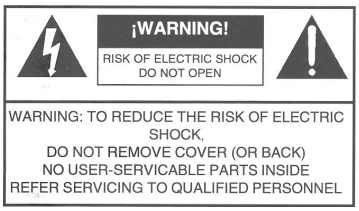
PALSTAR

R30A SHORTWAVE RECEIVER

Owner's Manual

2 Important Safeguards

WARNING: TO PREVENT FIRE OR ELECTRICAL SHOCK DO NOT EXPOSE TO RAIN OR MOISTURE



An appliance and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause the appliance and cart combination to overturn.

The lightning flash with arrow head symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE. DO NOT OPEN THE CABINET WHILE OPERATING. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THE THREE WIRE CORD WITH AN EXTENSION CORD RECEPTIACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

1. Read Instructions—All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions—The safety and operating instructions should be retained for future reference.
3. Heed Warnings—All warnings on the appliance should be adhered to.
4. Follow Instructions—All operating and use instructions should be followed.
5. Cleaning—Unplug this appliance from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
6. Do Not Use Attachments—not recommended by the manufacturer or they may cause hazards.
7. Water and Moisture—Do not use this product near water—for example, near a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool—and the like.
8. Accessories—Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the appliance.
9. Ventilation—This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to. Any slots or openings in the cabinet are provided for ventilation. To ensure reliable operation of the video product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface.
10. Grounding or Polarization—this product is equipped with a 3-wire line cord receptacle. It is intended for use with a 3-wire properly grounded power socket. Do not defeat the safety purpose of the supplied line cord and plug.
11. Power Sources—This product should be operated only from the type of power source indicated on the marketing label. If you are not sure of the type of power supplied to your home, consult your appliance dealer or local power company.
12. Power-cord Protection—Power-supply cords should be routed so they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit.
13. Lightning—For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet.

14. Power Lines—An outside antenna system should not be located in the vicinity of overhead power lines, other electric light or power circuits, where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them may be fatal.

15. Overloading—Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

16. Object and Liquid Entry—Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.

17. Servicing—Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

18. Damage Requiring Service—Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a. When the power-supply cord or plug is damaged.

b. If liquid has been spilled, or objects have fallen into the product.

c. If the product has been exposed to rain or water.

d. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.

e. If the product has been dropped or the cabinet has been damaged.

f. When the product exhibits a distinct change in performance—this indicates a need for service.

19. Replacement Parts—when replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original parts. Unauthorized substitutes may result in fire, electric shock or other hazards.

20. Safety Checks—Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.

21. Outdoor Antenna Grounding—Before attempting to install this product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges.

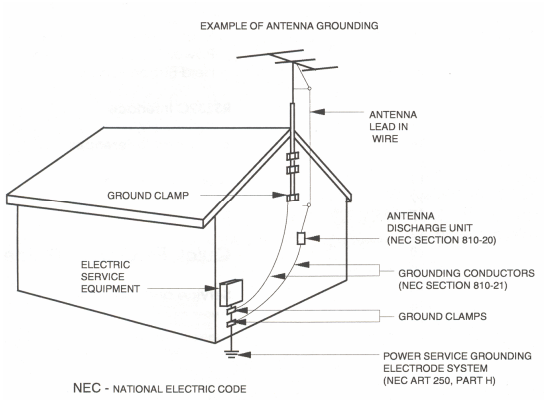
a. Use No.10 AWG copper, No.8AWG aluminum, No.17AWB copper-clad steel or bronze wire or larger, as ground wire.

b. Secure antenna lead-in and ground wires to house with stand-off insulators spaced from 4 feet to 6 feet apart.

c. Mount antenna discharge unit as close as possible to where lead-in enters house.

d. A driven rod may be used as the grounding electrode where other types of electrode systems do not exist. Refer to the National Electric Code, ANSI/NFPA 70-1990 for information.

e. Use jumper wire not smaller than No.6 AWG copper or equivalent, when a separate antenna grounding electrode is used.

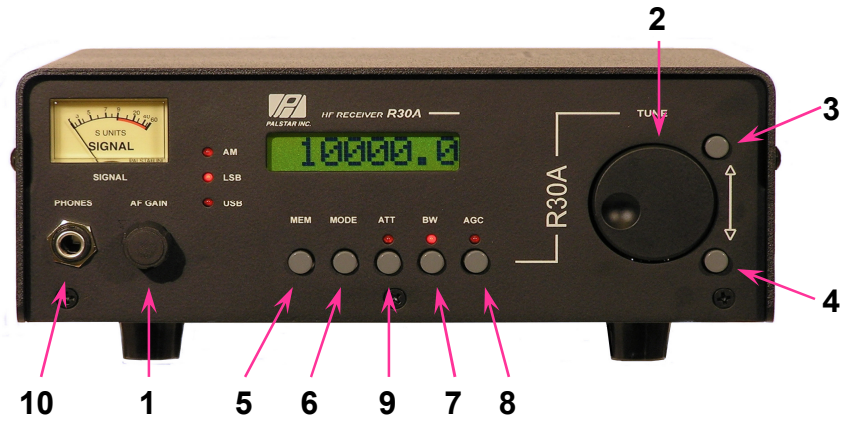


The Palstar RA30 is a compact, high-performance, general coverage receiver for the Long Wave, Medium Wave, and Short Wave bands, with tuning from 100 kHz to 30MHz.

The R30A HF shortwave receiver is capable of receiving multimode signals and features high sensitivity and high dynamic range to eliminate annoying intermodulation distortion interference. Two world famous Collins IF filters (2.5KHz ad 5.8KHz) provide unmatched selectivity.

The radio also features 100 programmable memories, variable rate tuning and switchable bandwidth in all modes. A 10 AA cell internal battery pack automatically connects to the radio when the AC adaptor plug is disconnected, allowing portable operation.

6 Front Panel Functions



1. On/Off & Volume Control This knob functions as the power on/off switch and controls the audio output volume.

2. Tuning Knob

NORMAL MODE: Turning the Tuning Knob changes the frequency of the receiver. The tuning rate varies with the speed at which the knob is turned. There are two tuning rate ranges. The SLOW rate is 20 Hz per step, increasing to a maximum of 100 Hz per step as the knob is turned faster. The FAST rate is 100 Hz per step, increasing to a maximum of 500 Hz per step as the knob is turned faster. To switch between the two rates, press the Tuning Knob toward the front panel until it clicks. To return to the other rate, once again press the knob until it clicks. With a bit of experience, you can easily tell which rate is selected by watching the digital display change while turning the knob.

MEMORY MODE: Once Memory Mode is enabled (by pressing the MEM button once), turning the Tuning Knob steps through the stored memory channels. Pressing the Tuning Knob toward the front panel until it clicks switches between display of the channel numbers and display of the frequency of the stations stored in each memory channel.

If the digital display shows “CH” {number}”, [{number} is the number of the active memory channel]; then pressing the Tuning Knob

toward the front panel until it clicks will cause the stored frequencies to be displayed, instead of the channel numbers. To return to channel number display, once again press the Tuning Knob until it clicks. To return to Normal Mode, press the MEM button again.

FREQUENCY LOCK MODE prevents the tuned frequency from being changed by either the Tuning Knob or the UP and DOWN buttons. This is used when it is necessary to monitor a specific frequency, and you want to be sure the tuning cannot be changed by inadvertently bumping the controls or by vibration. After tuning in the desired station, to engage Frequency Lock Mode, press in and hold the Tuning Knob for 2 seconds. The Digital Display will show "LOCDIS" to indicate that the frequency cannot be changed. To release the Frequency Lock, once again press in and hold the Tuning Knob for 2 seconds. If the R30A is powered down while the frequency is locked, it will still be locked when powered up again.

3. UP Button When in:
NORMAL MODE: Increases receiver frequency in **100 Kilohertz steps**. If the button is held down, it repeats automatically.

MEMORY MODE: Steps UP through the recorded memory channels one at a time. If the button is held down, it repeats automatically.

MEMORY STORE MODE: Steps UP through all memory channels one at a time. If the button is held down, it repeats automatically.

4. DOWN Button When in:
NORMAL MODE: Decreases receiver frequency in **100 Kilohertz steps**. If the button is held down, it repeats automatically.

MEMORY MODE: Steps DOWN through the recorded memory channels one at a time. If the button is held down, it repeats automatically

MEMORY STORE MODE: Steps DOWN through all memory channels one at a time. If the button is held down, it repeats automatically.

5. MEMORY Button
a. Entering memory mode: Starting from the Normal Mode,

pressing the MEM button once will place the receiver in Memory Mode, and the digital display will show memory channel information. The display will be “CH {number}”, where {number} is the number of the active memory channel. To display the frequency of the active
memory channel, press once on the Tuning Knob until it clicks. To return to the channel number, press on the Tuning Knob again.

To step through the memory channels, either press the UP or DOWN buttons or turn the Tuning Knob. If you have pressed the Tuning Knob to display memory channel frequency, then the frequency of the stored channels will be displayed instead of the channel numbers as you step through.

Only memory channels that have information stored in them will be displayed. For example, if only memory channels 1 through 10 have information stored in them, continuing to step past memory channel 10 will loop back to memory channel 1 and start over. Likewise, if channels 1 through 10 and 15 through 20 have information stored, while channels 11 through 14 are empty, stepping past 10 will skip over 11 through 14 and resume at 15.

To return to Normal Mode, press the MEM button again. Upon the return to Normal Mode, the unit will be tuned to the station stored in the memory channel selected while in Memory Mode. If the R30A is turned off while in memory Mode, it will be in Memory Mode when it is powered up again.

b. To store memory information: In Normal Mode, tune in the station you wish to store in memory. All associated settings (i.e. AM, LSB, or USB; Bandwidth; AGC; and Attenuation) will be stored along with the frequency. Be certain that everything is correct before entering Memory Store Mode, because once Memory Store Mode is enabled, you will not be able to view or change the frequency or to view or change the associated settings.

c. To enter Memory Store Mode: First tune in the station you desire to store, then press and hold the MEM button for 2 seconds. The digital display will show “CH {number}.” The default {number} displayed will be the lowest available empty memory channel number, and {number} will be flashing.

d. To store the previously tuned station in the default channel number, press the MEM button once.

e. To store the previously tuned station in a memory channel other than the default: First select the channel desired by using the Tuning Knob or the UP and DOWN buttons. Empty channels will be indicated by a FLASHING channel number. Previously used channels will be indicated by a FLASHING channel number, followed by the FLASHING letter "P". Choosing to store in a previously used channel will cause the new station information to overwrite the previously stored information. Once the desired channel number is displayed, press the MEM button once to store.

f. If you are in Memory Store Mode, and decide that you do not want to store a memory, turn the power off and wait 5 seconds or so. When the R30A is turned on again, it will come up in Normal Mode.

NOTE: The memories in the Palstar R30A are non-volatile, the will remain no matter how long power is disconnected from the receiver. Once a memory channel has had information stored to it, it cannot be deleted or emptied, it can only be overwritten by new information.

Digital Display

NORMAL MODE: Displays received frequency.

MEMORY MODES: Displays memory channel information.

FREQUENCY LOCK MODE: Displays "**LOCDIS**"

6. MODE Button - *Repeatedly pressing the MODE button steps through Amplitude Modulation (AM), Lower Side Band (LSB), and Upper Side Band (USB) reception modes.* The currently selected mode is indicated by the lights to the left of the digital display. The bandwidth automatically switches to the width appropriate for the reception mode selected.

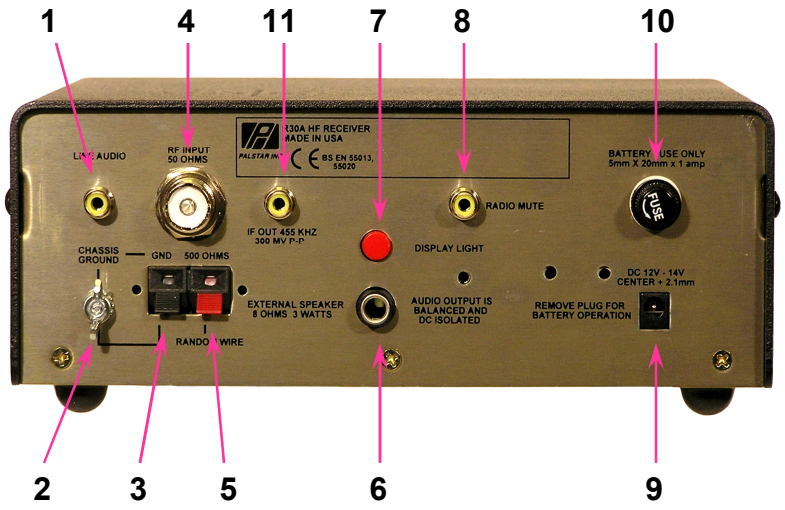
7. BW (BandWidth) Button - *Switches between WIDE bandwidth (5.8kHz) for AM reception and NARROW bandwidth (2.5 kHz) for SSB reception.* The indicator is lit when bandwidth is NARROW.

The bandwidth automatically switches to the width appropriate for the reception mode selected by the MODE button, but the opposite bandwidth can be selected by pushing the BW button once. Pressing BW again will return to the previous setting.

8. AGC (Automatic Gain Control) Button - *Switches between Fast and Slow AGC response time.* The indicator is lit when AGC responses time is FAST. For most normal reception, AGC response time should be SLOW. The primary use for the FAST response time is when listening to CW (Morse code) stations.

9. ATTenuator Button - *Switches in 10 dB of attenuation to prevent overloading of the receiver by strong local stations.* The indicator is lit when attenuation is ON. For most normal reception, attenuation should be OFF.

10. Headphone Jack - A standard 1/4" monaural phone plug (2 conductor) is provided to enable listening without disturbing others. The headphone jack is designed for use with 8 ohm monaural headphones. If stereo headphones are used, the sound will only be heard in one ear. When headphones are plugged in, the internal speaker (of external speaker, if one is in use) is disabled.



Rear Panel Functions/Connections

1. LINE AUDIO: A standard phono (RCA type) jack is provided to connect audio to the Line Input jack of a tape recorder so that off-air recordings can be made.

2. WING NUT GROUND: To earth ground or water pipe.

3. CLIP GROUND: same as wing nut ground.

4. Low impedance coaxial antenna connection. A standard SO-239 connector for use with a standard PL-259 plug and coaxial cable antenna feed line. This connector is for unbalanced antennas. To use with a balanced antenna, an external BALUN (BALanced to Unbalanced transformer) should be used.

5. High impedance connection for long wire and Hi-Z dipole antennas. For connecting a random length wire, or other end-fed, unbalanced, wire antenna. Antennas of this type require a good RF ground for best performance. Connect the antenna to the RED terminal, and the ground to the BLACK terminal.

6. EXTERNAL SPEAKER OUTPUT: Audio output is DC isolated

and balanced (use 1/4" mono jack or supplied 3.5mm adaptor) The external speaker should have an impedance of 8 Ω, and a minimum power handling capability of 3 Watts. When the external speaker is plugged in, the internal speaker is disabled

7. DISPLAY LIGHT SWITCH: This press-on, press-off switch allows the backlighting in the Digital Display to be turned off to conserve power when operating from batteries (recommended).

8. MUTE JACK: Ground center pin to mute receiver when using an external transmitter. A standard phono (RCA type) jack is provided to connect a mute control line for use when the R30A is used in conjunction with a transmitter. A relay contact closure or other control circuit capable of pulling a +5 VDC logic line to ground will cause the R30A to mute.

9. EXTERNAL POWER JACK: Connect to the provided wall adaptor or other suitable 12 VDC power source. When an external power source is plugged into the power jack, the internal battery pack is disabled. The power plug is a standard 14mm long connector (2.1mm ID, 5.5mm OD, center positive). The limit of the acceptable voltage range that can be connected to the power jack is between 10.5 and 15 VDC. However, operating the R30A from voltages in excess of 14 VDC for prolonged periods can cause excessive heating of the built-in regulator chips.

If you choose to power the R30A from a source capable of supplying high currents such as the battery of a car or boat, you must protect the radio by placing an in-line fuse holder in the power cable and use a fast blow fuse rated no more than 1 Amp.

10. FUSE: Fuses internal battery only—use 5mm x 20mm 1A replacement.

11. IF OUT: Wideband 455KHz IF output for use with an external synchronous detector.

Tilt Bail - A fold-down wire bail is provided to tilt the R30A to a more convenient angle, as illustrated on the front cover.

Internal Battery Pack - The Palstar R30A has provision for internal battery operation. Operation from the battery pack is enabled by the Power Source switch on the back panel. The internal battery pack uses 10 “AA” size penlight cells (not provided). Alkaline cells are recommended for maximum battery life. If rechargeable cells such as Nicad or NiMH are used, they must be recharged in a separate charger. Access for installing or changing the batteries is gained by unscrewing the 6 screws located on the sides of the unit and removing the top cover. Next, remove the battery restraining strap by removing the screw at one end and then pivot it up until the other end unhooks. Be sure to observe proper polarity when installing the batteries. Once the batteries are in place, secure them with the battery restraining strap and replace its screw, then reinstall the top cover.

Radio Theory Primer - Frequency and Wavelength

Radio is a way of communicating across distances without the use of wires by means of electromagnetic waves. These electromagnetic waves can travel through the Earth's atmosphere, but unlike sound waves, they are not reliant on the air to carry them. They travel just as well (or even better) through the vacuum of space. The most basic characteristic of any electromagnetic wave is its *frequency*, which is the rate at which it rises from zero to some positive level, and then back through zero to some negative level and then back to zero again. One of these complete alternations is called a *cycle*. The number of these cycles occurring each second is the frequency of the electromagnetic wave. The unit of frequency, the cycle per second, is named after Heinrich Hertz, an early radio researcher. One Hertz is equal to one cycle per second.

Closely related to the frequency of electromagnetic waves is the characteristic known as *wavelength*. As a single radio wave or cycle begins to leave an antenna, it travels outward through space. How far does it get before one cycle is completed? It travels at the speed of light, 186,000 miles per second, or in Metric units, 300 million (300,000,000) meters per second. If we were to radiate a one hertz wave, the front edge of it would have traveled 300 million meters by the time the rear edge of the wave leaves the antenna one second later. Thus, the wavelength of a one Hertz transmission would be 300 million meters or 186,000 miles. long!
If we were to radiate a wave with a frequency of one million Hertz, one cycle would only take one one-millionth of a second, and the wavelength would therefore be one one-millionth of 300 million or 300 meters. One million Hertz can be referred to as 1000 kilohertz (KHz) or 1 megahertz (MHz). 1 MHz is located just about in the center of the standard AM broadcast band. To calculate the wavelength of any frequency in meters, simply divide 300 by the frequency in megahertz.

With this explanation of wavelength, you can now understand what is meant when someone talks about, say, the "80 meter band" or the "49 meter band." This is just another way to refer to a group of frequencies that have been set aside for a specific purpose. For

example, the 80 meter band is an amateur radio (ham) band that runs from 3.5 MHz to 4.0 MHz. The 49 meter band is assigned to international shortwave broadcasting and runs from 5.90 MHz to 6.20 MHz.

These meter designations for the bands are chosen to be a nice round number from somewhere near the middle of the band. The frequency of an 80 meter wave is 3.75 MHz, the frequency of a 49 meter wave is 6.122 MHz. Obviously, some of the wavelengths in the band are shorter, and some are longer than the length designated by the band name.

The Electromagnetic Spectrum

Electromagnetic waves have different characteristics depending on their frequency. The only difference between radio waves, the microwaves that cook your food, light beams, and X-rays, is their frequency. The Palstar R30A receives frequencies in the range of 100 kilohertz (kHz) to 30 megahertz (MHz). Frequencies in the range of 100 kHz to 300 kHz are called Long Wave (LW). Frequencies in the range of 300 kHz to 2 MHz are called Medium Wave (MW). Frequencies in the range of 2 MHz to 30 MHz are called Short Wave (SW) or High Frequency (HF).

At frequencies above 30 MHz (which are higher than those received by the Palstar R30), we run into the range of Very High Frequency (VHF) and Ultra High Frequency (UHF) and beyond. We will discuss later what you can expect to hear on these different frequencies.

Radio Propagation

Propagation refers to the way radio waves travel through the air. When radio waves leave an antenna, some of them travel close to the ground. Receivers close to the antenna receive these *ground waves* directly. The range of ground waves is limited. The closeness of the waves to the Earth means that the Earth absorbs some of their energy, and farther away from the antenna, the Earth curves downward, away from the straight-traveling waves, and the waves pass too high overhead to be received on the ground. To receive radio waves at longer distances, some other mechanism is needed.

16 Radio Propagation (continued)

The upper atmosphere of the Earth contains layers of electrically charged or ionized gasses. These ionized layers are caused by the action of light and energy from the Sun on the atmosphere. The ionized layers act as reflectors of radio waves, causing them to bounce back toward the Earth. By bouncing back and forth between the Earth and the ionized layers, it is possible for radio waves to travel all the way around the world. This is called *sky wave* reception.

The study of shortwave radio propagation is a scientific discipline in itself, but, fortunately for us, it can be simplified. Because the nature and location of the ionized layers in the atmosphere are caused by the action of light and energy from the Sun, it is easy to understand that the differences vary between day and night, and between summer and winter. In the day and during summer, radio reflective ionized layers are at higher altitude, and the maximum frequency that the layers will reflect (called the Maximum Usable Frequency, abbreviated MUF) is higher. At night, and more so in the winter when the days are shorter, the reflective layers are at lower altitudes, and the MUF is lower. Frequencies in the lower VHF range and higher usually penetrate right through the ionized layers and are only able to be reflected under rare conditions.

The basics of shortwave radio propagation can be summarized in a few statements:

1. The higher frequencies are better during daytime and in the summer months.

2. The lower frequencies are better during night time and in the winter months.

3. Periods of high sunspot activity favor the higher frequencies, periods of low sunspot activity favor the lower frequencies.

4. Solar flares and other disturbances on the Sun can cause geomagnetic storms that upset normal propagation for hours and days at a time. These disturbances are more frequent during times of high sunspot activity.

What I can hear on my Palstar R30A Receiver?

Long Wave (LW), 100 kHz to 300 kHz The most common inhabitants of this range of frequencies are navigation aids known as non-directional beacons. They transmit at low power (usually 100 watts or so), and their signal consists of a two or three letter identifier repeated over and over in Morse code.

Medium Wave (MW): frequencies - range of 300kHz to 2 MHz
The lower end of this range, from 300 kHz to 540 kHz, was once the mainstay of ship to shore communications, mostly in Morse code. As ships have increasingly switched to high-tech satellite communications, there is less and less activity there. Many official agencies such as the Coast Guard have even abandoned their round the clock monitoring of the old international distress frequency of 500 kHz. The main band of interest in this frequency range is the Standard AM broadcast band which runs from 540 kHz to 1700 kHz. The higher power stations can be heard over large areas at night. MW is also home to one Amateur Radio band, the 160 meter band from 1600 kHz to 2000 kHz.

Short Wave (SW): frequencies in the range of 2 MHz-30 MHz

Shortwave Broadcasters The primary bands of interest in the Shortwave (SW) spectrum for most listeners are undoubtedly the international broadcast bands.
They are as follows:

Frequency in kHz	Band Name
2300-2495	120 Meters
3200-3400	90 Meters
4750-5060	60 Meters
5960-6200	49 Meters
7100-7300	41 Meters
9500-9900	31 Meters
11650-12050	25 Meters
15100-15600	19 Meters
17550-17900	16 Meters
21450-21850	13 Meters
25600-26100	11 Meters

18 What Can I Hear?

Everyone is familiar with standard AM and FM stations, which occupy a single frequency and broadcast on it every day. The biggest difference that you will notice between these standard broadcast stations and shortwave broadcasters is that shortwave stations move around a lot. Because the target audiences of shortwave stations are located all over the world, shortwave broadcasters transmit on frequencies and at times chosen to have the best chance of reaching the target audience at the correct time of day. In addition, these frequencies are often changed with the seasons to take advantage of the seasonal changes in propagation.

Another difference is that there is more day-to-day variability in the reception shortwave stations. Because the stations are located so far way, often on another continent, reception is totally dependant on the condition of the atmosphere between the transmitter and your receiver. There will be some days when your favorite station will be very weak or not heard at all.

Amateur Radio Bands

The Amateur Radio (Ham) bands are occupied by ordinary people from all over the world who have been licensed by their governments to engage in two-way radio transmissions as a hobby. Whenever there is a natural disaster such as a tornado, hurricane, earthquake, etc., the Ham bands are the place to listen. It is common for Ham radio to be the only communications link into or out of a disaster area for many days after the occurrence. In fact, the ability of Hams to provide emergency communications is one of the primary reasons Ham radio exists.

The primary modes heard on the Ham bands are CW (Morse Code, usually down at the lower end of each band), and voice communications in the form of Single Sideband (SSB, there will be more about SSB later on). There is also a smattering of other modes: radio teletype, slow-scan TV, and other data communications methods. These signals require the use of special decoder devices or computers with special decoding software in order to read or view them.

The Amateur Radio bands are as follows:

Frequency in kHz	Band Name
3500-4000	80 Meters
7000-7300	40 Meters
10100-10150	30 Meters (CW/Data only)
14000-14350	20 Meters
18068-18168	17 Meters
21000-21450	15 Meters
24890-24990	12 Meters (Shared with Fixed Service)
28000-29700	10 Meters

Other Services

The Shortwave spectrum is also home to many other radio services, including ship-to-shore, transoceanic airlines, government, military, and others. Often called “Utility Stations” or “Utes” for short, their transmission modes include CW, AM voice, SSB voice, radio teletype and data. The monitoring of Utes is a specialized and rapidly changing area of the SWL hobby. It is beyond the scope of this guide to provide more details, but there are books, magazine columns, newsletters, and internet webpages if you want more information.

World Time

Let’s say you want to listen to a BBC newscast at 5pm. But, is that 5pm in London where the program originates, 5pm in Southeast Asia where the BBC relay transmitter is located, or 5pm in New Zealand, where the intended audience lives?
To eliminate such problems, shortwave broadcast schedules are kept in World Time. World Time is the local time at the Prime Meridian, zero degrees of longitude, which runs through Greenwich, England.

In the past, World Time was known as Greenwich Mean Time, today it is usually called Coordinated Universal Time, abbreviated as UTC. The military designates UTC with the letter “Z” and refers to it as “Zulu”, which is the phonetic pronouncer for “Z.” UTC is a 24 hour clock and the times are written in four digits with no punctuation. Thus, midnight is 0000 hours, 1pm is 1300 hours, and so on.

To convert UTC to local time, you will need to know how many time zones you are located east or west of Greenwich, England. If you are located east of Greenwich, you add the number of time zones, west of Greenwich you subtract the number of time zones.

Also, you need to remember that UTC never goes on Daylight or Summer Time, so your offset will be different between summer and winter if you live in an area that sets the clocks forward in summer.

If you live in North America, one of the easiest ways to determine UTC is to tune your R30A to the National Institute of Standards and Technology's shortwave stations, WWV or WWVH, which broadcast simultaneously on standard frequencies of 2.5, 5, 10, 15 and 20 MHz. (WWVH does not transmit on 20 MHz.) They announce the UTC time every minute, with accuracy tied to the most accurate atomic clocks on the world.

WWV is located in Boulder, Colorado, and WWVH is located on the Island of Kauai in Hawaii. So you can tell them apart, WWV has a male announcer voice, and WWVH has a female announcer voice. One or the other of these stations should be able to be heard on one of the frequencies 24 hours a day from anywhere in North America.

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You may find that having a clock that can be left set to UTC will make it easier to figure out when your favorite shortwave program is on. There are several low-cost 24 hour digital clocks available from suppliers who cater to radio buffs.

CW Reception

CW (an abbreviation for Continuous Wave) or Morse code reception requires a bit more doing than listening to AM voice transmissions. A CW transmission is simplicity itself -- a transmitter is switched on and off by a telegraph key in the pattern of the dots and dashes of the Morse code. However, if you tune in this signal in regular AM mode, all you will hear is a kind of intermittent raspy noise as the dots and dashes go by. To convert the CW signal into a pleasant audio tone that is easy to read, there is a circuit in the receiver called a Beat Frequency Oscillator (BFO). The BFO cre-

ates a signal that is mixed with the received signal with just enough frequency offset to result in the audio tone.

In the Palstar R30A, the BFO is engaged by choosing the Upper Sideband (USB) or Lower Sideband (LSB) modes. As you tune across a CW signal, its pitch will change, and you tune until the pitch is most pleasing to your ear.

Single Sideband (SSB) Reception

Single Sideband (SSB) is a mode that provides the benefits of reduced bandwidth (thereby taking up less room on the radio dial) and greater efficiency in the use of transmitted power (thereby allowing the signal to effectively reach further without increasing transmitter power). The cost of these improvements is the requirement that the receiver have a Beat Frequency Oscillator (BFO), and tuning is somewhat more difficult. SSB is widely used by Hams, Utility stations, the military, and even some shortwave broadcasters.

Here is a brief explanation of what SSB is: a radio transmitter is tuned to the frequency it is to transmit on, called the carrier frequency. The desired signal (voice or music) is mixed with the carrier frequency in a process called modulation. The result is three frequencies: 1) the original carrier frequency, 2) an upper sideband consisting of the carrier frequency with the modulating signal added to it, and 3) a lower sideband consisting of the carrier frequency with the modulating signal subtracted from it.

All of the information to be transmitted is contained in each sideband. Once sidebands are generated, the only purpose the carrier serves is to provide a reference for the receiver to use in recovering the audio from the signal. If you strip away one of the sidebands and the carrier, what is left is a Single Sideband signal. Feed it to an antenna, and it will go out over the air just like any other radio frequency signal. (As you can see, the term “carrier” is a bit of a misnomer; it really doesn’t “carry” anything) Either the upper or the lower sideband can be used.

A regular AM receiver cannot properly process an SSB signal without the carrier to use as a reference. If you try to listen to an

SSB signal in AM mode, you will hear a highly distorted sound, often described as being a "Donald Duck" type of sound. To properly hear the audio, a local replacement for the carrier is provided by the BFO.
The "USB" and "LSB" mode buttons on the front of your Palstar R30A are pre-tuned and optimized BFO settings for the reception of Upper and Lower Sideband signals. You must choose the correct one: listening to USB in the LSB mode or vice-versa will result in more distortion. To avoid confusion over which to use, Hams by agreement use LSB on 160, 80, and 40 Meters, and USB on the bands above that. Shortwave broadcasters tend to use USB.

Having chosen the correct USB or LSB setting, as you tune across a SSB signal the audio pitch will change, and you will reach a point where the voice becomes understandable, and it finally will reach a normal sounding pitch. If you continue to tune past, the pitch will again change.

ANTENNAS

Previously we talked about the relationship between frequency and wavelength. Antennas work best when their length is a significant fraction (i.e. 1/4 or 1/2) of a wavelength. That means that an antenna gives its ideal best performance on only one frequency. Since the Palstar R30A receives from 100 kHz to 30 MHz, the range of wavelengths it covers is from 3000 Meters to 10 Meters, so no single antenna can give optimal performance on all frequencies.

Fortunately, receiving antennas are less demanding than transmitting antennas, and adequate performance can be had with quite simple arrangements. If you live in an ordinary frame or brick home, surprisingly good results can be had with a wire strung around the walls of a room. Just strip 1/4" (10 mm) or so of the insulation from one end and connect it to the Red terminal on the antenna terminal block on the back of the R30A. The wire can be simple 22 gauge insulated hookup wire. If you don't have a metal roof, effective wire antennas can also be strung in attics.

You may desire the improved performance that an outdoor antenna provides, or, if you live in a steel-reinforced or metal-sided

building, it may be too shielded for an indoor antenna to work well.

Performance of the antenna will be improved by providing an earth connection to a ground stake. For best results, get a good quality ground stake approved for grounding an electrical service entrance, and drive it at least 8 feet into the earth. The wire from the ground rod connects to the wing nut or to the Black terminal on the antenna connector block on the back of the radio. The wire used in an outdoor antenna needs to be strong enough to support its own weight, as well as to hold up any additional weight such as ice from an ice storm. Normally, 14 gauge or larger is considered an adequate size, especially if the wire is copper-clad steel especially designed for antenna use. If the far end of the antenna is supported by a tree or other support that sways in the wind, a pulley and weight arrangement will prevent the swaying from putting additional strain on the wire.

WARNING: Any outdoor antenna MUST be located so that it cannot fall on power lines or power lines cannot fall on it, if they should come down. Also, any outdoor antenna MUST have an approved lightning arrestor, installed in accordance with applicable building and electrical codes, at the point where the antenna connection enters the building.

24 Specifications

Frequency Coverage	100 kHz to 30 MHz
Reception Modes	AM, LSB, USB, CW
Receiver System	Microprocessor controlled PLL tuning, dual conversion superheterodyne receiver.
Display	6-digit backlit LCD display, additional indicators show ATT, AGC, LSB, USB, AM, BW Analog S-meter, calibrated S1 to S9, +20dB, +40dB, +60dB
Tuning	Rotary encoder, Tuning rate: 20 Hz to 100 Hz slow and 100 Hz to 500 Hz per step in fast mode. Up/Down buttons: 100 KHz per step
Memory	100 frequency memories selected with front panel encoder tuning knob or up/ down buttons. Receiver frequency is retained while switched off. Locked display with tuning knob.
IF Filters	All modes, either 2.5 kHz or 5.8 kHz operator selectable
RF Attenuator	10 dB
Controls	Power on/off and volume MODE AM, LSB, USB MEM Memory button ATT Attenuator BW Bandwidth AGC Fast or Slow Up & Down (100 KHz steps)
Antenna Inputs	50 Ω SO239 and 500 Ω and ground with compression terminals
Audio Outputs	External speaker—1/4” jack selected balanced output. Headphone—1/4” jack Internal Speaker is disconnected when headphones or external speaker are plugged in. Recorder output (line audio). Mute audio for use with a transmitter.
Power Supply	External 12 DC supply & internal 10 cell battery pack for portable use (lamps in off mode). 2.1mm ID, 5.5mm OD, center positive DC Input Jack

Dimensions	232mm W x 100mm H x 225mm D 9.13" W x 3.94" H x 8.88" D Weight: 1.8 kg (3.9 lbs)	
Sensitivity	100 kHz to 2 MHz AM SSB 2 MHz to 30 MHz AM SSB	 2 µV .5 µV 1 µV .5 µV max 10db(S+N/N)
Selectivity	45 MHz 455 Khz (AM) SSB	8 kHz BW 6 kHz 2.4 kHz
Dynamic Range	>90 dB at 50 kHz from desired	
Spurious Responses	At 45 MHz At 455 MHz	> 65 dB rejection > 90 dB rejection
Intermodulation	Third order Intercept +15dbm	
Frequency Stability	+/- 20 Hz per hour –15°C to +50°C	
AGC Range	1µV to 500 mV Attack time Delay - slow Delay - fast	< 2 dB change < 3 ms < 4 secs <.5 secs
Audio	2 watts into 8 Ω Distortion: 1 kHz signal AM at 60% mod. Depth SSB	2% THD < 1% < .5%
S/N Ratio	(AM Mode) 6 kHz filter ref. 60% @ 1 kHz 5 µV 500 µV (SSB Mode) 5 µV 500 µV	 20 dB > 50 dB 30 dB > 50 dB
Power Supply	DC required Quiescent current Typical current use	12 vdc@1A regulated 350 mA (with lamps) 350-800 mA

Limited Warranty

Palstar Inc. warrants products manufactured by it to be free from defects in material and workmanship under normal use and service **for a period of two (2) years for the AT-AUTO, AT10K, AT5K, AT4K,** and **all other products for one (1) year from the date of delivery to the first buyer** (the "Warranty Period"). Palstar Inc's obligation under this warranty is limited to repair or replacement of the product; at its option at the Palstar factory in Piqua, OH.

Effective only when the product is returned to the factory with all transportation charges prepaid and examination of the product discloses in Palstar's judgment, to have been defective during the Warranty Period.

The Warranty Period shall not extend beyond its original term with respect to interim in-warranty repairs by Palstar. This Warranty Period shall not apply to any product which has been repaired or altered by anyone other than Palstar without prior written authorization. Warranty does not extend to any products which have been subject to damage from improper installation, application or maintenance in accordance with the operating specification. Palstar neither assumes nor authorizes any person to assume for it any obligation or liability other than herein stated.

Repair Policy

When sending in a product for service, please "double" box it carefully and ship it insured for your protection. Please include a note clearly describing the problem, how you wish the item returned and how you wish to pay for the service. Package your radio properly. Palstar, Inc. is not responsible for merchandise damaged in shipment. Our service rate is $30 per hour (1/2 hr. minimum).

Return Policy

All returns must receive prior authorization from Palstar. Returned items must be received in original—AS SHIPPED– condition including the original box, manuals, accessories, and copy of sales receipt. Returns must be within 14 days of purchase. Returned items are subject to a 25% restocking fee. Shipping is not refundable.

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