JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

SYRIAN TELECOMMUNICATIONS ESTABLISHMENT (STE)
THE SYRIAN ARAB REPUBLIC

THE STUDY
ON
NATIONAL TELECOMMUNICATIONS NETWORK
EXPANSION PLAN
IN
THE SYRIAN ARAB REPUBLIC

FINAL REPORT

MAIN REPORT

VOLUME 2 FEASIBILITY STUDY

AUGUST, 1996

NTT INTERNATIONAL CORPORATION
NTT DATA INSTITUTE OF MANAGEMENT CONSULTING

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NATIONAL TELECOMMUNICATIONS NETWORK EXPANSION PLAN IN THE SYRIAN ARAB REPUBLIC (VOLUME 2: FEASIBILITY STUDY)

Study period: Feb. 1996 to Aug. 1996

Counterpart: Syrian Telecommunications Establishment

1. Background

The Master Plan which targets the year 2010 was prepared at the Phase 1 stage in order to improve the current telecommunications states and to establish a long-term telecommunications infrastructure expansion plan in Syria. Since it is important to execute projects in regular order according to the plan, projects to be fulfilled urgently is selected and their feasibility study is conducted at the Phase 2 stage.

2. Objectives

To evaluate the feasibility of each project during the first five-year period (1996-2000) in the Master Plan, a feasibility study on the identified projects such as telephone network, mobile telephone and computerization extracted from the Plan is conducted mainly focusing on Damascus city.

3. Outline of the Plan

3.1 Concept

The following systems are selected from the viewpoints of the urgent need to fulfill demand for telephones, introduce new services quickly, and improve customer service and management. The target systems and areas are as follows:

- Telephone network expansion : Fulfillment of the demand in all Damascus city
- Mobile telephone system : Introduction to two big cities, Damascus and Aleppo
- Packet switched data network : Expansion of the existing and introduction of new system
- Computer system : Expansion of the existing and introduction of new system

The target year for each system in this Project is 2000, except for the Mobile telephone system which is targeted for 1998.

3.2 Contents of the plan

Table 1 Contents of the Plan

System	Area/Locations	Plan	Target year
1. Telephone Network	All Damascus city		2000
(1) Switching		Approx.208 thousand units	
(2) Subscriber Network		Approx.264 thousand pairs	
(3) Transmission		68 systems (Optical)	
2. Mobile Telephone	Damascus and Aleppo	Approx. 52 thousand subs.	1998
3. PSDN	Five big cities	380 lines	2000
4. Computer system	Five big cities, STE H.Q.	1 center, 25 telephone-center, 339 terms.	2000

4. Project Cost

The overall investment cost amounts to US $ 110 million in foreign currency and this amount is almost the same as that invested in the project started in 1992.

It is estimated that it is feasible investment amount under the condition that the same financing program as that is available in the future.

Table 2 Investment cost

System	Foreign currency (MIL US $)	Local currency (MIL S.P)
1. Telephone Network	62.5	1,328.8
2. Mobile Telephone	29.7	124.6
3. PSDN	1.7	6.6
4. Computer system	5.6	25.5
5. Contingency	9.9	148.6
Total	109.4	1,634.1

Exchange rate (1995): 1 US $=42 Syrian Pounds

5 Project Evaluation

The projects in the plan are deemed "practicable" from both the technical and financial points of view and also deemed "indispensable" in providing the infrastructure for social and economic activities in Damascus and other cities surveyed.

5.1 Financial Evaluation

According to the financial evaluation, this project has an FIRR of 16.1 percent for 10 years project evaluation period and 20.5 percent for 20 years.

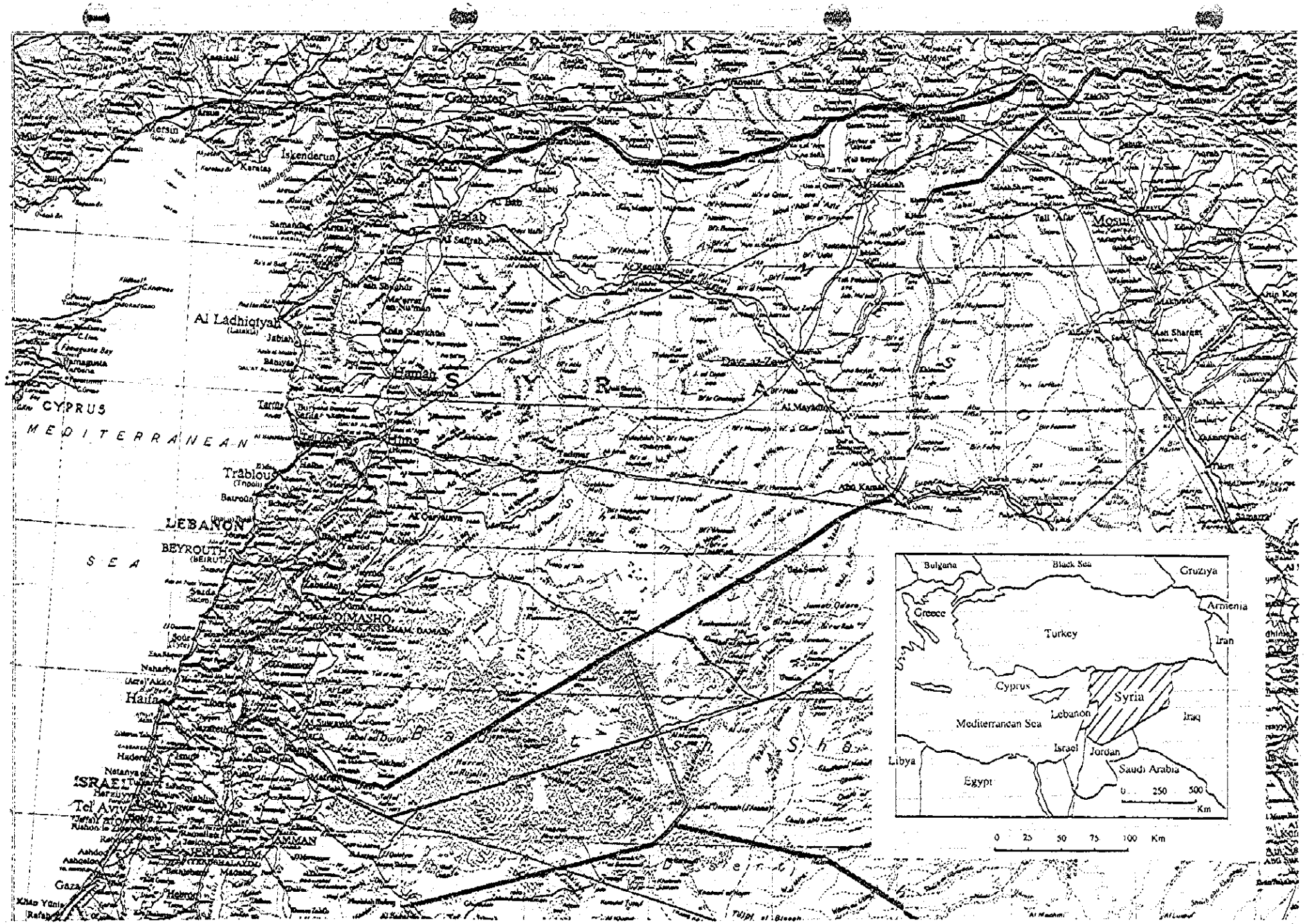
5.2 Economic Evaluation

As a result of a sample survey, it is estimated that consumer surplus for business users is approximately 30 percent of total telephone charges and for residential users is approximately 50 percent.

6. Recommendation

(1) Strengthening the forecasting section and assigning technically-trained staff to the forecasting section
(2) Facility records are indispensable.
(3) Improvement of project management

Unless otherwise stated, the following exchange rate prevailing in 1995 has been used: USD 1.00 = S.P 42.00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S Y R I A N
D E S E R T
Gaziantep
Iskenderun
Aleppo
Mosul
Al Ladhiqiyah
Hamah
Dayr az-Zawr
Hims
Tarābulus
CYPRUS
MEDITERRANEAN SEA
LEBANON
BEYROUTH
DIMASHQ
Haifa
ISRAEL
Tel Aviv
AMMAN
Gaza
Hebron
Bulgaria
Black Sea
Gruziya
Armenia
Greece
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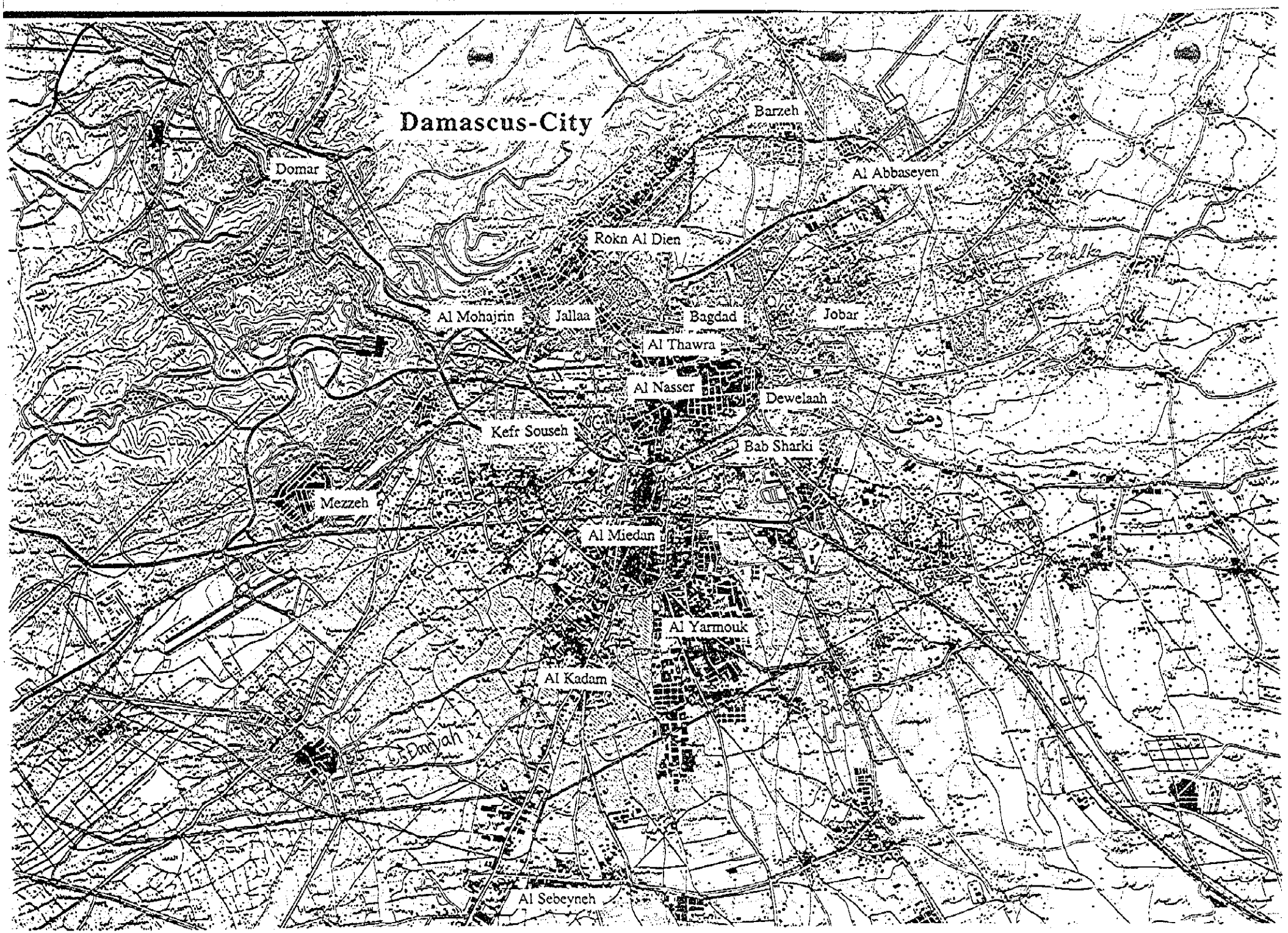
Damascus-City
Barzeh
Domar
Al Abbaseyen
Rokn Al Dien
Zarâlka
Al Mohajrin
Jallaa
Bagdad
Jobar
Al Thawra
Al Nasser
Dewelaah
Kefr Souseh
Bab Sharki
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Al Miedan
Al Yarmouk
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Barzeh
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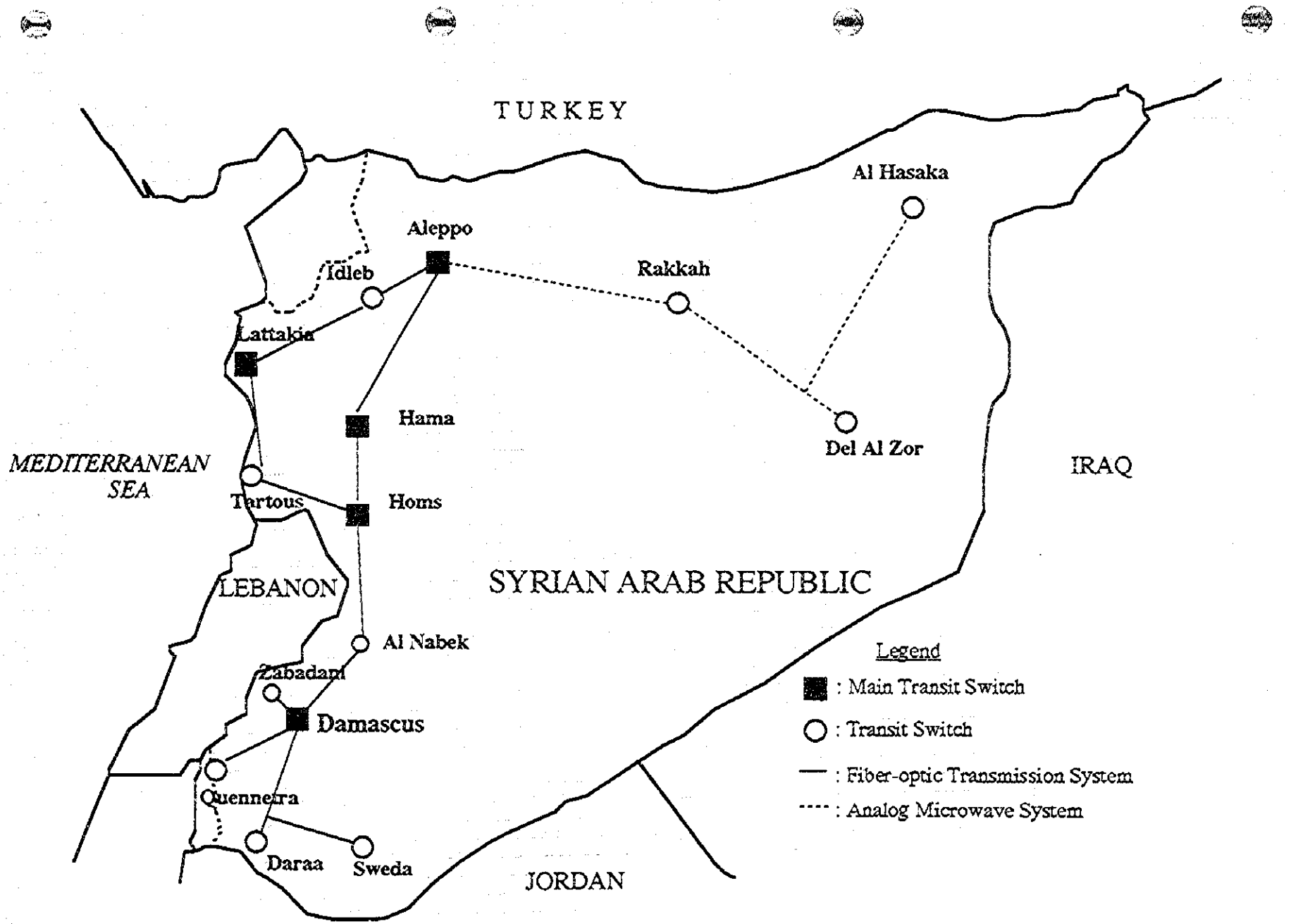
Al Sebeyneh



Route Map of STE National (Backbone) Telecommunication Network

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Abbreviation

A	:	Ampere
ABR	:	Available Bit Rate
AC	:	Alternating Current
ADM	:	Add-Drop Multiplexer
AMA	:	Automatic Message Accounting system
APX76	:	(Name of Product/ Device)
ATM	:	Asynchronous Transfer Mode
ATMF	:	ATM Forum
B-channel	:	Basic-channel
B-ISDN	:	Broadband-ISDN
bps	:	bit per second
BRK	:	Breaker
BSC	:	Base Station Controller
BTS	:	Base Transceiver Station
BW	:	Both Way
C	:	(A kind of programming Language)
CBR	:	Constant Bit Rate
CCC	:	Cross Connection Cabinet
CCH	:	Control Channel
CCS	:	Common Channel Singnalling System
CCT	:	Circuit
CD-ROM	:	Compact Disc - Read Only Memory
ch	:	channel
CIH	:	City Information Highway
CIR	:	Committed Information Rate
CNM	:	Customer Network Management
D-channel	:	Data-channel
DB	:	Data Base
dB	:	deciBel
dBm	:	deciBels referred to a milliwatt
DC	:	Direct Current
DCC	:	Data Country Codes
DEG	:	Diesel Engine Generator
DOS	:	Disc Operating System
DP	:	Dial Pulse
DP	:	Distribution Point
DQ	:	Directory Inquiry

DTE	:	Data Terminal Equipment
DXC	:	Digital Data Connector
E-mail	:	Electronic mail
E1	:	(Original Hierarchy 2048kbit/s)
E10A	:	(Digital Switching System of Alcatel)
ECOM25L	:	(Name of Product/ Device)
ECOM25M	:	(Name of Product/Device)
EIR	:	Equipment Identity Register
EIRR	:	Economic Internal Rate of Return
EMD	:	Edelmetall Motor Drehwähler Switch of Siemens
erl	:	erlang
ETSI	:	European Telecommunications Standards Institute
EWSD	:	Electronische Wahle System Digital (Digital Electronic Switching System) of Siemens
F/S	:	Feasibility Study
FDDI	:	Fiber Distributed Data Interface
FEP	:	Front End Processor
FH	:	Frame Handler
FIRR	:	Financial Internal Rate of Return
FR	:	Frame Relay
G4	:	Group Four facsimile
GB	:	Giga-Byte
GDP	:	Gross Domestic Product
GSM	:	Global System for Mobile Communications
H.Q.	:	Headquarters
HDLC	:	High Level Data Link Control
HDSL	:	High Bit Rate Digital Subscriber Line
HLR	:	Home Location Register
Hz	:	Hertz
ID	:	Identification
INTS	:	International Switch
INV	:	Inverter
IP	:	Interworking Ports/Units
ISC	:	International Switching Center
ISDN	:	Integrated Services Digital Network
ITU-T	:	International Telecommunication Union - Telecommunication Standardization Sector
JICA	:	Japan International Cooperation Agency
LAN	:	Local Area Network

LBP	:	Low Tension Branch Panel
LE	:	Local Exchange
LL	:	Leased Lines
LS	:	Local Switch
LT	:	Local Transit Switch
LTP	:	Low Tension Change-over Panel
MAN	:	Metropolitan Area Network
MB	:	Mobile Box
MBS	:	Managed Bandwidth Service
MDF	:	Main Distribution Frame
MDP	:	Main Distribution Panel
MFC	:	Multifrequency Code Signalling System
MFPB	:	Multifrequency Pushbutton
MIS	:	Management Information System
MP	:	Master Plan
MS	:	Mobile Station
MSC	:	Mobile Service Switching Center
MT	:	Magnetic Tape
MTR	:	Meter
MTS	:	Mobile Transfer Switch
MTU	:	Magnetic Tape Unit
MUX	:	Multiplexer
NEAX61	:	(Digital Switching System of NEC)
NGN	:	New Generation Network
NMS	:	Network Management System
NTN	:	Network Terminal Number
nx64	:	n multiplied by 64
O&M	:	Operation and Maintenance
O/MC	:	Operation and Maintenance Center
OJT	:	On the Job Training
OM	:	Operation and Maintenance
OMC	:	Operation and Maintenance Center
OTDR	:	Optical Time Domain Reflectometer
PABX	:	Private Automatic Branch Exchange
PAD	:	Packet Assembler/Disassembler
PBX	:	Private Branch Exchange
PC	:	Personal Computer
PCM	:	Pulse Code Modulation
PE	:	Polyethylene

PEE	:	The Public Establishment for Electricity
PH	:	Packet Handler
PSDN	:	Packet Switched Data Network
PSTN	:	Public Switched Telephone Network
PVC	:	Permanent Virtual Circuit
PVC	:	Polyvinyl Chloride
R	:	Router
R2	:	R2 signalling
RDBMS	:	Relational Data Base Management System
RECT	:	Rectifier
REG	:	Regenerator
RF	:	Radio Frequency
RSU	:	Remote Switching Unit
RU	:	Remote Unit
SDH	:	Synchronous Digital Hierarchy
SIM	:	Subscriber Identity Module
SM	:	Single Mode
SMDS	:	Switched Multi-Megabit Data Service
SMT	:	Synchronous Terminal Multiplexer
SP	:	Signal Point
SP	:	Syrian Pound
STD	:	Subscriber Trunk Dialing
STE	:	Syrian Telecommunications Establishment
STM-1	:	Synchronous Transport Module - 1
STM-4	:	Synchronous Transport Module - 4
STP	:	Signal Transfer Point
SVC	:	Switched Virtual Circuit
SYRIAPAC	:	(Service Name X.25)
sys	:	system
T/C	:	Telephone Center
T1	:	(Original Hierarchy 1554kbit/s)
TA	:	Terminal Adapter
TCH	:	Traffic Channel
TDM	:	Time Division Multiplex
TE	:	Transit Exchange
TMN	:	Telecommunications Management Network
TR	:	Token Ring
TRM	:	Terminal Multiplexer
TRX	:	Transceiver

TX	:	Transmitting
UBR	:	Unspecified Bit Rate
UNI	:	User Network Interface
UNIX	:	(A kind of operating system developed for open system)
UPS	:	Uninterruptible Power Supply
US$	:	United States of America Dollar
V	:	Volt
VBR	:	Variable Bit Rate
WAN	:	Wide Area Network
WLL	:	Wireless Local Loop
XMUX	:	(Name of product/ device)

CHAPTER 1 INTRODUCTION

1.1 Introduction

The Master Plan which targets the year 2010 was prepared at the Phase 1 stage in order to improve the current telecommunications states and to establish a long-term telecommunications infrastructure expansion plan in Syria. Since it is important to execute projects in regular order according to the plan, projects to be fulfilled urgently is selected and their feasibility study is conducted at the Phase 2 stage.
This Report describes the findings and results of the work, which was carried out from February to August, 1996. The Master Plan is described as Volume 1 apart from this Volume 2.

1.2 Background

As of 1993 the number of main telephone lines in Syria was approximately 550,000, and the penetration ratio of telephone lines was 4.11 per 100 inhabitants, which is considerably low compared with the average penetration ratio of 10.4 for Middle East countries. This situation is considered to be one of obstacles to socio-economic development of the country.

In 1990, Syrian Telecommunications Establishment (hereinafter referred to as "STE") with the funding of the State of Kuwait implemented a project to increase the number of lines by 700,000 by 1995.
This project, however, met only demands through 1985, and the number of waiting applicants for telephone services reached approximately 1.94 million at the end of 1995 according to STE's data.

STE has planned several development projects for the Eighth National Five-Year Plan (1996 to 2000) to meet telephone demand. These projects, however, have not been approved yet because the national socio-economic development programs have not been decided. STE has many urgent matters to decide such as replacement of timeworn equipment and improvement of the current inefficient billing system which takes nine months to issue telephone bills. To solve these urgent matters, the Government of Syria has decided to implement comprehensive long term communications development programs including introduction of computerized systems, mobile services and an efficient management structure.

Under these circumstances, the Government of Syria requested the Government of Japan to conduct the Study on National Telecommunications Network Expansion Plan in Syria.

In response to this request, The Government of Japan has decided to send a JICA Study Team (hereinafter referred to as "the Study Team" to make a master plan and a feasibility study based on the Master Plan.

1.3 Objectives of the Study

To evaluate the feasibility of each project during the first five-year period (1996-2000) in the Master Plan, a feasibility study on the identified projects such as telephone network, mobile telephone and computerization extracted from the Plan is conducted mainly focusing on Damascus city.

The target projects are as follows:

(1) Expansion and improvement of the telephone network
(2) Introduction of Mobile Telephone system
(3) Introduction of Packet Switched Data Network system
(4) Introduction of three (3) Computerized systems

- Telephone-center System
- Billing System
- Management Information System

CHAPTER 2 SELECTION OF TARGET PROJECTS

2.1 Policy of Selection

2.1.1 Relation with the Master Plan

The long-term plan covering up to the year 2010 for development and improvement of the telecommunications network in Syria was studied and made as the Master Plan (Volume 1) by the JICA Study Team in 1995. The Master Plan includes many telecommunications systems such as telephone network expansion and introduction of mobile telephone network, data transmission network and computerized system, which will provide a total telecommunications network that will meet customers' requests, and keep up with the times and national economic development.

The target projects for the Feasibility Study should be selected out of the next five year plan (1996 to 2000) based on the Master Plan.

2.1.2 Criteria for Selection

Basic criteria for selection of telecommunication networks development should be as follows:

(1) To expand the telephone network to satisfy high demand

(2) To introduce new services with high urgent demand

(3) To replace/renew older facilities which are obstacles to service quality and O/M works

(4) To secure stable network services

(5) To improve productivity of daily work

(6) To improve productivity of administration and management

2.1.3 The Target Systems

The following systems should be selected as the target systems from viewpoints of urgent fulfillment of the telephone demand, earlier introduction of new services and improvement of customer services and management:

(1) Telephone network expansion

(2) Mobile telephone system

(3) Packet switched data network

(4) Computer system

2.1.4 Areas of Projects

Areas or locations for the project should be selected from viewpoints of the following subscriber categories:

- Administrative/Governmental group area
- Industrial/Business group area
- Commercial group area
- Residential group area

2.2 Selected Target Projects

Areas and locations of target projects for the Feasibility Study were selected based on the above policy:

2.2.1 Telephone Network Expansion

Expansion and replacement of telephone network systems in all Damascus city except for the rural area:

(1) Switching system (including replacement of older exchanges, expansion of STD and INTS)

(2) Subscriber network

(3) Transmission system

2.2.2 Mobile Telephone System

Damascus and Aleppo areas including main roads (main parts of the western Syria)

2.2.3 Packet Switched Data Network

The five big cities (Damascus, Aleppo, Homs, Hama, Lattakia)

2.2.4 Computer System

(1) Billing System

- **Center system : Aleppo**
- **Telephone center : The five big cities**

(2) Telephone-center System

The five big cities (except for Damascus)

(3) Management Information System

The five big cities and STE's headquarters

The target system projects are shown in Table 2.2.4-1.

Table 2.2.4-1 Selected Target System Projects

System	Area/locations	Remarks
1. Telephone Network (1) Switching (2) Subscriber Network (3) Transmission	All Damascus city (except for rural area)	Replacement of EMD and expansion of STD are included
2. Mobile Telephone	Damascus & Aleppo including main roads	Western part
3. Packet Switched Data Network	5 big cities	
4. Computer (1) Billing System * Center	Aleppo	
* Telephone Center	5 big cities	
(2) Telephone-center System	5 big cities (except for Damascus)	
(3) Management Information System	5 big cities, Headquarters	

5 big cities: Damascus, Aleppo, Hama, Homs, Lattakia(except for rural areas)

2.3 Target Year

The target year for this project should be decided by each system, taking into account the service commencement year as early as possible, which will be assumed on conditions of the urgency and the duration of finance, tendering and installation for each system.
As a result of the study, the target year for each system in this project is shown in Table 2.3-1.
The lead time for provisioning for each system is described in Chapters 4 - 7.

Table 2.3-1 Target Year for Each System

System	Target Year	Remarks
1. Telephone Network (1) Switching (2) Subscriber Network (3) Transmission	2000	
2. Mobile Telephone	1998	
3. Packet Switched Data Network	2000	
4. Computer (1) Billing System * Center	2000	
* Telephone Center		
(2) Telephone-center System		
(3) Management Information System		

CHAPTER 3 FUNDAMENTAL NETWORK PLAN

3.1 Network Structure

3.1.1 International Network

(1) Present Network

At present there are two(2) INTS (International Switches) in Damascus and Aleppo and each INTS has its own set of international destinations respectively. Low-traffic destinations, however, are reached only from a certain INTS, so inter-INTS circuits are established between the two INTSs. International calls from all STDs in Syria are routed to both INTSs, but because of the difference between the capacities of the Damascus and Aleppo INTSs, the traffic volumes from/to the geographically close STDs, and the number of destinations available from each of the two INTSs about 90% of the traffic is distributed to the Damascus INTS.

(2) Network Structure in Damascus city

International calls from/to LEs (Local Exchanges) in Damascus city are routed to the Damascus INTS and the Aleppo INTS via Damascus STD.
The traffic distribution ratio should be 60% to the Damascus INTS and 40% to the Aleppo INTS by the year 2000 step by step from the viewpoints of the security.
The international network structure and routing for year 2000 is shown in Figure 3.1.1-1

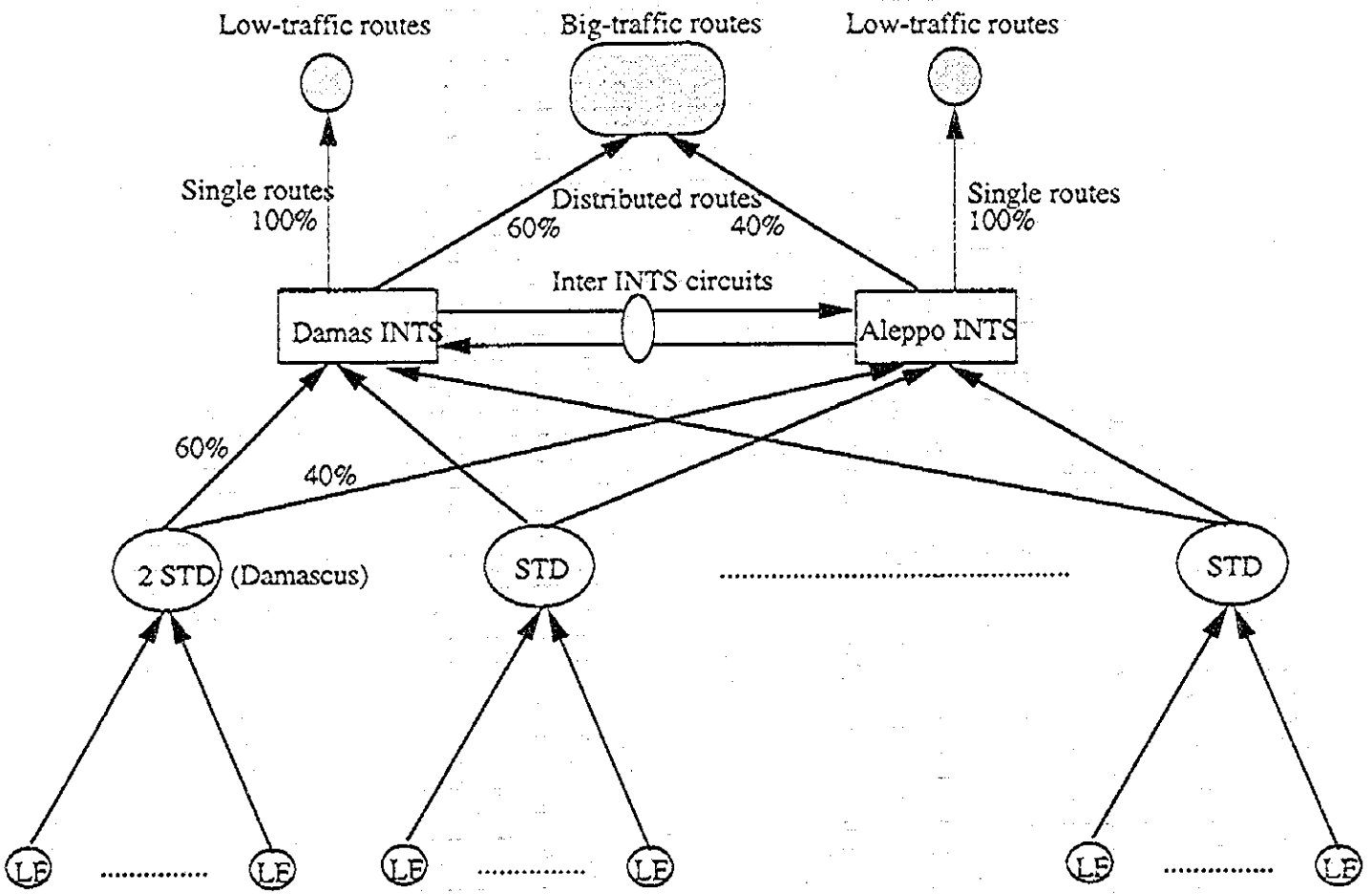


Figure 3.1.1-1 International Network Structure and Routing for the year 2000

3.1.2 Long Distance Network

(1) Existing National Telephone Network

The existing network structure has the four(4) levels hierarchy, and the fourth level is divided into five(5) areas in Syria as shown in Figure 3.1.2-1.
Digitalization of telecommunications system will promote a minimum hierarchy structure because of decreasing the circuit cost and simplifying the structure. In Syria transition from the four(4) level hierarchy to the three(3) level hierarchy is in progress in order to eliminate the 2-level stage of Nabek and Zabadani in Damascus region.

(2) Long Distance Network in Damascus Region

For long-distance call connection, the Damascus region is, as shown in Figure 3.1.2-2, divided into the following three areas:

- Damascus city area
- Damascus rural area
- Damascus region area

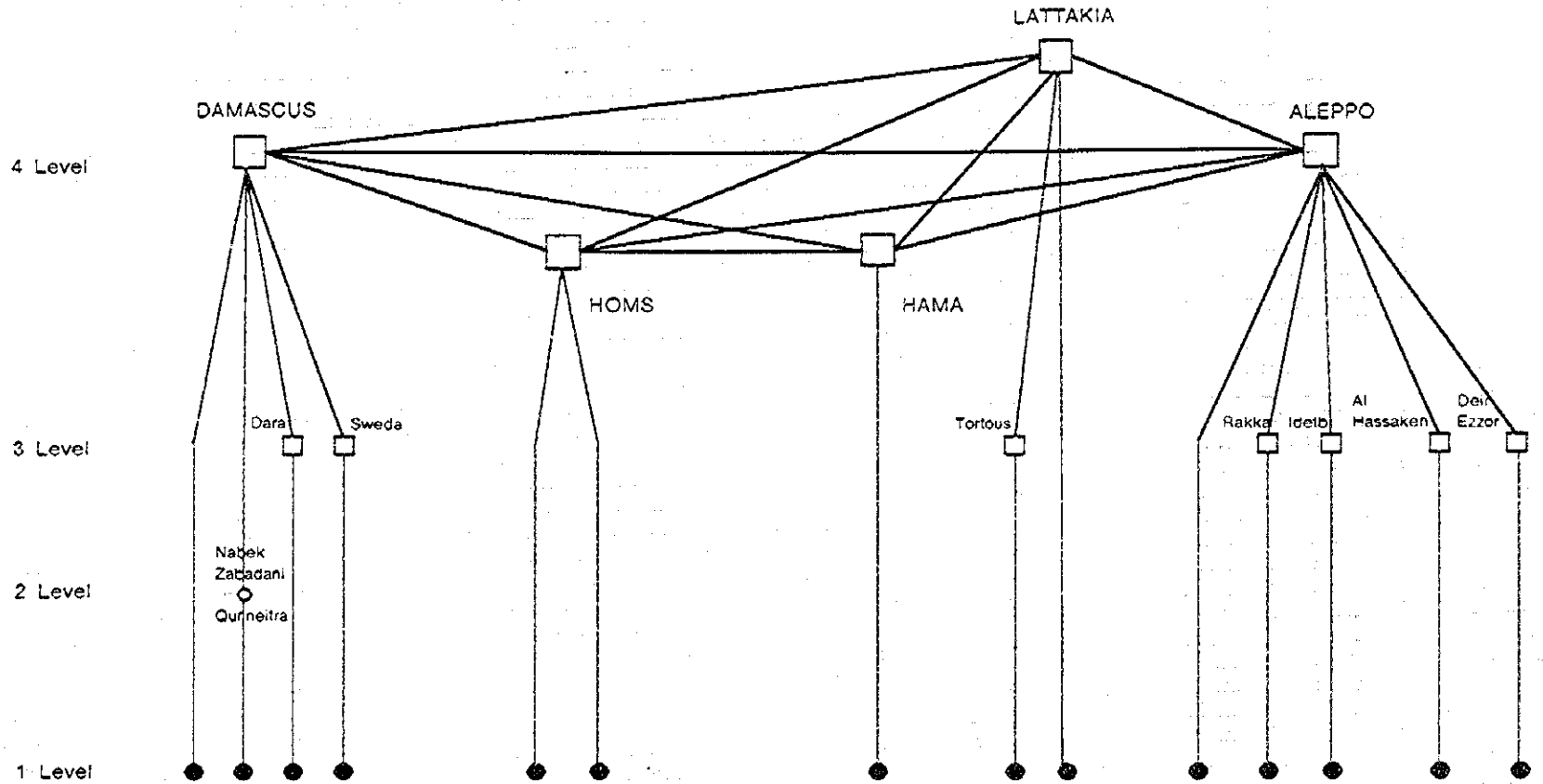


Figure 3.1.2-1 Existing Network Structure for National Telephone Network

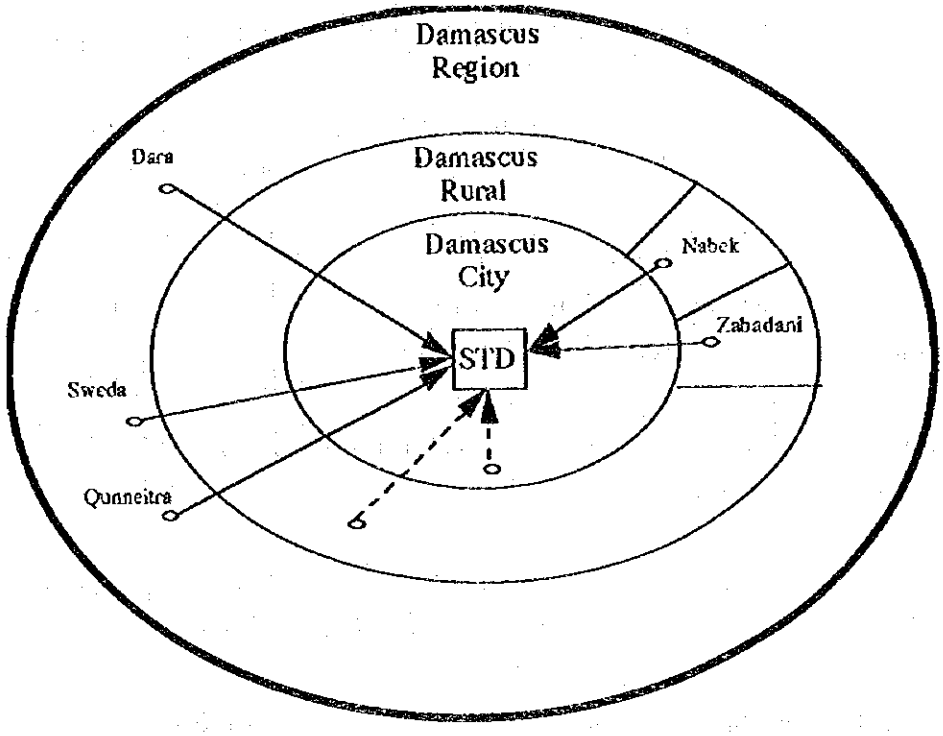


Figure 3.1.2-2 Damascus Region

To study the future network structure in Damascus region, the following considerations should be taken as basic conditions of the region:

- The existing routing is not simplified based on a certain logical routing method.
- Intensive increase of subscribers and traffic volume in Damascus city and its suburb in the rural area is foreseen in near future.
- Many small automatic exchanges including RSUs are planned to replace manual exchanges in the rural and region areas.

- The need for network security increases with network size, and security thus becomes critical for a large network..
- The existing circuits and LT (local transit exchange) function should be utilized as effectively as possible from the viewpoints of maximum dimensioning of exchanges.

- The existing and future transmission routes for each district block should be taken into consideration for the security reason.

Taking into consideration the above, the new network structure and routing for Damascus region should be as follows:

- To establish a new STD at a new building separated from the existing Al Nasser STD from point of view of security and expansion of circuits.

- To distribute the traffic and routes to two(2) STDs at ratio of 50% to 50% in principle.

- To divide the city and the rural area into seven(7) blocks according to the transmission routes.

- To centralize the small circuits groups from the small exchanges (about less than 10,000 subscribers) in a block to the exchange which has transit function (combined LE/LT) to minimize the circuits cost, and to carry the centralized traffic to STDs via this exchange.

The long distance network structure in Damascus region as a result of the above should be Figure 3.1.2-3.

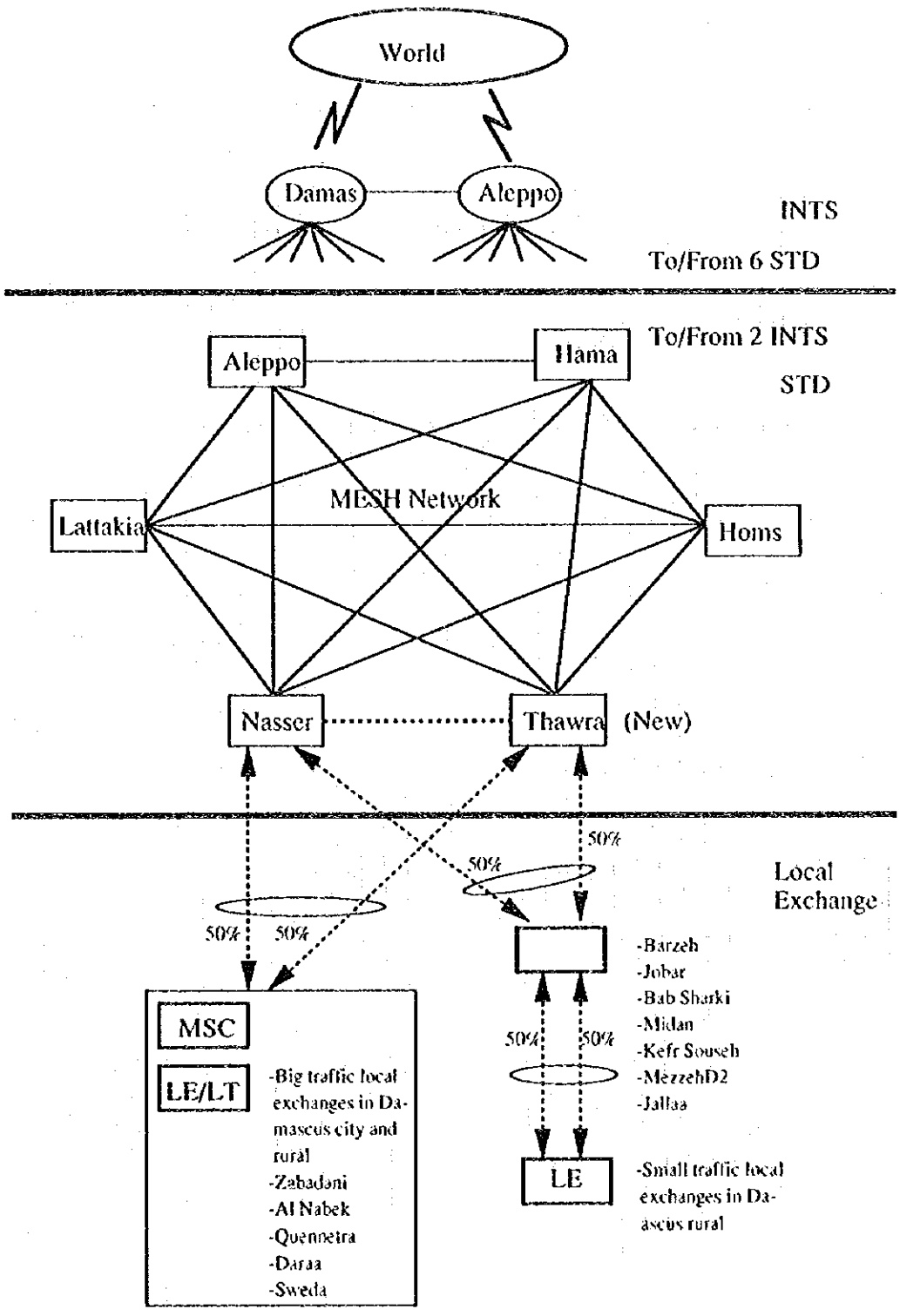


Figure 3.1.2-3 Long Distance Network Structure in Damascus Region

3.1.3 Local Network in Damascus City

(1) The Present Network

Damascus city has a large multi-exchange local network and at present the network will be classified as an unstructured network from the following reasons:

- New exchange and expansion plan not based on a certain fixed network plan
- New routes setting from viewpoints of the existing routes without the fixed routing standards

The present routing in Damascus local area is shown in Figure 3.1.3-1.

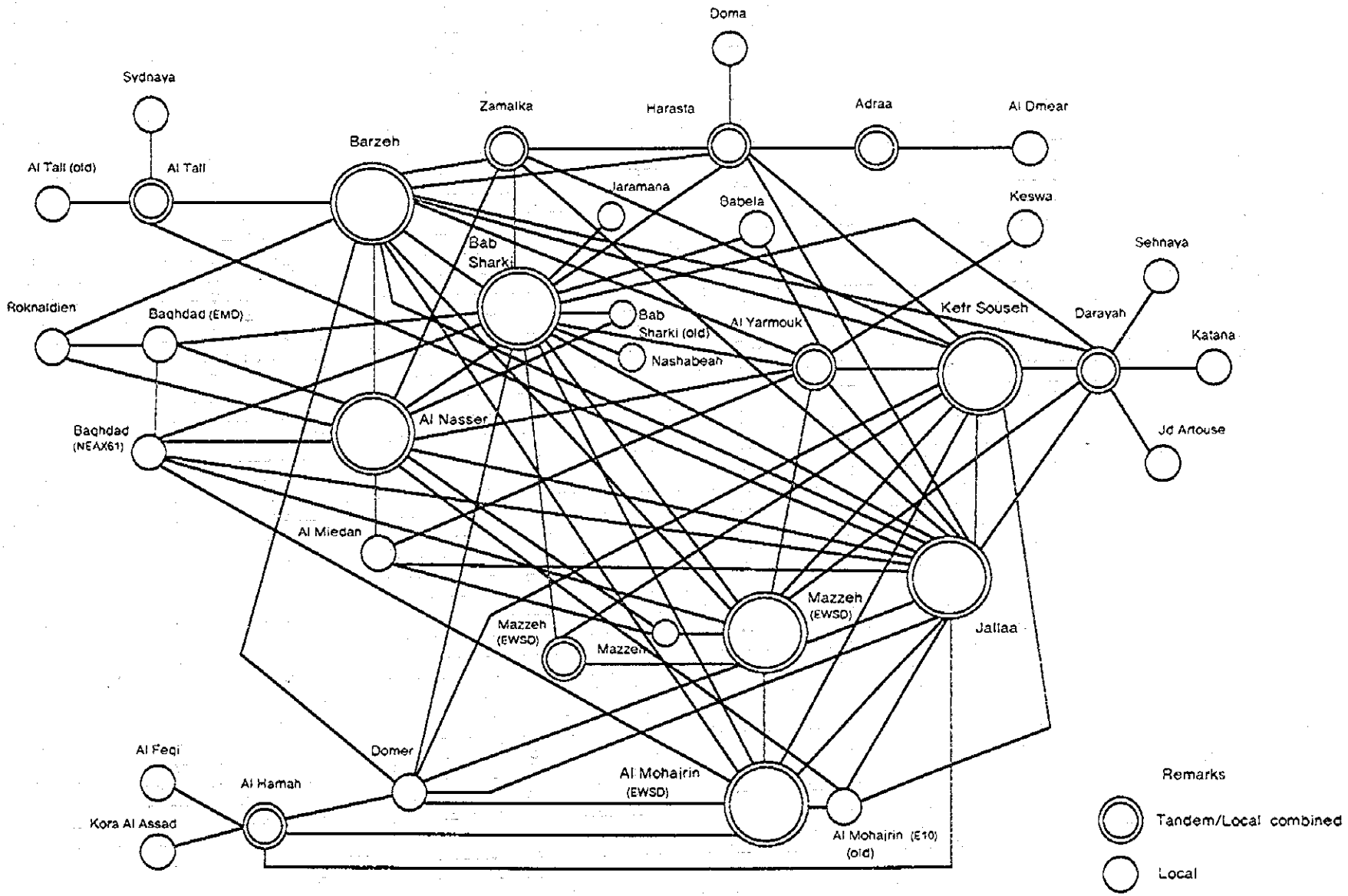


Figure 3.1.3-1 Routing in Damascus Local Area

(2) Considerations for the Future Network

The large expansion of the network and increase of big number of subscribers towards the year 2000 will need an optimum, i.e. a simple, effective and high security local network. For restructuring the existing network the following considerations should be taken:

- The local network for local connection calls will have a big number of automatic exchanges (about eighty) which are located over Damascus city and its rural.

- There will be a lot of big exchanges which have subscribers more than 20,000 in Damascus city and its suburb, and their traffic quantities may increase hugely.

- On the other hand, there will be a lot of small exchanges which have subscribers less than 3,000.

- The rural area is divided into several district blocks on the transmission routes, and there exists a gate way exchange as a node point in each block.

- The security of the network is absolutely needed according to becoming a huge network.

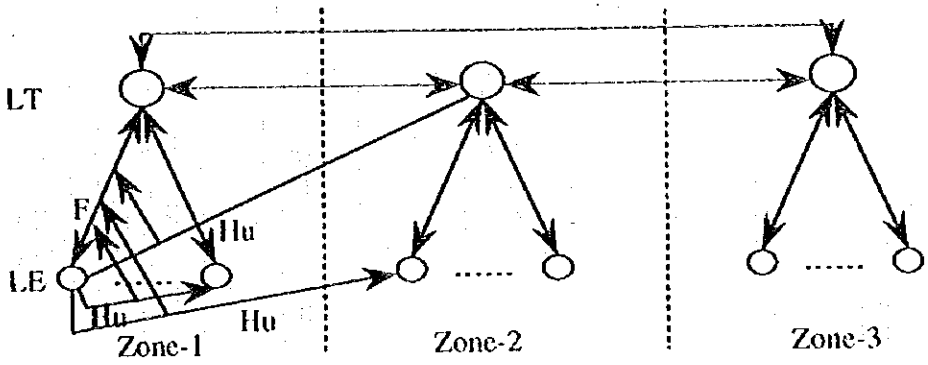
- The transition from the existing network to the restructured network should be able to carry out easily step by step.

(3) The Proposed Local Network Structure in Damascus

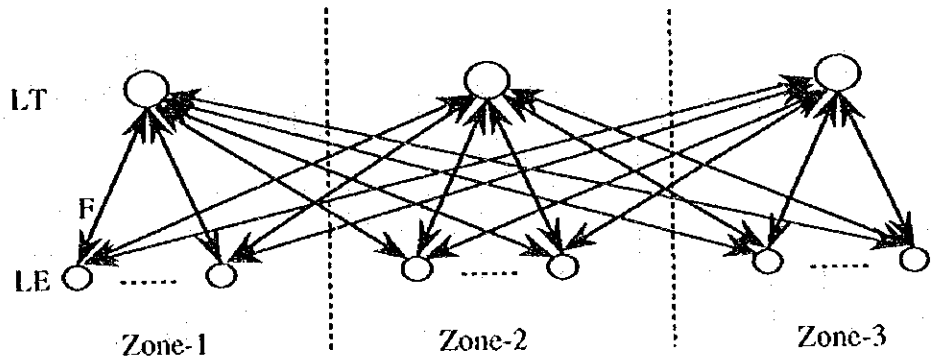
Generally the optimum network is to be studied to minimize basically both of the switching and the transmission costs, however, at the same time, other considerations such as easy planning, easy operation and maintenance, good security should be taken. Here the following three models of local network structure were studied and simulated using estimated traffic data for Damascus area:

- Zone tandem model
- Multi-tandem model
- Combined Zone and Multi-tandem model

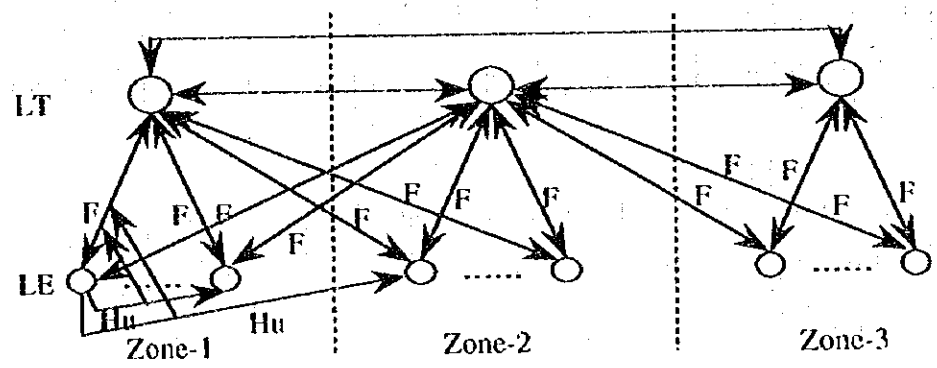
The three models are shown in Figure 3.1.3-2.



Zone Tandem Model



Multi-Tandem Model



Combined Zone and Multi-Tandem Model

Figure 3.1.3-2 Local Tandem Model

As a result of the study, the summary features for each model is shown in Table 3.1.3-1.

Table 3.1.3-1 Summary Features of Each Model

	Number of circuits	Security	Operation & maintenance	Combined LT & LE
a) Zone tandem model	less than b)	good	medium	possible
b) Multi-tandem model	too many	excellent	simple and easy	impossible(dedicated transit exchange)
c) Combined Zone and multi-tandem model	less than b) and more than a)	excellent	a little complicated	possible

Based on the above result and considerations for the future network described in (2), the proposed local network structure should be **"Combined Zone and Multi-Tandem"** model.

As a home exchange, the zone tandem (transit) exchange should have about twenty(20) LEs, each with two (2) home exchanges (a main home tandem and a sub home tandem) on final routing path ways.

The Damascus city and its rural areas are divided into seven(7) blocks as tandem area according to geographical area, appropriate number of LEs and the transmission routes based on district loop system.

The tandem exchange switches long distance calls from the small exchanges in its own block area to 2 STDs.

The proposed restructured local network in Damascus area is shown in Figure 3.1.3-3.

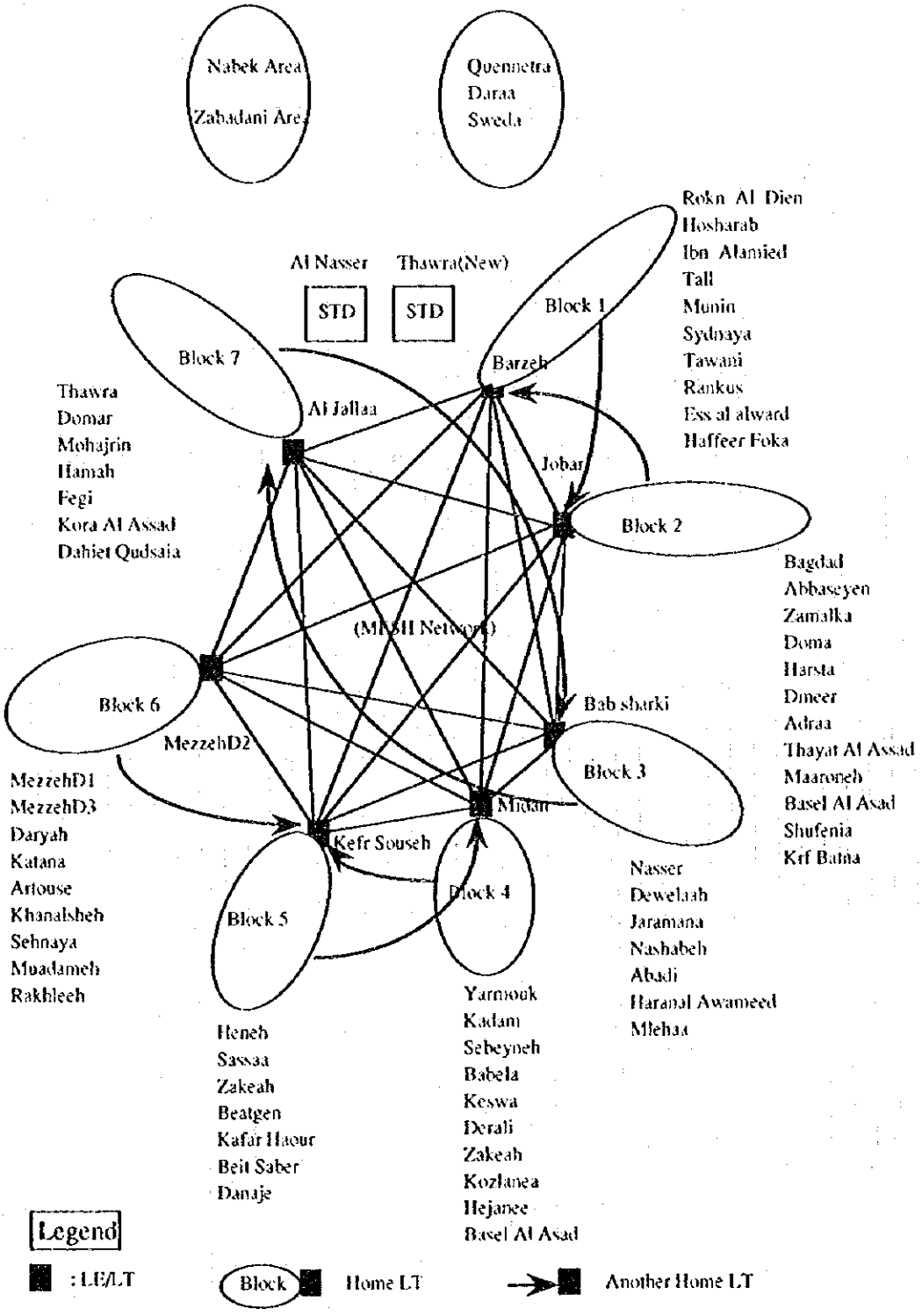


Figure 3.1.3-3 Proposed Local Network in Damascus Area

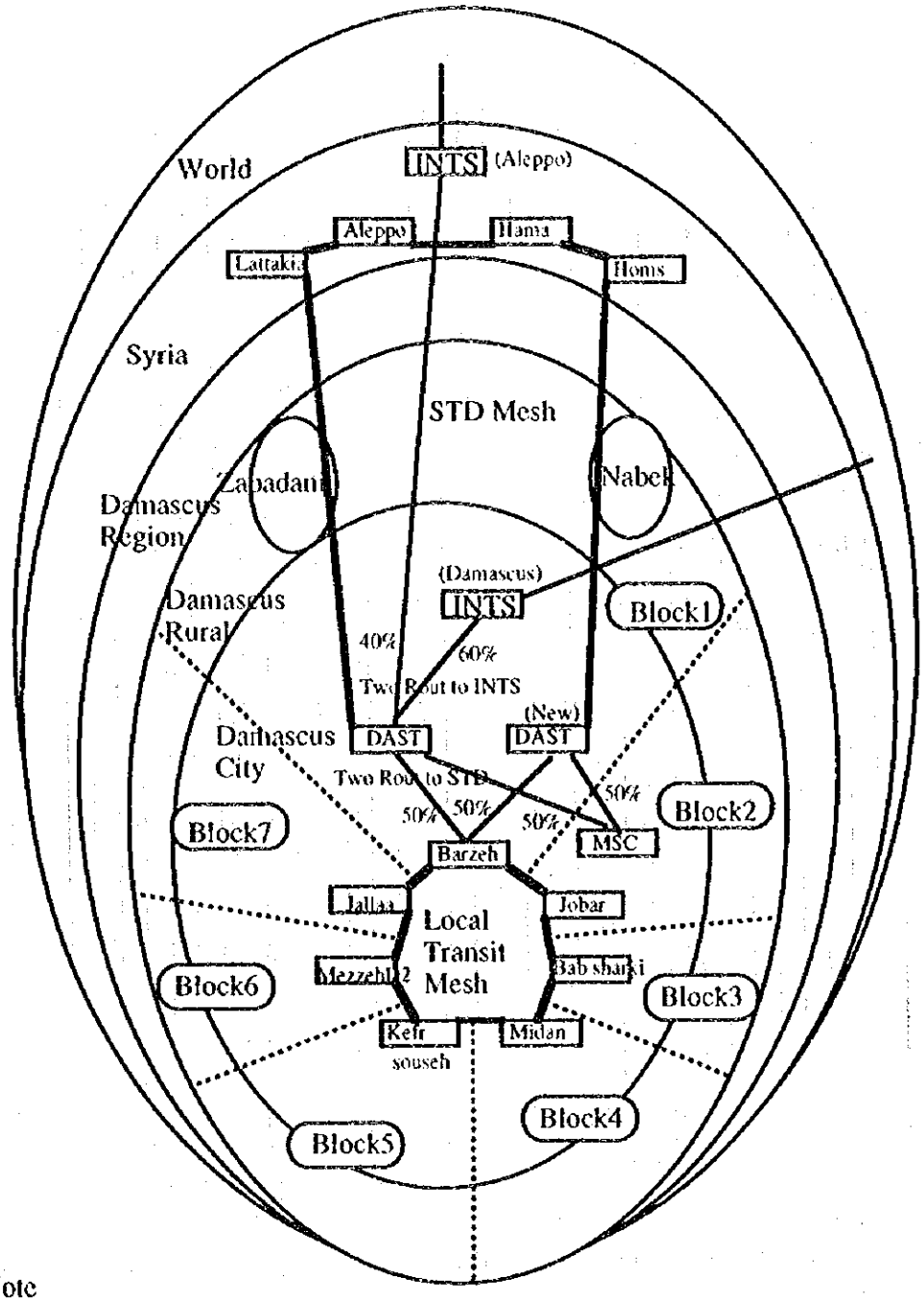
3.2 Routing Plan

The routing should be basically "far to near rotation method" and the routing criteria for traffic volume is as follows:

-	A direct high usage route between LE and LE	:	more than 20 erl.
-	A direct final route between LE and LE	:	more than 90 erl.
-	A final route between LE and 2 home LTs	:	all final traffic and over-flow traffic from high usage routes

3.3 Proposed Integrated Network in Syria

The proposed integrated network structure and routing in Syria as the summary of the study will be shown in Figure 3.3-1.



Note

1 Two(2) Routs Between seven(7) Local Tandems and two(2) DASTs
2 Two(2) Routs Between six(6) STDs and two(2) INTSs
3 Seven(7) Local Tandems are connected with Mesh Network
4 Six(6) STDs are connected with Mesh Network except between two(2) DASTs

Figure 3.3-1 Proposed Integrated Network in Syria

3.4 Numbering Plan

3.4.1 National Numbering Plan

The national numbering plan is as follows:

(1) Structure of numbering

Country Code + Area Code + Trunk Code + Subscriber Code

963 XX XX(X) XXXX

(2) Prefix code

0X: National, 09: New services, 00: International

(3) A/B Code Table for National Call

	B CODE									
A CODE	1	2	3	4	5	6	7	8	9	0
1	Damas-cus, its rural	Al Nabek	Zabodan i	Quen-netra	Dara	Sweda				
2	Aleppo	Rakka	Idleb							
3	Homs		Hama							
4	Lattakia		Tartous							
5	Deir Ezzar	Al Hasaka								
6										
7										
8										US Access
9										Cellular
0	International									

(4) 11X Code Table for Special Service

	C code									
AB code	1	2	3	4	5	6	7	8	9	0
11		Police	Fire		Military Police	Military Police	Military Police	Military Ambulance	Military Ambulance	Ambulance

(5) Numbering Plan for Mobile communication

From a domestic PSTN telephone to a mobile telephone:

090-XXXXXX (6 digits)

Note: One more digit shall be added when the number of subscribers increases to nearly 1,000,000.
The abovementioned subscriber code should contain the area identifier for administrative purposes.

From an overseas PSTN telephone to a mobile telephone:

Country Code	+ Mobile Code	+ Subscriber Code
+ 963	90	XXXXXX

From a mobile telephone to a domestic PSTN telephone

0 +	Area Code +	Trunk Code +	Subscriber Code
0	XX	XX(X)	XXXX

From a mobile telephone to overseas PSTN

00 + Country Code + Area Code + Trunk Code + Subscriber Code

3.4.2 Numbering Plan in Damascus City

(1) The present numbering structure in Damascus city is as follows:

Area code:	011
Trunk code:	3 digits (XXX)
Subscriber code:	4 digits (XXXX)

(2) A trunk code table for Damascus local connection is shown in Table 3.4.2-1, and the full details are shown in S3-2-3-1 in the Supporting Report.

(3) Trunk codes for existing exchanges and proposed trunk codes for this project are shown in Table 3.4.2-2.

Table 3.4.2-1 Trunk Code Table for Daseus Local Connection

ABX Code

	0	1	2	3	4	5	6	7	8	9
0										
1										
2		Kefr Souseh	Al Nasser	Al Thawra				Rokn Al Dien	Ibn Alamied	
3		Domar	Al Hamah	Al Jalla				Al Mohajrin	Al Fegi	Al Demas
4					Bagdad	Al Abbaseyen	Dewelaah	Johar		
5		Barzeh	Zamarka	Harsta	Bab Sharki	Al Nashabeh	Jaramana	Doma	Adraa/Dmeer	Al Taal/Sydnay
6		Mezzeh 1	Daryah	Al Yarmouk	Babela		Mezzeh 2	Sehnayaa	Artouse/Katana	Keswa
7										
8		Al Kadam	Al Sebeynch						Al Miedan	
9										

Existing Code New Code

Table 3.4.2-2 Proposed Trunk Codes

Office/Bldg. name	Unit Name	Capacity (1995)	Capacity (2000)	Proposed Trunk code
Al Nasser	A1	40,000	40,000	221-224
Al Thawra	A2	15,000	22,000	231-233
Kefr Souseh	K1	25,000	25,000	211-213
Domar	O1	15,000	20,000	311-313
Al Mohajrin	G3	10,000	14,000	371-373
	G1	11,000	11,000	376-377
Jallaa	B1	30,000	30,000	331-333
Bab Sharki	H1	20,000	20,000	541-542
	H2	10,000	10,000	543
(Dewelaah)		0	22,000	461-463
Mezzeh-1	D1	10,000	10,000	611-612
	D2	15,000	15,000	613-614
Mezzeh-2	D3	25,000	25,000	661-663
Al Miedan	F1	17,000	23,000	881-888
Al Yarmouk	L1	30,000	30,000	631-633
(Al Kadam)		0	20,000	811-813
(Al Sebeyneh)		0	20,000	821-823
Rokn Al Dien	E1	10,000	16,000	276-277
Barzeh	M1	30,000	30,000	511-513
(Ibn Alamied)		0	12,000	281-283
Bagdad	C1	20,000	23,000	441-445
	C2	20,000	20,000	446-447
(Al Abbaseyen)		0	23,000	451-453
(Jobar)		0	23,000	471-473

3.5 Signaling Plan in Damascus City

(1) The present signaling system

The current signaling systems between exchanges in Damascus area are employed as shown in Table 3.5-1.

Table 3.5-1 Signaling systems in Damascus area

	EWSD	NEAX61	E10A	EMD
EWSD	No.7 (BW)	MFC R2	MFC R2	DP 3W
NEAX61	MFC R2	MFC R2	MFC R2	DP 3W
E10A	MFC R2	MFC R2	MFC R2	DP 3W
EMD	DP 3W	DP 3W	DP 3W	DP 3W

(2) Signaling system in this project

In this project, new establishment of digital exchanges, replacement from EMD exchanges to new digital exchanges and expansion of existing digital exchanges are planned. Accordingly signalling systems to be introduced should be ITU CCS (Common Channel Signaling System) No.7, which has the following features:

- High speed signal transmission
- Signal transmission during conversation
- A wide variety of signals and a large signaling capacity
- Both way speech circuits operation

All circuit groups between digital exchanges where SS7 ISUP is applied should be operated as both way groups.

The present associated mode for signaling link will be employed until a quasi-associated mode is introduced in near future. These transfer modes are shown in Figure 3.5-1.

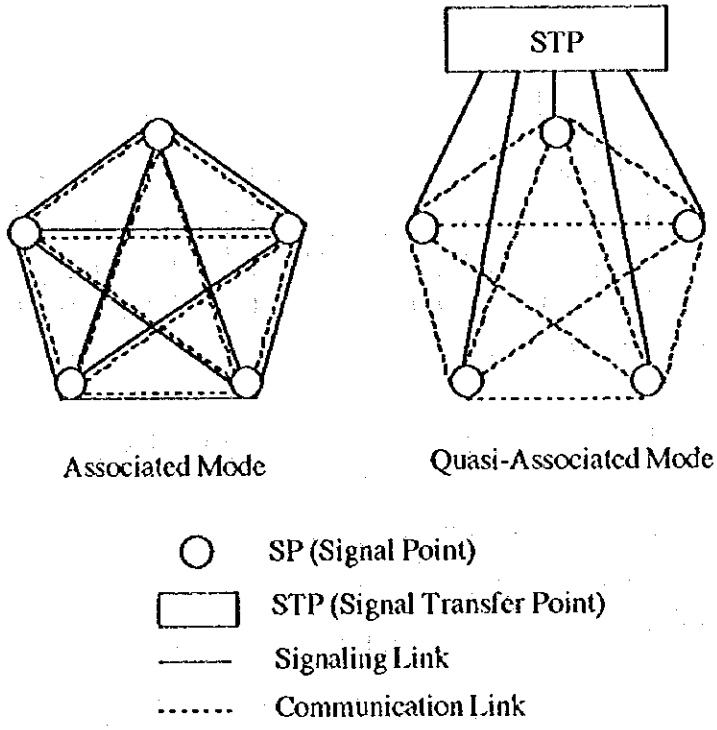


Figure 3.5-1 Signal Transfer Mode

3.6 Charging Plan

3.6.1 The Present Charging System

The present charging systems are as follows:

(1) International call

AMA (Automatic Message Accounting) system is applied at the STD exchanges (EWSD), to which ID (Identification) is transmitted from all local exchanges except from an EWSD type exchange, which has an AMA system itself.

Calls are charged by calculating call duration and destination according to the tariff.
From the exchanges which have the AMA system, MT (Magnetic Tape) is sent to the billing center once per month.

(2) Long distance call

The same AMA system as for international calls is applied to all STD exchanges.

(3) Local call

Electronic/mechanical meter system is applied to each local exchanges.
From the exchanges which have the electronic meter system, MT (Magnetic Tape) is sent to the billing center once every three(3) months.

The charging systems by each local exchange type are shown in Table 3.6.1-1.

Table 3.6.1-1 Charging System by Each Exchange

	International call	Long distance call	Local call
EWSD	AMA	AMA	Electronic meter
NEAX61	AMA(at STD)	AMA(at STD)	Electronic meter
E10A	AMA(at STD)	AMA(at STD)	Electronic meter
EMD	AMA(at STD)	AMA(at STD)	Mechanical meter

3.6.2 Charging Plan in This Project

In this project, new establishment of digital exchanges, replacement from EMD exchanges to new digital exchanges and expansion of existing digital exchanges are planned. Accordingly charging system to be introduced should be AMA system for international and long distance call, and electronic meter system for local call.

3.7 Synchronization Plan

3.7.1 Clock Distribution System

A master-slave synchronization system had been employed in the Syrian digital network.

3.7.2 Stability of Clock

The stability of the master clock and back-up oscillators in each hierarchy stage will be as follows:

Master clock (International switch)	10^{-12}
STD (Toll transit switch)	10^{-8}
LS (Local switch)	10^{-8}
RSU (Remote switch unit)	10^{-6}

3.7.3 Clock Distribution Network

The clock distribution network is shown in Figure 3.7.3-1.
In near future Aleppo INTS will have a submaster clock as a stand-by for the master-clock in Damascus INTS. In case of master-clock failure, the sub-master clock will distribute a clock signal to the entire Syrian digital network.

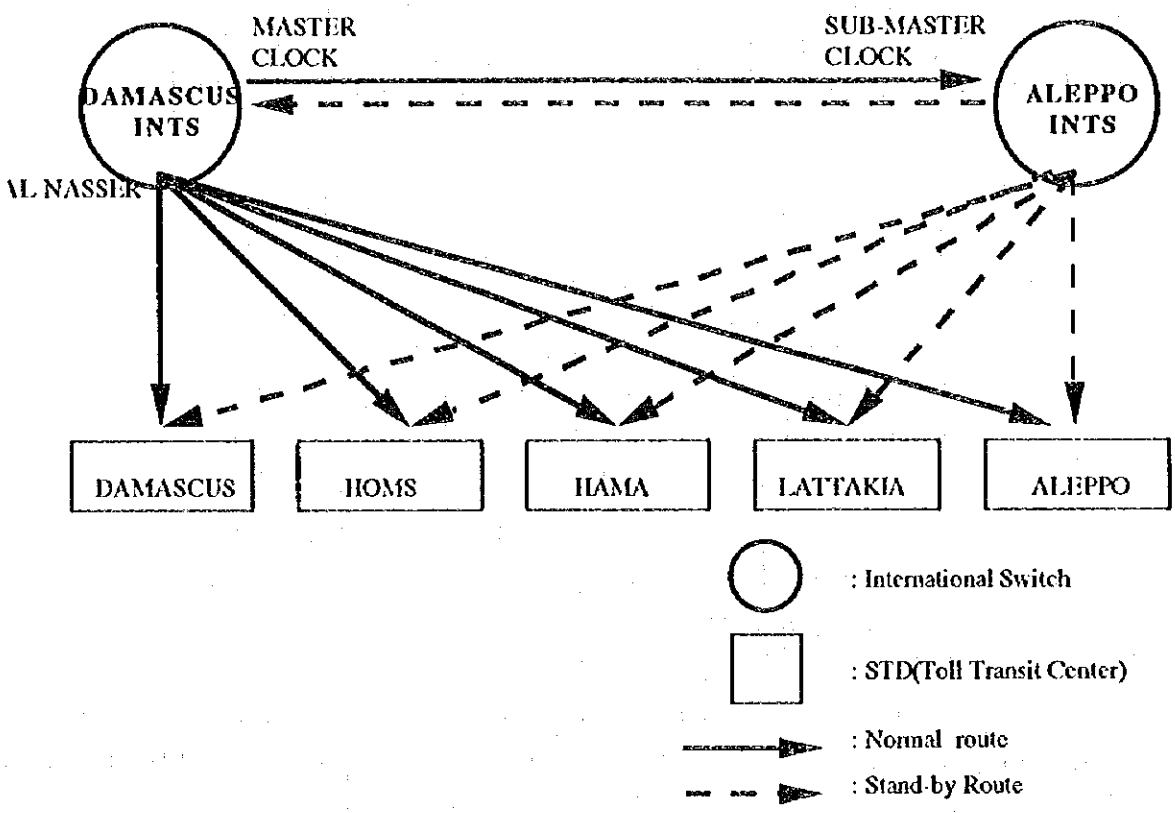


Figure 3.7.3-1 Clock Distribution Network

3.8 Technical Standards of Network

3.8.1 Connection Loss

The loss probability in circuit groups is allocated, as shown in Figure 3.8.1-1, on the basis of ITU-T Recommendation E.520.

Note:

1. Normal load: Mean of the 30 highest working days in a 12-month period.
2. High load: Mean of the five highest days in the same 12-month period.

If loss probability allocated to each connection of a digital transit exchange and terminating exchange is 0.001, the total loss probability between exchanges on both ends becomes 0.007, as shown in Figure 3.8.1-1.

The ITU-T recommends a loss probability of 0.05 (one side) for domestic data switching networks (Rec. X.131). This means that the end-to-end loss probability of digital switched networks should not exceed 0.1.

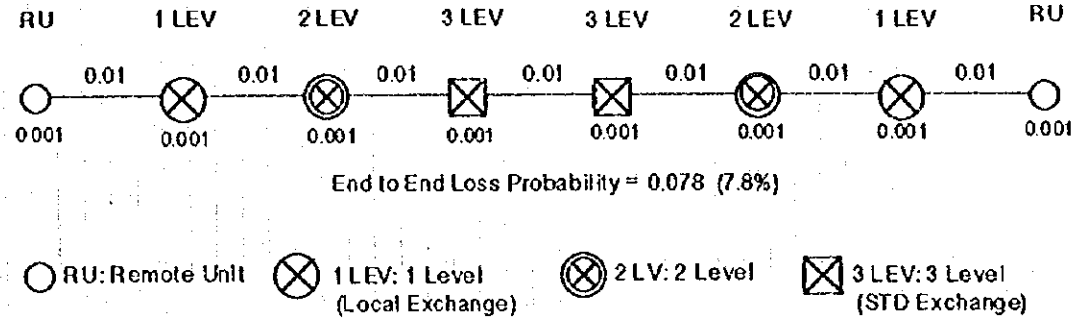


Figure 3.8.1-1 Connection Loss Allocation(Maximum)

3.8.2 National Transmission Loss Allocation

Figure 3.8.2-1 shows the national transmission loss allocation in the digital network in Syria.

The subscriber line loss does not exceed 8 dB at 800 Hz, and the maximum direct current loop resistance of the line is 1,500 to 1,700 ohms.

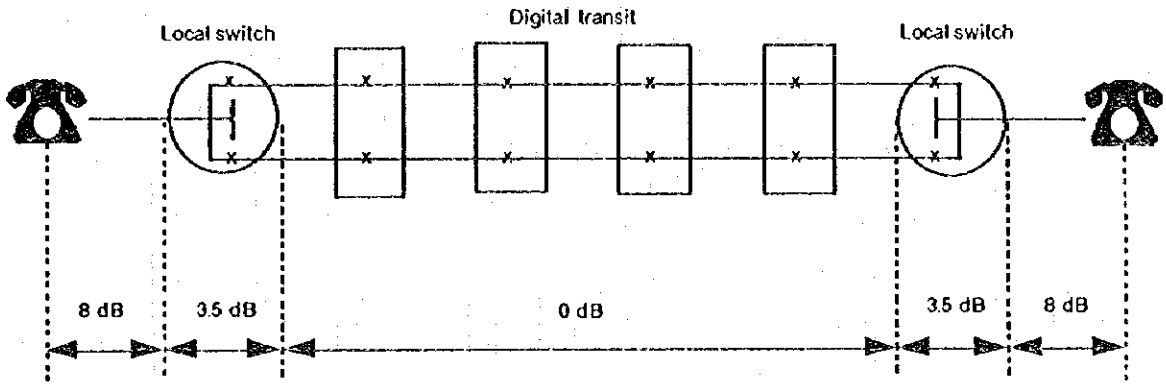


Figure 3.8.2-1 National Transmission Loss Allocation

3.8.3 Target Values of Network Quality

The target values for network quality are listed in Table 3.8.3-1.

Table 3.8.3-1 The Target Values for Network Quality

Network Quality	Grade of Service	Target Values	Related ITU-T Recommendations
Connection Performance	Initial address message delay (for signaling system No.7 netwowks)	Total delay 4 sec. International 1.5 sec. National 2.5 sec	E723
	Answer message delay (for signallingsi system No.7 network)	Total delay 2.5 sec. International 1.0 sec. National 1.5 sec	E723
	Probability of end-end blocking	Local connection 2% Toll connection 3% Intenational connection 5%	E721
Transmission Performance	Transmission Loss for Digital Links	Total loss 0 dB	
	Bit Error Ratio for Severely Errored Seconds of Digital Network	Fewer than 0.2% of one second intervals to have a bit error ratio worse than $1x\ 10^{-3}$	G821

CHAPTER 4 TELEPHONE NETWORK EXPANSION PLAN

4.1 Demand Forecast and Fulfillment Plan

In this Study, the demand of Damascus city is forecasted and the fulfillment plan is made through the microscopic survey and study, referring to the demand forecast and fulfillment plan of the whole of Syria made in the Master Plan through macroscopic point of view.

Table 4.1-1 shows the demand forecast in the Master Plan.

Table 4.1-1 Demand forecast in the Master Plan

(Unit : Thousands)

Year	1996	1997	1998	1999	2000		2002		2005
Damascus City	427.3	433.7	440.0	446.6	453.2	--	466.7	--	487.7
Whole Country	1747.0	1773.0	1799.0	1826.0	1853.0	--	1908.0	--	1994.0

4.1.1 Demand Forecast

4.1.1.1 The Result of the Detailed Study on Demand in Damascus City

We carried out the microscopic study on the telephone demand in Damascus City, in which we studied the characteristic of service area of each telephone office, such as, the number of present subscribers, boundary, population growth in the area, and proportion of the demand of business subscriber to residential subscriber. Table 4.1.1.1-1 shows the proportion of the demand of business subscriber to residential subscriber.

Table 4.1.1.1-1 The proportion of the demand of the business to the residential

Category	I	II	III
Subscriber's Ratio	Business user: 40% Residential user: 60%	Business user: 35% Residential user: 65%	Business user: 30% Residential user: 70%
Telephone Centers	Al Nasser Al Thawra	Bagdad Jallaa Al Mohajrin	Mazzeh 1 & 2 Kefr Souseh Domar Al Miedan Al Yarmouk Rokn Al Dien Barzeh Bab Sharki New Tel. offices

Through these studies, we found the followings:

- Large demand is emerging toward the suburban area and it grows rapidly. The reason is that suburban area is turning into residential areas because of scarcity of land and unavailability of buildings at the central area of the city.

- The existing telephone subscribers in suburban area are at present connected to the telephone offices located in city area near the suburban area.

- As a result, the boundary of the actual service areas becomes inadequate, and the number of subscribers connected to the existing telephone offices is becoming uneven in view of occupancy of capacity of telephone office.

In view of the above result, we concluded as follows:

- In order to satisfy the exploding new demand toward the year 2000, new telephone offices should be established, by dividing and reallocating the present service areas.

The reasons of the above conclusion are:

- Some large new demand is emerging far away from the location of the present offices. The telephone lines from new subscribers to the telephone office would be longer if a new telephone office at a suitable location is not established, which increases the investment expenditure for outside plant.

- At some telephone offices, the capacity is almost fully used and it cannot serve any more subscribers. If a new telephone office is established near the existing fully occupied telephone office, the new one will take the existing subscribers out from the existing one to reduce its burden. In this way, the existing one can serve new demand with the same capacity.

4.1.1.2 Demand Forecast of each Service Area

Following the conclusion of previous section, the locations of new telephone offices and reallocated the boundary of areas were planned, taking into account of subscriber density and size of the area, based on the forecasted demand in the year 2000. The demand of the year 2000 is allocated to each telephone office, including newly planned telephone offices. The result is shown in Table 4.1.1.2-1.

The table also shows the number of existing subscribers in 1995. Part of the present sub-

scribers should be reallocated to the new telephone offices, and the numbers of present subscriber of the old telephone offices become reduced. The table shows the reallocation, too.

Table 4.1.1.2-1 The Demand Allocation to the New Telephone Offices

Telephone Office	Existing Subscribers in 1995	Reallocation to new offices in 1995	Demand forecast in 2000
Al Nasser	39,580	35,600	38,700
(Al Thawra)		9,200	21,000
Kefr Souseh	8,937	8,900	22,500
Domar	8,662	8,700	19,000
Al Mohajrin	13,598	13,600	23,500
Jallaa	23,785	23,800	28,500
Bab Sharki	24,099	13,300	21,600
(Dewelaah)		9,400	21,500
Mazzeh 1	19,491	10,800	22,500
(Mazzeh 2)		8,700	19,600
Al Miedan	17,000	11,400	21,500
Al Yarmouk	25,813	10,900	22,600
(Al Kadam)		10,200	19,600
(Al Sebeyneh)		10,300	19,600
Rokn Al Dien	10,000	8,000	14,500
Barzeh	17,527	9,000	22,500
(Ibn Alamied)		3,500	11,600
Bagdad	39,930	31,900	39,500
(Al Abbaseyen)		7,000	21,700
(Jobar)		4,200	21,700
Total	248,422	248,400	453,200

The telephone offices in parentheses ( ) are new.
The telephone offices with **boldface** need new allocation.

Figure 4.1.1.2-1 shows the existing telephone offices, the planned new telephone offices, the present service areas, and the planned new boundary of the service areas.

On the basis of the result above, the demand of each telephone office was forecasted for each year, which is shown in Table 4.1.1.2-2.

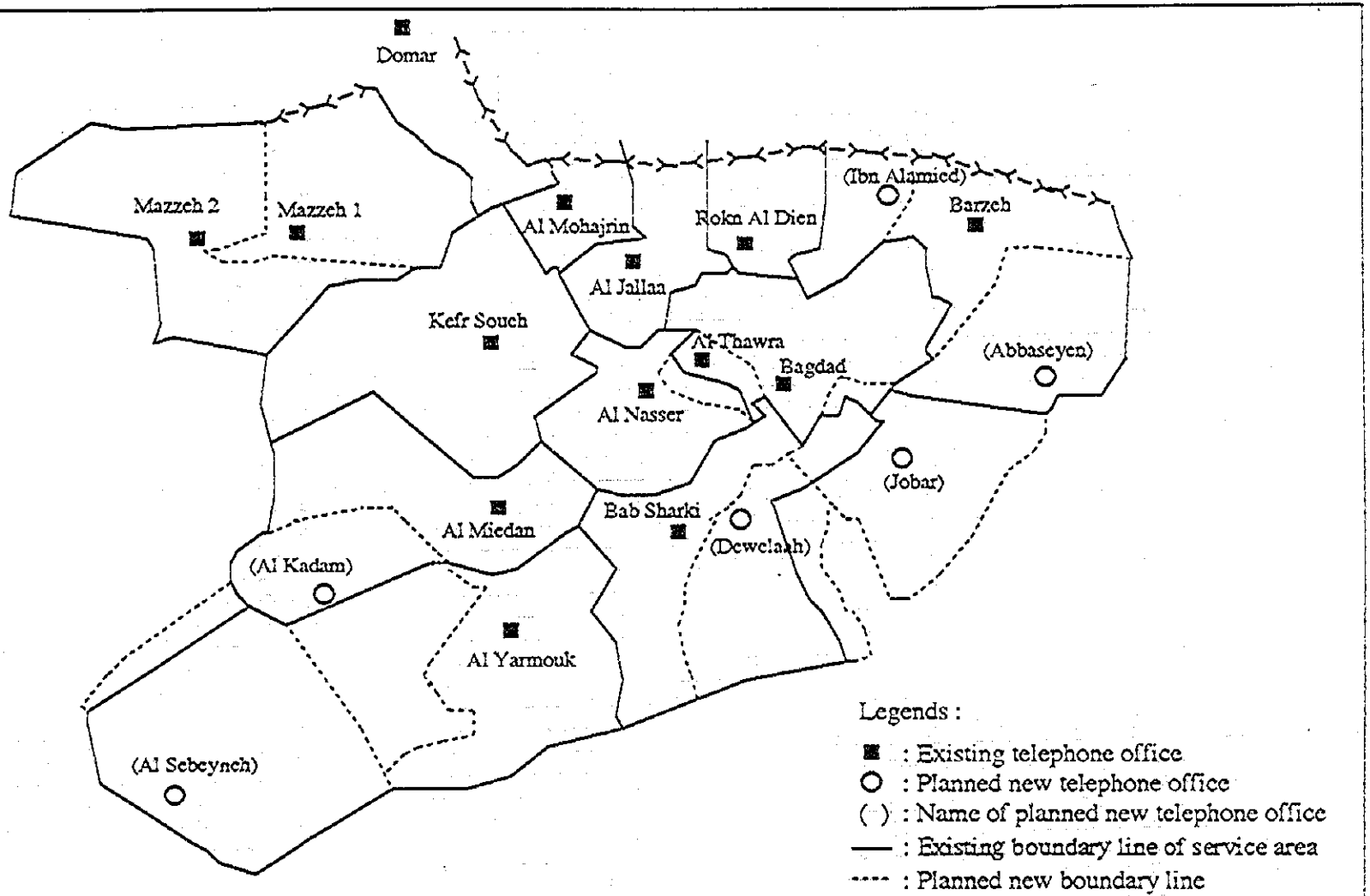


Figure 4.1.1.2-1 The Planned New Telephone Offices and Newly Allocated Service Areas in Damascus

Table 4.1.1.2-2 Demand Forecast in Damascus City

(Unit : No. of demand)

Telephone office	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Al Nasser	38,100	38,300	38,400	38,500	38,700	38,800	38,900	39,000	39,100	39,200
Al Thawra	20,700	20,800	20,800	20,900	21,000	21,500	21,700	23,500	24,000	24,500
Kefr Souseh	21,000	21,300	21,700	22,100	22,500	22,700	23,000	23,500	24,000	24,500
Domar	18,100	18,200	18,400	18,500	19,000	19,400	19,900	20,200	20,300	20,500
Al Mohajrin	21,900	22,300	22,600	23,000	23,500	23,700	24,100	24,500	24,900	25,300
Jallaa	26,400	26,900	27,500	28,400	28,500	28,600	28,700	28,900	29,000	29,200
Bab Sharki	20,000	20,400	20,800	21,200	21,600	21,800	22,000	22,300	22,700	23,000
(Dewelaah)	20,100	20,400	20,800	21,100	21,500	21,700	22,000	22,300	22,700	23,000
Mazzeh[1]	21,000	21,300	21,700	22,100	22,500	22,800	23,000	23,400	24,000	24,500
Mazzeh[2]	18,200	18,600	18,900	19,200	19,600	19,800	20,000	20,100	20,300	20,500
Al Miedan	20,700	20,900	21,100	21,300	21,500	22,800	23,000	23,400	24,000	24,500
Al Yarmouk	20,900	21,300	21,700	22,100	22,600	22,800	23,000	23,400	24,000	24,500
(Al Kadam)	18,200	18,600	18,900	19,200	19,600	19,800	20,000	20,200	20,400	20,500
(Al Sebeyneh)	18,200	18,600	18,900	19,200	19,600	19,800	20,000	20,200	20,300	20,500
Rokn Al Dien	14,300	14,400	14,400	14,500	14,500	15,800	16,000	16,100	16,300	16,500
Barzeh	21,000	21,300	21,700	22,100	22,500	22,800	23,000	23,400	24,000	24,500
(Ibn Alamied)	10,900	11,100	11,200	11,400	11,600	11,800	12,000	12,100	12,300	12,500
Bagdad	35,800	36,500	37,200	37,900	39,500	39,600	42,200	42,400	42,600	42,800
(Al Abbaseyen)	20,900	21,300	21,700	22,000	21,700	21,900	22,100	22,300	22,900	23,600
(Jobar)	20,900	21,200	21,600	21,900	21,700	21,900	22,100	22,300	22,800	23,600
<TOTAL>	427,300	433,700	440,000	446,600	453,200	459,800	466,700	473,500	480,600	487,700

The names in the parentheses ( ) are the planned new telephone offices.

4.1.1.3 Demand forecast of Public Payphone

At present there are 304 public payphones in Damascus city, and the penetration ratio per 1,000 habitants is 0.2 phones. This figure is still low compared to the world average 0.7 according to ITU's "World Telecommunication Indicators" (94/95).

It is estimated that the penetration ratio will become one (1) payphone per 1,000 habitants in the year 2010. In the year 2000, it is estimated 850 phones are in service and the penetration ratio will exceed the world average in the year 2005.

Table 4.1.1.3-1 shows the result of the demand forecast of the public payphone in Damascus.

Table 4.1.1.3-1 The Demand Forecast of Public Payphones in Damascus

	1995	1996	1997	1998	1999	2000	2005	2010
Forecasted Number of Inhabitants (000)	1,560	1,610	1,670	1,720	1,780	1,840	2,170	2,550
Forecasted Number of Payphone Lines	(304)	400	500	620	730	850	1,580	2,550
No. of Payphone Lines per 1,000 Inhabitants	0.20	0.25	0.30	0.36	0.41	0.46	0.73	1.00

The figure in parentheses ( ) is the number of existing public payphones.

4.1.2 Fulfillment Plan

The destination of this study is to make the fulfillment plan until the year 2000. The fulfillment plan is to be made to catch up with the demand of the year 2000. As a result, the fulfillment plan after the year 2000 can be set as the same as the forecasted demand. Table 4.1.2-1 shows the fulfillment plan until the year 2000.

Although some new telephone offices are not established in 1996, the figure of them shows the obligation that the new offices should undertake. Accordingly, the numbers of the subscribers of present existing offices are lightened.

This fulfillment plan shows the number of subscribers that should be served in the corresponding year. Therefore, the telecommunication facilities, such as switching equipment, outside plant, should be implemented previously.

Table 4.1.2-1 The Fulfillment Plan of Damascus City

(Unit : No. of subscribers)

Telephone office	1996	1997	1998	1999	2000
Al Nasser	36,300	36,900	37,600	38,300	38,700
Al Thawra	10,600	12,000	13,500	14,900	21,000
Kefr Souseh	11,900	14,900	17,900	20,900	22,500
Domar	10,200	11,800	13,300	14,900	19,000
Al Mohajrin	15,400	17,200	19,100	20,900	23,500
Jallaa	24,900	25,900	27,000	28,100	28,500
Bab Sharki	15,100	16,800	18,600	20,400	21,600
(Dewelaah)	12,000	14,700	17,300	20,000	21,500
Mazzeh[1]	13,300	15,900	18,400	21,000	22,500
Mazzeh[2]	11,100	13,400	15,800	18,200	19,600
Al Miedan	12,800	14,100	15,500	17,000	21,500
Al Yarmouk	13,400	16,000	18,500	21,100	22,600
(Al Kadam)	12,200	14,300	16,300	18,300	19,600
(Al Sebeyneh)	12,300	14,300	16,300	18,300	19,600
Rokn Al Dien	8,500	9,000	9,500	10,000	14,500
Barzeh	12,000	15,000	18,000	20,900	22,500
(Ibn Alamied)	5,200	7,000	8,700	10,400	11,600
Bagdad	33,300	34,700	36,100	37,400	39,500
(Al Abbaseyen)	10,400	13,900	17,300	20,600	21,700
(Jobar)	8,300	12,400	16,500	20,600	21,700
<TOTAL>	289,200	330,200	371,200	412,200	453,200

<Notes>

1. The names in parentheses ( ) are the planned new telephone offices.
2. The plan is figured out on the presumption that new offices are established in 1996.

4.2 Traffic Forecast and Circuit Calculation

4.2.1 Traffic Forecast in Damascus Area

The traffic for local calls and long distance calls including international and mobile telephone calls is calculated based on the figures year 2002 of the fulfillment plan in the Master Plan, taking two(2) years provisioning time.

Damascus area is divided into three(3) areas, which are Damascus city, Damascus rural and Damascus region, and the new structures of the local and long distance networks are proposed as described in Chapter 3.

The calling rate per subscriber classified in business and residential subscriber on the basis of actual traffic trend as shown in Table 4.2.1-1. As a result of detailed study by each district and telephone offices, the ratio of business and residential subscribers by exchange office and the ratio of call kinds are categorized in four(4) parts in Damascus area as shown in Table 4.2.1-2 and Table 4.2.1-3.

The traffic matrices are calculated based on the above all factors and the gravity model methods. And the mobile telephone traffic from and to PSTN is added to the matrices as shown in Figure 4.2.1-1.

The future traffic volume per subscriber is estimated as the following conditions;

1. The volume of originating traffic is approximately equal to terminating traffic.

2. The calling rate by the year 2002 will be as same as the following basic data.

3. The traffic flow of the international call is based on Figure 3.1.1-1.

Table 4.2.1-1 Originating Calling Rate

Business user	0.065 erl. per subscriber	
Residential user	0.040 erl. per subscriber	

Table 4.2.1-2 Business and Residential Subscriber's Ratio

Category	1		2		3		4	
Subscriber's	Business	Residential	Business	Residential	Business	Residential	Business	Residential
Ratio	40%	60%	35%	65%	30%	70%	20%	80%
Damascus City	Al Nasser Al Thawra		Bagdad Jallaa Al Mohajrin		Mazzeh 1 Masseh 2 Kefr Souseh Domar Al Miedan Al Yarmouk Rokn Al Dien Barzeh Bab Sharki New telephone centers			
Damascus Rural					The telephone centers with the demand more than 10,000 in the year 2000		The telephone centers with the demand less than 10,000 in the year 2000	

Table 4.2.1-3 Traffic Distribution

Item	Category 1	Category 2,3	Category 4
Intra-office call	12%	13%	38%
Local call	76%	77%	56%
National call	8%	8%	5%
International call	4%	2%	1%

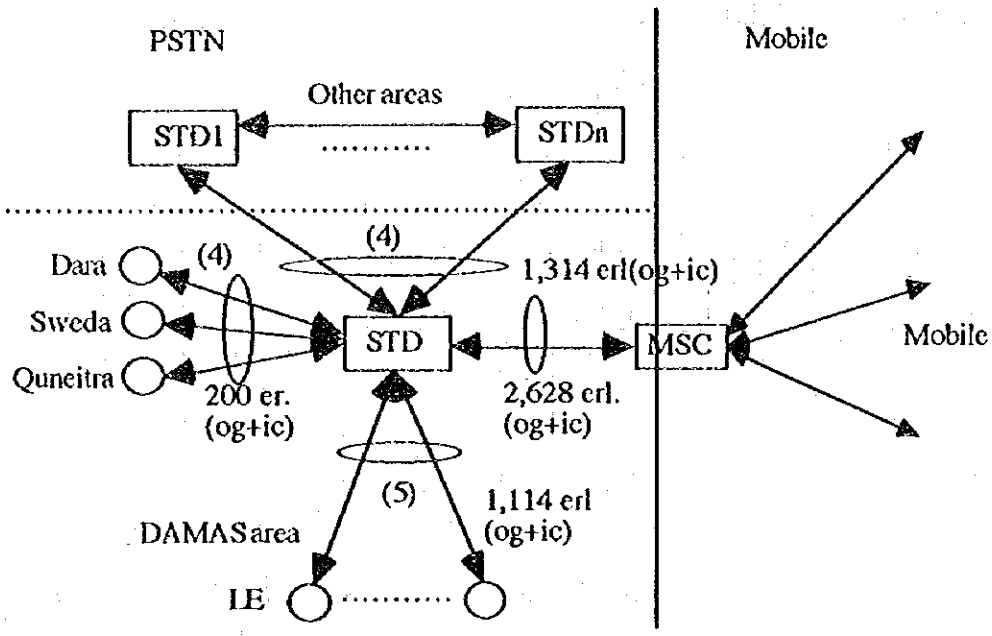


Figure 4.2.1-1 Mobile Telephone Traffic to and from PSTN

The outline of traffic matrix is shown in Table 4.2.1-4 and the details are shown in S2-4-1 to S2-4-8 in the Supporting Report.

The results of traffic calculation are shown in Table 4.2.1-5, Table 4.2.1-6 and Table 4.2.1-7.

Table 4.2.1-4 Traffic Quantity of Exchanges in Damascus City

Office/Bldg.	Unit Name	Category	Busin/Resid Ratio	No. of subscribers			Traffic quantity of originating calls(in erl.)					
				Business	Residence	Total	Intra-office	Local	National	International	Mobile	Total
Al Nasser	A1	I	40/60	15,560	23,340	38,900	233	1,478	156	78	23	1,968
Al Thawra	A2	I	40/60	8,680	13,020	21,700	130	825	87	43	13	1,098
Kefr Souseh	K	III	30/70	6,900	16,100	23,000	142	841	87	22	11	1,103
Domar	O	III	30/70	5,970	13,930	19,900	123	728	76	19	9	954
Al Mohajrin	G1,2	II	35/65	4,585	8,515	13,100	83	492	51	13	6	645
	G3	III	30/70	3,300	7,700	11,000	68	402	42	10	5	528
Jallaa	B2	II	35/65	10,045	18,655	28,700	182	1,077	112	28	14	1,413
Bab Sharki	H2	III	30/70	4,350	10,150	14,500	90	530	55	14	7	695
	H1	III	30/70	2,250	5,250	7,500	46	274	29	7	3	360
(Dewelaah)		III	30/70	6,600	15,400	22,000	136	805	84	21	10	1,055
Mezzeh-1	D1	III	30/70	3,000	7,000	10,000	62	366	38	10	5	480
	D2	III	30/70	3,900	9,100	13,000	80	475	49	12	6	624
Mezzeh-2	D3	III	30/70	6,000	14,000	20,000	124	732	76	19	9	959
Al Miedan	F1,2	III	30/70	6,900	16,100	23,000	142	841	87	22	11	1,103
Al Yarmouk	L1	III	30/70	6,900	16,100	23,000	142	841	87	22	11	1,103
(Al Kadam)		III	30/70	6,000	14,000	20,000	124	732	76	19	9	959
(Al Sebeyneh)		III	30/70	6,000	14,000	20,000	124	732	76	19	9	959
Rokn Al Dien	E	III	30/70	4,800	11,200	16,000	99	585	61	15	7	767
Barzeh	M	III	30/70	6,900	16,100	23,000	142	841	87	22	11	1,103
(Ibn Alamied)		III	30/70	3,600	8,400	12,000	74	439	46	11	6	576
Bagdad	C1,2	II	35/65	7,945	14,755	22,700	144	852	89	22	11	1,117
	C3	II	35/65	6,825	12,675	19,500	124	732	76	19	9	960
(Al Abbaseyen)		III	30/70	6,630	15,470	22,100	136	808	84	21	10	1,060
(Jobar)		III	30/70	6,630	15,470	22,100	136	808	84	21	10	1,060

Table 4.2.1-5 Result of Local Traffic Calculation

Office/Unit	Traffic(erl)
Barzeh	1,682.46
(Jobar)	1,616.62
Bab Sharki 1	1,060.68
AL Miedan	1,682.46
Kefr Souseh	1,682.46
Mezzeh D2	950.94
Jallaa	2,154.66
Rokn Al Dien	1,170.40
(Ibn Alamied)	877.80
Bagdad 1	1,704.20
Bagdad 2	1,463.96
(Al Abbaseyen)	1,616.62
Bab Sharki 2	548.62
AL Nasser	2,956.40
(Dewelaah)	1,609.30
Al Yannouk	1,682.46
(Al Kadam)	1,463.00
(Al Sebeyneh)	1,463.00
Mezzeh D1	731.50
Mezzeh D3	1,463.00
Al Thawra	1,649.20
Domar	1,455.68
Al Mohajrin 1	983.48
Al Mohajrin 2	804.66
Damascus-Rural	11,913.32
Total	46,386.88

Table 4.2.1-6 Result of Long Distance Traffic Calculation

	Traffic(erl)			
Office/Unit	STD 1	STD 2	LE/LT-LE	Total
Barzeh	165.85	165.85	38.83	370.53
(Jobar)	159.95	159.95	37.91	357.81
Bab Sharki 1	105.54	105.54	25.46	236.54
AL Miedan	158.05	158.05	31.03	347.13
Kefr Souseh	148.20	148.20	21.17	317.57
Mezzeh D2	138.13	138.13	66.34	342.60
Jallaa	202.26	202.26	39.59	444.11
Rokn Al Dien	88.36	88.36		176.72
(Ibn Alamied)	66.27	66.27		132.54
Bagdad 1	128.67	128.67		257.34
Bagdad 2	110.53	110.53		221.06
(Al Abbaseyen)	122.05	122.05		244.10
Bab Sharki 2	41.42	41.42		82.84
AL Nasser	271.37	271.37		542.74
(Dewelaah)	121.50	121.50		243.00
Al Yarmouk.	127.02	127.02		254.04
(Al Kadam)	110.46	110.46		220.92
(Al Sebeyneh)	110.46	110.46		220.92
Mezzeh D1	55.23	55.23		110.46
Mezzeh D3	110.46	110.46		220.92
Al Thawra	151.38	151.38		302.76
Domar	109.90	109.90		219.80
Al Mohajrin 1	74.25	74.25		148.50
Al Mohajrin 2	60.75	60.75		121.50
Damascus-Rural	583.94	583.94		1,167.88
Al Nabek	250.37	250.37		500.74
Zabadani	164.82	164.82		329.64
Quennetra	35.27	35.27		70.54
Darra	259.64	259.64		519.28
Sweda	184.73	184.73		369.46
Aleppo	1,177.12	1,177.12		2,354.24
Homs	521.92	521.92		1,043.84
Hama	249.76	249.76		499.52
Lattakia	652.11	652.11		1,304.22
MSC	1,327.32	1,327.32		2,654.64
Total	8,345.06	8,345.06	260.33	16,950.45

Table 4.2.1-7 Result of International Traffic Calculation

	Traffic(erl)		
Office/Unit	INTS(DAMAS)	INTS(Aleppo)	Total
STD 1	415.58	277.05	692.63
STD 2	415.58	277.05	692.63
Aleppo	197.35	131.57	328.92
Homs	66.60	44.40	111.00
Hama	36.49	24.33	60.82
Lattakia	73.88	49.26	123.14
Total	1,205.48	803.66	2,009.14

4.2.2 Circuit Calculation in Damascus Area

The circuits between exchanges are calculated based on the traffic matrices, the proposed network structures and the routing plan as described in Chapter 3.

In addition, the following detailed conditions are considered for the calculation.

(1) Routing for each exchange stage is Table 4.2.2-1.

Table 4.2.2-1 Routing for Each Exchange Stage

Stage of exchange	Traffic distribution ratio	No. of routes
INTS	INTS(Damascus) : 60% INTS(Aleppo) : 40%	2 INTSs in Syria 2 routes from/to each 6 STDs
STD	Al Nasser STD : 50% Thawra new STD : 50%	2 STDs in Damascus 2 routes from/to each INTS 2 routes from/to each LE Mesh network between STDs
LE/LT(combined)	Umbrella LE : 50% Sub-Umbrella LE : 50%	2 routes from/to 2 STDs 2 routes from/to each LE under umbrella and sub-umbrella Mesh network between LE/LTs
LE	Home LE/LT : 50% Sub-Home LE/LT : 50%	2 routes from/to 2 home LE/LTs
MS(Mobile Switch)	Al Nasser STD : 50% Thawra new STD : 50%	2 routes from/to 2 STDs

(2) Both way circuits are applied to the calculation, because of No.7 CCS between exchanges.

(3) The connection loss probability per 1 link is 0.01.

The scope of circuit calculation in this project is as follows and shown in Figure 4.2.2-1:

- Long distance routes which are composed of international, long distance and mobile telephone calls
- Local routes (high-usage and final) form/to LEs in Damascus city
- All routes including international and mobile telephone calls from/to STDs in Damascus.

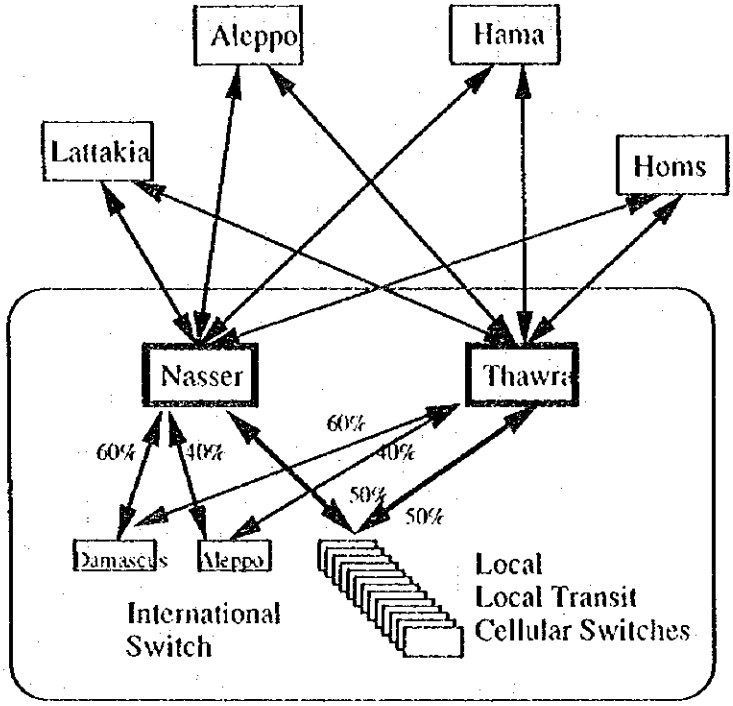


Figure 4.2.2-1 The Scope of Circuit Calculation

The calculation results are shown in Table 4.2.2-2, Table 4.2.2-3 and Table 4.2.2-4, and the details are shown in S2-4-9 to S2-4-14 in the Supporting Report.

Table 4.2.2-2 Result of Local Circuit Calculation

Office/Unit	No. of circuits(BW)
Barzeh	5,400
(Jobar)	6,060
Bab Sharki 1	4,500
AL Miedan	4,560
Kefr Souseh	5,130
Mezzeh D2	4,230
Jallaa	7,350
Rokn Al Dien	1,350
(Ibn Alamied)	1,020
Bagdad 1	2,010
Bagdad 2	1,740
(Al Abbaseyen)	1,860
Bab Sharki 2	660
AL Nasser	3,510
(Dewelaah)	1,890
Al Yarmouk	1,980
(Al Kadam)	1,710
(Al Sebeyneh)	1,770
Mezzeh D1	900
Mezzeh D3	1,710
Al Thawra	1,890
Domar	1,800
Al Mohajrin 1	1,170
Al Mohajrin 2	930
Damascus-Rural	15,030
Total	80,160

Table 4.2.2-3 Result of Long Distance Circuit Calculation

	No. of circuits(BW)			
Office/Unit	STD 1	STD 2	LE/LT-LE	Total
Barzeh	210	210	270	690
(Jobar)	180	180	210	570
Bab Sharki 1	150	150	150	450
AL Miedan	180	180	210	570
Kefr Souseh	180	180	210	570
Mezzeh D2	180	180	270	630
Jallaa	240	240	150	630
Rokn Al Dien	120	120		240
(Ibn Alamied)	90	90		180
Bagdad 1	150	150		300
Bagdad 2	150	150		300
(Al Abbaseyen)	150	150		300
Bab Sharki 2	60	60		120
AL Nasser	300	300		600
(Dewelaah)	150	150		300
Al Yarmouk	150	150		300
(Al Kadam)	150	150		300
(Al Sebeyneh)	150	150		300
Mezzeh D1	90	90		180
Mezzeh D3	150	150		300
Al Thawra	180	180		360
Domar	150	150		300
Al Mohajrin 1	90	90		180
Al Mohajrin 2	90	90		180
Damascus-Rural	840	840		1,680
Al Nabek	300	300		600
Zabadani	210	210		420
Quennetra	60	60		120
Darra	300	300		600
Sweda	210	210		420
Aleppo	1,230	1,230		2,460
Homs	570	570		1,140
Hama	300	300		600
Lattakia	690	690		1,380
MSC	1,380	1,380		2,760
Total	9,780	9,780	1,470	21,030

Table 4.2.2-4 Result of International Circuit Calculation

	No. of circuits(BW)		
Office/Unit	INTS(DAMAS)	INTS(Aleppo)	Total
STD 1	450	300	750
STD 2	450	300	750
Aleppo	240	150	390
Homs	90	60	150
Hama	60	60	120
Lattakia	90	90	180
Total	1,380	960	2,340

4.3 Switching System

4.3.1 Exchange Facilities

4.3.1.1 Present State of Exchanges

(1) Local Exchange

There are eighteen (18) working exchanges in Damascus city at present, which are listed in Table 4.3.1.1-1. Ten (10) of them are EWSD exchanges which were recently established. EWSD is an advanced digital exchange that is capable of introducing new services, and has centralized operation and maintenance functions. The other eight (8) exchanges are older types composed of four (4) EMDs, two (2) E10As and two (2) NEAX61s. In particular, the EMDs are worn-out step-by-step exchanges that were established over twenty years ago, and have problems such as difficulty in the introduction of new services and shortages of spare parts. Thus, EMD exchanges urgently needed to be replaced with new digital exchanges.

Regarding the Local Network hierarchy, two types of exchanges have already been established. One is of only local exchange function, the other is a combined type that has local and transit exchange function. The actual number of line units of the local exchange is limited to about 30,000 lines from security points of view.

Local exchanges that furnish ISDN services (basic access) have already been introduced to four (4) big cities (five local exchanges) and have approximately 450 line units, but there are no actual ISDN users at present. However the STE has a plan to start ISDN services in the near future.

Exchange	No. of ISDN basic access line units
Damascus G3	150
Damascus B1	100
Lattakia D1	50
Aleppo B2	100
Homs D1	50
Total	450

Table 4.3.1.1-1 Number of Existing Subscribers

Office/Bldg. name	Exchange Type	Capacity (1995)	Existing Subscribers (Feb. 1996)
Al Nasser	NEAX61	40,000	39,580
Al Thawra	EWSD	15,000	0
Kefr Souseh	EWSD	25,000	8,937
Domar	EWSD	15,000	8,662
Al Mohajrin	EWSD	10,000	3,598
	E10A	11,000	10,000
Jallaa	EWSD	30,000	23,785
Bab Sharki	EWSD	20,000	16,599
	E10A	10,000	7,500
Mezzeh-1	EMD	10,000	9,491
	EWSD	15,000	10,000
Mezzeh-2	EWSD	25,000	0
Al Miedan	EMD	17,000	17,000
Al Yarmouk	EWSD	30,000	25,813
Rokn Al Dien	EMD	10,000	10,000
Barzeh	EWSD	30,000	17,527
Bagdad	EMD	20,000	19,965
	NEAX61	20,000	19,965
TOTAL		353,000	248,422

(2) Long Distance Transit Exchange (STD)

At present there is one (1) STD exchange at Al Nasser in Damascus City which has about 20,000 trunk circuits, 60% of which are working now. There is no established theory how to set up routes between STD and Local exchanges. In fact, twenty-five (25) local exchanges are connected to STD via direct routes and thirty-eight (38) local exchanges are connected via two (2) exchanges. Sixteen (16) out of thirty-eight (38) local exchanges in the Damascus area have a function for selecting the first route followed by the second route. The other twenty-two (22) local exchanges select two routes based on equal priority that are through two via exchanges. As a result, planning, operation and maintenance is a little complicated.

(3) International Exchange (INTS)

At present there are two (2) INTSs, one in Damascus and one in Aleppo. International calls are connected to these INTSs via STD exchanges. However, the number of circuits between INTSs and STDs is not balanced. The Damascus INTS has about 10,000 trunk circuits, half of which are for STDs. The Damascus INTS is almost at full capacity, but the Aleppo INTS has room to expand circuits.

4.3.1.2 Facility Plan

(1) Local Exchange

(a) Basic Telephone

The expansion plan was decided in consideration of the following conditions.

- The number of line units for each local exchange was decided on basis of the fulfillment plan, taking into account a lead time of 2-years for provisioning i.e. employing the year 2002 fulfillment plan.
- Four (4) EMD exchanges shall be replaced with new digital exchanges by 2000.
- The actual maximum number of lines for an exchange are assumed to be 30,000 lines from security reason.
- The newest digital exchange with capability of new services such as ISDN and free call should be introduced.

Expansion, new establishment and replacement of exchanges in Damascus city are proposed based on the above all conditions as shown in Table 4.3.1.2-1.

Table 4.3.1.2-1 Proposed Number of Line Units

Office/Bldg.	Exchange Type		Capacity	Proposed expansion and replacement for 2000				Total
	(1995)	(2000)	(1995)	New	Expansion	Replace-ment	Sub-total	(2000)
Al Nasser	NEAX61	NEAX61	40,000	0	0	0	0	40,000
Al Thawra	EWSD	EWSD	15,000	0	7,000	0	7,000	22,000
Kefr Souseh	EWSD	EWSD	25,000	0	0	0	0	25,000
Domar	EWSD	EWSD	15,000	0	5,000	0	5,000	20,000
Al Mohajrin	EWSD	EWSD	10,000	0	4,000	0	4,000	14,000
	E10A	E10A	11,000	0	0	0	0	11,000
Jallaa	EWSD	EWSD	30,000	0	0	0	0	30,000
Bab Sharki	EWSD	EWSD	20,000	0	0	0	0	20,000
	E10A	E10A	10,000	0	0	0	0	10,000
(Dewelaah)	---	---	0	22,000	0	0	22,000	22,000
Mezzeh-1	EMD	---	10,000	10,000	0	10,000	0	10,000
	EWSD	EWSD	15,000	0	0	0	0	15,000
Mezzeh-2	EWSD	EWSD	25,000	0	0	0	0	25,000
Al Miedan	EMD	---	17,000	23,000	0	17,000	6,000	23,000
Al Yarmouk	EWSD	EWSD	30,000	0	0	0	0	30,000
(Al Kadam)	---	---	0	20,000	0	0	20,000	20,000
(Al Sebeyneh)	---	---	0	20,000	0	0	20,000	20,000
Rokn Al Dien	EMD	---	10,000	16,000	0	10,000	6,000	16,000
Barzeh	EWSD	EWSD	30,000	0	0	0	0	30,000
(Ibn Alamied)	---	---	0	12,000	0	0	12,000	12,000
Bagdad	EMD	---	20,000	23,000	0	20,000	3,000	23,000
	NEAX61	NEAX61	20,000	0	0	0	0	20,000
(Al Abbaseyen)	---	---	0	23,000	0	0	23,000	23,000
(Jobar)	---	---	0	23,000	0	0	23,000	23,000
TOTAL			353,000	192,000	16,000	57,000	151,000	504,000

(b) ISDN (Integrated Services Digital Network)

ISDN services will be introduced mainly to the governmental organization, company and business users for the G4 facsimile, data communication and so on. The STE has ambitious demand forecast for ISDN that is assumed to be 1% to 2.5% (50,000 ISDN sub.) of basic telephone line units all over the Syrian country by the year 2002, however it is difficult to fix ISDN demand at initial stage because that demand is deeply related to introducing strategy (mainly advertisement and tariff). In this report, the study team assume the ISDN demand by the year 2000 to be 1% of basic telephone line units (4,000 ISDN sub.) within Damascus city. It is important to reconsider the ISDN demand with the progress of increasing users.

(2) Long Distance Transit Exchange (STD)

Considering increase of subscribers and telecommunication security, one new STD should be established at the Thwara building separated from the existing STD at Al Nasser building as described in Chapter 3. For security reason, two routes will be required between STD and local exchanges as shown in Figure 4.3.1.2.-1.

The total number of circuits between two Damascus STDs and other area's STDs / INTSs / MSC is shown in Table 4.3.1.2-2.

(3) International Exchange (INTS)

To solve the imbalance between two INTSs the traffic distribution ratio will be 60% for Damascus INTS and 40% for Aleppo INTS step by step as shown in Figure 4.3.1.2.-1.

The total number of circuits between two INTSs and two Damascus STDs is shown in Table 4.3.1.2-2.

Table 4.3.1.2-2 Summary of the Total Number of Circuits for Long Distance, MSC and International Calls in this Project

Damascus STD	Damascus city+rural	Damascus other area	Other STD	MSC	INTS		Total
					Damas.	Aleppo	
Al Nasser	4,530	1,080	2,790	1,380	450	300	10,530
Al Thawra	4,530	1,080	2,790	1,380	450	300	10,530
Total	9,060	2,160	5,580	2,760	900	600	21,060

Note

Damascus other area : Zabadani, Al Nabek, Quennetra, Daraa, Sweda
Other STD : Aleppo, Hama, Homs, Lattakia

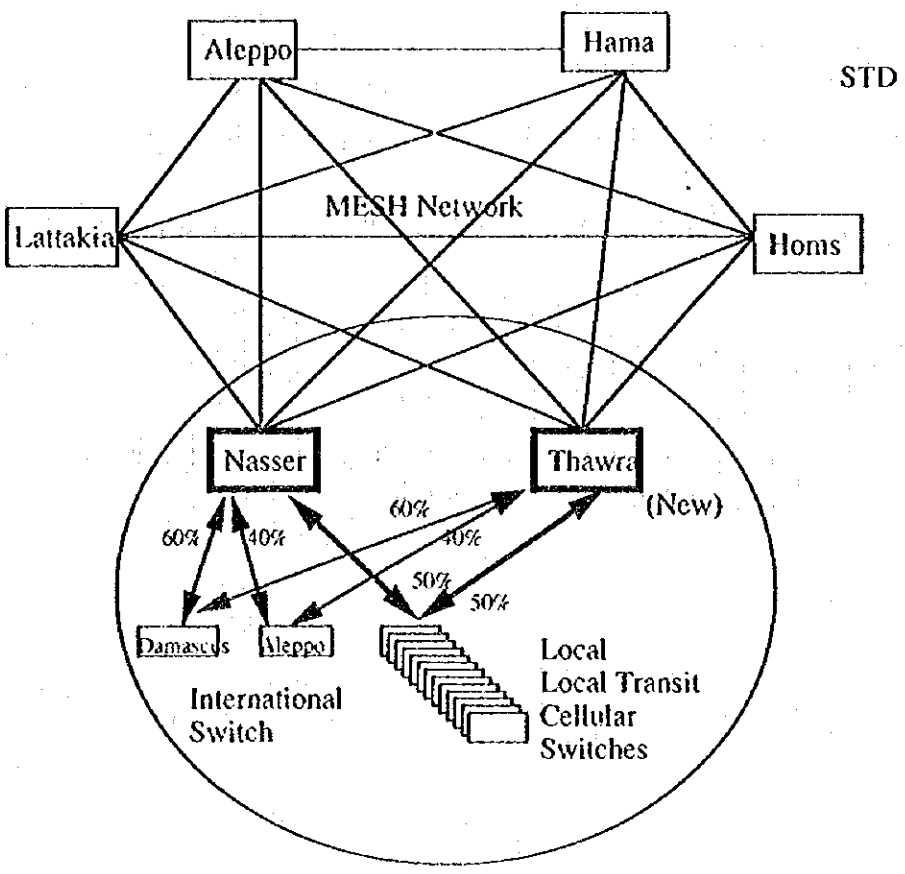


Figure 4.3.1.2.-1 Long Distance Network

4.3.2 Power Supply System

4.3.2.1 Design Criteria

The power supply systems in the objective exchange offices are designed in consideration of the present conditions of the commercial power and the future plan of the telecommunications facilities to be introduced.

(1) General

(a) Composition of Power Supply System

- AC Mains(Receiving/Distribution of AC commercial power)
- Engine Generator
- UPS (Uninterruptible Power Supply) or INV(Invertor)
- Rectifier
- Batteries

(b) Lead time for provisioning

The power supply systems are designed to correspond to the following periods:

-	AC Mains	:	Capacity at the ultimate stage (Capacity for the contract is to be the same as that at the initial stage.)
-	Engine Generator	:	Capacity at the ultimate stage
-	UPS/INV	:	Capacity at the ultimate stage
-	Rectifier	:	Capacity at the initial stage
-	Batteries	:	Capacity at the initial stage

Note: initial stage : year of service commencement (S + 0)
ultimate stage : year at the final capacity

(2) AC Mains

The AC commercial power:

High tension: 20KV, 50Hz, 3-phase (PBE facility)

Low tension: AC 380V/220V, 50 Hz, 3-phase/1-phase (STE facility)

(3) Engine Generator

(a) Type of Engine Generator

- Diesel engine
- Continuos operation type

- Cooling type : Air-Radiator or Water-cooling type
- Output : AC 380V/220V, 50 Hz, 3-phase/1-phase

(b) Capacity of Fuel Tank

Considering the condition of operation and maintenance, the fuel tank will be, in principle, capable of storing:

Main exchange offices/stations: 3 days(minimum)
Small exchange offices/stations: 4 to 10 days

(4) UPS/INV

In case of commercial power interruption, the engine generator requires a moment for start-up and stabilizing. Therefore, the UPS/INV should be provided to prevent power supply interruption.

- Holding time : 10 minutes
- Input voltage : AC 380V/220V, 50 Hz, 3-phase/1-phase or DC -48V
- Output voltage : AC 220 V, 50 Hz, 1-phase

(5) Rectifier

Most facilities and equipment work by providing DC power (DC-48V), so the following rectifier will be applied:

- Input voltage : AC 380V/220V, 50 Hz, 3-phase/1-phase
- Output voltage : DC-48 V
- Type : One stand-by (n+1), floating

(6) Batteries

In order to prevent a DC power supply interruption, sets of batteries will be provided. The back-up time of the batteries is established to be four(4) hours in consideration of the reliability of commercial power and the other power supply system.

- Back-up time : Four (4) hours
- Output voltage : DC-48 V
- Type : Maintenance type for main exchange offices/stations
  Maintenance free type for small exchange offices/stations

(7) Miscellaneous Equipment

As miscellaneous equipment, the following equipment will be provided:

- High tension facility (Line, transformer)
- MTR (Meter)
  Low tension commercial power (AC 380V/220V, 50 Hz, 3-phase/1-phase) is lead in through the MTR.
- BRK (Breaker)
  Low tension commercial power is connected with the BRK.
- MDP (Main Distribution Panel)
  MDP divides the commercial power into two streams, one is to directly supply AC power to the load, another is to be connected with engine generators, UPS and rectifier/batteries.
- LBP (Low tension branch panel)
  Low tension power is distributed to the various load through the LBPs.
- LTP (Low tension change-over panel)
  LTP has a function of change-over from commercial power source to output of engine generator, vice versa.
- MTS (Mobile transfer switch)
  MTS has a function of switch-over from internal power source such as commercial power or output of engine generator to external power source in case the internal power source fails.
- MB (Mobile box)
  The external power source is connected to the MB.

4.3.2.2 System Diagram

The power supply system at the exchange office is designed taking into account the accommodation plan of the telecommunications systems. The high tension facility is provided, owned and maintained by PEE (The Public Establishment for Electricity).
STE has to bear the full provisioning cost of it.
The typical system diagram of the powers supply system at the exchange offices is indicated in Figure 4.3.2.2-1.

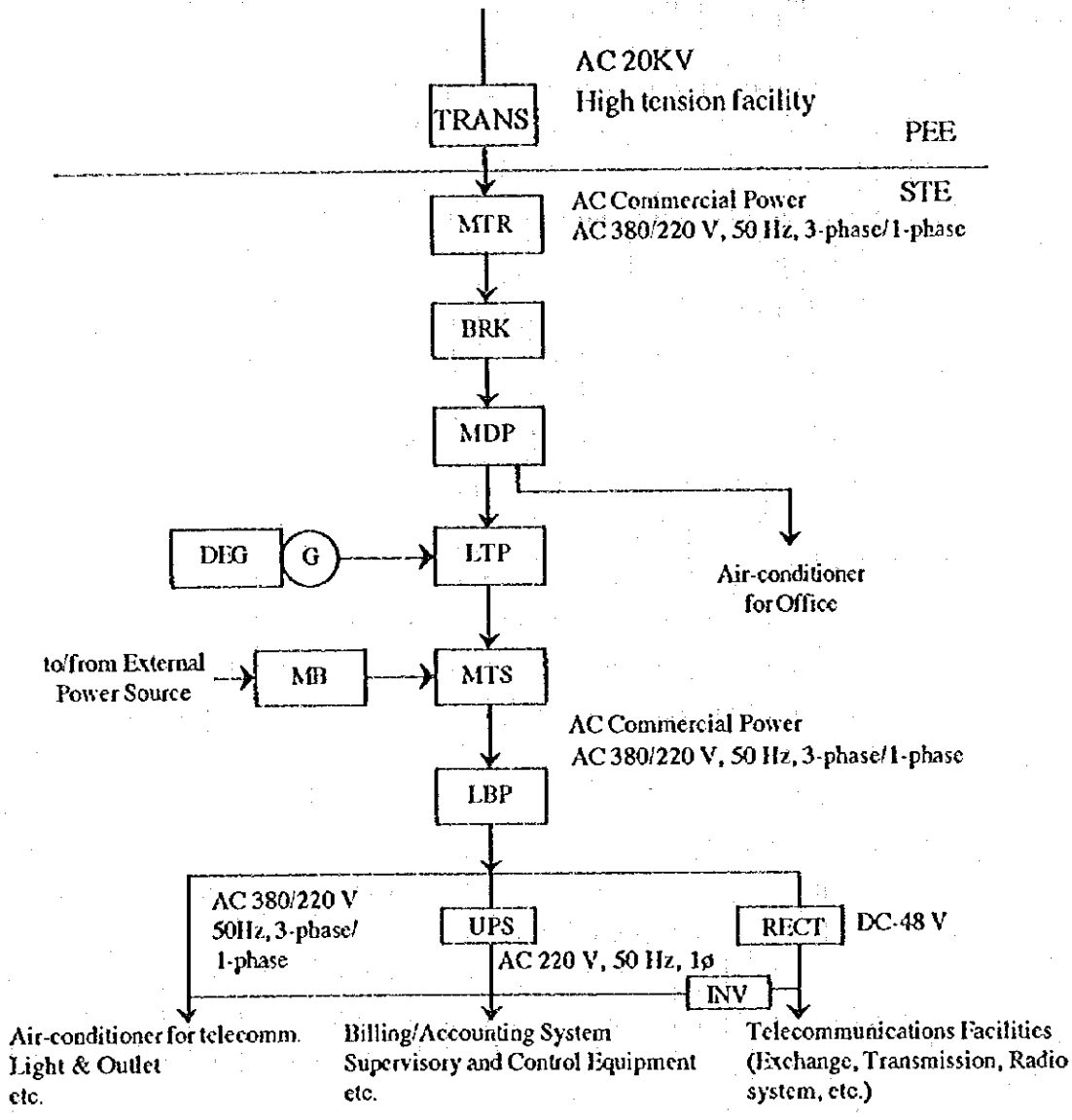


Figure 4.3.2.2-1 System Diagram of Power Supply System

4.3.2.3 Power Consumption

The power consumption at each exchange office is estimated based on expansion and new establishment sizes of exchanges as shown in Table 4.3.2.3-1.

Table 4.3.2.3-1 Power Consumption

Office/Bldg. name	Unit Name	Scope of expansion and replacement in 2000		Initial capacity	Ultimate capacity	Initial Stage(year 2000)					Ultimate Stage				
		New/Replace	Expansion	(2000)		AC direct (A)	EG direct (KVA)	Rectifier (A)	Batteries (AH)	UPS (KVA)	AC direct (A)	EG direct (KVA)	Rectifier (A)	Batteries (AH)	UPS (KVA)
Al Nasser	A1	0	0	40,000	40,000	1600	600	7200	2100	---	630	314	2500	8000	7.5
Al Thawra	A2	0	7,000	22,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Kefr Souseh	K1	0	0	25,000	30,000	630	314	2500	5000	7.5	600	314	2500	8000	7.5
Domar	O1	0	5,000	20,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Al Mohajrin	G3	0	4,000	14,000	30,000	600	314	2000	4000	7.5	630	314	2500	8000	7.5
	G1	0	0	11,000	30,000	250	200	2400	12000	---	630	314	2500	8000	7.5
Jaffaa	B1	0	0	30,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Bab Sharki	H1	0	0	10,000	30,000	630	170	1800	6000	---	630	314	2500	8000	7.5
	H2	0	0	20,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
(Dewelaah)		22,000	0	22,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Mezzeh-1	D1	10,000	0	10,000	30,000	630	314	2000	4000	7.5	630	314	2500	8000	7.5
	D2	0	0	15,000	30,000	630	314	2000	4000	7.5	630	314	2500	8000	7.5
Mezzeh-2	D3	0	0	25,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Al Mieidan	F1	23,000	0	23,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Al Yarmouk	L1	0	0	30,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
(Al Kadam)		20,000	0	20,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
(Al Sebeyneh)		20,000	0	20,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
Rokn Al Dien	E1	16,000	0	16,000	30,000	630	314	2000	4000	7.5	630	314	2500	8000	7.5
Barzeh	M1	0	0	30,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
(Ibn Alamied)		12,000		12,000	30,000	630	314	2000	4000	7.5	630	314	2500	8000	7.5
Bagdad	C1	23,000	0	23,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
	C2	0	0	20,000	30,000	350	300	3600	8800	---	630	314	2500	8000	7.5
(Al Abbaseyen)		23,000	0	23,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5
(Jobar)		23,000	0	23,000	30,000	630	314	2500	5000	7.5	630	314	2500	8000	7.5

4.3.2.4 Facility Provisioning Plan

Based on the power consumption at each exchange, the facility provisioning is planned as shown in Table 4.3.2.4-1.

Table 4.3.2.4-1 Facility Provisioning Plan of Power Supply System

Office/Bldg. name	Unit Name	AC mains (A)	Engine Generator (KVA)	Rectifier (A)	Batteries (AH)	UPS (KVA)
Al Nasser	A1	---	---	---	---	---
Al Thawra	A2	---	---	+1000	+2000	+2.5
Kefr Souseh	K1	+30	---	+500	---	---
Domar	O1	+230	+132	+1000	---	---
Al Mohajrin	G3	+230	+132	+500	+2000	+2.5
	G1	---	---	---	---	---
Jallaa	B1	+30	---	---	---	---
Bab Sharki	H1	---	---	---	---	---
	H2	---	---	+500	---	---
(Dewelaah)		630	314	2500	5000	7.5
Mezzeh-1	D1	---	314	2000	4000	+2.5
	D2	---	---	---	+250	---
Mezzeh-2	D3	+30	---	+500	---	---
Al Miedan	F1	+330	314	2500	5000	7.5
Al Yarmouk	L1	---	---	---	---	---
(Al Kadam)		630	314	2500	5000	7.5
(Al Sebeyneh)		630	314	2500	5000	7.5
Rokn Al Dien	E1	+330	314	2000	5000	7.5
Barzeh	M1	---	---	---	---	---
(Ibn Alanied)		630	314	2000	4000	7.5
Bagdad	C1	630	314	2500	5000	7.5
	C2	---	---	---	---	---
(Al Abbaseyen)		630	314	2500	5000	7.5
(Jobar)		630	314	2500	5000	7.5

4.4 Transmission System

4.4.1 Transmission Facilities

4.4.1.1 Present Status of Transmission

Under the Contract 40/A and 3/A, Damascus junction network was renovated with 140Mbps fiber-optic transmission systems. Recently, the network has been enhanced its circuit capacity by installing more 140Mbps systems under the 25% Expansion Contract 40A. The number of 140Mbps systems for each route (or section) in the network is summarized in Table 4.5.1.2-1.

The network configuration is similar to physical mesh network and somewhat bit complicated with many 140Mbit systems. The installation under the 25% Expansion Contract relieves capacity shortages. The drawback to the capacity increase is that it endangers network security to a certain extent by using up all fibers in some sections which could be stand-bys for failed fibers.

4.4.1.2 Result of Survey

A field survey has been carried out to determine obstacles to transmission facility plan execution. No major obstacles were found.

Since the transmission room in telephone office C (Bagdad), has little space for new equipment, the field survey was carried out by contractor.

The floor-to-ceiling height is more than 4 meters and is sufficient for any transmission equipment. The floor is strong enough for loading equipment, based on existing equipment.

4.4.1.3 Facility Plan

The facility plan takes the following considerations into account;

(1) The proposed logical mesh network at the center of Damascus (see Figure 3.1.3-3) must not complicate physical network much more.

(2) The existing systems are new ones and should be utilized.

(3) 50% circuits are secured even in the case of one route failure. (100% circuit protection is better from view point of security, but not economical. Since distances between two telephone offices are short in Damascus, route failure is rarely expected to happen.)

(4) One pair of spare fibers is maintained for as many sections as possible.

(5) According to the world technology trend, SDH transmission systems shall be introduced into the Damascus Junction Network as soon as possible.

The Master Plan proposes eight SDH rings (loops) in the network. Some of the eight loops are selected to satisfy the circuit demand in Damascus targeted area in the year 2002 (2000 + two years lead time). As Jobar become a Home LT in the plan as shown in Figure 3.1.3-3, the plan makes LOOP 9 as a SDH ring over Jobar, Dewelaah, Damascus C (Bagdad), and Damascus H1 (Bab Sharki). The other loops will be accomplished after the year 2000.

Based on the circuit calculation in Section 4.2.2, the number of circuits required for each section are summed and are shown in Figure 4.4.1.3-1. Circuits between STD1 and MSC (Mobile service switching center) are included, but long distance circuits from/ to STD1 and STD2 to/ from the other toll transit exchanges and INTSs are excluded. Circuits between MSC and each of BTSs(Base transceiver stations) are handled in Chapter 5.

Figure 4.4.1.3-1 illustrates sections where circuit shortages are anticipated in compare with existing numbers of circuits.

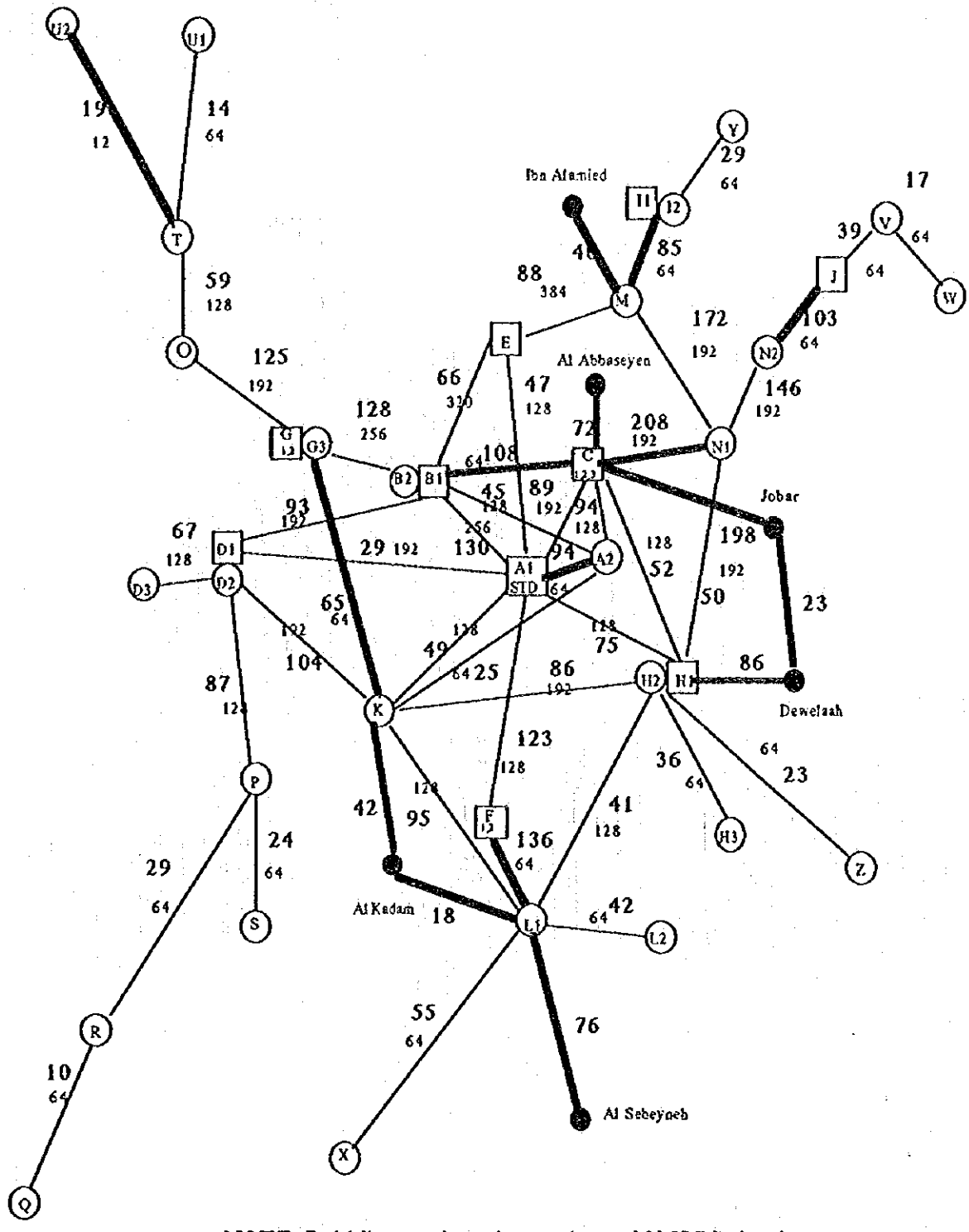
For the sections with circuit shortages, SDH rings, LOOP2, LOOP3, LOOP5, and LOOP9 are proposed as shown in Figure 4.4.1.3-2. Table 4.4.1.3-1 shows circuits related to each of the loops. The "CAPA" in the table means Loop Capacity required for SDH transmission systems in each of the loops. For the 50% circuit protection, the half of the "CAPA" is required as loop capacity. (For 100% circuit protection, full "CAPA" is required.) Therefore, SDH-4 systems are justified for each of the loops.

The section between Damascus K (Kefr Souseh) and Damascus G (Al Mohajirin) has a circuit shortage, but no new facility is planned there, because re-routing of circuits can solve the shortage.

Removed 140Mbps systems must be transferred to sections related to new telephone offices, Ibn Alamied, Al Abbaseyen, and Al Sebeyneh, where also new optical fiber cables are required.

The usage of SDH-4 systems easily enable spare fibers to remain, as the SDH-4 systems have larger capacities.

Concept designs are made for the loops as shown in Figure 4.4.1.3-3, based on required circuits on Table 4.4.1.3-1. Estimates of power, space and cost required for the transmission facility have used the concept designs.



NOTE: Bold figures show the numbers of 2MBPS circuits required at the end of 2002.
Small figures show exisiting section capacities in 2MBPS.

: Sections with circuit shortage

Figure 4.4.1.3-1 Circuits required in Damascus Junction Network (in 2002)

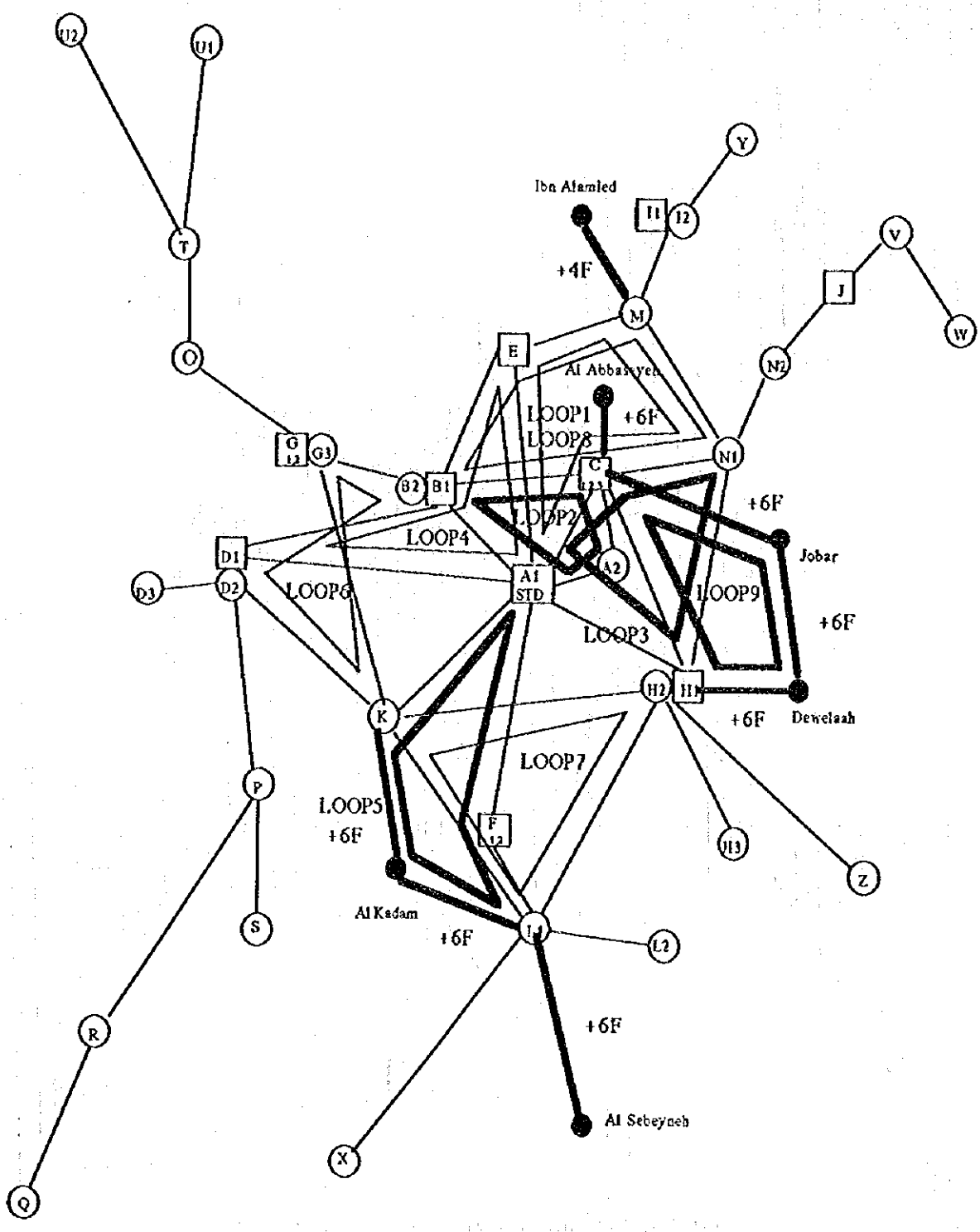


Figure 4.4.1.3-2 Damascus Loops

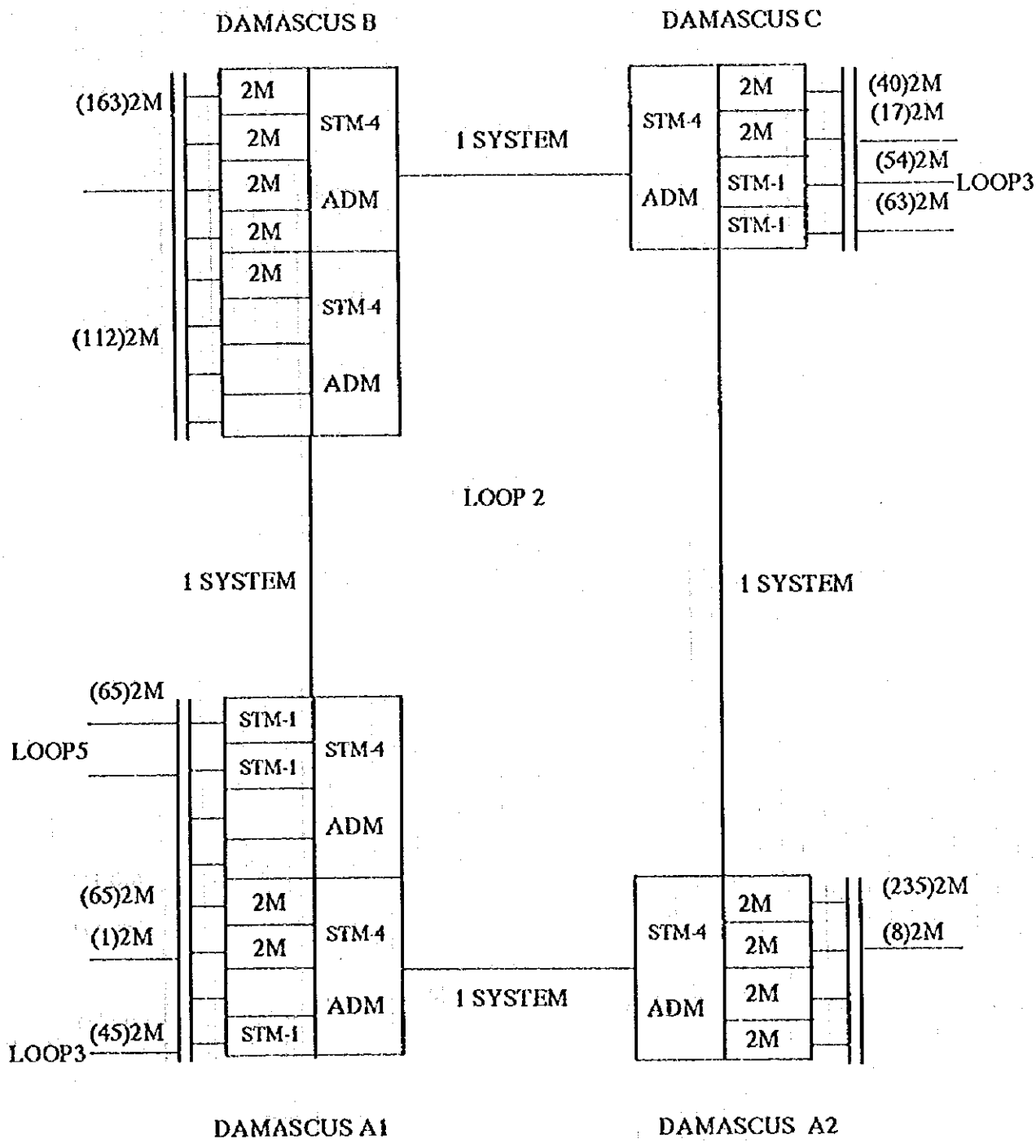


Figure4.4.1.3-3 Damascus Junction Network Configuration (1/4)

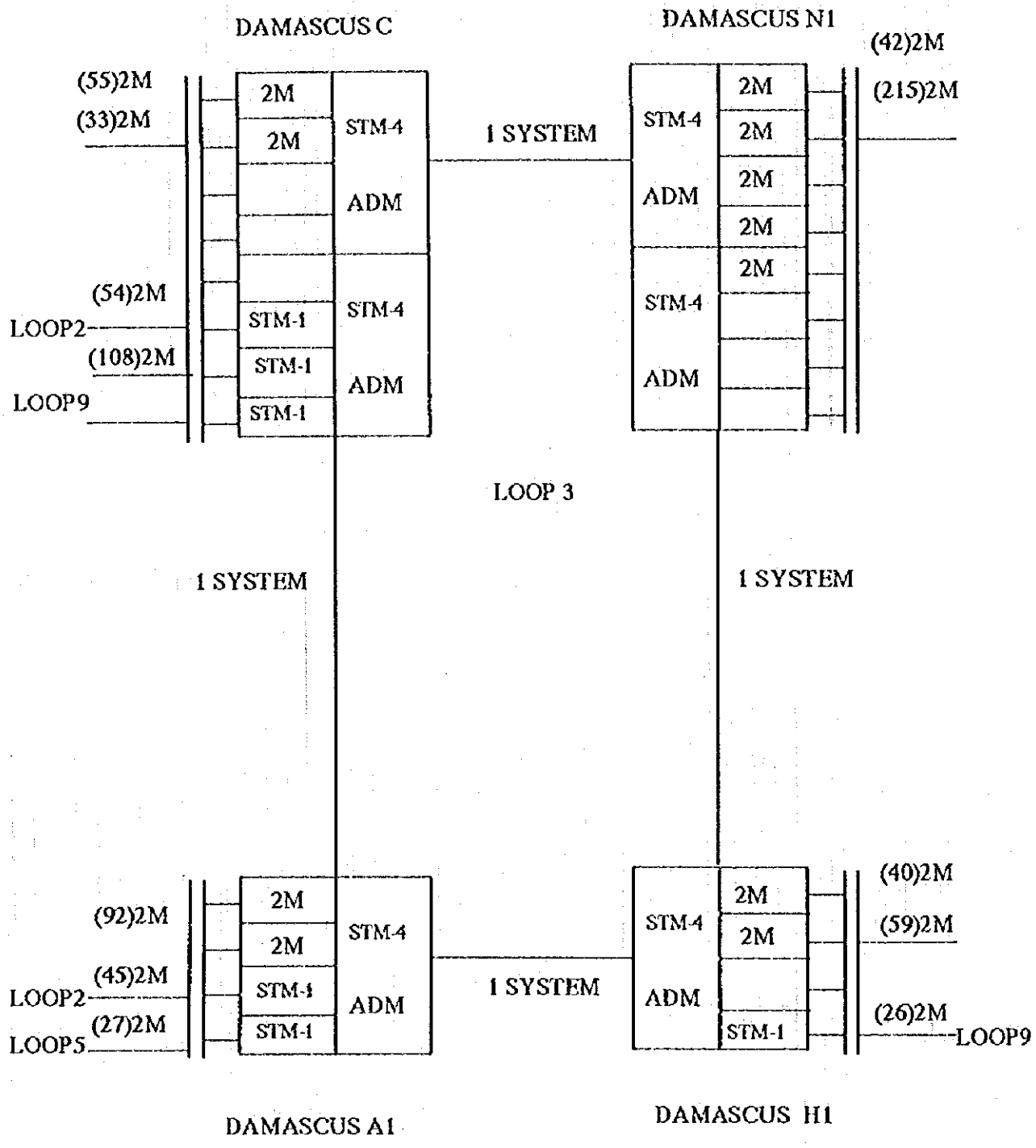


Figure 4.4.1.3-3 Damascus Junction Network Configuration (2/4)

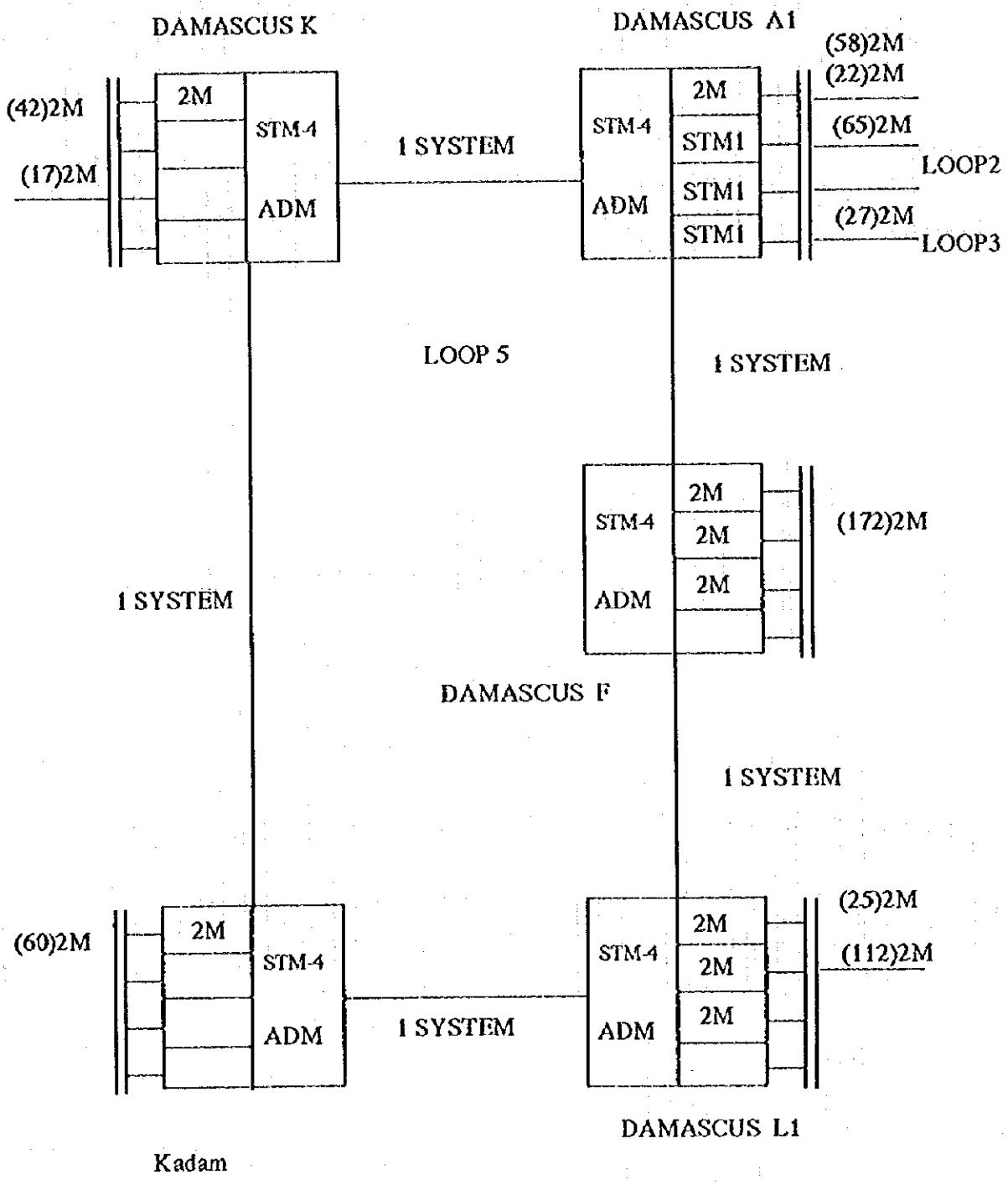


Figure 4.4.1.3-3 Damascus Junction Network Configuration (3/4)

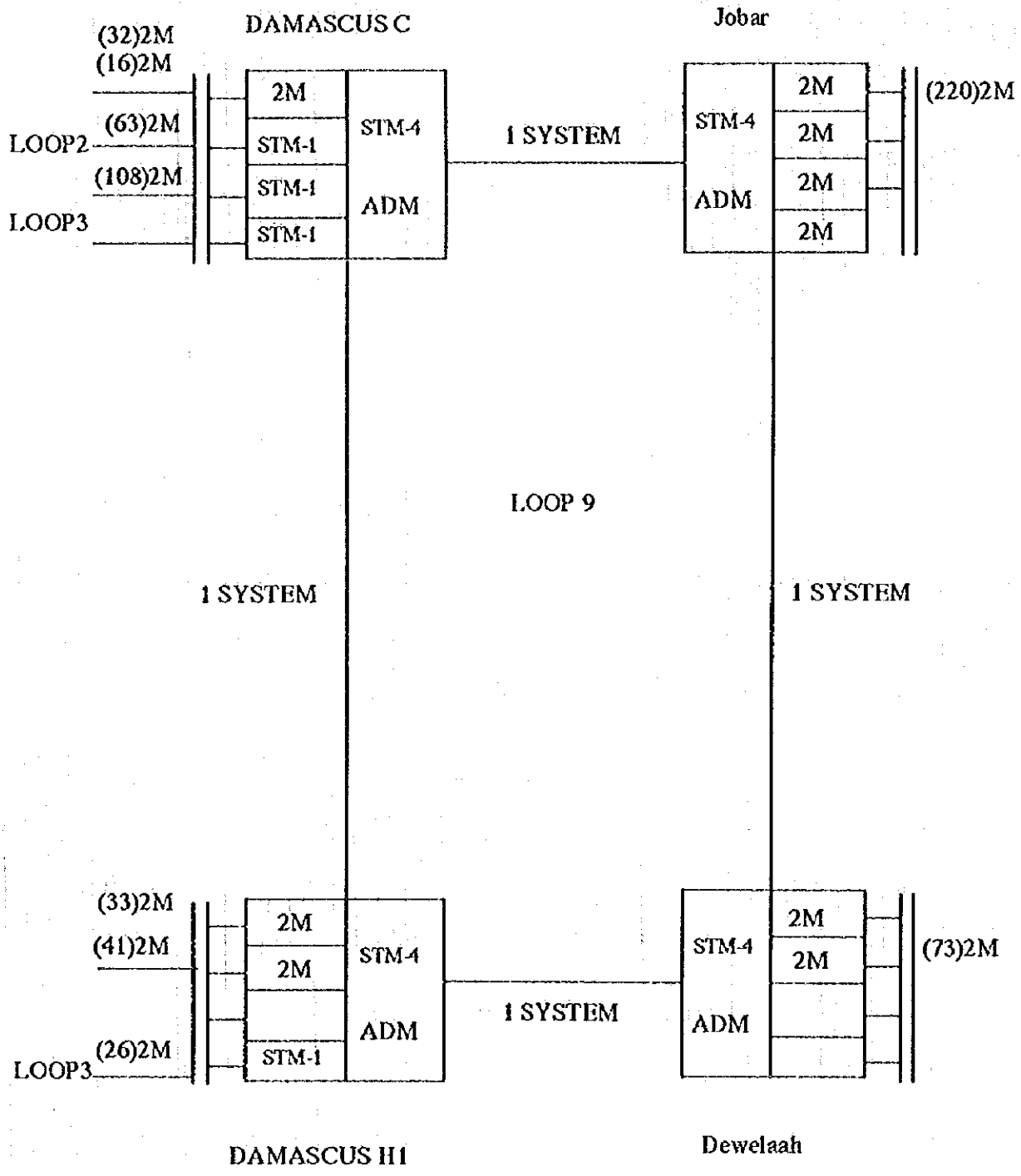


Figure 4.4.1.3-3 Damascus Junction Network Configuration (4/4)

Table 4.4.1.3-1 Circuits for Loops (LOOP2) (1/8)

	FS	LOOP2	M1		H1	F1	K1	D1	B1	E1		I2	C1	C2		N1	J	N2	H2	A1		H3
			Barze	Jobar	BabS1	Mieda	KefrS	Mezz1	Jalla	RoknA	IbnAl	Tall	Bagd1	Bagd2	Abbas	Zamal	Doma	Harst	BabS2	Nasse	Dewel	Jaram
1		Jobar								210												
2	H1	BabS1																				
3	F1	Mieda							240													
4	K1	KefrS							120													
5	D1	Mezz1		390																		
6	B1	Jalla		330		420	420						150	150	150	120	150	120	240	240	240	210
7	C1	Bagd1								60												
8	C2	Bagd2								60												
9		Abbas								60												
10	D3	Mezz2											30	30	30	30	30	30				
11	P1	Darya															30					
12	A2	Thawr								60	30	30	120	90	60	30	30	30		300	90	
13	O1	Domar											60	30	30	30	60	30		120		
14	G1	Moha1											30	30	30					90	30	
15	G3	Moha2											30	30						60		
16	T	Hamah															30			30		
17		STD1							240													
18		STD2	210	180	150	180		180	240	120	90	120	150	150	150	120	150	120	60	300	150	90
19		MSC																				
		total1	210	900	150	600	420	180	840	570	120	150	570	510	450	330	480	330	300	1140	510	300
		total2	0	450	360	240	120	390	4050		0	0	60	60	60	0	0	0	0	0	0	0
		total	210	1350	510	840	540	570	4890	570	120	150	630	570	510	330	480	330	300	1140	510	300
		2Mbps	7	45	17	28	18	19	163	19	4	5	21	19	17	11	16	11	10	38	17	10
		STM1	0.11	0.71	0.27	0.44	0.29	0.302	2.59	0.3016	0.06	0.1	0.333	0.302	0.27	0.175	0.254	0.17	0.159	0.603	0.27	0.16
		PORT	C	C	A1/12	A1	A1	B	B1	B	C	C	C	C	C	C	C	C	A1/8	A1	A1/9	A1/7
					C/5														C/2		C/8	C/3

Table 4.4.1.3-1 Circuits for Loops (LOOP2) (2/8)

	Z1			L1			L2	D2	D3	P1	A2	O1	G1	G3	T				
	Nasha	Abadi	Mieha	Yarmo	Kadam	Sebey	Babel	Mez11	Mezz2	Darya	Thawr	Domar	Moha1	Moha2	Hamah	STD1	STD2	MSC	total2
1								120		120									450
2											360								360
3																			240
4																			120
5																			390
6	120	30	120	120	120	120	120				360								4050
7																			60
8																			60
9																			60
10																			180
11																			30
12				60		30			30										990
13											60								420
14											60								270
15											30								150
16																			60
17											180	150	90	90	60				810
18								90	150	90		150	90	90	60				3630
19																1380			1380
	120	30	120	180	120	150	120	210	180	210	1050	300	180	180	120	1380	0	0	13710 TOTAL
	0		0	0	0	0	0	0	180	30	990	420	270	150	60	810	3630	1380	457 2Mbps
	120	30	120	180	120	150	120	210	360	240	2040	720	450	330	180	2190	3630	1380	7.254 STM1
	4	1	4	6	4	5	4	7	12	8	68	24	15	11	6	73	121	46	CAPA
	0.063	0.016	0.063	0.095	0.0635	0.079	0.063	0.111	0.19	0.127	1.079	0.381	0.238	0.175	0.095	1.159	1.921	0.73	
	A1	A1	A1	A1	A1	A1	A1	B	A1/1	B	A2	B	B	B	B	A1	A2	A2	
									B/11										

Table 4.4.1.3-1 Circuits for Loops (LOOP3) (3/8)

	FS	LOOP3	M1		H1	F1	K1	B1	E1		I2		Y1						C1	C2		N1	J	N2	W1	V1			
			Barze	Jobar	BabS1	Mieda	KefrS	Jalla	RoknA	IbnAl	Tall	Munin	Sydna	Tawan	Ranku	Essal	Hafee	Hosha	Bagd1	Bagd2	Abbas	Zamal	Doma	Harst	Dmeer	Adraa	Maaro	Thaya	Basel
1	M1	Barze																	270	240	360								
2		Jobar								210	240	90	120	30	60	60	30	30				270	300	240	90	90	30	90	60
3	H1	BabS1	450																										
4	F1	Mieda		570																									
5	K1	KefrS	300																										
6	B1	Jalla																				120	150	120					
7	C1	Bagd1								60	30																		
8	C2	Bagd2								30	30																		
9		Abbas								60	30																		
10	N1	Zamal																	60	60	90								
11	J	Doma																	30	30	60								
12	N2	Harst																	30	30	60								
13	H2	BabS2																				30							
14	A1	Nasse																	150	150	90	60	60	60					
15		Dewel							30	30	30											60	30	30					
16	H3	Jaram																				60	30						
17	L1	Yarmo									30											30	30	30					
18		Kadam									30								30	30	30	30	30						
19		Sebey									30								30	30	30	30	60	30					
20	L2	Babel																	30		30	30	30						
21	D3	Mezz2																				30	30	30					
22	P1	Darya																					30						
23	A2	Thawr								30	30											30	30	30					
24	O1	Domar																				30	60	30					
25	G1	Mohal																											
26	T	Hamah																					30						
27		STD 1		180	150														150	150	150	120	150	120					
28		STD2	210							90	120											120	150	120					
29		Jobar(STD)																							30	30	30	30	
		total1	960	750	150	0	0	0	30	510	600	90	120	30	60	60	30	30	780	720	900	1050	1200	840	120	120	60	120	60
		total2	990	2310	1050	570	300	1350		0	0	0	0						90	60	90	210	120	120					
		total	1950	3060	1200	570	300	1350	30	510	600	90	120	30	60	60	30	30	870	780	990	1260	1320	960	120	120	60	120	60
		2Mbps	65	102	40	19	10	45	1	17	20	3	4	1	2	2	1	1	29	26	33	42	44	32	4	4	2	4	2
		STM1	1.03	1.62	0.635	0.3	0.16	0.7	0.016	0.27	0.32	0.048	0.063	0.016	0.03	0.03	0.02	0.02	0.46	0.41	0.52	0.67	0.7	0.51	0.063	0.06	0.03	0.06	0.03
		PORT	N1	C	H1	A1	H1	A1/3	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	C	C	C	N1	N1	N1	N1	N1	N1	N1	N1
								C/13																					

Table 4.4.13-1 Circuits for Loops (LOOP3) (4/8)

			H2	A1		H3	Z1			L1			L2	D3	P1	A2	O1	G1	G3	T					
	Shufe	KfrBa	BabS2	Nasse	Dewel	Jaram	Nasha	Abadi	Mleha	Yarmo	Kadam	Sebey	Babel	Mezz2	Darya	Thawr	Domar	Moha1	Moha2	Hamah	STD 1	STD2	Jobar(STD)	total2	
1				120																				990	
2	30	90		150																				2310	
3				240												360								1050	
4																								570	
5																								300	
6			240		240	210	120	30	120															1350	
7																								90	
8																								60	
9																								90	
10																								210	
11																								120	
12																								120	
13																								30	
14			30																					600	
15				150																				360	
16				30																				120	
17																								120	
18																								180	
19																								240	
20																								120	
21																								90	
22																								30	
23																								150	
24																								120	
25					30																			30	
26																								30	
27			60		150	90																		1470	
28																								810	
29	30	30																						180	
	60	120	330	690	420	300	120	30	120	0	0	0	0	0	0	360	0	0	0	0	0	0	0	11940	TOTAL
			30	600	360	120	0		0	120	180	240	120	90	30	150	120	30	0	30	1470	810	180	398	2Mbps
	60	120	360	1290	780	420	120	30	120	120	180	240	120	90	30	510	120	30	0	30	1470	810	180	6.317	STM1
	2	4	12	43	26	14	4	1	4	4	6	8	4	3	1	17	4	1	0	1	49	27	6		CAPA
	0.03	0.063	0.19	0.683	0.413	0.22	0.063	0.016	0.063	0.063	0.095	0.127	0.063	0.048	0.016	0.27	0.063	0.016	0	0.0159	0.778	0.429	0.0952381		
	N1	N1	H1	A1	H1	H1	H1	H1	H1	H1	A1/3	A1/3	A1/2	C	C	A1/12	C	A1		C	A1	C	C		
											H1/3	H/5	H/2			C/5									

Table 4.4.1.3-1 Circuits for Loops (LOOP5) (5/8)

	FS LOOP5		M1		H1	F1	K1	D1	B1	E1	I2	C1	C2		N1	J		A1		H3	L1			L2	X1
			Barze	Jobar	BabS1	Mieda	KefrS	Mezz1	Jalla	RoknA	Tall	Bagd1	Bagd2	Abbas	Zamal	Doma	Basel	Nasse	Dewel	Jaram	Yarmo	Kadam	Sebey	Babel	Keswa
1	F1	Mieda	570	570	240				240									210	120		270	270	270	210	150
2	K1	KefrS							120									270				270			
3	D1	Mezz1				450																			
4	B1	Jalla				420	420														120	120	120	120	
5	L1	Yarmo								30								120							
6		Kadam								30	30	30	30	30	30	30		90	30	30					
7		Sebey								30		30	30	30				90				180			
8	L2	Babel										30		30				60				30			
9	D2	Mezz1																				30			
10	D3	Mezz2																				60			
11	P1	Darva																				60			
12	A2	Thawr																			60	30	30		
13	O1	Domar																				60			
14	G1	Mohal																				30			
15		STD 1				180	180														150	150	150	90	
16		STD2				180																150			
17		Mieda(STD)															30								60
		total1	570	570	240	1230	600	0	360	90	30	90	60	90	30	30	30	840	150	30	600	1440	570	420	210
		total2	0	0	0	3690	660	450	1320		0	0	0	0	0	0		0	0	0	150	360	390	150	
		total	570	570	240	4920	1260	450	1680	90	30	90	60	90	30	30	30	840	150	30	750	1800	960	570	210
		2Mbps	19	19	8	164	42	15	56	3	1	3	2	3	1	1	1	28	5	1	25	60	32	19	7
		STM1	0.3	0.3	0.127	2.603	0.67	0.238	0.89	0.0476	0.02	0.048	0.032	0.048	0.016	0.016	0.016	0.444	0.079	0.016	0.397	0.9524	0.508	0.302	0.111
		PORT	A1	A1	L1	F1	K1	L1	A1	A1	K	A1	A1	A1	K	K	L1	A1	L1	L1	L1	Kadam	L1	L2	L1

Table 4.4.1.3-1 Circuits for Loops (LOOPS) (6/8)

													D2	D3	P1	A2	O1	G1			F1		
	Kozla	Zakea	Hejan	Deral	Basel	Heneh	Sassa	Kanak	Beatg	Kafar	Kakla	Danaj	Mez11	Mezz2	Darva	Thawr	Domar	Moha1	STD 1	STD2	Mieda(STD	total2	
1	60	90	30	30	30	30	60	60	60	60	30	30										3690	
2																						660	
3																						450	
4																						1320	
5																						150	
6																						360	
7																						390	
8																						150	
9																						30	
10																						60	
11																						60	
12																						120	
13																						60	
14																						30	
15																						900	
16																						330	
17	30	30	30	30	30																	240	
	90	120	60	60	60	30	60	60	60	60	30	30	0	0	0	0	0	0	0	0	0	9000	TOTAL
													30	60	60	120	60	30	900	330	240	300	2Mbps
	90	120	60	60	60	30	60	60	60	60	30	30	30	60	60	120	60	30	900	330	240	4.762	STM1
	3	4	2	2	2	1	2	2	2	2	1	1	1	2	2	4	2	1	30	11	8		CAPA
	0.048	0.06	0.03	0.03	0.03	0.016	0.032	0.032	0.03	0.032	0.016	0.02	0.016	0.032	0.032	0.063	0.032	0.016	0.476	0.175	0.1269841		
	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	K	K	K	A1/3	K	K	A1	A1/6	F1		
																K/1				K/5			

Table 4.4.1.3-1 Circuits for Loops (LOOP9) (7/8)

	FS	LOOP9		H1	F1	K1	D1	B1	E1		I2		Y1						C1	C2		N1	J	N2	W1	V1	
			Jobar	BabS1	Mieda	KefrS	Mezz1	Jalla	RoknA	IbnAl	Tall	Munin	Sydna	Tawan	Ranku	Essal	Hafec	Hosha	Bagd1	Bagd2	Abbas	Zamal	Doma	Harst	Dmeer	Adraa	Maaro
1		Jobar							210	210	240	90	120	30	60	60	30	30	270	240	360	270	300	240	90	90	30
2	H1	BabS1	450																								
3	F1	Mieda	570																								
4	K1	KefrS	300																								
5	D1	Mezz1	390																								
6	B1	Jalla	330																								
7	H2	BabS2																	30								
8		Dewel							30	30	30								150	120	60	60	30	30			
9	H3	Jaram																	30	30	30						
10	L1	Yarmo																	60	30	30						
11		Kadam																									
12		Sebey																									
13	L2	Babel																									
14	D3	Mezz2																									
15	A2	Thawr																									
16	O1	Domar																									
17	G1	Moha1																									
18	G3	Moha2																									
19		STD 1	180																								
20		STD2	180	150																							
21		Jobar(STD)																							30	30	30
		total1	2400	150	0	0	0	0	240	240	270	90	120	30	60	60	30	30	540	420	480	330	330	270	120	120	60
		total2	4020	690	690	300	390	570		0	0	0	0						0	0	0	0	0	0			
		total	6420	840	690	300	390	570	240	240	270	90	120	30	60	60	30	30	540	420	480	330	330	270	120	120	60
		2Mbps	214	28	23	10	13	19	8	8	9	3	4	1	2	2	1	1	18	14	16	11	11	9	4	4	2
		STM1	3.4	0.44	0.37	0.16	0.206	0.3	0.127	0.13	0.14	0.048	0.06	0.016	0.032	0.03	0.02	0.016	0.29	0.222	0.254	0.17	0.17	0.14	0.063	0.06	0.03
		PORT	Jobar	H1	C/19	H1	C	C/11	C/7	C/7	C/8	C	C	C	C	C	C	C	C	C	C	C/9	C/10	C/8	C	C	C
					H1/4			H1/8	H1/1	H1/1	H1/1											H1/2	H1/1	H1/1			

Table 4.4.1,3-1 Circuits for Loops (LOOP9) (8/8)

					H2	A1		H3	L1			L2	D2	D3	P1	A2	O1	G1	G3					
	Thaya	Basel	Shufe	KfrBa	BabS2	Nasse	Dewel	Jaram	Yarmo	Kadam	Sebey	Babel	Mez11	Mezz2	Darya	Thawr	Domar	Moha1	Moha2	STD 1	STD2	Jobar(STD)	total2	
1	90	60	30	90		150	150	120	120				120		120								4020	
2							240																690	
3							120																690	
4																							300	
5																							390	
6							240																570	
7																							30	
8					60	150																	750	
9							30																120	
10							60																180	
11							30																30	
12							30																30	
13							30																30	
14							30																30	
15							90																90	
16							30																30	
17							30																30	
18							30																30	
19							150																330	
20					60		150	90															630	
21	30		30	30																			180	
	120	60	60	120	120	300	1440	210	120	0	0	0	120	0	120	0	0	0	0	0	0	0	9180	TOTAL
					30	0	750	120	180	30	30	30	0	30	0	90	30	30	30	330	630	180	306	2Mbps
	120	60	60	120	150	300	2190	330	300	30	30	30	120	30	120	90	30	30	30	330	630	180	4.857	STM1
	4	2	2	4	5	10	73	11	10	1	1	1	4	1	4	3	1	1	1	11	21	6		CAPA
	0.063	0.03	0.032	0.063	0.079	0.16	1.159	0.175	0.159	0.016	0.016	0.02	0.063	0.016	0.063	0.05	0.016	0.016	0.016	0.175	0.33	0.095238		
	C	C	C	C	H1	C/5	Dewel	H1	H1	H1	H1	H1	C	H1	C	C	H1	H1	H1	C/6	C	Jobar		
						H1/5														H1/5				

4.4.2 Power Supply System

Power required for the transmission facilities in Section 4.4.1 is estimated from the concept designs of SDH systems as shown in Table 4.4.2-1. There is no standard power consumption for each equipment, so the Table 4.4.2-1 only shows orders of power consumption.

Table 4.4.2-1 Estimated Power Consumption

		SDH system [W]	140M system [W]*	TOTAL [W]	Note existing systems [w]
DAMAS A1	Al Nasser	705		705	1250
DAMAS A2	Al Thawra	236		236	350
DAMAS B	Jallar	382		382	1400
DAMAS C	Bagdad	705	350	1055	1400
DAMAS F	Al Miedan	206		206	1200
DAMAS H1	Bab Sharki	353		353	1000
DAMAS K	Kerf Souseh	176		176	1000
DAMAS L1	Al Yarmouk	206		206	900
DAMAS N1	Zamalka	382		382	1000
JOBAR		236		236	0
DEWELAAH		176		176	0
KADAM		176		176	0
IBN ALAMIED			350	350	0
ABBASEYEN			350	350	0
SEBEYNEH			350	350	0

Note*: applied existing Al Thawara power consumption

Since no power supply facilities are exclusively used for transmission equipment in the Damascus targeted area, power required for transmission is covered by the Power Supply System for switching system in Section 4.3.2.