Operator's Manual

Video Entertainment System
PR-422CA Marine FM/TV Antenna

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CE

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Naval PR-422CA is an Active Extra High Performance Omni-directional wide-band active Terrestrial AM-FM-TV Antenna (0.1-30 and 40-860 MHz)) for Maritime purposes where second-rate efficiency is unacceptable. It covers AM-SW and FM Radio bands as well as TV bands.

Constructed for High End Commercial and Military use, this compact and robust antenna shell is made of thick UV protected ABS plastic filled with polyurethane foam which provides both structural support and environmental protection. The mounting base is cast from Almag Marine Alloy. Almag 35 is a high purity alloy of aluminum and magnesium. Mounting hardware is made of stainless acid-proof steel. All Almag/stainless interfaces are protected with TefGel to prevent electrolysis and galling. The Shielded 3-band Low Noise Amplifier is protected from static charges and is removable for field repair or replacement. Projected life at sea >15 years.

This internal amplifiers receive (+15VDC) operating power from the Naval head-end via coax cable. It is removable, through the mounting flange, for repair or upgrade. This is a factory repair item and should not be serviced by the untrained.

This antenna is based on a construction of 3 circular dipoles coupled to a low noise amplifier via a broadband filter network. Maximum performance is assured through the extensive use of a Network Analyzer in the initial design and in the final construction and tuning of each unit.

Microwave transistors provide needed gain with a minimum of internally generated noise. Careful engineering and the use of very high quality components yield excellent inter-mod performance and sharp hand tuned filters greatly reduce the chance of interference from outside of the TV bands.

The PR-422CA is at the head of the 4000 Series Marine Cassette Banded Amplifier System with distribution passives introduced in 1998. The Series 4000 is the result of painstaking engineering and the use of state of the art components such as high performance GaAs Hetrerojunction Bipolar Transistors.

Installation Instructions for: TV Antenna System.

Mount the PR-422CA antenna high on the ship's superstructure, clear of nearby objects. It is best if the antenna is the highest object on the ship to insure maximum possible range and Omni-directional performance. Do not mount the antenna in the beam of a radar.

Mount the antenna on a 2-inch pipe that is braced against resonant vibrations. The antenna has a short coaxial lead ending in an F connector. Make a barrel connector splice to RG-11 coaxial cable; seal the splice and connectors against moisture and water entry, using "coax-seal" or similar waterproof putty. The usual precautions should be taken in installing the coaxial cable run. Clamp it against downloading force, so that the connection will not pull apart from the weight of the cable. Take care not to crush the cable, and avoid bends over sharp edges. The coaxial run to the headend amplifier should be less than 75 feet for best results. Any coaxial cable exposed to sunlight should be painted with non-metallic paint to prevent possible UV damage over the long term.

Bolt the head end amplifier to the bulkhead in a position convenient for service, preferably at a height corresponding to eye level for a standing person. Be sure to allow room to open the cabinet door. Connect the Cabinet Ground to Ship's Ground.

A direct AC supply to the PRA-420 should have a circuit breaker or switch, or alternatively should be supplied at an AC outlet in the same room. The room should be dry, with ventilation for heat to escape. A TV set should be in sight of the head end amplifier so as to help when performing adjustments to the system. It is often convenient to use a small portable TV set for this purpose. A 20dB test point is provided on the PR-4900 to connect the monitor TV. Do not use any of the 4 (-8dB) ports as the levels there are too high for the monitor and will cause overloading.

The head end amplifier cabinet is supplied with feed-through F connectors. The shipyard may wish to change over from RG-11 cable to RG-6 with a pigtail splice near the cabinet; alternatively, RG-11 may be connected direct to the F connectors on the cabinet if convenient.

All coaxial cables should be tagged on each end with a non-metallic tag. The tag ID should be indicated on as-fitted drawings.

Outlets are supplied with plastic ground isolation bases. These reduce possible problems with ground loops aboard a steel ship. When making connections to these “passives”, the connector may be slightly wrench-torqued so as to insure a lasting connection throughout the life of the ship.

Water resistant F-connectors with Silicone gel sealant and O rings are available on request for RG-6 and RG-59 cables, but are not yet available for RG-11. A good quality connector should be selected (such as Amphenol), as well as a quality crimping tool. It is important for the installer to be properly skilled in making these connections. RG-11 is best for the branch runs from the headend to the first passive connection; RG-6 can be used after that, providing the runs are not excessive in length. Keep in mind that coax-cable losses affect the UHF frequencies much more than the lower VHF frequrencies so it is possible to lose the upper UHF channels altogether if the coax length and losses are excessive.

Testing:

Equipment Required:

-TDR (Time Domain Reflectometer): Tektronics or equivalent.
- Frequency Selective Voltmeter: Sencor or equivalent

Test procedures:

TDR reading should be taken on each piece of coaxial cable where physical measurements are not possible. Lengths of all cables (to one foot accuracy) should be shown on as-fitted drawings. In addition to determining cable lengths, the TDR is able to see anomalies on the coax, and the installer should use this feature to insure that the cables and connections are true.

Perform a system test after installation is completed, before closing ceiling panels, etc. Inject a pilot signal at the headend. For this purpose, a VCR generates a good signal and is convenient to use as a pilot signal generator, as it is a repeatable signal source for future troubleshooting.

Experiences has shown that Shore Cable signals can vary from hour to hour and as such should not be used to inventory system levels. Most VCR units usually have a switch to allow RF output on either channel 2 or 3. Use either channel for the test; note the channel chosen on the as-fitted drawings.

When used with PRA-422 Power Supply-Amplifier, Attenuators: Each attenuator is a 3 turn potentiometer and is rather delicate. Use a tuning tool or small screwdriver. Turn slowly so the end of travel stop may be felt..

Inject the VCR signal to the selected input port on the PRA-422. While viewing the appropriate channel on the TV monitor, reduce attenuation on the amplifier until some signal degradation is noticed; then increase attenuation until this degradation is reduced. The amplifier is now adjusted for maximum gain without overdriving it. (The attenuator is situated at the amplifier input) Note the level of this Pilot. This level should be recorded and will be the reference point for all further tests.

Levels can now be taken at each coaxial output connector throughout the system, ie., at the end of each cable and at the output of each passive (splitter/tap-off/outlet). These levels must be recorded on a system block diagram or sketch. Levels can be referenced to either one microvolt or one millivolt, whichever is more convenient. There is 60 dB difference between the dBuV and dBmV figures; all drawings should indicate which reference is used. It is strongly recommended that readings be made using a logarithmic dB scale, since confusion often arises when linear voltage readings are used.

When testing is complete, the cable and connector attenuation values should correspond to the various signal level readings taken throughout the system. If a part of the system has higher than calculated attenuation, the problem must be investigated and corrected. When this happens, levels downstream from the correction point must be taken again, and recorded on the as-fitted drawings.

These final drawings are invaluable for future trouble shooting. Copies should be made for Naval Tampa, the Ship-owner, and the Shipyard for future reference. Naval Tampa will archive such drawings in hard copy and on electronic media where possible.

Typical problems:

Improper terminations: These will show up as a higher-than-calculated losses; they can be frequency sensitive. They may also show as a short or open circuit if the termination is seriously corrupt.

Proper installer skills, hardware and tools are essential to a good working system. Factory Engineers are available at reasonable cost to travel world wide.

Final Adjustments:

Before commencing any testing, ensure that the system is powered up and that the amplifier is active. See the note on “Attenuators” in the Test Procedures section, above.

It is, of course, better to use testing and measuring equipment when available, such as a signal generator and a frequency-selective voltmeter.

If no measuring equipment is available: Connect the antenna to the PR-4000 or PR-4010. Use a TV monitor attached to the 20dB test point on the PR-4900.

Locate a TV station in the low VHF band and adjust the monitor for best picture. Locate the attenuator on the PR-422CA and turn it full counter clockwise to introduce maximum attenuation of 20 dB. Turn the attenuator slowly clockwise while observing the monitor.

At some point some signal degradation may be noticed as the amplifier starts to over-drive.

At this point the attenuation should be increased again slightly CCW to limit over driving. The amp is now at maximum gain without overdrive.

Using a Signal Generator and Frequency Selective Voltmeter: For the channel under adjustment, disconnect the antenna or other input device. Feed the generator to the Antenna Input port via a DC block. Adjust the level of the generator for 0 dBmV and a frequency suitable for the amplifier being adjusted. Measure the signal at the outlet with the weakest signal (typically at the end of the longest or highest loaded branch. Using the corresponding attenuator, adjust so as to obtain a level of max 0dBmV at this outlet. Repeat the above procedure for each amplifier in the system.

When replacing the older MK-20CA antenna you will need a BNC to F connector which we supply free of charge with a splice kit, when requested.

TECHNICAL SPECIFICATIONS

Frequency range: 1.0-30MHz and 40-860 MHz

Gain: 14-25 dB

Noise factor: 4.5 dB Max.

Output level: 111 dBuV (2 signals-50 dBIM)

Supply voltage: 15 V DC

Current consumption: approx. 130 mA

CE Mark designed tested and certified.

Using Coax-Seal® to waterproof a coax cable splice

This is a new space age plastic material which will quickly and effectively seal all types of coax cable fittings. COAX-SEAL stays flexible for years thus insuring moisture proof connections, good SWR and long coax-cable life. Make sure fittings and coax cable are clean and dry before applying. Peel six inches of COAX-SEAL and wrap around by winding from coax cover toward fitting with one half overlap with each winding.

Shown below is a short pigtail of RG-59U coax cable terminated in a Snap and Seal "F" connector which is then joined to a female-female adapter or barrel connector. The antenna shown is an Active Marine TV Antenna as used by the US Navy

The next few photos will show how this barrel connector is used in a splice and how it is waterproofed for marine use.

This picture show: The second cable with connector is attached to the barrel adapter and wrench torqued. The connector on the right has an O ring in it's mouth and it is sealed to the coax internally with silicone grease.

This picture show: A small roll of Coax-Seal. It is a putty like material in tape form. The white waxed paper keeps it from sticking to its self.

This picture show: Note that the first wrap comes back on itself exactly and the second trun starts the diagonal wrap. Wrap from the coax cover toward the fitting with one half overlap with each winding.

This picture shows : The last wrap again comes straight back over the previous wrap without a diagonal. The seal is slightly sticky and should be molded now by hand to remove any gaps and to ensure that all the wraps are blending together. At some point the wraps will almost fuse together and the material may have to be cut away from the cable.

Most common problems with this antenna:

1. Water entry into the F connections just below the antenna...electrolysis will corrode the soft copper center conductor of the coax.

Cure: Clean off the corrosion, dry the connectors and seal against the weather with "coax-seal" putty tape. Electrical tape will not ensure a water tight connection.

2. Separation of the coax from the internal amplifier's printed circuit board from not supporting a long cable against downloading or, from a sharp pull to the coax.

Changeable Antenna Amplifier

Removing the changeable/repairable amplifier

Look into the mounting flange and the white plastic cap will be seen. Grip the rim of the cap with long nose pliers and pull. Move pliers to the other side of the cap and pull and wiggle. The cap should break free of its silicone rubber seal and slide towards you on the cable with the black rubber boot attached. This will expose the snap ring retainer. Using a snap ring tool, compress the snap ring and remove it. The amplifier can then be removed by a steady pull on the coax cable. It is connected to the inside of the antenna simply by a push on PAL connector as shown above.

Once the amplifier has been removed, push the coax cable into the tube and the whole assembly will slide out the top of the tube.