ASME Y14.44-2008

Reference Designations for Electrical and Electronics Parts and Equipment

Engineering Drawing and Related Documentation Practices

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME SETTING THE STANDARD

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ASME Y14.44, Reference Designations for Electrical and Electronics Parts and Equipment, was adopted on 22 July 2008 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, U.S. Army Research, Development and Engineering Center (ARDEC), ATTN: AMSRD-AAR-QES-E, Picatinny Arsenal, NJ 07806-5000. Copies of this document may be purchased from The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900, http://www.asme.org.

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Date of Issuance: November 21, 2008

The next edition of this Standard is scheduled for publication in 2013. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

Periodically certain actions of the ASME Y14 Committee may be published as Cases. Cases are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

CONTENTS

Foreword iv
Committee Roster v
Correspondence With the Y14 Committee vi

1 General 1

2 Unit Numbering Method 3

3 Location Numbering Method 11

4 Location Coding Method 13

5 Designation of Deposited Components on Hybrid Printed Circuits 17

6 Marking on Equipment 17

7 Class Designation Letters 19

Figures

1 Typical Basic Reference Designations in a Diagram 3
2 Socket Reference Designations and Markings 4
3 Reference Designation in a Typical Schematic Diagram 5
4 Connector Designations for Plug-In Items 6
5 Typical Connector and Interunit Cable Designation 7
6 Physical and Circuit Relationship of N-Designated Circuit Groups 7
7 Typical System Subdivision 9
8 A Typical Set 9
9 Identification of Subassemblies and Parts of Units 10
10 Identification of Items of Subassemblies 11
11 Application of Reference Designations to a Unit 11
12 Intermixture of Unit Numbering Method and Location Numbering Method in the Same Unit 12
13 Typical First-Level Coordinate Number Assignment 12
14 Use of Suffix Letter to Locate Surfaces 13
15 Location Numbering Applied at Several Subdivision Levels 14
16 Coordinate First-Level Breakdown 15
17 Sequential-Type, First-Level Breakdown 16
18 Location Coding of Multiple Levels of Equipment 16
19 Coding of Panels 17
20 Identifiable Rows and Columns 17
21 Designation of Deposited Components on Hybrid Printed Circuits 18

Nonmandatory Appendix

A Block Numbering Method 21

FOREWORD

This Standard establishes the requirements for the generation and application of reference designations for electrical and electronics parts and equipment. All information contained in this Standard was documented in IEEE Std 200 (ANSI Y32.16), which was previously withdrawn. Due to the need for this Standard in the industry, it was agreed that it should be reestablished by ASME and a new subcommittee (Subcommittee Y14.44) was formed to carry out the development of a new standard under the ASME Y14 series of engineering drawing and related documentation practices.

The following is a summary of the significant changes that were made to the previous IEEE Std 200 Standard and incorporated into this Standard:

(a) Reformatted document per the requirements contained in *The ASME Codes and Standards Writing Guide 2000*.

(b) Figure 8 (formerly, Fig. 3) was revised as follows: A7J2 and A9J2 were changed to reflect a male connector with the appropriate symbology per IEEE Std 315A. W2P1 and W3P1 were changed to reflect a female connector with the appropriate symbology per IEEE Std 315A.

(c) Revised Fig. 3 (formerly, Fig. 8) to reflect the appropriate symbology per IEEE Std 315A.

(d) Corrected location code and reference designation breakdown in Fig. 17.

Was: 12 D 5 B6 / Q3

Is: 12 D 6 B5 / Q3

(e) Deleted section 10.

(f) Deleted Appendix B.

Where this Standard is specified as a requirement in a document, its defined requirements are assumed to be consistent with the needs of the user. Therefore, each user provides appropriate interpretations, as the need arises, consistent with the environment in which it is applied.

The successful generation of this Standard is attributed to the subcommittee members and their respective companies and the department and agencies of the U.S. Government.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers, Secretary, Y14 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

This Standard was approved as an American National Standard on July 3, 2008.

ASME Y14 COMMITTEE
Engineering Drawing and Related Documentation Practices

(The following is the roster of the Committee at the time of approval of this Standard.)

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CORRESPONDENCE WITH THE Y14 COMMITTEE

General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by proposing revisions and attending Committee meetings. Correspondence should be addressed to:

Secretary, Y14 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Attending Committee Meetings. The Y14 Standards Committee regularly holds meetings or telephone conferences, which are open to the public. Persons wishing to attend any meeting or telephone conference should contact the Secretary of the Y14 Standards Committee or check the ASME Web site at http://cstools.asme.org.

REFERENCE DESIGNATIONS FOR ELECTRICAL AND ELECTRONICS PARTS AND EQUIPMENT

1 GENERAL

1.1 Scope

This Standard covers the formation and application of reference designations for electrical and electronics parts and equipment.

The reference designations of this Standard are intended for uniquely identifying and locating discrete items on diagrams and in a set; for correlating items in a set; graphic symbols on diagrams; and items in parts lists, circuit descriptions, and instructions.

This Standard includes three methods for forming and applying reference designations.

(a) the unit numbering method
(b) the location numbering method
(c) the location coding method

A complete reference designation may incorporate reference designations formed by the use of any of these methods at any level from basic parts to complete units.

The unit numbering method has a long history of satisfactory use in all types of electrical and electronics equipment. The location numbering method and location coding method have been developed to permit a rapid physical location of items in large, complicated equipment featuring multiple use of many identical or closely similar items. These methods shall be applied in such a way that duplicate complete reference designations do not occur in a piece of equipment or system.

Device function designations for power switchgear and industrial control use are not covered by this Standard.

1.2 Application

The reference designations of this Standard are for use on equipment and related diagrams, drawings, parts lists, and in manuals or similar publications. Reference designations are not intended to replace other identification numbers, such as drawing, part, type, or stock numbers. Additions or changes to an existing unit or set should follow the designation system originally used.

In this Standard, the unit is the highest level to which a reference designation is assigned.

1.3 References to This Standard

If this Standard is referenced in a contract or order, the following should be specified:

(a) title, number, and date.

(b) the reference documents that are to govern, where applicable (e.g., American National Standards or Military Standards). See para. 1.6.

(c) marking of reference designations on product (whether required or not). See section 6.

1.4 Changes in Reference Designation Class Letters

If changes in the state-of-the-art appear to make changed or new reference designation class letters necessary, provide the following information:

(a) item for which new designation is requested, type or class of item, and frequency of use (per drawing, per set, etc.)

(b) present reference designation used

(c) proposed reference designation

(d) reasons for recommending a change (supply source material, if feasible)

(e) graphic symbol

Address comments to The American Society of Mechanical Engineers, Secretary, Y14 Standards Committee, Three Park Ave., New York, NY 10016, and refer to this Standard.

1.5 Use of "Shall," "Should," and "May"

In this Standard, the word "shall" is to be understood as a requirement; the word "should" as a recommendation; and the word "may" as permissive, neither mandatory nor recommended.

1.6 Reference

The following revisions of American National Standards form a part of this Standard to the extent specified herein. A more recent revision may be used, provided there is no conflict with the text of this Standard. In the event of a conflict between the text of this Standard and the references cited herein, the text of this Standard shall take precedence.

IEEE Std 315-1975, Graphic Symbols for Electrical and Electronics Diagrams

Publisher: Institute of Electrical and Electronics Engineers (IEEE), 445 Hoes Lane, Piscataway, NJ 08855-4141

1.7 Definitions

accessory: a basic part, subassembly, or assembly designed for use in conjunction with or to supplement another assembly, unit, or set contributing to the effectiveness thereof without extending or varying the basic function of the assembly or set. An accessory may be used for testing, adjusting, or calibrating purposes. Typical examples are test instrument, recording camera for radar set, headphones, and emergency power supply.

assembly: a number of basic parts or subassemblies, or any combination thereof, joined together to perform a specific function. Typical examples are electric generator, audiofrequency amplifier, and power supply.

NOTES:
(1) The application, size, and construction of an item may be factors in determining whether an item is regarded as a unit, an assembly, a subassembly, or a basic part. A small electric motor might be considered as a part if it is not normally subject to disassembly.
(2) The distinction between an assembly and a subassembly is not always exact; an assembly in one instance may be a subassembly in another where it forms a portion of an assembly.

assembly, microelectronic device: an assembly of inseparable parts, circuits, or combination thereof. Typical examples are microcircuit, integrated circuit package, and micromodule.

attachment: a basic part, subassembly, or assembly designed for use in conjunction with another assembly, unit, or set, contributing to the effectiveness thereof by extending or varying the basic function of the assembly, unit, or set. A typical example is UHF converter for VHF receiver.

basic part: one piece or two or more pieces joined together, which are not normally subject to disassembly without destruction of designed use. Typical examples are electron tube, resistor, relay, power transformer, and microelectronic device.

functional designation: words, abbreviations, or meaningful numbers-letter combinations, usually derived from the function of an item (e.g., slew, yaw), used on drawings, instructional material, and equipment to identify an item in terms of its function. (A functional designation is not a reference designation nor a substitute for it.)

group: a collection of units, assemblies, or subassemblies that is a subdivision of a set or system, but that is not capable of performing a complete operational function. Typical examples are antenna group and indicator group.

microelectronic device: an item of inseparable parts and hybrid circuits usually produced by integrated circuit techniques. Typical examples are microcircuit, integrated circuit package, and micromodule.

reference designation: letters, numbers, or both used to identify and locate discrete units, portions thereof, and basic parts of a specific set. (A reference designation is not a letter symbol, abbreviation, or functional designation for an item.)

basic reference designation: the simplest form of a reference designation consisting only of a class letter portion and a number (namely, without mention of the item within which the reference-designated item is located).

complete reference designation: a reference designation that consists of a basic reference designation and, as prefixes, all the reference designations that apply to the subassemblies or assemblies within which the item is located, including those of the highest level needed to designate the item uniquely.

partial reference designation: a reference designation that consists of a basic reference designation and which may include, as prefixes, some but not all of the reference designations that apply to the subassemblies or assemblies within which the item is located.

NOTE: The reference designation for a unit consists of only a number.

relay: an electrically controlled (usually two-state) device that opens and closes electrical contacts to affect the operation of other devices in the same or another electric circuit.

set: a unit of units, necessary assemblies, subassemblies, and basic parts connected or associated together to perform an operational function. [("Set," as used to denote a collection of like parts, such as a tool set or a spare set) is not a part of this Standard.] Typical examples are search radar set, radio transmitting set, and sound measuring set; these include such parts, assemblies, and units as cables, microphone, and measuring instruments.

subassembly: two or more basic parts which form a portion of an assembly or a unit, replaceable as a whole, but having a part or parts which are individually replaceable. Typical examples are filter network and terminal board with mounted parts.

NOTES:
(1) The application, size, and construction of an item may be factors in determining whether an item is regarded as a unit, an assembly, a subassembly, or a basic part. A small electric motor might be considered as a part if it is not normally subject to disassembly.
(2) The distinction between an assembly and a subassembly is not always exact; an assembly in one instance may be a subassembly in another where it forms a portion of an assembly.

switch: a device for making, breaking, or changing the connections in an electric circuit.

NOTE: For the purpose of this Standard, a switch may be operated by manual, mechanical, hydraulic, thermal, barometric, or gravitational means, or by electromechanical means not falling within the definition of "relay."

system: a combination of two or more sets (generally physically separated when in operation) and such other units, assemblies, and basic parts necessary to perform

an operational function or functions. Typical examples are telephone carrier system, ground-controlled approach (GCA) electronic system, telemetering system, and facsimile transmission system.

unit: a major building block for a set or system, consisting of a combination of basic parts, subassemblies, and assemblies packaged together as a physically independent entity. Typical examples are radio receiver, radio transmitter, electronic power supply, and antenna.

NOTE: The application, size, and construction of an item may be factors in determining whether an item is regarded as a unit, an assembly, a subassembly, or a basic part. A small electric motor might be considered as a part if it is not normally subject to disassembly.

2 UNIT NUMBERING METHOD

2.1 Basic Reference Designations

A basic reference designation for an item (such as resistor, inductor, electron tube, or subassembly) shall consist of one or more letters identifying the class and a number (e.g., AR14, C3). In some cases a suffix letter may be added (e.g., C7A, C7B). All letters shall be uppercase. The designation shall be written with all characters the same size, on the same line, and without separation. The reference designation for a unit consists of only a number (see para. 2.2.2). The reference designation (generally the basic reference designation) may be used in a parts list in lieu of an item or find number.

2.1.1 Class Letter. The letters identifying the class of an item shall be selected from Section 22 of IEEE Std 315 (see also para. 2.1.8).

2.1.1.1 Special Class Letter Considerations. For reference designation assignment purposes

(a) the term "subassembly" as used herein shall apply equally to an assembly.

(b) a group of parts shall not be treated as a subassembly unless it is one or more of the following:

(1) a plug-in item

(2) a significant item covered by a separate schematic

(3) a multiple-application item

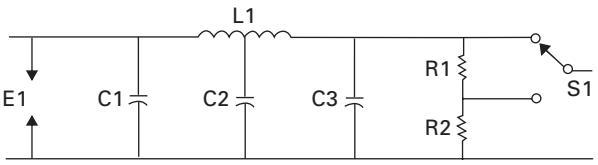
(4) likely to be handled as a replaceable item for maintenance purposes

See also para. 2.2.8.3.

2.1.2 Number. The number portion of the reference designation differentiates an item from all other items identified by the same class letter.

2.1.3 Sequential Number Assignment. Within each significant item (unit, assembly, subassembly, etc.), for the parts of each class, numbers shall be assigned sequentially on the schematic diagram in a systematic manner beginning with 1. Preferably start at the upper left of the schematic diagram and proceed from left to right and top to bottom for each successive portion of the circuit. Continue (preferably from left to right) until all parts of the circuit have been designated in order of input to output or functional sequence. If revisions require deletion or addition of items, the original items should not be renumbered to keep the series consecutive. Added items shall be assigned numbers following the highest number originally used. Numbers assigned to items that have been deleted shall not be reused.

Fig. 1 Typical Basic Reference Designations in a Diagram



NOTE: Minor changes, such as a change in characteristics of the same type of part (for example, substitution of a 470-Ω composition resistor for a 330-Ω wire-wound resistor) do not require a change in reference designation.

Figure 1 shows a typical application of basic reference designations on a schematic diagram.

2.1.4 Suffix Letter. A suffix letter, beginning with A, shall be added to the basic reference designation to identify each portion of a multiple-element part or similar item (such as a dual electron tube, multiple-contact relay, or multiple-unit capacitor) as follows:

(a) if differentiation is required for explanations in related text.

(b) if portions of the part are shown separated from each other on schematic diagrams.

(c) if it is necessary to identify elements and their terminals for wiring. For example, the parts of a dual electron tube would be designated V2A and V2B.

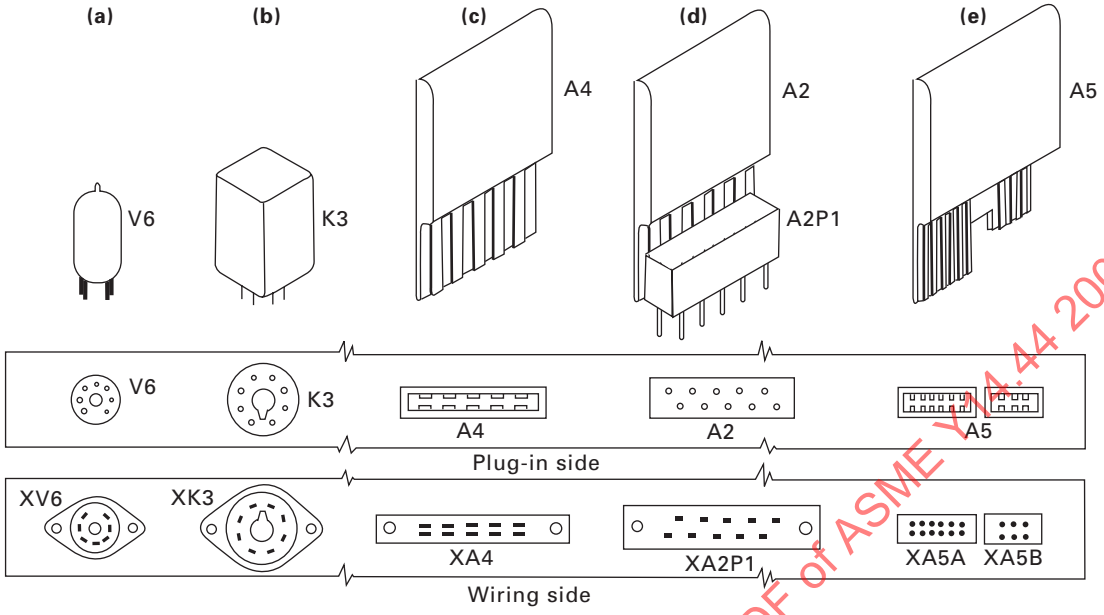
Suffix letters are also used to identify several separate connectors under the conditions stated in para. 2.1.5.3(e) [see Fig. 2, illustration (e)].

Suffix letters shall not be assigned to items above the lowest reference designation level.

2.1.5 Special Cases

2.1.5.1 Terminals. To identify terminals of parts (such as sockets, terminal boards, and transformers), the part reference designation shall be suffixed with a dash and the terminal identification. This principle may also be applied, by extension, to relays, key switches, and similar devices, provided the terminals of the devices have or may be assigned numeric identification. Thus, a pair of relay contacts connected to terminals 5 and 6 of relay K7 would be assigned the reference designation K7-5, 6. In the above cases, the reference designation class letter E shall be omitted. A typical application of the letter E is for the identification of isolated terminals

Fig. 2 Socket Reference Designations and Markings



used for wiring convenience. The class letter WT has been established to identify a tie point on a connection diagram. Terminal numbers, when used on diagrams, shall be placed in or adjacent to the symbol (see Fig. 3).

2.1.5.2 Sockets

2.1.5.2.1 Single-Item Mounting. A socket, fuse holder, or similar device that is always associated with a single particular part or subassembly (such as an electron tube, a fuse, or a printed circuit board with or without integral contacts or connectors) shall be identified by a composite reference designation consisting of the class letter X followed by the basic reference designation that identifies the mounted part. For example, the socket for electron tube V6 would have a basic reference designation of XV6; the only socket for subassembly A4 would have a basic reference designation of XA4 (see Fig. 2).

If the mounted item has two or more bases or connectors integral with the item, suffix letters shall be assigned to each base of the item (according to para. 2.1.4). The sockets should then be identified as indicated above. For example, if electron tube V3 has two bases, A and B, the sockets would be identified as XV3A and XV3B.

2.1.5.2.2 Multiple-Item Mounting. If several items taking the same class letter are mounted in one holder, the designation of this multiple-item mounting shall be derived from the designation of the lowest-numbered item mounted. For example, if fuses F1 and F2 are mounted in a dual fuse holder, the fuse holder shall be designated XF1.

2.1.5.3 Connectors. Connector reference designations shall be assigned in accordance with the following principles:

(a) The movable (less fixed) connector of a mating pair shall be designated P (see Fig. 4, connector P3 on A7 and connector P1 on W2).

(b) The stationary (more fixed) connector of a mating pair shall be designated J or X (see Fig. 4, connector XA7P3 on A9 and connector J2 on A7).

(c) A connector designated P on a flexible cable shall mate with a fixed connector designated J rather than X.

(d) If two cables are to be connected to each other, each of the mating cable connectors shall be designated P.

(e) A connector to mount an item, or affixed to the mounting for an item, shall be designated with an X prefix if its mate is directly affixed (not on flexible cable) to the mounted item [see Fig. 2, illustration (d)]. If there is more than one directly affixed connector on the mounted item, the designation of each of the mating mounting connectors shall consist of the following in the order listed (see Fig. 4, connector XA7P3):

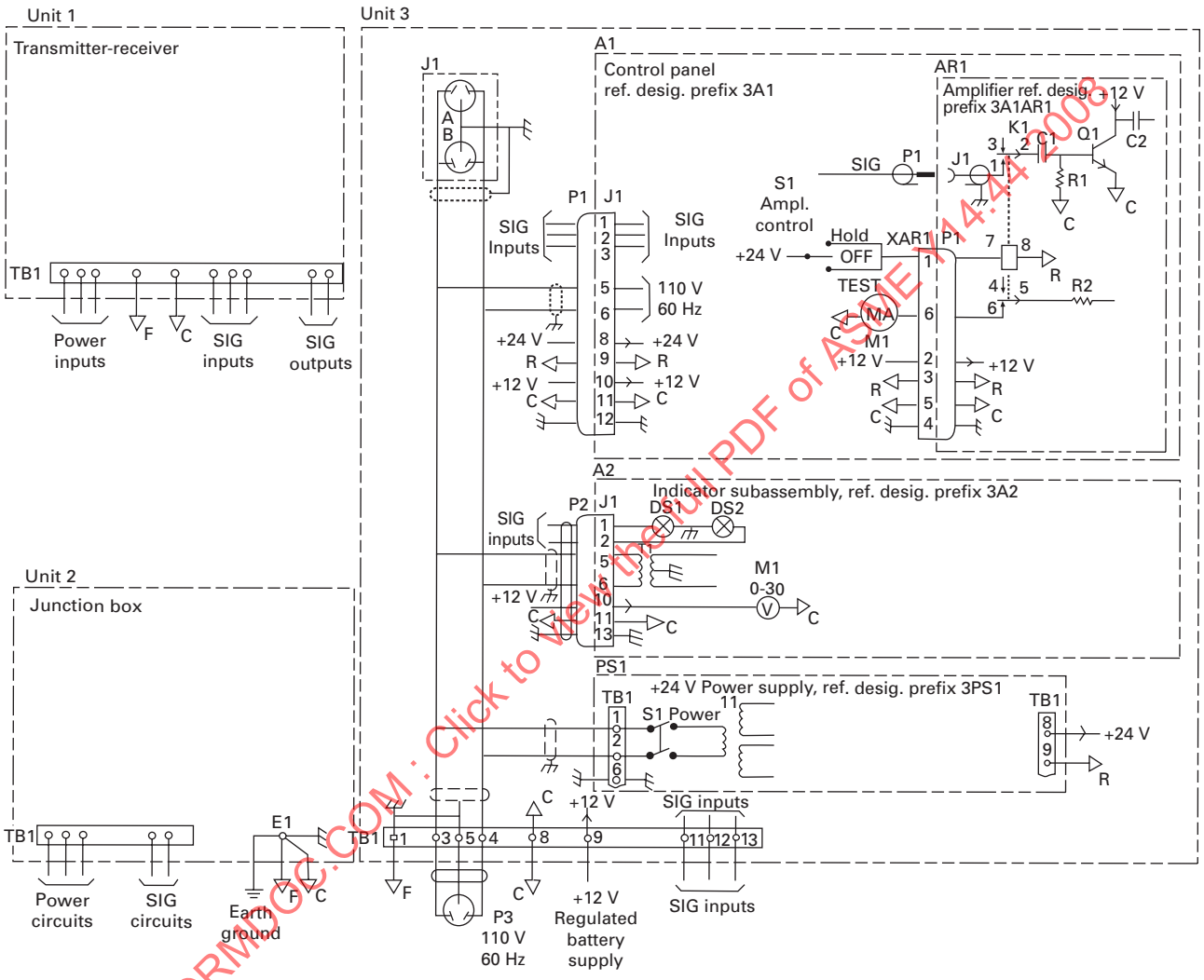
(1) the class code letter X

(2) the basic reference designation of the mounted item

(3) the basic reference designation of its mating connector on the mounted item

If the mounted item has more than one integral connector, as in Fig. 2, illustration (e), and requires more than one mounting connector, the basic reference designations of the mounting connectors shall have a letter suffix assigned in accordance with para. 2.1.5.2.1.

Fig. 3 Reference Designation in a Typical Schematic Diagram



GENERAL NOTES:

(a) Partial reference designations are shown for complete designation prefix with unit number and subassembly designations.

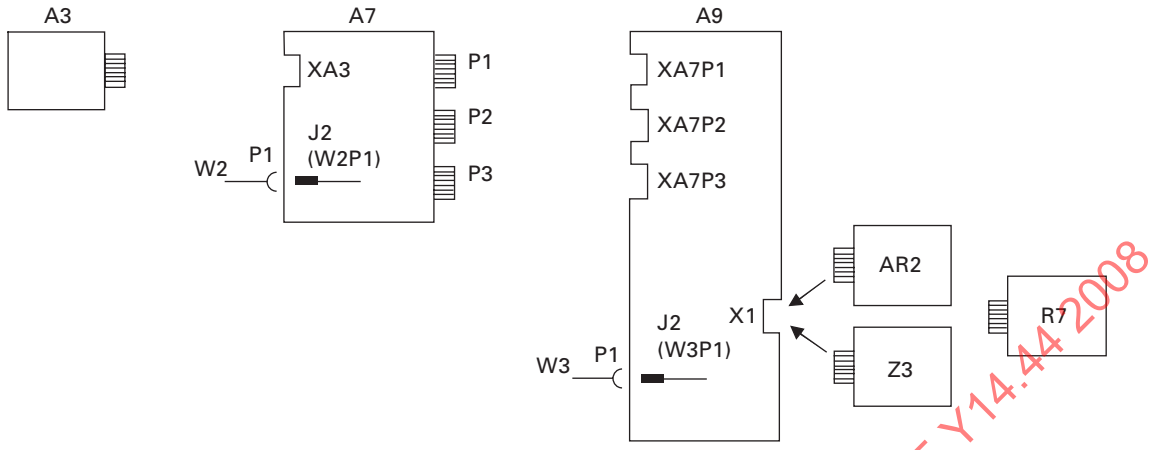
(b) Common connection circuit return symbol identifications are as follows:

R
+24 V Supply return

C
Signal ground

F
Frame ground

Fig. 4 Connector Designations for Plug-In Items



(f) If a cable has one end connector terminated and another end permanently connected (soldered, etc.) to the circuit wiring, the connector and, if necessary, the wire shall be assigned reference designations as individual parts of the circuits rather than as a separate subassembly.

(g) If more than one of the different class code items normally plug into one mounting connector, that connector shall be designated X and shall be followed by a sequentially assigned number. For example, the single connector mounting AR2, R7, or Z3 (depending upon circuit instructions) shall be designated X1 (see Fig. 4).

(h) If there are alternate connections within a given item (for example, for different supply voltages, low impedance, or a patch board), the numeric portion of the basic reference designation for the mating P and J items should be in a nonduplicating numerical sequence. Preferably avoid assigning the same number to the P and J parts of any mating combination of alternate connection connectors. Explain in the technical data, or by functional designations on the equipment, which connectors should be mated for a given operating condition.

(i) If there is an adapter located between other connecting devices, the adapter may be disregarded in assigning reference designations to the other connecting devices; however, the adapter shall be assigned a reference designation (e.g., CP2).

2.1.5.4 Supplementary Information. If both portions of a connector mating pair are not shown on a schematic diagram, the reference designation for the mating connector or plug-in item shall be indicated in parentheses adjacent to the connector shown.

EXAMPLES:

J1
(P1)

J3
(CP2)
(W4P1)

If one connector has as its mate any of the several other connectors, or if the item has multiple uses, a suitable functional designation may be shown in lieu of the reference designations of all of the mating connectors (see also para. 2.1.5.5).

2.1.5.5 Intersubassembly and Interunit Cable Connections. Each cable shall be identified by a unique reference designation on a diagram. A cable assembly having multiple uses should be identified by a part number or nomenclature, and this should be shown on diagrams near the reference designation.

In a complex set having a large number of interassembly and interunit connections, proper interconnection of items shall be expedited by assigning a unique identification to each mating pair of connectors in the set (if one or both are connected to a cable or flexible waveguide). On diagrams and in technical data, this unique mating pair identification shall be shown in parentheses after the basic reference designation for the connectors. The mating pair identification may be in the form of sequential numbers (preferable), functional designations if suitable, or other mutually agreed upon methods (see Fig. 5). Location code numbers may also serve this purpose in some cases (see paras. 4.9 and 4.10).

If a cable assembly normally will be made up in the field using bulk cable or using wire already installed in the structure housing the set, the connectors to be installed on the cable, if furnished, may have reference designations assigned as though these connectors were part of the equipment item to which the cable end will connect.

Fig. 5 Typical Connector and Interunit Cable Designation

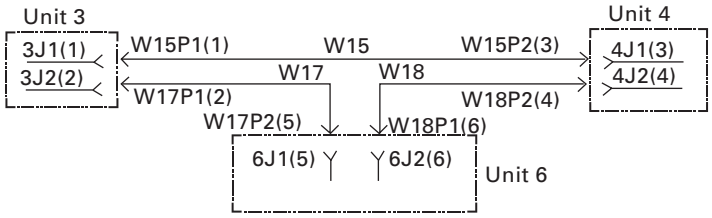
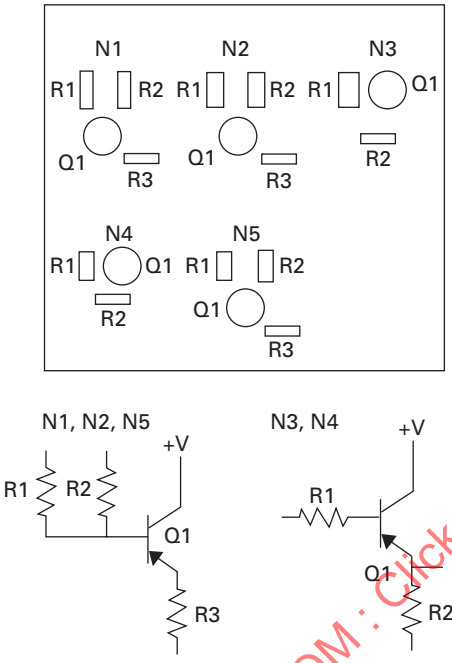


Fig. 6 Physical and Circuit Relationship of N-Designated Circuit Groups



2.1.5.6 Repeated-Use Circuits. Essentially similar repeated-use circuits should be identified by assigning the same basic reference designation to corresponding parts within each circuit. Circuit groups shall be distinguished from one another by assigning a separate N designation to each group within a given assembly. For example, N1C1, N2C1, and N3C1 identify corresponding items in each of three groups. On a schematic or other assembly documentation, N-designated circuits shall be clearly defined, with the complete reference designations shown for all separated items. If the physical assembly does not have all parts of each individual N-designated circuit contiguously arranged (namely, the parts are distributed over the assembly), either the complete reference designations shall be marked on the assembly or separate documentation shall clarify the locations of the circuit parts (see Fig. 6).

2.1.5.7 Selected and Matched Parts. Selected parts are parts whose values are selected to achieve optimum performance. The reference designation of a selected part shall be assigned from the series that applies to the subassembly of which it forms a part, whether or not the selection of the part value is based on its effect on a higher-level assembly.

Only one reference designation should be assigned to identify the selected part, even though several parts are supplied with the subassembly to permit selection of the proper value of one part to satisfy the requirement.

If more than one part is required to obtain the proper value (by parallel or series connection), each such part shall be assigned a suffix letter in accordance with para. 2.1.4.

This method also may be applied to a situation where matched parts within an assembly are treated as a single item.

2.1.6 Reference Designations for Relays

2.1.6.1 Class Letter. Relays as defined in para. 1.7 shall be assigned the class letter K.

2.1.6.2 Elements of Relays. If the individual elements of a relay must be identified, it shall be done by one of the following methods. (Method 1 is preferred for maintenance diagrams, while Methods 2 and 3 shall be limited to applications where terminal identification is unnecessary.) Only one method shall be used on any one diagram or set of diagrams.

(a) Method 1. The elements of the relay may be identified by suffixing the basic relay reference designation with a dash, followed by the assigned terminal designations for the elements, and separated by a comma (e.g., K7-5, 6).

(b) Method 2. If elements of a relay are shown separated on a drawing, they may be identified by adding a suffix letter (other than I or O) to the reference designation of the composite item. The suffix letters shall start with A (preferably beginning with the operating device) and run consecutively.

(c) Method 3. If relays or contactors have readily removable elements (such as coils or contact sets) that are subject to replacement in normal use, or if reference to individual elements is required for adequate operating or maintenance information, these elements shall be identified by suffixing the basic relay reference

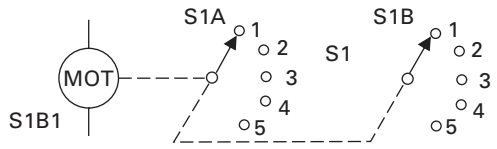
designation with a class letter and number characteristic of the element.

EXAMPLES:

Elements	Reference Designations
Relay or contactor	K3
Operating coil	K3L1
First set of contacts	K3S1
Second set of contacts	K3S2

2.1.7 Reference Designations for Switches

2.1.7.1 Class Letter. Switches, as defined in para. 1.7, shall be assigned the class letter S. Standard graphic symbols have been developed for certain types of switches operated by means other than manual (for example, interlock switch, liquid-level–actuated switch). In such cases, the class letter applies to the entire graphic symbol. If symbols required to fill a particular need have not been standardized, the proper graphic symbol for the actuating means shall be drawn adjacent to the switch symbol and identified by a suitable reference designation. An example is as follows:



Motor-Actuated Switch

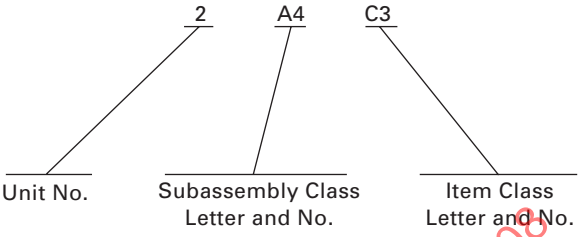
2.1.7.2 Elements of Switches. If the individual elements of a switch must be identified, it shall be done in a manner similar to that prescribed for relays in para. 2.1.6.2.

2.1.8 Actual Versus Intended Function. If a part serves a purpose other than its intended one, the function actually performed shall be represented by the graphic symbol used on the schematic diagram; the reference designation shall be chosen from Section 22 of IEEE Std 315 and shall be indicative of its physical characteristics. For example, a semiconductor diode used as a fuse would be represented by the graphic symbol for a fuse (actual function), but the reference designation would be D or CR (class of part). If a part has a dual function, the class letter for the principal physical characteristic of the part shall apply.

2.2 Complete Reference Designations

For a piece of equipment consisting of one simple assembly, such as a small volt-ohmmeter or a radio receiver, only a basic reference designation (see para. 1.7) is necessary to completely identify each part in the equipment.

For more complex sets involving two or more units or one or more levels of subassemblies, to completely identify an item within the set, the basic reference designation shall be prefixed with the designations assigned to the subassemblies and the unit incorporating the item. An example is as follows:



2A4C3 - Capacitor 3 of subassembly 4 in unit 2

Figure 7 shows a typical subdivision of a system. A typical set corresponding generally to set A of Fig. 7 is shown pictorially in Fig. 8. A schematic diagram incorporating typical complete reference designations assigned according to the principles of the unit numbering method is shown in Fig. 3.

2.2.1 Systems, Sets, and Groups. If reference designations are used to identify systems, sets, or groups, an explanation of the method used shall be furnished with the technical data supplied.

2.2.2 Units of a Set. Each unit within a set shall be assigned an identifying number. This number shall begin with 1 and preferably run consecutively for all units of the set. This number is the reference designation of the unit. If there is only one unit, the unit number may be omitted.

Units that are enclosed within the same cabinet, mounted in a common rack, or otherwise similarly joined with other units, subassemblies, etc., shall be treated as assemblies.

2.2.2.1 Units of a Group. Units of a group not covered by separate documentation shall be numbered as though they were units of the set of which they form a part without group identification.

Units of a group covered by separate documentation shall be treated as though they were units of a separate set.

2.2.2.2 Units Not Part of a Set. Units of a system that are not part of a set shall be assigned unit identifying numbers if covered by system technical data. Such units shall not be assigned unit identifying numbers if covered by separate technical data (e.g., existing designs, standard units, oscilloscopes).

2.2.3 Identification of Items in a Unit Which Are Not in a Subassembly.[1] The complete reference designation of an item that is in a unit, but not in a subassembly, consists of the unit number identifying the specific unit, followed by the basic reference designation for the item assigned according to para. 2.1. For typical examples, see 1R1, 2J1, and 3R1 of Fig. 9.

[1] For purposes of this Standard, the term "assembly" may be substituted for the term "subassembly" at any appropriate level.

Fig. 7 Typical System Subdivision

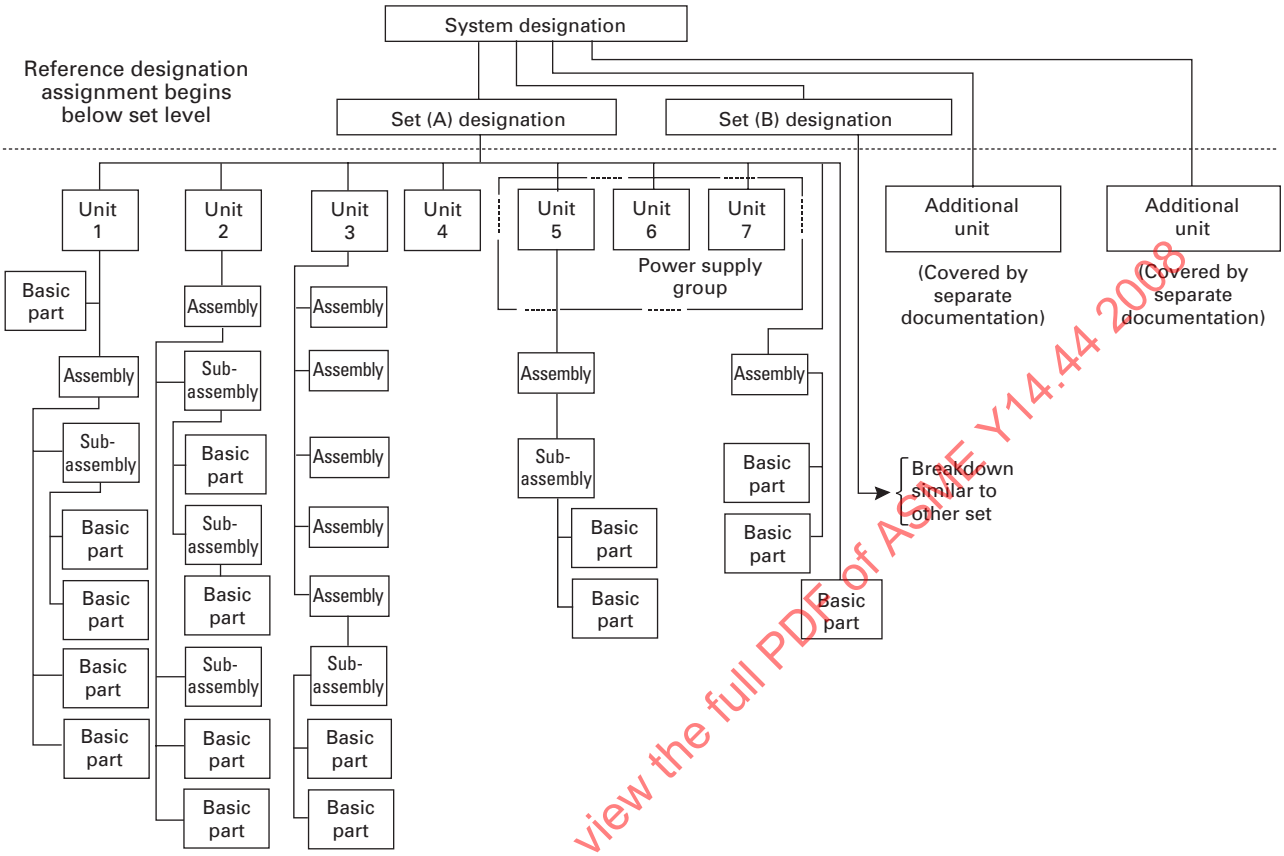


Fig. 8 A Typical Set

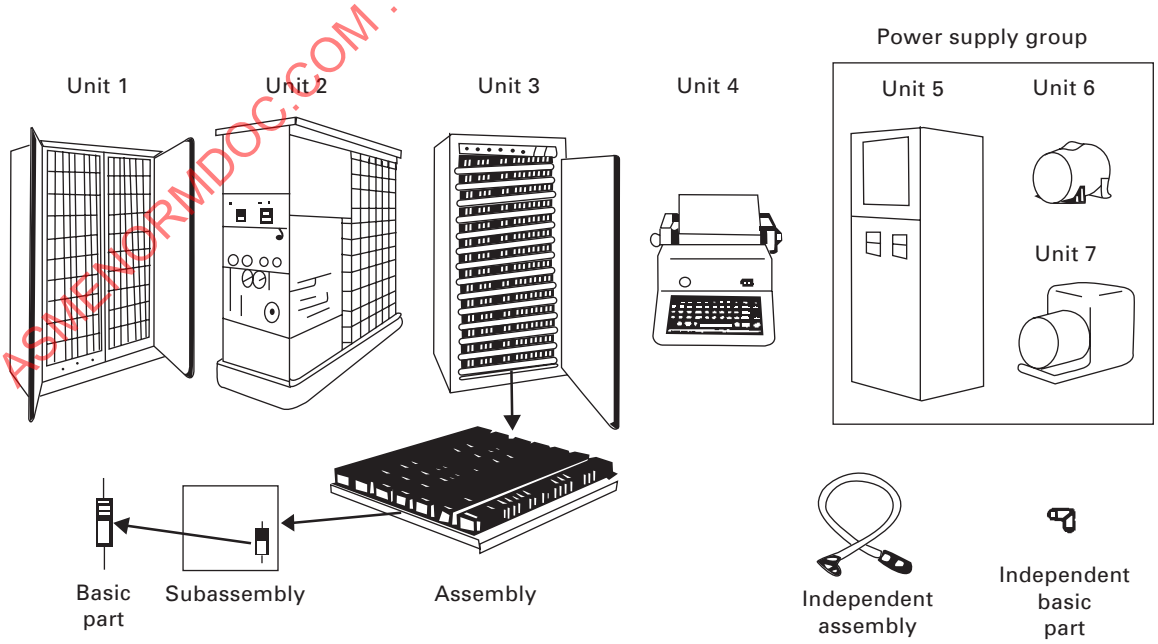
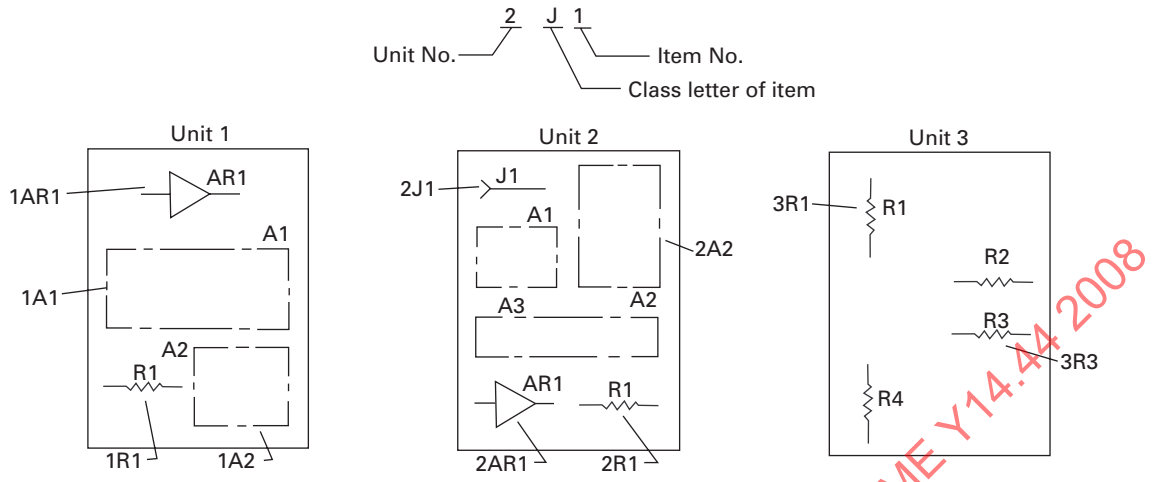


Fig. 9 Identification of Subassemblies and Parts of Units



2.2.4 Identification of Items of Subassemblies. The complete reference designation of an item (subassembly or basic part), which is a portion of a subassembly, consists of the following, in the order listed:

(a) the unit number identifying the unit incorporating the particular subassembly

(b) the basic reference designation for the particular subassembly

(c) the basic reference designation for the part located in the particular subassembly

For typical examples, see Fig. 10.

2.2.5 Expansion of Method. In a multiple-level unit, identify subassemblies of subassemblies as though they were parts of subassemblies. The reference designation method can be expanded as necessary to permit identification of items resulting from any degree of subdivision required for fabricating, stocking, or maintenance purposes. Every effort should be made, however, to keep the designations as short as practicable. Reference designations should not contain more than the five levels shown in the example of Fig. 11, unless required by the number of plug-in levels.

2.2.6 Subassemblies and Parts Not Integral With Units. Subassemblies (such as interconnecting cables) and parts that are not incorporated within units shall be identified by the use of sequential numbers in the same manner as those that are integral with units, except for the omission of the unit number (e.g., cable assembly W15 having a connector at each end, designated W15P1 and W15P2). See Fig. 5.

2.2.7 Partial Reference Designations. Partial or basic reference designations may be used in text, on diagrams, and on units if the appropriate unit and subassemblies are evident. For these applications, the reference designation used may be limited to a sufficient portion of the complete reference designation to identify the subassembly or part (e.g., AR1C1, A1AR1, A2, etc.) See Fig. 3. If parts composing more than one unit are scattered throughout a drawing, a sufficient portion of the complete reference designation shall be included to permit positive identification (e.g., A1S1 for switch 1 of assembly 1, where the unit number is evident and has been omitted). On diagrams and units, either complete designations (with respect to the highest level illustrated) or partial designations may be used. If partial reference designations are used, a note on the diagram shall be provided.

EXAMPLE:
REF DES PREFIX _____

The appropriate reference designation prefix shall be inserted in the blank space.

When more than one prefix is involved, a note having the intent of Fig. 3, Note (1), should be added to the drawing.

2.2.8 Special Cases

2.2.8.1 Identical Units. Different unit numbers shall be used to identify identical units of a set. Except for the unit number, however, the basic reference designation of all subassemblies and parts shall be the same for corresponding items of identical units. For example, if units 3 and 9 are identical, and a particular resistor of unit 3 is designated 3R10, the corresponding resistor of unit 9 shall be 9R10.

2.2.8.2 Identical Assemblies and Subassemblies. Different complete reference designations shall be used to identify the following:

(a) identical assembles in a unit or set

(b) identical subassemblies that are part of higher-level subassemblies

The basic reference designations assigned to the parts within the subassemblies, however, shall correspond in

Fig. 10 Identification of Items of Subassemblies

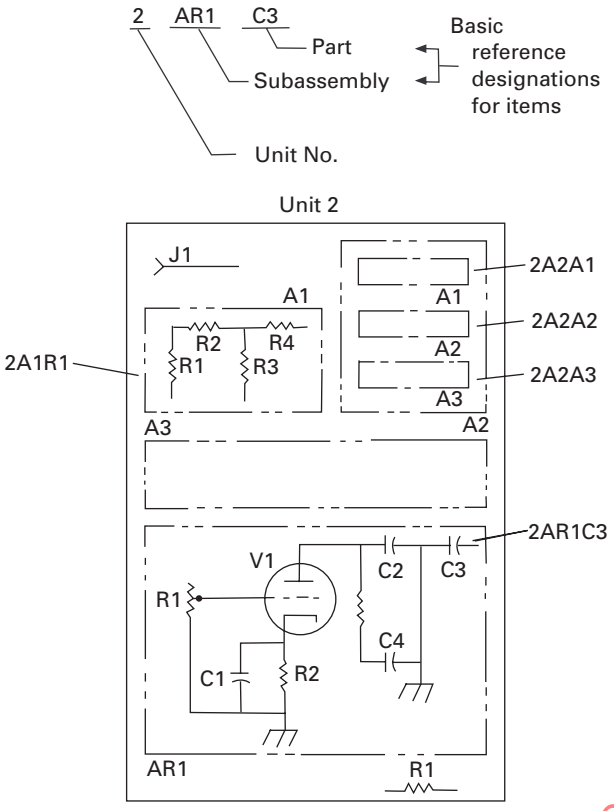
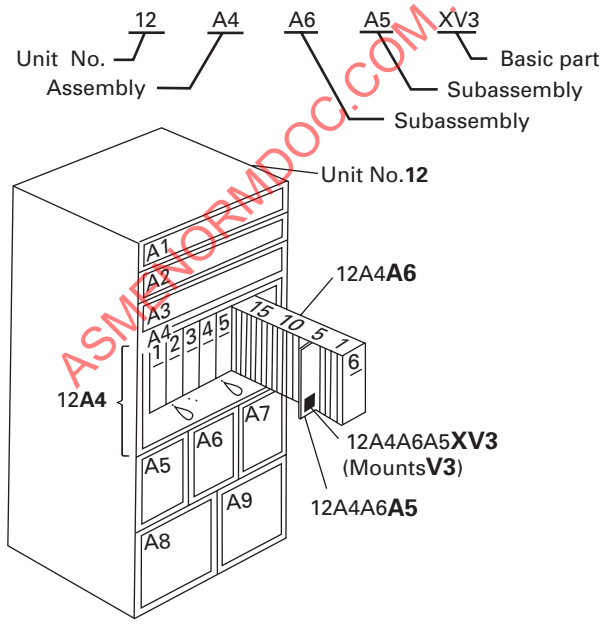


Fig. 11 Application of Reference Designations to a Unit



GENERAL NOTE: Basic reference designations are shown in bold characters for explanation only.

all of the identical, multiple-use items. For example, if assembly 3 of unit 6 (designated 6A3) and assembly 4 of unit 8 (designated 8A4) are identical, and a particular capacitor in 6A3 is designated 6A3C11, the corresponding capacitor in 8A4 shall be 8A4C11.

2.2.8.3 Inseparable Subassemblies, Modular Assemblies, Printed Circuit Boards, and Integrated Circuit Packages. Potted, embedded, riveted, or hermetically sealed subassemblies, modular assemblies, printed circuit boards, integrated circuit packages, and similar items that ordinarily are replaced as a single item of supply shall be treated as parts. Reference designations shall be assigned to identify the items (elements) within such subassemblies if reference to individual items (elements) is required for adequate operation or maintenance information.

3 LOCATION NUMBERING METHOD

3.1 General

The location numbering method of assigning reference designations is an adaptation of the unit numbering method (section 2) wherein the number portion is based on the physical location of the item in the unit, assembly, or subassembly, and the letter N is used to identify areas that are not assemblies. Either of the two methods of assigning numbers, sequential or coordinate, may be used at any equipment level based on equipment configuration. In either case, the location number shall start with the unit number.

3.2 Sequential Numbering

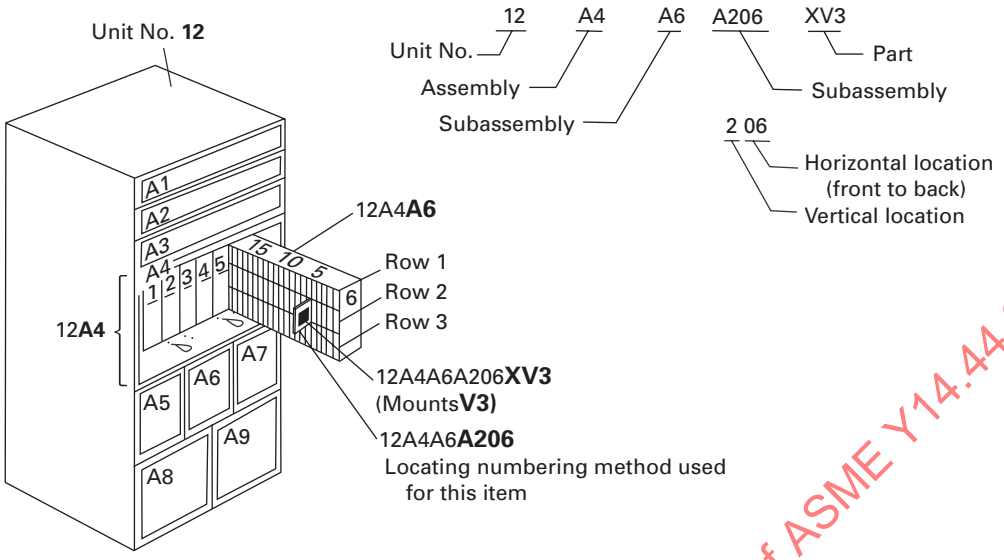
Sequential numbers shall be assigned to recognizable areas, assemblies, subassemblies, or parts within units, assemblies, or subassemblies. The sequence shall start with 1 and shall be assigned in accordance with para. 3.4. Numbers may be assigned to (or reserved for) unused areas that are suitable for future expansion. Figure 12 illustrates a typical sequential number assignment.

3.3 Coordinate Numbering

3.3.1 Coordinate Increments. Any suitable increment may be used (based on equipment configuration) to determine coordinate numbers of rows and columns, provided the increment is small enough to provide a zone that will give unique identification to the smallest designated item. For a given item, if the zone identification in any one direction is not required, it shall be numbered according to para. 3.4.

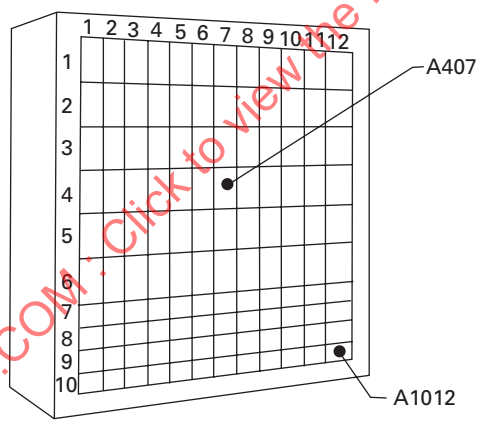
3.3.2 Coordinate Numbers. The number portion of the reference designation is determined by the coordinates of the upper left-hand corner of the zone (row and column) in which the designated item appears. If more than one digit is required for zone identifications in the horizontal direction, all zones in that direction shall have

Fig. 12 Intermixture of Unit Numbering Method and Location Numbering Method in the Same Unit

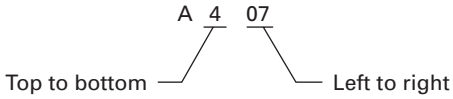


GENERAL NOTE: Basic reference designations are shown in bold characters for explanation only.

Fig. 13 Typical First-Level Coordinate Number Assignment



the same number of digits (e.g., the first zone of a group of 153 from left to right would be identified as 001). When using the coordinate number in text or on drawings, the number of the increment defining the vertical position (top to bottom) shall be given first, and then the number of the horizontal increment (left to right). For example:



See Fig. 13 for further illustration of this principle.

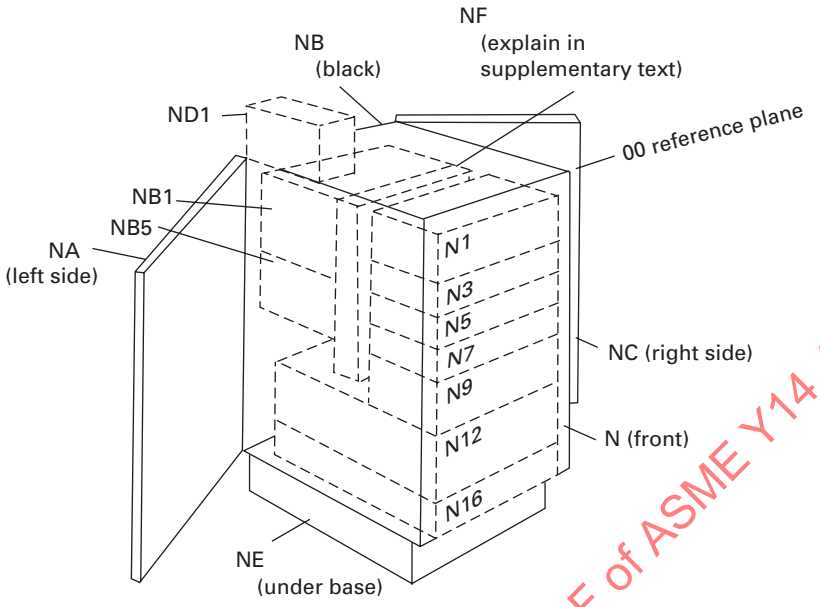
3.4 Number Assignment

Numbers shall be assigned from top to bottom, left to right, and front to back from the normal operating position of the item (or from the maintenance position for an otherwise inaccessible object). This applies whether numbers are applied to rows and columns or to recognizable areas or assemblies. The location of any subportion should be made within a plane (two directions).

3.5 Area Identification

Figure 13 shows an item that is suitable for coordinate-type, first-level breakdown. Figure 14 shows an item having areas suitable for sequential-type, first-level breakdown, and makes use of class letter suffixes to identify areas. The following suffix letters are to be used with the letter A or N to provide this identification. The N designation shall not be used for the location of assemblies.

Fig. 14 Use of Suffix Letter to Locate Surfaces



Suffix Letter	Location of Areas
None	Front, operating, or instrument side
A	Left — determined when viewed from operating or instrument side
B	Back — determined when viewed from operating or instrument side
C	Right — determined when viewed from operating or instrument side
D	Above 00 reference line (see Fig. 14)
E	Under bottom of unit
F	Other — to be explained in unit data

For an illustration of the application of these principles to more complex equipment, see Fig. 15.

3.6 Location Assignment Drawings

When equipment configuration prevents assignment of location numbers in a readily apparent manner, equipment outline drawings, showing the assignment pattern, shall be included in the technical data supplied with the equipment.

3.7 Intermixing of Numbering Methods

The rules given in paras. 3.1 through 3.6 apply to any equipment level except the unit, to which the rules of para. 2.2.2 apply. However, if the equipment configuration does not lend itself to location number assignments at any level, simple reference designations, as covered in section 2, may be used at that level.

3.8 Reuse of Numbers of Deleted Parts

In those instances where location numbering has been applied, the requirement of para. 2.1.3 that "numbers assigned to items that have been deleted shall not be reused" does not apply. In such cases, it is necessary to provide a record of deleted items by means of technical data supplied with the equipment.

3.9 Marking on Equipment

Equipment shall be marked in accordance with section 6, except that location numbers shall be used in lieu of reference designations, as applicable.

4 LOCATION CODING METHOD

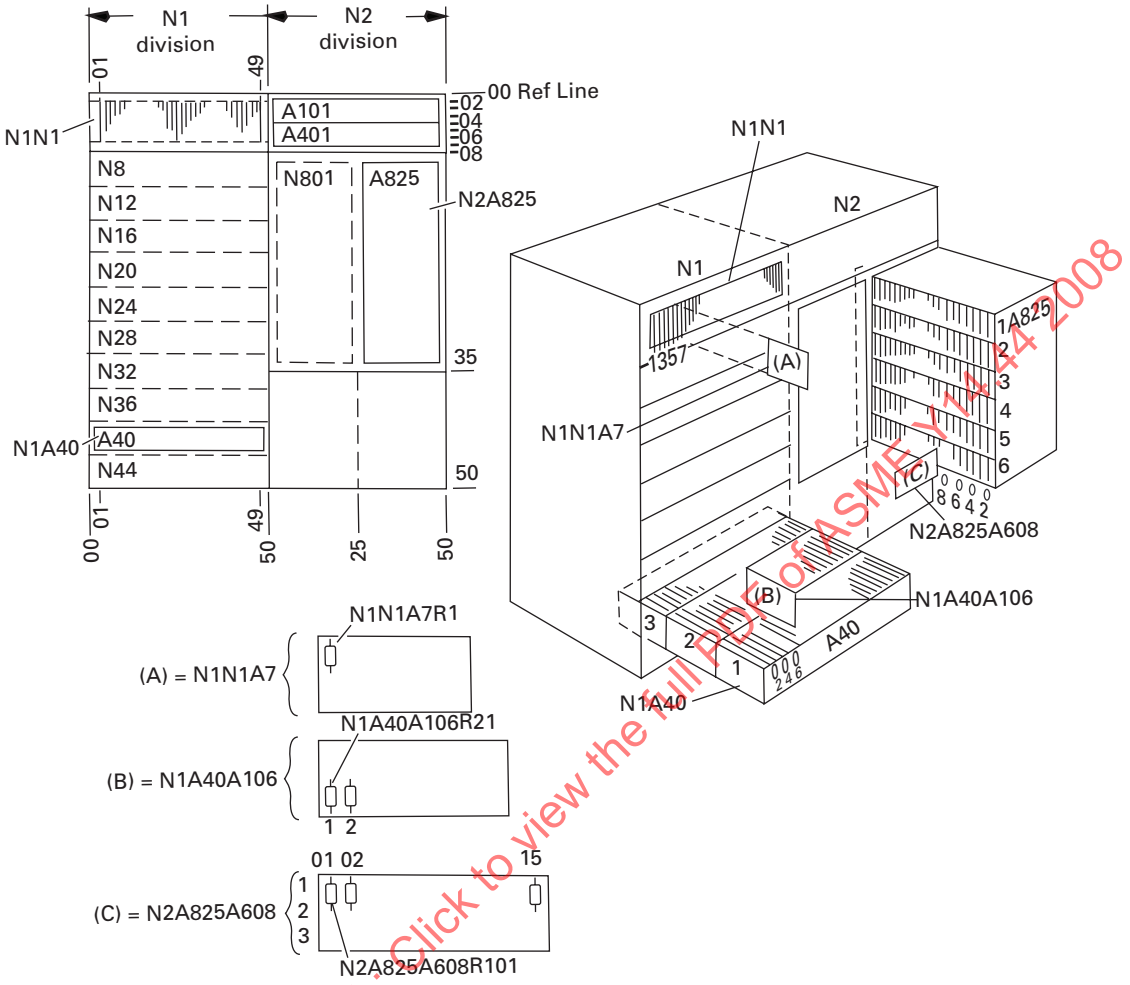
4.1 General

The location coding method of assigning a code that serves as a reference designation is a form of the location numbering method (see section 3) in which letters, as well as numbers, are used to identify items and to specify their physical location in the equipment. Either of the two procedures for assigning codes, sequential or coordinate, may be used at any equipment level, based on equipment configuration. In either case, the code shall start with the unit number, which is determined in accordance with para. 2.2.2.

4.2 Sequential Coding

Sequential numbers or letters shall be assigned to recognizable areas, assemblies, subassemblies, or parts within units, assemblies, or subassemblies. The sequence within each level shall start with 1 or A, and shall be assigned in accordance with para. 4.3.3. Letters and numbers shall normally be assigned to alternate levels of the equipment; numbers to the odd levels are first (unit level), third, fifth, etc.; letters to the even levels are second, fourth, sixth, etc.

Fig. 15 Location Numbering Applied at Several Subdivision Levels

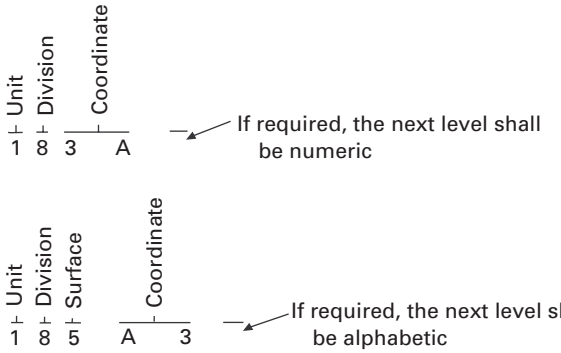


4.3 Coordinate Coding

4.3.1 Coordinate Increments. Any suitable increment may be used (based on equipment configuration) to determine coordinate coding of rows and columns, if the increment in either direction is no larger than the narrowest row or column.

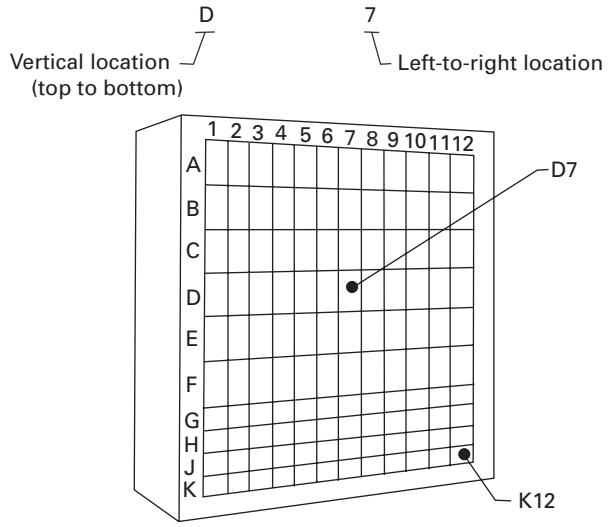
4.3.2 Coordinate Codes. The code is determined by the coordinates of the upper left-hand corner of the zone (row and column) in which the item appears. Numbers shall be used in one direction (vertical or horizontal) and letters shall be used in the other. If zone identification in one direction is not required for a specific item, it shall be numbered according to para. 4.2.

When a coordinate code is used at any level of the equipment, both a number and a letter are required to locate an item. If this occurs at an even level of the equipment, the letter portion is written first. If it occurs at an odd level, the number portion is written first. In order to maintain the sequence outlined in para. 4.2, the coordinate designation shall be considered to be two levels of the equipment so that the succeeding level will be a letter or number, as appropriate. Examples are as follows:



4.3.3 Number and Letter Assignment. Numbers and letters shall be assigned from left to right, top to bottom (or, optionally, bottom to top), front to back from the normal operating position of the item, or from the maintenance position if the item cannot be maintained from

Fig. 16 Coordinate First-Level Breakdown



the operating position. This applies whether numbers or letters, or both, are applied to rows and columns or to recognizable areas or assemblies. For the application of either method, it is recommended that the location coding of any subportion be made within a plane (two directions).

4.4 Additional Rules

(a) The letters I, O, and Q shall not be used in the location coding method.

(b) The location code shall be applied in a manner that limits the number of characters of the code, consistent with clarity and ease of interpretation.

(c) The location code shall be applied to recognizable portions, subportions, assemblies, etc., consistent with equipment design (namely, from the largest division down to the smallest subdivision).

4.5 Area Identification

Figure 16 illustrates an item that is suitable for coordinate-type, first-level breakdown. Figure 17 illustrates an item having areas suitable for sequential-type, first-level breakdown. Figure 18 shows the application of location coding to multiple levels of equipment. Figure 19 shows the method of numbering surfaces within a division (cabinet-type equipment). If the item is a unit, the surface shall be lettered correspondingly.

4.6 Location Drawing

Drawings showing code assignments shall be provided as part of the technical data supplied with the equipment.

4.7 Intermixing of Methods

The foregoing rules apply at any equipment level. However, if a portion of the equipment does not lend itself to location code assignment, the location numbering method, covered in section 3, or the unit numbering method, covered in section 2, may be used where suitable. When the location coding method is mixed with the methods using reference designations (containing class letters), a slash (solidus) shall be used between the reference designation and the location code. An example is as follows:

Location code			Reference designation
Unit	Division	Surface	
1	A	3	/ Part S2

4.8 Reuse of Locations

Where geographic patterns are apparent, coding shall be assigned to unoccupied mounting positions. Revised or new items placed in a previously occupied position shall use the code assigned to that location. It then becomes necessary to keep a record of deleted items by means of technical data supplied with the equipment.

4.9 Partial Location Codes

Partial location codes may be used on drawings and diagrams when the omitted portions are evident. When parts composing a subassembly are scattered throughout a drawing, a sufficient portion of the complete location code shall be included to permit positive identification. When partial location codes are used, a clarifying note shall be used to specify the omitted codes.

EXAMPLE:
LCTN CODE PREFIX _____

If partial location codes are used on only a portion of the drawing, that portion shall be enclosed by a suitable line, and the location code of the higher-level subportion conspicuously marked.

4.10 Connectors and Sockets

All plug-in items shall maintain unity of connection by having the same code on both the plug-in position and the wiring surface for that position.

4.11 Levels With Adjacent Letters or Numbers

If an equipment configuration (because of repeated use of subassemblies) is such that two numbers or two letters are assigned to adjacent levels, they shall be separated by a hyphen.

4.12 Rows and Columns

Rows and columns of items that do not conform exactly to a coordinate grid shall also have letters assigned to the rows and numbers assigned to the columns, or vice versa, if the rows or columns can be identified. Examples are shown in Fig. 20.

Fig. 17 Sequential-Type, First-Level Breakdown

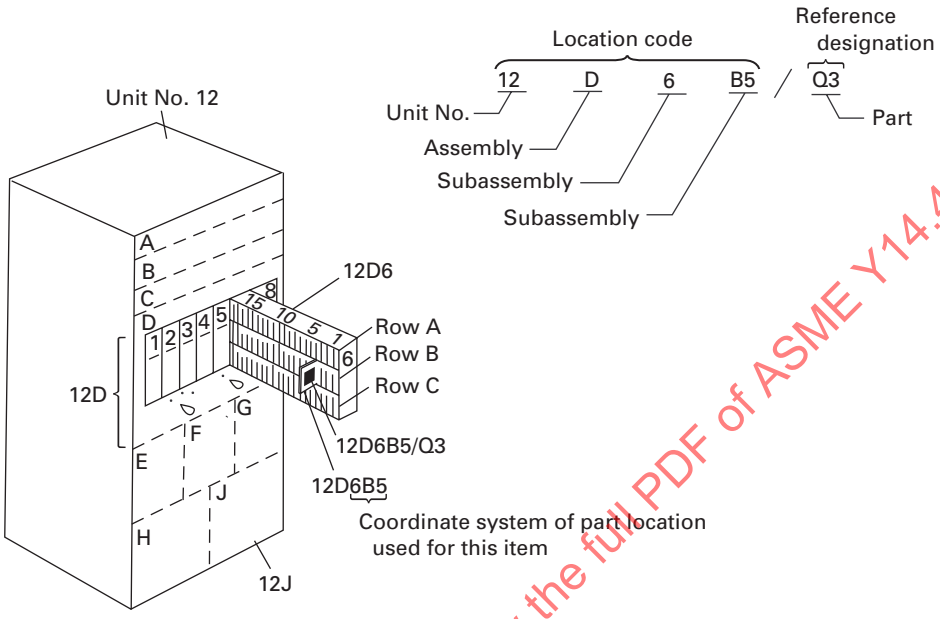


Fig. 18 Location Coding of Multiple Levels of Equipment

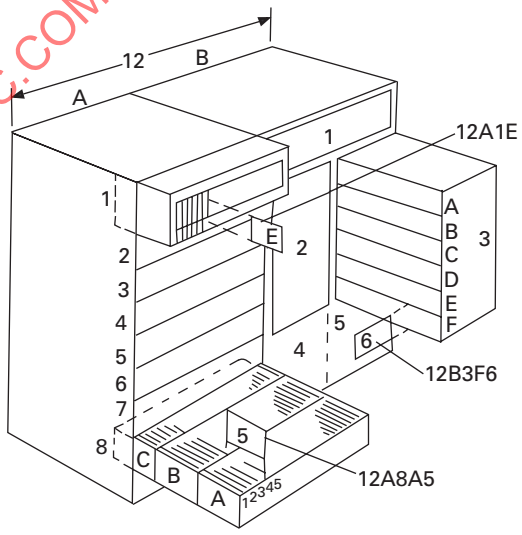


Fig. 19 Coding of Panels

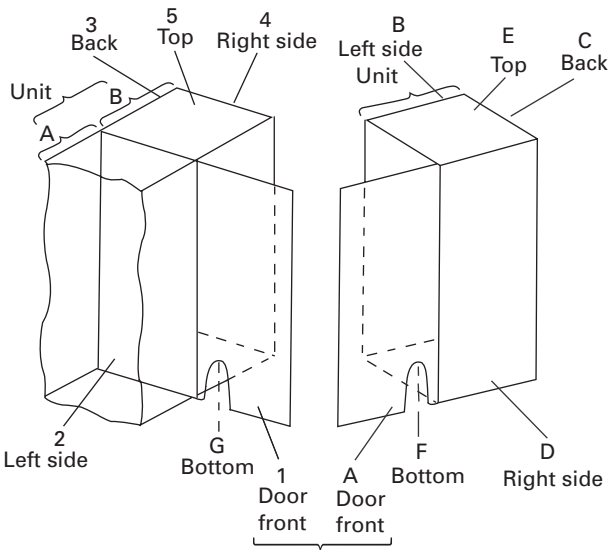
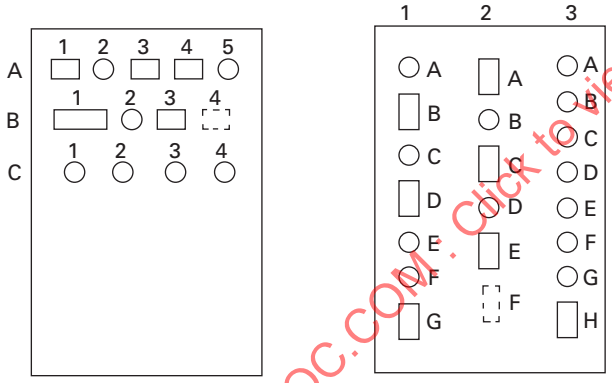


Fig. 20 Identifiable Rows and Columns



4.13 Marking on Equipment

Equipment shall be marked in accordance with section 6, except that location codes shall be used in lieu of reference designations, as applicable.

5 DESIGNATION OF DEPOSITED COMPONENTS ON HYBRID PRINTED CIRCUITS

If it is necessary to differentiate parts (e.g., for adequate operation or maintenance information) that are deposited upon and discrete parts attached to substrates that comprise a hybrid printed circuit assembly, the following designation method shall be used:

(a) The completely fabricated substrate (with deposited components thereon) shall be considered as an inseparable item, class letter U.

(b) Any assembly of a substrate with added discrete parts shall be considered a separable item, class letter A (not a U) for reference designation purposes.

(c) Reference designation serial numbers shall be assigned on the basis of the A (assembly) schematic without consideration of the substrate U status. This will result in the deposited and the discrete item not being distinguished by a serial number assignment.

(d) For purposes of identification of deposited components, they shall be considered as part of the substrate on which they are deposited. The substrate would normally be given the designation U1. Thus, the deposited components would be designated, for example, as U1R1, and U1R3 through U1R7. See Fig. 21, illustrations (a) and (b).

(e) The discrete components added to the substrate would be designated, for example, as R2, C1 through C3, D1, Q1, and Q2. See Fig. 21, illustrations (a) and (b).

6 MARKING ON EQUIPMENT

6.1 Marking Requirements for Reference Designations

Equipment shall be permanently and legibly marked with the reference designation for each subassembly and part, except in the following cases:

(a) where space limitations preclude such marking

(b) when the customer specifically requires that markings be omitted

(c) where it is customary in industry to omit markings on specific nonmilitary products, in which case reference designation markings shall be optional; this exception does not apply to military procurements invoking this Standard

As an alternative in the case of exception noted in para. 6.1(a), diagrams showing the location of parts or subassemblies should be placed on the subassembly or unit, respectively. The diagrams should be placed where they will be visible when the parts or assemblies are viewed. If the equipment is not completely marked, or if diagrams are not placed on the unit for any reason, parts location diagrams shall be included in the maintenance data for the set.

6.2 Location of Markings

Reference designations shall be located adjacent to each subassembly or part, and shall be marked on the chassis, back of the front panel, on partitions, on insulating mounting strips, etc., as appropriate. Reference designations shall not be marked on parts and subassemblies that are subject to replacement if other means are feasible (this does not preclude marking for parts within such subassemblies). The reference designations shall be marked in such a position as to physically locate the parts and yet be readily visible for purposes of maintenance without removal of the part or other