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Development Meeting on the Manufacture
of Telecommunications Equipment
(including low-cost receivers for sound
broadcasting and television)

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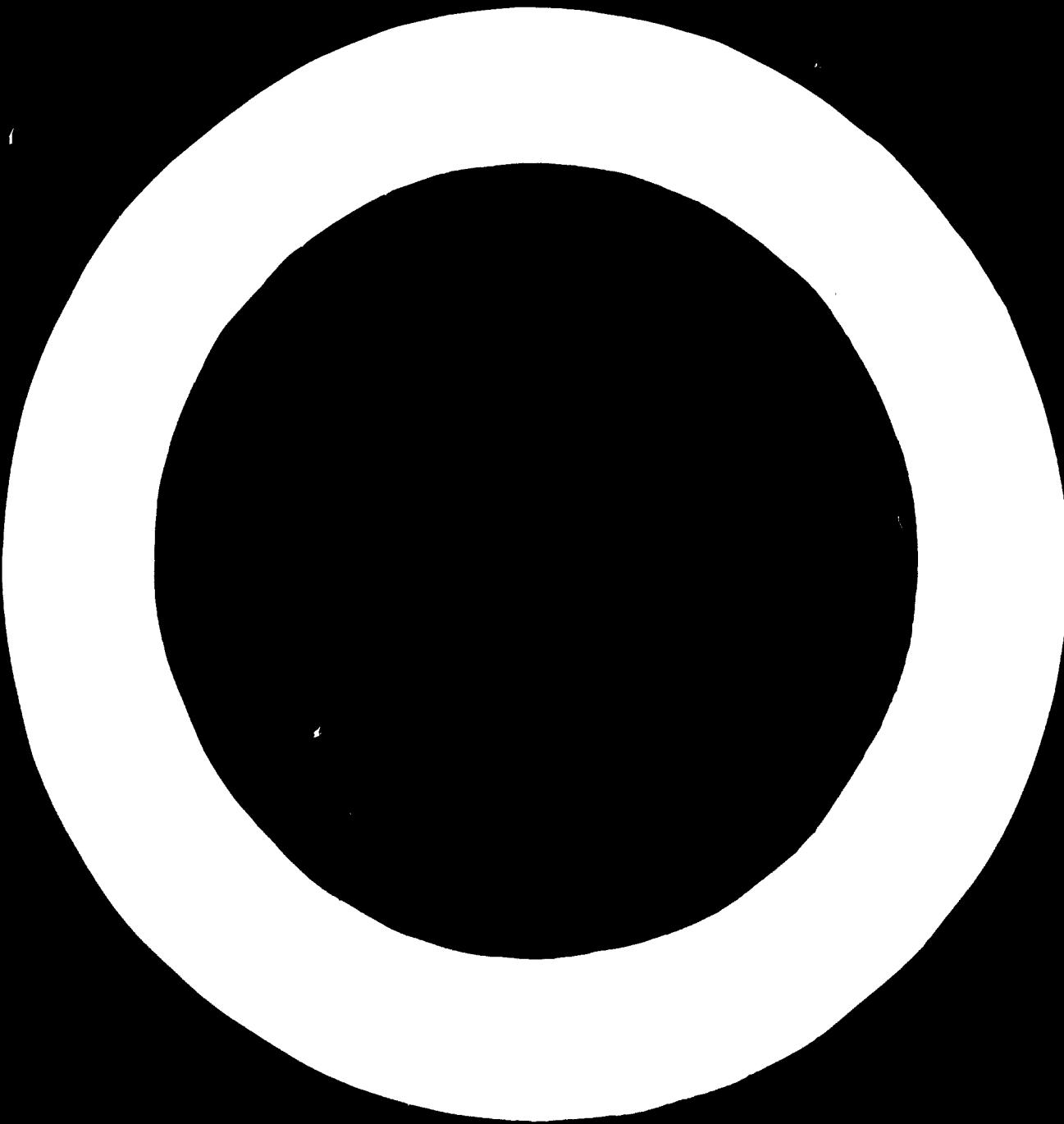
THE STAGE OF MANUFACTURE OF TELECOMMUNICATION
EQUIPMENT IN INDIA 1/

by

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1. INTRODUCTION

1.1.1. At the present time, levels of environmental pollution are increasing rapidly. The setting up of the U.K. National Pollutant Inventory and the subsequent control of pollutants under the Air Pollution Control Act 1968 has been a major factor in this. Levels of PM10 (particulate matter) were measured at 10 µg/m³.

- (a) to assess the environmental impact of particulate emissions from:
 - (i) domestic sources, and
 - (ii) industrial sources.
- (b) to recommend areas where further action is required to reduce the level of PM10 in the atmosphere, and to advise on the best way of achieving this.

1.1.2. The measures proposed by the government to combat air pollution. This report provides the results of the first stage of the assessment, which will be completed over a period of 12 months. The results will be used to inform the government's decision on the most effective way of reducing the level of PM10.

1.2.1. Air pollution is a complex subject. It is the result of many different developments and processes. The main types of pollutants include particulate matter, gases and vapours. These can be classified into three main categories: physical, chemical and biological.

1.2.2. Particulate matter is a general term for dust, smoke, soot and other materials suspended in the air. It can be divided into two main groups: primary and secondary. Primary particles are those which are directly emitted from a source, such as organic compounds, dust, smoke or soot. Secondary particles are formed by the chemical reaction of primary particles with other substances in the atmosphere. Examples of secondary particles include ammonium sulphate and nitrate. The main sources of particulate matter are industry, agriculture and traffic. The results of the assessment will be used to identify the most effective ways of reducing the level of PM10.

1.2.3. The Committee on Air Pollution (CAP) was established in 1968 to advise the government on the control of air pollution. The CAP consists of experts in various fields, including medicine, engineering, chemistry, physics and biology. The committee's role is to provide advice on the control of air pollution, particularly particulate matter. The CAP's recommendations are based on scientific evidence and are intended to help the government to take appropriate action to protect public health. The CAP's recommendations are based on scientific evidence and are intended to help the government to take appropriate action to protect public health.

1.2.4. The statement in the Shashi Committee report does not include specific communication equipment like telephone, telephone switching equipment etc. and also items like cable, building fittings and tools, and teleprinters.

1.2.5. The statement has also not included production that would be developed primarily for exports of aircraft, equipment, i.e. tractors etc.

1.3. Specific activities: A table which summarizes the production trends, the turnover realized in 1972 as well as the estimated investment is given in Annexure III. Development of manufacture of basic and intermediate and substitution of indigenous available raw materials, for the manufacture of component etc. have been encouraged.

1.4. The present focus of activity is being taken towards the implementation of the recommendations made by this committee so that self-sufficiency is achieved in the foreseeable future.

2. Government is charge of matters concerning electronics.

2.1 Administrative efforts made by the Government.

2.1.1. In India the electronic activity is handled both by the Government and the private enterprises. The Government runs the telephone and telegraph services and the Posts and Communications Service. The entire telecommunication equipment including switching equipment, telephone instruments, channelling equipment, microwave equipment and cable, with local long distance equipment, teleprinters, made in factories owned by Government. Most of the electronic equipment received for the strategic needs are also made in Government owned factories.

2.1.2. The Government plays the development of the electronics industry in the country and regulates the industrial licensing for the manufacture of all electronic items.

2.1.3. One of the important measures undertaken by Government recently was to invite manufacturers to submit proposals for establishing additional capacity to manufacture of the total quantities of components as would be required for the year 1973, which would be of the order of 1000 crores, i.e. 100 million, cor. min. The response has been excellent and this target is expected to be fully reached.

2.2 Civil and Industrial units:

2.2.1. Private industry is primarily engaged in the manufacture of electronic components, radio, television set and testing instruments. The private factories manufacture 11 types of components and most of the manufacturing units are engaged during the day in imports on the basis of the technical know-how obtained from manufacturers in foreign countries. Number of manufacturer all over the world in Europe, Africa and Japan have established arrangements with Indian manufacturers.

2.2.2. The manufacturing units have founded associations for promoting the development of their industry. Some of the important associations are the Radio and Television Manufacturers Association, Electronic Components Industries Association, the All India Radio Merchant Association, Federation of All Circle Industries Association etc. Amongst the professional institutions concerned with electronics are the Institution of Electronics Engineers, Institution of Electronics and Radio Engineers etc.

2.3 Research and Development: Research and Development organizations active in the field of electronics in India can be broadly classified under four major heads :-

(i) National Laboratories like :-

Central Physical Laboratory, Central Electronic Engineering Research Facility, IIT Institute of Management, Central Electronics and Telecommunications Research Institute, etc.

(ii) Laboratories connected with universities such as :-

Telecommunications Research Centre, Indian Institute of Electrical Research, Research Institute of the Indian Institute of Science, Electronic Division of the Indian Institute of Science, etc. Institute giving briefings on scientific researches in radio, television, Space and telegraphy is also available in various parts of the country.

(iii) Laboratories connected with other educational institutions such as :-

Indian Institute of Science, Institute of Radio Physics and Electronics, Chemical Research Laboratory and Indian Institute of Technology.

(iv) Laboratories with industry such as :-

Research and Development Centres of Hindustan Electronic, Indian Telephone Industries and several smaller units of the other concerns engaged in production.

2.4 Developmental Research:

2.4.1 The Multi-Purpose Research Organization plays the role in the area of Electronics in which short wavelength applications, i.e., of the field, radio instrument, electronic controlled timer, computer, electronic voltmeter, television receiver. Specialized equipment being developed are microwave components, microwave tubes, silicon devices, integrated circuit.

2.4.2 Laboratories connected with universities are engaged in developing a number of items of equipments for specialized purposes such as communication equipment for land line including optical cable, microwave radio relay, digital transmission, electronic telephone and so on equipment for social experiments, research work and by conducting studies. Electronic Division of the Indian Institute of Science, Bangalore, developed electronic instruments for wavelength measurement, i.e. 100 MHz and reactor control etc.

2.4.3 Industrial institutions have concentrated on fundamental studies in areas such as propagation of electric waves, dielectric properties, plasma column and wave propagation lines, cables, coaxial transmission, transistors, dielectric surfaces, etc., studies of the properties of radio waves propagation, atmospheric noise, generation of millimeter waves etc. In this are being set up an servo control centre at Bangalore, a testing laboratory, a electron computer in Delhi, conducted by the Institute of Fundamental Research, Jodhpur University and different technical institutes.

2.4.4 Research is mainly been oriented towards improvement in the quality of the products, higher productivity and reduction in cost.

2.6.5. The trend is towards central locality in the user departments and industry in for efficient design of electric power plant. Most of the national laboratories and defence research organisations are beginning to develop plans in this field, which is very much sterile.

2.6.6. The Government is taking a stand that it is the starting of development and research activity in the field of electrical engineering in India. We are in India, the first step of research institution is being done by the universities and our own institutions. Some of the major research institutions have been mentioned below.

2.7. Internal load and establishment of the Institute of electronics.

2.7.1. Information system. Consider the cost of setting up such an information system will be 1.5 billion rupees. In this case, if the subscribers are increased by 10%, the cost of the system will be 1.65 billion rupees. It is a good scheme for the too many local loads and branch lines for the service. The central office will be connected to all local branches by optical fibre (2.2 billion). The local lines are 400 km long, which will be taken care of, addition of 100 km extra distance and delay, is 1.1 billion rupees. In route of 100 km additional cost of 1.1 billion rupees will be required to provide about 200 new subscribers to the local office. The total cost will be 12.6 billion rupees after 2.0 billion already spent.

2.7.1.1. Land sharing arrangements. The cost of land for the plant is to be 20 million rupees per acre. The cost of land will be 0.15 million rupees per acre (1.5 billion), and for the first office, the plant will be 1.25 crores. Land required for the plant will be 3000 acres. It will generate current worth 1.25 million rupees or 1.1 billion rupees. This will share land and electronic equipment in blocks of 1000 acres each (one billion rupees).

2.7.1.2. Local telephone exchange. The total load of the service is stated over 1.1 billion rupees worth. The nearest telephone exchange located in western sector, will serve about 40,000 subscribers. It is sufficient for local telephone system and to have time and space for future switching equipment. All the lines will be optical fibre and has been used for relay in relay and switches. It is first fit with latest efficiency and standard design. It has to be avoided.

2.7.1.3. Multi-level telephone exchange. Till now in our block were provided one level of telephone. In the last decade, we have got tied multi-level, wide band exchange. The total cost of one year's usage is 1.8 billion rupees per annum (2.1 billion rupees per year) for a year. Microband will be provided for each subscriber. A circuit requires 8 ports. If 1 subscriber needs 1 billion, he can wish to have 1 port and so on for individual subscriber. Each micro-band will be 0.25 million rupees per annum (single line carrier) of 1 million rupees per annum. Total cost of one subscriber will be 1.25 million rupees per annum. It will be carried to 11 million rupees will be used for the project. This is a single line telephone system for interconnection of 500 subscribers, which is interconnected with the external and internal telephone systems. These will be interconnected with the exchange and will be interconnected to the main line. The total capacity will be 500,000 calls per day, which will be 0.5 billion rupees per annum (500 million rupees per annum).

2.5.1.4 Telegovt. Service. We have about 3.5 lakh telephones in India and the lighting unit of each will go in India for teleGovt. service. For setting up the teleGovt. system, we are depending on the existing switching (ISI), we have to add some more to the existing one at the Central centre.

2.5.1.5 Telecom. Though we have a very large number of telephone exchanges in India, still there are many exchanges which will be exchanged at New Delhi, so as to avoid traffic. So we are trying to expand our network and therefore the other places in India also have to be connected. I d., we have 25 exchanges with installed capacity of 10,000 lines. The number of exchanges will be increased to 30 and installed capacity will be 10,000 lines in 1972.

2.5.2 International Services

2.5.2.1 India is direct exchange of 113 countries and 1100 telephone channels, 3000 telephones abroad, 1000000 telephone circuits in the international circuit. Through the calls, we can establish connection in every country of the world.

2.5.2.2 Proposed Project India has planned to connect with the Indian Ocean satellite. The launching of the satellite is expected during 1973.

2.5.2.3 An experiment has been started to connect India directly with the satellite through which telephone calls can be made for a period of two years or three. A engineer working on this project has proposed a satellite technology.

2.5.3 Projects

2.5.3.1 Radio Telephony is to be developed in India according to following:

- | | |
|--------------------------------------|-----------|
| (a) Radio wave transmitter | |
| (b) Direct Broadcast | |
| (c) Long distance circuit | 21 |
| (d) Long distance terminal equipment | 21 |
| (e) Broadcast receiving equipment | 4 million |
| (f) Repeaters for Broadcast | 3-4 Lacs |
- including 1000 km. p.r.

2.5.3.2 Mobile Radio The mobile radio system is to be tested in March next year in 1972. The mobile radio will be used for the transmission of medium wave long distance telephone circuit in the region. The present price of the low power radio is Rs. 1000/- and it is estimated to bring this cost down to Rs. 500/- in the next year.

2.5.3.3 India is to be connecting the telephones in the satellite. Television transmission is to be done by the satellite over a band of two to three radio links. Frequency bands are to be assigned and applied in the following manner as follows:

2.5.4 Industrial Electronics Industrial electronics is to serve industrial needs of the country. In this activity like automation, instrumentation, control systems, electronic components, electronic industry, computer industry, etc. are to be developed. The major companies involved are Bharat Electronics Limited, TATA, Hindustan, Elettron, Sulzer (Delhi and Mumbai), C.R.E.C. (Mumbai), O.P.T. (Mumbai), Research Institute. (R.I.), the IIT's, the universities, the defence research organization in India itself and under the direction of the government in another three years time.

2.5.3 Radio electronics: Radio electronics playing an important role in the development of telecom in all departments in India. With the present developments and future projections of quantity of radio electronics to increase, it can be expected to increase rapidly in the coming years.

2.6 Other industries:

2.6.1 Telecommunications: The way of telecommunication, improvement and reorganization of existing telephone services to fast rate in India. But no standard telephone connection system to provide round the radio station to radio stations, especially in rural areas, which can be used by the radio station department.

2.6.2 Electronics manufacturing: Radio components, the manufacturing organization of radio components in the form of circuit board, frequency management, and other equipment required of international regulations, licensing, certification etc. of radio equipment. Presently, 12 units manufacturing firms are functioning. The following will be the total manufacturing capacity in the year of 1973.

2.6 Current situation and trend of Electronic Industries:

The present status of electronic industries recommended by the committee headed by the late Mr. K. S. R. Rao is given in figure 1. The chart position regarding the different categories of electronic industry from our point of view.

2.6.1 Electronic components: manufacture of electronic components is included among the industries under review of the Government. The present export being licensed is given in the same. Future effort is being made to set up additional capacity for the manufacture of electronic components to keep up with the present demand for electronic industry. Report. With the capacity envisaged the total production of electronic components will increase to about 10.5 crore (1.05 billion) in 1971. Production is expected to be Rs. 30 crores (1.7 billion) in 1973.

2.6.2 Manufacture of Telephones: As already mentioned, the present production of 3 million hand receivers is being stepped up to 6.5 million receivers in the next few years. The 3 million hand receivers of current production 2.5 million remaining 1.5 million new 1.5 million valve type receivers. The number of chassis produced is about 75% of the total production of 3 million receivers. Our top 10 receiver industry has been set up with indigenous know-how and it will start with the production of 16.5 receiversthe per, starting 1.5 receiversthe per. In addition, India is producing public address system, telephones, hearing aids and telephone sets.

2.6.3 Telecommunications: The manufacture of electronic civil electronic equipment industry is the only one which is mainly catering to communication need. Civil electronic products include equipment like transistors, capacitors, diodes, large variety of radio communication equipment. The civil electrical equipment for civil communication need is the Indian Telephone Industry which produces almost all the units required like automatic switching equipment, carrier telephone, local carrier telephone system, aerial cable system, submarine cable, electronic instruments etc. The total production for 1970 is of the order of Rs. 25 crore. Telephone are going to be manufactured by Hindustan Telephone where present production is 3,000 telephone per year which is being stepped up to 5,000 per year in the course of the next few years.

2.6.1 Guidelines: Guidelines for development of the electronic industry have been given very clearly in the industrial policy of the Government in actively encouraging independent units and units incorporated therein. Due emphasis is also given to all the products of the electronic industry viz. printed circuit, components, instruments etc.

2.6.2 Foreign Investment: Foreign investment in capital projects like joint venture in the field of electronics, import of raw material of electronic components, electronic parts of electrical equipment, similar electronic components, design and development of the like, not precluded and the objective will be to attract foreign capital and technology resources from abroad. The field will include design and development of electronic components, import of raw material of electronic components, existing foreign companies' liaison, and joint ventures will be encouraged to help bring down their cost of production whenever they want to manufacture large quantities of the electronic components required for new items. There is no need to wait for a long time for the approval of the Ministry of U.P... The need to start the project is the main object.

2.6.3 foreign investment: Guidelines for foreign investment in the field of the electronic industry including hardware, test instruments, equipments etc. export of electronic components and products of the like. The foreign investment can be made either by a joint venture or by a wholly-owned technical company or by a separate company to go into partnership. The same case of the foreign investors should be applied. The technical know-how is generally not subject to the law of the land but it is subject to the law of the country. The general guideline for right foreign investment is the nature and scope of the item and the cost of production. It is difficult to give a definite date of import whichever is earlier. For example if it is imported from U.S.A. there are other guidelines but according to the criteria of scope, the sophisticated technology involved, the cost of item, the cost of labour, higher fees etc., etc. will decide. From our point of view it is better to import for a few years initially and then to go into joint venture or to buy to turn over the business to the Indian partners gradually. The profit percentage is slightly reduced in such cases. A foreigner needs to want capital investment for given right time period of a year. These terms are the starting stage of foreign investment which are to be shared their review.

2.7 Graduate Education and Training

2.7.1 Under the institution of higher education will be managed by the state Government. The State Government will manage the institution of four Central Universities and technical institutions. The list is given below.

2.7.2 The major courses in each of the 1st class degree being granted by the technical personnel required for the professional examinations. The major facilities for degree courses in Mathematics and Science are provided by organisations selected colleges of institutions. The aim of these is being laid emphasis on the quality of the course.

2.7.3 The enrolment target for the third Plan was 25,000 for the Degree Courses and 5,000 for the Diploma courses. By last this target, 12) Degree Institutions and 27) Institutions of Higher Level had been started. This excludes Girls' Lyceum. The enrolment operation is expected during the fourth Five Year Plan. In 1961-62, student were admitted in the degree level and 56,00 at the diploma level.

2.7.4 So far 102 courses had been adopted for post graduate education and research in technical education.

3. International Cooperation under the Governorate

3.1 India has been active participant in the conference of International Telecommunications Union (ITU), Inter-Asian Consultative Committee on Telegraphy, and Asian Tele (CAT) on Asia with telecommunication. We have also been participating actively in the Space and telecommunications conference of the ICSU, UNO and the electric power instrumentation unit of the international scientific commission. India is a member of the IEC (Electrical Unit).

3.2 There is mutual exchange of scientists in the field of electronics and telecommunications between India and other countries especially in Africa and Asia. These exchanges are also being organized between India and the advanced countries. India is also participating in the Third, Fourth and Fifth Development Plans and their bilateral programs etc. The facility at the experimental satellite communication station at Meedlod is available to the trainees of the countries in this region.

FIGURE 11

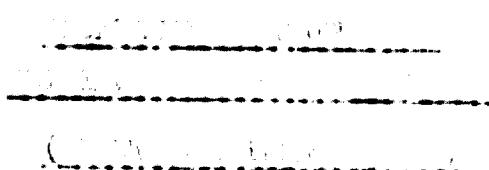


Figure 11. Ratio of the maximum value of the derivative of the absorption coefficient to the absorption coefficient at 2500 Å versus wavelength.

Equipment item	2500 Å	2600 Å	2700 Å	2800 Å	2900 Å	3000 Å	3100 Å	3200 Å	3300 Å	3400 Å	3500 Å
1. Indirect absorption concentration factor	11.8	10	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
2. Low-power direct equipment	2.0	3.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3. Ion wave, direct concentration factor	1.7	2.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
4. High-power direct or indirect, direct concentration factor	1.7	2.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
5. Line emission line	3.6	1.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
6. Line, emission, molecular concentration	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
7. Test instrument	—	3.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
total	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

ANNEXURE I

Telecommunications Research Institute and Electronics

Telecommunications Research Institute is the main field of radio and telegraphy department and is entrusted with equipment for use in the country. The development work done in the T.R.I. has been utilized effectively for developing and designing the communication equipment for the Second and the Third five Year Plan. The principal areas of activity have been in the fields of carrier systems, electro-electronic switching equipment, electronic measuring equipment and power plant etc. Owing to a good base in the field of microwave and its equipment design will be in the design of pulse and digital transmission. During the Fourth Five Year Plan the work in the above digital transmission will continue with effort to make available these equipment and service continuously. Owing to the availability of components are becoming available and design efforts are required to make use of these to the maximum extent possible for providing more foreign exchange. The other fields where new work have to be started in digitalized transmission, picture, facsimile, V.H.F. transmission subscriber equipment, external plants etc. to provide new services and new facilities.

The main items of work in the field of electronics are:

- (1) design and development of intermediate 27 channel system for large tube oscillators.
- (2) design of transistorized type 500 channel switch for small tube oscillators.
- (3) re-design of the existing multiplexing equipment to accommodate indigenous components.
- (4) picture and facsimile transmission.
- (5) electronic measuring instruments of various types.
- (6) design of solid state 96 channel microwave switch in the new 4/6 GHz range.
- (7) design of solid state 2 and 36 channel microwave systems in the 7/8 GHz range.
- (8) design of solid state heterodyne 36 channel microwave systems 2.0-2.4 GHz range.
- (9) design of T.V. transmission facilities.
- (10) design of low power units for scatter and satellite communications.

- (11) Development of geographical information system for the area.
- (12) Revision of administrative boundaries - to suit the new political divisions.
- (13) Revision of boundaries of the various districts and sub-districts.
- (14) To delineate the boundaries of the various districts and sub-districts with the help of remote sensing.
- (15) Development of a database for the revised boundaries and their integration.

	1910	1911	1912
Total telephone lines	11,111	11,311	11,511
Telephone tax	\$5,110	\$5,110	\$5,110
Telephone (per line)			
Local lines	3,200	3,200	3,200
Long distance	5,776	5,776	5,776
(average 1.6)			
Interurbans	2,200	2,200	2,200
(average 1.0)			
Local carrier systems	12	12	12
(average 1.0)			
Local wire carriers	6,213	5,900	5,800
Average (no. of cities)			
Local wires	244,000	37,000	15,000
(average 1.0)			
Tollers (no. cities)	6,213	3,200	2,100
Average (no. of cities)			
Public office lines	3,600	2,600	1,700
Average (no. of cities)			
Combined telephone & telegraph offices	11,110	11,310	11,510
Average (no. of cities)			

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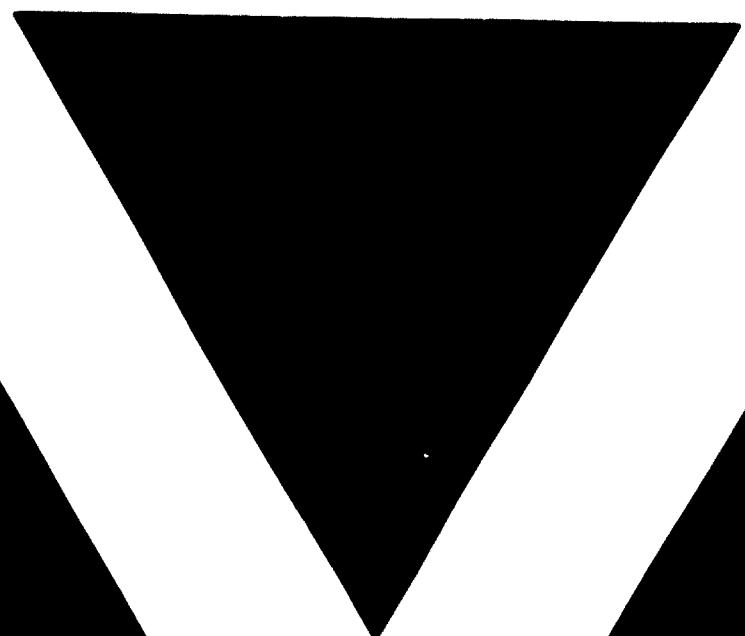
APPENDIX 12: CIRCUIT DESIGN

1. CIRCUIT DESIGN

(Circuit Design)

Item	Product	Design	Design	Design
1.	Transistor (NPN or PNP) Silicon Junction Diodes	12.0	12.0	12.0
2.	Resistors	12.0	12.0	12.0
3.	Capacitors (e.g., electrolytic)	1.0	1.0	1.0
4.	Thermistors	1.0	1.0	1.0
5.	Inductors	3.0	3.0	3.0
6.	Plastic film and paper capacitors	20.0	20.0	20.0
7.	Germanium diodes	4.0	10.0	10.0
8.	Varistors (Zn Oxide)	3.0	3.0	3.0
9.	Varistors	20.0	20.0	20.0
10.	Load resistors	3.0	3.0	3.0
11.	Switches and Switches	3.0	5.0	5.0
12.	Integrated Circuits	-	4.0	5.0





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