

"Flourishing Age No. 2" Internet Radio

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Abstract

In the days of the May Day vacation, I made 25 "Internet Radio", designed his own installation. On the basis of the digital simulation theory, I succeeded in making a radio that could listen to more than 2000 radio stations. It should be a national patent. We can listen to more than ten local radio stations and have thousands of network stations ready for each teacher. Sending one is currently being rigorously debugged, and the result is gratifying.

Subject Areas

Civil Engineering

Keywords

Internet Radio Devices, Bluetooth, Traditional Radio

1. Traditional Radio

"Flourishing age No. 2" Internet Radio is divided into two parts:

The internal radio is made up of CXA1691BM or CD1691CB BP type FM receiver (continuous adjustable, no noise, single sound), the reception board is $5 \times 5 \times 1$ cm, the receiver integrates the CXA1691BM or CD1691CB, the headphone line and the receiving antenna, and the board does not have the noise, that is, it will be sashes when the platform is not received, and it contains 9018 high frequency (antenna) magnifying power. It has high sensitivity, good sound quality and automatic frequency control (AFC) function. After receiving the platform, the transmitter can automatically track the transmitter frequency change. This function is beneficial to lock the transmitter frequency, even if the transmitter has a slight frequency change, it can still lock the frequency of the transmitter and make the overall performance better. The board can be matched with a FM transmitter to form a wireless audio system or a wireless monitoring system. It can also be used alone and receive FM broadcasting. The board designs a typical working voltage 3 V, and the default reception frequency (85 - 110 MHz) is continuously adjustable. The receiving frequency can be FM band (88 - 108 MHz) according to user requirements.

FM radio (with DSP function) is back up. When a Wi-Fi connection is not available, you can choose FM to listen to the radio station [1].

There are many kinds of circuit structure of radio. Most of the early produced radios are discrete component circuits. At present, large scale integrated circuits are basically used as the core circuits (this machine adopts the FM and amplitude modulation special integrated circuit CXA1691M produced by the Japanese Sony Corp, and the domestic model CD1691M). The characteristics of integrated circuit radio are: simple structure, superior performance index, small volume and so on. The AM/FM type radio circuit is available. The radio is selected by the tuning circuit, and the frequency converter is mixed with the local oscillator signal sent by the oscillating circuit, and the difference frequency is selected as the intermediate frequency output (465 KHZ of AM in our country and 10.7 MHZ in FM), and the modulation signal (low frequency signal) is output after the detector of the detector, and the modulation signal (low frequency signal) is transferred. The signal (low frequency signal) is obtained by low-frequency amplification and power amplification to obtain enough current and voltage, that is, power, and then pushes the loudspeaker to make a loud sound. This radio is a new type of AM/FM two band radio, which is made up of large scale integrated circuit CXA1691M (CD1691M). Because of the inconvenient fabrication of inductors, capacitors, large resistors and adjustable components, the peripheral components are mainly inductors, capacitors, resistors and adjustable components, which constitute various kinds of circuits such as control, resonance, power supply, filtering, coupling and so on. The internal circuit diagram of CXA1691M (CD1691M) is shown in Figure 1 ([2] [3] [4]).

The function of each function block circuit of radio circuit is introduced below.



Figure 1. Material object.

1) Input tuning (that is, platform selection) and frequency conversion

Because at the same time, a lot of radio stations, radio antennas receive more than just a radio signal, are a number of radio signals. Because the carrier frequency of each radio is different, the radio frequency circuit is tuned to change the frequency of its own oscillation. When the frequency of the oscillation is the same as the carrier frequency of a radio station, the radio signal of the radio station can be selected to complete the selection. (series resonance principle) because we use a super heterodyne sound, the selected signals are not immediately sent to the detection level, but the frequency conversion (i.e. frequency conversion, the purpose is to make a large number of radio stations in the radio frequency range basically consistent, because the frequency stable magnification number is relatively stable). The frequency of the oscillation produced by this machine is mixed with the signals received from outside, and the difference frequency is selected. That is, a fixed intermediate frequency signal is obtained (the intermediate frequency of AM is 465 KHz, and the intermediate frequency of FM is 10.7 MHz). In the radio circuit, this part of the circuit has four LC tuning circuits, with the arrow with the dotted line connected by a four variable capacitor CBM-443DF, in which the CA and L1 are the input circuit of the amplitude modulation band (the selection circuit), the CB and the T1 are the amplitude modulation band local oscillating electric circuit, and the C7 (120 P) is a cushion capacitor, and this is the base. The vibration frequency cushion is high, making the frequency of the local oscillator circuit higher than the input circuit frequency 465 KHZ, CC and L2 parallel to the frequency modulation band input circuit (selection circuit), the CD and L3 parallel to the FM (FM) band local oscillator circuit, and the variable capacitance parallel to their adaptable micro adjustable capacitance, used as the modulation. K2 is a band switch that performs band conversion with the electronic switch inside the "15" of the integrated circuit. The switch closes is a low level amplitude modulation band, and the switch disconnects is a high level FM band. The above components together with the internal circuit of the integrated circuit (IC) constitute a tuning and local oscillator circuit, and the frequency conversion function is basically completed by IC.

2) Medium frequency amplification and detection

Function: send the medium frequency modulation signal (amplitude modulation 465 KHZ, FM to 10.7 M) into medium frequency amplification circuit for medium frequency amplification circuit, then demodulate and remove the low-frequency modulation signal, that is the required audio signal. The intermediate frequency amplifying circuit is characterized by a "mid-week (intermediate frequency transformer)" tuning circuit or a medium frequency ceramic filter. The intermediate frequency signals sent by the IC internal frequency conversion circuit output from the "14" foot, and the 10.7 MHz's FM intermediate frequency signal is selected to the "17" foot of the IC by the three end ceramic filter CF2. The amplitude modulation medium frequency signal of 465 kHz is selected to the IC "16" foot by the CF1 three end ceramic filter, and the intermediate frequency signal is amplified inside the IC to be magnified. And demodulating the audio signal from the "23" foot. The frequency discrimination (frequency modulation demodulation) and the amplitude modulation detection circuit are all inside the IC. The capacitance C15 between the "23 - 24" feet of the IC is the coupling capacitance of the audio signal obtained after the detection is coupled to the input end of the audio power amplification (through the communication, the AC audio signal passes through, the DC component isolating), and the "2" foot C9 and T2 are the external FM frequency discrimination networks.

3) Low frequency amplification and power amplification

Function: after the demodulation, the audio signal is amplified by low-frequency and power amplifying circuit and sent to the speaker or earphone to complete the electro acoustic conversion. In Figure 2, the 1, 3, 4 and 24 - 28 legs of IC are all low-frequency amplification circuits. The "1" foot is a noise filter with a capacitor C10 (0.022 UF), the "3" foot connected capacitor C8 (4.7 UF) is a negative feedback capacitance of the power amplifier, and the "4" foot is a DC volume control (changing the pin potential to change the magnification of the internal differential amplifier) and the volume control potentiometer center tap. The "25" C18 (10 UF) of the "25" is a self-lifting capacitor of the power amplifier to improve the output dynamic range of the OTL amplifier circuit. The "26" foot is the power supply of the power amplifier circuit, and the external C19 (100 UF) and C17 (0.1 UF) are the low frequency filter and high frequency filter capacitor of the power supply respectively. The audio signal is input into the IC for power amplification through the "24" foot. The amplified audio signal is output from the "27" foot, through the C16 (100 U) coupling to the speaker or the headset, and C20 (0.1 UF) is a high frequency filter capacitor to prevent high frequency components from being sent into the loudspeaker.

4) Power and other circuits

The power supply part of the machine includes the 3V battery, the low frequency filter capacitor C19 (100 UF), the C17 (0.1 UF) power supply high frequency filter capacitor, the low frequency decoupling filter capacitor C2 (10 U) outside the "8" foot, the power supply high frequency filter capacitance C3 (0.22 UF) and the power switch K1, R3 and LED, which are connected by the





volume potentiometer and Indicating circuit. The peripheral C13 (10 UF) of the C12 (4.7 UF) and the "22" foot of the "21" foot is the filter capacitor of the automatic gain control (AGC) circuit. In addition, in order to prevent the interference of each part of the circuit, the circuits in each part of the IC are grounded individually and connected by multiple pins to the external circuit, such as the "13" foot is a preformat circuit, and the "28" foot is a power amplifier circuit.

5) Antenna receiving part

CXAl691M (CDl691M) also has a tuned high level circuit to improve sensitivity. The frequency modulated electromagnetic wave received by the rod antenna is coupled to the "12" foot FM high level input by C1 coupling, and then mixing. The amplitude modulation part receives electromagnetic waves from the antenna bar, and enters the frequency conversion circuit through the secondary coil of L1. The assembly of printed circuit boards is the key to the quality of the whole machine. The quality of the assembly has a great influence on the performance of the radio. Therefore, the general requirement of PCB assembly is to check the quality of the components before assembly, to ensure that the components are used normally; the insertion position must be correct, and the insertion and insertion of the components must be correct, and the solder joints should be smooth, no false, and false and connected.

Before debugging, it is necessary to ensure that the radio can receive the sound of the Sasha (or radio). If the sound or radio is not heard, it is necessary to check whether the welding of the circuit is wrong, the element is damaged or not, until the sound can be heard to does the following adjustment experiment.

There are three kinds of ultra-heterodyne radios.

1) Intermediate frequency modulation: intermediate frequency tuning circuit

The neutral amplifier circuit is the key to determine the sensitivity and selectivity of the receiver circuit, and its performance directly determines the performance of the whole machine. The intermediate frequency transformer is adjusted to resonate at AM/465kHz (or FM/10.7MHz) frequency, which is the adjustment task of the amplifier circuit.

2) Adjust the cover: that is, the resonant circuit of the vibration control

The frequency range of the received signal of the super heterodyne radio circuit should be consistent with the frequency mark on the scale of the housing. Therefore, it is necessary to carry out the calibration adjustment, also called the adjustable coverage (**Figure 3**).

In a super heterodyne radio, the difference between the frequency and the intermediate frequency of the local oscillating frequency is determined, not the frequency of the input circuit. Therefore, the difference between the frequency modulation and the intermediate frequency is essentially the difference between the modulation frequency and the intermediate frequency. Therefore, the adjusting coverage means adjusting the local oscillator circuit to make it AM/465kHz (or FM/10.7MHz) higher than that of the radio frequency dial. In the local oscillator circuit, the change of the inductance of the oscillating coil



Figure 3. Internal circuit diagram.

(the adjustable magnetic core) can significantly change the frequency of the oscillation at the low frequency (but also to the high frequency end). Changing the capacitance of the oscillation fine tuning capacitor can obviously change the oscillation frequency of the high frequency end.

3) The adjustment: that is the input circuit

It is also known as the adjustment sensitivity. The frequency and the intermediate frequency of this machine determine the external frequency of the received signal. The resonance of the input circuit and the frequency of the external signal determine the sensitivity and selectivity of the super heterodyne radio (that is, the function of the platform). Therefore, the input circuit is adjusted to make it resonant with the frequency of the foreign signal; it can make the radio highly sensitive and selective. The selectivity of the input circuit is also called compensation or tune tracking, but in the heterodyne tuning circuit, the selectivity of the input resonant circuit will affect the sensitivity. Therefore, the adjustment of the resonant frequency of the resonant circuit is mainly to adjust the sensitivity, so that the tuning points of the whole band are consistent. When adjusting, the position of the low end input loop coil on the magnetic rod is adjusted, and the fine-tuning capacitor parallel to the input loop of the high end antenna adjustment part is received.

Power amplifier circuit (**Figure 4**): TDA2822M is a dual channel single chip power amplifier developed in the early stage of ST, which is specially designed for portable video recorder. It is characterized by low cross distortion and low static current. It is suitable for stereophonic and Bridge amplification (BTL). One of the unique features of TDA2822M is that it has a wide range of working voltages and can work normally within the range of 2 V - 12 V, but it is best to allow TDA2822M to work above 3 V unless it is used for a headphone amplifier. This circuit is a bridge type amplification (BTL) mode with a TDA2822M amplifier integrated circuit into a single channel, with few peripheral components and



Figure 4. Power amplifier circuit.

no radiators, and the sound effect is satisfactory. TDA2822M is a dual channel single chip power amplifier developed for portable video recorder (ST), which is specially designed for portable video recording equipment. It is characterized by low cross distortion and low static current. It is suitable for stereophonic and Bridge amplification (BTL). One of the unique features of TDA2822M is that it has a wide range of working voltages and can work normally within the range of 2 V - 12 V, but it is best to allow TDA2822M to work above 3 V unless it is used for a headphone amplifier. This circuit is bridge type amplification (BTL) mode with a TDA2822M amplifier integrated circuit into a single channel, with few peripheral components and no radiators, and the sound effect is satisfactory.

2. Network Radio

It is a kind of software running on computers or mobile intelligent devices, which can listen to all kinds of network radio stations on the Internet. Such as dragonflies, FM, Any Radio network radio and so on. The birth of mobile phone network radio software brings the gospel to mobile users who do not provide radio modules. They can synchronize the same content with ordinary FM radio programs online and don't have to worry about the bondage of the headphones. But when using, we need to pay attention to listening in the WIFI environment and adopting the current 4G network in China. The other is the need for hardware FM support, an extension of a traditional radio, that can be wired or wirelessly connected to the Internet network, listening to network stations on the network, and you don't have to use the computer radio software to listen to it, but this thing needs to be purchased alone, it's very rare. Nowadays, network radio generally refers to broadcasting software on intelligent devices. Its characteristics are as follows:

1) Radio: the number of radio stations is huge, covering the entire world, fi-

nancial, entertainment, social news, pop music, rock, jazz, folk music, light music and other types of radio, to meet your different preferences.

2) Automatic update: automatically update the latest radio stations, automatically save the latest radio stations in the latest listening to the radio clip.

3) Timing switchgear: set time, automatic radio broadcasting station, every morning let you wake up in a wonderful music broadcast; regular shutdown let you accompany the beautiful music melody naturally into the dream.

4) More than languages: 12 languages are available to meet the needs of many countries.

5) UPNP function: share files with computers, add favorite music to computer, and play on Internet radio.

6) Collection of favorite radio stations: the collection of favorite radio stations

7) More than functions: alarm clock wake-up function, weather forecast.

The age of amateur radio enthusiasts receiving a broadcast signal by guarding a pile of antennas has become history. They can now clearly receive many radio programs across the globe via the Internet. I believe that in the years to come, radio will develop in two directions. First, it tends to be more specialized in the direction of development, mainly for enthusiasts and enthusiasts; two is to the popular direction, through the mobile phone, MP3, watch and other products to add radio functions, to meet the diversified needs of consumers. The former is relatively small, and the latter is relatively large. Therefore, the enterprises specializing in manufacturing radios will be reduced, but there is still a huge space for new technology in technology development and practical development, with DAB (Digital Audio Broadcasting) wireless transmission of digital broadcasting. It not only has a high quality near CD, but also has strong anti-interference ability. Each digital radio needs only one frequency band, which can effectively save channel resources (Figures 5-7). In addition to transmitting audio information, digital technology signals can efficiently transmit multimedia information and become a tool for multimedia communication. Power supply voltage range: DC 3.7 - 5 V [5] [6] [7].



Figure 5. Receive Japan NHK radio.

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CCTV-4 中文国际 美洲		\mathbb{C}
CCTV-5 体育		\mathbb{C}
CCTV-5+体育赛事		S
CCTV-6 电影		\mathbb{C}
CCTV-7 军事农业		\mathbb{C}
CCTV-8 电视剧		\mathbb{C}
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Figure 6. Receive CCTV radio signal China.



Figure 7. Receiving foreign radio stations on the subway.

3. Auxiliary Equipment

Use of chargers: Automatic identification and conversion of various 3.6 V lithium ion rechargeable batteries self-stop charging. Current and V (max) could detection, full self-stop display, protection battery. When the charge is charged, the red light is switched on and turns to green.

Comprehensive protection function, short circuit without charging, lithium battery misplaced without charging. Input voltage: 110 - 240 V, 47 - 63 HZ (world power): 3.6 - 4.2 V. The radio can be recharged for 36 hours a time. Charging specifications: Sliding slot can be loaded into battery size: 70 mm long, 34 mm in diameter (high). All kinds of lithium ion rechargeable batteries, such as LIR123A/18650/16340/14500 lithium batteries, are called 3.6 - 4.2 V. Have in-

telligent charger and other lithium battery special charger and special intelligent charger for a strong light flashlight [8].

Bluetooth Name: BM3. The Bluetooth password of this network radio: 1688. Communication distance: 3 - 12 meters (different from environmental barriers); Support Bluetooth version: support Bluetooth version 4.1 or below; Support mobile phone system: Android, apple system; Vocal tract: Double vocal tract; Audio quality: MP3 lossless decoding; Functional characteristics: Have a Bluetooth connection password to prevent others from accidentally connecting operation. Have Ultra small volume, easy to embed the modified product. Dual channel stereo output, compatible with most of the market power amplifier, home audio, car audio and other equipment.BM3 Bluetooth audio module parameters in the network radio: Power supply voltage: 2 V - 12 V Output power: 2 W (1 KHz, 8 Omega, 9 V, 10% total distortion). Static current: less than 9 mA (Vcc = 3 V). Harmonic distortion: 0.2% (1 kHz, 8 Omega to 32 omega). Closed loop gain: 39 dB (typical value). Load range: more than 4 Omega. Main parameters: Shape size: total length 39 mm × width 13 mm × high 8 mm. Working voltage: 2.5 V - 15 V. Working current: 20 mA@3.0 V, turn off the standby current: 18 uA. Receiving range: 76 - 108 MHz FM stereo broadcasting (which can receive campus broadcast). No need to debug power to work. Other functions: sensitivity is better than 3 volt; DSP receiver technology has good selectivity and strong anti-interference ability. Audio output power: 2×10 mw direct drive headphones. Antenna connection: earphone wire or audio cable as receiving antenna. Module features: The power supply is reverse connection and ant protection design. It has the function of LED lamp indication. Integrated receiving IC patch production process and the digital frequency stabilization performance is more stable and the sound quality is quite good. Automatic search, automatic protection of the shutdown channel, no preservation after power failure, stereophonic broadcast reception. Direct earphone: 10 mW. Scope of application: FM stereo radio reception. Have Wireless sound box receiving and making. Instructions and could power protection and anti-protection. LED lamp indicator: LED lights are always lit after boot, and LED lights are turned off after shutdown. Module on power supply press S5 button to turn on/off: S1: upwards search station.S2: downwards search station.S3: the volume increases (the volume becomes larger per click.) S4: the volume decreases (the volume becomes smaller per click). The module has high sensitivity, small noise, strong anti-interference ability, high precision A/D (analog to digital converter) and digital frequency synthesizer, which supports the global frequency band (76 - 108 MHZ). Integrating COMS technology single chip IC has minimal power consumption. Have high power 32 ohm load audio output, direct headphone connection, no external audio driver amplification.

4. Summary

In the days of the May Day vacation, I made 25 "Internet Radio", designed his

own installation. On the basis of the digital simulation theory, I succeeded in making a radio that could listen to more than 2000 radio stations. It should be a national patent. We can listen to more than ten local radio stations and have thousands of network stations ready for each teacher. Sending one is currently being rigorously debugged, and the result is gratifying.

CXA1691BM (or CD1691CB) BP type FM sound board: the receiving board is $5 \times 5 \times 1$ cm, receiving integration using CXA1691BM or CD1691CB, earphone line and receiving antenna. No silent version will have sand sound when not receiving the platform. It contains a class of 9018 high frequency (antenna) amplifier circuit with high sensitivity, good sound quality and automatic frequency. Rate control (AFC) function, after receiving the platform, can automatically track the transmitter frequency changes in about 1 MHZ range, this function is conducive to locking the transmitter frequency, and even if the transmitter has a slight frequency change can still lock the frequency of the transmitter, so that the overall performance is superior. The board can be matched with a FM transmitter to form a wireless audio system or a wireless sound transmission system. It can also be used alone and receive FM broadcasting. The board designs a typical working voltage 3 V, and the receiving frequency (88 - 108 MHz) is continuously adjustable.

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