



# **INSTALLATION & OPERATING INSTRUCTIONS**

## **CARAVAN ROOF MOUNT AIR CONDITIONER**

**1 MODEL CAL136.301**



**IMPORTANT INSTRUCTIONS  
MUST STAY WITH UNIT  
OWNER — READ CAREFULLY**

### **WARNING**

THIS UNIT MUST BE SERVICED BY AN AUTHORIZED SERVICEMAN. MODIFICATION OF THE APPLIANCE CAN BE EXTREMELY HAZARDOUS AND COULD LEAD TO SERIOUS INJURY OR DEATH.

# 1. GENERAL INFORMATION

## SPECIFICATIONS

|                       |                                                  |      |
|-----------------------|--------------------------------------------------|------|
| Cycles                | 50                                               | 60   |
| Nominal Capacity (KW) | 3.1                                              | 3.8  |
| Electrical Rating     | 100V.; 50/60 Hz.; 1ø                             |      |
| FL Amps (Compressor)  | 12.6                                             | 12.8 |
| FL Amps (Motor)       | 3.4                                              | 3.6  |
| LR Amps (Compressor)  | 71.0                                             | 66.0 |
| LR Amps (Motor)       | 9.0                                              | 8.0  |
| Power (KW)            | 1.3                                              | 1.6  |
| Min. Wire Size        | Up to 8 meters, use 2.5mm <sup>2</sup>           |      |
| Circuit Protection    | 20 amp Time Delay Fuse or 20 amp Circuit Breaker |      |

### This air conditioner is designed for:

- A. Installation on a recreational vehicle or caravan vehicle at the time the vehicle is manufactured.
  - B. Installation and use on the roof of a RV/caravan only.
  - C. Connection to an air distribution system located in the ceiling/roof cavity of the RV/caravan.
  - D. Roof construction with rafters/joists on minimum of 16"/400mm centers.
  - E. Minimum of 1.75"/45mm and maximum of 4.5"/115mm distance between roof to ceiling of caravan required. Alternate installation methods will allow for roofs more than 4.5"/115mm thickness.
  - F. The air conditioner may be operated on motor generator sets which provide the proper voltage, electrical cycles, and phase of operation when unit is in operation.
- \* The Manufacturer of this air conditioner gives only general guidelines for generator requirements. These generator requirements come from experiences consumers have with our equipment in field applications. When sizing generators, the total electrical power consumption of the caravan must be considered. Keep in mind that generators lose power because of altitude increases above sea level, high outside temperatures, and lack of maintenance.

#### \* GENERATOR REQUIREMENTS

- 1 Unit: 3.5 KW
- 2 Units: 5.0 KW

## 2. PRECAUTIONS FOR SAFE OPERATION

- A. Read these Operating Instructions thoroughly and carefully before attempting operation of the air conditioner.
- B. The Manufacturer will not be liable for any damages or injury due to failure to follow these operation instructions.
- C. **DO NOT** add any devices or accessories to this equipment not specifically authorized by the manufacturer.

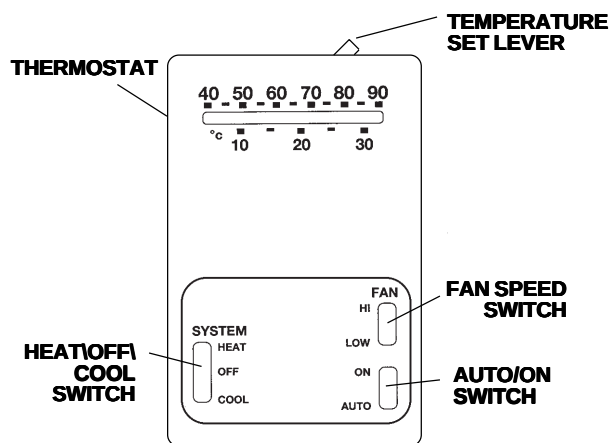
- D. This equipment must be serviced only by qualified service personnel. Some areas require service personnel to be licensed.

## 3. OPERATING INSTRUCTIONS

### A. COOLING OPERATION

- 1. Place the Temperature Set Lever to desired temperature level.
- 2. Place the Fan Speed Switch to the position that best satisfies your needs:
  - a. **High Speed**: Selected when maximum cooling and dehumidification are required.
  - b. **Low Speed**: Selected when RV/caravan reaches the desired comfort level and needs to be maintained. Normally this speed is used for nighttime operation.
- 3. Select **Auto/On Switch** operation as follows:
  - a. **Auto Position**: Air conditioner fan runs whenever cooling is required and stops whenever cooling is not required.
  - b. **On Position**: Air conditioner fan runs continuously to circulate air in the RV/caravan.
- 4. Set the **Heat/Off/Cool Switch** to cool position.

The air conditioner compressor will now come on when cooling is required and cycle off when the temperature level selected is reached.



## ! CAUTION

**Wait at least two (2) minutes before restarting the air conditioner after shutting off with either the Heat/Off/Cool Switch or the Temperature Set Lever. This allows the refrigerant pressure on the air conditioner to equalize and will allow the compressor to restart easily.**

### B. HEATING OPERATION:

(If furnace is connected to the thermostat)

- 1. Set the Temperature Set Lever to desired indoor temperature.
- 2. Set the Heat/Off/Cool Switch to heat position.

The furnace will now come on when heat is required and cycle off when the temperature level selected is reached.

### C. SPECIAL FEATURE

When Thermostat's:

**Heat/Off/Cool Switch** is in the OFF or HEAT position and  
the **Auto/On Switch** is in the ON position,  
the air conditioner fan will run continuously to circulate the air inside the RV/caravan.

## 4. MAINTENANCE

**AIR FILTERS:** Periodically remove the return air filters located above the removable panels in the air box. Wash filters with soap and warm water, let dry and then reinstall or replace as required.

**NOTE: Never** run the air conditioner without return air filters in place. This may plug the unit evaporator coil with dirt and may substantially affect the performance of the unit.

### FROST PREVENTION:

Air conditioners have a tendency to frost during operation in cool temperatures with moderate humidity conditions; particularly on low fan speed. This condition normally exists during the evening or nighttime hours of operation of the air conditioner. To help your air conditioner maintain peak performance without frosting-over during this time period, preset the thermostat to approximately 75°F/25°C and run fan at high fan speed.

The ability of the air conditioner to maintain the desired inside temperature depends not only on the heat gain of the vehicle but also on some preventative measures taken by the occupants. During extreme outdoor temperatures, the heat gain of the vehicle may be reduced by:

- ✓ Parking vehicle in a shaded area;
- ✓ Using window shades (blinds and/or curtains);
- ✓ Keeping windows and doors shut;
- ✓ Avoiding the use of heat producing appliances.

Starting the air conditioner early in the morning and giving it a "head start" on the expected high outdoor ambient will greatly improve its ability to maintain the desired temperature level.

## ! CAUTION

The Manufacturer of the air conditioner will not be responsible for damage caused by condensed moisture on ceilings or other surfaces. Air contains moisture and this moisture tends to condense on cold surfaces. When air enters the vehicle, condensed moisture may appear on air registers, ceilings, windows, etc. The air conditioner removes this moisture from the air during normal operation. Keeping doors and windows closed when this air conditioner is in operation will minimize condensed moisture on cold surfaces.

## 5. SERVICE — Unit Does Not Operate

If your unit fails to operate or operates improperly, check the following before calling your service center.

- A. If the RV/caravan is connected to a motor generator, check to be sure the motor generator is running and producing power.
- B. If the RV/caravan is connected to a power supply by a land line, check to be sure the line is sized properly to run your air conditioner load and that it is plugged into the power supply.
- C. Check your fuse or circuit breaker to insure it is not open.
- D. Check to insure the air conditioner conduit is plugged into the relay box at the return air area of the air conditioner.
- E. After the above checks, call your local service center for further help. This unit must be serviced by qualified service personnel only.

When calling for service, always give the air conditioner Model Number, Product Number, Serial Number and type of installation (air box or ducted). This information can be found on the unit rating plate located on the air conditioner base pan. To locate the rating plate, remove the return air grill and look up through the roof opening in the ceiling.

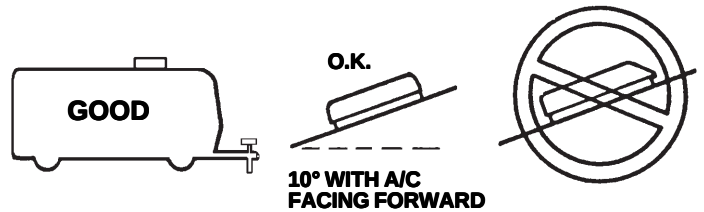
# INSTALLATION INSTRUCTIONS

## 1. PRECAUTIONS FOR SAFE INSTALLATION

- Read these Installation Instructions thoroughly and carefully before attempting installation or operation of the air conditioner.
- The Manufacturer will not be liable for any damages or injury due to failure to follow these Installation Instructions.
- DO NOT** add any devices or accessories to this equipment not specifically authorized by the manufacturer.
- This equipment must be serviced only by qualified service personnel. Some areas require service personnel to be licensed.

- Check location acceptability before beginning the installation.

- It is preferred that the air conditioner be installed in a relatively flat and level roof section when the RV or caravan is parked on a level surface. If this is not possible, up to a 10 degree pitch in any direction can be tolerated.



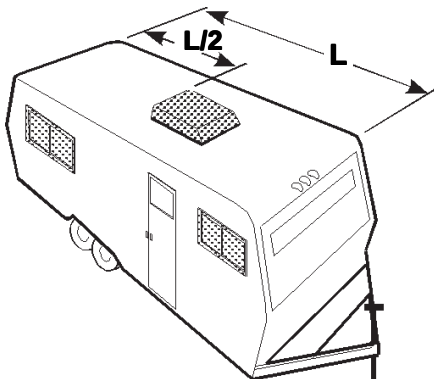
## 2. LOCATION

This air conditioner is designed for installation and use on the roof of an RV or Caravan. One or more units may be used on the vehicle.

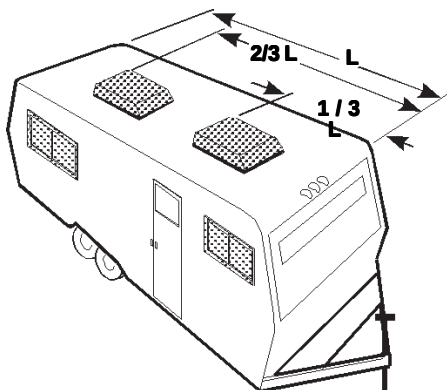
### A. DESIGN RECOMMENDATIONS

For one unit installation: The air conditioner should be mounted slightly forward of center (front-to-back) and centered from side-to-side on the on the RV or caravan.

For two unit installation: Install one air conditioner 1/3 and one air conditioner 2/3's back from front of RV or caravan and centered from side-to-side.

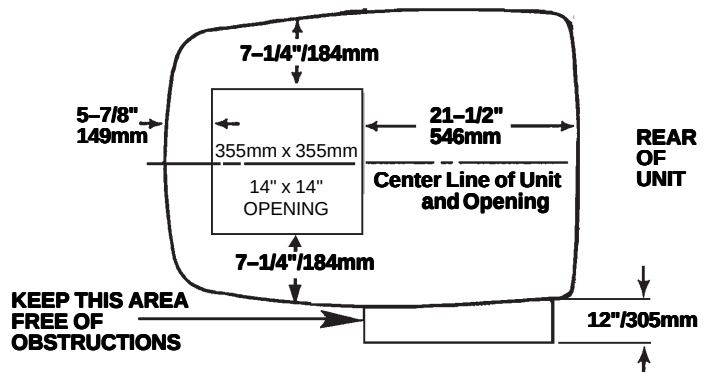


**L = LENGTH**

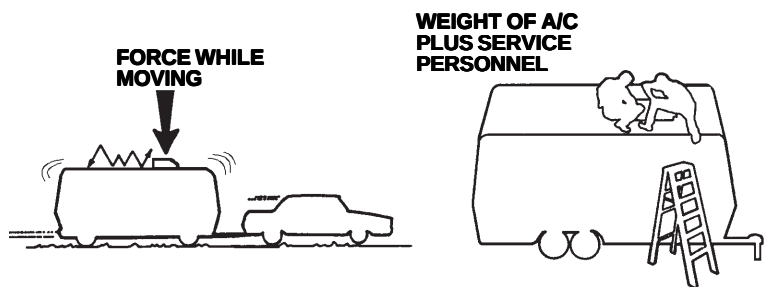


- Check on the roof to be sure no obstructions are in the area where the air conditioner will be.

### AIR CONDITIONER DIMENSIONS (On Top of Vehicle)



- Be sure your roof structure is capable of supporting a weight of 65Kg/130Lbs. when the RV or caravan is in motion. Normally, if the roof can support a static load of 100Kg/200Lbs., it meets this requirement.



### 3. AIR DISTRIBUTION SYSTEM SIZING & DESIGN

The installer of this air conditioner system must design the air distribution system for his particular application. Several requirements for this system **MUST** be met for the air conditioner to operate properly. These requirements are as follows:

- A. Roof cavity thickness must be between 1.75"/45mm to 4.50"/115mm. This distance is measured between roof and ceiling surface.
- B. The total cross-sectional discharge area of outlet ducts from the plenum area under the air conditioner must be a minimum of 17.5 in.<sup>2</sup>/113cm<sup>2</sup>.
- C. Duct sizing requirements are as follows:

|                         | MIN.             | MAX.       |
|-------------------------|------------------|------------|
| Duct Depth              | 1.25"/32mm       | 2.25"/60mm |
| Duct Width              | 7.00"/178mm      | — — —      |
| Total Duct Length       | 12ft./3.7M       | 36ft./11M  |
| Duct Length (Short Run) | 1.3 Total Length |            |

- D. Register Requirements as follows:

|                                      | MIN.                                  | MAX.     |
|--------------------------------------|---------------------------------------|----------|
| Distance from Duct End               | 5"/130mm                              | 8"/200mm |
| Distance from end of elbow           | 15"/380mm                             | — — —    |
| Distance between registers           | 24"/610mm                             | — — —    |
| Total Registers Required             | 4                                     | 8        |
| Number of Registers required per run | 2                                     | — — —    |
| Free Area per Register               | 14in. <sup>2</sup> /90cm <sup>2</sup> | — — —    |

- E. The duct material must meet or exceed any agency Standard that may be in existence at the time the RV/caravan is produced.

#### NOTE

IT IS THE RESPONSIBILITY OF THE INSTALLER OF THIS SYSTEM TO INSURE THE DUCTWORK WILL NOT COLLAPSE OR BEND DURING OR AFTER THE INSTALLATION.

- F. All discharge air ducts must be properly insulated to prevent condensation from forming on their surfaces or adjacent surfaces during operation of the air conditioner. This insulation must be R-7 minimum.
- G. Ducts and their joints must be sealed to prevent condensation from forming on adjacent surfaces during operation of the air conditioner.

#### NOTE

THE MANUFACTURER WILL NOT BE HELD LIABLE FOR ROOF STRUCTURAL OR CEILING DAMAGE DUE TO IMPROPERLY INSULATED OR SEALED DUCTWORK.

- H. Return air opening must have 40 in.<sup>2</sup>/260 cm<sup>2</sup> free area including the air filter.
- I. Return air to the air conditioner must be filtered to prevent dirt accumulation on air conditioner cooling surface.
- J. Total system pressure must be between:

**0.12—0.65 in. W.C.  
(3.0—16.5mm W.C.)**

This is to be determined with the air conditioner blower operating on high speed and return air filter and grill in place.

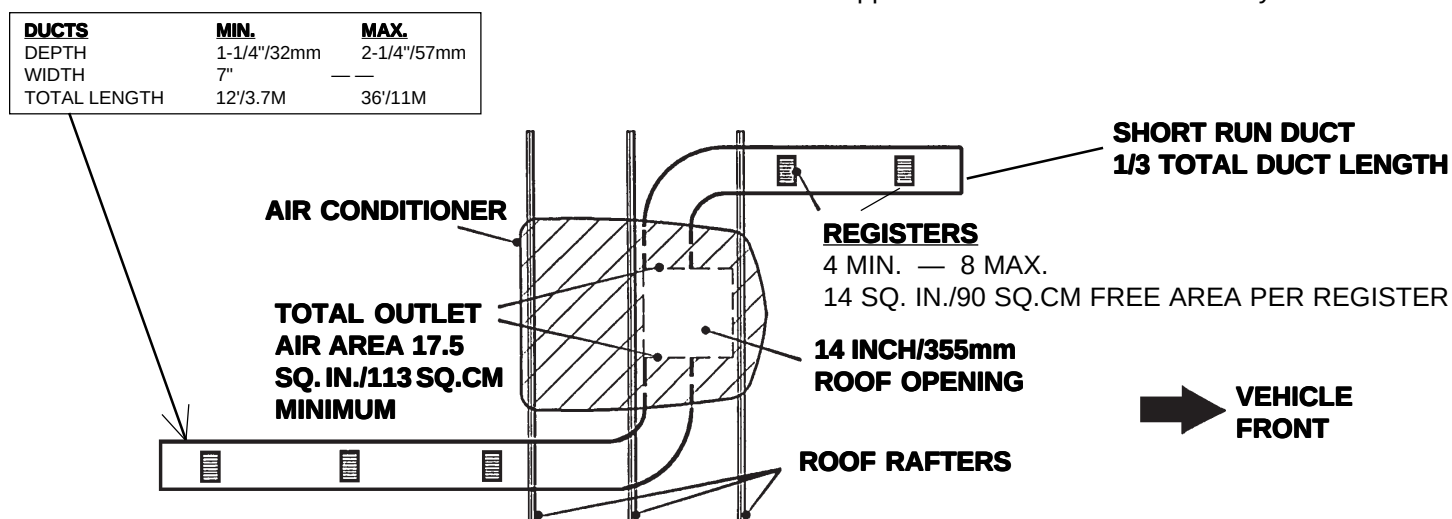
#### NOTE

IT IS THE RESPONSIBILITY OF THE INSTALLER OF THIS AIR CONDITIONER SYSTEM TO INSURE THE STRUCTURAL INTEGRITY OF THE RV ROOF.

- K. The thermostat must be located on an inside wall of the RV/caravan, 54"/1.4M above the floor. The thermostat must not be located near a heat source.

### 4. AIR DISTRIBUTION SYSTEM INSTALLATION

The Manufacturer recommends the basic configuration shown below for installing this air conditioner system. We have found by testing, that this configuration works best in most applications of this air conditioner system.



It is the responsibility of the installer of this system to review each RV/caravan floor plan and determine the following:

- A. Duct size;
- B. Duct layout;
- C. Register size;
- D. Register locations;
- E. Thermostat location.

These items must be determined in conjunction with the air distribution system sizing and design requirements listed in Section 3 of this manual.

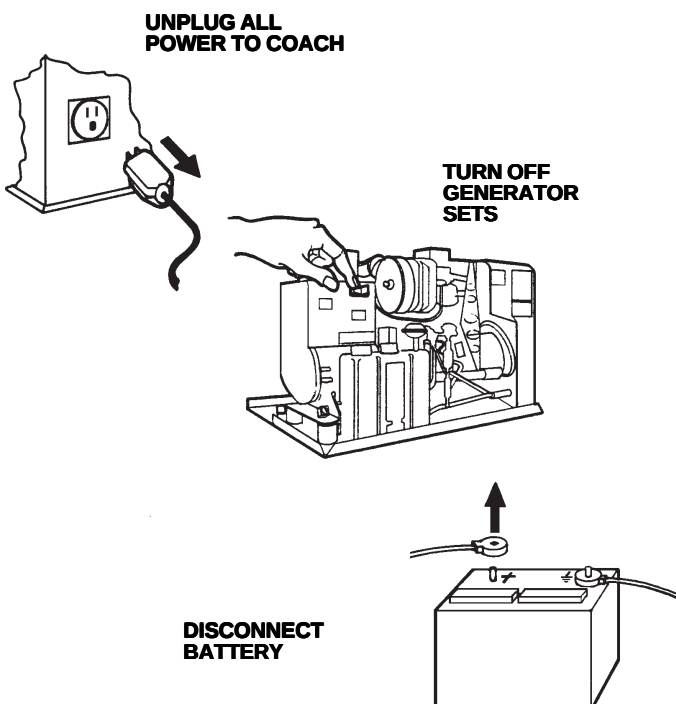
ALTERNATE CONFIGURATIONS AND METHODS MAY BE USED WHICH STILL ALLOW THE AIR CONDITIONER TO OPERATE PROPERLY. HOWEVER, THESE ALTERNATE METHODS MUST BE APPROVED IN WRITING BY THE MANUFACTURER.

The following instructions are based upon the use of Return Air Kit No. 105023 and Relay Kit No. 3104751. The Relay Kit has mounting bolts supplied to tie the air conditioner to the roof of the RV/caravan.

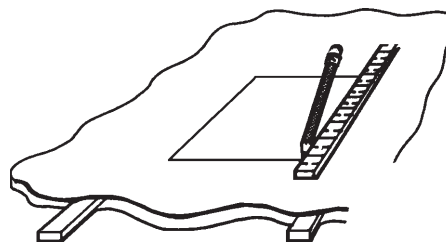
## A. ROOF & CEILING OPENING PREPARATION

### **! WARNING**

**THERE MAY BE ELECTRICAL WIRING BETWEEN THE ROOF AND THE CEILING. DISCONNECT ALL POWER SUPPLIES AND THE POSITIVE (+) TERMINAL FROM THE SUPPLY BATTERY. FAILURE TO FOLLOW THIS INSTRUCTION MAY CREATE A SHOCK HAZARD.**



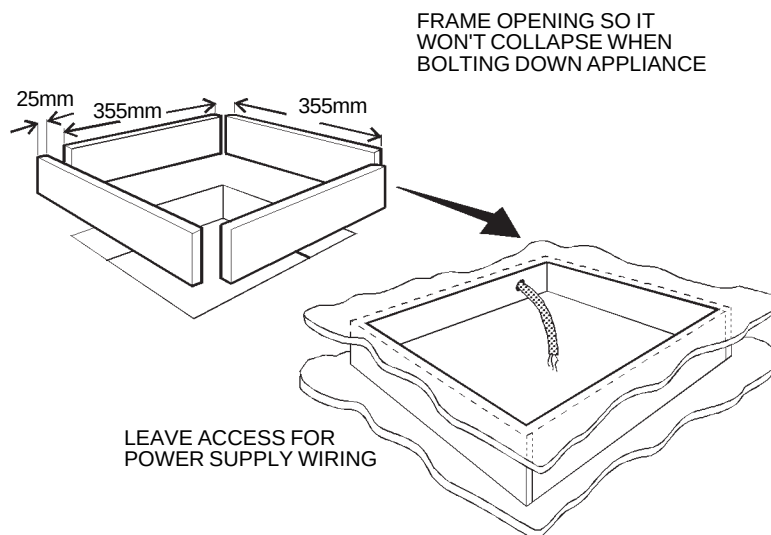
1. A 14"/355mm square opening must be cut through the roof and ceiling of the RV/caravan. This opening must be located between the roof reinforcing members.
2. Mark a 14"/355mm square on the roof and carefully cut the opening.



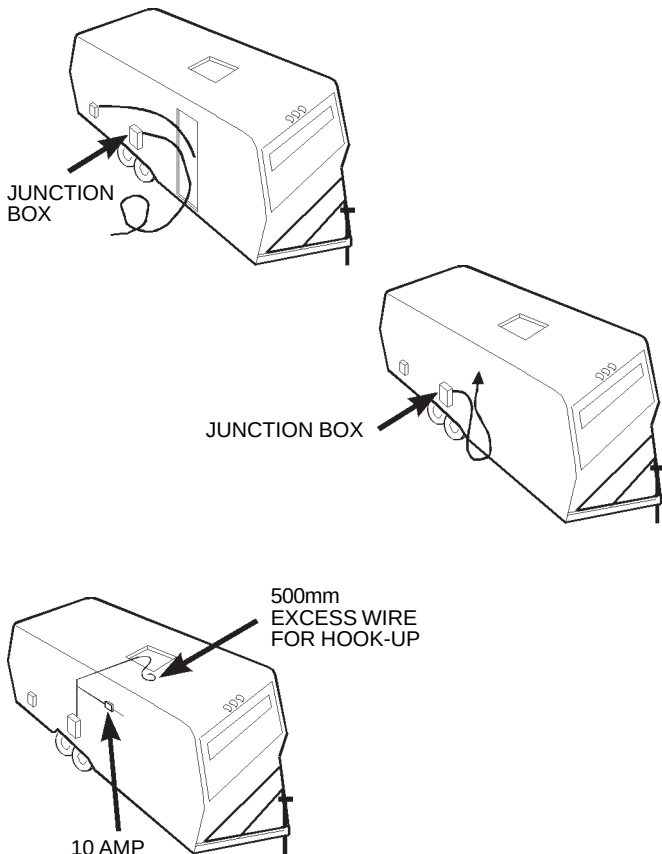
3. Using the roof opening as a guide, cut the matching hole in the ceiling.



4. The opening created must be framed to provide adequate support and prevent air from being drawn from the roof cavity. Lumber 3/4"/20mm or more in thickness must be used. Remember to provide an entrance hole for power supply wiring and thermostat wires.



5. Route a grounded power supply line from circuit breaker or fuse box to roof opening.
  - a. The power supply must be a separate circuit, fused with a 20 amp time delay fuse or a 20 amp circuit breaker.
  - b. The power supply wire must be a grounded 12 AWG/2.5mm<sup>2</sup> wire of COPPER material for distances of 24'/8M or less.
  - c. The power supply wiring **MUST** comply with all applicable regulations and wiring codes.
  - d. 15"/380mm of supply wire must extend into the roof opening to insure ease of attachment to relay kit junction box.
  - e. The supply wire must be located toward front of 14"/355mm opening, either on right or left side.



**NOTE:** Under no circumstances should the roof be constructed to create a low spot where water will accumulate when the air conditioner is installed. This may create a water leak into the interior of the RV/caravan.

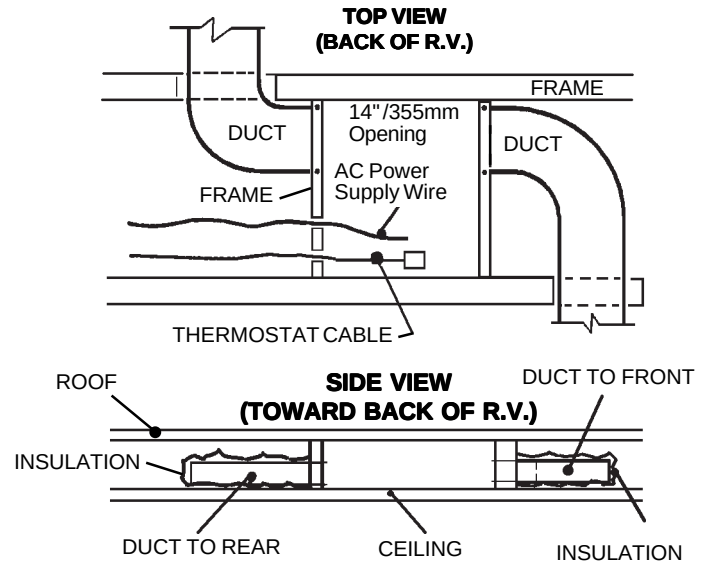


## B. AIR DISTRIBUTION DUCT INSTALLATION

Install the air distribution ducts in the RV/caravan roof cavity. The distribution system must meet:

1. RV/caravan's requirements,
2. System requirements listed in Section 3 of this manual.

Terminate the start of the duct at the back edge of the 14"/355mm opening previously cut.



## 5. THERMOSTAT & CABLE INSTALLATION

### A. LOCATION

The proper location of the thermostat is very important to insure that it will provide a comfortable RV/caravan temperature. Observe the following general rules when selecting a location.

1. Locate the thermostat about 5'/1.4M above the floor.
2. Install thermostat on a partition, not on an outside wall.
3. NEVER expose it to direct heat from lamps, sun or other heat producing items.
4. Avoid locations close to doors that lead outside, windows or adjoining outside walls.
5. Avoid locations close to supply registers and the air from these registers.
6. Never locate thermostat in a room that is warmer or cooler than the rest of the RV/caravan — such as the kitchen.
7. The major living area is normally a good location.

### B. CABLE INSTALLATION

1. A four conductor cable 18-24AWG/.25—.75mm<sup>2</sup> is to be used for low voltage connections.
2. Choose the shortest, direct route from the 14"/355mm opening to the thermostat location selected.
3. Consider where screws, nails or staples might contact the cable and avoid inadvertent contact with cable.

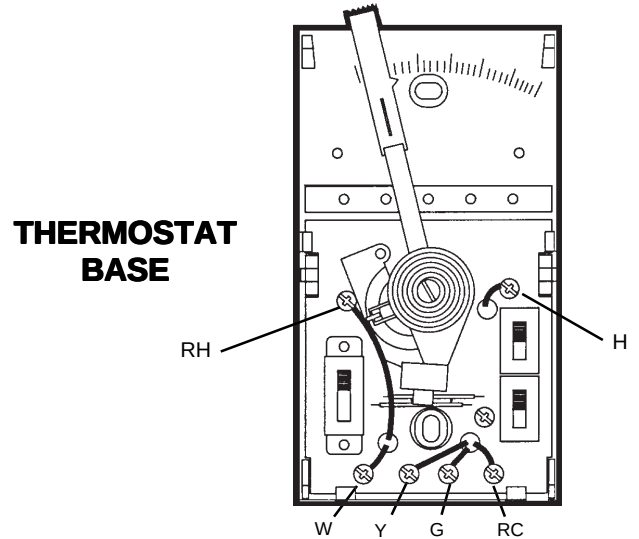
4. Leave approximately 3"/75mm of cable extending through the wall for connection to the thermostat.
5. Leave approximately 15"/380mm of cable extending into the 14"/355mm opening at the air conditioner location.

### C. THERMOSTAT INSTALLATION (Packed with Relay Kit)

The provided thermostat is a "Heat/Cool Thermostat". These instructions cover only the cooling connections required. If connection of furnace is required, follow the instructions provided with the furnace. Normally the furnace will connect to the "RH" and "W" terminals on the thermostat.

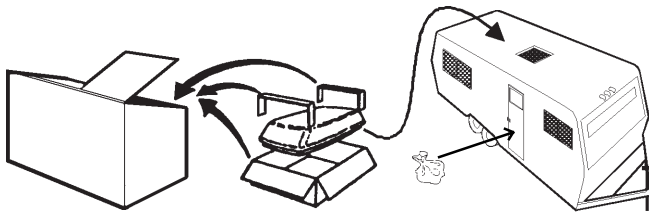
1. Remove the cover of the thermostat by holding bottom and gently lifting off the top.
2. Connect the "RED" wire from the air conditioner to the "RC" terminal on the thermostat.
3. Connect the "YELLOW" wire from the air conditioner to the "Y" terminal on the thermostat.
4. Connect the "BLUE" wire from the air conditioner to the "H" terminal on the thermostat.
5. Connect the "ORANGE" wire from the air conditioner to the "G" terminal on the thermostat.

6. Push the thermostat wires into the hole in RV/ caravan wall and fill excess hole with insulation.
7. Mount the thermostat base to the RV/caravan wall with the screws provided.
8. Check all thermostat wires on the base to insure they are completely clear of the bimetal coil of the thermostat.
9. Replace the thermostat cover.



## 6. PLACING AIR CONDITIONER ON THE ROOF

- A. Remove and discard the carton. The unit mounting bolts and literature are in a separate plastic bag. Be sure to place this information in the RV/caravan.

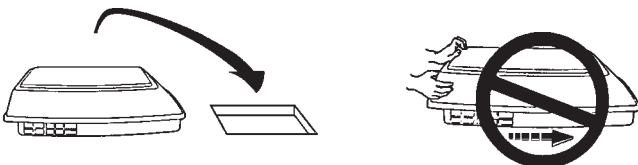


- B. Place the air conditioner on the roof.

**! CAUTION**

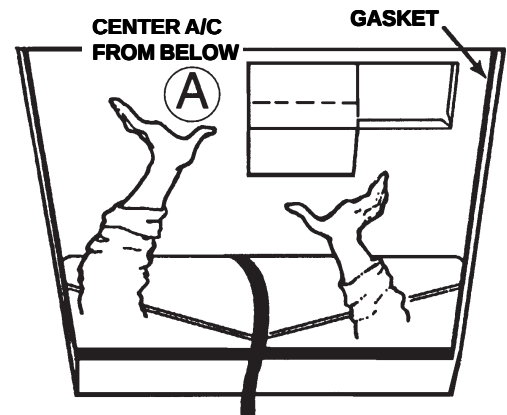
**USE CARE IN LIFTING. THIS UNIT WEIGHS APPROXIMATELY 100 LBS./45 KG.**

- C. Lift and place the unit over the prepared opening using the gasket on unit as a guide. The blunt end goes toward the rear of the RV/caravan.



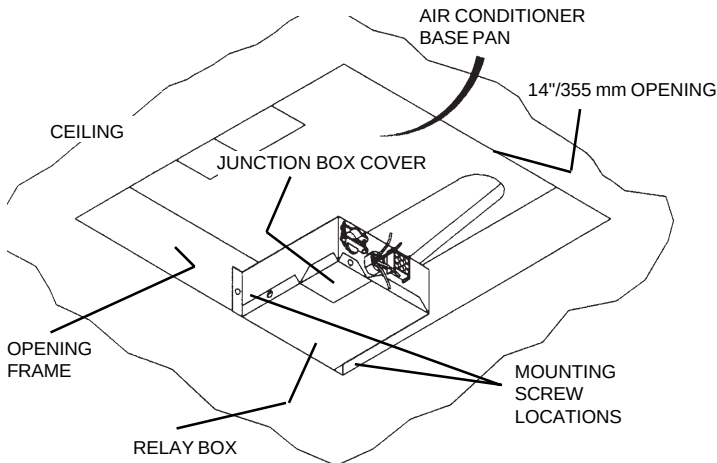
## 7. INSTALLATION OF RELAY KIT

- A. Reach through the roof opening and adjust the air conditioner until the gasket is centered on the opening.



- B. Install the relay box into the 14"/355mm opening.
1. Placement of box:
    - a. On right front wall or left front wall of the opening.
    - b. Place tight into the corner.
    - c. Place flush with the box junction box cover toward ceiling.
- NOTE:** It is **IMPORTANT** to place this box in the location described so return air into the air conditioner is not blocked off.

- Using the two (2) screws provided, attach the relay box to the wall of the opening.

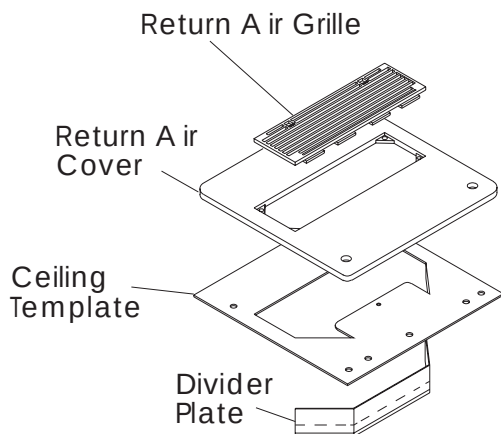


- Reach up into the return air opening of the air conditioner and pull the electrical conduit down. Snap the molded plug of this conduit into the mating connector on the relay box.

## 8. INSTALLATION OF AIR CONDITIONER

### A. INSTALLATION OF CEILING TEMPLATE

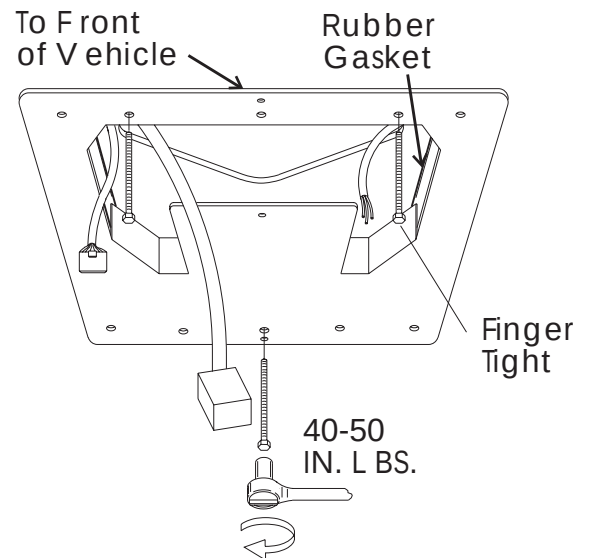
- Remove Return Air Cover and Ceiling Template from the 3105007, return air cover kit carton.
- Take the ceiling template and hold it up to the 14\"/>



- Hold the ceiling template with one hand and, with the other, install the three (3) 1/4\"/>

NOTE: Mounting bolts are packed with the relay kit

- Finger-tighten the three (3) bolts and check alignment of the air conditioner.
- Evenly tighten the bolts to a torque of 40–50 in. lbs./4.5–5 NM to secure the air conditioner to the roof and insure a good water seal.

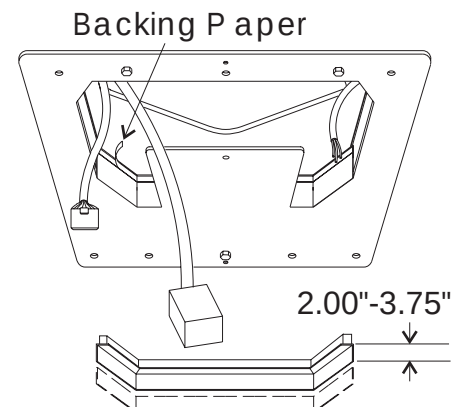


## ! CAUTION

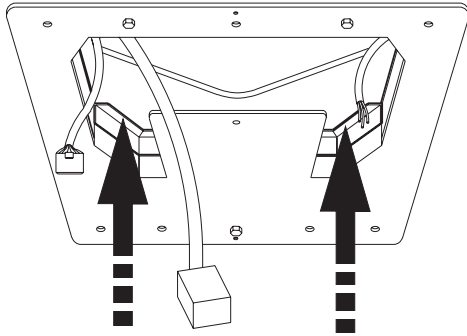
**IF THE BOLTS ARE LEFT LOOSE, THERE MAY NOT BE AN ADEQUATE ROOF SEAL. IF BOLTS ARE OVERTIGHTENED, DAMAGE MAY OCCUR TO THE AIR CONDITIONER BASE OR CEILING TEMPLATE.**

### B. INSTALLATION OF DIVIDER PLATE

- Measure the ceiling to roof thickness:
  - If distance is 2.00" - 3.75", remove perforated tab from Divider Plate.
  - If distance is 3.75" - 5.50", remove no tabs.
- Remove the backing paper from double sided tape located on Ceiling Template.



3. Place Divider Plate up to bottom of Air Conditioner base pan firmly. The foam tape on the divider plate must seal to bottom of base pan.



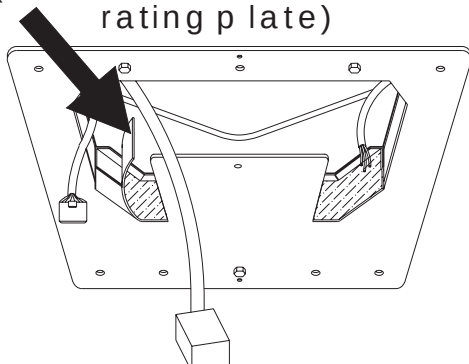
Push Divider Plate firmly onto template

**Note:** The adhesive on double sided tape is extremely sticky. Divider Plate must be properly positioned before pressing in place.

4. With slight pressure, push divider plate against exposed double sided tape on ceiling template.
5. Locate 7" x 18"/175mm x 460mm self-adhesive insulation supplied with the Return Air Kit. Remove the backing paper from the insulation and carefully stick onto the ceiling template divider panel.
  - a. Excess width is intended to seal the divider plate to the side of the 14"/355mm opening. This is to prevent cold discharge air from circulating into the air conditioner return air opening.
  - b. If the insulation is too high, stick the excess height of insulation to the air conditioner base pan. **Do not cover up unit rating plate.**

**Note:** The adhesive on insulation is extremely sticky. Be sure part is located where desired before pressing into place. We recommend pulling off part of backing paper, locating part and then removing backing paper as insulation is pressed into place.

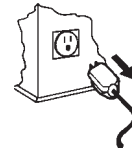
Place insulation in position  
(Do not cover unit rating plate)



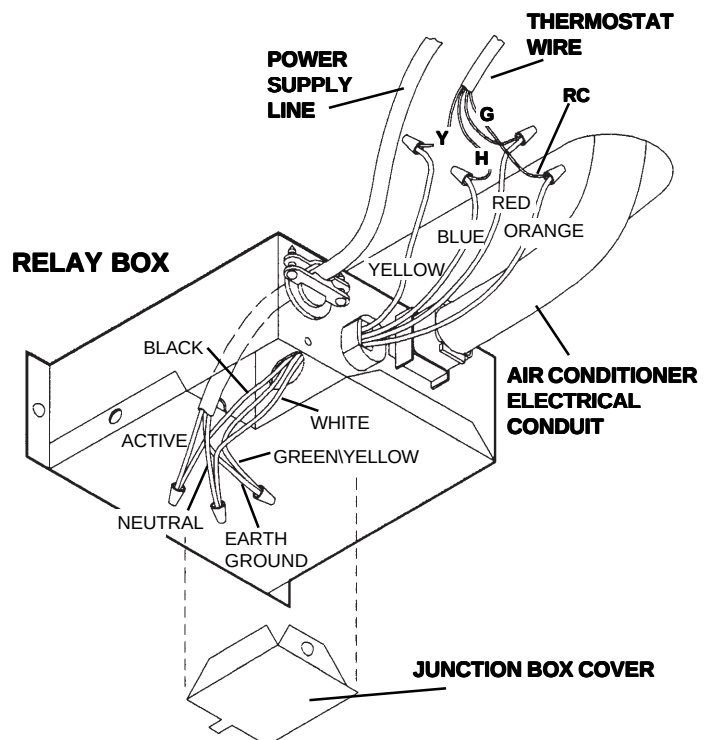
## 9. CONNECTION OF POWER SUPPLY

### A. CONNECTION OF 220 VOLT POWER SUPPLY

**Disconnect ALL power before wire leads are connected.**



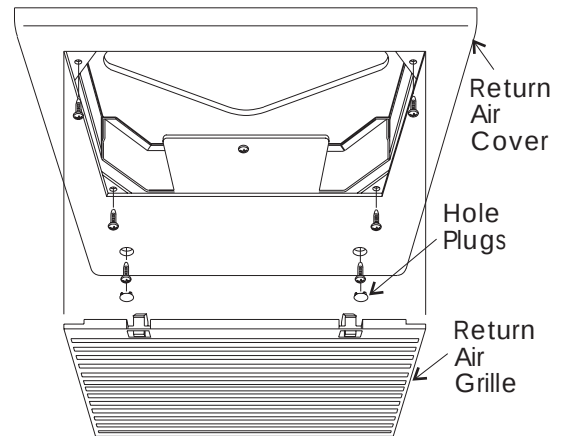
1. Remove the junction box cover from the relay box.
2. Route the power supply line through the connector located at the junction box.
3. Connect the **black wire** in the junction box to the ACTIVE WIRE of power supply.
4. Connect the **white wire** in the junction box to the NEUTRAL WIRE of power supply.
5. Connect the **green/yellow wire** in the junction box to the EARTH/GROUND WIRE of power supply. Note: Use appropriate sized twist wire connectors to join power supply to unit wires. Tape the twist wire connectors to the supply wiring to assure they do not vibrate off.
6. Tighten the strain relief onto the power supply line to hold it firmly in place.
7. Carefully push all excess wire back into the junction box. (See following illustration).



## B. CONNECTION OF THERMOSTAT CABLE

1. Connect the **RED** wire from relay box to the wire coming from the "RC" terminal on thermostat.
2. Connect the **YELLOW** wire from relay box to wire coming from the "Y" terminal on thermostat.
3. Connect the **BLUE** wire from relay box to wire coming from the "H" terminal on thermostat.
4. Connect the **ORANGE** wire from relay box to wire coming from "G" terminal on thermostat.
5. Use twist connectors to assure good connections.

5. Install two (2) hole plugs into screw holes in back of return air grille. Align tabs with mating notches and snap into place.



## 10. INSTALLATION OF RETURN AIR COVER

1. Remove Return Air Grille from the Return Air Cover.
2. Place the Return Air Cover up to Ceiling Template.
3. Install Cover to Template with #8x3/8" / 9.5mm blunt point phillips head screws provided (6 required).
4. Reinstall Return Air Grille into Return Air Cover.

**This completes the installation of the Air Conditioner. We recommend that power be supplied to the air conditioner and check the unit for proper operation. Refer to the Owners portion of this manual for a description of air conditioner operation.**

## RELAY KIT WIRING DIAGRAM

## AIR CONDITIONER WIRING DIAGRAM

