

***SPECTRUM DISPLAY UNIT  
MODEL SDU-5000  
OPERATING MANUAL***



AOR, LTD.  
TOKYO, JAPAN.



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## **I. General**

For years the professionals have been using spectrum display units(SDU) and spectrum analyzers as an aid to intercepting those elusive signals. Now the serious listener can afford to have the luxury of an SDU with features never before offered in this type of equipment. You will be able to watch up to a 10MHz window of the spectrum. By moving the SDU cursor left or right, or Pressing  key, you can pinpoint a signal of interest and instantly read frequency and signal level while listening. This new feature is possible using the AR-3000A general coverage receiver, and all data can be stored on disk for later analysis when a PC is used.

## **II. Technical hilights**

First SDU using 16 color LCD screen.

Composite video output(NTSC or PAL) for bigger screen or VCR recording/playback.

Easy to operate, menu driven system.

100% compatible with AR-3000A with 10.7MHz IF.(Direct control features are limited.)

Direct frequency and level digital presentation on screen with AR-3000A.

Dual resolution: Wide 30KHz/Narrow 5KHz.

High frequency accuracy using Direct Digital Synthesizer(DDS).

Displays average, peak, and maximum signal level.(Features found only in very expensive spectrum analyzer.)

### **III. Specifications**

|                             |                                                                                                             |
|-----------------------------|-------------------------------------------------------------------------------------------------------------|
| General                     | :Model SDU-5000 Spectrum Display Unit                                                                       |
| Input Frequency             | 10.7MHz                                                                                                     |
| Sweep Width                 | :0 to 10MHz( 1KHz step)                                                                                     |
| Frequency Accuracy          | : $\pm 600\text{Hz}$                                                                                        |
| Resolution BandWidth        | :5, 30KHz                                                                                                   |
| Reference Level             | :-10, -40dBm                                                                                                |
| Maxim Input Level           | :-10dBm                                                                                                     |
| Dynamic Range               | :50dB min                                                                                                   |
| Level Accuracy's :Linearity | :Within $\pm 2\text{dB}$<br>(within -40 dB from reference level)                                            |
|                             | :Band Ripple :+3dB -6dB @10.7MHz $\pm 5\text{MHz}$                                                          |
|                             | :Temperature : $\pm 6\text{dB}$ (0°C~40°C)                                                                  |
| Marker Mode                 | :Direct read out for frequency and level<br>:Peak Detect<br>:Averaging (2 to 32 times sampling, adjustable) |
| Plot Mode                   | :Outline, Paint                                                                                             |
| Display Mode                | :Upper, Lower                                                                                               |
| Input Impedance             | :20k $\Omega$                                                                                               |
| Composite Video Out         | :1Vp-p/NTSC, PAL (75 $\Omega$ )                                                                             |
| Display Type                | :3.1"HQM simple matrix color LCD<br>(16 colors)                                                             |
| Display Resolution          | :192 x 210 dots                                                                                             |
| Screen Refresh              | :500mSec                                                                                                    |
| Power Requirement           | :DC 12V $\pm 5\%$ @800mA                                                                                    |
| Backup                      | :from primary DC 12V supply                                                                                 |
| Dimension & Weight          | :3.75"H x 7.5"W x 10"D<br>20oz max                                                                          |

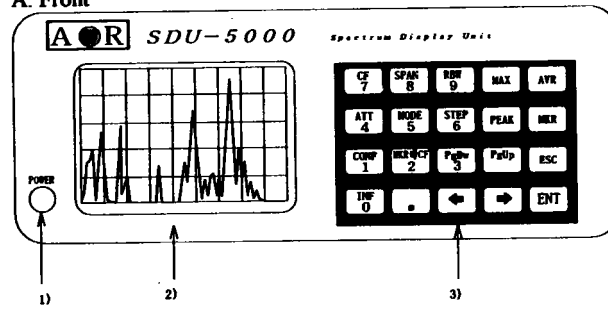
### **IV. Accessories supplied**

- 1 )AR-3000A control cable.
- 2 )DC power supply cable.
- 3 )Operating Manual.

## V. Control, Display and Connectors

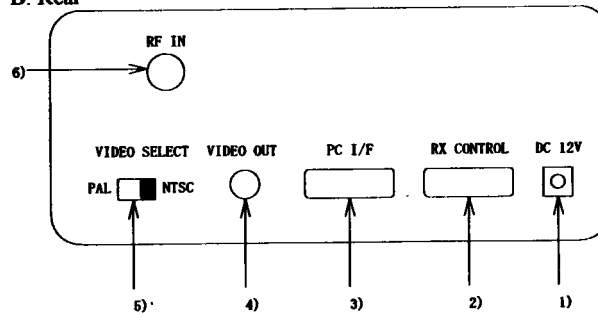
This section describes control and display of the SDU-5000.

### A. Front



- 1) Power switch : Press Power switch once to turn on, press again to turn off.  
 2) Color LCD display:  
 3) Keyboard :24 control keys.

### B. Rear



- 1)DC 12V :Provided for DC 12V power supply comes with SDU-5000.  
 2)RX Control :Connect to AR-3000A with a special cable supplied.  
 3)PC I/F :RS-232C port for PC.  
 4)Video Out :Connect to an external video monitor.  
 5)Video Select :Select NTSC or PAL for external monitor.  
 6)RF IN :10.7MHz input from receiver.

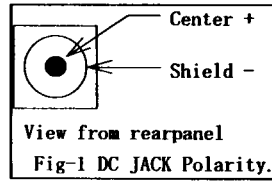
### C. Side

- Brightness Control :Brightness control for LCD.

## **VI. Precaution**

### **A. Power supply requirement**

The SDU-5000 does not include DC Power supply. Use well regulated DC power supply capable of delivering minimum 1,000mA(1A). Consult the store where you purchased this unit.



Refer Fig-1 for the polarity of DC jack.

### **B. Location**

Do not use or leave the SDU-5000 in direct sunlight. It is best to avoid locations where excessive heat, humidity, dust and vibration are expected. Always treat the SDU-5000 with care.

### **C. Looking after your SDU-5000**

Always keep the SDU-5000 free from dust and water. Use a soft dry cloth to gently wipe the set clean. Never use chemicals such as benzene or thinners which will damage certain parts.

### **D. Color LCD**

Internal LCD display is made by glass, avoid strong shocks and dropping.

### **E. Brightness of LCD**

The brightness of LCD display is adjustable by volume on side panel.



## **VII. Setup and Connection**

### **A. Power Supply**

The power switch of SDU-5000 should be turned off.

Connect power supply with supplied cable.

### **B. AR-3000A Modification**

To connect the SDU-5000 to AR-3000A receiver, it is necessary to modify your AR-3000A.

The modification requires special skill and proper tools. Some dealer offers AR-3000A with this modification. If your AR-3000A is not modified yet, consult following company for proper modification.

#### **1. U.S.A**

Electronic Equipment Bank, Inc.

323 Mill Street, Vienna VA 22180

Tel (703)938-3350 Fax (703)938-6911

#### **2. Europe**

AOR UK

Adam Bede High Tech Center, Derby Road, Wirksworth, Derbys. DE4 4BG

Tel 01629 82596 Fax 01629 825927

The following section describes the operation of the SDU-5000 with properly modified AR-3000A receiver.

### C. Connection(AR-3000A with IF modification)

- 1] Both SDU-5000 and AR-3000A should be turned OFF.
- 2] Connect AR-3000A's remote terminal to RX CONTROL of the SDU-5000. Use special cable provided with the SDU-5000.
- 3] Connect AR-3000A's IF OUTPUT to RF IN of the SDU-5000.
- 4] Turn on AR-3000A power.
- 5] Turn on remote switch of the AR-3000A.
- 6] Turn on SDU-5000 power.
- 7] SDU-5000 start to control AR-3000A by RS-232C.

If SDU-5000 can not control AR-3000A, the display shows "connect error " message and select other receivers mode automatically.

### D. Connection(Other receivers with 10.7MHz output)

The SDU-5000A is designed to operate with any receivers that have 10.7MHz IF output. However some features are limited.

- 1] Both SDU-5000 and the receiver should be turned OFF.
- 2] Connect receiver's IF output to RF IN of the SDU-5000.
- 3] Turn receiver power ON.
- 4] Turn SDU-5000A power ON.

It is necessary to set RF Gain, Display Mode, and Span according to the instruction provided in this manual.

#### **E. Connection (External Display Monitor)**

SDU-5000 provides NTSC or PAL video output switchable. Follow the steps as described below.

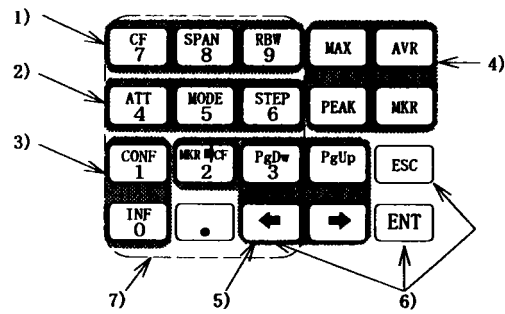
- 1 ] SDU-5000, receiver and external monitor should be turned OFF.
- 2 ] Connect VIDEO OUT to VIDEO IN of the monitor.
- 3 ] Select NTSC-PAL according to the monitor type. Most European users may set the switch to PAL, while North American users want to use NTSC.
- 4 ] Turn on the monitor power.
- 5 ] Turn on the receiver power.
- 6 ] Turn on the SDU-5000 power.

**NOTE:** If the NTSC-PAL switch is in PAL position, internal LCD is disabled.

## VIII. Operation

### A. Basic Key operation

SDU-5000 is controlled by the keyboard. This section describes common operations of the keyboard.



#### 1. Parameter Setting

Set the operation parameter. (Center Frequency, Span Width, Resolution BandWidth)

#### 2. AR-3000A Control

Control AR-3000A. (ATT, Mode, Step)

#### 3. Configuration

Set and readout the operating configuration. (Receiver type, RF Gain, Plot Mode, Display Mode)

#### 4. Analysis Function

Set the display function. (Averaging, Maximum hold, Peak detect, Marker)

#### 5. Marker and Tuning

Move marker and tuning the center frequency.

## 6. Special function keys

a) 

This key completes sequence of various data entry.

b) 

This key is used for abort the sequence.

c) 

This key is used to move cursor and to tuning down the center frequency.

While in setting parameter or selecting menu with numeric keys, this key is used for cancel the previous input.

## 7. Numeric keys(0 to 9 and [.] )

The numeric keys are used for entering the frequency, span, step, and selecting menu.

## B. Setting Parameters.

### 1. Center Frequency

#### a) Direct Entry

- 1) Hit **CF** key once.
- 2) The display shows "Center Frequency?"
- 3) Enter the center frequency in MHz with numeric keys.
- 4) Hit **ENT** key once.

Example: 81.25MHz

**CF** **SPAN** **CONF** **.** **8** **1** **2** **5** **ENT**

#### b) Step Adjustment

It is necessary to set AR-3000A for a specific frequency increment you would like.

- ←**: Move the center frequency one step lower side.
- : Move the center frequency one step upper side.

**NOTE:** The marker should be OFF when using this feature.

#### c) Scrolling

This feature allows to scroll the center frequency to upper/lower side by half of frequency span.

- FW**: To scroll the center frequency lower.
- UP**: To scroll the center frequency upper.

#### d) Marker

If marker is displayed, **MARK** key allows to switch the marker frequency to the center frequency. This feature allows instantaneous movement to desired frequency based on the display.

### 2. Frequency span width

- 1) Hit **SPAN** key once.
- 2) The display shows "Span Frequency?"
- 3) Enter the frequency span width in KHz with numeric keys.
- 4) Hit **ENT** key once.

Example: 5MHz

**SPAN** **MODE** **INT** **INT** **INT** **ENT**

### 3. Resolution bandwidth

Two resolutions of band width are provided, 5kHz and 30kHz.

- 1) Hit **RBW** key once.
- 2) The display shows menu.
- 3) Enter the selected menu no with numeric keys.
- 4) Hit **ENT** key once.

Example: 5kHz

**RBW** **CONF** **ENT**

### C. Controlling AR-3000A

When AR-3000A is a companion receiver for the SDU-5000, Attenuator, Mode and Step Frequency can be set from the SDU-5000.

#### 1. Attenuator

- 1] Hit  key once.
- 2] The display shows menu.
- 3] Enter the selected menu no with numeric keys.
- 4] Hit  key once.

Example: ATT On



#### 2. Mode

- 1] Hit  key once.
- 2] The display shows menu.
- 3] Enter the desired mode with numeric keys.
- 4] Hit  key once.

Example: NFM



#### 3. Step Frequency

- 1] Hit  key once.
- 2] The display shows "Step?"
- 3] Enter the step frequency in KHz with numeric keys.
- 4] Hit  key once.

Example: 12.5kHz



## D. Setting operating configuration

To utilize maximum features available for the SDU-5000, operating configuration can be set and retained in the unit while power is applied. The configurations you can set are : RECEIVER TYPE, RF GAIN, PLOT MODE and DISPLAY MODE.

### 1. Receiver type

- 1) Hit  key once.
- 2) The display shows configuration menu.
- 3) Hit   keys.
- 4) The display shows provided receiver list.
- 5) Hit the selected number with numeric keys.
- 6) Hit  key.

Example: AR-3000A

#### NOTE:

If SDU-5000 can not control AR-3000A, display "connect error " message on display and switch to "other receivers mode" automatically.

### 2. RF Gain

RF Gain can be chosen from Low(-10dBm) or High(-40dBm).

- 1) Hit  key once.
- 2) The display shows configuration menu.
- 3) Hit   key.
- 4) The display shows RF Gain select menu.
- 5) Hit the selected number with numeric keys.
- 6) Hit  key.

Example: Low(-10dBm)



### 3. Plot mode

Plot type can be from PAINT or OUTLINE.

- 1) Hit **CONF 1** key once.
- 2) The display shows configuration menu.
- 3) Hit **PgDn 3** **ENT** key.
- 4) The display shows plot mode select menu.
- 5) Hit the selected number with numeric keys.
- 6) Hit **ENT** key.

Example: OUTLINE

**CONF 1** **PgDn 3** **ENT** **MRG/CP 2** **ENT**

### 4. Display mode

This function enables the SDU-5000 to display the frequency in normal (Left is lower frequency from center cursor) or reverse (Left is higher frequency for the center cursor). When the receiver type is set to AR-3000A, SDU-5000 select the proper display mode automatically.

- 1) Hit **CONF 1** key once.
- 2) The display shows configuration menu.
- 3) Hit **ATT 4** **ENT** keys.
- 4) The display shows display mode select menu.
- 5) Hit the selected number with numeric keys.
- 6) Hit **ENT** key.

Example: Reverse Direction

**CONF 1** **ATT 4** **ENT** **MRG/CP 2** **ENT**

### 5. Display current configurations.

To verify the SDU-5000's current configurations use **INF 0** key.

The display shows current configurations until other key is pressed.

## E. Analysis

SDU-5000 provide professional features to analyze the receiving signals. Four analyzing tools are provided, i.e. AVERAGING, MAXIMUM HOLD, MARKER and PEAK DETECT.

### 1. Averaging

This feature allows the SDU-5000 to display the signal level based on a mathematical formula. The sampling rate can be set from 2 to 32. When you need to know signal's average level, or want to display constant signal without showing instantaneous signal such as noise, etc.

- 1] Hit  key once.
- 2] The display shows "AVR. (2 - 32)"
- 3] Enter the sampling rate with numeric keys.
- 4] Hit  key.
- 5] The display shows present number of sampling on the top right corner of the display screen.

If you wish to exit the function, hit  key.

### 2. Maximum Hold

This feature allows the SDU-5000 to display the maximum signal level. When you need to know instantaneous signal or intermittent signal, this feature is useful. The screen keep the level until strong signal is received.

- 1] Hit  key once.
- 2] The display shows "MAX".

If you wish to exit the function, hit  key.

### 3. Marker

To enable the marker feature, hit  key once. The screen shows "Marker" and "+" symbol on the displayed signal. The marker position's signal level and frequency are displayed on the screen. The marker is moved with   keys. If you wish to tune the signal at the marker position, hit  key once, so that the marker frequency shift to a center of the screen. (Marker frequency becomes new center frequency.)

If you wish to exit the marker mode, hit  key.

### 4. Peak Detect

When the  key is pressed. The SDU-5000 stop updating the signal input, and red "+" symbol is displayed on the strongest signal peak position. Hit  key once to move the marker to a next strong signal peak position. Hit  key once to go back pervious position. If you wish to tune the signal at the marker position, hit  key once, so that the marker frequency shift to a center of the screen. (Marker frequency becomes new center frequency.)

If you wish to exit the peak detect mode, hit  key again.

## **IX. PC I/F**

SDU-5000 is capable of remote control via the 9 pin female D-type rear connector (PC I/F) using a simple RS-232C cable with out the need for an interface.

### **A. Connection**

Connection to an IBM PC 25 Pin D-type serial port requires the following connections.

| IBM PC 25pin |                       | SDU-5000 9Pin |
|--------------|-----------------------|---------------|
| 1,7          | Frame & signal ground | 5             |
| 2            | TX data               | 3             |
| 3            | RX data               | 2             |
| 4            | RTS                   | 7             |
| 5            | CTS                   | 8             |

For a three wire hook up, simply connect the RST and CTS lines together (Pin 7 & 8) at the SDU-5000 end of the cable.

### **B. Communication parameter**

If using a terminal driver configure the following communications parameters.

|                                             |          |
|---------------------------------------------|----------|
| <input type="checkbox"/> Baud rate speed    | 9600 BPS |
| <input type="checkbox"/> Stop bits          | 2 Bits   |
| <input type="checkbox"/> Data bits (length) | 8 Bits   |
| <input type="checkbox"/> Parity             | None     |
| <input type="checkbox"/> X parameter        | On       |

### C. Commands

SDU-5000 provide remote control command functions similar as key operation.

| Key          | Command character | Function                    |
|--------------|-------------------|-----------------------------|
| INF<br>0     | " 0 " (3 0 h)     |                             |
| CONF<br>1    | " 1 " (3 1 h)     |                             |
| MEAS-CP<br>2 | " 2 " (3 2 h)     |                             |
| Page<br>3    | " 3 " (3 3 h)     |                             |
| ATT<br>4     | " 4 " (3 4 h)     |                             |
| MODE<br>5    | " 5 " (3 5 h)     |                             |
| STEP<br>6    | " 6 " (3 6 h)     |                             |
| CF<br>7      | " 7 " (3 7 h)     |                             |
| SPAN<br>8    | " 8 " (3 8 h)     |                             |
| RES<br>9     | " 9 " (3 9 h)     |                             |
| MAX          | " A " (4 1 h)     |                             |
| AVR          | " B " (4 2 h)     |                             |
| PEAK         | " C " (4 3 h)     |                             |
| MR           | " D " (4 4 h)     |                             |
| Fullp        | " E " (4 5 h)     |                             |
| .            | " . " (2 E h)     |                             |
| ←            | " F " (4 6 h)     |                             |
| →            | " G " (4 7 h)     |                             |
| ESC          | ESC (1 B h)       |                             |
| ENT          | CR (0 D h)        |                             |
| ---          | " H " (4 8 h)     | Read out configurations     |
| ---          | " I " (4 9 h)     | Read out all displayed data |
| ---          | " J " (4 A h)     | Read out marker             |

#### D. Format1(Contents of the configurations)

When SDU-5000 receive the "H" command from PC, SDU-5000 send current configuration data with following format.

| Contents of Text | Function                    | Detail                                                       |
|------------------|-----------------------------|--------------------------------------------------------------|
| Rn               | Receiver type               | n=1:Others<br>n=2:AR-3000A                                   |
| Gn               | RF Gain                     | n=1:low<br>n=2:high                                          |
| Dn               | Display mode                | n=1:Normal<br>n=2:Reverse                                    |
| Bn               | Resolutionb Band width      | n=1:5kHz<br>n=2:30kHz                                        |
| Cnnnn.nnnnn      | Center frequency in MHz     | Fixed point zero suppression                                 |
| Snnnn            | Frequency span width in kHz | Fixed point zero suppression                                 |
| An               | Attenuate                   | n=0:Off<br>n=1:On                                            |
| Mn               | Mode                        | n=1:WFM<br>n=2:NFM<br>n=3:AM<br>n=4:USB<br>n=5:LSB<br>n=6:CW |
| Tnnm.n           | Step frequency in kHz       | Fixed point zero suppression                                 |

Example:

R1 G1 D1 B2 C80.00000 S2000 A0 M3 T12.5 [CR][LF]

#### E. Format2(Contents of the read out data)

When SDU-5000 receive the "I" command from PC, SDU-5000 send 161 pairs of signal level and frequency data with following format.  
(The data is currently displayed.)

"I"[CR][LF] ← *Start of data block*

"F"+ Frequency(MHz)+", "+ "L"+level(dBm)+[CR][LF]  
                                  ↑ *x161 pairs of data*

"I"[CR][LF] ← *End of data block*

Example:

I[CR][LF]

F80.0000,L-75[CR][LF]

F80.1000,L-66[CR][LF]

F80.2000,L-45[CR][LF]

I[CR][LF]

#### F. Format3(Contents of the read out marker)

When SDU-5000 receive the "J" command from PC, SDU-5000 send the signal level and frequency at marker position with following format.

"J"+Frequency(MHz)+", "+ "I"+level(dBm)+[CR][LF]

Example:

j80.0000,I-76[CR][LF]



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## Supplement Manual for SDU5000

(complying with AR5000)

The following changes are made for the SDU5000 with serial number 005901 or above.

### 1. Supplied accessories

Following items are supplied in the package.

- DC lead for power supply
- Coaxial cable with BNC connectors
- D-sub 9-pin gender changer

### 2. Feature of New Version

- Support both AOR receivers(AR3000A and AR5000) and ICOM receivers.(IC-R7100, R7000 and R9000)
- When AR5000 is used, Center frequency is renewed automatically every one second.
- Allows frequency and mode change from ICOM receivers.
- Add "Stepping frequency set" for the other receiver.
- Add "Step-up/Step-down" feature for the other receiver.
- Add "Marker Center" feature for the other receiver.
- Add "K" command for high speed data down-loading.

### 3. Specification & Operating Procedure Change

#### 3-A. Select receiver type

In the configuration menu, following receivers can be selected.  
AR5000, AR3000A, IC-R7000, IC-R7100 and IC-R9000.  
For a default(reset) state, the OTHER will be selected.

#### 3-B. Center frequency setting

When AR5000 is used.

Minimum frequency step is 10 Hz or its increment. The input digit where under 10Hz is ignored at this time.

When other receivers are used.

Regardless the receiver type, minimum frequency step is 50Hz or its increment.

Frequencies below 50Hz increment will be rounded-up(off) to a nearest 50Hz value.

For ICOM receivers, frequency set below 100Hz will be ignored by the receiver.

#### 3-C. Attenuator setting

This feature is available for the AR5000 and AR3000A. 10dB Attenuator is chosen when a receiver is AR5000. When AR5000 is being used, relations between ATT and center Frequency are as mentioned in the [table -1].

[table-1]

| Center Frequency / MHz | ATT ON       | ATT OFF |
|------------------------|--------------|---------|
| CF < 1000              | 10 dB        | 0 dB    |
| CF ≥ 1000              | ignored(0dB) | 0 dB    |



**3-D. Step frequency setting**

When AR5000 is used.

It can be set up 10Hz in the unit to 10Hz~999.99kHz. And, the step frequency changes to 10Hz automatically when setting of AR5000 is under 10Hz.

When other receivers are used.

Regardless the receiver type, 50Hz to 999.95kHz can be set in 50 Hz increment.

Frequencies below 50Hz increment will be rounded-up(off) to a nearest 50Hz value.

**3-E. Operating Mode**

If AR5000 is chosen in the receiver, seven kinds of reception modes of WFM, NFM, AM, LSB, USB, CW, AUTO are indicated in menu.

In the ICOM receivers, if the mode is not supported by the SDU5000, "NFM" will be displayed.

**3-F. Center Frequency Setting and MKR\_>CF for other receivers.**

The setting range depends on the "SPAN" set.

**3-G. K Command(High speed data down-loading)**

If the SDU receives K command, the SDU start down-loading present level status by the following format.

[ "K" + "CR,LF" | DATA (00h-FFh) | "K" + "CR, LF" |

If the RF gain is set to LOW the range of data will be 00h to FFh that correspond with -60dBm and -10dBm level.

If the RF gain is set to HIGH corresponding level will be -90dBm and -40dBm. The relation ship between parameters will be expressed as next page;

Data(D); Hex decimal N (0 to 160)

Freq.= Center Freq.-(SPAN /2) + N x SPAN / 160

RF Level Hi        -90 + D x 50 / 256

RF Level Lo        -60 + D x 50 / 256

Example:        Center Freq.        :        80MHz  
                  SPAN                        :        10MHz  
                  RF Gain                    :        High  
                  N                                :        20th ; 35h = 53

Frequency & Level =

Frequency                ; 80 -10/2 + 20 x 10 /160 = 76.25MHz

Level                        ; -90 + 53 x 50 /256 = -79.6 dBm

### 3-H. Change in H Command

Configuration information command has been modified.

| RECEIVER TYPE "R" | MODE "M" for AR5000 | MODE "M" for ICOM |
|-------------------|---------------------|-------------------|
| 1. AR5000         | 1. WFM              | 1. LSB            |
| 2. AR3000A        | 2. NFM              | 2. USB            |
| 3. IC-R7100       | 3. AM               | 3. AM             |
| 4. IC-R7000       | 4. LSB              | 4. AMW            |
| 5. IC-R9000       | 5. USB              | 5. WFM            |
| 6. Others         | 6. CW               | 6. FM             |
|                   | 7. AUTO             | 7. FMN            |

### 3-I. Operating with AR5000

- (1) Connect the remote connector of AR5000 and the RX connector of SDU5000 using the cable comes with SDU5000.
- (2) Connect the AR5000's IF OUT and SDU's RF IN using coaxial cable.
- (3) Turn power on for both AR5000 and SDU5000.
- (4) Setting the AR5000
 

Baud Rate                :        9600 bps.  
 Operation mode        :        VFO-A ~ VFO-E
- (5) Select AR5000 from the configuration menu.
- (6) If connection is completely made no ERROR message will be appeared, and connection complete message will be displayed. Otherwise, the OTHER receiver will be selected.

**3-J. Operating with ICOM receivers(manual supplement)****(a) Setting ICOM Receivers**

|                |   |           |     |
|----------------|---|-----------|-----|
| Baud Rate      | : | 9600 bps. |     |
| Frequency Data | : | 5 Bytes   |     |
| Address        | : | IC-R7100  | 34h |
|                | : | IC-R7000  | 08h |
|                | : | IC-R9000  | 2Ah |
| Transceive     | : | On        |     |

Refer to individual operation manual comes with the receiver.

**(b) Connection with the SDU5000**

- (1) Connect the level converter(CT-17) to ICOM receivers, Use the cable comes with the converter.
- (2) Connect the level converter(CT-17) and the SDU using the cable comes with the SDU.
- (3) Connect ICOM receiver's IF OUT and SDU's RF IN using coaxial cable.
- (4) Turn power on for both receiver and the SDU.
- (5) Select ICOM receiver from the configuration menu.
- (6) If connection is completely made no ERROR message will be appeared, and connection complete message will be displayed. Otherwise, the OTHER receiver will be selected.

**4 . The precaution in the combination of AR5000 and SDU5000.****4-A. About the automatic renewal of the Center frequency(CF)**

Renewal is stopped when a communication error occurs though SDU5000 renews CF in every one second. Somel menu is opened, and renewal is resumed by closing menu. And, when menu is being opened, the SDU5000 doesn't do the automatic renewal of CF.

**4-B. The reception mode setting.**

When Mode is set up from SDU5000, setting of AR5000 becomes as shown in table -2.

table-2

| SDU's setting | MODE | IFBW                |
|---------------|------|---------------------|
| WFM           | FM   | 220 kHz             |
| NFM           | FM   | 15 kHz              |
| AM            | AM   | 6 kHz               |
| LSB           | LSB  | 3 kHz               |
| USB           | USB  | 3 kHz               |
| CW            | CW   | 3 kHz               |
| AUTO          | AUTO | depends on bandplan |

If IFBW is beyond 30kHz, AR5000 becomes WFM in the FM mode at the time of the connection of SDU and AR5000 as for the indication of SDU.

**4-C. IF output setting**

The ability to select IF output setting becomes disabled because the setting of IF output of AR5000 is done automatically at the time of the connection of SDU5000 and AR5000.

**4-D. Step adjustment**

The step adjust function doesn't work with AR5000 when step-up or step-down is done from SDU5000.



# NOTES for the SDU5000 (Rev 1.3)

1. First ensure that the receiver is switched On and connected to the SDU5000. The SDU ROM will permit operation with the AOR AR3000A, ICOM IC-R7000, IC-R7100, IC-R9000 and as a band scope with other receivers with a 10.7 MHz I.F. output such as the AOR AR3000 (a small modification is required to the AOR receivers in order to provide compatibility).

If using an ICOM receiver, the CT17 optional interface will be required. The ICOM receiver must be configured for remote control, refer to the ICOM operating manual. The following setup is required:

|                 |              |
|-----------------|--------------|
| Baud rate       | 9600 bps     |
| Frequency data  | 5 Byte       |
| Transceive      | ON           |
| Address default |              |
|                 | IC-R7000 08H |
|                 | IC-R7100 34H |
|                 | IC-R9000 2AH |

Example setup for the ICOM IC-R7100 receiver

## **Step 1. For transceive ON**

On the ICOM receiver, press and hold both "3" and "ENT" keys and switch the power switch ON. Then switch the receiver OFF.

## **Step 2. For baud rate of 9600**

On the ICOM receiver, press and hold both the "5" and "ENT" keys and switch the power switch ON. Then switch the receiver OFF.

The receiver must be configured and switched On **before** the SDU5000 in order to guarantee a valid connection via the RS232.

Note: The output level of the ICOM receiver(s) is about 10 - 15dB below that of the AOR receiver(s).

2. Should the connection be lost, use "CONF" to confirm that the correct receiver had been selected.
3. If a connection cannot be established, switch Off the SDU5000, unplug the 12V DC feed and leave the unit for 10 seconds. Reconnect and try again.
4. It is possible to get false indications below 0 MHz !! (minus figures will appear in front of the frequency readout).
5. A small false signal may appear on some bands to the right (or left) of the centre in a constant position (455kHz), this is normal and due to an internal 455 kHz I.F. of the receiver.
6. When tuning in channelised bands ensure the correct STEP size is selected (i.e. 9kHz for medium wave).
7. Depending upon the step size, resolution and span a frequency (say 198 kHz) may appear up to 5 or 6 kHz off frequency. Reset the centre frequency and the error will be reduced. This effect is MOST noticeable when using the "marker" and is explained here.

Each division of the graticule has 16 steps so dividing the entire screen into 160 steps. To work out the frequency shift for each movement of the marker take the chosen bandwidth (SPAN), divide this kHz bandwidth by 10 then by 16... the answer will be in kHz.

i.e. for a bandwidth of 10 MHz, each shift will be  $10000 / 10 / 16 = 62.5$  kHz

P.T.O.

Of course you can work the formulae backwards too! If you require a 5kHz step:

$5 \times 16 \times 10 = 800 \text{ kHz}$  - you may note a quick way: simply divide or multiply by 160  
(the total number of increments)

The following relative table may be of assistance:

| Each marker movement    | Bandwidth (span) |
|-------------------------|------------------|
| 1 kHz                   | 160 kHz          |
| 5 kHz                   | 800 kHz          |
| 6.26 kHz                | 1000 kHz         |
| 9 kHz                   | 1440 kHz         |
| 10 kHz                  | 1600 kHz         |
| 12.5 kHz                | 2000 kHz         |
| 20 kHz                  | 3200 kHz         |
| 25 kHz                  | 4000 kHz         |
| 50 kHz                  | 8000 kHz         |
| 62.5 kHz (maximum span) | 10000 kHz        |

8. Due to the AGC effect of the host receiver, the peak trace may reduce as it is tuned toward the centre of the display. As a result measurements may be more accurate when measured away from the centre frequency. The level of change may be in the order of 10 - 15 dB but will depend on AGC action (the larger the signal then the greater the change).

To help with this, the modified AR3000A/3000 is fitted with an SDU AGC/mute switch. For best accuracy, switch the AGC "off" when taking measurements on the centre frequency.

#### **ICOM ICR8500**

Set the R8500 up as an ICR7100 by accessing the ICOM initial set mode as per page 30 of the ICOM operating manual. Set the baud rate to 9600 and address to 34h. The supplied RS232 is ready to go without modification.

***Remember, although not a low cost product the SDU5000 is a fraction of the price of a dedicated spectrum analyser.***