It is proposed that the installation work in this Project be carried out by the Contractor on turn-key basis. For the completion of work in the predetermined work period, it is indispensable that the installation design and drawings, implementation plan and method, factory test procedure, field test procedure, and so forth, to be provided by the Contractor be examined carefully by ARENTO and the yes or no reply with comments, where necessary, be issued without delay.

Although the project is to be implemented by Contractor on turn-key basis, it is desirous for ARENTO to continually watch the overall progress of work by making effective supervision. This will also be necessary for assessment of the piecework payment.

In case where the work is done at the existing exchanges, the Contractor is required to exercise utmost care neither to interfere with duty performance of ARENTO personnel nor to cause trouble with the operating equipment, not to speak of avoiding casualties. Special circumspection is necessary in the tower assembly work.

Depending upon the objective situation, the work commencement may be postponed or the work period may be extended. Therefore, to meet the materials and labor costs, as well as to cope with the price fluctuations, during such extra period, both promptly and effectively, it is necessary to set aside and maintain the contingency fund.

3-9-2 Test

Main test categories in this Project are factory test and field test.

(1) Factory Test

To perform the factory test of manufactured equipments efficiently, the desirable method is to make sampling inspection, that is to say, for the main equipments out of the equipments supplied by the Contractor, the authoritative sampling inspection plan formulated on the basis of modern statistical theory should, in principle, be employed.

For at least one set out of various equipments of the same type, it is preferable to carry out the ambient temperature test. This kind of test, if it is to be carried out at the field, involves extreme difficulty.

The Contractor must formulate the factory test procedure within three months or so after the coming into effect of the contract and submit such test procedure to ARENTO for approval.

(2) Field Test

The field test comprises the following categories:

1) In-station test

2) Radio section test

3) Acceptance test

   a) Telephone circuit performance test

   b) Reliability test

In-station test is made by measuring the performance of individual units of each equipment category after installation so as to make sure that the equipment maintains, after shipment from factory and installation at site, the characteristics confirmed by the factory test.

Radio section test is made by means of actual signal transmission through antenna from radio equipment at a certain station and actual signal receiving at the adjacent station, is to examine whether the measured values of propagation loss, antenna gain, feeder loss, etc., are within the allowable range as compared with the corresponding design values.

Acceptance test comprises telephone circuit performance test and reliability test. The former is made by measuring the end-to-end performance of telephone circuit at the time of radio propagation is in normal state so as to make sure that the circuit performance conforms to the standard. The latter is made by measuring the Bit Error Rate continuously for a relatively long period (half months to one month) so as to detect the system outage due to abnormal radio propagation and radio equipment trouble (including power failure).

3-10 Training

3-10-1 Basic Philosophy of Training Program.

The governing philosophy for organizing the necessary training program originates from following facts:

(1) The telecommunication system to be proposed and the equipments that compose the system are featured in the especially high degree of reliability, stable performance and easy maintenability. Therefore, it is possible to establish the systematic maintenance procedure, and this maintenance procedure is easy to comprehend.

(2) Notwithstanding the recently developed communication equipment is the product of advanced techniques and precision engineering, and consists of interchangeable units, panels or modules. Therefore, the maintenance personnel to engage in the maintenance work in the exchanges do not need special technical knowledge about inside details of those units, panels or modules. Theories of a high level in the fields of electronics and mathematics are not necessary for the maintenance personnel.

(3) Compared with the communication equipment, the power supply equipment are less reliable and stable, therefore, the power system must be far more frequently maintained.

(4) The maintenance work, whatever the kind, cannot be performed without the maintenance materials.

Therefore, it is essential that all maintenance materials be available in good condition whenever they are needed. This means that how to handle and manage the maintenance materials assumes top importance.

Considering above, basic philosophy of the training program is as follows:

1) The training of maintenance personnel places major emphasis on O/M procedure and attaches less weight to theories.

2) The training on technical handling and management of maintenance materials is directed to the staff of supervisor level.

3-10-2 Working Schedule of Training

In order to attain the desired effect in the whole aspect of training, it is recommended that the training be administered in two categories: factory training and on-the-job training. The training schedule for this purpose appears in Table II-10.

3-10-3 Factory Training

The principal purpose of factory training is to train those ARENTO staff, who will be the supervisors or senior technician having suitable background the overall scope of O/M technique including the knowledge of proposed communication system, power supply system and equipment, maintenance procedure, as well as managing and technical handling of maintenance materials.

The trainees in such factory training are expected to serve as instructors in the training planned by ARENTO.

The eligibility to receive factory training is to possess a more or less knowledge about electronics and solid state circuits, and preferably about O/M of radio, carrier and power systems.

The subjects of training comprise radio engineering, supervising, digital multiplex equipment and power system. For the period of training, approximately two months are necessary.

3-10-4 On-the-Job Training

For the purpose of proper operation and effective maintenance of the communication system, it is important that the training of personnel to engage in system operation and maintenance be completed before the system service-in.

For this reason, it is recommended to carry out on-the-job training that allows trainees to participate in the actual system construction work.

3-11 Operation and Maintenance

For the smooth operation of telecommunication transmission routes, the organization of operation must be firmly established.

For the organization of operation, the general trend is to establish such organization at main repeater stations or terminal stations on the transmission route chain, thus making them attended stations, while keeping other repeater stations unattended. In most cases, those main repeater stations constitute the nodes of individual transmission sections and sometimes form the branching stations, so that they are made the attended stations from the viewpoint of operation and maintenance of the communication system.

However, the microwave circuits to be established in this Project are those in the urban district and hence short in distance. Thus, on these microwave circuits, neither the intermediate repeater stations nor the radio switching sections exist.

In this Project, Moharam Bey will be used as the center exchange of the PCM digital microwave network to interconnect 10 exchanges (including Mohram Bey) located in Alexandria City and its environs, whereas the trunk lines to the toll circuits, as well as the special service circuits, will be accommodated in the toll board and S/S board of Auto scheduled to become the sub-center exchange.

Moharam Bey, the center exchange, will become the key exchange where the local telephone circuits from the rest of the 10 exchanges will be concentrated and, at the same time, the local circuits will be distributed to those other exchanges. Thus, at Moharam Bey, a large number of radio and carrier facilities will be installed. Therefore, in this center exchange, the organization of operation for the purpose of operation and maintenance of the whole transmission system, including the radio system, must be established.

The remaining nine exchanges will be unattended. For the maintenance of radio and carrier facilities of these exchanges, maintenance personnel will be dispatched from the center exchange. In the center exchange, the control desk for centralized supervising and control of nine other exchanges will be established, in order that the proposed system will be assured of smooth operation.

In all countries, telecommunication services perform the center nerve role for social and economic activities. As such, the system does not warrant even the slight interruption as its impact is grave and extensive.

Considering that the traffic exists day and night, the personnel in charge of proper traffic management must assume duty by staggered shifts on round-the-clock basis.

3-11-1 Operation Service

Operation service is mainly concerned with the microwave system operation. It includes the monitoring of system performance, the changeover from working to standby equipment and vice versa at the time of maintenance, and the discovery of trouble, as well as the trouble-shooting to restore the normal operation.

Strictly speaking, the operation organization and the maintenance organization are different. Actually, however, the operation staff engage themselves in the maintenance work in not a few cases, so that the clearcut distinction between the operation and maintenance organizations is difficult.

3-11-2 Maintenance Service

Whether the operation proceeds smoothly or not depends to a great extent upon whether the routine maintenance service is satisfactory or not. In this connection, it is necessary to have the status of communication facilities and system clarified quantitatively or qualitatively. This leads to the importance of what is called preventive maintenance, or, more precisely, the early discovery of malfunctioning in part of the whole system so as to eliminate it before too late, through the tests, inspections, etc., of the facilities in the routine maintenance work. To serve this purpose, the establishment of maintenance procedure will be prerequisite.

Nowadays, the technical research and development are making rapid progress and, as a result, the equipments are becoming smaller and smaller in size with their weight also being reduced correspondingly. Furthermore, parts and components of communication equipment are having their MTBF (mean time between failures) improved. Hence, the reliability of communication equipment is also improving.

For this reason, the longer intervals of periodic tests and inspections of communication systems are now the general trend. In spite of such general trend, it is preferable that at the initial stage the periodic system tests and inspections be carried out at short

intervals (six months for inspections and one year for tests). (This is preferable from the viewpoint of training also.) At the same time, it is recommended to carry out tests and inspections according to the relevant annual schedule.

Worthy of an additional remark is that the periodic inspections be conducted for the radio propagation path. As is well known, the city area of Alexandria bristles with high buildings and this situation will accelerate in the future. Since those high risers are likely to become obstacles on the radio path, the fact-finding inspections are necessary at intervals of six months to one year.

It is also desired that the maintenance staff be assigned to Moharam Bey on permanent duty.

3-11-3 Operation Organization

The operation center is to be established at Moharam Bey. Its composition is shown below.

(1) Organization

1 Section Manager	1 Operation Chief + 2 persons on duty by rotation (microwave)	x
	4 rotations + 2 persons (total: 11 persons)	
	1 Operation Chief + 2 persons on duty by rotation (carrier)	x
	4 rotations + 2 persons (total: 11 persons)	
	1 Technical Administration Chief + 2 staff members (total: 3 persons)	
	26 persons	

(2) Work Items

The operation chief prepares the work schedule for persons to assume duty by rotation in order that he can supervise the communication system operation as a whole. At the same time, he tries to improve the capability of persons who work under him.

Persons who assume duty by rotation carry out the system performance monitoring and the necessary trouble-shooting for restoring the normal system operation. At the same time, they execute the periodic tests and inspections as prearranged.

The technical administration chief takes charge of administrative business, such as compilation of system failure statistics.

The section manager overseas the operation chief and the technical administration chief so as to keep the whole system in satisfactory operation.

3-11-4 Maintenance Organization

The maintenance center is to be established at Moharam Bey. Its composition is as follows:

(1) Organization

1 Section Manager	1 Maintenance Chief (radio)	+ 6 technicians (total: 7 persons)
	1 Maintenance Chief (transmission)	+ 6 technicians (total: 7 persons)
	1 Technical administration Chief	+ 2 staff members (total: 3 persons)
		18 persons

(2) Work Items

The Maintenance chief in charge of radio and carrier systems, respectively, prepare the annual schedules for periodic tests of those systems and carry out the tests on the prearranged test items. At the same time, they take part in trouble-shooting and minor maintenance work (such as new/additional circuit construction) by giving orders to persons working under them.

For radio and carrier equipments at other unattended exchanges also, they make annual test schedules and execute itinerant maintenance according to those schedules.

The chief in charge of technical administration compiles system failure statistics and analyzes those statistics to develop means for satisfactory system operation. At the same time, he undertakes the plant record updating, as well as the spare parts inventory management, also.

The section manager oversees the Maintenance chief, giving necessary instructions to them, in order to leave nothing to be desired in the aspect of operation and maintenance of the whole system.

3-11-5 Others

(1) Dust Proofing

To keep the communication equipment performance in good condition at all times, it is of paramount importance to keep the equipment room clean and dust-free. From this viewpoint, it is not desirable to keep the equipment room windows open for inflow of the outer air as is the case with Manshia.

(2) Itinerant Maintenance Vehicle

For the itinerant maintenance of the network planned in this Project, at least two, and, if possible, three, station wagon type vehicles are indispensable.

(3) Plant Record Updating

For the purpose of smooth maintenance and to facilitate future system expansion, the prime requisite is to prepare drawings that accurately present the status quo of all equipments, cables, towers, cable racks and so forth installed or constructed in this Project, and associated documents. These drawings and documents must be updated, where necessary, and kept in safe custody so that they can be consulted, whenever necessary.

(4) Spare Parts Inventory

In order to cope with all possible equipment troubles, a sufficient inventory of spare parts must be in store at all times at Moharam Bey, the scheduled network center.

A ledger wherein to enter accurately the spare parts items used and replenished must be prepared. For each spare parts item, the minimum inventory level is to be determined and, when the quantity in store breaks below such minimum level, action must be taken immediately to replenish the stock.

The minimum inventory level for each item should be determined in consideration of MTBF of the item concerned, as well as the time required for purchase procedure, for manufacture and for transport.

(5) Repair Center

A repair center equipped for temporary repair work must be established at Moharam Bey. The scope of repairs that can be accepted by this repair center should be determined through consultation with the successful tenderer for the Project.

3-12 Implementation Time Schedule

The time schedule for project implementation appears in Table II-10. Consideration is made so that the system construction will be completed, with service-in to follow, in approximately 24 months after the closing of tender. It is recommended to so arrange that the Contractor shall be duty-bound to assist system maintenance for one year after the service-in.

3-13 Employment of Consultant

For the implementation of this Project, it is essential to employ a capable Consultant. This is because the whole work covers as many as 10 existing and newly planned exchanges and, for the execution of work in full accordance with the implementation schedule and at top economic efficiency, the executive plans must be properly coordinated and effectively managed.

Obligations of the Consultant include the following:

(1) Assistance in the evaluation of tender proposals;

(2) Assistance in contract negotiations;

(3) Preparation of inspection specifications;

(4) Execution of witness inspection at factory;

(5) Presentation of inspection report and issuance of inspection certificate;

(6) Check and review of installation drawings;

(7) Control and adjustment of overall project program;

(8) Supervision of installation;

(9) Witness to acceptance test;

3-14 Cost Estimation

The equipment price and service cost estimates are based on up-to-date data. The estimates are listed in Table II-11.

Conditions of cost estimation are as follows:

(1) The estimation not to include building and tower foundation cost;

(2) Radio equipment to include supervisory equipment;

(3) Antenna system to include feeder, branching filter and dehydrator;

(4) Spare parts/units inventory to meet two years' needs;

(5) The Contractor to dispatch two engineers for one-year O/M assistance;

(6) Installation materials cost to include the Contractor's field survey cost, and cost of tie cable to connect carrier terminal equipment and switching equipment;

(7) Equipment and materials prices to be quoted on CIF, Alexandria, basis;

(8) Local currency budget to finance vehicle procurement at work site, office rent, typist and laborer wages, office supplies purchase, report making, and living expenses of staff personnel at work site;

(9) Contingency to account for approximately 10% of equipment, materials and work cost.

4. FDM/FM Analog Microwave Network Plan

4-1 Microwave Network Route

Same as Paragraph 3-1 in PART II.

4-2 Frequency Plan

When FDM/FM system is employed, normal RF channel arrangement recommended in CCIR Rec.387-3 is used, in principle.

However, the microwave network in the City of Alexandria is routed in the extremely narrow belt zone as stated in para.3 above. Furthermore, the individual microwave routes branching from a terminal radio station, e.g., Moharam Bey Exchange or Auto Exchange, hold the branchig angles ranging from 30° to 95°.

Differing from PCM digital microwave network, FDM/FM system required the much better receiver input signal to interference input. However, because of the small branching angles mentioned above, the antenna directivity alone cannot suppress the interference sufficiently. Therefore, in a part of the network, or, more precisely, in Moharam Bey - Ibrahimya, Moharam Bey - Sidi Gaber, Auto - Manshia and Auto - Agami sections, slot RF channel arrangement must be used to avoid interference. Frequencies in slot RF channel arrangement are shifted by 20 MHz from the frequencies in normal RF channel arrangement.

Figure II-10 illustrates RF channel arrangement for FDM/FM analog microwave network. This RF channel arrangement can accommodate 12 RF channels in principle, each of which can carry 1,200 telephone channels.

4-3 Transmission Capacity

4-3-1 Number of Required Channels

Same as Paragraph 3-3-1 in PART II.

4-3-2 Interconnection at Each Station

Same as Paragraph 3-3-2 in PART II.

4-3-3 FDM Hierarchy Selection

FDM/FM system can transmit 1,200 telephone channels per RF channel. And the 1,200-channel FDM signal consists of four Master Groups (each for 300 channels).

One Master Group consists of five Super Groups. One Super Group consists of five Groups. One Group consists of 12 telephone channels.

4-3-4 Number of RF Channels

The number of required RF channels determined by considering the conditions presented in the preceding Paragraphs 4-3-1, 4-3-2 and 4-3-3 is given in Figure II-11.

4-4 Status of Radio Propagation Path and Required Antenna and Tower

4-4-1 Visibility

Same as Paragraph 3-4-1 in PART II.

4-4-2 Antenna and Tower Required

The antenna height and tower height have been determined in consideration of the status of each propagation path.

The parabolic antenna size (diameter) has been determined so as to satisfy the outage objective against 47,500 pW noise as recommeded in CCIR Rec.395, by estimating interferences of all kinds, distortion noise and thermal noise.

The antenna size differs from that in PCM network at the following locations:

Location (Direction)	PCM Network	FDM/FM network
Ibrahimya (to Moharam Bey)	1.2 mø	1.8 mø
Sidi Gaber (")	1.2 mø	1.8 mø

Also to be noted is that three radio sections, i.e., Auto - Moharam Bey, Ibrahimya - Moharam Bey and Moharam Bey - Glym require additional antennas to accomodate more than six RF channels as shown in Figure II-12.

4-5 Composition of Microwave Link

A typycal composition of FDM/FM analog microwave link appears in Figure II-13.

This microwave link is composed of the conventional type equipment, so that there will be no need for particular comment.

What requires attention is that when more than six RF channels are accommodated, one additional antenna is needed, as stated previously. Therefore, considering the wind pressure and load increment by such additional antenna, the cost of tower on which to mount the antennas, including the additional antenna, necessarily increases.

4-6 Transmission Quality

For FDM/FM circuit of less than 250 km in length, the objective for hourly mean total noise power is 1,000 pWp at average, 2,000 pWp at highest, according to CCITT Rec.G 123, regardless of the circuit length.

This objective noise power includes the noise that is generated by carrier terminal equipment.

On the other hand, with regard to outage due to multipath fading or rainfall, the system design was made so as to meet the objective specified in CCIR Rec.395. Free space signal-to-noise ratio and outage calculated for each radio link of FDM/FM network appear in Table II-12, and hourly mean noise power and outage calculated about typical three radio sections are shown below. Paranthesized is the objective.

Section	Hourly Mean Noise Power	Outage at 47,500 pWp
Agami - Moharam Bey	1161 pWp	2.17×10^{-5}%
	(2,000 pWp)	(1.12×10^{-2}%)
Agami - Abu Qir	1716 pWp	6.68×10^{-5}%
	(2,000 pWp)	(1.12×10^{-2}%)
Abu Qir -Moharam Bey	1161 pWp	3.6×10^{-5}%
	(2,000 pWp)	(1.12×10^{-2}%)

Note: Figures show the weighted values.

4-7 Power Supply

Same as Paragraph 3-7 in PART II except the power requirements as under.

Power Requirements

The required DC and Ac power plant capacities for each station are assumed roughly as follows:

Station	Type of Equipment	-24V.DC Watt	AC kVA
Agami	Radio	710	10.6
	Mux	1,370	
El Max	Radio	1,950	25.8
	Mux	3,500	
Manshia	Radio	1,830	27.9
	Mux	5,480	
Auto	Radio	6,190	76.0
	Mux	14,269	
Moharam Bey	Radio	9,240	95.7
	Mux	19,030	
Ibrahimya	Radio	2,050	31.3
	Mux	7,300	
Sidi Gaber	Radio	1,640	32.0
	Mux	4,946	
Glym	Radio	3,870	74.9
	Mux	10,450	
Sidi Bishr	Radio	1,990	29.6
	Mux	3,975	

Station	Type of Equipment	-24V.DC Watt	AC kVA
Abu Qir	Radio	710	9.2
	Mux	790	

Note: The above AC power is to include that for room and equipment lighting and AC outlet for test equipment, etc.

4-8 Technical Standard of Telecommunication Facilities

Technical standards of the assumed main equipments that constituted FDM/FM analog microwave network are listed below.

4-8-1 11 GHz FDM/FM Radio Transmitter and Receiver

(1) Component: Fully solid state
(2) Frequency band: 10.7 - 11.7 GHz
(3) Transmission capacity: 1,200 ch/RF ch
(4) Repeating system: Baseband repeating system
(5) Modulation system: FDM/FM
(6) Transmission output: 28 dBm
(7) Noise figure: 7.5 dB
(8) Maximum frequency deviation: 100 KHz rms/ch
(9) Preemphasis: CCIR 8 dB
(10) Highest modulation frequency: 5,564 KHz
(8.5 MHz pilot)
(11) Occupied frequency band: 7,000 KHz
(12) IF bandwidth: $\pm$ 17.5 MHz
(13) Receiver input:
Standard: -24.5 dBm
Maximum limit: -18.5 dBm
(14) Squelch opeartion level: -81 dBm

4-8-2 Radio System Switching Equipment

The radio system switching equipment shall be capable of switching between protection RF channel and one of working RF channels upon radio signal fading, upon equipment failure or upon restoration to normal conditon according to CCIR Rec.444-2.

4-8-3 Provision of Service Channels

Suitable equipment is to be provided for service channels according to CCIR Rec.400-2.

The service channels include:

- Omnibus orderwire channel between any two stations in the network
- Express orderwire channel between Moharam Bey and Auto
- Supervisory channel to supervise the equipment conditions in unattended station
- Control channel to control the system switching operation

5. Building and Antenna Tower

5-1 General Requirements

The present Project is to interconnect the main local telephone exchanges in Alexandria by the PCM digital microwave network. Therefore, the installation of required radio equipment and multiplex equipment in those exchanges must be planned taking into account the presence of other communication equipments and associated facilities which are already installed or scheduled to be installed, no matter whether the exchanges are existing or to be newly estabished.

As a matter of fact, the new installation, expansion or replacement of the switching equipment is to be carried out in each exchange by other projects, so that these projects must be duly considered in the aforementioned installation or radio equipment and multiplex equipment.

Such is also the case with the installation of power supply equipment and air-conditioning equipment.

Rooms or floor space for installation of radio equipment, multiplex equipment and associated facilities which are required for implementation of the present Project, as well as the antenna tower foundations, are to be provided by ARENTO.

In the following Paragraphs 5-2 through 5-4 are described the study items concerning the basic requirements and the proposals in regard to the project implementation.

5-2 Stations to be Studied and Planned, and Basic Principles of Planning

5-2-1 Stations to be Studied and Planned

See the stations for the present Project will be housed in exchange buildings already existing or newly planned.

Number of the exchanges to be studied or the stations to be planned was originally 12 from Abu Qir at-the-eastern end of the city to Hanoville at the western end. However, the number has been reduced to 10. (For the names of these 10 exchanges, see Paragraphs 5-3 and 5-4.) The reasons are as follows:

1) For Chatby Exchange, there is no concrete plan whatsoever at present. The plan will be made, if at all, in the future.

2) Bianqi and Hanoville are small exchanges. Both the buildings and site premises leave no surplus for exchange expansion. Furthermore, these two exchanges are to be consolidated into one exchange, called Agami, which will be established in a new building at a different site in the near future.

5-2-2 Basic Principles for Installation of Radio Equipment and Multiplex Equipment

There is no exchange where the room or floor space for installation of radio equipment and multiplex equipment by the present Project has been determined. For the necessary building plan for installation of communication equipment, such as switching equipment, and associated facilities by other new projects also, any concrete information could not be obtained from ARENTO at the present stage.

Therefore, the proposals relating to such equipment installation have been formulated by the following guidelines, in principle:

1) In the case of exchanges, whose buildings are scheduled to be newly constructed or whose existing buildings are to be expanded, the equipment installation will be executed in the newly constructed or expanded buildings.

2) In the case of exchanges, whose existing buildings seem, at present, to have adequate floor space for new equipment installation, such equipment installation will be carried out in the existng buildings.

3) In the case of exchanges, whose exisiting buildings leave no floor space for further equipment installation, the existing buildings will be expanded so that the required new equipment can be installed in the expanded buildings.

5-2-3 Basic Principles of Antenna Tower Planning

The antenna tower height and the size and mounting height of parabolic antenna are to be determined, based on the draft plan for PCM digital microwave network (see Paragraph 3-4). Other basic principles are as follows:

1) For the exchanges without the existing antenna towers, the towers are to be newly erected.

2) For the existing towers or the towers under construction, the height, load requirements and so forth are to be examined. The towers that meet the requirements as presently specified are to be utilized in the present Project. If such requirements fail to be satisfied, new towers are to be constructed.

5-3 Existing Conditions

5-3-1 General Comment

Out of ten exchanges in which the newly planned stations will be housed, three (Moharam Bey, El Max and Agami) are the 100% newly planned exchanges and two (Abu Qir and Glym) are the exchanges to have the separate buildings newly constructed.

Another two (Ibrahimya and Auto) are the old exchanges originating as far back as 1930s into 1940s and three (Sidi Bishr, Sidi Gaber and Manshia) are the exchanges built during 1960s into 1970s.

In all exchange buildings the switching equipment will be newly installed or expanded or replaced by separate projects. Although this is bound to exert an influence on building arrangements, the concrete building plan has not yet been formulated. Hence, it was impossible to make the fact-finding study of the buildings in consideration of the prospective building line-up.

With respect to each exchange site location in the City of Alexandria, as well as the environmental condition, reference should be made to Annex 2. (Site Information)

5-3-2 Abu Qir Station

(1) Building

The exchange occupies the part of reinforced concrete built, single storied Post Office (floor space: approx. 340 m^2) completed in 1963.

Radio equipment and multiplex equipment are installed together in an approximately 7 m^2 small room. The room leaves no space for additional equipment installation.
A new exchange building is scheduled to be constructed on the adjoining land.

(2) Tower

The tower is an independent tower on the ground (shape: square). The height is 27 m. One parabolic antenna, 1.2 m in diameter, is mounted (height of mounting: 25 m).

(3) Site, etc.

The site of the scheduled new exchange building adjoins the existing building site on the backside. The new site has an area of approximately 50 m x 80 m.

5-3-3 Sidi Bishr Station.

(1) Building

The exchange building is the newest and one of the largest exchange building in the City of Alexandria. The completion was in 1975.

The building is of reinforced concrete structure. The office section is composed of seven stories which the equipment room section consists of four stories. Over these two sections is the pent house employed as the guest house.

The topmost story of the equipment room is completely vacant. At present, the radio equipment and multiplex equipment are installed in approximately 3.5 m x 10 m space of the second story from top of the equipment room. The existing switching equipment occupies the adjoining space so that the space available for further equipment installation is not very large.

(2) Tower

A 7 m high, 2 m square tower exists on the roof top. This tower was erected in 1980 separately from the building. The reinforced concrete foundation lies on the columns of the floor below. One parabolic antenna is mounted on the tower. (Height of mounting: 5 m) The antenna diameter is 1.2 m.

(3) Site, etc.

The front (western side) and the northern side of the building face the road. Along the boundary on the eastern side is the two-storied annex. Between this annex and the main building exists an approximately 14 m wide and approximately 35 m long courtyard. Nowhere else than this courtyard can be found the land space for erecting a tower.

5-3-4 Glym Station

The existing Glym Exchange was constructed in 1939. The site for a new exchange building (hereafter called New Glym Exchange) is procured at a location approx. 100 m distant from the existing. A part of construction is already underway at this site.

(1) Building

The existing building is a two-storied building of reinforced concrete and masonry structure. Part of the building is the pent house (now used as the guest house). No surplus floor space for equipment expansion is available.

(2) Tower

The existing building has no tower. At the New Glym site, a self support tower with a height of 71.5 m above ground is under construction (as of the time of field survey). (This tower is 10 m square at the foot and 2.4 m square at the top.)

(3) Site, etc.

The existing building occupies the site almost to the limit. Even if the annex at the backside is removed, the land space in the site is not sufficient for the construction of new structures.

5-3-5 Sidi Gaber Station

(1) Building

The building was completed in 1965. The topmost story of the equipment room wing was expanded afterward. The building is of reinforced concrete structure. Office section is composed of five stories and the equipment room section consists of three stories. The pent house occupies a small part of the building.

The equipment room as presently arranged leaves surplus floor space. Radio and multiplex equipments are installed in the approximately 7 m x 10.5 m partitioned corner of the equipment room of the top story.

(2) Tower

The existing roof-top tower is 7 m in height (2 m square at the foot). This tower erected in 1980 is located at the northern end of the roof. The reinforced concrete continuous foundations are located just on the top of two rows of columns and beams of and over the center passage of the equipment room. One parabolic antenna, 1.2 m in diameter is mounted on the tower (height of mounting: 5 m).

(3) Site, etc.

The site is surrounded by the road on all sides. Surplus land space for building extension and construction of new structures is not available.

5-3-6 Ibrahimya Station

(1) Building

The building is old, having been constructed in 1940.

Part of the equipment room was expanded in the format half of 1970s.

The two-storied building is of reinforced concrete and masonry structure, with a penthouse which is now used as office.

Radio equipment and multiplex equipment are not installed at present.

(2) Tower

No tower exists at present.

(3) Site, etc.

The site is an extremely small, i.e., approximately 30 m by 30 m, land, and abuts on the road on two sides. Two small, single storied annexes are in the back part. Even if those annexes are removed, surplus land space available is not large than 6 m x 18 m or thereabouts including the footpath.

This limited land space is the sole space that can be utilized either for equipment room extension or for tower construction.

5-3-7 Manshia Station

(1) Building

Manshia Exchange, which was constructed in 1968, is a relatively new exchange in the City of Alexandria. The building is of reinforced concrete structure. The office section is composed of 10 stories, with the setback penthouse (which is used as the guest house). The equipment room section consists of five stories.

The building as a whole is shaped like the deformed square, with a light court in the center. The bottom of the light court constitutes the roof of the ground floor (semi-underground). The overall dimension of the building is approximately 53 m x 40 m x 35 m.

The equipment room as presently arranged leaves considerable surplus space. Out of the radio and multiplex equipments to Auto and Bianqi Exchanges, the radio equipment is installed in the slightly bent figured room of approximately 3.2 m x 5.8 m rebuilt from the ex-kitchen and corridor section of the penthouse, and the multiplex equipment is installed inside the simple partitions (height: 2.2 m) provided at the end side of the switching equipment room (where no equipment is installed at present) on the second story from top of the equipment room section. This partitioned space is approximately 7 m x 6 m large.

The effective height under beam of the equipment room is 5.5 m. The standard column spacing is 10.5 m x 3.6 m. The full width of the room is 14 m.

In part of the office wing section also, some radio communication equipment is working.

(2) Tower

On the penthouse roof exists the 12 m high tower (2.3 m square at the foot and 2 m square at the top) erected in 1980. On this tower are mounted two parabolic antennas (each, 1.2 m in diameter; height of mounting: 10 m). The foundation is of reinforced concrete and large scale steel sections.

Also on the roof are a pole made of steel pipe (erected on the external wall of the penthouse) with one small parabolic antenna mounted, four guyed poles for antenna, and so forth.

(3) Site, etc.

The site is located at the center of business quarters and is surrounded on all sides by narrow roads and a small square. The building occupies the site to the limit. No surplus space for building extension is available.

Manshia Exchange, along with Auto Exchange, houses the administrative organs of ARENTO in Alexandria, so that it contains many office rooms.

5-3-8 Auto Station

(1) Building

Auto Exchange, built in 1935, is the oldest exchange in Alexandria. One half of the building, i.e., the front side facing the plaza, was expanded afterward with a small courtyard behind. The three storied building is of reinforced concrete and masonry structure. In part of the roof of expanded portion is the penthouse which is used for offices and other purposes.

Radio and multiplex equipments are installed to full capacity of a top floor room (approximately 6 m x 7.3 m) that faces the backyard.

(2) Tower

A 72 m high above ground level, self-support tower is erected in the rear of the building. Four 3.3 mø, one 2.0 mø, one 1.8 mø and one 1.2 mø parabolic antennas, totaling seven are mounted at present on this tower.

(3) Site, etc.

The site is irregularly shaped, surrounded by roads on all sides. Between the main and annexes lies a considerably large vacant land. The tower occupies part of this land.

5-3-9 Moharam Bey Station

Moharam Bey is a newly planned exchange and will be the center of the network. Neither the building nor the tower exists.

5-3-10 El Max Station

El Max is an exchange scheduled to be newly established. Neither of building and tower exists. The site is decided. A land, 50 m in width and 100 m in depth, facing the highway (El Max Road) has already been procured for the site.

5-3-11 Agami Station

Agami is a scheduled new exchange consolidating the existing Bianqi and Hanoville Exchanges. The building does not exist yet. Nor does the tower.

For the site, the corner land formed by the highway and the seaward access road to Hanoville Exchange is the most possible selection. The size and the bearing capacity of soil are considered to be nearly the same as in the case of the El Max Exchange site.

5-4 Proposals and Basic Requirements Pertaining to Planning

5-4-1 General Comment

Proposals and basic requirements pertaining to the exchange building to house the equipment and antenna tower planning are mainly about the following two points;

(1) The room or floor space for installation of radio and multiplex equipment requisite for implementation of the Project as presently planned. (This room or floor space will hereafter be referred to as the radio and multiplex equipment room.)

(2) The tower on which to mount the parabolic antenna for radio equipments as requisite for implementation of the Project as presently planned. (This tower will hereafter be referred to as the tower.)

The basic principle of proposals pertaining to the planning are described in Paragraph 5-2. Other basic requirements are as follows:

1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room in the existing and newly planned exchanges is to be provided by ARENTO. In this case, full coordination is required to the arrangement plan for rooms to install other communication equipments and associated facilities.

In this proposal, it is possible to install radio and multiplex equipments in the existing exchange buildings other than those scheduled to be expanded, except Ibrahimya. This holds true, judging from the status quo as indicated in the foregoing description. Therefore, if the radio and multiplex equipment room, the requisite for implementation of this Project, cannot be provided due to the progress of another project or the like, the existing plan must be reconsidered and modified or the building expansion must be carried out.

The room where to install radio equipment should preferably be located as near the tower as possible, i.e., at the topmost story of the building, so that the waveguide length can be reduced to the possible minimum.

The typical equipment layout for each station and required floor space are presented in ANNEX-5.

2) Tower

For the tower to be newly erected, the self-support on ground tower is proposed for both the exchange newly planned or to be expanded and the existing exchange. The reason is that for the former the building plan details could not be known during the field survey and for the latter the influence of tower on the building has to be considered. However, for Ibrahimya and Manshia where surplus land space for tower erection is not available, the roof-top tower is proposed.

The proposed tower height and the size and number of parabolic antenna to be mounted, as well as the height of antenna mounting, appear in Figs. II-7 and II-12.

3) Other

Required AC power for communication facilities to be established in this Project is to be provided by ARENTO. The room or floor space for installation of rectifiers and batteries provided by the Contractor is available in both the existing exchanges and the exchanges to be newly built or expanded.

5-4-2 Abu Qir Station

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room is to be provided in the exchange building to be newly constructed.

(2) Tower

The existing tower is to be used, the height of 1.8 m diameter antenna mounting is to be not more than 20 m.

5-4-3 Sidi Bishr Station

(1) Radio and Multiplex Equipment Room

The vacant floor space in the existing equipment room is to be used for installing radio and multiplex equipments.

(2) Tower

An self-support tower of 60 m height above ground is to be newly erected. (The altitude mean above sea level (AMSL) of the location for tower erection is assumed to be 5 m.)

An appropriate position in the courtyard located between the main building and annex is to be used for tower erection. The tower should preferably be nearest to the radio equipment room.

Note: Tower erection on the main building roof is believed to be inadvisable. The height of roof-top tower will be 38 m as the height of main roof is 22 m. Erection of tower of such height on roof will cause structural difficulties in the installation of foundation, and also will have ill effect on building structure.

5-4-4 Glym Station

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipments are to be installed in the exchange building to be newly constructed.

(2) Tower

The tower under construction (height: 70 m; height above ground inclusive of the foundation: 71.5 m) at the time of field survey, i.e., in April 1981, is to be used.

Note: The design drawing for this tower shown by ARENTO (Opera, Cairo) indicated seven parabolic antennas to be borne to communicate with Sidi Gabir, Ibrahimya, Manshiya and Sidi Bisra (all literally quoted from the drawing) Exchanges. (The seven parabolic antennas comprise two with 12 ft. diameter, two with 6 ft. diameter and three with 4 ft. diameter.) the assumption is that when the local telephone network of Alexandria with Moharam Bey as the center is

completed by the present Project, many of the parabolic antennas referred to above would become unnecessary, and accordingly mounting of antennas required by the present project on the New Glym Exchange tower is possible. However, the confirmation in this respect is to be made at the time the working plan is formulated.

5-4-5 Sidi Gaber Station

(1) Radio and Multiplex Equipment Room

The vacant floor space in the equipment room of the existing exchange building is to be used for installing radio and multiplex equipments.

(2) Tower

The existing roof-top tower is to be used.

5-4-6 Ibrahimya Station

(1) Radio and Multiplex Equipment Room

Small single storied annexes in the back of the site are to be completely removed and the land space thus obtained is to be used for main building expansion. Radio and multiplex equipments are to be installed in such expanded portion.

However, even if all annexes are removed, the land space thus available is limited to approximately 6 m x 18 m inclusive of the space now used as pathway. The expanded portion is to be constructed by means of maximum utilization of such land space. In this connection, the following basic plan may be proposed:

1) The expanded portion is to be a three storied building of reinforced concrete structure, separated structurally from the existing building. The construction is to be so designed that part of columns (four at a minimum, and three, depending upon the type of tower) will form the tower foundation as described in Paragraph (2).

2) The ground floor is to contain the passage and the power room. The first floor is to have the multiplex equipment room and the second floor the radio equipment room.

3) If the floor height of ground floor remains the same as in the existing building (i.e., approximately 4.7 m) and the first and second floors are to have the same floor height as that of ground floor the building height to the roof top measures nearly 14.1 m. This is practically equal to the height of the existing penthouse.

(2) Tower

The tower, approximately 40 m in height above ground, is to be built on the roof of the expanded portion described in Paragraph (1). If the anchor bolts are fixed to the upper end of the columns mentioned in Paragraph (1) - 1) and, by such anchor bolts, the base plate is mounted at a point 90 cm from the roof-top slab, the tower height becomes 40 - (14.1 +0.9) = 25 m

5-4-7 Manshia Station

(1) Radio and Multiplex Equipment Room

The vacant floor space in the equipment room of the existing exchange building is to be used for installing radio and multiplex equipments.

(2) Tower

A new tower is to be erected on rooftop of either guest house or equipment room section. Height of the tower is 7 m in either case. Location of tower shall be so selected that any construction on rooftop (existing tower, antenna poles, water reservoir, etc.) will not be an obstacle to the microwave path.

Accurate location and structure of foundations of the tower are to be designed carefully not to have ill effect on building structure after detailed investigation of existing building structure.

5-4-8 Auto Station

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room is to be provided in the existing exchange building. For this room, the re-use of the office, etc., that adjoins the existing radio equipment room is preferable, considering the locational relationship to the tower.

(2) Tower

The existing tower is to be used.

5-4-9 Moharam Bey Exchange

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room is to be provided in the newly planned exchange building.

(2) Tower

A self-support tower of 92 m height above ground is to be newly erected. (The altitude mean above sea level (AMSL) of the location for tower erection is assumed to be 2 m.) At the scheduled site of tower erection, the soil condition is considered to be not good so that the pile or pier foundations of some 20 m in depth will be necessary.

5-4-10 El Max Exchange

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room is to be provided in the newly planned exchange building.

(2) Tower

A self-support tower of 50 m height above ground is to be newly erected. (The altitude mean above sea level (AMSL) of the location for tower erection is assumed to be 3 m.)

5-4-11 Agami Exchange

(1) Radio and Multiplex Equipment Room

The radio and multiplex equipment room is to be provided in the newly planned exchange building.

(2) Tower

A self-support tower of 50 m height above ground is to be newly erected. (The altitude mean above sea level (AMSL) of the location for tower erection is assumed to be 5 m.)

TABLE II-1 TELEPHONE DEMAND FORECAST (ALEXANDRIA ZONE)

YEAR	1972	1974	1976	1978	1980	1981	1982	1983	1984	1985	1989	1999
1. G.D.P												
WHOLE C.	8 762	10 762	16 092	16 895	17 698	18 851	20 285	21 406	22 821	24 076	29 717	51 384
ALEX	1 420	1 744	2 607	2 737	2 867	3 054	3 254	3468	3 697	3 901	4 784	8 069
(MILLION US$)												
2. POPULATION												
WHOLE C.	34.84	36.42	37.87	38.62	39.36	40.07	40.79	41.53	42.28	42.91	45.99	53.64
ALEX.	2.21	2.31	2.40	2.45	2.50	2.54	2.59	2.63	2.68	2.72	2.90	3.38
(MILLION)												
3. GDP per CAPITA												
WHOLE C.	252	296	425	438	450	470	497	515	540	561	646	958
ALEX.	643	755	1 086	1 117	1 149	1 202	1.258	1 317	1 379	1 434	1 651	2 387
(US $)												
4. DEMAND					175 338	190 700	207 468	225 626	245 785	267 745	338 747	691 265
FORECAST												
~~TELEPHONE~~ DENSITY					7.01	7.51	8.01	8.58	9.17	9.84	11.68	20.45
Per 100 POP												

TABLE II-2 DEMAND DISTRIBUTION FOR EACH EXCHANGE

EXCHANGE \ YEAR	1982	1983	1984	1985	1989	1994	1999
AUTO (ALEX I/II)	27418	31039	34965	38089	41208	73238	123279
MANSHIA	24274	26398	29003	31594	40988	60268	85717
IB RA HIMYA	34025	37229	40800	44445	57926	85056	120971
GLYM	41286	44223	47682	51942	62668	85542	121663
SIDI GABER	26556	27978	29494	32129	36923	48603	69127
KAFR EL DAWAR	1867	2031	2212	2410	3387	4860	6913
HANOVILLE (AGAMI)	830	903	983	1071	1694	2430	3456
EL AGAMI	1660	1885	1966	2142	3049	4374	6211
ABU QIR (AGAMI)	1245	1354	1720	1874	2371	3402	4839
EL MAX	7400	8700	10000	12010	14100	18250	20000
SIDI BISHR	13070	14440	15730	17735	22357	33050	47006
MOHARAM BEY	26800	28400	30000	32100	51000	65500	80000
EL GABARI	415	451	492	536	677	972	1383
POLICE BUILD	207	226	246	268	399	486	691
TOTAL	207468	225626	245785	267745	338747	486033	691265

TABLE II-3 TELEPHONE EXPANSION PLAN IN ALEXANDRIA (BY 1984)

EXCHANGE NAME	EXISTING LINES	EXPANSION(BY1984)	TOTAL	NOTE
AUTO	(ROTARY) 20 000 (ROTARY IS TO BE REPLACED BY ESS)	(ESS) 30 000	(ESS) 30 000	
IBRAHIMYA	(ROTARY) 10 000 (SAME AS ABOVE)	(ESS) 20 000	(ESS) 20 000	
GLYM	(ROTARY) 10 000 (SAME AS ABOVE)	(ESS) 25 000	(ESS) 25 000	
MANSHIA	(XB) 10 000	(ESS) 20 000	30 000	(XB) 10000 (ESS) 20000
SIDI GABER	(XB) 10 000 (ESS) 11 000 (INCLUDING REMOTE UNIT)	(XB) 9 000 (ESS) 1 000	31 000	(XB) 19000 (ESS) 12000
SIDI BISHR	(XB) 6 000	(XB) 8 000	(XB) 14 000	
AGAMI (BIANQI & HANOVILLE)	(PABX) 400 (PABX) 400 (PABX'S ARE TO BE REPLACED BY ESS)	(ESS) 4 000	(ESS) 4 000	
ABU QIR	(PABX) 400 (SAME AS ABOVE)	(ESS) 2 000	(ESS) 2 000	
MOHARAM BEY	—	(ESS) 30 000	(ESS) 30 000	
EL MAX	—	(ESS) 15 000	(ESS) 15 000	
TOTAL	78 200	122 800	201 000	

TABLE II-4

TRAFFIC ESTIMATION IN 1989, 1994 & 1999 (IN ERLANG)

TO / FROM	1989 LINE	1989 LOCAL	1989 S/S	1989 TRUNK		1994 LINE	1994 LOCAL	1994 S/S	1994 TRUNK		1999 LINE	1999 LOCAL	1999 S/S	1999 TRUNK	
(AUT) AUTO EX	40000	2400	120	160		73000	4380	219	292		123000	7380	369	492	
(IBR) IBRAHIMYA	58000	3480	174	232		85000	5100	255	340		121000	7260	363	484	
(GLM) GLYM	63000	3780	189	252		86000	5160	258	344		122000	7320	366	488	
(MAN) MANSHIA	41000	2460	123	164		60000	3600	180	240		86000	5160	258	344	
(S.G) SIDI GABER	37000	2220	111	148		49000	2940	147	196		70000	4200	210	280	
(S.B) SIDI BISHR	23000	1380	69	92		33000	1980	99	132		47000	2820	141	188	
(ABQ) ABU QIR	4000	240	12	16		4000	240	12	16		4000	240	12	16	
(AGM) AGAMI	8000	480	24	32		8500	510	26	34		10000	600	30	40	
(MAX) EL MAX	15000	900	45	60		18000	1080	54	72		20000	1200	60	80	
(MHR) MOHARAM BEY	51000	3060	153	204		66000	3960	198	204		80000	4800	240	320	
TOTAL	340000					482500					683000				

Note ; Blacket shows an abbreviation for each station

TABLE II - 5 TRAFFIC DISTRIBUTION IN 1989

TO / FROM	AUTO	IBR	GLM	MAN	S.G	S.B	ABQ	AGM	MAX	MHR		S/S	TRUNK	TOTAL
(AUT) AUTO EX	—	464	504	328	296	184	32	64	120	408		120	160	2680
(IBR) IBRAHIMYA	494	—	777	506	457	284	49	98	185	629		174	232	3885
(GLM) GLYM	546	791	—	559	505	314	52	110	205	696		189	252	4219
(MAN) MANSHIA	329	477	518	—	304	189	33	66	123	420		123	164	2746
(S.G) SIDI GABER	293	425	462	300	—	169	29	58	110	374		111	148	2479
(S.B) SIDI BISHR	174	252	274	178	161	—	17	34	65	222		69	92	1538
(ABQ) ABU QIR	29	41	45	29	25	16	—	6	11	36		12	16	266
(AGM) AGAMI	58	82	90	58	50	32	6	—	22	72		24	32	532
(MAX) EL MAX	111	160	174	114	102	64	11	22	—	141		45	60	1004
(MHR) MOHARAM BEY	424	614	667	434	392	244	42	84	159	—		153	204	3417
TRUNK	240	348	378	246	222	138	24	48	90	306		—	—	2040
TOTAL	2698	3654	3889	2752	2514	1634	295	596	1090	3304		1020	1360	

TABLE II- 6

NO OF CHANNELS REQUIRED IN 1989
(80% PROVISION)

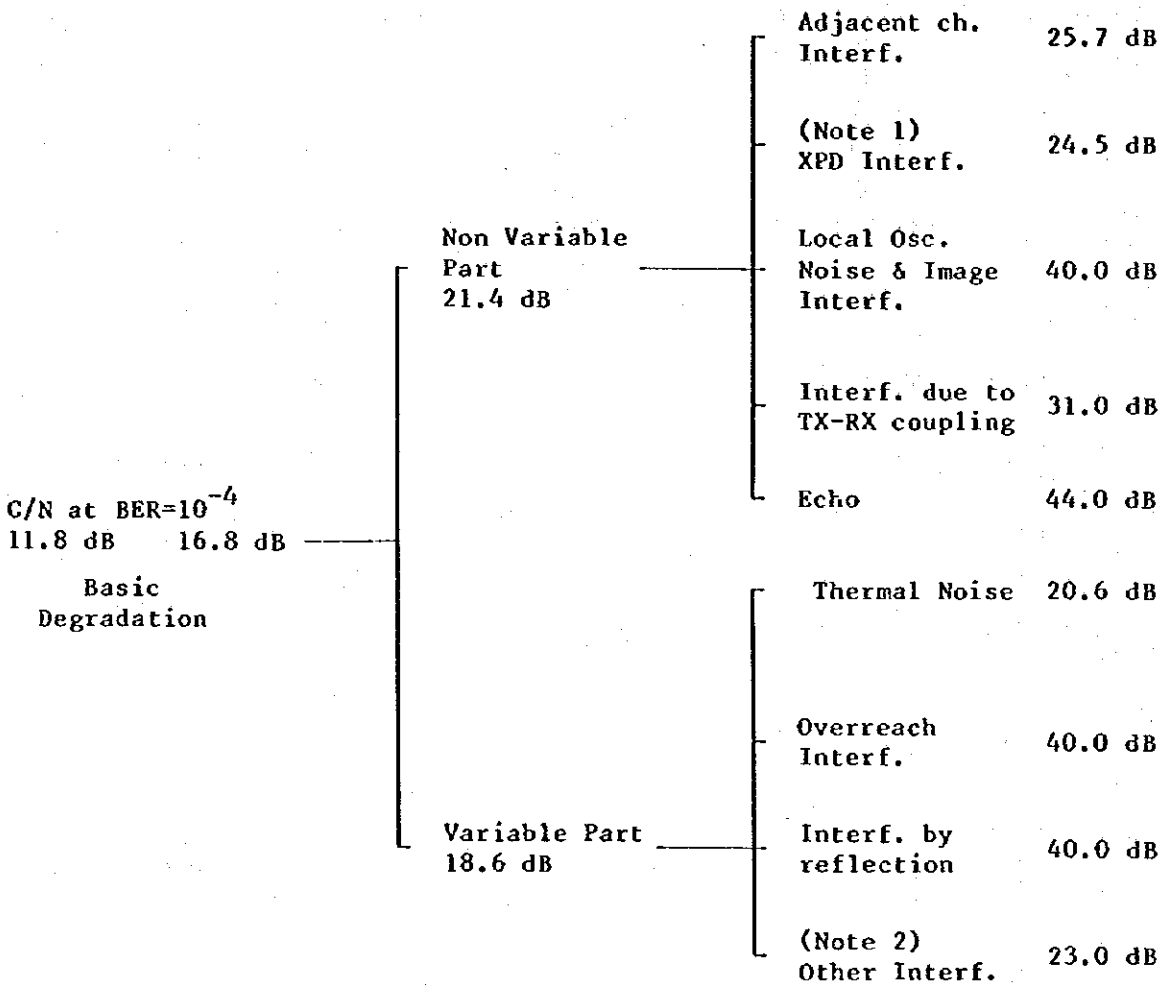
TO / FROM	AUTO	IBR	GLM	MAN	S.G	S.B	ABQ	AGM	MAX	MHR		S/S	TRUNK	TOTAL
(AUT) AUTO EX	–	413	448	291	263	163	35	70	106	362		106	142	2 399
(IBR) IBRAHIMYA	439	—	690	450	406	253	50	101	165	559		154	206	3473
(GLM) GLYM	486	703	—	497	449	279	55	110	182	618		168	224	3 771
(MAN) MANSHIA	293	424	461	—	270	168	36	72	110	374		110	146	2 464
(S.G) SIDI GABER	261	378	410	266	—	150	32	64	98	333		98	131	2 221
(S.B) SIDI BISHR	154	224	243	158	143	—	22	43	64	198		67	87	1 403
(ABQ) ABU QIR	32	43	46	32	30	20	—	13	15	38		16	20	276
(AGM) AGAMI	64	86	93	64	59	40	13	—	30	77		32	40	598
(MAX) EL MAX	98	142	154	102	90	63	15	30	—	126		46	60	926
(MHR) MOHARAM BEY	377	546	593	386	349	217	44	88	142	—		136	182	3 060
TRUNK	214	310	336	218	198	122	28	56	86	272		—	—	1 840
TOTAL	2 418	3 269	3 474	2464	2 257	1 475	330	647	998	2 957		933	1238	

TABLE II-7

NO OF CHANNELS REQUIRED IN 1984
(ACCORDING TO 5 YEARS PLAN)

TO / FROM	AUTO	IBR	GLM	MAN	S.G	S.B	ABQ	AGM	MAX	MHR		S/S	TRUNK	TOTAL
(AUT) AUTO EX	—	158	337	333	254	150	21	56	170	250		103	116	1948
(IBR) IBRAHIMYA	157	—	237	171	181	106	16	34	76	161		66	53	1258
(GLM) GLYM	332	225	—	327	471	345	45	64	147	346		159	138	2599
(MAN) MANSHIA	382	167	335	—	258	149	27	62	165	363		128	161	2197
(S.G) SIDI GABER	307	202	576	309	—	256	34	54	130	311		114	104	2397
(S.B) SIDI BISHR	204	130	487	182	259	—	26	22	65	214		95	112	1796
(ABQ) ABU QIR	20	16	44	33	32	26	—	16	13	20		13	16	249
(AGM) AGAMI	56	34	64	68	56	26	16	—	48	50		28	32	508
(MAX) EL MAX	167	70	136	151	114	60	12	56	—	161		63	66	1056
(MHR) MOHARAM BEY	257	168	362	296	258	151	21	48	156	—		104	116	1937
TRUNK	286	122	309	339	192	192	24	48	145	286		—	—	1943
TOTAL	2168	1292	2887	2209	2075	1461	242	490	1115	2162		873	914	

TABLE II-8 TYPICAL C/N ALLOTMENT FOR
4-PHASE PCM RADIO SYSTEM



Notes:

1. XPD : Cross Polarization Discrimination

2. "Other Interf." includes those from the other PCM links and from the FDM/FM links.

   (Interf. : Interference)

TABLE II-9 Performance Calculation of PCM Microwave Link

Radio Sec. 1 / Item 2	AGM MAX	MAX AUTO	MAN AUTO	AUTO MHR	IBR MHR	S.G MHR	MHR GLM	GLM S.B	S.B ABQ
Length (km)	10.43	5.79	0.93	4.93	1.66	0.86	2.89	4.55	8.53
Free Space Loss (dB)	134.2	129.1	113.2	127.7	118.2	112.5	123.0	127.0	132.4
Ant.1 Diameter (m)	3.3	3.3	1.8	1.8	1.2	1.2	3.3	3.3	3.3
Ant.1 Gain (dB)	49.2	49.2	43.0	43.0	39.5	39.5	49.2	49.2	49.2
Ant.2 Diameter (m)	3.3	1.8	1.8	3.3	3.3	1.8	1.8	1.8	3.3
Ant.2 Gain (dB)	49.2	43.0	43.0	49.2	49.2	43.0	43.0	43.0	43.0
Feeder Length (m) Elliptical	32	25	75	36	108	78	91	36	36
Feeder Length (m) Circular	90	85	0	115	0	0	85	120	68
Feeder Sys. Loss (dB)	12.7	11.6	17.4	13.8	22.3	17.8	21.5	13.9	12.9
Span Loss EQL (dB)	0	-	6.0	-	-	-	-	-	-
Normal Rx Input (dBm)	-21.5	-21.5	-23.6	-22.3	-24.8	-20.8	-25.3	-21.7	-26.1
Fade Margin, M (dB)	44.9	44.9	42.8	44.1	41.6	45.6	41.1	44.5	40.4
Probability of Multipath Fading	2.8×10^{-3}	3.5×10^{-4}	6.1×10^{-7}	1.8×10^{-4}	4.5×10^{-6}	5.3×10^{-7}	2.7×10^{-5}	1.5×10^{-4}	1.5×10^{-3}
Outage due to Fading									
Estimated (Te) (%)	9.1×10^{-8}	1.1×10^{-6}	3.2×10^{-9}	7.0×10^{-7}	3.1×10^{-8}	1.5×10^{-9}	2.1×10^{-7}	5.4×10^{-7}	1.3×10^{-5}
Required (Tp) (%)	2.1×10^{-6}	1.2×10^{-4}	1.9×10^{-5}	1.0×10^{-4}	3.3×10^{-5}	1.7×10^{-5}	5.8×10^{-5}	9.3×10^{-5}	1.7×10^{-4}

Table II - 10 Implementation Time Schedule

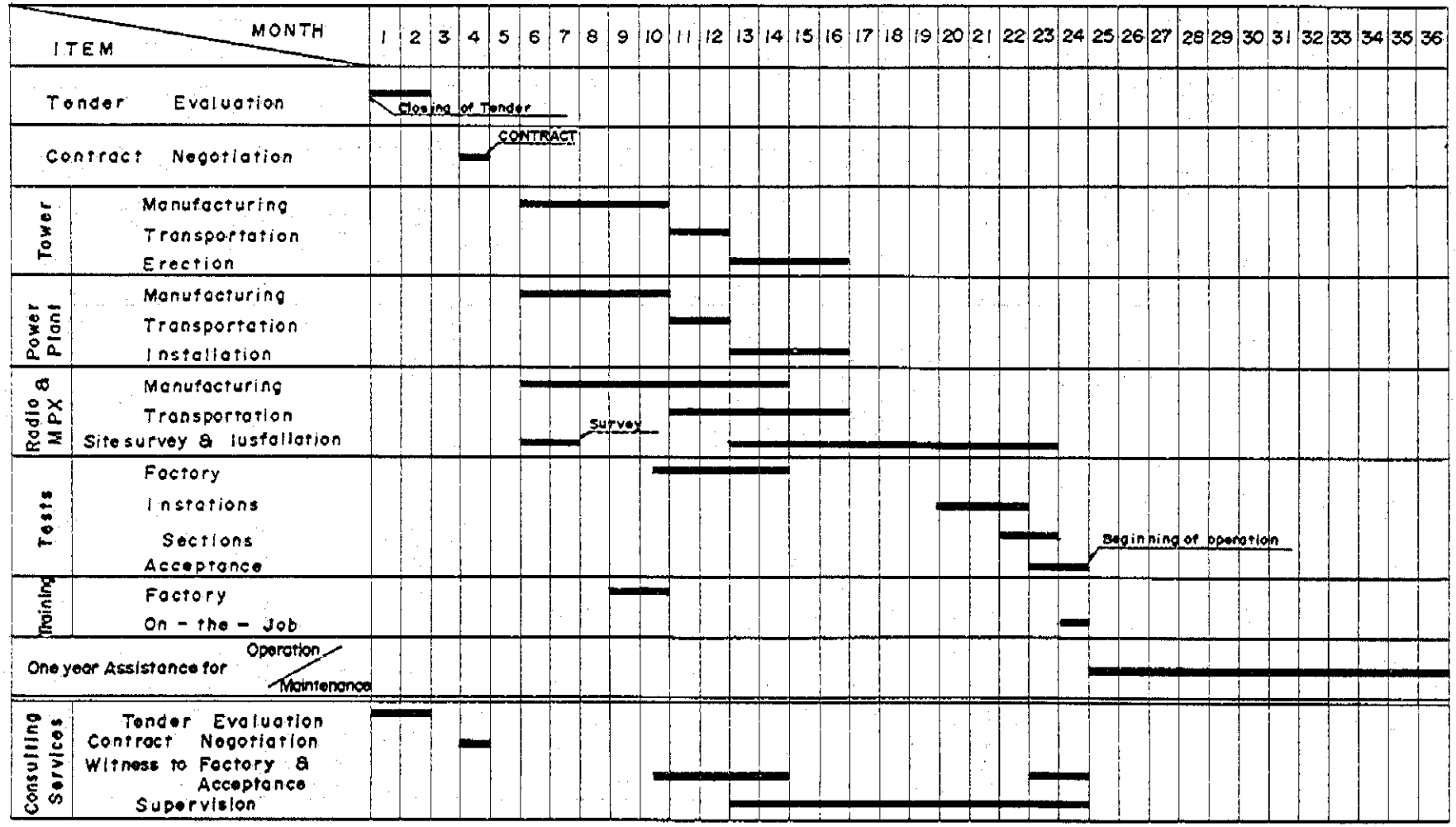


TABLE II-11

PROJECT COST FOR PCM NETWORK

Unit: Million Yen

No.	Item \ Currency	Foreign Currency	Local Currency	TOTAL
1	Radio Equipment	626	-	626
2	Antenna	37	-	37
3	Tower	125	-	125
4	Carrier Equipment	2,529	-	2,529
5	Power Supply Equipment	178	-	178
6	Test Equipment	45	-	45
7	Spare	84	-	84
8	Installation Material	812	-	812
9	Training	28	1	29
10	Operation/Maintenance	45	14	59
11	Installation	698	329	1,027
12	Consulting Services	104	46	150
13	Contingency	525	43	568
14	TOTAL	5,836	433	6,269

TABLE II-12 Performance Calculation of FDM/FM Microwave Link

Radio Sec. 1 / Item 2	AGM MAX	MAX AUTO	MAN AUTO	AUTO MHR	IBR MHR	S.G MHR	MHR GLM	GLM S.B	S.B ABQ
Path Length (km)	10.43	5.79	0.93	4.93	1.66	0.86	2.89	4.55	8.53
Free Space Loss (dB)	134.2	129.1	113.2	127.7	118.2	112.5	123.0	127.0	132.4
Ant.1 Diameter (m)	3.3	3.3	1.8	1.8	1.8	1.8	3.3	3.3	3.3
Ant.1 Gain (dB)	49.2	49.2	43.0	43.0	43.0	43.0	49.2	49.2	49.2
Ant.2 Diameter (m)	3.3	1.8	1.8	3.3	3.3	1.8	1.8	1.8	3.3
Ant.2 Gain (dB)	49.2	43.0	43.0	49.2	49.2	43.0	43.0	43.0	49.2
Feeder Length (m) Elliptical	32	25	75	36	108	78	91	36	51
Feeder Length (m) Circular	90	85	0	115	0	0	85	120	53
Feeder Sys. Loss (dB)	12.7	11.6	17.4	13.8	22.3	17.8	21.5	13.9	14.8
Span Loss EQL (dB)	-	-	6.0	-	3.0	6.0	-	-	-
Normal Rx Input (dBm)	-20.5	-20.5	-22.6	-21.3	-23.3	-22.3	-24.3	-20.7	-20.8
S/N Free Space (dB) Weighted	85.0	85.0	82.9	84.2	82.2	83.2	81.2	84.6	84.8
Fade Margin M (dB)	41.8	41.8	39.7	41.0	39.0	40.0	38.0	41.4	41.6
Probability of Multipath Fading	2.8×10^{-3}	6.1×10^{-7}	3.5×10^{-4}	1.8×10^{-4}	4.5×10^{-6}	5.3×10^{-7}	2.7×10^{-5}	1.5×10^{-4}	1.5×10^{-3}
Outage due to Fading									
Estimated (Te) (%)	1.8×10^{-5}	2.3×10^{-6}	6.5×10^{-9}	1.4×10^{-6}	5.6×10^{-8}	5.3×10^{-9}	4.3×10^{-7}	1.1×10^{-6}	1.0×10^{-5}
Required (Tp) (%)	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}	1.12×10^{-2}

TABLE II-13

PROJECT COST FOR FDM NETWORK

Unit: Million Yen

No.	Item \ Currency	Foreign Currency	Local Currency	TOTAL
1	Radio Equipment	609	-	609
2	Antenna	51	-	51
3	Tower	138	-	138
4	Carrier Equipment	3,540	-	3,540
5	Power Supply Equipment	198	-	198
6	Test Equipment	43	-	43
7	Spare	84	-	84
8	Installation Material	812	-	812
9	Training	28	1	29
10	Operation/Maintenance	45	14	59
11	Installation	698	329	1,027
12	Consulting Services	104	46	150
13	Contingency	548	50	598
14	TOTAL	6,898	440	7,338

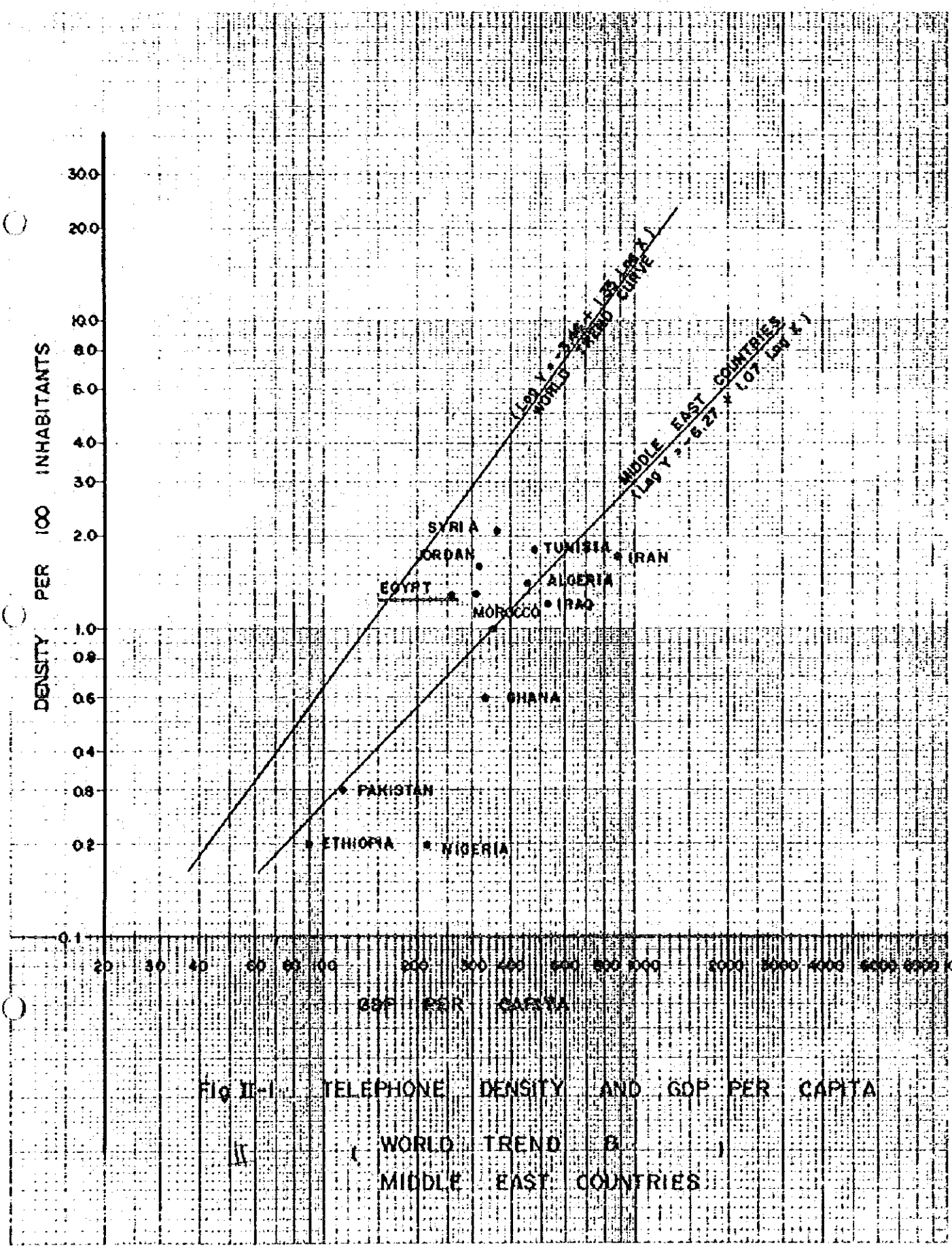


Fig II-1 TELEPHONE DENSITY AND GDP PER CAPITA
(WORLD TREND & MIDDLE EAST COUNTRIES)

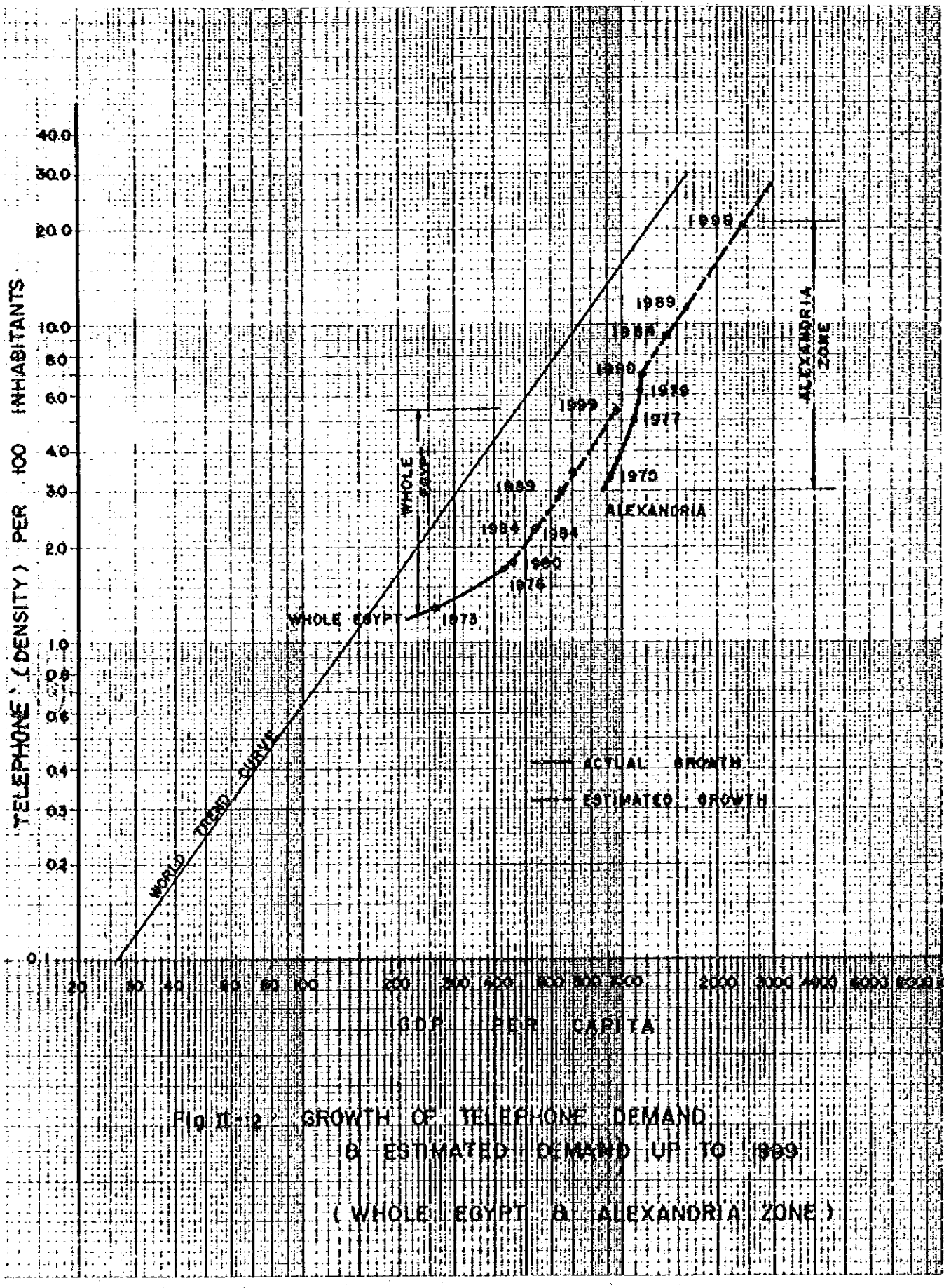


Fig II-2 GROWTH OF TELEPHONE DEMAND & ESTIMATED DEMAND UP TO 1989 (WHOLE EGYPT & ALEXANDRIA ZONE)

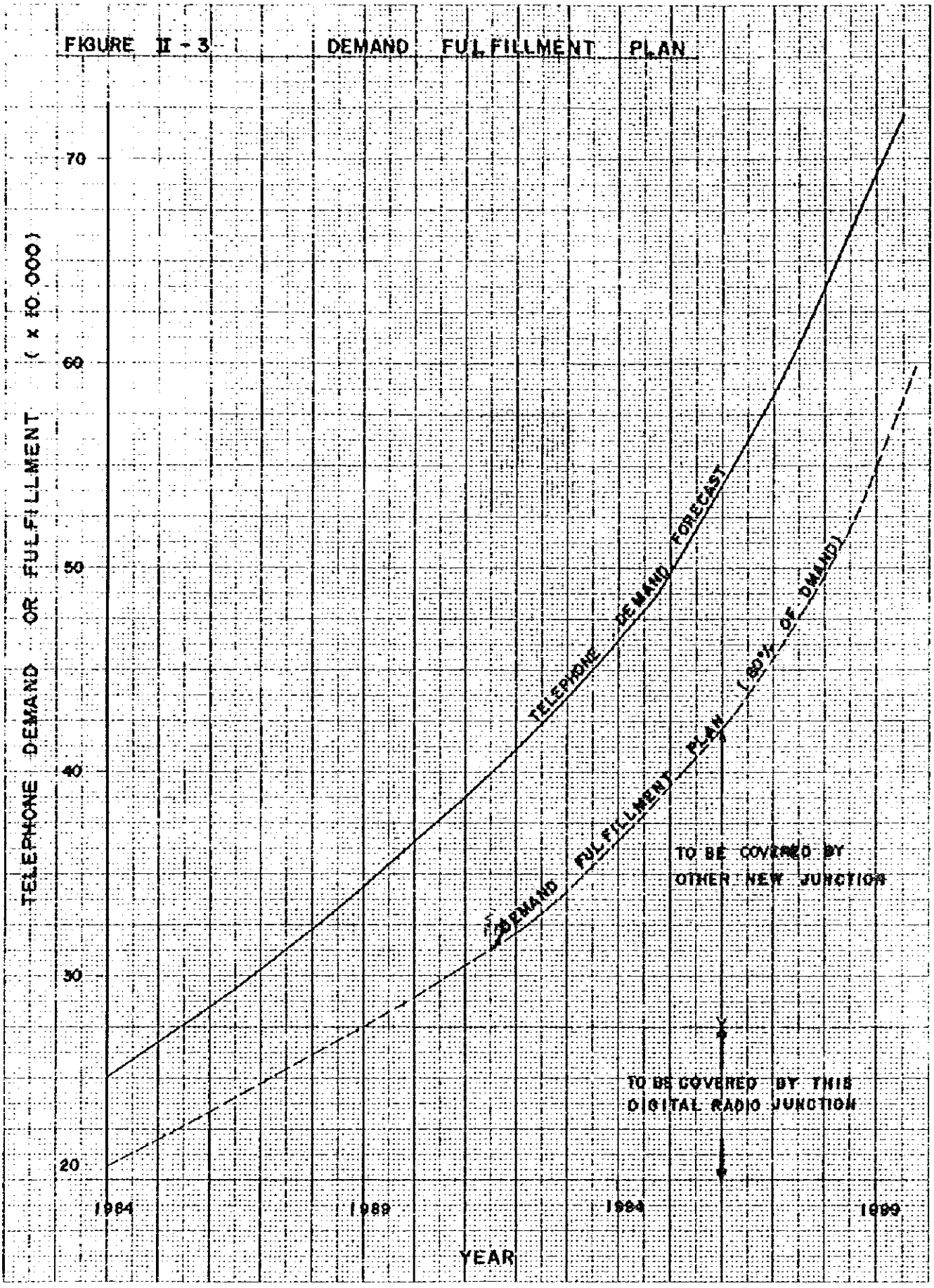


FIGURE II - 3
DEMAND FULFILLMENT PLAN
TELEPHONE DEMAND OR FULFILLMENT (x 10,000)
70
60
50
40
30
20
TELEPHONE DEMAND FORECAST
DEMAND FULFILLMENT PLAN (80% OF DEMAND)
TO BE COVERED BY OTHER NEW JUNCTION
TO BE COVERED BY THIS DIGITAL RADIO JUNCTION
1984
1989
1984
1989
YEAR

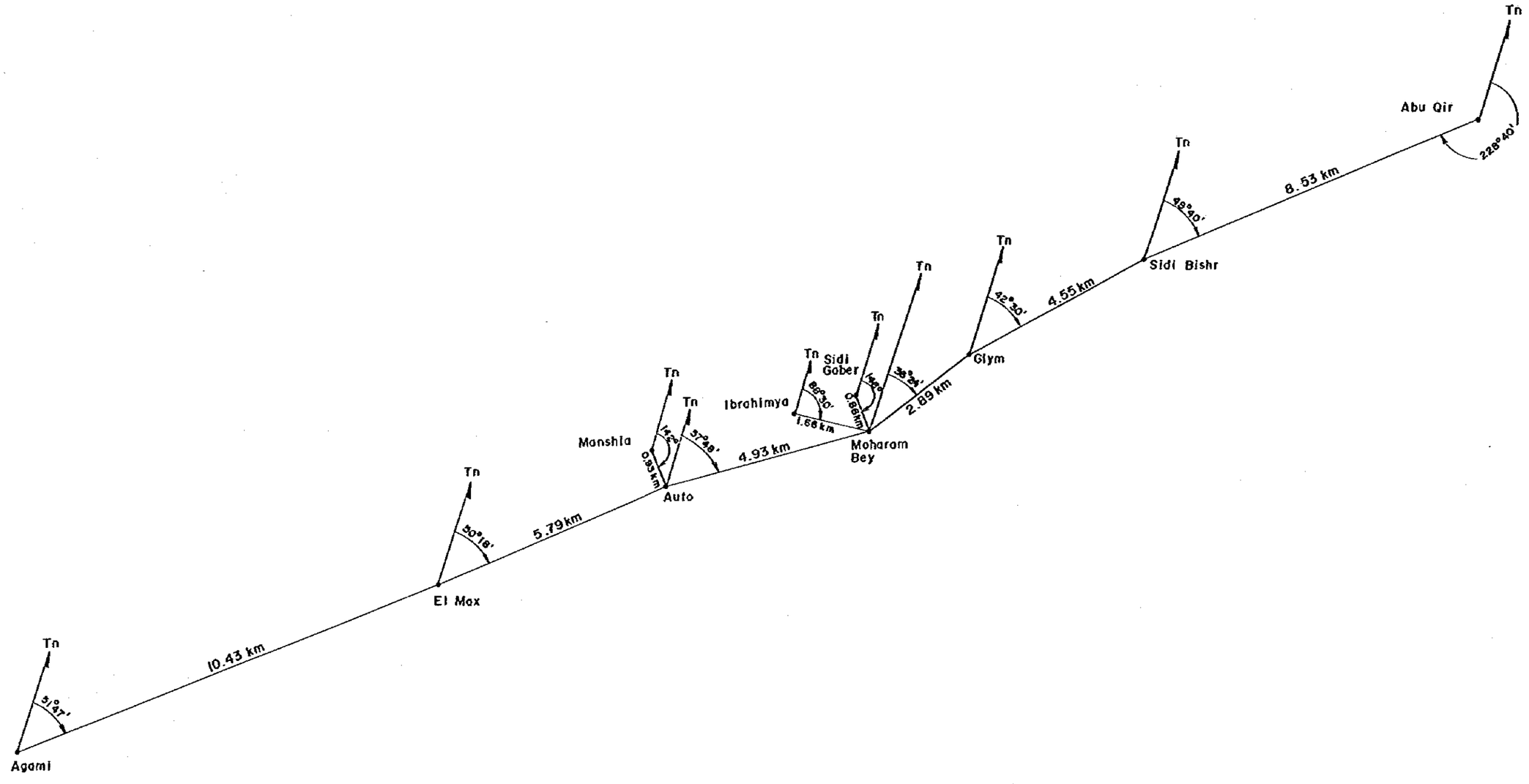
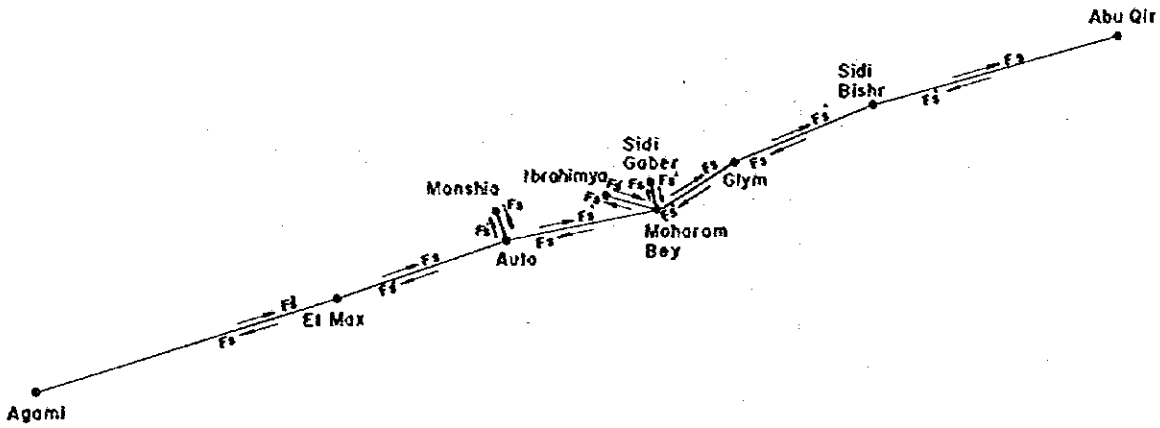


FIGURE II – 4 ROUTE MAP OF MICROWAVE NETWORK IN ALEXANDRIA



RF Channel Arrangement (Slot)

Letter Symbol		Frequency	Polarization
Fs	f 2	10735	V (H)
	f 3	10775	H (V)
	f 4	10815	V (H)
	f 5	10855	H (V)
	f 6	10895	V (H)
	f 7	10935	H (V)
	f 8	10975	V (H)
	f 9	11015	H (V)
	f 10	11055	V (H)
	f 11	11095	H (V)
	f 12	11135	V (H)
F's	f 2'	11265	V (H)
	f 3'	11305	H (V)
	f 4'	11345	V (H)
	f 5'	11385	H (V)
	f 6'	11425	V (H)
	f 7'	11465	H (V)
	f 8'	11505	V (H)
	f 9'	11545	H (V)
	f 10'	11585	V (H)
	f 11'	11625	H (V)
	f 12'	11665	V (H)

FIGURE II-5

RF CHANNEL ARRANGEMENT FOR PCM DIGITAL MICROWAVE NETWORK

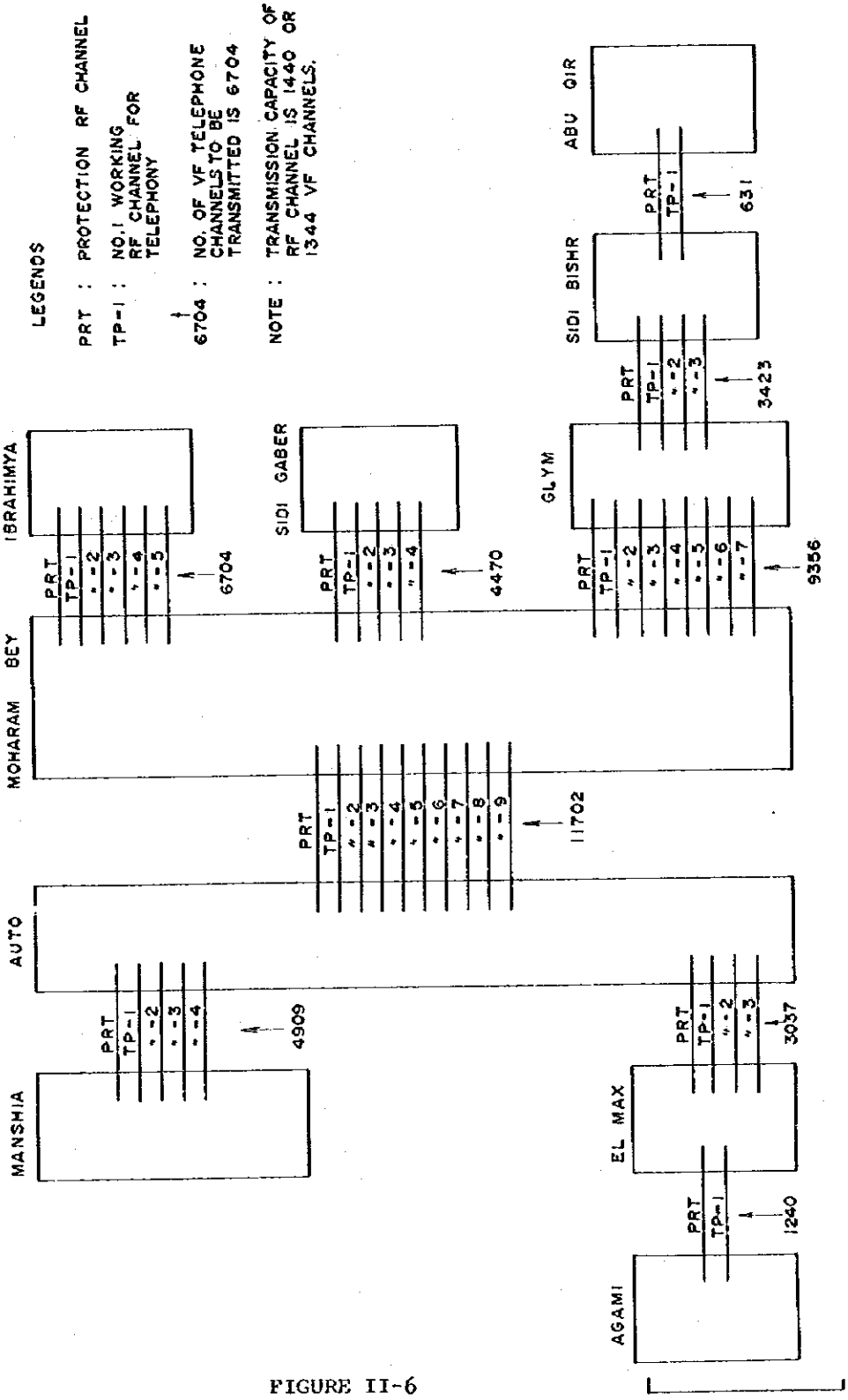


FIGURE II-6

NO. OF RF CHANNELS REQUIRED (1989)
FOR PCM MICROWAVE NETWORK

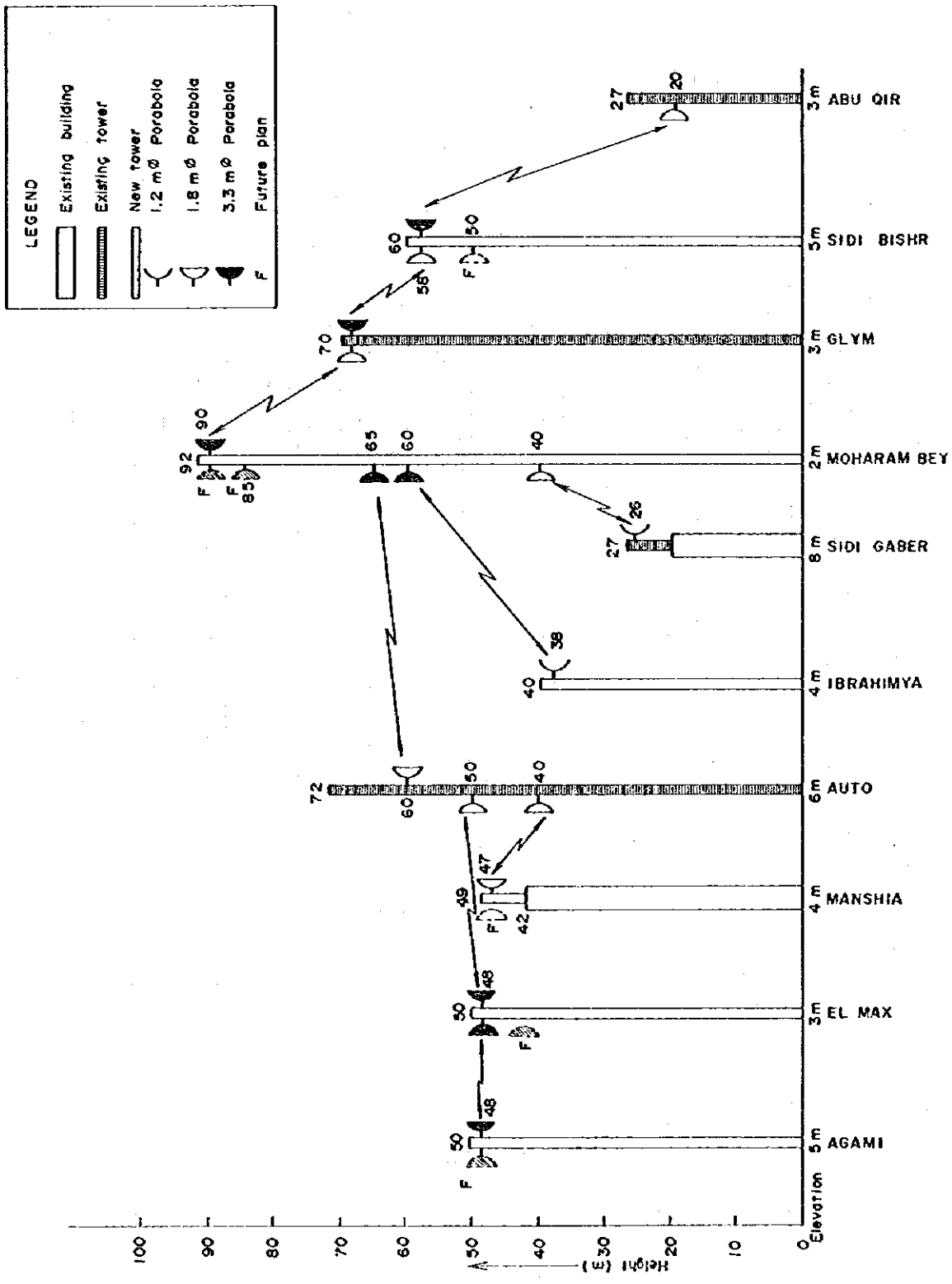


FIGURE II-7

ANTENNAS & TOWERS (PCM SYSTEM)

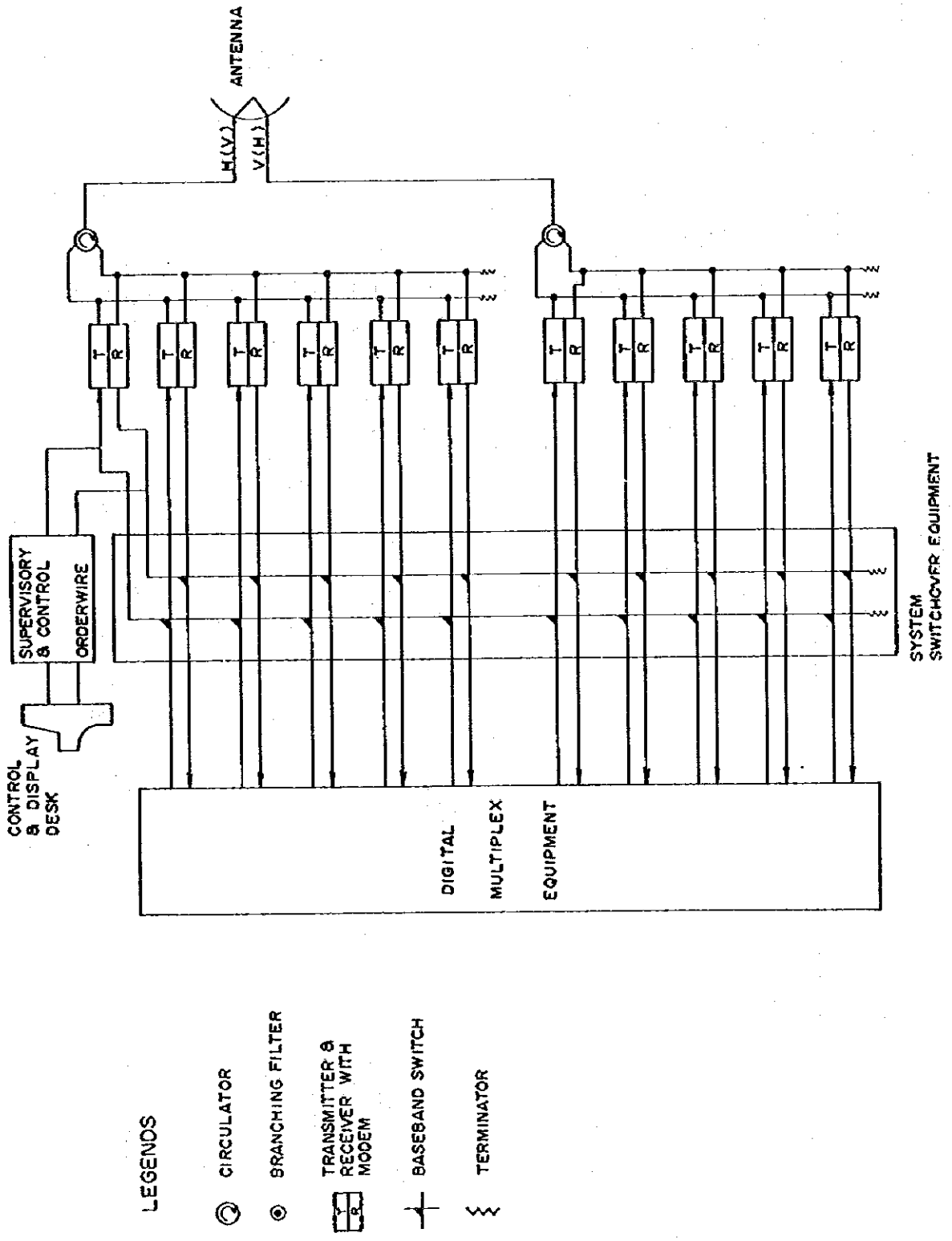


FIGURE II-8

TYPICAL COMPOSITION OF PCM DIGITAL MICROWAVE SYSTEM

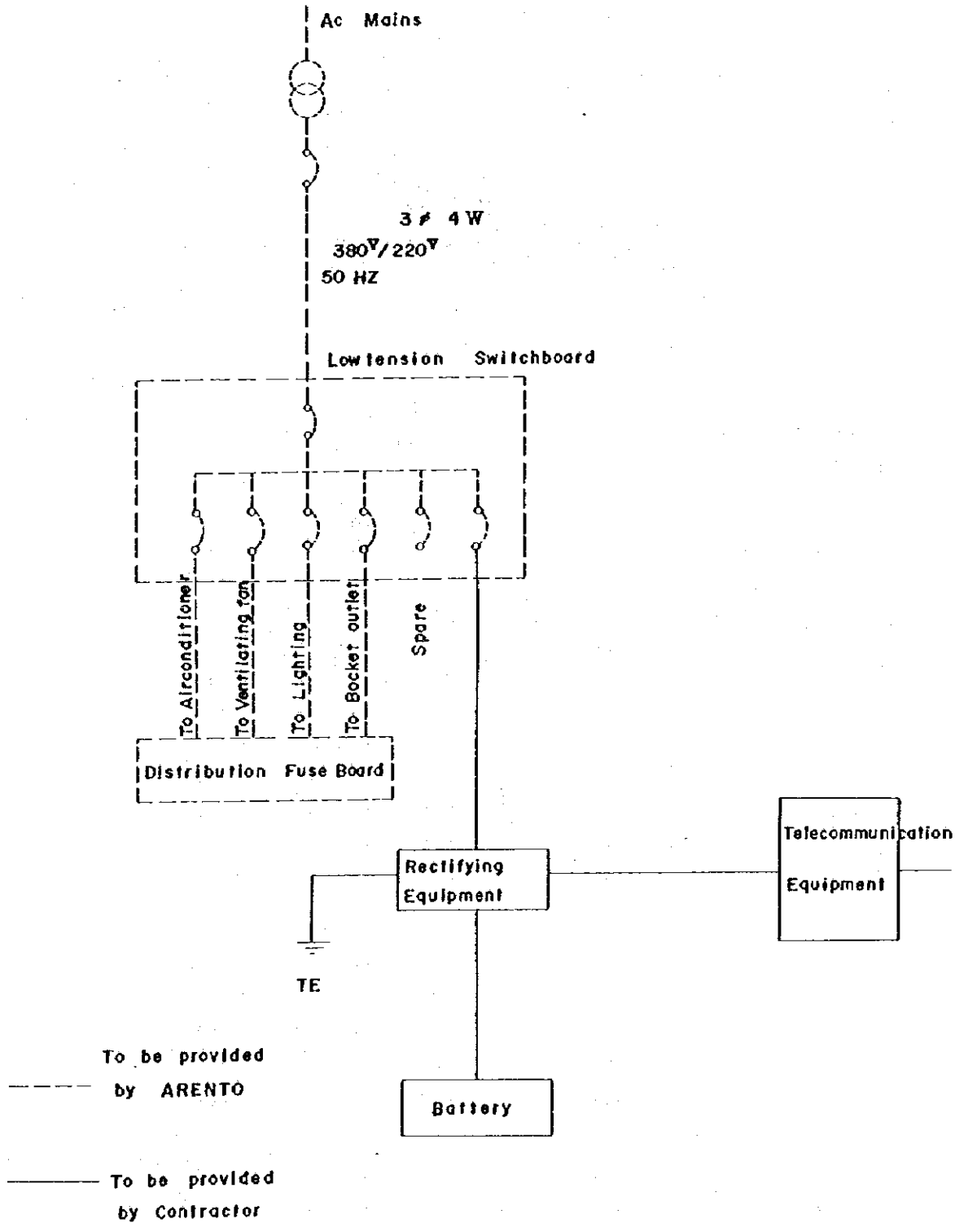
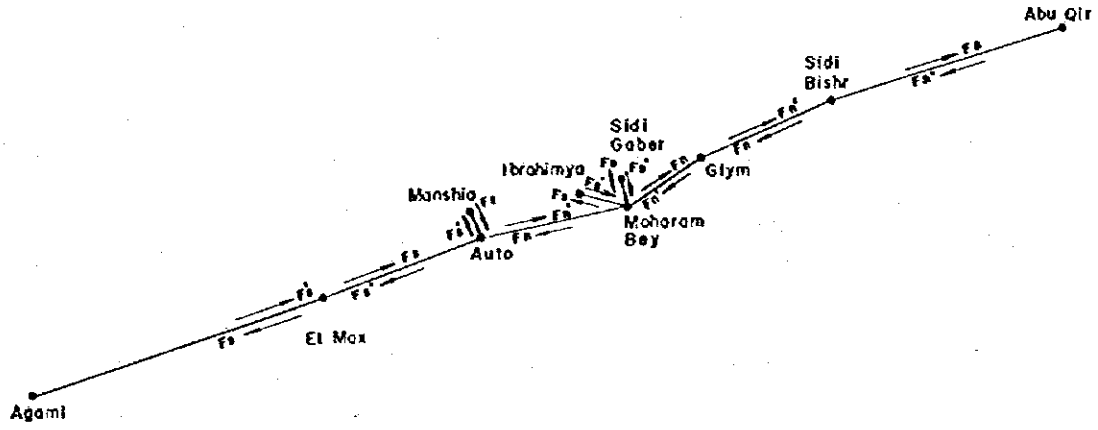


Figure II - 9 Block Diagram of Typical Power Supply System



RF Channel Arrangement (Slot)

	Letter Symbol	Frequeney	Polarization
Fs	f 1	10695	H (V)
	f 2	10735	V (H)
	f 3	10775	H (V)
	f 4	10815	V (H)
	f 5	10855	H (V)
	f 6	10895	V (H)
	f 7	10353	H (V)
	f 8	10975	V (H)
	f 9	11015	H (V)
	f 10	11055	V (H)
	f 11	11095	H (V)
	f 12	11135	V (H)

RF Channel Arrangement (Normal)

	Letter Symbol	Frequeney	Polarization
Fn	f 1	10715	H (V)
	f 2	10755	V (H)
	f 3	10795	H (V)
	f 4	10835	V (H)
	f 5	10875	H (V)
	f 6	10915	V (H)
	f 7	10955	H (V)
	f 8	10995	V (H)
	f 9	11035	H (V)
	f 10	11075	V (H)
	f 11	11115	H (V)
	f 12	11155	V (H)

F's	f 1'	11225	H (V)
	f 2'	11265	V (H)
	f 3'	11305	H (V)
	f 4'	11345	V (H)
	f 5'	11385	H (V)
	f 6'	11425	V (H)
	f 7'	11466	H (V)
	f 8'	11505	V (H)
	f 9'	11545	H (V)
	f 10'	11585	V (H)
	f 11'	11625	H (V)
	f 12'	11665	V (H)

F'n	f 1'	11245	H (V)
	f 2'	11285	V (H)
	f 3'	11325	H (V)
	f 4'	11365	V (H)
	f 5'	11405	H (V)
	f 6'	11445	V (H)
	f 7'	11485	H (V)
	f 8'	11525	V (H)
	f 9'	11565	H (V)
	f 10'	11605	V (H)
	f 11'	11645	H (V)
	f 12'	11685	V (H)

FIGURE II-10 RF CHANNEL ARRANGEMENT FOR FDM/FM ANALOG MICROWAVE NETWORK

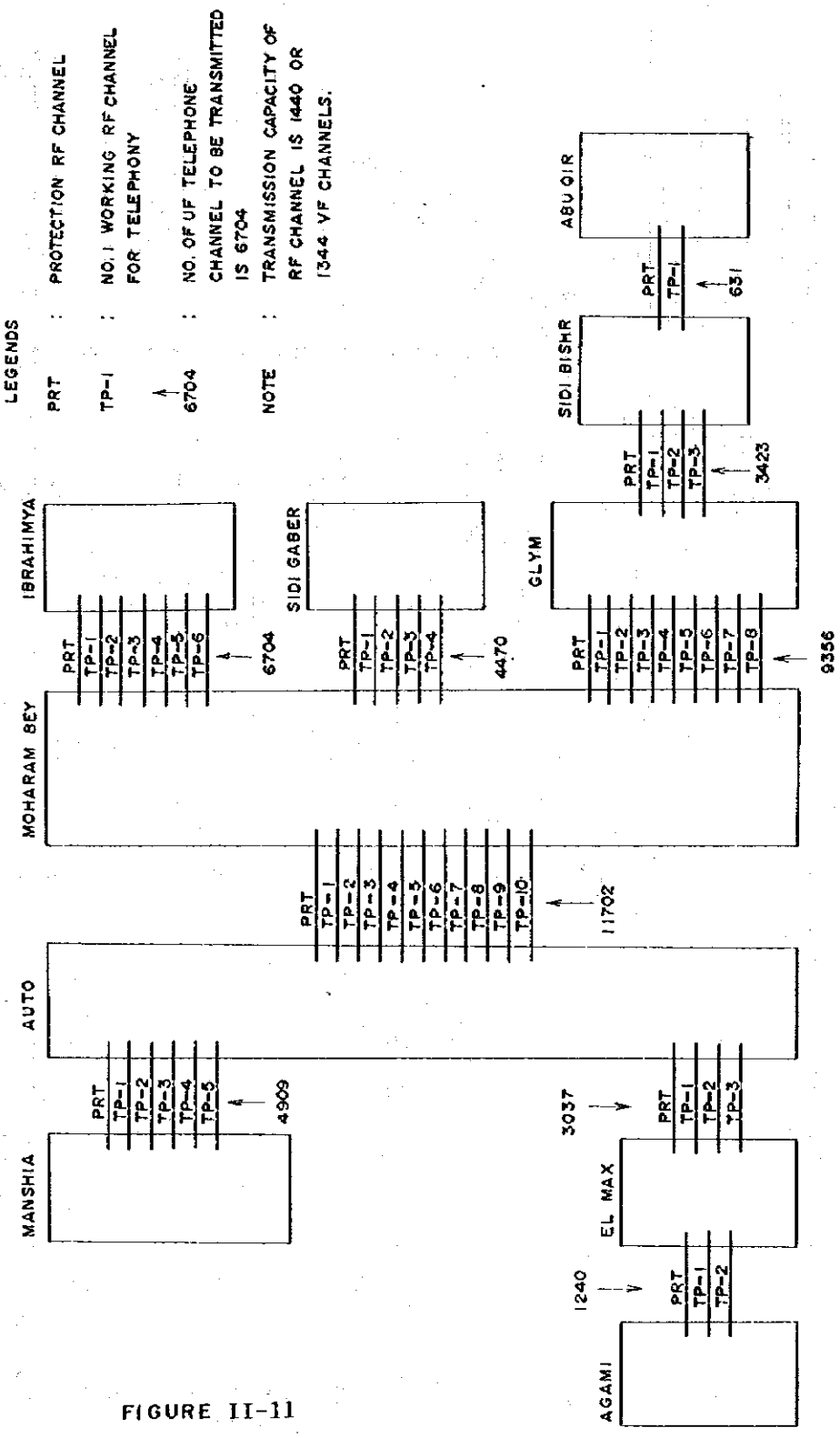


FIGURE II-11

NO. OF RF CHANNELS REQUIRED (1989)

FOR FDM/FM MICROWAVE NETWORK

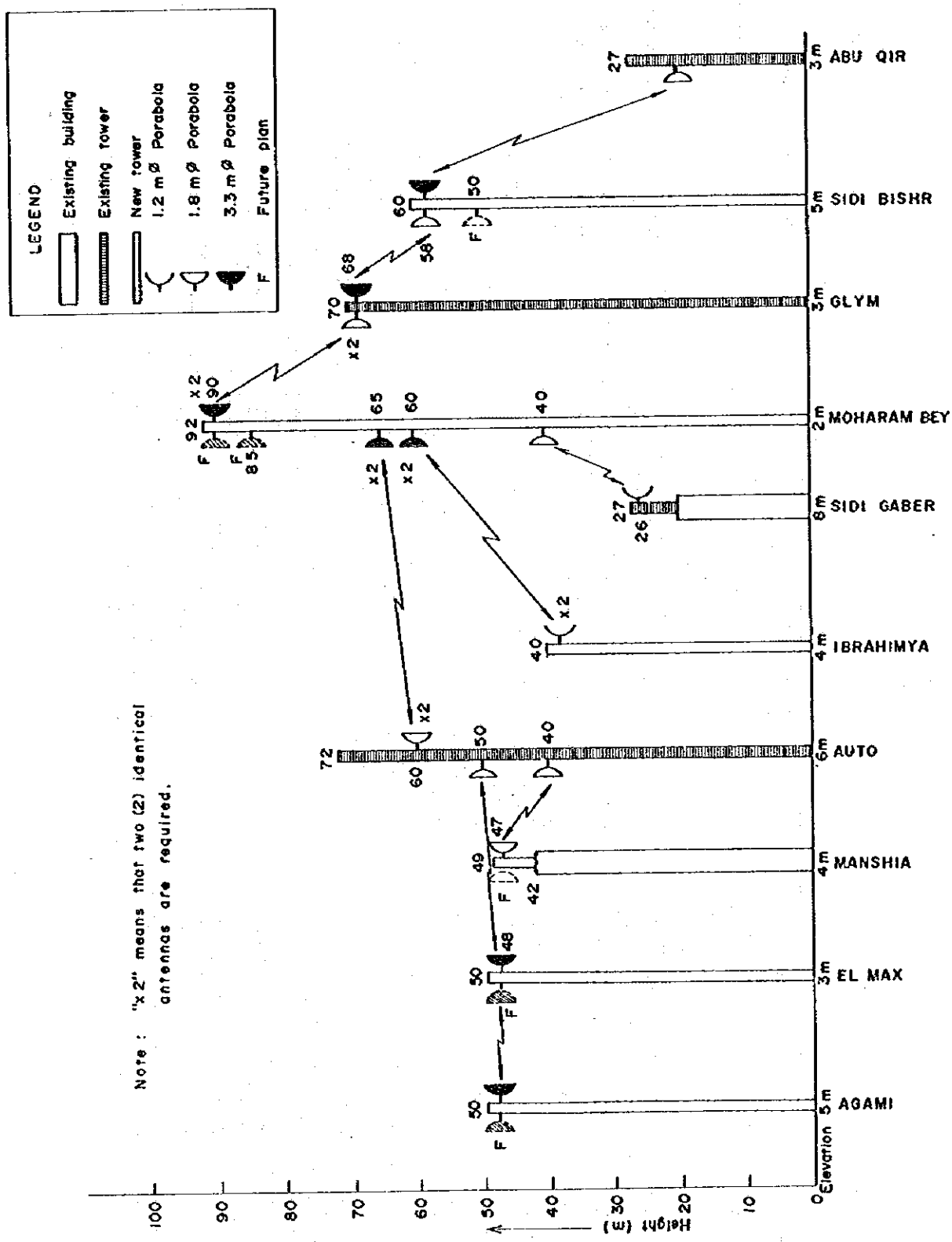


FIGURE II-12
ANTENNAS & TOWERS (FDM/FM SYSTEM)

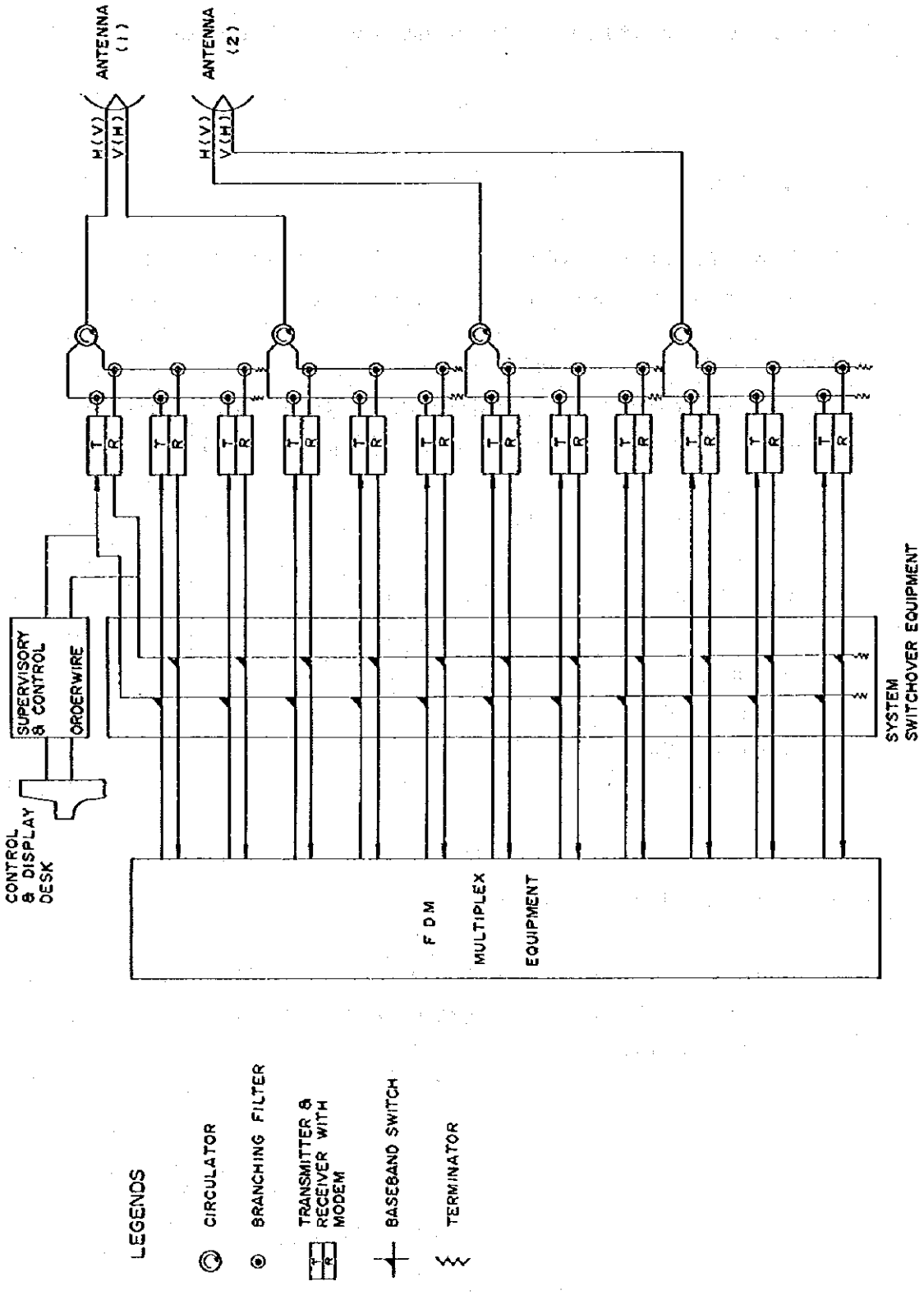


FIGURE II-13

TYPICAL COMPOSITION OF FDM/FM ANALOG MICROWAVE SYSTEM

ANNEX-1 Calculation of Originating Calling Rate

1. Local Call

1-1 Alex Traffic Department's Local Traffic Data
(Average Number of Busy Hour Calls during July-December, 1980)

Exchange	Average Number of Busy Hour Calls	Number of Line Switches
AUTO-I	14,337	10,000
AUTO-II	22,409	10,000
IBRAHIMYA	11,210	10,000
GLYM	9,956	10,000
MANSHIA	14,771	10,000
SIDI GABER		10,000
SIDI BISHR		6,000
Total		66,000

1-2 Calling Rate Estimate

When the average holding time of local calls is set at 150 seconds, the calling rate of local calls becomes 0.06 Erl/line.

2. Trunk Call

2-1 Number of Busy Hour Trunk Calls

The number of busy hour trunk calls is 238.

2-2 Calling Rate Estimate

When the average holding time of trunk calls is set at 12 minutes (720 seconds), the calling rate of trunk calls becomes 0.0008 Erl/line. With the summertime peak traffic considered, the calling rate is set at 0.004 Erl/line.

ANNEX-2 Site Information

The site conditions of the exchanges to organize the proposed network are summarized below in terms of locations in Alexandria City and environmental features. Meanwhile, the coast line of Alexandria City extends generally from northeast to southwest. The urban area of the city is formed along such coast line.

1. Abu Qir

Location: Refer to Figure AN-1-1.
Approximately 20 m northeast of Abu Qir Railway Station.

Elevation (AMSL): 3 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Sidi Bishr	228° 40'	8.53 km

Radio Path Condition:

Between Abu Qir and the neighborhood of Sidi Bishr, no outstanding obstacle exists. That is to say, the radio path has only to clear a 7-8 storied building near Sidi Bishr Exchange.
Between 3.5 km and 6.7 km from Sidi Bishr is the sea where the reflected wave exists. However, this reflected wave can be effectively suppressed by the antenna directivity.

Site Description:

This exchange is located at the eastern end of the city, that is, approximately 20 km northeast of the downtown center. The Post Office, in which the exchange is established, faces the square on the northern side of Abu Qir railway station. The site where to construct the new exchange is located in the rear part of the existing exchange building when viewed from the square side. Many of the buildings in the surrounding area are from 2-3 storied to 5 storied. In the northeastern direction from the site exists Abu Qir Port. Along the sea coast on the southeastern side of the site lies the Tabiya Industrial Complex.

2. Sidi Bishr

Location: Refer to Figure AN-1-1.
The existing Sidi Bishr Exchange building.

Elevation (AMSL): 5 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Abu Qir	49° 40'	8.53 km
Glym	222° 30'	4.55 km

Radio Path Condition:

In Abu Qir direction:

Refer to the corresponding column for Abu Qir.

In Glym direction:

By means of antenna mounting near the top of the existing tower at Glym and of the scheduled 60 m tower at Sidi Bishr, the required clearance can be obtained. The whole area under the radio path consists of streets.

Site Description:

This exchange is located in the northeastern part of the city, or, more precisely, one block inside of the urban area seaboard. In the urban area, the land re-development, as well as the construction of new buildings, is brisk. In the environs of the exchange, the 4-5 storied medium height buildings and 15 or more storied high rise buildings coexist. The most part of these buildings are the collective housings, i.e., the flats. The whole surrounding area abounds with mild surface undulations.

3. Glym

Location: Refer to Figure AN-1-2.
In the newly planned Glym Exchange site.

Elevation (AMSL): 3 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Sidi Bishr	42° 30'	4.55 km
Moharam Bey	216° 20'	2.89 km

Radio Path Condition:

In Sidi Bishr direction:

Refer to the corresponding column for Sidi Bishr.

In Moharam Bey direction:

Several 10-13 storied buildings exist on the way. The radio path must clear all these buildings. The whole radio path is on the area where a number of high rise buildings are densely erected.

Site Description:

This exchange is located approximately 3 km northeast of Sidi Gaber railway station. The exchange building faces the front street of the area with many high grade residences. In the environs, the 4-5 storied to 15 or more storied buildings coexist and many of them are the flats. Approximately 300 m distant from the exchange is the Broadcasting Station. The site for the new exchange is the corner land 100 m or so distant from the existing exchange building. Both the existing and newly planned exchange buildings are on Gamal Abdel Nasser Avenue.

4. Sidi Gaber

Location: Refer to Figure AN-1-2.
The existing Sidi Gaber Exchange building.

Elevation (AMSL): 8 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Moharam Bey	146° 0'	0.86 km

Radio Path Condition:

In Moharam Bey direction:

At presents, the Sidi Gaber Exchange roof-top commands a clean view of the site land surface. No problematical obstacle exists.

Site Description:

This exchange is located 400-500 m north-northwest of Sidi Gaber railway station. The location is midway between the seaboard and the railway station. The exchange building faces Sidi Gaber Street where the tramway runs. In the exchange environs, tall buildings are relatively few. However, from the exchange building roof-top, a swarm of high rise buildings can be seen in the northeastern direction (toward Glym) and in the southwestern direction (toward Auto). This exchange is nearest to the possible site of Moharam Bey exchange.

5. Ibrahimya

Location: Refer to Figure AN-1-2.
The existing Ibrahimya Exchange building.

Elevation (AMSL): 4 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Moharam Bey	88° 30'	1.66 km

Radio Path Condition:

In Moharam Bey direction:

A building approximately 32 m high exists on the other side of the road in front of Ibrahimya Exchange. The radio path must clear this building.

Site Description:

This exchange is located approximately 1.4 km southwest of Sidi Gaber. In the environs are many 4-5 storied buildings. Mixed among them are not a few buildings more than 30 m in height. The exchange location is near the northwestern section of Alexandria Sporting Center. On the western side of the exchange building is the Chatby area.

6. Manshia

Location: Refer to Figure AN-1-3.

Elevation (AMSL): 4 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Auto	142° 0'	0.93 km

Radio Path Condition:

In Auto direction:

The Manshia Exchange roof-top commands a view of the approximately 35 m upper part of the existing tower at Auto.

Site Description:

This exchange is located in the commercial center of the city which is near the seaboard at the near-center of Eastern Harbor. The streets are old with many 4-6 storied old buildings. Relatively new 10 or more storied buildings are also found among those old buildings. The exchange location is a little inside of the front street and is surrounded on all four sides with small by streets or small open lands.

7. Auto

Location: Refer to Figure AN-1-3.

Elevation (AMSL): 6 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Moharam Bey	57° 48'	4.93 km
Manshia	322° 0'	0.93 km
El Max	230° 18'	5.79 km

Radio Path Condition:

In Moharam Bey direction:

In the neighborhood of Auto Exchange, no outstanding obstacle exists. However, in the Smouha area where Moharam Bey Exchange site is located, the construction of tall buildings is expected. Therefore, the antenna height must be determined so as to give an enough clearance.

In Manshia direction:

Refer to the corresponding column for Manshia.

In El Max direction:

A 6-storied apartment house (height up to roof-top: 18.3 m) is under construction beside the canal near El Max Exchange. This building is on the radio path and becomes the obstacle. Therefore, the antenna height at El Max must be determined to clear the building completely. This building roof-top commands a view of an approximately 25 m upper part of Auto Exchange tower.

Site Description:

This exchange is located opposite, across a square, to Masr Station, the terminal in Alexandria of Cairo-Alexandria Railway. The location is at the near-center of the former urban area. The environs are relatively open with few tall buildings. In the directions toward Manshia and Ibrahimya, many tall buildings are found on the way. However, in the east-northeastern direction along the railway line and in the southwestern direction, tall buildings are few. Near the railway station (on the southeastern side of the station) is the 14-storied Post Office building.

8. Moharam Bey

Location: Refer to Figure AN-1-2.

Elevation (AMSL): 2 m (estimate)

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Glym	36° 24'	2.89 km
Sidi Gaber	326° 0'	0.86 km
Ibrahimya	268° 30'	1.66 km

Radio Path Condition:

Refer to the corresponding columns for Glym, Sidi Gaber and Ibrahimya.

Site Description:

The Moharam Bey Exchange site is located midway between the point approximately 300 m southeast of Sidi Gaber railway station and Marine Racing Club. This area belongs not to Moharam Bey area but to Smouha Area. The site, though the most possible site, was not yet finally selected as of the time the field survey was completed. The site environs abound with vacant lands and constitute an area being newly developed. A 30 storied building to house the court and the flats is to be constructed near the site. During the field survey, the cast-in-place reinforced concrete pile (length: approx. 20 m) work was found to be in progress. A little away from the site, two buildings, each more than 10 storied, were also under construction. Thus, in the whole area, a large scale development is expected in the not long future.

9. El Max

Location: Refer to Figure AN-1-3.

Elevation (AMSL): 3 m (estimate)

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
Auto	50° 18'	5.79 km
Agami	231° 10'	10.43 km

Radio Path Condition:

In Auto direction:

Refer to the corresponding column for Auto.

In Agami direction:

The radio-path passes the factory zone located 4-5 km from El Max Exchange site. Therefore, the path must clear the factory buildings.

Site Description:

This exchange is located in the near-center of the industrial area lying between the Mediterranean Sea on the north and Lake Maryu on the south and extending in the northeast - southwest direction. The area is as narrow as 1-1.5 km in the northwest - southeast direction. The exchange location is near the western end of Western Harbor. The exchange building faces El Max Road, the main road leading to Desert Road. The most part of nearby buildings are factories though the vacant lands also occupy no small part of the area. No tall building exists. Close by the exchange location are the mosque and the slaughter-house, and a short distance away are the harbor facilities.

10. Agami

Location: Refer to Figure AN-1-4.

Elevation (AMSL): 5 m

Azimuth Angle and Path Length:

Adjacent Exchange	Azimuth Angle from True North	Path Length
El Max	51° 47'	10.43 km

Radio Path Condition:

In El Max direction:

Refer to the corresponding column for El Max.

Site Description:

The exchange site is in Agami Area located at the westernmost sector of the city or approximately 20 km southwest of the downtown. Agami Area is a summer resort. The town that mainly consists of vacationist housings lies along the seaboard, and the similar residential facilities are scattered in the surroundings. Buildings are mostly the 1-2 storied chalets, 3-5 storied flats and resort hotels, none being especially high. Further local development is expected from now on, as seen in the new seashore development plan called "Zahrat el-Agami (Blooming Spot of Agami)" which was announced in April 1981 by the Egyptian Gazette. The existing Bianqi and Hanoville Exchanges are in this Agami Area. The site for the new Agami Exchange is the corner land at the junction of the main road leading to El Derr and the road to Hanoville Exchange. This site is somewhat distant from the area center.

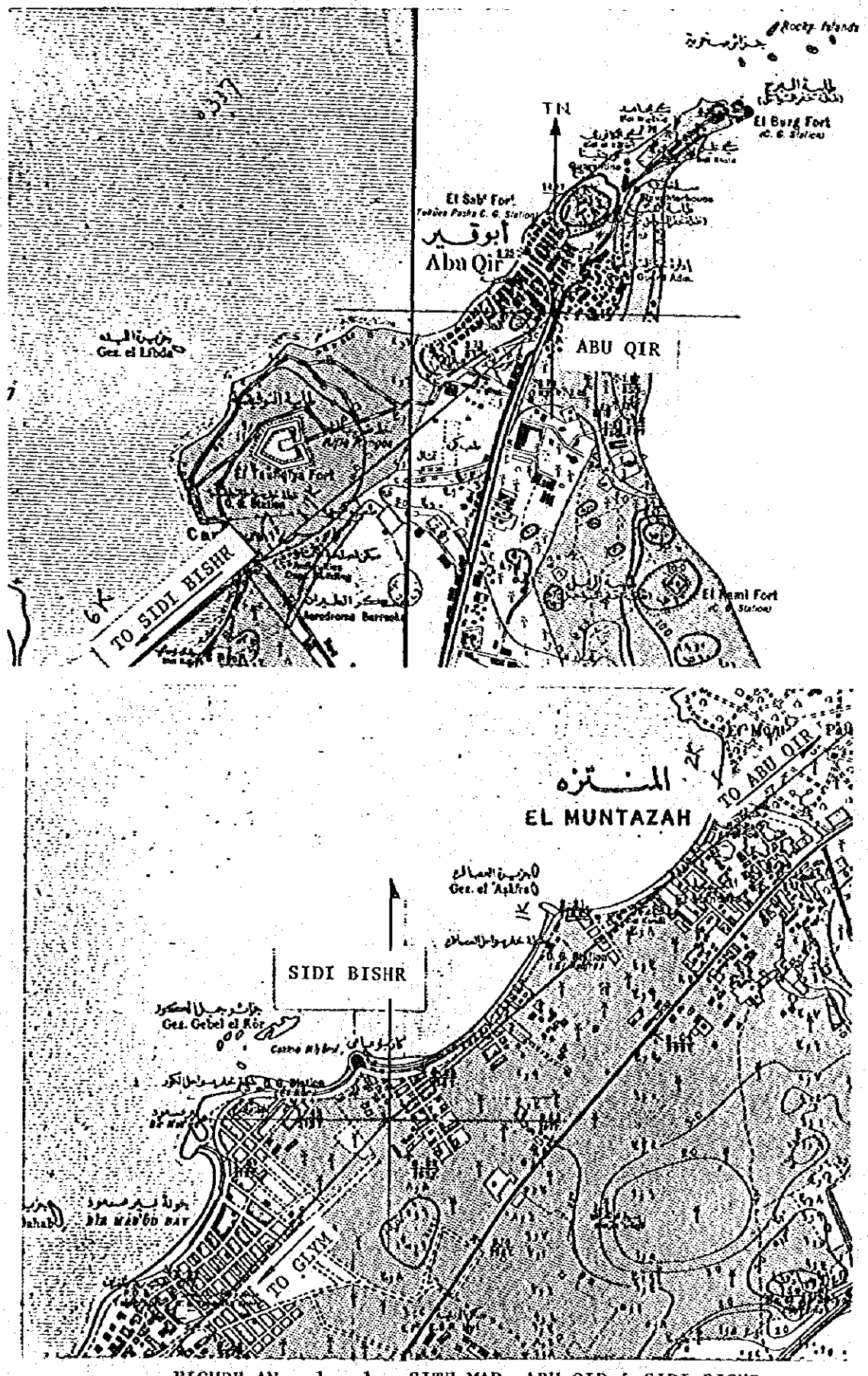


FIGURE AN - 1 - 1 SITE MAP ABU QIR & SIDI BISHR

(Scale 1 : 25,000)

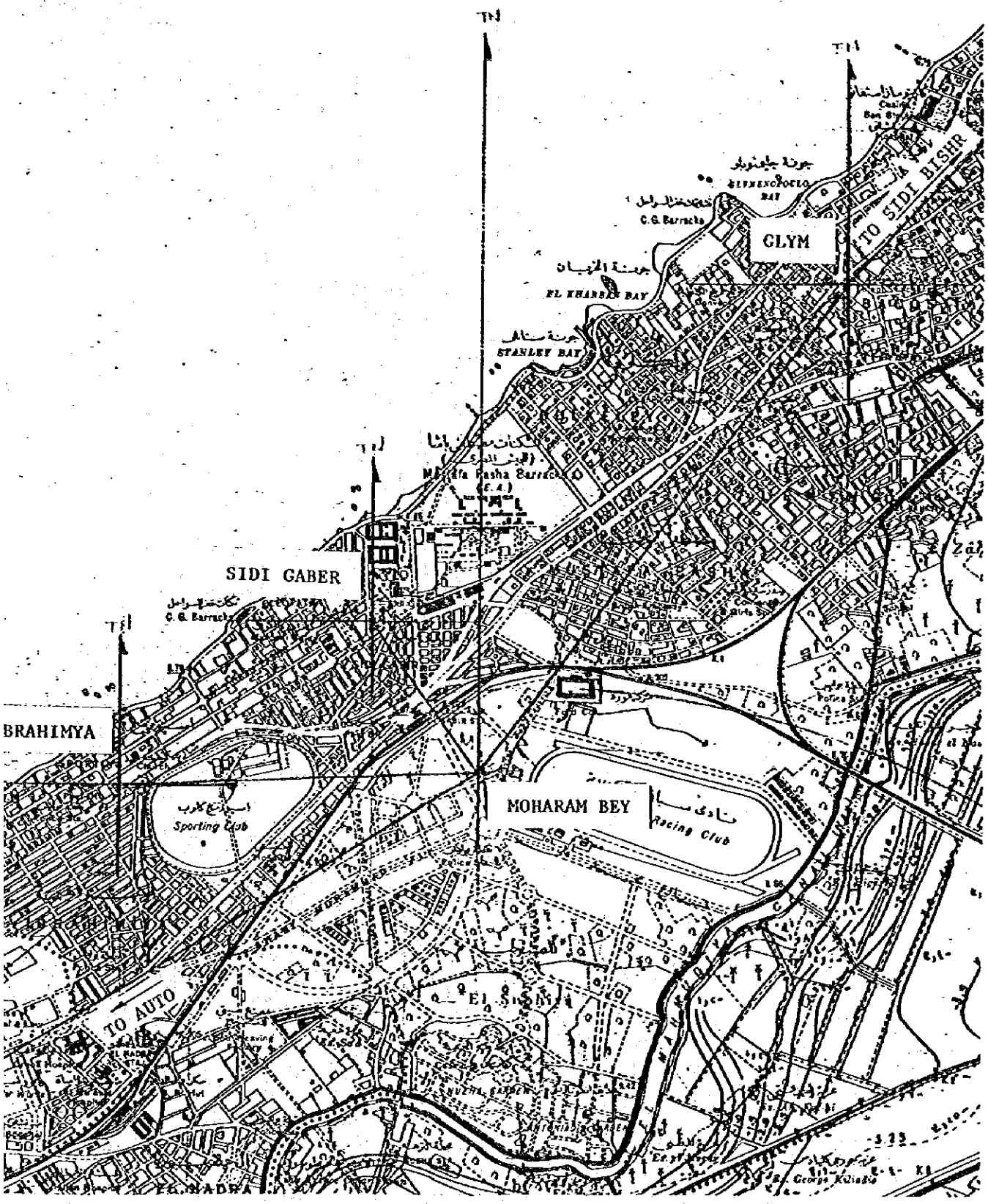


FIGURE AN - 1 - 2 SITE MAP GLYM, MOHARAM BEY, SIDI GABER & IBRAHIMYA (Scale 1:25,000)

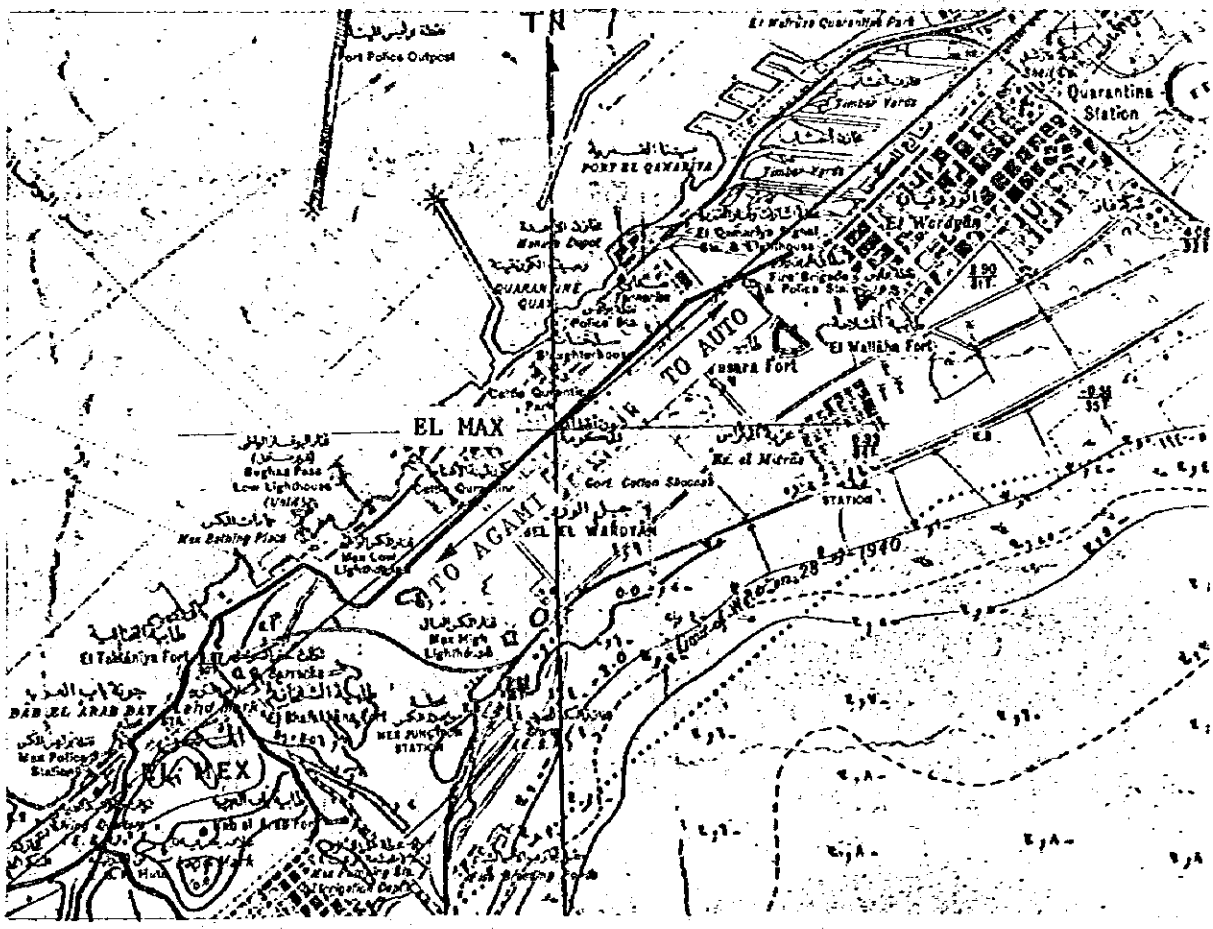


FIGURE AN - 1 - 3 SITE MAP AUTO, MANSHIA & EL MAX

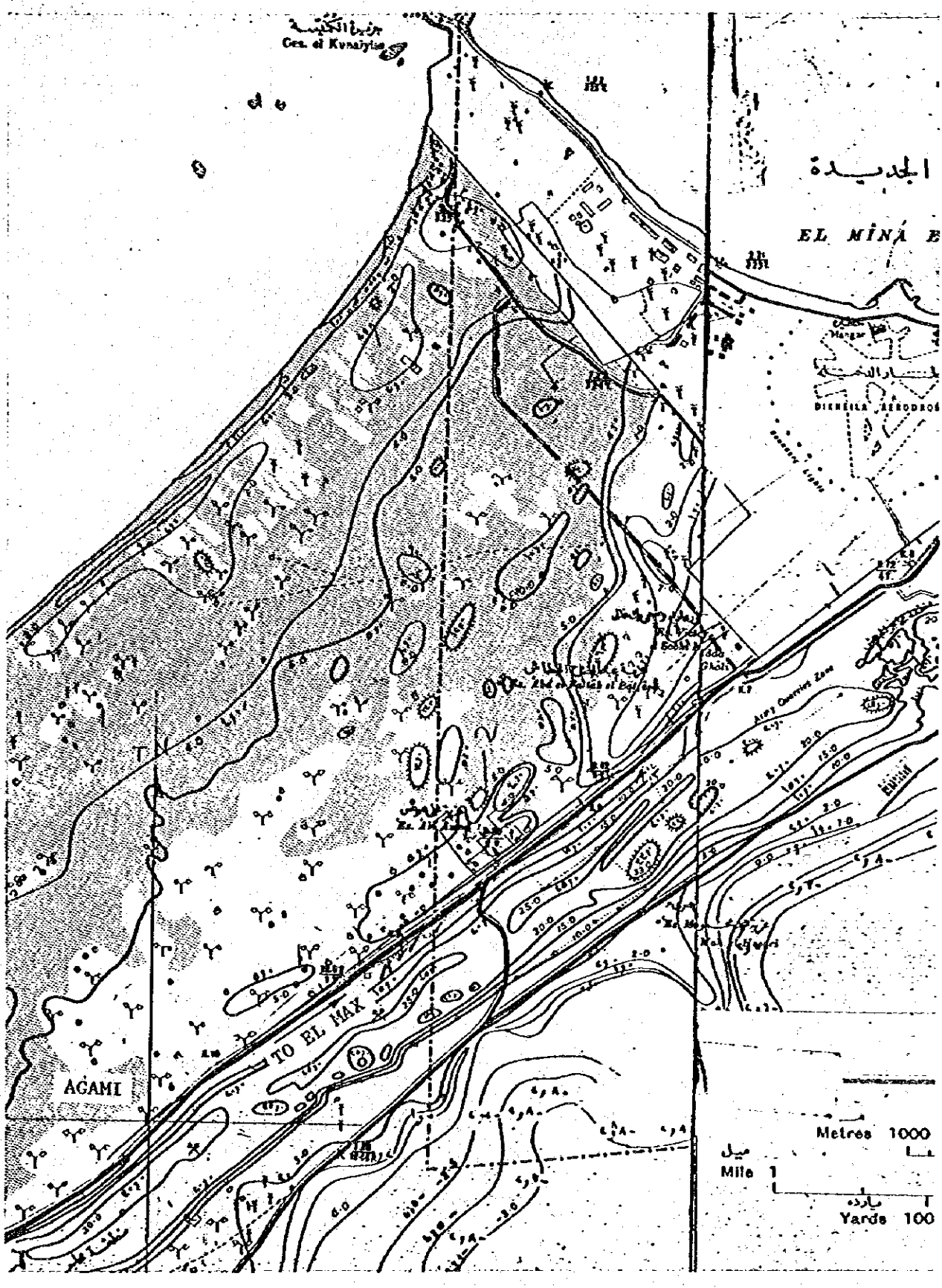


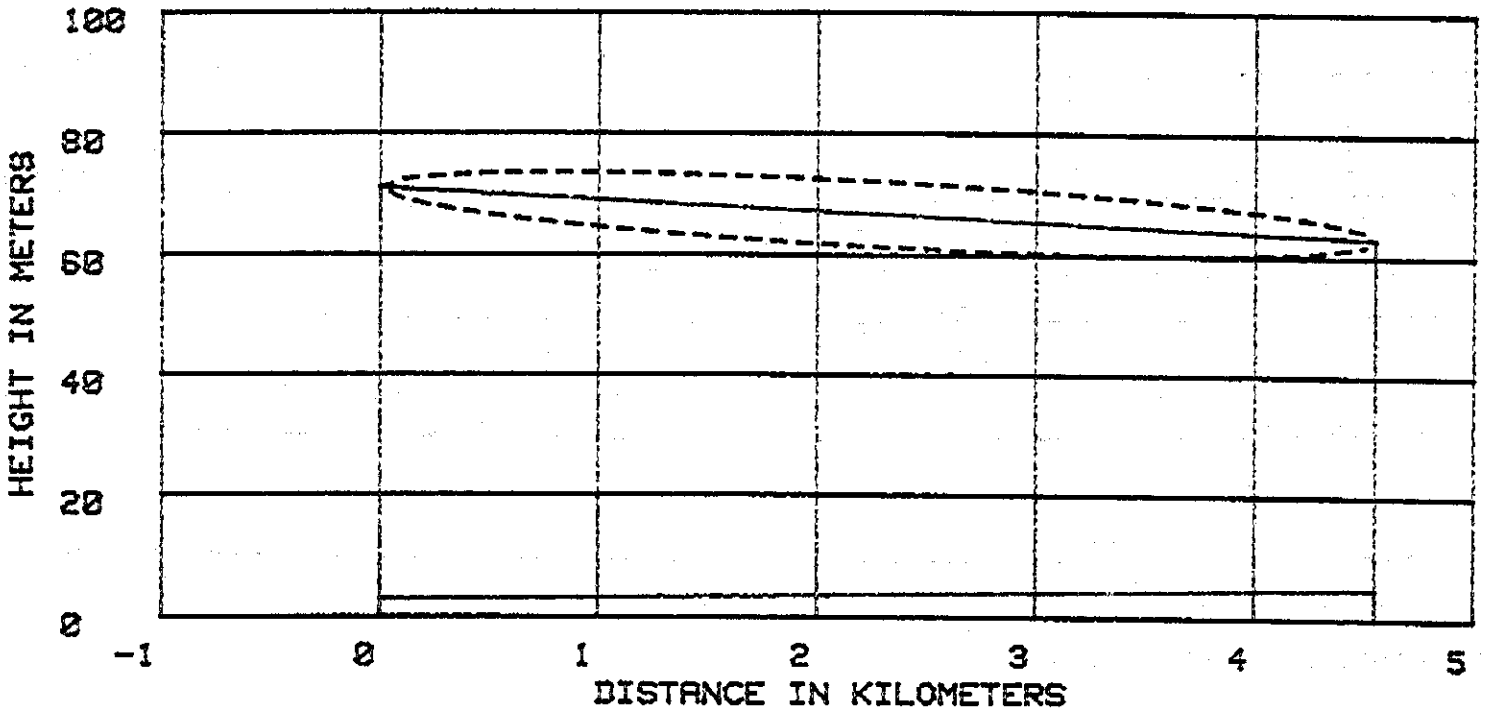
FIGURE AN - 1 - 4 SITE MAP AGAMI

ANNEX 3-1

GLMS.B

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



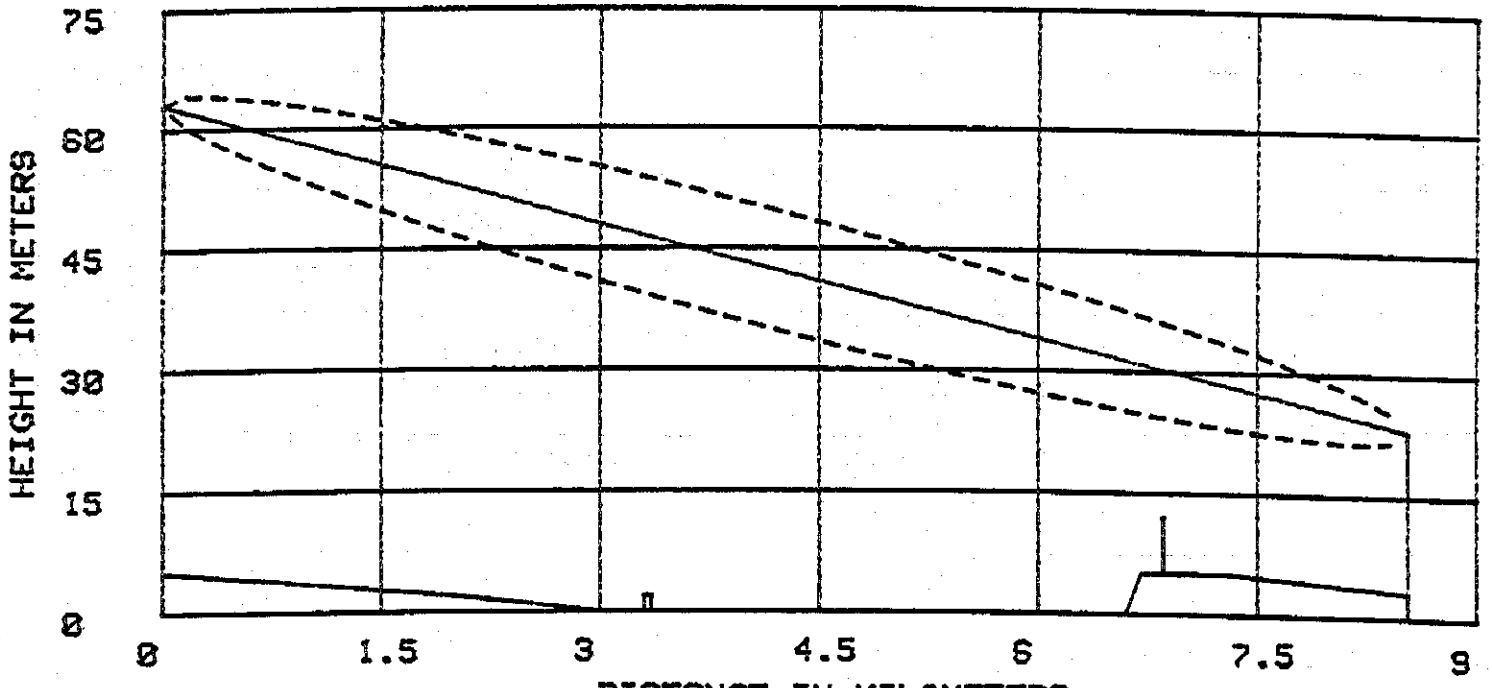
DISTANCE D : 4.55 km

SITE 1 : GLYM		SITE 2 : SIDI BISHR	
GROUND ELEVATION:	3.0 m	GROUND ELEVATION:	5.0 m
ANTENNA HEIGHT:	68.0 m	ANTENNA HEIGHT:	58.0 m

S.BRBQ

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : 8.53 km

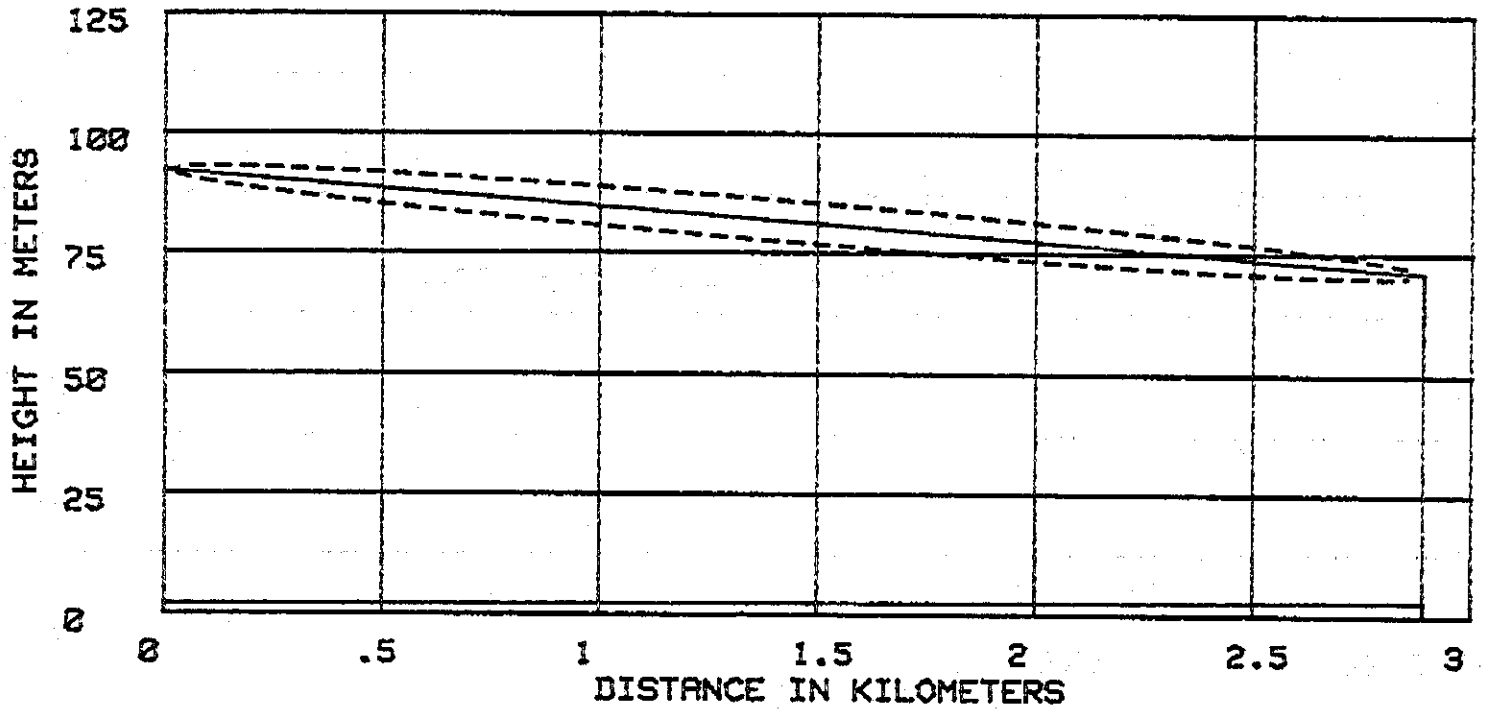
SITE 1 : SIDI BISHR		SITE 2 : ABU QIR	
GROUND ELEVATION:	5.0 m	GROUND ELEVATION:	3.0 m
ANTENNA HEIGHT:	58.0 m	ANTENNA HEIGHT:	20.0 m

ANNEX 3-3

MHRGLM

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



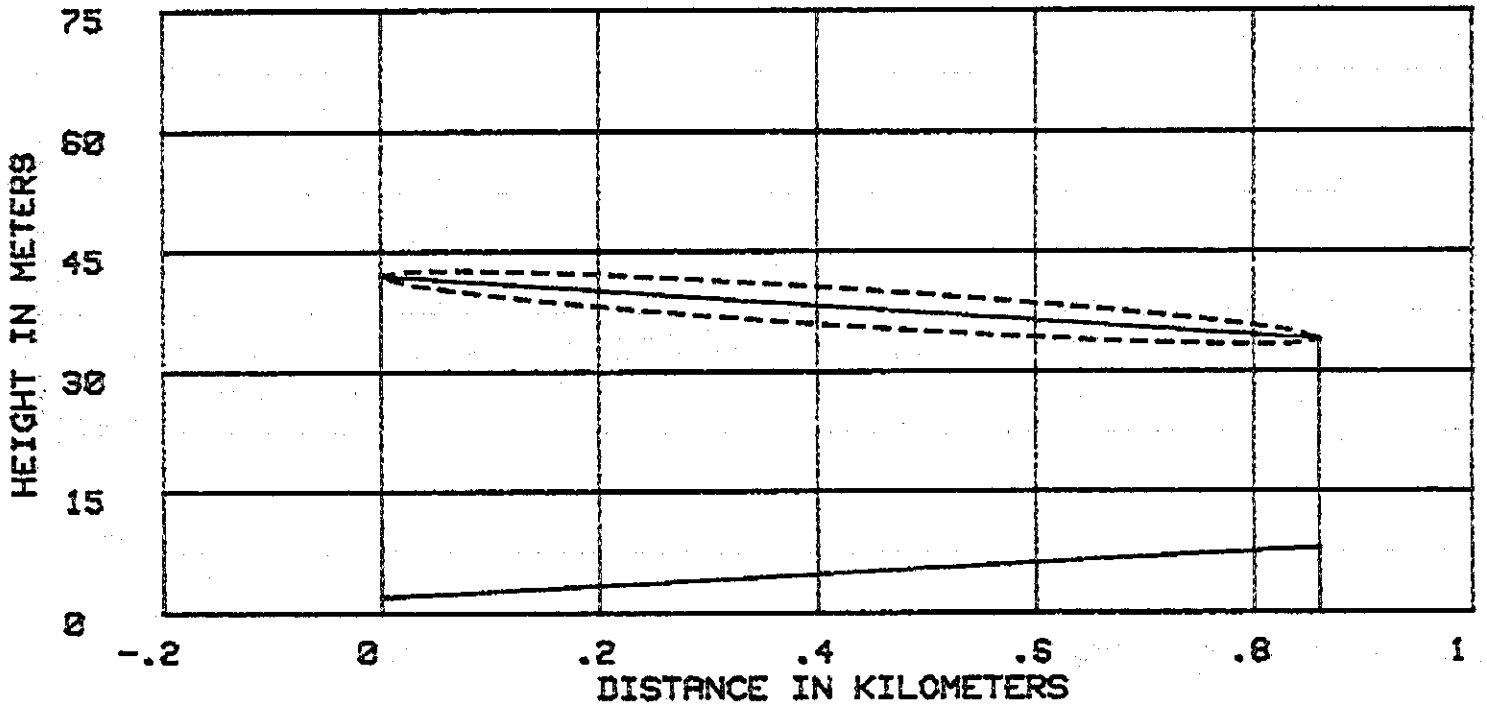
DISTANCE D : 2.89 km

SITE 1 : MOHARAM BEY		SITE 2 : GLYM	
GROUND ELEVATION:	2.0 m	GROUND ELEVATION:	3.0 m
ANTENNA HEIGHT:	90.0 m	ANTENNA HEIGHT:	68.0 m

MHRS.G

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : .86 km

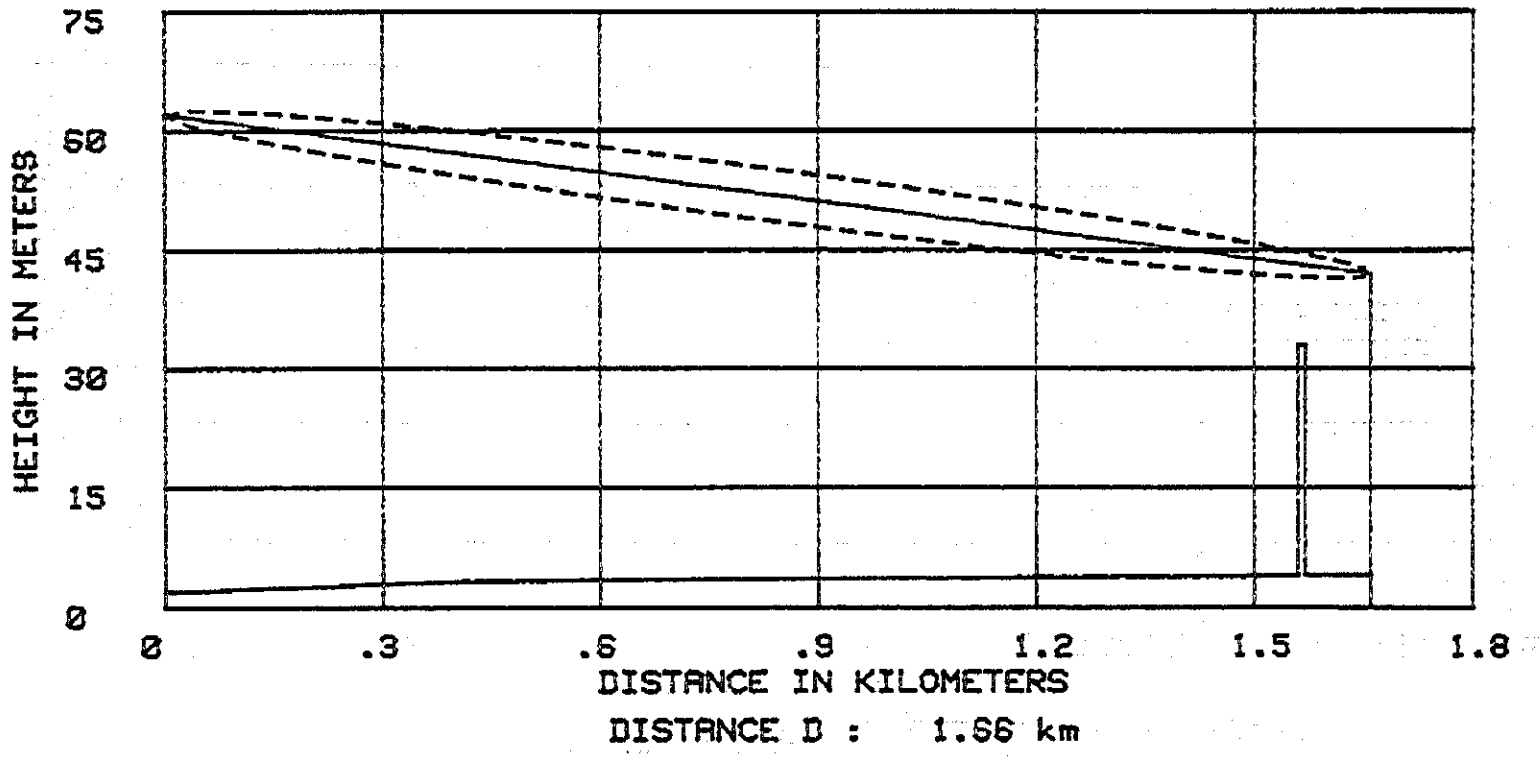
SITE 1 : MOHARRAM BEY		SITE 2 : SIDI GABER	
GROUND ELEVATION:	2.0 m	GROUND ELEVATION:	8.0 m
ANTENNA HEIGHT:	40.0 m	ANTENNA HEIGHT:	26.0 m

ANNEX 3-5

MHRIBR

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : 1.66 km

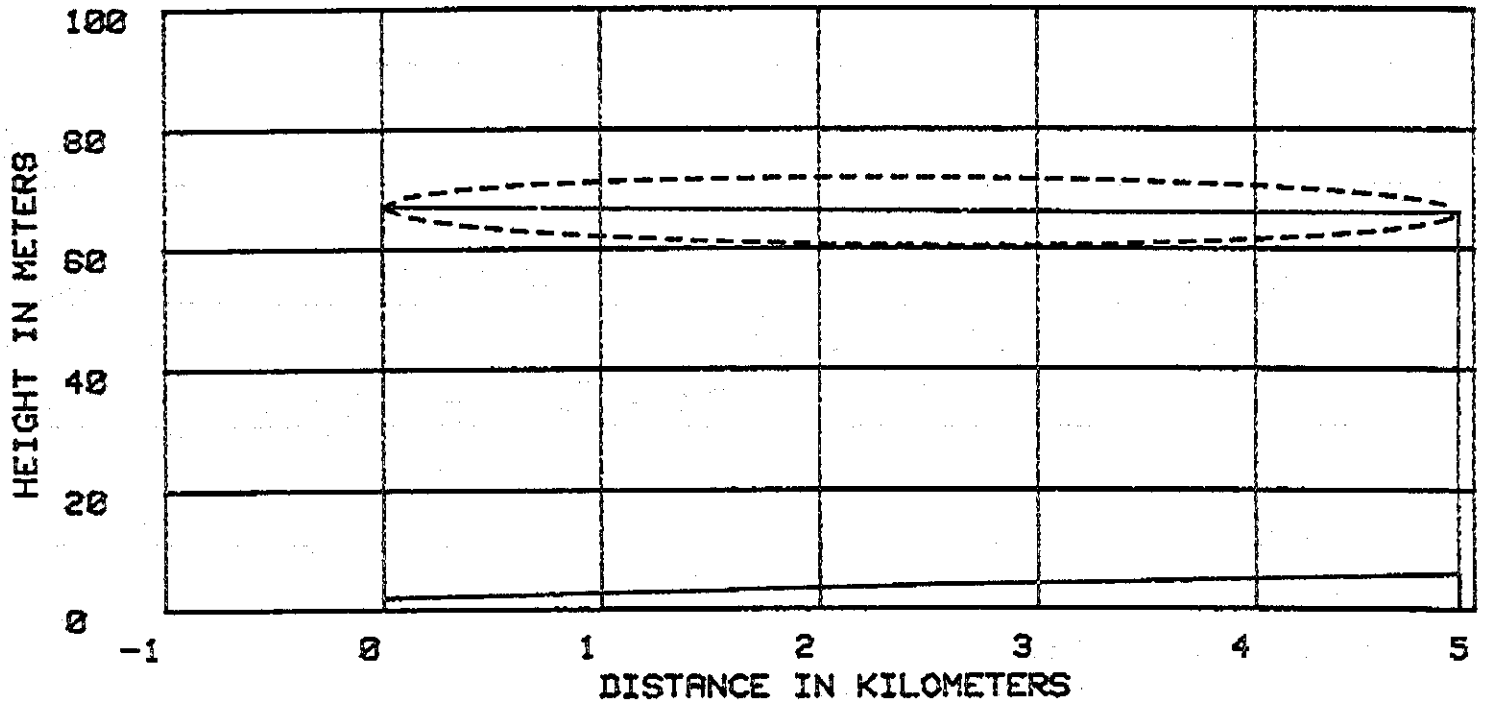
SITE 1 : MOHARAM BEY		SITE 2 : IBRAHIMYA	
GROUND ELEVATION:	2.0 m	GROUND ELEVATION:	4.0 m
ANTENNA HEIGHT:	60.0 m	ANTENNA HEIGHT:	38.0 m

ANNEX 3-6

MHRAUT

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : 4.93 km

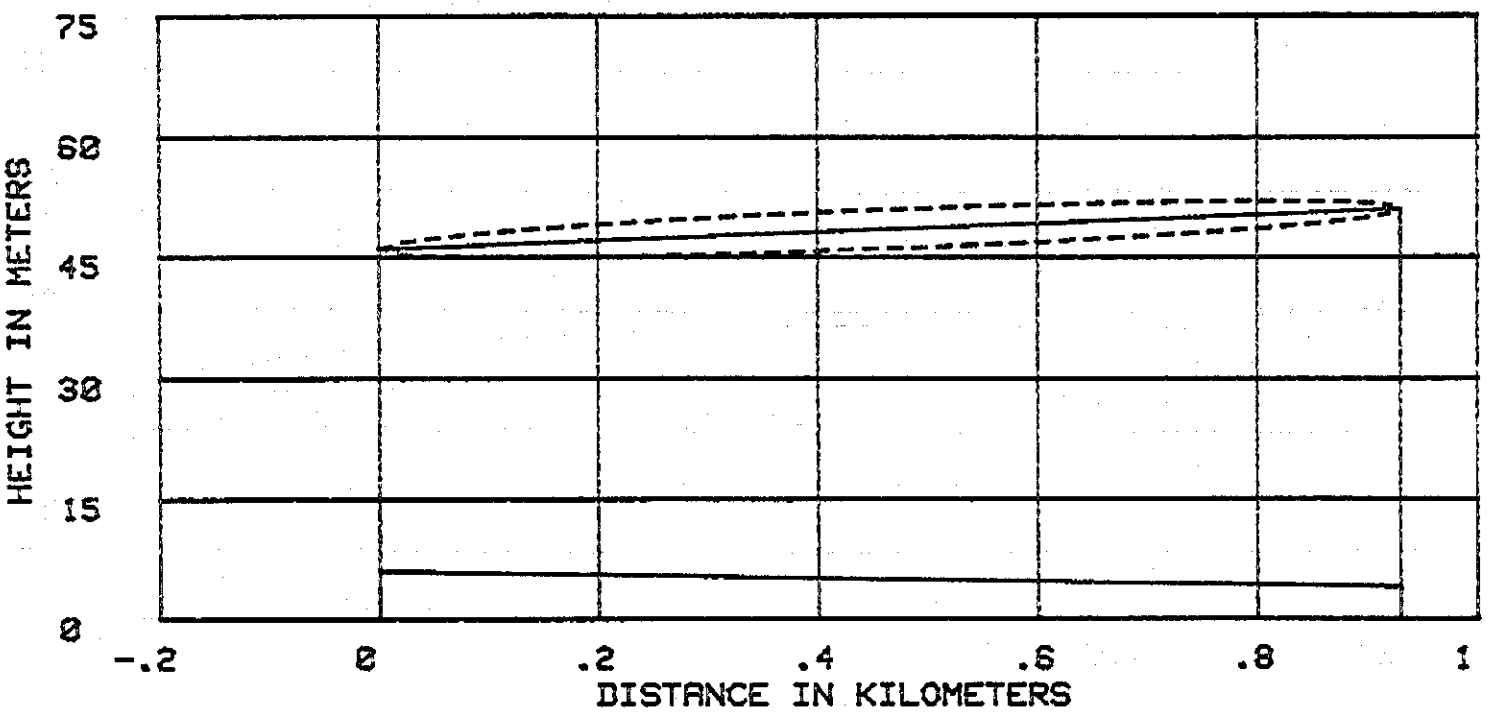
SITE 1 : MOHARAM BEY		SITE 2 : AUTO	
GROUND ELEVATION:	2.0 m	GROUND ELEVATION:	6.0 m
ANTENNA HEIGHT:	55.0 m	ANTENNA HEIGHT:	60.0 m

ANNEX 3-7

RUTMAN

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



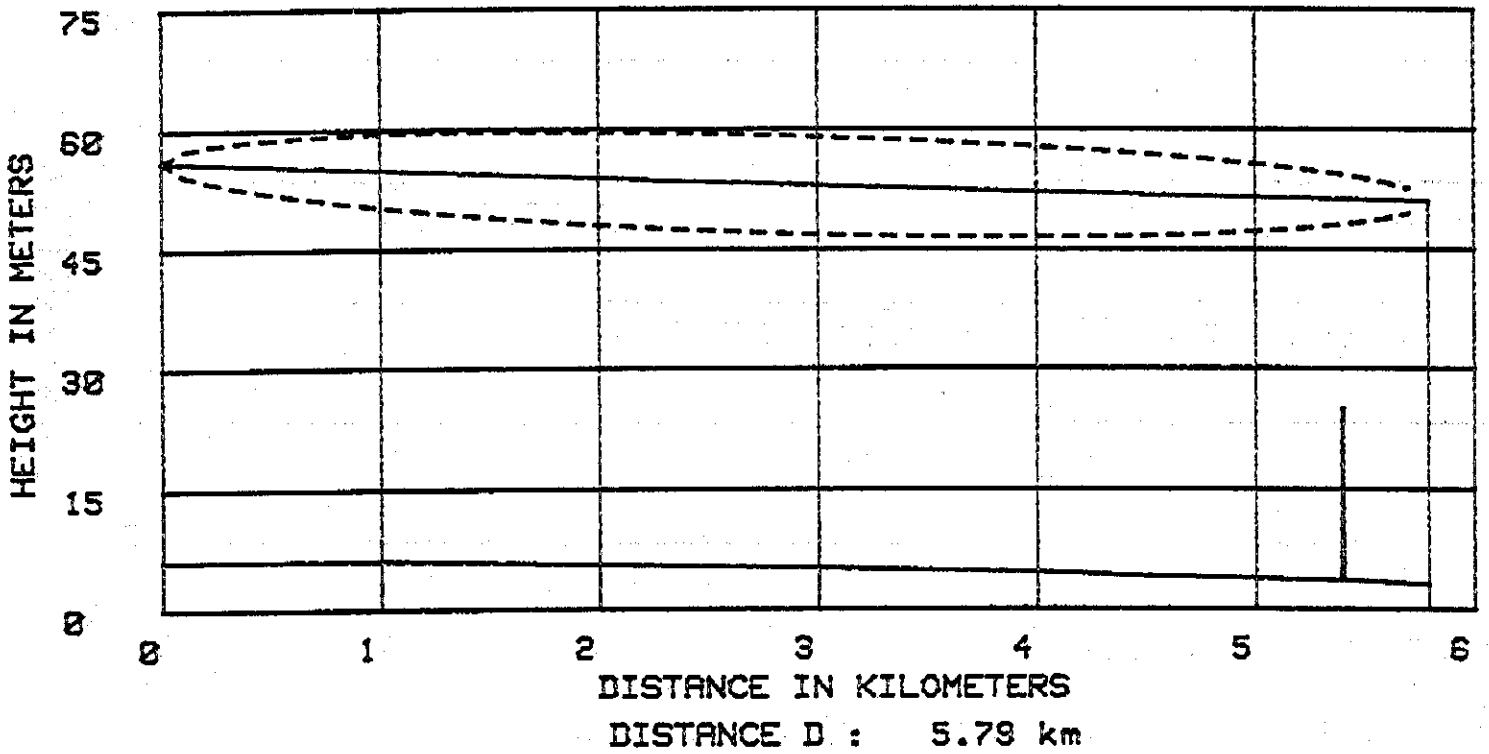
DISTANCE D : .93 km

SITE 1 : AUTO		SITE 2 : MANSHIA	
GROUND ELEVATION:	6.0 m	GROUND ELEVATION:	4.0 m
ANTENNA HEIGHT:	40.0 m	ANTENNA HEIGHT:	47.0 m

AUTMAX

PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : 5.79 km

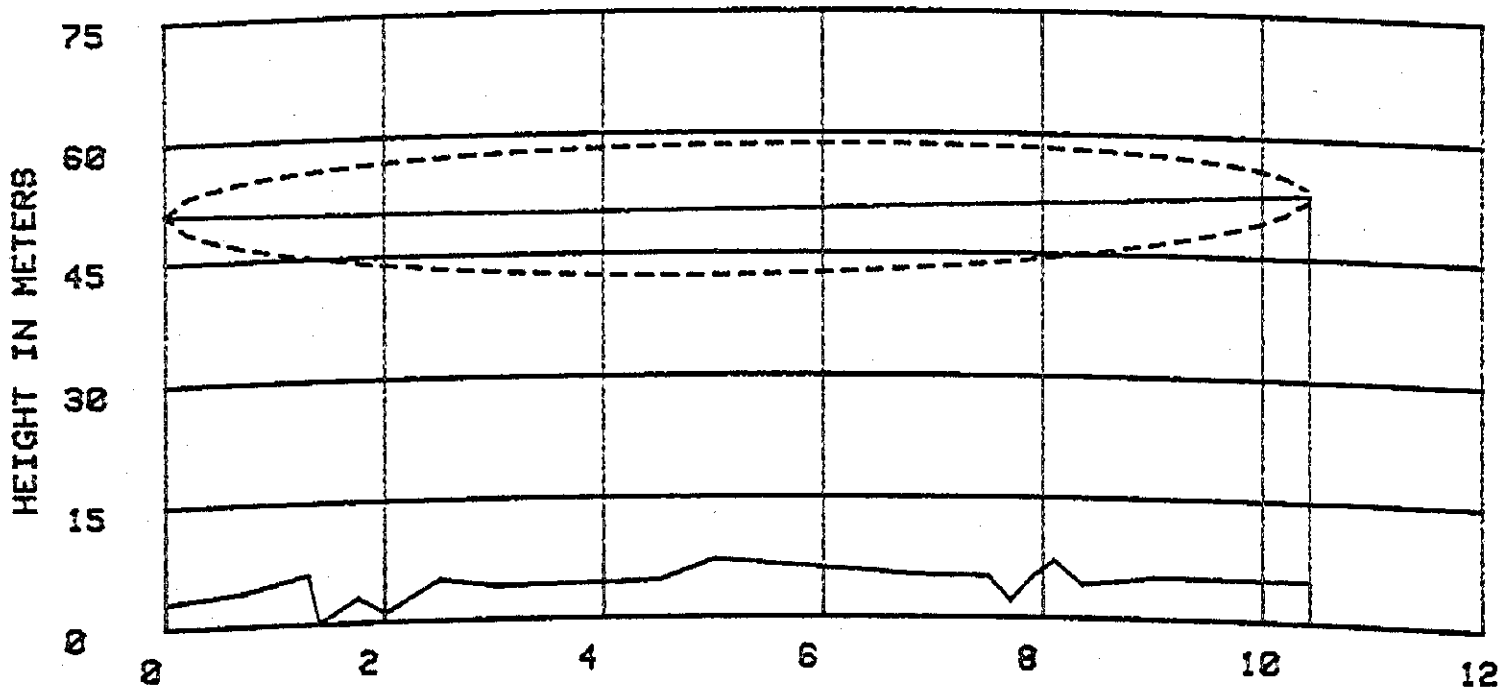
SITE 1 : AUTO		SITE 2 : EL MAX	
GROUND ELEVATION:	6.0 m	GROUND ELEVATION:	3.0 m
ANTENNA HEIGHT:	50.0 m	ANTENNA HEIGHT:	48.0 m

ANNEX 3-9

MAXRGM

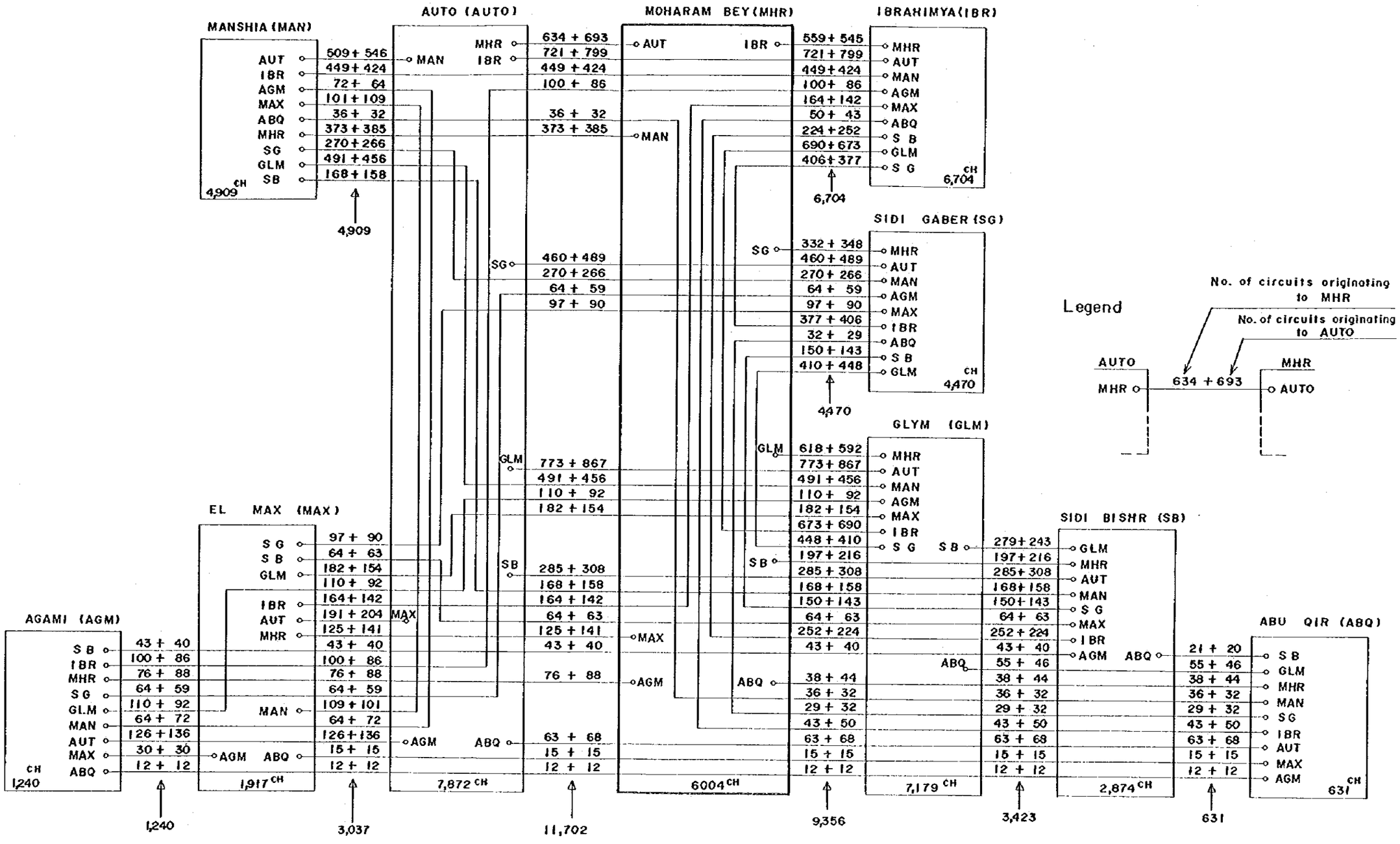
PATH PROFILE (4/3 RADIUS)

FREQUENCY : 11700.0 MHz



DISTANCE D : 10.43 km

SITE 1 : EL MAX		SITE 2 : AGAMI	
GROUND ELEVATION:	3.0 m	GROUND ELEVATION:	5.0 m
ANTENNA HEIGHT:	48.0 m	ANTENNA HEIGHT:	48.0 m

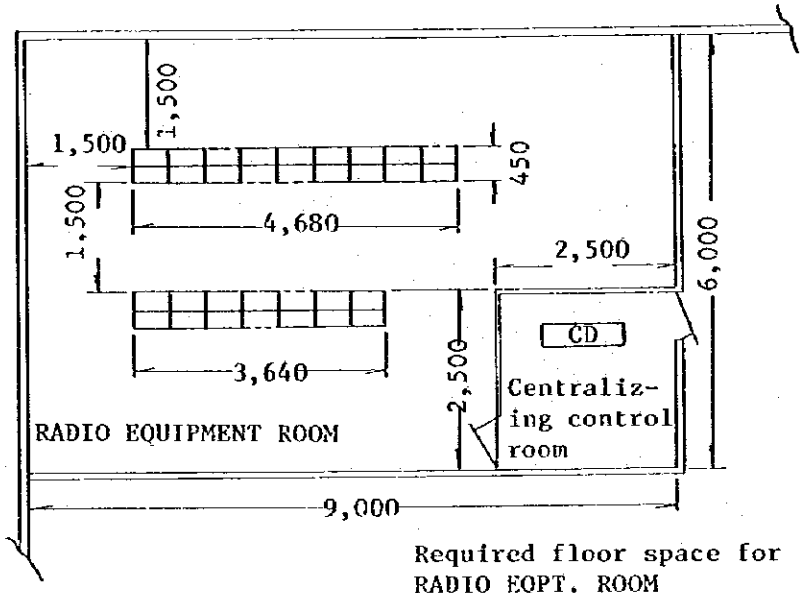


ANNEX – 4 VF Channel Allocation for Each Station between Exchanges.

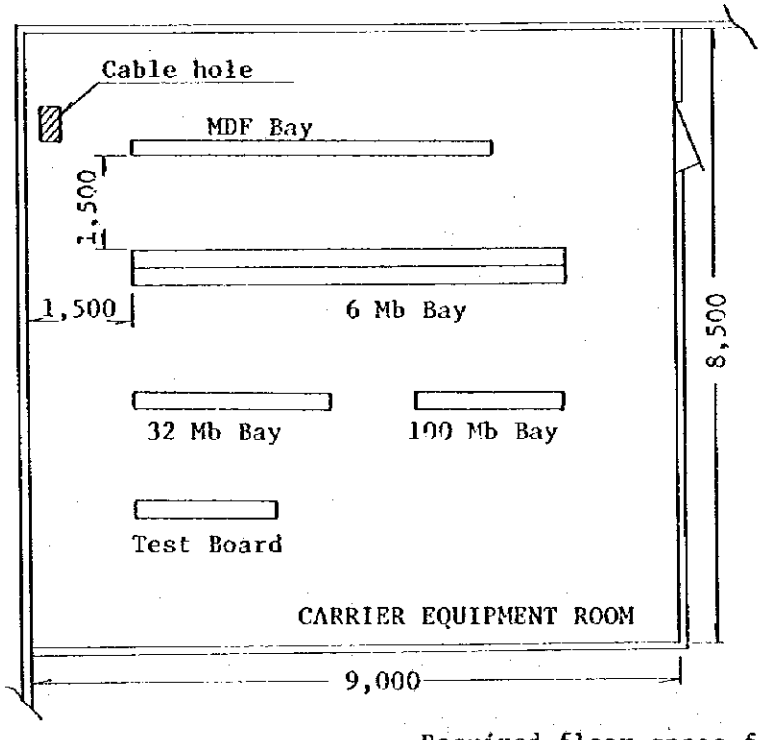
ANNEX 5

5-1 TYPICAL FLOOR PLAN FOR MOHARAM BEY STATION

Unit millimeter

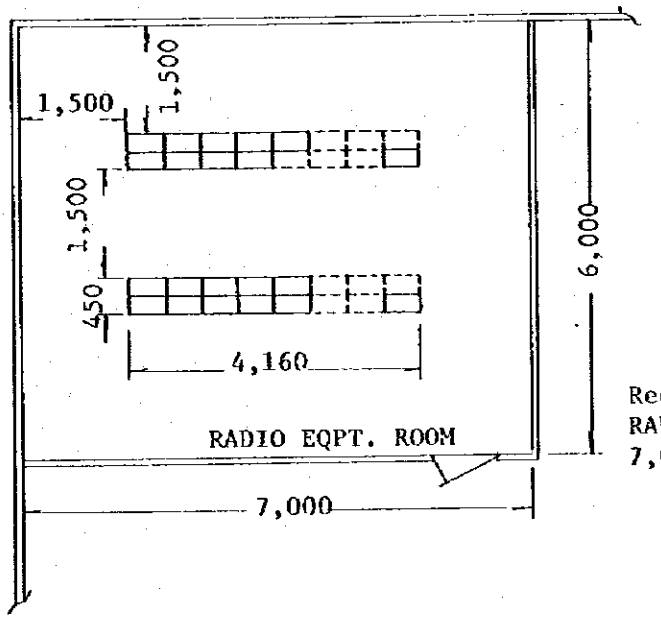


Required floor space for
RADIO EQPT. ROOM
6,000 x 9,000 = 54 (m^2)

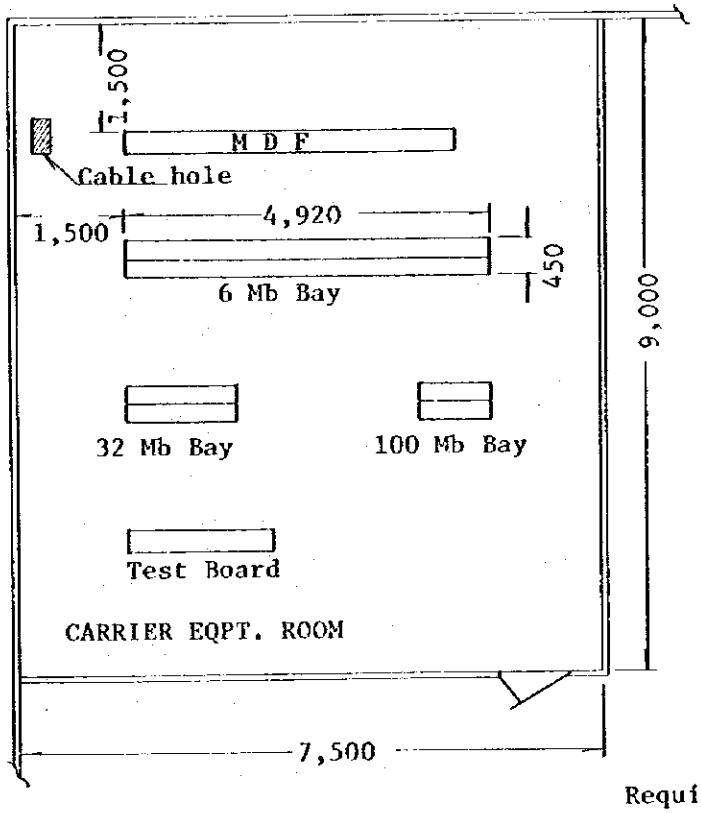


Required floor space for
CARRIER EQPT. ROOM
9,000 x 8,500 = 76.5 (m^2)

5-2 TYPICAL FLOOR PLAN FOR AUTO STATION

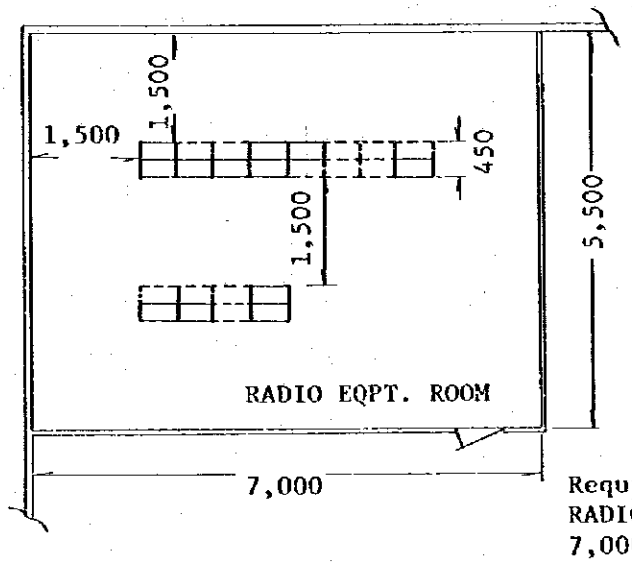


Required floor space for
RADIO EQPT. ROOM
7,000 x 6,000 = 42 (m^2)

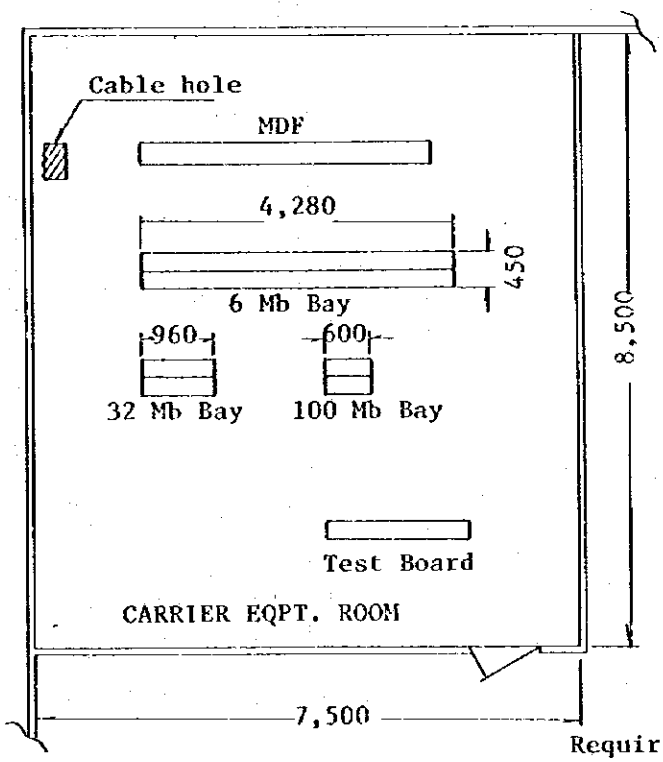


Required floor space for
CARRIER EQPT. ROOM
7,500 x 9,000 = 67.5 (m^2)

5-3 TYPICAL FLOOR PLAN FOR GLEM STATION



Required floor space for
RADIO EQPT. ROOM
7,000 x 5,500 = 38.5 (m^2)



Required floor space for
CARRIER EQPT. ROOM
7,500 x 8,500 = 63.75 (m^2)

TYPICAL FLOOR PLAN FOR IBRAHIMYA STATION

5-4-1

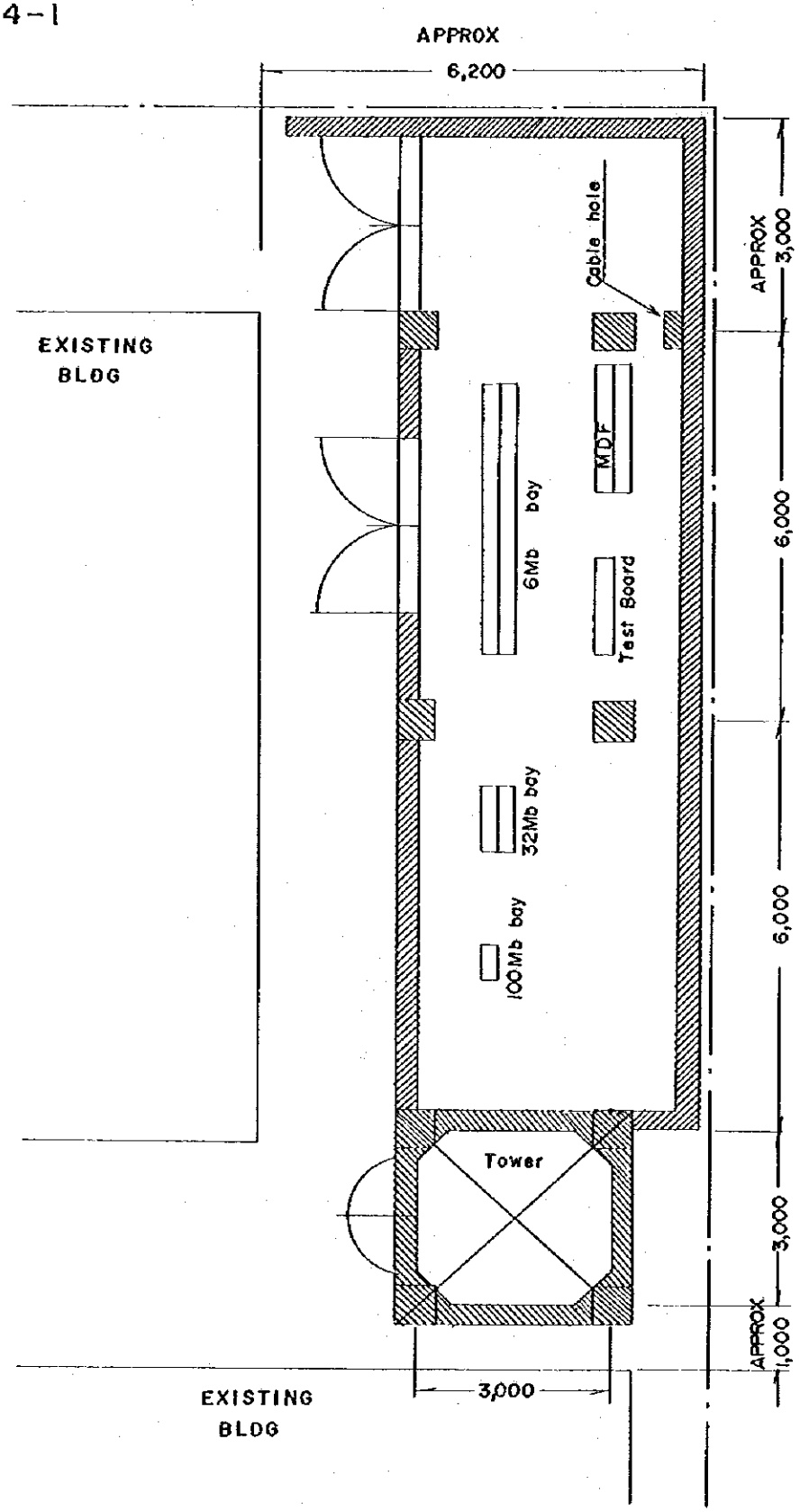


Figure shows 1st Floor (to be installed Carrier equipment)

of proposed new building

5-4-2

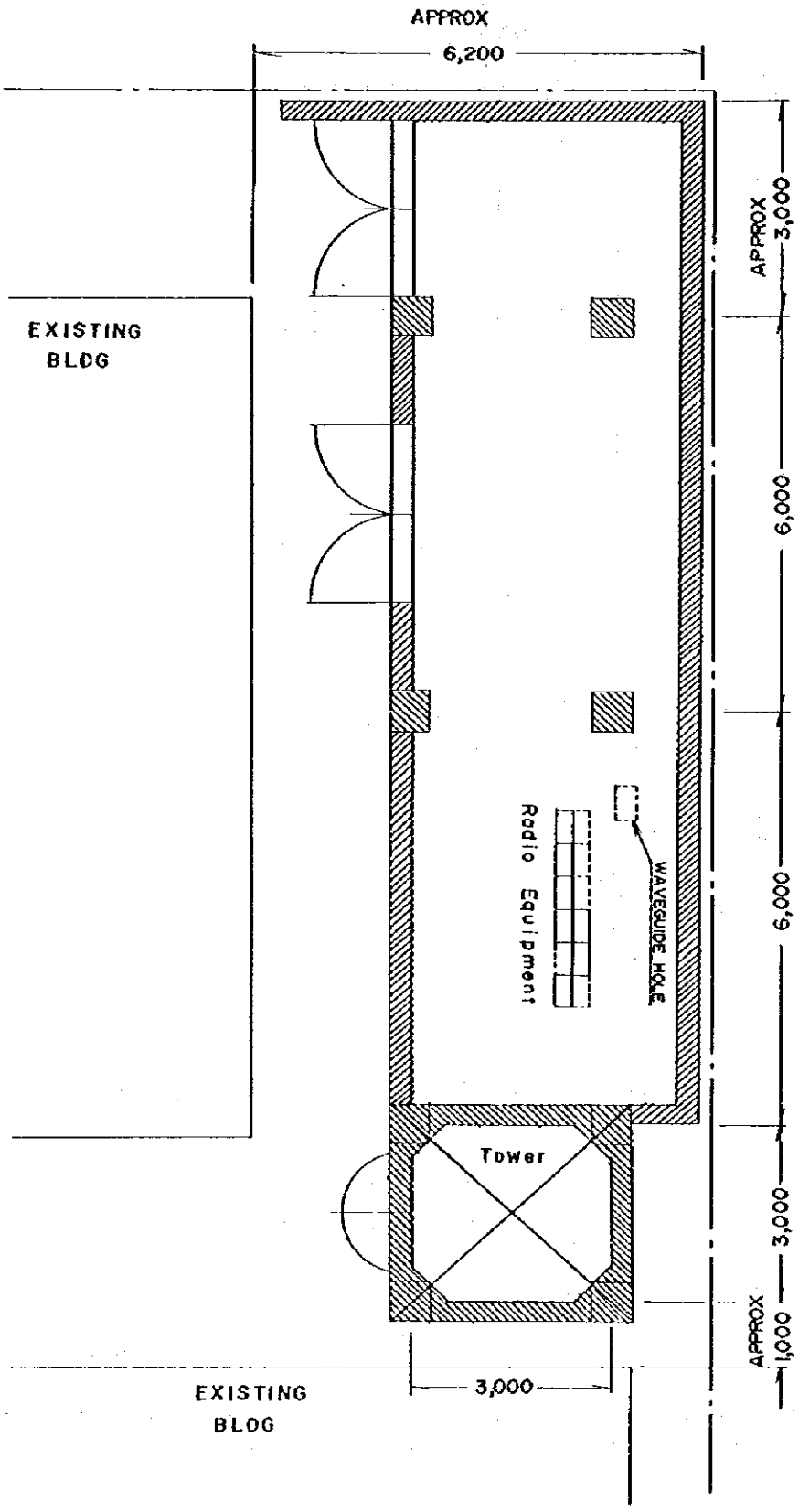
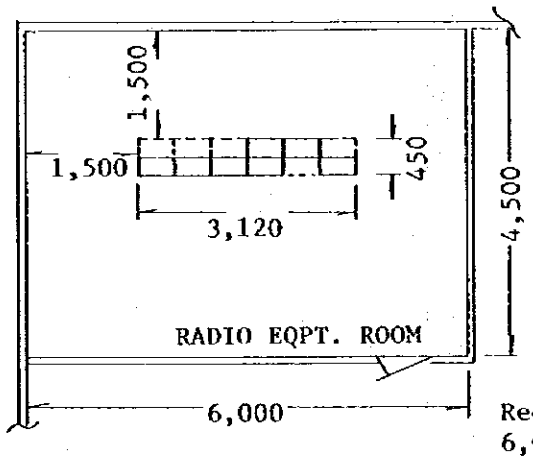


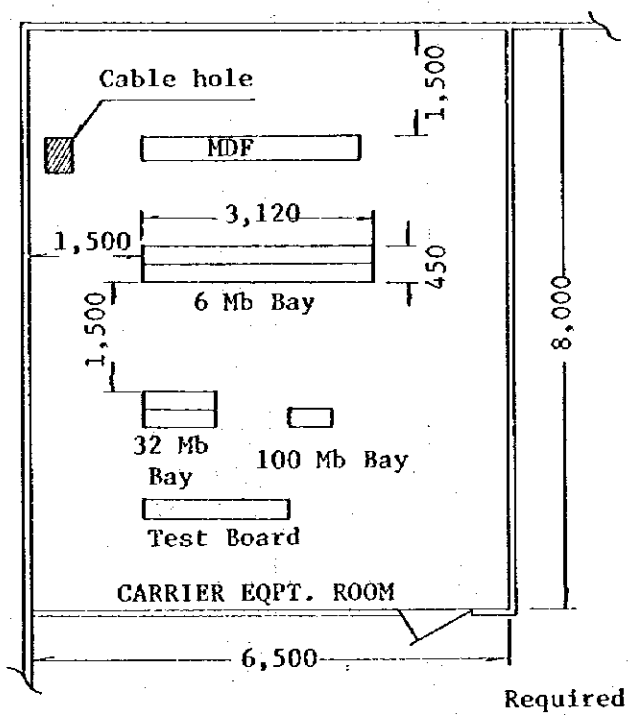
Figure shows Typical 2nd Floor (to be installed Radio equipment)
of proposed new building (IBRAHIMYA)

5-5 TYPICAL FLOOR PLAN FOR SIDI GABER STATION

a. SIDI GABER
b. SIDI BISHR
c. MANSHIA
d. EL MAX



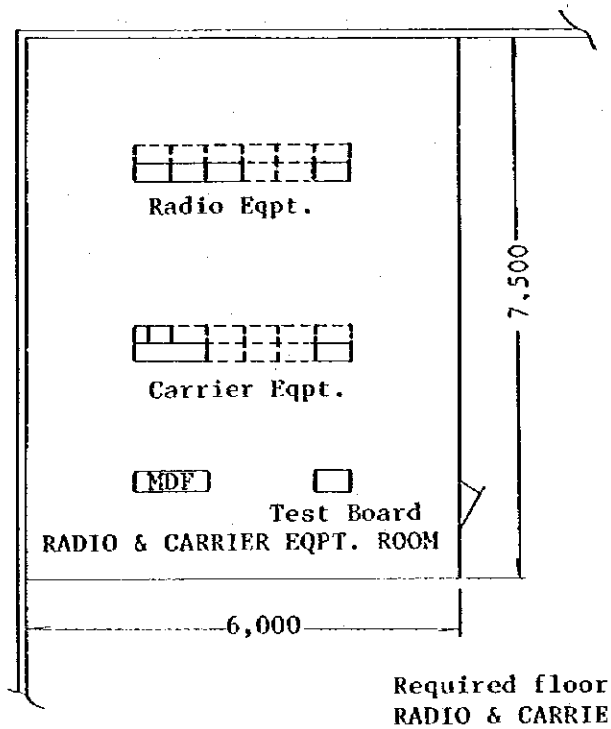
Required floor space
6,000 x 4,500 = 27 (m^2)



Required floor space
6,500 x 8,000 = 52 (m^2)

REMARKS: The figure shows typical floor plan of Sidi Gaber station, because all of above four stations are similar scale.

5-6 TYPICAL FLOOR PLAN FOR AGAMI OR ABUQIR STATION



Required floor space for
RADIO & CARRIER EQPT. ROOM
6,000 x 7,500 = 45 (m^2)

REMARKS: As same plan, both stations of AGAMI and ABUQIR, 2 systems (Normal + Emergency system), are same construction.

Above figure shows AGAMI STATION.

ANNEX-6

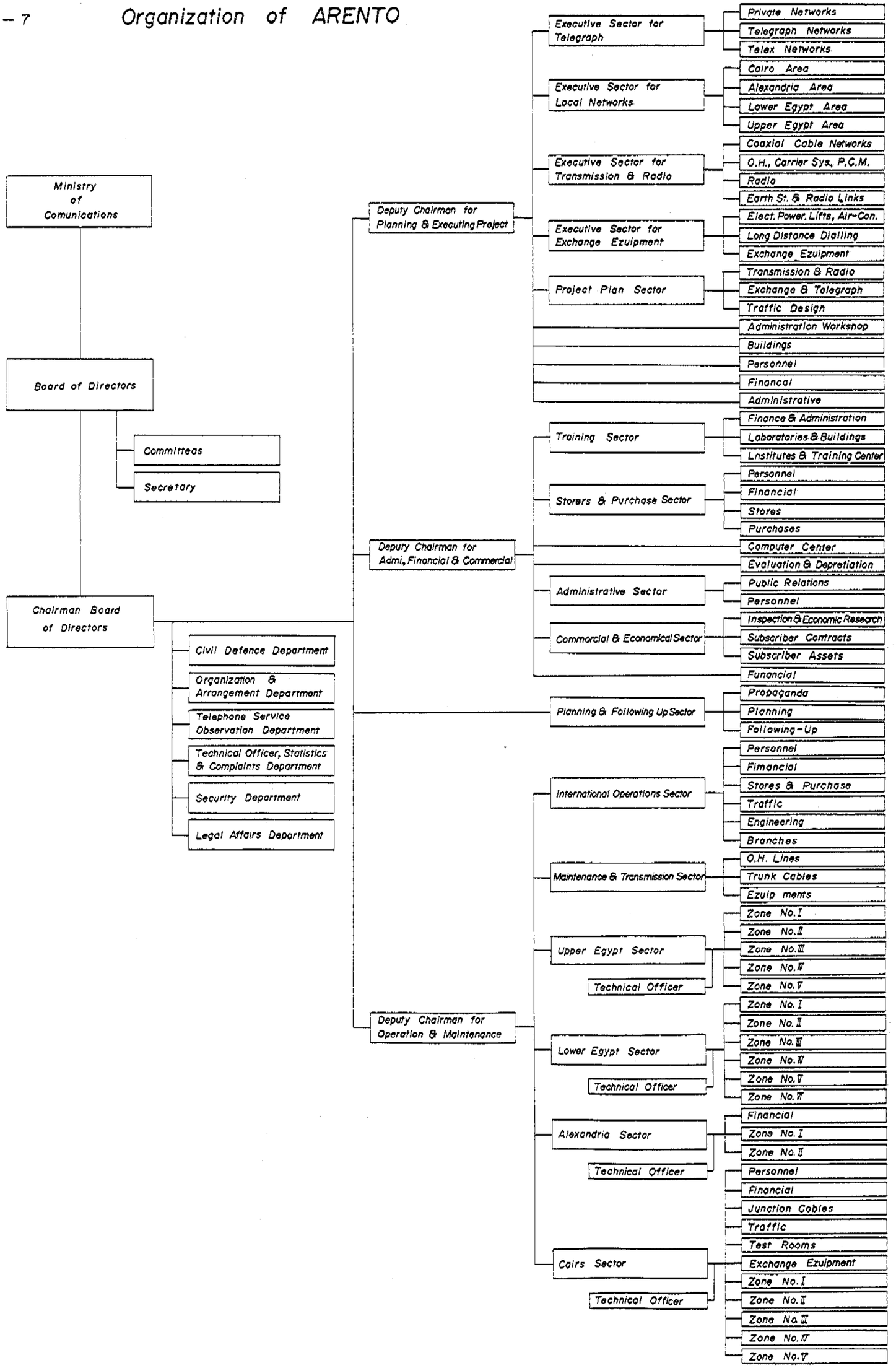
COMPARISON OF PROJECT COST FOR PCM AND FDM NETWORK

Unit: Million Yen

Currency / System / Item	Foreign Currency		Local Currency		Total	
	PCM	FDM	PCM	FDM	PCM	FDM
Radio Equipments	626	609	-	-	626	609
Antenna	37	51	-	-	37	51
Tower	125	138	-	-	125	138
Carrier Equipment	2,529	3,540	-	-	2,529	3,540
Power Supply Equipment	178	198	-	-	178	198
Test Equipment	45	43	-	-	45	43
Spare	84	84	-	-	84	84
Installation Material	812	812	-	-	812	812
Training	28	28	1	1	29	29
Operation/ Maintenance	45	45	14	14	59	59
Installation	698	698	329	329	1,027	1,027
Consulting Services	104	104	46	46	150	150
Contingency	525	548	43	50	568	598
TOTAL	5,836	6,898	433	440	6,269	7,338

ANNEX – 7

Organization of ARENTO



PART III

ECONOMIC EVALUATION

PART III Ecomonic Evaluation

1. Economy and Project

1-1 General

This part is dedicated to the study of economic and financial feasibilities of investments, including invited loans, in the local, i.e., Alexandria, transmission network improvement and expansion projects. Out of these projects, the object of such loans and investments planned this time is the transmission facilities construction project which is aimed at system of subscriber telephone circuits scheduled to be completed by the end of 1989.

In this Part, the fund operation program for project financing by ARENTO, the responsible entity for project implementation, will be formulated and the internal rate of return of the project will be estimated by means of analysis of the ratio of profit to total capital and so forth. These studies are to identify the earning power of the project and to establish the optimum program for invited loan repayment.

Initial investment, operating expenses and profits, etc., as parameters of financial analysis will be limited to those relating to the current project. Such parameters will be either quoted from among data and information that appear in the latter part of this paper, or estimated from such data and information.

For the newly planned transmission system, the up-to-date PCM digital microwave system will be introduced. This new system, compared with the conventional system, brings about greater system modernization in the technical aspect, resulting in the cost reduction in connection with the equipment investment. This cost trade-off by the introduction of new system, with the concomitant economic efficiency added, will be taken into account in this financial analysis of the project.

With regard to the economic analysis of the project from the socio-economic viewpoint, it is important to note that the Alexandria district occupies one of the central positions in the commercial, industrial and tourist business activities of Egypt; hence, the improvement of telecommunications facilities in Alexandria deserves top priority.

Social and economic data and information used in the investigation and analysis are from the undermentioned references.

(1) Five Year National Development Plan of Egypt (1980 Apr.)
(Arab Republic of Egypt)

(2) Statistical Year Book of Egypt (1980)
(A. R. E)

(3) Monthly Bulletin of Foreign Trade (1980)
(A. R. E)

(4) Pre-feasibility Study Report on Alexandria Telephone Network Construction Plan (1981 Marc.)
(Japan International Co-operation Agency)