-510 which provides a host of different features and billing options such as variable rate schedules, multiple billing time periods, fixed recurring charges, customized formats for invoices and statements and prepaid billing options. Available in both English and Spanish versions, the billing software may be run "on line" for real time accounting of prepaid calling cards, or offline in a conventional "batch" mode.

## Section 7 • SMARTRUNK II UPGRADES

**7.1 Over the air activation**

New network subscribers are enabled in the database by the ST-500 management software, but the service activation must be done from each subscriber's radio. This makes it easy to add radios to the network since they can be added to the database at any time but only activated when the subscriber is ready to begin service. A five digit password assigned by the system operator is required for over the air activation.

**7.2 Automatic Routing Path**

In a normal SmarTrunk II system, the subscriber must dial a routing digit for any kind of call, e.g., 1\* for a PSTN/PABX call; 3\* for mobile to mobile, etc.

With the ST-510, routing digits are not required because the system is able to recognize different numbering plans and automatically route each call accordingly.

**7.3 Sharing PSTN Resources**

A SmarTrunk II system requires that PSTN/PABX lines be connected directly to specific controllers. This means that only those controllers with lines connected can be used for PSTN/PABX calls.

When using the ST-510 Network Switch, PSTN/PABX lines are connected to the switch rather than individual controllers, so that PSTN/PABX resources can be shared by any controller in the network. It also may be possible to reduce long distance charges by routing long distance calls to a target city through the network.

**7.4 Larger Call Records Database**

With the ST-510, call records are stored in the hard disk of the main CPU where they can be maintained indefinitely, depending on disk capacity. This eliminates the need to frequently download these records from the individual ST-852/853 controllers.

**7.5 More subscriber profiles**

Because subscriber data is stored on the hard disk of each ST-510 in the network, the number of subscriber profiles is virtually unlimited. The new subscriber profiles are also more complex because of the many additional parameters for each subscriber.

### 7.6 Larger Subscriber Capacity

A normal SmarTrunk II system is limited to 4,096 subscribers per site. With the ST-510, up to 320,000 subscribers can be activated on the network.

### 7.7 Local & remote management

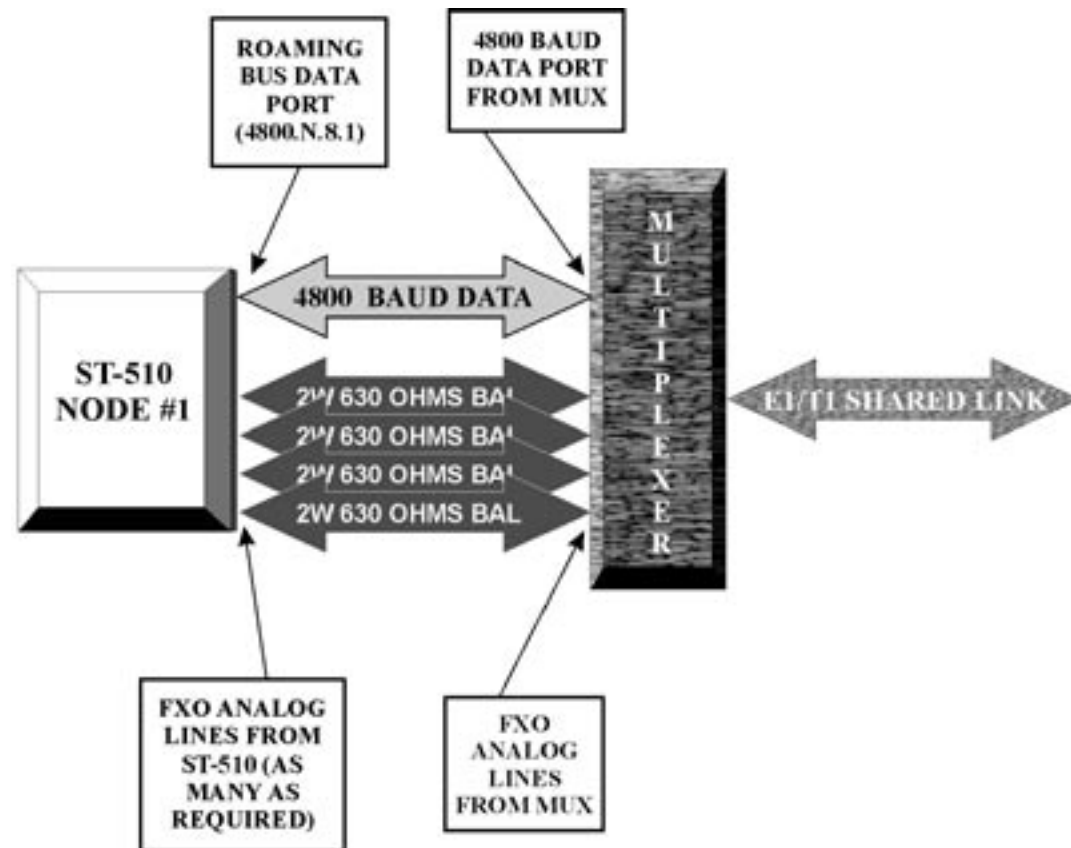
The ST-510 includes a Windows® based management software package which can be run locally on a PC at any site, or remotely by modem. In addition to adding new subscribers, this software can be used to maintain and report high level technical information such as peak period usage, system usage by channel, system loading by site, grade of service, balance of traffic between channels, etc.

Special routines permit the system administrator to detect potential system problems such as low remaining disk storage area and poor communication efficiency into the switch. This information is essential to allow system administrators to optimize system efficiency.

## Section 8 • NETWORKING INTERCONNECTION

### 8.1 Networking Over E1/T1 Link

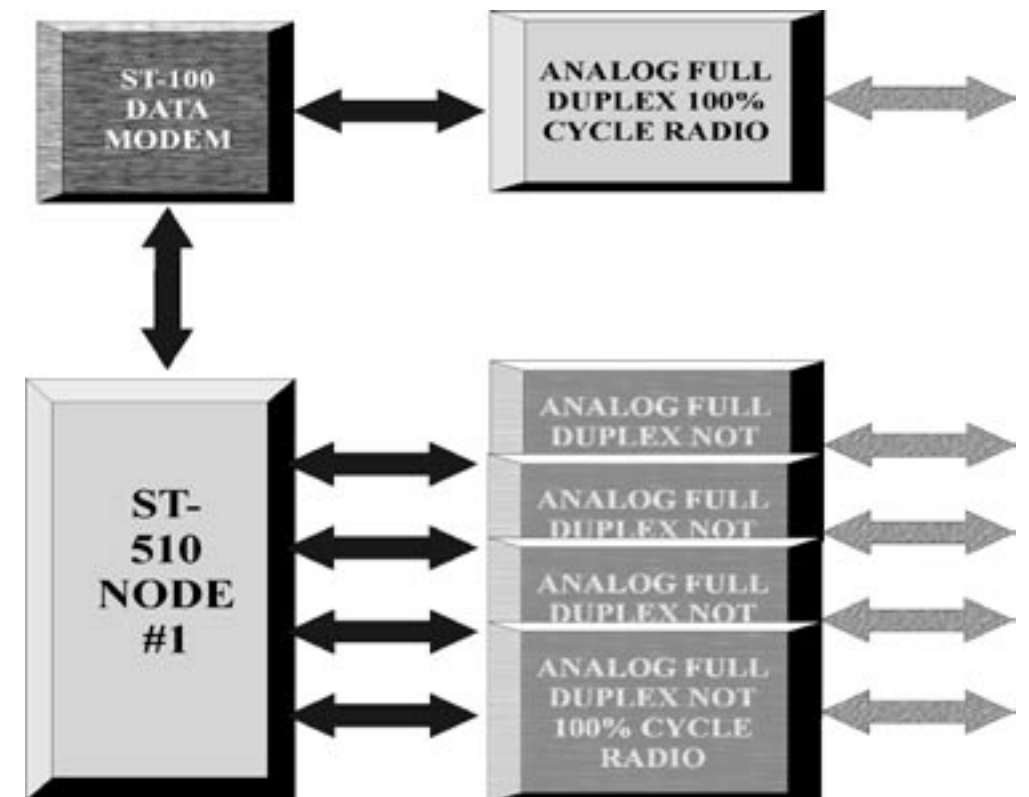
Figure #1 shows a standard way to link a ST-510 using a shared or fractional E1/T1 link. On the ST-510 side, there is only a data connection for the Roaming Bus and, in this example, four simultaneous audio ports that may be multiplexed by a digital MUX and inserted into the E1/T1 scheme.



In a real case, it is necessary to install as many audio ports as the traffic will require, but only one data port for each ST-510 to be connected with any node in the network.

### 8.2 Analog Radio Link

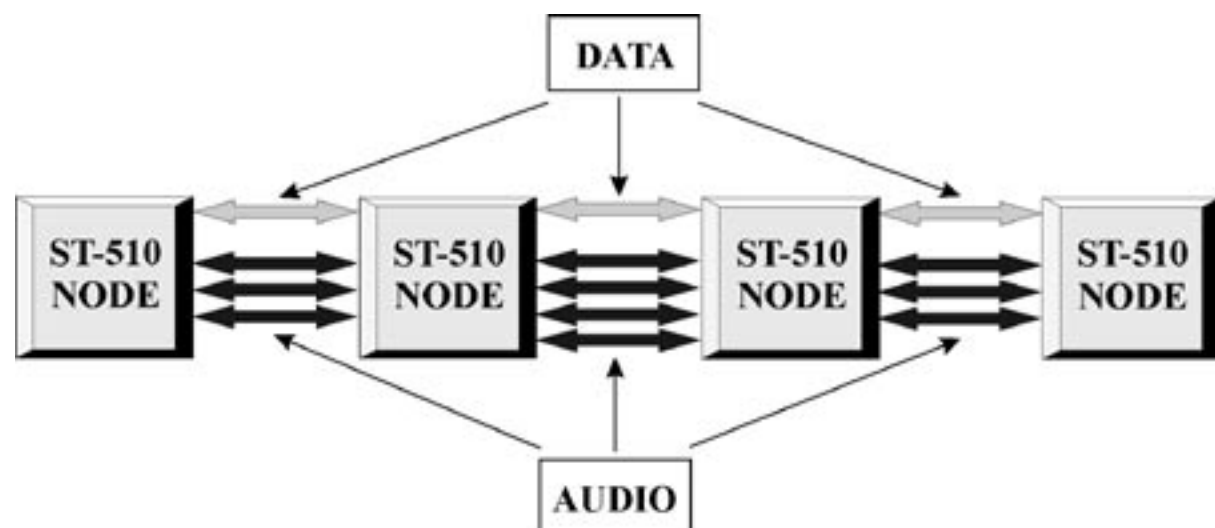
In case of linking using analog radios, the ST-510 will be connected through auxiliary audio ports for audio paths and may use the ST-100 Data Modem for the Roaming Bus connection. The ST-100 may also be used as a phone patch to provide local dial tone at a remote site without a ST-510 switch.



In the following examples, the audio channels are shown as single lines but in a real application, they may be multiplexed signals from E1/T1 links.

In the following examples, the orange arrows represent the 4800-baud data channel while the green arrows represent analog audio paths.

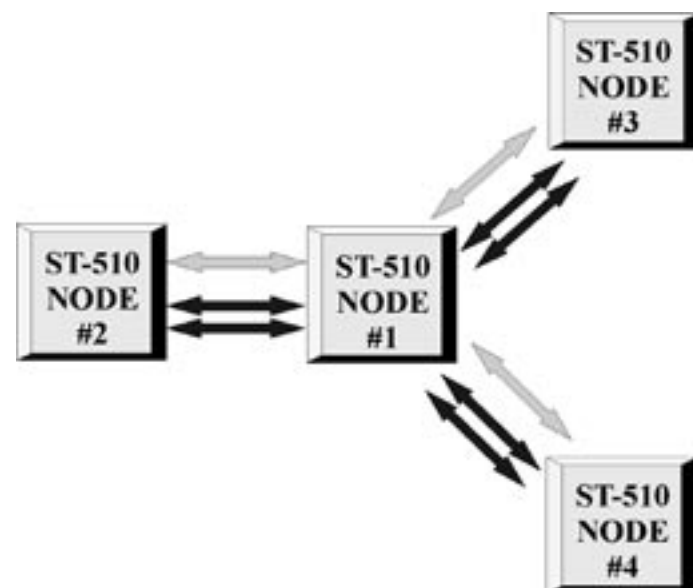
### 9.1 Bus Topology



In this case, note that the ST-510 nodes #2 and #3 will have two data ports, one for each ST-510 connected through.

The greater number of audio lines between nodes #2 and #3 reflect the higher traffic flow, because they must support the traffic between nodes #1 to #3, #1 to #4, #2 to #4, and #2 to #3.

### 9.2 Star Topology

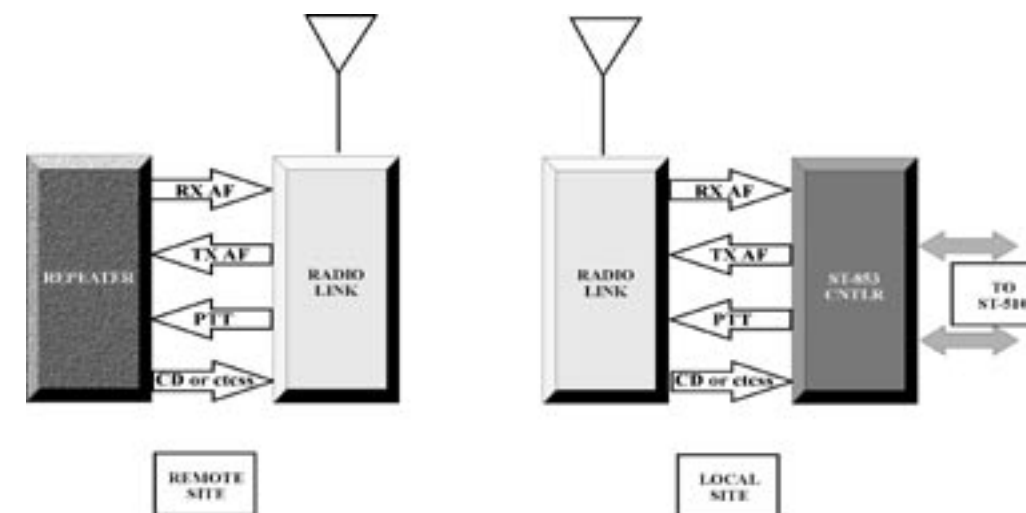


In some applications it may be necessary to place one or more channels in a shadow area to obtain wider RF coverage. In order for all controllers to be connected to the network, it is necessary to place a link between each channel and any ST-510 in the network.

### 10.1 Remote Repeater Channel

One of the ways to cover a remote area is to leave the SmarTrunk controller at the primary site and place a remote repeater at the remote high-site.

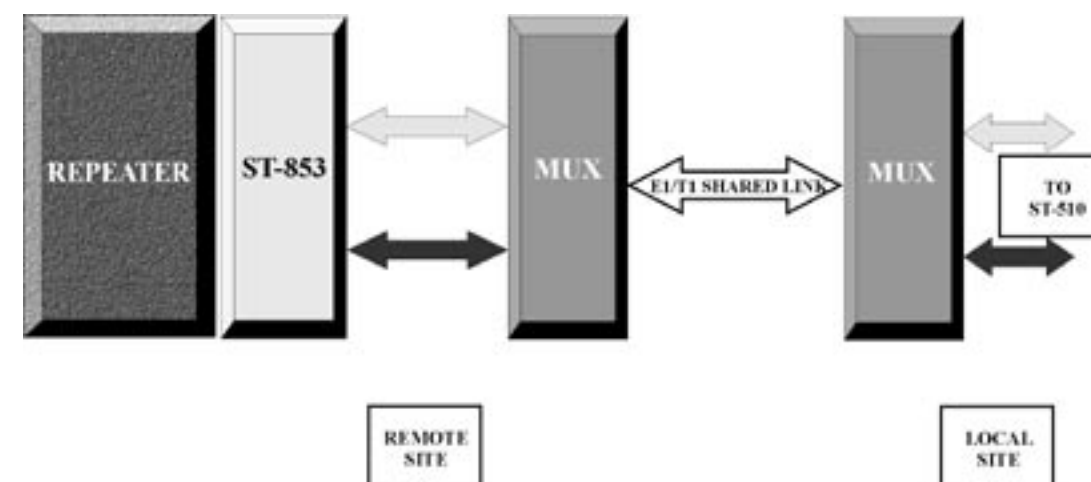
In this case, all the signaling between the repeater and the controller will be carried by a link. The SmarTrunk controller remains close to the switch, so the audio and data connection will be only wires.



In this application, the Rx-Tx delay in the radio link must be less than 100 mSec.

### 10.2 Remote Controller Channel

In another case, the repeater and the controller are located at the remote high-site, but audio and data is carried by a link to the main ST-510 switch. In this case, a data and audio link must be used for each channel, which may increase the cost of the linking equipment.



**APPENDIX A** ..... System Design Questionnaire

**APPENDIX B** ..... ST-510 Technical Specifications

**APPENDIX C** ..... Optional Features

**ST-510 SmarTrunk II™ Network Switch  
System Design Questionnaire**

Since the ST-510 SmarTrunk II Network Switch is custom-configured for each application, the factory requires a complete definition of your requirements in order to prepare a quotation. Please provide us with a description of your proposed system by completing and returning the following questionnaire.

**Customer Name** \_\_\_\_\_

**System Description** \_\_\_\_\_

1. How many SmarTrunk II sites are in the system? \_\_\_\_\_

2. How many channels will be at each site?  
Site 1 \_\_\_\_\_ Site 4 \_\_\_\_\_  
Site 2 \_\_\_\_\_ Site 5 \_\_\_\_\_  
Site 3 \_\_\_\_\_ Site 6 \_\_\_\_\_

3. Will the system require PSTN or PABX access? Yes \_\_\_\_ No \_\_\_\_

**If No, please ignore questions 4 – 8.**

4. Approximately what percentage of calls made on the system will be telephone calls as compared to dispatch calls? \_\_\_\_\_%

5. How many sites will be interconnected? \_\_\_\_\_

6. How many total telephone lines (including PABX connections) will the system require \_\_\_\_\_?

7. At which site(s) will telephone interconnection be required? (Remember that if the dial tone is coming from Site B, then Sites A & C will also be receiving Site B dial tone. This could be expensive or cost effective, depending on the telephone requirements.)

Access at one Site \_\_\_\_\_ Access at each Site \_\_\_\_\_

8. What telephone access will the system have available?  
- Analog Two Wire \_\_\_\_\_  
- Six Wire \_\_\_\_\_  
- E1/T1 \_\_\_\_\_  
- ISDN \_\_\_\_\_  
- DID \_\_\_\_\_  
- Other \_\_\_\_\_

9. Does the system require Voice Mail Service? Yes \_\_\_\_ No \_\_\_\_

10. Should calls be recorded for security reasons? Yes \_\_\_\_ No \_\_\_\_

11. Will the system require Dispatch Consoles? No \_\_\_\_ Yes \_\_\_\_  
If Yes, how many? \_\_\_\_\_
12. Will you want the "Queued Traffic" option for the system? Yes \_\_\_\_ No \_\_\_\_
13. Will the system require Special Emergency Routines and Dynamic Regrouping?  
Yes \_\_\_\_\_ No \_\_\_\_\_
14. Will the system require Billing Software? Yes \_\_\_\_ No \_\_\_\_  
  
If Yes, should the billing software operate in "real time" or "batch modes"?  
Real Time \_\_\_\_\_ Batch \_\_\_\_\_
14. Will the system require Statistical and Supervisory Software for the system?  
Yes \_\_\_\_\_ No \_\_\_\_\_
15. Please list the available inter-site links: RF \_\_\_\_\_ Microwave \_\_\_\_\_ Leased Lines \_\_\_\_\_  
\_\_\_\_ Fiber Optic \_\_\_\_\_  
Other (please describe) \_\_\_\_\_

Please provide a network diagram. The network diagram is very important for us to design the correct linking interconnection. The diagram should include:

1. Site locations
2. Line of sight situation between sites
3. Dispatch Console locations
4. PSTN interconnect locations
5. Any other relevant information

## APPENDIX B

### ST-510 TECHNICAL SPECIFICATIONS

#### GENERAL SPECIFICATIONS:

**Weight:** 70 lbs./32Kg. Min. (depending on system configuration)

**Mounting:** 19" Rack mount

**Dimensions:** Minimum 7 Units high by 22"

**Temperature Range:** -10°C to 75°C (Humidity <80%)

**Power supply:** 110/220Vac 60/50 Hz 450 VA

**Controller interface:** SmarTrunk ST-852/ST-853

**Telco interface:** 2W 600 ohms balanced

**DSP:** DPCM 8.000 Hz, 8 bits

**Audio Switch:** Analog Matrix

**Switching time:** <2 msec

**Switching boards:** ST-420

**Maximal system capacity:** up to 128 ST-420 boards for each ST-510

#### MAIN CPU:

**Main Processor:** Intel Celeron 500 Mhz

**RAM memory:** 32 MB

**Hard Disk:** 20Ghz

**Bus speed:** 66Mhz

**Video Output:** SVGA 8Mb SRAM

**CD ROM Unit:** X50

**Floppy disk:** 3 1/2" 1.44Mb

#### SWITCHING MODULE:

**Dimensions:** 19"W x 10"D x 3 Standard EIA Racks Units High

**Internal Power supply:** 12Vcc @700mA and 5Vcc @1A

**Ripple:** <0.8%

**Each Rack Unit:** 11 ST-420 boards, 1 Bus Extension port and 1 Power Supply

**Switching Bus:** 64 wire with CF64acr Connection.

#### SWITCHING BOARDS:

**Model:** ST-420

**Board Connection:** CM64acr Connector

**Addressing Mode:** Parallel 5 bits

**Data bus:** 16 I/O bits 2Mhz

**Board matrix:** Analog 16 rows

**External data interface:** RS-232, 4800 baud, No Parity, 8 data bits, 1 Stop bit.

**Internal Data Buffer:** 62 bytes

**Board main processor:** National COP8SAC740 10 MHz

#### Board Function:

ST-853 interface

Internal DSP Resource

TELCO interconnect

Roaming bus

Roaming bus + Link Channel

ST-500 Console Interface

#### Board Ports:

2W 600 ohms Balanced Telco Adapter FXO/FXS

RS-232, 4800, N, 8, 1

Auxiliary Audio Input: Hi Impedance 2V RMS 50Hz to 4000 Hz band pass