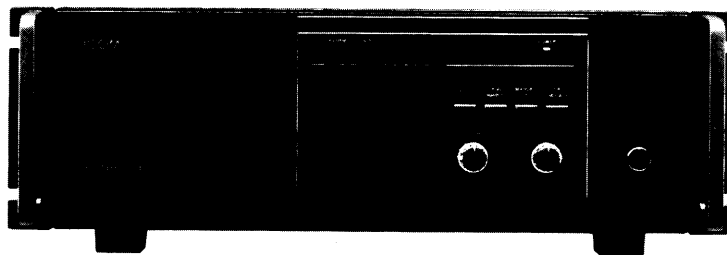




INSTRUCTION MANUAL

1200MHz FM REPEATER
IC-RP1220



INTRODUCTION

Thank you for choosing this new Icom product.

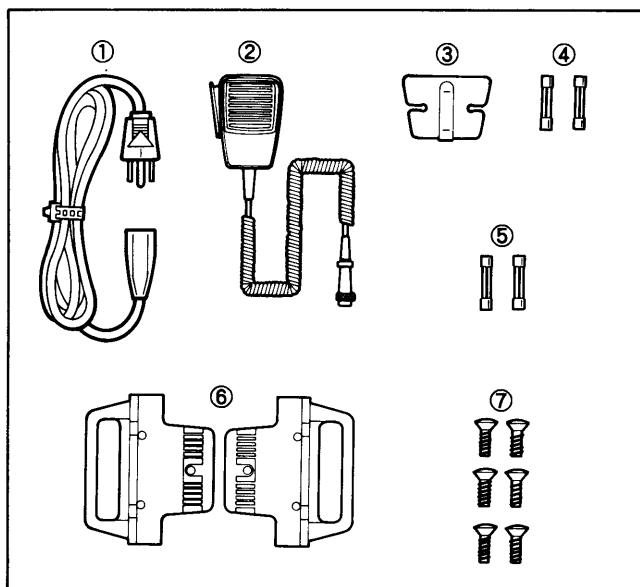
Icom's advanced new **IC-RP1220 1200 MHz FM REPEATER** is designed to meet the increasing demand of today's amateur radio operators for high precision, sophisticated radio communications.

EXPLICIT DEFINITIONS

The following explicit definitions apply to this instruction manual.

| WORD | DEFINITION |
|---------|---|
| WARNING | Personal injury, fire hazard or electric shock may occur. |
| CAUTION | Equipment damage may occur. |
| NOTE | If disregarded, inconvenience only. No personal injury, risk of fire or electric shock. |

UNPACKING



| Accessories included with the IC-RP1220: | Qty. |
|--|------|
| ① AC power cable | 1 |
| ② Microphone (HM-4) | 1 |
| ③ Microphone hook | 1 |
| ④ Spare fuses for AC line (2 A) | 2 |
| ⑤ Spare fuses for DC line (10 A) | 2 |
| ⑥ Rack mounting handles | 2 |
| ⑦ Screws for rack mounting handle | 6 |

IMPORTANT

- (1) **READ THIS INSTRUCTION MANUAL CAREFULLY** before attempting operation. If you have any questions regarding the operation of the IC-RP1220, feel free to contact your nearest authorized Icom Dealer or Service Center.
- (2) **SAVE THIS INSTRUCTION MANUAL.** This instruction manual contains important safety and operating instructions for the IC-RP1220.

PRECAUTIONS

- (1) **UNPLUG** the AC power cable from the AC outlet and wait a few minutes when removing the repeater cover.
- (2) **NEVER** let metal, wire or other objects touch any internal part of the repeater. Risk of electric shock could occur.
- (3) **NEVER** place the repeater within the reach of babies or children at any time.
- (4) **NEVER** expose the repeater to rain, snow or any liquid.
- (5) **DO NOT** operate the repeater when it is covered by objects which impede heat dispersal.
- (6) **AVOID** using the repeater in temperatures below -10°C ($+14^{\circ}\text{F}$) or over $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$). The transceiver may not function properly in extreme temperatures.
- (7) **AVOID** using the repeater in excessively dusty environments.
- (8) **AVOID** placing the repeater in direct sunlight.
- (9) Keep connection cables as far away as possible from electronic instruments. This will prevent instrument malfunctions.

NOTE: The IC-RP1220 does not come with a duplexer. The duplexer must be purchased separately. For duplexer information, please ask your nearest authorized Icom Dealer or Service Center.

TABLE OF CONTENTS

| | | | |
|--------------------------------------|-----|---|-------|
| INTRODUCTION | i | 4. BASIC PRESETTINGS | 7~9 |
| EXPLICIT DEFINITIONS | i | 4-1 SETTING A FREQUENCY | 7 |
| UNPACKING | i | 4-2 SETTING A TONE FREQUENCY | 8 |
| IMPORTANT | i | 4-3 SETTING THE OUTPUT POWER | 9 |
| PRECAUTIONS | i | 5. FUNCTIONS PRESETTINGS AND | |
| TABLE OF CONTENTS | ii | OPERATION | 10~14 |
| FEATURES | ii | 5-1 ID FUNCTIONS | 10 |
| 1. CONTROL FUNCTIONS | 1~2 | 5-2 HANG-UP TIMER FUNCTION | 10 |
| 1-1 FRONT PANEL | 1 | 5-3 TIME-OUT TIMER FUNCTION | 10 |
| 1-2 REAR PANEL | 2 | 5-4 ID TIMING CHART | 11 |
| 2. INSTALLATION | 3~5 | 5-5 WRITING THE ID CALL SIGN | 13 |
| 2-1 REAR PANEL CONNECTIONS | 3 | 5-6 EXTERNAL CONTROL FUNCTION | 14 |
| 2-2 LOCATION | 4 | 6. MAINTENANCE | 15~16 |
| 2-3 ANTENNA | 4 | 6-1 REPEATER DISASSEMBLY | 15 |
| 2-4 DUPLEXER | 4 | 6-2 FUSE REPLACEMENT | 15 |
| 2-5 GROUNDING | 4 | 6-3 CPU RESETTNG | 15 |
| 2-6 POWER | 5 | 6-4 BACKUP BATTERY | 15 |
| 2-7 MICROPHONE CONNECTOR | 5 | 6-5 CLEANING | 15 |
| 2-8 ACC SOCKET | 5 | 6-6 TROUBLESHOOTING | 16 |
| 3. BASIC OPERATION | 6 | 7. INSIDE VIEWS | 17~19 |
| 3-1 INITIAL SETTINGS | 6 | 7-1 TOP VIEW | 17 |
| 3-2 OPERATION | 6 | 7-2 BOTTOM VIEW | 18 |
| | | 7-3 LOGIC-A UNIT | 19 |
| | | 8. SPECIFICATIONS | 20 |

FEATURES

HIGHLY EFFICIENT AND STABLE 10 W OUTPUT POWER

Icom's expertise in radio technology has produced the IC-RP1220, an FM repeater highly efficient and completely stable with a PA module used in the transmitter output circuit.

2-WAY POWER SUPPLY SYSTEM

The repeater has two-way, AC and DC power source capability. If AC power to the repeater is interrupted, DC power can be automatically connected as a backup power source.

HEAVY DUTY POWER SUPPLY

A heavy duty power supply unit is adopted to follow load fluctuations and secure continuous 24-hour operation.

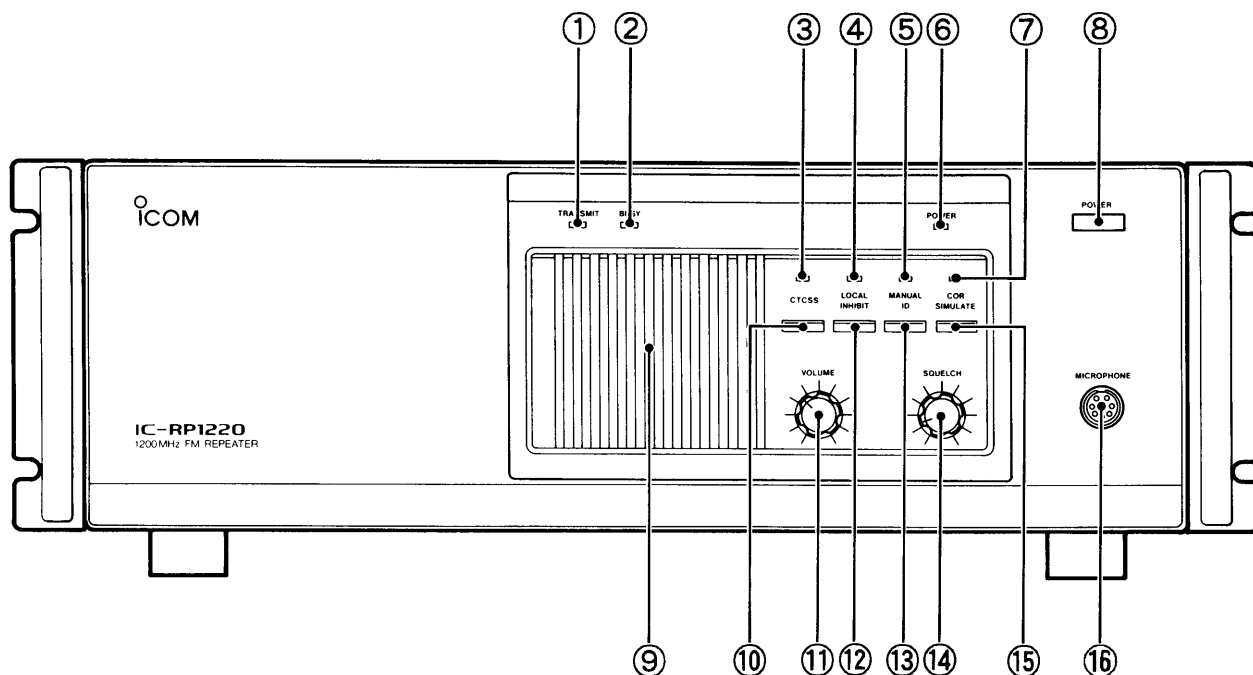
REMOTE CONTROL SYSTEM

With an external receiver and the built-in DTMF tone decoder, it is possible to control user-programmable functions. To prevent functioning errors, a 4-bit password is available to control them. The following functions can be remotely controlled from the control operator.

- Tone squelch function ON/OFF
- Tone encoder function ON/OFF
- Tone squelch frequency setting
- Tone encoder frequency setting
- Repeater function ON/OFF
- ID function ON/OFF
- ID signal transmission
- ID signal transmission speed
- Time-out timer setting
- Hang-up timer setting
- Repeater stopping time setting
- CPU resetting
- PLL reference frequency adjustment
- Three additional control outputs ON/OFF

1 CONTROL FUNCTIONS

1-1 FRONT PANEL



① TRANSMIT INDICATOR [TRANSMIT]
Lights up when the repeater is transmitting.

② BUSY INDICATOR [BUSY]
Lights up when the squelch is open.

③ CTCSS INDICATOR [CTCSS]
Lights up when the tone squelch function is turned ON.

④ LOCAL INHIBIT INDICATOR [LOCAL INHIBIT]
Lights up when the repeater function is deactivated.

⑤ ID INDICATOR
Lights up while the ID signal is being transmitted.

⑥ POWER INDICATOR [POWER]
Lights up when the repeater is in operation.
• In AC operation: Lights up in green
• In DC operation: Lights up in red

⑦ COR SIMULATE INDICATOR [COR SIMULATE]
Lights up when the COR simulate function is turned ON.

⑧ POWER SWITCH [POWER]
Turns the power ON and OFF.

⑨ SPEAKER
Monitors the received signal.

⑩ CTCSS (Continuous Tone Controlled Squelch System) SWITCH [CTCSS]
Turns the tone squelch function ON and OFF.

⑪ VOLUME CONTROL [VOLUME]
Varies audio output level.

⑫ LOCAL INHIBIT SWITCH [LOCAL INHIBIT]
Deactivates the repeater function. The repeater functions as a full duplex transceiver.

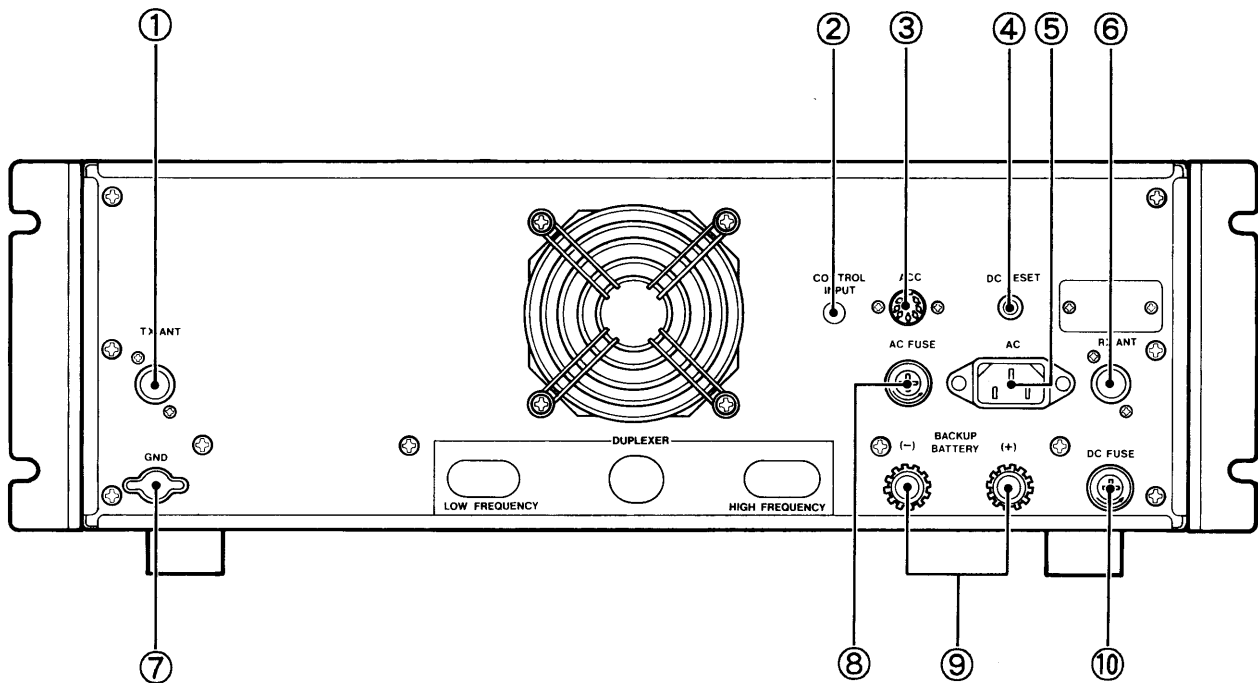
⑬ MANUAL ID SWITCH [MANUAL ID]
Transmits an ID (identifier) signal manually. Each push of the switch emits an ID signal.

⑭ SQUELCH CONTROL [SQUELCH]
• Varies the retransmitting threshold level.
• Varies the noise squelch threshold level when the repeater function is turned OFF.

⑮ COR (Carrier Operated Relay) SIMULATE SWITCH [COR SIMULATE]
Sets the repeater in continuous transmit mode for checking repeater operation. See p. 6.

⑯ MIC CONNECTOR
Accepts the supplied microphone (HM-4).

1-2 REAR PANEL



① TRANSMIT ANTENNA CONNECTOR [TX ANT]

Outputs the transmitter output power.
Connect to a duplexer with a 50 Ω coaxial cable.

CAUTION: Transmitting without an antenna may damage the transmitter of the repeater.

② CONTROL SIGNAL JACK [CONTROL INPUT]

Inputs the DTMF remote-control signal.
The repeater is designed for remote control of received DTMF signals when this jack is out of use.

③ ACCESSORY SOCKET [ACC]

Input and output connections for external equipment.

④ DC POWER RESET SWITCH [DC RESET]

Activates the DC power operation.
The switch is also used for canceling the exceeding discharge limiter.

⑤ AC POWER SOCKET [AC]

Connects the supplied AC power cable to a domestic AC outlet.

⑥ RECEIVE ANTENNA CONNECTOR [RX ANT]

Inputs incoming signals from the antenna sent through the duplexer.
Connect to a duplexer with a 50 Ω coaxial cable.

⑦ GROUND TERMINAL [GND]

WARNING: Ground the repeater through this terminal to prevent electrical shocks, TVI, BCI and other problems.

See p. 4 for more information.

⑧ AC FUSE HOLDER [AC FUSE]

Holds the 2 A fuse for the internal AC power supply.

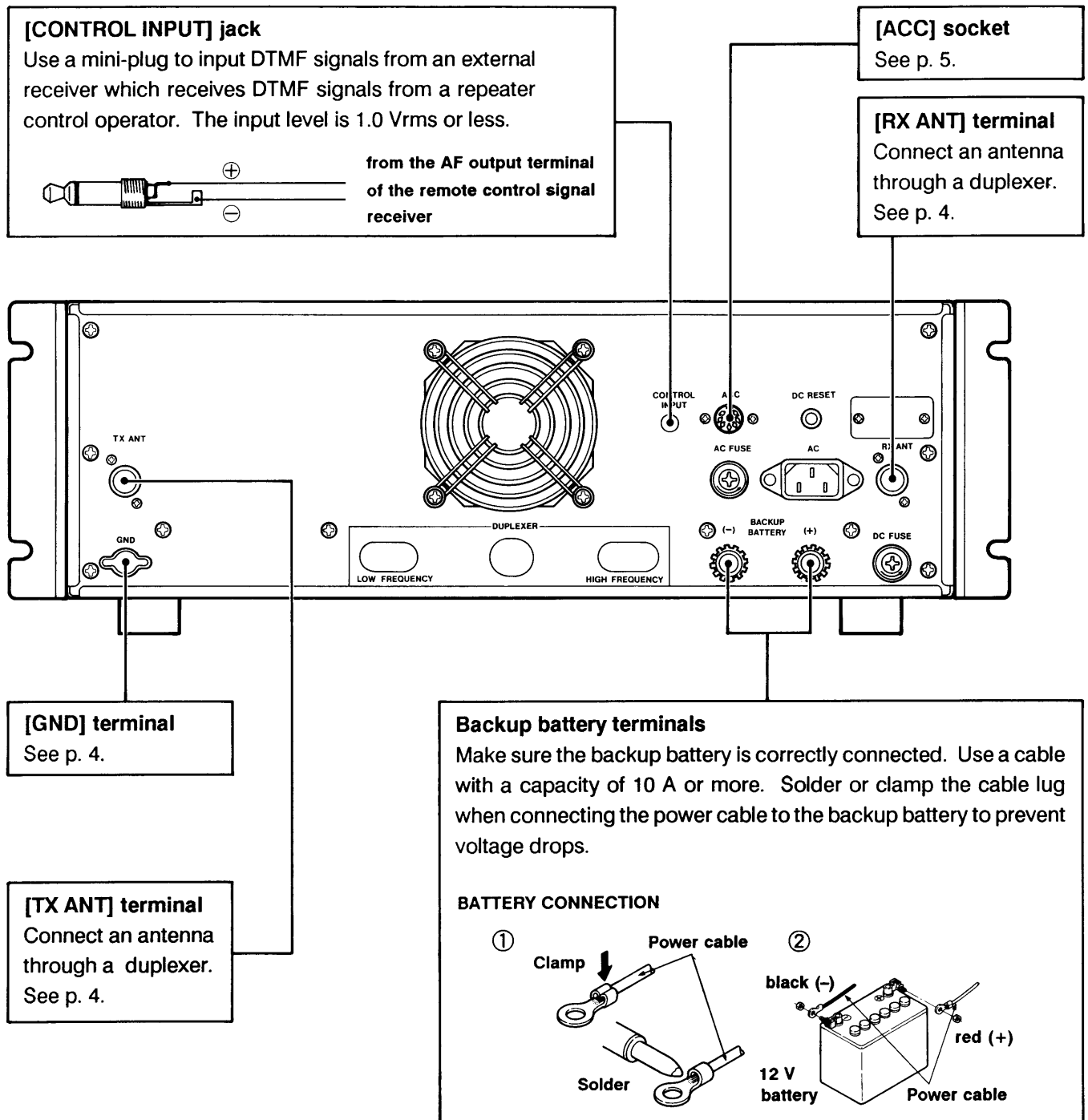
⑨ DC POWER INPUT TERMINALS [BACKUP BATTERY]

Connects a 12 V storage battery for the repeater backup when the AC power is interrupted. These terminals are also used for DC power operation.

⑩ DC FUSE HOLDER [DC FUSE]

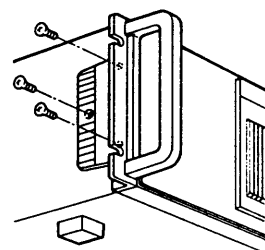
Holds the 10 A fuse for the DC power supply.

2-1 REAR PANEL CONNECTIONS



● HANDLE INSTALLATION

- 1) Remove 2 screws from each side of the front panel.
- 2) Attach the supplied handles to the sides of the repeater using the supplied screws as shown in the diagram at right.



2-2 LOCATION

This repeater should be installed in a cabinet to protect it from dust, moisture, etc. When the supplied mounting handles are attached to each side of the repeater, the repeater may be easily installed to the 19-inch standard cabinet. Read the following installation instructions carefully.

- 1) Select a location to facilitate good ventilation and emergency maintenance, allow sufficient access between the repeater and the surrounding walls.
- 2) AVOID placing the repeater in the environments and conditions described in the PRECAUTION section on inside front cover.

2-3 ANTENNA SYSTEM

CAUTION: Transmitting without an antenna may damage the transmitter of the repeater. Protect your repeater from lightning by using a lightning arrestor.

(1) ANTENNA

Antenna performance is important for reliable radio communications. For this reason, a 50 Ω omnidirectional antenna is well worth the extra investment. A number of high quality fixed location antennas are available from various manufacturers. Choose one most suited to your needs.

Use heavy duty stainless steel mounting hardware to protect the antenna from bad weather and preserve it for longer periods of time.

(2) COAXIAL CABLE

We recommend using a coaxial cable as follows, particularly in a fixed location installation of a repeater where feed lengths are very long.

Use a thick, low loss, all weather-type coaxial cable, and

for best results make the connection between the antenna and repeater as short as possible.

2-4 DUPLEXER

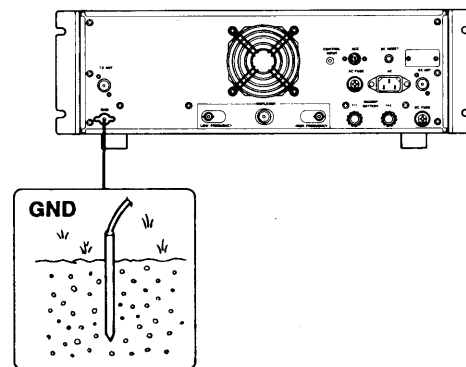
This repeater does not include a duplexer. The duplexer must be purchased separately.

The cables between the repeater and duplexer should be as short and thick as possible to reduce insertion loss.

2-5 GROUNDING

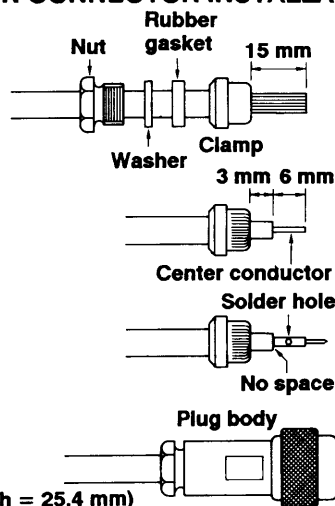
To prevent electrical shocks, TVI, BCI, interference to other stations, and other problems, connect the [GND] terminal on the repeater rear panel to an earth-sunk rod or copper plate with the heaviest gauge wire or strap available and make the connection as short as possible.

• Grounding



WARNING: NEVER connect the ground terminal to a gas or electrical pipe since the connection could cause an explosion or electric shocks.

TYPE-N CONNECTOR INSTALLATION



- 1) Slide the nut, washer, rubber gasket and clamp over the coaxial cable. Cut the end of the cable evenly.
- 2) Strip the cables and fold the braid back over the clamp as shown at left.
 - The clamp end should be flush with end of the vinyl jacket.
 - Evenly trim the braid end.
- 3) Soft solder the center conductor. Install the center conductor pin and solder it.
- 4) Carefully slide the plug body into place aligning the center conductor pin on the cable.
 - Tighten the nut onto the plug body.
 - Be sure the center conductor is the same height as the plug body.

(1 inch = 25.4 mm)

2 INSTALLATION

2-6 POWER

Make sure the [POWER] switch is turned OFF when connecting an AC power cable and a backup battery (emergency power supply).

The IC-RP1220 can operate with either an AC or DC power supply. If AC power is interrupted when operating the repeater with an AC power supply, power is automatically provided to the repeater when a 12 V DC battery is connected to the [BACKUP BATTERY] terminals.

(1) IN AC OPERATION

- The [POWER] indicator lights up in green.
- Use the supplied AC power cable for connection to a domestic AC outlet.
- Extension cords should not be used unless absolutely necessary. Using improper extension cords could result in fire risk.
- Usually the battery is continuously charged with a small amount of current from an AC power supply through the regulator circuit in the repeater. Discharging is therefore prevented even if the battery is not used for a long time.

(2) IN DC OPERATION

CAUTION: Voltages greater than 16 V DC will damage the repeater. Check the source voltage before connecting the power cable.

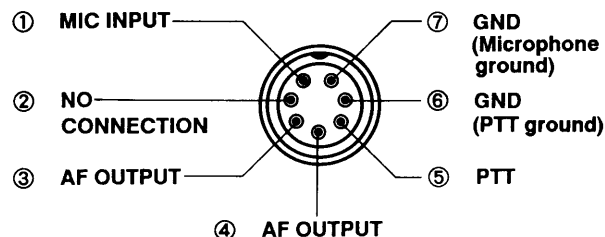
- The [POWER] indicator lights up in red.
- **DO NOT** place the backup battery on or near the repeater. Lead-acid batteries should be placed at least 5 m (16.4 ft.) from the repeater. Use a heavy duty cable to make the connection and be sure both the positive (red) and negative (black) terminals are correctly connected.
- After the battery is connected and the [POWER] switch is ON, the repeater continuously supplies approx. 100 mA for charging the battery. If the repeater stops functioning while connected to the battery, disconnect the battery, recharge it, then push the [DC RESET] switch to continue operations after the battery is charged. During repeater transmissions, approx. 6 A of battery power is consumed for each 10 W of repeater output.

2-7 MICROPHONE CONNECTOR

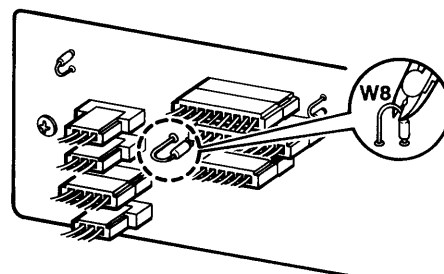
Connect the supplied HM-4 microphone.

For operations with an optional handset, a modification of the repeater is necessary. Remove the repeater top cover, then cut the wire W8 on the LED UNIT.

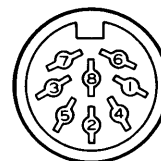
● Microphone connector (Front panel view)



● LED UNIT (Front panel view)



2-8 ACC SOCKET



(Rear panel view)

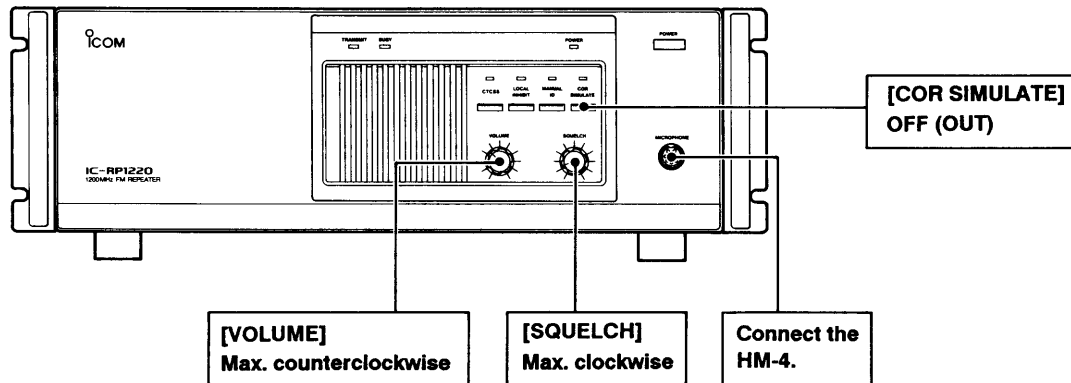
CAUTION: DO NOT short pin 7 to ground as this can damage the internal regulator or DC line fuse.

| PIN NO. | PIN NAME | DESCRIPTION | SPECIFICATIONS |
|---------|----------|--|---|
| 1 | NC | No connection. | |
| 2 | GND | Connects to ground. | |
| 3 | SEND | Input/Output pin. When grounded, transmits. | Grounded level : - 0.5 ~ +0.8 V Input current : Less than 20 mA |
| 4 | MOD | External modulator input. | Input imp. : 10 k Ω Input level : Approx. 500 mVrms |
| 5 | AF | Fixed AF output regardless of [VOLUME]. | Output imp.: 1.5 k Ω Output level : Max. 85 mVrms |
| 6 | SQLS | Squelch output. Goes to ground when squelch opens. | Squelch open : Less than 0.3 V/5 mA Squelch closed : More than 6.0 V/100 μ A |
| 7 | 13.8 V | 13.8 V output. | Output current : Max. 1 A |
| 8 | NC | No connection. | |

3-1 INITIAL SETTINGS

When applying power for the first time after the purchase of the repeater, be sure to confirm the following points:

- 1) That the [COR SIMULATE] switch is OFF.
- 2) That the [VOLUME] control is rotated maximum counterclockwise.
- 3) Rotate the [SQUELCH] control maximum counterclockwise and confirm that the [BUSY] indicator lights up in green.
- 4) Rotate the [VOLUME] control clockwise and adjust it as desired as the noise comes from the speaker.



3-2 OPERATION

- 1) Turn the [POWER] switch ON. The [POWER] indicator lights up in green.
 - If the [POWER] indicator lights up in red, AC power is not applied to the repeater. Make sure the AC cable is correctly connected.
 - When using only DC power, turn the [POWER] switch ON then push the [DC RESET] switch to apply power. Confirm that the [POWER] indicator lights up in red.
- 2) Set repeater mode for either a private or open repeater.

For private repeaters:

Push the [CTCSS] switch ON. The [CTCSS] indicator lights up and the repeater transmits only received signals with specified subaudible tones superimposed on them.

For open repeaters:

Push the [CTCSS] switch to turn OFF the tone squelch function if the [CTCSS] indicator lights up. The repeater transmits all receive signals if the [CTCSS] indicator does not light up.

- 3) That the [SQUELCH] control is rotated maximum clockwise.
- 4) That the supplied HM-4 microphone is connected to the mic connector.
- 5) Rotate the [SQUELCH] control clockwise until the [BUSY] indicator goes OFF and noise from the speaker disappears.
 - The level of this control determines the level of the input signals to be repeated. Adjust [SQUELCH] as required to repeat only strong signals.
- 6) Rotate the [VOLUME] control maximum counterclockwise as the monitor signal from the speaker is not related to repeater functioning.

● MICROPHONE FUNCTION

Push and hold the [PTT] switch on the microphone to transmit your voice.

The repeater functions as a transceiver when [LOCAL INHIBIT] is ON and the PTT switch is pushed. Speak into the microphone using your normal voice level. Be sure not to overlap voice signals on the modulation of received signals. See p. 5 for additional information.

● COR SIMULATE FUNCTION

The repeater can be set in continuous transmit mode for checking repeater operation when [COR SIMULATE] is pushed IN. Check the following functions.

1. Time-out timer
2. Hang-up timer
3. Repeat stopping time
4. ID speed
5. ID function

4 BASIC PRESETTINGS

WARNING: DISCONNECT the AC power cable from the repeater before performing any work on the repeater.

4-1 SETTING A FREQUENCY

The transmit and receive frequencies can be set by dip switches on the LOGIC-A UNIT. See p. 18 for the LOGIC-A UNIT location. See p. 19 for each switch location.

- 1) Remove the bottom cover.
 - Remove 6 screws on the bottom cover and another 3 screws on each side of the front panel.
- 2) Setting the PLL reference frequency
 - Turn ON S4-1 on the LOGIC-A UNIT to set the PLL reference frequency for 10 kHz.
 - Turn OFF S4-1 on the LOGIC-A UNIT to set the PLL reference frequency for 25 kHz.

3) Setting the PLL N-data

$$\text{N-data for receiving} = \frac{\text{receive frequency} - \text{1st IF frequency (MHz)}}{\text{PLL reference frequency (MHz)}}$$

$$\text{N-data for transmitting} = \frac{\text{transmit frequency (MHz)}}{\text{PLL reference frequency (MHz)}}$$

Set the N-data obtained in the above formula by using the dip switches. Every dip switch has an independent volume of N-data.

NOTE: Confirm that the dip switches are correctly set, and apply power to confirm the operating frequency after replacing the bottom cover.

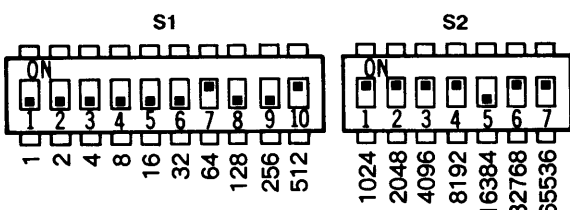
● Example of setting N-data for receiving

receive frequency : 1279.00 MHz
 1st IF frequency : 136.60 MHz (fixed)
 PLL reference frequency : 0.01 MHz (10 kHz)

$$\begin{aligned} \text{N-data for receiving} &= \frac{\text{receive frequency} - \text{1st IF frequency}}{\text{PLL reference frequency}} \\ &= \frac{1279 - 136.6}{0.01} \\ &= 114240 \end{aligned}$$

Set dip switches (S1, S2) at the values equivalent to the obtained N-data.

Example of setting dip switches



| Dip switches | N-data value |
|--------------|---------------|
| S2-7 → | 65536 |
| S2-6 → | 32768 |
| S2-4 → | 8192 |
| S2-3 → | 4096 |
| S2-2 → | 2048 |
| S2-1 → | 1024 |
| S1-10 → | 512 |
| S1-7 → | 64 (+) |
| Total | 114240 |

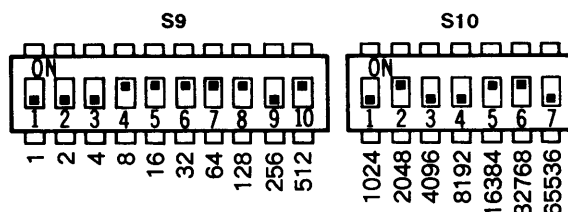
● Example of setting N-data for transmitting

transmit frequency : 1299.00 MHz
 PLL reference frequency : 0.025 MHz (25 kHz)

$$\begin{aligned} \text{N-data for transmitting} &= \frac{\text{transmit frequency}}{\text{PLL reference frequency}} \\ &= \frac{1299}{0.025} \\ &= 51960 \end{aligned}$$

Set dip switches (S9, S10) at the values equivalent to the obtained N-data.

Example of setting dip switches



| Dip switches | N-data value |
|--------------|--------------|
| S10-6 → | 32768 |
| S10-5 → | 16384 |
| S10-2 → | 2048 |
| S9-10 → | 512 |
| S9-8 → | 128 |
| S9-7 → | 64 |
| S9-6 → | 32 |
| S9-5 → | 16 |
| S9-4 → | 8 (+) |
| Total | 51960 |

Count on us!

