OLD FAMILIAR STRAINS

a newsletter for collectors of radio strain insulators and related items
Volume 5 No. 4/5 October, 1998

MILITARY INSULATORS

2016 PDF edition

Editorial

Here's your fall double (or should I say triple?) issue. At 40 pages, it weighs in at nearly three times the length of recent issues. Yes, I saved some funds to bring you a December issue. However, if your mailing label shows a 1298 date or earlier, please send in a donation before Christmas shopping taps us all out.

I hope that you like the extended length issues that we do each fall. Not only does it give me a larger palette, it provides much needed schedule flexibility during my summer months. Some of that "free" time was spent putting on the 2nd annual Filling the Void Insulator Show and Sale here in Portland (story on page 37). I also painted the outside of the house this summer, but that's another story (actually *two* stories).

Writing the military insulator article gave me the opportunity to review a whole scad of past OFS issues. And it was a very enjoyable journey through the old articles. If you don't have a complete set of back issues, you ought to get them. They're cheap enough (most are $2.00) and most articles are timeless. If you would like a list of the topics covered in the old issues, send me an SASE, or include a note with your renewal an I'll send you one.

A copy of Vol. 5 No. 3-1/2 is in your envelope. As we've done for the last couple of years, I created the 1/2 sheet "issues" to pass out at free at shows in order to spread the word about Old Familiar Strains

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The picture on this month's cover originally appeared on the cover of the June, 1943, issue of *Electronics*. It was an official U.S. Navy photo of a PBY Consolidated Flying Boat. Prominent in the back ground, is one of the plane's wire antenna arrays replete with ceramic insulators. I couldn't pass it up. I plan to revisit the topic of airplane insulators and antennas in the next issue.

SPECIAL EDITION AVAILABLE

For those of you that like to have "one of everything" I am pleased to announce the availability of a special edition of this copy of *Old Familiar Strains*. Several institutions and individuals who are not regular readers contributed information for this issue and I created a special "presentation edition" to send them as thanks.

This limited edition contains the same text as the regular edition with the exception of a dedication in the place of the editorial, and the show reports/classified ads pages are left out. Each is permanently bound in a presentation-quality report binder.

While they last, a few copies are available at $8.00 each (post paid).

Index of Selected Topics Appearing in:

- **Radio Antenna Insulators Used by the US Military**
- **Military Part Numbers for Radio Antenna Insulators**
- **Building a Collection of Military Antenna Insulators**

Radio Antenna Insulators Used by the US Military

by Dan Howard

The Army and the Navy were some of the first organizations to experiment with radio in this county. Consequently, a comprehensive review of the radio antenna insulators used by these organizations will take the reader from the earliest days of wireless, through both World Wars, and up to the modern day when wire antennas have largely been replaced by newer technology. Here, in three parts, I'll present a summary description of radio antenna ("strain") insulators used by the US Military from the beginning (1899) to date.

In the pages following this article, other topics including military part numbering systems and collecting military insulators will be addressed. Some antenna insulators that were used on military aircraft will be pictured here, but the subject of aircraft insulators will be covered in more depth in an upcoming issue.

Part I: Military Radio Antenna Insulators from 1899 to 1940

In the late 1890's, both the US Army and the US Navy began exploring the potential of "wireless" telegraphy. Literally "telegraphic communication without wires" in those days, the earliest military experiments with radio were conducted with developmental equipment over what would be considered very modest distances by today's standards. As will be explained below, both the Army and the Navy had an interest in developing radio during this period. However, the services saw the role of radio differently. So, rather than coordinating their efforts, each service developed or purchased antenna insulators suited to its own needs. For that reason, Army and Navy insulators from the early period will be discussed separately.

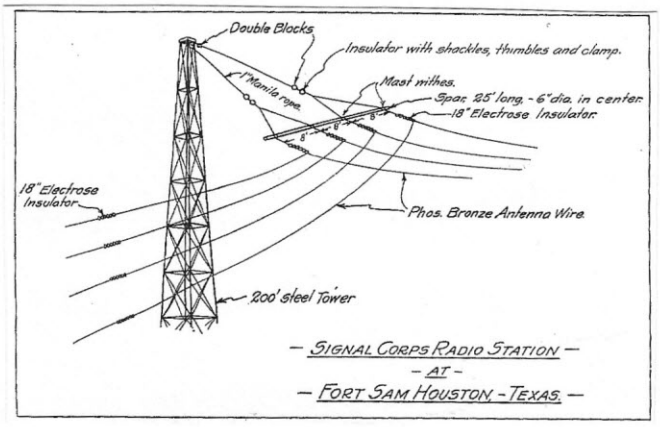
The Army Signal Corps

In her history of the Signal Corps *Getting the Message Through*, Rebecca Raines points out that changes in the art of war during the 1800's necessitated finding more effective means of long distance communication. (1:3) Previously, when armed conflicts were settled "hand-to-hand," voice commands or bugle calls were sufficient to communicate orders. As modern weaponry caused the battlefield to grow larger (and noisier), other means for communicating were sought out.

The Army Signal Corps began using the telegraph and other forms of wired communications with some success during the Civil War. Of course, that required stringing miles of communications wire. And an army on the move often outpaced its communications lines. In 1899, the Army began experimenting with wireless telegraphy. In April of that year, the Signal Corps used wireless equipment to communicate between Fire Island and the Fire Island lightship off Long Island, NY. (1:104)

Despite a promising early start, radio was still too cumbersome to be of much value during World War I. Early spark transmitters were bulky and noisy. Untuned sparks not only interfered with each other in the crowded trenches but they were easily monitored by opposing forces. Consequently, "as for signaling methods, wire communications, in particular the field telephone, proved to be the chief means of signaling used by the United States Army during World War I." (1:185) A good portion of the radio gear that was used in World War I was from European sources.

"Despite the conscientious efforts by government and industry, the limited duration of America's involvement in the war left little time for the development and application of new technology, and the United States relied chiefly on Allied radio equipment." (1:172) I assume that much of this equipment was borrowed only for the duration of the conflict. As such it was probably not issued US military numbers nor would it have been recorded on the lists of official equipment for signaling units. I have found no mention of foreign antenna insulators in the Army records that I have reviewed.

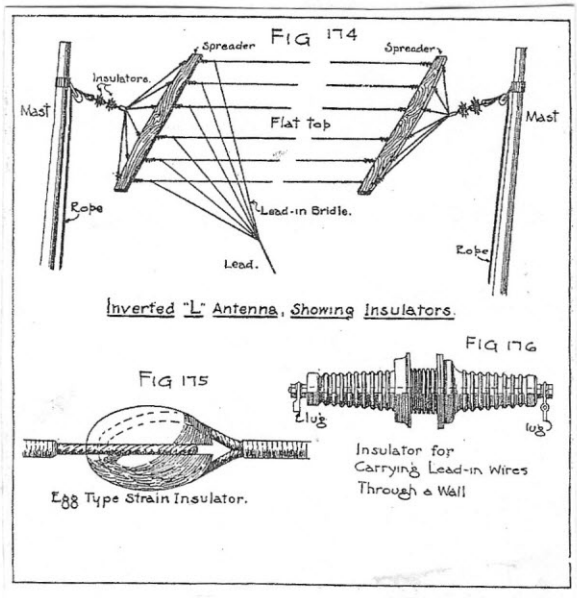


Fort Sam Houston Antenna

During World War I, "the profusion of new equipment prompted the Signal Corps to adopt standard nomenclature for its items, and the now familiar letters SCR began to appear. This designation originally stood for 'Set, Complete, Radio' but it has come to signify 'Signal Corps Radio.'" (1:172) Under the "SCR" system, insulators were assigned 'IN" numbers. The electrical engineering "section's responsibilities included the preparation of drawings and specifications for all Signal Corps equipment to be produced, except for radios."[1] (1:172) I believe that the electrical section most likely assigned the IN part numbers as well.

Although the Army operated high-powered shore stations at one time, I believe that the Signal Corps was primarily interested in developing and acquiring radio equipment which was suitable for field communications. Much of the developmental work that took place during World War I seems to have centered around portable gear suitable for infantry and artillery use. Accordingly, most of the Signal Corps antenna insulators that I have identified from this period seem to be suited for portable light duty wire antennas and the like.

Early Signal Corps "Radio Pamphlets" and other documents mention strains such as the IN-2 which was the Electrose[2] No. 4500 ball



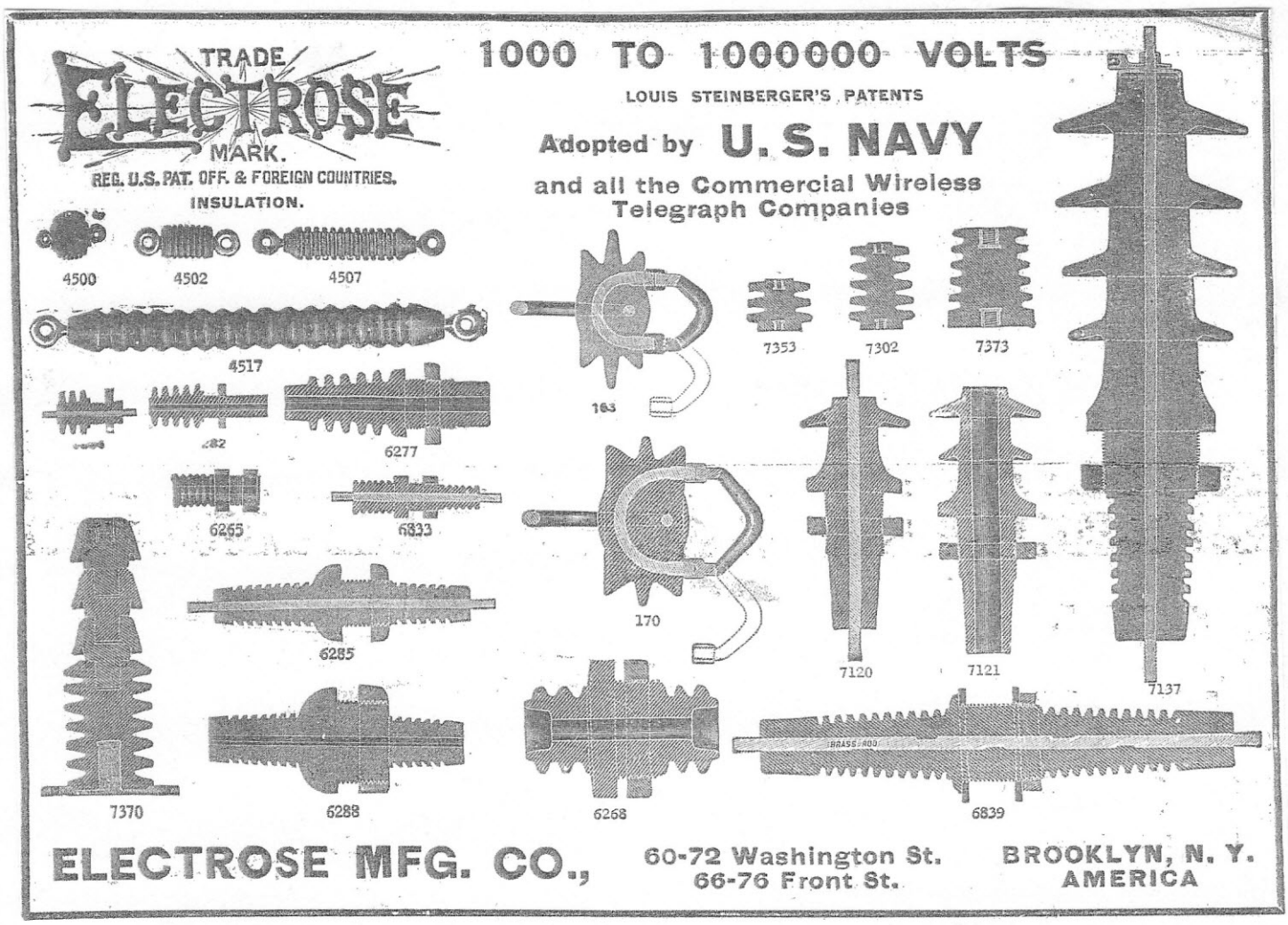
Radio Pamphlet 40 Insulators

[1] I have been unable to determine who currently has custody of these old files. If the early specifications were made available, I am sure that they would tell us even more about the early military insulators.

[2] Electrose is a shellac-based material that was used for insulators until World War II. For more information on electrose insulation and the Electrose Company, see *Old Familiar Strains* June, 1997.

insulator. IN numbers were also used for other types of insulators including knobs, feed through insulators, stand off insulators, and pin insulators. Some popular IN styles continued to be stocked until sometime after World War II. Table 1, on page 17, summarizes the IN numbers I have found for strain insulators.

During the late Teens and early 1920's, the Signal Corps issued a number of single-subject "Radio Pamphlets" as training aids. Around 1920, much of the information previously published in the Radio Pamphlets was revised and consolidated to form Radio Pamphlet No. 40 *The Principles Underlying Radio Communication.* This well illustrated, 600+ page volume provides a unique insight into the state of Army radio in the early 1920's. Radio Pamphlet 40 specifically mentions two types of radio strain insulators: porcelain egg insulators and Electrose insulators of various types. Other contemporary sources mention insulators made of materials such as varnished phenolic. Interestingly, although they used glass pin type insulators, I have not found reference to glass strains being used by the Army.



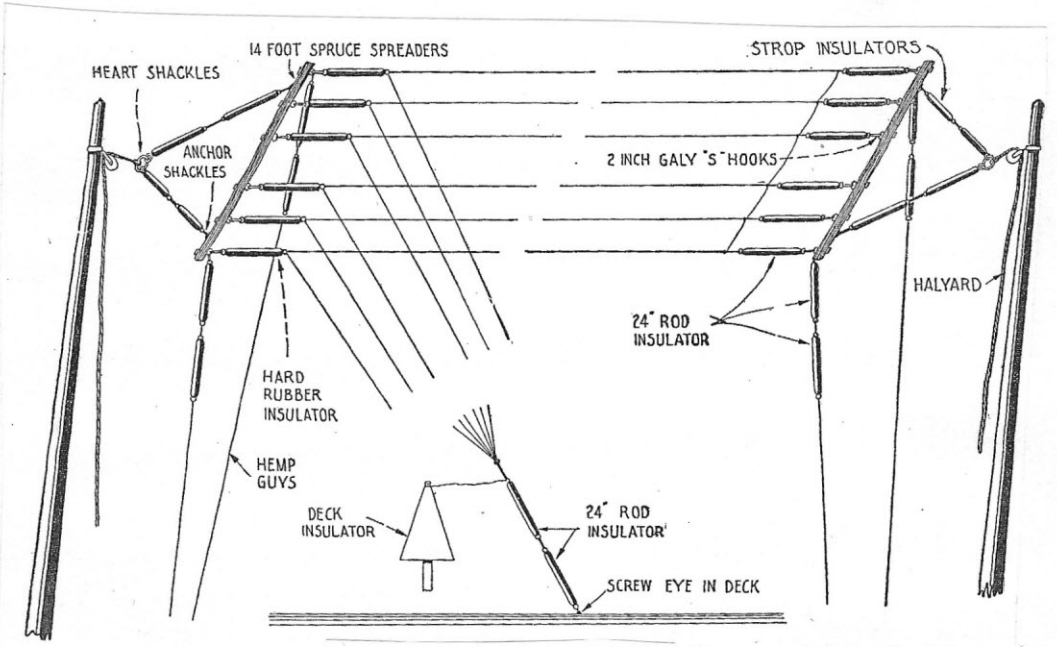
Company ads from the period proclaim Electrose brand insulators as "the standard" for the Army, Navy and other government services. (2) In addition to the IN-2 insulators, 18" Electrose insulators were used on the flat top antenna at Ft. Sam Houston. (3:842)

In addition to these "official" types, one can reasonably speculate that the Army, like the Navy, experimented with insulators from a variety of foreign and domestic sources during this highly-developmental period. The Signal Corps may have commissioned some custom strain insulator designs. But, based on what I've found, I believe that the Signal Corps was able to satisfy its requirements with standard commercial insulators for the most part.

The Navy

"Within the military, the Navy rather than the Army took the lead in radio development. Wireless telegraphy provided a heretofore unavailable means of communicating with and between ships at sea." (1:136) As you will see in the following section, the Navy's efforts in developing radio involved placing a tremendous variety of radio strains in service before settling on a few very successful designs.

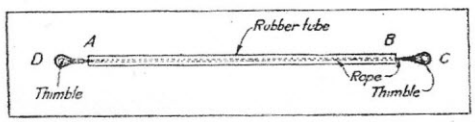
I believe that radio development in the Navy had two primary focuses. The first was on equipping large, high-powered shore stations for communicating with ships at sea. The second focus was on developing radio equipment for ships that would be reliable under adverse conditions and provide good long distance communications. Reflecting this interest in long distance radio applications, most of the early Navy insulators that I have seen tend to be large units designed for heavy-duty work. Here are a few examples.



Standard Marconi Aerial

In October, 1899, the Navy completed radio installations on the U.S.S. New York, U.S.S. Massachusetts, and the U.S.S. Porter. (4:30) Each antenna strand was insulated with three ebonite[3] rods in series. Each rod was 1" in diameter and 18" long.

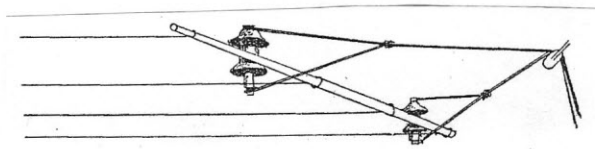
The Marconi aerial system, used on many ships, incorporated "strop" insulators which were made by passing dry hemp ropes through tight fitting rubber sleeves. Molten sulfur was poured in from the ends to seal out moisture. Thus, the rope would not be cut or spliced and an insulator would be formed. (5:123) The figure below shows plans for making a similar devise at home.



Antenna Insulators.—In a somewhat similar manner we may construct insulators for aerial wires. A thin hard rubber tube about 12 inches in length may have extended through it a piece of ⅜-inch diameter marlin rope which in turn is served about heart shaped thimbles, as at C and D. The tube should be large enough to permit a small air space between the rope and the walls, around which is poured a quantity of melted sulphur. When dry the sulphur usually soaks into the rope sufficiently to make a water tight joint, after which the insulators may be attached to the spreaders for support of the wires.

Rope Insulator

24" hard rubber rod insulators were also used in shipboard antenna systems. Eyebolts in the ends of the rods provided an attachment point. (5:123) Rubber, porcelain, and Electrose "eyebolt" insulators continued to be popular in the military for many years.



Aerial with Locke No. 105 Insulators

Robison illustrates an early antenna insulating system which utilized Locke No. 105 dead end insulators. The preceding figure shows how ropes were passed through the insulators and a wooden spar was laid in between the petticoats to hold the antenna wire. (6:181)

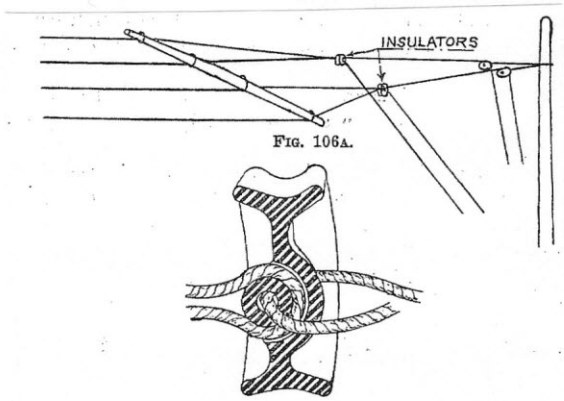


FIG. 106A.

FIG. 106.—Aerial Insulator—Buck Link—Strain 10.

Buck Link Insulator

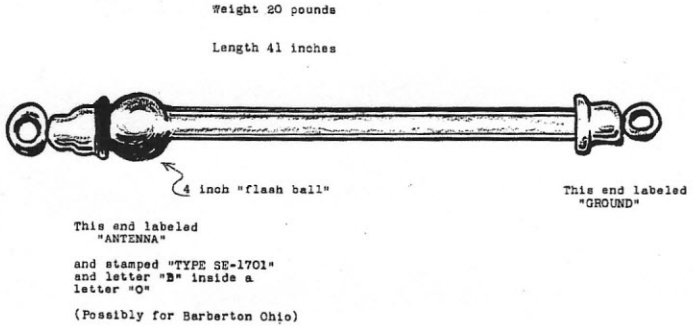
At General Electric, Harold Buck and Edward Hewlett were collaborating prior to World War I to make heavy duty porcelain strain and suspension insulators. (7:25) According to Robison's Manual, at one time, the "Buck Link" strain insulators (which are similar to the "fish tail" Hewlett insulators) were used as radio strains. (6:181) These insulators are discussed in Elton Gish's article in the May, 1997, issue of *Crown Jewels.*

[3] Ebonite was an early jet black synthetic rubber that was widely used for car battery cases

As shown in the April, 1998, issue of *Old Familiar Strains*, Corning Glass Works produced "Navy Type" insulators starting in the mid-1920's. Large, heavy-walled glass tubes, fitted with metal ends were produced in lengths from 12 to 32 inches.

On at least two notable occasions, the Navy contracted with leading insulator companies to produce insulators for special applications. In the last issue, we discussed the Navy's trans-Pacific chain of high powered radio stations. In that instance, the Navy contracted with Locke to develop and build 6' long porcelain insulators capable of withstanding the tremendous physical and electrical pressures of its high-powered installations[4].

In 1918, a 500KW station was installed at Annapolis, Maryland, across the Severn River from the Naval Academy. (4:241) "The Federal Telegraph Co. designed aluminum corona shields at their Palo Alto laboratory and, in conjunction with the Ohio Insulator Co., designed insulators of high tensile strength and low electrostatic capacity." (4:241)



SE-1701

Finally, I believe that the "Eiffel Tower" insulator illustrated above was actually a Navy item. According to the story which appeared in the April, 1970, issue of *Crown Jewels*, a collector purchased a large porcelain insulator with an unusual "flash ball" at one end. He was told that a domestic manufacturer had contracted to provide a dozen of these special insulators to insulate antennas at the Eiffel Tower. This insulator was a "leftover." The author notes that the insulator is marked "Type SE-1701." While some of the insulators may have been exported to France, based on the marking I suspect that the U.S. Navy may have used the insulators as well.

Most of the Navy's research and development in the area of radio has been conducted by the famous Naval Research Laboratory (NRL). In 1916, the Navy embarked on a numbering system to keep track of radio components and parts. Components designed by the NRL were assigned a consecutive number that started with an "SE" because the department was within the Bureau of Steam Engineering at that time (see Table 2 for a summary of the SE insulators found so far). Commercially-designed parts were also assigned consecutive numbers which started with the letter "C." For more information on this and other numbering systems, please refer to "Military Part Numbers for Radio Antenna Insulators" which appears later in this issue.

Part II: Military Radio Antenna Insulators during World War II

During World War I, efforts were made to develop smaller more selective sets that were compatible with systems used by our allies. Unfortunately, these lessons were soon forgotten[5] and radio development continued between the wars with each of the services

[4] For more information see "High Power in Hawaii" in the June, 1998 *Old Familiar Strains*.

[5] Raines points out that communications compatibility continues to be a problem today.

(and each of the allies) going its own way. It was not until the threat of shortages at the start of World War II that standardization again became a priority.

On January 16, 1942, President Roosevelt formed the War Production Board (WPB). Authority over war materiel procurement and production was given to its first chairman, Donald Nelson. (8:150) Shortly after the WPB was formed, shortages of key component parts started to crop up[6]. "By February it had become apparent that mass production of many radio and other electronic components required by the Signal Corps, the Air Corps, and the Navy was impossible if each of the organizations persisted in procuring these items under its own specifications." (8:152)

"To simplify specifications and make them uniform throughout the procuring services, the WPB asked the American Standards Association, a federation of some eighty national technical societies, trade associations, and government agencies to work with the services to achieve standardization.

In response, the American Standards Association organized the War Committee on Radio in early March...and the committee began its important work of developing war standards for the critical components...." (8:153)

The War Committee on Radio proposed to accomplish the following purposes:
1. Speed production of radio equipment.
2. Make replacements of parts easier
3. Keep standards of quality high.

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[6] Steatite insulators were becoming especially popular during this period - so much so that there was a brief steatite "crisis" at the beginning of 1942. For more information on the World War II steatite shortage and steatite insulators in general, please refer to "Steatite" in the December, 1997, issue of *Old Familiar Strains.*

4. Conserve materials.
5. Provide interchangability between Army and Navy.
6. Provide uniform type numbers for equivalent equipment.
7. Consider substitutes for critical materials.
8. Omit items uneconomical to manufacture.
9. Rationalize range of sizes, materials and usefulness.
10. Draft specifications for approved items.
11. Give consideration to present testing conditions which must use inexperienced personnel. This involves simplified requirements including, where possible, use of familiar everyday terms (inches, ounces, Fahrenheit, etc.). (9:33)

The War Standards Board issued a series of standardization reports under the auspices of the American Standards Association (ASA). Three ASA reports of special interest are "Glass Radio Insulators," "Steatite Radio Insulators," and "Porcelain Radio Insulators." Each report was later adopted by the military and given a Joint Army Navy (JAN) number. The military designated the reports JAN-I-8 (steatite) (approved 4/29/44), JAN-I-9 (glass) (approved 5/31/44), and JAN-I-21 (porcelain) (approved 6/30/44).[7]

The ASA reports helped accomplish many of the standardization goals cited previously. Rather than proposing sweeping changes, the committees began by gathering together the specifications previously embraced by the services and utilizing tried-and-true commercial designs. This is especially evident in the specification for glass radio insulators which bears a striking resemblance to a Corning glass catalog. Likewise, the steatite catalog mirrors the offerings of leading manufacturers of the day. Again, the purpose of the Board was not to radically change things but to create a set of

[7] dates from MIL-I-23264A.

standards that would help the existing system work better. Most importantly, these specifications were intended for the use of all services. This marked the beginning of the JAN (Joint Army Navy) system.

Under the terms of the standards, each insulator could be identified by a 9-digit code. The codes for glass (NA), porcelain (NP), and steatite insulators (NS) are summarized in the military part numbers article which appears later in this issue. Several styles of World War II era insulators are illustrated in that section as well.

Under the JAN system, insulator designs were organized by style numbers. Each general shape or "style" was given a number. Then, certain standard lengths of each style were specified. Also, each style and size could be ordered in a variety material grades. For the porcelain and steatite insulators, standard white or brown glazes could be specified. I have summarized the different combinations in Table 4. Although specifications for a wide variety of insulators were written, without further research it would be hard to know if all of the items were actually manufactured or if some simply exist on paper.

Finally, identical World War II-era insulators can often be found with several different Manufacturer's Designated Symbols (MDS) (see Table 8). I think that this results from a contracting policy decision. As has often been the case, most equipment contracts were given to a handful of large contractors. At times this lead to less-than-optimal use of the nation's manufacturing capacity. In order to spread things out, contracts written in this period provided that 30 to 40 percent of production must be subcontracted. (8:150)

Part III: Later Military Radio Antenna Insulators

World War II had seen the widespread use of plastic in its many forms. After the war, insulator manufacturers seemed quick to utilize the new materials to make lighter, tougher insulators. However, World War II had also seen advances in FM and microwave communication (which don't use wire antennas). Although wire antennas are still used today, I think that the end of World War II marks the start of the decline of the importance of the antenna strain insulator.

In 1962, JAN-I-8, JAN-I-9, and JAN-I-10 were superseded by a new standard, MIL-I-23264 "Insulators, Ceramic, Electrical and Electronic, General Specifications For.[8]" Under the new standard, "NA," "NP," or "NS" marks were replaced with "NL." All insulators produced under this new standard were marked NL whether steatite, glass, or porcelain. An additional multiple letter code identified the type of insulating material..

Like the JAN system, insulator designs were again organized according to style numbers under MIL-I-23264. Tables 4 and 5 cross reference the old and new style numbers.

As you review the post-war styles, shown on pages 23 and 24, you may note most are simple bar or rod designs. After World War II, ribbed porcelain and glass strains seem to have fallen from favor. Starting with MIL-I-23264 the design standards list only straight-sided rods and bars, johnny balls, and larger units with metal end caps.[9]

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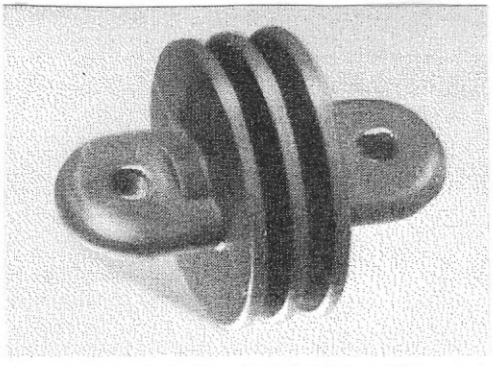
[8] MIL-I-23264 was revised and reissued in 1968 as MIL-I-23268A. To the best of my knowledge, it is still in effect today.

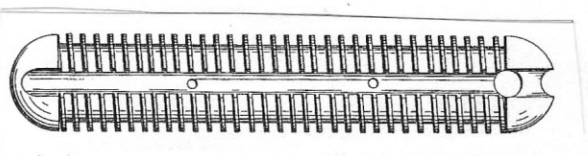
[9] Cables can bring a great deal of pressure to bear on

However, the military hasn't phased out ribbed strains entirely. You will recall our previous reports on the ribbed plastic designs made by Budwig[10] and Buffington[11]



Budwig HQ-2

Although I've never seen the Budwig HQ-2 end insulator or HQ-1 center insulator mentioned in military documents, I understand that the military has purchased many of them over the years. The insulators were originally made from tan plastic with a fiberglass filler. Mr. Gary Cochran, the president of Budwig, said that the color of the insulators was changed from tan to olive in 1980 "at the request of the military." Apparently the olive insulators were preferred for low visibility.



W4FXQ Insulator

When I corresponded with Mr. William Buffington, Jr., W4FXQ, he said that his patented strain insulator was not particularly popular with amateurs. However the military apparently found a use for it. He said that a portion of his 3 *million* piece production run was sold to the military. The light-weight and versatile W4FXQ insulator would be ideally suited to special applications and field improvisations. And its black color would make it easy to hide.

I don't have military part numbers for the Budwig and Buffington units. It may be that I haven't found the right documents yet. But there is another possibility. Technical Manuals seem to say that some strain insulators are considered integral parts of larger components like antennas. If that were the case, then the antenna would be assigned a number but its parts might not be[12].

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the metal ends may serve another purpose as well. In a January, 1997, article in *Crown Jewels*, Elton Gish discusses how, starting in the 1930's, certain high voltage insulators were treated with a metallic oxide glaze or incorporated metal parts. By adding a conducting surface to the insulator, electrical eddy currents are dissipated without causing radio interference (RFI). I believe that this might have been an important side benefit of adding metal end caps to the heavy-duty radio strains.

[10] OFS Vol. 1 No. 5 December, 1994 "Budwig Manufacturing Company

[11] OFS Vol. 1 No. 3 July, 1994 "An Interesting Modern Insulator

[12] Hypothetically, such a unit would be purchased, stocked, and replaced as a whole. A value-added manufacturer such as Birnbach (OFS Vol. 4 No. 4-5 October, 1997) might contract to produce wire antenna AN-###. They might buy Budwig insulators by the thousands, solder them onto the antenna wire, and then sell the completed assemblies to the Army or pass them on to another value-added contractor. Thus, Budwig insulators could be bona fide military insulators without having published specifications or part numbers. This "stock-as-a-whole-unit" theory might help explain some of the other "non-catalogued" military insulators.

Conclusion

The field of military antenna insulators spans the entire history of radio communication in this country. The Army and Navy were among the first to use radio. In a few months we'll be marking the centennial of their pioneering experiments in the then-new art of wireless.

Ever since those early tests, radio in its many forms has played a role in military communications.

My purpose in preparing this article and the companion article on military numbering systems was to introduce the reader to the many varieties of military radio strains and to provide a framework for further research. Without access to detailed Army and Navy records (which may or may not still exist) I doubt that we'll ever know of every type of insulator that was ever used. I hope to continue hearing from collectors with reports of "new ones" and together we can build on this foundation for years to come.

A consolidated table of end notes and list of sources appears on page 33.

Military Part Numbers for Radio Antenna Insulators

by Dan Howard

"Radio Insulators Used by the US Military" provides a historical context for the evolution of Army and Navy radio antenna insulators. This article focuses on the various numbering systems used to keep track of the parts. Understanding these systems will not only benefit the collector, but will be of interest to any student of US military history.

Since the mid-Teen's, the Army and Navy have used part numbering systems to make acquiring and stocking radio equipment more efficient. Each system will be discussed in turn.

Army Part Numbers
(Prior to World War II)

Other than written descriptions of the parts, the earliest cataloging system that I have come across is the Signal Corps' "Set, Complete, Radio" (SCR) system. This system was started in 1916 as purchases picked up at the beginning of World War I.

Under the SCR system, a two letter code followed by a number was used to account for virtually any part or system of parts. Items like antennas (AN), bags (BG), insulators (IN), etc., were issued a pneumonic class code, which was followed by a serial number identifying the specific part or item.

Most radio insulators were assigned IN numbers. However, insulators which were integral to other parts such as antenna mounting plates and were assigned codes such as "MP" (mounting plate? / mast plate?). I have recorded IN numbers as high as IN-129 but I don't know if all of the numbers in the series were used.

The first IN numbers were issued in the late Teens. Although numbers such as IN-86 and IN-86A continued in common usage through the 1950's, many became obsolete before the end of World War II. Technical Manuals (TM's) continued to list IN numbers well after the war. However during this period the "official" Signal Corps stock number (see below) was also listed for the sake of accuracy (and because you probably had to have it to order replacements).

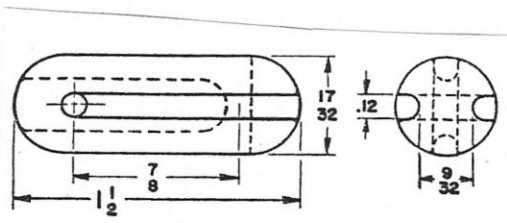
The Signal Corps occasionally assigned the same number to different insulators of equivalent utility (size, shape, strength). IN-10 was used for both mica and phenolic insulators, for example. Several types of IN-86 exist. IN-86A is the same length and capacity as IN-86 but the Locke version of IN-86A substitutes wire bales for the screw eyes that were used on IN-86 (see page 17). The Navy seems to have followed the same philosophy. Navy part 61014A was assigned to Corning's Pyrex glass "Amateur Transmitting" insulator. The same number was used for standard porcelain insulators of the same size.

Not all two letter part numbers date from before World War II. Under MS16229, "IL" and "MX" numbers appeared on modern insulators (see JETDS/JECNS below).

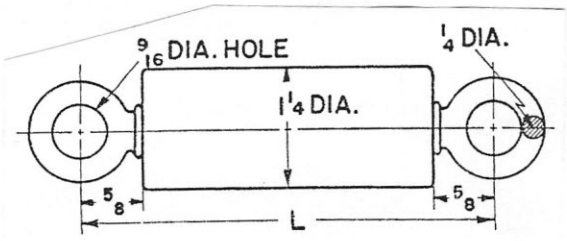
Table 1 lists the IN numbers for radio strain insulators that are known to me. Spreader insulators, center insulators, and other types are not included in this list.

Table 1: Signal Corps "IN" Insulators

number	Signal Corps part #	description	MIL-I 23264 style #	color	shown on page #
IN-1		hard rubber with hooks			
IN-2		Electrose 4500 ball			7
IN-3		stream line dilecto			
IN-5		5-1/2" x 5/8" hard rubber			
IN-8		4" phenol fiber rod			
IN-10		7" micarta with harness hooks			
IN-10		7" micarta strip with clevises			
IN-10		varnished phenol fiber			
IN-55	3G555	3-1/2" hard rubber			
IN-55	3G555	porcelain with hook ends			
IN-61		18" porcelain rod			
IN-78		1-1/2" airplane type, Locketite		white	17
IN-78A		1-1/4" airplane type, Locketite		white	17
IN-86	3G586	3-1/2" x various dia. steatite			17
IN-86	3G586	4-1/2" rod			17
IN-86A[13]	3G586	4-1/2" bar w/ wire bale ends, Locke		brown	17
IN-86A	3G586	4-1/2" bar w/ wire bale ends, Locke		white	17
IN-88	3G588	2" rod	64	brown	17
IN-88	3G588	2" rod, Locketite	64	white	17



IN-78



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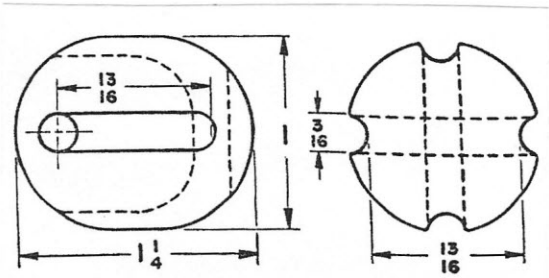
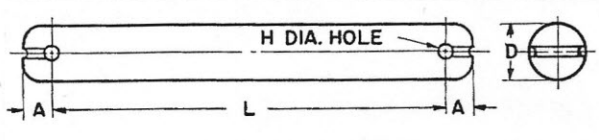


IN-78A

IN-86A



IN-88

[13] A friend told me that these insulators were sometimes used on Jeeps. The insulators were inserted in the lanyards that tie down the whip antennas.

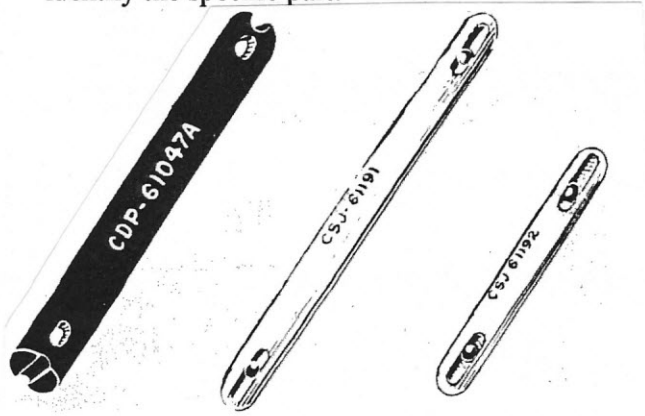
Navy Numbers (Prior to World War II)

Like the Army Signal Corps, the US Navy assigned its own stock numbers to insulators. Naval radio development was the responsibility of the Naval Radio Laboratory (NRL). In the Teens and 20's, the NRL was a department of the Bureau of Steam Engineering. Consequently, early components developed by the NRL were coded with Bureau of Steam Engineering "SE" numbers (for example SE-2701). Components that were designed by naval contractors had similar numbers, but were prefixed with the Manufacturer's Designated Symbol (MDS) (for example CNP-#####). (4:219) A summary of the "C" symbols for known (and suspected) manufacturers of insulators is presented in Table 8. Unlike the Army's numbering system which first segregated parts into different classes, the "SE" included components of all types into the same numbering sequence. For example SE-1220 is a receiver and SE-1701 is an insulator.

Table 2: Navy "SE" Insulators

number	61### part #	description	color	shown on page #
SE-1701		41" porcelain w/ flash ball	black	10
SE-2133	61013	10" ribbed	brown	
SE-2133	61013A	10" ribbed	brown	
SE-2188		12-1/4" Pyrex without saddleways	clear	20
SE-2193		12" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		16" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		18" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		20" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		22" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		24" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		26" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		28" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		30" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2193		32" x 1-7/8" glass tube with metal ends (Pyrex "Navy Type")	clear	20
SE-2951A		12" porcelain	white	

Many insulators manufactured for the Navy from the mid-1920's until World War II carry "61" numbers. In the mid-1920's the, the Navy converted from the consecutive "SE" numbering system for its radio equipment to a system of alphabetical combinations. (10:123) This change mirrored the Signal Corps' SCR system of classifying equipment by type. Under the new doctrine, part numbers for large systems were a combination of letters. Component parts of these systems were assigned numeric part numbers based on part type classifications. The first two digits of the 5-digit codes indicate the type of part. Most insulators start with "61" The last three digits identify the specific part.



The Navy continued require that parts be marked with manufacturer's symbols during this period. However, insulators are found bearing the 61### numbers appear with and without the three letter "C" symbols.

I don't have a an official cross-reference between these Navy codes and the JAN numbers. However, I have been able to match up a few by comparing styles and dimensions to known specifications. Table 3 lists the Navy "61" numbers that I have found so far.

Table 3: Navy Part Numbers (61### series)

number	description	also known as	MIL-I 23264 style #	shown on page #
61006	1-1/2" x 17/32" egg insulator		73	25
61012B	30" porcelain with metal ends		71	25
61013	10" ribbed insulator	SE-2133		
61013A	10" ribbed insulator	SE-2133		
61014	5-1/4" ribbed insulator			
61014A	5-1/4" ribbed insulator			
61085A	2-1/2" ribbed insulator			
61191	6" x 1/2" rod	NL****65-048	65	18,24
61192	3" x1/2" rod	NL****65-024	65	18,24
61249	18" x 1-7/8" with metal ends		71	24/25
61431	18" x 1-7/8" with metal ends (1 flanged)		71	24/25
61481	14" x 1-1/4" with metal ends	NL****71-112	71	24/25

The JAN Numbering Systems.

In addition to the previously mentioned Navy part numbers, and the Army's IN numbers, a joint Army Navy (JAN) system of part numbers was developed at the beginning of World War II[14]. Under the JAN specification system , a system of standard style numbers was developed which applied to insulators of all types for both services. A typical number might look like this: "NS4B5224."

Insulators made of steatite were prefixed "NS." Glass insulators were marked "NA," and porcelain insulators, "NP." Brown or white glaze was designated by a "B" or "W" in the code. The last 2 numbers generally designate the length the insulator *(in eighths-of-inches!)*

According to the American Standards Association standard for steatite insulators, unglazed insulators were to be permanently marked with the type designation and the manufacturer's name or symbol. These markings were to be accomplished by means of stamping or molding. (11:8) Glazed insulators were to be similarly marked. As collectors have found, these guidelines weren't always adhered to.

The next three tables list the JAN specifications[15] for glass, porcelain, and steatite radio antenna insulators. Each table is followed by notes which further explain the meanings of the markings.

[14] For more information on the development of the Joint Army Navy specifications, see page 10.

[15] Each ASA report was formally adopted by the military and assigned a "JAN-I" number. Except for the information on porcelain insulators, which I had to infer from other sources, these tables were based on the original reports of the Society.

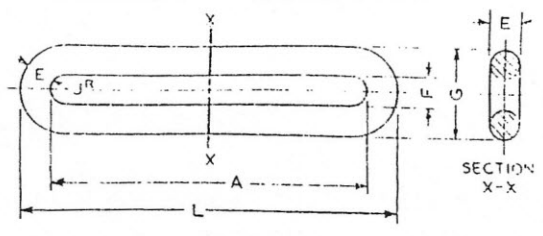
Table 4: NA, NP, & NS insulators

Table 4a: Glass Insulators

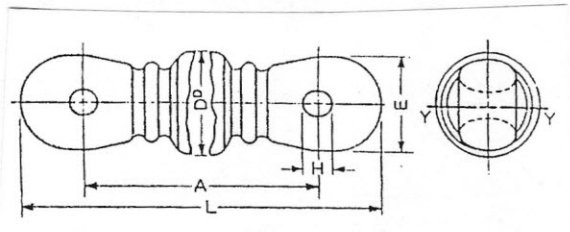
number	Navy part #	description	MIL-I 23264 style #	shown on page #
NA**5018		2-1/4" glass link insulator	64	20
NA**5026		3-1/4" glass link insulator	64	20
NA**5050		6-1/4" glass link insulator	64	20
NA**5320		2-1/2" ribbed glass insulator	na	20
NA**5342	61014	5-1/4" ribbed glass insulator	na	20
NA**5380	SE-2188	10" ribbed glass insulator	na	20
NA**5401	SE-2193	12" "Navy Type" glass with metal ends	71	20
NA**5402	SE-2193	18" "Navy Type" glass with metal ends	71	20
NA**5403	SE-2193	24" "Navy Type" glass with metal ends	71	20

Notes:

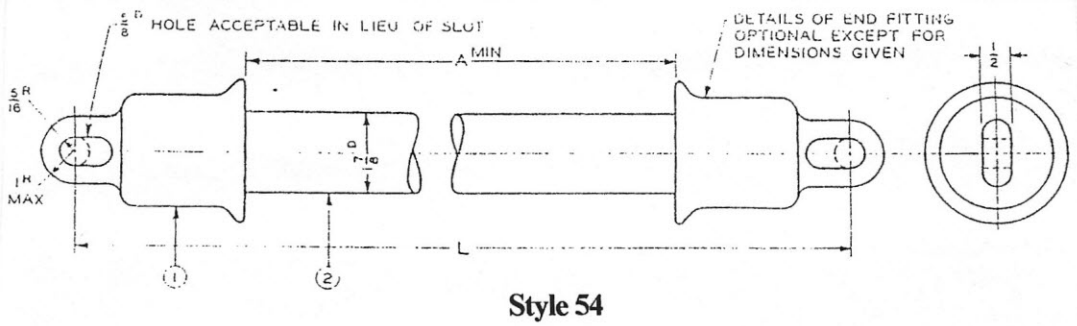
- Glass insulators are available in clear (grade 3) or opaque (grade 4) material. On grade three insulators, the "*" symbols in the model number are replaced with "3C." Opaque insulators are marked "4N."
- On styles 50 and 53, the last two digits indicated the length (in eighths of inches) between the eyes.
- Style 53 (ribbed) insulators are the three standard Pyrex styles (3-5/8" broadcast receiving, 7-1/4" amateur transmitting, 12-1/4" strain insulator).
- On Style 54, the last two digits are a part number.
- Style 54 insulators are similar to the Pyrex Navy Type strains.



Style 50



Style 53



Style 54

Table 4b: Porcelain Insulators

number	Signal Corps part #	description	MIL-I 23264 style #	shown on page #
NP**50**		various x 1/2" porcelain rod	64	24
NP2B5016		2" x 1/2" porcelain rod	64	24
NP**51**		various x 1/2" porcelain rod	65	24
NP**52**		various x 3/4" porcelain rod	66	24
NP**54**		various with metal ends	71	24/25
NP2B5404		20-7/8" x 1-7/8" with metal ends	71	24/25
NP**56**		porcelain egg insulator	73	25
NP**57**		porcelain egg insulator	74	25

Notes:

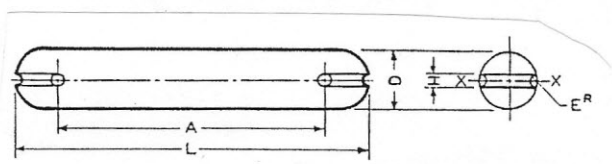
- The first "*" symbol is a place-holder for the material grade number.
- The second "*"is a place-holder for the color code: "B" - brown, "W" - white.
- The last two digits represent the length (in eighths of inches) or the style number. I do not have a complete list of available lengths for the various styles of porcelain insulators.
- For purpose of illustration, I've included two examples from my collection in the list.

Table 4c: Steatite Insulators

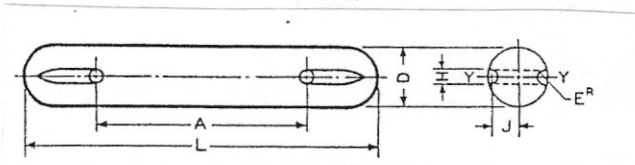
number	Signal Corps part #	description	MIL-I 23264 style #	color	shown on page #
NS**5016		2" x 1/2" steatite rod	64		21,24
NS**5124		3" x 1/2" steatite rod	65		21,24
NS**5148		6" x 1/2" steatite rod	65		21,24
NS**5212		1-1/2" x 3/4" steatite rod	66		21,24
NS**5224		3" x 3/4" steatite rod	66		21,24
NS4B5224	3G3552-24	4" x 3/4" steatite rod	66	brown	21,24
NS**5240		5" x 3/4" steatite rod	66		21,24
NS4B5240		5" x 3/4" steatite rod	66	brown	21,24
NS4W5240		5" x 3/4" steatite rod	66	white	21,24

Notes:

- The first "*" symbol is a place holder for the material grade (3, 4, or 5)
- The second "*" is a place-holder for the color code: "B" - brown, "W" - white.
- The last two digits represent the length (eye-to-eye) in eighths of inches.
- For purpose of illustration, I've included three examples from my collection in the list.

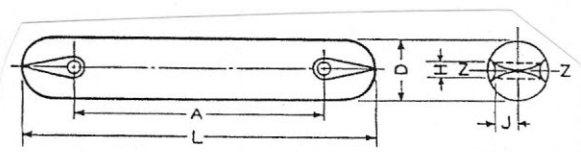


Style 50 ↑



Style 51 ↑

Style 52 ↓



Later Numbering Systems

In 1962, the World War II-vintage JAN insulator specifications were overhauled. MIL-I-23264 superseded the previous specifications which had been separated by material type. Under MIL-I-23264, the steatite specification (JAN-I-8), the glass specification (JAN-I-9), and the porcelain specification (JAN-I-21) were merged into one system. Radio insulators made from all three materials were now designated "NL." Though many of the insulator styles did not change, the style type numbers were updated. Under the new system, insulator style numbers 60 through 75 were reserved for strain insulators and 76 through 79 were reserved for spreaders. Columns in Tables 4 & 5 will help you cross reference between the systems.

Under MIL-I-23264, insulator part number markings grew to 11 digits. Instead of assigning separate prefixes to glass, porcelain and steatite, a new 3-digit "insulating compound designator" was used.[16]

MIL-I-23264 reiterated the previous requirement that each insulator be marked with a manufacturer's code and type number. On small insulators (less than 1" in length and 1/2" in diameter) "the marking shall consist of the manufacturer's code symbol followed by a hyphen and the last digit from the type designation part number. For example: 81443-4 shall be used in lieu of NL222W01-004 81443. (12:9)

To the best of my knowledge, the numbering codes and specifications established under MIL-I-23264 (as revised) are still in effect today.

[16] Additional designations specified in MIL-I-10 could be overlaid on this code, potentially adding several digits. Insulators with strange or unusual codes would be interesting to identify and study.

Table 5: NL Insulators

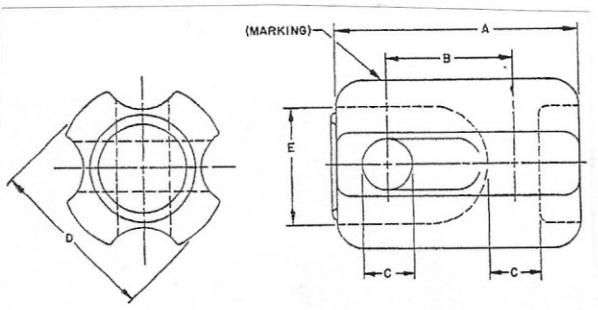
number	Signal Corps/ Navy part #	description	MIL-I 23264 style #	JAN style #	shown on page #
NL****60-028		3-1/2 x 2-1/2" johnny ball	60	??[17]	24
NL****60-034		4-1/4" x 2-1/2" johnny ball	60		24
NL****60-043		5-3/8" x 2-1/2" johnny ball	60		24
NL****61-024		3" x 3-3/16" johnny ball	61		24
NL****61-026		3-1/4" x 3-3/16" johnny ball	61		24
NL****61-029		3-5/8" x 3-3/16" johnny ball	61		24
NL****61-033		3-7/8" x 3-3/16" johnny ball	61		24
NL****61-037		4-5/8" x 3-3/16" johnny ball	61		24
NL****61-043		5-3/8" x 3-3/16" johnny ball	61		24
NL****61-048		6" x 3-3/16" johnny ball	61		24
NL****64-016		2" x 1/2" rod	64	50	24
NL****65-024		3" x 1/2" rod	65	51	24
NL****65-048		6" x 1/2" rod	65	51	24
NL****66-012		1-1/2" x 3/4" rod	66	52	24
NL****66-024	3G1250-80.5	3" x 3/4" rod	66	52	24
NL****66-040		5" x 3/4" rod	66	52	24
NL****66-048		6" x 3/4" rod	66	52	24
NL****67-048	3G1250-112.1	6" x 1" x 1-1/2" bar	67		24
NL****67-064		8" x 1" x 1-1/2" bar	67		24
NL****67-080		10" x 1" x 1-1/2" bar	67		24
NL****67-096	3G1100-192	12" x 1" x 1-1/2" bar	67		24
NL****67-120		15" x 1" x 1-1/2" bar	67		24
NL****68-208		26" x 1-3/4" rod with metal ends	68		24
NL****69-136		17" x 1-1/4" rod with metal ends	69		24
NL****70-104		13" x 1-1/4" rod with metal ends	70		24
NL****70-168		21" x 1-1/4" rod with metal ends	70		24
NL****71-072		9" x 1-1/4" rod with metal ends	71	54	24/25
NL****71-112		14" x 1-1/4" rod with metal ends	71	54	24/25
NL****71-167		20-7/8" x 1-7/8" rod with metal ends	71	54	24/25
NL****71-207		25-7/8" x 1-7/8" rod with metal ends	71	54	24/25
NL****73-012	61006	1-1/2" x 17/32" egg insulator	73	56	25
NL****74-010		1-1/4" x 1" egg insulator	74	57	25
NL****75-027		3-3/8" x 2-1/2" johnny ball	75		25
NL****75-031		3-7/8" x 2-1/2" johnny ball	75		25
NL****75-043		5-3/8" x 3-1/4" johnny ball	75		25
NL****75-044		5-1/2" x 3-1/16" johnny ball	75		25
NL****75-054		6-3/4" x 3-1/2" johnny ball	75		25

Notes:

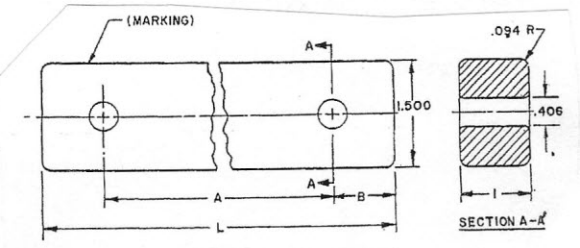
- The first three "*" symbols are place-holders for the insulating compound designators. According to MIL-I-10, the first digit (a number ranging from 2-8) indicates the dielectric loss index at 1 MHz. The second digit (a number ranging from 1-4) indicates the dielectric strength. The third digit (a number ranging from 1-6) indicates the flexural strength. The minimum standards per MIL-I-23264 are 422.
- The fourth place-holder is for the color code: "B" for brown, "W" for white, or "C" for unglazed.

[17] Previous standards for this johnny ball style insulator were codified under MIL-I-17918. I did not have the opportunity to review this document prior to publishing this report.

- The last three digits (styles 64-71) indicate the length in eighths of inches (eye to eye).
- Johnny balls (Styles 60, 61, 73, 74, 75) are measured in terms of overall length.



Style 60



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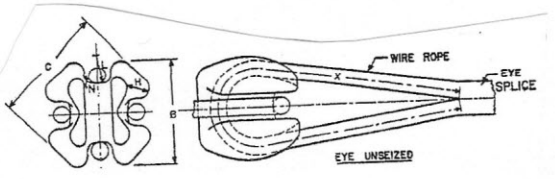
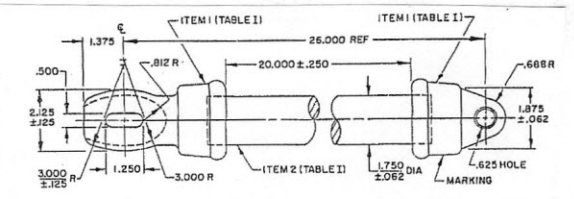


Style 61



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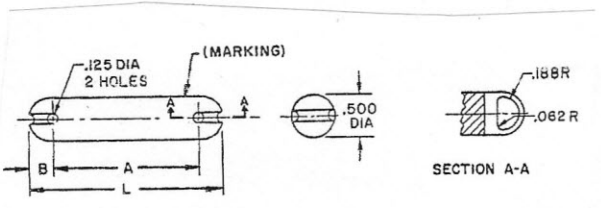
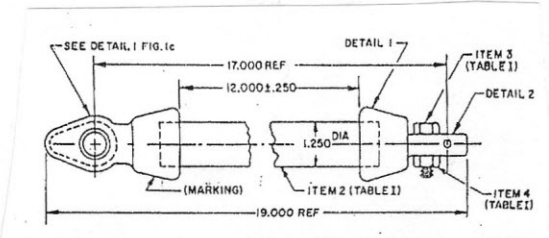


Style 64



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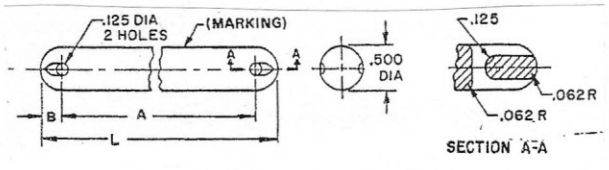
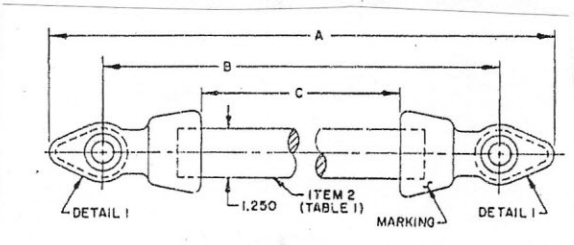
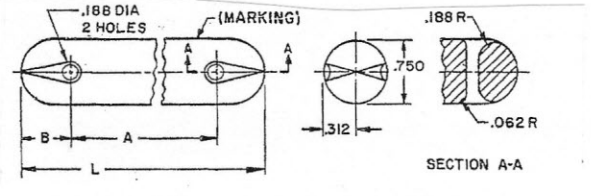


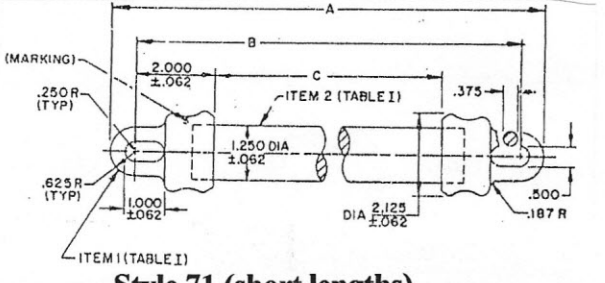
Style 65



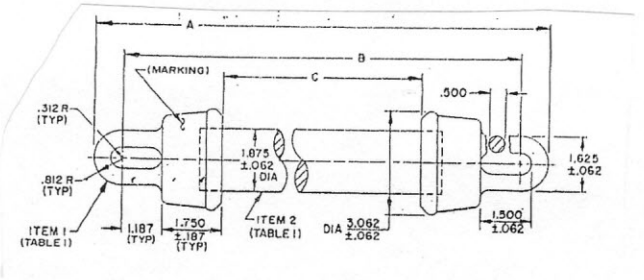
Style 70



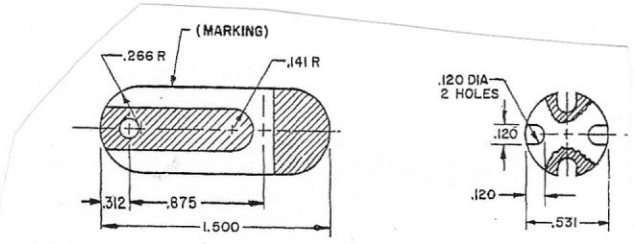
Style 66



Style 71 (short lengths)



Style 71 (long lengths)



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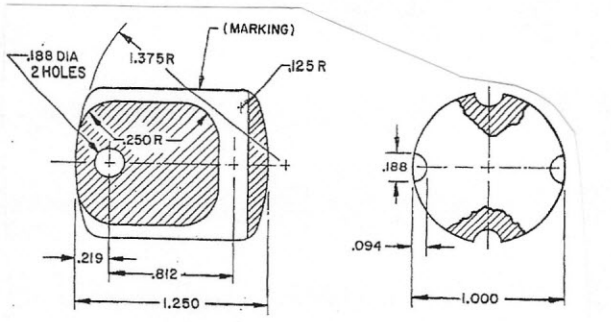

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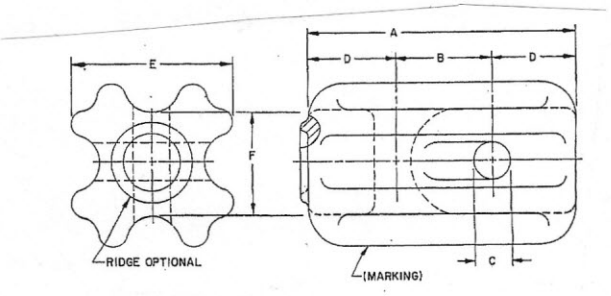


Style 75

Other Numbering Systems

According to radio manual AN-16-30ARR7-2, any given part may have: 1) a schematic reference symbol, 2) an Army stock #, 3) a Navy stock #, 4) a British reference #, 5) a Mfg. & design or standard type #, 6) a Government or Government document and specification #! In the following sections, I'll explain the most familiar numbers and try to explain the interrelationships.

Signal Corps Stock Numbers

In addition to the numbers listed in the previous sections, in the post-war period the Signal Corps used its own stock numbers for many of the insulators. For instance, the familiar IN-86 insulator was stocked under the Signal Corps number 3G586. These stock numbers mainly appear in Technical Manuals (TM's) and on wrappers. I have not seen them printed on the insulators themselves. Signal Corps stock numbers for insulators seem to start with "3G." The meaning of the other digits remains a mystery to me. The "3G" numbers known to me are summarized in Table 6

In the 1970's the Signal Corps Stock numbers for insulators were converted to a new format. A sample number for a radio strain is "MS25052-1B." I don't have enough examples of the new system determine the significance of these numbers. I assume that these numbers were eventually replaced by the Federal stock numbers.

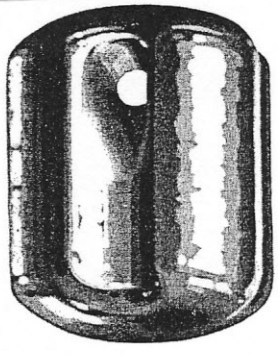
I think that we can excuse the Signal Corps for needing its own numbering systems to control equipment inventories. "The Corps had used some 2,500 different items of equipment during World War I, it needed more than 70,000 by June, 1943. By the war's end the number of

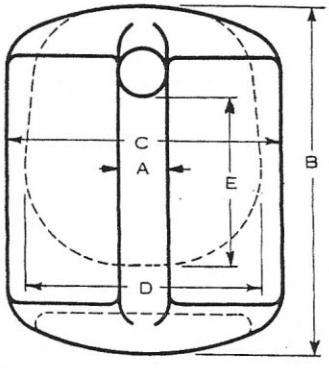
separate items had risen to over 100,000." (8:496).

Table 6: Signal Corps "3G" Stock Numbers

number	description	also known as	MIL-I 23264 style #	color	shown on page #
3G555	3-1/2" hard rubber insulator	IN-55			
3G555	porcelain insulator w/ hooks	IN-55			
3G586	4-1/2" rod	IN-86			17
3G586	3-1/2" rod	IN-86			17
3G586	4-1/2" bar w/ bale ends, Locke	IN-86A		brown	17
3G586	4-1/2" bar w/ bale ends, Locke	IN-86A		white	17
3G588	2" rod	IN-88		brown	17
3G588	2" rod Locketite	IN-88		white	17
3G1100-192	12" x 1" x 1-1/2" bar	NL****67-096	67		24
3G1250-80.5	3" x 3/4" rod	NL****66-024	66		24
3G1250-112.1	6" x 1" x 1-1/2" bar	NL****67-048	67		24
3G1300-300	12" porcelain insulator				
3G1875-500	johnny ball, Thomas #500		75		26
3G1875-502	johnny ball, Thomas #502		75		26
3G1875-504	johnny ball, Thomas #504		75		26
3G1875-506	johnny ball, Thomas #506		75		26

THOMAS INSULATORS





Catalog No. 500-6

Catalog No.	Dimensions in Inches				
	A	B	C	D	E
500	3/8	2 1/8	1 9/16	1	5/8
502	9/16	3 1/4	2 5/8	1 7/8	1 3/16
504	9/16	3 3/4	2 7/8	2 1/8	1 11/16
505	1	3 3/4	2 7/8	2 3/8	7/8
506	13/16	5 1/4	3 3/8	2 3/8	2 3/16

JETDS / JECNS (Joint Electronics Type Designation System):

MIL-I-23264A cross-references to the Joint Electronics Type Designation System. The JETDS seems to be a more modern version of the Signal Corps "SCR" component numbering system[18]. Under JETDS, insulators were issued "IL" numbers (presumably replacing the IN numbers). I have some IL insulators in my collection including the very common IL4/GRA-4 center insulator. Unfortunately, I don't have a whole lot of other information about them. Table 7 shows the IL numbers for radio strains that I know of with the equivalent MIL-I-23264 style numbers.

Table 7: JETDS "IL" Numbers

number	description	MIL-I 23264 style #	shown on page #
IL-4/GRA-4	center insulator with SO-239 connector		
IL-5/U	6" x 5/8" rod (spring-tensioned)		
IL-26/U	rod with metal ends	71	24/25
IL-27/U	rod with metal ends	71	24/25
IL-28/U	rod with metal ends	71	24/25
IL-29/U	rod with metal ends	71	24/25
IL-30/U	1-3/4" dia. rod with metal ends	68	24
IL-31/U	bar insulator	67	24
IL-32/U	1-3/4" dia. rod with metal ends	69	24
IL-33/U	1-1/4" dia. rod with metal ends	70	24
IL-56/U	1-1/4" dia. rod with metal ends	70	24
IL-57/U	johnny ball	75	25
IL-61/TSC-38B	35" x 3/8" fiberglass rod with metal ends		

The charts on pages 28 and 29 are reprinted from FM 24-18 "Field Radio Techniques, 1965 edition. They not only show how the "SCR" system worked in the 1960's but they also illustrate how the earlier system, which was started in 1916, was laid out.

Federal/National Stock Numbers

New-old-stock samples in my collection which date from the 1970's carry Federal stock numbers (FSN) on the wrappers. Presumably these took the place of the Signal Corps stock numbers. A 4-2-3-4 pattern of numbers is used. The first 4 digits are the Federal Supply Class (FSC). The FSC for insulators is 5970. The second two digits (which are sometimes omitted) refer to the country of manufacture. The code for the United States is 00 or 01. The code for Canada is O2. I don't know what the other numbers mean.

Technical manuals dating from the 1950's also list Federal Stock Numbers but the pattern is 4-2-4. I assume that the system originated after World War II and apparently has undergone periodic revision. I understand from OFS reader, Don Wrigley, that the "book" which

continued on page 30

[18] Several authors offer authoritative explanations of the SCR system. One such source is Ludwell Sibley's article "The 'AN' Nomenclature System" which appeared in the November, 1989, issue of *The Old Timer's Bulletin*.

JOINT ELECTRONICS TYPE DESIGNATION SYSTEM

1. Equipment Indicators

The type designation for a major equipment consists of an AN, a slant bar, a series of three letters, a dash, and a number (fig. 60). The AN indicates a major equipment; the first letter in the series of three letters indicates where it is used (installation); the second letter indicates what it is (type equipment); the third letter indicates what it does (purpose); and the number indicates the model number of the specific type. For example, AN/MRC–2 indicates model 2 of a mobile radio communications set. The AN indicates that it is a major equipment.

2. Component Indicators

The type designation of a component consists of one or two letters (see chart below), a dash, and a number. The letter or letters indicate the component, and the number indicates the model number. For example, RT–196 indicates the 196th model in the field of radio receivers and transmitters. If the component is part of, or is used with, a major equipment, you will have a longer type designation. For example, RT–196/PRC–6 indicates model 196 of a radio receiver and transmitter that is used with, or is a part of, model 6 of a portable radio communications set.

Indicator	*Meaning*
AB	Supports, Antenna
AM	Amplifiers
AS	Antenna Assemblies
AT	Antennas
BA	Battery, Primary Type
BB	Battery, Secondary Type
BZ	Signal Devices, Audible
C	Control Articles
CA	Commutator Assemblies, Sonar
CB	Capacitor Bank
CG	Cables and Transmission Line, RF
CK	Crystal Kits
CM	Comparators
CN	Compensators
CP	Computers
CR	Crystals
CU	Coupling Devices
CV	Converters (electronic)
CW	Covers
CX	Cords
CY	Cases
DA	Antenna, Dummy
DT	Detecting Heads
DY	Dynamotors
E	Hoist Assembly
F	Filters
FN	Furniture
FR	Frequency Measuring Devices
G	Generators
GO	Goniometers
GP	Ground Rods
H	Head, Hand, and Chest Sets
HC	Crystal Holder
HD	Air Conditioning Apparatus
ID	Indicating Devices
IL	Insulators
IM	Intensity Measuring Devices
IP	Indicators, Cathode Ray Tube
J	Junction Devices
KY	Keying Devices
LC	Tools, Line Construction
LS	Loudspeakers
M	Microphones
MD	Modulators
ME	Meters, Portable
MK	Maintenance Kits or Equipments
ML	Meteorological Devices
MT	Mountings
MX	Miscellaneous
O	Oscillators
OA	Operating Assemblies
OC	Oceanographic Devices
OS	Oscilloscope, Test
PD	Prime Drivers
PF	Fittings, Pole
PH	Photographic Articles
PP	Power Supplies
PT	Plotting Equipments
PU	Power Equipments
R	Receivers
RD	Recorders and Reproducers
RE	Relay Assemblies
RF	Radio Frequency Component
RG	Cables and Transmission Line Bulk, RF
RL	Reel Assemblies
RP	Rope and Twine
RR	Reflectors
RT	Receiver and Transmitter
S	Shelters
SA	Switching Devices
SB	Switchboards
SG	Signal Generator
SM	Simulators
SN	Synchronizers
ST	Straps
T	Transmitters
TA	Telephone Apparatus
TD	Timing Devices
TF	Transformers
TG	Positioning Devices
TH	Telegraph Apparatus
TK	Tool Kits or Equipments
TL	Tools
TN	Tuning Units
TS	Test Equipment
TT	Teletypewriter and Facsimile Apparatus
TV	Tester, Tube
U	Connectors, Audio and Power
UG	Connectors, RF
V	Vehicles
VS	Signaling Equipment Visual
WD	Cables, Two Conductor
WF	Cables, Four Conductor
WM	Cables, Multiple Conductor
WS	Cables, Single Conductor
WT	Cables, Three Conductor
ZM	Impedance Measuring Devices

EQUIPMENT INDICATORS			
1st Letter INSTALLATION	2d Letter Type of EQUIPMENT	3d Letter PURPOSE	Miscellaneous Identification
A -- Airborne (installed and operated in aircraft). B -- Underwater mobile, submarine. C -- Air Transportable (inactivated, do not use). D -- Pilotless carrier. F -- Fixed. G -- Ground, general ground use (include two or more ground type installations). K -- Amphibious. M -- Ground, mobile (installed as operating unit in a vehicle which has no function other than transporting the equipment). P -- Pack or portable (animal or man). S -- Water surface craft. T -- Ground, transportable. U -- General utility (includes two or more general installation classes, airborne, shipboard, and ground). V -- Ground, vehicular (installed in vehicle designed for functions other than carrying electronic equipment, etc., such as tanks). W -- Water surface and underwater.	A -- Invisible light, heat radiation. B -- Pigeon. C -- Carrier. D -- Radiac. E -- Nupac. F -- Photographic. G -- Telegraph or teletype. I -- Interphone and public address. J -- Electro-mechanical (not otherwise covered). K -- Telemetering. L -- Countermeasures. M -- Meteorological. N -- Sound in air. P -- Radar. Q -- Sonar and underwater sound. R -- Radio. S -- Special types, magnetic, etc., or combinations of types. T -- Telephone (wire). V -- Visual and visible light. W -- Armament (peculiar to armament, not otherwise covered). X -- Facsimile or television.	A -- Auxiliary assemblies (not complete operating sets) B -- Bombing. C -- Communications (receiving and transmitting). D -- Direction finder and/or reconnaissance. E -- Ejection and/or release. G -- Fire control or searchlight directing. H -- Recording and/or reproducing (graphic meteorological and sound). L -- Searchlight control (inactivated, use G). M -- Maintenance and test assemblies (including tools). N -- Navigational aids (including altimeters, beacons, compasses, racons, depth sounding, approach, and landing). P -- Reproducing (inactivated, do not use). Q -- Special, or combination of purposes. R -- Receiving, passive detecting. S -- Detecting and/or range and bearing. T -- Transmitting. W -- Control. X -- Identification and recognition.	X -- Changes in. Y -- Voltage. Z -- Phase, or frequency. T -- Training. FM24-18-1-58

Figure 60. Equipment indicators.

explains and cross-references these numbers has grown into a thick stack of microfiche.

Manufacturer's Symbols

Over the years, military purchasers have found it helpful to have parts permanently labeled with a manufacturer's symbol. I am aware of three different systems which have been used with radio strain insulators. The first system is the one that you are most likely to encounter.

Starting with the Navy Bureau of Steam Engineering in the Teens, parts designed by contractors were assigned Manufacturers Designating Symbols (MDS) which started with the letter "C." These codes grew from 2 to 3 and finally to 4 letters over the years. Table 8 shows the symbols for the manufacturers which I believe may have made military radio insulators.

Table 8 cross references the manufacturer's name and symbol with the Federal Source Code for Manufacturers (FSCM). These 5 digit numeric codes replaced the MDS's in 1980 (Chesson, pg. 69). FSCM's are used by procurement offices in many branches of government, not just the Navy.

According to the Department of Defense Index of Specifications and Standards (1991), CAGE (Commercial and Government Entity) numbers have now superseded FSCM's. However, Don Wrigley says that in practice, the numbers are used interchangeably with the FSCM's.

Table 8: Manufacturer's Symbols

The manufacturer's symbols were found in F.W. Chesson's article, "Electronic Military Equipment: Naval Equipment Manufacturers," which was published in The AWA Review, Volume 7. Don Wrigley provided the FSCM's. I have listed the companies that likely manufactured insulators or lightning arresters. I don't know with certainty that all of the companies contracted to make military strains or if they were assigned a symbol because they provided some other type of product to the Navy. I have marked the companies that I have confirmed military strain production for.

	MDS	FSCM	confirmed example	OFS article
Akron Porcelain Co.	CAYO	83346		
American Lava Corp	CAS	70371		
Barker & Williamson Co.	CAHC	05690		
Belden Mfg. Co.	CQG	70903		
Birnbach Radio Co.	CYB	71002		10/97
Bud Radio, Inc.	CDB	71218		
Budwig Mfg. Co.	???	31827	x	12/94
Buffington	???		x	7/94
Centralab, Inc.	CBN	71590	x	12/97
Corning Glass Works	CBI	07115	x	2/98
Cook Electric Co.	CBBG	71688		
E F Johnson Co.	CEJ	74970		
Electrose Insulator Co.	CH	N/A	x	6/97
General Ceramics	CDP	72656	x	12/97
Illinois Electric Porcelain	CBDT	84973	x	
Insuline Corp. of America	CAXD	74887		
Isolantite, Inc.	CBU	81143	x	12/97
J F D Mfg. Co.	CJD	73899		
L S Brach	CLS	71113	x	10/95
Lapp Insulator Co.	CBO	75539	x	12/97

Locke Insulator Co.	CAL	N/A	x	6/98
National Porcelain Co.	CNP	76626	x	
National Company	CNA	42498		
Ohio Brass Company	CBJ	79911	x	
Porcelain Insulator Co.	CBDS	83786		
Porcelain Products Co.	CPP	86559	x	
Standard Electrical Products				
Star Porcelain Co.	CAVQ	78537		12/96
Stupakoff Ceramic & Mfg. Co.	CSJ	78616	x	
R. Thomas and Sons	???			
Victor Insulators, Inc.	CVT	86993		

Conclusion

If you have additional information to share regarding these numbering systems, I would appreciate your input. I contacted a number of sources for help with this section. Many found it amusing when I expressed my desire to understand the military numbering systems.

And, as you can see, it has been no small task. Hopefully, as a minimum, these charts will help you identify what type of number is printed on your insulator. From there you should be able to narrow your search for additional information.

A consolidated table of end notes and list of sources appears on page 33.

Appendix 1: Decoding Your Insulators

I thought that it might help to have a table of sample military markings to make it easier to find your insulator amongst the many tables. Here are some sample code formats that I have seen. Find one that looks like your marking, and go to the indicated section to "decode" your insulator.

IL-5/U
(JETDS - Table 7)
IL = insulator
5 = style number
U = general use

IN-86 VBI
(Signal Corps part number - Table 1)
IN= insulator
86 = style number
VBI = ?

MT-48C
Not a military part #! This is a part number used by Bendix on its aircraft insulators.

MX 273/AR
(JETDS part number - page 27)
MX = Misc. Signal Corps Part #
273 = part number
AR = Airborne Radio

NL422B66-024[19]
(MIL-I-23264 part number - Table 5)
NL = insulator
422 = insulating compound designator
B = brown glazed finish
66 = style 66
024 = 3" (measured in eighths of an inch)

CDP NP2 B 5016
(JAN-I-21 part number - Table 4)
CDP = MDS for General Ceramics - Table 8
NP = porcelain insulator
2 = ceramic type 2
B = Brown glazed finish
50 = style 50
16 = 2" (measured in eighths of inches)

NS5W5148[20]
(JAN-I-8 part number - Table 4)
CBJ = MDS for Ohio Brass - Table 8
NS = steatite insulator
5 = steatite type 5
W = white glaze finish
51 = style 51
48 = 6" (measured in eighths of inches)

SE-2951-A
(early Navy part number - Table 2)
SE = Bureau of Steam Engineering
2951 = insulator style or type number
A = probably in improved version of 2951

CSJ-61192
(later Navy part number - Table 3)
CSJ = MDS for Stupakoff - Table 8
61 = Navy type code for insulators
192 = Navy insulator style number

81443-4
(see page 22 - Later numbering systems)
81443 = manufacturer's symbol (FSCM)
4 = last digit of the type designation number

[19] may be followed by -digit source # - see pg.

[20] may be preceded by 3 or 4 letter manufacturer's symbol see Table 8.

Combined End Notes for "Radio Antenna Insulators Used by the US Military" and "Military Part Numbers for Radio Antenna Insulators"

1. Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps* (Washington: Center of Military History United States Army, 1996).

2. Electrose Mfg. Company advertisement. *The Wireless Age,* October 1920.

3. "The U.S. Signal Corps Stations." *The Wireless Age,* September 1916.

4. Capt. L.S. Howeth, USN (Retired). *History of Communications-Electronics in the United States Navy* (Washington: United States Government Printing Office, 1963).

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6. Capt. S.S. Robison, USN, *Robison's Manual of Radio Telegraphy and Telephony,* 4th ed. (Annapolis: The United States Naval Institute, 1918).

7. Elton Gish, "Porcelain Insulator News: Hewlett Suspension Insulators," *Crown Jewels of the Wire,* May 1997.

8. George R. Thompson, et al., *The Signal Corps: The Test* (Washington: Office of the Chief of Military History Department of the Army, 1957).

9. "War Standards for Military Radio." Electronics Industries, December 1942.

10. F.W. Chesson, "Navy Electronics Directory," *The AWA Review,* Vol. 8 (1993).

11. American Standards Association. *American War Standard - Steatite Radio Insulators C75.2-1943.*

12. MIL-I-23264A 8 July 1968. (Washington: U.S. Government Printing Office, 1968).

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In addition to these references, I reviewed dozens of Technical Manuals, Field Manuals, Radio Pamphlets, and other government documents while preparing these articles. I've elected to identify only those documents on which I placed significant reliance.

Illustration Credits:

pg. 6 "The U.S. Signal Corps Stations." *The Wireless Age,* 9/16, pg. 842.
pg. 5. Radio Pamphlet 40 pg. 323.
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Pg. 17 IN-86A courtesy of Dick Mackiewicz.
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pg. 26 Thomas catalog 1930 pg. 81.
pg. 28-29 *M 24-18 Field Radio Techniques 30 July 1965.*
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Building a Collection of Military Antenna Insulators

by Dan Howard

Here are some tips for building a collection of military antenna insulators. Though they may lack some of the "color" of some of the items built for home use, I think that you'll see that there are plenty of other reasons to include military antenna insulators in your collection.

Availability: Many styles of military strains are easy to find. And they seem to run in packs. More often than not, if I find one, I'll find a box of ten. The most common sizes are the smaller strains that hams and others have purchased to used on antennas. The four and six inch sizes show up regularly. And the bigger bars still show up now and then. It's hit and miss with the other styles. When we have a cataloging system in place, I'm sure that we'll poll the readers as to what is out there.

Colors: Welcome to the wonderful world of white and brown. It seems like ninety-nine percent of all military strains are white or brown glazed ceramic. You can add clear and black to the list if you count the Pyrex Navy strains and the ebonite insulators. And, tan and olive if you include the Budwig strains. Okay, so the colors are somewhat dismal.

Rumor has it that the Army favored brown glaze for its low visibility against land and buildings. Supposedly the Navy favored white glaze for its low visibility against the sea and sky. Raines said that antennas were favorite targets of gunners during the trench war of World War I. I guess that any extra little bit of camouflage would have been an asset under those conditions. I don't think that the white = Navy / Brown = Army guidelines were hard and fast rules, as I have seen plenty of brown insulators with Navy markings.

Designs: When hunting military strains, **keep an open mind**. Some military insulators may look totally different than the insulators illustrated here. Insulators designed for special applications can be very odd looking indeed (and that can make them standouts in a collection).

History: I personally enjoy collecting military strains for what they can tell me about the history of radio development. If you chose to collect only military strains, you could still incorporate items from every period of radio development into your collection. And if you are lucky enough to find samples of the World War I vintage items, your collection would likely include some very interesting examples of early milestones in radio insulator technology.

Commercial radio did not take off in the U.S. until the 1920's. By that time military radio was twenty years old!

Markings: As noted previously, the military manufacturing standards mandated marking styles and manufacturer's designated symbols (MDS) on military radio strains. Unfortunately (for collectors), it appears that the marking standards have been relaxed somewhat. According to some examples that I have seen, marking the manufacturer's code on the insulator is now optional. I've unsealed new-in-box military strains that have no markings at all. Examine each insulator carefully, though. Sometimes black ink markings can be very difficult to see against a dark brown glaze.

The insulators that are marked are typically marked in one of two fashions. Plain rod or bar insulators are usually marked on the side. Ribbed insulators and insulators with metal end

caps are usually marked on the ends. End cap markings may be made in raised letters. Others, including the Navy-Type Pyrex strains carry encuse markings on the metal ends. On the 7-1/2" and 12" Pyrex glass insulators, look carefully for an etched number on the end rings.

If you are lucky enough to find an insulator in its wrapper, you can often learn some additional useful information. Besides the specification code and the name of the manufacturer (both of which may or may not be printed on the insulator itself), you may find a contract date which can help you date the item. You may also be able to find a Signal Corps or Navy part number.

Materials: Porcelain and steatite insulators typify military production. Corning produced Pyrex glass strains for the Navy until World War II. Many other types of materials including electrose, hard rubber, and ebonite were tried in the early days but were phased out prior to World War II. Modern materials including fiberglass and vinyl plastics are sometimes used today, but porcelain and steatite are still the most common materials.

Measuring: For most styles of military strain insulators, the "length" of an insulator is specified as its **effective** length**, not its overall length**.. With the exception of some johnny balls, the length of most insulators is expressed as the distance between the centers of the "eyes" or holes on the ends. You will find this distinction very important as you check your collectibles against the tables. Especially in later insulators, the main distinction between "types" is the diameter. You may be able to identify an unmarked insulator by first measuring the diameter and determining the likely type, and then checking the length between the eyes.

Where to Find Them: Military strains were made in huge volumes during World War II and much of the unsold production hit the surplus market shortly after the war. Surplus strains are still available through mail order houses such as Fair Radio Sales.[21] Stores that sell military surplus equipment can also be a source of insulators.

I regularly find military strains at local ham swap meets. Hams appreciate the superior quality and versatility of the surplus strains for building antennas. If you have the chance, dig through the inventory. In a bin of similar insulators, I have found as many as four embossing variations.

If you still aren't convinced after reviewing these ABC's of collecting, I'll be happy to find a place for any military strains that you find inconvenient to keep.

[21] You can order a catalog from Fair Radio Sales by calling (419) 223-2196 or contacting them on the internet at fairadio@wcoil.com.

Show Reports

March 7, 1998 Huntsville, AL, 3rd Annual North Alabama Bottle, Insulator and Collectibles Show (reported by John Lewis)

John Lewis said that, with the help of the bottle collectors, all twenty tables at the North Alabama Show sold out this year. Sales for many of the dealers were brisk. John found some pin insulators to add to his collection but strains were scarce (when aren't they?) He is already forecasting a fourth annual show for 1999.

June 5-6, 1998 W. Manchester, OH, Alan Statsny's Hog Roast (reported by Rick Soller)

On June 5-6, 1998, **Alan Statsny** held his popular Hog Roast and swap meet at his house in W. Manchester, OH, which was attended by several radio strain collectors including **Alan, Bob Stahr, Rock Soller, Alan Hohnhorst, Steve Blair, and Dennis Stewart.** Alan Hohnhorst brought two boards of radio strains to show, enticing some trades in the process while several dealers had radio strains to trade. Attendees also had the opportunity to view Alan Statsny's sizable collection of insulators including some from the Bethany Relay Station featured in the last of issue of *OFS* (June, 1998). The Lapp cross-shaped steatite piece was especially interesting. Great weather, delicious food, and wonderful company made this a perfect event worth going to next year.

August 8, 1998 Portland, OR, Filling the Void Insulator Show & Sale (reported by Dan Howard)

Gil Hedges-Blanquez, Tim Wood, and **Dan Howard** swapped strains and stories during the second annual Filling the Void Insulator Show & Sale held in Portland, OR. Advertised as a picnic / back yard swap, the show doubled in size from last year. Ten collectors had tables with a total attendance of about 40. Tim and Gil each took home some new ones. Dan and his dad Dick built 8' high display easels from two-by-fours and brought Dan's antenna insulator and lightning arrester collections out into the back yard to be enjoyed by the guests. Dan's pink porcelain beehive insulator (complete with a circling bumble bee) was on display as part of a display of standoff insulators.

August 15, 1998 Spokane, WA, First Annual Spokane Insulator & Bottle Sale/Swap/BBQ (reported by Dan Howard)

Bill Burger hosted a nice insulator swap at his home on the out skirts of Spokane on the 22nd of August. **Gil Hedges-Blanquez** and I joined the other collectors early Saturday morning. Spokane is known for its weather extremes - hot in summer and cold in winter. The two days prior to the show saw temperatures in the low 100's. When I arrived at 7:30, Bill suggested that I set my table inside of his large garage. Good advice. Temperatures in the sun were soon very warm. Gil took home a large Lapp strain insulator (that had arrived in my trunk). I found a pair of 7-1/2" Hewlett fish-tail strain insulators. No, I'm not branching out - Buck/Hewlett insulators were actually used on early Navy antennas - and the price was RIGHT. Bill's BBQ rolled into high gear just after noon. A delicious way to wrap up the show. Dad and I hit the road for Seattle about 1:00 after thanking our hosts.

August 16, 1998 Seattle, WA, Puget Sound Antique Radio Association Annual Swap Meet (reported by Dan Howard)

Yes, it was a long weekend with shows on Saturday and Sunday. After leaving Spokane on Saturday afternoon, we raced from one end of Washington to the other so that we could be at the PSARA meet Sunday morning.

It's been a dry couple of months in the Northwest, so why did we get a gully-washer right as things were beginning to get interesting? The portable gazebo that we had packed along to keep the sun at bay in Spokane, came in right handy when the clouds opened up in Seattle. Boy did we suddenly have a lot of friends. That's okay. I just kept pestering them for insulators - saved me the trouble of going out in the rain to see what they had brought.

The parking lot was full of vintage radio and phonograph items again this year. However most of it played hide-and-seek under tarps and trunk lids all morning. The walk-through traffic count was way off from prior years and sales suffered as a consequence. I did find a common lightning arrester and a couple of Pyrex stand-off insulators for my trouble, though.

Other News

Phillip Drexler has been scouring the swaps in his area this Summer. He reports that he has found a number of new lightning arresters including a Knox 1000 in blue porcelain and a new-in-box RCA 235A1. The 235A1 is an interesting cylindrical arrester that was designed to strap to the side of an antenna mast.

Don Hutchinson got lucky recently and found a boxed Twin Towers lightning arrester in like-new condition.

John Lewis purchased a few nice strains recently. He reports purchasing a nice 3" cobalt blue glass strain. He followed up that news with a report about the dark green and light green strains that came his way in the same purchase. Good for you, John.

Charlie Crews reports that he recently found a pair of the Navy version of the Pyrex 7-1/2" strains. He said that his were marked on the ends like the one reported in the last issue. Charlie says that you have to look carefully to see the markings. (Guess that it's time to recheck my insulators to see if any are marked...)

The goodies are out there. Write and tell us about your new acquisitions.

Thanks for Asking

Don Hutchinson writes "Are there clear strains and also a straw (or something like that) color? I have a few radio strains that look like they are a straw, yellowed, off clear color."

Answer: I don't have a definitive answer to that question. I've seen some clear insulators in Jim Singleton's collection that are dark enough to be called a honey or amber color. However, there are some subtle differences in color that are definitely lost on me. I would leave it up to the individual collector to determine what constitutes a recognizable difference. Thanks for asking.

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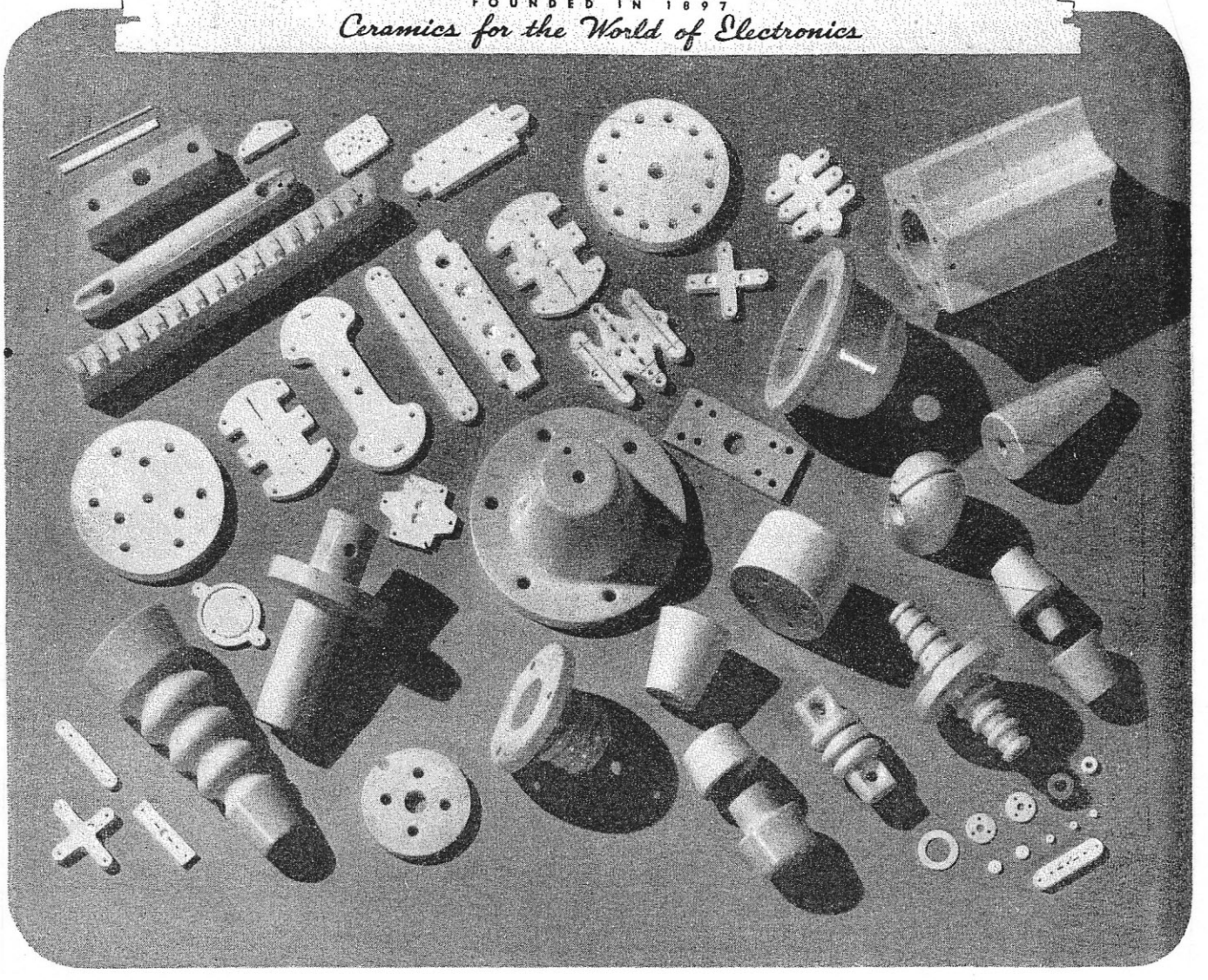

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