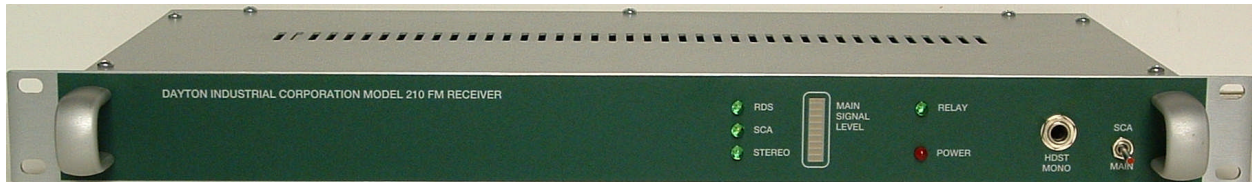


# MODEL AF210 FM/STEREO FM/SCA RECEIVER/MONITOR OPERATION MANUAL

## GENERAL:

The Model AF210 is a precision FM broadcast receiver with stereo, SCA and RDS demodulators; all designed for the most demanding sensitivity, low distortion and best signal to noise requirements. The Model AF210 is single channel with PLL (synthesized) tuning. The AF210 was designed for professional broadcast requirements, and has applications for FM relay (translator) service, SCA monitoring, EAS monitoring, data and paging service.



## FEATURES:

- Wide and narrow band AGC to prevent overload
- Balanced and Unbal FM audio (stereo) output
- Composite audio output
- SCA audio output
- RDS demodulator, (data, quality, clock outputs)
- Selectable 50, 75 microseconds, or no de-emphasis
- Selectable 25, 50 or 100 KHz (standard) frequency tuning steps
- Selectable 150, 225 microsecond or no SCA de-emphasis
- Main or SCA 500mW audio amplifier output
- FM stereo with 46dB separation
- FM signal strength blend and high cut if desired
- Adjustable level carrier detection relay
- LED indicators for signal strength, power, main carrier, stereo, SCA carrier and RDS presence.
- Switchable 67 or 92 KHz SCA de-modulator
- Adjustable soft FM mute
- Adjustable SCA mute
- 19 inch rack mount (1 3/4") chassis

**POWER:** 115 VAC, 20 Watts (wall converter supplied), or 12VDC direct, 500mA

**SIZE:** 1 3/4" H x 19" W x 8" D  
Weight: 5 lbs

## SPECIFICATIONS:

**TUNING RANGE:** 88 to 108 MHz, selected by internal DIP switch, in 100 KHz steps

**ANTENNA INPUT:** "F" connector, 75 ohm

With 1 KHz modulation, 75KHz deviation:

**SENSITIVITY:** 0.75uV (12dB SINAD)  
Limiting @ <3uV

**FREQ RESPONSE:** 20Hz to 15KHz (-3dB)

**DISTORTION:** 0.25% THD at 100 % mod

**MAXIMUM S/N:** 60dB

**AM REJECTION:** 50dB

**INTERMODULATION:** 5mV (73dB) Rejection

**SECOND ADJACENT CHANNEL REJECTION:** 60dB

**LINE Outputs:** 1.0 V RMS, 600 Ohms

**SPKR Output:** 0.5 Watt into 8 Ohms

**SCA SENSITIVITY:** 5 microvolts (20 dB SINAD)

**MAIN to SCA CHANNEL CROSS TALK:** 52dB rejection

**SCA DISTORTION:** 1.2% THD (7.5KHz dev)

**SCA FREQUENCY RESPONSE:** 4 KHz minimum

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# MODEL AF210: FM, FM/SCA, FM/RDS MONITOR/RECEIVER OPERATIONS MANUAL

## 1.0 FREQUENCY SETTING:

The first item to be performed is to set the receiver frequency of operation. The receiver is a PLL design, the frequency is set by a series of switches, arranged as internal DIP switches, marked SW1 and SW2.

Access to the switch is by removing the top cover of the receiver. Remove the seven (7) screws and remove the cover.

Locate SW1 and SW2. (See also parts layout diagram Figure 1.0, Page 5) The switches are marked indicating the "on" position. The "on" position for a switch is the logical "1", and the "off" position is the logical "0" for the receiver microcontroller.

**Please note that SW1 positions R1 and R2 are always to be in the "0" or "off" position.**

The frequency of operation is set by the positions of switches D0, D1,....through...D12. Note that the switch "on" position is always the position towards the microcontroller, IC10. The D0 switch position is SW1, switch 4.

Table 1.0 (Page 6) lists the switch position for each switch corresponding to the desired frequency of operation. Set the switches according to Table 1.0 for the desired operating frequency.



Figure 2.0 AF210 REAR PANEL DIAGRAM

## 2.0 CONNECTORS/CONTROLS (REAR):

After setting the frequency, the next item is to make the appropriate connections at the receiver rear panel. The connectors (standard) are shown in Figure 2.0. The screwdriver controls are set at the factory and should not be adjusted (except for the SPKR Volume control).

**2.1 RF IN (88 - 108 MHz):** The RF connector is an "F" connector. The input impedance is 75 Ohms. The antenna connection should be coaxial cable to reduce interference. 50 Ohm "N" connector option available.

**2.2 R and L Stereo Outputs (Unbalanced):** RCA connectors for unbalanced line outputs from the receiver stereo decoder.

**2.3 COMPOSITE Output:** Receiver composite output from the audio to some 110KHz. An RCA connector (unbalanced) is provided.

**2.4 SCA:** Output from the SCA demodulator. An internal jumper is provided to select the demodulator output (audio), or the demodulator output after a "data" detector circuit for demodulating FSK type data.

**2.5 VOL:** A screwdriver volume control for the SPKR powered audio output.

**2.6 SPKR:** RCA connector output for connecting an 8 Ohm monitor speaker. The receiver power output is 0.5 Watt.

**2.7 DATA:** A screwdriver adjust that is used when the SCA Data demodulator is being used. This adjustment sets the duty cycle (normally 50%) of the FSK data output.

**2.8 SCA MUTE:** A screwdriver adjustment used for setting the input signal level where the SCA output is muted. This is factory set at -80dBm.

**2.9 RELAY:** A screwdriver adjustment that sets the input signal level where the carrier detect relay operates. This is factory set at -90dBm.

**2.10 ON:** A switch for controlling the input power, 12VDC, 500mA. A front panel power LED will be bright when power is applied.

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2.11 12 VDC, 500mA: A 2.0mm connector for applying power, 12VDC, 500mA to the receiver. A 115 to 12VDC power converter is supplied to match with this connector. The connector is positive, center pin, 2.0 mm.

## 2.12 SCREW CONNECTOR TERMINALS:

2.12.1 BALANCED STEREO OUTPUTS: Screw terminals are provided for L+,L-,G, R-,R+. The L+,L- terminals are provided for balanced L audio. The screw terminals R-, R+ provide the balanced R audio output.

2.12.2 NO,NC,COM: Screw terminals for the carrier detect relay outputs. Both NO and NC are referred to the COM terminal.

2.12.3 "S": A screw terminal for monitoring the receiver received field strength indicated as a voltage level. The voltage is measured with a voltmeter and the higher the voltage (0 to 5 VDC), the higher the receiver field strength.

2.13 SCA1: A toggle switch provided to select either 67 KHz (SCA1) or 92 KHz SCA sub-carrier demodulator.

2.14 RDS: A five pin DIN connector for the RDS outputs. See the diagram of page 4.



Figure 3.0 AF210 FRONT PANEL DIAGRAM

## 3.0 INDICATORS/CONTROLS FRONT PANEL:

3.1 POWER: Red or Green LED that is bright whenever power is applied to the receiver, 12 VDC 500mA, input power receptacle on the rear panel.

3.2 MAIN SIGNAL LEVEL: Ten element vertical LED indicator that indicates the received signal level. This is adjusted with the lowest element lighted with no signal input. The more elements that are lighted, the higher the received field strength.

3.3 STEREO: Green LED that is bright whenever the received signal contains the stereo pilot. The L and R stereo outputs are active. If the received signal strength is low or the pilot is absent, the L and R outputs are monaural.

3.4 SCA: Green LED that is bright whenever an SCA subcarrier (67 or 92KHz) is present in the received signal. The demodulated output is available at the rear

panel mounted "SCA" RCA connector. The rear panel switch (SCA1) is provided for selecting either the 67 or 92KHz subcarrier.

3.5 SWITCH SCA or MAIN: A two position front panel switch for selecting either the MAIN audio or the SCA demodulated audio for application to the rear panel mounted SPKR RCA connector or front panel mounted HDST speaker outputs.

3.6 HDST MONO JACK: A 1/4 inch audio jack for monitoring the MAIN or SCA demodulated signals with 8 Ohm headsets. The output is MAIN or SCA channel mono, but will be heard in both sides of stereo headsets. The HDST and SPKR outputs are in parallel. The volume control is located on the rear panel, marked VOL.

The HDST jack is a 1/4 inch stereo jack. **Do not use a MONO headset plug as the audio will be shorted and damage may result.**

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3.7 RDS: Green LED that is lighted whenever the RDS signal is present. The RDS components, clock (RDCL), data (RDDA), and quality (QUAL) are available at the rear panel, either at the block of screw terminals or at a five pin DIN connector, depending on how the receiver is configured.

3.8 RELAY: Green LED indicator that is lighted whenever the main carrier relay is active. The relay is set to operate at the factory whenever the received main carrier is above a specified (- 90 dBm) level. The NO, NC and COMmon terminals of the relay are provided at the rear panel screw terminal block.

## 4.0 INTERNAL JUMPERS/CONNECTORS:

A diagram of the main internal printed circuit board is presented in Figure 4.0, (Page 6). The internal jumper selection descriptions are provided below. The jumpers should be removed and repositioned using a pair of needlenose pliers or similiar device.

4.1 J4, marked "67" or "92": A three pin, two position jumper for selecting either the 67 or 92KHz subcarrier operation. This jumper is connected to the rear panel switch (SCA1/) for selecting 67KHz or 92KHz sub-carrier operation.

4.2 J8, marked "DATA", "SCA", "AUDIO": A three pin, two position jumper for selecting the SCA demodulated audio "AUDIO", or the SCA demodulated

audio after it is applied to the Frequency Shift Key (FSK) circuit the provides a logic level output. This jumper is normally in the AUDIO position unless FSK data is to be received.

4.3 J13, "75", "GND", "50": J13 has two sections, each is a three pin, two position jumper arrangement for selecting the receiver de-emphasis. The normal position for the jumpers is the 75 microsecond de-emphasis position.

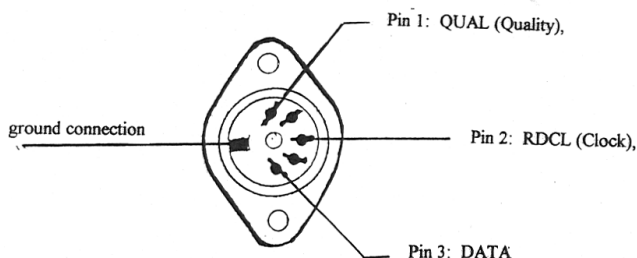
4.4 J10, "225" and "150": J10 is a three pin, two position jumper for selecting the SCA audio de-emphasis. The normal position is the 225 microsecond deemphasis position.

### RDS Connector:

The RDS digital logic outputs are provided at a rear panel mounted DIN connector. The connector pins are:

- Pin 1: QUAL (Quality),
- Pin 2: RDCL (Clock), and
- Pin 3: DATA

A ground connection (Green lead) is provided at the unmarked vertical pin.



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:  
(1) This device may not cause harmful interference, and  
(2) This device must accept any interference received that may cause undesired operation.

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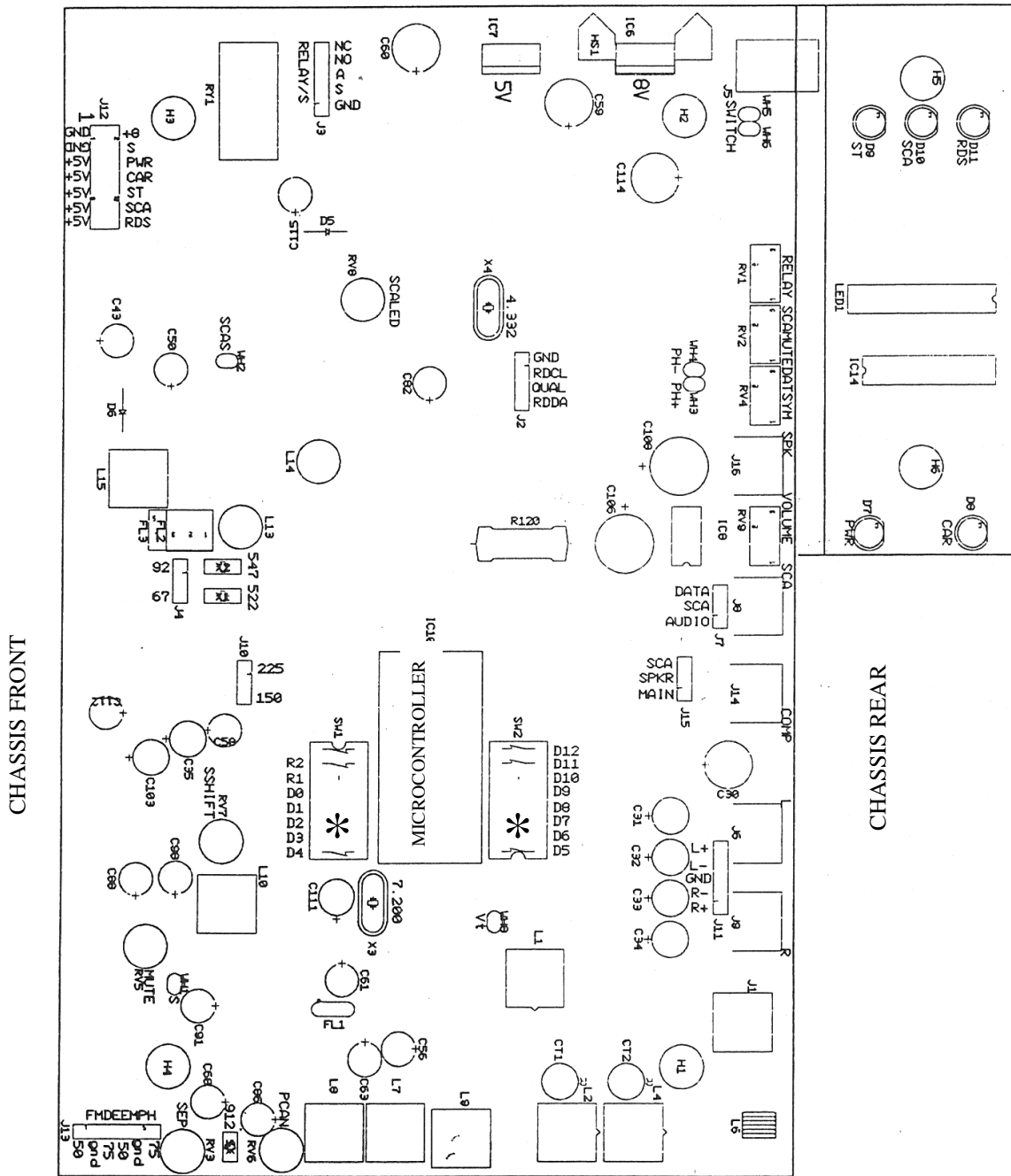


Figure 1 AF210 Receiver Board Component Layout

\* Frequency Setting switches

FREQUENCY OF OPERATION AND DIP SWITCH SETTINGS													
FREQ	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
87.9	0	1	0	1	1	0	1	1	1	1	1	0	0
88.1	0	0	1	1	0	1	1	1	1	1	1	0	0
88.3	0	1	1	1	0	1	1	1	1	1	1	0	0
88.5	0	0	0	0	1	1	1	1	1	1	1	0	0
88.7	0	1	0	0	1	1	1	1	1	1	1	0	0
88.9	0	1	0	0	1	1	1	1	1	1	1	0	0
89.1	0	1	1	0	1	1	1	1	1	1	1	0	0
89.3	0	0	1	0	1	1	1	1	1	1	1	0	0
89.5	0	1	0	1	0	1	1	1	1	1	1	0	0
89.7	0	1	1	0	1	1	1	1	1	1	1	0	0
89.9	0	1	1	0	1	1	1	1	1	1	1	0	0
90.1	0	0	0	1	1	1	1	1	1	1	1	0	0
90.3	0	1	0	0	1	1	1	1	1	1	1	0	0
90.5	0	1	0	1	1	1	1	1	1	1	1	0	0
90.7	0	1	0	1	1	1	1	1	1	1	1	0	0
90.9	0	1	0	1	1	1	1	1	1	1	1	0	0
91.1	0	1	0	1	1	1	1	1	1	1	1	0	0
91.3	0	1	1	1	1	1	1	1	1	1	1	0	0
91.5	0	1	1	1	1	1	1	1	1	1	1	0	0
91.7	0	0	0	0	0	0	0	0	0	0	0	1	0
91.9	0	1	0	0	0	0	0	0	0	0	0	1	0
92.1	0	1	0	0	0	0	0	0	0	0	0	1	0
92.3	0	1	1	0	0	0	0	0	0	0	0	1	0
92.5	0	1	0	1	0	0	0	0	0	0	0	1	0
92.7	0	1	0	1	0	0	0	0	0	0	0	1	0
92.9	0	0	1	1	0	0	0	0	0	0	0	1	0
93.1	0	1	1	1	0	0	0	0	0	0	0	1	0
93.3	0	1	0	0	1	0	0	0	0	0	0	1	0
93.5	0	1	0	1	0	0	0	0	0	0	0	1	0
93.7	0	1	0	1	0	0	0	0	0	0	0	1	0
93.9	0	1	1	0	1	0	0	0	0	0	0	1	0
94.1	0	0	1	1	0	0	0	0	0	0	0	1	0
94.3	0	1	0	1	1	0	0	0	0	0	0	1	0
94.5	0	0	1	1	1	0	0	0	0	0	0	1	0
94.7	0	1	1	1	1	0	0	0	0	0	0	1	0
94.9	0	0	0	0	1	0	0	0	0	0	0	1	0
95.1	0	1	0	0	1	0	0	0	0	0	0	1	0
95.3	0	1	0	0	1	0	0	0	0	0	0	1	0
95.5	0	1	1	0	1	0	0	0	0	0	0	1	0
95.7	0	0	1	0	1	0	0	0	0	0	0	1	0
95.9	0	1	0	1	0	1	0	0	0	0	0	1	0
96.1	0	1	1	1	0	1	0	0	0	0	0	1	0
96.3	0	1	1	1	0	1	0	0	0	0	0	1	0
FREQ	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
96.5	0	0	0	0	1	1	0	0	0	0	0	1	0

96.7	0	1	0	0	1	1	0	0	1	1	0	0	0
96.9	0	0	1	0	1	1	0	0	0	0	0	0	1
97.1	0	1	1	0	1	1	0	0	0	0	0	1	0
97.3	0	0	0	1	1	1	0	0	0	0	0	1	0
97.5	0	1	0	1	1	1	0	0	0	0	0	1	0
97.7	0	0	1	1	1	1	0	0	0	0	0	1	0
97.9	0	1	1	1	1	1	0	0	0	0	0	1	0
98.1	0	0	0	0	0	0	1	0	0	0	0	1	0
98.3	0	1	0	0	0	0	1	0	0	0	0	1	0
98.5	0	1	0	0	0	0	1	0	0	0	0	1	0
98.7	0	1	1	0	0	0	1	0	0	0	0	1	0
98.9	0	0	0	1	0	0	1	0	0	0	0	1	0
99.1	0	1	0	1	0	0	1	0	0	0	0	1	0
99.3	0	0	1	1	0	0	1	0	0	0	0	1	0
99.5	0	1	1	1	0	0	1	0	0	0	0	1	0
99.7	0	0	0	1	0	0	1	0	0	0	0	1	0
99.9	0	1	0	0	1	0	1	0	0	0	0	1	0
FREQ	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
100.1	0	0	1	0	1	0	1	0	0	0	0	1	0
100.3	0	1	1	0	1	0	1	0	0	0	0	1	0
100.5	0	0	1	1	0	1	0	0	0	0	0	1	0
100.7	0	1	0	1	1	0	1	0	0	0	0	1	0
100.9	0	0	1	1	1	0	1	0	0	0	0	1	0
101.1	0	1	1	1	1	0	1	0	0	0	0	1	0
101.3	0	0	0	0	1	0	1	0	0	0	0	1	0
101.5	0	1	0	0	0	1	1	0	0	0	0	1	0
101.7	0	1	0	0	1	0	1	0	0	0	0	1	0
101.9	0	1	0	0	1	1	0	0	0	0	0	1	0
102.1	0	0	0	1	0	1	1	0	0	0	0	1	0
102.3	0	1	0	1	0	1	1	0	0	0	0	1	0
102.5	0	0	1	1	0	1	1	0	0	0	0	1	0
102.7	0	1	1	0	1	1	0	0	0	0	0	1	0
102.9	0	0	0	1	1	1	0	0	0	0	0	1	0
103.1	0	1	0	0	1	1	1	0	0	0	0	1	0
103.3	0	0	1	0	1	1	1	0	0	0	0	1	0
103.5	0	1	1	0	1	1	1	0	0	0	0	1	0
103.7	0	0	0	1	1	1	1	0	0	0	0	1	0
103.9	0	1	0	1	1	1	1	0	0	0	0	1	0
104.1	0	0	1	1	1	1	1	0	0	0	0	1	0
104.3	0	1	1	1	1	1	1	0	0	0	0	1	0
104.5	0	0	0	0	0	0	0	1	0	0	0	1	0
104.7	0	1	0	0	0	0	0	1	0	0	0	1	0
104.9	0	1	0	0	0	0	0	1	0	0	0	1	0
105.1	0	1	1	0	0	0	0	1	0	0	0	1	0
105.3	0	0	1	0	0	0	0	1	0	0	0	1	0
105.5	0	1	0	1	0	0	0	1	0	0	0	1	0
105.7	0	0	1	1	0	0	0	1	0	0	0	1	0
105.9	0	1	1	1	0	0	0	1	0	0	0	1	0

FREQ	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
106.1	0	0	0	0	1	0	0	1	0	0	0	1	0
106.3	0	1	0	0	1	0	0	1	0	0	0	1	0
106.5	0	0	1	0	1	0	0	1	0	0	0	1	0
106.7	0	1	1	0	1	0	0	1	0	0	0	1	0
106.9	0	0	0	1	1	0	0	1	0	0	0	1	0
107.1	0	1	0	1	1	0	0	1	0	0	0	1	0
107.3	0	0	1	1	1	0	0	1	0	0	0	1	0
107.5	0	1	1	1	1	0	0	1	0	0	0	1	0
107.7	0	0	0	0	0	1	0	1	0	0	0	1	0
107.9	0	1	0	0	0	1	0	1	0	0	0	1	0

**DIP Switch Settings for the EVEN Frequency Range:**

To set the receiver for operation at even frequencies, use the D0 ("D", zero) switch to increase the operating frequency by 100 KHz. For example, to set the frequency for 104.4 MHz, follow the settings for 104.3MHz and then turn switch D0 to the "ON" position (D0 is OFF for all uneven frequency settings shown in the manual)

The D0 switch is located on the DIP switch SW1 on the printed circuit board. The SW1 positions are marked on the board and are:  
 SW1 position 1: Blank (No Operation)  
 SW1 position 2: R2  
 SW1 position 3: R1  
 SW1 position 4: D0  
 SW1 position 5: D1  
 SW1 position 6: D2  
 Etc.