
TOA EX-16 INTERCOM SYSTEM

INSTALLATION HAND BOOK



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 EX-16. It includes an outline of the system, an explanation of installation, cable connection, inspection procedures and a troubleshooting 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 EX-16 System

Because the EX-16 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. Each module and the integral terminals for connecting stations are connected to the mother board, thus eliminating wiring between the two, resulting 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.
3. Wiring for each station is an independent 4-wire system which uses a minimum number of connecting wires resulting in greater ease in installation.

2.1 Exchange

2.1.1 Features

The features of the TOA EX-16 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 of maintenance, expansion, and in speed of the system installation.
2. Extensive incorporation of IC's in the electronic circuits of the exchange results in a highly compact, space-saving design and in quieter operation than conventional intercom systems. The system consists of only two types of basic electronic 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 is available with the following specifications.

EX-16 Capacity:	16 lines max. (with paging function)
Dimensions:	360(W) X 300(H) X 100(D)mm (14.2" X 11.8" X 3.9")
Weight:	8.3 kg (18.3 lbs.) with 16 lines

Exchange capacity can be increased within the given limits in units of 4 lines.

Exchange Specifications

Ambient Temperature

Range:	32°~104° F (0°~40°C)
Audio Input Level:	+7dBm max.
Audio Output Level:	+30dBm max.
Bandwidth:	200Hz~10KHz
Crosstalk:	-60dB/1.5KHz
Subscriber Impedance:	600 ohms balanced (input/output)
Power Consumption:	30W
Power Source:	AC 110, 120, 220, 240V ±10% DC 24V

2.1.3 Further Details

The exchange is composed of the following sections:

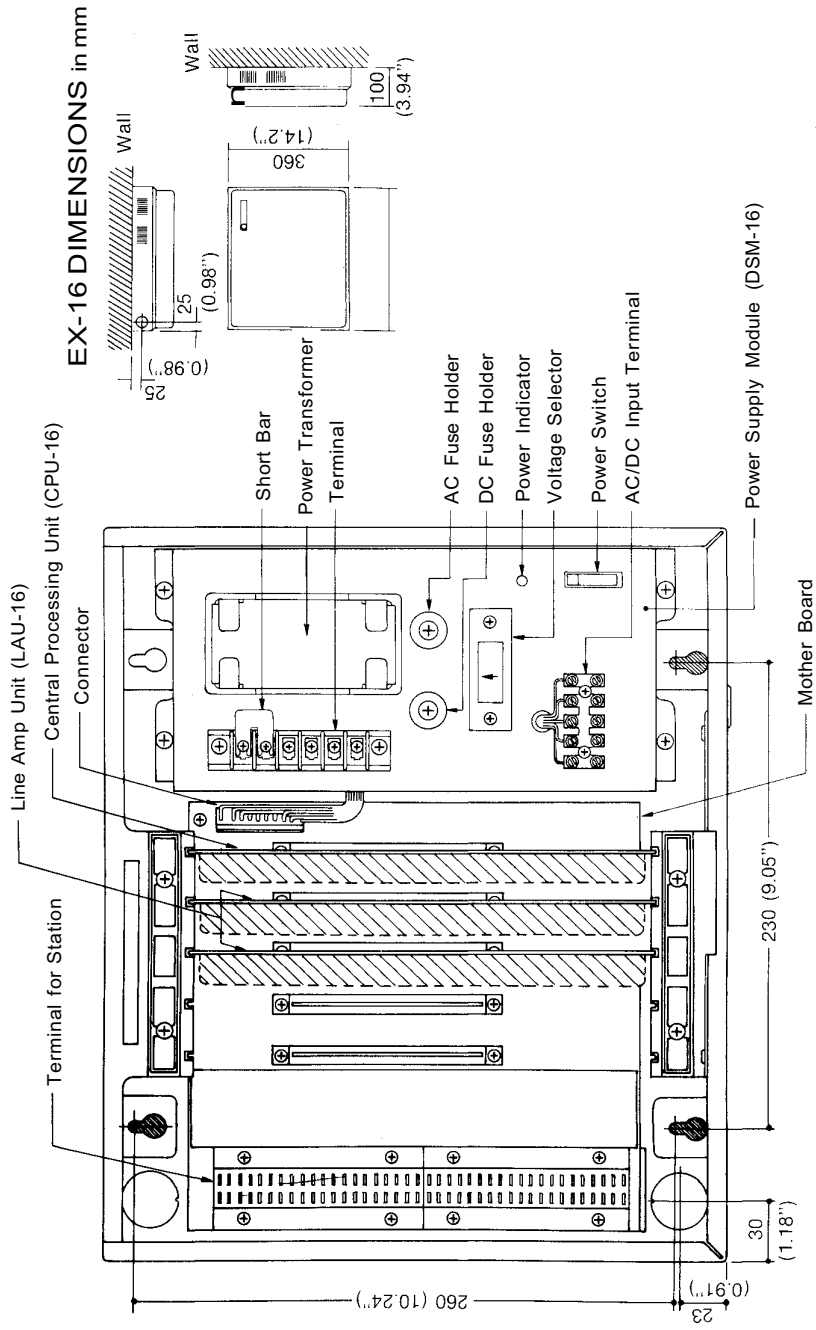
- * CPU (Central Processing Unit)
- * LAU (Line Amplifier Unit)
- * DSM (Power Supply Module)
- * Integral terminal board for connecting stations

The power supply module can be removed from the exchange case.

The exchange operates on AC/DC power.

The exchange is a compact, wall-mounted type. The connectors and terminal for stations are on the mother board and completely assembled at the factory.

(a) Structure of Exchange and Names of Parts

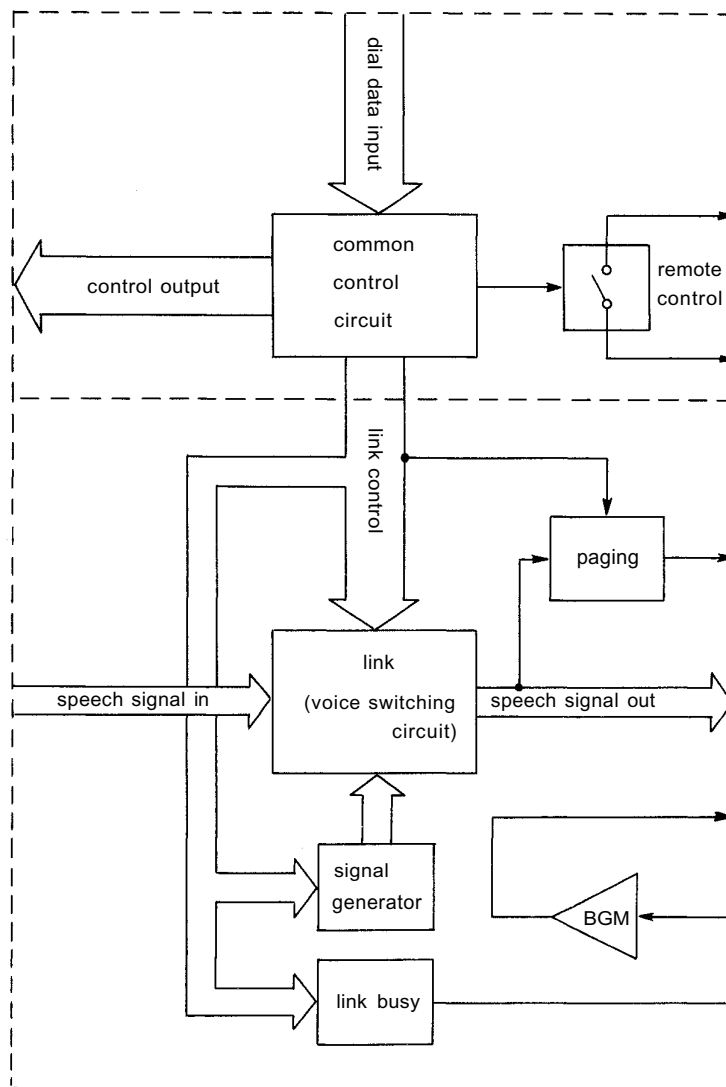


(b) CPU (Central Processing Unit)

The Central Processing Unit is divided into two sections: common control and speech path.

Common control: This section consists of a microcomputer and associated other circuits. It controls receiving dial data from stations, opening and closing of speech path, controlling of signal, paging and BGM switches in accordance with the exchange program.

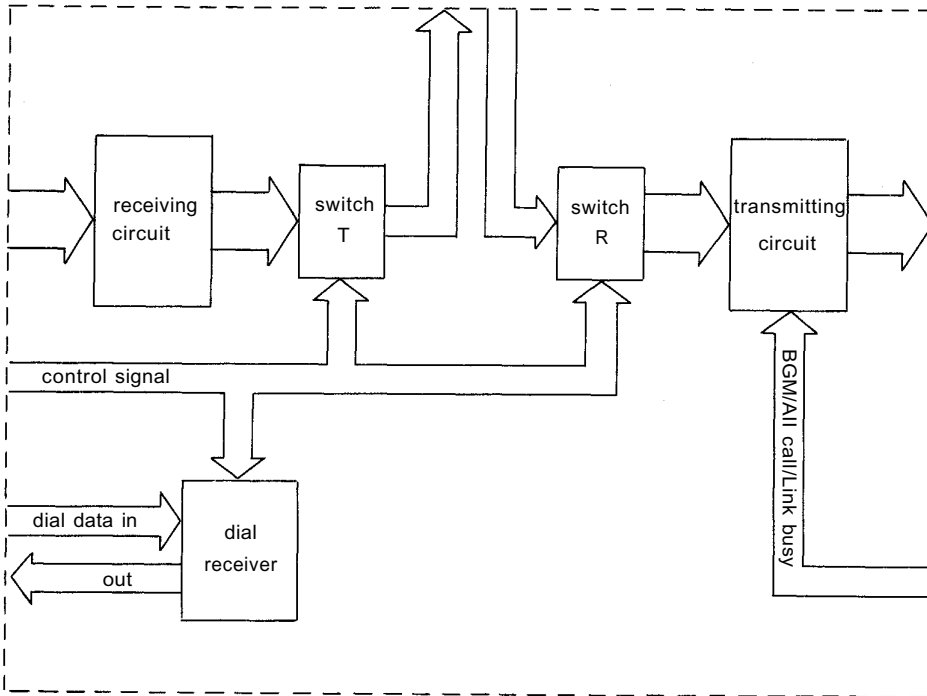
Speech path: This section consists of a voice switching circuit, signal generator, link busy signal circuit, BGM amp and the paging amp. It is controlled by the common control section.



(c) LAU (Line Amplifier Unit)

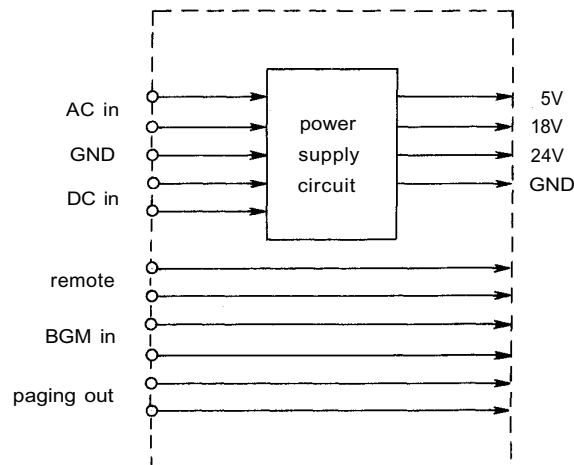
The Line Amplifier Unit consists of a power supply circuit for stations, transmitting and receiving circuits for voice signal, speech path switches, BGM switches and the dial data receiving circuits.

One unit accepts up to 4 stations. A maximum of 4 LAU's can be installed.



(d) DSM (Power Supply Module)

The Power Supply Module consists of a power supply unit for the exchange and terminals for external input and output connections. This module is attached to the mother board with a connector and can be easily detached from the exchange.



(e) Integral Terminal for Connecting Stations

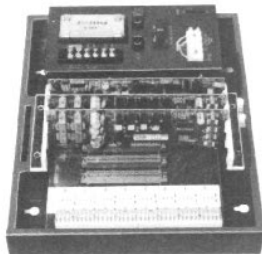
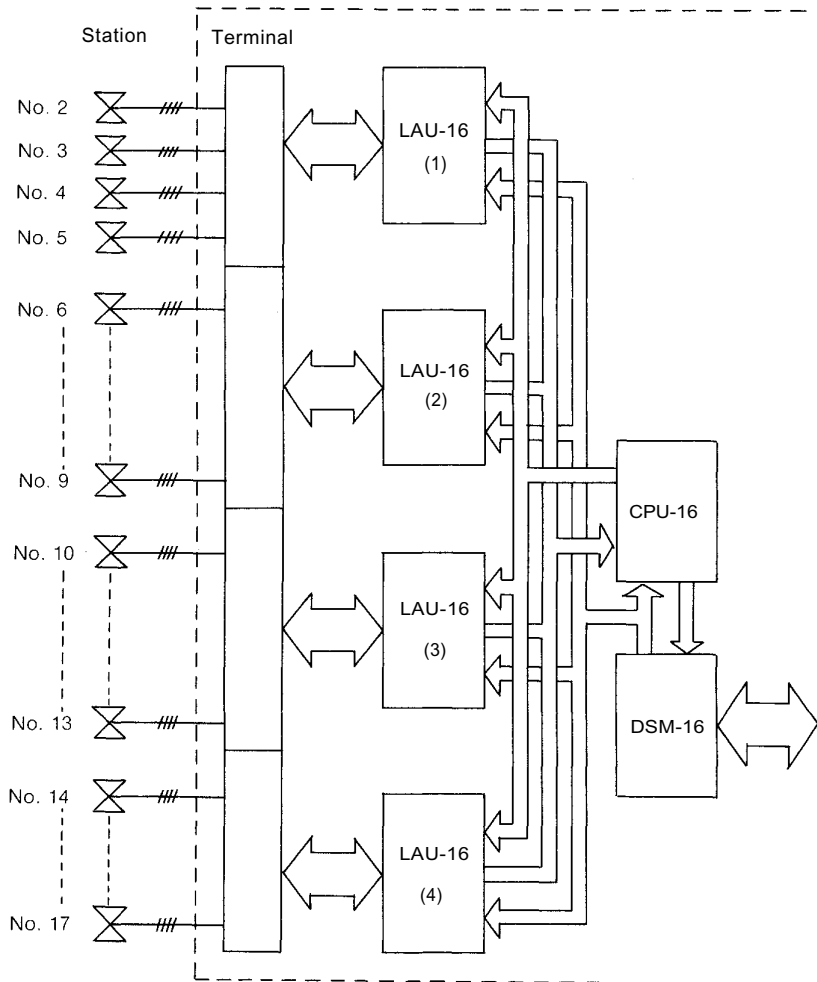
The connection terminal for the exchange and stations is built into the exchange and connected to each LAU with a mother board.

(Wiring of the terminal and the station will be explained in a separate section.)

2.1.4 System Block Diagram

A block diagram of the EX-16 system is shown below. In a standard system, at least one LAU-16 is installed. The remaining units are optional.

Each LAU-16 contains the necessary circuitry for four stations.



Inside View



Units

2.2 Stations

2.2.1 Features

The stations used in the Toa Intercom EX-16 have the following features:

1. Each station is provided with a male 4-pin plug (YC-102) for easy connection to cables.
2. Wiring from the exchange to each station is an 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 made quickly with only a screwdriver.

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

2.2.2 Specifications

Stations are available in the following three models.

Model \ Type Function	Desk Type Type with Handset	Flush Mount Type with Handset	Desk/Wall Type without Handset
Master Station	HFM-500	HFM-510	HFM-100
Substation	HFS-500	HFS-510	HFS-100

Optional Accessories: 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/substation 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 press-to-talk and BGM selection functions.

Station Specifications

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 to be surface wall-mounted.

2.3.2 Talk-Back Unit (TKU-11)

This unit, optional amplifier (10W max.) and speaker (Hi-Z) will allow high-volume paging with response from speaker. Conversations are conducted by using the press-to-talk bar for press-to-talk and release-listen. The talk-back speaker also operates when all-call paging is made from a master station.

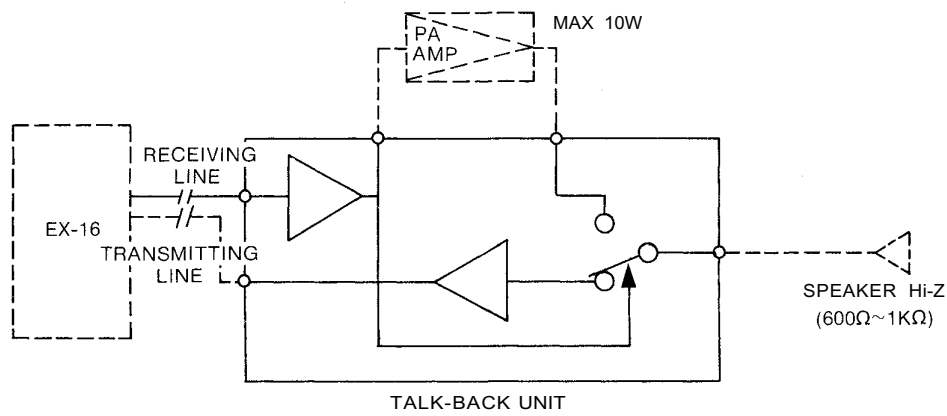
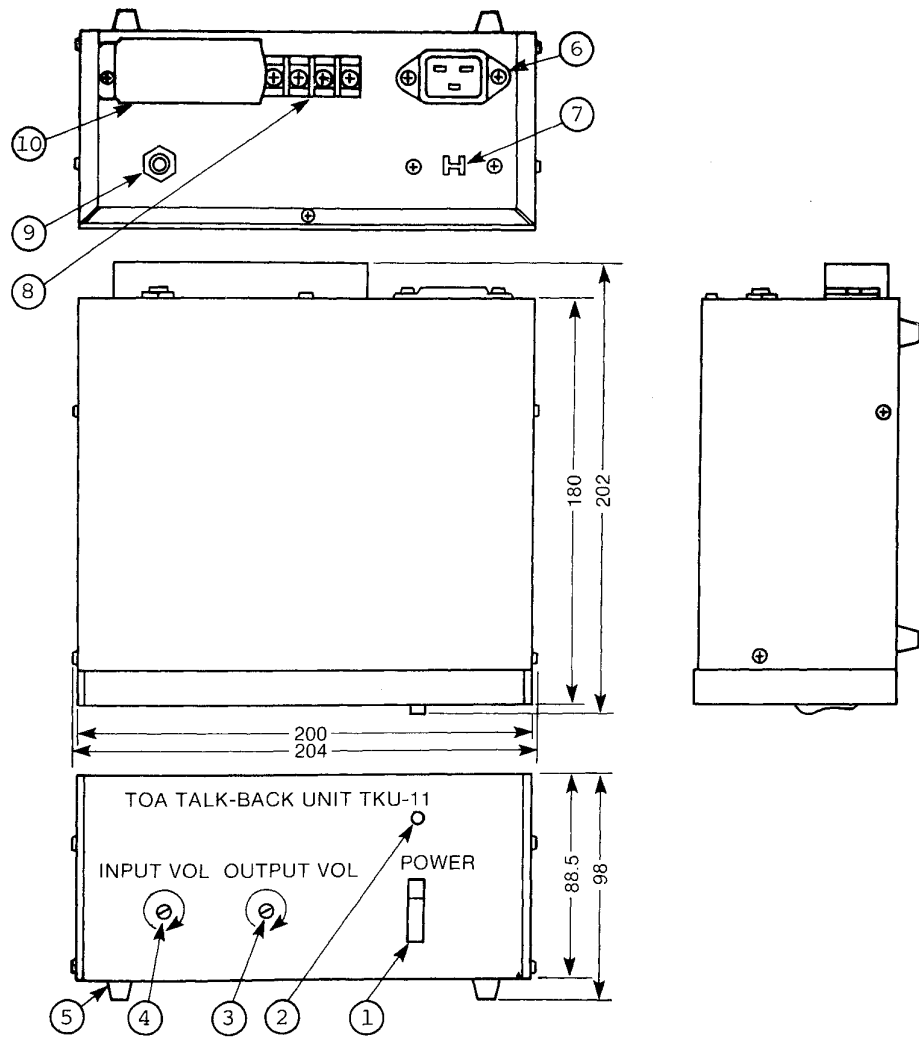


Fig. 5



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. 30 dBm, 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:	2 kg

3. Installation of the EX-16 System

3.1 Precautions for Installation

3.1.1 Exchange

Pay particular attention to the following points:

- * 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, with 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 AC power circuit provides 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.

- * An area where it will obstruct traffic, for example, in a 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°~104°F (0°~40°C).
- * A dusty area where it will be exposed to metal dust or dirt.
- * Near a storage place for chemicals, oil, etc.
- * An area subject to vibration.
- * Near high-voltage equipment.
- * In a strong electrical field.
- * Near equipment vulnerable to the influence of an electrical field.

3.1.2 Stations

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

- * A desk-type, wall-mounting-type or desk/wall-type should be chosen according to the user's need.
- * If the all-call paging or talk-back function is adopted, precautions should be taken to ensure against feedback 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 as far as possible from each other.
- * 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 troublesome acoustical conditions (e.g., reverberation or echo).

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

- * An area where it will be exposed to fire, heat or direct sunlight.
- * A dusty area where it will be exposed to 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.
- * On the same circuit as a SCR type light dimmer.

3.1.3 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 interference caused by high-voltage cables, electromagnetic induction and high-frequency waves.

3.2 Cable Installation

Wire type, number of wire pairs and number of individual wires are to be determined for individual sections of the wiring system according to the guidelines set down below.

- * 4-wire twisted pair cables are to be used for wiring between indoor terminal boards, intermediate 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.
- * There is a limit to the diameter of cables that can be used to connect stations to the terminals of EX-16. This limit must be taken into consideration when planning the wiring of this system. The diameter should measure between 0.016" (0.41mm) and 0.031" (0.79mm).

3.3 Core Diameter Versus Transmission Distance

The diameter of the cable to be used should be determined so that the set limits for speech attenuation (3dB maximum for transmission from the exchange to the station) and for the DC resistance (DC loop resistance: 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 1000 ft. (dB per 1 km)	DC Loop Resistance Ω per 1000 ft. (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)

3.4 Wiring

General Information

- * Wiring should be done independent of public telephone lines.
- * The wiring conduit is often installed underground or embedded in building structures such as walls and floors, so care should 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 systems must be planned with ample wires, a conduit and with provisions 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 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 Interference	Minimum spacing acceptable without extra protection	Remarks
Heating pipe	6" (15 cm)	This minimum spacing requirement should be observed, since intercom cable is vulnerable to heat.
Water pipe	4" (10 cm)	
Radio transmitting coaxial cables (CB and other). Telephone wire.	12" (30 cm)	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 cm)	

3.5 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 indoor 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:

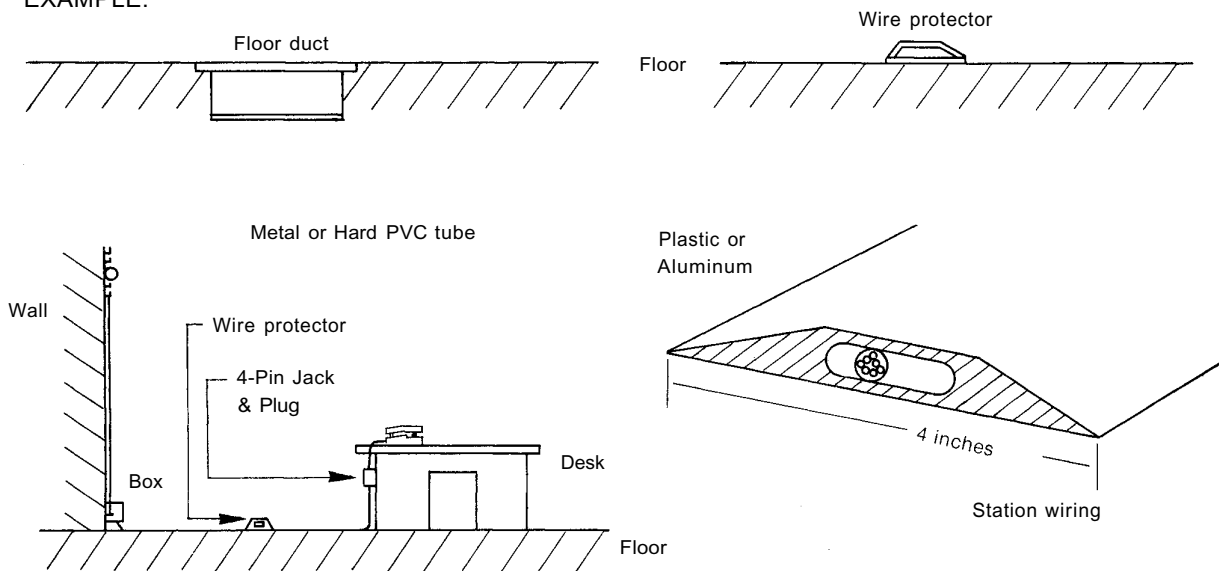
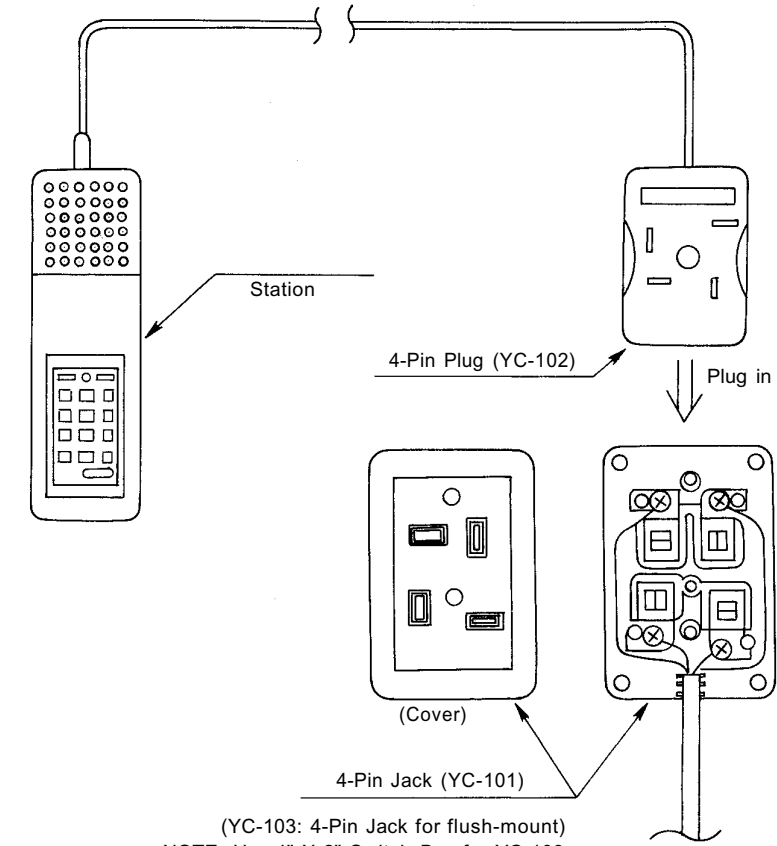


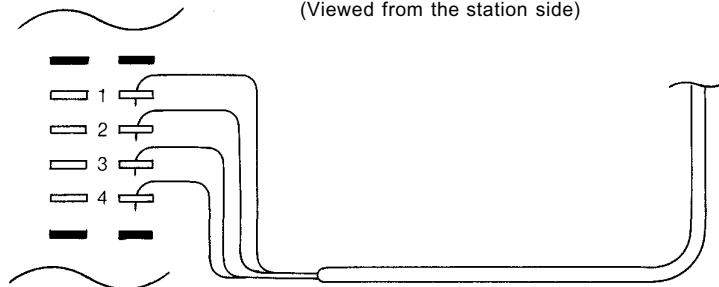
Fig. 10

3.6 Connection between the station and the exchange



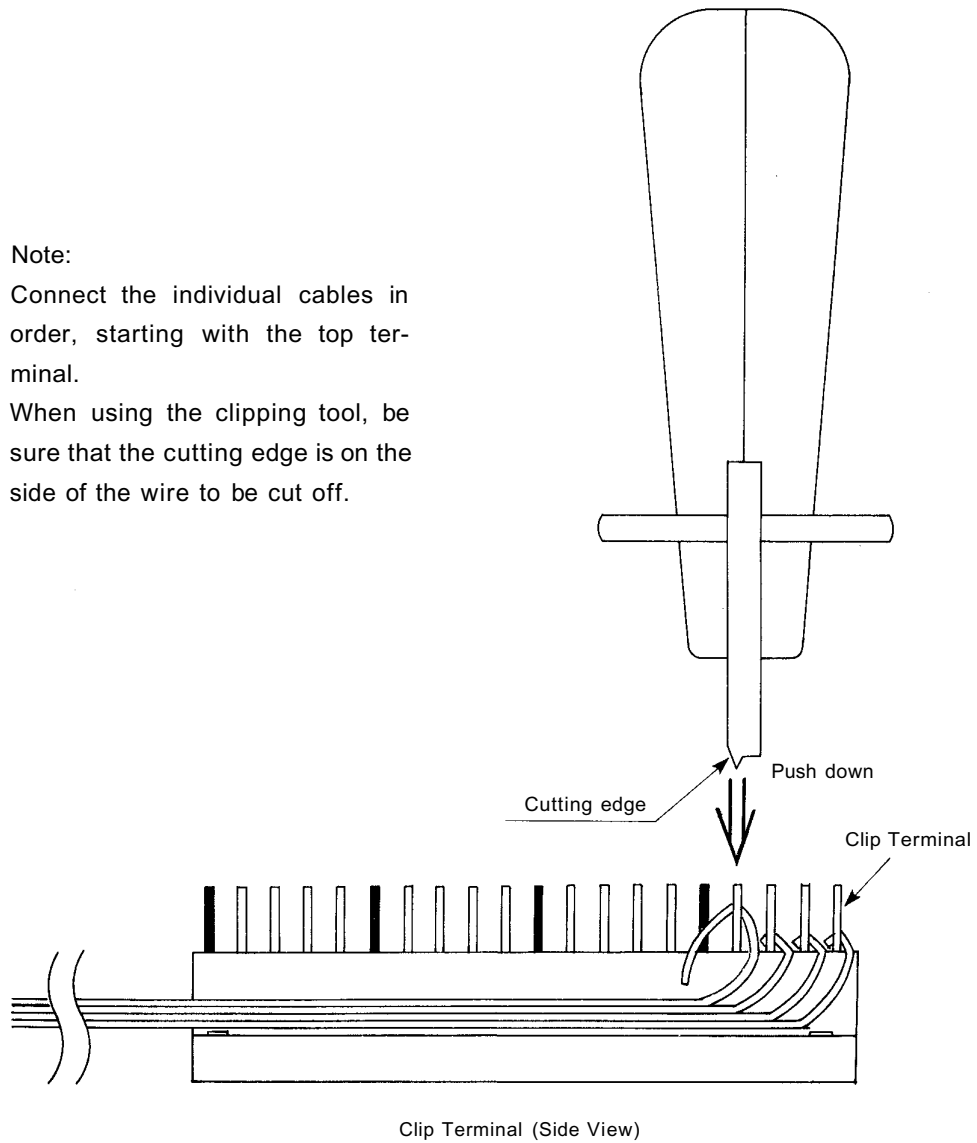
- 1 } Receiving Lines
- 2 } (not Polarity Specified)
- 3 } Transmitting Lines
- 4 } (not Polarity Specified)

(Viewed from the station side)

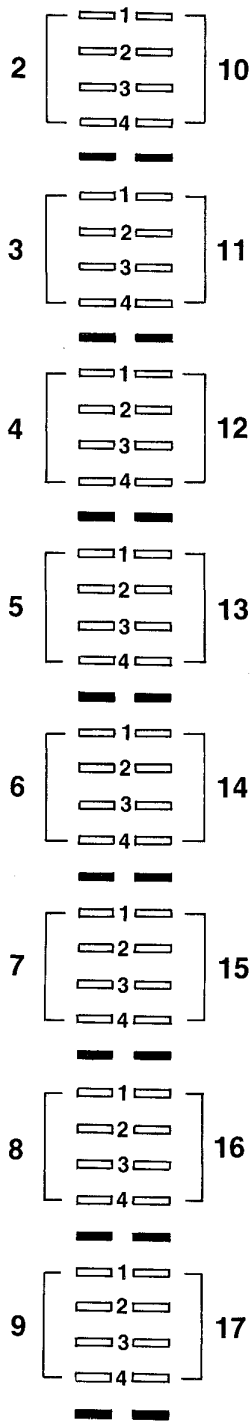


Clipping Tool C (YC-105)

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 of the wire to be cut off.

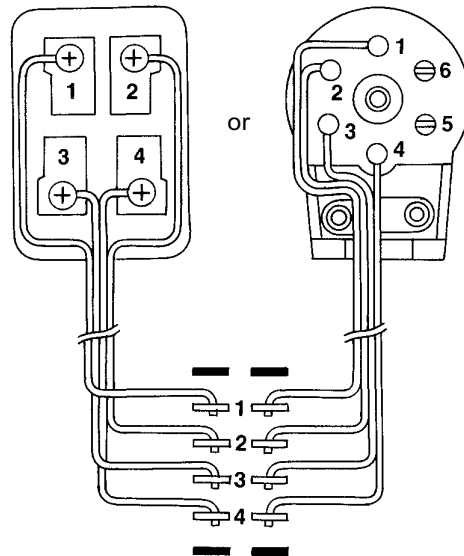


TERMINAL BOARD

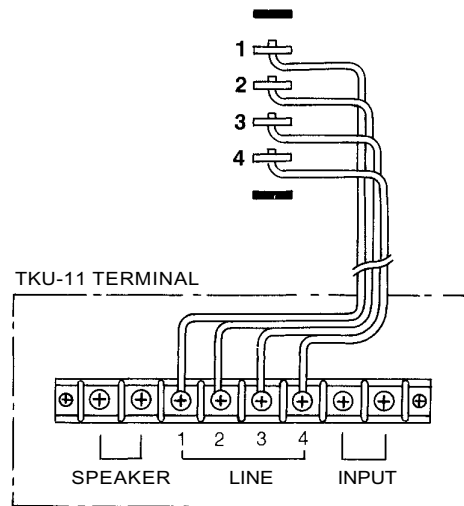


EX-16 WIRING INSTRUCTIONS

1 STATION CONNECTIONS

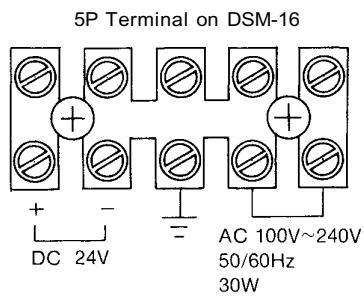


2 TALK-BACK CONNECTIONS



3.7 AC/DC Power Supply Connection

A 5P terminal for AC and DC power supply is provided on the DSM-16. The power cable, YA-308 or YA-309, can be connected to the 5P terminal. Be sure to ground the exchange.

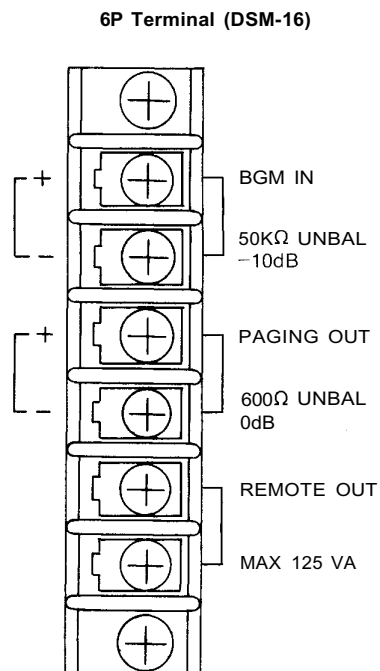


Power Supply Cables



3.8 Connection of the Input/Output Terminal

A 6P terminal for the input/output signals of the EX-16 is provided on the DSM-16.



3.8.1 BGM Input

Input impedance: 50 K Ω (unbalanced)

Input level: -10dB max.

Output level: 100mW

- (a) Remove the short bar connected to the terminal.
(When BGM is not employed, the short bar should be kept on the terminal. If the short bar is not replaced, a humming sound will be heard from the station.) The short bar is referred to on page 3.
- (b) Connect the BGM equipment. (Be sure to use the type of BGM equipment which meets the input specifications. Since the level adjustment cannot be controlled in the exchange, the BGM equipment must have an output level adjuster.)
- (c) After installation, adjust the output level of the BGM through the speaker. If the input is excessive, there will be distortion.

3.8.2 All-Call Paging Output

Output impedance: 600 Ω (unbalanced)

Output level: 0dBm

- (a) Connect a paging amp which matches the output specifications.
- (b) Test the paging output level and adjust to eliminate feedback. (Placing the speaker too close to the station sometimes causes feedback.)

3.8.3 Remote Control Output

Output signal: no voltage contact

Contact capacity: 125VA

The program switch on the CPU-16 allows selection of either of the following 2 functions for remote control.

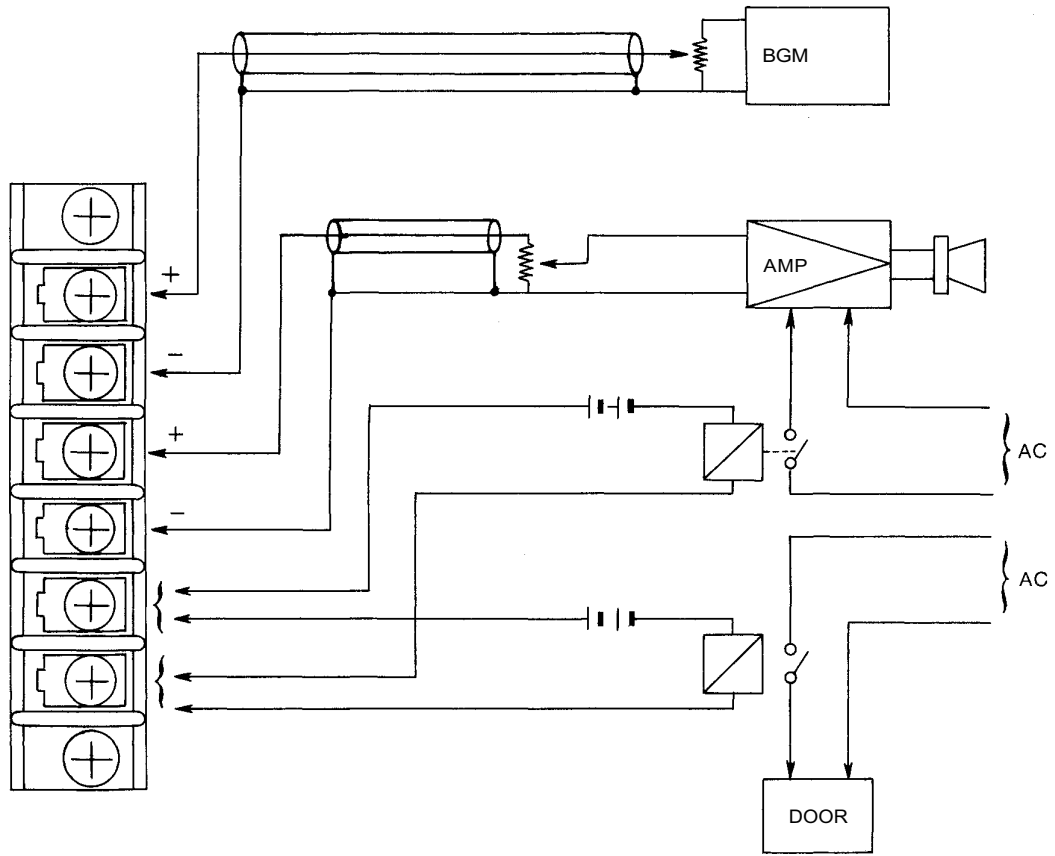
1. Door Remote Control

Every master station can be used as a remote control device for the door opening function. Pressing buttons **1** and **8** allows a 4-second interval wherein the door can be opened.

2. Power On/Off Remote Control

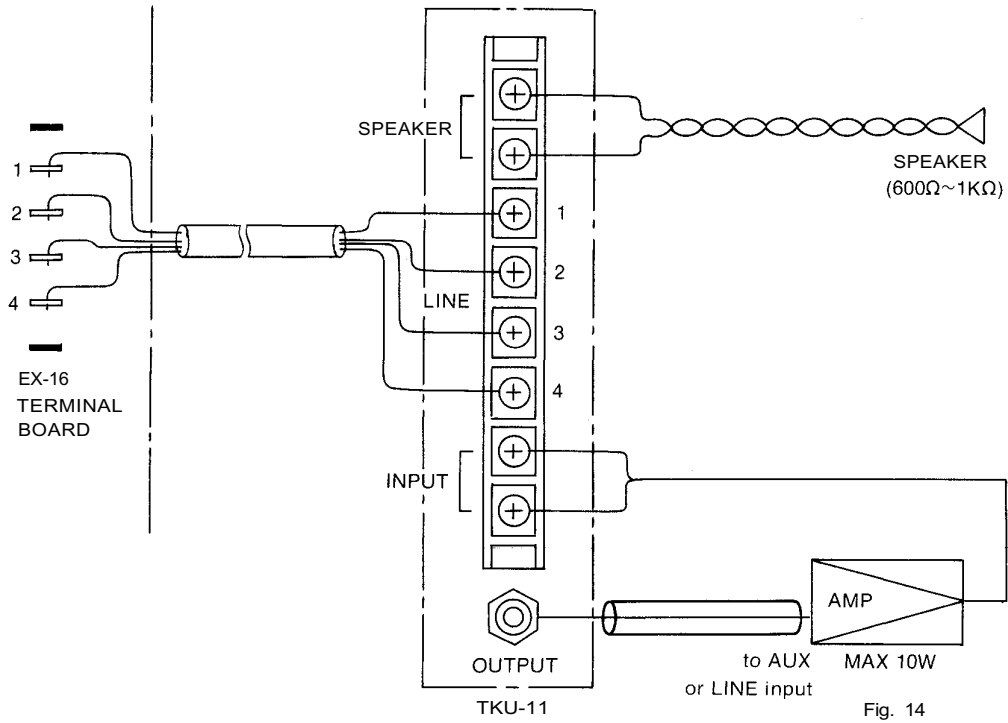
When the system is used in conjunction with a PA amplifier for the external all-call function, the power switch of the PA amplifier can be turned on/off with the relay built into the system. Pressing buttons **●** and **8** invokes the make-contact and the all-call function until it is cancelled by pressing **C**

3.8.4 Wiring Diagram



3.9 Connection of the Talk-Back Unit

Connection of the talk-back unit is shown below.



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 control on the front of the TKU-11. Adjustment is necessary after installation.

3.10 Connection of the Speaker Station

In the EX-16, instead of using a station, a speaker for one-way conversation can be installed using a jumper in the LAU-16.

This is possible at each station position on the LAU-16.

3.10.1 Wiring Procedure

- (a) First, determine the number of station speakers to be installed. (Any number of station speakers may be connected within the limits of the station numbers from No. 2 to No. 17.)
- (b) Use the Wiring Instruction Chart to determine the LAU No. and Jumper No. corresponding to the station number. (See page 24.)
- (c) Remove the corresponding LAU-16 from the mother board.
- (d) Connect the corresponding jumper points with the jumper wire. (See page 24.)

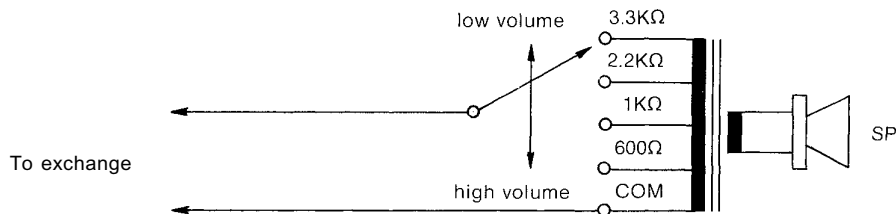
3.10.2 Speaker Volume Adjustment

1. Speakers with an impedance of 600 ohms or more may be used without the need for a transformer.

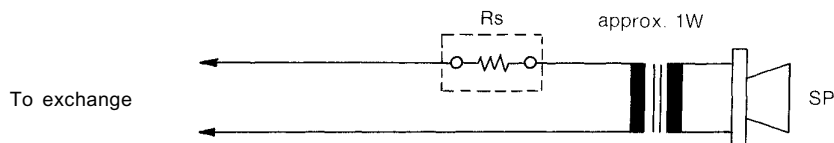
If it is desired to use lower impedance speakers, a transformer should be used to assure proper impedance matching.

2. Volume may be controlled only when:

- (a) a matching transformer is used.



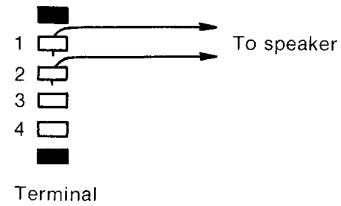
- (b) a resistor is connected.



The R_s value should be decided in accordance with the speaker impedance so that the volume is on a suitable level.

3.10.3 Connection with the Exchange

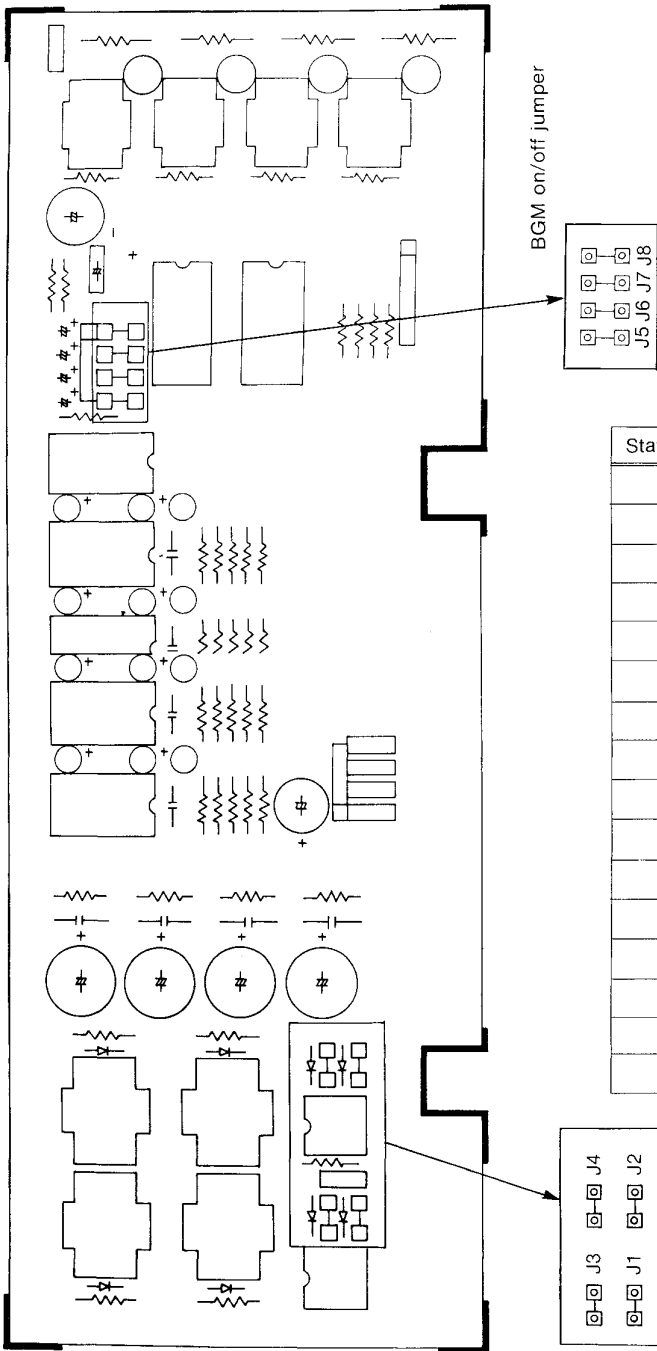
Connect speakers to terminals 1 and 2 as shown in the diagram. (Leave terminals 3 and 4 open.)



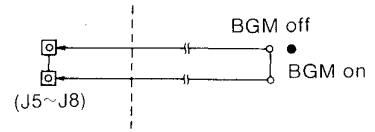
3.10.4 On/Off Control of BGM

BGM can be turned off when the jumpers are connected as shown in the diagram. If the jumpers are not connected, BGM will be heard from the speaker stations constantly. (See page 24.)

Jumper for Speaker Station Selection

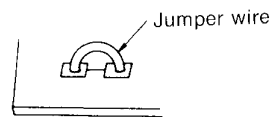


Jumper for BGM On/Off



For BGM on/off operation remotely, the control line can be extended the same way as for station wiring.

Station No.	LAU No.	Jumper No.	BGM on/off
2	1	J1	J5
3		J2	J6
4		J3	J7
5		J4	J8
6	2	J1	J5
7		J2	J6
8		J3	J7
9		J4	J8
10	3	J1	J5
11		J2	J6
12		J3	J7
13		J4	J8
14	4	J1	J5
15		J2	J6
16		J3	J7
17		J4	J8



How to Connect the Jumper Wire

1. Use a 0.6mm diameter plated wire as jumper.
2. Solder on the soldered end.
3. Use a soldering iron with less than 30W power and with minimum leakage.
Be careful not to touch other parts.

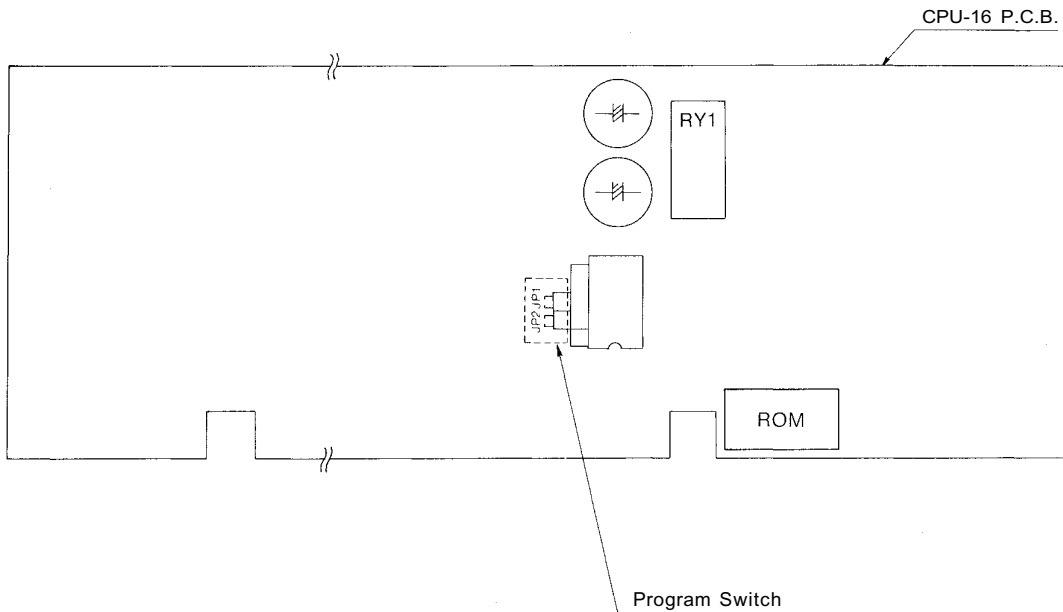
4. Installation Adjustment

4.1 Inspect Before Turning Power On.

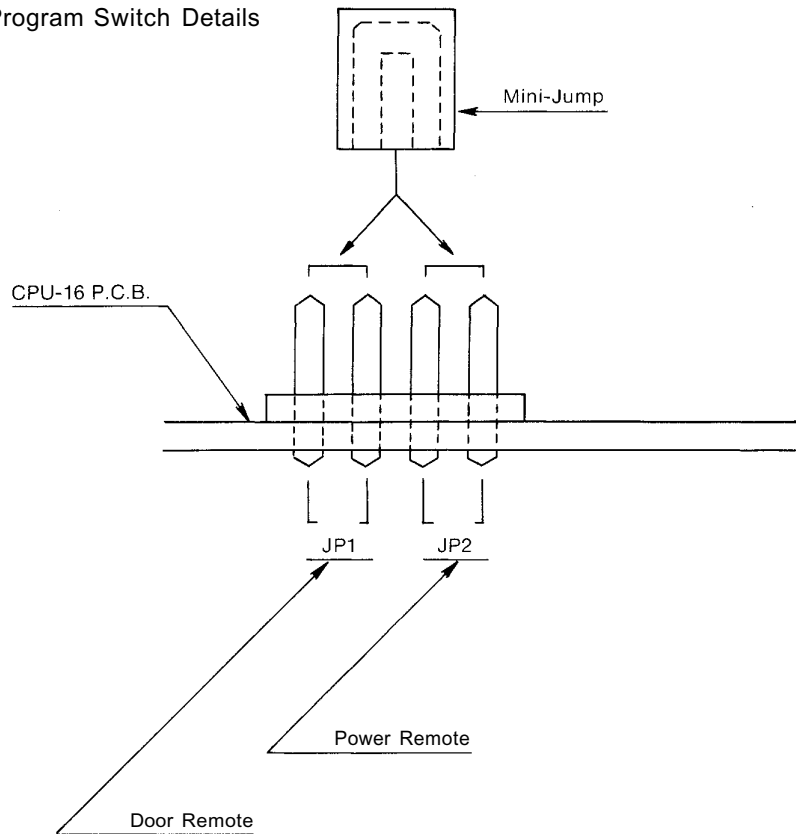
- * Before supply power, check the power connections (power connections should be complete) and the fuse. Also, voltage selector should be set correctly. All modules should be in place.
Check the ROM on the CPU-16. It should be set securely in the socket. Make sure that exchange and stations are properly connected.
- * Turn power on.
- * AC indicator lamp on the DSM-16 should go on. If not, electricity is not on. Turn off power and check the connections and fuses.
- * Handle plug-in units with care; plug-in units incorporate CMOS. After the exchange is turned on, do not attempt to disconnect the plug-in units.

4.2 Function Selection

Select door remote or power remote, as shown in the following diagram, using the program switch on the CPU-16.



Program Switch Details



1. Set the mini-jump in the JP1 position for door remote. Relay goes on for 4 seconds when buttons **1** and **8** are pressed.
 2. Set the mini-jump in the JP2 position for power remote.
Press buttons **●** and **8** to turn relay on.
Press button **C** to turn relay off.
- Note: The unit is set in the JP1 position (door remote) at the factory.

4.3 Testing

After: 1. wiring is completed

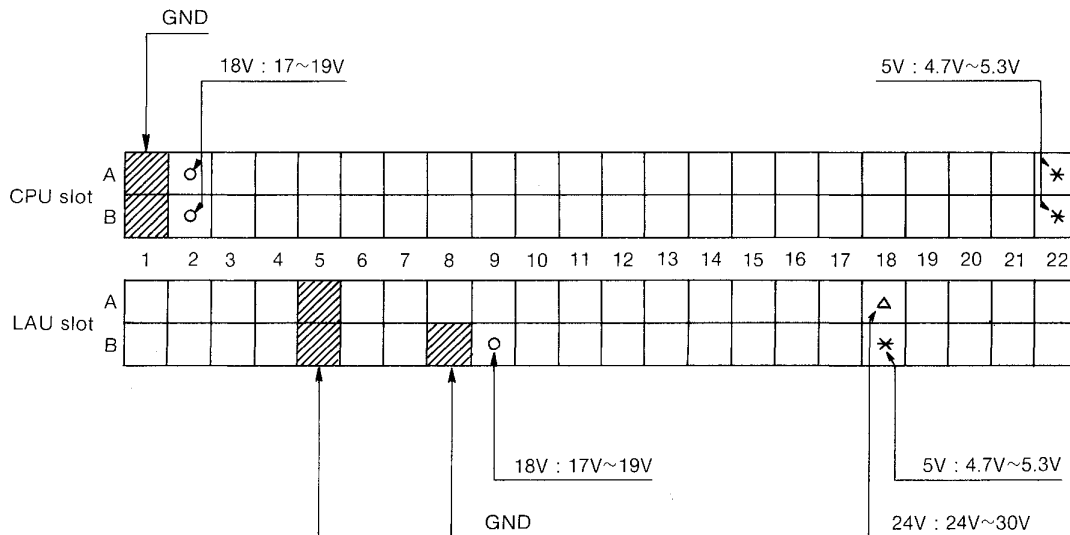
2. power is turned on and all system functions are checked, then, testing for adjustment should be carried out. The plug for each station should not be connected until the speech test is started.

4.3.1 Procedure

- (1) Turn on power switch on the exchange.
- (2) Adjust the sound level of the external PA paging and check the power remote function.
 - (a) Connect one station.
 - (b) Press buttons **●** and **8** to test the sound level. Adjust the volume control of the external amplifier.
- (3) Complete a speech test with each of the other stations.
 - (a) Connect the plug for the station to be tested.
 - (b) Dial the station number. Check the sound level and the speech quality.
 - (c) Dial **●** and **8**. If a howling noise is heard, then the paging or speaker stations are too close together.
- (4) After the speech test is completed for all stations, the sound level adjustment for BGM should be done. To begin, the sound level should be set so that the BGM is heard from all stations when the power switch of the exchange is turned on. To turn off the BGM, press the **(PTT)** key once.

4.3.2 Adjusting Method

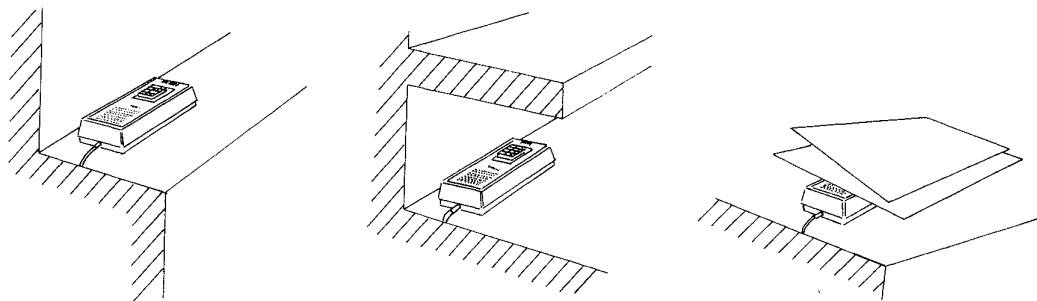
- (a) If exchange does not work:
 - (1) Turn off the power and disconnect all units from the mother board.
 - (2) Turn on the power and check the DC voltage at the points on the mother board illustrated below.



- (3) If the voltage measured is normal at every point, connect one unit at a time checking the voltage after each connection.
 - (4) If the voltage is upset after connecting any given unit, the unit is to be replaced.
- (b) If there is no response to dialing:
- (1) Disconnect the plug for the particular station from the line and check the wiring between the exchange and the station.
 - (2) If no wiring error is detected, test after changing each station.
 - (3) If preceding steps do not remedy the situation, replace the units attached to the station in the same order as the LAU-16 and CPU-16 and test again.
- (c) In the event of a conversation failure or persistent noise during conversation,
- (1) Disconnect the plug between each station and the exchange and check the wiring.
- (d) If conversation is frequently interrupted:
- (1) If speech from A to B is interrupted, turn down the volume control of speaker at B's station.
 - (2) If speech from B to A is interrupted, turn down the volume of speaker at A's station.
 - (3) If conversation is interrupted both ways or block oscillation should occur upon ceasing of the ringing tone, turn down the volume at both stations.

Note 1: The volume control is located at the back of the station. Adjust with a small (—) screwdriver.

Note 2: The above-mentioned trouble tends to occur when the station is installed in a room subject to echo or reverberations or when the station is not located properly with respect to the walls of the room it is in. Avoid installation of the station in any of the locations illustrated in the following diagram.



4.3.3 Relationship Between Ambient Noise and Conversation Mode

The EX-16 system is provided with voice switches for the press-to-talk function which is required when the ambient noise level is high. Below is a guide for using the press-to-talk function.

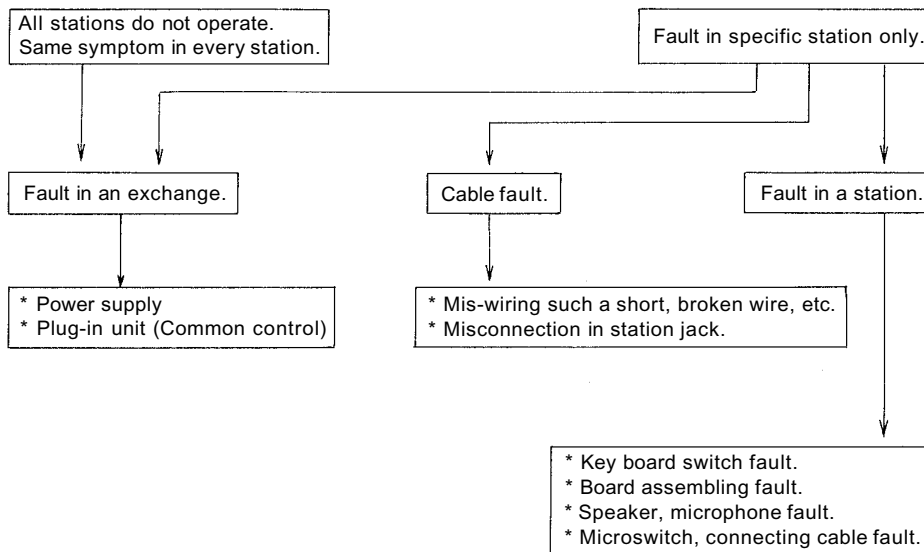


5. Trouble Shooting Guide

Repairing of the EX-16 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.

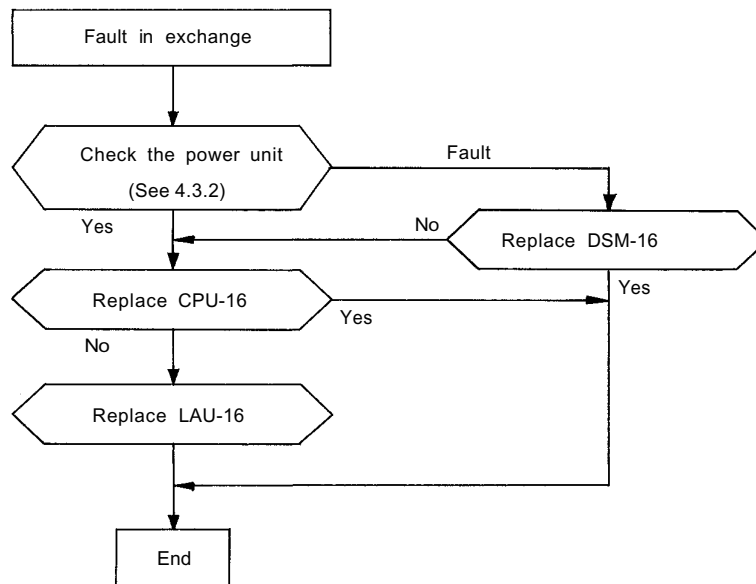
1. Faults in an exchange
2. Faults in a station
3. Faults in cable

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



5.1 Fault in Exchange

- * When the power supply unit or the CPU-16 is out of order, the same kind of fault will occur at all stations.
- * When the LAU-16 is out of order, a fault will appear only at a particular station.
- * If the exchange is out of order, the faulty unit must be searched out and replaced.



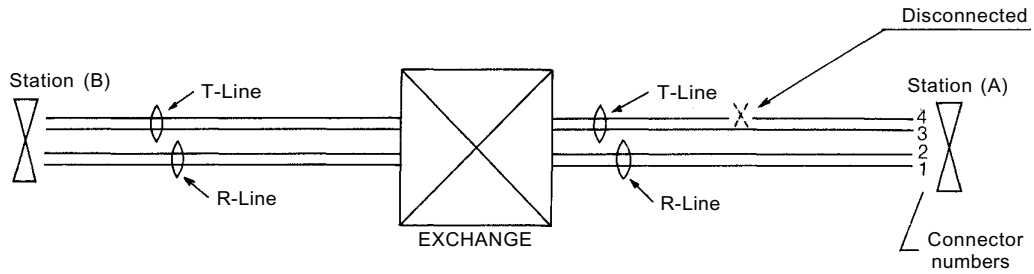
5.2 Fault in Specific Station Only

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

SYMPTOM	CHECK-ITEM	CAUSE
Dialing can not be made at privacy off mode.	Replace the station and make sure that the station is not faulty.	<ul style="list-style-type: none"> * Disconnection of both T & R Lines. * T & R Lines are shorted.
Specific key does not operate.	Replace the station and make sure that the station is not faulty.	<ul style="list-style-type: none"> * 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 symptom remains even if the station is replaced.	<ul style="list-style-type: none"> * Short or open in R Line. * Fault in LAU.
	Becomes normal if the station is replaced.	<ul style="list-style-type: none"> * Disconnection of R Line or improper connection of the station connector. * Fault in LAU. * Station fault.
Sound is not transmitted to the other party.	Same symptom remains even if the station is replaced.	<ul style="list-style-type: none"> * Short or open in T Line. * Fault in LAU.
	Becomes normal if the station is replaced.	<ul style="list-style-type: none"> * Fault in MIC circuitry of the station. (Replace MIC or PCB.)
On dialing, noise is heard by the called party.	Same symptom remains even if the station is replaced.	<ul style="list-style-type: none"> * One of T Lines is disconnected. * Fault in LAU.
	Becomes normal if the station is replaced.	<ul style="list-style-type: none"> * 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 symptom remains even if the station is replaced.	<ul style="list-style-type: none"> * 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 symptom remains even if the station is replaced.	<ul style="list-style-type: none"> * One of R Lines is disconnected. * Fault in LAU. * Station fault.
	Becomes normal if the station is replaced.	<ul style="list-style-type: none"> * One of the R Lines is disconnected or the station connector is not connected properly.

5.3 Fault in Cable

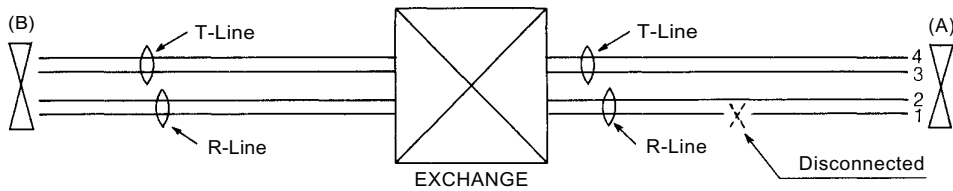
1. One of transmitting lines (T-Line) is disconnected



Symptom:

- 1-1 A can dial.
- 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.

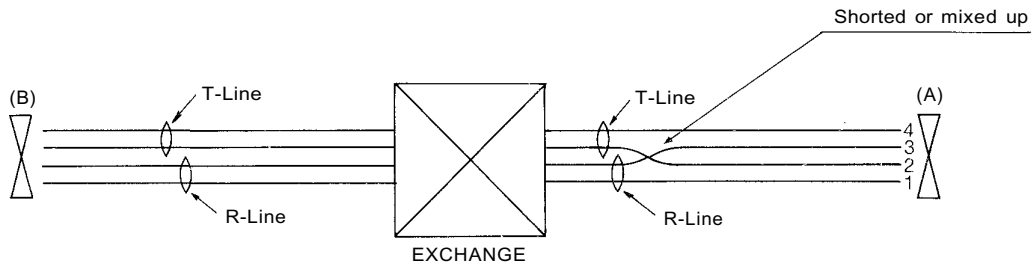
2. One of receiving lines (R-Line) is disconnected.



Symptom:

- 2-1 A can dial 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.



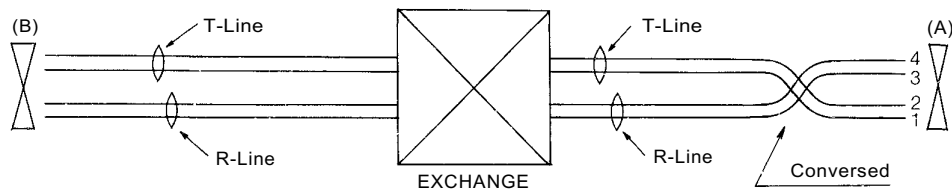
Symptom:

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.



Symptom:

4-1 A can not dial.

4-2 Conversation is impossible between stations.

4-3 When B dials A, noise will be heard at B.



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