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TELECOMMUNICATIONS IN THE P.S. AREA

This note is concerned with the Telecommunication facilities provided in the present P.S. Area. It is subdivided into :

- Sec. 1 : Classification of systems,
- Sec. 2 : Description and Operation of systems,
- Sec. 3 : Layout.

Not included in this note are the more general systems used in CERN, such as :

1. The normal telephone system,
2. The special telephone arrangements for fire and accident,
3. The personnel location systems (calling lights).

1. CLASSIFICATION OF SYSTEMS

Four systems are provided by the P.S. Division, especially for the installation and operation of the machine. These four systems may be classified in terms of the kinds of instruments at both transmitting and receiving ends and the area covered (see Table 1 below).

Table 1

System	Instruments at		Area
	Transmitting End	Receiving End	
Portable Telephones Network (Previously Intercomm. I)	Head set with normal or throat microphone, or telephone hand-set, to plug into jack stations		P.S. Area
Public Address	Microphone	Loudspeaker	P.S. Area
Control Centres Intercomm. (Previously Intercomm. II)	Microphone	Loudspeaker	Control Centres
Call-in Telephones (previously Intercomm. III)	Hand set	Loudspeaker or buzzer and hand set	P.S. Area

2. DESCRIPTION AND OPERATION

2.1. Portable Telephones Network

2.1.1. Description

This equipment offers continuous speaking and listening facilities to a group of persons, belonging to a team, provided that they have connected their portable head or hand telephone sets to one of the 5 or 10 lines serving the zone. The connections are readily obtained at jack stations spread throughout the zone. The 5 or 10 lines are fed by a 24 V. battery through a distribution box containing illuminated push-buttons and fuses. In total 30 lines are installed in the present P.S. Area, grouped as follows :

- 5 in the Linac Wing
- 5 in the Power House
- 10 in the Ring Tunnel and Central Building
- 10 in the Experimental Halls and Main Control Room.

Each of the four groups has its own distribution box but there are only two batteries (one for the Power House and another one for the rest). In addition all the 30 lines are brought back to 30 terminals (+ 10 reserve) in a patch-panel (Main Control Room) at which interconnections may readily be made. If lines of different groups are interconnected, it must be checked that the common line so obtained has only a single battery feed. Fig. 1 shows a schematic diagram of the system, in which the proposed references are also indicated. Only one jack station per group is shown. In addition a plugged-in portable set is also indicated. The jack stations are in general mounted on walls or on control desks but portable stations are also available to be plugged into special sockets. To complete the system, head sets with one or two earphones and normal microphones, head sets with two earphones and throat microphone (noisy location) and hand sets are available.

2.1.2. Operation

When the machine reaches a more advanced stage (all control centres manned at least during working hours) operation will be shared between the various control centres as follows :

1. Power House : Allocation and switching of the 5 lines in the Power House Distribution Box.
Maintenance of local battery.
2. Linac : Allocation and switching of the 5 lines in the Linac Distribution Box.
3. Central Building : Allocation and switching of the 10 lines in the Central Building Distribution Box.
4. Main Control Room : Allocation and switching of the 10 lines in the Experimental Halls. Maintenance of the common battery. Interconnections in the patch panel. Distribution of the instruments and of the portable jack stations against signature on an appropriate card.

The Main Control Room operator has overall responsibility for the system and takes the necessary steps with the other operators when an inter-connection between lines of different zones has to be established.

At present (Main Control Room not permanently manned) Mr. Hoffmann (569) acts as the Main Control Room operator. As to operational limitations, one must point out that for a number of sets exceeding 10 connected to the same line a second battery feed must be provided to the line. This can be obtained easily at the patch-panel.

2.2. Public Address

2.2.1. Description

This is a normal system consisting essentially of microphones, amplifiers and loudspeakers for the purpose of giving, from the Control Centres, announcements concerned with Machine operation.

The present P.S. Area is subdivided into four zones, each of them served by separate systems as follows :

1. Power House (Microphone station in Power House Control Centre)
2. Linac (" " in Linac Control Centre)
3. Ring and Central Building (Microphone station in Central Building Control Centre)
4. Experimental Halls (Microphone station in Main Control Room).

Interconnection facilities are provided by means of keys on the microphone stations so that the following possibilities exist :

1. Power House can announce in any area but Linac
2. Linac " " only in Linac Wing and in the Inflector Area.
3. Central Building can announce only in the Ring and in the Radial Tunnels.
4. Main Control Room can announce in any area with priority.

Fig. 2 shows, schematically, the above connections. Solid lines from Main Control Room indicate the priority mentioned.

2.2.2. Operation

When the machine enters into regular operation a set of standard warning announcements will be prepared and possibly a tape recorder used in the Main Control Room. This matter will be dealt with in a further note.

2.3. Control Centres Intercomm.

2.3.1. Description

By means of this system it is possible to establish direct connections between some or all of the 5 control centres, through microphone - amplifier - loudspeaker links.

As schematically indicated in Fig. 3, each control centre is equipped with :

1. A microphone station (T- CMS -----) containing a microphone, a transistorized preamplifier and keys (one for each other centre) with indicating lamps.
2. A loudspeaker (T - CL -----).

All microphones and loudspeakers are connected back to a central amplifier in the Main Control Room. The use of highly directional microphones with rapidly-falling-off characteristics avoids accoustic feed-back.

2.3.2. Operation

Any microphone station can call any other station by operating the corresponding key. This action results in :

1. The connection of both the calling and called microphone and loudspeaker stations through the main amplifier, and the lighting of the lamps corresponding to the other centre in the two stations.
2. The lighting of the lamps corresponding to the two connected stations in all other stations.

The called station has not to operate any key. If the operator in any other centre wishes to participate in the conversation, he has simply to operate the key corresponding to one of the already connected centres.

It is quite obvious that conversation can take place simultaneously between all 5 centres. However, two independent conversations are not possible because of mixing in central amplifier.

2.4. Call-in Telephones

2.4.1. Description

The purpose of this system is to provide readily-established connection between a certain number of fixed points in the P.S. Area and the interested control centres.

Fig.4 shows a schematic diagram of the system. Each fixed point (T - TS -----) consists of a normal telephone hand-set and a box which incorporates a transistorized microphone amplifier. The switch (e.g. SW 11) is in the form of a hook carrying the hand-set.

In the case of the instruments on the Control Desks, the switch may be incorporated in the hand-set itself. Continuing with the example quoted above, when hand set T - TS 11 is lifted, the switch SW 11 closes and operates the contact RL 1, so connecting the 15-watt transistorized amplifier T - TA 1 in the Control Centre to the power supply. The output of T - TA 1 feeds the loudspeaker and the input is connected via a capacitance to the hand-set T - TS 11. The control centre operator can answer by means of the hand-set T - TS 1, the operation of which closes SW 1 and opens RL 2. A direct communication is then established between the two instruments.

If only a warning signal is wanted in the Control Centre (instead of direct speech over the loudspeaker), the amplifier can be excluded and the buzzer BZ 1 connected instead (switch SW 2).

For this system the present P.S. Area is subdivided into 3 zones :

1. Power House (separate battery)
2. Ring Tunnel
3. Linac and Experimental Halls.

As indicated in Fig. 4, the following connections may be pre-arranged :

1. Power House instruments call either the Power House Control Centre or the Main Control Room.
2. Ring instruments call either the Central Building or the Power House Control Centre or the Main Control Room.

2.4.2. Operation

The use of this system is very simple. As already mentioned, anyone who wants to call the control centre concerned has only to pick up one of the telephone sets T-TS distributed over the P.S. Area. The operator receives the message through the loudspeaker and can answer by picking up his own handset provided for this purpose. The systems are preconnected to suit operations in progress at any given time.

One has to stress that this system should be used every time a direct connection with the control centre is wanted. This, of course, includes use in case of an accident to warn the operator (and after having pushed an emergency push-button).

2.5. Summary

For the sake of clarity, we summarize below the main uses of the four systems :

1. Portable Telephones Network : To be used when a relatively long conversation has to take place between well defined points. Up to ten sets can be connected in parallel to the same line, but the most important limitation of the system is introduced by the fact that there are only one (in the case of 10 lines) or two (in the case of 5 lines) jacks per line and station. Should more than one or two people require connection at the same point, extensions can be provided to other nearby jack stations, or several lines can be connected in parallel at the patch-panel.

2. Public Address : To be used by the operators to make announcements in connection with Machine operations.

3. Control Centres Intercomm. : To be used by the operators for exchanging information, warnings and orders. The five Control Centres can hold a common conversation. Selection can be obtained, however, at any Control Centre.

4. Call-in Telephones : To be used any time a direct connection is wanted between a particular point in the P.S. Area and the Control Centre. This system should also play an important role in connection with accidents of any sort and fire. Instructions will be issued shortly in this respect.

3. DETAILED LAYOUT

Fig. 5 shows the location of the instruments already in position or to be installed in the near future. It does not show the equipment in the control centres, which will be dealt with separately, nor the loudspeakers for the Public Address system. Only Portable Telephone Jack Stations and Call-in Telephones are therefore indicated (99 Portable Telephone Jack Stations and 60 Call-in Telephones).

3.1. Control Centre Layouts

3.1.1. Power House

The calling and interconnecting facilities are all present on the central desk, namely :

1. One Portable Telephone jack station (see 2.1.1.)
2. One station for the Public Address (see 2.2.1.)
Microphone common with 3.
3. One microphone station for the Control Centres Intercomm. (see 2.3.1.)
4. One hand-set for the call-in telephone system (see 2.4.1.).

In the Control Room are also located : the amplifiers for the Public Address system; loudspeakers for the Call-in Telephone system and for the Control Centres Intercomm.; and the distribution box for Portable Telephones Network.

3.1.2. Computer Room (attached to the Power House systems)

This room contains :

1. two jack stations for Portable Telephones Network.
2. two loudspeakers for Public Address.
3. one microphone station and one loudspeaker for the Control Centres Intercomm.
4. one hand-set for the Call-in Telephones System.

3.1.3. Linac

At the Control Centre there are :

1. one jack station for Portable Telephones Network.
2. one microphone for Public Address.
3. one microphone station and one loudspeaker for the Control Centres Intercomm.

3.1.4. Central Building

There are in this room :

1. Two jack-stations and distribution box for Portable Telephones Network.
2. One microphone station for the Public Address.
3. One microphone station and loudspeaker for the Control Centres Intercomm.
4. Two hand-sets, the loudspeaker and the amplifier for the Call-in telephones System.

An additional jack station (point 1), the microphone station (point 3) and an additional hand-set (point 4) will be installed in a temporary central desk.

3.1.5. Main Control Room

On a temporary central desk, similar equipment to that in the Power House Control Room will be installed.

In addition the Centre contains :

1. One distribution box, the general patch-panel and two wall-mounted jack stations for Portable Telephones. It is planned to install 4 additional jack stations, one in each main row of racks (see Fig. 6).
2. The amplifiers for the Experimental Hall and Ring Public Address Systems.
3. The loudspeaker(s) for the Control Centres Intercomm.
4. Two hand-sets and the loudspeaker for the Call-in Telephone System.

3.2. Extensions

All the four systems described in Sec. 2 are likely to be extended in the future. Some extensions, concerned with existing parts of the P.S. Area, are already planned and the installation partly made.

An example is the extension of the Portable Telephones Network in the South Experimental Hall. Apart from the Jack Stations shown in Fig. 5, cables are laid in the South Tunnel terminated by Tuckel sockets corresponding to each cross-trench. From these sockets it is therefore very easy to extend the cables to chosen points in the floor. For instance, sockets for this purpose could be reserved in the Terminal Boxes for Experimental cables (see P.S. Int. EE/CONT. 59-4). Also extensions in the Counting Room would be quite straightforward.

As far as the new buildings are concerned (South Power House, North-East Site, etc.) it is obvious that extension of the Portable Telephones

Network and of the Call-in Telephones are quite simple. The Public Address requires a new installation, and a connection to the existing one. The actual central amplifier of the Control Centres Intercomm. has been designed for 8 microphone and loudspeaker stations and only 5 are installed now. We can therefore add 3 stations for 3 Control Centres.

by : The Controls Section

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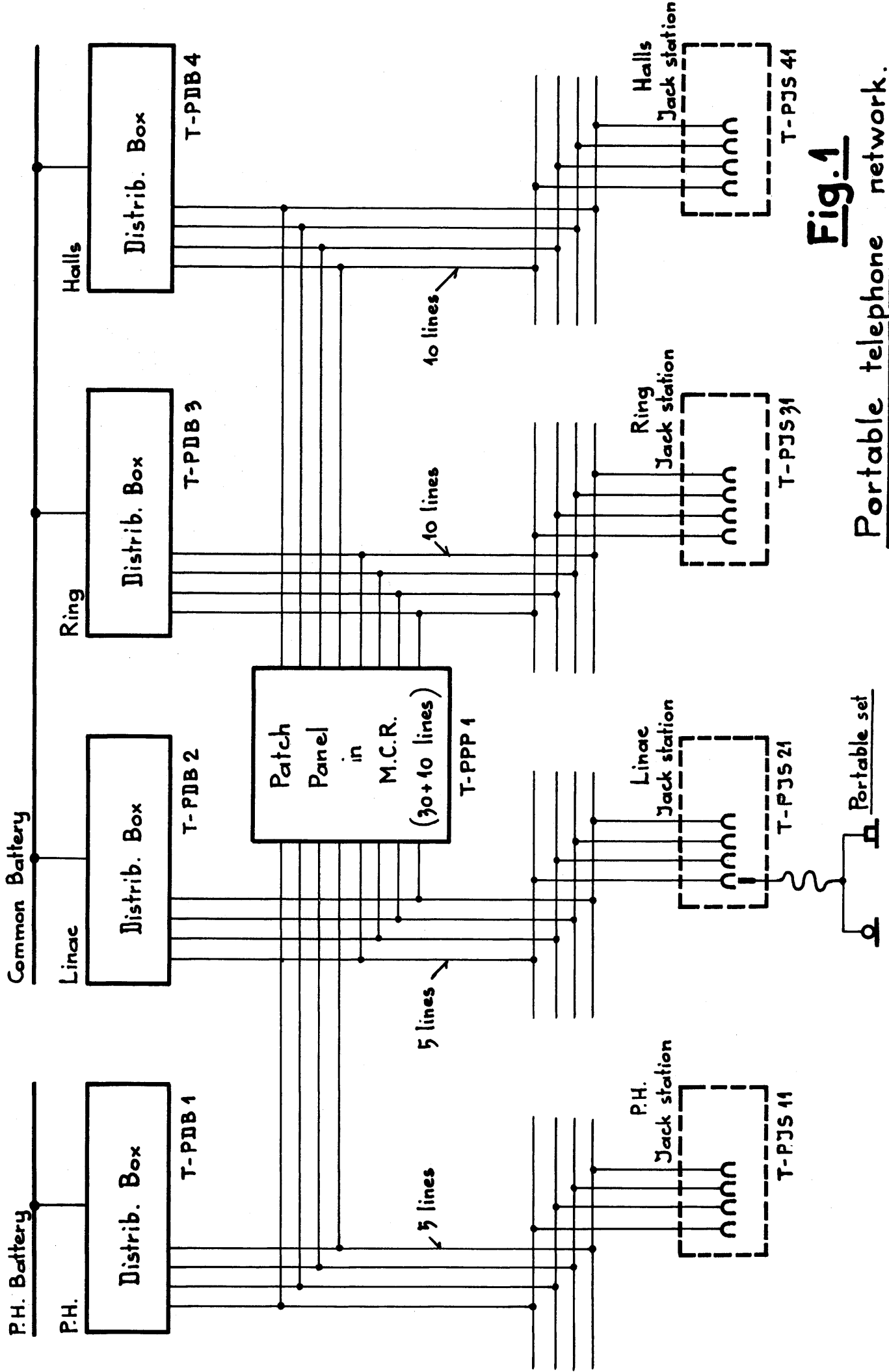


Fig. 1

Portable telephone network.

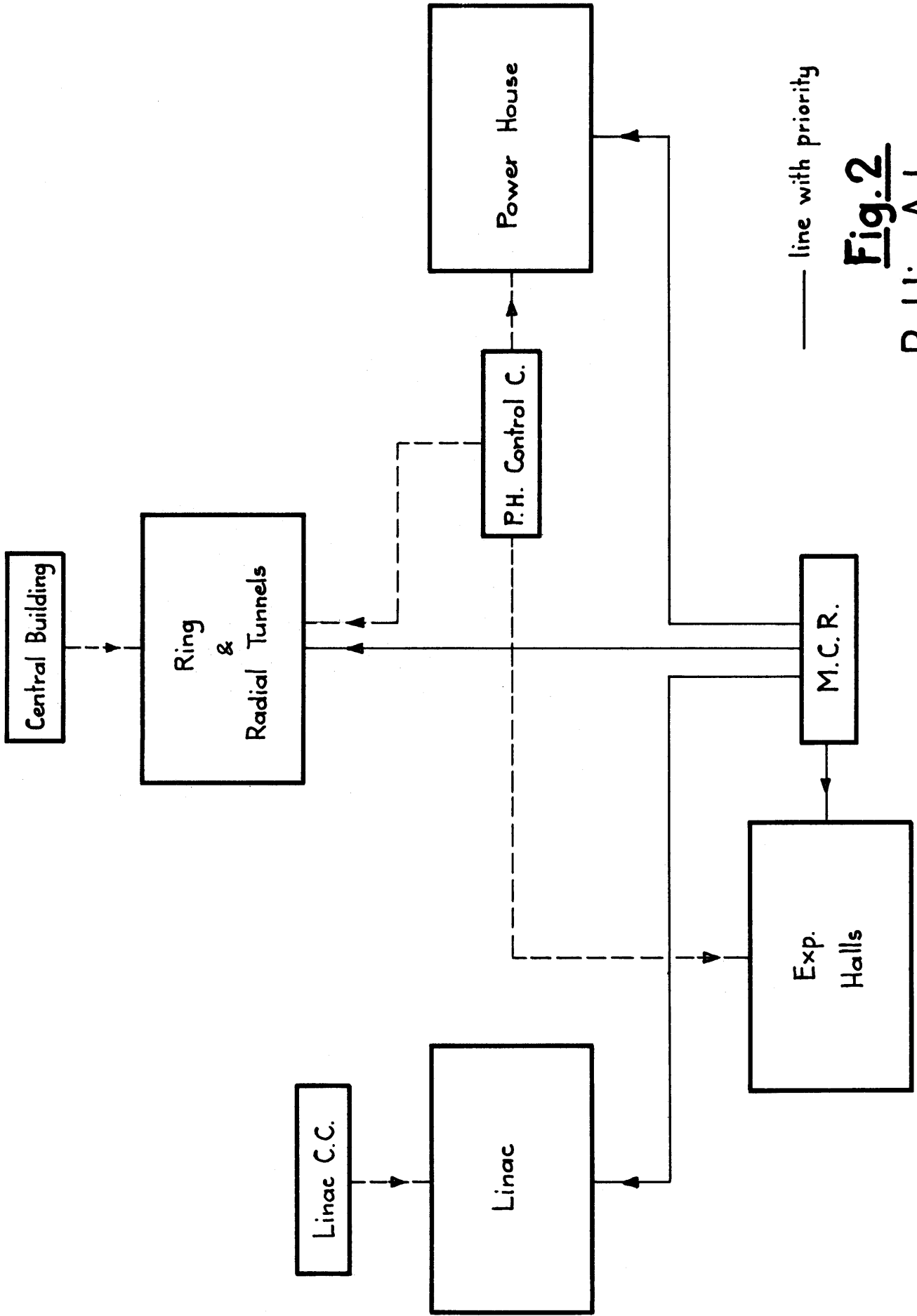


Fig. 2
Public Address

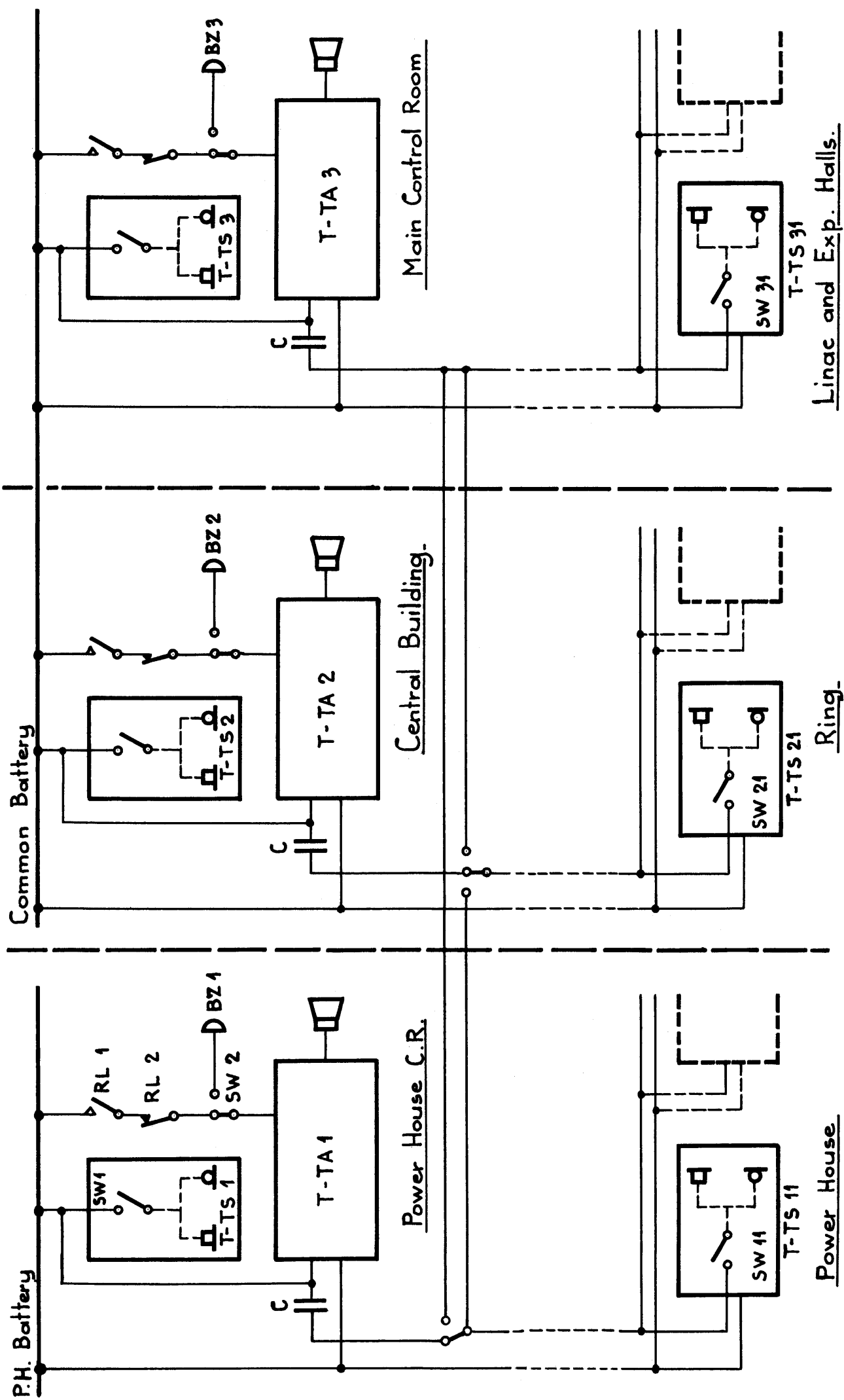
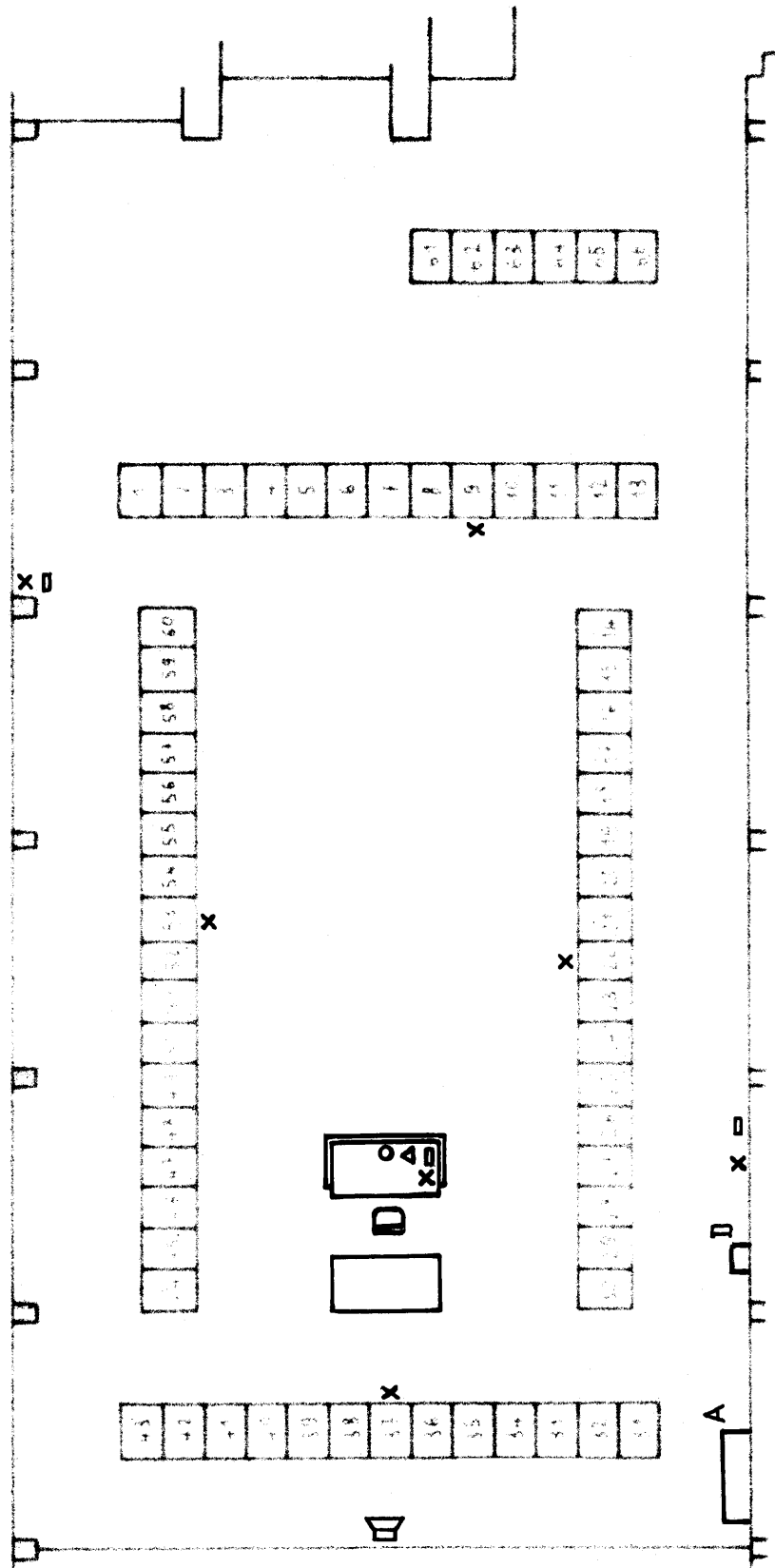


Fig.4 Call-in Telephones.



- x Portable Telephone Jack stations
- Call-in Telephones
- △ Public Address, Microphone station
- Control Centres intercomm., microphone station
- ▭ Loudspeakers for Call-in Telephones and Control Centres intercomm.
- A Amplifiers
- Distribution board

Main control room.

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Fig. 6