**EXES
5000**

INTERCOM SYSTEM

TOA EXES-5000 INTERCOM SYSTEM

INSTALLATION HAND BOOK

&
TROUBLE SHOOTING

TOA Sound & Communications

TOA ELECTRIC CO., LTD.
KOBE, JAPAN

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1. Introduction

This is the installation manual for the exchange, stations, and other components of TOA Intercom System EXES-5000.

It includes an outline of the system, an explanation of installation, cable connection, and inspection procedures, and a trouble-shooting guide. Careful study of this manual is recommended prior to installation of the system.

This manual is only intended to give the information necessary for proper installation of the system.

Prior to installation of the system, unpack the components of the system to make sure that they are in order.

2.   Introduction of the EXES-5000 System

Because the EXES-5000 System is a fully electronic intercom system, it has the following features that surpass conventional mechanical systems.

1. All components of the exchange are designed according to the modular concept. This results in a sizable reduction in the number of procedures required to install the system.

2. The exchange and terminal board (BOX-064) are designed as separate units, allowing independent inspection of the wiring and the exchange proper.

3. The wiring for each station is an independent 4-wire system which uses a minimum number of connecting wires and means greater ease in wiring.

2-1.   Exchange

2-1-1.   <u>Feature</u>

The features of the exchange of the TOA EXES-5000 Intercom System are as follows:

1. All components of the exchange are designed as plug-in modules. This results in a great increase in ease and speed of system installation.

2. Extensive incorporation of ICs in the electronic circuits of the exchange results in a highly compact, space-saving design and quieter operation than conventional intercom system.

This, in turn, means greater freedom in selection of installation site.

3. Since the system is completely electronic, power consumption is kept to a minimum, and incorporation of a built-in batteries is also possible.

2-1-2. <u>Specifications</u>

The exchange of the system is available in the following two models.

EX-510 Capacity : 64 lines max. (56 lines with paging function).

12 links max. (10 links with conference function).

Dimensions: 20.6" (H) x 19.7"(W) x 12.6"(D)
             (522mm)   (500mm)   (320mm)

Weight   : 99.2 Lbs max. (45 kg. max.)

EX-520 Capacity : 128 lines max. (120 lines with paging function).

16 links-max. (14 links with conference function).

Dimensions: 29.3" (H) x 19.7"(W) x 12.6"(D)
             (744mm)   (500mm)   (320mm)

Weight   : 114.6 Lbs max. (52 kg. max.)

Exchange capacity can be increased within the given limits in units of 8 lines or 4 links. The number of links available, however, is reduced by two when the optional conference

function is incorporated. The number of lines
available, on the other hand, is reduced by 8
when the paging function is adopted.

Exchange Specifications

Ambient Temperature Range

               : 32°~122°F. (0°~50°C.)

Audio Input Level: +10dBm (10mW)max.

Audio Output Level

               : +30dBm (1W) max.

Bandwidth   : 50 - 5,000Hz

Noise Level   : -75dBm

Cross talk   : -60dB

Harmonic Leakage : Under -40dB (circuit

                terminals)

Subscriber Impedance

               : 600 ohms balance (input/
                output)

Power Consumption: EX-510   EX-520

  Maximum   130W   180W

Power Source   : Emergency power supply (bat-
                tery pack); works approxi-
                mately 2 hours during a
                power failure.

Regular Power Source

                  : AC: 120V $\pm$ 10%, 50/60HZ

                    (Possible 110, 220, and 240)

Batteries   : Nickel-Cadium Batteries

                  (3.5AH x 2).

2-1-3. <u>Further Details</u>

The component modules of the exchange are grouped according to function as follows:

<u>Common Control Section</u>

CPU   (Central Processing Unit)

OCU   (Output Control Unit)

HCU   (Highway Control Unit)

<u>Speech Path Section</u>

SGD   (Signal Generating and Distributing Unit)

DLU   (Duplex Link Unit)

CLU   (Conference Link Unit)

LMU   (Line Modem Unit)

PIU   (Paging Interface Unit)

The individual units will be described later in detail. The exchange also includes the power supply unit (DS-510) and case.

The power supply unit is self-contained and can be removed from the exchange cabinet.

The exchange usually operates on AC power.

The optional battery takes over automatically

in the event of a power failure. The case is
composed of a cabinet and a frame with connec-
tors.

The cabinet is not needed when the exchange is
mounted on a 19" rack.

The connectors and the frame are completely
wired at the factory.
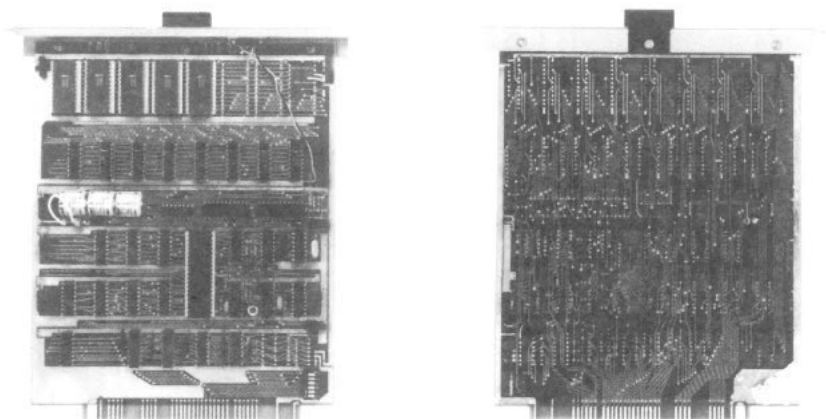
CPU   (Central Processing Unit)

Function: Reads out the exchange procedure written into the memory and collates the data from the stations for processing in succession.

PROGRAM Switch

When functions such as secretary transfer, master/substation and executive priority are employed, the registration, cancellation and changing of these functions are taken care of through Station No.200. The PROGRAM switch is for converting Station No.200 to Programming station for such functions. Normally, this Switch should be kept in the OFF position.
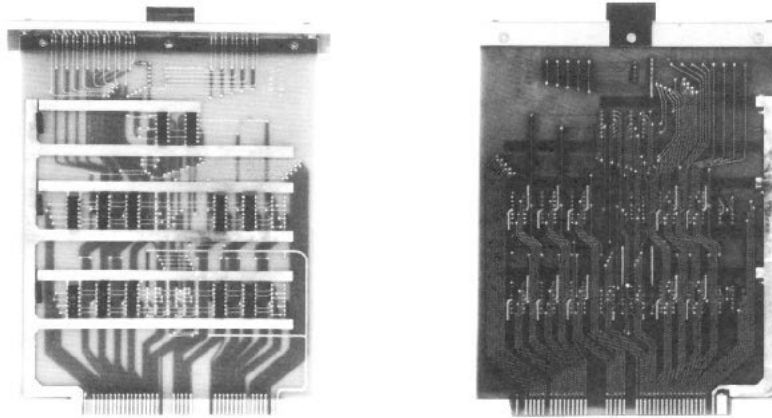
OCU   (Output Control Unit)

Function: temporary storage before usage of
             the output data from CPU classified
             by lines.
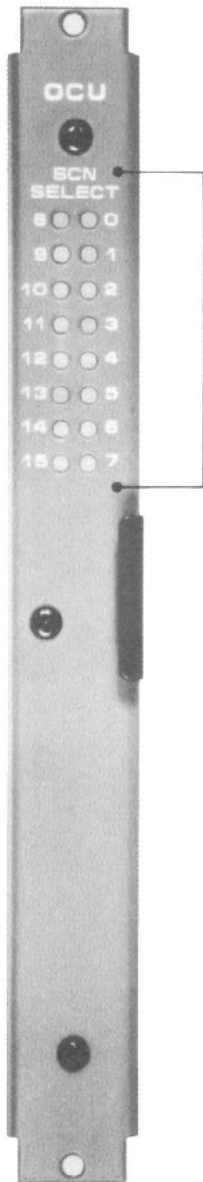
SCN SELECT Lamp

These lamps display the scanning conditions of
both the station "Privacy ON/OFF" conditions
and the dial data from the station in each LMU.
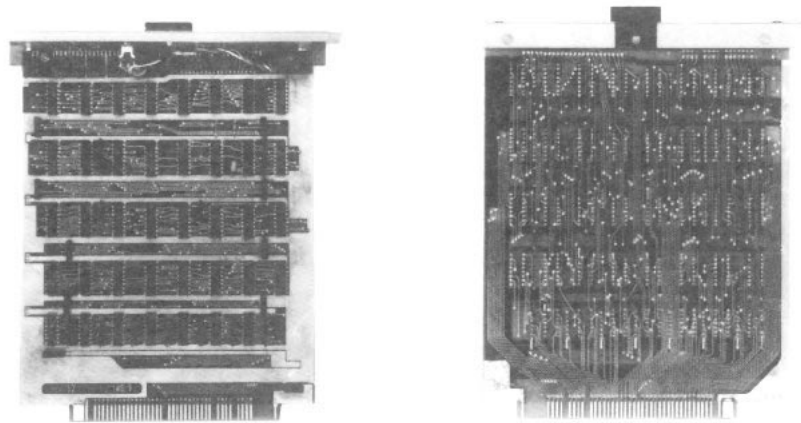
HCU   (HIGHWAY CONTROL UNIT)

Function: For turning on and off the time-
           sharing switches at LMU, DLU and SGD
           according to instructions received
           from the CPU.

LINE ADDRESS Lamp

These lamps dispaly the numbers of the stations
using the selected link (T: Transmitting station,
R: Receiving station)

SIGNAL CODE Lamp

These lamps display the code of signal tone
being used by the selected link.

SIGNAL CODE					TONE
F	4	2	1		
●	○	○	○	0	Calling
●	○	○	●	1	Privacy/Disconnected
●	○	●	○	2	Busy
●	○	●	●	3	Dialing/No-registration
●	●	○	○	4	Group paging/Zone paging
●	●	○	●	5	All call
●	●	●	○	6	Priority/Executive priority
●	●	●	●	7	Registration/Call holding/Mic-off

LINK SELECT Switch

The switch position is to be selected in accor-
dance with the number of links in use. The line
address and the signal code of the link in use
are then displayed by the lamps.

Note: These select switches are to be manipu-
       lated using the binary notation.

LINK BUSY Lamp

These lamps display the number of the link in
use.

CLOCK Lamp

Indicates that the control signal for the time
sharing switch is being transmitted normally.
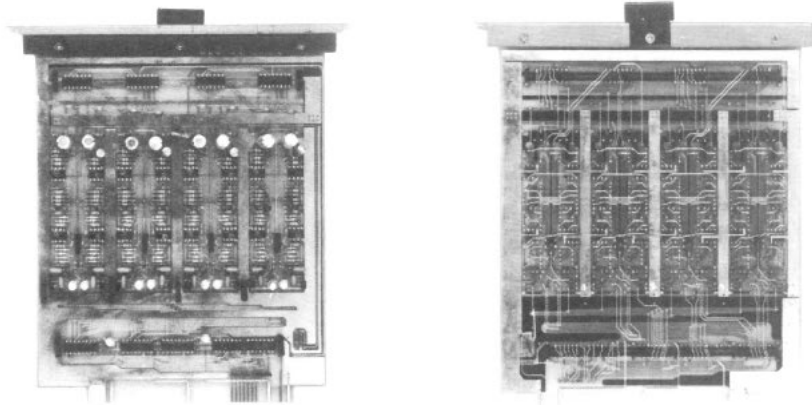
DLU   (DUPLEX LINK UNIT)

Function: This unit operates under HCU control
             to connect or disconnect the in-
             dividual links for hands free con-
             versation between two stations.
             One DLU is provided with 4 links.
             Up to 3 DLUs can be installed with
             the EX-510, and up to 4 DLUs with
             the EX-520.
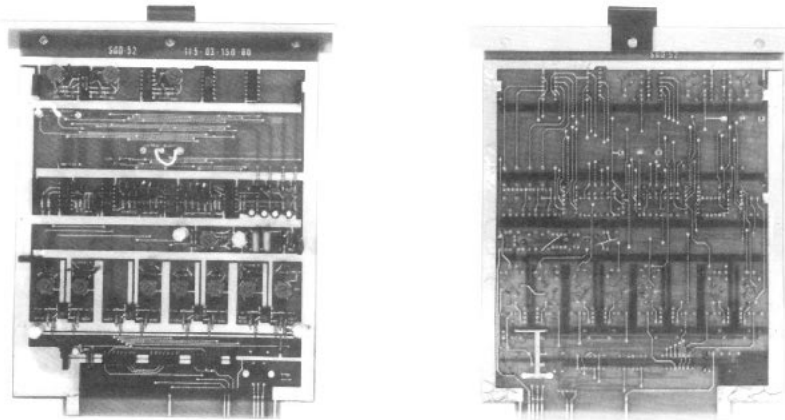
SGD　　(SIGNAL GENERATING AND DISTRIBUTING UNIT)

Function:　Composed of 8 kinds of signal

　　　　　　generators (calling, privacy/dis-

　　　　　　connected, busy dialing/no-regist-

　　　　　　ration, group paging/zone paging, all

　　　　　　call, priority/execution priority,

　　　　　　registration/call holding/mic-off)

　　　　　　and distributors.

　　　　　　This unit distributes under HCU

　　　　　　control the required signal tones to

　　　　　　the individual links.
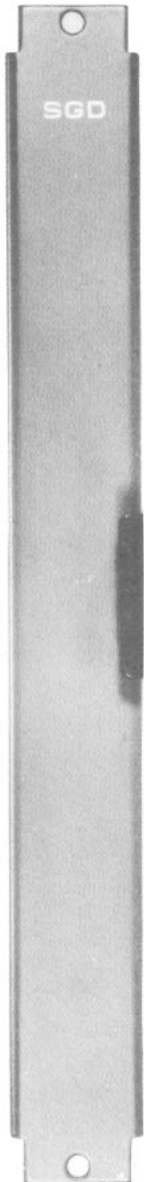
SGD-52   SIGNAL TIMING DIAGRAM

Q7 ⎍⎍⎍⎍⎍ 7.3 Hz

Q8 ⎍⎍⎍⎍⎍ 3.7Hz

Q9 | 0.28 sec 1.8Hz

Q10 | 0.54 sec 0.92Hz

Q11 | 1.1 sec 0.46Hz

Calling tone | fL | fH | fL | fH | | | | | | - - - - -

Ⓛ fL/fH : 470/627

Ⓗ fL/fH : 627/783

Privacy tone

Ⓢ | 235Hz | | 235Hz |

Ⓕ | 235Hz | | 235Hz | | 235Hz | | 235Hz |

Busy tone | 470Hz | | 470Hz |

Dialing tone
Zone/Group
Paging | 783Hz | 627Hz | 783Hz | 627Hz |

All-Call Paging | 470 | 627 | 940 | 783 | 470 | 627 | 940 |

Priority tone | 783Hz | | 783Hz | | 783Hz | | 783Hz |

Holding tone | 940Hz | 783Hz | | 940Hz | 783Hz |

- 14 -
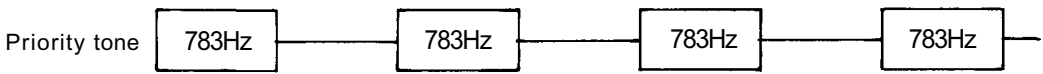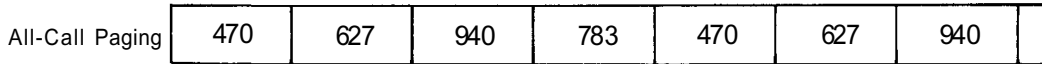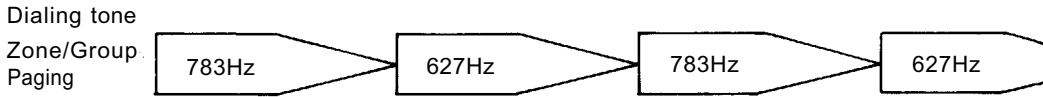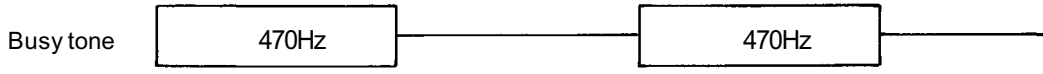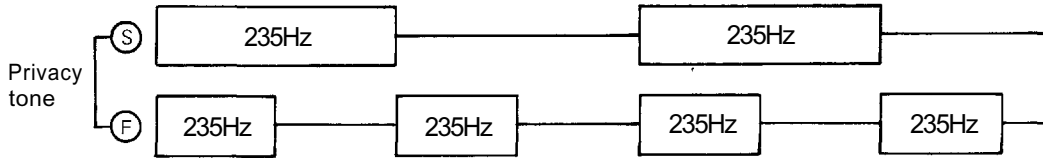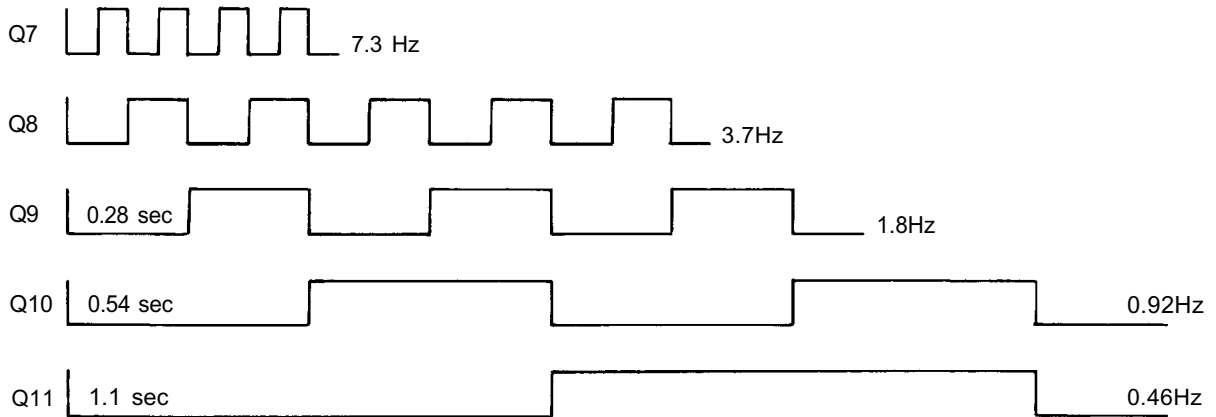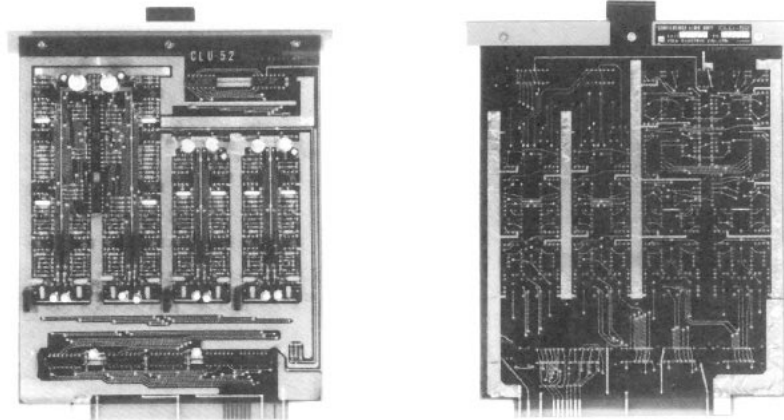
CLU   (CONFERENCE LINK UNIT)

Function: This unit operates under HCU control
            to connect or disconnect the links
            for hands-free conference among up
            to 4 parties and hands-free speech
            between two parties.
            One CLU is provided with 1 conference
            link and 2 hands-free speech links.
            The CLU is optionally available.
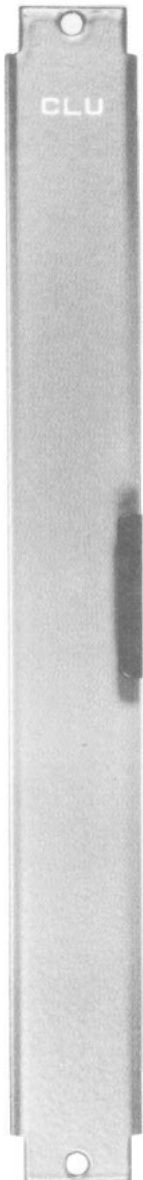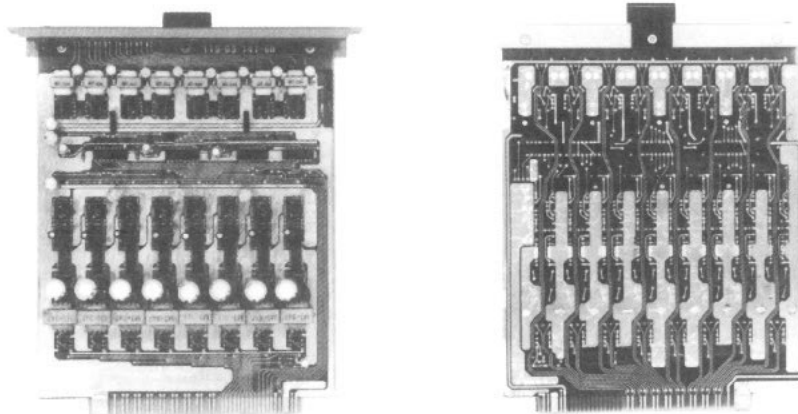
LMU   (LINE MODEM UNIT)

This unit is composed of a modulator to receive
signals from the station, a demodulator to send
out signals to the station and a scanning circuit
that scans the station "Privacy ON/OFF" condi-
tions and the dial data.

Up to 8 stations can be connected to 1 LMU.

Station No. Lamp

Of the numbered lamps, the one corresponding
to a given station is lit brightly or dimly to
reflect the condition of the station.

    Bright : Exchange and station are connected
               and the privacy switch is off.
                (It is not known whether the station
               is busy or not)
    Dim   : Exchange and station are connected,
               with the privacy switch on.
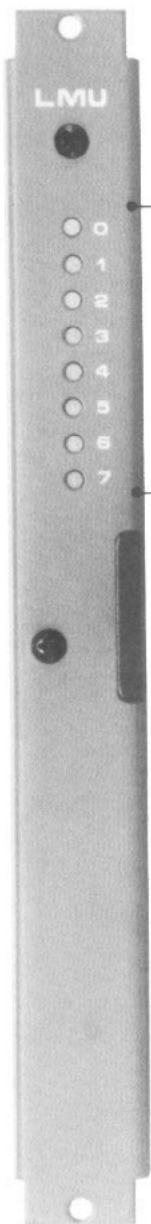
Off   : Exchange and station are not con-

nected.

```
 _____
|LMU|LMU|LMU|LMU|LMU|
|   |   |   |   |   |
|200|208|216|224|232|
| | | | | | | | | |     ----
|207|215|223|231|239|
|   |   |   |   |   |
|___|___|___|___|___|
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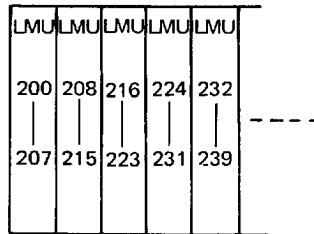
Arrangement of the LMUs with individual ranges
for the station numbers covered (from left to
right) is shown here.
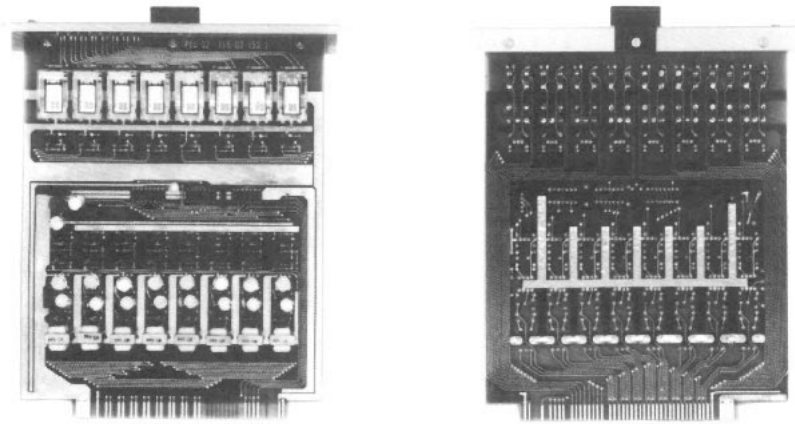
PIU   (PAGING INTERFACE UNIT)

Function: This unit is provided for zone pag-
            ing and group paging. It is design-
            ed to send out over the lines both
            zone and group paging signals.
            The zone paging signal goes out
            through the assigned YR-801 cable to
            terminal J8 or J16 of the Terminal board
            (BOX-064), while the group paging
            signal is distributed to the connec-
            tor of the PIU unit.
            This unit can control up to 7 areas
            (zones and/or groups) plus All-Call.

All-Call and Individual (Zone/Group) Paging Lamp

These lamps display the areas being paged as
well as All-Call paging conditions. All-Call
paging is displayed when all of the lamps are
lit.
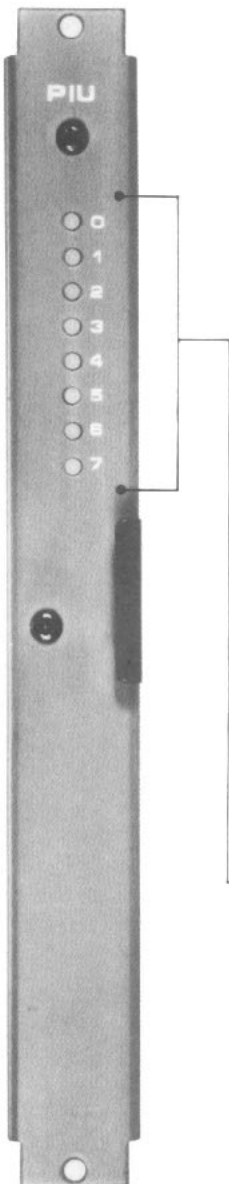
2-2. Stations

    2-2-1. Features

        The stations of the Toa Intercom EXES-5000 have the following features:

        1. Each station is provided with a 4-Pin plug (YC-102) for easy connection to cables.

        2. Wiring from the exchange to each station is the independent 4-wire system. The fact that only 4 wires are necessary makes installation easier, and with a 4-Pin jack (YC-1Olor YC-103)at the end of each cable, connection can be quickly made with a screwdriver.

        3. There are three types of stations available: the desk-top type, the flush mounting type and desk/wall type. Each type is available in 2 models, both master and substation, and these can be chosen in accordance with requirements.

    2-2-2. Specifications

        Stations are available in the following three models.

Model / Type — Function	Desk Type with Handset	Flush mount Type with Handset	Desk/Wall Type without Handset
Master Station	HFM-500	HFM-510	HFM-100
Sub-Station	HFS-500	HFS-510	HFS-100

Optional accessory: YC-100 Wall mounting Panel for HFM-100 and HFS-100.

                    YC-510 Back Box for HFM-510 and HFS-510.

Master Station: Capable of calling any
                master/sub-station in the
                system, and also of using all
                available functions.

Sub-Station   : Capable of calling only its
                Master Station, and also of
                using the privacy, single digit
                dialing and press-to-talk
                functions.

Station Specifications

Ambient Temperature

                :   +32°~+140°F. (0°~+60°C.)

Permissible Loop Resistance

                :   300 ohms

Input/Output Impedance

                :   600 ohms (balanced)

Loudspeaker Output

                :   300mW maximum

Handset Speaker Output

                :   100mW maximum

2-3. <u>Accessories</u>

   2-3-1. <u>Terminal Board BOX-064</u>

         The terminal board BOX-064 provided with the

         Toa Intercom System EXES-5000 connects the ex-

         change with the station lines

         Compact and easy to connect, this terminal

         board saves space and ensures simple disconnec-

         tion of any station line from the exchange when

         inspection is necessary. One terminal board

         BOX-064 can connect the 64 stations to the ex-

         change. Two terminal board BOX-064s are need-

         ed for one exchange EX-520. The exchange and

         the terminal board are connected by junction

         cable YR-801.

         To connect the station line to the terminal

         board, clip terminals are provided to ensure

         simple connection without soldering using the

         hardware provided. To facilitate future ex-

         pansion of the system with additional stations,

         or modification of the system using different

         types of stations, it is advisable to equip

         the exchange with the collective terminal board

         to be described later on. (See page 27, Fig.9)

         This terminal is to be regarded as part of the

         exchange.

2-3-2. <u>Junction Cable YR-801</u>

Toa Intercom System EXES-5000 Junction Cable
YR-801 connects the exchange to the terminal
BOX-064. A single line of this junction cable
provides sufficient wires to connect the ex-
change to 8 stations (8 x 4 = 32) through the
terminal board BOX-064. At each end, the cable
is equipped with a multi-pole connector which
can easily be plugged into the provided socket
on the exchange or the terminal board BOX-064.
Refer to the drawing which appears in the Cable
Installation and Connection section of this
manual for the right direction and order of
cable connections.

3.   Installation of the EXES-5000 System

3-1.   Exchange

Pay particular attention to the following points
during installation of the exchange:

* The layout should allow easy servicing and in-
  spection.
* The exchange is compact and lightweight; however
  it is important to ascertain the strength of the
  floor or wall on which it will be placed.
* The exchange should be grounded. When it is used
  in combination with other systems, for example, a
  PA system, the exchange should be connected to the
  other components for common grounding.
* Choose a low "source noise" AC power supply for
  the exchange. Line noise can affect speech quali-
  ty.
* Be sure to provide a power outlet for the exchange
  and have its capacity checked. A capacity of 500
  watts should be sufficient.
* Plan the layout so that the terminal board BOX-
  064 can be installed near the exchange.
* The exchange can be mounted on a 19" rack.

This high performance exchange is compact as well
as quiet, and can be easily installed almost any-
where. Areas described below, however, should be
strictly avoided.

* An area where it will obstruct traffic, for example,
  an indoor hallway or near the entrance or exit of
  a room.

* An area where it will be exposed to fire, heat or
  direct sunlight (suitable ambient temperature is
  32°~+122°F., 0°~+50°C.).

* A dusty area (where there is metal dust or dirt).

* Near a storage place for chemicals, oil, etc.

* An area subject to vibration.

* Near high-voltage equipment.

* In a strong electric field.

* Near equipment vulnerable to the influence of an
  electric field.

3-2. Stations

Particular attention should be given to the following
points during installation.

* Choose a desk-type, flush mounting type or desk/
  wall type station according to the user's need.

* If the zone paging function is adopted, precautions
  should be taken to ensure against feed-back due to
  interference between the station (microphone) and
  the paging speaker; that is, they should be instal-
  led facing different directions or separated from
  each other as far as possible.

* The "para-branching" operation or the connection
  of more than one station to one circuit is not

possible.

Stations are compact for easy installation almost
anywhere. However, areas described below should be
strictly avoided.

* An area where it can be exposed to fire, heat or
  direct sunlight (suitable ambient temperature is
  32°~+140°F., 0°~+60°C.).

* A dusty area (where there is metal dust or dirt).

* Near a storage place for chemicals, oil, etc.

* An area subject to vibration.

* Near high-voltage equipment.

* In a strong electric field.

* SCR type light dimmers.

3-3. Accessories

The terminal board BOX-064, which is to be connected
to the exchange by junction cable YR-801, can be
mounted on a wall near the exchange if the cable
length (8.2 feets) and cable routing is adequate.
The exchange should also be installed so that it can
easily be connected to the station line.
Junction cable YR-801, which connects the exchange
and the terminal board, should not be bent at a
sharp angle. The terminal board should be installed
so that the cable can be connected with a reasonable
amount of slack in it.

4. Cable Installation and Connection

  4-1. Cable Installation

    4-1-1. Wire type, number of wire pairs and number of
            individual wires are to be determined for in-
            dividual sections of the wiring system accord-
            ing to the guidelines set down below.

      * 4-wire telephone cables unshielded 2 twisted
        pair cables are to be used for wiring between
        stations and the intermediate or indoor boards.

      * As a rule, private branch cables are to be
        for wiring between indoor terminal boards,
        intermediate terminal boards, main terminal
        boards, etc.

      * Indoors, the number of cables that can be run
        through a conduit is, as a rule, less than
        200 pairs.

      * Outdoor wires should be used where wiring
        passes through inaccessible areas such as in
        ceilings or under floors. Indoor wires may
        also be used, however, in cases where there
        is no risk of deterioration due to exposure
        to heat, etc.

      * The number of cable pairs laid should be
        determined considering the possibility of
        future expansion of the system.

The following chart is provided to give an actual example of the wiring plan within an installed system.

Exchange (EX-510/ 520)	Terminal Board (BOX-064)	Main Terminal Board	Intermediate Terminal Board	Secondary Terminal Board	Station (HFM-500 etc.)

Amplifier(s) for Paging

*1.   Junction Cable (YR-801)
*2.   Private Branch Cable
*3.   4-Wire Telephone Cable
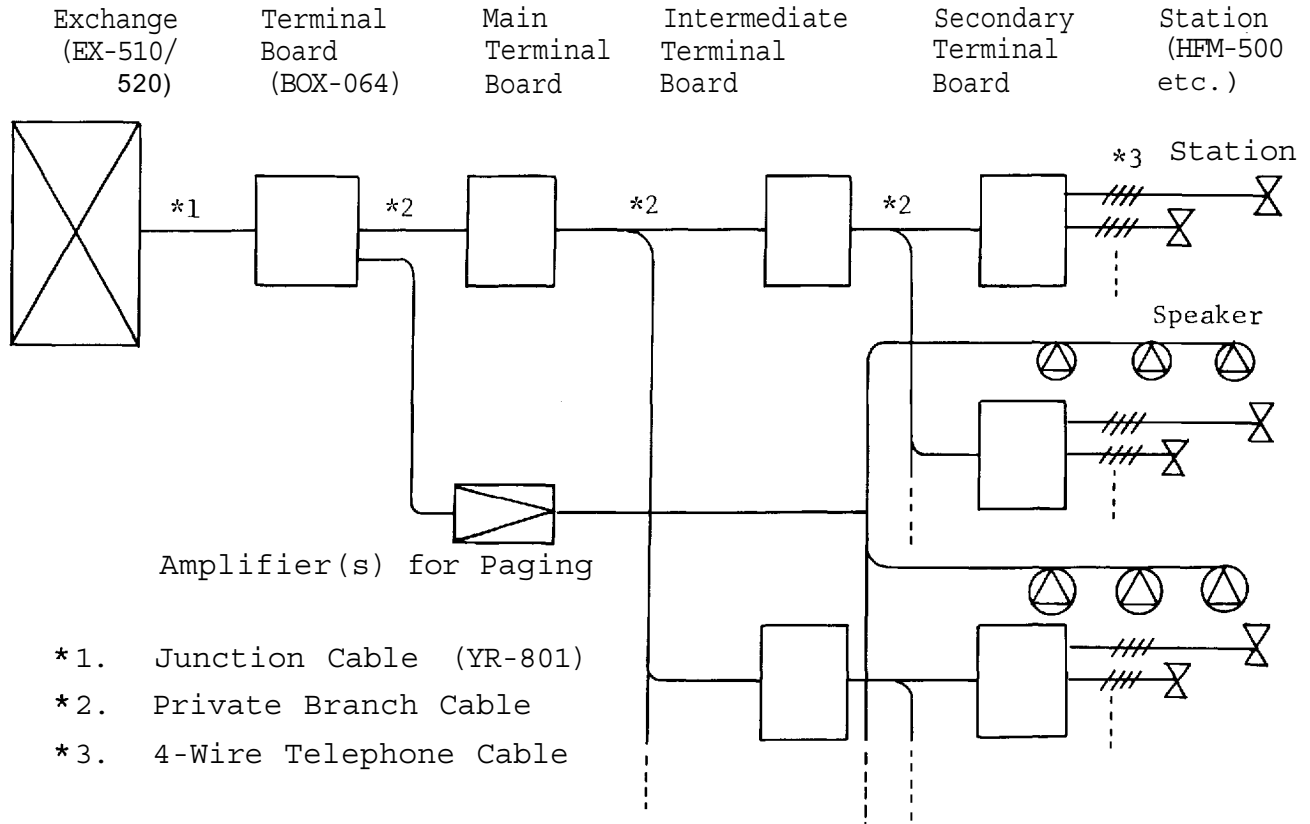
Fig. 9

Note: Since hardware to connect the cable to the terminal board BOX-064 is provided, there is a limit to the diameter of cables that can be used to connect the terminal board BOX-064 and the main terminal board, and this limit must be taken into consideration when planning wiring of the system. The diameter must be between 0.016"(0.41mm) and 0.031"(0.79mm).

4-2. <u>Core Diameter versus Transmission Distance</u>

The diameter of the cable to be used should be deter-

mined so that the set limits for speech attenuation

 (3dB maximum for transmission from the exchange

to the station) and the DC resistance (DC loop resis-

tance: Less than 300 ohms) are met.

<u>Speech Attenuation, DC Loop Resistance and Service</u>

<u>Distance as Functions of Core Diameter</u>

AWG No. (Solid)	Core Diameter mils, (mm)	Speech Attenuation db per 1000ft (dB per 1 km)	DC Loop Resistance Ω per 1000ft (Ω per 1 km)	Service Distance ft (km)
22	25.3 (0.64)	0.411 (1.35)	35.1 (115)	7,300 (2.2)
24	20.1 (0.51)	0.521 (1.71)	54.5 (179)	5,500 (1.1)

4-3. Wiring

General Information

* Wiring should be done independent of public tele-
  phone lines.

* Wiring conduit is often installed underground or
  embedded in building structures such as walls and
  floors, so care must be taken to draw up a wiring
  plan that has ample reserve for future extension
  of the system and that can be adapted to future
  remodelling or expansion of the building it is
  housed in. Wiring or expansion of the building it
  is housed in. Wiring systems must be planned with
  ample wires and conduit and with provision for
  additions to the system.

Spacing

Since the working voltage of this system is low and
the current passing through it is small, there is no
major safety problem involved in the wiring.
However, since interference due to contact with other
indoor wiring can cause wire damage, leakage, and
other problems, spacing should be given close con-
sideration when the small-current wiring of this
system is laid close to other indoor wiring, parti-
cularly AC wiring.

The following chart lists spacing standards to be
followed in respect to typical causes of inter-
ference.

Cause of Interference	Minimum spacing acceptable without extra protection	Remarks
Heating Pipe	6" (15)	This minimum spacing requirement should be observed, since intercom cable is vulnerable to heat.
Water Pipe	4" (10)	
Radio transmitting coaxial cables (CB and other). Telephone wire.	12" (30)	More spacing is required where there is a risk of induc- tion.
Radio/TV Antenna coaxial cables & twin lead. Ground cable.		
Protected Heating and Cooling Pipes.	4" (10)	

4-4. Piping

* Where wiring is to be passed through a wall or the

like, it should be protected by a hard PVC or

metal tube.

* If the number of connecting wires between an in-
  door terminal board and a station is small and the
  station's site is fixed so that it will not be
  moved frequently, install a box at that site and
  pull wiring through a metal or hard PVC tube as
  required by job or ordinance.

* Use a floor duct if the number of connecting wires
  is large and the stations are likely to be moved
  frequently.

* Station wiring which must be laid-across open areas
  of floor should be protected by plastic or metal
  shields.   (See drawing below)

EXAMPLE:

Floor duct

Wire protector

Floor

Metal or hard PVC tube

Plastic or
Aluminium

Wall

4-Pin Jack
   & Plug

Wire
protector

BOX

Desk

4 inches

Station wirings

Floor
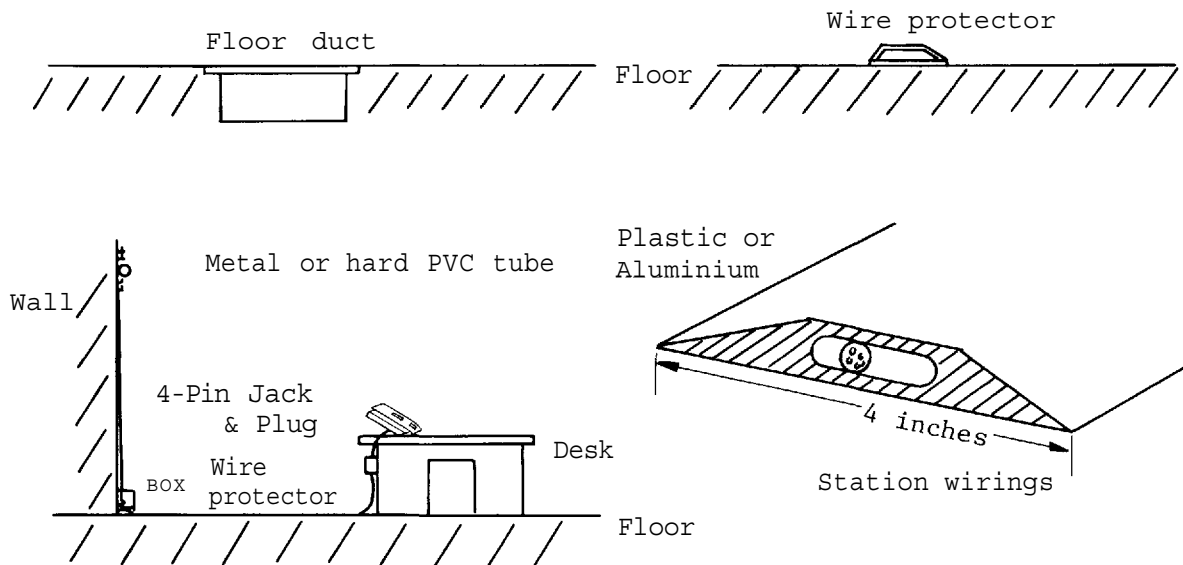
Fig. 10

4-5. <u>Exchange and Terminal Board (BOX-064) Connection</u>

The EXES-5000 system includes terminal board BOX-064, which is connected to the exchange by junction cable YR-801.

As seen from the Fig. 11, the numbering plan begins with Jl, the connector on the back of the exchange. A single junction cable should be connected to the terminal board to cover 8 station lines,

One terminal board BOX-064 can accommodate up to 64 stations, thus 128 stations can be provided with two terminal boards. If the paging function is required, however, J8 (EX-510) or J16 (EX-520) is used for paging.

Junction cable have connectors attached to each end. Be careful to make the connectors properly, otherwise damage to the connectors may occur. (See Fig.13)

Cable Diagram when Exchange EX-510 is used:

Exchange EX-510 with the rear panel removed.

Terminal Board (BOX-064) with the cover removed.

Fig. 11

Fasten with clamps

Junction Cable (YR-801)
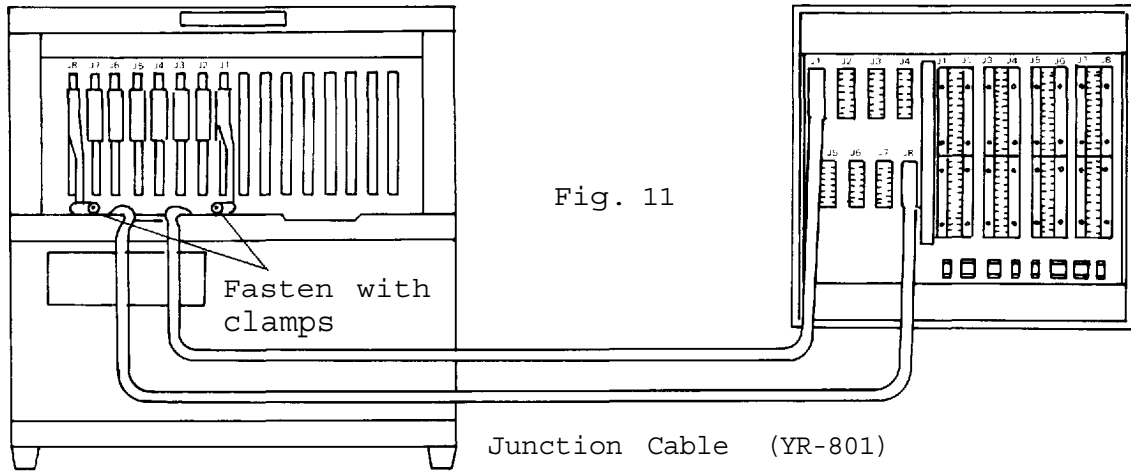
Cable Diagram when Exchange EX-520 is used:

Exchange EX-520 with the rear panel removed.

Fig. 12

Junction Cable (YR-801)

Teminal Board Side

Terminal Board Connector

Insert

Junction Cable 8.2 ft
(2.5m long)

Rear Connector of the Exchange

Exchange Side

Insert
tightly

*Alignment Pin

*

Fig. 13

Connection of the Terminal Board (BOX-064) to the

Main Terminal Board

Route cables from the main terminal board to the termi-
nal board (BOX-064) and connect to the individual clip
terminals using clipping tool C (Standard accessory).

See Fig. 14 for the diagram of the interior of the ter-
minal board (BOX-064).

Connector J1 is connected to clip terminal J1 on the
inside of the terminal board.
Connect the individual cables to the clip terminals
following the terminal wiring diagram attached to the
door. If the number of circuits involved is 65 or more
 (or 57 or more if the paging function is to be used),
two terminal boards are required. Diagram for con-
nection of up to 128 stations appears on the back of
the terminal wiring diagrams and should be followed
when installing such systems.

Before mounting the terminal board (BOX-064) on a wall,
to make sure that it will fit into the space provided.
 (See Fig. 14)

No.	Name
1	Junction Cable Connector (34C)
2	Clip Terminal for Cable Connection
3	Cable Clamp
4	Junction Cable Outlet
5	Knockout Hole for Staffing Line (for1/2" and 3/4")

Accessory: Clipping Tool C

Specifications of the Clip Terminals

1. Connectable wire
(solid wire)
size range:

1) Insulated wire
Core diameter 0.4-0.8mm
(1/64"-1/32")

2) Bared wire
Core diameter 1.0mm (max.)
(0.04")

2. Insertion force

Approximately 6.6 Lbs (3 Kg.)
on a copper wire with a core
diameter of 0.02" (0.5mm)

3. Can be connected repeatedly.
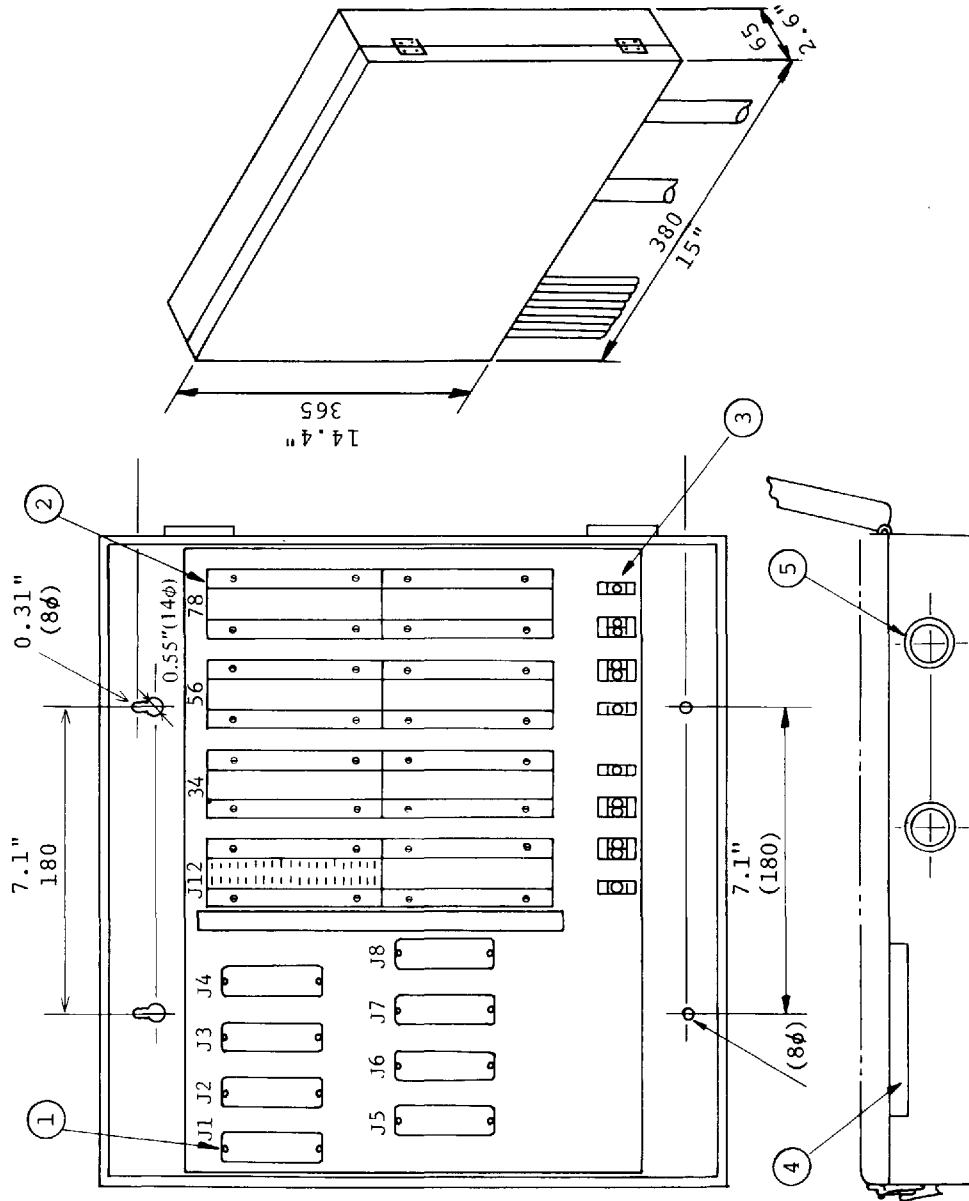
Fig. 14: Terminal Board BOX-064

<u>Connect cables to the clip terminals according to the</u>

<u>following procedure</u>:

* Remove the cable outside insulation tubing so that
  the wires are showing. (Cutting through insulation
  of individual cable wires should be avoided)
  The length of cable insulation to be removed should
  be 1.5 times the length of the clip terminal.

* Clamp the cable in place securely using a clamp.

* Leave the insulation on the cable wires and attach
  cable to the upper part of the clip terminal. Then,
  holding the excess length of wire in hand, pull it
  toward the access side and push it down from above
  the clip terminal using clipping tool C.

* The cable connection is complete when the excess
  wire is cut off.

<u>Connection of the Station Line to the Clip Terminal</u>

<u>of the Terminal Board (BOX-064)</u>

Clipping Tool C

Note:
Connect the individual
cables in order, starting
with the top terminal.
When using the clipping
tool, be sure that the
cutting edge is on the
down side.

<u>Cutting edge</u>   Push down
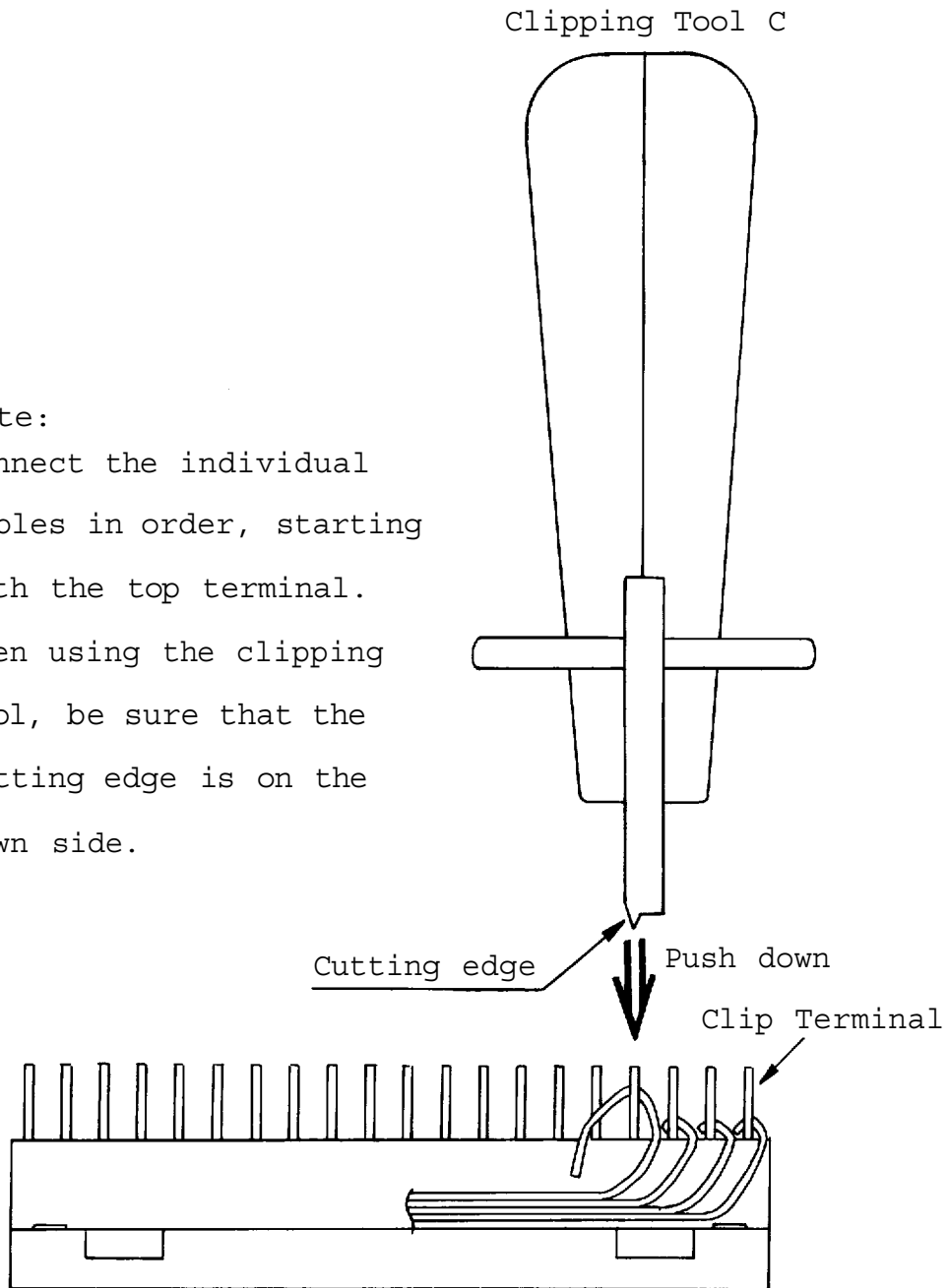
Clip Terminal

<u>Fig. 15:   Clip Terminal (Side View)</u>

4-6. Connection of the Station Plug to the Exchange Jack

Station

4-Pin Plug
(YC-102)

YC-102

Insert

(Cover)

4-Pin Jack
(YC-101)

(YC-103: 4-Pin Jack for flush-mount)
NOTE: use 4" x 2" Switch-Box for YC-103

$\left.\begin{matrix}1\\2\end{matrix}\right\}$ Receiving Lines
(not Polarity Specified)
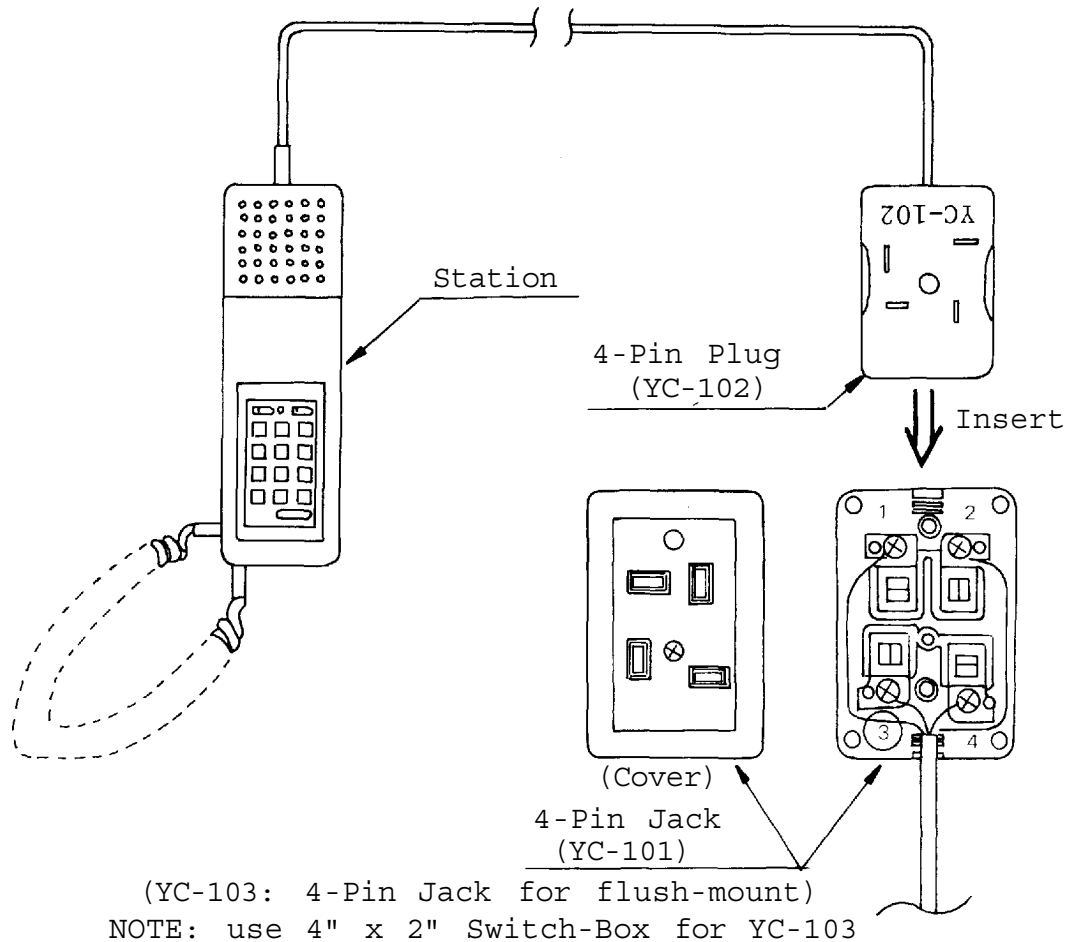
$\left.\begin{matrix}3\\4\end{matrix}\right\}$ Transmitting Lines
(not Polarity Specified)

Terminal Board (BOX-064) Clip Terminals

(Viewed from the station side)

From the exchange

To the exchange
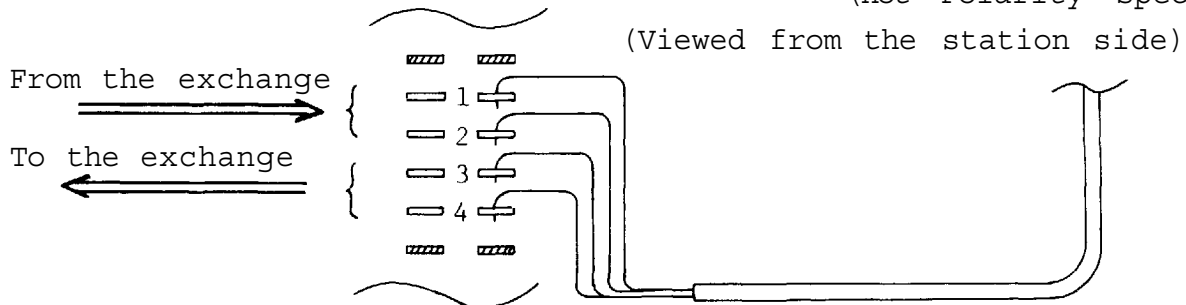
Fig. 16:

4-7. Zone/Group Paging Connection

Connection Instruction when Zone Paging Function is Employed

The audio signal line and control line out of PIU module are
connected to clip terminal J8 or J16 on the inside of the
terminal board. The Fig. 17 shows how to make connections be-
tween the terminal board BOX-064 and external PA amplifier.
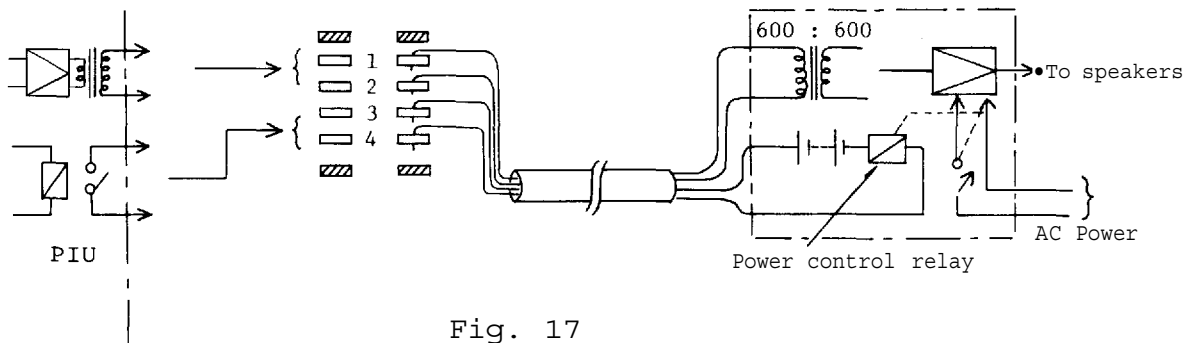
Fig. 17

Specifications of each output line

1. Audio signal line

    Impedance   :   600-ohm, balanced

    Output level :   -10 dBm

2. Control line

    Relay contact capacity

                 : 30V DC, 0.5A

In case where the length of wiring between the terminal board
BOX-064 and external PA amplifier extends over approximately
33 feet (10m), the balanced type should be employed to avoid
external noise such as hum. To control the power switch of
the external amplifier, do not fail to employ a relay since the

contact capacity of the line is a very small (30V DC, 0.5A).
Refer to Fig. 17 and control power switch indirectly with the
control line.

Connection Instruction when Group Paging Function is Employed

The audio signal lines need to be connected to each group of
the LMU modules.
First, take out the LMU modules belong to each necessary group.
Open the back cover of the exchange and take out the group
paging assignment module carefully by inserting a screwdriver
into a slot next to the module.
In the LMU modules, numbers are arranged so that, when viewed
from the parts side with the connectors on the left, station
numbers run from top downward, for example, #200 - #207.
In the PIU modules, numbers are arranged so that, when viewed
from the parts side with the connectors on the left, paging
numbers run from top downward, for example PO ~ P7.
Figures 18-1 and 18-2 show the circuits from the LMU and PIU
modules that are needed for the group paging function.
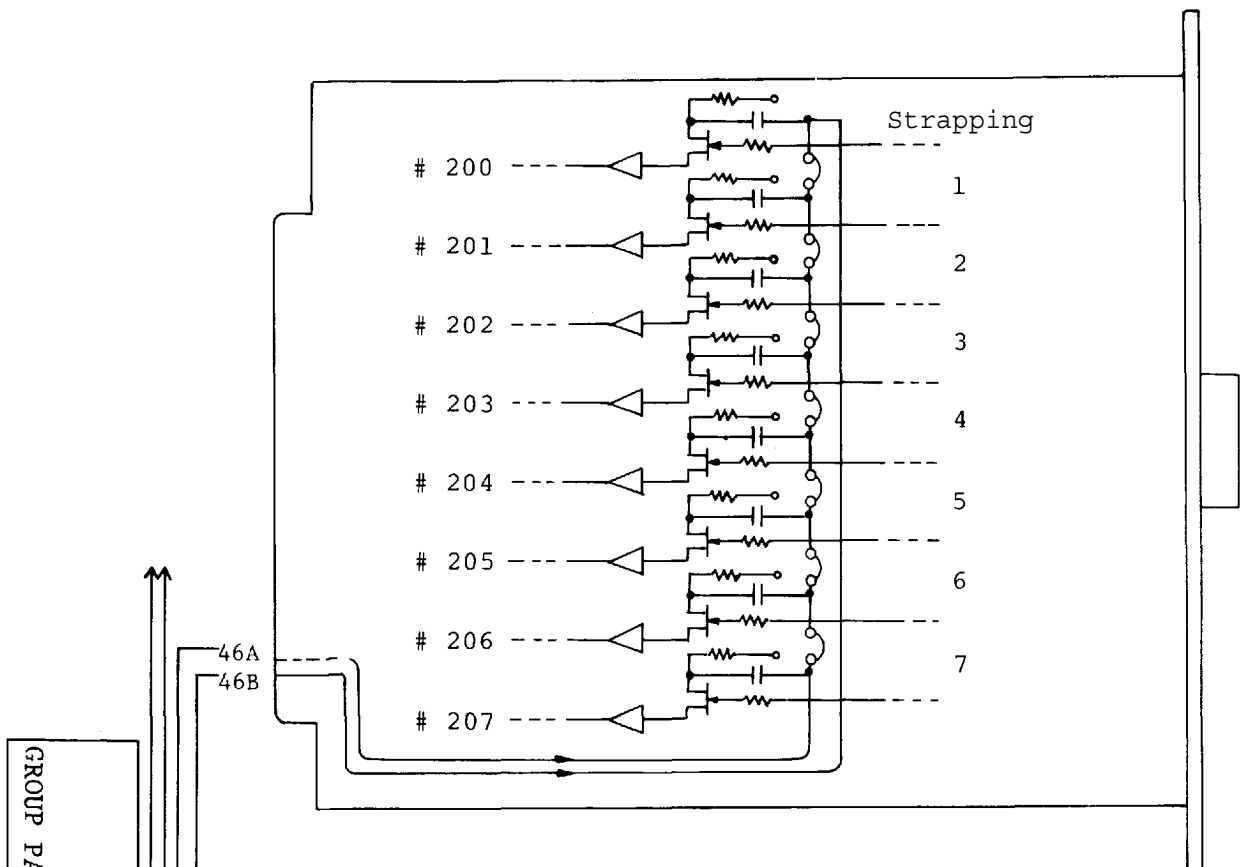
Fig. 18-1   LMU
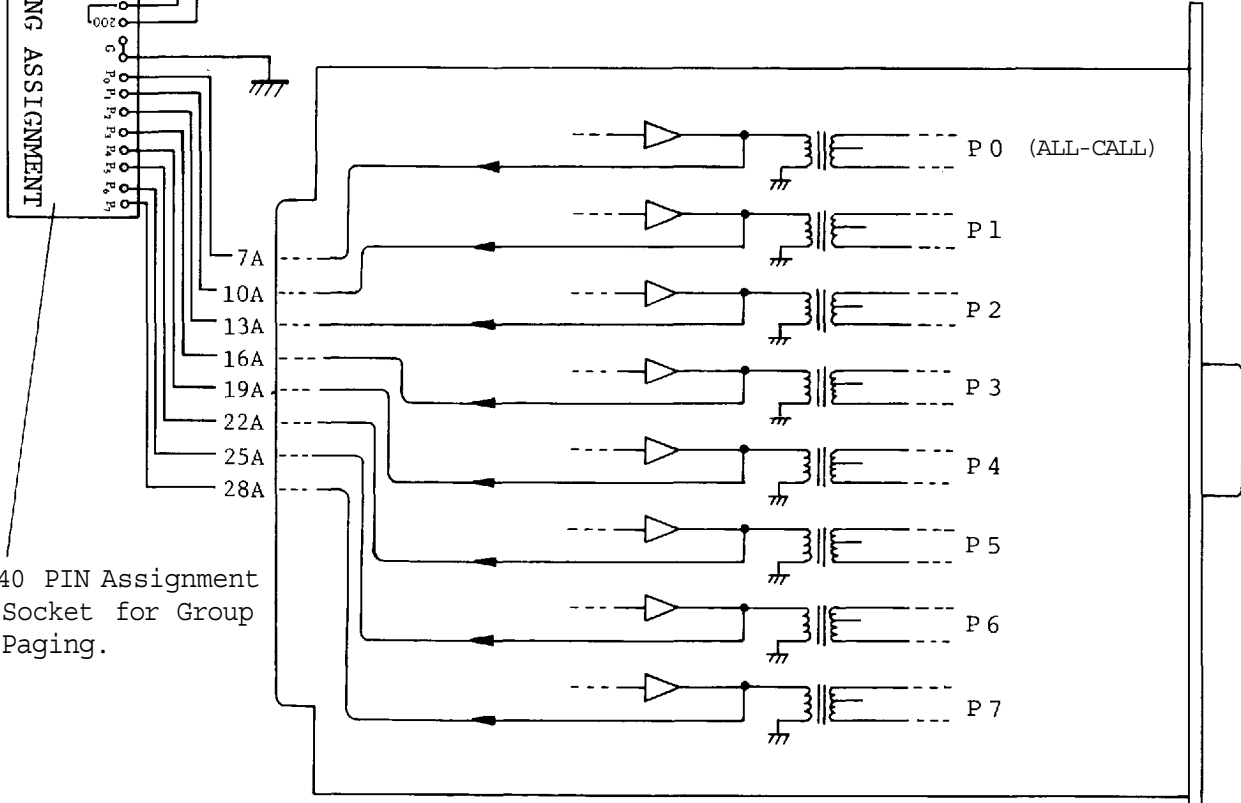
Fig. 18-2   PIU

Example:

When #200 ~ #205 are in Group P_1,

#206 ~ #220 are in Group P_2,

#223 ~ #231 are in Group P_3,

#232 ~ #239 are in Group P_4 layout is as follows:

```
  LMU  1        LMU  2        LMU  3          LMU  4        LMU  5

#200 ~ #205 #206 #207  #208 ~ #215  #216 ~ #220 #221 #222 #223  #224 ~ #231  #232 ~ #239

  P1              P2                   P3            P4
```
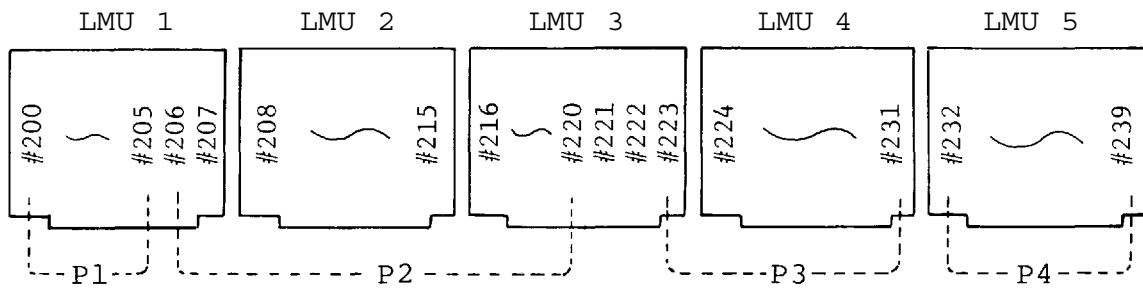
Fig. 19

Station numbers covered by the individual LMU modules are indicated in Fig. 19.   Grouping of the station numbers is indicated by the broken lines.

Jumper wires 6 for LMU 1 (#200 ~ #207) and
Jumper wires 5, 6, and 7 for LMU 3 (#216 ~ #223)
are to be cut off.

This accomplishes separation of each group on the LMU modules. The station numbers not included in group paging need to be separated by cutting the strapping wires.

* 200
# 201
# 202
# 203
# 204
# 205
# 206
# 207

115·03·147·60

MT-544 MT-544 MT-544 MT-544 MT-544 MT-544 MT-544 MT-544

Strappings

MT-547 MT-547 MT-547 MT-547 MT-547 MT-547 MT-547 MT-547
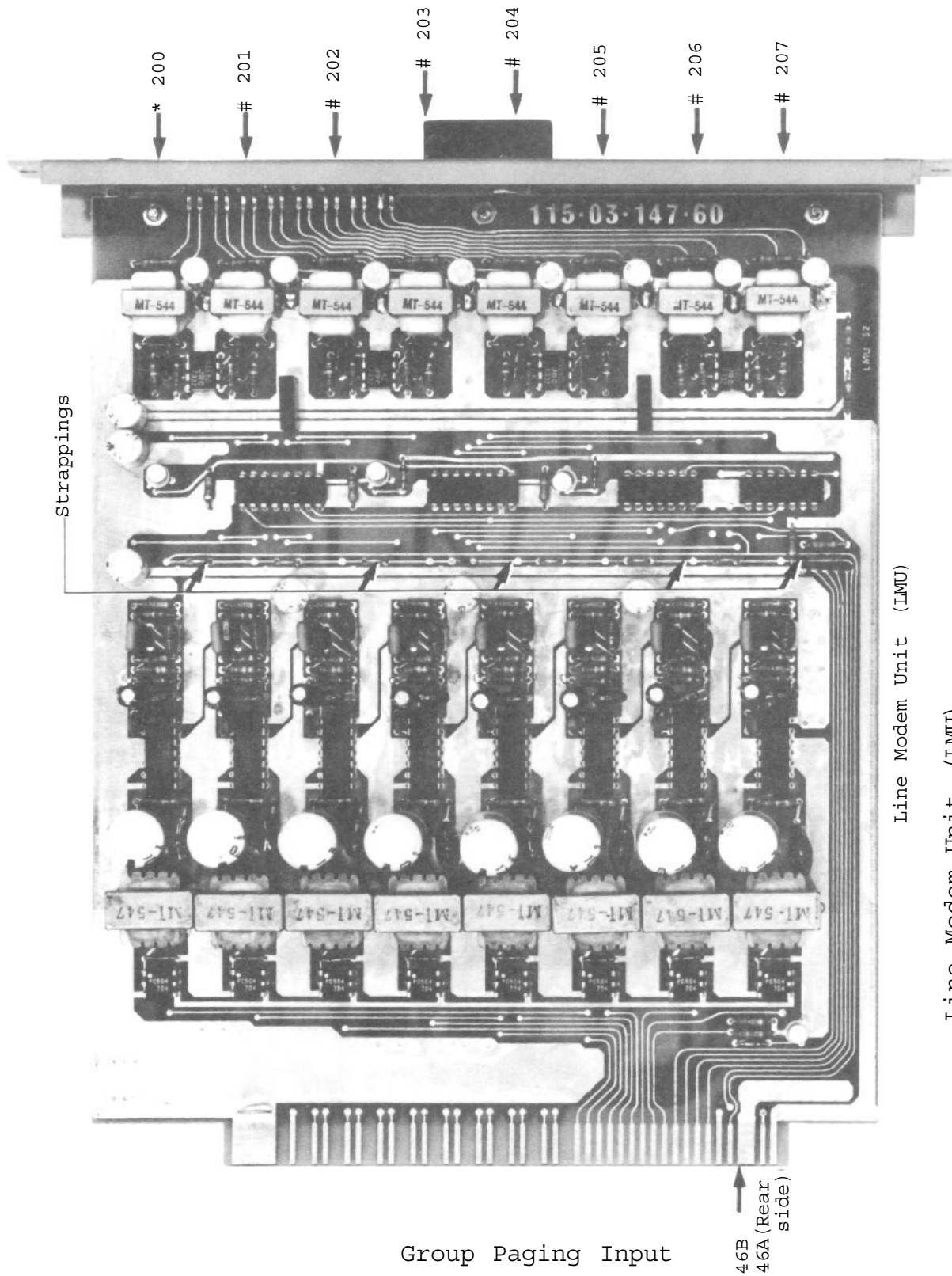
Line Modem Unit (LMU)

Line Modem Unit (LMU)

Group Paging Input

46B
46A (Rear side)

- 44 -

The input lines (46A and 46B of the connector of LMU) of
LMU 1 ~ LMU 7 #200 ~ #256) for EX-510 and LMU 1 ~ LMU 15
 (#200 ~ #319) for EX-520 are connected to the group paging
assignment socket.
The group paging output lines from PIU (7A, 10A, 13A, 16A, 19A.
22A, 25A, and 28A of the connectors of PIU) are also connected
to the group paging assignment socket.
Therefore, connections are needed on the group paging assign-
ment plug for the terminals.
The connections for the example is shown in Fig. 20.
Solder jumper wires or lapping wires for connection.

When connecting wires check the following:

* There are two wires from each LMU module to group paging
  assignment socket.
  For prevention of noise in the line, if there is any un-
  connected terminal and/or terminal that is not used in group
  paging, connect them to GND,
* If groups lap between more than two LMU modules, connect the
  terminals. In such case, only one terminal of a group has
  to be connected to the output line terminal.
  Since the group paging assignment plug is small, be careful
  not to short-circuit or to break pins.

  After connecting, insert the assignment plug into the socket
  of the 40 PIN IC.
  This will complete the connection of group paging.

LMU input terminals   PIU output terminals

GROUP PAGING ASSIGNMENT

LMU input terminals

Insert
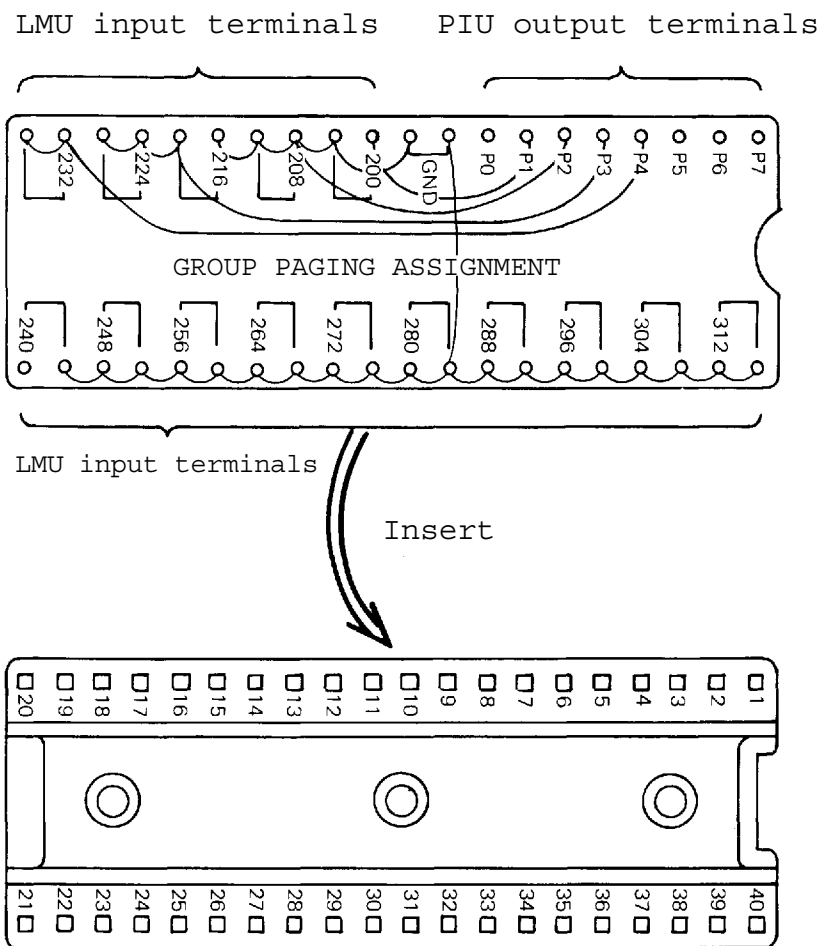
Fig. 20   Group Paging Assignment and 40-Pin IC Socket

4-8.   Connection of Power Supply

The connection on the terminals of the power section
is illustrated next page Fig. 21.

When batteries are to be connected, connect the con-
nector after plugging into the AC power source.

Connect to the AC power source, as illustrated below,
after setting the system.

Batteries

Put the Power supply
unit into the bottom
part of the exchange

Put batteries in the
bottom compartment
of the Power supply
unit

BLK   RED   RED
COM   +24V   +5V   BLU +12V
     BLU   BLK   BLU
     +18V   COM   +12V   (For
                                       EX-520)

COM +18V +24V   COM + 5V +12V

COM +24V   COM +24V

                            BLK

Power Supply Unit (DS-510)

Power
Cord

Set the voltage selector in conformity with
the source voltage to be used.
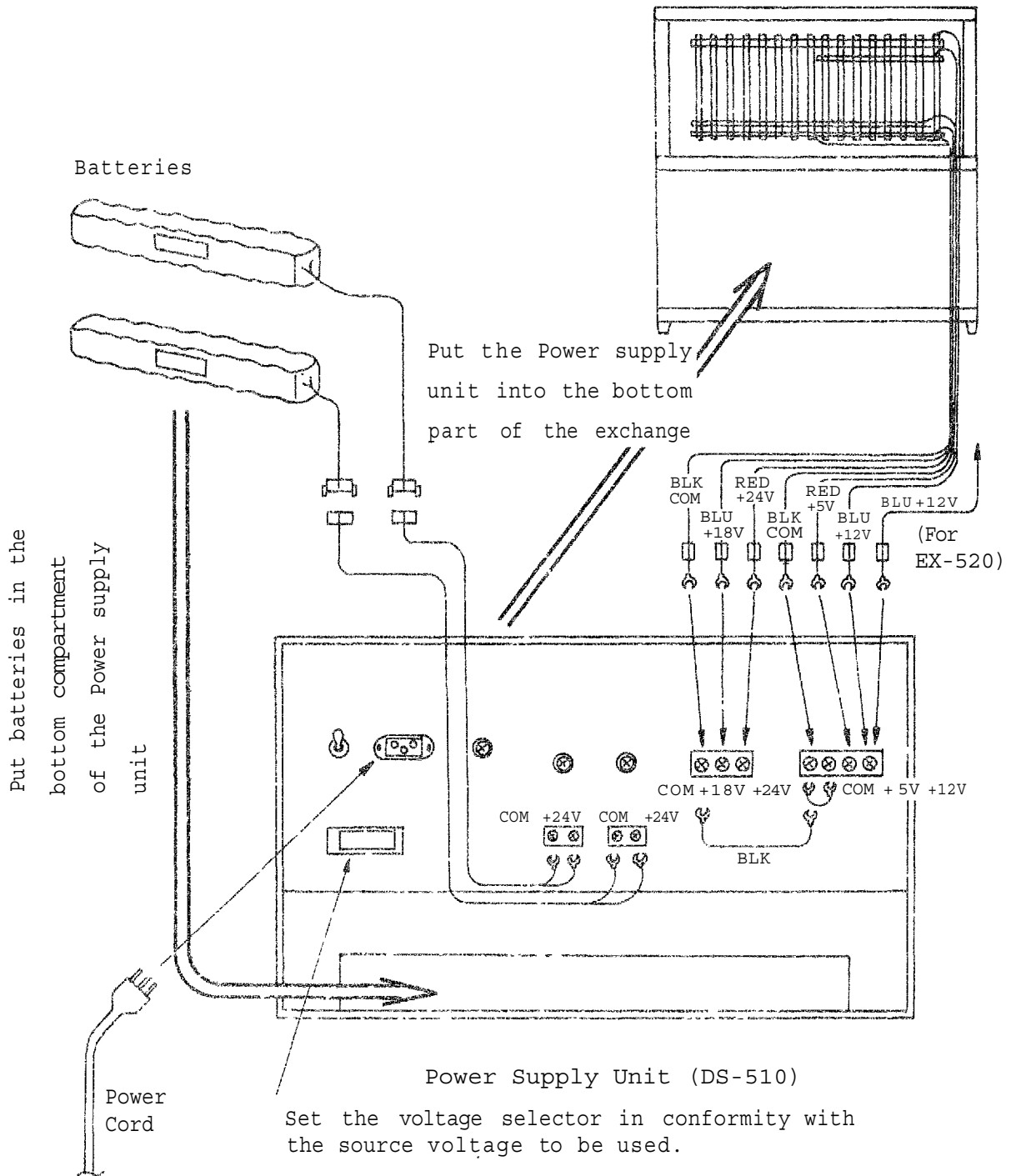
Fig. 21

5. <u>Programming of "secretary transfer", "master/sub-
    station", and/or "executive priority" functions</u>

    After confirming that the system is working correctly,
    register "secretary transfer", "master/substation", and/
    or"priority" functions.

    Use station #200 for the programming.
    Determine the station numbers before registering.
    * For "secretary transfer" function;
      Determine the station numbers of the executive and his
      secretary.
    * For "master/substation" function;
      Determine the station numbers of the master-station and
      of corresponding sub-stations
    * For "executive priority" function;
      Determine the station number of the privileged station.

    The following shows how to register the functions:

Flow Chart of Programming at Station No. 200

```
┌─────────────────────────────────────────────────────┐
(  Make sure that power source of exchange is on       )
└─────────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────────┐
│          Turn on PROGRAM switch of CPU               │
└─────────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────────┐
│     Touch  [C]  key to ascertain  dial  tone         │
└─────────────────────────────────────────────────────┘
                        │
                        ▼
              ◇ First installation ? ◇─────────────────────────┐
                        │                                       │
                       YES                                      │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│  Touch [7] key for more than 10 times to ascertain   │        │
│         signal  tone                                 │        │
└─────────────────────────────────────────────────────┘        │
                        │                                       │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│     Touch [C] key to ascertain  dial  tone           │        │
└─────────────────────────────────────────────────────┘        │
                        │                                       │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│  Touch [8] key for more than 10 times to ascertain   │        │
│         signal  tone                                 │        │
└─────────────────────────────────────────────────────┘        │
                        │                                       │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│     Touch [C] key to ascertain  dial  tone           │        │
└─────────────────────────────────────────────────────┘        │
                        │                                       │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│  Touch [•] key for more than 10 times to ascertain   │        │
│         signal  tone                                 │        │
└─────────────────────────────────────────────────────┘        │
                        │                                       │
                        ▼                                       │
┌─────────────────────────────────────────────────────┐        │
│     Touch [C] key to ascertain  dial  tone           │        │
└─────────────────────────────────────────────────────┘        │
                        │◄──────────────────────────────────────┘
                        ▼
         ◁ Is Secretary Transfer necessary ? ▷──YES──►┌──────────────────────────┐
                        │                              │  To  Secretary Transfer  │──┐
                       NO                              └──────────────────────────┘  │
                        │◄───────────────────────────────────────────────────────────┘
                        ▼
         ◁ Is Master/Sub-station  necessary ? ▷──YES──►┌──────────────────────────┐
                        │                              │  To  Master/Sub-station  │──┐
                       NO                              └──────────────────────────┘  │
                        │◄───────────────────────────────────────────────────────────┘
                        ▼
         ◁ Is Executive Priority necessary ? ▷──YES──►┌──────────────────────────┐
                        │                              │  To  Executive  Priority │──┐
                       NO                              └──────────────────────────┘  │
                        │◄───────────────────────────────────────────────────────────┘
                        ▼
┌─────────────────────────────────────────────────────┐
│          Turn off PROGRAM switch of CPU              │
└─────────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────────┐
│  Touch [C] key to make sure no tone is produced      │
└─────────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────────┐
(     Station No.200 returns to an ordinary station    )
└─────────────────────────────────────────────────────┘
```

1. Secretary Transfer

New registration ?
— YES / NO

Station number of executive [7][ ][ ][ ][ ]
Station number of secretary [7][ ][ ]
Ascertain signal tone
[C] Ascertain dial tone

New registration finished ?
— YES / NO

Release ?
— YES / NO

Station number of executive [7][ ][ ][ ][ ]
Station number of executive [7][ ][ ]
Ascertain signal tone
[C] Ascertain dial tone

Release finished ?
— YES / NO

Is secretary's station number changed while that of executive remains unchanged ?
— YES / NO

Station number of executive [7][ ][ ][ ][ ]
New station number of secretary [7][ ][ ]
Ascertain signal tone
[C] Ascertain dial tone

Registration of the changes finished ?
— YES / NO

Is station number of executive changed while secretary's station number remains unchanged or is secretary's station number also changed ?
— YES / NO

Previous station number of executive [7][ ][ ][ ][ ]
Previous station number of executive [7][ ][ ]
Ascertain signal tone
[C] Ascertain dial tone

New station number of executive [7][ ][ ][ ][ ]
New station number of secretary [7][ ][ ]
Ascertain signal tone
[C] Ascertain dial tone

Registration of the changes finished ?
— YES / NO

RETURN

Remarks: In the event of failure to touch keys for correct dialing, touch "C" key to ascertain dial tone and re-start from the beginning.

- 50 -

2. Master/Sub-station

New Registration ?

YES → Master-station number · 8 · Sub-station number → Ascertain dial tone · C · Ascertain signal tone → New registration finished

NO

Release ? — **YES** → Sub-station number · 8 · Sub-station number → Ascertain signal tone · C · Ascertain dial tone → Release finished ?

NO

Is Master-station number changed while Sub-station number remains unchanged ?

NO / **YES** → New Master-station number · 8 · Sub-station number · 8 → Ascertain signal tone · C → Registration of the changes finished ?

Is Sub-station number changed while Master-station number remains unchanged or is Master-station number also changed ?

NO / **YES** → Previous Sub-station number · 8 · Previous Sub-station number · 8 → Ascertain signal tone · Ascertain dial tone · C → New Master-station number · 8 · New Sub-station number · 8 → Ascertain dial tone · C → Ascertain signal tone → **RETURN**

Remarks: In the event of failure to touch keys for corrent dialing, touch "C" key to ascertain dial tone and re-start from the beginning.
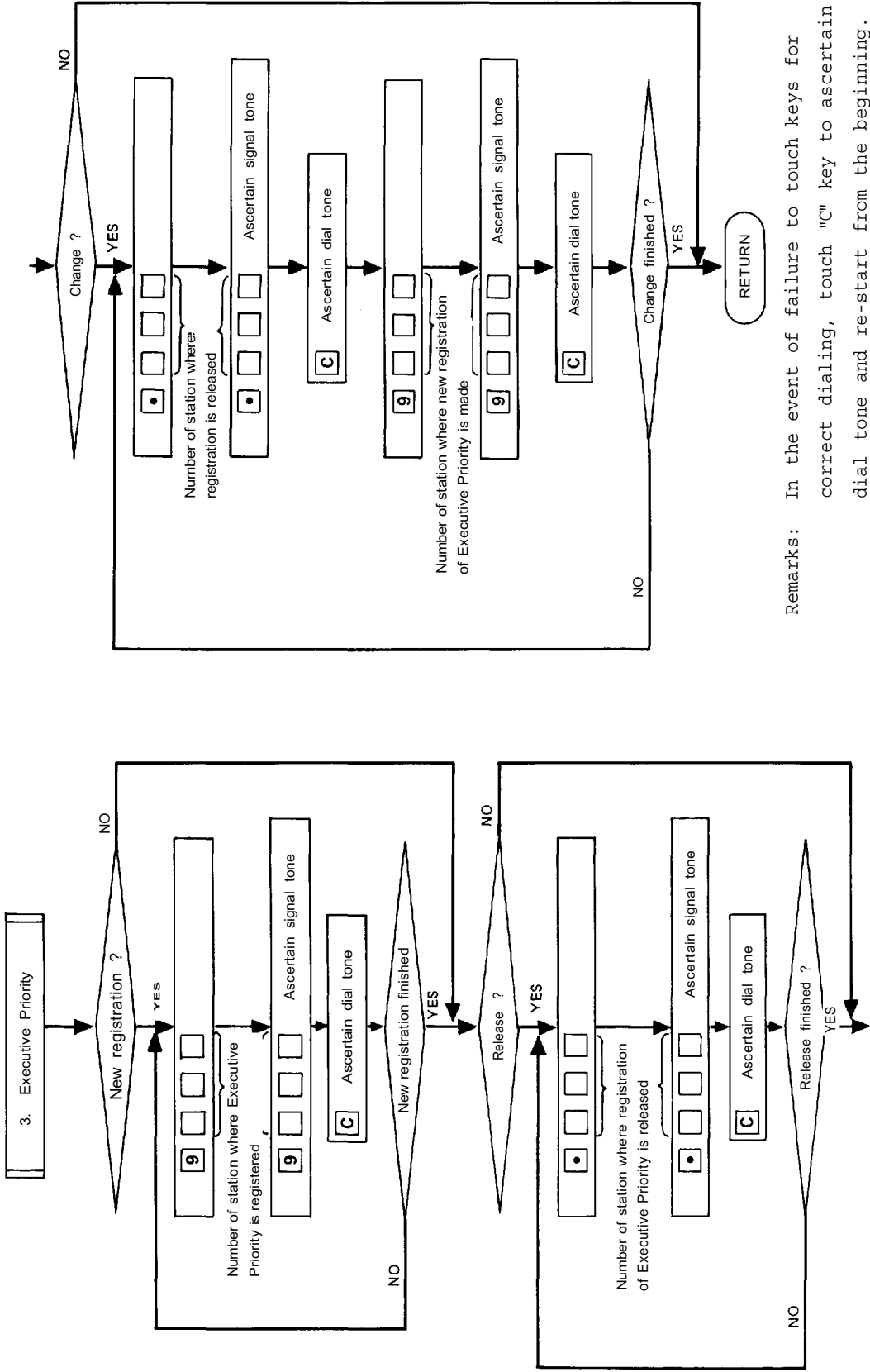
3. Executive Priority

New registration ?

NO / YES

Number of station where Executive Priority is registered — [9][ ][ ][ ]

Ascertain signal tone — [9][ ][ ]

Ascertain dial tone — [C]

New registration finished — YES / NO

Release ?

NO / YES

Number of station where registration of Executive Priority is released — [•][ ][ ][ ]

Ascertain signal tone — [•][ ][ ]

Ascertain dial tone — [C]

Release finished ? — YES / NO

Change ?

NO / YES

Number of station where registration is released — [•][ ][ ][ ]

Ascertain signal tone — [•][ ][ ]

Ascertain dial tone — [C]

Number of station where new registration of Executive Priority is made — [9][ ][ ][ ]

Ascertain signal tone — [9][ ][ ]

Ascertain dial tone — [C]

Change finished ? — YES / NO

RETURN

Remarks: In the event of failure to touch keys for correct dialing, touch "C" key to ascertain dial tone and re-start from the beginning.
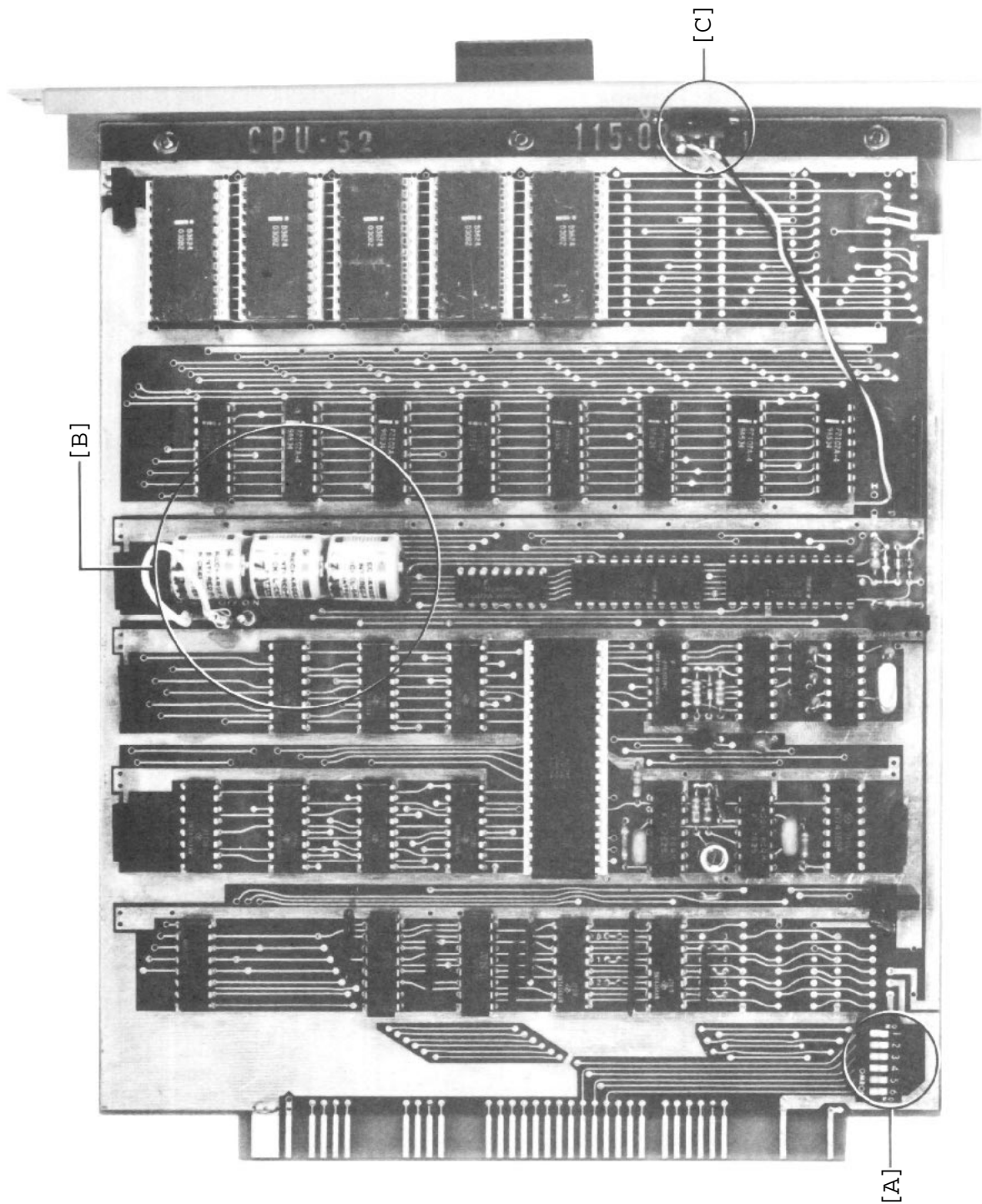
Photo of CPU

6. <u>Adjustment of the CPU modules</u> (Refer to CPU Photo on Page 53)

   * Take out the CPU module for adjustment before use.

   * The picture below shows the mounting side of the CPU

     module.

   * The numbered sections in the picture require adjustment.

     The adjustment method is as follows:

[A] DIP switch

   These switches select the CLU and/or DLU modules to be used,

   adjust the time interval before the start of the paging

   signal, and switch on "programming" of 3 special functions.
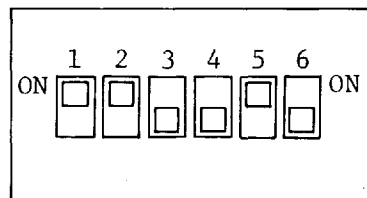
("OFF" When the switch
is down.)

Fig. 23 (PHOTO [A])

   1.   Turn on when DLU 1 or CLU is used.

   2.   Turn on when DLU 2 is used.

   3.   Turn on when DLU 3 is used.

   4.   Turn on when DLU 4 is used.

   5.   Adjusts the time interval before the start of the

        paging signal.

              ON   : Paging signal begins a few seconds after

                      the paging function is activated.

              OFF : Paging signal begins immediately after

                      the paging function is activated.

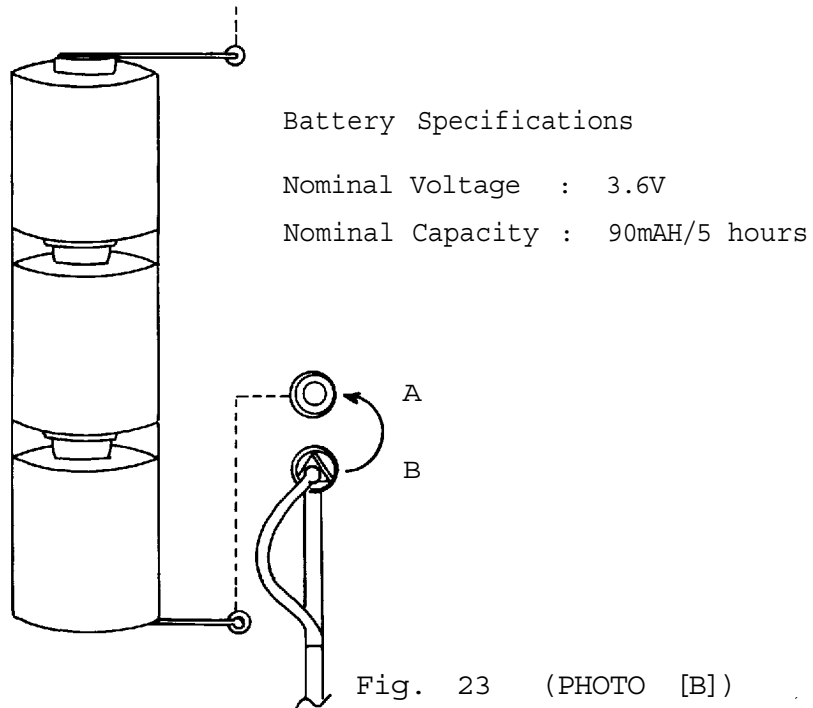   This adjustment is used to take into account the

time needed to warm up the paging amplifier, so
the switch can be in either position when the
paging function is not being used.

6. This switch activates "Programming" of the "Secretary
transfer", "master/substation", and/or "executive priority"
functions at station #200. However, since the "PROGRAM
switch", which fulfills the same function, is provided on
the front panel of the CPU model, this switch does not
have to be used, and should be kept in the OFF position.

[B] Connecting Jack for back up battery
This jack serves as the connection to the back up
batteries and therefore prevents cancellation of the
function of functions (one or more of the 3) program-
med at station #200 in the event of a power failure
or the accidental disconnection of the exchange from
its power source. (In the illustration Fig. 23, the
three cylinders lined up next to the connecting jack
are the back up batteries.)

Battery Specifications

Nominal Voltage   :   3.6V

Nominal Capacity :   90mAH/5 hours

A

B

Fig. 23   (PHOTO [B])

During delivery, the batteries are connected as il-

lustrated above to prevent unnecessary discharge.

Insert the jack into the pin A.

By so doing, the batteries will be connected and will

safeguard the programming of the special functions.

Note: Connect the batteries just before turning the

exchange power switch on.

Be careful not to short-circuit the batteries.

[C] Program Switch

This switch makes station #200 a programming station,
that is, it directs station #200 to program the "sec-
retary transfer", "master/substation" and/or "executive
priority" functions.

PROGRAM

ON

OFF
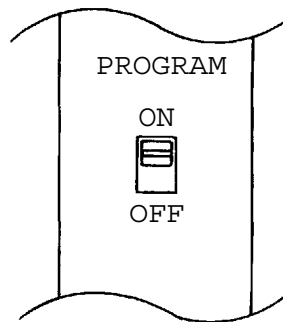
Use a small screw driver to
change the switch setting.

Fig. 24 (PHOTO [C])

ON   : Station #200 becomes the programming station.
         Calls from other stations will not be transmitted
         to station #200 during the time it is functioning
         as a programmer.
         This setting, however, has no effect on other sta-
         tions.

OFF : Station #200 acts as an ordinary station and can
         accept calls.

Before turning this switch on, be sure to study the "Inst-
ructions on Programming" given in this manual.

Note : Before using this switch, be sure that the system
         is functioning properly.
         Be sure that this switch is in the OFF position
         during ordinary operation.

7. Inspection

    7-1. Inspection before Power on

        * Before turning on the switch, check if the power cord
           is plugged in and the fuse is in place. All the
           modules should be placed and secured. Make sure
           that the connection of exchange and stations are
           completed.

        * Turn on the switch on the back of the exchange.

        * AC indicator lamp on the front of the exchange
           should be on. If not, electricity is not supplied.
           Turn off the switch and check the cord and fuse.

        * Handle Plug-in units with care; plug-in units in-
           corporate CMOS. After the exchange is plugged in,
           do not attempt to disconnect the plug-in unit.

        * If you wish to connect batteries, do so at this
           point. Connect the cord from the power source.
           Use 2 batteries: voltage; 24V, capacity; 3.5AH.

        * With batteries connected, the unit automatically
           switches to battery operation when AC power source
           is cut off. DC indicator lamp will be on accom-
           panied by buzzer. To stop the buzzer, push the
           buzzer reset switch.

7-2. <u>Operation and Function Testing</u>

Pick out a convenient station and call all the sta-
tions connected on the exchange and check the volume
and statics.

Volume of dialling tone and talking tone can be ad-
justed by the volume control on the back of the
station. Use a small screwdriver; turn clockwise
for maximum, and counterclockwise for minimum volume.
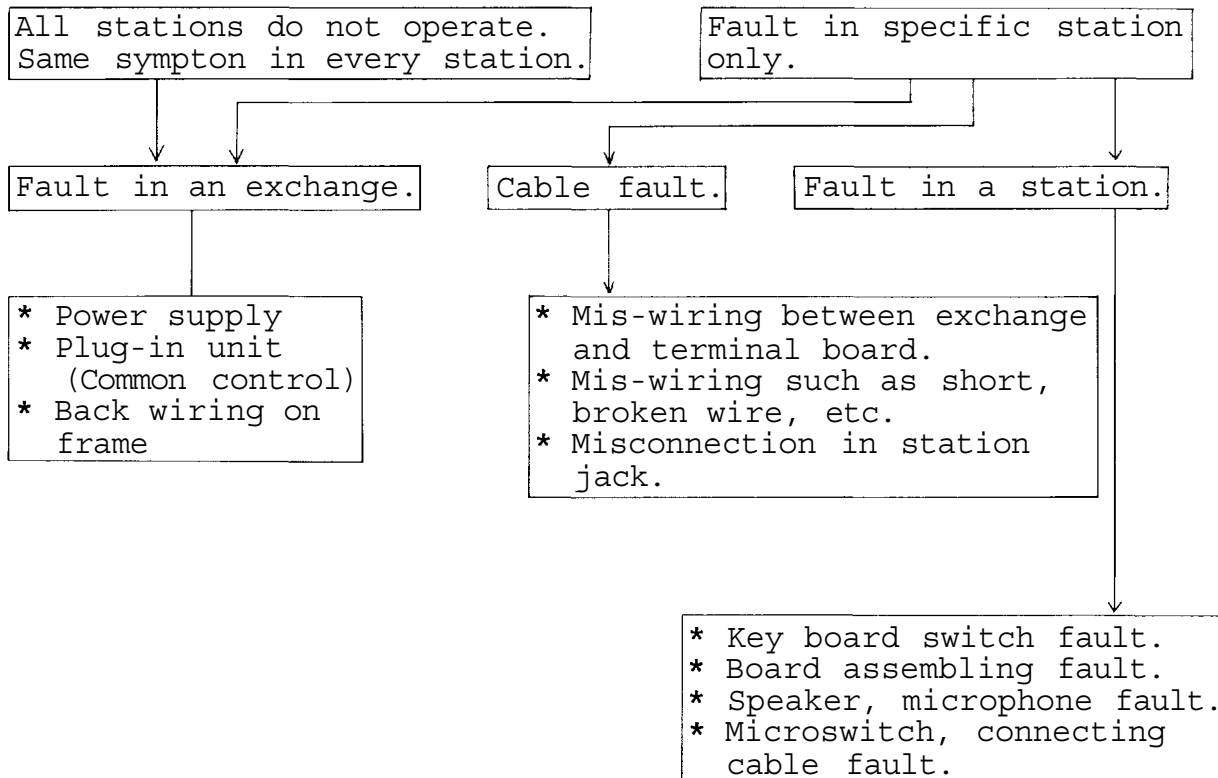There is also a volume switch on the keyborad of the
station for the user.

Paging volume should be adjusted to eliminate feed-
back, using a station closest to the paging speaker.
While testing for operation, check all the functions
listed in the operational instructions.

8.   TROUBLE SHOOTING GUIDE

Repairing of the EXES-5000 system is basically done by
replacing defective units with good ones.   The system's
faults in an installation can be divided into the fol-
lowing categories.

1.   Faults in an exchange

2.   Faults in a station

3.   Cable faults

To make system repairing easier, find which category is
involved, then refer to the chart below for assistance
in fault finding.

All stations do not operate. Same sympton in every station.	Fault in specific station only.

Fault in an exchange.	Cable fault.	Fault in a station.

* Power supply
* Plug-in unit
  (Common control)
* Back wiring on
  frame
	* Mis-wiring between exchange
	  and terminal board.
	* Mis-wiring such as short,
	  broken wire, etc.
	* Misconnection in station
	  jack.

* Key board switch fault.
* Board assembling fault.
* Speaker, microphone fault.
* Microswitch, connecting
  cable fault.

EXES-5000 SYSTEM CHECK FLOW CHART

1 START

Table 1:
+24V ...	+24 - +30V
+18V ...	+17.5 ~ +18.5V
+12V ...	+11.5 - +12.5V
+ 5V ...	+4.9 - +5.IV

2 DIP switch on CPU correctly set ? — no → 3 Set DIP switch according to Inst. P54

Fig. 1
SIGNAL CODE
4 3 2 1   ● ON
● ○ ● ●   ○ OFF

4 Back-up battery on CPU connected ? — no → 5 Plug the Jack into Pin A. P56

Fig. 2
SIGNAL CODE
4 3 2 1   ● ON
● ○ ○ ○   ○ OFF

6 Program switch on CPU off ? — no → 7 Program switch off

8 Power switch on

9 Proper voltages at each output power terminal? (tabl 1) — no → 10 Disconnect DC power connection and check — no → 11 If +24V or +18V is not in the range, check power supply (DS-510). If +12V or +5V is not in the range, replace DC/DC inverter.

12 No.15 of SCN SELECT on OCU lit brighter than others ? — no → 13 Replace CPU—OCU

14 CLOCK lamp on HCU lit blightly ? — no → 15 Replace HCU

16 Other lamps on HCU off ? — no → 17 Replace HCU—OCU-CPU

18 Station No. lamp on LMU lit corresponding to station connected ? — no → 19 Check wiring to the station—Replace the station—>LMU

20 Clear all No.200 programmings P48

21 Dial [2] at any M-station

22 One of LINK BUSY lamps on HCU lit brightly ? — no → 23 Replace Station—HCU—OCU—CPU

24 Turn on LINK SELECT switch(es) on HCU to make the total number of marked number to be the number of LINK BUSY lamp lit. The station dialled correspond to ADDRESS-T lamp. — no → 25 Replace HCU—OCU—CPU

26 n dialling [2], dial tone heard ? — no → 27 Dial [·]. SIG. CORD lamps on HCU lit as Fig. 1 momentary — no → 28 Replace HCU—OCU—CPU

32 Call from any station to any station

29 In other links, dial tone and lamps OK ? — no → 30 Replace SGD—HCU—Station

31 Replace CLU or DLU

33 alling station and called station correspond to lamps lit on ADDRESS T and R SIG.CORD lamp lit as Fig.2 — no → 34 Replace Station—CPU—HCU

35 Calling tone heard ? — no → 36 Replace SGD — Station wiring

37 Two way conversation OK ? — no → 38 In other links ? — no → 39 Replace Station-CLU or DLU

41 All other links OK ?

40 Replace CLU or DLU concerned

42 Conversation possible with all station ?

43 Program No.200 functions P48

44 END

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8-1. FAULT IN EXCHANGE

Before power supply check, confirm the following three points to eliminate elementary faults:

1.   Is voltage selector set correctly?
2.   Is AC power supplied?
3.   Is power switch ON?

Start checking after disconnecting all wiring connected to DC output of the power supply unit.
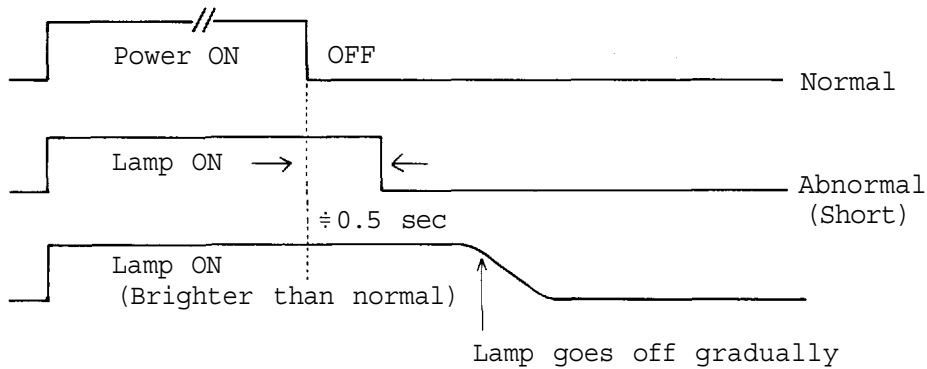
SYMPTON	CHECK-ITEM	
Exchange does not operate.	All DC output voltages are correct.	* Over-current flows into one of plug-in units.
	All or one of DC output voltages are not correct.	* Fault in the power supply unit DS-510.
Abnormal voltage of +24V terminal.	Right range: +24 ~ +30V	* Replace AC and DC fuses. * Incorrect setting of the voltage selector. * Faulty power transformer.
Abnormal voltage of +18V.	Right range: +17.5 ~ +18.5V	* Faulty 2SA-753. * Faulty µA7818KC.
Abnormal voltage of +5V or +12V.	Right range: +4.9 ~ +5.IV +11.5 ~ +12.5V	* DC/DC inverter (MIV-02) is defective.
Battery is not charged.	Check the current flowing into the battery. Right range: 80 ~120mA	* Replace PCB of charging circuitry.
AC & DC operation lamps are OFF. Buzzer does not operate. Note: Only when DC power supply (Battery) is employed.	Check all DC voltage.	* Replace PCB of charging circuitry.
Blown AC and/or DC fuse.	All DC output voltages are correct. heck all stations involved in All-Call paging.	* Over—current flows into one of plug-in units. (Especially on +18V) * MIV-02 is defective. * Replace fuse according to the following.

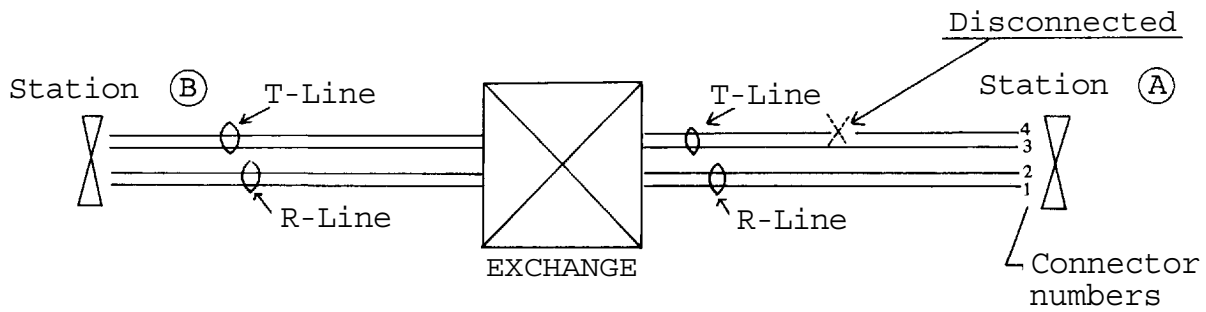| Number of stations	Fuse
0 ~ 30	DC 5A
31 ~ 64	DC 7A
65~	DC 10A

8-2. HOW TO FIND SHORT BETWEEN T-LINE AND R-LINE

If the shorted condition between T-line and R-line is not corrected for a long time, it may burn out the guard resistor (330ft 1/2W) on the LMU board. Therefore, find the shorted line according to the following procedure:

1. Turn off the privacy switch on all stations in the system.
2. Turn on the power switch of the system for several seconds, then, turn it off.
3. Watch the lamps on the LMU panels. The lamps on normal lines will go off after approximately 0.5 second. The lamps on the shorted lines will stay on more than 0.5 second.
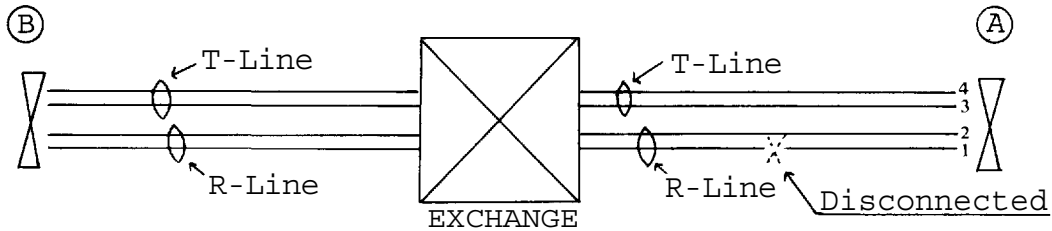
```
        ┌──────//──────┐
        │  Power ON    │  OFF
    ────┘              └──────────────────────── Normal

        ┌──────────────┐
        │  Lamp ON  →  │←
    ────┘              └──────────────────────── Abnormal
                       ┊≒0.5 sec                 (Short)
        ┌──────────────────┐
        │  Lamp ON          ╲
        │ (Brighter than normal)╲_____
    ────┘                    ↑
                  Lamp goes off gradually
```

1. One of transmitting lines (T-Line) is disconnected.

Symptom: 1-1 A can make dialing.
          1-2 A can hear B .
          1-3 B can not hear A .
          1-4 Noise is heard at B .
          1-5 Noise increases at B when Press-To-Talk bar is
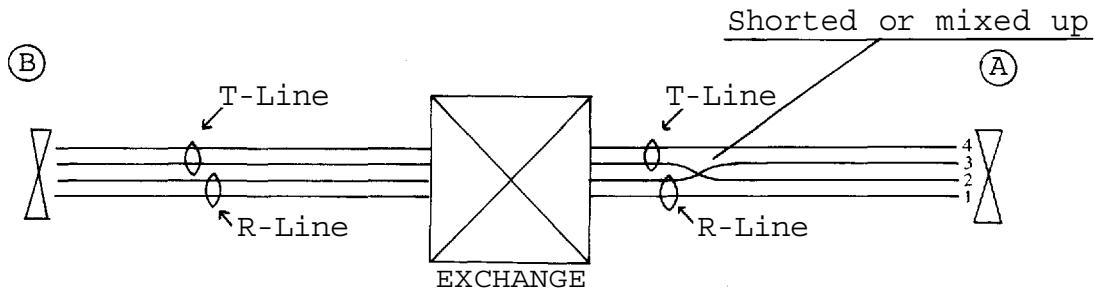   pressed at A .

LMU Lamps ----- Normal

2. One of receiving lines (R-Line) is disconnected.

Sympton : 2-1 A can make dialing without dialing tone.
           2-2 When B dials A , busy tone or dial tone will be
                heard at B immediately after the calling tone.

LMU Lamps ----- Normal
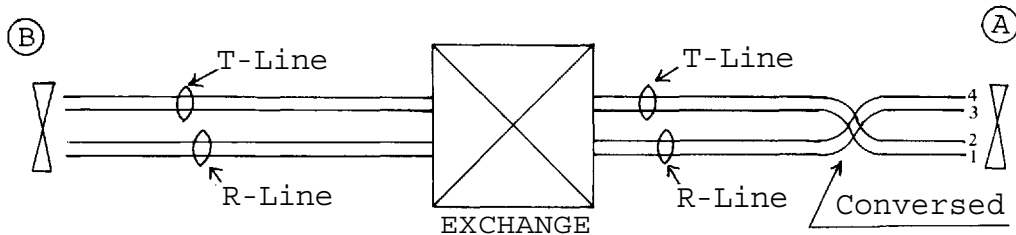
3. T-Line and R-Line are shorted or mixed up.

Sympton: 3-1 A can not dial.
         3-2 Conversation is impossible between stations.
         3-3 When B dials A , noise will be heard at B
              immediately after the calling tone.

LMU Lamps ----- Brighter than normal.

4. T-Line and R-Line are connected conversely.

Sympton: 4-1 A can not make dialing.
          4-2 Conversation is impossible between stations.
          4-3 When B dials A , noise will be heard at B.

LMU Lamps ----- Brighter than normal.

8-3. FAULT IN SPECIFIC STATION ONLY

Find the cause according to the following table if the fault lies with a specific station only, not with all stations.

	CHECK-ITEM	CAUSE
Dialing can not be made at privacy off mode.	LMU Lamp is off.	* Disconnection of both T & R-Lines. * Guard resistor 330 *ft* on LMU is burned out due to T & R-Lines short.
	Specific Lamp on LMU is brighter than normal.	* T & R-Lines are shorted.
	LMU Lamp is on in normal.	* Fault in the station. (Replace PCB board.)
Specific key does not operate.	Replace the station and make sure that the station is not faulty.	* Fault in key board switch or matrix circuitry. * Fault in the dial generator. (Replace PCB board.)
Calling tone can not be heard. Dialing tone can not be heard on dialing. Sound from the other party can not be heard.	Same sympton remains even if the station is replaced.	* Short or open in R-Line. * Fault in the demodulation circuitry on LMU. (Check LM-380, MT-547.)
	Becomes normal if the station is replaced.	* Disconnection of R-Line or improper connection of the station connector. * Fault in MT-547 on LMU. * Station fault.
Sound is not transmitted to the other party.	Same sympton remains even the station is replaced.	* Short or open in T-Line. * Fault in the modulation circuitry on LMU.
	Becomes normal if the station is replaced.	* Fault in MIC circuitry of the station. (Replace MIC or PCB)
On dialing, noise is heard by the called party.	Same sympton remains even the station is replaced.	* One of T-Lines is disconnected.
	Becomes normal if the station is replaced.	* Fault in MIC element. * Fault in T-Line of the station. * Low frequency oscillation of MIC AMP. (Faulty bypass capacitor)

Sound of the other party is broken during call.	Same sympton remains even the station is replaced.	* Adjust the volume control of station speaker if the room produces reverberation. (Lower the volume.) * Increase the gain of MIC AMP. * Replace PCB after checking if MIC unit is not touching its case.
Immediately after the calling tone, the line switches to cancel, busy, dial tone, etc.	Same sympton remains even the station is replaced.	* One of R-Lines is disconnected. * Fault in photo coupler PC-504 on LMU. * Fault in MT-547 on LMU or in the station.
	Becomes normal if the station is replaced.	* One of the R-Lines is disconnected or the station connector is not connected properly.

8-4. SPEECH AND FUNCTION TEST

1. Speech Test

    After completing the wiring check and the power supply
    and exchange test according to the system flow chart,
    the speech test for each station can then take place.

    > IMPORTANT NOTE
    >
    > Before testing, all programming (Secretary transfer,
    > Master/Substation, Executive Priority Function) must
    > be cleared from station No.200 by turning on the PRO-
    > GRAM switch of the CPU, or the speech test can not
    > proceed correctly.

    * Call every station one by one from any master station
      and examine the speech quality and sound volume.

    * The sound volume can be adjusted by the volume on the
      rear of the station. (Fully clockwise for maximum)

    * A call to a station in the room produces reverbera-
      tion and may present broken sound. Turn down the
      volume of the station speaker until the sound becomes
      normal.

    * Each station must be located properly where no feed-
      back will occur between station and external speakers.
      The gain adjustment of the paging amplifier is also
      important in order to avoid troublesome feedback.

    * The Press-To-Talk bar on the station keyboard must be
      used for the speech test when stations are installed
      in high noise areas (more than 60dB noise).

    * Speech quality (broken sound, natural conversation,
      tone quality, etc.) must be tested with each line in
      the CLU or DLU employed in the system.

2. Function Test

  * Check all employed functions with a few stations near
     the exchange.

  * Check "User Programmable Functions" at stations in-
     volved after the programming from station 200.

     + Secretary Transfer: Is transfer made correctly
                             with the privacy switch on
                             at the executive station.

     + Master/Substation : Touch dial $\boxed{0}$ at substation
                             can call its master station.

     + Executive Priority: Is this function operated at
                             stations involved.

  * Use all number keys including $\boxed{C}$ and $\boxed{\cdot}$, Press-
     To-Talk bar, Vol. L/H and privacy switch to test
     all functions.

     EXAMPLE: + Both calling and conversation tests with
                  station number 200 through 209.

               + Change the position of Vol. L/H and make
                  sure that the switch works.

               + Turn the privacy switch ON. Is privacy
                  tone heard from the station when some-
                  one calls?

MEMO

MEMO

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