

LOCATION, ERECTION AND ASSEMBLY
GENERAL REQUIREMENTS AND INFORMATION

CONTENTS

1.	GENERAL	8.	ASSEMBLY OF EQUIPMENT
1.1	Scope	8.1	Bolts, Nuts, Screws and Similar Parts
2.	INSTALLING EQUIPMENT	8.2	Protrusion of Threaded Parts
2.1	Tools	8.3	Preventing Seizure of Aluminum Threaded Parts
2.2	Supplies	8.4	Drilling Information for Self-Tapping Screws
3.	DEFINITION OF TERMS	8.5	Drilling Information for Wood Screws
3.1	"Front" and "Rear"	8.6	Portable Tarpaulins and Tarpaulin Holders
3.2	"Left" and "Right"	9.	COMMON INSTALLING INFORMATION
3.3	Building Bay	9.1	Use of Hack Saws in Close Quarters
4.	BELL SYSTEM PRACTICE (BSP) REQUIREMENTS	9.2	Miscellaneous Cutting Operations
5.	PIECE PART INFORMATION	9.3	Miscellaneous Erecting Operations
6.	LOCATION OF EQUIPMENT		
7.	ERECTION OF EQUIPMENT		
7.1	Wall Mounted Equipment		

1.	GENERAL	2.	INSTALLING EQUIPMENT
1.1	<u>Scope</u>	2.1	<u>Tools</u>
1.11	This section covers the general requirements and information common to the operations covered by this handbook.	2.11	In addition to tools supplied in the general kits, the tools listed below may be required for the operations covered by this section.
1.12	Specific requirements and information for particular operations are covered in the associated sections of this handbook to which they apply.	<u>NO.</u>	<u>DESCRIPTION</u>
1.13	Requirements and information contained in this handbook may in some cases refer to or apply to certain types of installations, the associated installing information for which is contained in other handbooks. (For example: Duct type frames on Broad Band Carrier installations-See Handbooks 220, 221, 222 and 223.) In such cases the information will either be duplicated in the associated handbook or reference will be made to the section of this handbook containing the desired information.	Purchase Locally	Apron, Carpenter's
		R-2628	Brush, Wire
		RM-626122	Canvas, Flameproofed
		R-1562	Cutter, Bolt
		Purchase Locally	Hack Saw, Keyhole (and blades)
		R-3162	Holder, Abrasive Paper
		R-3148	Saw, Reciprocating Power ←
		2.2	<u>Supplies</u>
		<u>NO.</u>	<u>DESCRIPTION</u>
		KS-14614	Compound, Antiseize
		R-3163	Paper, Abrasive
		RM-647651	Petrolatum
		RM-647944	Wax Compound

This section includes material from BSP's 800-614-154 and 800-610-154
Copyright, 1956 and 1968 respectively by
American Telephone and Telegraph Company
Printed in U.S.A.

Printed in U.S.A.

3. DEFINITION OF TERMS

- 3.1 "Front" and "Rear"
- 3.11 Relay Racks, Register Racks, Cross-bar Frames, SxS Frames, Single Sided Panel Frames - "Front" is can cover or apparatus side. "Rear" is terminal or wiring side.
- 3.12 Duct Type Frames (Carrier) - Either the 7/8" or the 2-7/16" flanges of the uprights may be used to mount panels and since apparatus may be mounted on one or both sides of the panels, the floor plan drawings must be consulted to determine the "Front" and "Rear" sides of these frames. See Section 19E2 and 19F.
- 3.13 Double Sided Frameworks (Panel) - "Front" is cover or can side associated with odd numbered circuits. "Rear" is cover or can side associated with even numbered circuits.
- 3.14 Switchboards and Desks - "Front" is side nearest operator. "Rear" is side away from operator.
- 3.15 Desks Arranged for Operators. Positions on Both Sides - Each position will have an individual designation.
- 3.2 "Left" and "Right"
- 3.21 "Left" or "Right" when used to designate equipment, applies with the observer facing the front of a switchboard, desk, rack, or frame except for duct type and double sided frameworks when the terms "left side facing front of frame," "left side facing rear," etc., are used.
- 3.3 Building Bay
- 3.31 A "Building Bay" is a principal compartment of the building as marked off by columns, girders, beams, etc. Four columns, usually spaced at approximately 20' x 20' or 18'-6" x 20', would set off a bay near the center of a room, whereas a bay adjacent to a wall might be set off by two columns and the wall, or in the corner of a room by the two walls and one column.

4. BELL SYSTEM PRACTICE (BSP) REQUIREMENTS

- 4.1 Where requirements in any of the sections contained in this handbook are taken from a Bell System Practice (BSP) such BSP or BSP's will in all cases be listed at the bottom of the first page of the sections so affected.
- 4.2 The figure numbers in the BSP's are frequently referred to in job specifications and drawings. A cross-reference table listing the BSP's and the handbook sections in which the associated BSP figures have been included is contained in Section 1C of this handbook in order that these figures may be readily located. The numbering of the figures in such cases will always be the same as in the associated BSP. Oversize Characters (about 1/4" high) will be used only for BSP figure numbers in Handbook 30.

5. PIECE PART INFORMATION

- 5.1 To facilitate ready identification of piece parts used in the fabrication of common assemblies, auxiliary framing, cable rack, rolling ladder track, etc., figures showing the shape and pertinent dimensions of such parts are included in the associated sections of this handbook. While it is intended that all parts which otherwise might be difficult to identify will be shown, it will, of course, be impractical to keep such information up to date at all times. The information should be used only for identification purposes and in no way replaces information shown on drawings furnished the job.

6. LOCATION OF EQUIPMENT

- 6.1 The location of switchboard sections, desks, frames, racks, power switchboards and other equipment should conform to the particular plans for each installation.

- 6.2 Where limited dimensions or tolerances are not specified, the equipment should be located to within such limits of the specified dimensions as will insure satisfactory functioning and workmanlike appearance of the equipment.

- 6.3 The use of decimals in dimensions is continually expanding, particularly on standard drawings. In some cases, the decimals used are in reality equivalents of fractions. The conversion table in Figure 1

can be used to convert these decimals to their fractional equivalents. For all other decimal dimensions, use the R-8550 6" Steel Rule.

7. ERECTION OF EQUIPMENT

7.1 Wall Mounted Equipment

- 7.1.1 Small cabinets, clocks and other similar equipment and isolated conduit runs should be securely fastened to walls or partitions by means of anchor bolts assemblies,

Fraction	Decimal	Fraction	Decimal
1/32	.03125	17/32	.53125
1/16	.0625	9/16	.5625
3/32	.09375	19/32	.59375
1/8	.125	5/8	.625
5/32	.15625	21/32	.65625
3/16	.1875	11/16	.6875
7/32	.21875	23/32	.71875
1/4	.25	3/4	.75
9/32	.28125	25/32	.78125
5/16	.3125	13/16	.8125
11/32	.34375	27/32	.84375
3/8	.375	7/8	.875
13/32	.40625	29/32	.90625
7/16	.4375	15/16	.9375
15/32	.46875	31/32	.96875
1/2	.5	1	1.

FIG. 1 FRACTION TO DECIMAL CONVERSION TABLE (PAR. 6.3)

DRILL FOR TAP CHART

Tap Size	(O.D")	R-Number	Drill Size	(Dia.)	R-Number
3-56	(.099)	R-2778	#45	(.083)	R-2777
6-32	(.138)	R-1520	#31	(.120)	R-2308
8-32	(.164)	R-1521	#28	(.140)	R-1938
10-32	(.190)	R-1548	#19	(.166)	R-1940
12-24	(.216)	R-1526	#13	(.185)	R-1471
1/4"-20	(.250)	R-2472	#3	(.213)	R-1472
5/16"-18	(.312)	R-2473	1	(.272)	R-1474
3/8"-16	(.375)	R-1750	5/16"	(.312)	R-1785
5/8"-11	(.625)	R-2469	9/16"	(.562)	R-1150

FIG. 2 SIZE OF DRILL REQUIRED FOR TAPS (PAR. 8.13)

7.11 wood screws, or other equally secure devices. Small equipment such as alarm bells fastened to walls or partitions should, unless otherwise specified, be fastened by means of wood screws or bolts to wood strips. The wood strips, in turn, should be securely fastened to the walls or partitions by means of anchor bolt assemblies, or other equally secure devices. Toggle bolts and other secure devices should be used on terra cotta or hollow tile walls and partitions.

7.111 Where mounting brackets, pipe clamps, or other types of wall supports are to be secured to insulated walls, spacing collars and washers should be placed between the expansion shield or other securing devices and the mounting surfaces of the bracket, clamp, etc., as required to prevent the details being mounted from being pulled below the surface of the insulation.

8. ASSEMBLY OF EQUIPMENT

8.1 Bolts, Nuts, Screws and Similar Parts

8.11 Bolts, nuts, cap screws, machine screws and similar threaded parts used for fastening framework in place, fastening units of framework together, or for fastening apparatus to framework and not constituting a part of the apparatus proper, should be installed in all the places normally requiring them, should be of the kind and size specified, and should be properly tightened.

8.111 Assemble square or hexagon nuts used to mount equipment with either chamfered or unchamfered side up on screws or threaded parts up to and including 0.164" (No. 8). On screws over 0.164" (No. 8) in size, the unchamfered side of the nut should be adjacent to the surface against which the nut is tightened.

8.112 Nuts used for fastening No. 5 and 6 type fuse posts to fuse panels may be assembled with either chamfered or unchamfered side up.

8.113 Nuts, bolts and studs associated with expansion shields, anchors, and toggle bolts should be drawn up snug. Excessive tightening may strip the threads in the shields, anchors, or toggle nuts as well as damage the building.

8.12 Stripped and Defaced Threaded Parts; Bolts, cap screws, machine screws and similar threaded parts should be free from sharp edges, stripped threads and defaced heads and, unless otherwise specified, should not be burred or bent to such an extent as to interfere with the placing or removal of a nut.

NOTE: Replacement of bolts and screws with defaced heads should be limited to cases where the heads are burred to such an extent that the sharp edges would be an accident or service hazard.

8.13 When necessary to drill and tap for machine screws, refer to Figure 2 to find the appropriate drill for Tap.

8.14 To avoid difficulties in inserting bolts and screws when assembling metal details, do not tighten any of the screws until all are placed in position. This is particularly essential where flathead screws are used.

8.15 Driving self-tapping screws may be facilitated by applying a coating of RM-647651 Petrolatum or RM-647944 Wax Compound to the threads before the screws are inserted in the framework parts.

8.16 In accordance with the latest standard practice applying to framework assembly drawings, the relative position of the heads of screws is identified by terminating the indicating arrow from the associated piece part number, at the side of the part that the screw enters. The use of qualifying notes, "Lead on Near Side" or "Head on Far Side" may be used in isolated cases for improved clarity. Exceptions may be made in such obvious conditions as screws used to mount apparatus, or assembled in tapped holes, where the screw could enter from only one direction.

8.2 Protrusion of Threaded Parts

8.21 Threaded Parts other than Self-tapping Screws: The threaded end of a bolt, screw, or similar threaded part may extend beyond the nut or tapped part by an amount equal to the diameter of the screw, except where such protrusion would interfere with equipment or wiring or would present a personal injury hazard.

- 8.211 Where there is no objection to a greater protrusion from functional or appearance standpoints, the above limit may be exceeded where desirable for manufacturing reasons.

NOTE: To avoid the necessity of stocking additional length bolts, as would otherwise be required, a given length bolt may be specified for use where a shorter bolt could have been used. Providing the extra length does not interfere with wiring or constitute an injury hazard, the use of a longer bolt than actually required in such cases, is within the intent of the requirement. Normally any bolt or screw specified on a drawing or in an installation method may be considered as satisfactory and need not be cut off unless otherwise specified.

- 8.212 In the case of studs to which terminals or bus bars are connected, excessive length of the stud beyond the nut should be avoided by shifting the position of the terminal or bus bar on the stud.

- 8.213 Studs in Loxin expansion shields which are exposed, such as the studs securing frames and racks with open bases or some sheet metal bases where studs are exposed external to the base, should be cut off approximately flush with the nut, after the frame aligning operations have been completed, using the R-1562 Bolt Cutter. Any burrs remaining after the cutting operation should be removed with a file. It is not necessary to cut off the excess lengths of studs which are not exposed, such as the studs enclosed within sheet metal bases.

- 8.22 Self-tapping screws, such as those used to mount equipment on sheet metal uprights of No. 5 crossbar frames, have tapered and fluted ends to facilitate entry. In order to get full thread engagement the screws should be driven so that the tapered and fluted end shall protrude a minimum of a full taper and a maximum of a full taper plus three threads.

- 8.221 Where there are two thicknesses of metal, in one of which a clearance hole is provided as in the uprights of No. 5 crossbar frames and the part having the clearance hole is towards the tapered end of the self-tapping screw, the maximum and minimum protrusion of the screw may be measured from the nearest surface.

- 8.23 Engagement of Threads: A sufficient number of threads of bolts, cap screws, machine screws, and similar threaded parts should be engaged to provide a secure fastening. Such threaded parts should not be so short that more than one complete turn of the thread in the nut remains unengaged.

- 8.231 In mounting apparatus or equipment parts on panels, bars, or other mounting details having tapped holes, the screws need not engage in the tapped holes to a depth greater than an amount equal to the diameter of the screw or thickness of panel whichever is least, unless otherwise specified.

- 8.2311 To facilitate checking, it is the usual practice to specify screws of sufficient length that, when mounted, the ends of the screw will be flush.

- 8.24 The kind of bolts, screws, washers and nuts used for similar purposes should, as far as practicable, be uniform throughout a particular unit of equipment.

8.3 Preventing Seizure of Aluminum Threaded Parts

- 8.31 When one or both of two threaded mating parts are made of aluminum or aluminum alloy, Antizeize Compound KS-14614 should be used on the threaded mating parts. If assembled threaded parts that have been treated with Antiseize Compound KS-14614 are taken apart, the compound shall be reapplied to such parts before reassembling.

- 8.311 Antiseize compound may be omitted when self-tapping or hardened steel screws are used in tapped holes or parts made of aluminum or in tapped holes of aluminum base alloy die casting.

DRILL SIZES FOR SELF TAPPING SCREW HOLES

SCREW SIZE		DRILL SIZES					
COMMERCIAL DESIGNATION	DIAMETER IN INCHES	IN SHEET STEEL		IN SHEET ALUM.		IN SLATE, HARD RUBBER OR PHENOL FIBRE	IN ASBESTOS COMPOSITION
		THICKNESS OF METAL	DIAMETER OF DRILLING	THICKNESS OF METAL	DIAMETER OF DRILLING		
4	.112	.015	.086	.031	.086	.104	.0995
		.018	.086	.040	.086		
		.025	.089	.050	.086		
		.031	.0937	.064	.089		
		.037	.0937	.080	.089		
		.050	.096	.101	.0937		
		.062	.0995				
		.078	.1024				
6	.137	.015	.104	.031	.104	.120	.118
		.018	.104	.040	.104		
		.025	.1065	.050	.104		
		.031	.1065	.064	.1065		
		.037	.1094	.080	.1094		
		.050	.1094	.101	.1094		
		.062	.116	.128	.113		
		.078	.120	.162	.116		
		.109	.1285	.250	.120		
8	.163	.025	.116	.040	.120	.147	.144
		.031	.116	.050	.1285		
		.037	.116	.064	.136		
		.050	.1285	.080	.1406		
		.062	.136	.101	.147		
		.078	.1406	.128	.147		
		.109	.147	.162	.152		
		.125	.147	.250	.152		
		.140	.152	.373	.152		
10	.186	.018	.144	.040	.144	.173	.166
		.025	.144	.050	.144		
		.031	.144	.064	.144		
		.037	.144	.080	.147		
		.050	.144	.101	.147		
		.062	.152	.128	.152		
		.078	.1562	.162	.161		
		.109	.161	.250	.166		
		.125	.1695	.375	.166		
		.140	.1695				
12	.212	.025	.166	.050	.161	.199	.196
		.031	.166	.064	.166		
		.037	.166	.080	.173		
		.050	.1695	.101	.180		
		.062	.177	.128	.180		
		.078	.180	.162	.1875		
		.109	.185	.250	.1935		
		.125	.196	.375	.199		
		.140	.196				
		.171	.199				
14	.243	.031	.185	.064	.199		
		.037	.185	.080	.199		
		.050	.191	.101	.2031		
		.062	.199	.128	.209		

DRILL SIZES FOR SELF TAPPING SCREW HOLES (Cont'd)

SCREW SIZE		DRILL SIZES					
COMMERCIAL DESIGNATION	DIAMETER IN INCHES	IN SHEET STEEL		IN SHEET ALUM.		IN SLATE, HARD RUBBER OR PHENOL FIBRE	IN ASBESTOS COMPOSITION
		THICKNESS OF METAL	DIAMETER OF DRILLING	THICKNESS OF METAL	DIAMETER OF DRILLING		
		.078	.2031	.162	.213		
		.109	.209	.250	.2187	.2187	.213
		.125	.228	.375	.228		
		.140	.228				
		.171	.2344				
		.187	.2344				
		.203	.2344				

FIG. 3 CORRECT DRILL SIZES FOR DRILLING HOLES FOR SELF-TAPPING SCREWS (PAR. 8.41)

8.4 Drilling Information for Self-Tapping Screws

8.41 Figure 3 shows the correct drill sizes (A.S.A.) for drilling holes for self-tapping screws. Where the correct size drill is not available, a drill within 5% of the correct size is permissible. Where no drill of satisfactory size is available, the correct size should be purchased locally.

8.42 Where it is difficult to tighten self-tapping screws, apply a drop of cutting oil or petroleum spirits to the screws. Wipe excessive oil from framework to prevent its running into equipment.

8.5 Drilling Information for Wood Screws

8.51 The commercial standards do not include many of the drill sizes which are considered desirable to use in the manufacture of woodwork equipment. The large majority of drilling operations on woodwork are performed in the shop where all sizes of drills are available. When a drawing calls for the use of a drill size which is not provided in the kits, and a slightly smaller size drill than specified is available, it should be used. When the difference between the specified dimension of the hole to be drilled and the nearest size drill available is so great as to introduce the possibility

of splitting the woodwork when the screw is inserted, a drill of suitable size should be purchased locally. Difficulty may be experienced in obtaining a drill of the exact size specified on the drawing, in which case it will be necessary to accept the size slightly smaller than that specified.

8.6 Portable Tarpaulins and Tarpaulin Holders

8.61 The portable tarpaulin should be folded in accordance with the instruction label on the tarpaulin holder.

8.62 The tarpaulin holder should be fastened to a wall or partition and located so that the top of the holder is approximately 6' - 0" above the floor.

8.63 Locate the tarpaulin holder so that the tarpaulin can readily be removed or replaced without interference from adjacent pipes, radiators or other equipment.

8.64 Tarpaulins received from the manufacturer require only little refolding in order to be placed in the tarpaulin holder. By unfolding the ends of packed tarpaulins, the 3' x 9" size will be obtained (5th step of folding instructions on the inside of cover of tarpauline holder). Then, to place the tarpaulin into the holder, it is only

8.64 necessary to roll it compactly with
(Cont'd) the open ends inside of the roll.

9. COMMON INSTALLING INFORMATION

9.1 Use of Hack Saw in Close Quarters

9.11 When necessary to use a hack saw in close quarters, where the regular hack saw frame is too large and impedes the work, a keyhole hack saw holder and blades may be purchased locally. An R-3148 Reciprocating Power Saw may be useful in such cases.

9.2 Miscellaneous Cutting Operations

9.21 The R-3148 Reciprocating Power Saw (furnished primarily for cutting cable hole covers) can also be used for miscellaneous cutting operations when rearranging existing auxiliary framing and cable rack, for cutting off excess ends of threaded rods, and for cutting holes in partitions.

9.22 When working at locations where an obstruction is between the saw and the material to be cut, the blade may be removed from the R-2281 Hack Saw Frame and reassembled.

9.3 Miscellaneous Erecting Operations

9.31 The R-3293 General Use Assembly Bag is divided into three pockets and provided with straps for suspending it from ladders and scaffolds. It can be used for holding tools, small piece parts, bolts, etc., during assembly operations.

9.32 A carpenter's apron, which is either made or purchased locally, provides a convenient means of carrying nuts, bolts, washers, clips, etc., when performing erecting operations.

9.33 To minimize loss of small parts, such as screws, nuts, bolts, washers, etc., when removing or assembling, apparatus or equipment and which are not to be reused immediately, place them in a small box, paper or canvas bag or any other available container and secure it to the equipment from which the parts were removed.

→ Indicates new or changed information.

[Vertical line at side of paragraphs indicates requirements.

Assistant Manager
Common Installation Engineering

Reason for Reissue:

To remove index and renumber paragraphs
To remove R-3114 Plumb Bob information
To add Paragraph 6.3 and Figure 3