

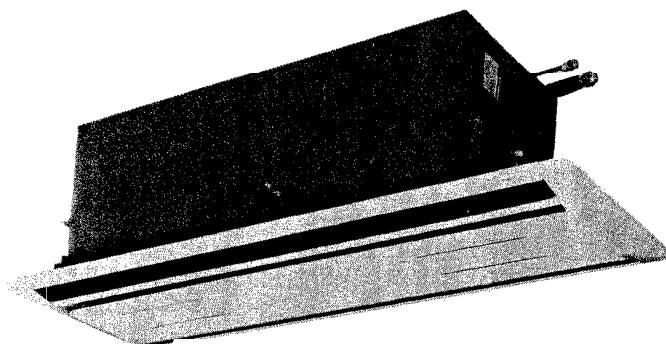
SERVICE MANUAL

SPLIT-SYSTEM
AIR CONDITIONER



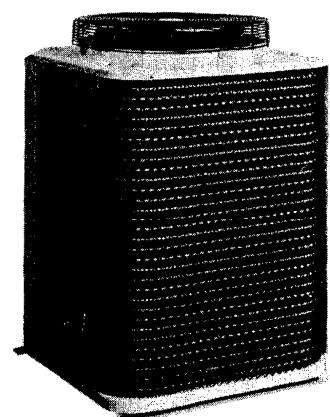
SANYO

SAP361RC
(U.S.A.)



Indoor Unit

SAP361R



Outdoor Unit

SAP361C

**SANYO SPLIT SYSTEM AIR CONDITIONER
SERVICE MANUAL**

MODEL: SAP361RC

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1. SPECIFICATIONS

1.1 Unit Specifications

Model No.	SAP361RC	
Unit Model No.	Indoor Unit	SAP361R
PERFORMANCE & ELECTRICAL RATINGS		
Capacity — Cooling — Heating	BTU/hr. BTU/hr.	34,000/33,000 —
Moisture Removal (High)	Pints/hr.	10.0/9.6
Air Circulation (High)	Cu.ft./min.	820/770
Energy Efficiency Ratio(EER) BTU/Whr.		9.6/9.7
COP		—
Frequency	Hz	60
Rated Voltage	V	230/208
Running Amps	A	16.8/17.8
Power Input	W	3,575/3,470
Back-up Heater	kW	—
Fuse (or Circuit Breaker) Capacity	A	30
FEATURES		
Controls	Microcomputer IC	— Yes
Fan Speeds		2
Timer		—
Ventilator		—
Air Deflection	Horizontal Vertical	— Manual
Air Filter		Washable, easy access
Temperature Control		IC Thermostat
Compressor		Rotary
Refrigerant (R22)	Ibs. (g)	9.9 (4,500)
Refrigerant Tubing Connections		Flare type
Refrigerant Line Length	Ft. (m)	100 (30)
Max. Outdoor Unit Height	Ft. (m)	50 (15)
Refrigerant Tube o.d.	In. (mm)	3/8 (9.52)
Narrow Tube	In. (mm)	3/4 (19.05)
Wide Tube	In. (mm)	
Drain Tube o.d.	In. (mm)	3/4 (26.67)
Refrigerant Tubing Kit		Optional
DIMENSIONS & WEIGHT		
Dimensions	Height In. (mm)	19-9/32 (490)
	Width In. (mm)	68-1/8 (1,730)
	Depth In. (mm)	24-13/32 (620)
Net Weight	Ibs. (kg)	137 (62)
Shipping Size	Cu.ft. (cu.m)	26 (0.74)
Shipping Weight	Ibs. (kg)	183 (83)
Outdoor Unit		
Indoor Unit		
38 (965)		
26-3/8 (670)		
26-3/8 (670)		
209 (95)		
25 (0.71)		
235 (107)		

DATA SUBJECT TO CHANGE WITHOUT NOTICE

Unit Model No.	SAP361R
Room Temp. Sensor*	OCS5K-UL
Resistance (kΩ)	65°F: 6.5 -- 7 83°F: 4.2 -- 4.5 73°F: 5.2 -- 5.8

Note: * = thermistor

Figure



Unit Model No.	SAP361R
Power Transformer (for Controller PCB)	ATR-J122U
Resistance (Ω)	Primary: WHT-WHT 143.5 Secondary: BRN-BRN 1.2



Unit Model No.	SAP361C
Magnet Relay	HE-A21 or FMCA-IUL



Unit Model No.	SAP361C
Crankcase Heater	CH5700
Rating	230 V, 30 W



Unit Model No.	SAP361C
Outdoor Coil Thermostat	YTB-4U201F
Operating Temperature	ON: 75°F, OFF: 79°F

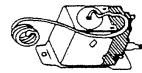


Unit Model No.	SAP361R
Freeze Protection Thermostat	RTB-4U302
Operating Temperature	ON: 50°F OFF: 23°F

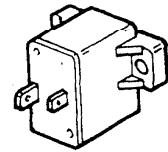


Unit Model No.	SAP361C
High Pressure Switch	FTB-2UC01
Rating	OFF: 412.47 psig

Figure



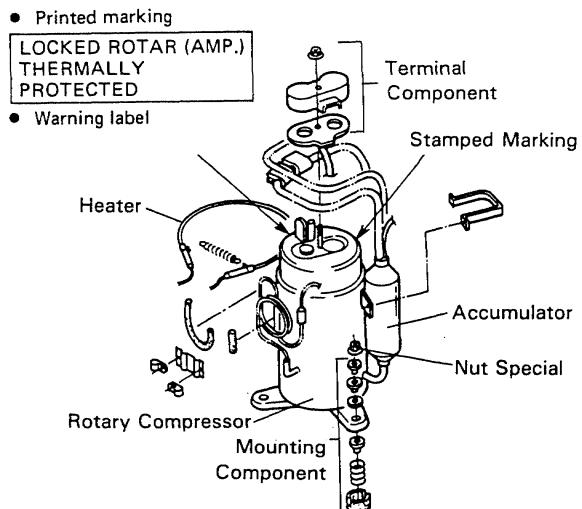
Unit Model No.	SAP361C
Thermistor	912 x 25E101YV20
Rating	100Ω (at 77° F)



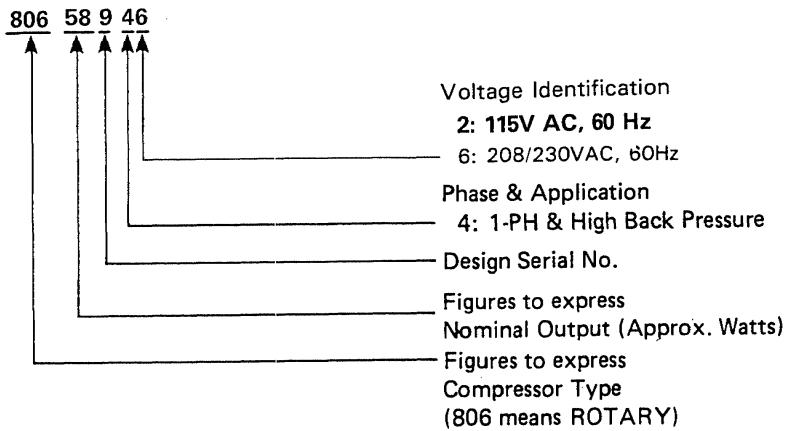
1.3. Compressor Identification

1. Marking (Stamped)

Compressor code No. → 806 589 46 Manufacturer:
 Model No. → C - R220H6K **TSE** T = Tokyo
 S = Sanyo
 E = Electric.
 Production Date → 30 01 6 ← (= 30 Jan., 1986)
 Ratings (V) → V230/208
 Frequency (Hz) and Phase → HZ60 PH1



2. Compressor Code No.



WARNING-SERVICEMAN

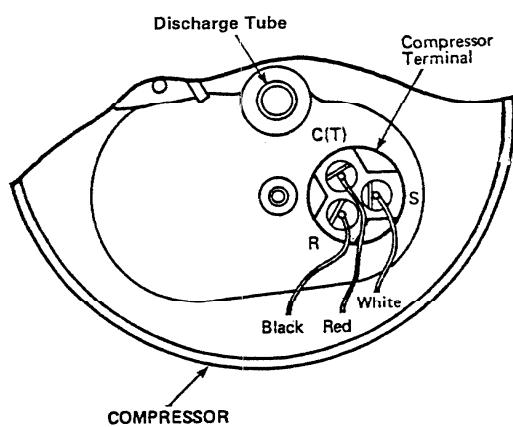
- FIELD SERVICE LEAK TEST PRESSURE MUST NOT EXCEED 150 P.S.I.G.
- THIS COMPRESSOR MUST BE GROUNDED.
- DO NOT OPERATE WITHOUT PROTECTIVE COVER OVER TERMINALS: DISCONNECT ALL POWER BEFORE REMOVING THE PROTECTIVE COVER.

CAUTION

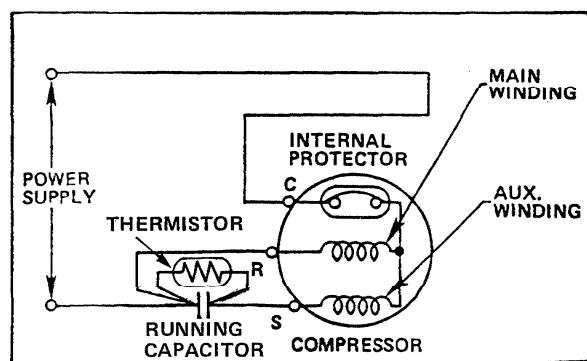
COMPRESSOR HOUSING MAY REACH 302°F (150°C) WITH TERMINAL PROTECTOR APPROVED BY TOKYO SANYO AND TESTED IN ACCORDANCE WITH UL984-1981.

TOKYO SANYO ELECTRIC CO., LTD.

3. Compressor Wire Orientation

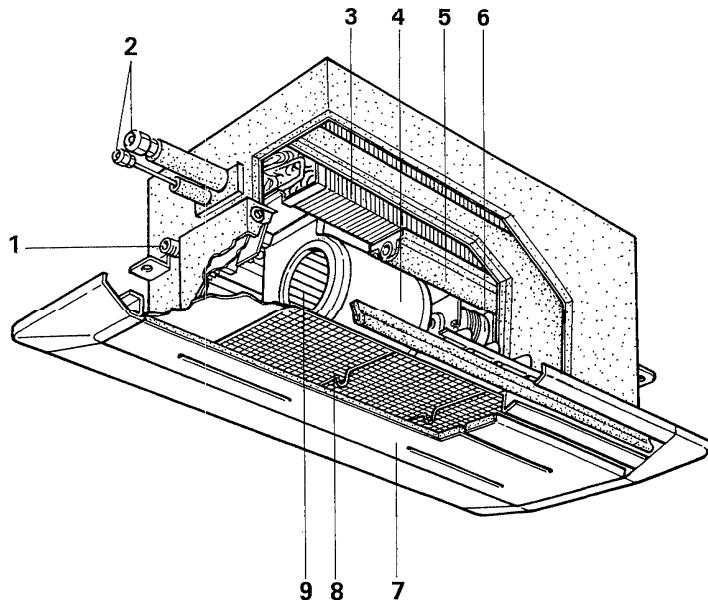


Wiring Diagram



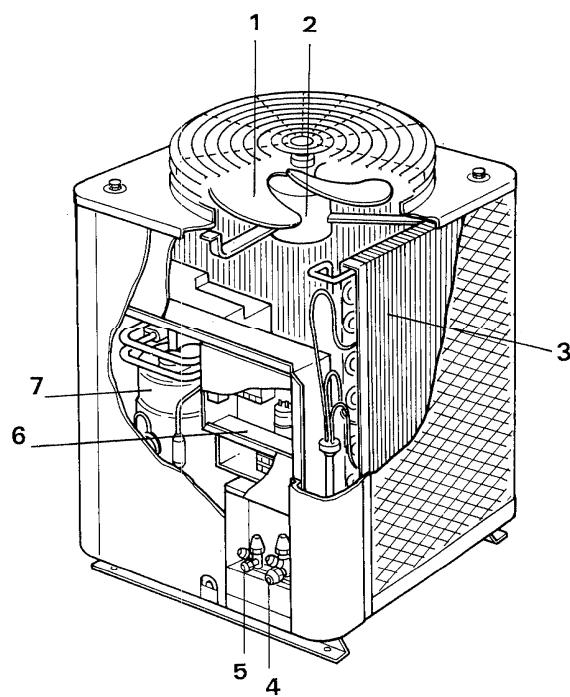
2. CONSTRUCTION OF THE UNIT

INDOOR UNIT SAP361R



1. Drain hose
2. Refrigerant tubing
3. Evaporator (=Indoor heat exchanger)
4. Blower casing
5. Drain pan
6. Fan motor
7. Air discharge panel
8. Air filter
9. Blower

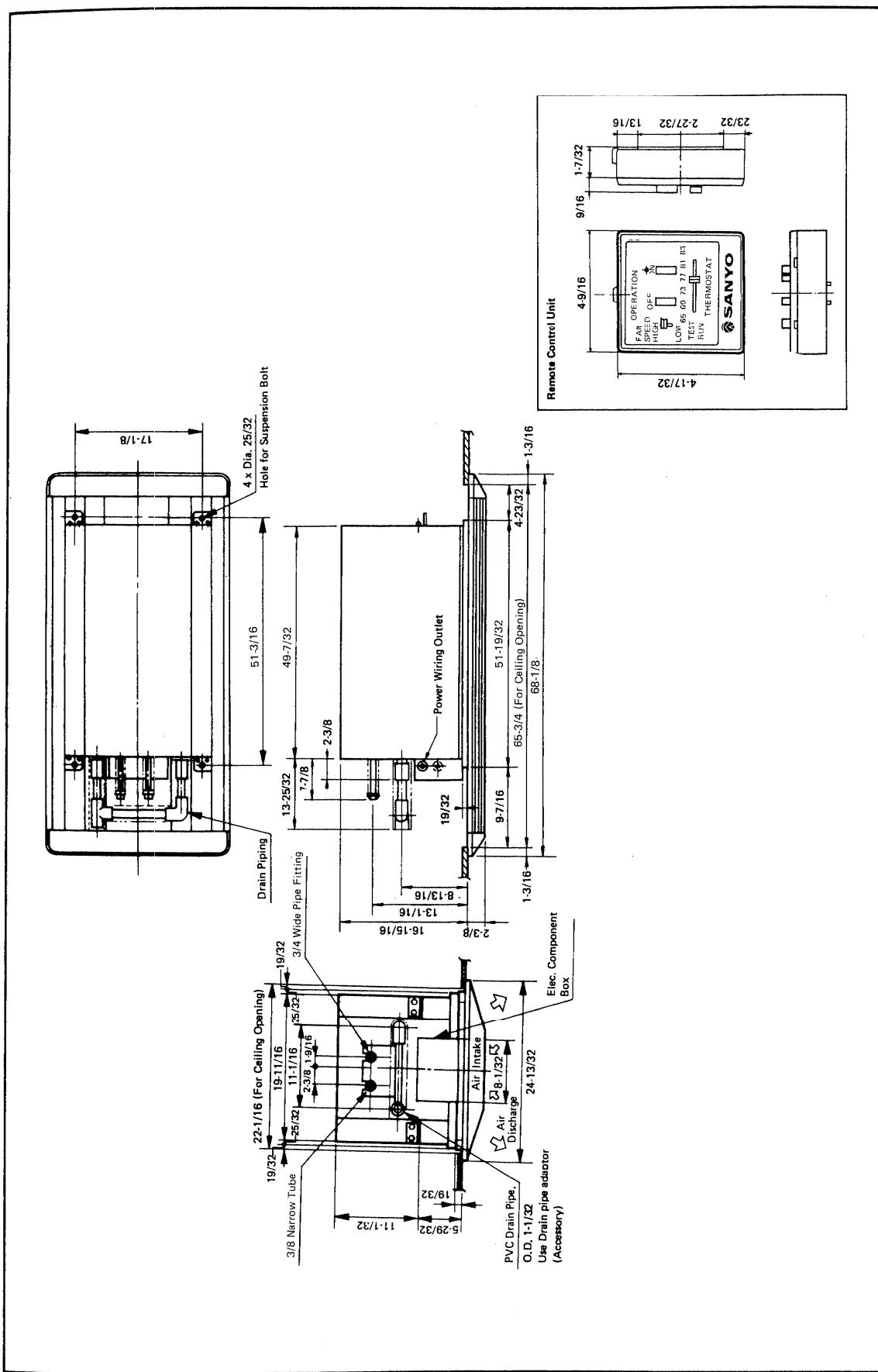
OUTDOOR UNIT SAP361C



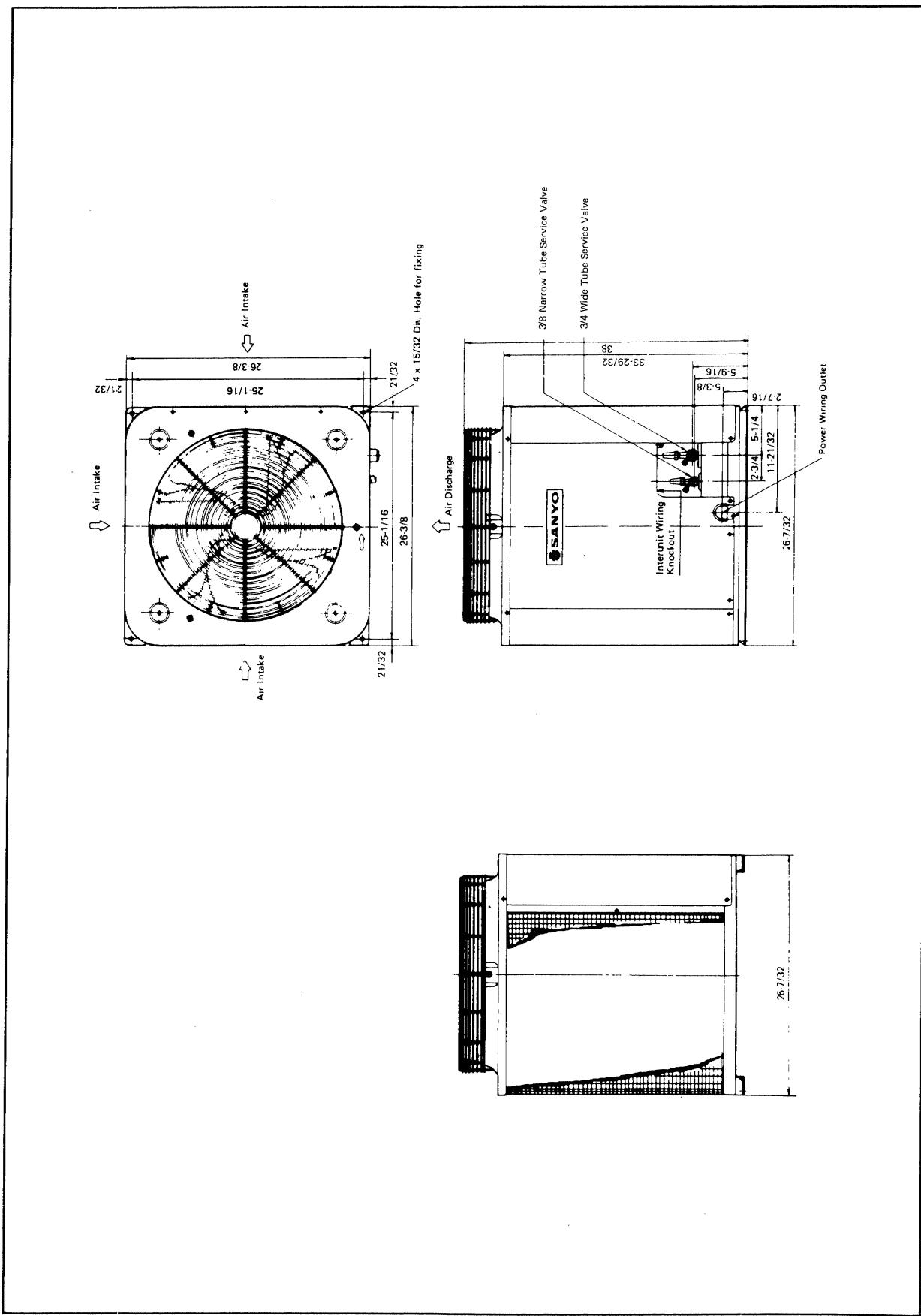
1. Propeller fan
2. Fan motor
3. Condenser (=Outdoor heat exchanger)
4. Service valve (Wide tube)
5. Service valve (Narrow tube)
6. Electrical component box
7. Compressor

3. DIMENSIONAL DATA

Indoor Unit SAP361R



Outdoor unit SAP361C

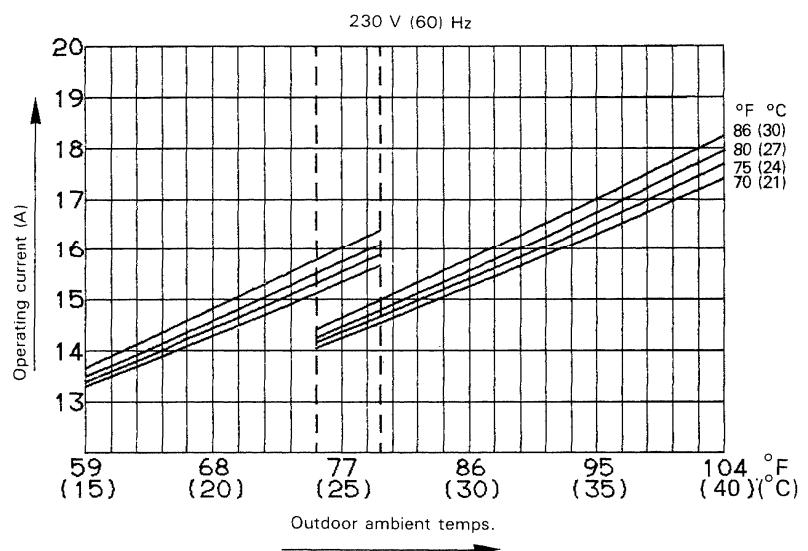


4. PERFORMANCE CHARTS

Cooling characteristics

Operating current characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor air velocity: High, overall value for indoor and outdoor shown.)

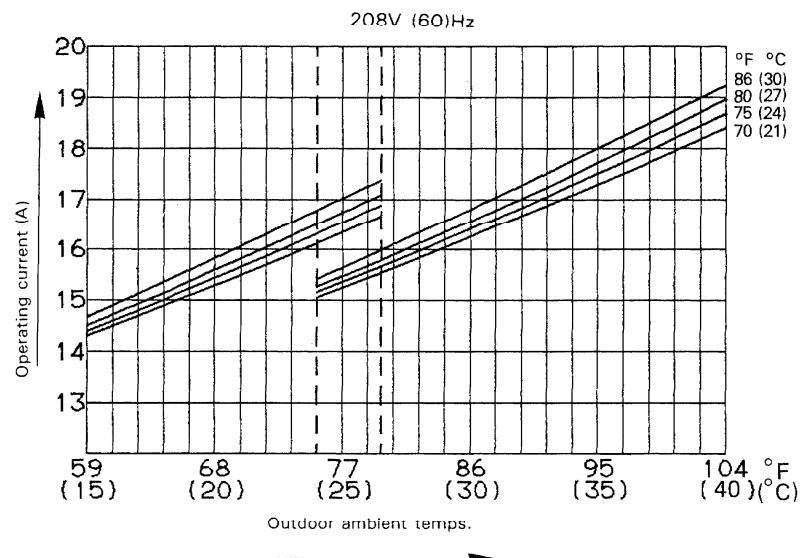
NOTE: When the outdoor temperature drops to 76°F (24°C) or lower, the outdoor fan speed is switched to Low. Adversely, when the outdoor temperature rises to 78.5°F (26.5°C) or higher, the outdoor fan speed is turned to HIGH. Therefore, fan speed may vary with outdoor ambient conditions within the dotted line area shown in the chart at right.



Cooling characteristics

Operating current characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor air velocity: High, overall value for indoor and outdoor shown.)

NOTE: When the outdoor temperature drops to 76°F (24°C) or lower, the outdoor fan speed is switched to Low. Adversely, when the outdoor temperature rises to 78.5°F (26.5°C) or higher, the outdoor fan speed is turned to HIGH. Therefore, fan speed may vary with outdoor ambient conditions within the dotted line area shown in the chart at right.

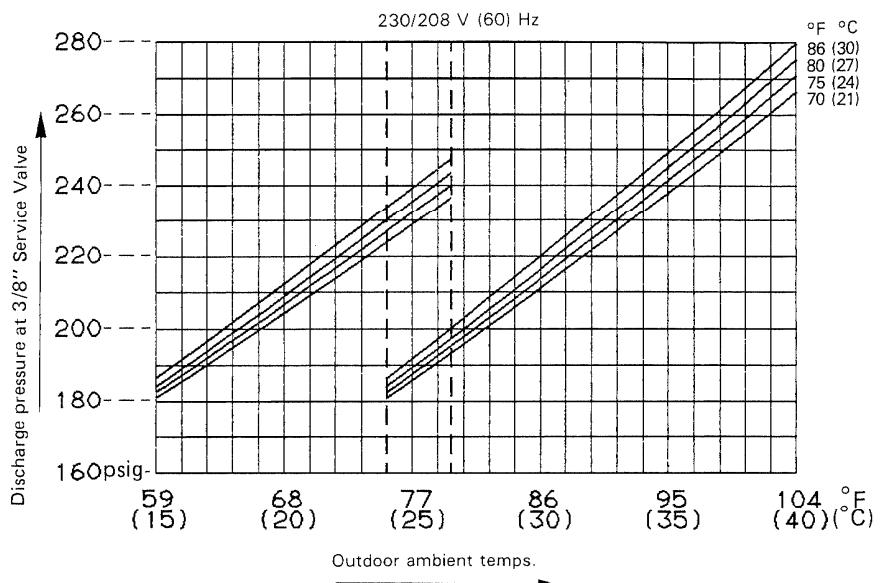


Cooling characteristics

High pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor air velocity: High.)

NOTE: When the outdoor temperature drops to 76°F (24°C) or lower, the outdoor fan speed is switched to Low. Adversely, when the outdoor temperature rises to 78.5°F (26.5°C) or higher, the outdoor fan speed is turned to HIGH.

Therefore, fan speed may vary with outdoor ambient conditions within the dotted line area shown in the chart at right.

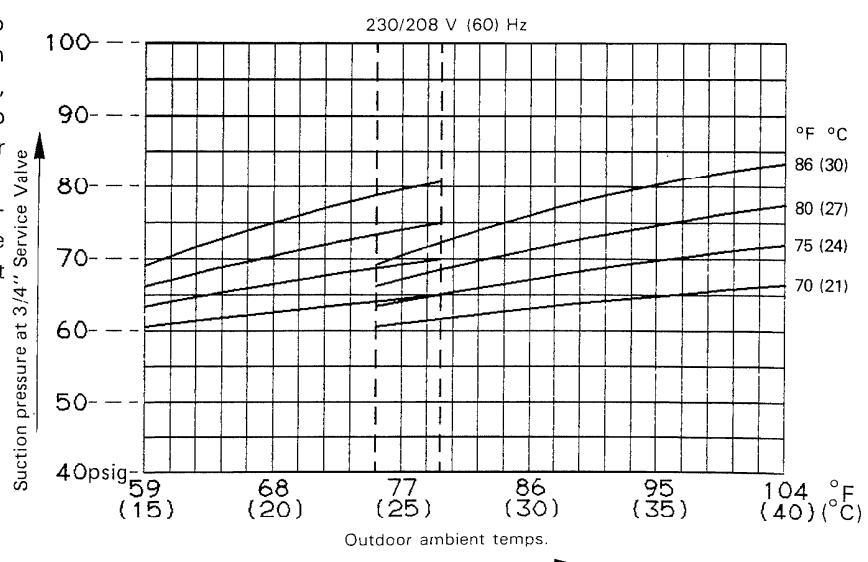


Cooling characteristics

Low pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor air velocity: High.)

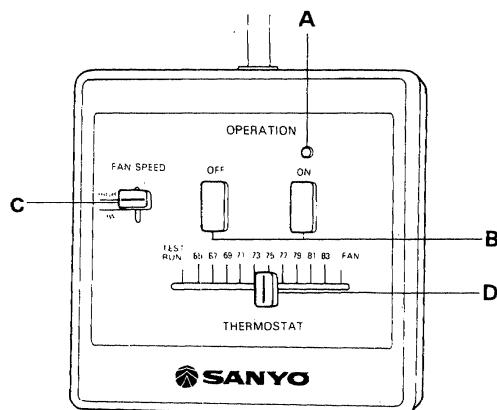
NOTE: When the outdoor temperature drops to 76°F (24°C) or lower, the outdoor fan speed is switched to Low. Adversely, when the outdoor temperature rises to 78.5°F (26.5°C) or higher, the outdoor fan speed is turned to HIGH.

Therefore, fan speed may vary with outdoor ambient conditions within the dotted line area shown in the chart at right.



5. OPERATING INSTRUCTIONS

1. REMOTE CONTROL UNIT



A. INDICATOR LAMP (Green)

This lamp lights up during fan only and cooling operation.

B. OPERATION SWITCH

OFF	Stops air conditioner.
ON	Starts air conditioner; bringing cooling, room air circulation and filtering dusts.

C. FAN SPEED SWITCH

HIGH	To operate the fan at high speed, set lever to HIGH position.
LOW	To operate the fan at low speed, set lever to LOW position.

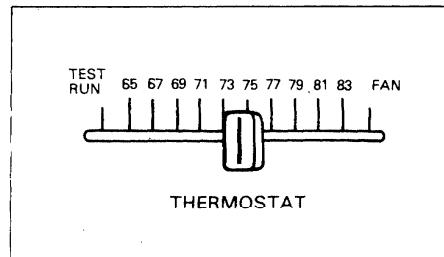
D. THERMOSTAT, FAN AND TEST RUN SLIDE SWITCH

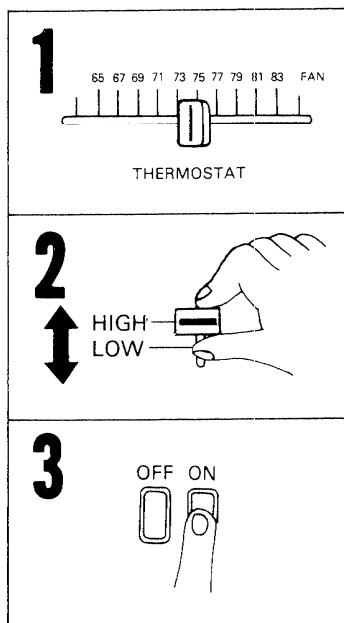
THERMOSTAT

The thermostat maintains the room temperature automatically at the desired level and ensures economical air conditioner operation. Just set the thermostat lever for the temperature level you want.

TEST RUN: This position is to be used for test operation only after installation or during service. Normally it should be locked.

FAN: Set thermostat lever to this position when FAN only operation is needed.





2. HOW TO OPERATE

Turn on the power supply disconnect at least five hours before starting the air conditioner.

1. Set THERMOSTAT lever to the desired position.
2. Set FAN SPEED selector lever to the desired position.
3. Press the ON button to start the air conditioner.

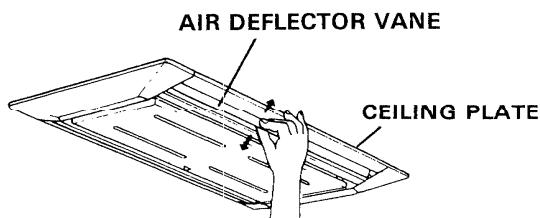
HOW TO STOP

Press the OFF button to stop the air conditioner.

EMERGENCY SHUTDOWN

If the air conditioner does not stop even when the OFF button is pressed, disconnect the power supply.

3. AIR FLOW DIRECTION ADJUSTMENT

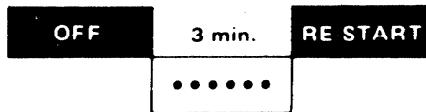


Air deflector vanes can be manually adjusted for the desired air distribution.

4. CAUTION

•SAFETY INTERVAL RESTARTING

After pressing the OFF button, the air conditioner stops and it will not start for three (3) minutes. To start the unit again after three minutes, press the ON button.



6. INSTALLATION INSTRUCTIONS

1. GENERAL

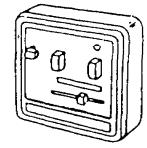
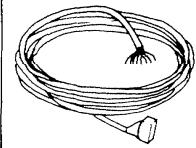
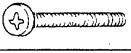
Here is a brief outline of where and how to install the unit. Please read over entire set of instructions for indoor and outdoor units and make sure all accessory parts listed are with the unit before beginning.

1-1. Tools Required for Installation (not supplied)

Drill, 3-5/32" dia. hole saw or key hole saw for normal walls. However, chisels or core bits will be required for brick, concrete, or similar walls.

- Regular Screwdriver
- Phillips Head Screwdriver
- Knife or Wire Stripper
- Level
- Tape Measure
- Tube Cutter
- Flaring Tool
- Torque Wrench
- Adjustable Wrench
- Reamer or Small File

1-2. Accessories Supplied with Unit for Installation

Description	Shape	Q'ty	Remarks	Description	Shape	Q'ty	Remarks
PVC elbow		1	For drain piping	Flanged hex nut		4	For suspending unit
PVC T-fitting		1		Special washer			
PVC pipe		4		Remote control unit		1	Install accessible position on the wall
PVC socket		2		Lead wire for remote control unit		1	
Pan-head screw	 M5	4	For ceiling panel				
Countersunk-head wood screw		2	For remote control unit				
Drain Hose adaptor		1					

1-3. Optional Copper Tubing Kit

Copper tubing for connecting outdoor unit to indoor unit is available in kits which contain the narrow and wide tubing, fittings and insulation.

1-4. Type of Copper Tubes and Insulation Material

If you wish to purchase these materials separately from a local source, you will need:

- Deoxidized annealed copper tube 1/4" outside dia. with a 0.0314" wall thickness, and an equal length of 5/8" outside dia. with a 0.0394" wall thickness.

Cut to the appropriate lengths + 12" to 20" on each to dampen vibration between units.

- Foamed insulation 3/4" I.D. as required to precise length of copper tubing, wall thickness of insulation should be 5/16" to 1/2" thick. (Refer to page 22)
- Copper Wire
Inter Unit: Min. AWG 14 in appropriate length.
Power Supply: Min. AWG 10
- 3" O.D. (I.D. 2-13/16", wall thickness 3/16") PVC pipe length to match thickness of wall.

1-5. Additional Materials Required to Give Installation a Professional Appearance

• Refrigeration (armored) tape	• Refrigeration Oil
• Insulated staples or clamps for connecting wire (Refer to local codes)	• 3-1/2" clamp – use 1 every 4 ft. (To secure copper tubing).
• Putty	

1-6 Tubing Length

- Refrigerant tubes between the indoor and the outdoor units shall be kept as short as possible.
- Standard length of tubing is designed as 50 ft. Refrigerant has factory charged in the outdoor unit at the time of shipment.
- If the pipe length will exceed more than 50 ft., additional refrigerant charge is necessary. (Refer to the below table and Fig. 1)

Max allowable tubing length as shipment (ft)	Limit of tubing length (L) (ft)	Limit of elevation difference (H) (ft)	Required amount of additional refrigerant * (oz/ft)	Refrigerant amount charged at shipment (lb)
10 ~ 50	100	50	0.85	9.9

* No additional charge of compressor oil is required.

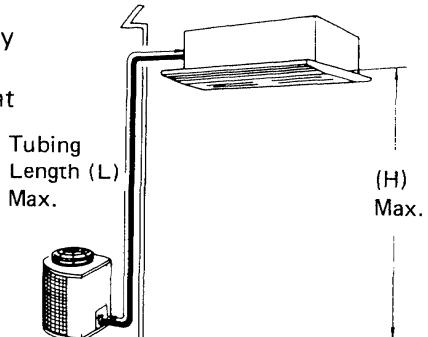


Fig. 1

2. INSTALLATION SITE SELECTION

Indoor Unit :

- AVOID:**
- areas where leakage of flammable gas may be expected.
 - places where large amounts of oil mist exist.
 - direct sunlight.
 - nearby heat sources that may affect performance of the unit.
 - locations where remote control will be splashed with water or affected by dampness or humidity.
 - installing remote control unit behind curtains or furniture that obstruct air circulation.

- DO:**
- select an appropriate position from which every corner of the room can be uniformly cooled.
 - select a location that will hold the weight of the unit.
 - select a location where tubing and drain pipe have shortest run to the outside.
 - allow room for operation and maintenance as well as unrestricted air flow around the unit. Fig. 2
 - allow room for mounting control unit about 4' off the floor, in an area that is not in direct sunlight or in the flow of cool air from the unit.

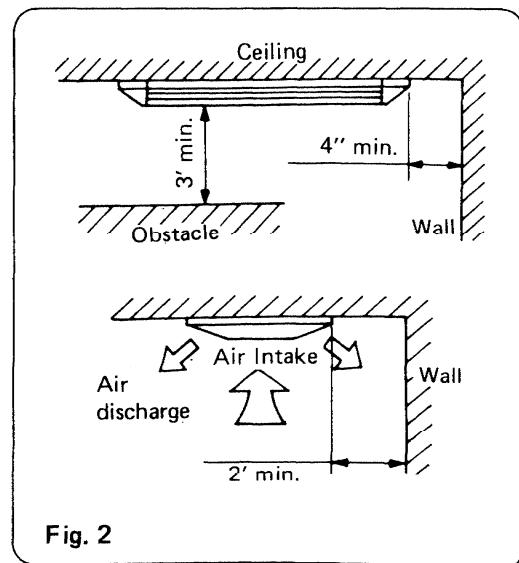


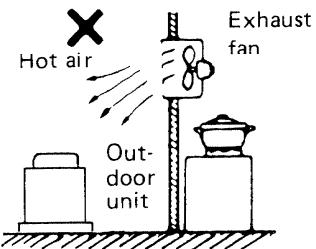
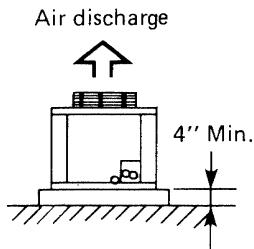
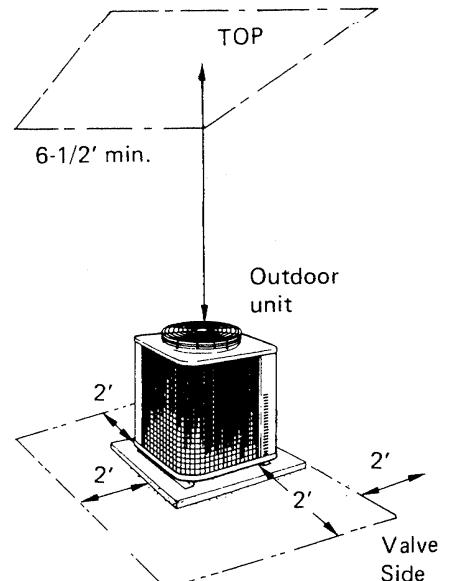
Fig. 2

Outdoor Unit :

AVOID: • heat sources, exhaust fans, etc., Fig. 3
 • damp, humid or uneven locations.

DO:

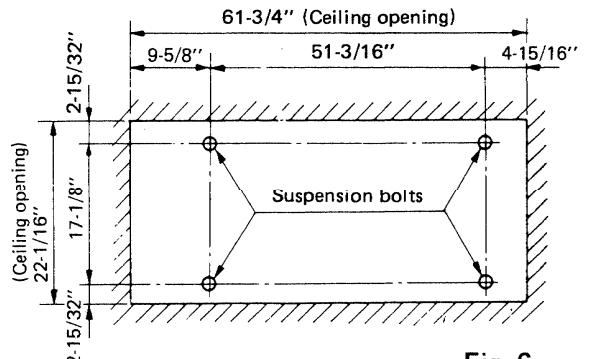
- choose a place as cool as possible.
- choose a place that is well ventilated and outside air temperature does not exceed 115° F constantly.
- allow enough room around unit for air intake/exhaust and possible maintenance. Fig. 4
- provide a solid base; about 4" above ground level to reduce humidity and possible water damage in unit and decrease service life. Fig. 5
- use lug bolts or equal to bolt down unit, reducing vibration and noise.


Fig. 3

Fig. 5

Fig. 4

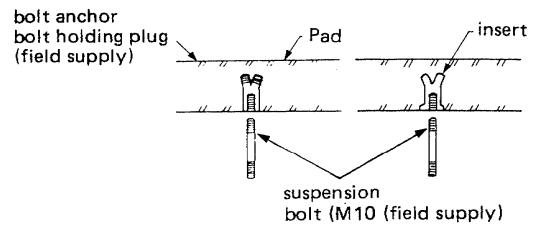
3. HOW TO INSTALL INDOOR UNIT

3-1. Mount the Unit

a) Make an opening on the ceiling and determine the positions of the suspension bolt holes according to Fig. 6


Fig. 6

b) In the holes for the bolts, insert securely bolt anchors (or bolt holding plugs). Then securely screw the bolts into the anchors, as shown in the illustration at right. Fig. 7A


Fig. 7A

NOTE : If the ceiling pad is not strong enough to suspend the air conditioner or if it is difficult to use bolt anchors, secure the suspension bolts with the construction member. Refer to Fig.7B.

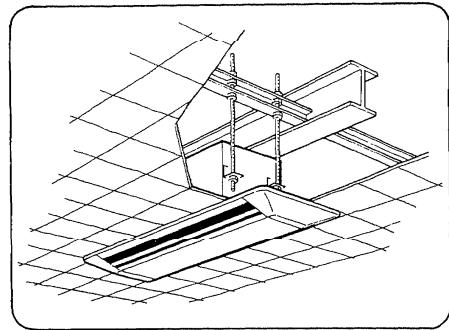


Fig. 7B

- c) If tubing and wire are to go directly out back of unit, make holes on the wall. Fig. 8
- d) Measure thickness of wall from inside edge to outside edge and cut PVC pipe at a slight angle.
Insert PVC pipe in wall. Fig. 9

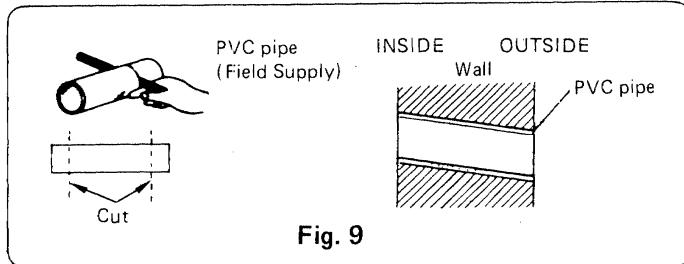


Fig. 9

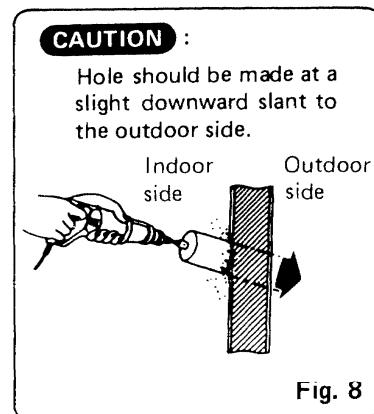


Fig. 8

- e) Screw flanged nuts (accessories) into the four suspension bolts, then lift the unit into position so that the suspension bolts pass through the holes in the suspension lugs on the unit. Fig. 10
- f) Put the special washers onto the suspension bolts upward which penetrate the suspension lugs and then fasten them with M10 nuts temporarily.
- g) Adjust the suspension height so that the distance between the bottom face of the flange of the indoor unit and the bottom face of the ceiling material is approx. 3/4". Fig. 11
Also, suspend the unit horizontally to prevent leakage of drainage or other trouble.

Ensure that the clearance between the flange of the unit body and the ceiling opening is as shown in Fig. 12.

Adjust the position of the unit within the range of the diameter ($\phi 20$) of the suspension hole. After adjustment, fasten M10 nuts securely.

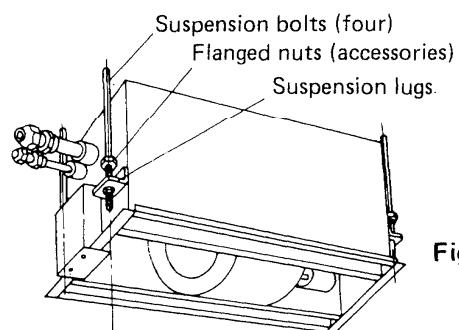


Fig. 10

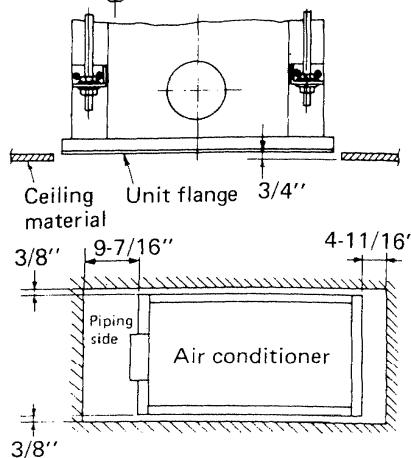


Fig. 11

3-2. Wiring Instructions for Interunit Connections

- a) Insert the interunit wiring (according to local codes) into through-the-wall PVC pipe. Run the wiring toward indoor unit. Fig. 13.

CAUTION : Never fix the wiring by any means before the indoor unit is fully seated.

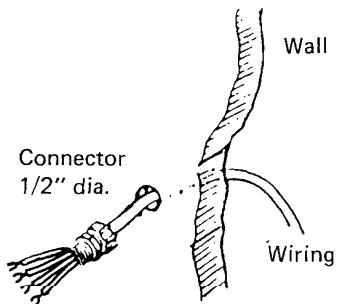


Fig. 13

- b) Unscrew the cover plate of the electrical component box. Fig. 14

- c) Temporarily set the wiring connector in the hole at the electrical component box.

- d) Secure the conduit connector to the electrical component box with a lock nut. Fig. 15

- e) Give some play to the interunit wiring from the outdoor unit to the corresponding terminals on the terminal base.

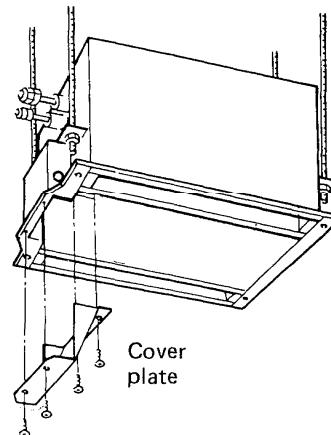


Fig. 14

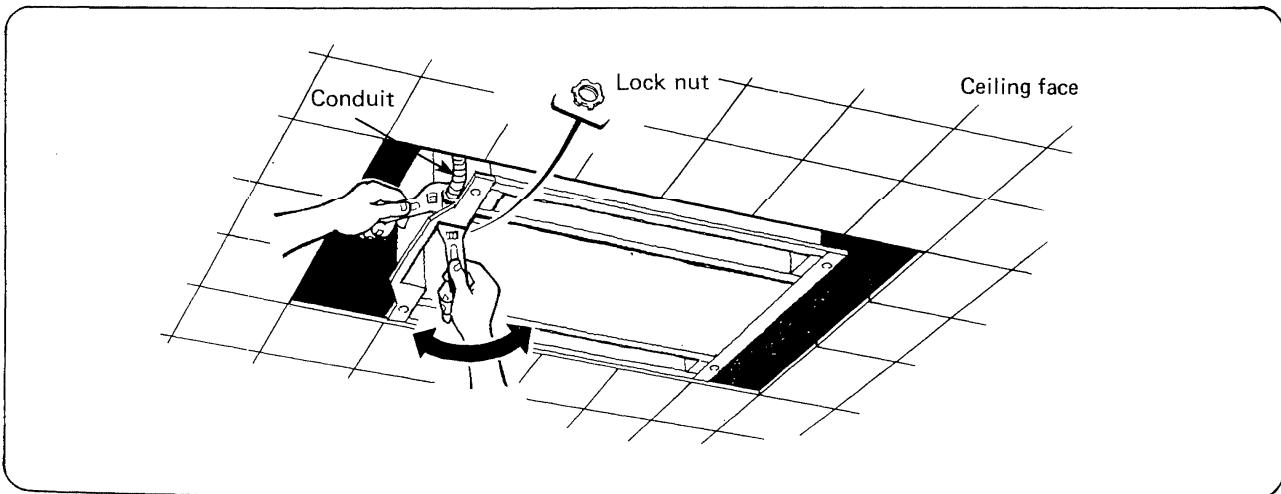


Fig. 15

CAUTION :

- Be sure to refer the wiring system diagram labelled on the electrical component box and carry out correct field wiring. Wrong wiring causes malfunction of the unit.
- Check local electrical codes and also any specific wiring instructions or limitation.

3-3. Drain piping

Drain pipe connecting parts

The connection outlets for the drain pipes are on the same side of the unit body as the refrigerant tubing and electrical box.

Connecting up drain piping

- There are two piping connection outlets as shown in the figure at right.
- Connect the PVC pipe connectors and straight pipe provided (indicated by solid lines) to the connection outlets on the unit body. Fig. 16
- For the piping past the above accessory pieces (PVC piping connectors and straight pipe), use PVC pipes and connect them up using adhesive.
- Be sure to slope the drain piping downward, ensuring that no traps are formed in it.
- Be sure to apply thermal insulation to drain piping in the room.
- Upon completion of drain piping work, remove the blind cover shown in the above figure, then pour water into the drain pan and check to see whether or not it flows satisfactorily.

3-4. Install remote control unit: Fig. 17

- a) Install the remote control mounting plate in a place which can be reached by the remote control cable.
- b) Connect the remote control wiring according to the instructions on the label pasted on the back of the dressing cover of the remote control unit, by matching up the colors of the remote control wiring with the numbers on the PCB in the remote control unit body.
- c) After wiring work as in the below figure, fix the remote control unit body to the plastic box using the M4 small screws (four) provided. (*The M4 small screws are contained in the packing of the remote control unit.)
- d) Align the prongs of the dressing cover with the mating holes on the remote control unit body, and fasten them firmly.
- e) After mounting pushbuttons on corresponding switches, hang the remote control unit onto the mounting plate and slide it until it is seated. Thus installation completes.

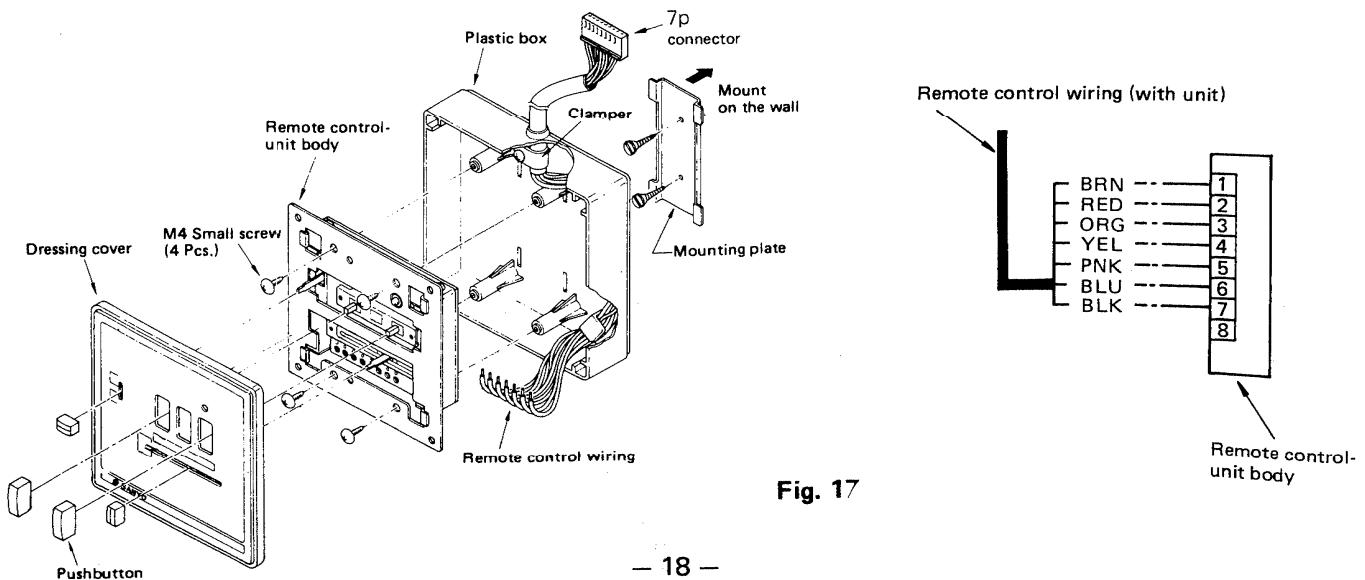


Fig. 17

NOTE : In case of use recessed outlet box, install remote control unit body, dressing cover and pushbutton directly to outlet box as same as Fig. 17. Do not use plastic box and mounting plate. Fig. 18

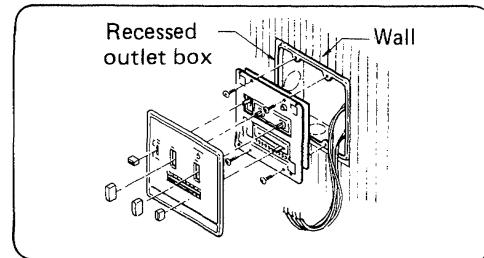


Fig. 18

3-5. Install Ceiling Panel: Fig. 19

- Screw the M5 x 35 small screws provided (in the ceiling panel packing) into four points on the flange face of the unit body which has been bolted to the back of ceiling. Screw in the small screws to an extent such that the distance between the bottom of the screw head and the bottom face of the flange is at least 3/4''. (See figure below.)
- Next, lift the ceiling panel into position so that the small screws (four pcs) which were screwed onto the unit body pass through the keyhole-shaped openings in the panel, then shift the panel sideways until it is caught by the screws.
- Keeping the ceiling panel in this position, check to see if the joining patterns of the ceiling panes are in line with those of ceiling material. If they are not in line, remove the ceiling panel and finely adjust the suspension position of the unit body.
- Once the joining patterns are properly aligned with each other, screw-in the four small screws.

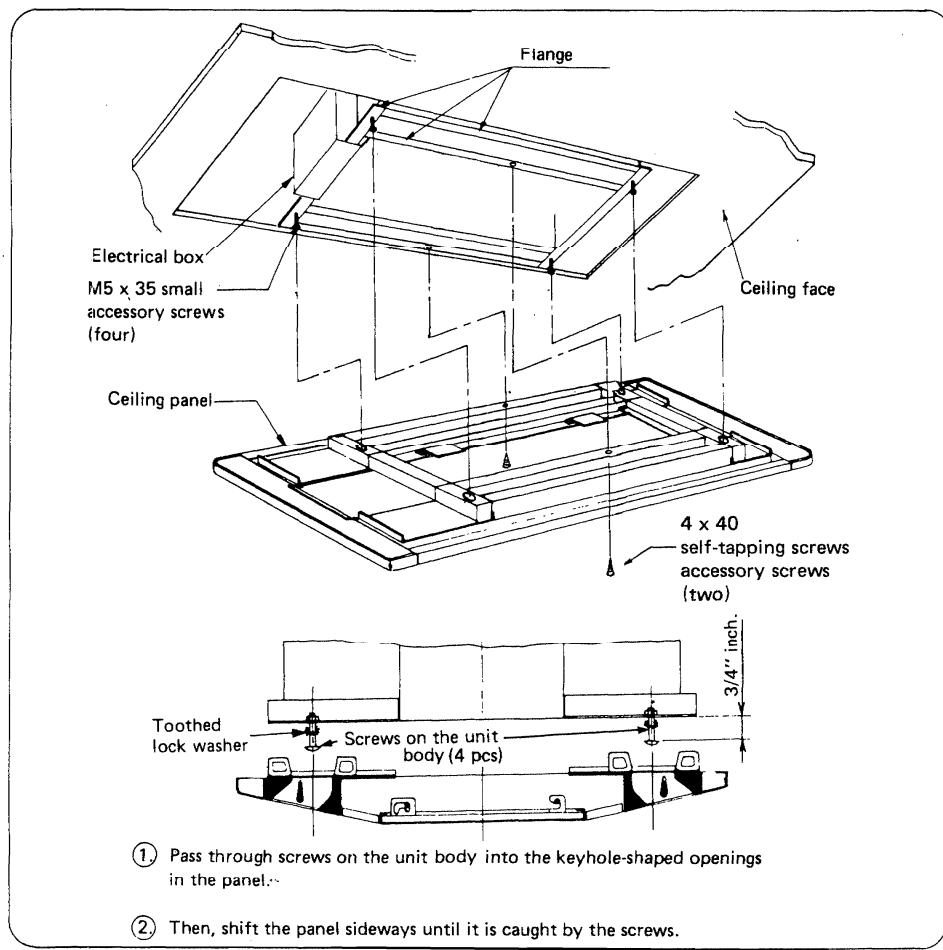


Fig. 19

4. HOW TO INSTALL OUTDOOR UNIT

- Place unit on level pad, blocks or equal and anchor.

Refer to INSTALLATION SITE LOCATION given in page 15.

CONNECTOR SIZE

MODEL	POWER LINE CONNECTOR SIZE	INTERUNIT LINE CONNECTOR SIZE
SAP361C	1/2"	1/2"

4-1. Wiring Instructions on Outdoor Unit

- Remove access panel "C" and punch knockout holes on the panel. Fig. 20
- Connect interunit power line and power supply line per drawing on inside of the panel "C". Fig. 21
- Be sure to size each wire allowing several inches longer than the required length for wiring.
- When connections are completed secure both connectors on the panel with lock nuts and then close the panel.
- Ground unit in accordance with local codes.

CAUTION :

- Be sure to comply with local codes on running the wire from the indoor unit to outdoor unit. (size of wire and wiring method etc.)
- Every wire must be connected firmly.
- No wire should touch refrigerant tubing, compressor or any moving part.

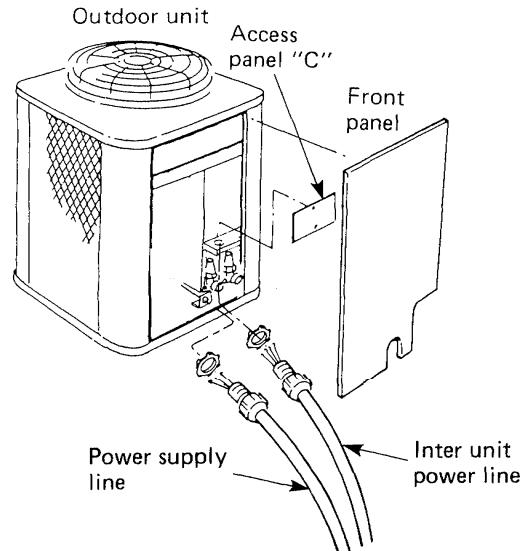


Fig. 20

WIRING SYSTEM DIAGRAM

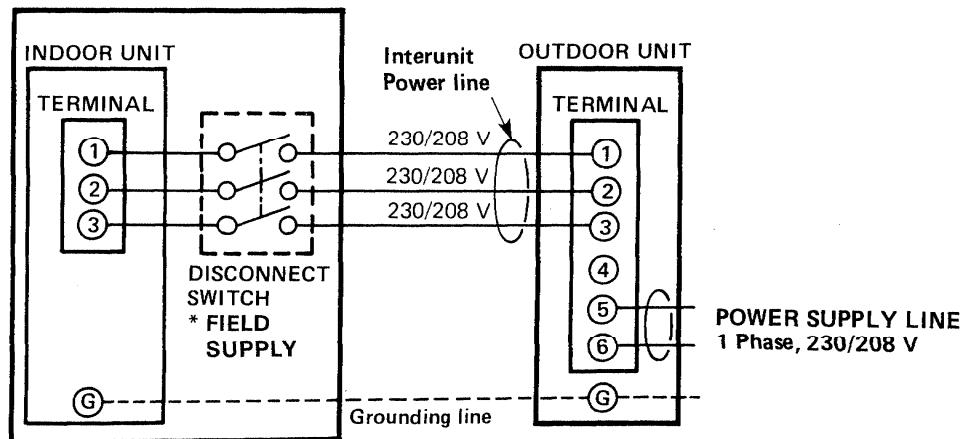


Fig. 21

5. REFRIGERANT TUBING

5-1. Use of the Flaring Method

The refrigerant tubing for every split type air conditioner must be connected by flaring. In this method, the copper tubes are flared at each end and connected with flare nuts.

5-2. Flaring Procedure with a Flaring Tool

- a) Cut the copper tube to proper length with a tube cutter. It is recommended to cut approx. 12 ~ 20 in. longer than the estimated tubing length.
- b) Remove burrs at the end of the copper tube with a reamer or a file. This process is important and should be done carefully to make a good flare. Fig. 22

NOTE : When reaming, hold the copper tube end downward and be sure that no copper scraps fall into the tube. Fig. 23

- c) Remove the flare nut from the unit and be sure to mount it on the copper tube.
- d) Make a flare at the end of copper tube with a flaring tool* Fig. 24 (*Use "RIGID" or equivalent.)

NOTE : Good flare should have following conditions:

- Inside surface is glossy and smooth.
- Edge is smooth.
- Tapered sides are in uniform length.

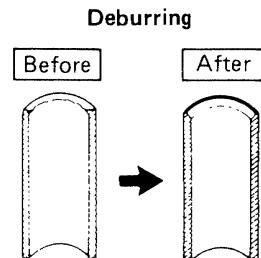


Fig. 22

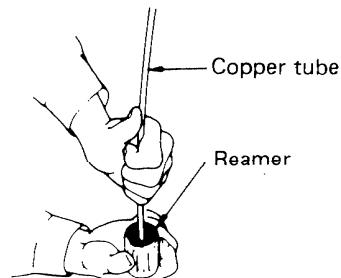


Fig. 23

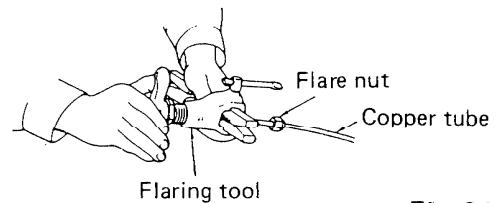


Fig. 24

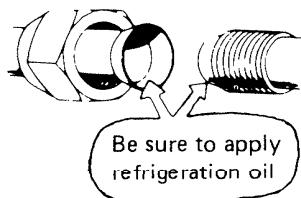


Fig. 25

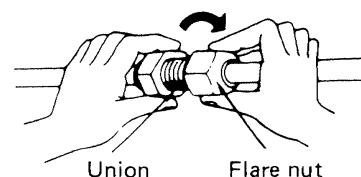


Fig. 26

5-3. Caution before Connecting Tubes Tightly

- a) Be sure to apply blind cap or water proof tape to prevent dust or water from getting into the copper tube , until it is used.
- b) Be sure to apply refrigeration oil to the matching surfaces of flare and union before connecting them together. This is effective for reducing gas leaks. Fig. 25
- c) For proper connection, hold the tube with union and the flared tube straight with each other, screw in the flare nut lightly at first to obtain smooth match. Fig. 26

5-4. Connecting Tubes between Indoor and Outdoor Units

1. Connect the indoor side refrigerant tubing extended from the wall with the outdoor side tubing tightly.
2. Flare nut on large dia. tube should be torqued to 600 ~ 680 lbs. in. Flare nut small dia. tube should be torqued to 300 ~ 340 lbs. in. Fig. 27
3. After performing a leak test on the connecting part, insulate it with INSUL. NIPPLE and finish with a vinyl masking tape over it. Fig. 28

NOTE : Never connect up tubes by brazing them. If it is inevitable, be sure to blow nitrogen gas while brazing to avoid oxidation of inside copper tube.

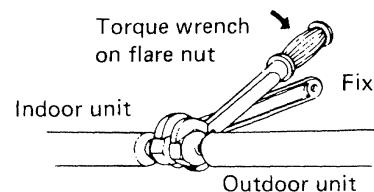


Fig. 27

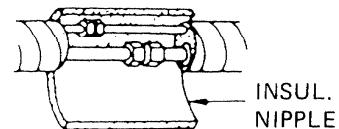


Fig. 28

5-5. Insulation of Refrigerant Tubing

To prevent heat loss and wet floors due to dripping of condensation, wide tube must be well insulated with proper insulation material. Thickness of insulation material should be min. 5/16". Fig. 29

- **Insulation material**

The material must of course have good insulation characteristics, be easy to use, age resistant, and must not easily absorb moisture. The following is recommended; foamed polyurethane or polypropylene.

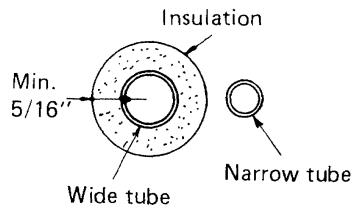


Fig. 29

5-6. Taping the Tubing

- a) At this time, the two refrigerant tubes (and electrical wire if code permits) should be taped together with armoring tape. The drain pipe may also be included and taped together as one bundle with the tubing.
- b) Wrap the armoring tape from the bottom of the outdoor unit to the top of the tubing, where it enters the wall. As you wrap the tubing cover half of each previous tape turn. Fig. 30
- c) Clamp tubing bundle to wall, one clamp every 4' approx.

NOTE : Do not wind the armoring tape around too tightly since this will impair the heat insulation effect. Also be sure condensation drain hose splits away from bundle.

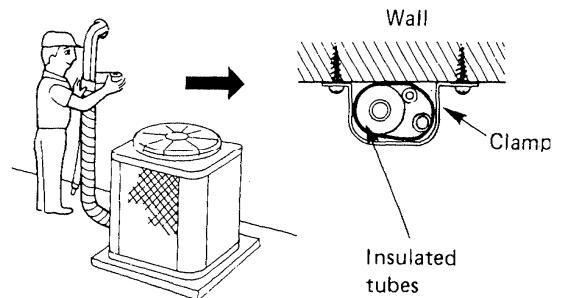
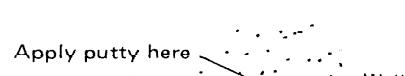


Fig. 30



5-4. Connecting Tubes between Indoor and Outdoor Units

1. Connect the indoor side refrigerant tubing extended from the wall with the outdoor side tubing tightly.
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3. After performing a leak test on the connecting part, insulate it with INSUL. NIPPLE and finish with a vinyl masking tape over it. Fig. 28

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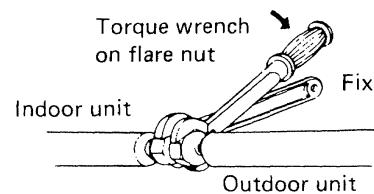


Fig. 27

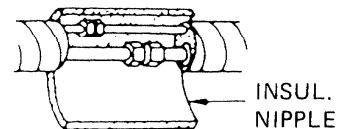


Fig. 28

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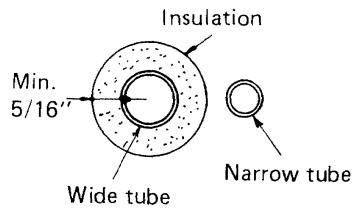


Fig. 29

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- a) At this time, the two refrigerant tubes (and electrical wire if code permits) should be taped together with armoring tape. The drain pipe may also be included and taped together as one bundle with the tubing.
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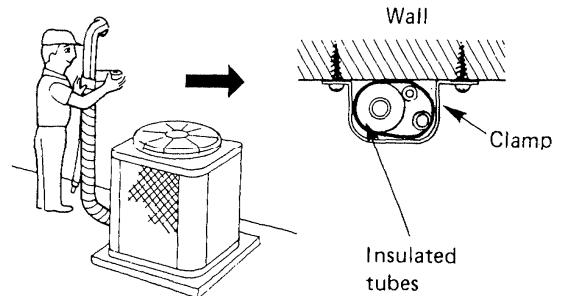
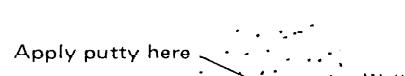


Fig. 30



6. AIR PURGING

Air does not function as a refrigerant, because it cannot be liquefied in the condenser. Air and moisture remaining in the refrigerant system have undesirable effects as indicated at right. Therefore, they must be purged completely.

- The pressure in the narrow tube rises.
- The operating current rises.
- Cooling and heating efficiency drops.
- Water contained in the air may freeze and block the capillary tubing.
- Water may lead to corrosion of parts in the refrigerant circuit.

CAUTION: Refrigerant has factory charged in the outdoor unit at the time of shipment.
Don't use this refrigerant gas for air purging.

■ TUBING DIAGRAM FOR AIR PURGING

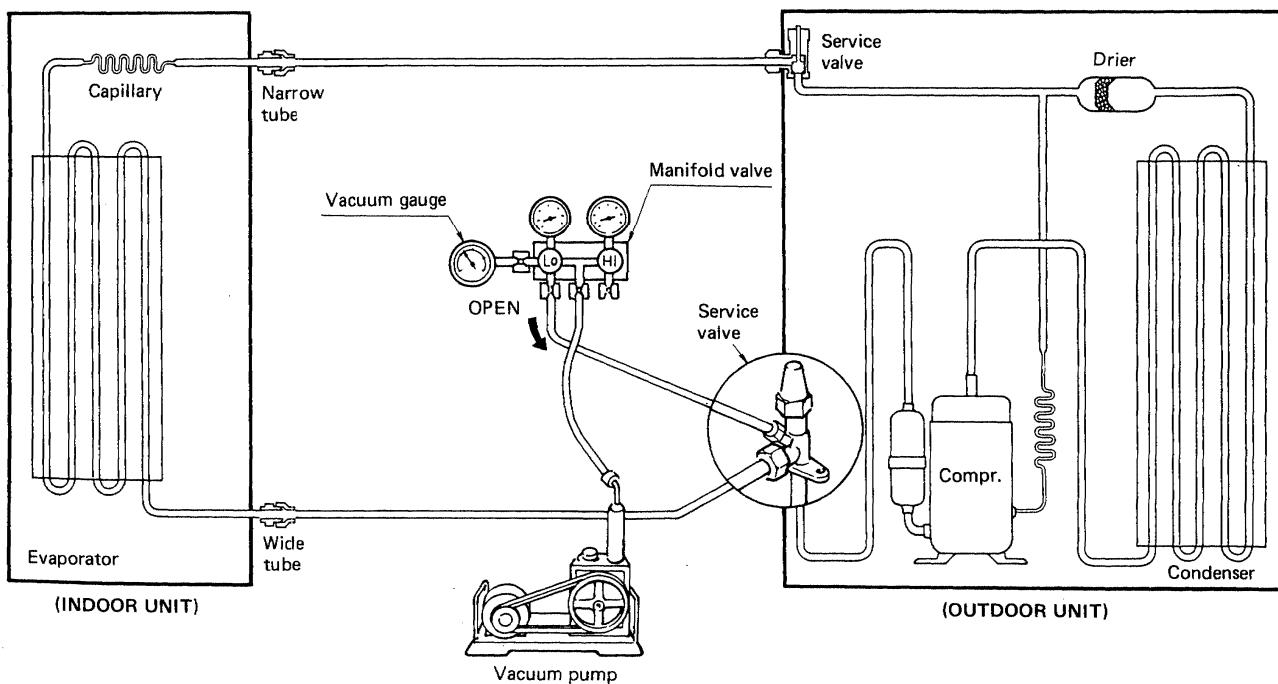


Fig. 32-A

6-1. Air Purging Procedure (Conventional evacuation system)

- a) Check gas leakage of all joints with liquid soap. Fig. 32-B
- b) If no gas leakage is confirmed, connect both vacuum pump and vacuum gauge to service valve through 1/4" port with a flare nut. Fig. 32-A
- c) Next, run the vacuum pump until the pressure reaches to 1.5 mmHg abs. or less value than that.
- d) Close the low pressure side knob on the gauge manifold valve and stop evacuation.
- e) Remove the cap from the wide tube service valve and turn the spindle gradually until it is back seated. Fig. 33
- f) Disconnect vacuum pump and gauge manifold valve from the service valve. Then replace bonnet and flare nut to 1/4" ports of service valve.
- g) The spindle of narrow tube service valve shall be fully back seated. Then, tighten the valve seal cap with the copper gasket.
- h) The all air purge procedure has been completed and the unit is ready for trial operation.

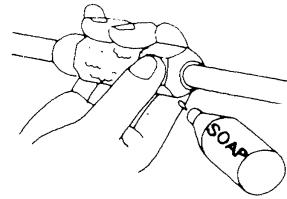


Fig. 32-B

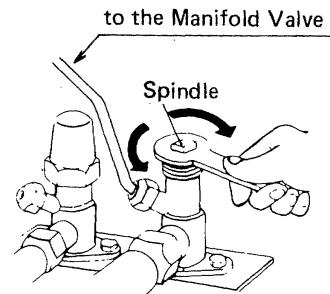


Fig. 33

6-2. Air Purging Procedure (If tubing length will not exceed more than 50 ft.)

- a) Connect refrigerant charging cylinder to narrow tube service valve, and open the valve of the charging cylinder. Fig. 34
- b) When gas begins to be expelled, stop the flow for about 5 seconds by holding your finger over the outlet, then remove it and allow gas to flow out freely for about 10 seconds.
Repeat this operation 6 or 7 times.
- c) Right after the end of gas bleeding before air comes in, tighten the flare nuts quickly with bonnets on both charging ports.
- d) The spindle of both service valves shall be fully back seated. Then, tighten the valve seal cap with the copper gasket.

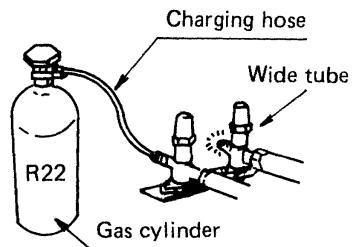


Fig. 34

■ SERVICE VALVE CONSTRUCTION

- **Valve Position -a-**

The valve spindles of both wide & narrow tubes are turned all the way in. The unit is shipped from the factory in this position. (Fig. 35-1)

- **Valve Position -b-**

The valve spindles of both wide & narrow tubes are turned all the way out ("BACK SEAT" position). This is the normal operating position. (Fig. 35-b)

- **Valve Position -c-**

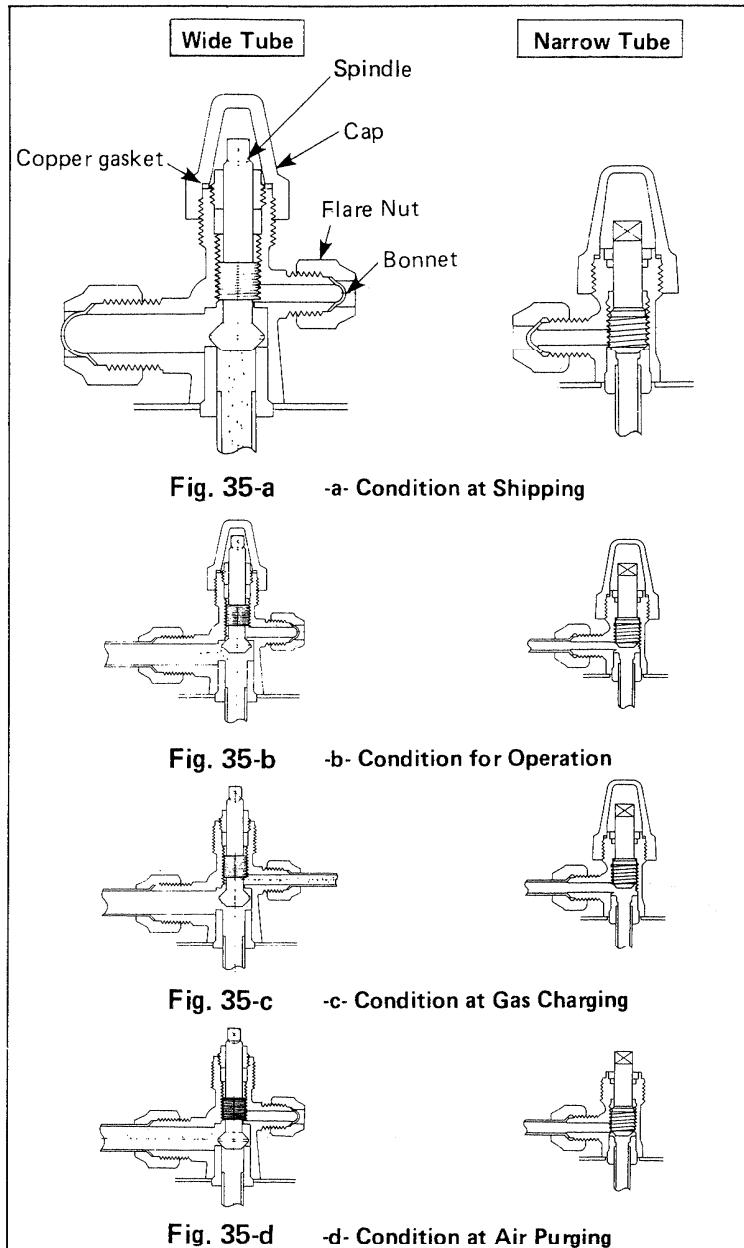
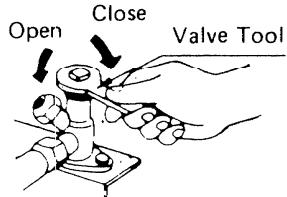
The valve spindles of both wide & narrow tubes are turned halfway-down position. This position is used for pressure measurement and gas charging. (Fig. 35-c)

- **Valve Position -d-**

Like position -a-, but with the flare nut of wide tube open. This position is used for air purging. (Fig. 35-d)

CAUTION :

Be sure to use the valve tool or ratchet wrench when opening or closing the shut-off valve spindle.



■ PUMP DOWN

Pump down means collecting all refrigerant in the system back into the outdoor unit without losing refrigerant gas. Pump down is used when unit is moved or for servicing the refrigerant circuit.

- 1) Close valve on wide tube halfway (2 turns).
- 2) Close valve on narrow tube all the way (4 turns).
- 3) Turn unit on (cooling) for approximately 3 minutes then shut off.
- 4) Close valve on wide tube all the way (2 additional turns).
- 5) Disconnect tubes slowly allowing pressure to equalize inside and out.
- 6) When tubing is disconnected provide dust covers for both valves and tubes until unit is reconnected.

7. PRECAUTIONS BEFORE STARTING

After insulation, be sure to bind up insulation material and refrigerant tubings with a water-proof tape so as rain should not creep into the insulation material and wiring. Fig. 36

Before attempting to start the air conditioner, check the following:

- a) All loose matter is removed from the cabinet especially steel fillings and chips.
- b) Control wirings are correctly connected and all electrical connections tight.
- c) All temporary jumper wires removed. (Refer to unit wiring diagram.)
- d) Check to see if compressor mounting bracket or board, which secures compressor during transportation, is removed. If not, remove them. Fig. 37
- e) Be sure to confirm that all shut-off valves are open.
- f) Power connected to unit for at least five hours before starting the compressor. The bottom of compressor should be warm to the touch and crankcase heater around the feet of the compressor should be hot to the touch.

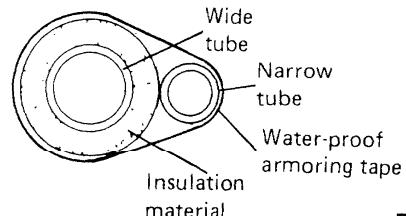


Fig. 36

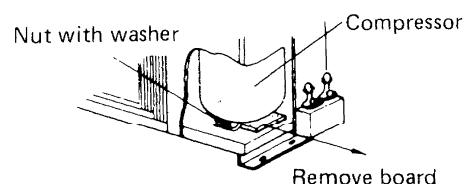


Fig. 37

8. TRIAL RUN

Check that all tubing and wiring have been completed correctly. Check again that wide and narrow tube service valves are fully opened. Turn on power and run the unit.

NOTE :

If the room temperature is too low, cooling operation may not be possible even if the thermostat knob is set at the lowest position.

In this event, perform test run as follows:

- a) Pull off the thermostat knob. Fig. 38
- b) Set the thermostat lever to the TEST RUN position. Fig. 39
- c) Press OPERATION "ON" button to start the air conditioner.
- d) After completion of test run, press "OFF" button to stop the unit.
- e) Reinstall the thermostat knob. (The stopper position facing down.)

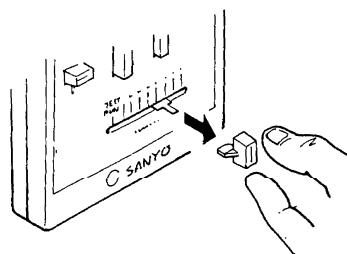


Fig. 38

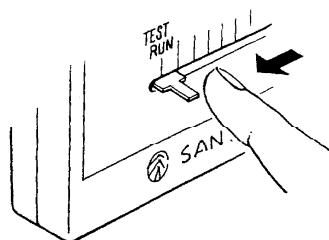


Fig. 39

7. TROUBLESHOOTING

— Quick Access Index —

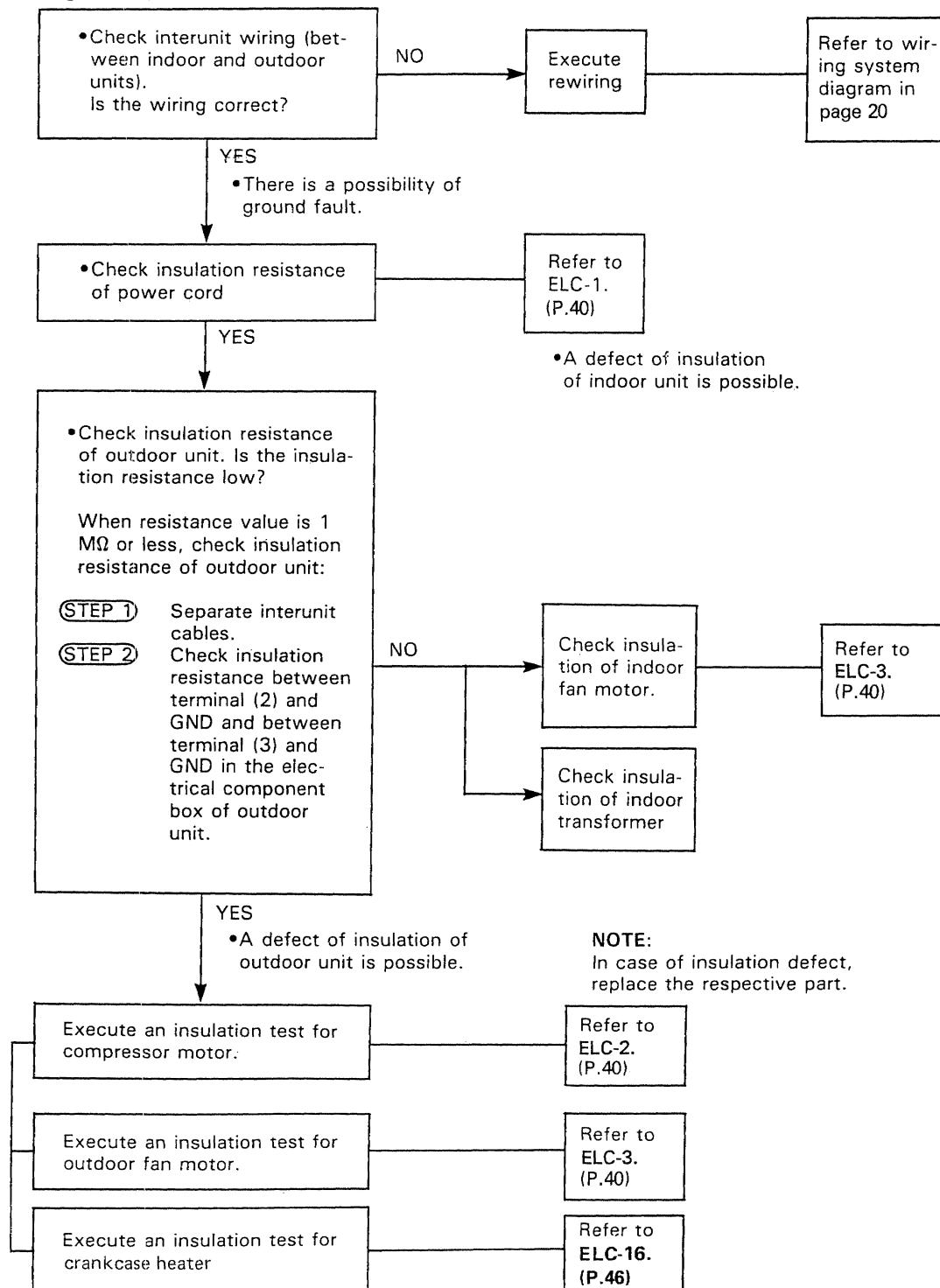
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1.1.1 When circuit breaker is set to ON, it trips soon (Resetting is not possible)	
1.1.2 Circuit breaker trips when the operation switch is depressed	
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2.4. Only compressor does not run	
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3.2. Excessive cooling	

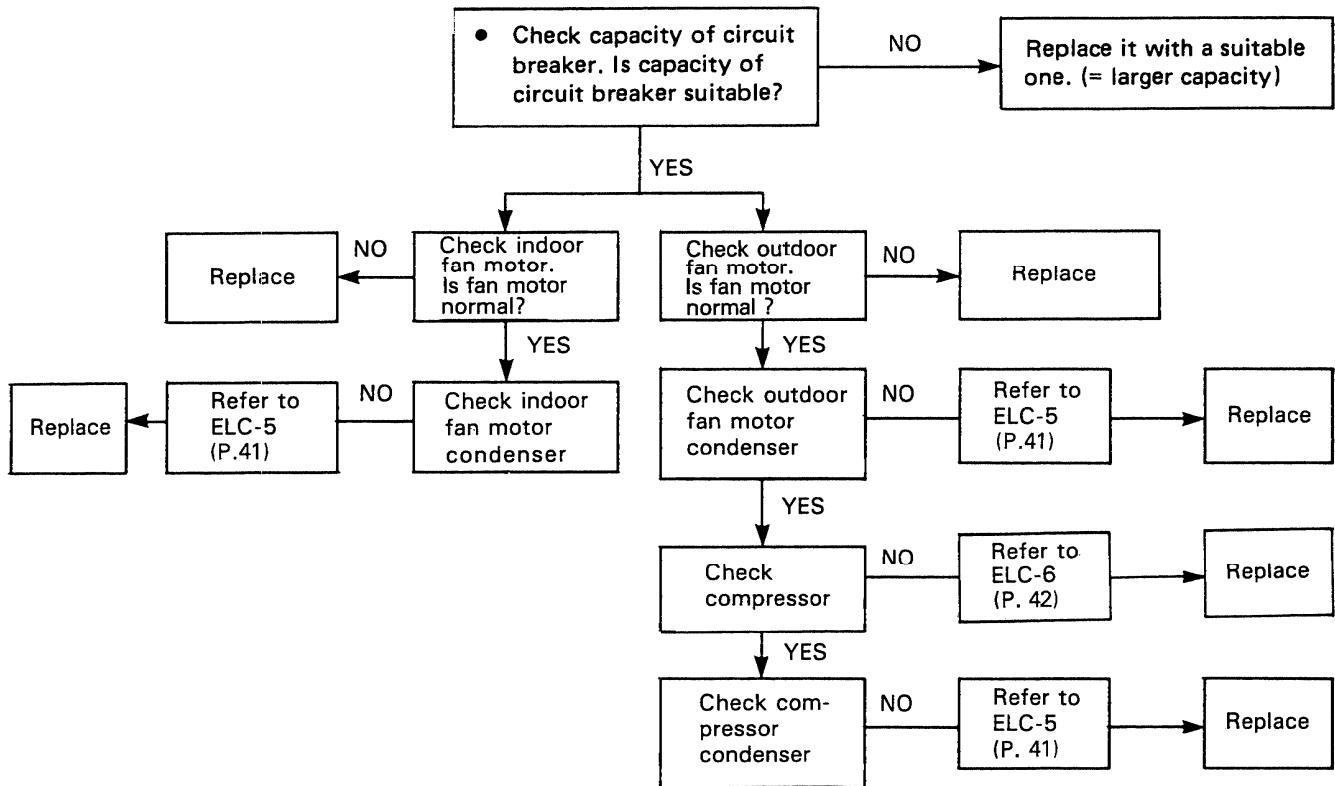
1. Air conditioner does not operate

1.1 Circuit breaker trips (or fuse blows)

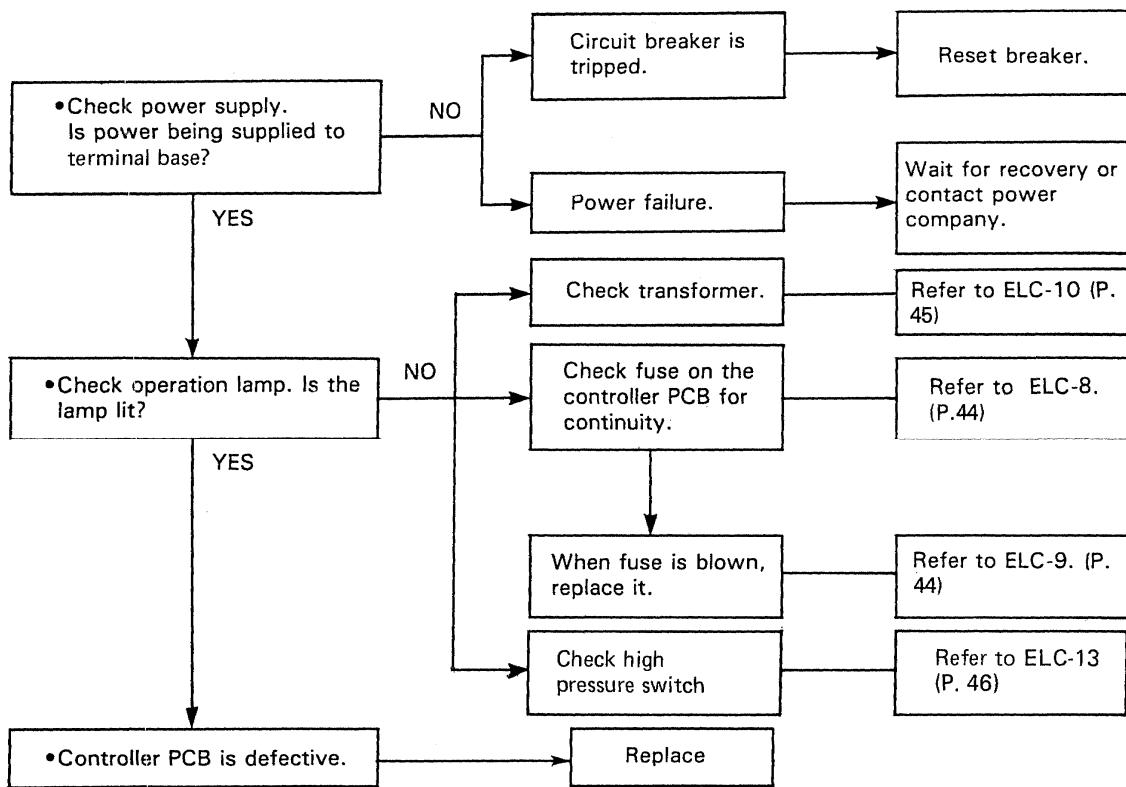
1.1.1 When circuit breaker is set to ON, it trips soon
(Resetting is not possible)



1.1.2 Circuit breaker trips when the operation switch is depressed.

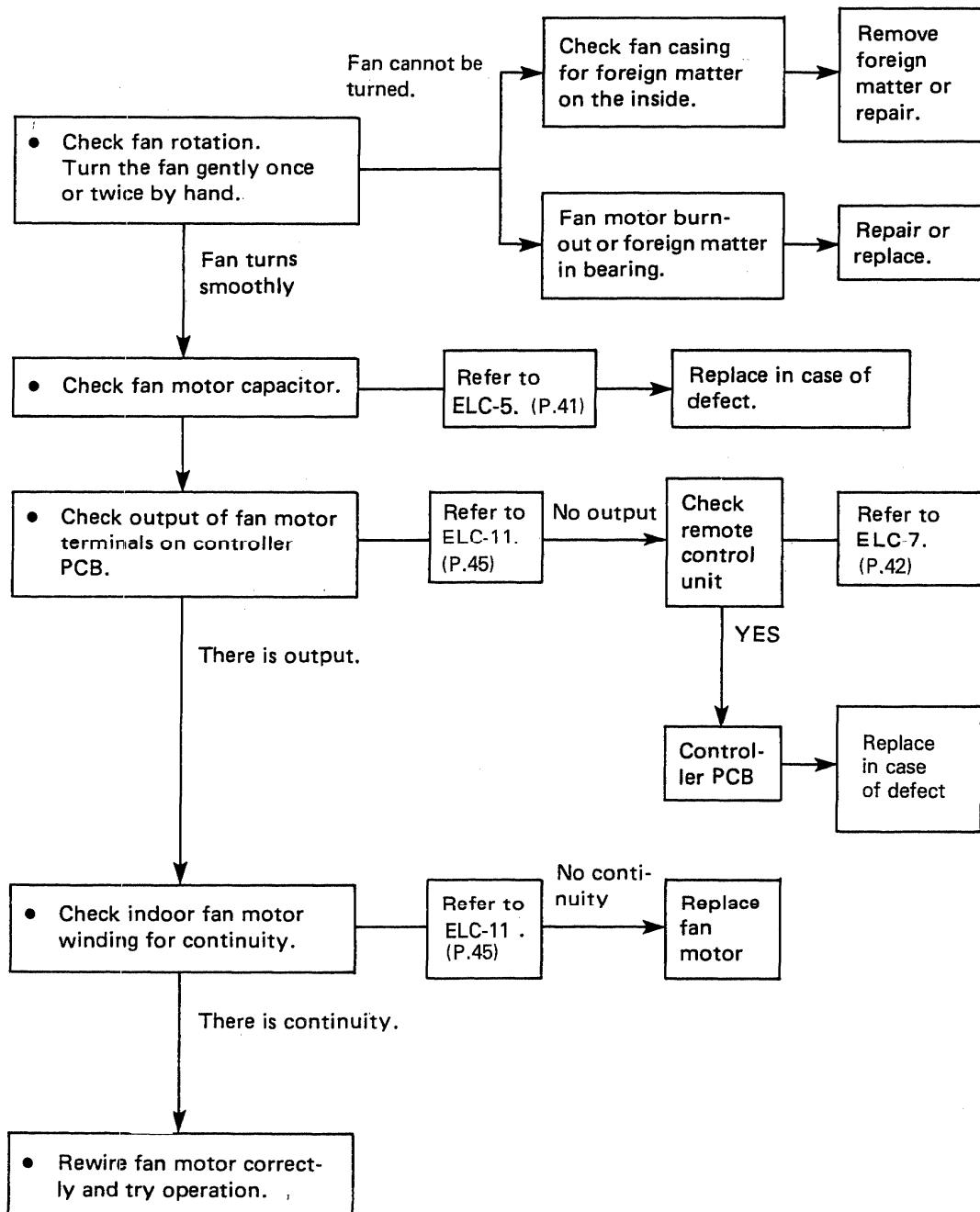


1.2 Neither indoor unit nor outdoor unit runs



2. Some part of air conditioner does not operate

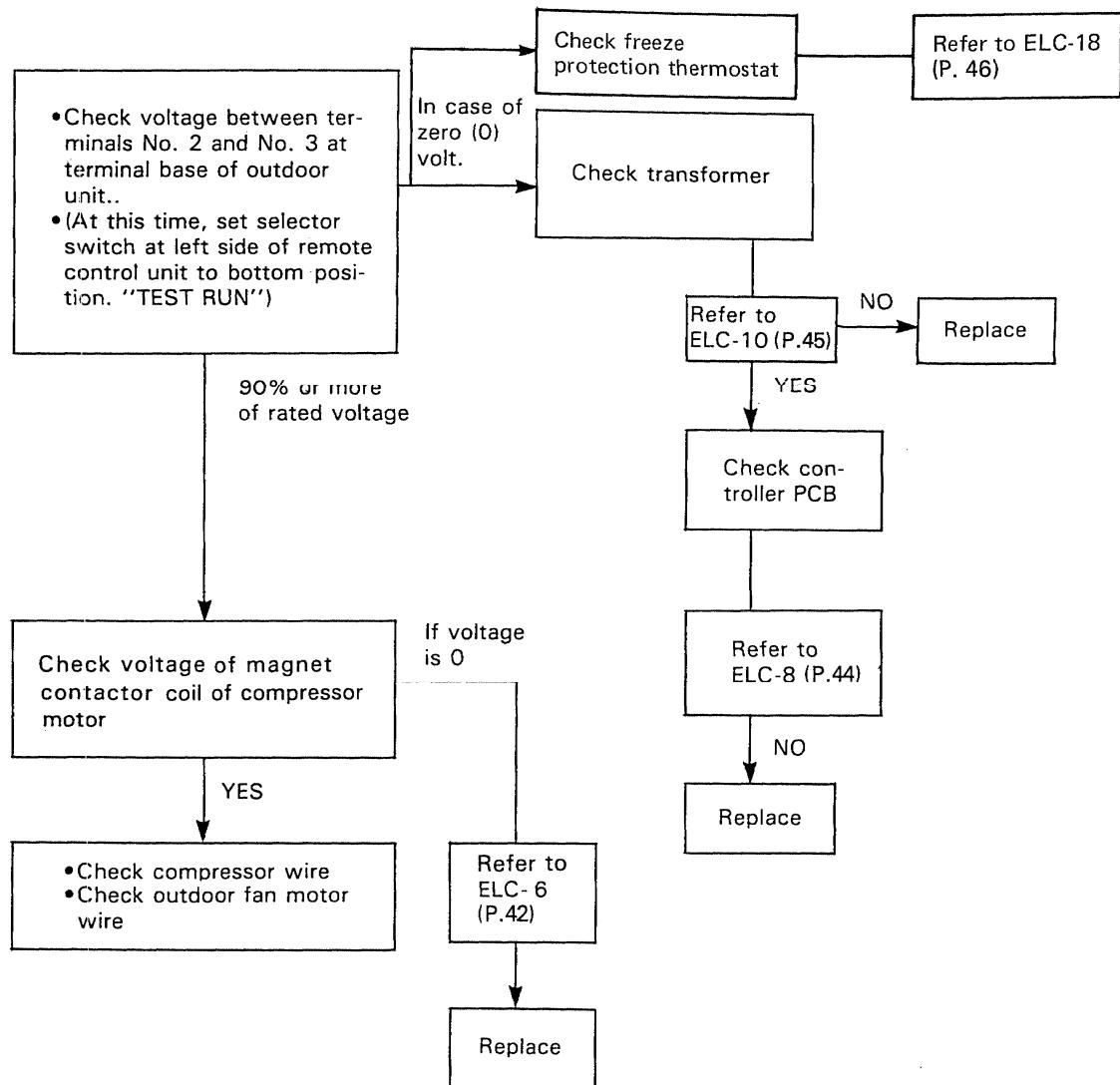
2.1 Indoor fan does not run



2.2 Neither outdoor fan nor compressor runs

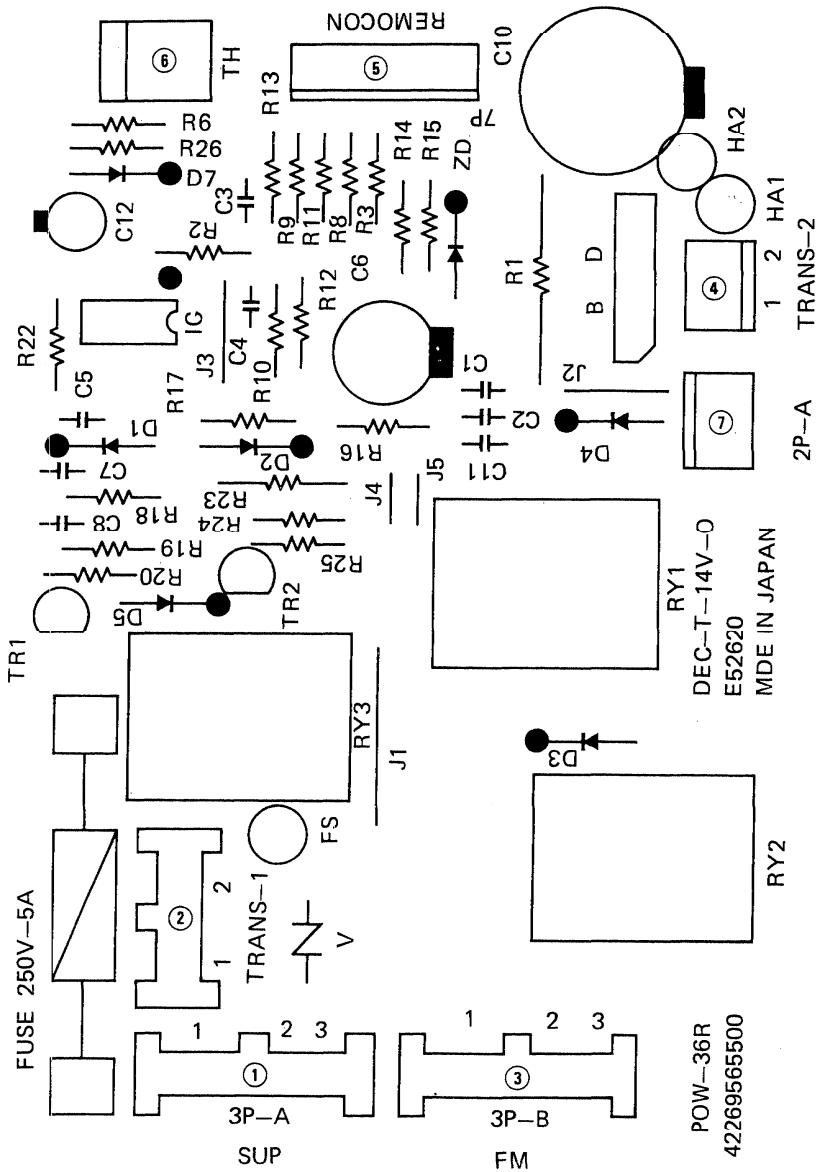
Note: Check following points at first;

1. Is thermostat setting suitable?
2. Has 3 minute timer operated?
(No operation for 3 minutes after power ON.)



8. CHECKING AND REPLACING ELECTRICAL COMPONENTS

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E1A. Connector Identification on Controller PCB
POW-36R (For SAP361R)

Fig. E-A

1. Connector, Power Supply to PCB *
2. Connector, Transformer (Primary: *)
3. Connector, Fan Motor *
4. Connector, Transformer (Secondary: 19V)
5. Connector, Remote Control Unit 24VDC
6. Connector, Thermistor Sensor 24VDC
7. Connector, Freeze Protection Thermostat 24VDC

* Line Voltage (High)

ELC-1. Measurement of Insulation Resistance of the Power Cord

Clamp the ground (GND) line of the Power Cord with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power lines.

Then also measure the resistance between the GND line and the other power line. The insulation is in good condition if the resistance exceeds $1 \text{ M}\Omega$ (Fig. E-1).

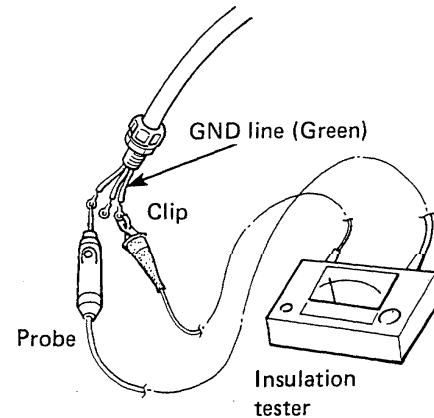


Fig. E-1

ELC-2. Measurement of Insulation Resistance of the Compressor

Remove the blue lead wire connected to the compressor motor from (5) on the terminal base. Measure the resistance by placing a probe of the tester to the blue lead wire and the terminal GND, to which green lead wire is connected.

The insulation is in good condition if the resistance exceeds $1 \text{ M}\Omega$ (Fig. E-2).

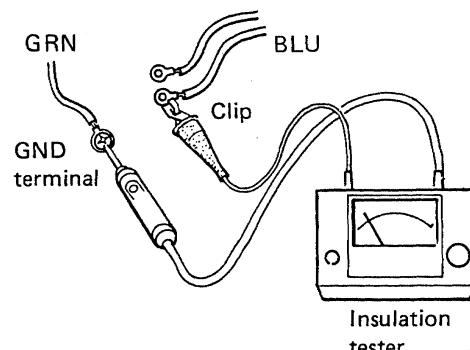


Fig. E-2

ELC-3. Measurement of Insulation Resistance of the Fan Motor

3.1. In case of indoor fan motor

Remove the fan motor connector from controller PCB (P39, Fig. E-A). Clamp the green lead wire (at the bear section) extended from the terminal GND in the electrical component box and measure insulation resistance by placing a probe of the insulation tester to either pole of this connector.

The insulation is in good condition if the resistance exceeds $1 \text{ M}\Omega$. Fig. E-3.

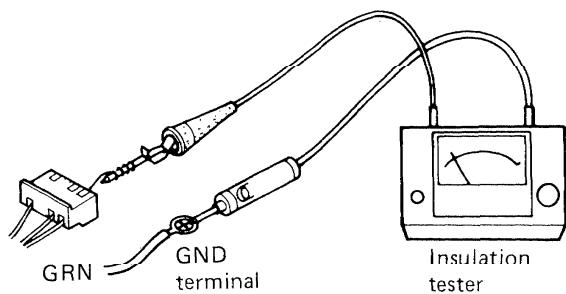


Fig. E-3

Note:

If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

3.2. In case of outdoor fan motor

Disconnect the white lead wire connected to Terminal (1) of the Auxiliary Relay (x). Clamp this lead wire with a lead clip of the insulation resistance tester and measure the resistance by placing a probe of the tester to the terminal GND.

The insulation is in good condition if the resistance exceeds $1 \text{ M}\Omega$. Fig. E-4.

3.3. Crankcase heater

Disjoin and check both ends of the crankcase heater

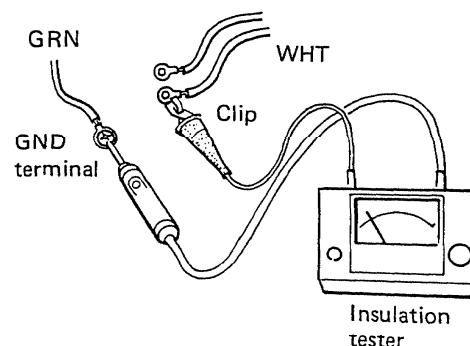


Fig. E-4

ELC-4. Checking of the Outdoor Fan Motor

Remove the fan motor lead wires (WHT, BRN, PNK, *GRY) and check as shown in the wiring diagram (Fig. E-5).

Set the resistance measuring range of the multimeter to "X1Ω" and measure the resistance between the fan motor lead wires.

SAP361C

Lead wire color	Coil resistance
WHT – BRN	$35\Omega \pm 10\%$
WHT – PNK	$72\Omega \pm 10\%$
WHT – YEL	$82\Omega \pm 10\%$

(Table - 1)

Note: When ambient temp is 70°F.

*Disconnect following three lead wires connected to the GRY wire of the fan motor:

Lead wire orientation	Lead wire color
1. From terminal "C" of the high pressure switch	BLU
2. From terminal (5) on the terminal plate	BLU
3. From terminal (8) of the auxiliary relay 1X	BLU

SAP361C

ELECTRIC WIRING DIAGRAM

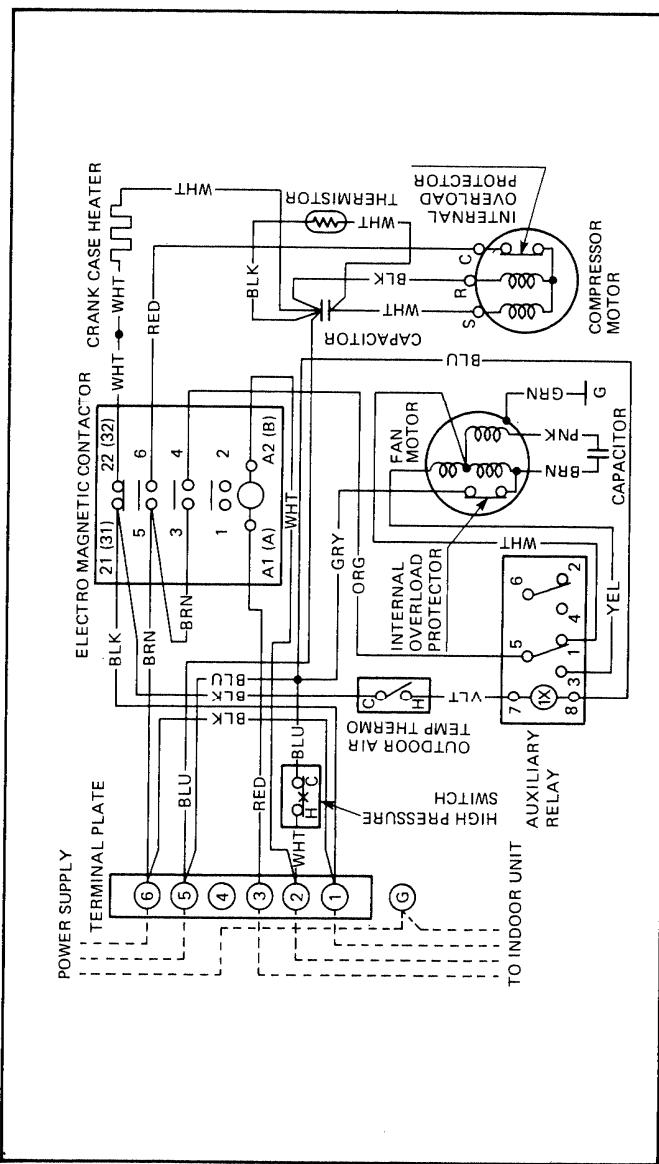


Fig. E-5

ELC-5. Checking of the Motor Capacitor

Checking of any of the indoor fan motor capacitor, outdoor fan motor capacitor and compressor motor capacitor can be done by the same method.

Remove both the lead wire terminals connected to the capacitor, place the probe on the capacitor terminals as shown in the Fig. E-6 and observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

For good condition of the capacitor the pointer bounces to a great extent and then gradually returns to its original position.

The range of deflection and deflection time differ according to the capacity of the capacitor.

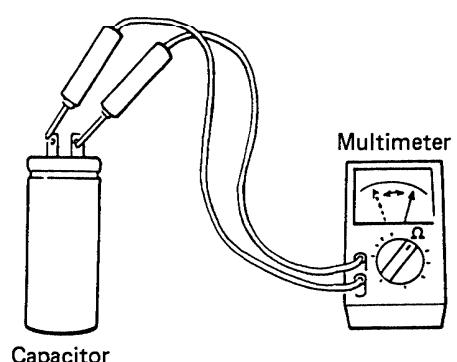


Fig. E-6

ELC-6. Checking of the Compressor Motor Winding

Remove the terminal cover of the compressor motor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between each pair out of the 3 terminals as indicated in Fig. E-7.

It is in good working condition if there is continuity among each pair of terminals.

SAP361C

Leadwire color	Coil resistance
C-R	$0.55\Omega \pm 10\%$
C-S	$1.53\Omega \pm 10\%$

(Table-2)

Note: When ambient temp is 77°F

ELC-7. Checking of the Remote Control Unit Proper

A. Caution: Use of the Test Switch (TEST RUN)

The position of the switch which is used to operate the air conditioner for a room temperature below 65°F (18.3°C) is the position of the switch for this TEST RUN.

If this operation is continued for a long time, there would be a bad effect on the air conditioner because of over-cooling. Therefore, use this switch only for checking, and in any case, DO NOT KEEP ON COOLING FOR MORE THAN 15 MIN. UNDER TEST RUN MODE.

When the checking is over, TURN THE SWITCH BACK TO ITS ORIGINAL POSITION (= RUN) WITHOUT FAIL.

REFERENCE) TEST RUN

Check that all tubing and wiring have been completed correctly. Check again that wide and narrow tube service valves are fully opened. Turn on power and run the unit.

NOTE :

If the room temperature is too low, cooling operation may not be possible even if the thermostat knob is set at the lowest position.

In this event, perform test run as follows:

- Pull off the thermostat knob. Fig. E-8.
- Set the thermostat lever to the lowest position. (The central position of the lever becomes the TEST RUN position.) Fig. E-9.
- Press OPERATION "ON" button to start the air conditioner.
- After completion of test run, press "OFF" button to stop the unit.
- Reinstall the thermostat knob. (The stopper position facing down.)

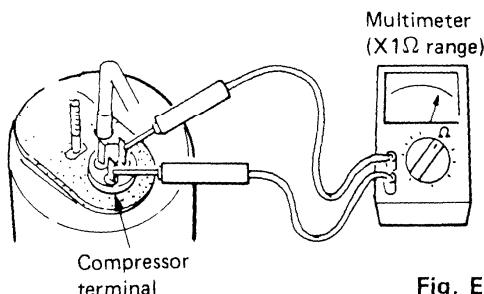


Fig. E-7

REMOTE CONTROL UNIT

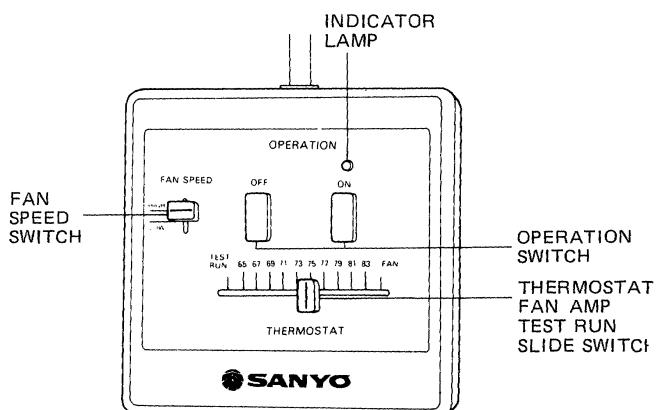


Fig. E-7A

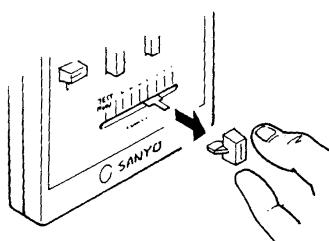


Fig. E-8

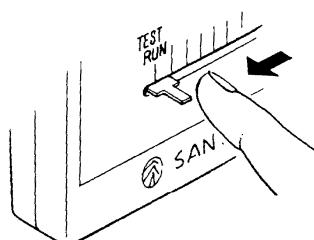


Fig. E-9

B. Checking of the Items of the Remote Control Unit

At first, pull out the connector (7P) of the remote control unit from the controller PCB of the unit (refer to Fig. E-10).

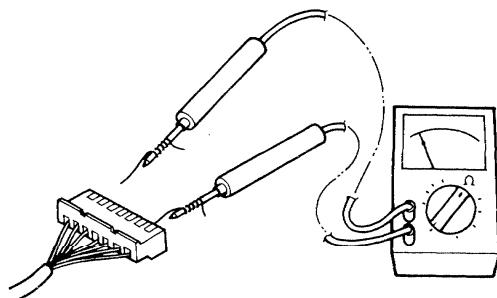


Fig. E-10

Checking points	Position of the selector	
	High	Low
3-4	NO	YES

(Table-3)

NOTE: YES Continuity
 NO Discontinuity

(2) Checking of the Operation Pushbutton

The operating switch is in good working condition if there is continuity between No. 2 (placing the negative (-) probe and No. 3 (placing positive (+) probe) while the pushbutton is pressed.

CAUTION:

Do not disassemble the Remote Control Unit.

It is supplied as a complete assembly and is carefully adjusted in the factory by skillful workmanship. Inexperienced disassembly will cause trouble and malfunction in the unit.

ELC-8. Checking of the Continuity of Fuse on the Controller PCB

Check the continuity by the multimeter as shown in Fig. E-11.

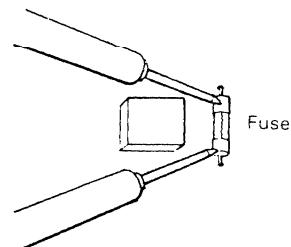


Fig. E-11

ELC-9. Method to Replace Fuse on the Controller PCB

1. Remove the controller PCB
2. Pull out the fuse at the metal clasp by a pair of pliers while heating the soldered leads on the back side of the controller PCB with a soldering iron (30W or 60W). Fig. E-12.
3. Remove the fuse ends one by one. For replacement, insert a fuse of the same rating and solder it.
(Allow time to radiate heat during soldering so that the fuse does not melt).

CAUTION

Be sure to replace the varistor adjacent to the fuse when the fuse is blown.

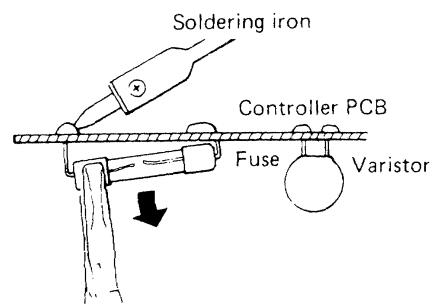


Fig. E-12

ELC-10. Checking of the Power Transformer

1. Remove connectors TRANS-1 and TRANS-2 from the controller PCB.
 2. Set the resistance measuring range of multimeter to "X1Ω" and measure the resistance of the lead wires between WHT-WHT and BRN-BRN as shown in Fig. E-13.

It will be completely satisfactory if all measured values agree with those indicated in Table-4.

Lead wires	Value of resistance
WHT – WHT	About 143.5Ω
BRN – BRN	About 1.2Ω

(Table-4)

NOTE: Ambient room temp 70°F

SAP361R ELECTRIC WIRING DIAGRAM

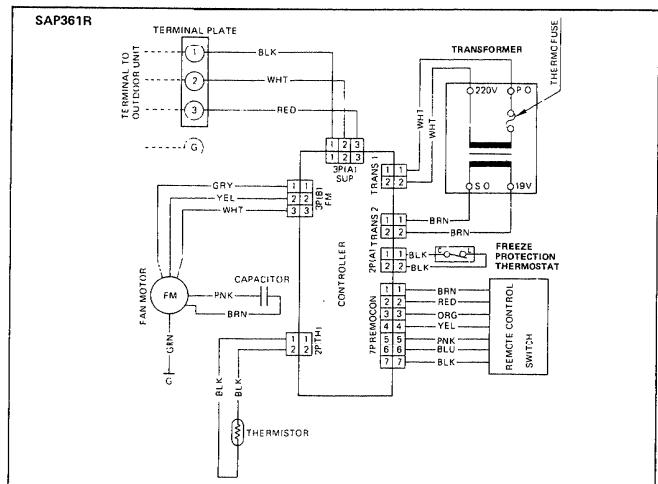


Fig. E-13

ELC-11. Checking of the Indoor Fan Motor

Remove the fan motor connector FM from controller PCB and measure the resistance between each lead wires of the fan motor connector setting the resistance measuring range to "X1Ω".

The motor is in very good working condition if all the values agree with those indicated in Table-5.

Lead wires	Value of resistance
WHT-BRN	About 47Ω
WHT-YEL	About 71Ω
WHT-PNK	About 19Ω

(Table-5)

Note: Ambient room temp. 68°F

ELC-12. Checking of the Thermistor

Disconnect the connector 2p(TH) with lead wires (BLK) from the controller PCB. Check the thermistor resistance with a multimeter (X1Ω range).

Desirable resistance at 77° F Approx. 5 kΩ

ELC-13. Checking of the High Pressure Switch

In the normal operating condition, there is continuity between contacts (C) and (H) of the High Pressure Switch. When the pressure in the refrigerant system exceeds the setting value (412.47 psig), the switch opens circuit and unit stops.

CAUTION:

When the unit is shut down by the high pressure cut-out, turn off the power and locate the possible cause of trouble and remove it. Before resuming operation, press the RESET button on the high pressure switch and restore power. (Fig. E14)

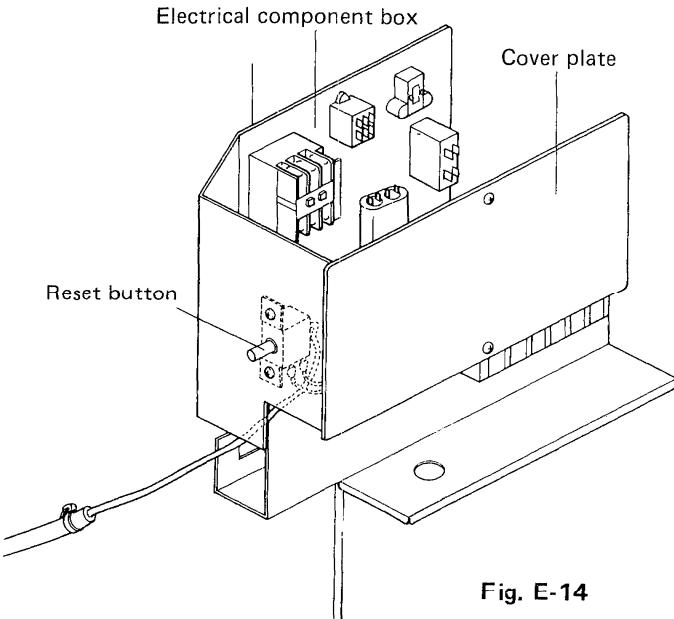


Fig. E-14

ELC-14. Checking of the Coil Thermostat

Disconnect the lead wire connected to the coil thermostat. Check the coil thermostat itself. Satisfactory if the value is as follows.

ON: 75°F	OFF: 79°F
----------	-----------

ELC-15. Checking of the Electro-Magnetic Contactor

Disconnect RED lead wire from terminal A1 (A) and WHT lead wire from terminal A2 (B) on the contactor and check continuity using a multimeter. Satisfactory if continuity is assured. If continuity cannot be verified, the coil must be broken. Check and replace the coil.

NOTE: An auxiliary relay may be checked in the same manner. In that case, disconnect lead wires (VLT and BLU) from the relay 1X and check relay terminals between 7 and 8 for continuity.

ELC-16. Checking of the Crankcase Heater

Disjoin both ends and check continuity. Satisfactory if continuity is assured. If continuity cannot be verified, the heater must have broken wire. Check and replace broken wire.

ELC-17. Checking of the Thermistor

Disconnect lead wires (WHT and BLK) connected to the thermistor. Check the thermistor resistance with a multimeter ($\times 1\Omega$ range).

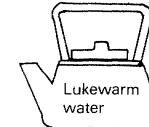
Desirable resistance at 77°F	Approx. 100Ω
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ELC-18. Checking of the Freeze Protection Thermostat

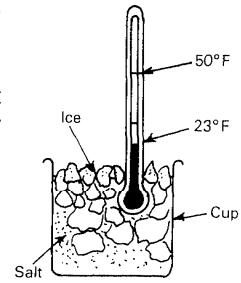
Disconnect the connector 2P (A) with lead wires (BLK) from the controller PCB. Check continuity/discontinuity of the thermostat as follows:

Temperature	Normal Condition
23°F or below	Discontinuous
50°F and above	Continuous

1. Prepare a cup of water with ice.
2. Add several spoonful of salt in it and stir well.
3. Measure the water temperature with a thermometer.
4. Dip the end of thermostat sensor in the cup and check continuity while measuring change in water temperature.
5. If discontinuity around 23°F is confirmed, pour lukewarm water (not boiling hot) and observe continuity around 50°F.



Above conditions are confirmed, functions of the thermostat is normal.



9. DISASSEMBLY AND SERVICE PROCEDURES

— Quick and Index —

[INDOOR UNIT]

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[OUTDOOR UNIT]

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9-1 Electrical Component Box — Access and Removal

- 1) Lift the air intake panel slightly upward and then slide it in the direction shown by arrow (A).
- 2) To remove the air filter, grasp the filter tabs and pull them downwards (arrow (B)). Fig.1

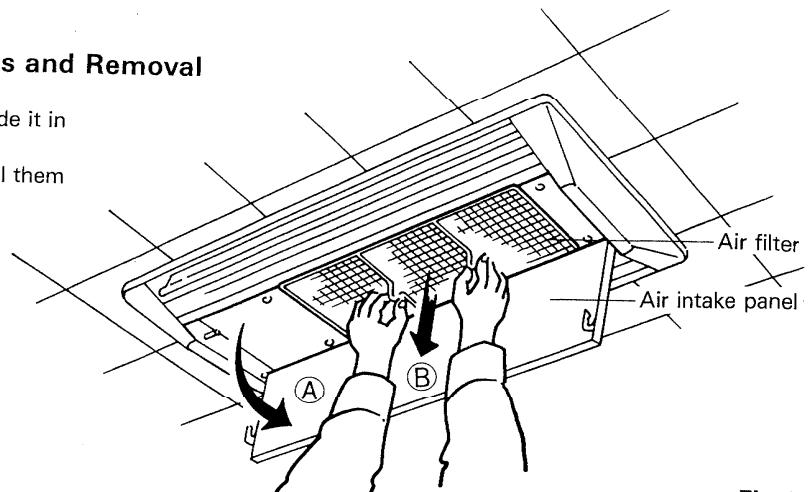


Fig.1

- 3) The electrical component box becomes accessible when the cover (black color) is removed. Fig.2

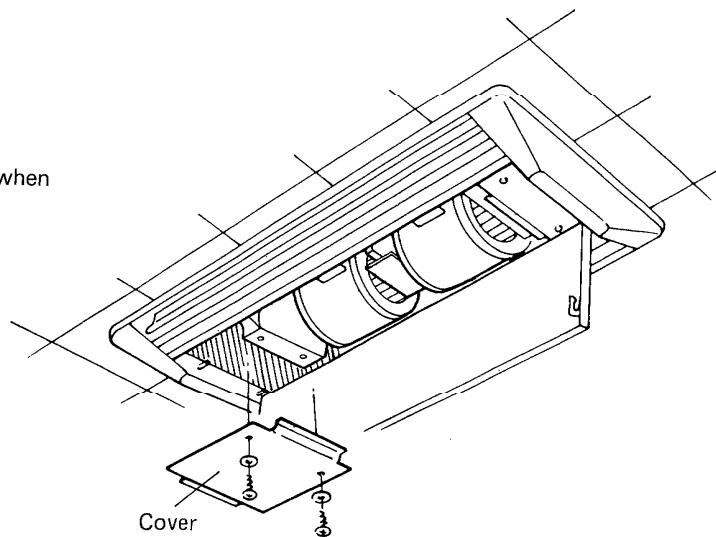


Fig.2

- 4) Remove the cover plates ① and ② of the electrical component box. Fig.3

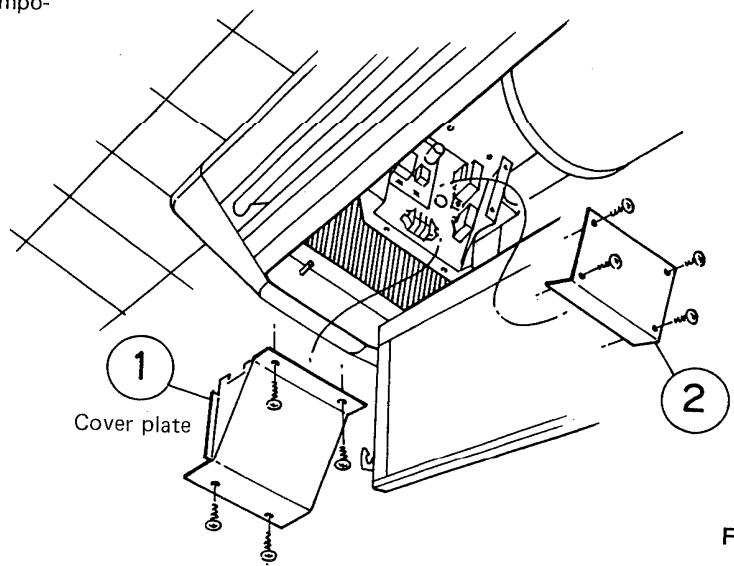


Fig.3

- 5) The electrical components can be checked in this condition.
 6) For removal of the electrical component box, remove the four screws shown by the arrows. ⑧ Fig.4.

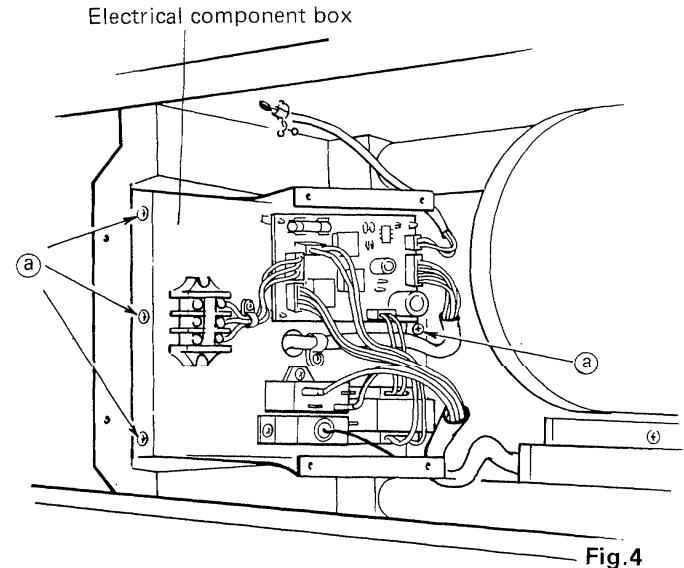


Fig.4

[CAUTION]

Do not use excessive force for removal of connector sockets or lead wires.

9-2 Ceiling Panel — Removal

- 1) Loosen the six screws ⑧ (black color).
- 2) The ceiling panel screw heads have a special shape as shown in the figure.
 Slide the entire ceiling panel to the side. The ceiling panel can be removed when the screw heads have moved from ⑨(A) to ⑨(B). Fig 5.

[CAUTION]

Support the ceiling panel at the time of removal, so that it will not drop down.

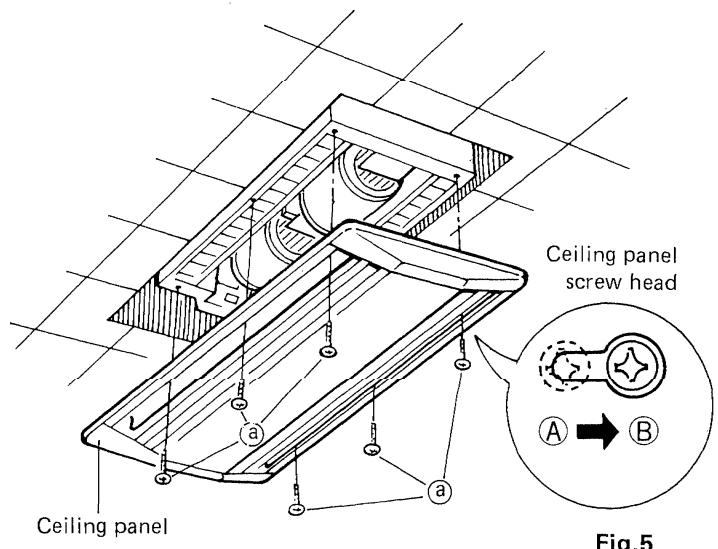


Fig.5

9-3 Fan and Fan Motor — Removal

- 1) Remove the cover ⑩(A), ⑩(B), and ⑩(C). Fig. 6

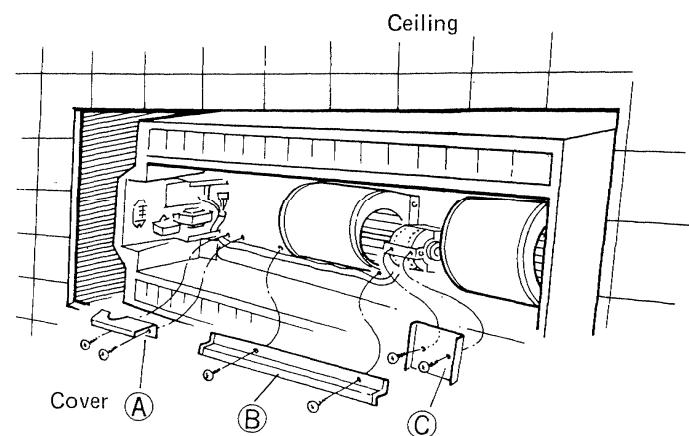


Fig. 6

- 2) Remove the eight screws (a) fixing the fan casing.
- 3) When the four nuts (b) fixing the fan motor installation base are removed, removal is possible as shown in the figure. Fig. 7.

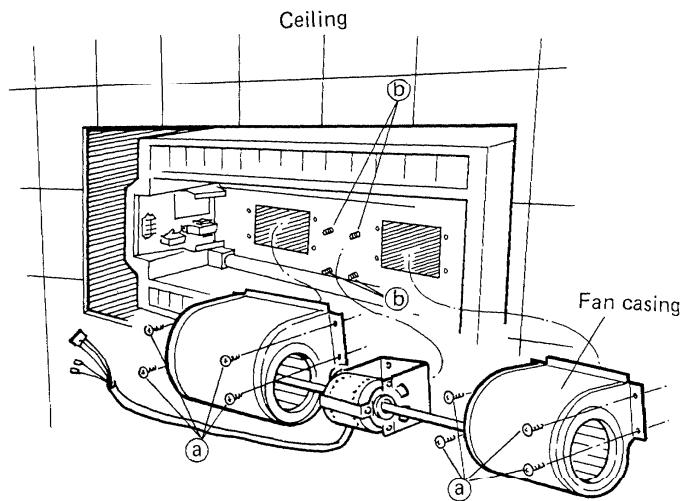


Fig.7

- 4) Loosen the bolt (a) fixing the fan boss on the motor shaft.
- 5) Pull the motor shaft from the fan. Fig.8.

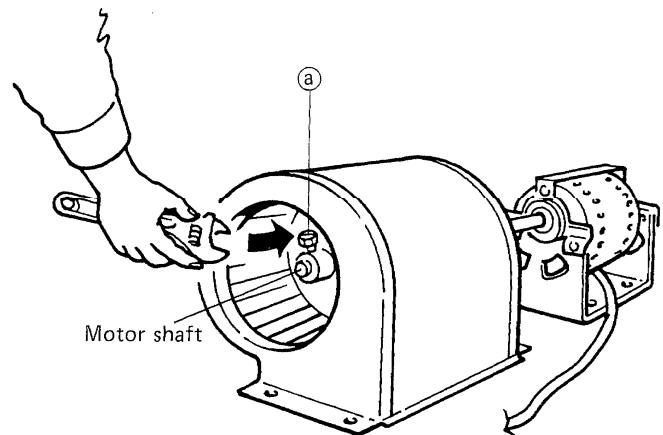


Fig.8

- 6) When the four screws (a) around the nozzle circumference are removed as shown in the figure, the fan can be removed. Fig.9

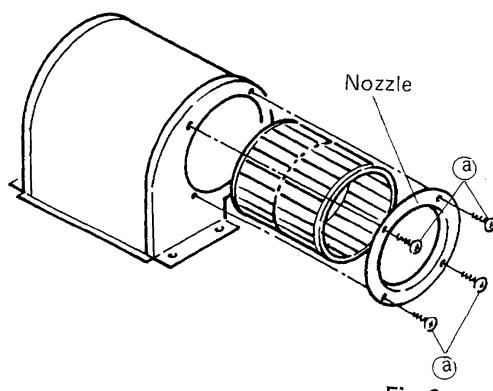


Fig.9

- 7) When the four screws (a) are removed as shown in the figure, the fan motor can be removed. Fig. 10.

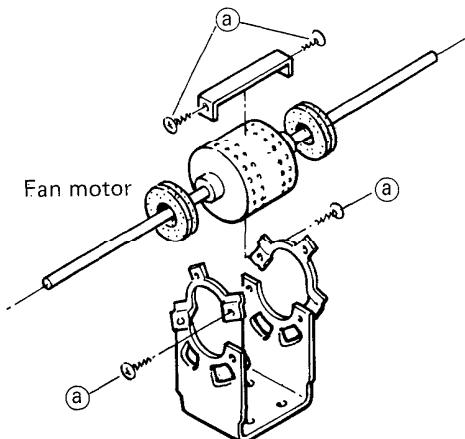


Fig. 10

9-4 Control Switch Unit – Removal

- 1) Remove the two knobs (1).
- 2) When the screwdriver (2) is inserted for about 1/8" into the notch of the control name plate (3) and raised to the front, the name plate can be removed. Fig. 11

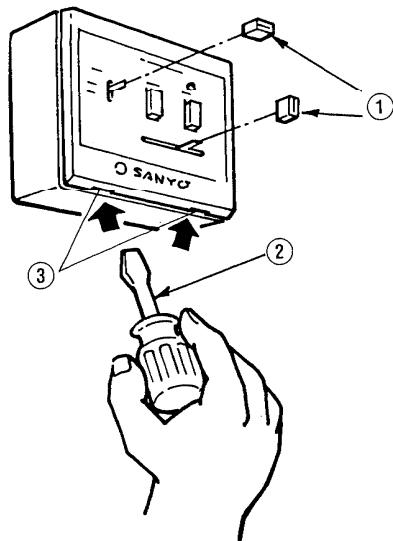


Fig. 11

- 3) When the four screws (a) are removed, the cover plate and the control switch PCB assembly can be separated from the box. The remote control unit can be checked in this condition.
- 4) For removal of the control switch PCB assembly, remove the connection of the lead wires (A) and remove the four screws (b). Fig. 12.

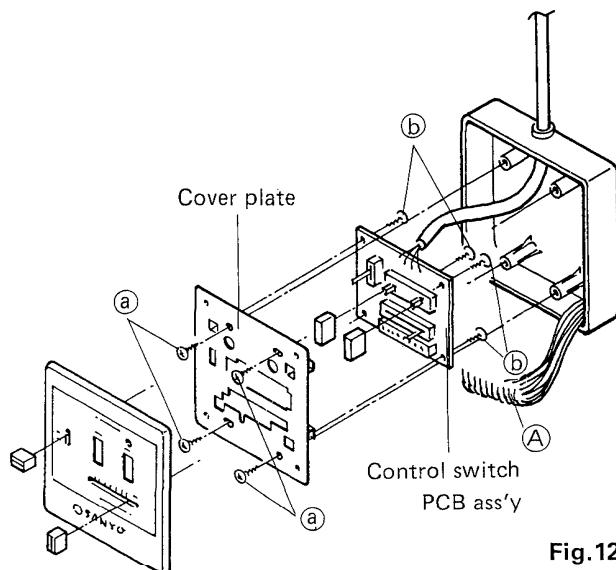


Fig. 12

9-5 Cabinet-Removal

- 1) Remove the outer panels in the order of front panel, side panel (A), and side panel (B).
- 2) Remove the cover plates (C) and (D).
- 3) Remove the mounting plate. Fig. 13

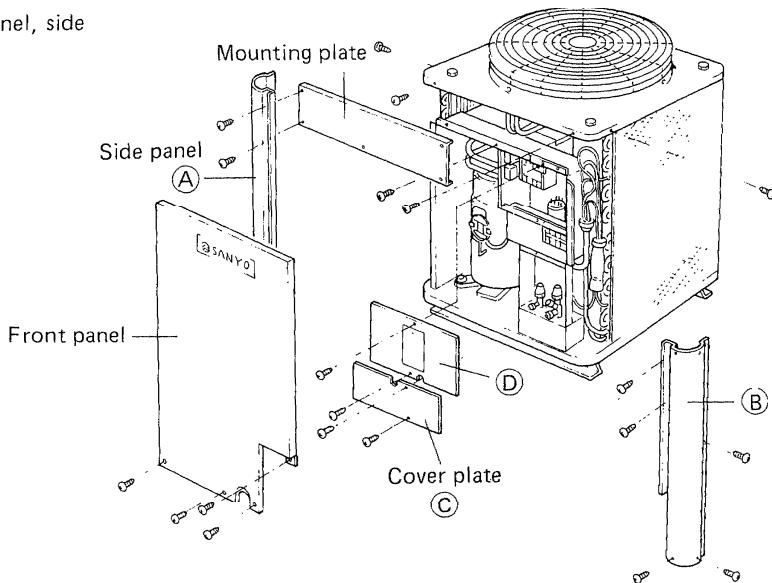


Fig. 13

9-6. Fan and Motor-Removal

- 1) Remove the guard first, and then remove two bolts (a) of the propeller fan to remove the propeller fan by lifting it up.
- 2) Remove the fan motor wire from the electrical component box, and remove the top cover with the fan motor fixed to the top cover. Fig. 14.

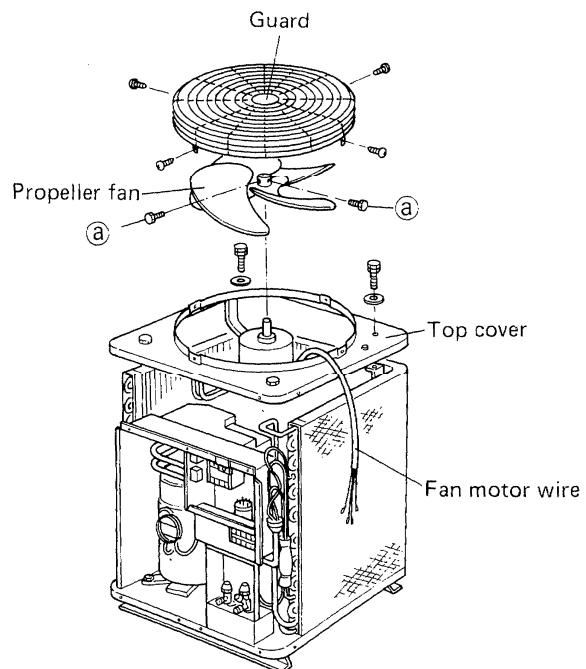


Fig. 14

9.7 Electrical Component Box – Removal

- 1) Remove the following wires from the electrical component box.
 - ① Compressor wire
 - ② Crankcase heater wire

- 2)
 - ① Remove the cover plate.
 - ② Loosen the fitting fixing the sensor and remove it.

- 3) Remove the high pressure switch from electrical component box.

- 4) When the above work has been completed, the electrical component box can be removed by removing the screw ③ Fig. 15

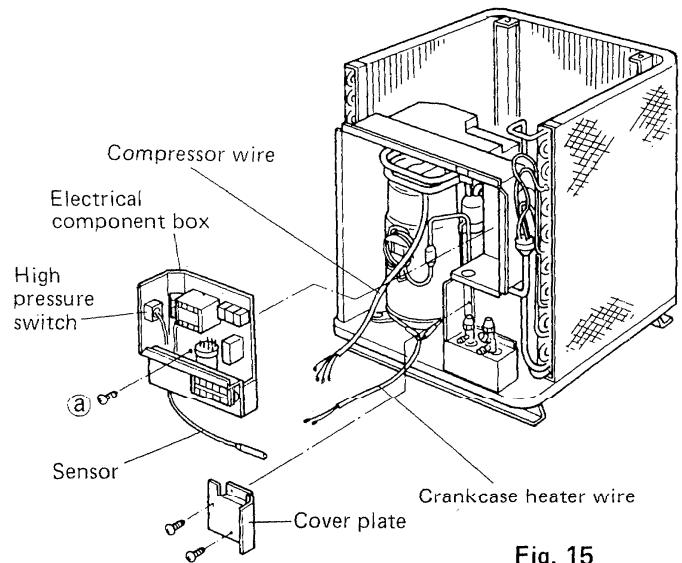


Fig. 15

- 5) 1. Disconnect wires from the high pressure switch.

2. Loosen one screw ④ and remove the high pressure switch from the electrical component box carefully. Fig. 15A

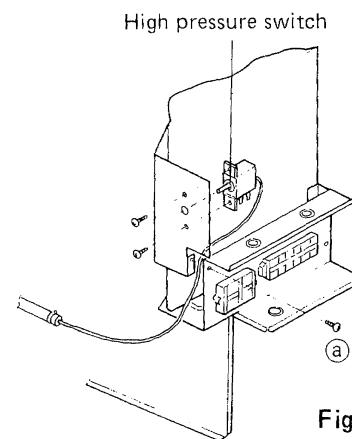


Fig. 15A

9.8 Compressor Cover – Removal

Remove the four screws fixing the cover and lift the cover to remove it. Fig. 16

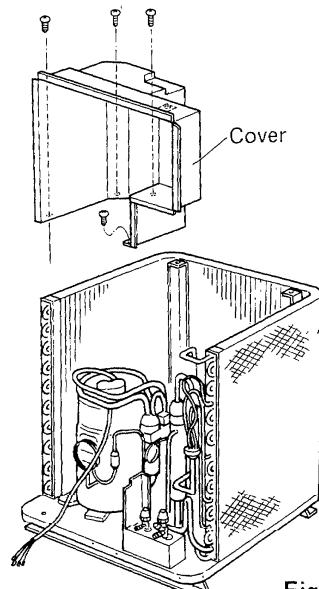


Fig. 16

9-9 Compressor — Removal

- 1) Use an oxyacetylene torch to cut the three places (A), (B), and (C) where the tubing is welded to the compressor.
- 2) Remove the three nuts (D) fixing the compressor, and raise the compressor to remove it. Fig. 17

[CAUTION]

As there are many places where wires must be removed, execute removal after checking against the electric diagram attached on the rear of the cover plate (D) (Fig. 13), and also refer to this electric diagram for reconnection after compressor exchange.

- 3) For the new service compressor, tubes are attached at the three points (A), (B) and (C) to prevent entry of dirt and moisture. At the time of exchange, connect the unit tubing after removing these tubes. Fig. 18

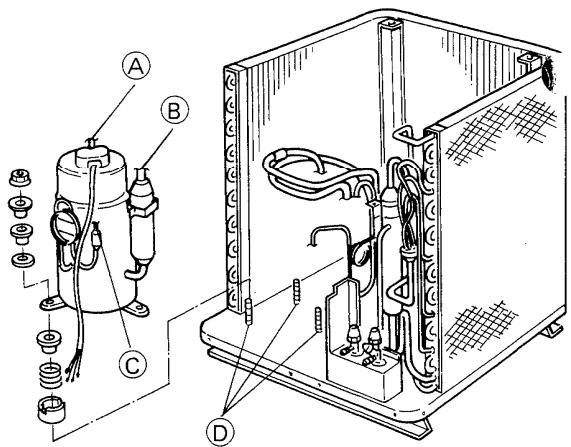


Fig. 17

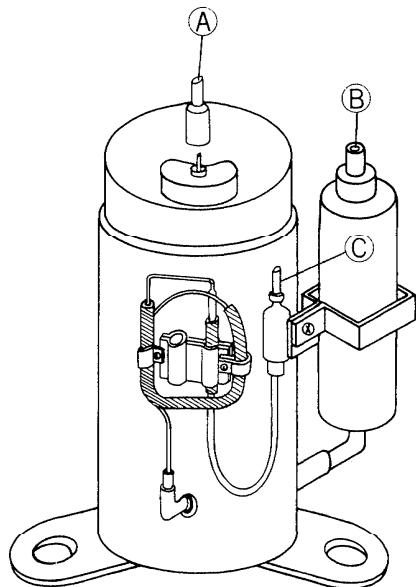


Fig. 18

CAUTION: Plastic material in a check valve or a 4-way reversing valve is weak against direct heat.

When brazing or unbrazeing across such parts, be sure to provide damp cloth over them and special care should be taken so as not to burn internal components.

9-10. Compressor Replacement

9-10-1. Tool List for Compressor Replacement

No.	Item	Q'ty	Remarks
1	Portable fire extinguisher	1	
2	Oxy-acetylene torch set	1	Prest-O-Lite Portable Outfit or equivalent
3	Torch lighter	1	
4	Oxweld goggles	1	
5	Brazing flux	1	
6	Soldering rod	1	
7	Vacuum pump (Capacity: 2 ~ 3 Cu-ft./min.)	1	Robinair or equivalent
8	Nitrogen gas (in 10 lbs. container)	1	
9	Refrigerant R22 (in 10 lbs. container)	1	
10	Refrigerant charging cylinder (5 lbs. or more)	1	
11	System analyzer valve set	1	Robinair, Imperial or equivalent "Robbi" thermistor vacuum gauge or equivalent
12	Vacuum gauge (Range 0 – 1000 microns)	1	
13	Charging hose W/ 1/4" fittings	5	
14	Charge fitting 1/4"	1	
15	Tube adapter 1/4"	1	
16	Pinch-off tool	1	
17	Diagonal cutting pliers	1	
18	Long-nose side cutting pliers	1	
19	Slip-joint pliers	1	
20	Torque wrench (340 lbs.)	1	
21	Tube cutter	1	Imperial or Rigid
22	Flaring tool	1	Rigid or equivalent
23	Swaging tool	1	
24	Combination file set	1	
25	Regular screwdriver 8"	1	
26	Phillips screwdriver 6"	1	
27	Adjustable wrench 10"	1	
28	Adjustable wrench 12 "	1	
29	Hex. nut driver (6mm)	1	(For compressor bolt)
30	Oil pan	1	
31	Liquid soap with a brush	1	
32	Clean moist cloth	1	

9-10-2. Safety Precautions

1. Make sure unit is disconnected from the power source while it is being assembled or disassembled for servicing.
2. Wear protective goggles at any time when brazing or unbrazeing.
3. Be sure to confirm system is at atmospheric pressure before using torch.
4. When brazing or unbrazeing tubes, never locate face or any other parts of the human body in direct line with the tubing opening.
5. Before commencing the trial run, be sure the unit is correctly wired and is grounded adequately when it is connected to the power.

9-10-3. Compressor Replacement Procedures

A. Separating the Outdoor Unit

In case the compressor malfunctions with a split type air conditioner under normal conditions, release the refrigerant gas at the location first and remove the tubing, then separate the outdoor unit. Pay special attention to ventilation if the place of installation is small.

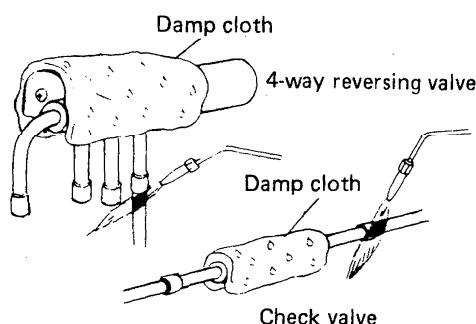
- 1) Make sure that the power is definitely turned OFF and remove the Access Panel "C" of the outdoor unit with power line and inter-unit line connectors. Remove wires from terminals within the electrical component box and wrap the ends of the wires separately with the insulating tape.
- 2) Place an oil pan at the under side of the service valves. Then remove the caps of the wide tube service valve and narrow tube service valve with an adjustable wrench.
- 3) Leave the wide tube service valve fully close by turning the spindle of the valve clockwise with a valve key or ratchet wrench. Close the narrow tube service valve in the same manner.
- 4) Apply two pairs of adjustable wrenches to the union of the wide tube service valve, then disconnect tubing from the outdoor unit.
- 5) Use an adjustable wrench and disconnect narrow tube from the outdoor unit.

The refrigerant gas will seep out from the indoor unit as well as the tubing.

- 6) Seal the ends of the tubing so that no moisture or dust to enter.
- 7) Gradually open the narrow tube service valve and release the remaining refrigerant.
- 8) Open the wide tube service valve and release the remaining refrigerant.
- 9) Finally leave the wide tube service valve and narrow tube service valve fully open.
- 10) Clean the oil that has spread around the periphery.
- 11) Keep the separated outdoor unit in an upright position and carry it to the service station.

CAUTION: Plastic material in a check valve or a 4-way reversing valve is weak against direct heat.

When brazing or unbrazing across such parts, be sure to provide damp cloth over them and special care should be taken so as not to burn internal components.



B. Removing the Old Compressor

CAUTION :

Always wear welder's goggles when heating the tubing with a torch and make sure not to get too close to the opening of the tubing. Furthermore, pay special attention to the position of the torch flame so as not to burn the compressor terminals.

- 1) The outdoor unit carried into the service shop may have some refrigerant gas remaining within it. Therefore, make sure that both wide tube service valve and narrow tube service valve are fully open.
- 2) Remove the cabinet according to the disassembly procedure of the outdoor unit. Refer to Page 52. Furthermore remove the terminal cover at the top of the compressor and remove the wiring of the overload relay and the compressor terminal, Fig. 19.
- 3) Set aside an Oxy-Acetylene torch which is needed for removing the tubing of the compressor.
- 4) Confirm that system has reached atmospheric pressure.
- 5) With an Oxy-Acetylne torch apply heat uniformly and unbraze the joints of upper section of the Liquid Injection Capillary tube to the compressor, the upper section of the accumulator and the upper section of the compressor discharge tube respectively, and pull them free with pliers. Fig. 18A shows unbrazing points with arrows.

* Be sure to save all mounting components with the replacement compressor for future use. Fig. 20

- 6) To remove the compressor, raise it straight and disengage from the base unit.

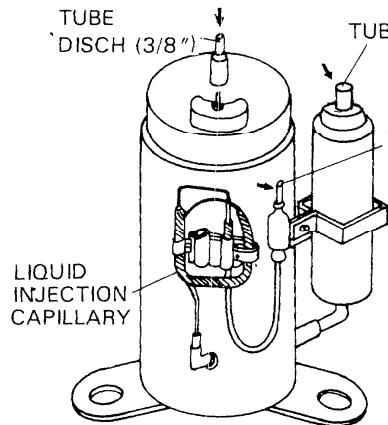


Fig. 18A

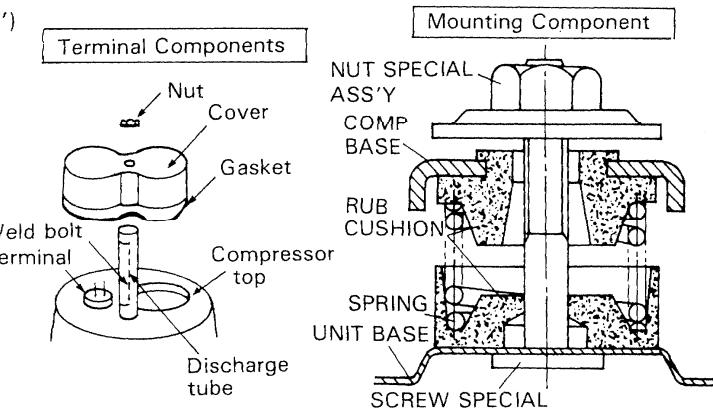


Fig. 19

Fig. 20

IMPORTANT NOTICE

Before installing the new compressor, check for possible system contamination by the following procedure:

- Place about 10 cc of the oil from the old compressor into a transparent container and visually check the degree of oil contamination. If the oil has a slight burnt odor but no color change or residue, an ordinary compressor replacement according to the instructions below may be carried out.
- If the oil has a burnt pungent odor and shows contamination (dark color with tiny particles of metal) the system must be cleaned sufficiently with a suction filter or a drier-strainer and then replace the oil drier with a new one.
- However, if just the compressor is replaced without sufficient system cleaning, contaminated oil may cause the burning of the compressor again.
- If the oil compressor is to be scrapped, by pinching the terminal section with a pair of pliers, there should not be any chance of it being mistakenly used.

C. Installing a New Compressor

1. Make sure that the defective old compressor has been removed and the new compressor to be installed is of the same specification by checking the 8 digit code number on stamped marking on the upper section of the compressor helmet case. (e.g.: 80658946) For the detail of the compressor identification refer to page. 5.
2. Transfer the mounting parts to the new compressor.
3. Nick the end of the pinched suction tube of the new compressor with a pincher and release the holding charge (Nitrogen: 29 psig).
4. With an Oxy-acetylene torch and pliers, unbake compressor seals at both discharge port and suction port (upper part of the accumlator).

CAUTION :

Be careful of the position of the torch so as not to burn the terminals of the compressor when brazing or unbrazeing.

5. Install the new compressor in exactly the same manner as the original compressor.
(* See CAUTION bottom of this page.)
6. Shape both the suction and discharge lines to the approx. area of the compressor fittings and engage each tube end to the mating compressor fitting.
7. Hold tubing securely with pliers and braze all connections carefully with the torch.
8. Perform leak testing, evacuation, and charging refrigerant according to procedures described in section 9-11. page. 59

CAUTION

* If the old compressor was heavily contaminated, be sure to replace strainer (or drier) when replacing the new compressor.

9-11. Leak Testing, Evacuation and Charging

9-11-1. Required Tools and System Set Up

No.	Item	Q'ty
1)	Vacuum pump	1
2)	Vacuum gauge	1
3)	System analyzer valve set	1
4)	Charging hose (With 1/4" connector)	6
5)	1/4" Flared tube cross fitting	1
6)	Charging Cylinder	1
7)	1/4" Flared Packless valve (To be used for V3, V4 and V5)	3

* One of conventional system set up and procedure for leak testing, evacuation and charging is described in section 9-11 for the reference.

** Robinair or Imperial Portable Charging Station may be used as a convenient packaged tool for the purpose of servicing the refrigerant system.

9-11-2. Leak Testing the System

After replacement of the new compressor, the system must be checked for leaks according to the below mentioned procedure:

- * If cylinder has not yet been filled, move at least one pound of refrigerant (R22) to the charging cylinder. Fig. 21
- 1) Prepare the system analyzer valve set and connect charging hoses as in Fig. 22. Be sure to close all valves before connection.
- 2) Confirm that both Narrow Tube and Wide Tube service valves on the outdoor unit **V6** and **V7** are opened halfway, and other valves are still closed.
- 3) Open valves **V8**, **V4** and **V2** respectively to allow refrigerant gas entering into the system. Fill gas to the system and close **V2**, **V4** and **V8** in sequence.
- 4) Apply liquid soap at:
 - Charge hose connectors,
 - Discharge and suction tubes,
 - Brazed liquid injection capillary section of the replaced compressor or other connection parts.
 Check to see change of bubbles.
 An electronic halogen gas leak detector of course, may be used for this purpose.
- 5) When leaks are located, depressurize system and repair leaks.
- 6) If there are no leaks, open **V1**, purge all gases of the system and proceed for evacuation in section 9-11-3. Refer to page 60.

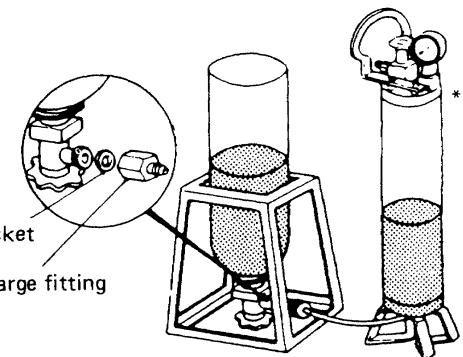


Fig. 21

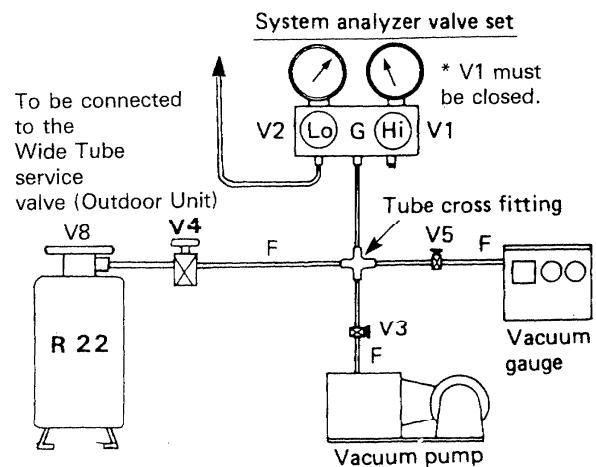


Fig. 22

9-11-3. Evacuation

- 1) Connect instrument as in Fig. 23.
 - 2) Confirm that all connections are made correctly and check all valves are closed. * **V6** and **V7** should be opened halfway.
 - 3) Open **V2** only.
 - 4) Open **V3** and **V5**. Never fail to open the shut off valve on the vacuum pump if there is.
 - 5) Run the vacuum pump for evacuation. Required time for complete evacuation differs with capacity of the pump. (Consult shop manual for specifications.)
- * While system is evacuating, utilize this time to fill the charging cylinder, if it is not ready.
- 6) If vacuum gauge reading has reached 500 microns or less, stop the vacuum pump and close **V3**.
 - 7) Keep this condition at least 5 minutes and observe the vacuum gauge for change. (Fig. 24)
If pointer on the gauge moves to larger numbers, check system for leaks again according to the procedure in section 9-11-2. Page 59.
 - 8) If the indication of the vacuum gauge will not change, system is now prepared for charging refrigerant. Close **V5**.
 - 9) Proceed to charging refrigerant in section 9-11-4. Page 61.

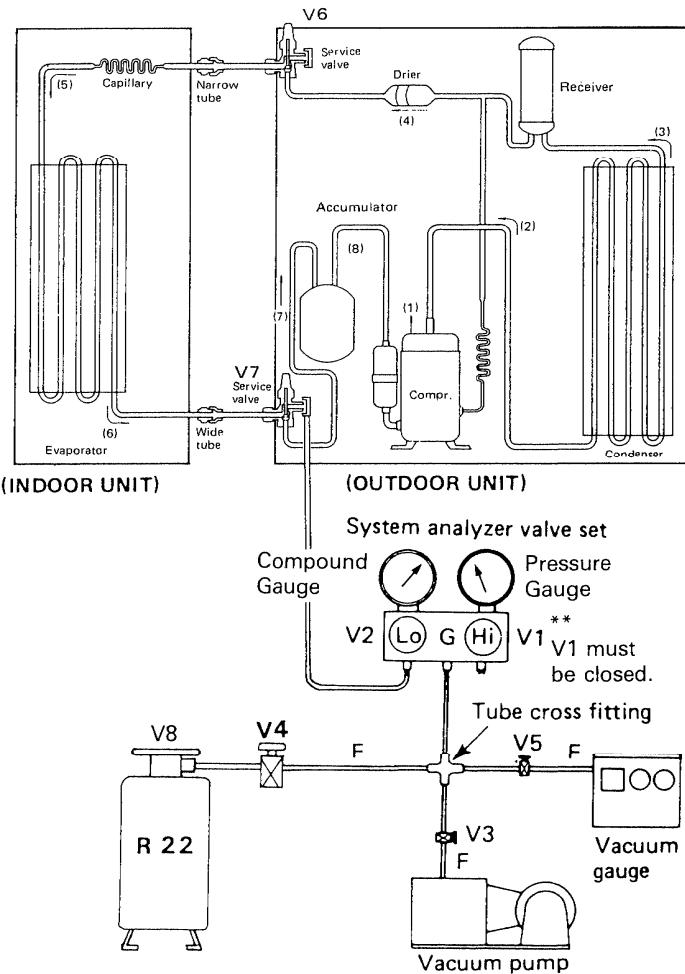


Fig. 23

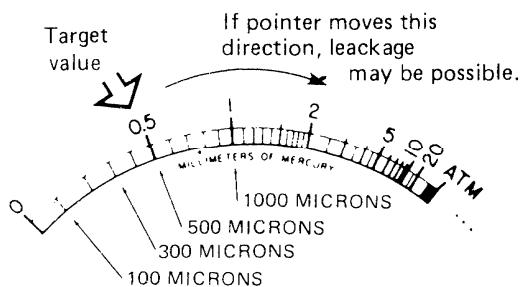
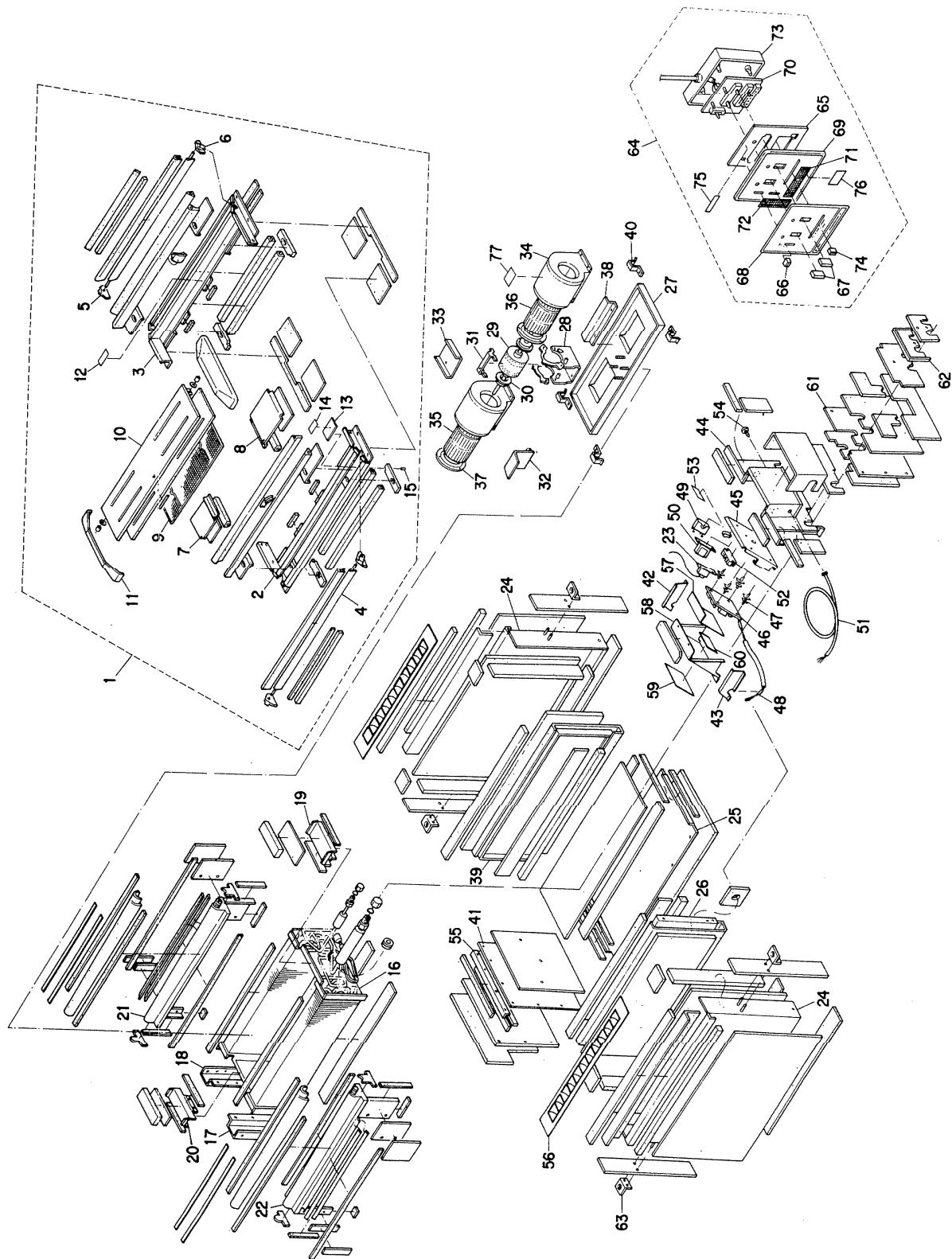


Fig. 24

10. PARTS LIST

SAP361R
INDOOR UNIT



A T T E N T I O N !

To ensure correct parts supply, please let us know followings,
 when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
1	859-341-35	Panel Ass'y SAP-361RW	1
2	854-0-1105-232H3	Top Plate Ass'y	1
3	854-0-1105-220H4	Top Plate Ass'y	1
4	854-0-1505-180H2	Blade Louver Ass'y	2
5	851-2-1521-11300	Mounting Rubber, Blade	2
6	854-2-1521-11400	Mounting Rubber, Blade	2
7	854-2-1133-193H2	Cover Plate Ass'y	1
8	854-2-1133-194H2	Cover Plate Ass'y	1
9	854-0-2308-24000	Air Filter Ass'y	1
10	343-0-1101-229H2	Top Panel Ass'y	1
11	854-2-1114-10713	Cap, Top Panel	2
12	854-6-4729-57400	Label	1
13	852-2-1504-16414	Badge	1
14	854-2-1301-25001	Ornament	1
15	852-2-1314-11901	Stopper	2
16	854-0-4118-43201	Evaporator Ass'y	1
17	854-2-4134-31501	Mounting Plate	1
18	854-2-4134-31601	Mounting Plate	1
19	854-0-2301-300H0	Drain Pan Ass'y	1
20	854-0-2301-301H0	Drain Pan Ass'y	1
21	854-0-2301-306H2	Drain Pan Ass'y	1
22	854-0-2301-307H2	Drain Pan Ass'y	1
23	4-2339-56226	Thermostat RTB-4U302	1
24	854-0-1102-199H2	Side Panel Ass'y	2
25	854-0-1105-193H2	Top Plate Ass'y	1
26	854-2-2314-190H2	Partition Plate Ass'y	1
27	854-0-2516-12901	Partition Plate Ass'y, Blower	1
28	854-0-2511-15401	Support Motor Ass'y	1
29	851-0-5290-874M1	Fan Motor Ass'y KFG4S-121A6P	1
30	854-2-2534-13510	Cushion Rubber	2
31	854-2-2518-28700	Mounting Plate	1
32	854-2-2307-12401	Cover Plate, Fan Motor	1
33	854-2-2307-11901	Cover Plate, Fan Motor	1
34	854-0-2502-17801	Fan Casing Ass'y	2
35	854-0-2501-14500	Centrifugal Fan Ass'y	1
36	854-0-2501-14600	Centrifugal Fan Ass'y	1
37	854-2-2519-11400	Air Guide	2
38	854-2-2360-41501	Mounting Plate	1
39	854-2-2314-189H2	Partition Plate Ass'y	1
40	854-2-2352-12300	Guide	4
41	854-2-1102-275H2	Side Panel Ass'y	1
42	854-2-5301-49401	Elec. Component Box	1
43	854-2-5301-49501	Elec. Component Box	1
44	854-0-5301-335H1	Elec. Component Box Ass'y	1
45	854-0-5301-33701	Elec. Component Box Ass'y	1
46	851-0-5158-18500	Controller Ass'y POW-36R	1
47	851-2-5366-01400	Spacer	4
48	851-0-5290-874T1	Thermistor Ass'y OCS5K-UL	1
49	4-2239-56222	Fixed Capacitor 440V 4MFD	1
50	851-0-5290-874P1	Transformer Ass'y ATR-J122U	1

NOTE: Metal and plastic parts will be supplied basically with necessary heat insulation pads or packing.

A T T E N T I O N !

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No.
2. Description
3. Q'ty
4. Volts-Hz-Ph
5. Product Model No.

Key No.	Part No.	Description	Q'ty
51	851-0-5292-14600	Remote Control Cable	1
52	4-2379-56168	Terminal Base JTU20-3	1
53	852-6-4729-17300	Label	1
54	852-2-2396-10103	Screw Special (EARTH)	1
55	854-0-1306-177H2	Mounting Plate Ass'y	1
56	854-2-1110-14201	Blade Louver	2
57	854-2-5304-26601	Cover Plate	1
58	854-2-5304-265H1	Cover Plate Ass'y	1
59	854-2-1358-46700	Label	1
60	851-2-5251-01900	Elec. Wiring Diagram	1
61	854-2-1101-450H2	Front Panel Ass'y	1
62	854-2-1133-181H3	Cover Plate Ass'y	1
63	854-2-1130-12200	Mounting Plate	4
64	851-0-0051-17600	Remote Control Unit Ass'y RCS-36R	1
65	854-0-5302-14201	Mounting Plate Ass'y, Switch	1
66	854-2-1311-12002	Knob	1
67	854-2-1311-10904	Knob	2
68	854-2-1359-21702	Indicator Plate	1
69	854-2-5304-28100	Cover Plate	1
70	851-0-5158-23900	Control Switch PCB Ass'y	1
71	800-2-5367-11300	Filter	1
72	800-2-5367-11600	Filter	1
73	854-2-5301-44711	Elec. Component Box	1
74	854-2-1311-12401	Knob	1
75	851-2-5261-27800	Label	1
76	851-2-5261-26600	Label	1
77	854-2-1367-51400	Name Plate	1
●	854-6-4119-43500	Operation Manual	1
●	854-6-4139-40200	Installation Instructions	1

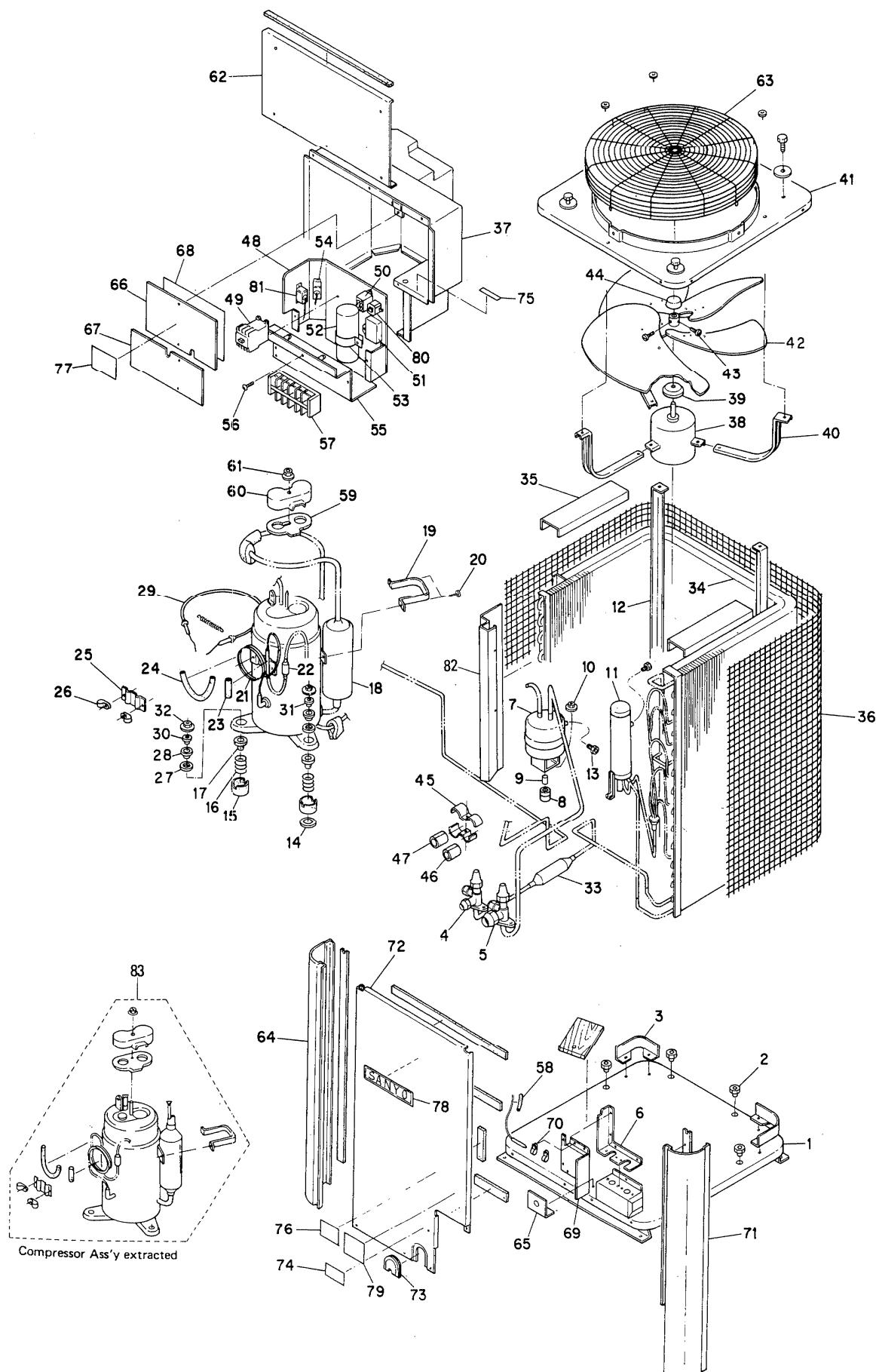
NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

■ Accessory Parts

LIST OF PACKAGED PARTS

SAP361R

Description	Shape	Q'ty	Parts No.	Description	Shape	Q'ty	Parts No.
PVC elbow		1	854 2 2334 12300	Drain hose adaptor		1	854 2 2334 13600
PVC T-fitting		1	854 2 2334 12200	Flanged hex nut		4	854 0 1355 10201
PVC pipe		4	854 2 2334 12400	Special washer		4	854 2 1355 13101
PVC socket		2	854 2 2334 12100	Remote control unit		1	851 0 0051 17600
Pan-head screw	M5	4	3 9231 54003	Lead wire for remote control unit		1	851 0 5292 14600
Countersunk-head wood screw		2	3 9261 21301				



A T T E N T I O N !

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
1	854-0-2204-36101	Bottom Plate Ass'y	1
2	854-2-1353-11000	Sheet Rubber	4
3	854-2-2360-19100	Mounting Plate	2
4	854-0-4504-13300	Valve Ass'y 3/8 in.	1
5	854-0-4507-15400	Valve Ass'y 3/4 in.	1
6	854-2-1133-17501	Cover Plate	1
7	854-0-4517-19201	Accumulator Ass'y	1
8	854-2-2318-10600	Cushion Rubber	1
9	831-2-4307-10100	Sleeve	1
10	851-0-2395-10501	Nut Special Ass'y	1
11	854-0-4110-15501	Receiver Tank Ass'y	1
12	854-0-2206-18200	Frame Ass'y	2
13	854-2-4306-10600	Fusible Plug	2
14	3-9022-01000	Washer	1
15	851-2-2390-14000	Cushion Rubber	3
16	851-2-2330-13201	Spring	3
17	854-2-2356-10500	Protection Rubber	3
18	854-0-4517-19100	Accumulator Ass'y	1
19	851-2-2356-16901	Band Mounting	1
20	852-2-2396-11001	Screw Special	1
21	854-2-4219-58100	Capillary Tube	1
22	852-0-4506-14000	Strainer Ass'y	1
23	852-2-2353-19500	Packing	1
24	853-2-4310-10300	Mounting Rubber, Capillary	1
25	852-2-2309-34101	Mounting Plate	1
26	3-9030-00508	Clamper F-6	2
27	854-2-2356-10600	Protection Rubber	3
28	854-2-2349-12201	Spacer	3
29	851-0-5290-857H1	Heater Ass'y CH5700 230V 30W	1
30	854-2-2356-10400	Protection Rubber	2
31	854-2-2356-10700	Protection Rubber	1
32	854-0-2321-10201	Nut Special Ass'y	3
33	852-0-4505-11100	Dehydrater Ass'y	1
34	854-0-4118-42900	Condenser Ass'y	1
35	854-2-2360-18900	Mounting Plate	2
36	854-2-1113-11700	Guard	1
37	854-0-2325-17500	Cover Ass'y	1
38	851-0-5290-857M1	Fan Motor Ass'y KFC6S-161A6P	1
39	852-2-2514-10700	Cover Rubber	1
40	854-0-2511-14401	Support Motor Ass'y	3
41	854-0-1106-20201	Top Cover Ass'y	1
42	854-0-2501-18900	Propeller Fan Ass'y	1
43	854-2-2529-10101	Set Screw, blower S45C M6 L16	2
44	854-2-2346-11400	Cap	1
45	854-2-4316-12600	Mounting Plate, Tube	2
46	854-2-4315-13200	Mounting Rubber, Tube	1
47	854-2-4315-16000	Mounting Rubber, Tube	1
48	854-0-5301-36901	Elec. Component Box Ass'y	1
49	4-2329-56318	Relay HE-A21	1
50	4-2329-56287	Relay MY2F-T1-USTS	1

NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

ATTENTION !

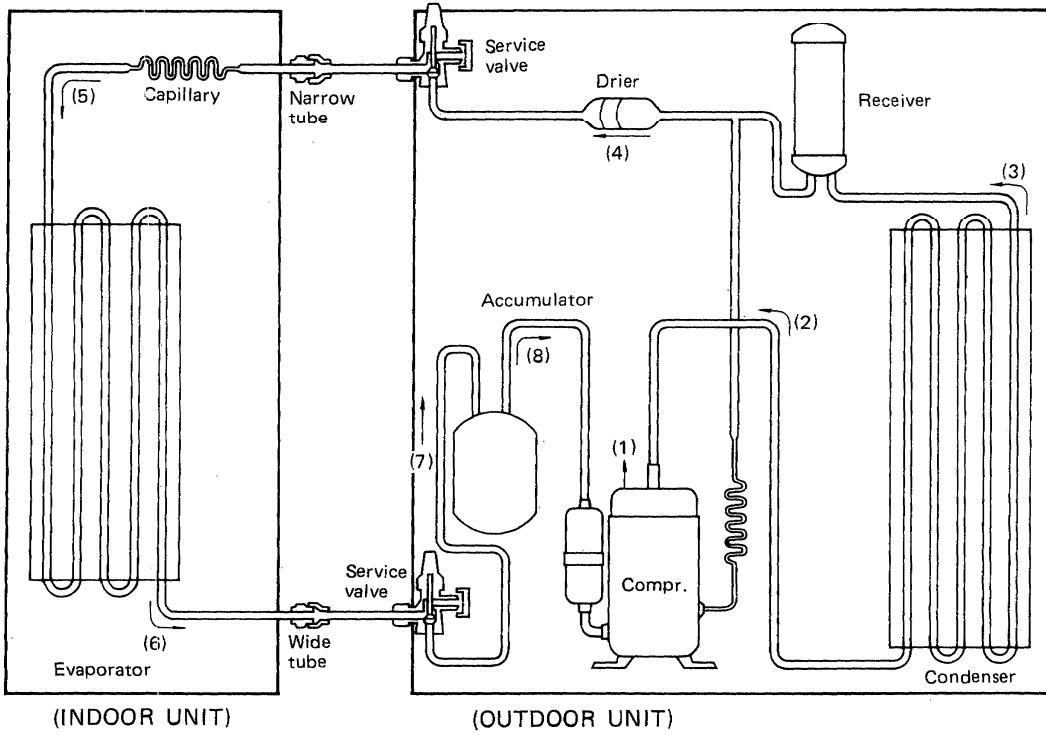
To ensure correct parts supply, please let us know followings,
 when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
51	4-2239-56222	Fixed Capacitor 440V 4MFD	1
52	4-2239-56381	Fixed Capacitor 370V 40MFD	1
53	854-2-5312-45200	Mounting Plate	1
54	4-2339-56195	Thermostat YTB-4U201F	1
55	854-0-5301-37001	Elec. Component Box Ass'y	1
56	852-2-2396-10103	Screw Special (EARTH)	1
57	4-2379-56175	Terminal Base JTU30-6	1
58	854-2-4310-10100	Mounting Rubber, Thermostat	1
59	801-2-5303-13100	Gasket Terminal	1
60	801-2-6194-12100	Cover Terminal	1
61	819-2-6919-10100	Nut, Compressor (INCH)	1
62	854-2-2208-226H1	Mounting Plate Ass'y	1
63	854-0-1113-13801	Guard Ass'y	1
64	854-0-1102-243H1	Side Panel Ass'y Left	1
65	854-2-2360-26801	Mounting Plate	1
66	854-2-5304-29400	Cover Plate	1
67	854-2-5304-29500	Cover Plate	1
68	851-2-5251-02500	Elec. Wiring Diagram	1
69	854-2-1133-20101	Cover Plate	1
70	3-9030-00506	Clamper F-4	2
71	854-0-1102-244H1	Side Panel Ass'y	1
72	854-0-1101-315H1	Front Panel Ass'y	1
73	852-2-1320-10500	Eyelet Rubber	1
74	854-6-4729-74900	Label	1
75	852-6-4729-17300	Label	1
76	854-6-4729-71600	Label	1
77	854-2-1358-46700	Label	1
78	854-2-1354-14301	Badge	1
79	854-2-1367-51300	Name Plate	1
80	4-2049-60102	Thermistor TDK 101YV	1
81	4-2319-56254	Switch FTB-2UC01	1
82	854-2-4134-34300	Mounting Plate	1
83	852-0-4516-16300	Compressor Ass'y	1

NOTE: Metal and plastic parts will be supplied basically with necessary heat insulation pads or packing.

11. REFRIGERANT FLOW DIAGRAM

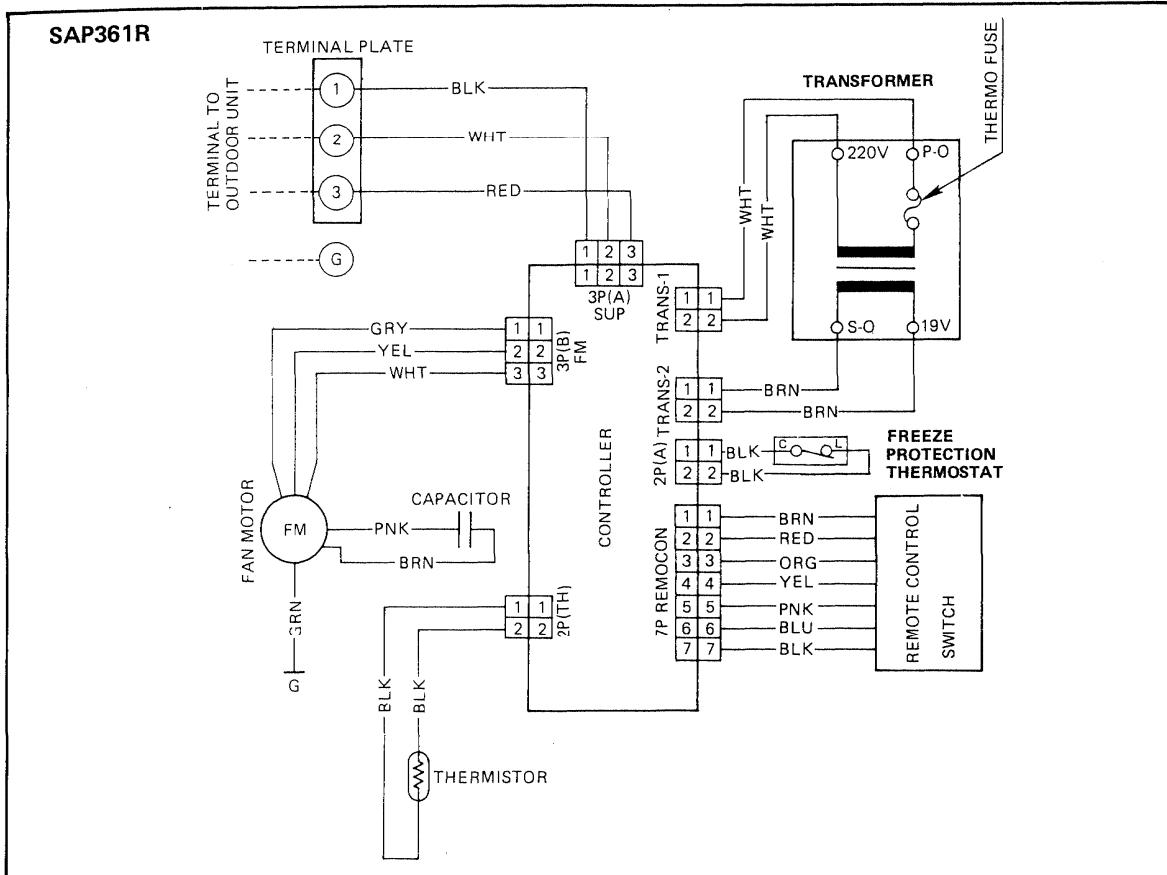


NOTE:

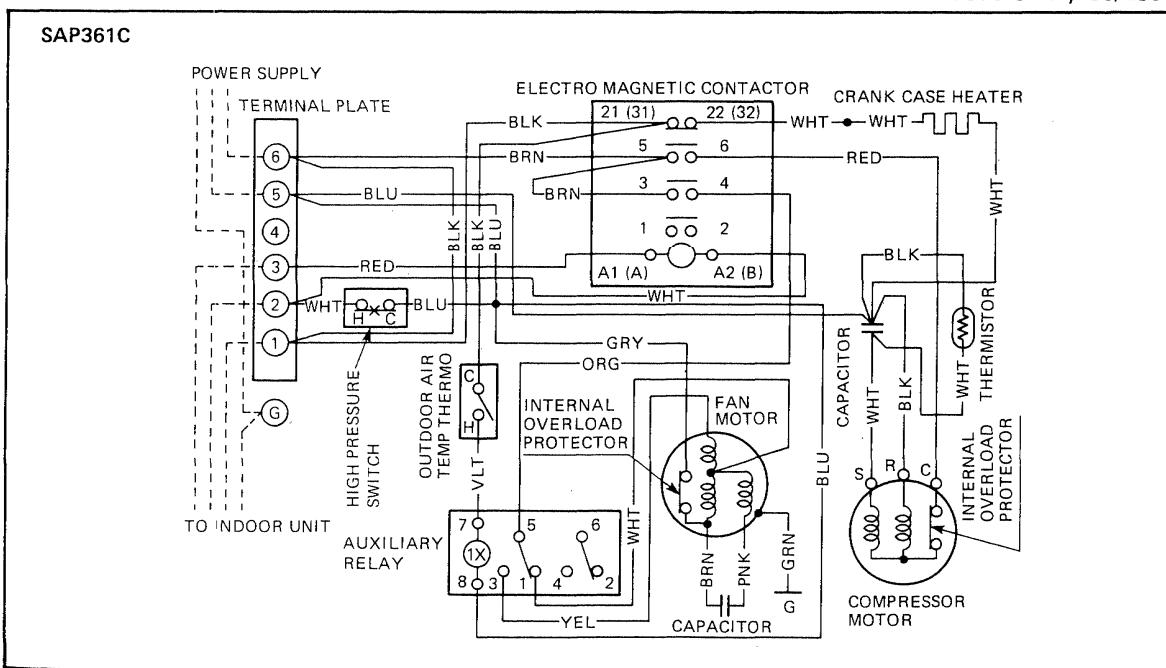
→ with sequential number shows flow of refrigerant in COOLING CYCLE.

12. ELECTRIC WIRING DIAGRAM

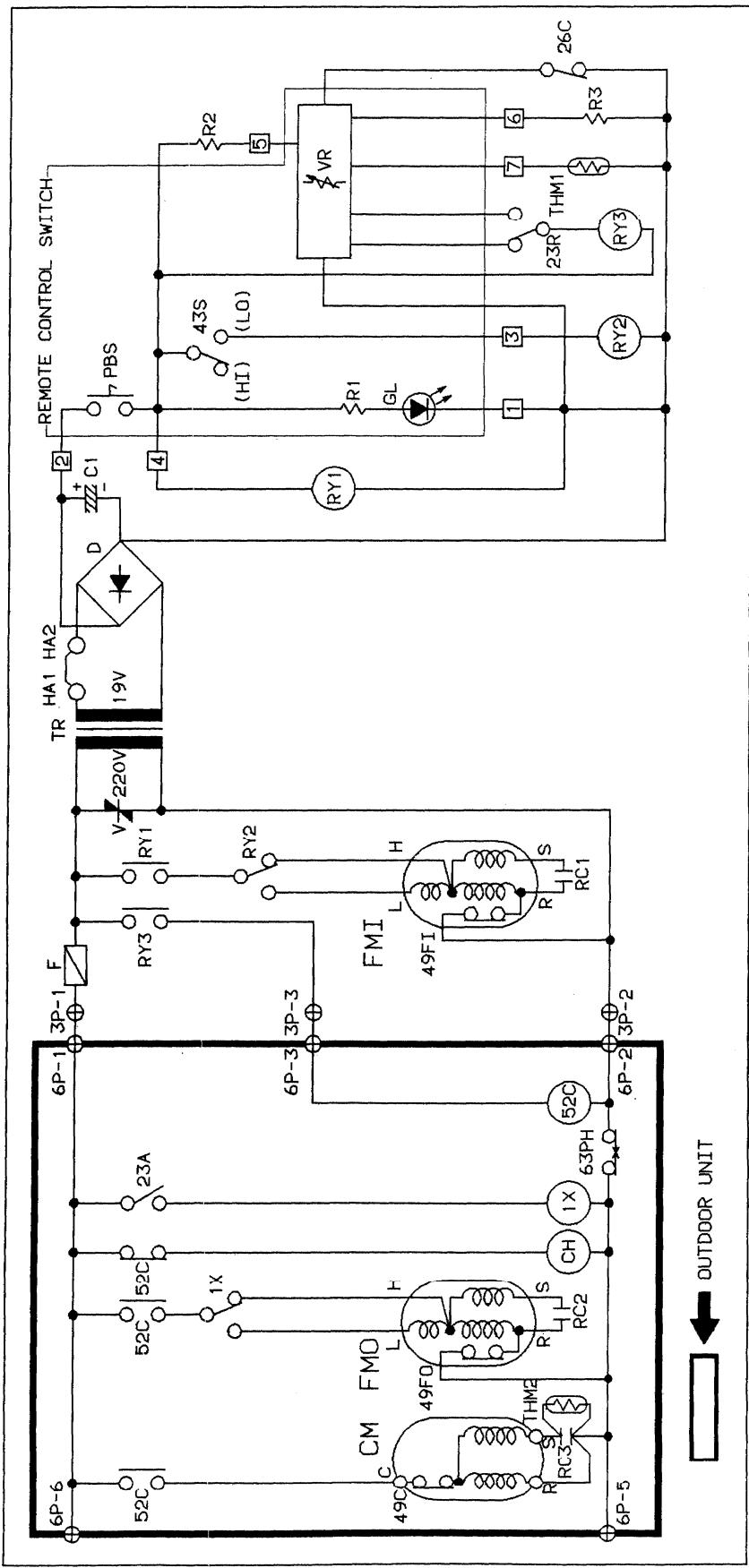
Indoor Unit: SAP361R 60Hz, 230/208V



Outdoor Unit: SAP361C 60Hz, 230/208V

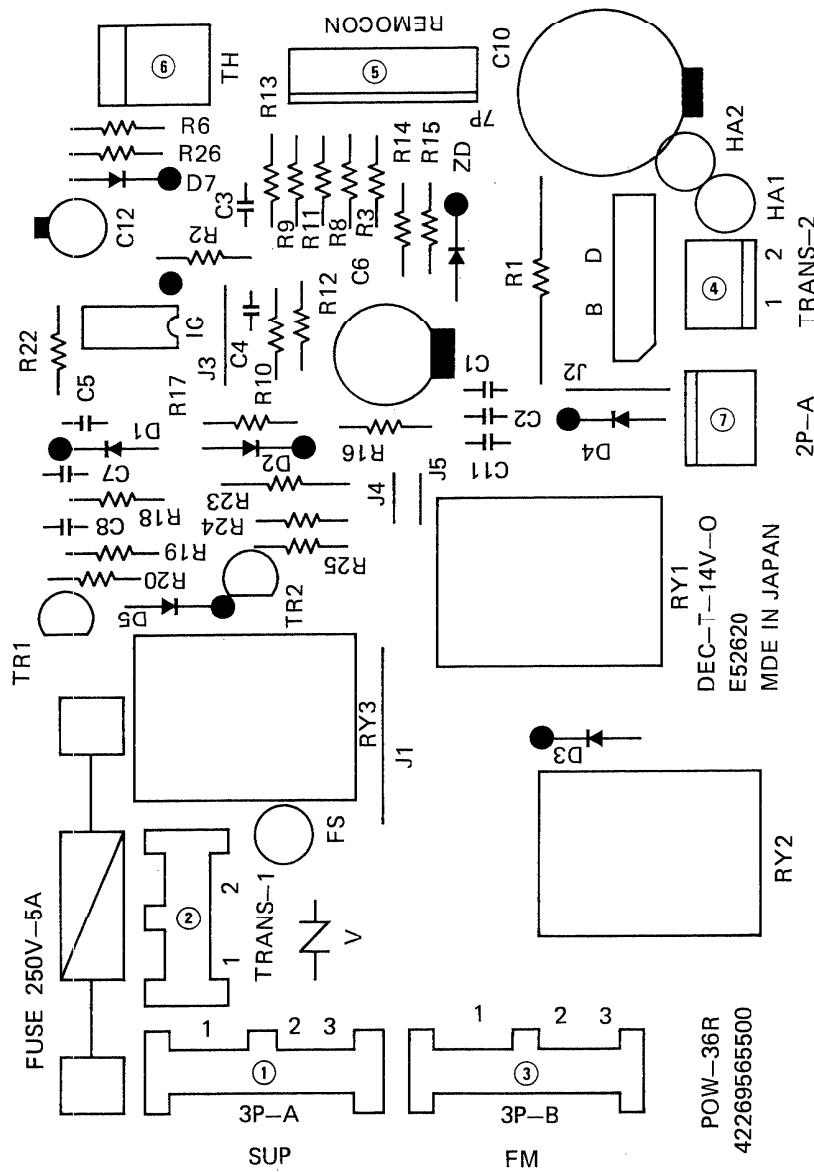


SAP361R SCHEMATIC DIAGRAM



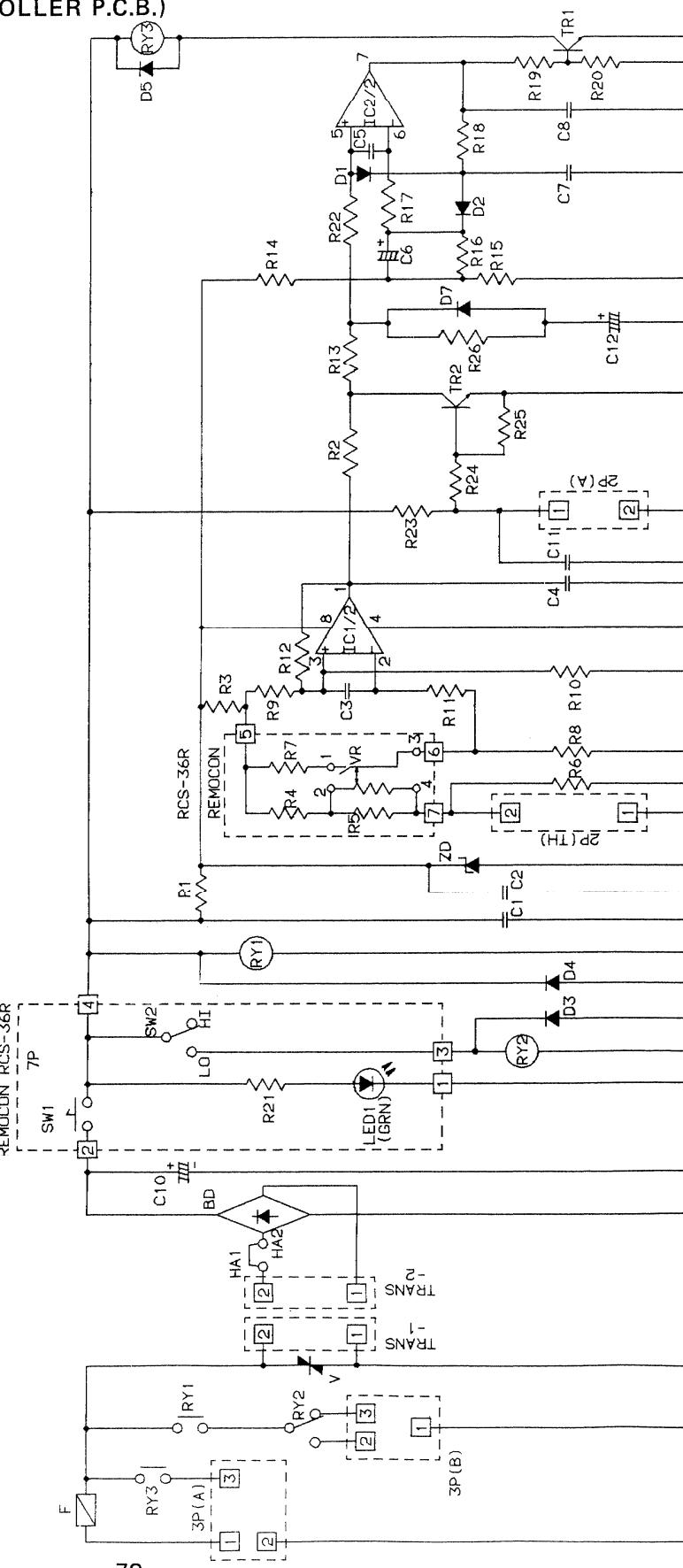
SYMBOL	PARTS NAME	SYMBOL	PARTS NAME
CM	COMPRESSOR MOTOR	TR	TRANSFORMER
FMI	INDOOR FAN MOTOR	C1	CAPACITOR
FMO	OUTDOOR FAN MOTOR	V	VARISTOR
52C	COMPRESSOR MOTOR MAGNETIC CONTACTOR	F	FUSE
1X	AUXILIARY RELAY	D	DIODE
RY1, RY2, RY3	AUXILIARY RELAY	THM1, THM2	THERMISTOR
49C	CM INTERNAL OVERLOAD PROTECTOR	PBS	PUSH BUTTON SWITCH
49FO	FMI INTERNAL OVERLOAD PROTECTOR	43S	FAN SPEED SELECTOR SWITCH
CH	FMO INTERNAL OVERLOAD PROTECTOR	VR	VARIABLE RESISTOR
RC1, RC2, RC3	CRANK CASE HEATER	R1, R2, R3	RESISTOR
23A	CAPACITOR	GL	INDICATOR LAMP
63PH	FREEZE PROTECTION THERMOSTAT	26C	FREEZE PROTECTION THERMOSTAT
	HIGH PRESSURE SWITCH		ROOM THERMOSTAT

CONTROLLER P.C.B. (PRINTED PATTERN)
POW-36R (For SAP361R)



ELECTRIC WIRING DIAGRAM (CONTROLLER P.C.B.)
POW-36R (For SAP361R)

Mark	Material	Specifications	Mark	Material	Specifications	Mark	Material	Specifications
R1	Resistor	2W 680Ω	R22	Resistor	1/4W 2.2kΩ±5%	D7	Diode	DS442X
R2	Resistor	1/4W 10kΩ±5%	R23	Resistor	1W 1.8kΩ	TR1	Transistor	2SC536K(NP E OR F
R3	Resistor	1/4W 12kΩ±5%	R24	Resistor	1/4W 12kΩ±5%	TR2	Transistor	2SC536K(NP E OR F
R4	—	—	R25	Resistor	1/4W 2kΩ±5%	HA1	Connector	AMP 170338-1
R5	—	—	R26	Resistor	1/4W 12kΩ±5%	HA2	Connector	AMP 170338-1
R6	Resistor	1/4W 18kΩ±1%	BD	Diode	DBA-10C	RY1	Relay	LZG-24HE DC24V
R7	—	—	C1	Capacitor	50V 0.022μF	RY2	Relay	LZG-24HE DC24V
R8	Resistor	1/4W 560Ω±5%	C2	Capacitor	50V 0.022μF	RY3	Relay	LZG-24HE DC24V
R9	Resistor	1/4W 2.94kΩ±1%	C3	Capacitor	50V 0.022μF	V	Varistor	SNR-A420K
R10	Resistor	1/4W 3kΩ±1%	C4	Capacitor	50V 0.022μF	F	Fuse	250V 5A
R11	Resistor	1/4W 10kΩ±1%	C5	Capacitor	50V 0.022μF	TRANS-1	Connector	PLUG UL TLEX (BLK)
R12	Resistor	1/4W 910kΩ±1%	C6	Capacitor	10V 330μF	TRANS-2	Connector	PLUG SL156
R13	Resistor	1/4W 11kΩ±5%	C7	Capacitor	50V 0.22μF	3P (A)	Connector	PLUG UL TLEX (BLK)
R14	Resistor	1/4W 10kΩ±5%	C8	Capacitor	50V 0.022μF	3P (B)	Connector	PLUG UL TLEX (RED)
R15	Resistor	1/4W 2kΩ±5%	C10	Capacitor	50V 4.7μF	2P (A)	Connector	PLUG 5273-02A-BL
R16	Resistor	1/4W 220Ω±2.5%	C11	Capacitor	50V 0.022μF	2P (TH)	Connector	PLUG 5273-02A
R17	Resistor	1/4W 10kΩ±5%	C12	Capacitor	16V 4.7μF	JP	Connector	PLUG EI
R18	Resistor	1/4W 4.3kΩ±5%	ZD	Zener Diode	GZA-12L	IC	IC	LA6358
R19	Resistor	1/4W 6.8kΩ±5%	D1	Diode	DS-442X	D4	Diode	DS-442X
R20	Resistor	1/4W 2.2kΩ±5%	D2	Diode	DS-442X	D5	Diode	DS-442X
R21	—	—	D3	Diode	DS-442X			





Sanyo Electric Inc.
200 Riser Road, Little Ferry, New Jersey 07643
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