EXES 1000

INTERCOM SYSTEM

TOA EXES-1000 INTERCOM SYSTEM

INSTALLATION HAND BOOK

&

TROUBLE SHOOTING

TOA
Sound &
Communications

TOA ELECTRIC CO., LTD.

KOBE, JAPAN

CONTENTS

1. <u>Introduction</u>

       This is the installation manual for the exchange, stations, and other components of TOA Intercom System EXES-1000.

       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-1000 System

Because the EXES-1000 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 is a wall-mounted type for space conservation. The exchange and terminal board module are designed as separate units so that installation only involves securing of the terminal board to a wall and attachment of the exchange to the terminal board,

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. Features

The features of the exchange of the TOA EXES-1000 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.

The system consists of only three types of
basic units. This, in turn, means greater
freedom in selection of an installation site.

3. Since the system is completely electronic,
power consumption is kept to a minimum.

2-1-2. Specifications

The exchange of the system is available with the
following specifications:

EX-110 Capacity: 32 lines max.   (31 lines with
paging function).

4 links

Dimensions   : 19.1"(H) x 15.8"(W) x 7.0"(D)
(486mm)   (400mm)   (180mm)

Weight   :   49 lbs max.(22 kg max.)

Exchange capacity can be increased within the
given limits in units of 8 lines.

The number of lines available is reduced by 1
when the paging function is adopted.

Exchange Specifications

Ambient Temperature Range

: 32° - 122°F (0° - 50°C)

Audio Input Level   :   +10dBm max.

Audio Output Level   :   +30dBm max.

Bandwidth   :   200 - 5,000Hz

Noise Level   :   -75dBm

Crosstalk   :   -60dB

Harmonic Leakage   :   Under -40dB

                           (circuit terminals)

Subscriber Impedance :   600 Ohms balanced

                           (input/output)

Power Consumption   :   120W max.

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

                           (possible 110, 220 and

                           240V)

2-1-3.   Further Details

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

Common Control Section

CCU   (Central Control Unit)

Speech Path Section

DLU   (Duplex Link Unit)

LMU   (Line Modem Unit)

The individual units will be described later in
detail. The exchange also includes the Frame &
Cabinet (FC-11). The Frame and Cabinet includes
a power supply module (DSM-11) and terminal
board module (TBM-11).

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

The exchange operates on AC power.

The exchange is a compact, wall-mounted type.

The connectors and the frame are completely wired
at the factory.

CCU (Central Control Unit)

The Central Control Unit is composed of the
following three sections:

a) Central Processing Section

Controls ROM for the exchange procedure and
RAM for the data in the memory, as well as
performing transmission of input/output data
between exchange and station.

b) Input/Output Control Section

Systematically classifies output data from
Central Processing Section and then, after
temporary storage, transmits the data.

It also receives dial data from station(s)
for Central Processing Section.

c)   Highway Switch Control Section

     Directed by the Central Processing Section,

     connects and disconnects the time-sharing

     switches of station selection, link selection

     and signal tone selection provided by LMU and

     DLU.
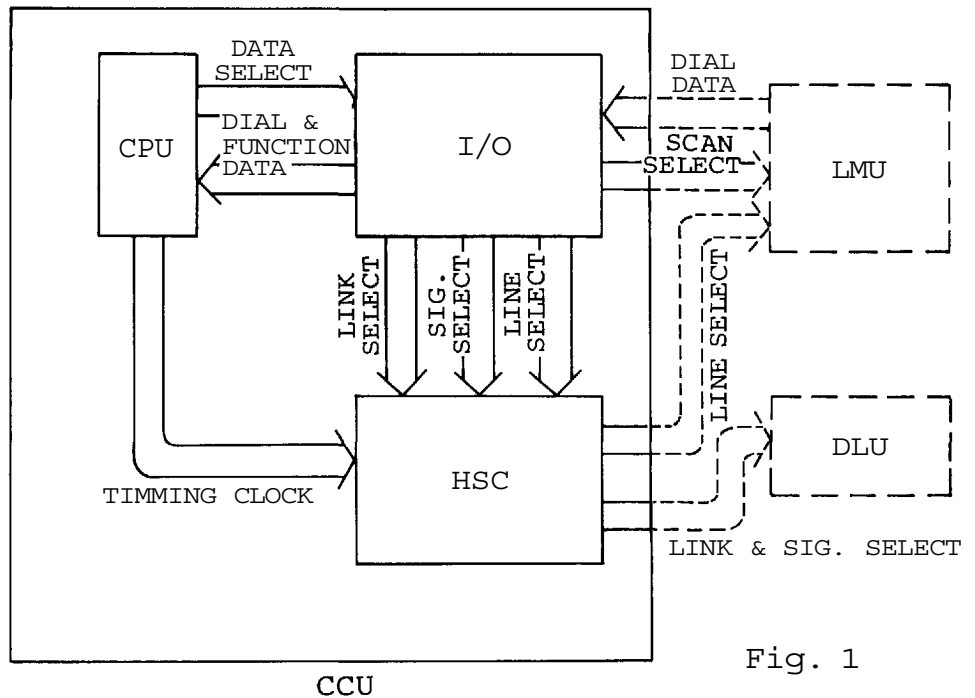
Fig. 1
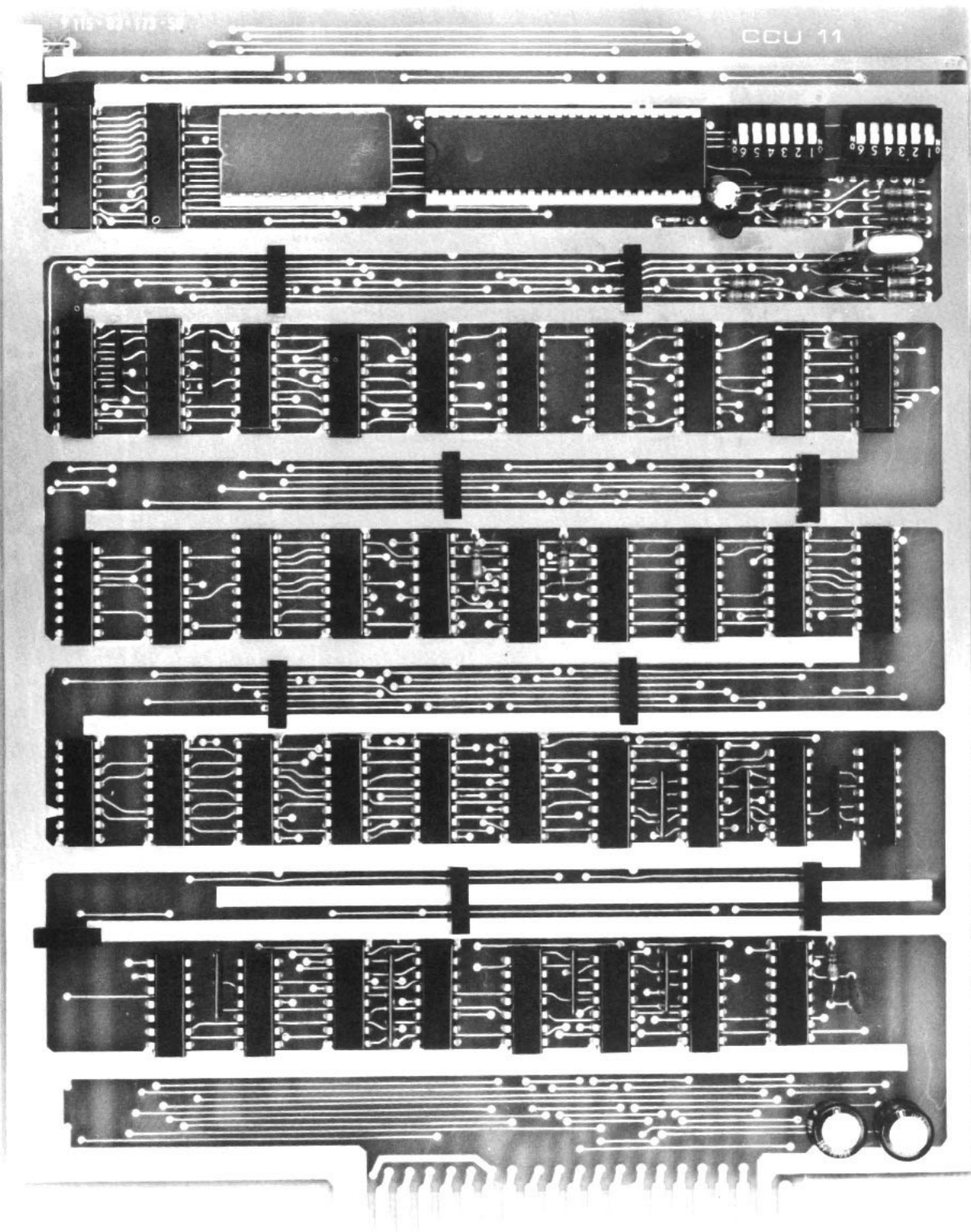
CCU (Central Control Unit)

DLU (Duplex Link Unit)

The Duplex Link Unit is made up of the following
two sections:

a)   Duplex Link Section

Operates under CCU control to make for inde-
pendent hands-free conversation between two
stations.   It is equipped with connection
circuitry for 4 links.

b)   Signal Generating and Distributing Section

Composed of a 4 tone signal generator [Call
(All Call Paging), Line Busy, Hold and
Privacy] and a distributor controlled by CCU
which transmits the necessary signal tone to
the line.

HIGHWAY T
FROM LMU

HIGHWAY R TO LMU

DL

SGD

LINK SELECT

SIGNAL SELECT

Fig.2

DLU

- 10 -
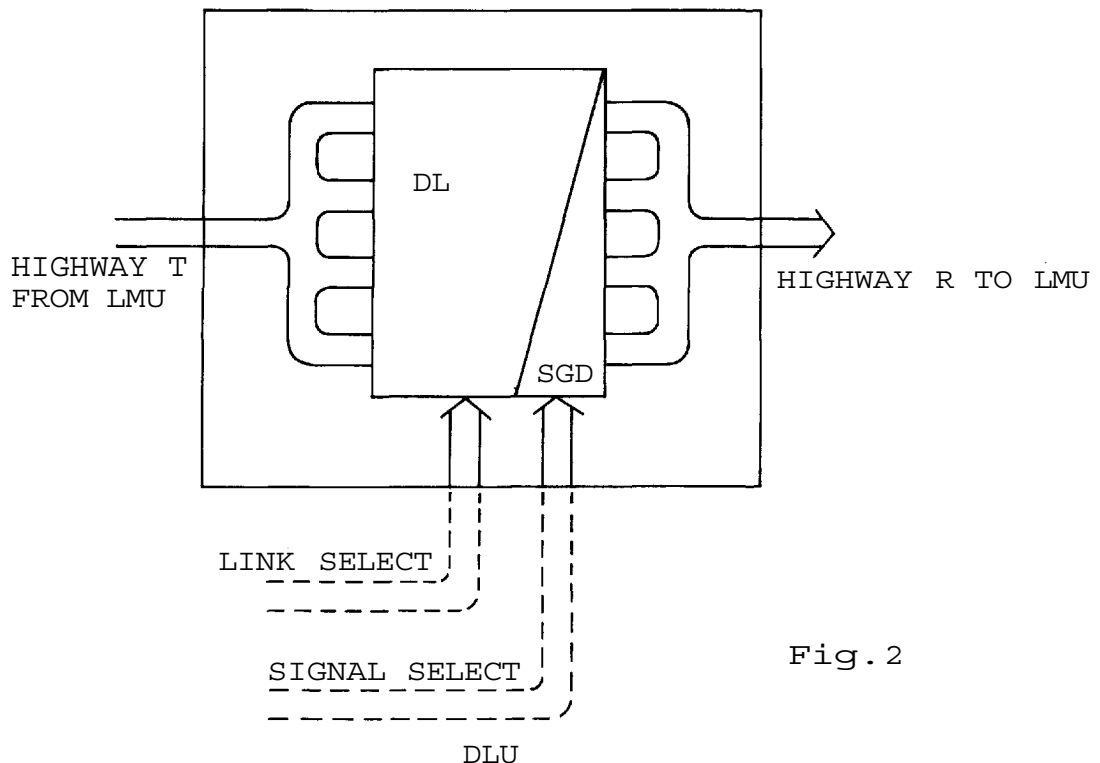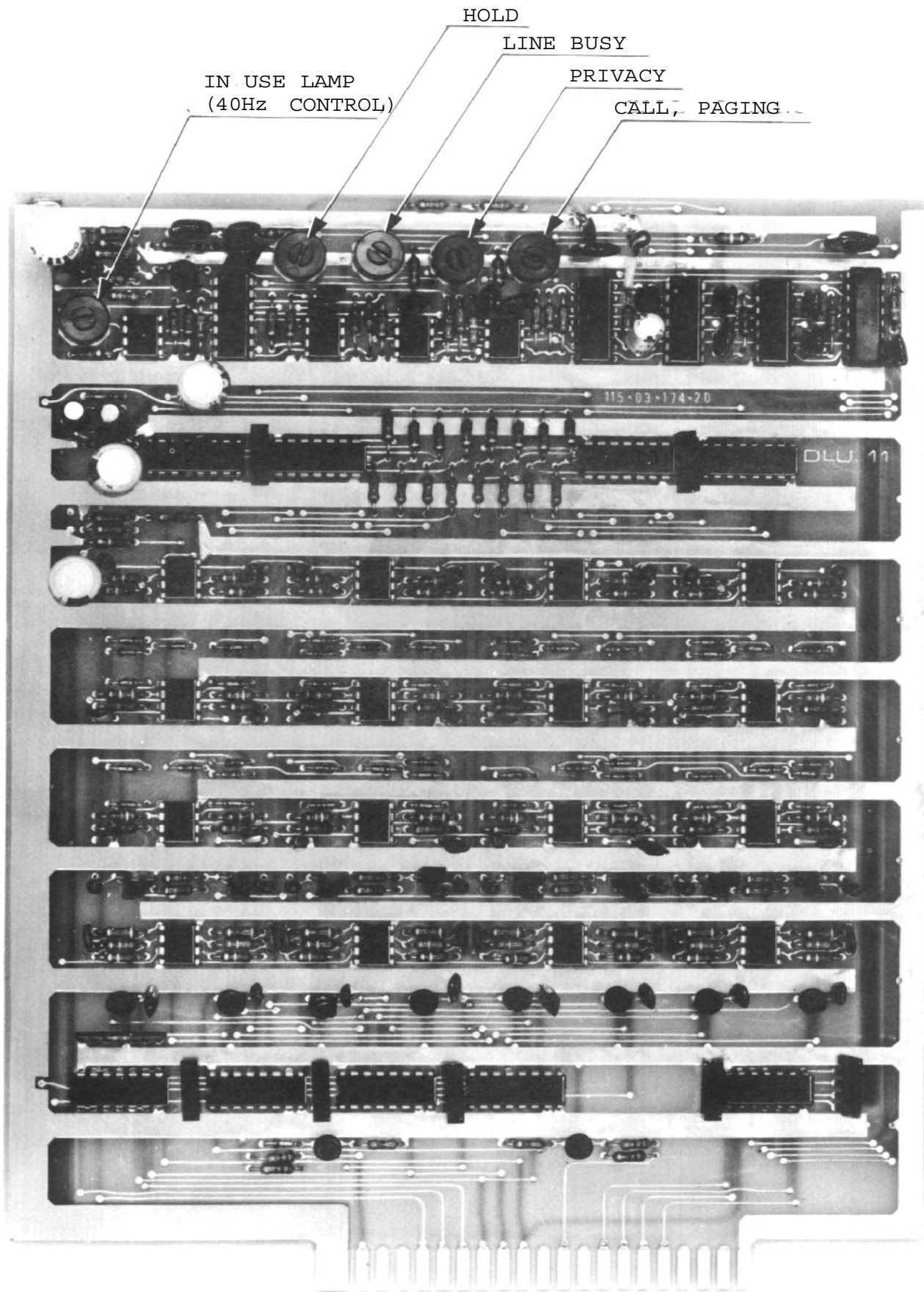
IN USE LAMP
(40Hz CONTROL)

HOLD

LINE BUSY

PRIVACY

CALL, PAGING

DLU (Duplex Link Unit)

LMU (Line Modem Unit)

This is an interface unit for connecting

stations and exchange and performs the follow-

ing two functions:

a) Line Scanner Section

    Scans the station "Privacy ON/OFF" conditions

    and the dial data of the station and also

    transmits data to the CCU.

b) Line Modem Section

    Modulates the audio signal from a station and

    transmits the modulated signal to DLU through

    Highway T also demodulates the signal from

    DLU through Highway R and transmits the de-

    modulated signal to the station. Up to 8-

    station can be connected to one LMU.
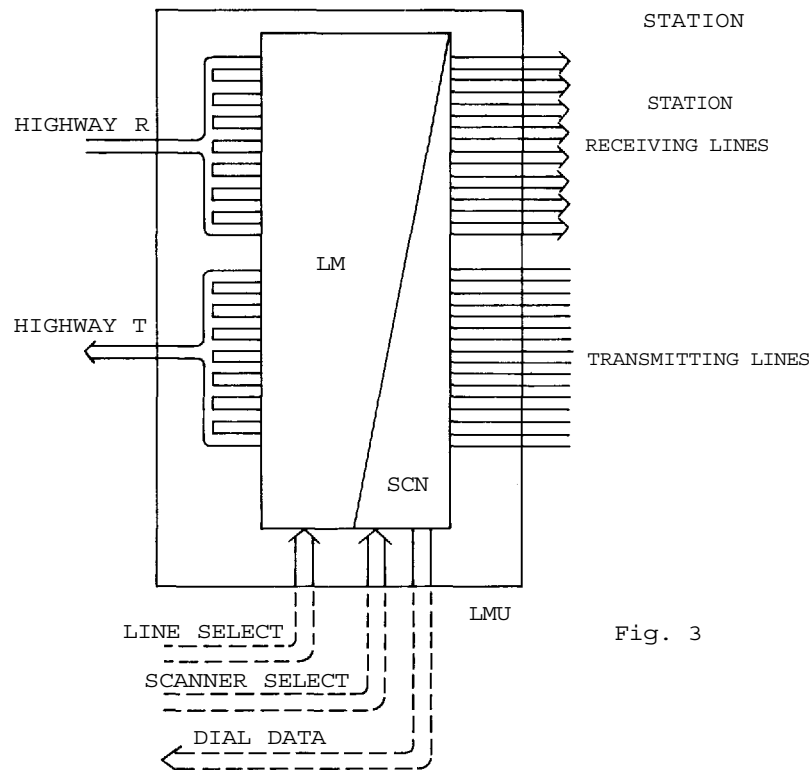
Fig. 3
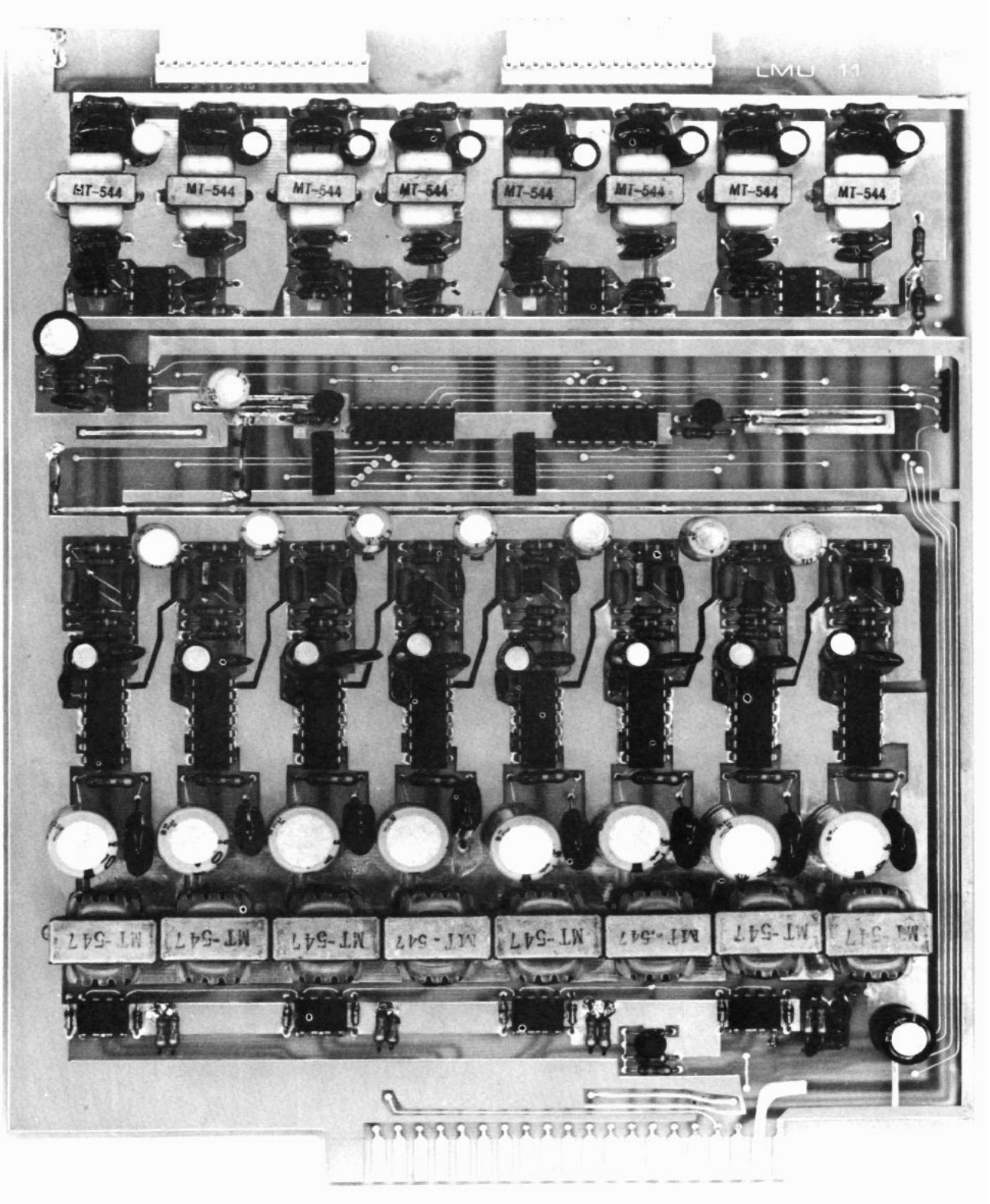
LMU (Line Modem Unit)

FC (Frame and Cabinet)

The Frame and Cabinet consists of the following
modules:

a)   Power Supply Module (DSM-11)

   The power supply is especially designed for
   the exchange EX-110 and is housed in the
   cabinet.   Connections must be done as shown
   in the photograph.
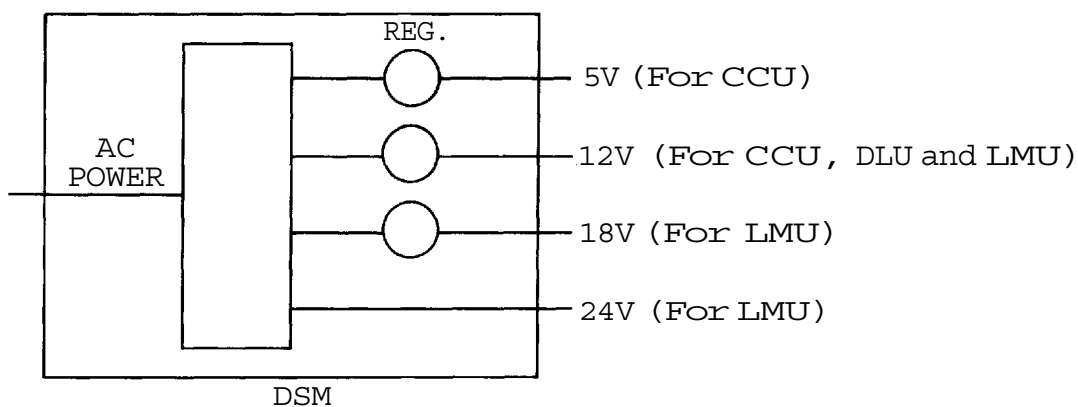
Fig. 4

b)   Terminal Board Module (TBM-11)

   The Terminal Board Module is designed to be
   separated from the exchange and is wall-mounted
   for space conservation.   It is provided with an
   AC input terminal and terminals for 32 stations.
   The clip terminals make soldering or screws
   unnecessary.

Power Output Terminal

Voltage Selector

Fuse

Power Supply Module(DSM-11)

Terminals for Stations ─

LMU
4
3
2
1

AC IN
100V–240V
50/60Hz
120 W

AC OUT

851002
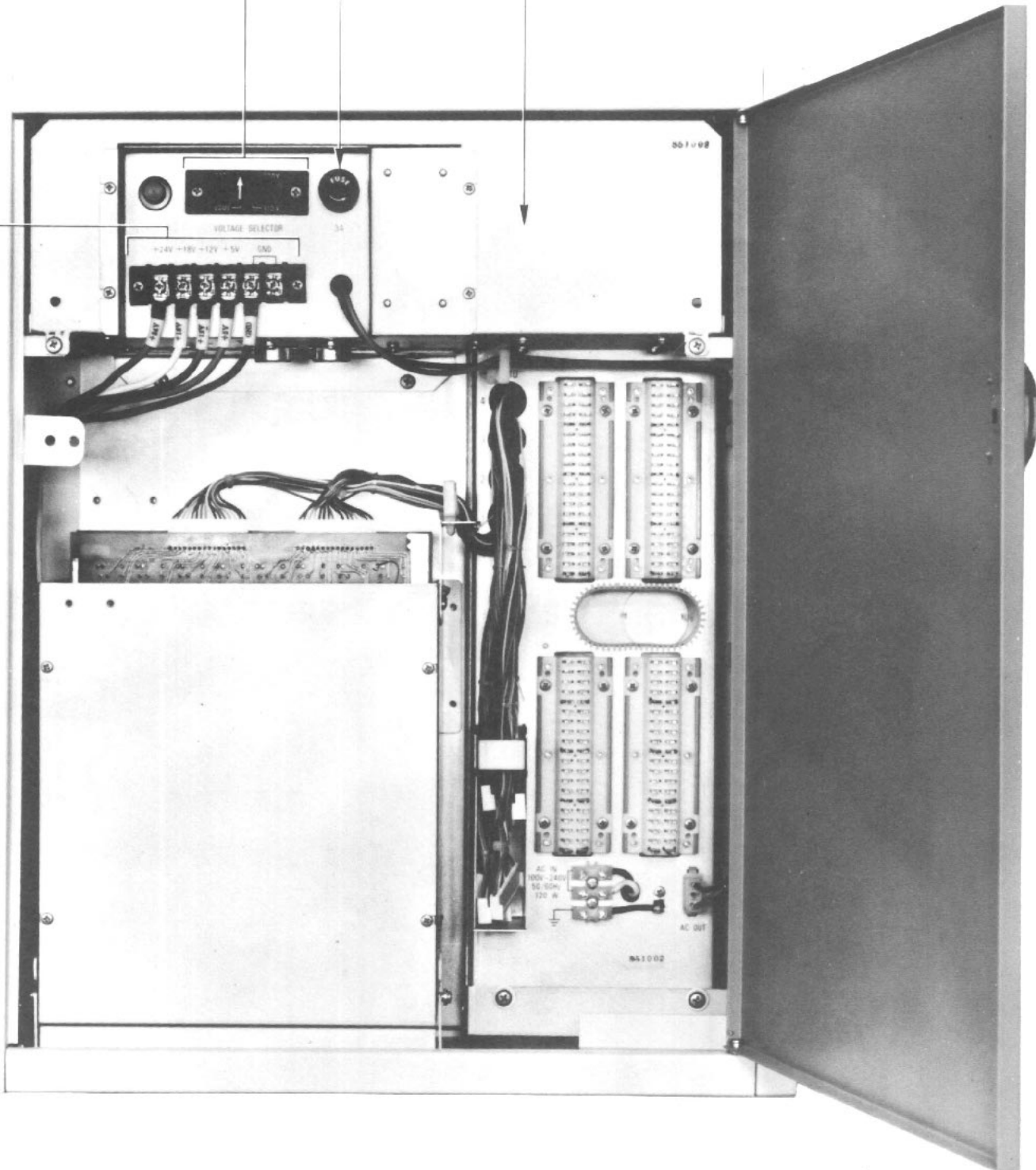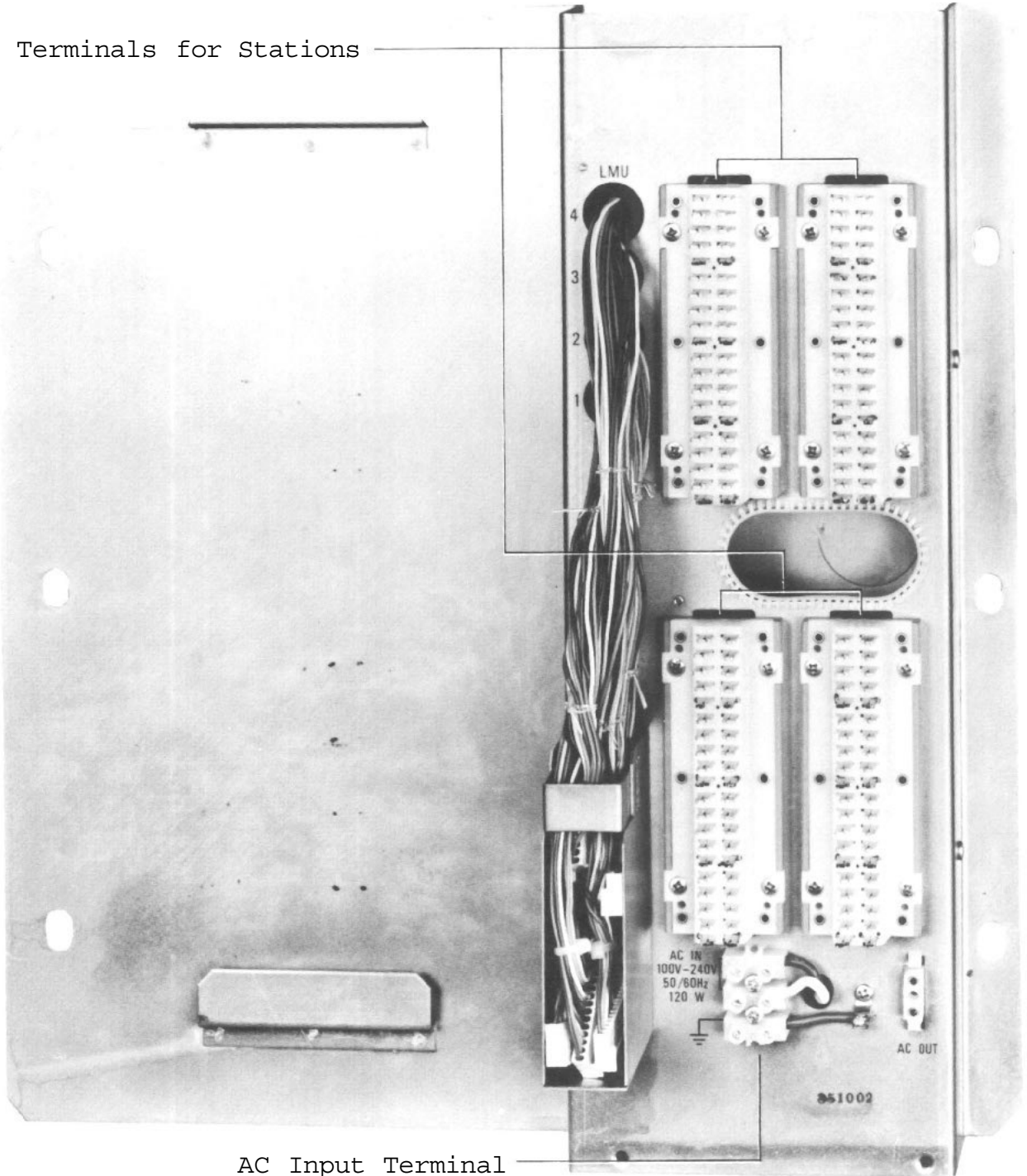
AC Input Terminal ─

Terminal Board Module (TBM-11)

2-1-4. Installation of each unit (CCU, DLU, LMU)

The card rack containes each unit is fixed with the fitting metal. The location of these unit is clearly marked on the card rack.

Remove the fitting metal. Pull out connection plugs from LMU's and pull a top part of the card rack toward you, then plugging in or out LMU's. No connection cable is required for CCU and DLU.

To increase the LMU, pull out the connection cable from the cable pocket to make the complete connection of the LMU which is additionally plugged in.

Finally, please double check if the LMU's are plugged in the proper location.

Station No. 10 - 17 : LMU 1

18 - 25 : LMU 2

26 - 33 : LMU 3

34 - 41 : LMU 4
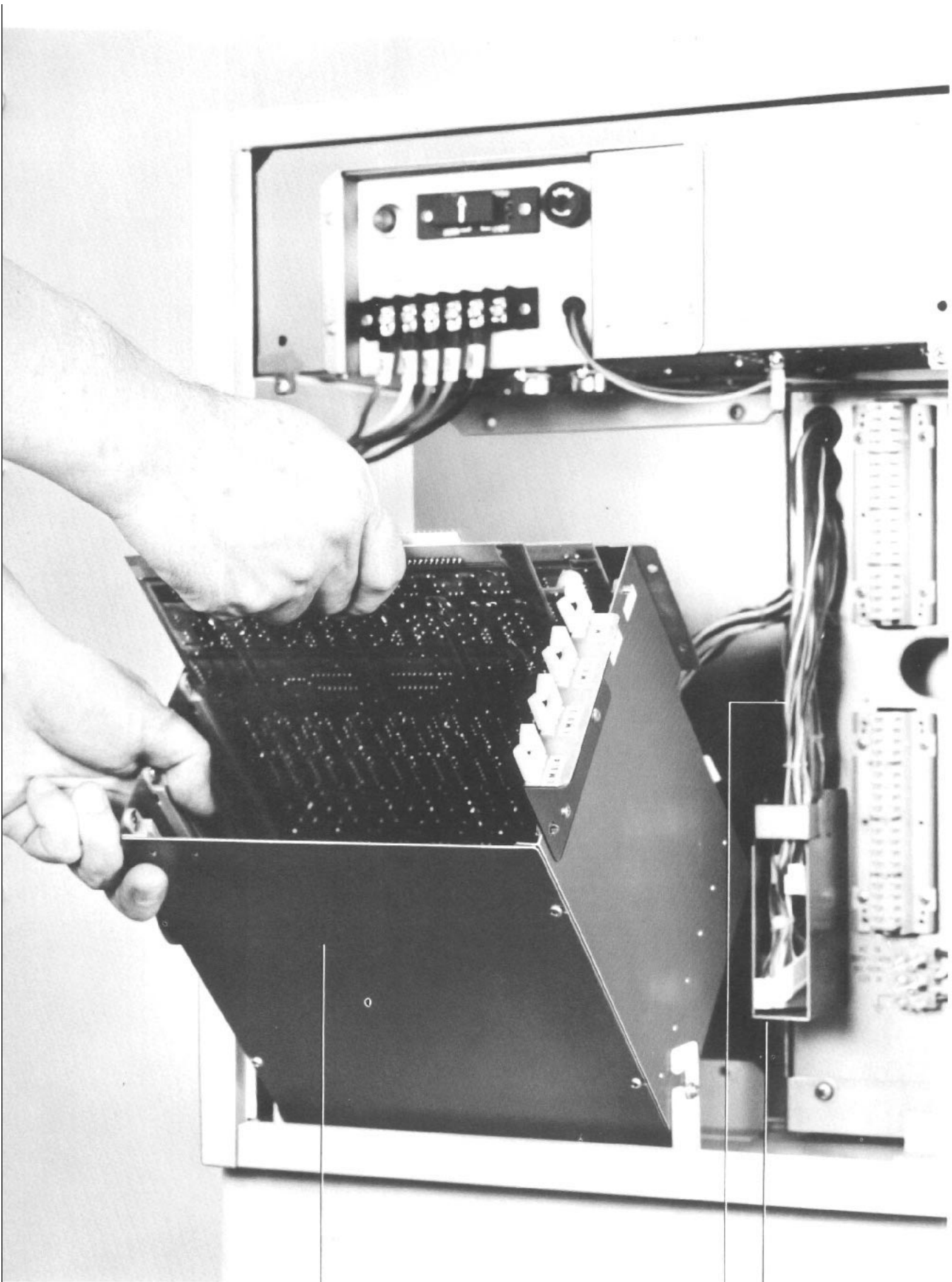
Card Rack

Cable Pocket

Connection Cables

2-2. Stations

  2-2-1. Features

The stations of the Toa Intercom EXES-1000 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-101 or YC-103)
    at the end of each cable, connection can be
    quickly made with a screwdriver.
    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 re-
    quirements.

  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. Accessories

    2-3-1. Wall Mounting Panel (YC-100)

        The Wall Mounting Panel is used for HFM-100 and

        HFS-100 when these stations are wall mounted

        (Refer to Page 28.)

    2-3-2. Talk-Back Unit (TKU-11)

        This unit, optional amplifier (10W max.) and

        speaker (Hi-Z) will allow high-volume paging and

        response from speaker. Conversations are con-

        ducted by using the Press-to-talk bar for press-

        to-talk and release-listen. The talk back

        speaker also operate when All-Call Paging is

        made from a master station.

TALK BACK UNIT
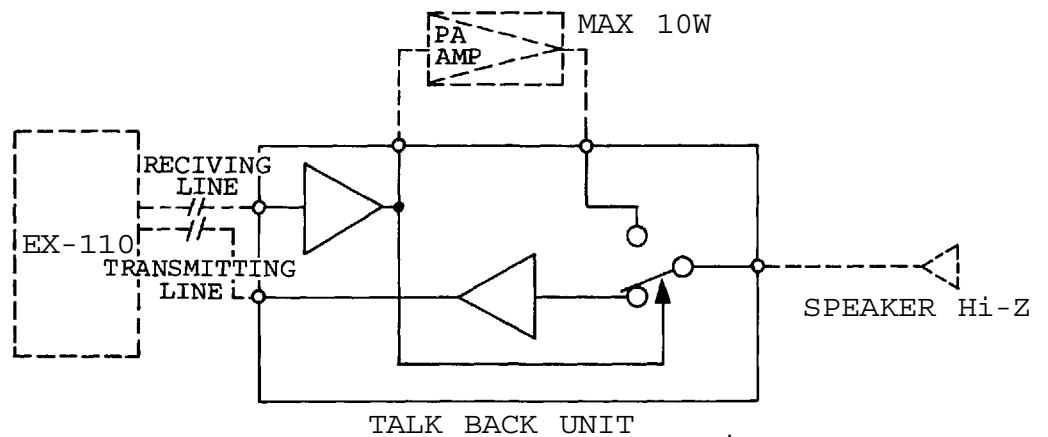
Fig. 5
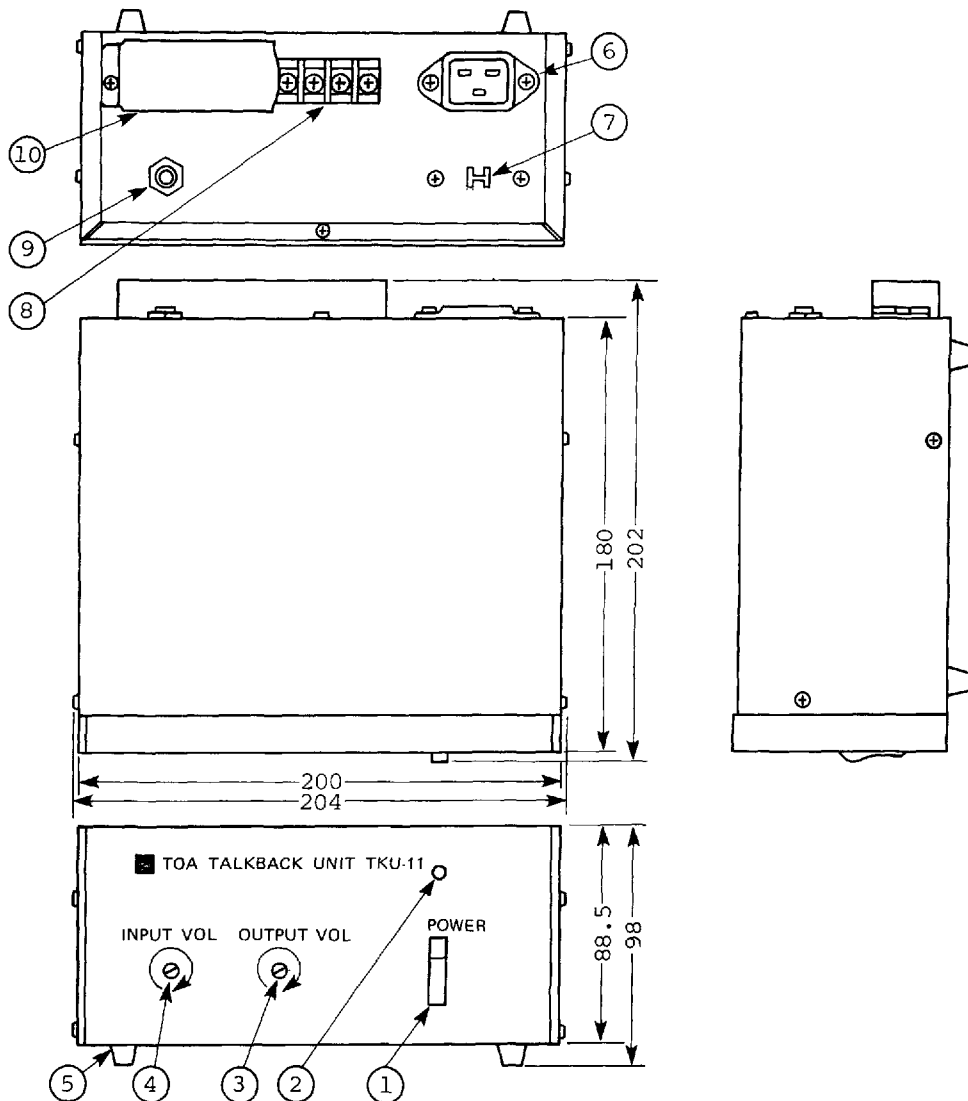
1. Power Switch
2. Power Indicator
3. Output Volume Control
4. Input Volume Control
5. Rubber Foot
6. AC Inlet
7. Voltage Selector
8. 8-Pin Terminal Board
9. Output Jack
10. Terminal Board Cover

SPECIFICATIONS

Power Source: 100~120/200~240V AC

Input   : Talk Back Max. 30dBm, 600Ω
             Amplifier Max. 10W, Hi-z

Output   : Talk Back Max. 10dBm, 600Ω
             Amplifier   0dBm, 600Ω

Control   : Voice Switching

Speech
  Control : Voice Switch or Press-To-Talk

S/N   : 55dB

Dimensions : 204 x 202 x 98mm

Weight   : 2kg

3. Installation of the EXES-1000 System

    3-1. Exchange

          Pay particular attention to the following points

          during installation of the exchange:

          * The layout should allow easy servicing and

            inspection.

          * The exchange is compact and lightweight; however

            it is important to ascertain the strength of the

            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

            quality.

          * Make sure that the power cord provided adequate

            insulation and capacity.

          This high performance exchange is compact as well as

          quiet, and can be easily installed almost anywhere.

          Areas described below, however, should be strictly

          avoided.

          Installation Instructions

          1. Put the cables through the terminal board cover

              and attach the terminal board cover to the

              terminal board.

2.   Install the terminal board to wall.

3.   Complete power connection, grounding and station cables to the terminals.

4.   Attach exchange cabinet to terminals.

5.   Attach AC connector from power supply to the terminal board.

* 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° ~ +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.

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

EXES-1000 EXCHANGE (EX-110)

WALL

WALL

180
(7.0")

486
(19.1")

400
(15.8")

EXCHANGE CABINET (FC-11)

POWER SUPPLY
(DSM-11)

TERMINAL BOARD (TBM-11)

LMU CORD

TERMINAL BOARD COVER

AC CONNECTOR

Card Rack

A
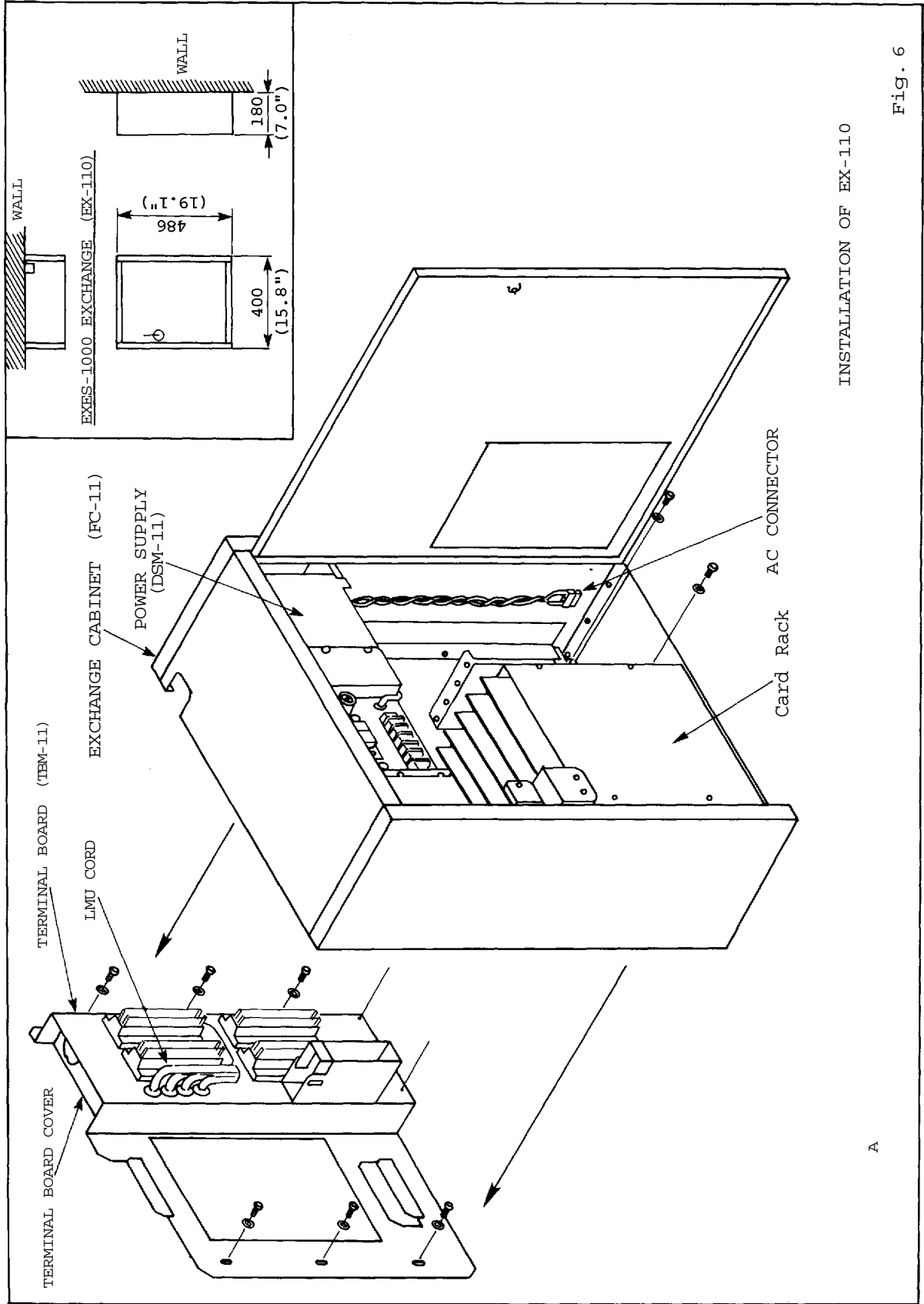
INSTALLATION OF EX-110

Fig. 6

- 25 -

REFERANCE FOR EXCHANGE MOUNTING

Use this drawing for the exchange installation especially useful
for the setting of hight from floor.

Exchange Cabinet

Terminal Board

Handle

50 (1.97")   10 (0.39")

200(7.87")

25 (0.98")

60 (2.36")   320(12.6")

350(13.8")
320(12.6")

20(0.78")

80(3.15")

8 (0.31")

375(14.76")

115(4.53")

12(0.47")

115(4.53")

Fig. 7

Installation TBM-11

- 26 -
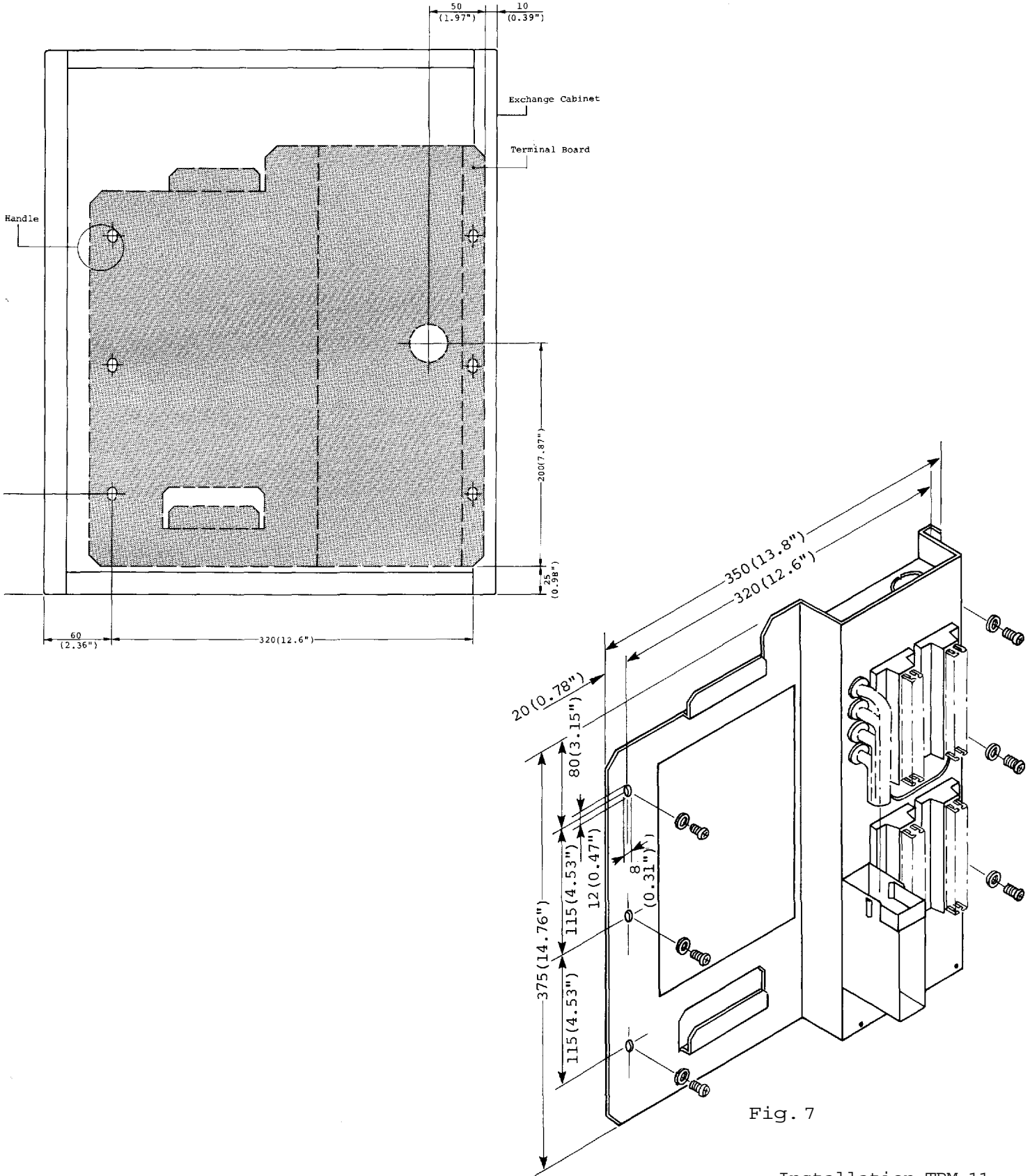
3-2. Stations

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 all call paging or talk back function is
  adopted, precautions should be taken to ensure
  against feed-back due to interference between the
  station (microphone) and the paging or talk-back
  speaker; that is, they should be installed 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.

* Adjust the volume switch and volume control on the
  station for comfortable speaker output level or
  for avoiding the trouble caused by acoustical
  conditions such as reverberation and echo.

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° ~ +122°F., 0°C ~ +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.

* SCR type light dimmers.

3-3. Accessories

a) YC-100

HFM-100, HFS-100
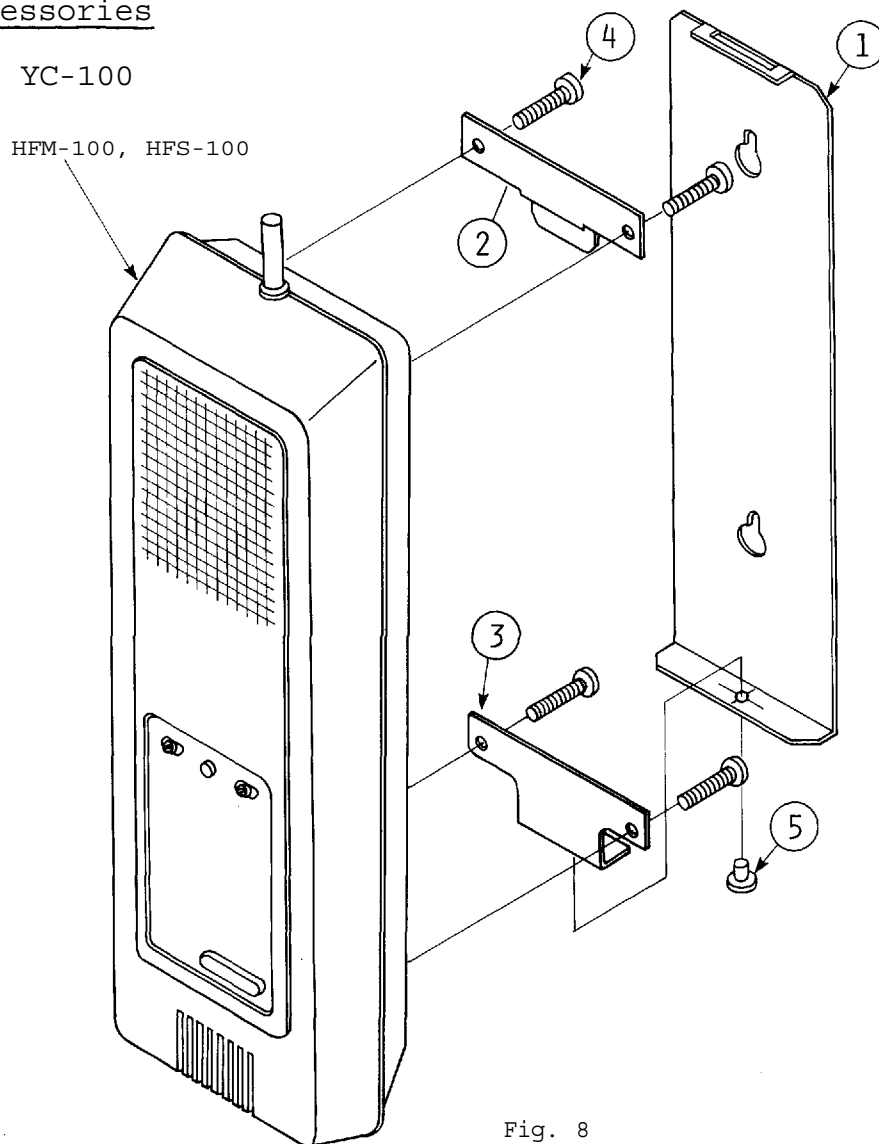
Fig. 8

First, install panel ① on wall. Install panel ② and ③ on HFM/S-100 with screws ④, then fix the unit on the panel ① with a screw ⑤.

b)   TKU-11

The talk-back unit is to be installed with an
optional amplifier (10W max.) in the place where
the talk-back function is desired.

The speaker is to be a Hi-Z trumpet speaker
installed on the ceiling or wall. The optimum
installation site for the speaker is approximately
2m from speaking position. The talk-back unit
should be placed by the optional amplifier. The
speaker should be installed as close to the talk-
back unit as possible.

Be sure to use shielded cable or twisted cable
for the speaker wires to prevent the effects
caused by high-voltage cables, electromagnetic
induction and high-frequency waves.

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 according
               to the guidelines set down below.

               * 4-wire telephone cables are to be used for
                 wiring between the intermediate and indoor
                 boards.

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

               * 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-110)

Main
Terminal
Board

Intermediate
Terminal
Board

Secondary
Terminal
Board

Station
(HFM-500
etc.)

*1

*1

*2

Station

Speaker

Amplifier(s) for Paging

*1. Private Branch Cable
*2. 4-Wire Telephone Cable

Talk Back Speaker

TKU

Shield or Twisted
Pair Cable

AMP MAX. 10W
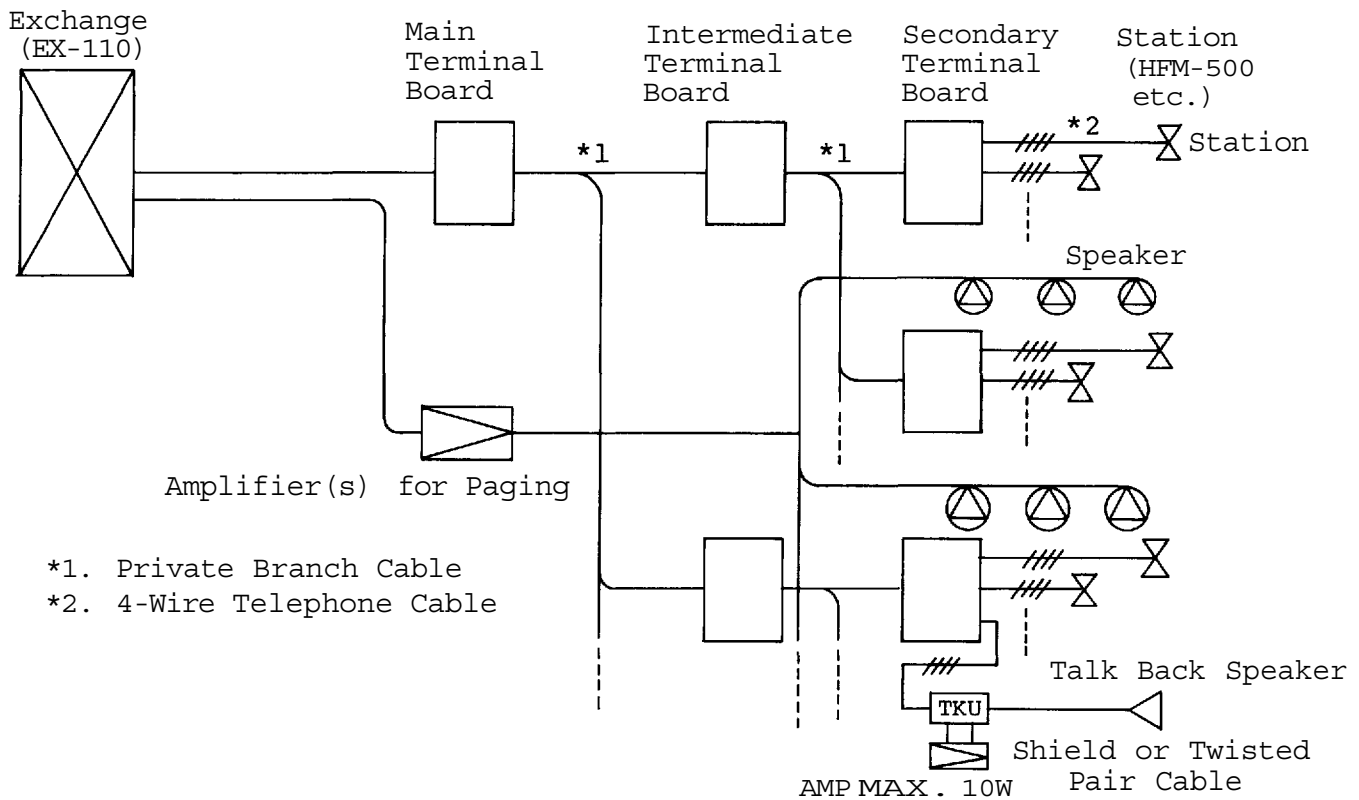
Fig. 9

Note: There is a limit to the diameter of cables

that can be used to connect the terminal

board TBM-11 and the main terminal board,

and this limit must be taken into con-

sideration 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 de-

termined so that the set limits for speech attenu-

ation (3dB maximum for transmission from the exchange
to the station and the DC resistance (DC loop re-
sistance: Less than 300 ohms) are met.

Speech Attenuation, DC Loop Resistance and Service
Distance as Functions of Core Diameter

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.

<u>Spacing</u>

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 consideration when the small-current wiring of this system is laid close to other indoor wiring, particularly AC wiring.

The following chart lists spacing standards to be followed in respect to typical causes of interference.

Cause of Interferance	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 induction.
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:

Wire protector

Floor duct

Floor

Metal or Hard PVC tube

Plastic or Aluminum

Wall

Wire protector

4-Pin Jack & Plug

Desk

Box

4-inches

Floor

Station wirings
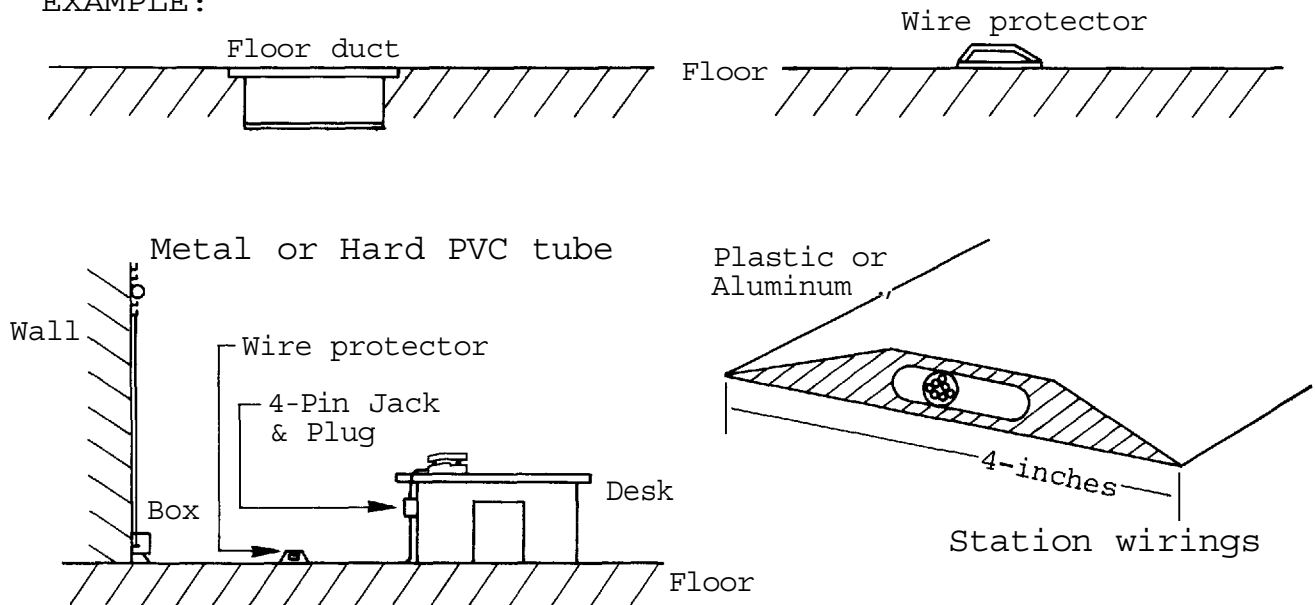
Fig. 10

4-5. <u>Connection of the Terminal Board (TBM-11) to the</u>

<u>Main Terminal Board</u>

Route cables from the main terminal board to the
terminal board (TBM-11) and connect to the individual
clip terminals using clipping tool C.

Connect the individual cables to the clip terminals
following the terminal wiring diagram attached to
the door.

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

<u>the 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.
* 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.

Hook the connecting wire around the tab at the top
of the terminal and then push it in using the
clipping tool.

Connection of the Station Line to the Clip Terminal
of the Terminal Board (TBM-11)

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
side the wire to be cut
off.

Push down

Cutting edge
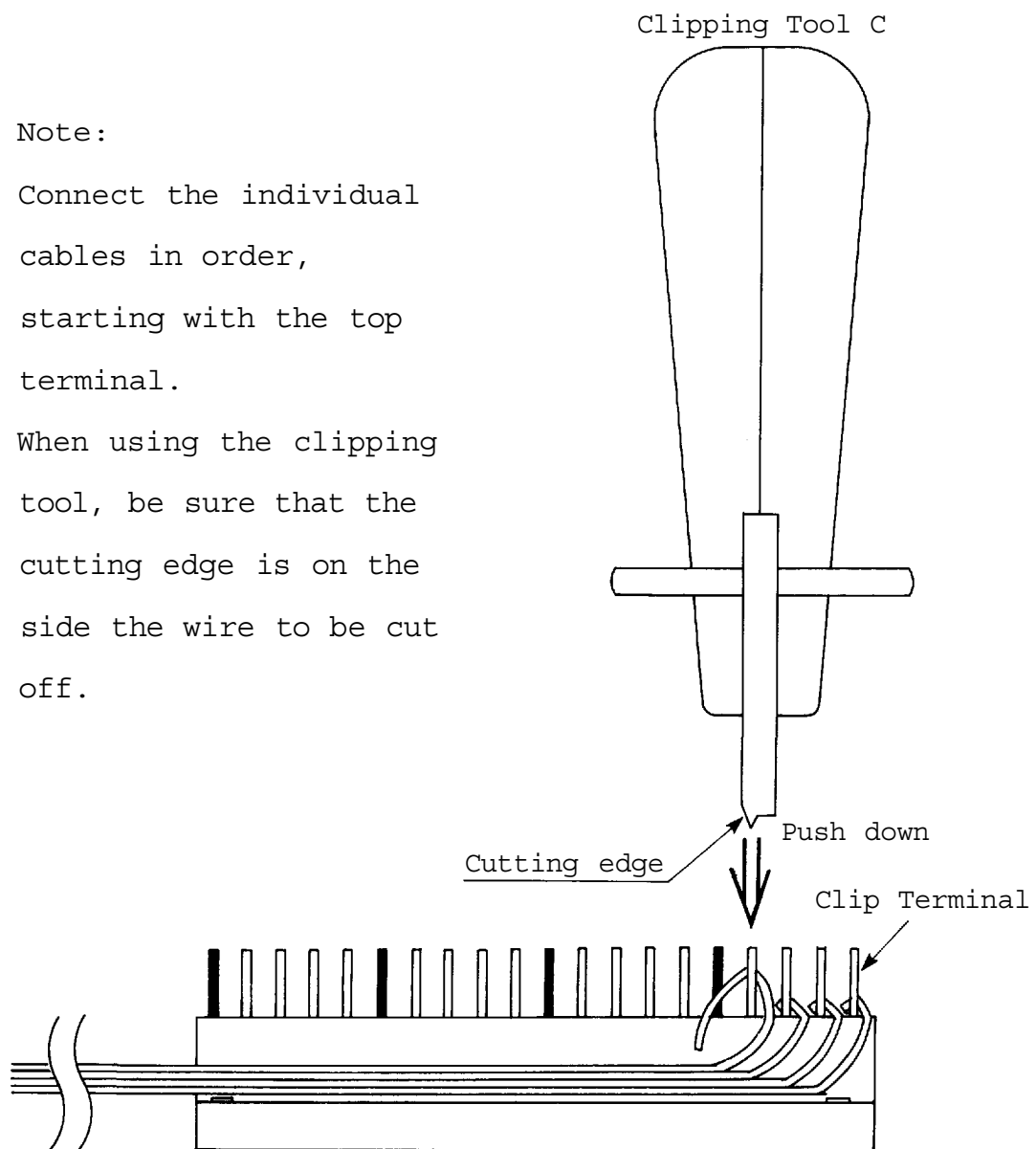
Clip Terminal

Fig. 11   Clip Terminal (Side View)

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

(YC-103: 4-Pin Jack for flush-mount)

NOTE: Use 4" x 2" Switch-Box for YC-103

Station

[HFM/S-100]
[HFM/S-500]
[HFM/S-510]

4-Pin Plug
(YC-102)

Insert

(Cover)
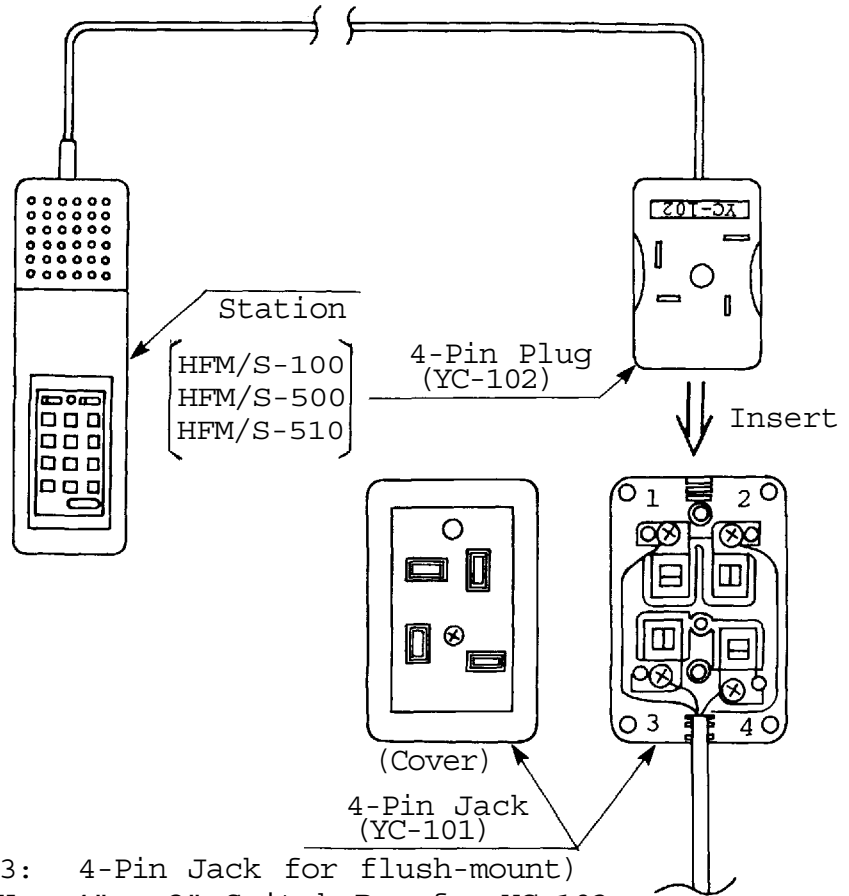
4-Pin Jack
(YC-101)

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

1 ┐ Receiving Lines
2 ┘ (not Polarity Specified)

Terminal Board (TBM-11) Clip Terminals

3 ┐ Transmitting Lines
4 ┘ (not Polarity Specified)

(Viewed from the station side)

From the exchange { 1
                    2

To the exchange { 3
                  4
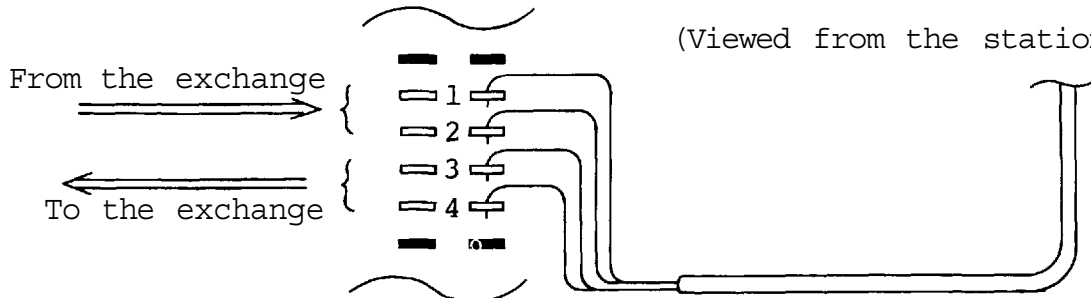
Fig. 12

EX-110 TERMINAL BOARD

LMU 3

26 30
27 31
28 32
29 33

LMU 4

34 38
35 39
36 40
37 41
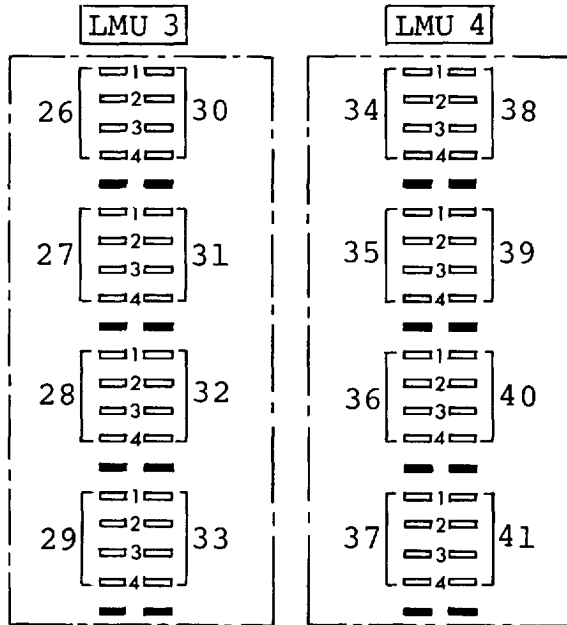
CONNECTIONS
STATION

STATION #11
TERMINAL

1 2
3 4

11

1
2
3
4

LMU 1

10 14
11 15
12 16
13 17

LMU 2

18 22
19 23
20 24
21 25

PAGING   TALKBACK

10

1 SIGNAL
2 LINE
3 DEAD
4 TERMINAL

1
2
3
4

1 2 3 4
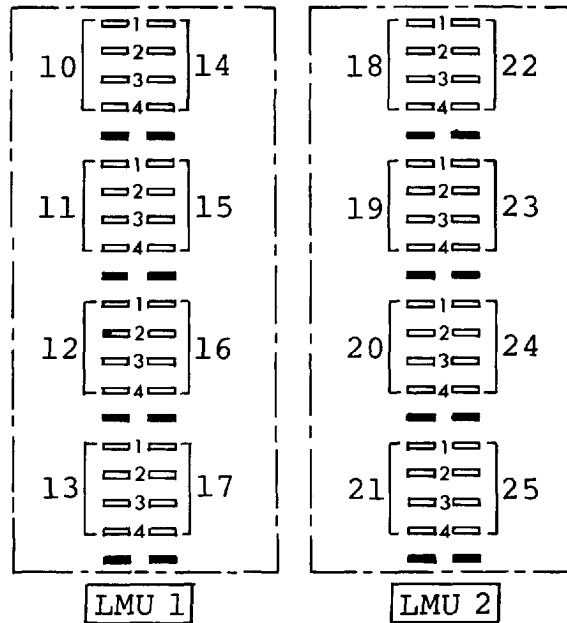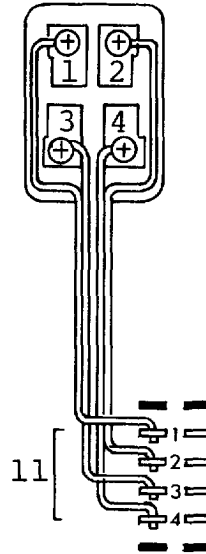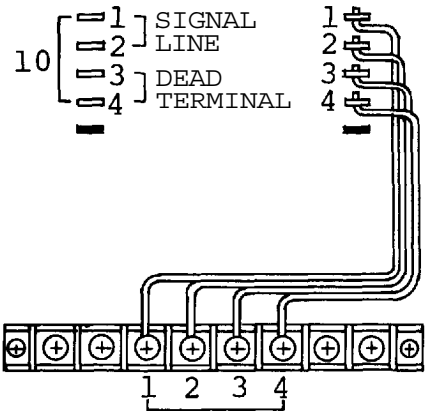
TKU-11 TERMINAL

4-7. <u>All Call Paging Connection</u>

Use No. 10 on the terminal for output when using the paging function.

Connection of the optional amplifier is illustrated below.
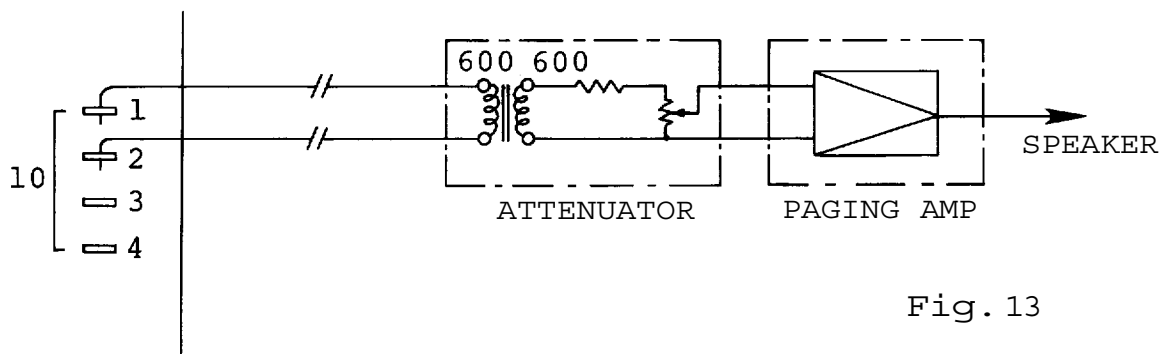
Fig.13

Since the output power from station No. 10 is considerably higher than a regular amplifier's input (AUX.) capacity, an attenuator is required.

Note: When paging function is used, station No. 10 cannot function as a station.

Signal Line

Impedance   : 600 ohms, balanced

Output level: +30 dBm (max.)

All call paging can be heard through the external PA speaker as well as through the speakers built in the handsets, except when the line is being used.

All Line Modem Units (from 1 to 4) are factory set so that paging through the speakers in the station is impossible. All LMU-11s are equipped with the

same specifications; when speaker paging from the
station is desired, follow these procedures:

1) Cut jumper A on all LMU-11s.

2) Excluding the LMU-11 for Nos. 10 to 17 (instal-
    lation position LMU-1), cut jumper B of the
    remaining LMU-11s.
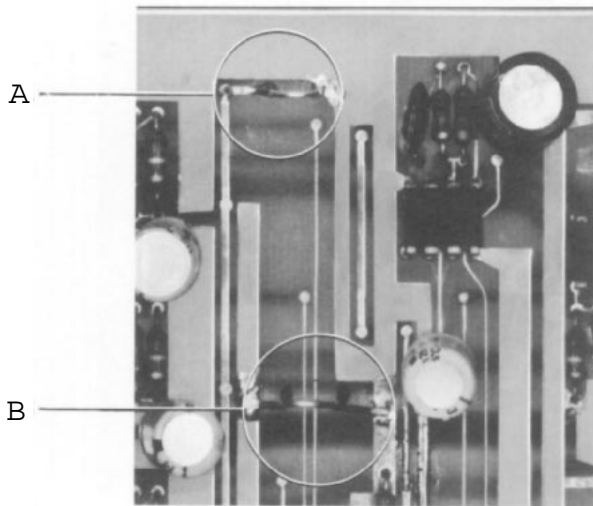
DIP SW AND JUMPER ARRANGEMENT

		WITH PAGING		WITHOUT PAGING	
CCU -11		DIP SW B-6 ON		DIP SW B-6 OFF	
		A	B	A	B
LMU-11	1	X	O	O	X
	2	X	X	X	X
	3	X	X	X	X
	4	X	X	X	X

(1)

O : JUMPER ON
X : JUMPER OFF

When a designated station speaker (for example, No.
13) is not required to be called by All Call paging,
remove the capacitor as shown in the illustration
below in addition to the above mentioned procedure.

Capacitor —

(2)

LMU11   N013

(1)

(2)

Capacitor

A

B
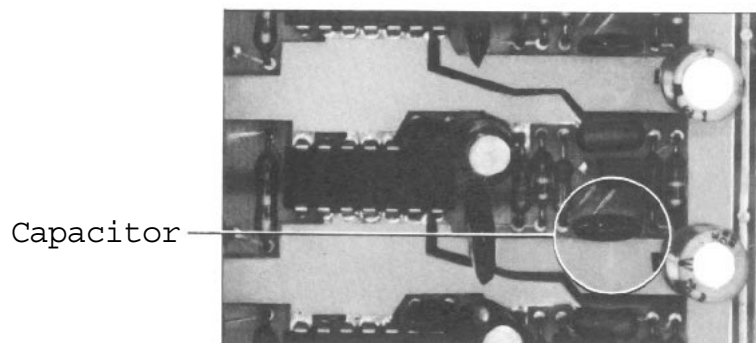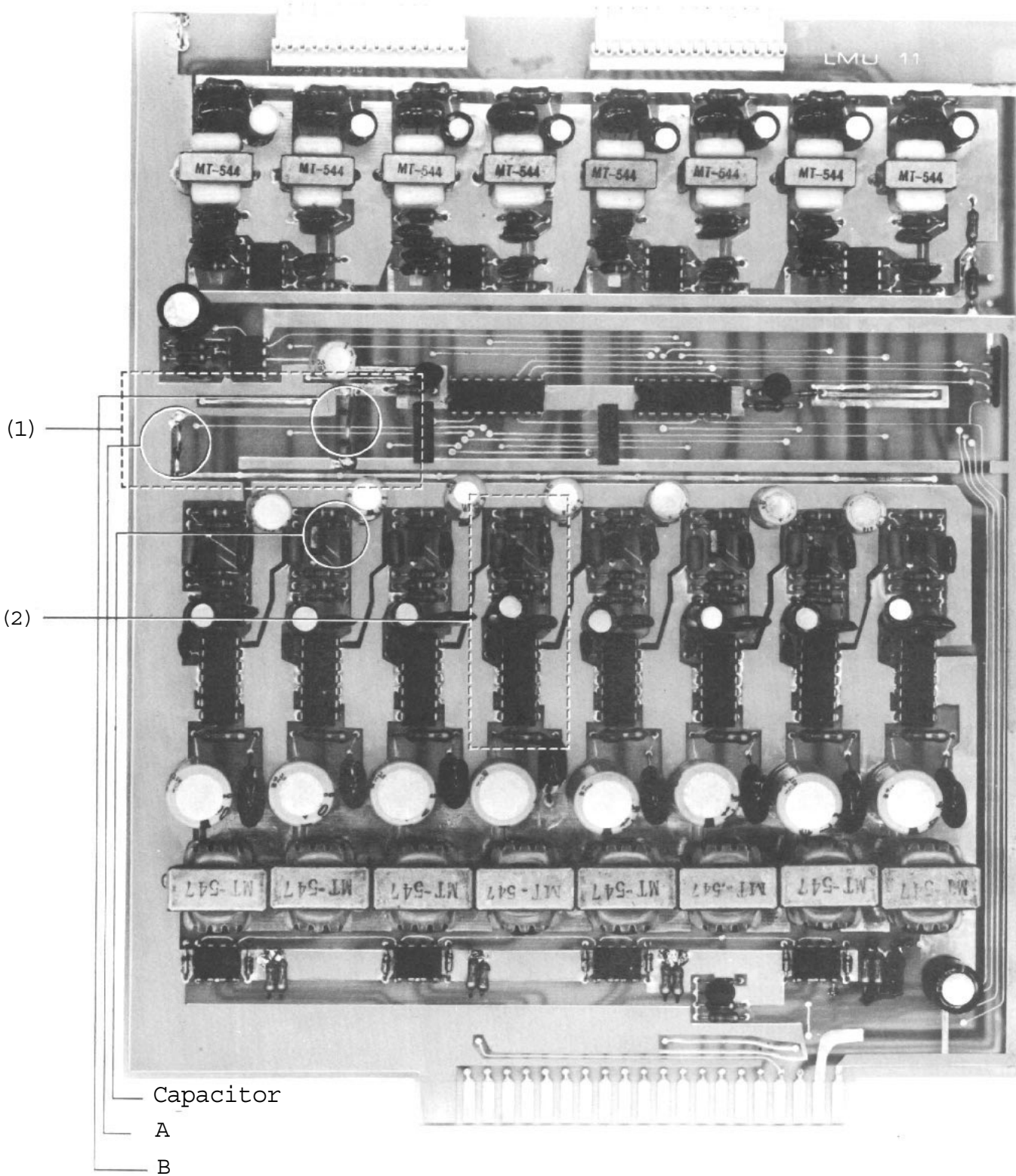
LMU-11

4-8. Connection of the Talk-Back Unit

Connection of the talk-back unit is shown below.
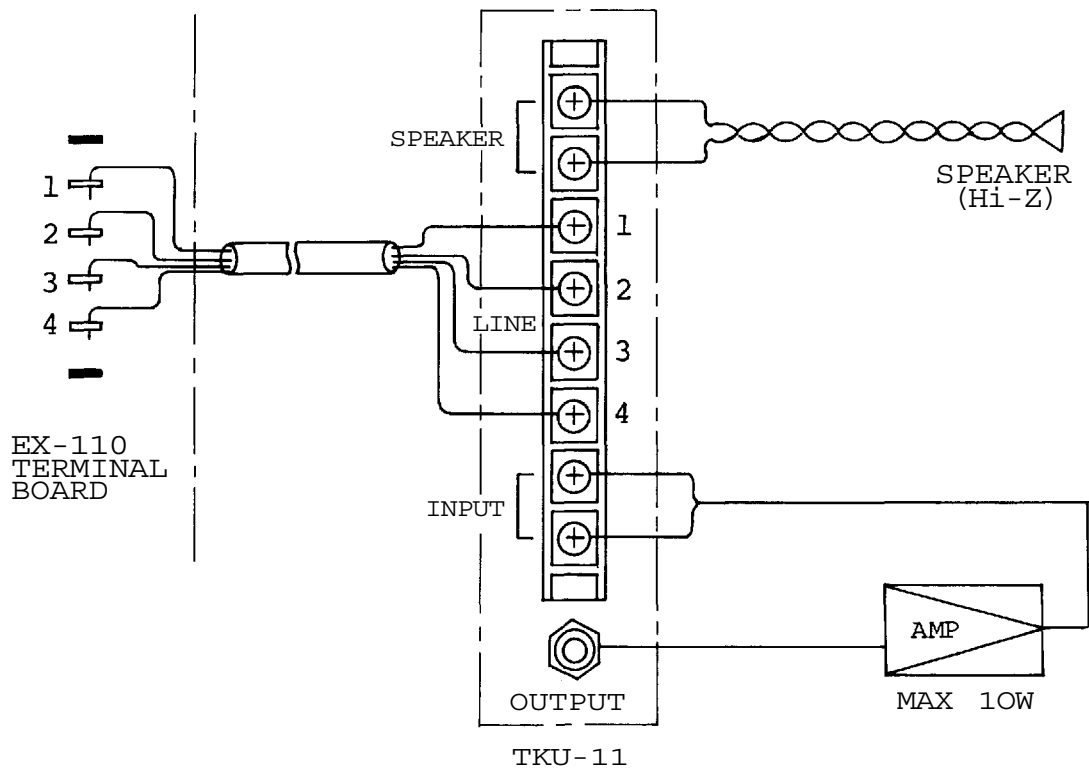
Fig. 14

When the talk-back speaker is used as a microphone,
sound clearness and microphone sensitivity vary
according to the ambient noise level and installation
position. The sensitivity of the talk-back speaker's
microphone can be adjusted by the input volume con-
trol on the front of the TKU-11.

Adjustment is necessary after installation.

4-9. <u>Power Supply Connection</u>

A 3P terminal for power supply is provided on the
terminal board of EX-110.

When a standard AC outlet without special power
cable works is used, the optional YA-308 or YA-309
power cable can be utilized.

A power supply for the exchange which is not affected
by power failures is recommended.

Be sure to ground the exchange.

After completion of the power supply connection, use
the power connector for switching on and off as power
switch is not equipped with the exchange.

Power Supply Cables
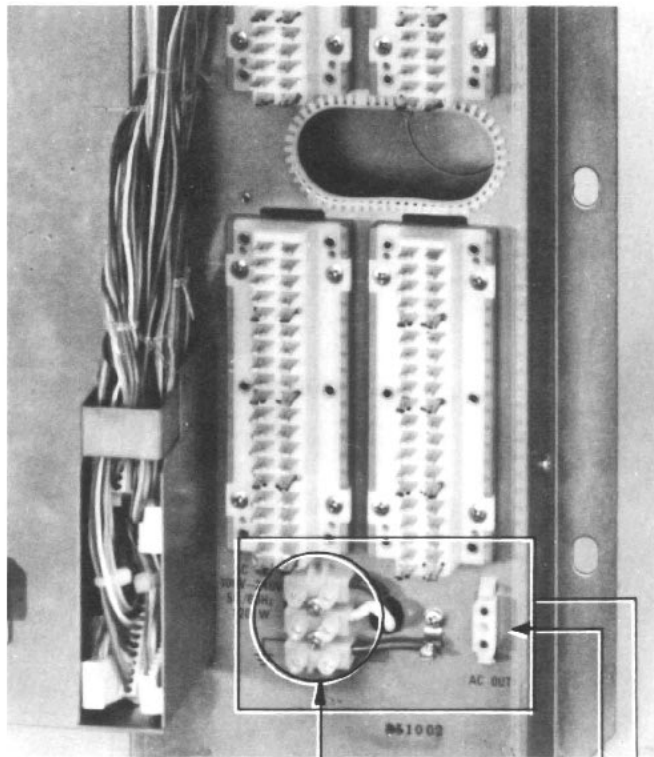
YA-308

YA-309

AC Input Terminal
Power Connector
Power Supply Connection
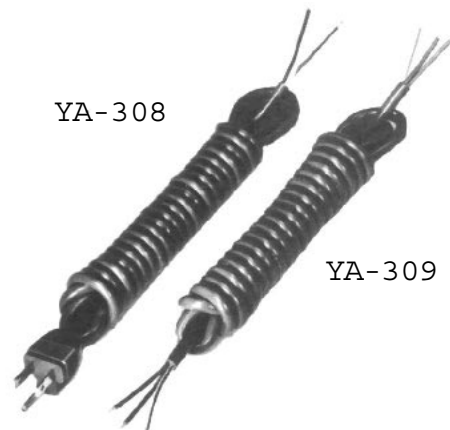
5. <u>Inspection</u>

    5-1. <u>Inspection before Power on</u>

        * Before supplying AC power, check if the power con-
          nections are completed and the fuse is in place.
          Also make sure that the voltage selector is set
          correctly. All the modules should be placed and
          secured. Check if the CPU and ROM on the CCU-11
          are securely in the sockets. Insert the LMU con-
          nection cord (LMU 1 - LMU 4) of the terminal board
          into the LMU properly. Make sure that the con-
          nections of exchange and stations are completed.

        * Supply AC power.

        * AC indicator lamp on the front of the power supply
          module should be on. If not, electricity is not
          supplied. Disconnect AC power and check the con-
          nections and fuse.

        * Handle plug-in units with care; plug-in units
          incorporate CMOS. After the exchange is powered
          do not attempt to disconnect the plug-in unit.

    5-2. <u>Operation and Function Testing</u>

          Pick out a convenient station and call all the
          stations connected on the exchange and check the
          volume and static.

          Volume of calling tone and talking tone can be
          adjusted 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 key-
board of the station for the user. Paging volume
should be adjusted to eliminate howling, using a
station closest to the paging speaker. Adjust
the input volume control of the talk-back unit for
microphone sensitivity. While testing for operation,
check all the functions listed in the operational
instructions.

6. Function Selection

The DIP switches on the CCU-11 allow selection of the following functions:

a. Secretary Transfer

b. Master/Substation

c. Call Holding/Call Transfer

d. All Call Paging and Response

When the CCU-11 board connector is up, the two DIP switch sections are located at the bottom.

Connector

DIP Switch (B)

DIP Switch (A)
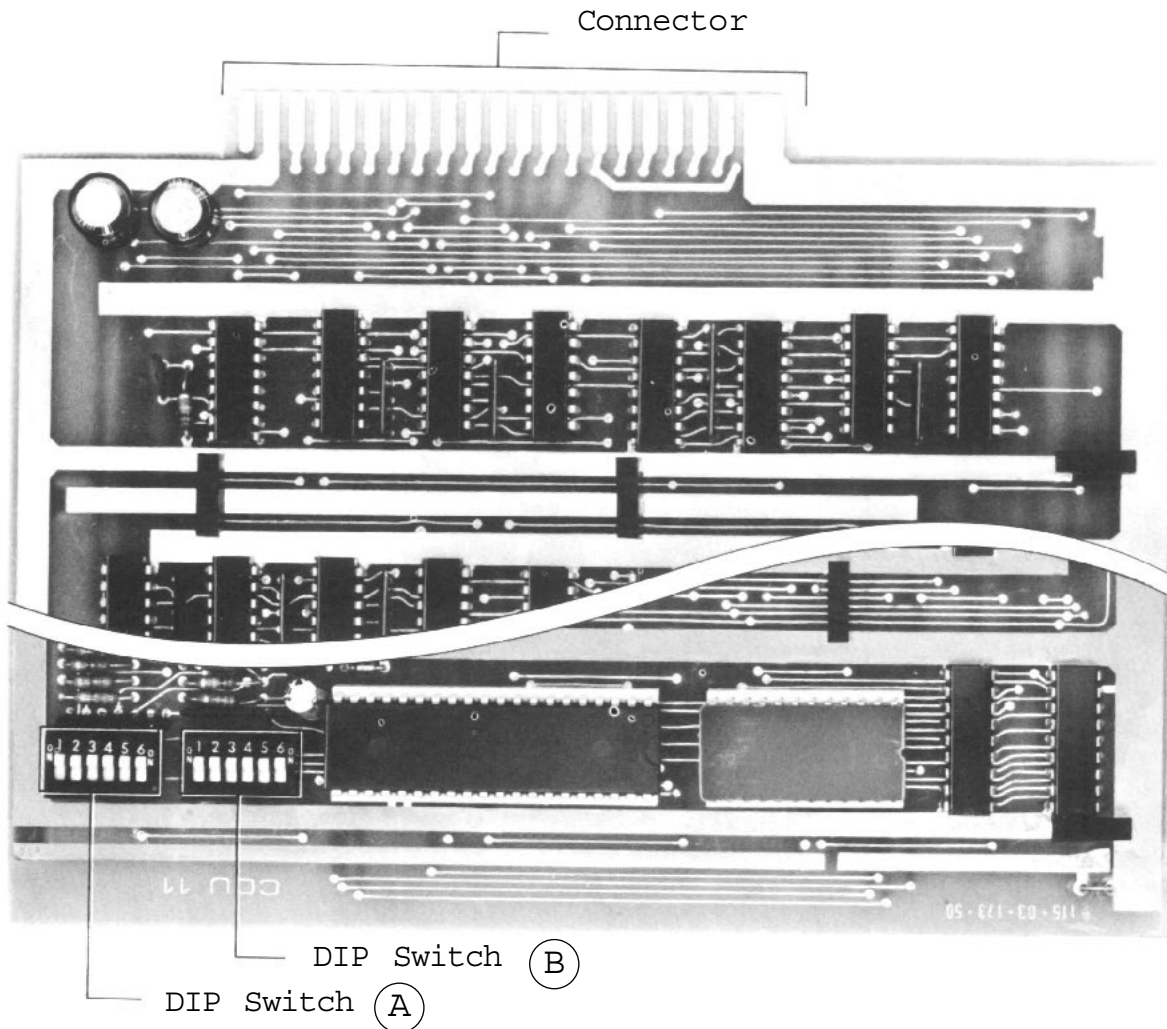
CCU-11

SW (A) for selection of Master/Substation:

SW No.	Master/Substation Combination
1	No. 13 ~ No. 14
2	No. 15 ~ No. 16
3	No. 21 ~ No. 22
4	No. 23 ~ No. 24
5	No. 29 ~ No. 30
6	No. 31 ~ No. 32

Turn on the corresponding switch for Master/Substation combination. For example, SW No. 1 for No. 13 - No. 14 Master/Substation combination.

SW (B) 1 ~ 4 for selection of Secretary Transfer.

5 for Call Holding/Call Transfer.

6 for All Call Paging.

SW No.	Executive	Secretary
1	No. 11 ~	No. 12
2	No. 19 ~	No. 20
3	No. 27 ~	No. 28
4	No. 35 ~	No. 36

Call Holding/Call Transfer and All Call Paging are possible for all master stations.

Each function is adopted when dip switch is ON.

7. TROUBLE SHOOTING GUIDE

Repairing of the EXES-1000 system is basically done by replacing defective units with good ones. The system's faults in an installation can be divided into the following 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. │     │ Fault in specific station    │
│ Same sympton in every station.│     │ only.                        │
└──────────────────────────────┘     └──────────────────────────────┘
         │        │                        │              │
         ▼        ▼                        ▼              ▼
┌──────────────────────┐   ┌──────────────┐   ┌──────────────────────┐
│ Fault in an exchange.│   │ Cable fault. │   │ Fault in a station.  │
└──────────────────────┘   └──────────────┘   └──────────────────────┘
         │                        │                        │
         ▼                        ▼                        │
┌──────────────────────┐   ┌──────────────────────────┐   │
│ * Power supply       │   │ * Mis-wiring between LMU's│   │
│ * Plug-in unit       │   │   and terminal board.    │   │
│   (Common control)   │   │ * Mis-wiring such as short,│  │
│ * Back wiring on     │   │   broken wire, etc.      │   │
│   frame              │   │ * Misconnection in station│   │
└──────────────────────┘   │   jack.                  │   │
                           └──────────────────────────┘   │
                                                           ▼
                                   ┌──────────────────────────────┐
                                   │ * Key board switch fault.    │
                                   │ * Board assembling fault.    │
                                   │ * Speaker, microphone fault. │
                                   │ * Microswitch, connecting    │
                                   │   cable fault.               │
                                   └──────────────────────────────┘
```

8. EXES-1000 System Check Flow Chart

Table 1:	+24V --	+24 ~ +30V
	+18V --	+17 ~ +18.5V
	+12V --	+11.5~ +12.5V
	+ 5V --	+4.9 ~ +5.1V

1 START

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

4 LMU connection cord correctly set on LMU? —no→ 5 Check indications and connect(plug-in) correctly

6 Power on

7 Power indicator on —no→ 8 Power cable connected to power terminal correctly? —no→ 9 Connect correctly

12 Proper voltages at * each output power terminal ? (Table 1) —no→ 10 AC fuse placed correctly ? —no→ 11 Place fuse correctly

16 Lamp on CCU lit ? —no→ 13 Proper voltages when each output terminal is disconnected? —no→ 14 Replace power supply DSM-11

15 Check each module and lapping terminals

18 Station operates quietly without continuous noise ? —no→

17 Replace CCU

23 Dial first digit of selected station. For example [1]

19 Turn off power and turn on again. Station operates quietly without abnormal noise? —no→ 20 Correct wiring to station —no→ 21 Check wiring

22 Replace CCU-DLU-LMU (Note 1)

24 Eavesdropping protection lamp lit brightly? —no→ 25 Replace Station-LMU-DLU-CCU

26 Dial second digit of selected station. For example [3]

28 In other links? (Note 2) —no→ 29 Replace Station-DLU-CCU-LMU

30 Replace DLU

27 Calling tone heard at both stations ? —no→

Note.1: Refer to the following chart

31 Two-way conversation possible ? —no→

Correct wiring to station

32 All other links OK ?

Replace CCU-DLU-LMU (Note 1) EQUALS TO

Replace CCU? → Replace CCU?

Replace DLU? → Replace DLU?

33 Conversation possible with all station?

Replace LMU? → Replace LMU?

Check others

END

Note 2: Always taking hold of No.1 link first. When taking hold of No.2 link, take hold of No.1 link by another station. The next station should be used to take hold of No.2 link. The same for No.3 and No.4 link.
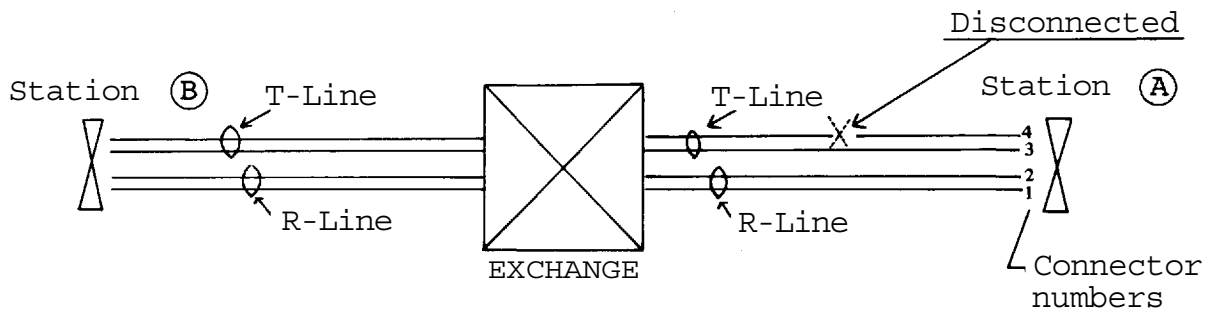
8-1. FAULT IN EXCHANGE

Before power supply (DSM-11) check, confirm the following
three points to eliminate elementary faults:

1. Is voltage selector set correctly ?
2. Is AC power supplied ?
3. Is the connection made between DSM-11 and TBM-11?

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 DSM-11.
Abnormal voltage of +24V terminal.	Right range: +24 ~ +30V	* Replace AC fuse. * Incorrect setting of the voltage selector. * Faulty power transformer.
Abnormal voltage of +18V.	Right range: +17.5 ~ +18.5V	* Faulty 2SA-671(TV_2). * Faulty NJM-305(M_3)
Abnormal voltage of +5V or +12V.	Right range: +4.9 ~ +5.IV +11.5 ~ +12.5V	* Faulty 2SA-671(Tr_2). * Faulty NJM-305(M_3).
Blown AC fuse.	All DC output voltages are correct.	* Over-current flows into one of plug-in units. * Replace fuse according to the following. <table><tr><td>AC MAINS</td><td>Fuse</td></tr><tr><td>AC: 110 ~ 120V</td><td>3A</td></tr><tr><td>AC: 220 ~ 240V</td><td>1.5A</td></tr></table>

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

Station Ⓑ   T-Line   EXCHANGE   T-Line   Disconnected   Station Ⓐ

R-Line   R-Line

Connector numbers

Sympton: 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 .

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

Ⓑ   T-Line   EXCHANGE   T-Line   Ⓐ

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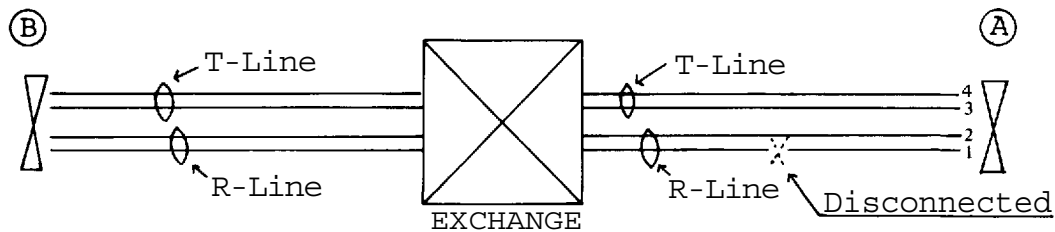
Sympton: 2-1 A can make dialing without dialing tone.
          2-2 When B dials A , busy tone or dial tone will be
               heard at B immediately after the calling tone.

3.   T-Line and R-Line are shorted or mixed up.
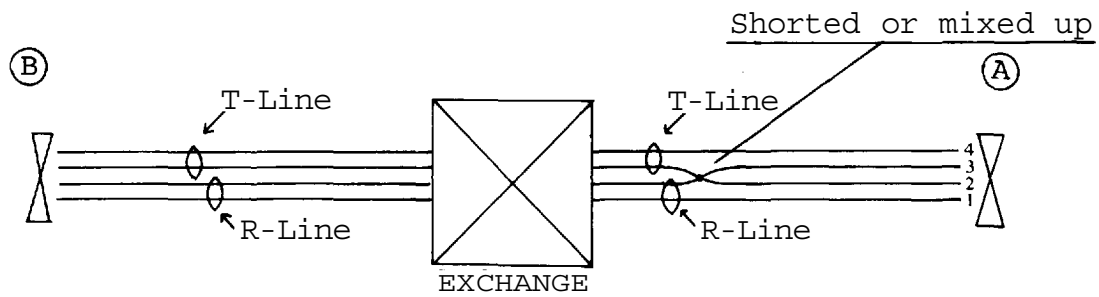
Sympton: 3-1 A can not dial.
         3-2 Conversation is impossible between stations.
         3-3 When B dials A , noise will be heard at B
              immediately after the calling tone.

4.   T-Line and R-Line are connected conversely.
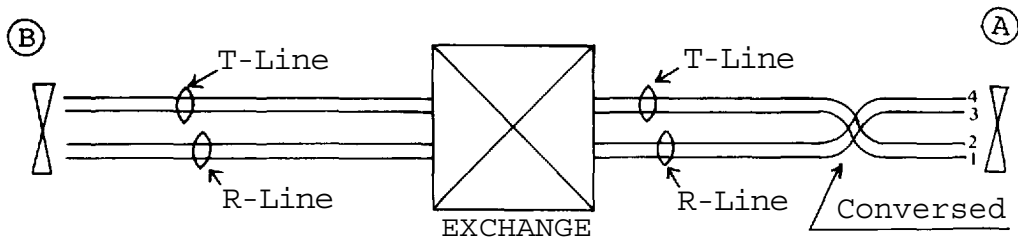
Sympton :   4-1 A can not make dialing.
            4-2 Conversation is impossible between stations.
            4-3 When B dials A , noise will be heard at B .

8-2. 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.

SYMPTON	CHECK-ITEM	CAUSE
Dialing can not be made at privacy off mode.	Replace the station and make sure that the station is not faulty.	* Disconnection of both T & R-Lines. * Guard resistor 330 Ω on LMU is burned out due to T & R-Lines short. * T & R-Lines are shorted.
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. 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. * Fault in LMU.
	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 optically coupled isolator TLP-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.

8-3. 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.

   * 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 link.
     (Refer to the system check flow chart Note 2.)

2. Function Test

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

    * Use all number keys including [C] and [·] , Press-
      To-Talk bar, Vol. L/H and privacy switch to test
      all functions.

        EXAMPLE: + Both calling and conversation tests with
                    station number 10 through 41.

                  + 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 ?

TOA ELECTRIC CO., LTD.

KOBE, JAPAN