**A◉R**

# AR3OOO operating manual

100KHz     1MHz     10MHz     100MHz     1GHz 2GHz

**AOR, LTD.**

# Operating Manual

# 1. Major Features

* The AR3000 covers the frequency range of 100kHz to 2036MHz without any gaps in the tuning range.
* All-modes are provided:— Narrow FM, Wide FM, AM, USB, LSB and CW.
* 400 memory channels in 4 banks of 100 are provided.
* High speed scanning at 20 channels per second.
* Frequency increments are selectable in 50Hz steps from 50 Hz to 100kHz.
* Computer control is possible, using the built-in communications port.

# 2. Operating precautions

The receiver is designed for use on 12V dc only. Always use the correct power cord, making sure that positive and negative connections are made correctly. For home use, a properly regulated AC power supply with 12–14V output is essential. The receiver is supplied with both DC power cord and AC power supply (with correct voltage where the set is destined) as standard accessory for mobile and home use. Disconnect the power supply from the mains, if the receiver is not being used. Take care to avoid spillage or leakage of liquids into the receiver. Special care should be taken to prevent liquid entry via the power jack.

# 3. Preparation

1. Connect 12V dc power supply correctly.
2. The squelch control should be turned to 12 o'clock position before the power switch is turned on.
3. Make sure that the LCD does not show any descriptions, eg. KEYLOCK, SEARCH, PRIORITY, SCAN, etc. when the set has been powered for the first time. Clear the descriptions on the display if any by referring to the respective section in this manual.
4. The receiver is provided with two antenna connectors on the rear panel, one for 100kHz—30MHz and another for above 30MHz. Connect any appropriate antenna(s) to the set according to your requirements.

Note: The squelch control can be considered as setting the level of signal which will stop the scanning/searching process, and allow the transmission to be heard. In the fully anticlockwise position, the squelch is open, and no scanning/searching will take place. Starting from the anticlockwise setting, rotate the squelch control clockwise until background noise from the speaker is cut off. This is the most sensitive setting for the squelch control, but at this setting, it is possible for bursts of interference to stop the scanning/searching.

It is advisable to advance the squelch slightly further clockwise to avoid this. The correct setting will be easily found by experience.

# 4. Explanation of Function Keys

The front panel keys (except 2ND F, UP, DOWN and ENTER) are designed to provide two different functions, each colour-coded in orange and white. The first function in orange lettering is activated by pressing each respective key directly. The second function in white lettering is activated by pressing the 2ND F key followed by each respective key.

**First Functions**

| Key | Function |
|---|---|
| MODE | Selects the receive mode. Press this key and rotate the main knob to select your desired mode on the LCD. |
| SEARCH | Initiates (or stops) search for active frequencies. |
| DIAL | Used to select a receiving frequency either by the main knob or keypads. |
| STEP | Used to select a frequency increment. Frequency increments are selectable in 50Hz steps from 50Hz to 100kHz. |
| SHIFT | Used to shift the receiving frequency by a pre-determined margin. This is useful when monitoring repeater channels. |
| MEMO | Recalls the data stored in memory. Also used to initiate memory channel scan. |
| PRIO | Toggles priority channel monitoring on or off in scan/search mode. Channel 00 is designated as priority channel. |
| ENTER | Enters information such as frequency, receive mode, search, memory channel, frequency shift, and frequency increment. |
| DOWN UP | Used to manually step forward or backward a receiving frequency, memory channels and search frequencies. Press and hold this key for approx. one second to start scan/search automatically. |

| | |
|---|---|
| $\boxed{0} \sim \boxed{9}$ | Enters numeric information e.g. a receiving frequency, frequency increment, etc. |
| (MAIN KNOB) | Used to select a receiving frequency, memory channel, and receive mode. Pull this knob once to increase the tuning rate ten times faster. To restore the tuning rate to normal pull this knob again. |
| $\boxed{.}$ | This key represents a decimal point at MHz when entering a receiving frequency, e.g. 151.1125 for 151.1125MHz. However, when entering a frequency increment, this key represents a decimal point at kHz, e.g. 0.05 for 50Hz. |

## Second Functions

| | |
|---|---|
| $\boxed{\text{2ND. F}}$ | Press this key to activate the second function. |
| $\boxed{\text{KEY. L}}$ | Disables all keyboard functions to prevent accidental changes in operation. |
| $\boxed{\begin{array}{l}\text{(SEARCH)} \\ \text{SET}\end{array}}$ | Used to set program search. |
| $\boxed{\text{BEEP}}$ | Switches beep tones on or off. |
| $\boxed{\text{LAMP}}$ | Switches internal backlight of the LCD on or off. |
| $\boxed{\begin{array}{l}\text{(SHIFT)} \\ \text{SET}\end{array}}$ | Used to enter a shift frequency. |
| $\boxed{\text{BANK}}$ | Selects one of 4 memory banks, each providing independent scan/search facilities. |
| $\boxed{\text{ATT}}$ | Switches the internal RF attenuator on or off. |
| $\boxed{\text{CLOCK}}$ | Used to display time on the LCD. |
| $\boxed{\text{CLOCK. S}}$ | Used for setting clock. |

| | |
|---|---|
| $\boxed{\begin{array}{l}\text{MEMO.} \\ \text{DEL}\end{array}}$ | Erases the data stored in memory. |
| $\boxed{\text{STEP. ADJ}}$ | Used to adjust the frequency increment. |
| $\boxed{\text{SLEEP. T}}$ | Used to program the built-in timer (POWER OFF). |
| $\boxed{\text{SLEEP. S}}$ | Used to set the built-in timer on. |
| $\boxed{\text{CH. PASS}}$ | In memory scan mode allows the receiver to bypass unwanted channels. |
| $\boxed{\begin{array}{l}\text{FREQ.} \\ \text{PASS}\end{array}}$ | In search mode allows the receiver to bypass unwanted frequencies. |
| $\boxed{\text{ALARM. T}}$ | Used to program the built-in timer (POWER ON). |
| $\boxed{\text{ALARM. S}}$ | Used to set the built-in timer on. |
| $\boxed{\begin{array}{l}\text{FREE.} \\ \text{SCAN}\end{array}}$ | In search or scan mode allows the receiver to automatically resume search/scan after a 5 seconds delay even if the signal is still present. |

# 5. Frequency Selection

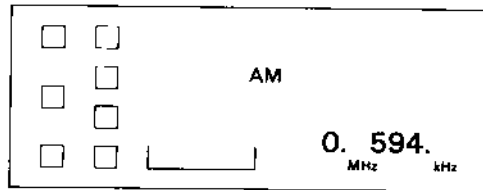The AR3000 provides two methods of frequency selection:— Direct mode and Manual mode.

### Direct Mode

You can directly enter the frequency in a particular bank of interest by using the front panel keypads.

For example:—
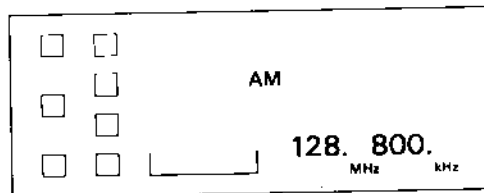1. If you want to tune the receiver to the radio station at 594kHz in AM mode, proceed as follows:—
   A  Press [DIAL] [MODE] keys.
   B  Rotate the main knob until the LCD shows AM, and then press [ENTER] key.
   C  Press [.] [5] [9] [4] [ENTER] keys in sequence.
   D  The LCD shows as follows:—

```
┌─────────────────────────────────────┐
│  □  □                                │
│                        AM            │
│  □                                   │
│        □                             │
│  □  □  └──────┘    0.  594.          │
│                      MHz      kHz    │
└─────────────────────────────────────┘
```

2. 128.8MHz AM mode station
   A  Press [DIAL] [MODE] keys.
   B  Rotate the main knob until the LCD shows AM, and then press [ENTER] key.
   C  Press [1] [2] [8] [.] [8] [ENTER] keys in sequence.
   D  The LCD shows as follows:—

```
┌─────────────────────────────────────┐
│  □  □                                │
│                    AM                │
│  □                                   │
│        □                             │
│  □  □  └──────┘   128.  800.         │
│                      MHz      kHz    │
└─────────────────────────────────────┘
```

3. 7.099MHz LSB mode station
   A Press DIAL MODE keys.
   B Rotate the main knob until the LCD shows LSB, and then press ENTER key.
   C Press 7 . 0 9 9 ENTER keys in sequence.
   D The LCD shows as follows: —
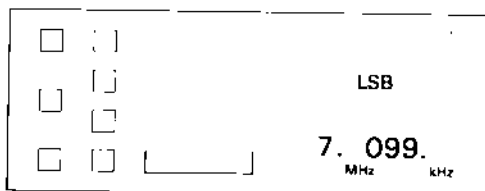


Note: The receive mode (AM, Narrow FM, etc) can be also selected by UP and DOWN keys instead of using the main knob.

## Manual Mode

This mode is mainly used to look for active frequencies.

For example: —
If you wish to tune across the 21MHz band in USB mode at 50Hz steps, first press DIAL MODE keys and rotate the main knob until the LCD shows USB, and then press ENTER key. Press 2 1 . 0 ENTER keys in sequence. Press STEP 0 . 0 5 ENTER keys in sequence. The LCD shows as follows: —
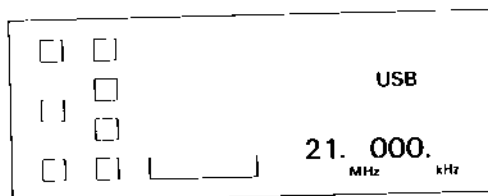


Rotate the main knob slowly clockwise to tune the frequency upward, and anticlockwise downward. Alternatively, the receiver can be tuned by UP and DOWN keys. Press and hold either UP or DOWN key approx. one second and the receiver automatically starts searching. Press DIAL key to stop searching.

# 6.  Memory Storage

The AR3000 has 400 memory channels (4 banks of 100 channels) which can store both receiving frequency and receive mode.

a.  In Direct mode

You can store the frequency information into memory by keypads directly.

Firstly select one of 4 banks you want to use.

Secondly enter the frequency and receive mode in Direct mode.  The LCD is showing the frequency information you want to store into memory.  To enter this information into memory channel 01, for example, press [ENTER] key to confirm the MCH indicator starts flashing.  Press [0] [1] [ENTER] keys in sequence to complete the process of memory entry.

b.  In Search mode

It is also possible to transfer frequency information into memory in Search mode.

Operate the receiver in Search mode.  When the receiver stops at the signal you want to store into memory, for example to channel 99, press [SEARCH] key.  Then, press [ENTER] key to confirm the MCH keys indicator starts flashing press [9] [9] [ENTER] in sequence. Channel number must always be entered as two digits e.g. 00,01 ... 10,11, ... 98,99. To cancel the process of memory entry, press [DIAL] key.  The receiver will return to Dial mode.

# 7.  Memory channel recall

You can manually recall any specific channel from a memory bank for listening.  Press [MEMO] key and select the channel number you want to recall by either using the main knob or [UP] [DOWN] key.  Alternatively, you can recall the memory channel by directly entering the channel number by keypads followed by [MEMO] key, e.g. press [9] [9] [MEMO].

# 8.  Memory channel scan

Press [MEMO] key, then press and hold either [UP] or [DOWN] key for approx. one second.  The receiver automatically starts scanning over those memory channels which contain frequency information.  The M indicator flashes in memory channel scan mode.  To stop the scan simply press [MEMO] key.

# 9.  Erasure of memory contents

To erase the memory contents first recall the memory channel on the LCD and press [2ND. F] key followed by [MEMO. DEL].

# 10.  Memory Pass (Channel lock-out)

This facility allows the receiver to bypass any channel in the scan sequence. Select the channel number to be bypassed, and press ⌈2ND. F⌉ key followed by ⌈CH. PASS⌉. To cancel the bypass, simply repeat the same sequence.

# 11.  Free scan

In search or scan mode, this facility allows the receiver to continuously search or scan after 5 seconds of delay on busy channel even if the signal is still present. To initiate the free scan press ⌈2ND. F⌉ key followed by ⌈FREE. SCAN⌉ in search or scan mode. Two decimal points each preceding the MHz and kHZ indicators flash alternately in free scan mode. To cancel the free scan simply repeat the same sequence. Note that free scan is cancelled when ⌈PRIO⌉ key is pressed and the receiver is engaged in priority mode.

# 12.  Search

The AR3000 can continuously search throughout its range of 100kHz to 2036MHz looking for active frequencies on the air. You can also program one search range in each memory bank by specifying both the start frequency of search and end frequency through keypads. Frequency increments (stepping frequency) are selectable in 50Hz steps from 50Hz to 100kHz in either case.

Examples:

a. Free Search (Dial mode)
Search from 594kHz upward in AM mode at 9kHz increment.

Press ⌈DIAL⌉ key.
Press ⌈STEP⌉ ⌈9⌉ ⌈ENTER⌉ keys in sequence.
Press ⌈MODE⌉ key and rotate the main knob until the LCD shows AM, and press ⌈ENTER⌉ .
Press ⌊.⌋ ⌊5⌋ ⌊9⌋ ⌊4⌋ ⌊ENTER⌋ keys in sequence.
Press and hold ⌊UP⌋ key for approx. one second.
The LCD shows "SEARCH", "AM", and "Frequency", and the receiver starts searching.

To stop searching, press ⌈DIAL⌉ key.

Pulling the main knob while searching increases the search tuning rate by a factor of 10. The LCD shows "STEP" to confirm the rapid tuning rate is engaged.

b. Program Search
Search between 350MHz and 400MHz in NFM mode at 12.5kHz steps.

Press [2ND. F] [SEARCH. SET] keys in sequence. Rotate the main knob until the LCD shows NFM. Press [ENTER] key.

Press [1] [2] [.] [5] [ENTER] keys in sequence. The LCD shows "L" in the place of channel number.

Press [3] [5] [0] [.] [ENTER]. The LCD now shows "H".

Press [4] [0] [0] [.] [ENTER] keys.

The LCD shows "P" for the program search and the receiver starts searching automatically. To stop searching press [SEARCH] key.

Press [SEARCH] key again to resume searching over the same search range.

Note: Assuming that Program Search, and Free Search have been programmed with frequencies, it is possible to transfer between the search modes as follows:—
If already in Program Search, press [SEARCH] key to stop the search process. The frequency at which the search stops automatically becomes the start point for Free Search, and free searching can take place up or down in frequency, as selected by the UP/DOWN keys. Search, and the receiver passes a signal which may be of interest, you can immediately stop the search and use Free Search to tune back to the signal. If you are already in Free Search mode, you can transfer to Program Search by pressing the DIAL key, but you will return to the start frequency programmed initially.

## 13. Memory Bank

The AR3000 provides 4 banks of 100 memory channels for a total of 400 channels. Each memory bank can independently store different memory frequencies and program search ranges for maximum operating convenience.

To select a memory bank press [2ND. F] [MEMO. BANK] keys in sequence. Repeat the sequence if necessary until you have selected the memory bank desired. A red LED alongside the row of memory bank numbers will light to tell which bank is selected.

## 14. Frequency Increment (Stepping frequency)

The AR3000 provides selectable frequency increments in 50Hz steps from 50Hz to 100kHz. You should choose a most appropriate frequency increment according to the frequency band you want to listen, e.g. 25kHz for VHF air band; 12.5kHz for land mobile; 50Hz for SSB, etc.

To select a 25kHz increment press [STEP] [2] [5] [ENTER] keys in sequence.

To select a 50Hz increment, for another example, press [STEP] [.] [0] [5] [ENTER] keys in sequence.

# 15. SHIFT

This facility allows you to instantly shift the frequency currently used to another frequency by a pre-determined margin. This is particularly useful if you are monitoring repeater stations which use offset frequencies for receive and transmission.

To shift −5MHz from the present frequency, press [2ND. F] [SHIFT. SET] [DOWN] [5] [.] [ENTER] keys in sequence. Pressing [SHIFT] key results in switching the −5MHz shift on or off.

To shift +5MHz from the present frequency, for another example press [2ND. F] [SHIFT. SET] [UP] [5] [.] [ENTER] keys in sequence. Pressing [SHIFT] key results in switching the +5MHz shift on or off.

The LCD will show "SHIFT" when this facility is engaged.

# 16. PRIORITY

Memory channel 00 is specially designated as "PRIORITY CHANNEL" in which you can store a frequency you would not like to miss even while scanning over other memory channels. Channel 00 is constantly monitored once every 2 seconds in priority mode. When the signal appears on channel 00, the receiver is locked to channel 00 for listening. To toggle the priority on or off simply press [PRIO] key. The LCD shows "PRIO" in priority mode.

– 17 –

# 17. KEY-LOCK

This facility allows you to lock all keyboard functions of the receiver to prevent accidental changes in operation. To toggle the key-lock mode on or off press [2ND. F] [KEY. L] keys in sequence. The LCD shows "KEY LOCK" in key-lock mode.

# 18. BEEP on/off

A beep tone is generated at each key stroke to confirm correct entry.
To mute this beep tone press [2ND. F] [BEEP] in sequence. Repeat the same sequence to restore the beep tone.

# 19. LCD back-light on/off

Press [2ND. F] [LAMP] in sequence to turn the back-light illumination on or off.

– 18 –

# 20. ATTENUATOR

The AR3000 has a built-in RF attenuator which can reduce the signal strength reaching the input stages of the receiver from the antenna. Switching the attenuator on results in better reception when a strong signal is received or adjacent strong signals overload the receiver's input.

Press [2ND. F] [ATT] in sequence. The LCD shows "ATT" when the attenuator is switched on. Repeat the same sequence to switch the attenuator off.

# 21. FREQUENCY PASS

This facility allows the receiver to bypass unwanted frequencies (interference signals, internal spurii, etc) in search mode. You can store any 48 frequencies in memory channel 00 to channel 47. Note that this facility does not function when the receiver is tuned in Direct mode or Manual mode.

The following example shows how to store a frequency of 45.945MHz into channel 00;

Press [2ND. F] [FREQ. PASS] keys. The PASS indicator flashes on the LCD.
Press [4] [5] [.] [9] [4] [5] [ENTER] keys in sequence. The channel indicator now shows 01, and the receiver is ready for another frequency to be entered.

To delete a frequency from memory, press [2ND. F] [FREQ. PASS] keys followed by [0] [0] [ENTER]. Repeat this sequence to delete other frequencies.

All frequencies stored in memory can be displayed sequentially on the LCD for checking. Press [2ND. F] [FREQ. PASS] [ENTER] keys to display the frequency in channel 00. Repeat pressing [ENTER] to scroll all frequencies in memory until the last frequency in memory appears. Note that "Frequency Pass" does not function if this process has been aborted half-way.

# 22. STEP ADJUSTMENT

In search mode, this facility allows the receiver to step through frequencies as the following example;

Search starts from 903.0125MHz in 25kHz step.
903.0125, 903.0375, 903.0625, 903.0875, 903.1125, . . .

When this facility is disengaged, like most other receivers, the AR3000 will start searching as the following example;

903.0125, 903.025, 903.050, 903.075, 903.100, . . . i.e. reverting to nearest 25kHz step.

To operate the receiver with "STEP ADJUST" engaged, press 2ND. F STEP. ADJ keys. The kHz indicator in the LCD flashes. Repeat the same sequence to disengage "STEP ADJUST". The kHz indicator stops flashing.

# 23. Main Knob

In Dial mode rotate the main knob clockwise to advance the receiving frequency upward, and anticlockwise downward. Pull the main knob once to increase the tuning rate by a factor of 10. To restore the tuning rate to normal pull the main knob again.

In Memory mode, the main knob is used to select memory channels.

# 24. Built-in Clock

A 24-hour real time clock is provided with the AR3000. The LCD shows for example 10—24—25 (10h 24m 25s a.m.) or 18—45—00 (06h 45m p.m.).

Press 2ND. F CLOCK keys to display the time while the receiver is operating.

To set the clock at 7h 20m 20s for example, press 2ND. F CLOCK. S keys followed by 0 7 2 0 2 0 ENTER .

The time once entered will be retained as long as the receiver is connected to the mains power supply.

# 25. Built-in Timer

The AR3000 can be either switched on or off automatically at pre-programmed timing using the built-in timer.

Example:
To program the timer to switch the receiver on at 6 a.m., press 2ND. F ALARM T keys followed by 0 6 0 0 ENTER .
Press 2ND. F ALARM. S . An LED will light to confirm the timer is engaged. Turn the main switch off. The LCD shows "ALARM", and the receiver will be automatically switched on at 6 a.m.

To cancel the timer setting, press 2ND. F ALARM. S keys while the receiver is powered on.

Also you can program the timer to switch the receiver off within a length of one minute to 120 minutes.

Example:
To program the timer to turn the receiver off after 30 minutes, press 2ND. F SLEEP. T keys. An LED alongside the SLEEP indicator flashes. Press 3 0 ENTER . Press 2ND. F SLEEP. S keys, and turn the mains switch off. The LED will light to confirm the timer is engaged.

To cancel the timer setting press 2ND. F SLEEP. S keys.

# 26. COMPUTER CONTROL

## First steps in computer control for the AR3000

The AR3000 has a built in RS-232C computer control interface, allowing two way communication with a personal computer. The computer must be capable of operating as a communications terminal via its own RS-232 port.

The computer must be set up to operate at 4800 baud, with two stop bits and no parity.

The D25 connector on the back panel of the AR3000 is connected as follows: —

pin 1      Ground
pin 2      TX data
pin 3      RX data
pin 4      RTS
pin 5      CTS
pin 7      Remote on/off

Note that pin 7 is grounded to enable remote control function, and if a switch is wired between pins 1 and 7, local/remote switching can be provided.

The only protocol support is by means of hardware handshaking using pins 4 and 5 (RTS and CTS). These pins must not be shorted together, and it is necessary to use the hand-

shake facility because data is being sent from the AR3000 every 25 mSec to indicate signal strength and squelch open/close.

Commands,

The following commands may be sent to the AR3000 by the personal computer.

1) Frequency in MHz. e.g. 88.3; or 1.053; etc.
            Leading zeros are not needed.

2) Mode selection by a single letter code as follows: —
      A — AM
      N — Narrow FM
      W — Wide FM
      L — Lower side band
      U — Upper side band
      C — CW

3) Attenuator setting.
      R — Attenuator on
      T — Attenuator off

4) Frequency steps in kHz.
      S — frequency step

The steps can be of any size from 50 Hz to 100 kHz, in increments of 50 Hz, but must be entered as kHz, e.g.

25 kHz is entered as 25
100 Hz is entered as 0.1
50 Hz is entered as 0.05
Leading zeros are not needed.

5) Memory operations
   M — Set memory
   Z — Read memory
   X — Set bank

**Using the commands.**

With the exception of the Z (memory channel read), and X (memory bank select), the commands must be entered in the following order. Note that the only mandatory command is the mode select: all the others are optional and may be missed out if no change is needed in that particular parameter. All parameters must be separated by a space character.

| | |
|---|---|
| —–M | (memory channel number as two digits) |
| ——.—–S | (frequency step in kHz) |
| R or T | (attenuator on or off) |
| ——–.——— | (receive frequency in MHz) |
| N, W, A, L, U, C. | (mode) |

**Some examples:—**

01M   12.5S   R   1024.575N

This will enter receive frequency of 1025.575 MHz, 12.5 kHz steps, narrow FM mode, attenator on, into memory channel 01.

128.8   A

This will put the receiver on to 128.8 MHz in AM mode.

99M   0.05S   T   21   U

This will enter a receive frequency of 21 MHz, 50 Hz tuning steps, upper sideband, attenuator off, into memory channel 99.

To recall a memory, simply send the memory number followed by Z. e.g. 01Z will recall the contents of memory 01.

To change memory banks, simply send X. The memory banks are changed in sequential form, 0—1—2—3—0—1—2—3, and no indication is returned from the AR3000 to show the bank in use. In practical use with a personal computer, it is better to assemble a virtually unlimited memory bank in the computer itself, and instruct the AR3000 directly in frequency. This can speed up operation depending on the speed of the computer, and offer much more versatile facilities than simply using the in built memory banks of the AR3000.

### Response from AR3000

The AR3000 will continuously send updated information on squelch open/close, and signal strength, except when a command is being received from the external computer. Signal strength is given by letters A to P representing 16 ascending signal levels. Squelch closed, i.e. no signal present, is given by character " % ".

In response to a read memory command from the computer, the AR3000 will respond with the following data:—

| | |
|---|---|
| #—— | (Memory channel number, 2 digits) |
| W or X | (W=attenuator on, X=attenuator off) |
| Z———.—— | (Frequency step in kHz) |
| Y————.————— | (Receive frequency in MHz) |
| Q, R, S, T, U, V. | (Receive mode. Q=narrow FM, R=wide FM, S=AM, T=lower sideband, U=upper sideband, V=CW.) |
| CR | Carriage return |

— 27 —

Each element of the data string is separated by a space, e.g.

#01   X   Z025.00   Y0435.225   Q   CR

This represents memory channel 01, attenuator off, 25 kHz frequency step, 435.225 MHz receive frequency, narrow FM.

## 27. Automatic Tape Recording

An AUX socket (DIN) is provided on the rear panel of the AR3000.
Pin 4 and Pin 2 (GND) are used as audio output, and Pin 7 and Pin 6 are used as remote switch.
On certain type of tape recorder, the polarity of the remote switch may be inverted. In this instance, the connections to Pin 7 and Pin 6 must be reversed after carefully checking polarity.
The tape recorder will be automatically activated when a signal is received with the AR3000, and the squelch opens.

Please note:
1. The AR3000 has ONE BNC
   aerial socket (not two).
2. The memories are held by a
   lithium backup battery.