

Sound - Powered Marine Telephone System

Instructions for Installing

**BULLETIN 633
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AUTOMATIC  ELECTRIC

**MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS**

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FIG. 1. CABIN-TYPE BULKHEAD-MOUNTING TELEPHONE.

SOUND-POWERED MARINE TELEPHONE SYSTEM

1. GENERAL

The Automatic Electric Marine Telephone System provides communication facilities between control and navigational points on board ship. No batteries or other external power supply is required, as each telephone is equipped with an Automatic Electric Sound-Powered handset consisting of transmitter and receiver assembled in one hand unit. These handsets are actuated entirely by the sound waves of the voice.

The system is of the common-talking type (one conversation at a time), with selective ringing to six lines. All stations use the same pair of wires for talking, but a separate (individual) wire is used for signaling each station. Any desired station may be called without operating the bells at the other stations. If more than one station is connected to an "S," signaling line, all stations on the line will be signaled simultaneously.

Each telephone is equipped with a hand generator for producing the signaling current and a six-point hand switch (with dial and pointer) for selecting the station to be called. Where there are a number of persons answering on a given line, ringing may be easily coded to attract the wanted party.

The handsets are normally disconnected from the talking circuit, and each is equipped with a control button in the handle for connecting the handset to the talking circuit.

In addition to the intercommunicating system described in the preceding paragraphs, this bulletin also covers the installation of separate jack boxes and handsets terminating in cords and plugs. One or more jack boxes may be connected to the common talking circuit of the intercommunicating system, to provide supplementary telephone service without signaling facilities. When not in use, the handset (with cord and plug) is placed in a stowage box located conveniently near the associated jack box.

The various types of telephones, bells, junction boxes, jack boxes, and handsets are shown in the illustrations. Typical wiring diagrams are also included; see Figures 21 to 22.

2. INSTALLATION PLAN

As an aid to the installation work, a simple cabling plan should be made. An elaborate drawing is not required nor need it be to scale.

The plan should indicate the locations of the telephones, bells, junction boxes, and jack boxes; the cable runs between the various units; the length of each cable run; and the size of each cable. The wiring plans in this bulletin will prove of material assistance in making such

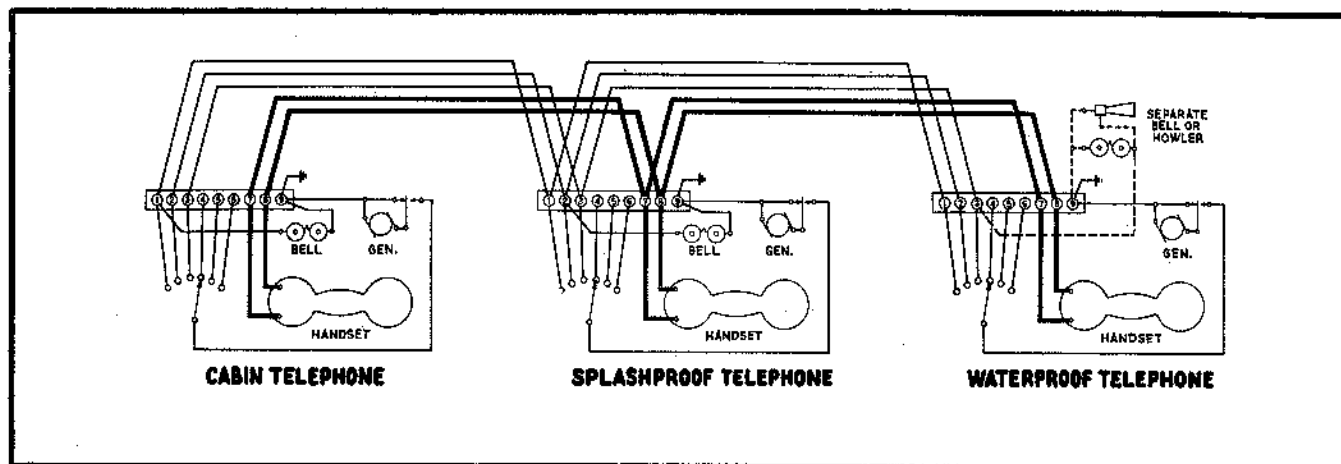


FIG. 2. DIAGRAM OF A THREE-STATION SYSTEM. TALKING CIRCUIT IS IN BLACK.

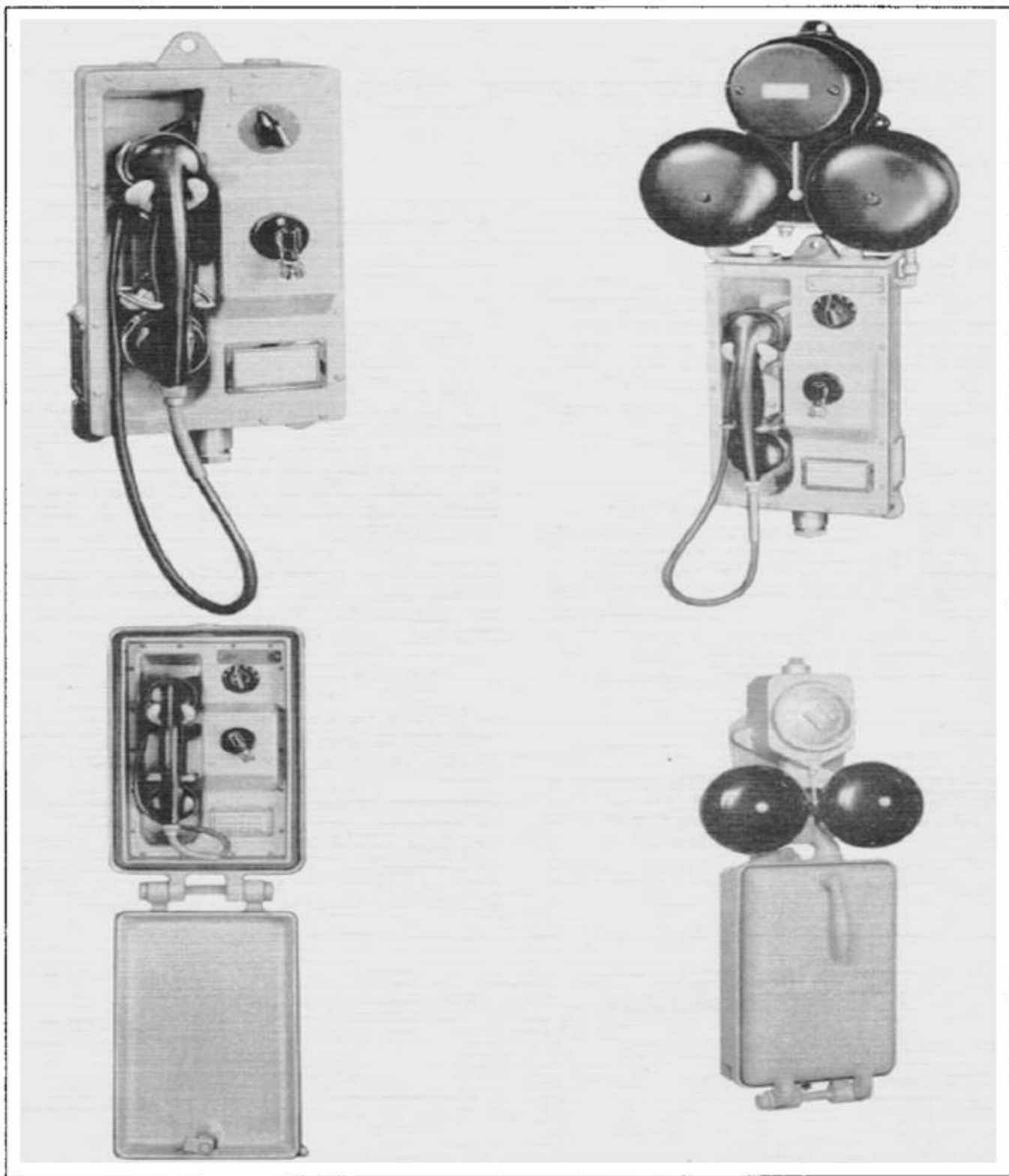


FIG. 3. A SPLASHPROOF BULKHEAD TELEPHONE WITH 3" INTERNAL BELL.

FIG. 4. SPLASHPROOF BULKHEAD TELEPHONE WITH 6" SPLASHPROOF BELL.

FIG. 5. WATERTIGHT BULKHEAD TELEPHONE WITH HINGED COVER OPEN -- NO BELL.

FIG. 6. WATERTIGHT BULKHEAD TELEPHONE WITH 6" WATERTIGHT BELL.

a cabling plan. Figure 21 in particular shows how various combinations of telephones, bells, junction boxes, and jack boxes may be made.

When only one junction box is required, it should be located as close to the center of cable distribution as practicable. When this is not possible, the box should be located at or near the center of distribution between the more closely grouped telephone stations.

When two junction boxes are required, one box should be located at or near the center of distribution for one group of telephones, and the other box at or near the center of distribution for the other group of telephones.

The use of an extra junction box will often eliminate extremely long cable runs from a group of telephones to a main junction box, thus requiring only one long cable run between the main box and the location of the extra box.

Locations of cable runs, methods of installing cable, multiple cable runs, etc., should conform to the rules and regulations of the Bureau of Marine Inspection and Navigation of the U. S. Department of Commerce.

3. CHECKING SHIPMENT

It is suggested that upon the receipt of the shipment, the goods be carefully checked to determine that every required item has been received. Any shortages should be promptly reported, and items not previously ordered should be ordered immediately to avoid further delay.

In the following table, the catalog numbers and the manufacturing (shipping) numbers of the various units are cross-indexed as an aid to identifying the items. For table, see below.

4. BULKHEAD-TYPE TELEPHONES

Three types of telephones are available: (1) the cabin type for completely enclosed and protected locations; (2) the splashproof type for damp locations that are not directly exposed to the weather; and (3) the watertight type for weather-exposed locations.

Both the cabin-type (Figure 1) and splashproof-type (Figure 3) telephones are equipped with bells (two-inch and three-inch respectively) mounted inside the case. The watertight-type telephone (Figure 5) requires a separately mounted bell. All three types may be connected to separately mounted loud-ringing (6-inch) bells when the conditions so require.

DESCRIPTION OF UNIT	CAT. NO.	MFG. NO.	SHOWN ON
Bulkhead Telephone - 2" Bell (Cabin)	AM-75	L-790-A1	Figure 1
Bulkhead Telephone - 3" Bell (Splashproof)	AM-76	L-791-A1	Figure 3
Bulkhead Telephone - 6" Bell (Splashproof)	AM-88	L-799-A1	Figure 4
Bulkhead Telephone - No Bell (Watertight)	AM-78	L-792-A1	Figure 5
Bulkhead Telephone - 2" Bell (Watertight)	AM-86	L-809-A1	---
Bulkhead Telephone - 6" Bell (Watertight)	AM-87	L-808-A1	Figure 6
Pedestal Telephone - 3" Bell (Splashproof)	AM-77	L-793-A1	Figure 7
Pedestal Telephone - 6" Bell (Splashproof)	AM-81	L-798-A1	Figure 8
Pedestal Telephone - No Bell (Watertight)	AM-79	L-794-A1	---
Pedestal Telephone - 2" Bell (Watertight)	AM-82	L-797-A1	Figure 9
Pedestal Telephone - 6" Bell (Watertight)	AM-83	L-797-B1	Figure 10
Bell - 6" (Splashproof)	AS-67	D-56416-A	Figure 13
Bell - 2" (Watertight)	AS-68	L-796-A0	Figure 12
Bell - 6" (Watertight)	AS-50	D-56418-A	Figure 14
Junction Box (Watertight)	SA-26	L-795-A0	Figure 15
Jack Box)	H-65103-1	
Handset, Cord, and Plug) AM-84	L-893-E0	Figure 16
Handset Stowage Box)	H-65103-2	
Jack Box	AM-85	H-65103-1	Figure 16
Approved Cable (One pair, three pair, or five pair as required) can be supplied			

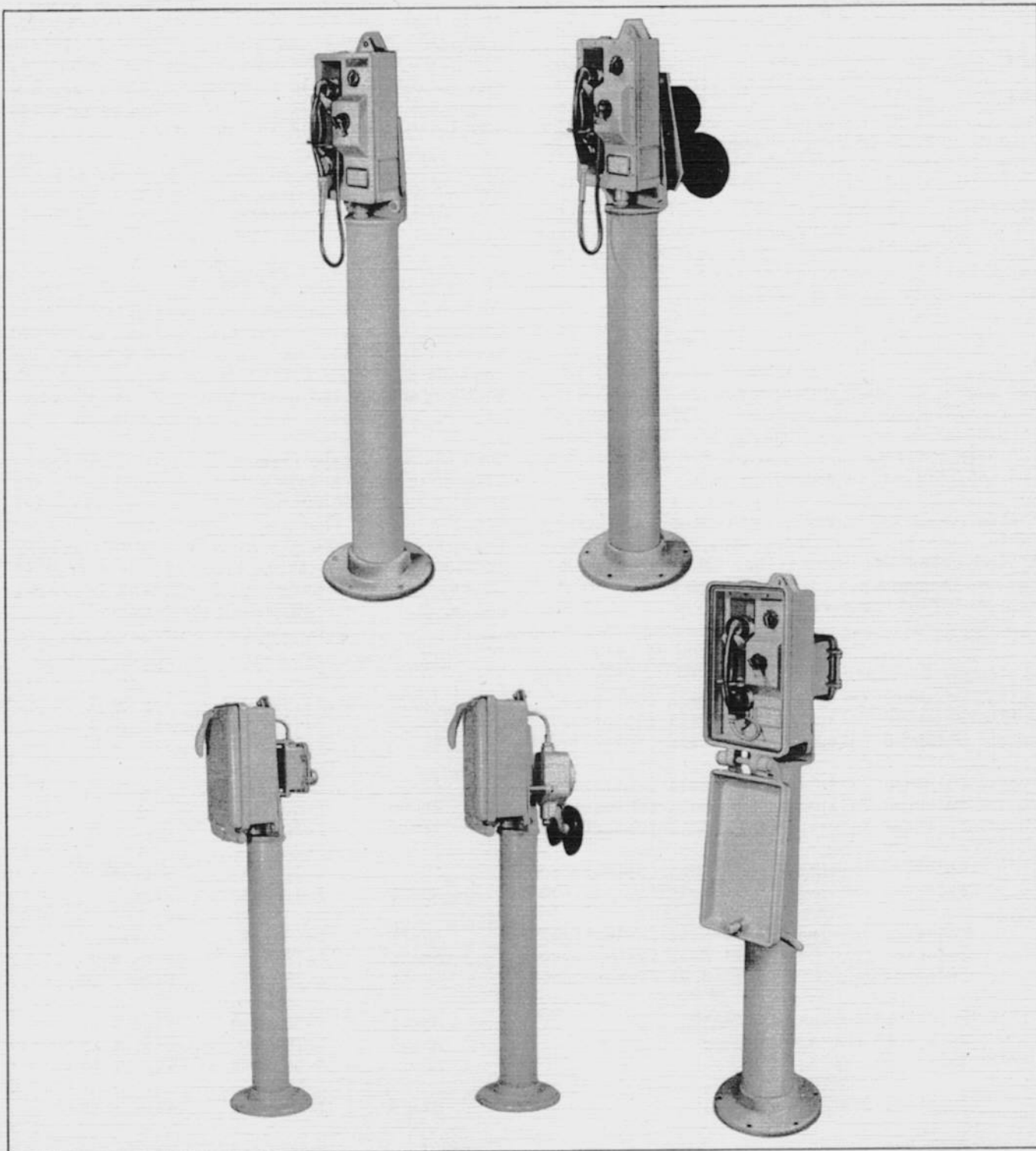


FIG. 7. SPLASHPROOF PEDESTAL TELEPHONE WITH 3" INTERNAL BELL.

FIG. 8. SPLASHPROOF PEDESTAL TELEPHONE WITH 6" SPLASHPROOF BELL.

FIG. 9. WATERTIGHT PEDESTAL TELEPHONE WITH 2" WATERTIGHT BELL.

FIG. 10. WATERTIGHT PEDESTAL TELEPHONE WITH 6" WATERTIGHT BELL.

FIG. 11. WATERTIGHT PEDESTAL TELEPHONE WITH COVER OPEN.

5. PEDESTAL-TYPE TELEPHONES (Figures 7, 8, 9, 10, 11)

Two types of telephones are available in this class: (1) the splashproof type (Figure 7) for locations not directly exposed to the weather and (2) the watertight type (Figure 9) for weather-exposed locations.

The splashproof-type telephone is equipped with a bell (3-inch) mounted inside the case. When so ordered, it may be supplied with a loud-ringing (6-inch) bell mounted on the pedestal (back-to-back with the telephone), or it may be connected to a separately mounted loud-ringing (6-inch) bell when conditions so require. (See Figure 8).

The watertight-type telephone requires an externally mounted bell. It may be supplied with either a 2-inch or a 6-inch bell mounted on the pedestal (back to back with the telephone), or it may be connected to a separately mounted 2-inch or 6-inch bell when conditions so require.

6. LOCATING TELEPHONES

The telephones should be located in positions where they will not be damaged by the opening of doors or other movable objects. Locations where the telephone will interfere with persons passing by should be avoided when possible. In determining the exact location of each telephone, it should be noted that the connecting cable from the junction box must enter the telephone through a terminal tube located at the bottom of the telephone.

Machine screws (engaging tapped holes in the bulkhead or floor, as the case may be) or through bolts should be used for fastening the telephones securely in place. A gasket, such as a piece of painted canvas, should be placed between the base flange of the pedestal-type telephone and the floor to prevent water from collecting under the pedestal.

Before a pedestal-type telephone is permanently bolted to the floor, the telephone case (and also the bell when the bell is mounted on the pedestal) should be removed from the pedestal, and the cable from the junction box pulled through the base and stem of the pedestal, as outlined in Sections 13 and 14.

7. SEPARATELY MOUNTED BELLS (Figures 12, 13, 14)

Separately mounted bells should be located as close to the associated telephones as practicable. In certain instances, however, it may be desirable to locate the bell at a suitable distance from the telephone, where it may be more readily heard. Watertight bells should be used for all weather-exposed locations.

Bells should be located in positions where they will not be subject to possible mechanical damage. In all cases, the bells should be so mounted that the gongs are at the bottom. In determining the exact location of each bell, it should be noted that the connecting cable may enter the bell box either from above or below in the case of watertight-type bells; but only from below in the case of splashproof-type bells. Machine screws (engaging tapped holes in the bulkhead) or through bolts should be used for fastening the bells securely in place.

An extra terminal tube is shipped with each bell. This tube is required for making a watertight cable entrance (for the one-pair cable from the bell) into the associated telephone case or into a junction box. The telephones are fitted with 3/4" pipe plugs at the top of the telephone for this purpose, the cabin telephone being equipped with one pipe plug and the splashproof and watertight type with two pipe plugs. The junction box is fitted with two 3/4" pipe plugs, one on each side.

When a separately mounted bell is associated with a pedestal-type telephone, the cable from the bell should preferably be run to the nearest junction box. It is possible, however, to connect a separately mounted bell to a pedestal telephone through the top of the telephone by means of a 3/4" conduit from the bell to one of the pipe-tapped openings in the top of the telephone.

8. JUNCTION BOXES (Figure 15)

Junction boxes should be so located that cable entrances may be made from all four sides. Four terminal tubes are assembled on each junction box for the cables from telephones and other boxes. When a terminal tube is not required, substitute a pipe plug for the terminal tube. Two one-inch pipe plugs are shipped as separate items with each junction box.

Two cables from separately mounted bells or jack boxes may also be terminated at a junction box, through terminal tubes (3/4" pipe threads) on opposite sides of the box. When a cable from a separately mounted bell or a jack box is to be connected to a junction box, remove one of the 3/4" pipe plugs from the box and substitute the terminal tube shipped as an extra item with the bell or jack box.

Machine screws (engaging tapped holes in the bulkhead) or through bolts should be used for fastening the junction boxes securely in place.

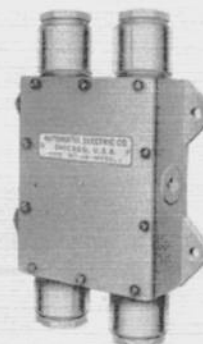
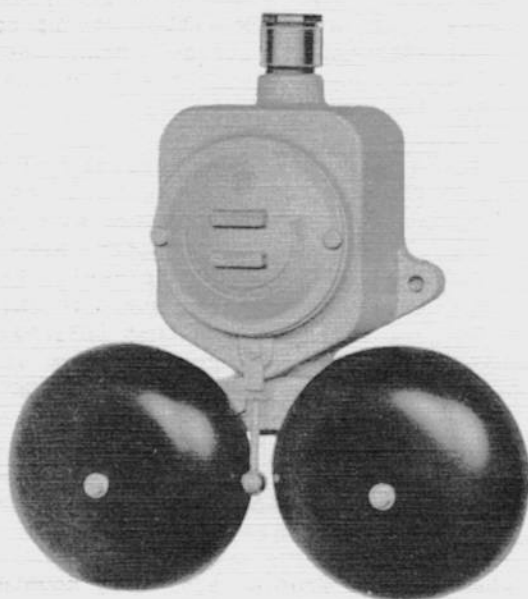
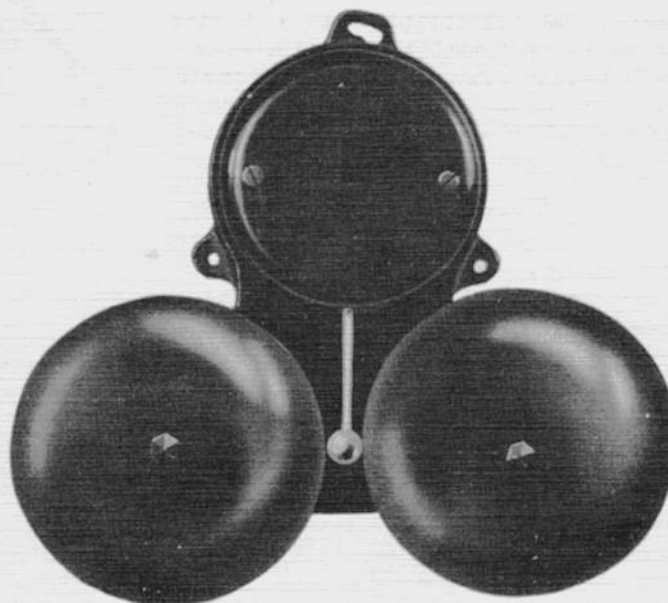
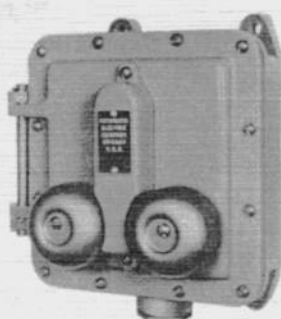


FIG. 12. (TOP, LEFT). WATERTIGHT 2" BELL.

FIG. 13. (TOP, RIGHT). SPLASHPROOF 6" BELL.

FIG. 14. (BOTTOM, LEFT). WATERTIGHT 6" BELL.

FIG. 15. (BOTTOM, RIGHT). WATERTIGHT JUNCTION BOX.

9. JACK BOXES (Figure 16)

Jack boxes should be so located that a cable entrance may be made from either end of the box. Each box is equipped with a terminal tube at one end, and a 3/4" pipe plug at the other end. The positions of the terminal tube and the pipe plug may be reversed to accommodate the cable.

An extra terminal tube is shipped with each jack box. This tube is required for making a water-tight cable entrance (for the one-pair cable from the jack box) into a telephone or a junction box, in a similar manner to that described in the third paragraph of Section 7 for separately mounted bells.

The opening in the jack box for the plug of the handset telephone is protected by a screw cap attached to the box with a short piece of chain. This cap should be placed over the opening (and pulled up tight) during all periods the box is not in use.

The stowage box for the handset telephone, cord and plug should be located as close to the associated jack box as convenient, bearing in mind that a relatively out-of-the-way location protected from direct exposure to the weather is preferred.

Machine screws (engaging tapped holes in the bulkhead) or through bolts should be used for fastening the jack boxes and stowage boxes securely in place.

10. INSTALLING CABIN-TYPE BULKHEAD TELEPHONE (Figure 1)

Place the telephone (face up) on a bench. Open the case, remove the four screws fastening the case to the sub-base, and lift the case (including the handset) from the sub-base. Place the case (face up) on the bench, pending re-assembly on the sub-base after the cable from the junction box has been installed.

Mount the sub-base on the bulkhead, using the two holes drilled in the sub-base for the mounting screws or bolts. Next, mount the handset bracket on the bulkhead (with three screws or bolts) at approximately the same height and adjacent to the side of the telephone which is opposite the generator hand crank (left-hand side facing the telephone).

Before the cable from the junction box is threaded through the terminal tube at the bottom of the sub-base, remove the armor and lead sheath from the end of the cable and prepare the conductors for connection, as outlined in Section 18.

Check that the nipple of the terminal tube at the bottom of the sub-base is tight and remove

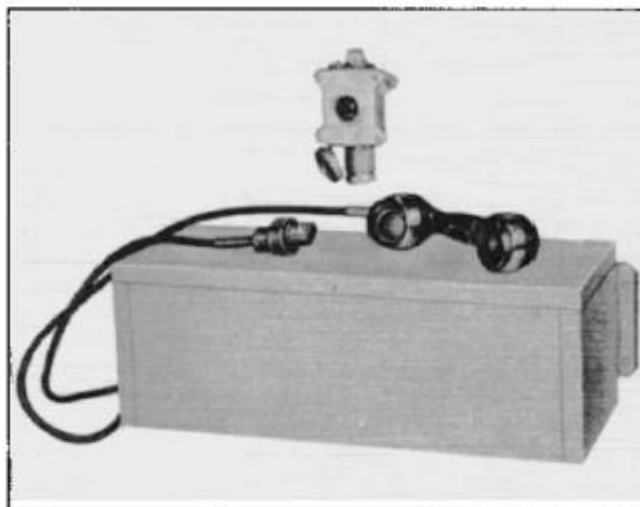


FIG. 16. JACK BOX, HANDSET, CORD, PLUG, and STOWAGE BOX.

the locknut, metal washer, and rubber gasket from the nipple. Slip the locknut, metal washer, and rubber gasket over the prepared cable end. One face of the metal washer is tapered to fit the angle face of the rubber gasket.

Thread the prepared cable end through the nipple at the bottom of the sub-base, until the point at which the armor of the cable was butted is flush with the end of the nipple inside the sub-base. Hold the cable in this position and insert the rubber gasket, metal washer, and locknut into the nipple. Thoroughly tighten the locknut to cause the rubber gasket to make the cable entrance watertight. Mount the telephone on the sub-base, using the four screws previously removed.

Connect the various conductors of the cable (from the junction box) to the terminal strip of the telephone in accordance with the diagram shown in Figure 17. (The color code connections for both 3-pair and 5-pair cable are shown to the right of the terminal strip in Fig. 17. Arrange the conductors so that they will not interfere with the ringer movement or the hand generator. Connect the loose conductor of the ringer movement to terminal #1, #2, #3, #4, #5 or #6, dependent upon which terminal represents the home (this) telephone; for example, if this telephone is station #3, connect the wire to terminal #3.

When a cable from a separately mounted bell is terminated at the telephone, connect one conductor to the "common ringing return" terminal #9. Connect the other conductor to terminal #1, #2, #3, #4, #5 or #6, dependent upon which terminal represents the home telephone.

When a cable from a jack box is terminated at the telephone, connect the two conductors to the "common talking-pair" terminals #7 and #8.

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After the wiring connections have been completed, close and lock the telephone case.

11. INSTALLING SPLASHPROOF-TYPE BULKHEAD TELEPHONE (Figure 3)

Place the telephone case (face up) on a bench. Remove the 18 screws fastening the telephone to the case and then lift the telephone from the case, being careful not to damage the gasket between the frame and case.

Temporarily support the telephone on its side, and remove the two screws fastening the terminal strip to the case. The telephone, with the local cable and the terminal strip, should then be carefully placed (face down) on the bench, pending re-assembly in the case after the cable from the junction box has been installed.

Mount the telephone case on the bulkhead by means of screws or bolts passing through three lugs of the case one lug being located at the top of the case, and two lugs at the bottom. Before the cable from the junction box is threaded through the terminal tube at the bottom of the case, remove the armor and lead sheath from the end of

the cable and prepare the cable conductors for connection, as outlined in Section 16.

The procedure for threading the prepared cable end through the terminal tube and making the cable entrance watertight is the same as that outlined in the preceding Section 10 for the cabin-type telephone.

Have an assistant temporarily support the telephone alongside the telephone case. Fasten the terminal strip of the telephone to the back wall of the case with the two screws previously removed.

Press the prepared cable conductors (inside the case) against the back wall of the case, and run the conductors vertically (along the center line of the case) to the top of the case. Make a small gooseneck in the conductors at a point where the gooseneck will be directly behind the handset wall of the telephone. The object of the gooseneck is to provide sufficient slack for the conductors at a point where there will be no possible interference with the bell and hand generator. The conductors should be sewed into a form with waxed lacing twine so that they will remain permanently in place.

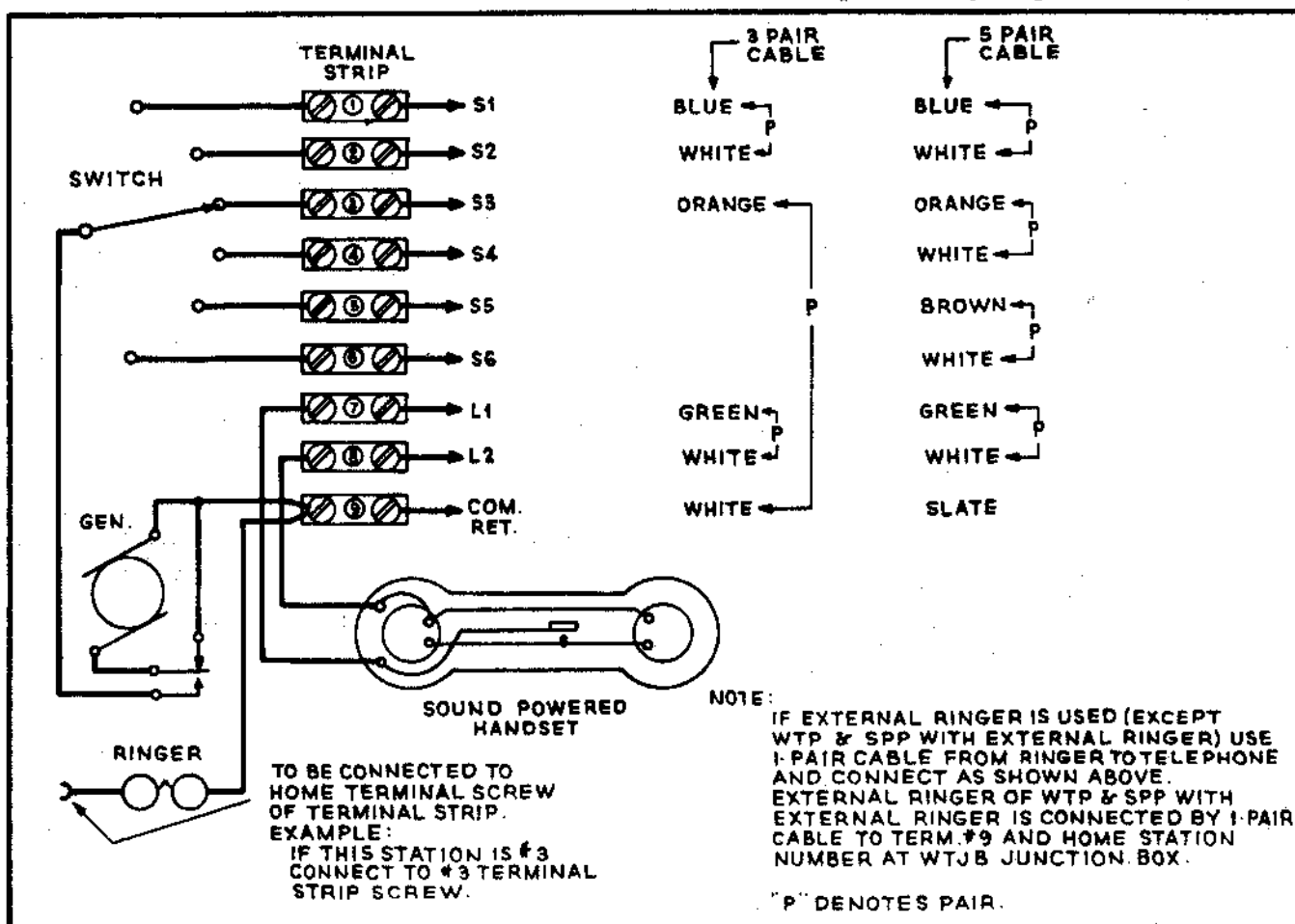


FIG. 17. PAIRING OF THREE AND FIVE-PAIR CABLE AT TERMINAL STRIP OF TELEPHONE.

Connect the various conductors of the cable to the terminal strip of the telephone as outlined in the preceding Section 10 for the cabin-type telephone.

Mount the telephone on the case with the 18 screws previously removed, being very careful to see that the gasket between the case and the telephone frame is not damaged in any manner and is in proper position to make a watertight joint.

12. INSTALLING WATERTIGHT-TYPE BULKHEAD TELEPHONE (Figure 5,6)

The installation of the watertight-type telephone is the same as that described in the preceding Section 11 for the splashproof-type telephone, with the minor exceptions that the case is fitted with a hinged front cover and the telephone is not equipped with a bell.

13. REMOVING TELEPHONE FROM PEDESTAL

13.1 No Bell Mounted On Pedestal

Remove the three bolts fastening the telephone case to the pedestal, lift up the case about three inches to clear the terminal tube at the bottom of the case, and place the case (face up) on a bench. Be careful not to lose the two rubber rings or washers (D-44941-A) and the short piece of pipe (H-65056-1) which were located between the bottom of the case and the top horizontal face of the pedestal.

With the telephone case on the bench, remove the 18 screws fastening the telephone to the case and then lift the telephone from the case, being careful not to damage the gasket between the frame and case. Temporarily support the telephone on its side, and remove the two screws fastening the terminal strip to the case. The telephone, with the local cable and the terminal strip, should then be carefully placed (face down) on the bench, pending re-assembly in the case after the cable from the junction box has been installed.

When the case is of the watertight type, the procedure is the same as that described in the preceding paragraph, with the minor exception that the case is equipped with a hinged front cover.

13.2 Watertight Bell Mounted on Pedestal (Figures 9,10)

Loosen the two unions of the connecting tube between the bell and the telephone case, and pull the connecting tube and the two enclosed wires from the back of the case. The procedure for removing the case from the pedestal and then the telephone from the case is the same as that described in the preceding sub-section 13.1

13.3 Splashproof Bell Mounted on Pedestal (Figures 7,8)

Loosen the union of the small connecting tube at the back of the telephone case, and pull the connecting tube and the two enclosed wires from the back of the case. Also remove the angle fitting (for the connecting tube) from the back of the case. The procedure for removing the case from the pedestal and then the telephone from the case is the same as that described in sub-section 13.1.

14. INSTALLING CABLE AT PEDESTAL TELEPHONE

Before the cable is pulled through the pedestal, remove the armor and lead sheath from the pedestal end of the cable and prepare the conductors for connection, as outlined in Section 18.

Pass the prepared cable end through the floor underneath the pedestal location, and thread the cable through the base and stem of the pedestal until the point at which the armor was butted is approximately six inches above the top horizontal face of the pedestal. The pedestal should then be permanently bolted in place.

Slip the two large rubber washers and the short piece of pipe (which were located between the bottom of the telephone case and the top horizontal face of the pedestal before the case was removed from the pedestal) over the cable end protruding from the pedestal in the following order: rubber washer, piece of pipe, and rubber washer. The purpose of the two rubber washers and the piece of pipe is to make a watertight connection between the top horizontal face of the pedestal and the bottom of the case.

Check that the nipple of the terminal tube at the bottom of the telephone case is tight; and remove the locknut, metal washer, and rubber gasket from the nipple. Slip the locknut, metal washer, and rubber gasket over the cable end protruding from the pedestal. One face of the metal washer is tapered to fit the angle face of the rubber gasket.

Have an assistant temporarily support the telephone case just above the top horizontal face of the pedestal. Thread the cable end protruding from the pedestal through the nipple at the bottom of the case, until the point at which the armor of the cable was butted is flush with the end of the nipple inside the case. Hold the cable in this position and insert the rubber gasket, metal washer, and locknut into the nipple. Thoroughly tighten the locknut to cause the rubber gasket to make the cable entrance watertight.

Carefully lower the telephone case (pushing the cable slack down into the pedestal) until the

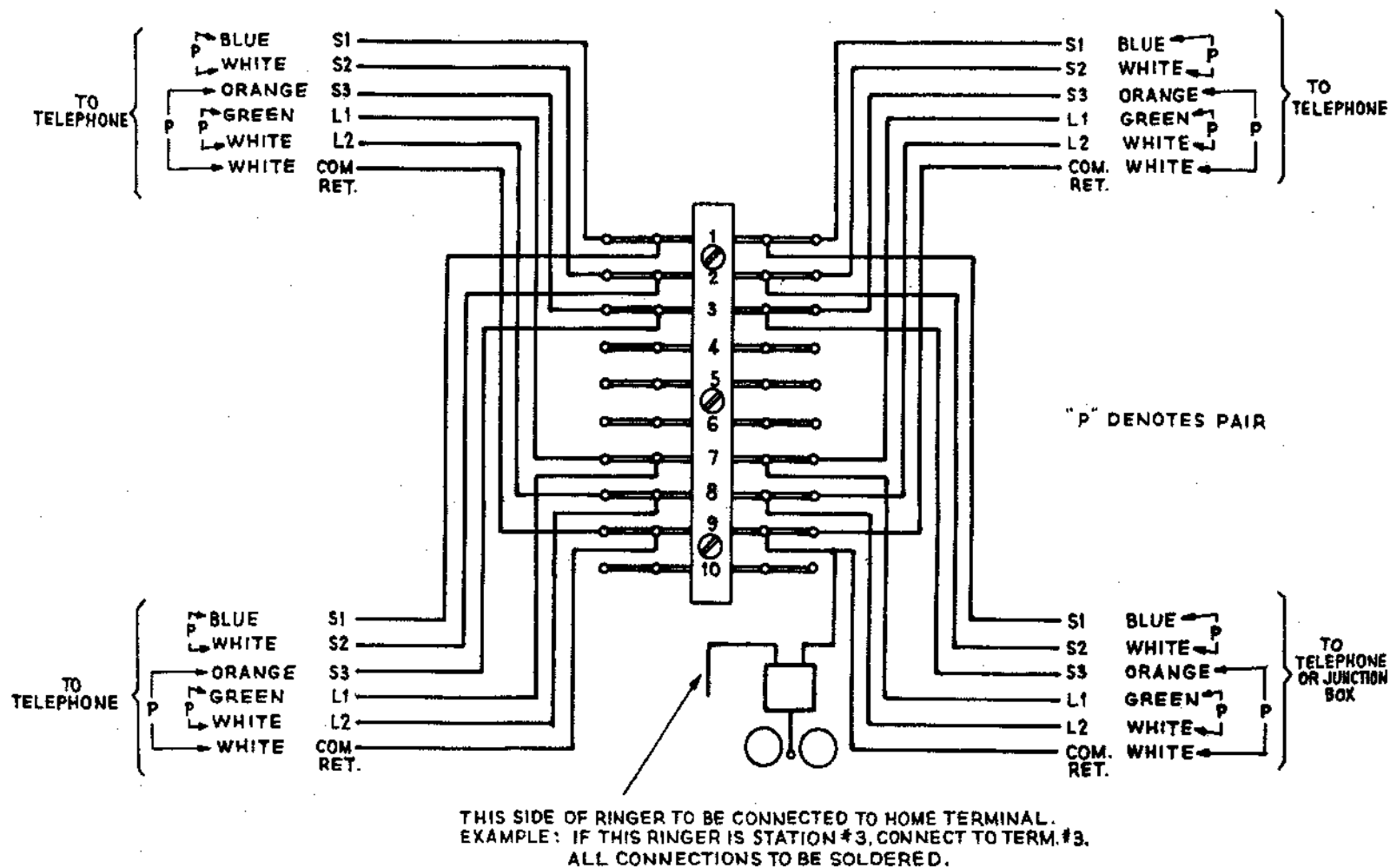


FIG. 18. CONNECTIONS AT A JUNCTION BOX FOR THREE PAIR CABLE.

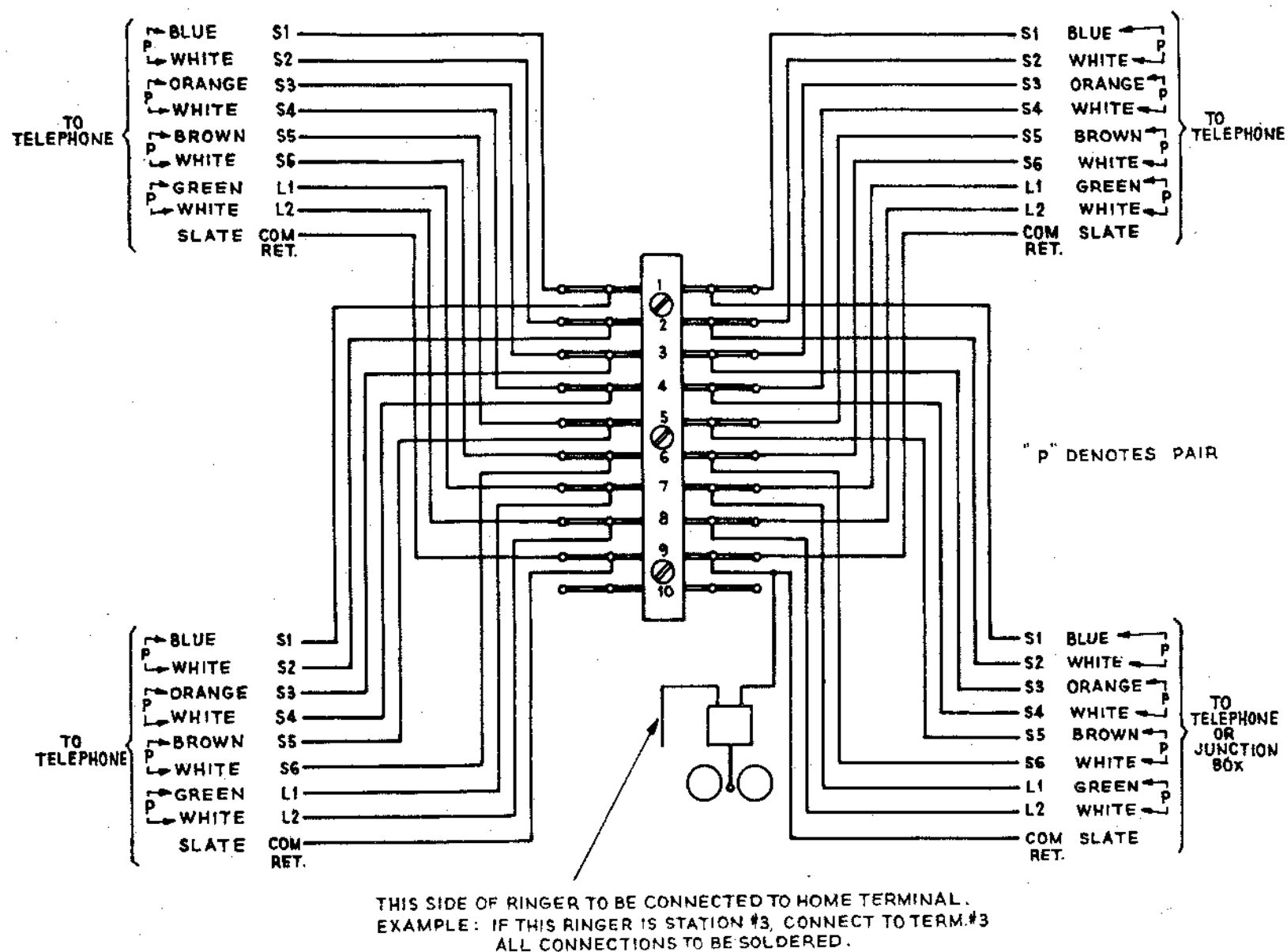


FIG. 19. CONNECTIONS AT A JUNCTION BOX FOR FIVE-PAIR CABLE.

bottom of the case rests upon the large rubber washer located on top of the short piece of pipe. Center the two large rubber washers and the piece of pipe around the terminal tube of the telephone case. Bolt the case to the vertical mounting plate of the pedestal.

Have the assistant temporarily support the telephone alongside the telephone case on the pedestal. Fasten the terminal strip of the telephone to the back wall of the case with the two screws previously removed. The method of forming the cable conductors inside the case, connecting the conductors to the terminal strip, and mounting the telephone on the case is the same as that outlined in the last three paragraphs of Section 11 covering the splashproof-type bulkhead telephone.

Mount the bell (when located on the pedestal) in the reverse manner to that outlined in Section 13.2, or 13.3. Connect one conductor from the bell to "common ringing return" terminal 9. Connect the other conductor to terminal #1, #2, #3, #4, #5 or #6, according to which terminal represents the home station.

15. INSTALLING CABLES AT JUNCTION BOX

Remove the 10 screws fastening the front cover to the box and lift the cover, being careful not to damage the gasket between the box and the cover. Before the cables from telephones are threaded through the terminal tubes, remove the armor and lead sheath from the end of the cable and prepare the conductors for connection, as outlined in Section 18.

Check that the nipples of the terminal tubes are tight and remove the locknut, metal washer, and rubber gasket from each nipple. Slip a locknut, metal washer, and rubber gasket over each prepared cable end.

Thread each prepared cable end through the proper nipple, until the point at which the armor of the cable was butted is flush with the end of the nipple inside the box. Hold the cable in this position and insert the rubber gasket, metal washer, and locknut into the nipple. Thoroughly tighten the locknut to cause the rubber gasket to make the cable entrance watertight.

Connect the conductors of the cables to the terminal strip in accordance with the diagram in Figure 18 when the cable is three pair, and in accordance with Figure 19 when the cable is five pair. All connections should be thoroughly soldered. Mount the front cover on the box with the 10 screws previously removed, being very careful to see that the gasket between the box and the cover is not damaged in any manner and is in proper position to make a watertight joint.

When a cable from a separately mounted bell is terminated at a junction box, connect one conductor to the "common ringing return" terminal #9. Connect the other conductor to terminal #1, #2, #3, #4, #5 or #6, according to which terminal represents the associated telephone, for example, if the telephone is station #3, connect the wire to terminal #3.

When a cable from a jack box is terminated at a junction box, connect the two conductors to the "common talking-pair" terminals #7 and #8.

16. INSTALLING CABLE AT SEPARATELY MOUNTED BELL

When the bell is of the watertight type, thread the prepared cable end through the terminal tube of the bell box. Each bell is equipped with a terminal tube at the bottom of the box, and a 3/4" pipe plug at the top. The positions of the terminal tube and the pipe plug should be reversed when the cable entrance is to be made through the top of the box. The procedure for making the cable entrance watertight is the same as that previously described for the telephones, with the general exception that the cover of the 6-inch bell is threaded instead of being fastened to the box with machine screws.

When the bell is of the splashproof type, no terminal tube is provided for the cable at the bell box. The cable entrance to the bell is through a hole at the bottom of the box. Remove the two screws fastening the front cover to the bell box, and lift the cover to expose the interior of the box. Prepare the cable end so that the point at which the armor is butted will be located inside the bell box. It may be necessary to slightly flatten the cable at the point where it enters the box, or the hole may be slightly enlarged. It is also desirable to extend the lead sheath of the cable beyond the hole in the center partition of the box, to make the cable entrance as watertight as possible. Connect the two conductors of the cable to the terminals of the bell and mount the front cover on the box with the two screws previously removed.

17. INSTALLING CONNECTING CABLE AT JACK BOX (Figure 16)

Remove the four screws fastening the front cover to the box and lift the cover, being careful not to damage the gasket between the box and the cover. Before the cable is threaded through the terminal tube fitting, remove the armor and lead sheath from the end of the cable and prepare the conductors for connection, as outlined in Section 18. The procedure for making the cable entrance watertight is the same as that previously described for the telephones.

Connect the two conductors of the cable to the terminals of the jack box. Mount the front cover on the box, with the four screws previously removed, being very careful to see that the gasket between the box and the cover is not damaged in any manner and is in proper position to make a watertight joint.

18. PREPARING CABLE ENDS FOR CONNECTION

18.1 Removing Armor

The distance that the armor is to be removed from the ends of the cables for the telephones, separately mounted bells, junction boxes, and jack boxes should be thoroughly checked before the armor is removed. A sufficient length should be included from the end of the cable to the point where the armor is to be butted, to provide for the forming of the cable conductors to the terminals of the equipment plus a reasonable amount of slack. In all cases where the cable entrance is made through a terminal tube, the armor of the cable should extend through the terminal tube to the end of the nipple (terminal tube) inside the case or box.

At the point where the armor is to be butted, cut through the armor (with a heavy knife) around the circumference of the cable, being very careful not to cut into the lead sheath. Next, cut through the armor lengthwise for a distance of approximately one inch from the end of the cable, and then with a side-cutting plier or a small pair of snips cut the armor lengthwise until the butt is reached. The armor and the rubber tape servings over the lead sheath can then be removed.

18.2 Removing Lead Sheath

The lead sheath should preferably extend beyond the armor butt to avoid any possibility of the armor coming in contact with the conductors of the cable. For some of the equipments, it is possible to extend the lead sheath one inch or more beyond the armor butt; whereas in other cases, the extension must be limited to less than an inch.

Score the lead sheath at the point where the butt is to be made, being careful not to cut through the sheath and thus avoid possible damage to the conductors underneath. Next, make two parallel cuts about 1/4" apart lengthwise along the sheath from the end of the cable to the scored butt. The sheath may then be removed by tearing the 1/4" lead strip from the cable and spreading and breaking off the rest of the sheathing at the butt.

A simple tool for scoring the two parallel cuts in the lead sheath may be made by driving two 6d finishing nails through a strip of hard wood. The nails should be spaced about 1/4" apart, and

the points should project only sufficiently to permit scoring to a depth of approximately one-half of the thickness of the lead sheath.

When the section of lead sheath has been removed, the varnished cambric and rubber-filled tape wrappings around the conductors should be trimmed off about 1/4" from the lead sheath butt. The cambric and rubber-filled tape wrappings protect the conductors from possible abrasion at the lead sheath butt.

18.3 Boiling Cable End in Beeswax

Immediately after butting, the stripped cable end should be immersed in hot beeswax. The butt end should be immersed first so that no possible moisture will be driven under the lead sheath. The cable should remain immersed until the bubbles cease. The surplus wax can be removed from the wires by wiping them with a piece of canvas, cloth or heavy paper. The cable end should be shaken so that the wires will be separated when the wax cools.

The purpose of the waxing is to exclude moisture from the insulating materials of the cable. Waxing also tends to prevent the unraveling of the insulation. The waxing operation should, therefore, be performed as quickly after butting as possible.

The correct temperature for waxing is between 250 degrees to 285 degrees F. The vessel containing the hot wax should be removed from the fire before immersing the cable. Under no circumstances should paraffine be used for boiling out the cable.

18.4 Preparing Conductors For Connection

The conductors of the cable end should be formed to "break off" opposite the respective terminals of the terminal strip, and each conductor skinned so that the insulation will be brought to the front edge of the terminal. A pair of short "stubby nose" pliers may be used for removing the silk and cotton insulation. The inside surfaces of the jaws should be smooth, without knurling, and in contact from tip to hinge when the plier is closed. Catch the conductor in the jaws of the plier (close to the hinge) and at a right angle to its length. Crush the silk and cotton wrappings with a small amount of pressure and then remove the insulation. Remove the enamel coating on the exposed wire with a wire skinning tool (no knife) or a piece of fine sandpaper.

In forming the conductors, it is desirable not to untwist the white mate conductors from the respective colored mates in order that the identity of the white wires may not be destroyed.

In case it is necessary to untwist the paired conductors, the white mates should be tagged or otherwise identified.

19. ATTACHING CABLE CONDUCTORS TO TERMINALS

When a conductor is to be attached to a solder-type terminal, wrap one and one-half turns of the bare wire around the terminal and cut off the surplus wire. Solder the connection with rosin core solder, using no other soldering flux. Provide slack in the conductor for future use in case of a broken wire. When a conductor is to be attached to a screw-type terminal, wrap one turn of the bare wire around the screw, being careful not to cross the wire. Pass the wire around the screw from left to right so that the action of tightening will not force out the wire. Provide slack in the conductor for future use in case of a broken wire.

20. SEALING CABLE ENDS

All unformed ends of cable that may be exposed to the elements should be sealed immediately after cutting to prevent the entrance of moisture. Saw the cable end square, run hot solder over the cable end, and complete the sealing with a hot iron.

21. TERMINAL TUBE FITTINGS FOR BULKHEADS

Terminal tubes may be used for making cable runs through bulkheads watertight. The nipple for three-pair and five-pair cable requires a 1-1/4" pipe tap. If the thickness of the bulkhead permits the screw threads of the nipple to extend beyond the back of the bulkhead, a clearance hole may be drilled through the bulkhead and a standard pipe locknut used for bolting the nipple to the bulkhead.

22. TIGHTENING TERMINAL TUBE NIPPLES

When terminal tube nipples are tightened with a pipe wrench, suitable protective material should be placed between the wrench and the nipple to avoid damaging the outer surface of the nipple. It is also desirable to apply a coat of aluminum paint to the nipples after tightening.

23. DIRECTORY CARDS

Each telephone, with the exception of the jack box, is fitted with a directory card and holder. The designation or location of each telephone should be printed on each directory card in order that all stations may be readily identified on the six-point hand switches.

24. TESTING THE COMPLETED INSTALLATION

Call each telephone from every other telephone, and establish conversations between all telephones.

When a jack box is included in the installation, plug the handset cord into the jack box and talk to any other telephone by arrangement (no signaling).

To call another telephone, set the hand switch to the proper position and operate the crank handle of the hand generator in a clockwise direction. The bell at the called station will ring as long as the crank handle is turned. Remove the handset from the bracket and press the button in the handle to connect the transmitter and receiver to the common talking circuit. To answer at the called station, remove the handset from the bracket and press the button in the handle of the handset.

25. HANDSETS

The new Type 22 Handset is smaller and approximately 20% lighter than the former one, and slightly more efficient with respect to intelligibility. The transmitter and receiver units are smaller and lighter, and their removal and replacement have been made easy by the use of spring connections which eliminate the need for disconnecting any wires. The general physical properties of the new handset are similar to those of the old one, and its use is approved by the Bureau of Marine Inspection and Navigation, as able to withstand the usual impact tests, splash and salt spray tests.

At regular intervals, the handsets should be checked by voice tests for proper receiving and transmitting. Any receiver or transmitter unit that fails to provide satisfactory trans-



FIG. 20. TYPE 22 HANDSET AND STOWAGE HOOK D-731155-A.

mission should be replaced by a new unit, and the defective unit returned to the manufacturer for repair.

A transmitter or receiver telephone capsule may be removed from the handset case by turning the retaining ring by hand in a counter-clockwise direction to release the mouthpiece or earpiece. The capsule can then be lifted from the case.

If a new capsule is to be substituted, it is slipped into the handset case being twisted around until the long clamping screw enters the long slot in the case. Do not reverse the long and short clamping screws on the unit. They, together with moulded keys, position the capsule properly in the handset case. In addition, they prevent the accidental interchange of transmitter and receiver units.

After the telephone unit has been seated in the handset case, the mouthpiece or earpiece is placed over the telephone unit in such a manner that the two studs on the bottom face engage corresponding locating holes in the clamping ring of the unit to hold the mouthpiece or earpiece in the proper position. The retaining ring is slipped over the mouthpiece or earpiece and tightened with hand pressure in a clockwise direction.

26. LIST OF REPAIR PARTS

(a) For Cabin-Type Telephone, Fig. 1

Handset and cord assembled	L-893-CO
Cord only for handset	H-56744-18
Mouthpiece for handset	D-38305
Earpiece for handset	D-67324
Transmitter	D-38302-A
Receiver unit for handset	D-5191-A
Six-point switch (with dial & pointer)	Yaxley #1316
Hand generator (less crank)	AC-90124
Generator crank	D-32265
Ringer assembly	MC-56230-D
Switch assembly	D-731082-A
Screws for switch	H-56742
Cord guard	H-65057
Cord gasket	D-67270
Cord washer	H-56742
Retaining ring	D-65355
Handset shell assem.	D-52098-A

(b) For Splashproof-Type Telephone, Fig. 4

Handset and cord assembled	L-893-AO
Cord only for handset	H-56744-21
Mouthpiece for handset	D-38305
Earpiece for handset	D-67324
Retaining ring	D-65355
Transmitter	D-38302-A
Receiver unit for handset	D-5191-A
Six-point switch (with dial & pointer)	Yaxley #1316
Hand generator (less crank)	AC-90124
Generator crank	D-32267-A
Ringer assembly	D-56392-A
Switch assembly	D-731082-A
Cord gasket	D-67270
Gasket	H-56744-12
Cord guard	H-56744-5
Cord washer	H-56742-14
Screws for switch	D-56742-20
Handset shell assem.	D-52098-A

(c) For Watertight-Type Telephone, Fig. 5

Handset and cord assembled	L-893-AO
Same as (b) (less ringer)	

(d) For Jack Box, Fig. 16

Handset, cord and plug assem.	L-893-EO
Cord only for handset	H-56744-19
Plug only for handset	H-65120
Other Items See (a)	

(e) For Watertight Bell (2-Inch Gongs) Figure 12

Coil	D-281350
Coil	D-281365
Armature Assembly	H-47380-6
Clapper Assembly	H-47380-12

(f) For Watertight Bell (6-Inch Gongs) Figure 14

Order parts by general description

(g) For Splashproof Bell (6-Inch Gongs) Figure 13

Ringer Assembly	D-56408-C
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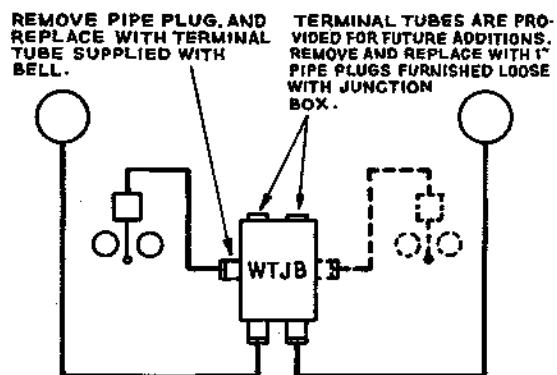
(h) For Splashproof Bell (3-Inch Gongs) Figure 3

Ringer Assembly	D-56392-A
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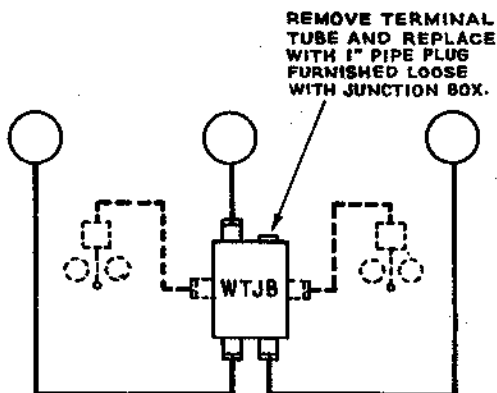
WIRING DIAGRAMS FOR AUTOMATIC ELECTRIC MARINE TELEPHONE SYSTEM



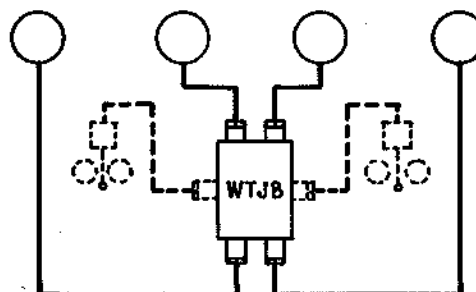
**2-STATION SYSTEM
WITH NO EXTERNAL BELLS**



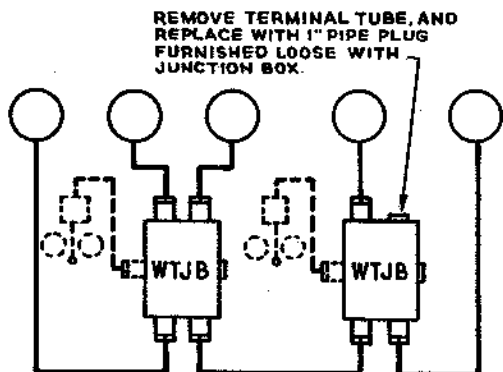
**2-STATION SYSTEM
WITH 1 OR 2 EXTERNAL BELLS**



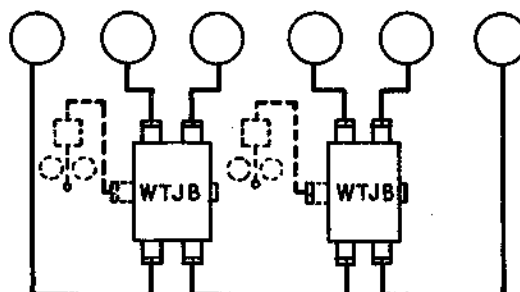
**3-STATION SYSTEM
WITH OR WITHOUT EXTERNAL BELLS**



**4-STATION SYSTEM
WITH NOT MORE THAN 2 EXTERNAL BELLS**



**5-STATION SYSTEM
WITH OR WITHOUT EXTERNAL BELLS**



**6-STATION SYSTEM
WITH NOT MORE THAN 4 EXTERNAL BELLS**

FIG. 21. WIRING DIAGRAMS.

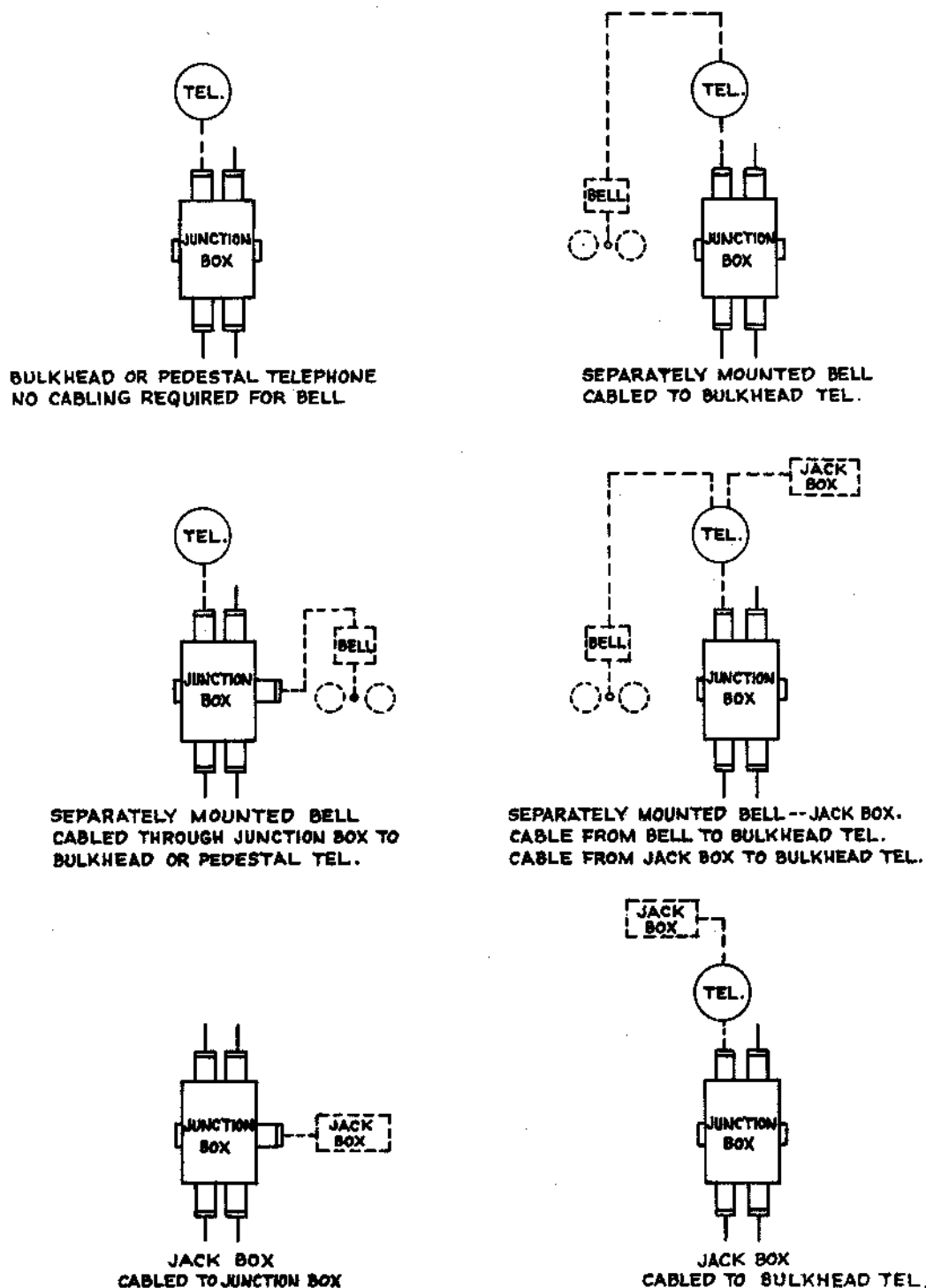


FIG. 22. WIRING DIAGRAMS.