4.1 SCOPE.

4.1.1 Purpose. This section defines and illustrates the types of engineering drawings in accordance with ASME Y14.24, normally prepared for end product definition. Sample drawings are shown in **Metric** or **Decimal Inch** dimensions as determined by individual contract.

4.2 APPLICABLE DOCUMENTS. Note: DoD Policy Memo 05-3 "Elimination of Waivers to Cite Military Specifications and Standards in Solicitation and Contracts" has eliminated the need for waivers to use MIL-SPECS and MIL-STDS on DoD contracts. (See PREFACE 1, Section 2)

DOD-D-1000	Drawing, Engineering and Associated Lists (Supsd by: MIL-DTL-31000)
MIL-C-28809	Circuit Card Assemblies, Rigid, Flexible and Rigid-Flex (CNCLD: No S/S)
MIL-DTL-31000	Detail Specification Technical Data Packages (Supersedes: DOD-D-1000 and MIL-T-47500)
MIL-T-47500	Technical Data Package, General Specification for (Supsd by: MIL-DTL-31000)
MIL-PRF-55110G	Printed Wiring Boards, Single, Double and Multilayer (Supsd by MIL-PRF-31032A & Suppl 1)
MIL-PRF-31032A & Suppl 1	Printed Circuit Board/Printed Wiring Board, General Specification for
MIL-STD-15-2	Electrical Wiring Equipment Symbols For Ship's Plans (CNCLD: No S/S)
MIL-STD-17/1	Mechanical Symbols (Non-Aerospace) (CNCLD: Refer to: ASTM F 1000, ASTM F 856, ASME Y32.2.6)
MIL-STD-17/2	Mechanical Symbols For Aeronautical, Aerospace & Spacecraft Use. Part 2 (CNCLD: No S/S)
MIL-STD-34	Preparation of Drawings for Optical Elements & Optical System (CNCLD Supsd by: ASME Y14.19)
MIL-STD-100	Engineering Drawing Practices (CNCLD Supsd by: ASME Y14.100 & Appendices, Y14.24, Y14.34M & Y14.35M)
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-883	Test Methods and Procedures for Microelectronics
MIL-STD-1285	Marking of Electrical and Electronic Parts
MIL-STD-1306	Fluerics Terminology & Symbols (CNCLD: No S/S)
MIL-STD-2118	Flexible & Rigid-Flex Printed-Wiring for Electronic Equipment, Design Requirements (CNCLD: No S/S)
MIL-HDBK-780	Standardized Military Drawings
MIL-HDBK-965	Parts Control Program (CNCLD: No S/S)
MIL-BUL-103	List of Standardized Military Drawings (SMD's)
NAS 944	Symbols For Hydraulic Test Equipment Drafting
ASME Y14.3	Multiview & Sectional View Drawings

4.2 APPLICABLE DOCUMENTS. (Continued)

ASME Y14.5M	Dimensioning & Tolerancing
ANSI Y14.15	Electrical & Electronic Diagrams (CNCLD: No S/S)
ASME Y14.18M	Drawings for Optical Parts (CNCLD: No S/S)
ASME Y14.24	Types and Applications of Engineering Drawings
ASME Y14.34M	Parts Lists, Data Lists, Index Lists & Indentured Lists
ASME Y14.100	Engineering Drawing Practices
ANSI Y32.4	Graphic Symbols for Plumbing (INACTIVE: No S/S)
ANSI/IEEE Y32.9	Graphic Symbols for Electric & Layout Drawings Used In Architectural & Building Construction
ASME Y32.10	Graphic Symbols For Fluid Power Diagrams (INACTIVE: No S/S)
ANSI/IEEE Std 91 /91A	Graphic Symbols For Logic Diagrams
ANSI/IEEE Std 200	Reference Designations For Electrical & Electronic Parts & Equipment.
ANSI/IEEE Std 315 & Suppl 315A	Graphic Symbols For Electrical & Electronic Diagrams
ANSI/IEEE Std 991	Preparation of Logic Circuit Diagrams
ANSI/IPC-T-50	Terms & Definitions For Interconnecting and Packaging Electronic Circuits
ANSI/IPC-D-275	Rigid Printed Boards and Rigid Printed Assemblies (Supersedes: MIL-STD-275) (CNCLD Supsd by: IPC-2221 and IPC-2222)
ANSI/IPC-D-350	Printed Board Description in Digital Form
IPC-D-310	Guidelines for Phototool Generation and Measurement Techniques
IPC -D-325	Documentation Requirements for Printed Boards
IPC-DW-425	Design & End Product Requirements for Discrete Wiring Boards
IPC-2221A	Generic Standard on Printed Board Design
IPC-2222	Sectional Design Standard for Rigid Organic Printed Boards
SAE AS1290	Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems

4.3 DEFINITIONS. Terms are defined in Section 25.

4.4. GENERAL DRAWING CONTROL REQUIREMENTS.

4.4.1 Drawing Control & Approvals. Drawing control and approval signature requirements are specified in corporate or plant procedures, by a contractual requirement, or as directed by the program manager's office.

4.4.2 Drawing Format. All drawings shall be prepared on reproducible material using company format with company code identification and drawing numbers, unless otherwise specified by contract.

4.4.3 Drawing Requirements. Contracts normally specify when drawings and associated lists are to be prepared to ASME Y14.100 for basic commercial practices. When DoD activities and associated contractors require specifications and standards that exceed basic commercial applications, Appendices B through E in ASME Y14.100 are also cited for those DoD requirements. The current document for specifying drawings as Technical Data Package (TDP) Elements is MIL-DTL-31000, (formerly MIL-D-1000 Levels or MIL-T-47500 Elements) and citing, the entire or in part, the Appendices B through E of ASME Y14.100-2004. The minimum requirements for the different ELEMENTS are specified in SECTION 2 herein.

4.5 ENGINEERING DRAWINGS.

4.5.1 Engineering Drawings. Engineering drawings are documents prepared digitally or on reproducible material for presenting graphical and/or textual information, or the combination of both for the purpose of describing the physical and functional requirements of an end-product.

4.5.2 Types of Engineering Drawings. Often, several types of engineering drawings together with appropriate associated lists are needed to completely define the end-product requirements of an item. The number and types of engineering drawings and associated lists should be kept to a minimum to adequately convey the information needed. However, as the complexity of the item increases, different types of engineering drawings may be required to provide additional engineering description and controls. In addition, ancillary (formerly special purpose) drawings, Book-Form, Wiring List, Numerical Control, Optical, Wiring Harness, Processes, Methods, Heat Treatment, Protective Finishes or Special Painting may be required for management control, logistic purposes, configuration management, manufacturing aids, etc. as required by the procuring activity, contract or purchase order. The following is a listing of types of engineering drawings:

a. Ancillary Drawings
b. Layout Drawing
c. Detailed Drawing
d. Assembly Drawing
e. Modifying Drawing: Altered Item and Selected Item Drawings, and Modification Drawings
f. Arrangement Drawing
g. Installation Drawing
h. Control drawing: Procurement Control Drawing, Vendor Item Control Drawing (VICD) (formerly Specification Control Drawing (SCD), Source Control Drawing (SOCD), Envelope Drawing, Interface Drawing, Identification Cross-Reference Drawing, and Design Parameter Drawing.
i. Mechanical Schematic Diagram
j. Electrical/Electronic Diagram: Functional block diagram, single line diagram, schematic or circuit diagram connection or wiring diagram, interconnection diagram, wiring list, and logic circuit diagram.
k. Special Application Drawing: Wiring harness drawing, cable assembly drawing, printed board drawing, sets-assembly drawing, master drawing, artwork master, undimensioned drawing, tube bend drawings; pictorial and tabular delineation, matched set drawing, kit drawing and contour definition drawing.

4.5.3 Drawing Quality Control. All drawings submitted, regardless of type and TDP Elements (formerly level) (see Section 2) shall include:

a. Adequate quality for reproduction and microfilming except conceptual & developmental drawings for microfilming.
b. Record of revisions to be maintained on all drawings.
c. Intended information to be conveyed clearly, accurately and unambiguously.
d. Drawings should not include information pertaining to inspection, sampling, process, or production data such as tools, gages, fixtures or routing.

TYPES OF DRAWINGS
(CONTENTS OF THIS SECTION ONLY)

TYPES OF DRAWINGS (Continued)

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TYPES OF DRAWINGS
(LISTED BY CATEGORY IN ALPHABETICAL ORDER)

DESIGN LAYOUT DRAWING
*1. APPLICATION GULIDELINES
*2. REQUIREMENTS

ENGINEERING DRAWING
1. INTEGRAL PARTS LIST
2. SEPARATE PART LIST

* INTERNAL WORK-UP DOCUMENTS FOR INFORMATIONAL USE AND NOT GENERALLY SUBMITTED FOR DELIVERY. SEE FIGURE 16, PAGE 4-39

DETAIL	FIG.	PG
MONO-DETAIL DWG	40	87
MULTI-DETAIL DWG	41	89
PRINTED-BOARD DETAIL DWG	53	117
TABULATED DETAIL DWG	66	151
TUBE BEND DWG	68	155

ANCILLARY	FIG.	PG
BOOK FORM DWG	7	21
CERTIFICATION SHEET	9	25
COMBINATION OF ADOPTED ITEMS DWG	11	29
CONTOUR DEFINITION DWG	13	33
CORRELATION DWG	15	37
DIGITAL FORM	20	47
FORMULATION DWG	28	63
IDENTIFICATION CROSS REF DWG	76	173
KIT DWG	35	77
MODIFICATION DWG	39	85
NUMERICAL CONTROL DWG	42	91
OPTICAL ELEMENTS DWG	43	93
OPTICAL SYSTEM DWG	44	95
PACKAGE CONTENT DWG	46	99
PRINTED-BOARD ARTWORK MASTER (STABLE BASE ARTWORK)	54	121
PRINTED-BOARD PRODUCTION MASTER	55	123
PROPOSAL DWG	56	125
SHIP EQPMT (MARINE ITEM) DWG	60	135
TEXTILE DWG	67	153
UNDIMENSIONED DWG	69	157
WIRING HARNESS DWG	73	167
WIRING (RUNNING) LIST	74	169

ASSEMBLY	FIG.	PG
ARRANGEMENT DWG	3	13
CABLE ASSY DWG	8	23
DETAIL ASSY DWG	17	41
EXPLODED ASSY DWG	26	59
INSEPARABLE ASSY DWG	29	65
INSTALLATION ASSY DWG	30	67
MATCHED PARTS DWG	37	81
PHOTO ASSY DWG	47	101
PICTORIAL DWG	48	103
PRINTED-BOARD (CIRCUIT BOARD) ASSY DWG	52	113
SEPARABLE ASSY DWG	59	133
TABULATED ASSY DWG	65	149

CONTROL	FIG.	PG
ALTERED ITEM DWG (MECHANICAL)	1	9
ALTERED ITEM DWG (ELECTRICAL)	2	11
DESIGN PARAMETERS DWG	77	175
ENVELOPE DWG	24	55
FIRMWARE DWG (SEE FIG.2)		
INSTALLATION CONTROL DWG	31	69
INTERFACE DWG	34	75
OUTLINE ASSY DWG	45	97
PROCUREMENT CONTROL DWG	75	171
SELECTED ITEM DWG	58	129
SOFTWARE DWG	62	139
SOURCE CONTROL DWG	63	143
STANDARDIZED MILITARY DWG	64	145
VENDOR ITEM DWG	70	161

DIAGRAMATIC	FIG.	PG
BASIC LOGIC DIAGRAM	5	17
BLOCK DIAGRAM, FUNCTIONAL	6	19
COMBINATION SCHEMATIC	10	27
DETAILED LOGIC CIRCUIT DIAGRAM	19	45
ELECTRONIC SCHEMATIC	22	51
FLOW MECHANICAL SCHEMATIC DIAGRAM	27	61
INTERCONNECTION DIAGRAM	33	73
LOGIC CIRCUIT DIAGRAM	36	79
MECHANICAL SCHEMATIC	38	83
PIPING DIAGRAM	49	105
SCHEMATIC DIAGRAM	57	127
SINGLE LINE/ONE LINE DIAGRAM	61	137
WIRING/CONNECTION DIAGRAM	72	165

CONSTRUCTION	FIG.	PG
ELEVATION DWG	23	53
ERECTION DWG	25	57
PLAN DWG	50	107
PLOT (PLAT) DWG	51	109
VICINITY PLAN/SITE DWG	71	163

INSTALLATION	FIG.	PG
INSTALLATION DWG	32	71

ALTERED ITEM DRAWING (MECHANICAL)

DESCRIPTION & USE: (See FIGURE 4-1)

A drawing that shows the details of an alteration to an existing item under the control of another design activity or defined by a nationally recognized standard. The drawing type permits the required alteration to be performed by any competent manufacturer including the original manufacturer, or third party. An Altered Item Drawing shall not be prepared to modify an existing item that was developed by the design activity.

REQUIREMENTS:

a. Show details of the alteration.
b. Specify in the altered item parts list the part number of the unaltered (original) item.

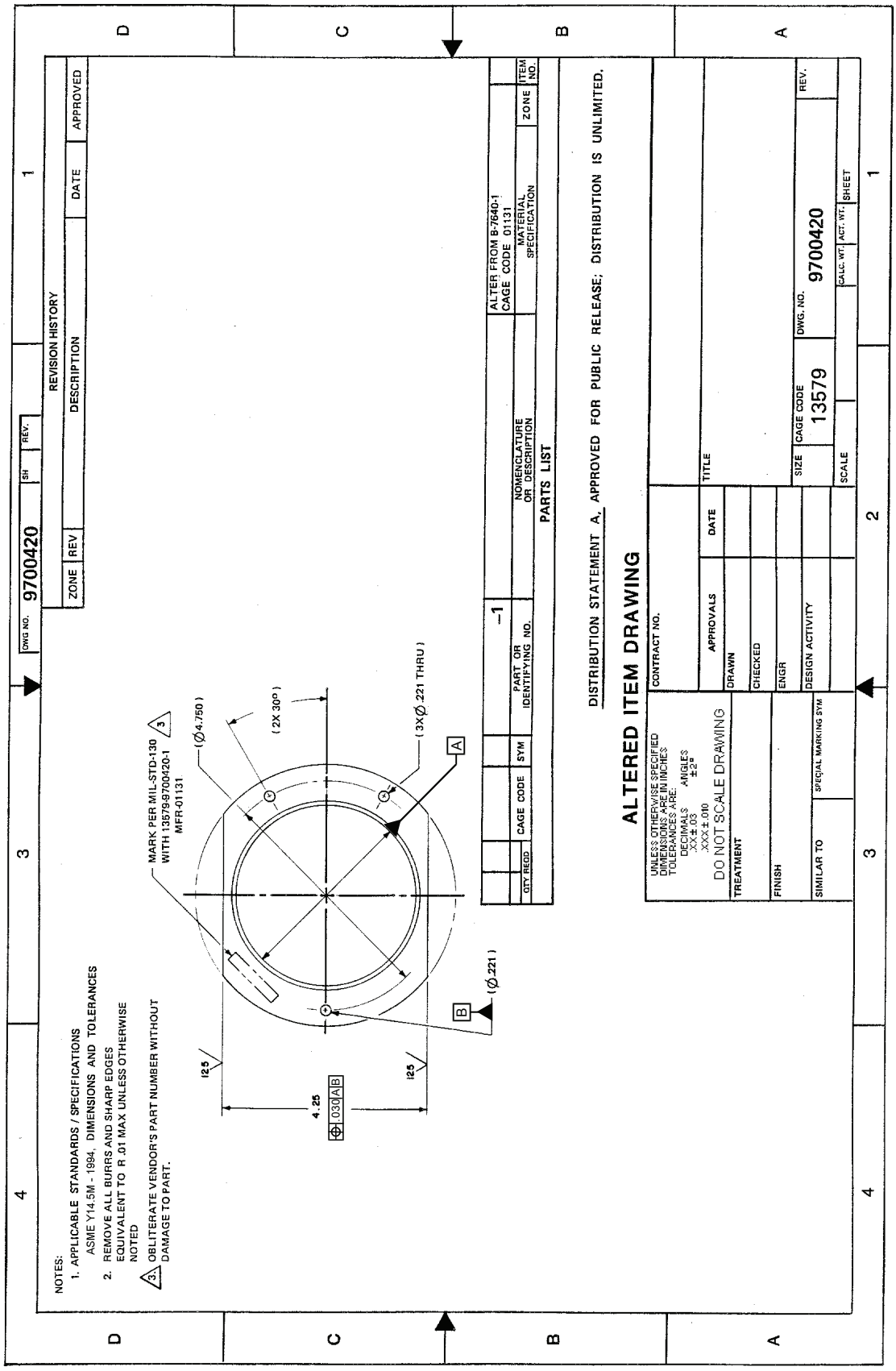
    1) Show item identification of existing nationally recognized standard's form, fit, function, and performance requirements prior to alteration.

    2) Show the Commercial And Government Entity (CAGE) Code if the item part number of the unaltered item was assigned by a vendor.

c. Marking: specify obliteration of the item's unaltered part number. Specify marking with the altered part number, preceded by the design activity code identification number. See SECTION 11 and MIL-STD-130. Reidentifying marking shall be in addition to the existing original marking and shall be visibly separate from and in no way interfere with the existing marking.
d. Drawing submission must include not only the altered item drawing, but also a document which completely defines the unaltered item. If the originating design activity drawing is available, this may be submitted; if not, prepare a Vendor Item Control Drawing (VICD), (formerly Specification Control Drawing (SCD) or Source Control Drawing (SOCD)). If the unaltered item and its alternation are simple, they may be combined on a single drawing.

    1) Specify any additional item(s) in the Parts List when necessary to produce the altered item.

e. Add the notation "ALTERED ITEM DRAWING" above or adjacent to the title block in .25 inch high letters.



ALTERED ITEM DRAWING (MECHANICAL)
FIGURE 4-1

ALTERED ITEM DRAWING (ELECTRICAL/FIRMWARE)

DESCRIPTION & USE: (See FIGURE 4-2)

For software resident in a programmable device (firmware), both Software Drawings and Firmware Drawings shall be required. Circuit boards with one or more devices that require programming at that level will be prepared as an assembly drawing. Devices assembled at that level will be supported by appropriate specifications or drawings that specify requirements prior to programming.

REQUIREMENTS:

a. The drawing describing the programming requirements of a single programmed device will be prepared as an Altered Item Drawing. The notation ALTERED ITEM DRAWING shall be placed above the title block in .25 inch high letters.

    1) The firmware drawing shall define the requirements of the device prior to programming either on this drawing (by referencing the original vendor's PIN or providing complete description of the item) or by Vendor Item or Source Control Drawing if a Military specification or standard military drawing item is not available. In addition, the requirements for programming (bit pattern downloading) of the device shall be included. The firmware drawing shall indicate the name and version number of the software being impressed. The same type of requirements shall be included on drawings for circuit boards with multiple devices programmed at the same time. Inspection requirements for the programmed device shall also be included. If more than one version of the programmed device is to be installed or used, the drawing shall provide a PIN for each version. The drawing shall also include an application chart or table that will cross-reference the master media for each version to each applicable programmed part by their respective PINs. See FIGURE 4-2.

    2) For source information, the master media for programming the device shall be identified by reference to the appropriate Software Drawing and PIN.

NOTES:

1. MICROCIRCUITS SHALL BE PROGRAMMED BY DOWNLOADING FROM THE MASTER MEDIA USING THE PROGRAMMING INSTRUCTIONS CONTAINED IN TABLE 1.
2. ITEM IDENTIFICATION: APPLY THE FOLLOWING MARKING
   19200-123XXX6-(APPLICABLE SUFIX IDENTIFIER NUMBER - SEE TABLE)
   MFR-(MANUFACTURER'S CAGE CODE)
3. APPLY LABEL TO PART, INSURING THAT THE QUARTZ WINDOW IS COMPLETELY COVERED. OBLITERATE THE ORIGINAL PART NUMBER.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED

FIELDED SOFTWARE VERSION IDENTIFICATION	MICROCIRCUIT DIGITAL-CMOS EPROM (PROGRAMMED)	MICROCIRCUIT DIGITAL-CMOS EPROM (BLANK MEDIA)	MASTER MEDIA PIN	MICROCIRCUIT, DIGITAL PROGRAMMING INSTRUCTIONS IDENTIFICATION & DATE
FIELD REV02	123XXXX6-3	844YYYY	123XXXX8-3	XXXXXX, REV 2, YRMODA
CONT REV1B	123XXXX6-2	844YYYY	123XXXX8-2	
CONT REV1A	123XXXX6-1	844YYYY	123XXXX8-1	

TABLE 1

ALTERED ITEM DRAWING

CONTRACT NO.		
APPROVALS	DATE	TITLE: SOFTWARE, MICROCIRCUIT, DIGITAL – CMOS EPROM
DRAWN		
CHECKED		
ENGR		SIZE / CAGE CODE / DWG NO. 123XXXX6 / REV.
DESIGN ACTIVITY		SCALE / CALC. WT / ACT. WT / SHEET

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

ALTERED ITEM DRAWING (ELECTRICAL/FIRMWARE)
FIGURE 4-2

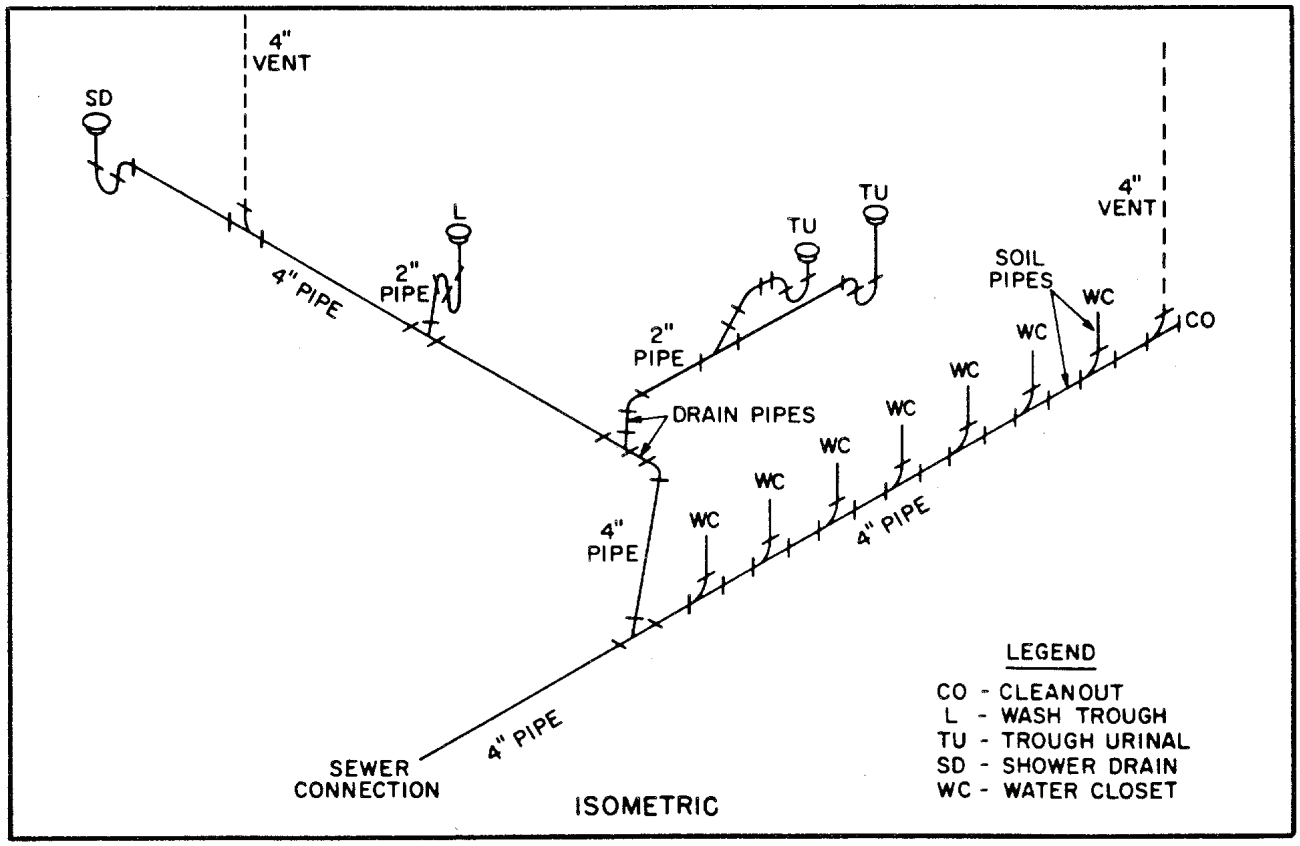
ARRANGEMENT DRAWING

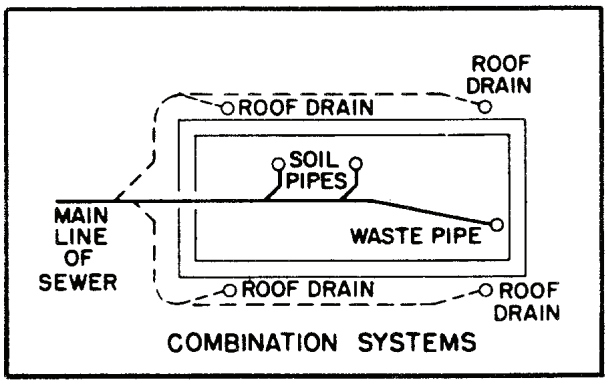
DESCRIPTION & USE: (See FIGURE 4-3)

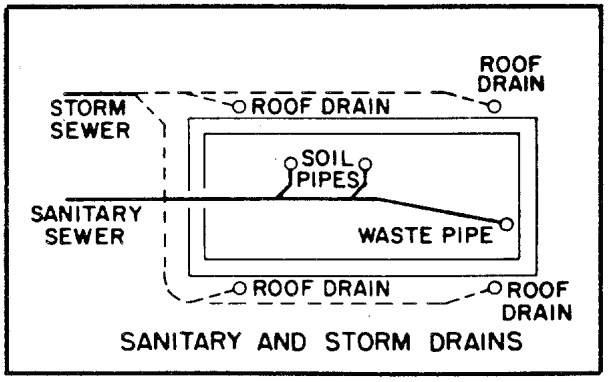
An arrangement drawing depicts in any projection or perspective, with or without controlling dimensions, the relationship of major units. An arrangement drawing does not establish item identification. It is not normally used to control design.

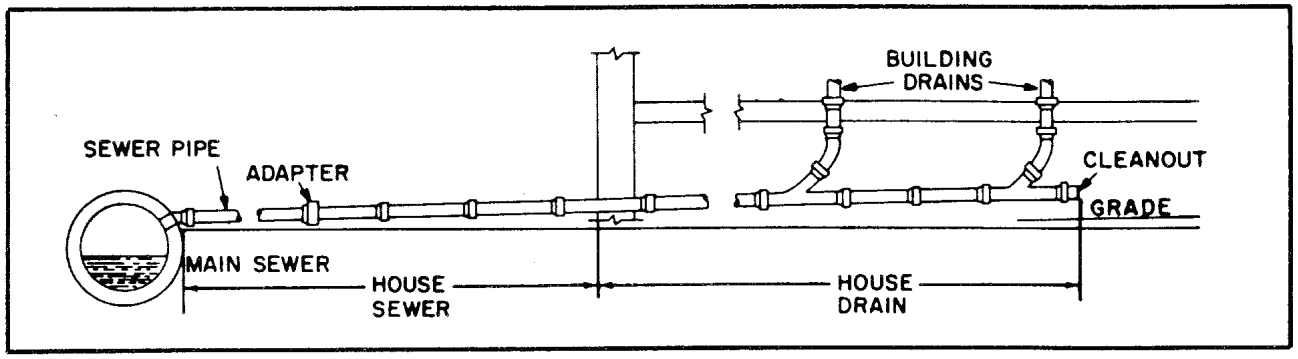
REQUIREMENTS:

a. Show sufficient views to convey the configuration and location of major units. Overall, locating and other general dimensions necessary to define the configuration may be shown. Major units shall be identified.
b. Overall, locating and other general dimensions necessary for identifying appropriate size requirements.
c. Identifies significant items.
d. Add the notation “ARRANGEMENT DRAWING” placed above or adjacent to the drawing Title block in .25 inch high letters.









THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

ARRANGEMENT DRAWING
FIGURE 4-3

ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-4)

An assembly drawing depicts the assembled relationship of (a) two or more parts, (b) a combination of parts and subordinate assemblies, or (c) a group of assemblies required to form an assembly of higher order. The drawing shall contain sufficient views to show the relationship between each subordinate assembly and part. Cite subordinate assemblies and parts in the field of the drawing by their find (item) numbers cross-referenced to the identifying numbers in a parts list. When the assembled relationship and identification of parts are shown on an assembly drawing of a subordinate assembly, do not repeat on the assembly drawing of higher order or associated parts list.

REQUIREMENTS:

Assembly drawings or associated parts list shall contain references to pertinent associated lists, installation drawings, wiring and schematic diagrams, etc. The division of an item into subordinate assemblies should be in accordance with practical assembly and disassembly procedures.

NOTE 1: Show & identify electrical items on assembly drawings depicting where mounted; however, small electrical items mounted by means of wires affixed thereto may be shown and identified either on the assembly drawing or on the pertinent wiring diagram.

NOTE 2: Itemize attaching parts (bolts, nuts, washers, etc.) required to mount and retain assemblies on foundations or on assemblies of higher order on the drawing showing the attachment.

TYPES OF DRAWINGS IN THE ASSEMBLY CATEGORY

NOTE:
Each of the above drawings are depicted separately.

ASSEMBLY DRAWING
FIGURE 4-4

BASIC LOGIC DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-5)

Logic diagrams are engineering reference documents and are not used for fabrication. The logic diagram shows by means of logic symbols and supplementary notations the details of signal flow and control but not necessarily the point-to-point wiring in a system of two-state devices.

REQUIREMENTS:

a. A logic diagram shows the logic functions of a system at any level of assembly.

b. The logic diagram facilitates circuit analysis and diagnosis of equipment problems.

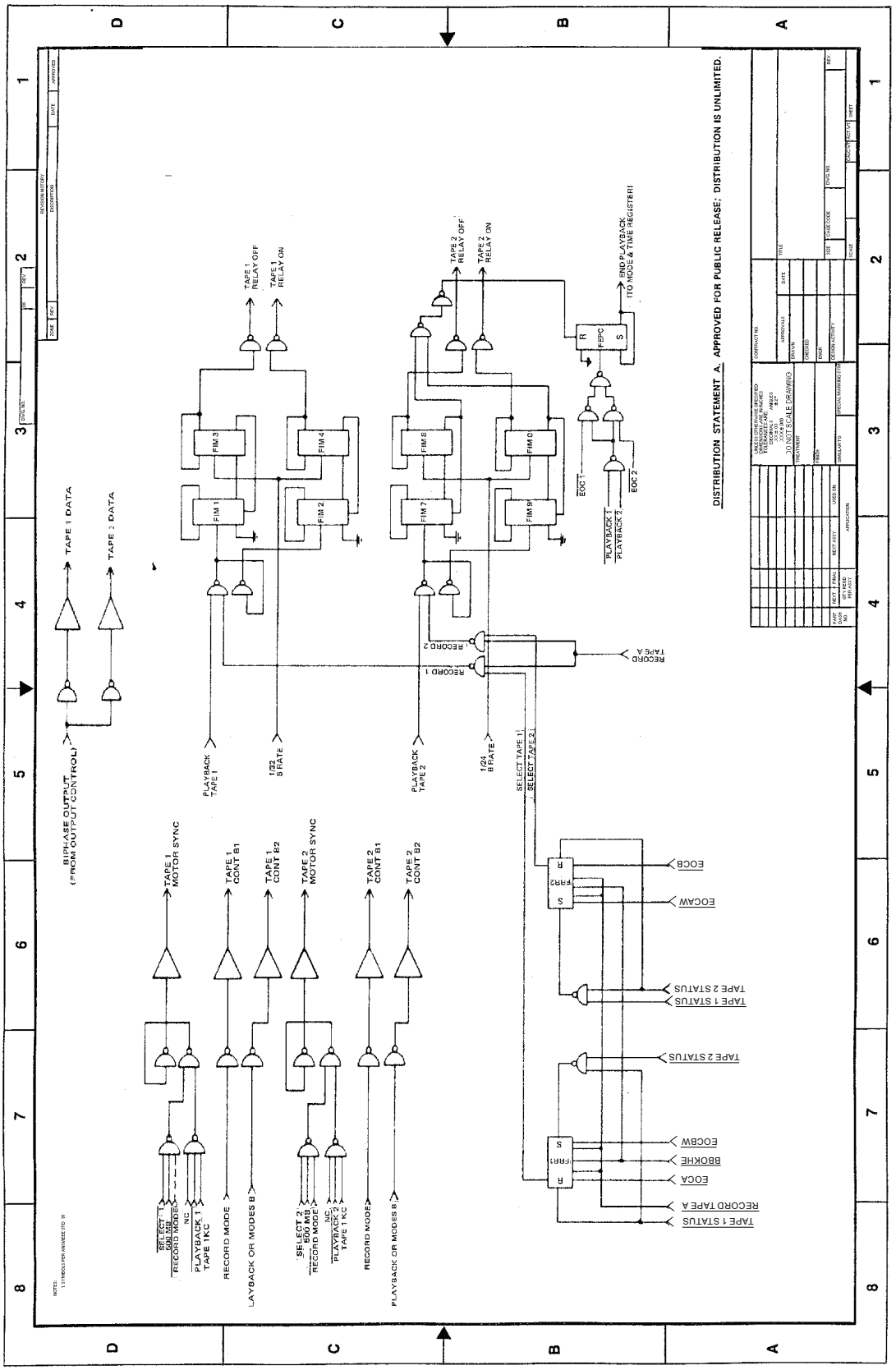
c. Logic diagrams are prepared in accordance with ANSI/IEEE STD 991 and includes, as applicable.

    1) Logic functions depicted by logic symbols in accordance with ANSI/IEEE STD 91/91A connected by lines that represent signal paths.

    2) PIN numbers, test points, nonlogic functions and assembly boundaries necessary to describe the physical and electrical aspects of the circuit.

    3) The position of symbol on a drawing does not alter its meaning nor does it imply physical locations of parts.

    4) A symbol may be drawn to any proportionate size or line thickness to suit reproduction and commensurate with drawing size.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

BASIC LOGIC DIAGRAM
FIGURE 4-5

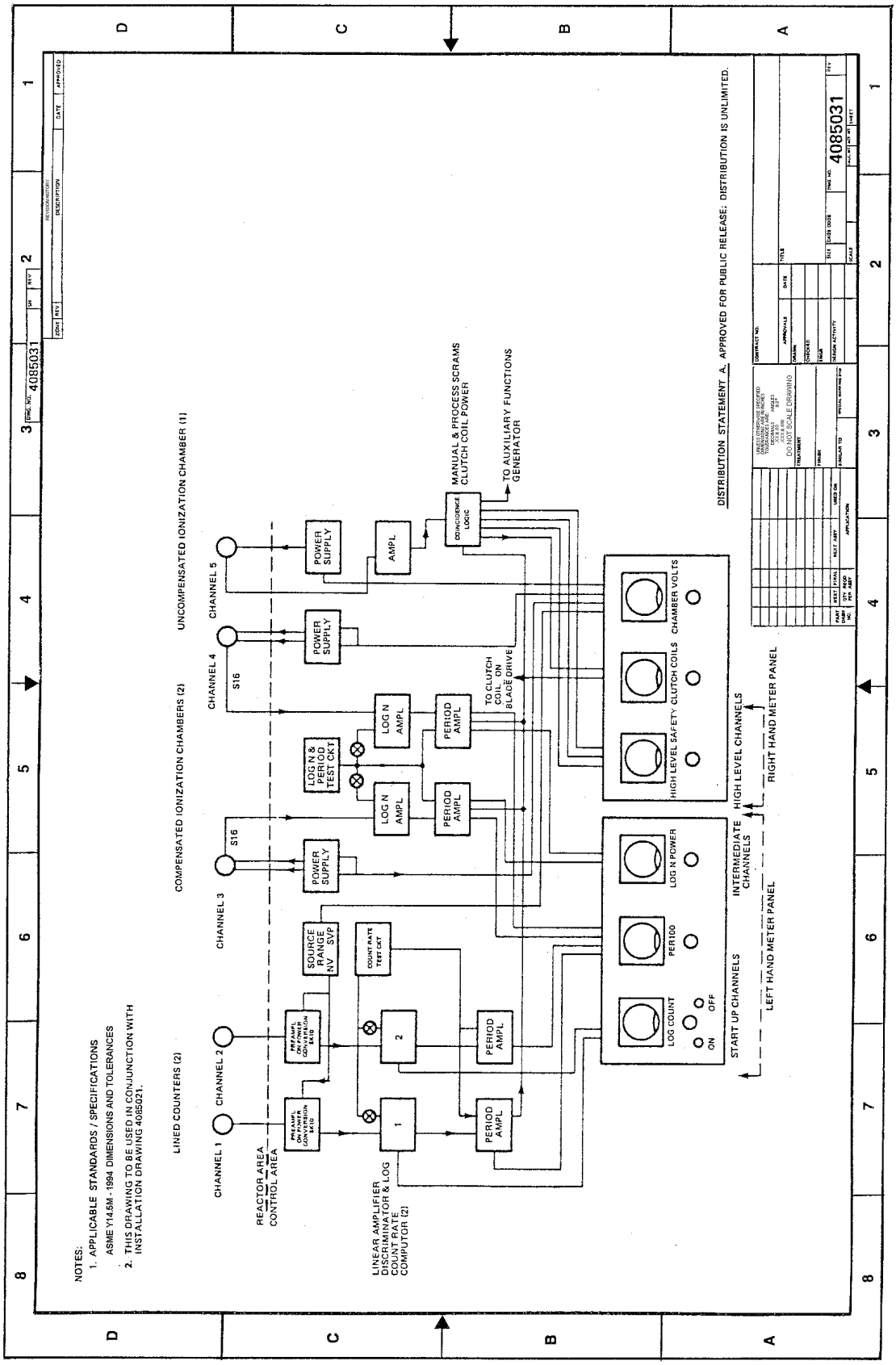
BLOCK DIAGRAM, FUNCTIONAL

DESCRIPTION & USE: (See FIGURE 4-6)

A block diagram shows the functional relationship of major elements of a circuit, assembly, system, etc. in a more simplified form than the Single Line Diagram. It represents the circuit functions by the use of single lines and rectangular blocks.

REQUIREMENTS:

The block diagram drawings use single lines and rectangular blocks together with explanatory notes or text to describe the major circuit functions. Graphic symbols or reference designations are not normally used.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

BLOCK DIAGRAM, FUNCTIONAL
FIGURE 4-6

BOOK-FORM DRAWING

DESCRIPTION & USE: (See FIGURE 4-7)

A book-form drawing is an assemblage of related data disclosing by means of pictorial delineations, text or technical tabulations, or combinations thereof, the engineering requirements of an item, a family of items, or a system. A book-form drawing is used for a special purpose application in which it is expeditious to provide a document consisting of numerous small sheets, suitable for binding into book form.

REQUIREMENTS:

A book-form drawing shall preferably be prepared on A-size drawing formats. Other standard size formats may be used provided the final document size sheets are reduced to 11inch height and can be folded to 8.5 inch width, with resultant legibility maintained. Book-form drawings shall not be prepared to circumvent the requirements for furnishing the types of drawings normally required for the delineation of an item or system. Book-form continuation sheets (sheet 2 and subsequent) need not include a revision block.

INDEX OF EQUIPMENT INTERCONNECTION INFORMATION

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX
3	REFERENCE DOCUMENTS
4 thru 8	NOTES - ILLUSTRATIONS
9	LIST OF UNITS
10 thru 12	SUMMARY OF CABLING INFORMATION BY UNITS
13 thru 29	CABLE RUNNING SHEETS
30 thru 34	STRAPPING SHEETS

NOTE: Illustrated is page two (2) of a multipage document in book form. See Section 6 for page 1 format.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SIZE	CAGE CODE	DWG. NO.	REV.
A			
SCALE		SHEET 2	

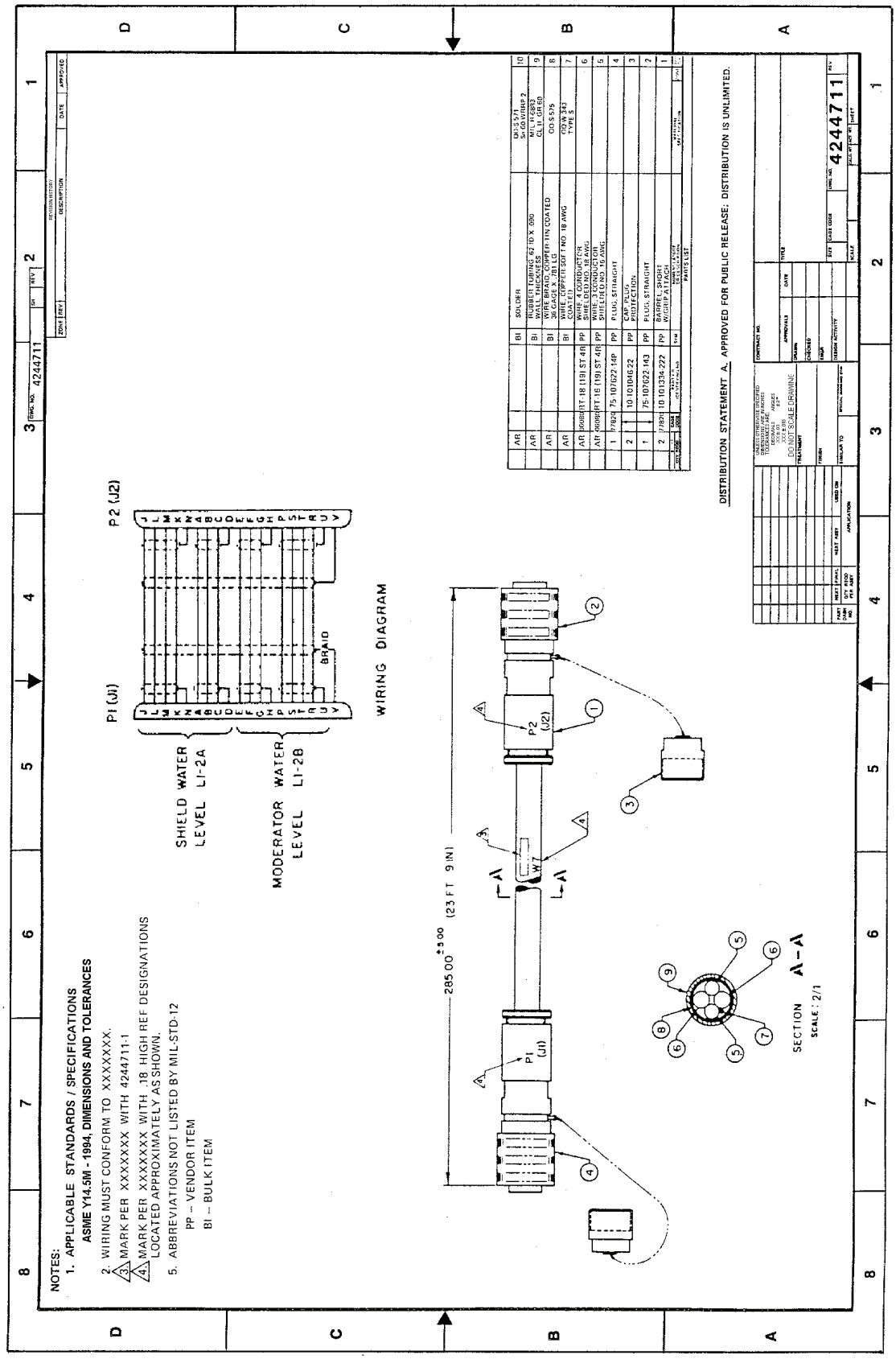
BOOK-FORM DRAWING
FIGURE 4-7

CABLE ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-8)
A cable of a definite continuous length, having one or more ends processed or terminated in fittings which provide for connection to other items.

REQUIREMENTS:
An assembly drawing containing all of the necessary information to fabricate a finished cable. The wiring diagram is usually an integral part of the drawing. A parts list is included and reference designations required to be marked on components are shown. Single usage cables have mating connector reference designations marked in parentheses on each connector. A cable assembly drawing includes, as applicable:

a. Dimensions and tolerances for overall length and breakout locations.
b. Identification of parts, bulk materials, and processes required for fabrication of the cable assembly.
c. Preparation of the cable ends.
d. Orientation and offset of connectors.
e. Maximum diameter of cable.
f. Minimum bend radii for wiring within the assembly.
g. Detail views of molded areas.
h. Conductor lay patterns (optional).
i. Identification band or other marking requirements.
j. A wire list, wiring diagram, or schematic diagram defining electrical connections and specifying wire number, color codes, and termination requirements. (A simplified, single line diagram is generally sufficient to define these requirements.)
k. Finish, special assembly, and/or storage (for example: dust covers) instructions.
l. Test requirements.
m. Views in a cable assembly drawing need not be to scale. Relative locations of items which are not a part of the cable assembly may be shown in phantom and identified for reference purposes.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

CABLE ASSEMBLY DRAWING
FIGURE 4-8

CERTIFICATION DATA SHEET

DESCRIPTION & USE: (See FIGURE 4-9)

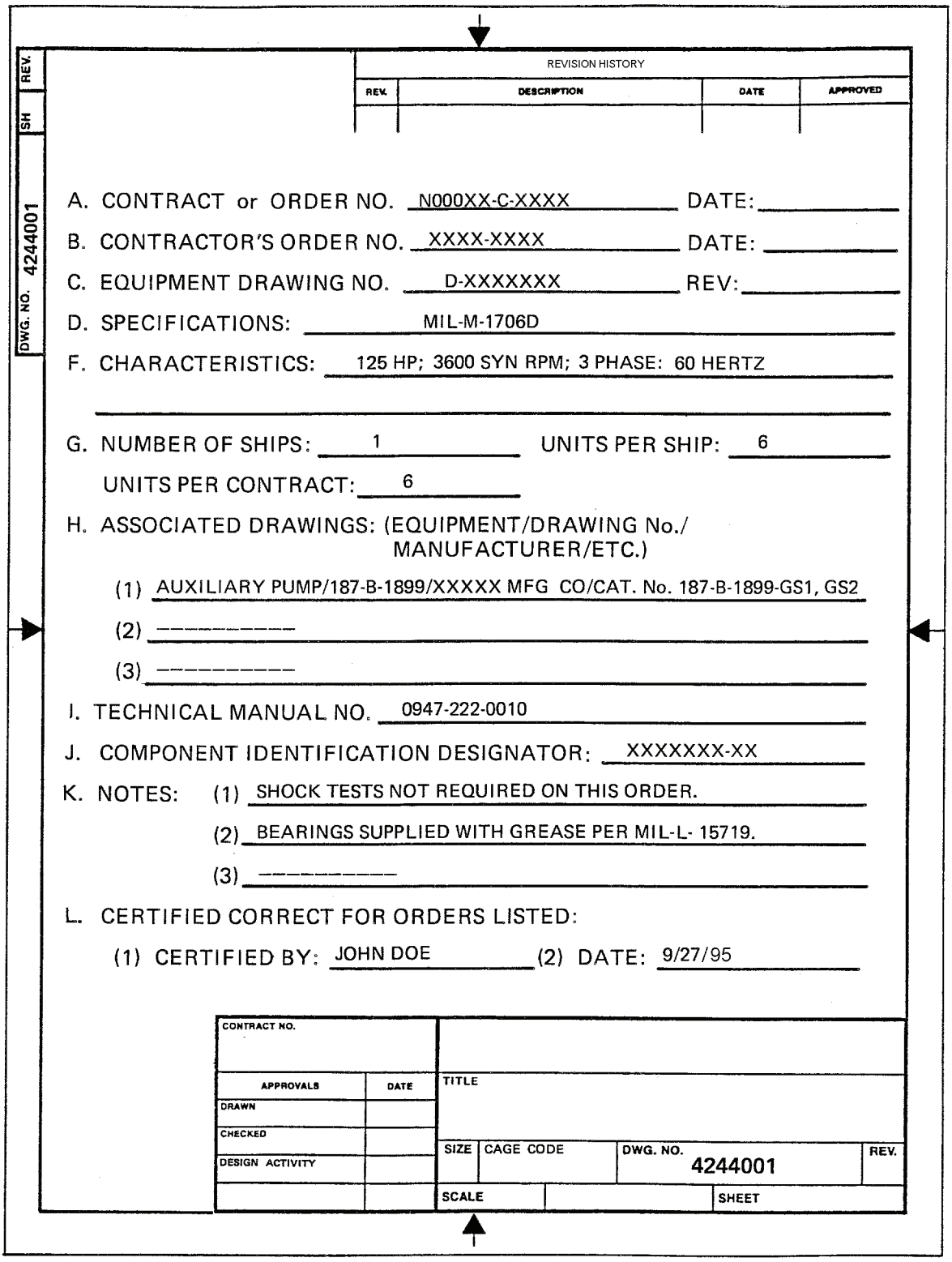
Certification data sheets are supplementary drawings which contain certain contract data, equipment characteristics data, drawing references, etc. which must be furnished for each contract, purchase order, or equipment produced or procured by a contractor.

Certification data can also be applied on an Outline Drawing, Drawing List, or other type of document specified in lieu of a Certification Data Sheet. In that event, the applicable information shall be included in the document selected and specified.

REQUIREMENTS:

The Certification Data Sheets shall contain all applicable information as shown for the headings in FIGURE 4-9 sub headings A through L and the following:

a. Manufacturer's drawing number assigned to identify the certification data sheet.
b. File number and date of letter of design acceptance, when applicable.
c. Design deviations, if any. These deviations must be of such minor nature that existing equipment drawings can be used with later equipment without change by noting on the drawings the minor deviations from the basic design.



REV. | SH | DWG. NO. 4244001

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APPROVED

A. CONTRACT or ORDER NO. N000XX-C-XXXX DATE: _____

B. CONTRACTOR'S ORDER NO. XXXX-XXXX DATE: _____

C. EQUIPMENT DRAWING NO. D-XXXXXXX REV: _____

D. SPECIFICATIONS: MIL-M-1706D

F. CHARACTERISTICS: 125 HP; 3600 SYN RPM; 3 PHASE: 60 HERTZ

G. NUMBER OF SHIPS: 1 UNITS PER SHIP: 6

UNITS PER CONTRACT: 6

H. ASSOCIATED DRAWINGS: (EQUIPMENT/DRAWING No./ MANUFACTURER/ETC.)

(1) AUXILIARY PUMP/187-B-1899/XXXXX MFG CO/CAT. No. 187-B-1899-GS1, GS2

(2) ----------

(3) ----------

I. TECHNICAL MANUAL NO. 0947-222-0010

J. COMPONENT IDENTIFICATION DESIGNATOR: XXXXXXX-XX

K. NOTES: (1) SHOCK TESTS NOT REQUIRED ON THIS ORDER.

(2) BEARINGS SUPPLIED WITH GREASE PER MIL-L- 15719.

(3) ----------

L. CERTIFIED CORRECT FOR ORDERS LISTED:

(1) CERTIFIED BY: JOHN DOE (2) DATE: 9/27/95

CONTRACT NO.		
APPROVALS	DATE	TITLE
DRAWN		
CHECKED		SIZE / CAGE CODE / DWG. NO. 4244001 / REV.
DESIGN ACTIVITY		SCALE / SHEET

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

CERTIFICATION DATA SHEET
FIGURE 4-9

COMBINATION SCHEMATIC

DESCRIPTION & USE: (See FIGURE 4-10)

Combination schematics are a portrayal of an "overall scheme of function" for a combination of working devices. They may require the combining of two (2) or more schematic type drawings.

i.e. Electrical Schematic

Electronic Schematic

Mechanical Schematic

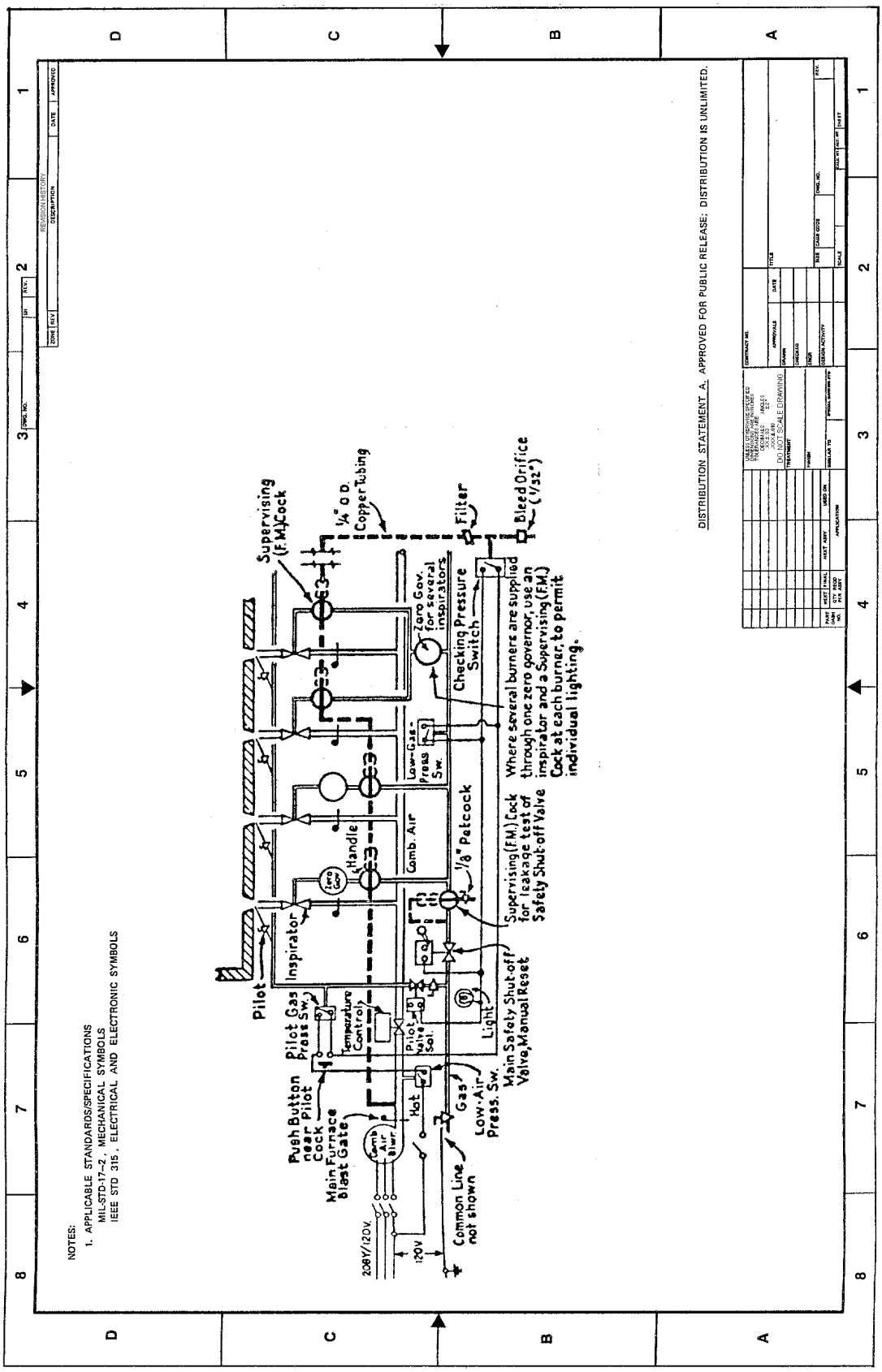
Flow Schematic

Logic Diagram

REQUIREMENTS:

The requirements of the individual types of drawings for electrical, electronic, logic, mechanical and flow schematics apply when combining two or more of the schematic functions on a single drawing.

NOTE: The decision to combine drawings should be made cautiously. Combining drawing types should result in a significant advantage versus not combining and having separate drawings. Advantages of combining drawings should outweigh any potential disadvantages. Potential disadvantages resulting from combining drawings include (1) increased complexity of the drawing which may diminish clarity and usefulness and (2) frequent change activity to the drawing which may increase the need to update associated record(s), material control data, manufacturing planning, microfilm, etc.



COMBINATION SCHEMATIC
FIGURE 4-10

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

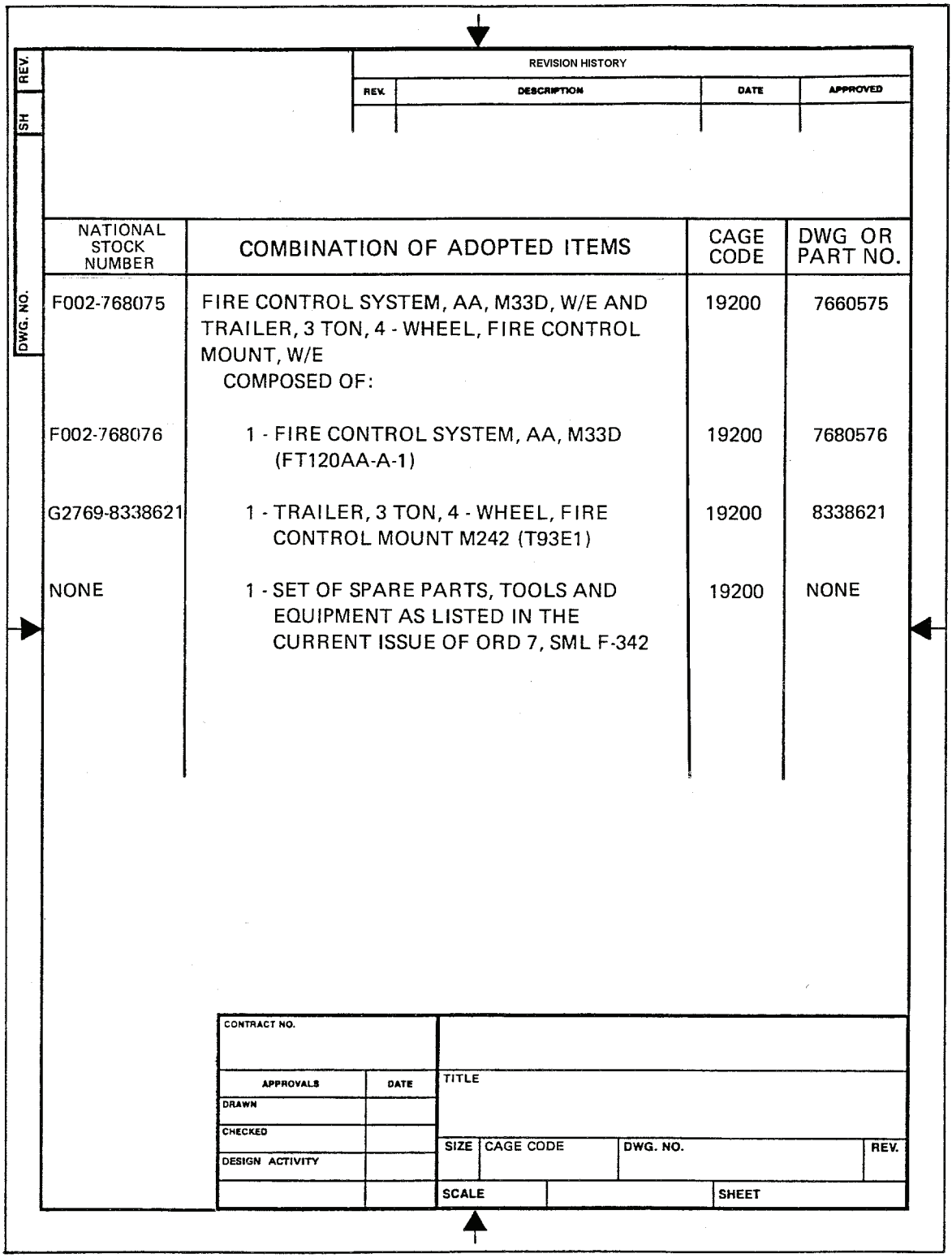
COMBINATION OF ADOPTED ITEMS DRAWINGS

DESCRIPTION & USE: (See FIGURE 4-11)

A Combination of Adopted Items Drawing depicts the items comprising a combination of items and is assigned the manufacturer's drawing number to identify the Combination of Adopted Items Drawing. The drawing is used to establish an identification of the combination for assignment of National Stock Numbers (NSN).

REQUIREMENTS:

The Combination of Adopted Item Drawings shall contain all applicable information as shown for the headings in FIGURE 4-11.



REV. | SH | DWG. NO.

REVISION HISTORY

REV.	DESCRIPTION	DATE	APPROVED

NATIONAL STOCK NUMBER	COMBINATION OF ADOPTED ITEMS	CAGE CODE	DWG OR PART NO.
F002-768075	FIRE CONTROL SYSTEM, AA, M33D, W/E AND TRAILER, 3 TON, 4 - WHEEL, FIRE CONTROL MOUNT, W/E COMPOSED OF:	19200	7660575
F002-768076	1 - FIRE CONTROL SYSTEM, AA, M33D (FT120AA-A-1)	19200	7680576
G2769-8338621	1 - TRAILER, 3 TON, 4 - WHEEL, FIRE CONTROL MOUNT M242 (T93E1)	19200	8338621
NONE	1 - SET OF SPARE PARTS, TOOLS AND EQUIPMENT AS LISTED IN THE CURRENT ISSUE OF ORD 7, SML F-342	19200	NONE

CONTRACT NO.		
APPROVALS	DATE	TITLE
DRAWN		
CHECKED		SIZE / CAGE CODE / DWG. NO. / REV.
DESIGN ACTIVITY		
		SCALE / SHEET

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

COMBINATION OF ADOPTED ITEMS DRAWINGS
FIGURE 4-11

CONSTRUCTION DRAWING

DESCRIPTION & USE: (See FIGURE 4-12)

A construction drawing delineates the design of buildings, structures, or related construction, ashore or afloat, individually or in groups, and are normally associated with the architectural-construction-civil engineering operations. Construction drawings establish all the interrelated elements of an architectural-civil engineering design, including pertinent services, equipment, utilities and other engineering details. Maps, except those accompanying or used in conjunction with construction drawings, sketches, presentation drawings, perspectives, and renderings are not considered to be construction drawings.

REQUIREMENTS:

See:

TM-5-581	Construction drafting (US Army)
NAVFAC-DM-6	Drawings & Specifications (US Navy)

TYPES OF DRAWINGS IN CONSTRUCTION CATEGORY:

NOTE:
Each of the above construction type drawings are depicted separately.

CONSTRUCTION DRAWING
FIGURE 4-12

CONTOUR DEFINITION DRAWING

DESCRIPTION & USE: (See FIGURE 4-13)

A contour definition drawing (Also known as a "loft drawing") contains the mathematical, numeric, or graphic definition required to locate and define a contoured surface. It does not establish item identification for the item(s) delineated thereon.

A contour definition drawing is prepared to define complex surface geometry which cannot be conveniently included in the detail drawings of an item.

REQUIREMENTS:

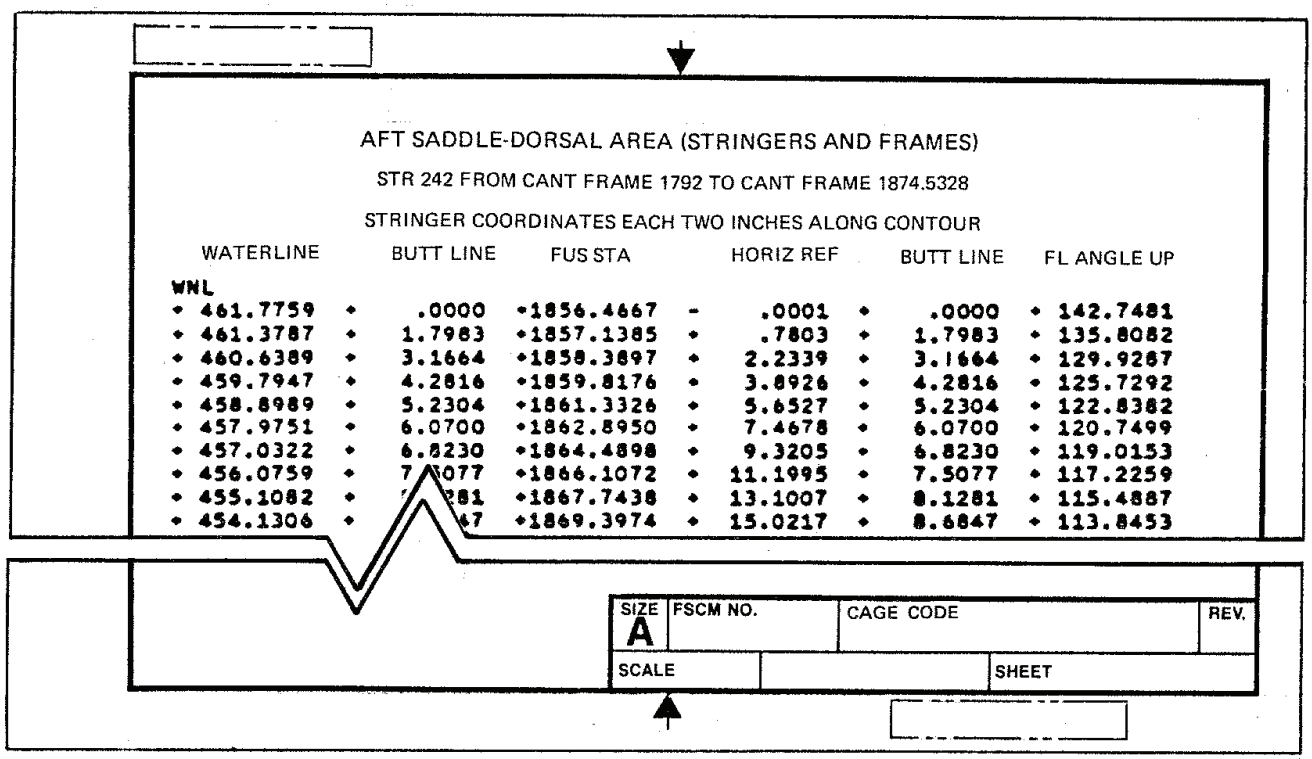
A contour definition drawing includes, as applicable:

a. Mathematical equations for the geometric features.

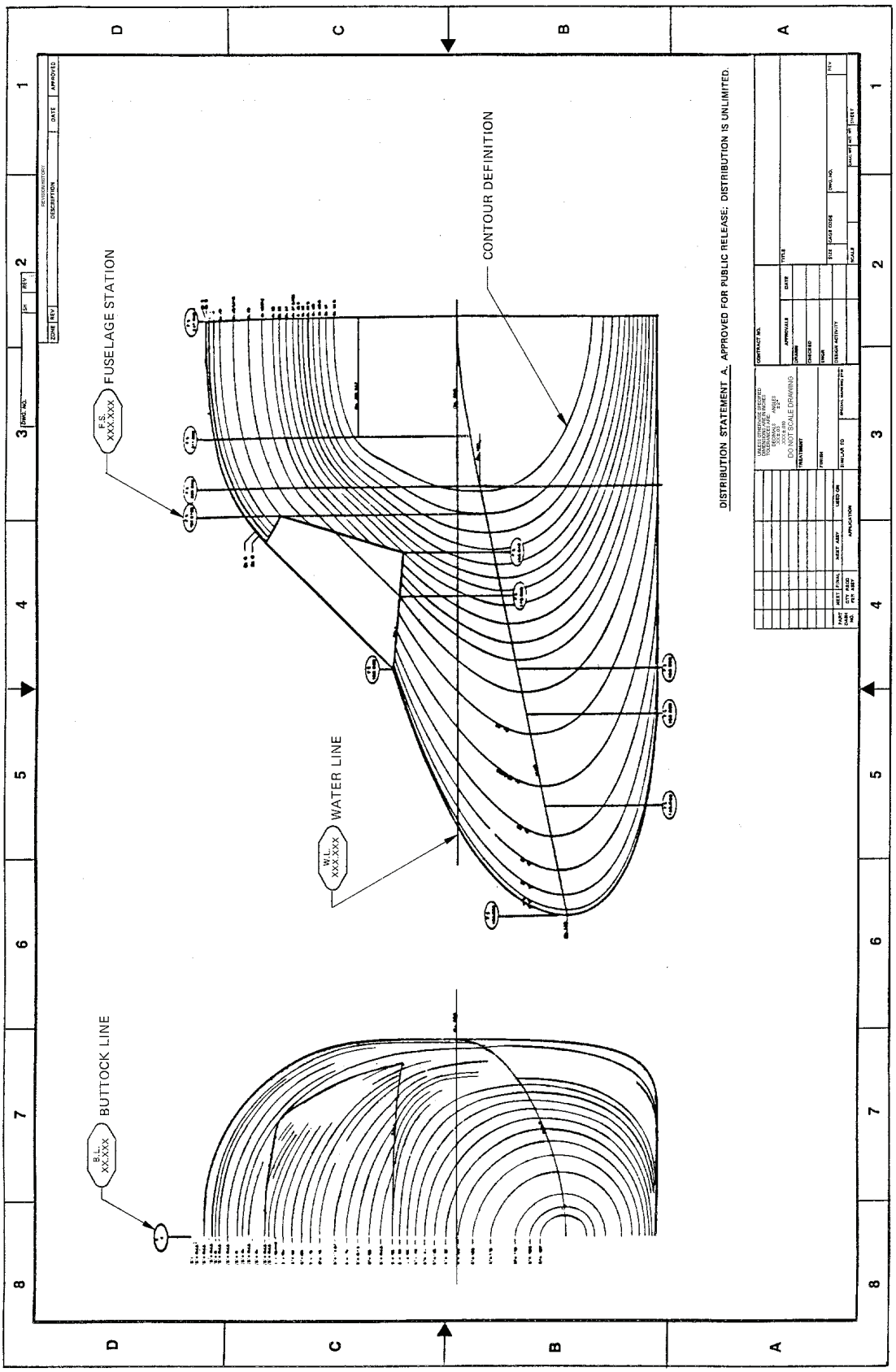
b. Tabulated coordinates.

c. Graphic sections.

d. A summary of features and relationships to more basic coordinate systems in appropriate combinations to define the contoured surface or the desired points on a contoured surface.



CONTOUR DEFINITION DRAWING (TABULAR)



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

CONTOUR DEFINITION DRAWING (PICTORIAL)
FIGURE 4-13

CONTROL DRAWING

DESCRIPTION & USE: (See FIGURE 4-14)

A control drawing discloses configuration and configuration limitations; performance and test requirements; weight and space limitations; access clearance, pipe and cable attachments, etc. to the extent necessary that the item can be developed by a vendor or procured on the commercial market to meet the stated requirements without disclosing details of design or divulging proprietary vendor data or for the installation and cofunctioning of an item to be installed with related items. Control drawings are classified as:

TYPES OF DRAWINGS IN THE CONTROL CATEGORY

NOTE:
Each of the above drawings are depicted separately.

CONTROL DRAWING
FIGURE 4-14

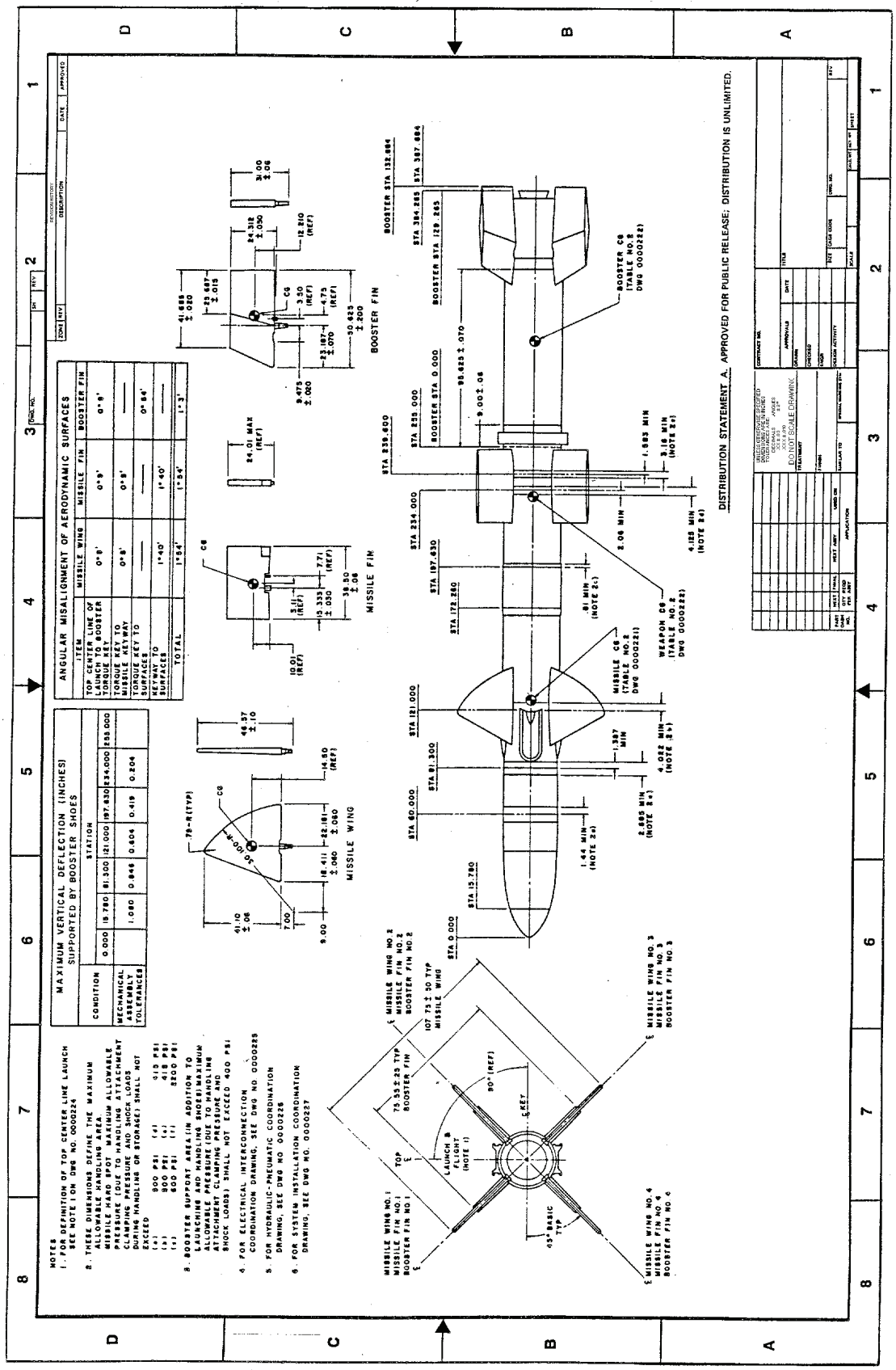
CORRELATION DRAWING

DESCRIPTION & USE: (See FIGURE 4-15)

A correlation drawing depicts physical and functional engineering requirements within a subsystem. They are used to correlate interface engineering data between a subsystem design activity and others involved in the design of the subsystem.

REQUIREMENTS:

Following requirements for interface control drawings except that the delineation provided on correlation drawings shall be restricted to units within the subsystems. Correlation drawings shall contain no requirements intended to control interfaces of associated subsystems. Show the notation "CORRELATION DRAWING" in .25 inch high letters, adjacent to the title block. Data prescribed on correlation drawings which cannot be changed without affecting co-functioning subsystems shall be suitably identified.



CORRELATION DRAWING
FIGURE 4-15

DESIGN LAYOUT DRAWING

DESCRIPTION & USE: (See FIGURE 4-16)

A design layout drawing shows a design concept with design information requiring special consideration by the engineer and draftsman, i.e. special clearances, adjustments, equipment provisions, materials, processes, finishes, critical tolerances and other special features. It serves as an engineering work sheet from which engineering drawings are made. The drawing is not used for fabrication, procurement or inspection. A layout is drawn to scale with sufficient accuracy and completeness for its intended use.

Note: Today, most design and consequently most of the design development is done using CAD software. Thus, most of the design development that used to be done exclusively using manual drafting techniques on physical media is now being done using digital 3D CAD solid modeling software and techniques. Refer to SECTION 26 in the DRM for more information regarding CAD and solid modeling techniques and applications.

REQUIREMENTS:

a. Plastic film or other suitable stable material is recommended.

b. It is imperative that design layout drawings be signed and dated by the originator when the drawing has begun. This should also be witnessed by another signature having a working knowledge of the design involved. This action shall establish any claim to patent applicability to the design as the drawing progresses. When the design warrants consideration for a patent, a patent counsel should be obtained.

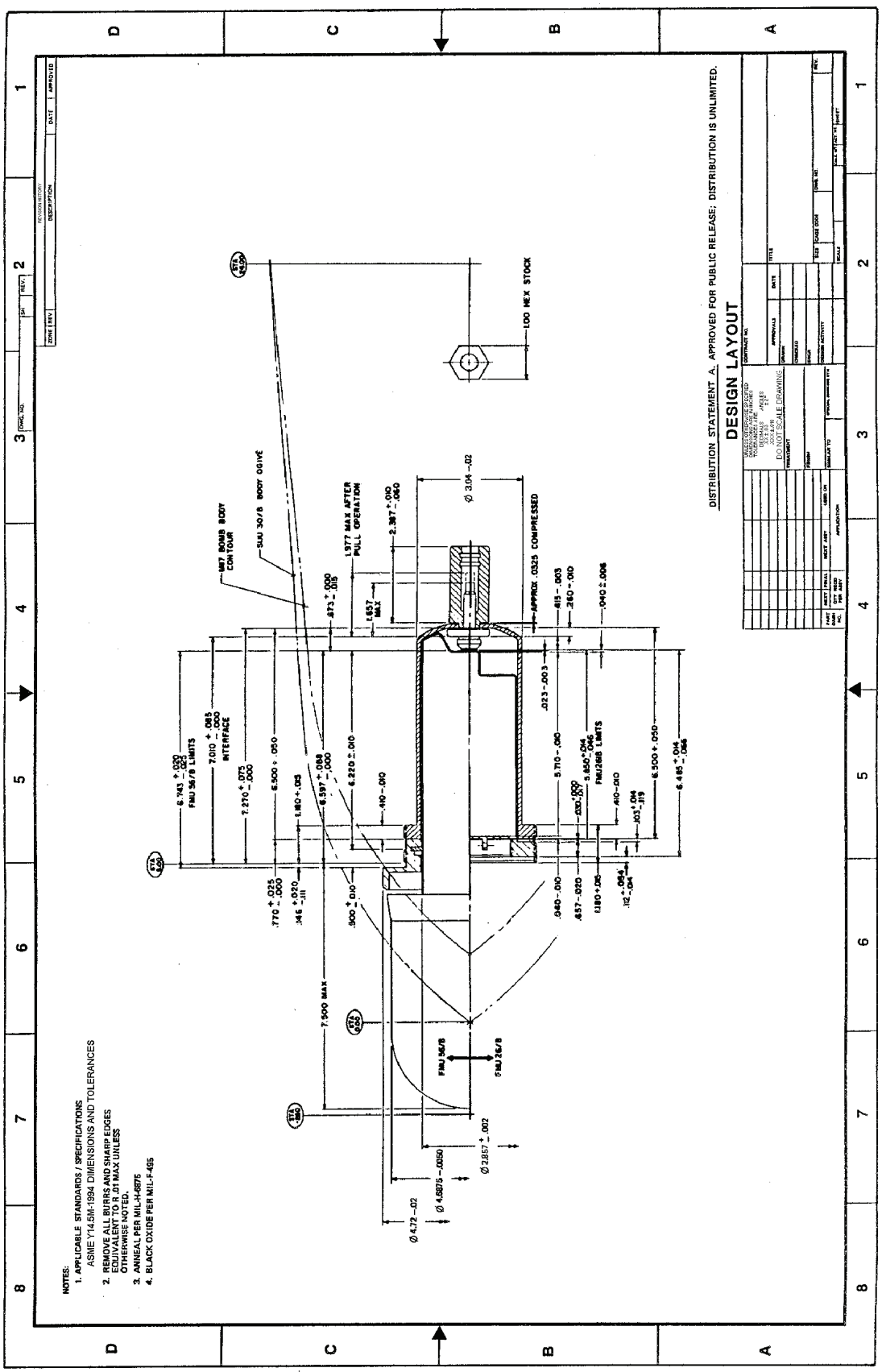
c. Specify all necessary design information. Include as applicable:

    1) Location of primary components.
    2) Interface and envelope dimensions including a cross-reference to applicable interface documentation.
    3) Paths of motion.
    4) Operating positions.
    5) Critical fits and alignments.
    6) Selected materials, finishes, and processes.
    7) Wire bundle, pneumatic line, and hydraulic line routing and sizes.
    8) Adjustments.
    9) Critical assembly details and sequence.
    10) Identification for selected purchased items and new design items.
    11) Identification for the assembly depicted (When the layout is to be used as an interim assembly drawing.

d. As the design layout progresses, the layout should be subject to periodic reviews by engineering, manufacturing and finance to asses producibility considerations within the projected cost estimates and customer requirements.

e. Identify the drawing as "DESIGN LAYOUT" above the title block in .25 inch high letters.

f. This drawing should be coordinated with responsible program management and supporting functions before starting working drawings.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

DESIGN LAYOUT DRAWING
FIGURE 4-16

DETAIL ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-17)

A detail assembly drawing shows the assembled relationship of items, one or more of which is detailed on the assembly drawing. Separate engineering drawings are not required for items so delineated. Particularly useful for inseparable assemblies.

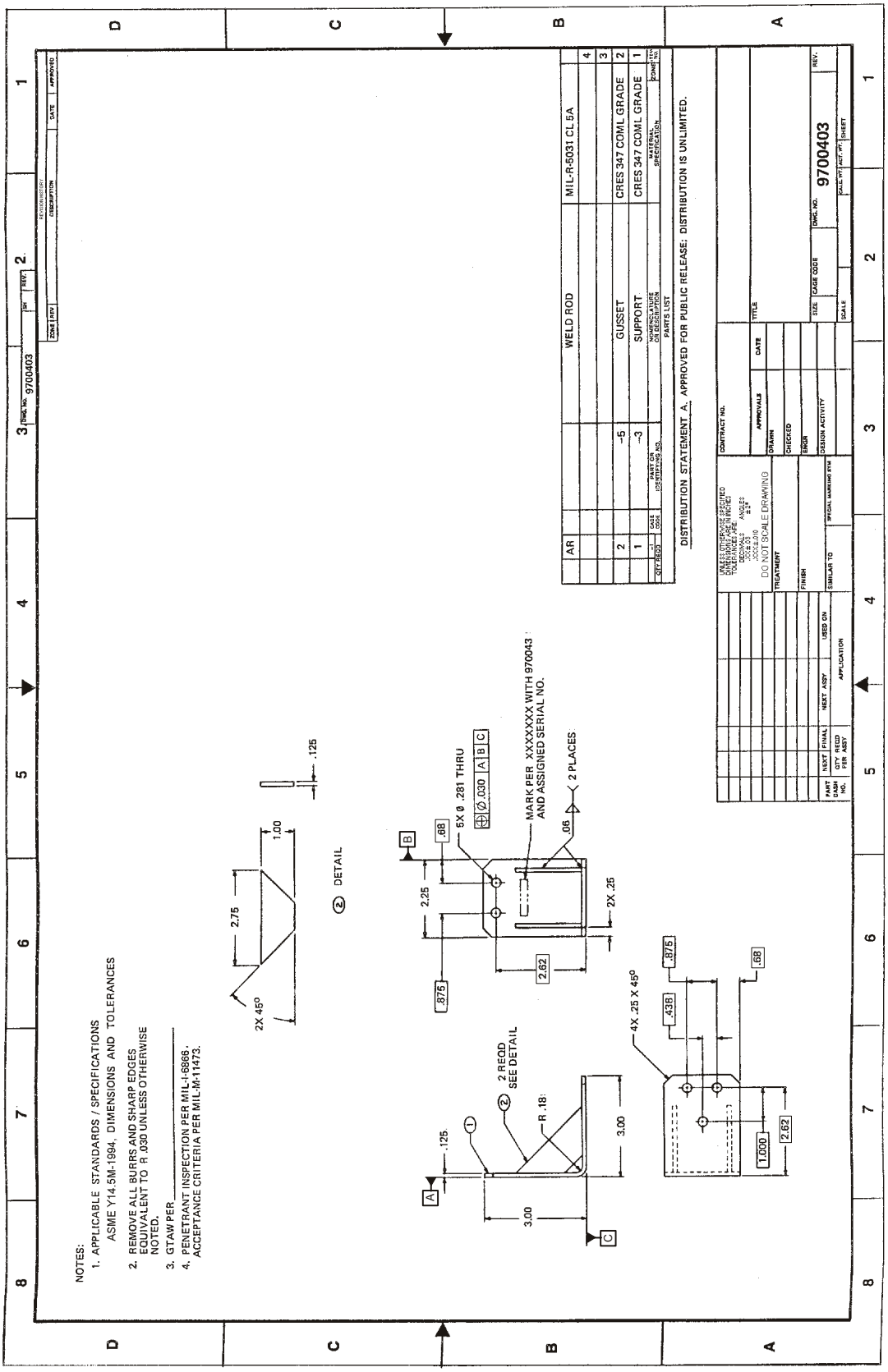
REQUIREMENTS:

a. Include all necessary information for procurement, fabrication and inspection of the details and assembly.

b. Show items which require extensive machining operations on a separate mono-detail drawing.

c. Parts may be detailed in the assembled condition or as separate details on the drawing. Function should be the prime consideration, with secondary consideration given to fabrication.

d. Meet all requirements of a mono-detail drawing and an inseparable assembly drawing.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

DETAIL ASSEMBLY DRAWING
FIGURE 4-17

DETAIL DRAWING

DESCRIPTION & USE: (See FIGURE 4-18)

A detail drawing depicts all necessary information for fabrication of an item(s) ready for application in its using assembly. Detail drawings are classified as:

TYPES OF DRAWINGS IN THE DETAIL CATEGORY:

NOTE:
Each of the above drawings are depicted separately.

DETAIL DRAWING
FIGURE 4-18

DETAILED LOGIC CIRCUIT DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-19)

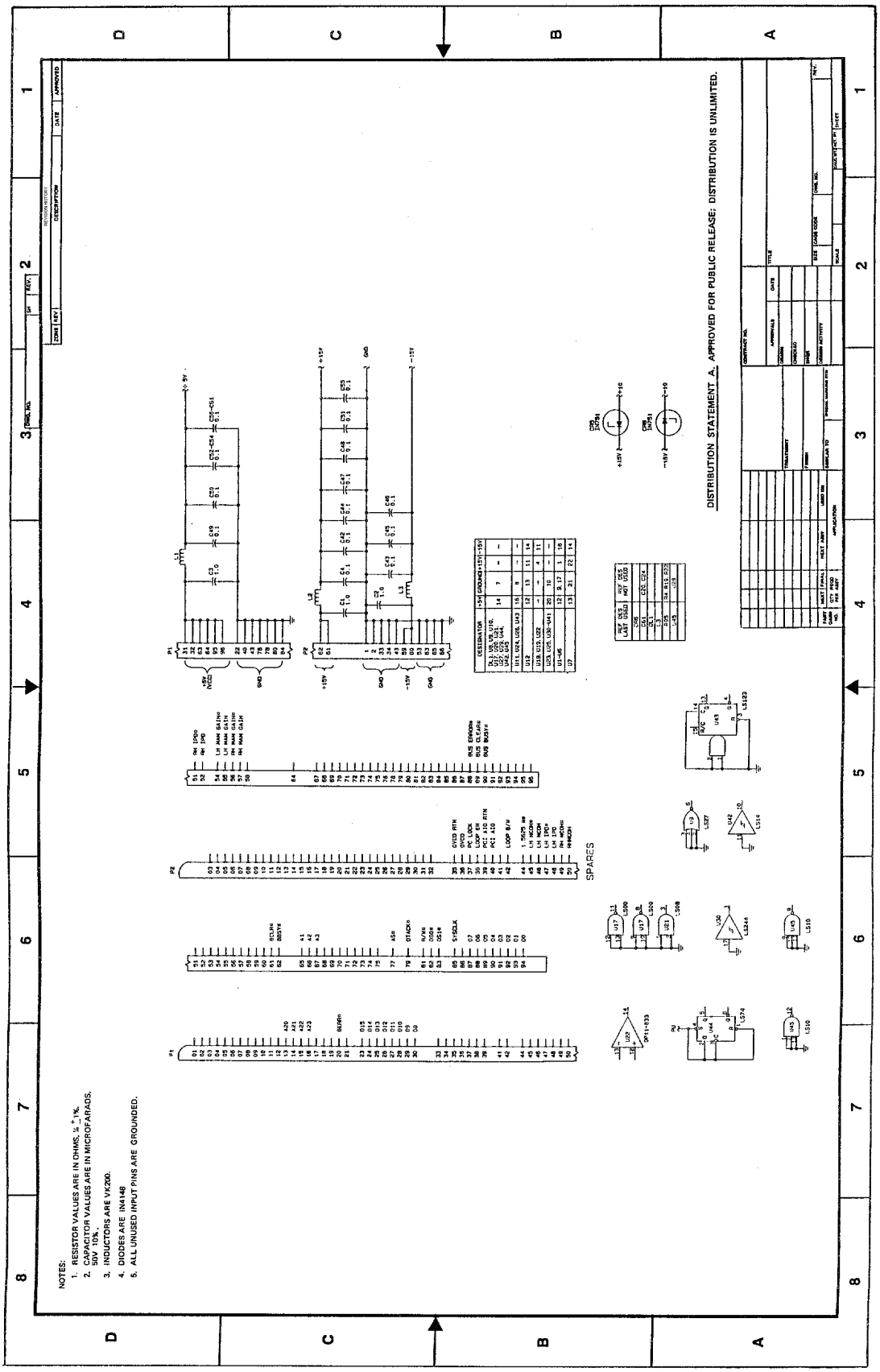
The detailed logic diagram is used primarily to facilitate the rapid diagnosis and localization of equipment malfunctions. It is also used to verify the physical consistency of the logic and to prepare fabrication instructions.

REQUIREMENTS:

A logic circuit diagram is prepared in accordance with ANSI/IEEE STD 991 and includes, as applicable;

a. A detailed logic diagram shows all logic functions and include non logic functions, socket locations, pin numbers, test points and other physical elements necessary to describe the physical and electrical aspects of the circuit.

b. The symbols are connected by lines that represent signal paths. The orientation of a symbol on a diagram does not alter the meaning of the symbol nor does it imply physical location of parts. See ANSI/IEEE STD 91/91A.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

DETAIL LOGIC CIRCUIT DIAGRAM
FIGURE 4-19

DIGITAL FORM

DESCRIPTION & USE: (See FIGURE 4-20)

When the Printed Board Master Pattern Drawing (See FIGURE 54) is described in digital form, the description and form shall be in accordance with ANSI/IPC-D-350. These forms may be used for transmitting information between the printed-board designer and the manufacturing facility. The records are also useful when the manufacturing cycle includes computer-aided processes and numerical controlled machines.

REQUIREMENTS:

Printed Board Master Pattern Drawing Digital Forms shall provide sufficient detail on tooling, manufacturing and testing requirements. The Digital Forms shall consist of data covering various segments composed of individual records. The format of the records are specified in ANSI/IPC-D-350. The five basic record types are:

a. Parameter Records

b. Comment Records

c. Feature/Location Records

d. Complex or Composite Records

e. End of Job Record

Digital Forms or Records shall be transmitted on either standard 80-column punched cards or on magnetic tape (7-track or 9-track) per ANSI/IPC-D-350 requirements.

DIGITAL FORM
FIGURE 4-20

DIAGRAMMATIC DRAWING

DESCRIPTION & USE: (See FIGURE 4-21)

A diagrammatic drawing is a graphic presentation of an assembly (or higher-tier assembly), using standardized symbols, codes, and interconnecting lines to describe the function of an installation, assembly or system. Diagrammatic drawings are classified as:

TYPES OF DRAWINGS CLASSIFIED IN THE DIAGRAMMATIC CATEGORY

NOTE:
Each of the above diagrams are depicted separately.

DIAGRAMMATIC DRAWING
FIGURE 4-21

ELECTRONIC SCHEMATIC

DESCRIPTION & USE: (See FIGURE 4-22)

Electronic Schematics are reference documents and are not used for fabrication. The Schematic Diagram shows by means of graphic symbols and connecting lines the electrical connection and functions of a specific circuit arrangement. It facilitates tracing the circuit and its functions without regard to the actual size, shape or location of the components. The components may be identified by reference designations and electrical values only, provided the item description is included in related documentation such as the assembly drawing parts list.

REQUIREMENTS:

a. Electronic graphic symbols shall comply with ANSI/IEEE STD 315 (ANSI Y32.2) and logic elements with ANSI/IEEE STD 91 which may be used together on the same diagram.

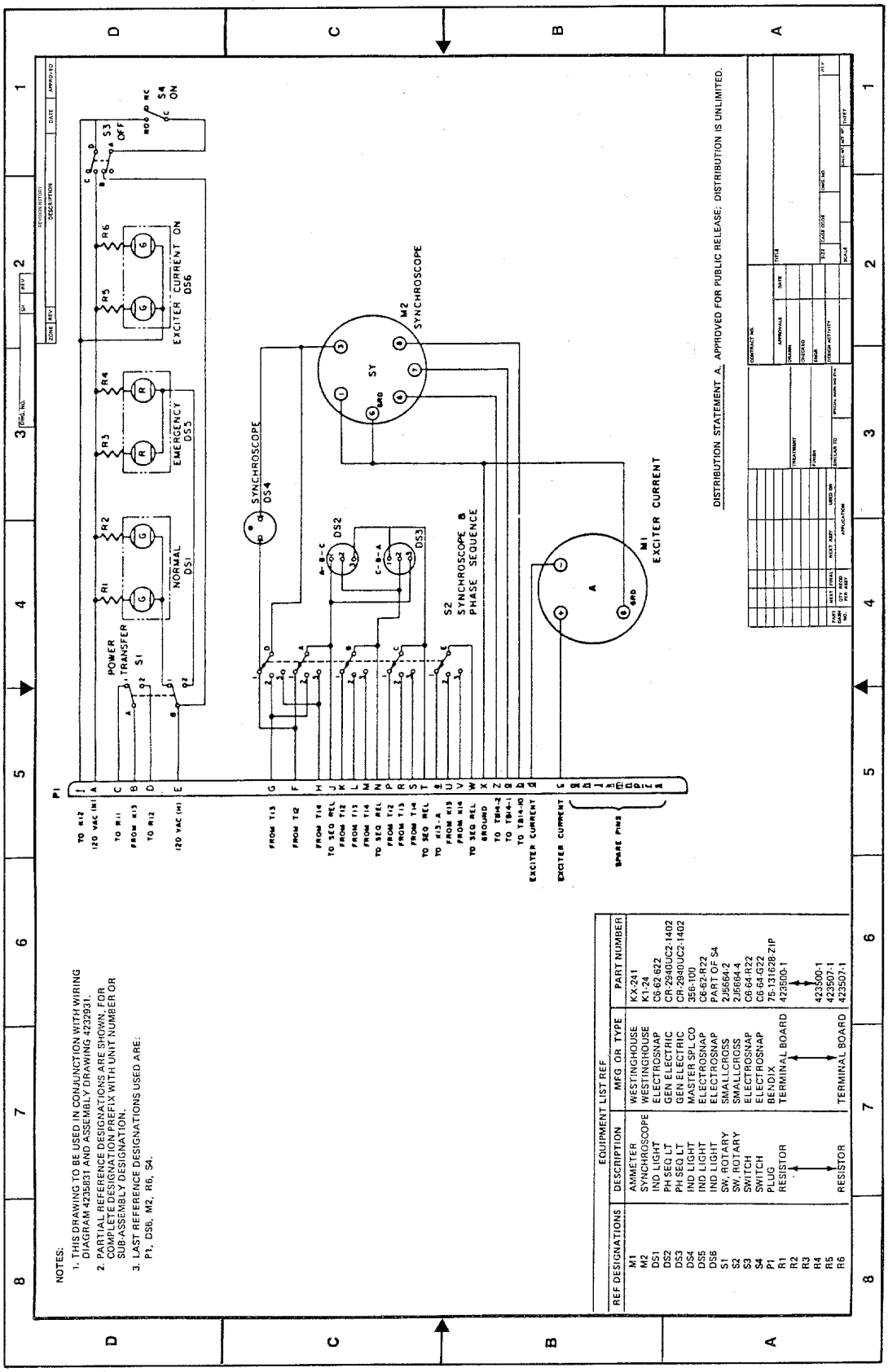
b. Electrically operated devices are shown in a position with the power "off" unless otherwise shown and noted.

c. Symbols are drawn in heavier weight lines than lines joining symbols.

d. Symbols shall include as applicable values or part identifications for such items as resistors, capacitors and inductors.

e. Reference designations to be in accordance with ANSI/IEEE STD 200 and 315 for each item.

f. Standard type designation (if assigned) for such items as semiconductor devices, microcircuits, electron tubes, etc. When no type designation is assigned to the specific configuration used in the circuit by a nationally recognized standard, the item may be identified on the diagram by reference designation only provided the item description is included in the related documentation (e.g., the assembly drawing parts list).



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

ELECTRONIC SCHEMATIC
FIGURE 4-22

ELEVATION DRAWING

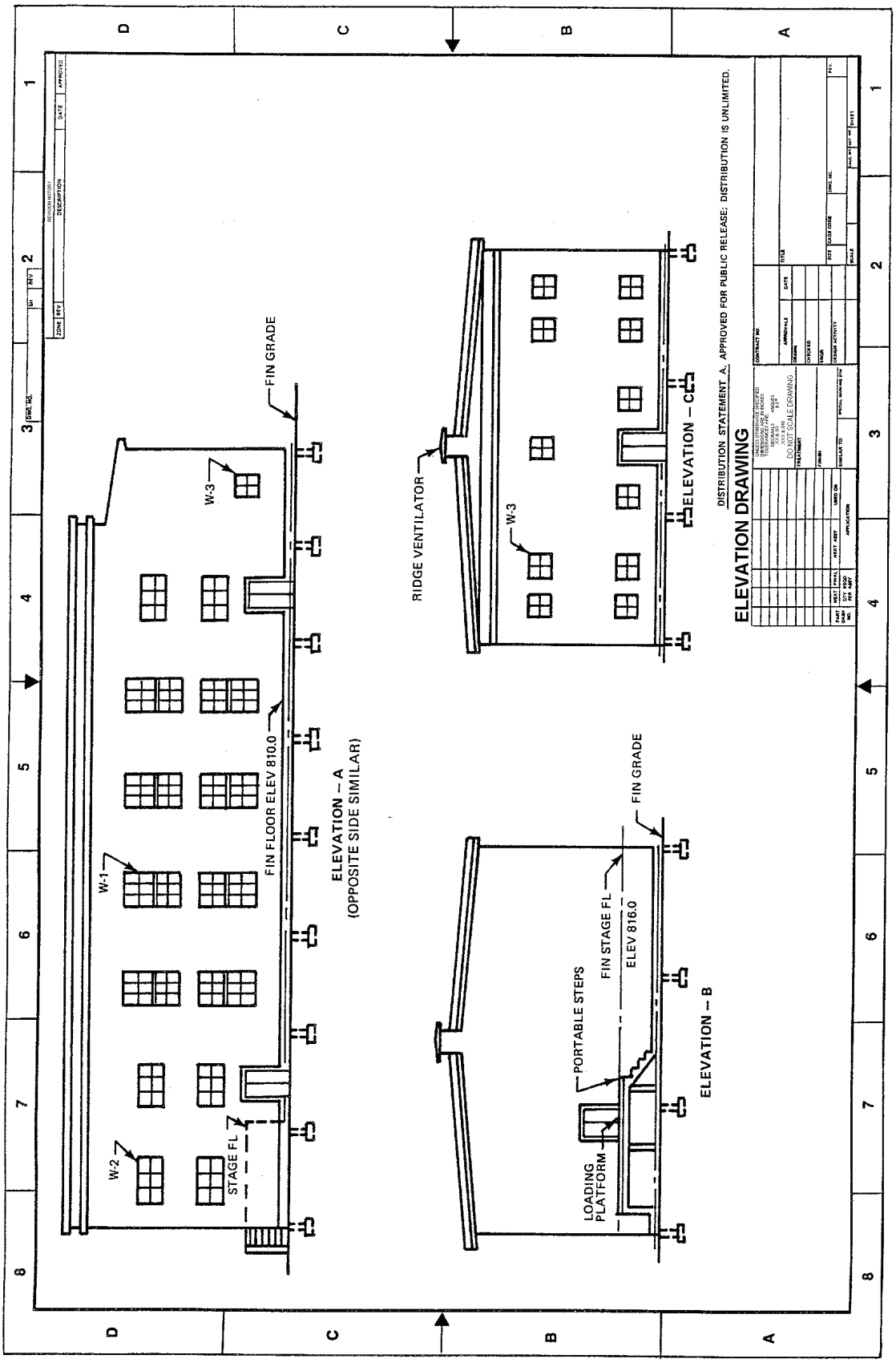
DESCRIPTION & USE: (See FIGURE 4-23)

An elevation drawing depicts vertical projections of buildings, structures or profiles of equipment such as aircraft, automotive and marine, or portions thereof.

REQUIREMENTS:

a. An elevation drawing shows configuration, shapes and sizes of features, walls bulkheads, compartments, assignment of space, location and arrangement of machinery or fixed equipment. An elevation drawing may indicate materials of construction.

b. Identify the drawing as “ELEVATION DRAWING” above or adjacent to the title block in .25 inch high letters.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

ELEVATION DRAWING
FIGURE 4-23

ENVELOPE DRAWING

DESCRIPTION & USE: (See FIGURE 24)

An envelope drawing depicts an item which specifies a configuration & performance envelope, without details of internal construction. All features other than those shown on the drawing are left to the producer to meet the specified design requirements and performance data for the development of a new product when design disclosure and production are subcontracted.

a. The term "design requirement" means the minimum performance requirements to be met to satisfy the design of the end item or a system designed for the end item.

b. The term “performance data" is a list of physical and functional characteristics under specified operating conditions (i.e. loads, speeds, etc.) and environmental conditions, as required to fully describe the essential operating characteristics under which the item must operate and perform. The characteristics shall be defined sufficiently to permit interchangeability of substitute items by other manufacturers if the specified performance data for the item is met:

REQUIREMENTS:

a. Disclosure requirements are the same as for a Vendor Item Control Drawing (VICD) or Source Control Drawing (SOCD).

b. Define all interface* requirements in exact detail.

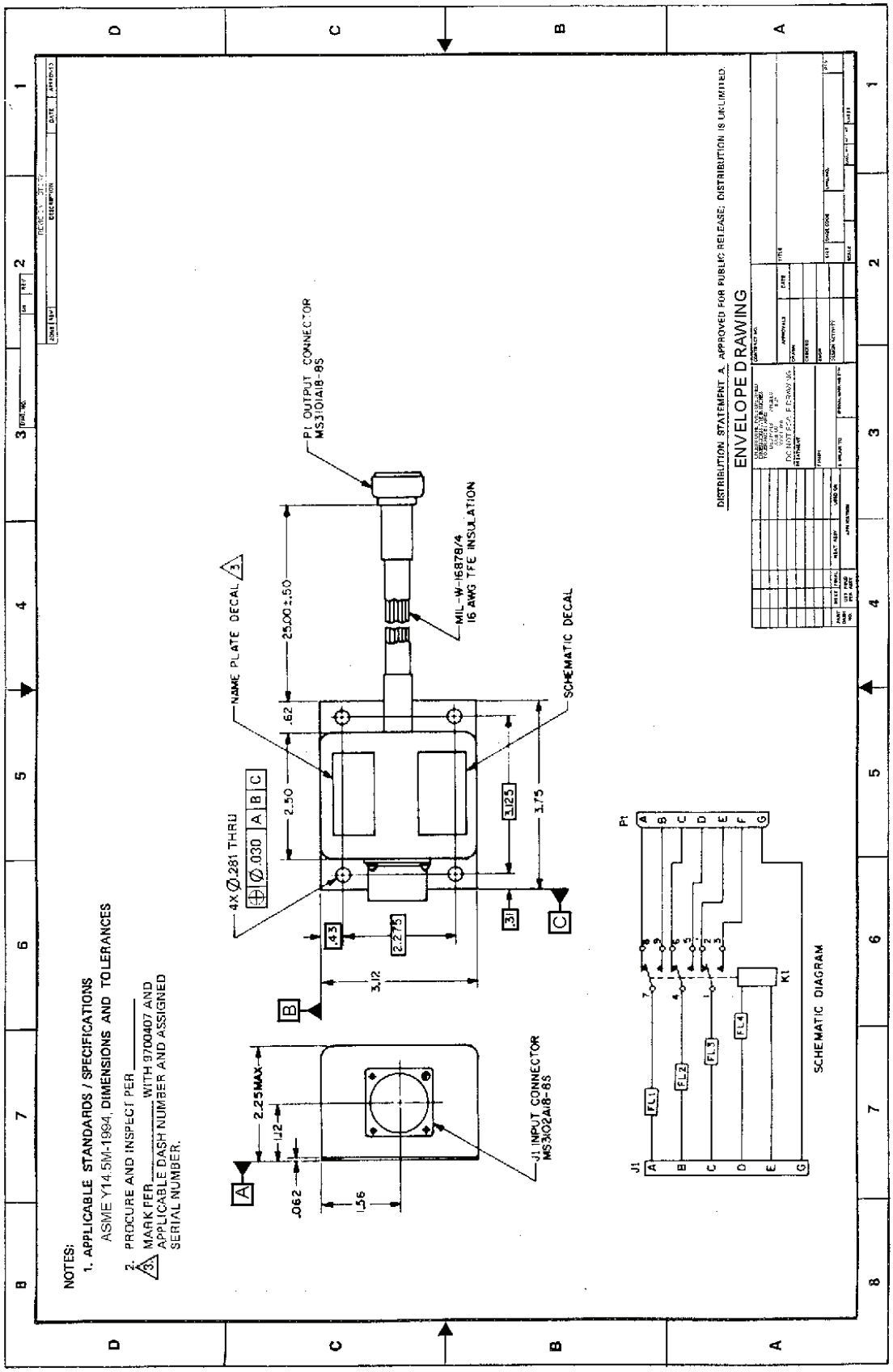
c. Add the notation "ENVELOPE DRAWING” above or adjacent to the title block in .25 inch high letters.

d. Delete any proprietary notice when applicable.

e. Identify the item on its using assembly by the Envelope Drawing-suffix identifier (dash) number.

f. Envelope drawings are only temporary drawings and become obsolete after development of the item is complete.

g. Once a vendor part number is assigned to the item, the Envelope Drawing may be converted to a Vendor Item Control Drawing (VICD) or Source Control Drawing (SOCD).



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

ENVELOPE DRAWING
FIGURE 4-24

ERECTION DRAWING

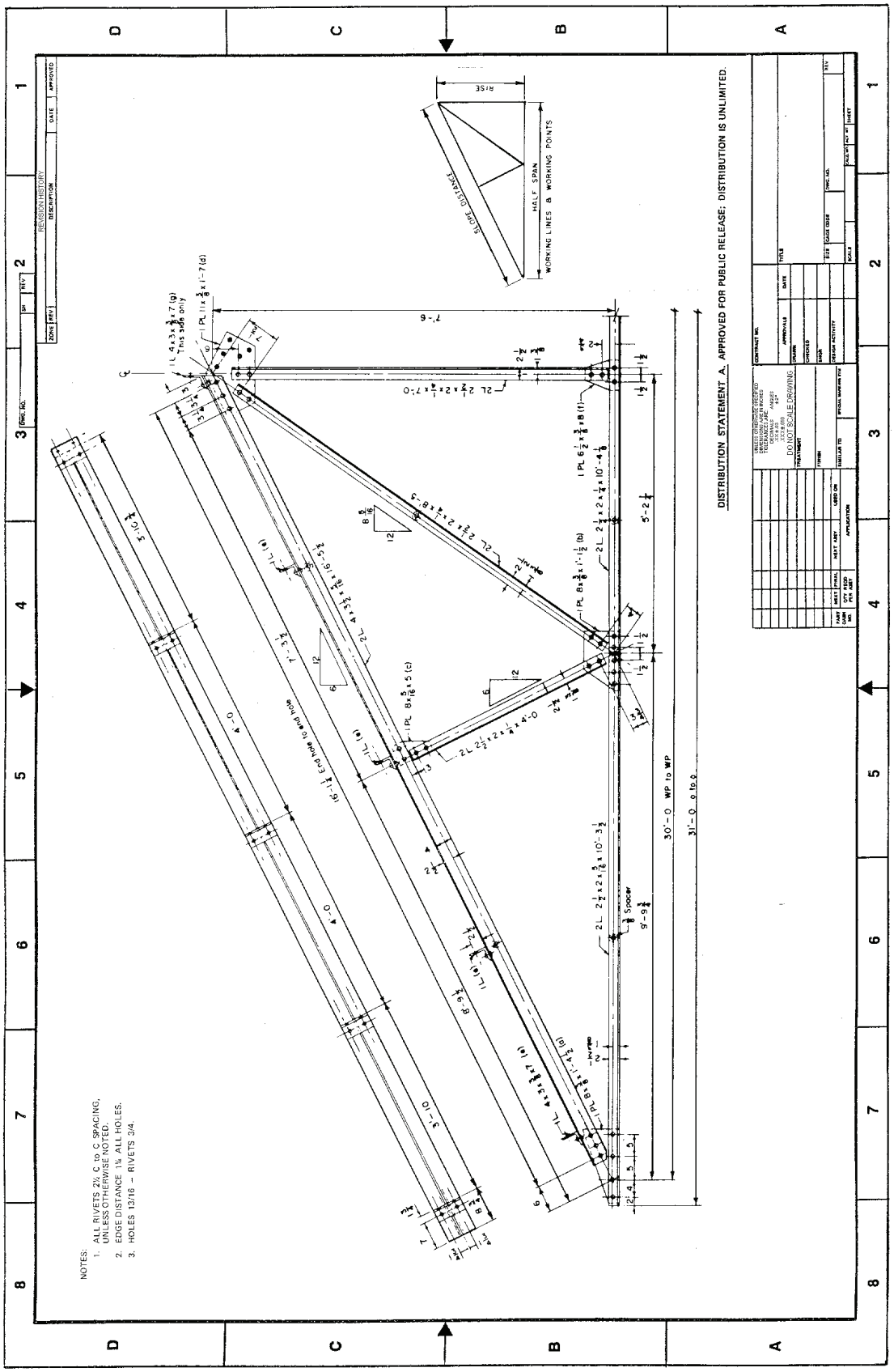
DESCRIPTION & USE: (See FIGURE 4-25)

An erection drawing shows procedures and operation sequence for erection or assembly of individual items or assemblies of item.

REQUIREMENTS:

An erection drawing shall show the location of each part in the structure, identification marking, types of fastenings required, approximate weight of heavy structural members, controlling dimensions, and any other information needed to erect the structure.

Erection drawings may also show existing structure, equipment, and components as reference. Such items are typically shown using phantom lines, as phantom lines indicate that the items depicted are reference and not part of the scope of the drawing. Modifications to existing items may also be shown. Modifications should not be represented using phantom lines; they should be shown using object lines, hidden lines, center lines, the same as all other items that are part of the scope of the erection.



ERECTION DRAWING
FIGURE 4-25

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

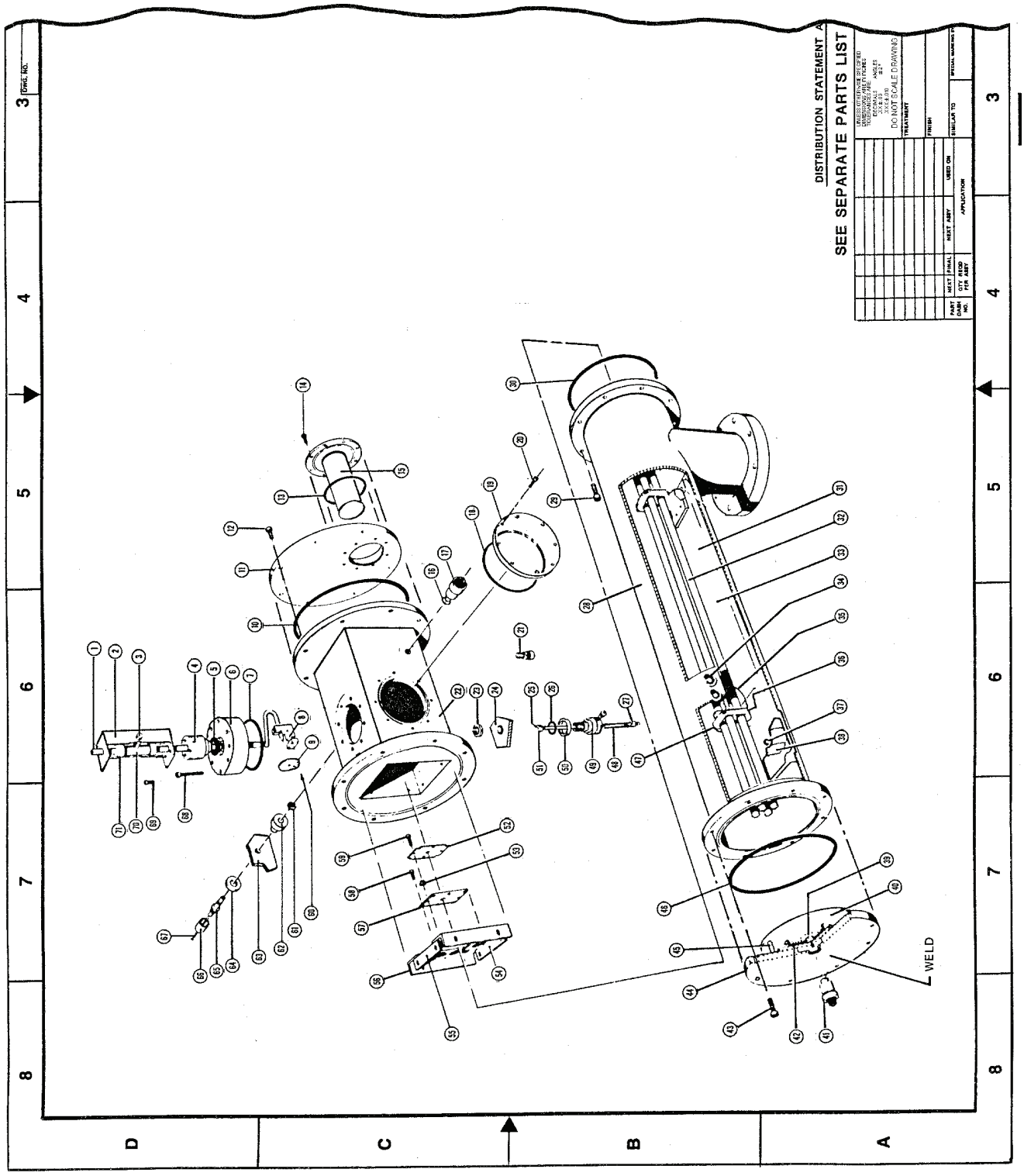
EXPLODED ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-26)

An exploded assembly (Often referred to as “expanded view drawing”) shows assembly relationship in isometric or perspective drawing views, but with parts "exploded" along center lines which show assembly/disassembly relationship. This type of drawing is usually used for Illustrated Parts Breakdown (IPB) or provisioning.

REQUIREMENTS:

The drawing shows each part or a group of inseparable parts with its axes in alignment to its actual assembled position.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

EXPLODED ASSEMBLY DRAWING
FIGURE 4-26

FLOW MECHANICAL SCHEMATIC DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-27)

Flow Schematic drawings are a portrayal of a transfer of energy in either fluid or gaseous compound or the distribution of, such as ventilating air, lubricating oil, etc.

REQUIREMENTS:

Sufficient detail shall be shown to explain;

a. The arrangement of the piping, valves, etc.

b. Operational sequence Symbolic line representation may be used to distinguish functions of various parts. When the objective is to show arrangement the following characteristics may be shown;

    1) Routing of Fluids

    2) Physical locations and arrangement of components

    3) Pipe diameters

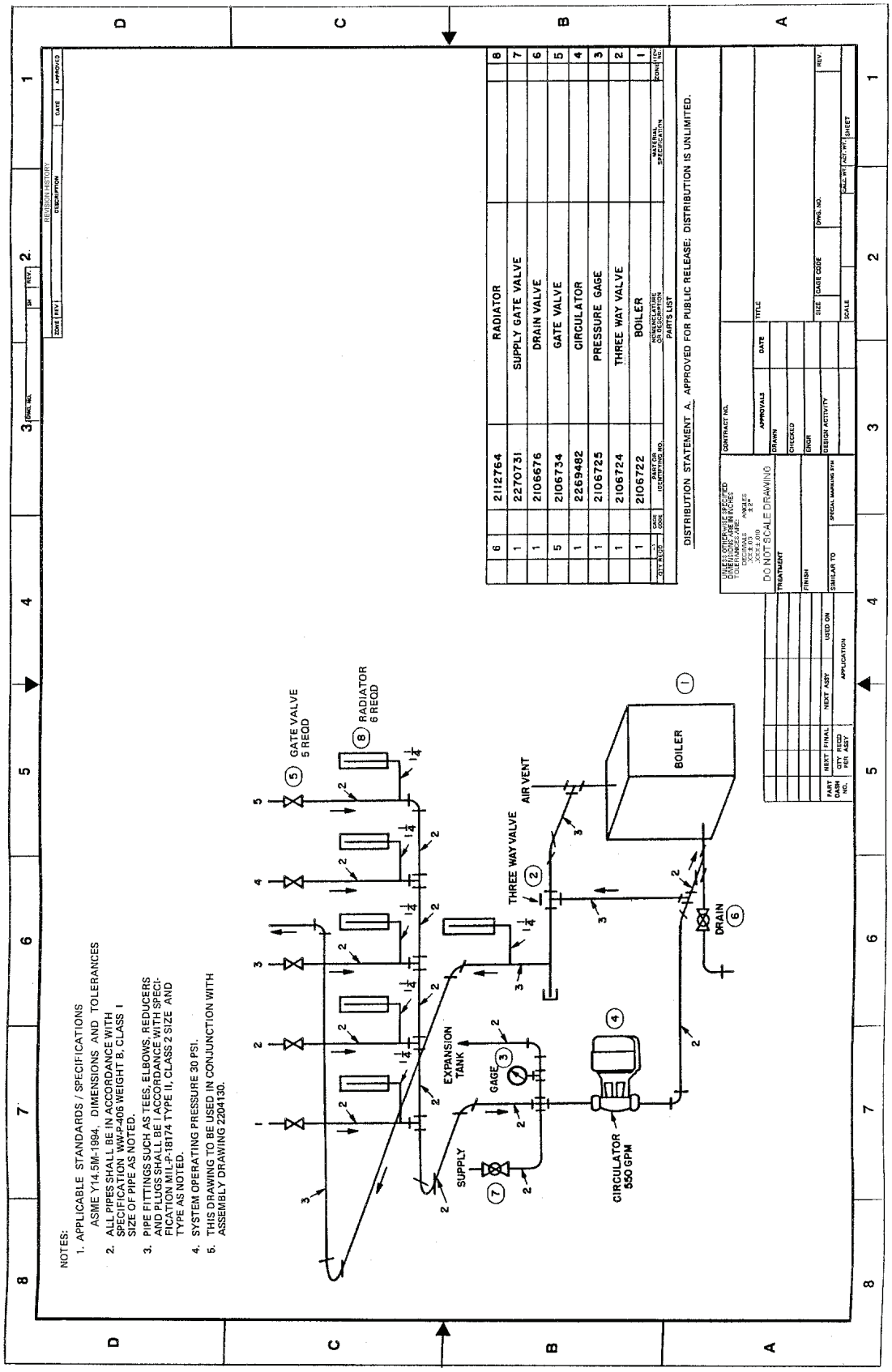
    4) Types and sizes of fittings

    5) Flow

    6) Pressure

    7) Volume

    8) Etc.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

FLOW MECHANICAL SCHEMATIC DIAGRAM
FIGURE 4-27

FORMULATION DRAWING

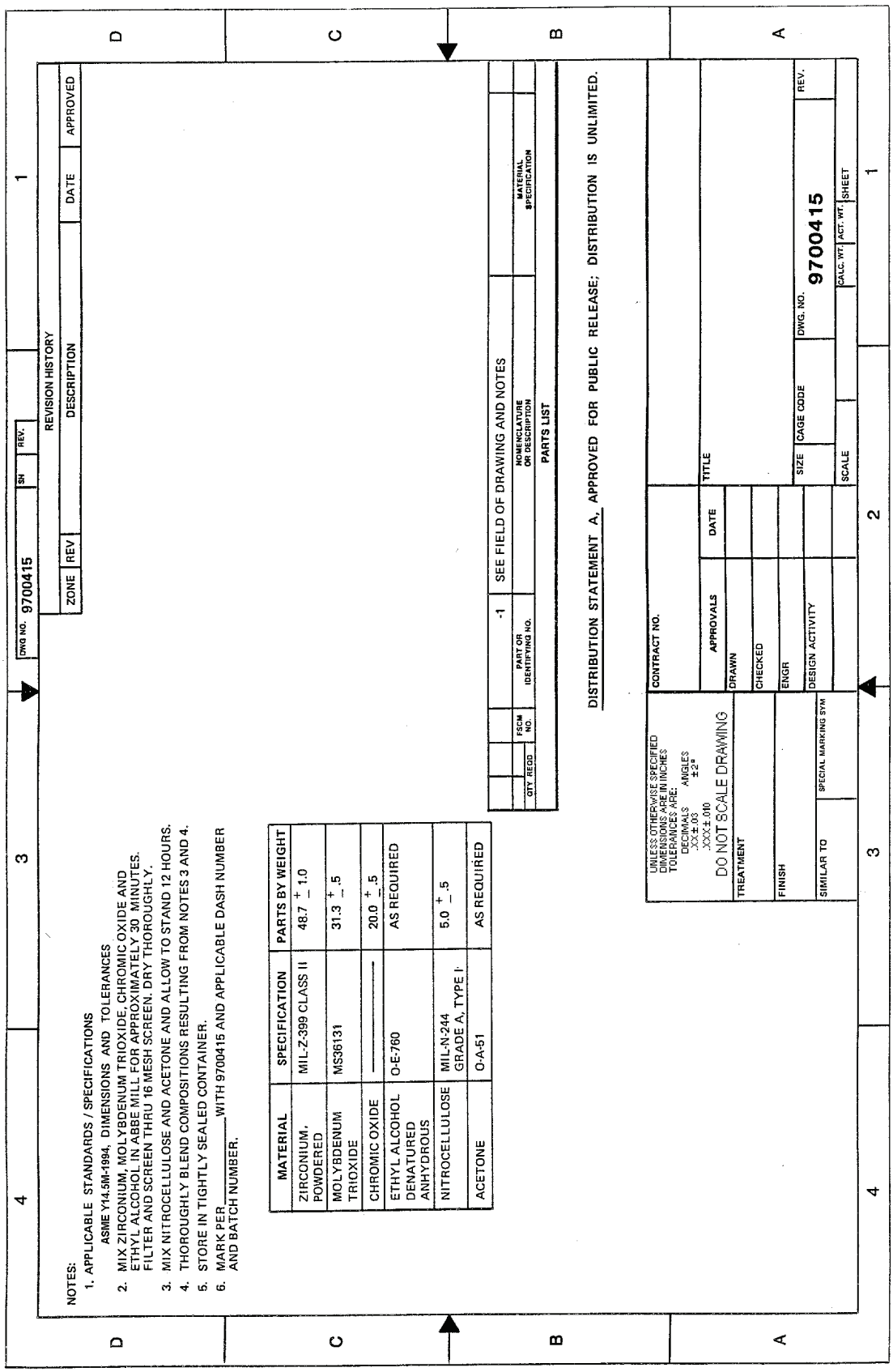
DESCRIPTION & USE: (See FIGURE 4-28)

Lists the constituents of an explosive propellant, pyrotechnic, filler, etc. to identify the mixture, weight, volume, or particle size as used within the particular formulation.

REQUIREMENTS:

a. All information included on the drawing must meet the legibility requirements of SECTION 3 of this manual.

b. Disclose and identify the formulation, including weight, volume composition, or part-size and type, with necessary batching and processing steps.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

FORMULATION DRAWING
FIGURE 4-28

INSEPARABLE ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-29)

An inseparable assembly drawing shows the assembled relationship of two or more parts, separately fabricated and permanently joined together by brazing, cementing, riveting, soldering, welding, etc., and not subject to disassembly. The assembly is considered as a single item, as it is used as an end item in subsequent assemblies.

REQUIREMENTS:

a. The drawing shall fully define the end product in its as-assembled condition. An inseparable assembly drawing includes, as applicable:

    1) A unique identifier for all items which become a part of the inseparable assembly.

    2) Methods of assembly and requirements for finishes, processes, settings and adjustments, and other relevant data necessary to complete the item.

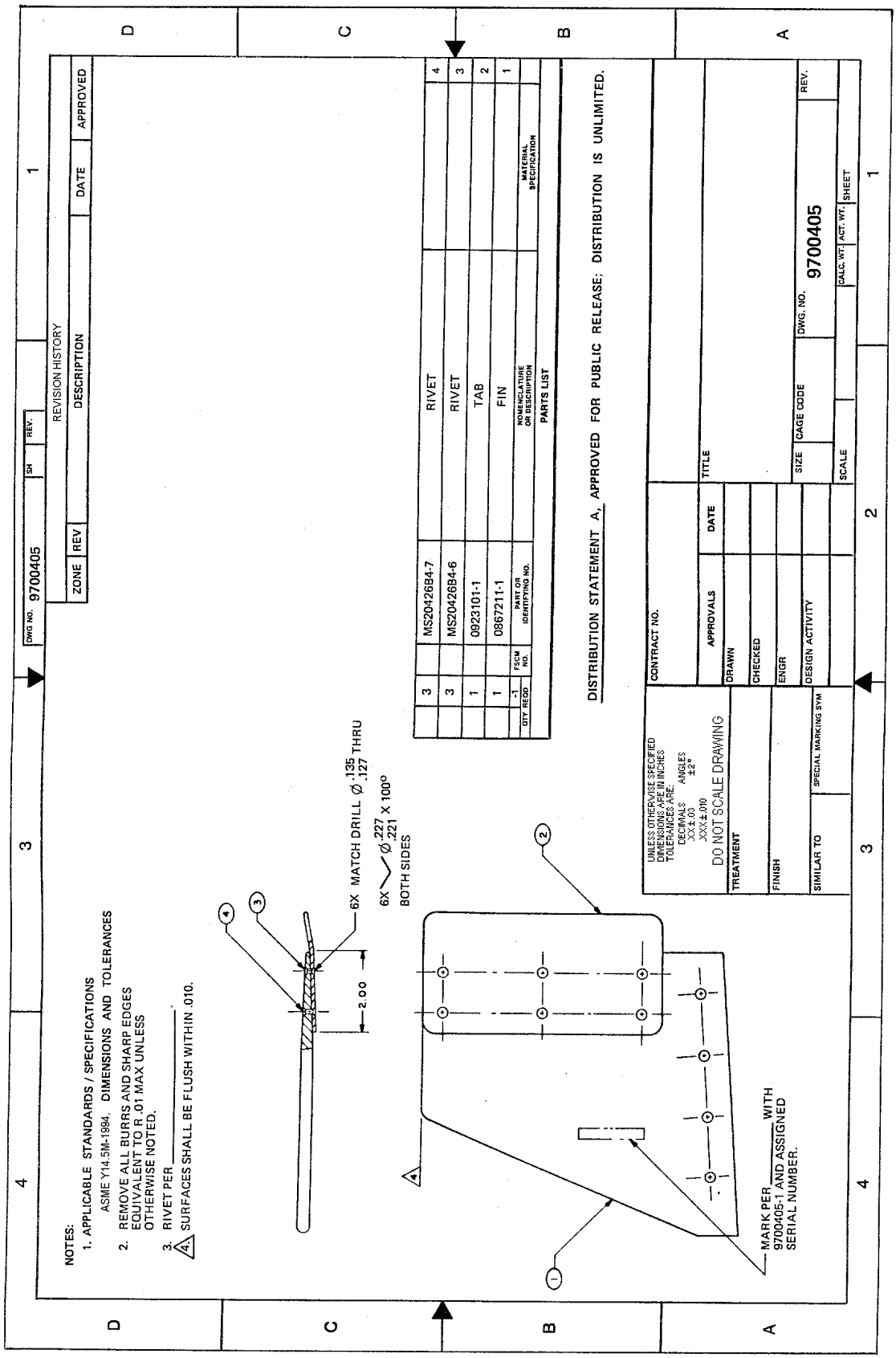
    3) Depiction of the items in the assembled condition, using sufficient detail for identification, orientation, and assembly of the items.

    4) An item identification assigned to the assembly configuration.

    5) Identification marking requirements.

b. Part of an inseparable assembly may be defined on separate detail drawings or on an inseparable detail drawing. See: separate descriptions for Detail Drawings and Inseparable Detail Drawings.

c. Any dimensions that are not characteristic of the end product are informational only and should be identified as reference using the techniques in SECTION 5 of this manual.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INSEPARABLE ASSEMBLY DRAWING
FIGURE 4-29

INSTALLATION ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-30)

An installation assembly drawing is often used to depict an assembly which is so large or complex that the major assembly drawing cannot accommodate all the relevant data. An installation assembly drawing shows the installed and assembled position of items relative to its supporting structure or to associated items. i.e. to install and assemble bellcranks, electrical wire harnesses, tubing, etc.

REQUIREMENTS:

a. A Parts List of items to be installed.

b. Locating dimensions and associated tolerances including space requirements for installations, servicing and safe operational clearances.

c. Types and quantities of attachment hardware for mounting such as mounting supports, hold-down bolts, lifting lugs, etc.

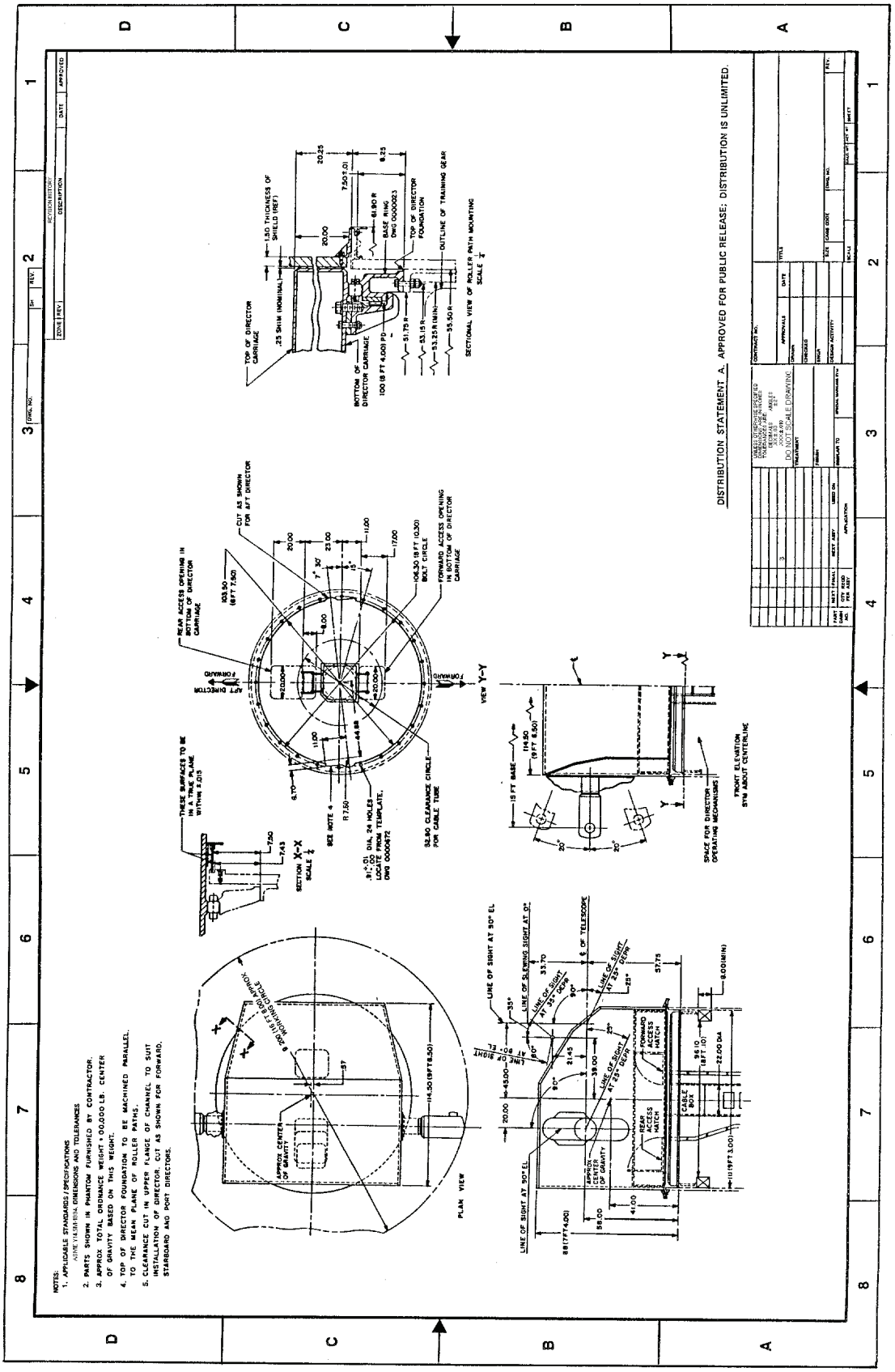
d. Process and special installation requirements.

e. Adjustment data for obtaining fits, clearance alignment, etc. by customer.

f. Special test or inspection requirements and clearance required to perform such tasks.

g. Detail definition of special installation parts.

h. Weight, center line of equipment, center of gravity, coupling data, interface connections and clearance required to make such connections.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INSTALLATION ASSEMBLY DRAWING
FIGURE 4-30

INSTALLATION CONTROL DRAWING

DESCRIPTION & USE: (See FIGURE 4-31)

An installation control drawing sets forth information for an item in terms of area, weight and space, access clearance, angles of train in clearances, pipe and cable attachments required for the installation and co-functioning of the item with related items.

REQUIREMENTS:

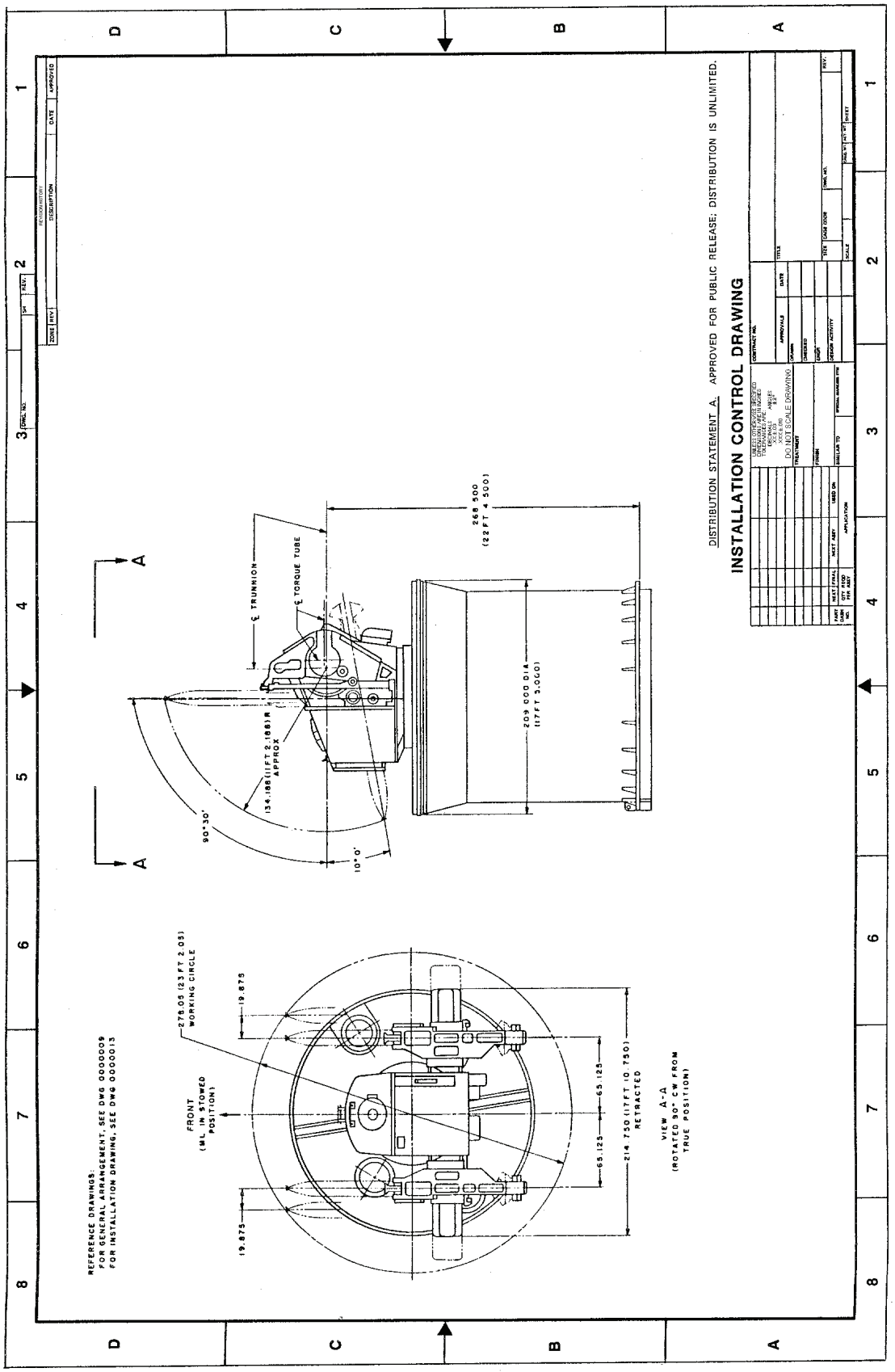
An installation control drawing shall include the following information as applicable:

a. Overall and principal dimensions in sufficient detail to establish the limits of space in all directions required for installation, operation and servicing.

b. The amount of clearance required to permit the opening of doors or the removal of plug-in units.

c. Clearance for travel or rotation of any moving parts, including the centers of rotation, angles of train in azimuth, elevation and depression, and radii from each pivot to the end of each rotating element involved in clearance determination.

d. The notation "INSTALLATION CONTROL DRAWING" shall appear above or adjacent to the title block in .25 inch high letters.



INSTALLATION CONTROL DRAWING
FIGURE 4-31

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INSTALLATION DRAWING

DESCRIPTION & USE: (See FIGURE 4-32)

An installation drawing shows the configuration envelope and complete information necessary to install an item relative to its supporting structure or to associated items. An installation drawing may show a specific completed installation. Installation drawings for a one-of-a-kind installation may be revised to record the as-installed or as-built condition.

REQUIREMENTS:

a. An installation drawing shall include the following, as applicable:

b. Installed item(s) shown in solid lines; other items (e.g., bulkheads & structures) in phantom.

c. Interface mounting and mating information, such as dimensions of location for attaching hardware.

d. Interface pipe and cable attachments required for the installation and cofunctioning of the item to be installed with related items.

e. Information necessary for preparation of foundation plans, including mounting place details, drilling plans and shock mounting and buffer details.

f. Location, size and arrangement of ducts.

g. Weight of unit.

h. Location, type and dimensions of cable entrances, terminal tubes and electrical connectors.

i. Interconnecting and cabling data.

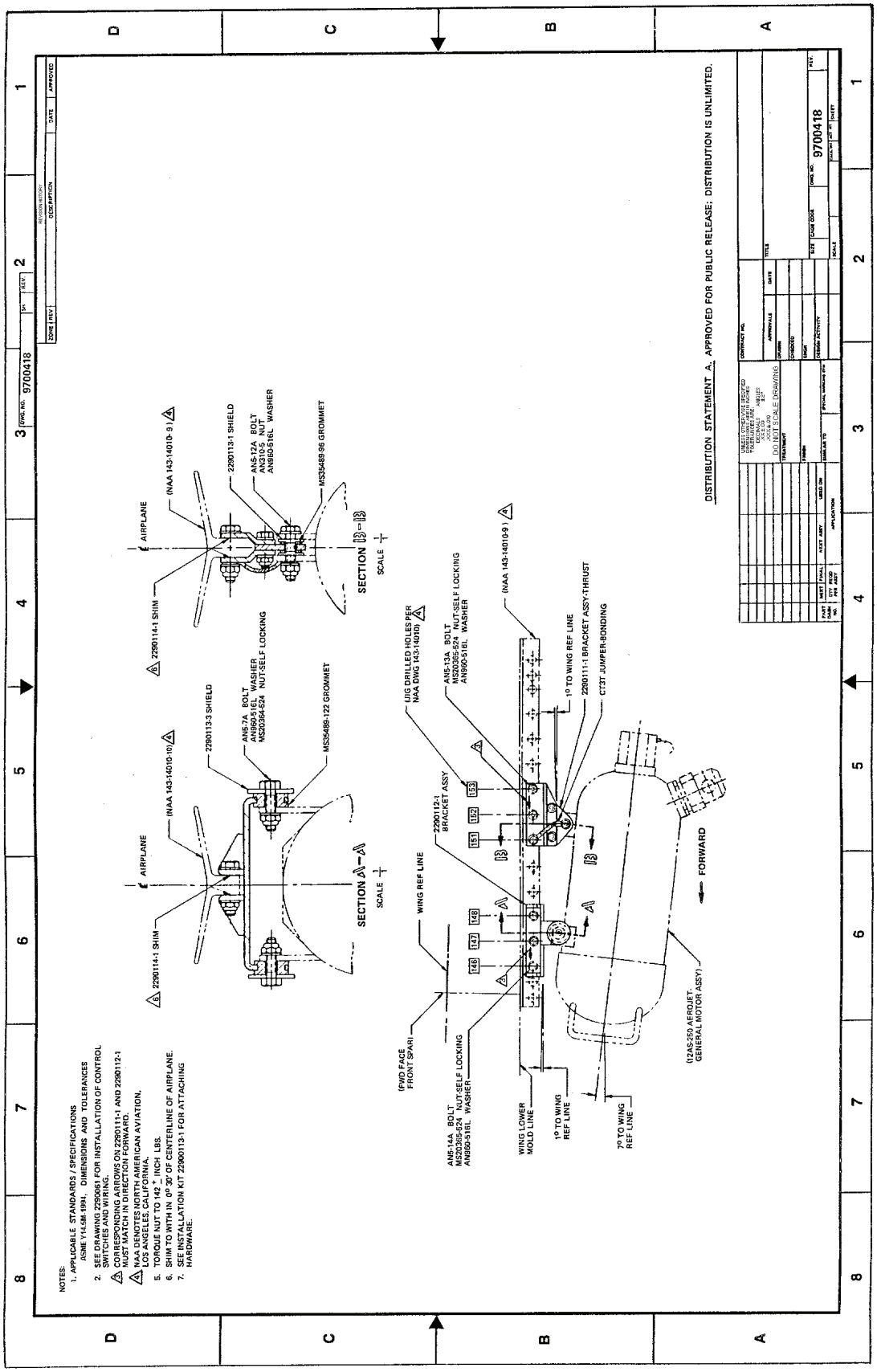
j. Reference notes to applicable lists and assembly drawings.

k. When not disclosed on other referenced documents: Overall and principal dimensions in sufficient detail to establish the limits of space in all directions required for installation, operation and servicing; the amount of clearance required to permit the opening of doors or the removal of plug-in units; clearance for travel or rotation of any moving parts, including centers of rotation, angles of elevation depression.

l. An installation drawing may include a parts list to establish the requirements for the installation hardware and, if desired, the items being installed.

m. The term "INSTALLATION DRAWING", in the second part of the drawing title.

n. A general note, "USE IN CONJUNCTION WITH (using assembly drawing.)"



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INSTALLATION DRAWING
FIGURE 4-32

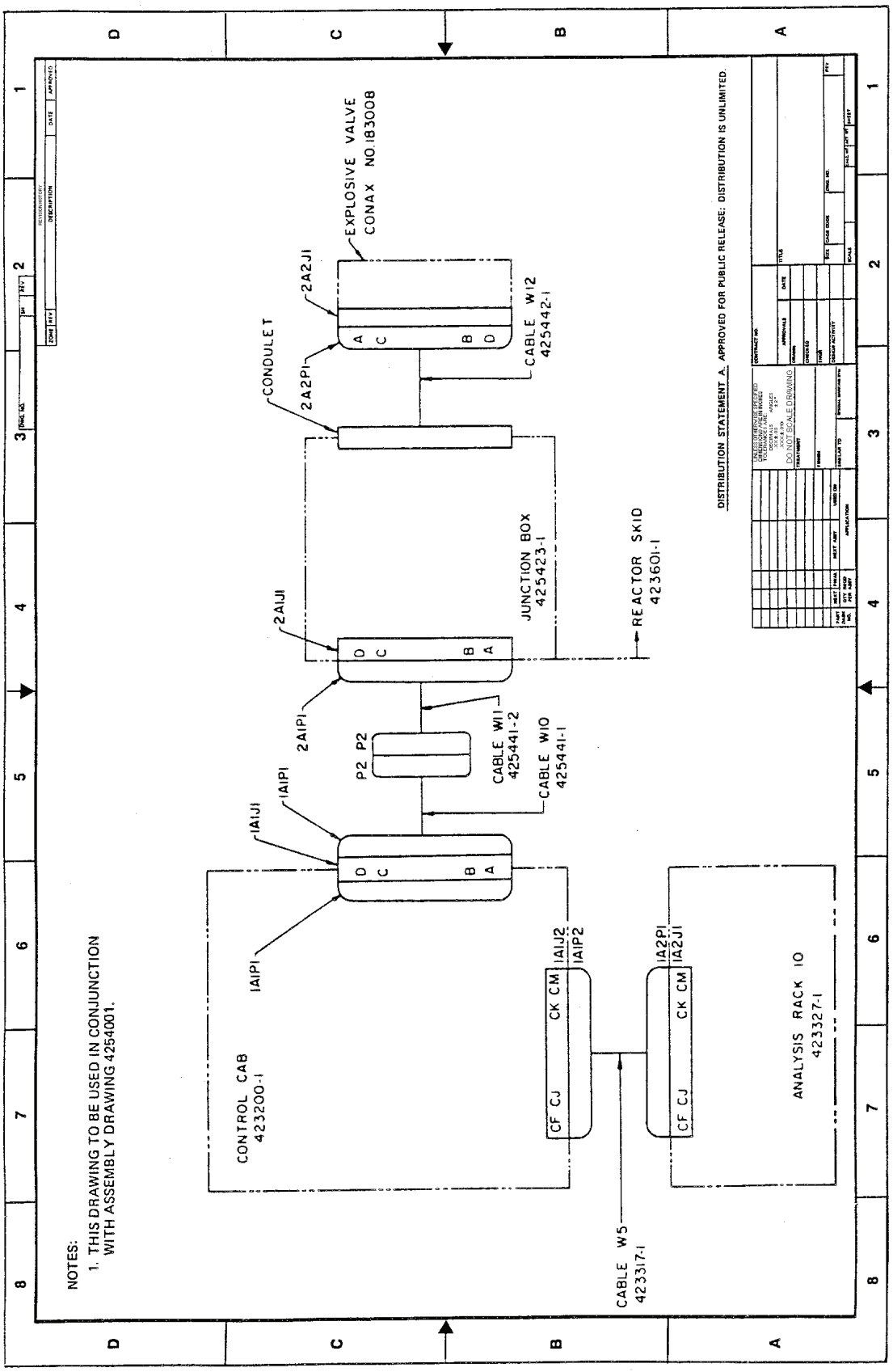
INTERCONNECTION DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-33)

An Interconnection Diagram is a form of connection or wiring diagram which shows only external connections between units, sets, groups and assemblies. They may be used to develop the general configuration and branching required for each wire harness and cable assembly. See also Wire (Running) List FIGURE 4-74 as another form of an inter-connection diagram.

REQUIREMENTS:

The Interconnection Diagram Drawing delineates features and illustrates the interconnections between units, sets, groups, and systems by means of symbols and lines. ANSI/IEEE Y32.9, and IEEE STD 315, provides directions for use of symbology relative to diagrammatic drawings.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INTERCONNECTION DIAGRAM
FIGURE 4-33

INTERFACE DRAWING

DESCRIPTION & USE: (See FIGURE 4-34)

An Interface Drawing shows physical and functional interface engineering requirements of an item which affect the design or operation of co-functioning items. These drawings are used as design documents, delineating interface engineering data coordinated for the purpose of: (a) establishing and maintaining compatibility between co-functioning items; (b) controlling interface designs thereby preventing changes to item requirements which would affect compatibility with co-functioning subsystems; (c) communicating design decisions and changes to participating activities.

REQUIREMENTS:

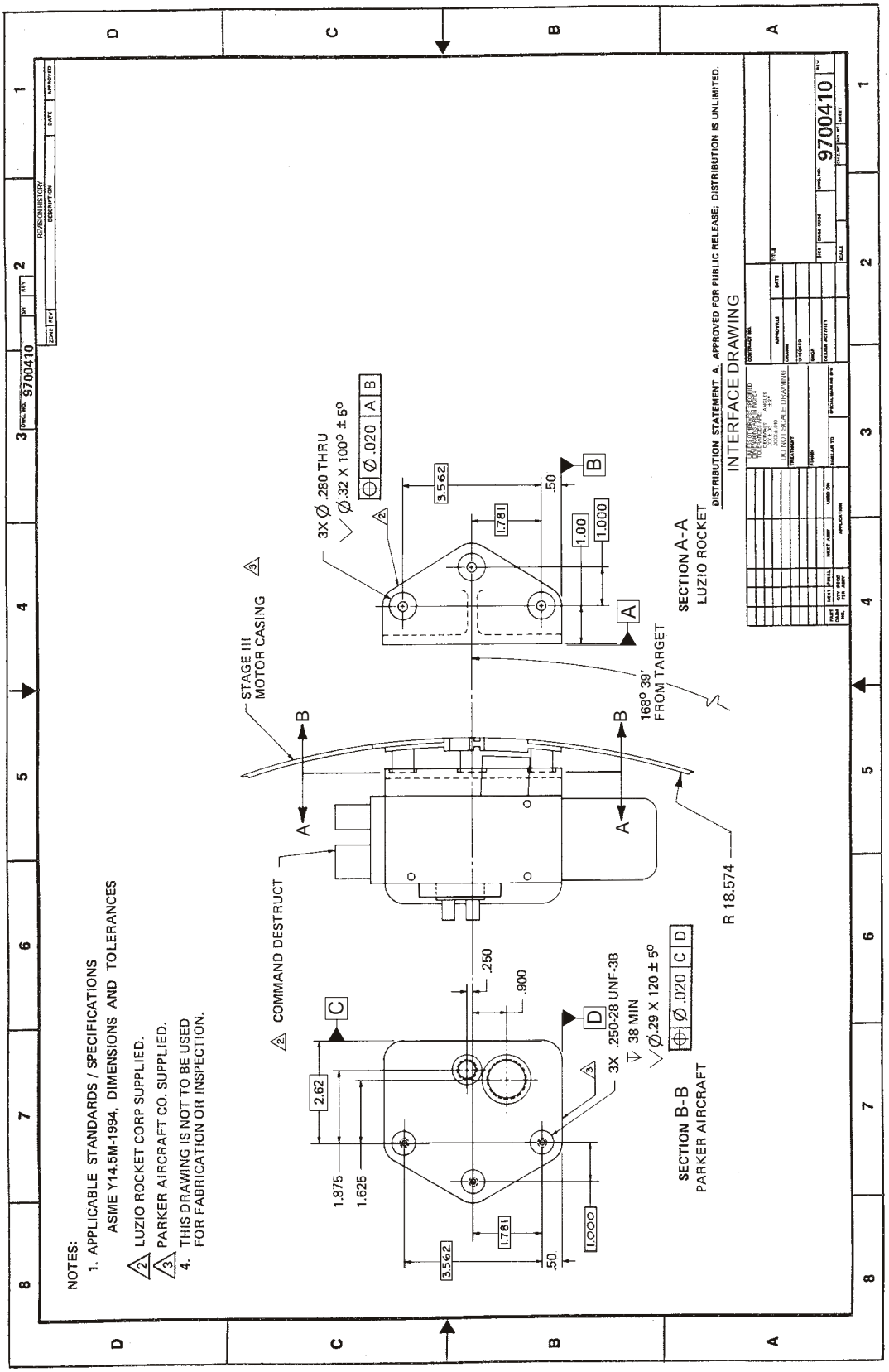
An interface control drawing shall delineate, as necessary:

a. Configuration and all interface dimensional data applicable to the envelope, mounting and mating of the items.

b. Complete interface engineering requirements, such as mechanical, electrical, electronic, hydraulic, pneumatic, optical, etc., which affect the physical or functional characteristics of co-functioning items. Each interface type may be described in a separate interface drawing or in combination on a single drawing.

c. Any other characteristics which cannot be changed without affecting system design criteria.

d. The notation INTERFACE DRAWING shall be shown above or adjacent to the title block in .25 inch high letters.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

INTERFACE DRAWING
FIGURE 4-34

KIT DRAWING

DESCRIPTION & USE: (See FIGURE 4-35)

A kit drawing depicts a packaged unit, item or group of items, instructions, photographs or drawings such as are used in modification, installation or survival. The items in a kit normally do not in themselves constitute a complete functional assembly. A kit drawing may be a listing of part numbers, a pictorial representation of parts or a combination of both.

REQUIREMENTS:

a. The drawing shall include a list of the entire kit content, including part numbers, titles, quantities required, special tool requirements for installation of the kit, retest or recalibration requirements, and related installation drawings or other instructions necessary to complete the installation, modification, etc..

b. Include a general note on the drawing, indicating the kit's use.

   e.g., "USE IN CONJUNCTION WITH (NEXT ASSY. NO.)"

KIT DRAWING
FIGURE 4-35

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

LOGIC DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-36)

A logic diagram depicts by graphic symbols and supplementary notations the details of signal flow and control.

TYPES OF LOGIC DIAGRAMS:

NOTE :
Each of the above diagrams are depicted separately.

LOGIC DIAGRAM
FIGURE 4-36

MATCHED PARTS DRAWING

DESCRIPTION & USE: (See FIGURE 4-37)

A matched parts drawing that shows parts which are machine matched or otherwise mated, for which replacement as a matched set is essential.

REQUIREMENTS:

a. Include a parts list to reflect an assembly composed of the individual matched items.

b. Identify each part with its applicable part suffix identifier (dash) number and each part within the set with its assembly suffix identifier (dash) number.

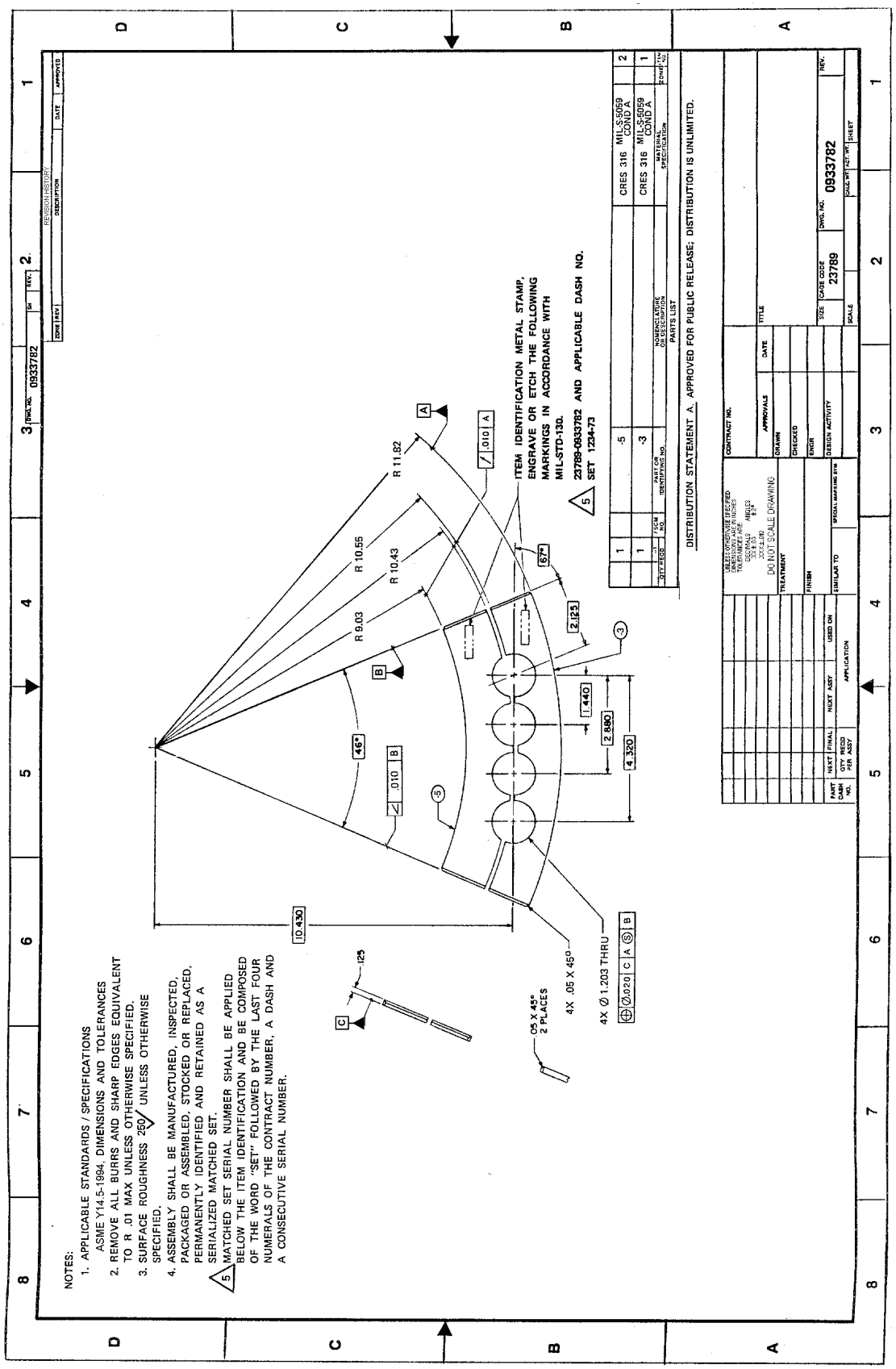
c. Show the operating or mating characteristic of the matched set.

d. Matched parts drawings shall have the following notes specified in the general notes:

1) ASSEMBLY SHALL BE MANUFACTURED, INSPECTED PACKAGED OR ASSEMBLED, STOCKED OR REPLACED, PERMANENTLY IDENTIFIED AND RETAINED AS SERIALIZED MATCHED SET.

2) MATCHED SET SERIAL NUMBER SHALL BE APPLIED BELOW THE ITEM IDENTIFICATION AND BE COMPOSED OF THE WORD "SET" FOLLOWED BY THE SERIALIZATION BASE NUMBER, IF APPLICABLE, A DASH AND A CONSECUTIVE SERIAL NUMBER.

e. Identify each part within the set with the same serial number so that it can be distinguished from similar parts from other matched sets.



MATCHED PARTS DRAWING
FIGURE 4-37

SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

MECHANICAL SCHEMATIC DIAGRAM DRAWING

DESCRIPTION & USE: (See FIGURE 4-38)

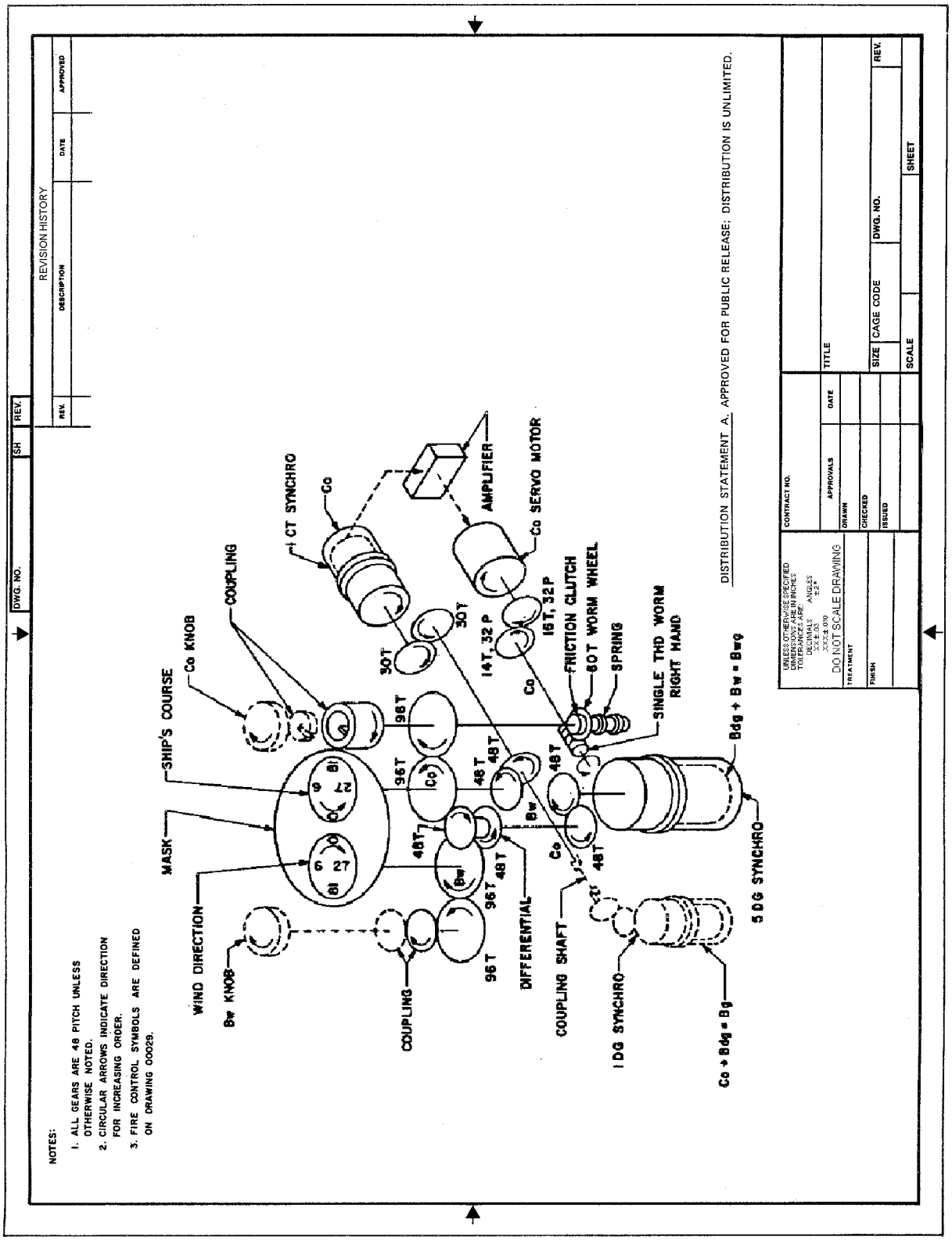
A mechanical schematic diagram drawing shows the operational sequence or arrangement of a mechanical device or system. Its use is to illustrate the operation of an end item where conventional drawings are inadequate to fully explain, e.g. complex arrangement of gear trains, clutches, linkages, cams, etc. Although it contains design information, it does not establish item identification of the item(s) delineated thereon.

REQUIREMENTS:

a. Describe any device element whose function is not clear.

b. Decode any non-standard symbols used.

c. Indicate directions of rotation, limits of travel, etc.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

MECHANICAL SCHEMATIC DIAGRAM
FIGURE 4-38

MODIFICATION DRAWING

DESCRIPTION & USE: (See FIGURE 4-39)

A modification drawing delineates a change to a delivered item and used to add, remove or rework delivered equipment to improve safety, reliability, performance, etc. The modification shall be reidentified by a new drawing number.

REQUIREMENTS:

Modification drawing contain complete information for accomplishing the change, including, as applicable:

a. Instructions for the removal or installation of affected parts.

b. Special notes, including identification by part drawing number of modified part.

c. Dimensions necessary to accomplish the modification. (These should be given from some specific point which is readily identified and accessible, rather than from some theoretical reference point.)

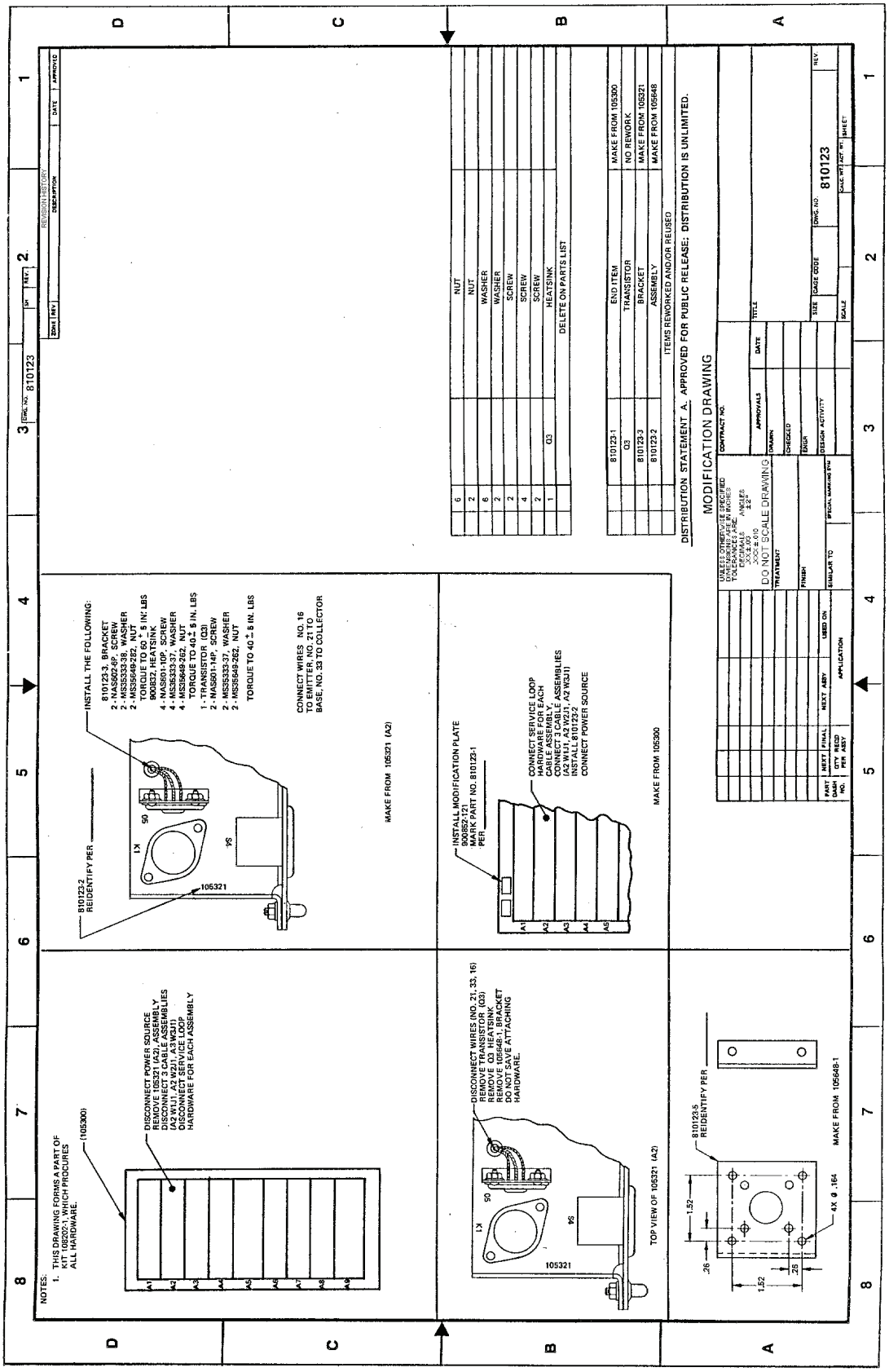
d. A parts list (integral or separate) containing all items required for the modification and items to be deleted, salvaged, and items to compile a kit, as applicable.

e. Listing of special tools or equipment required or supplied.

f. Effectively The serial number of the end products* which are to be modified.

g. The notation “MODIFICATION DRAWING” above or adjacent to the title blocks in .25 inch high letters.

h. Instructions for disposition of unused holes, wires, removed items, etc. (optional)



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

MODIFICATION DRAWING
FIGURE 4-39

MONO-DETAIL DRAWING

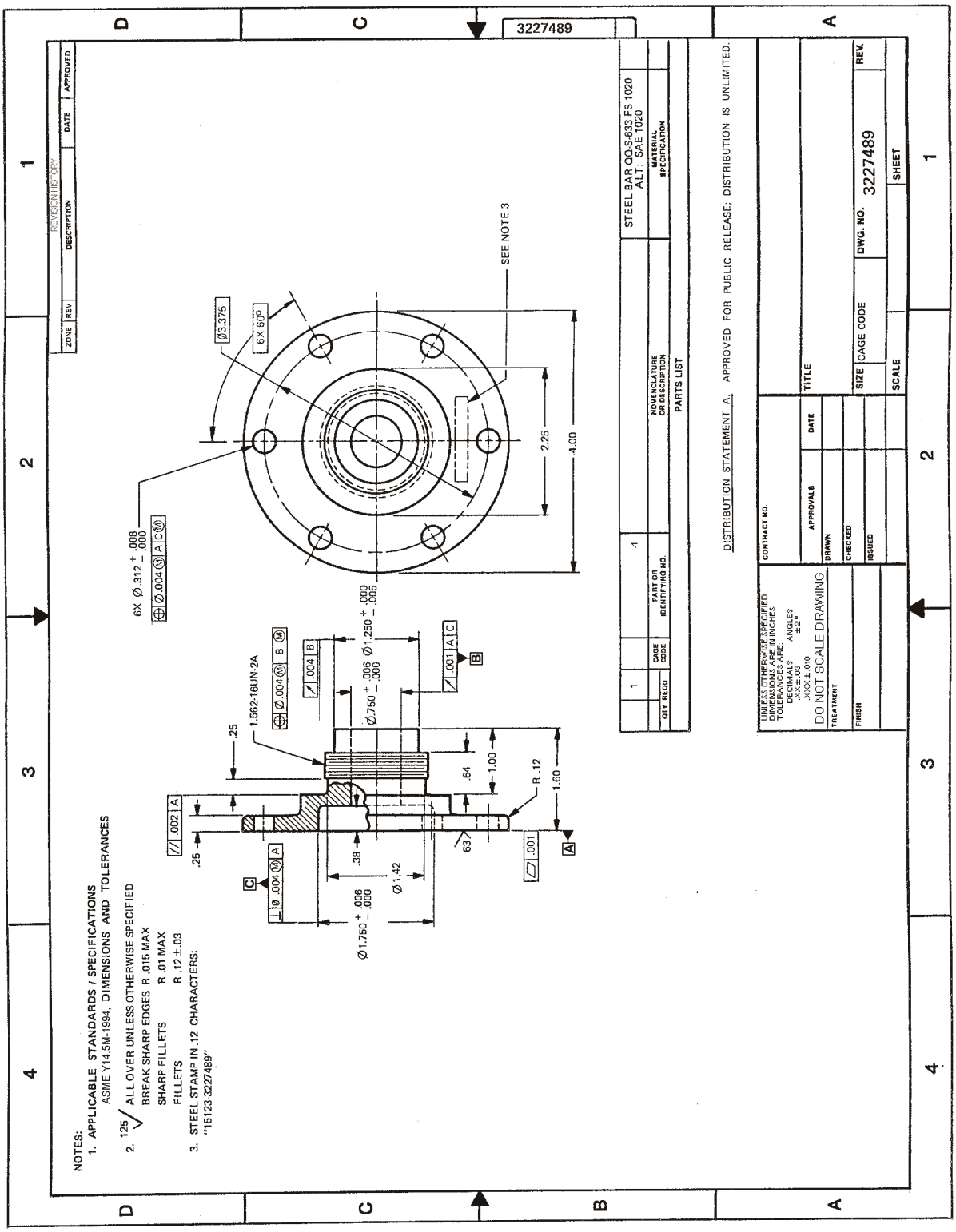
DESCRIPTION & USE: (See FIGURE 4-40)

A mono-detail drawing delineates a single part to the extent it is a complete end item by itself or ready for use in the next assembly.

REQUIREMENTS:

Drawing contains all information necessary for fabrication, finish, marking and inspection.

NOTE: A drawing detailing **SHOWN** and **OPPOSITE parts** using a single set of views is considered to be a tabulated mono-detail drawing.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

MONO-DETAIL DRAWING
FIGURE 4-40

MULTI-DETAIL DRAWING

DESCRIPTION & USE: (See FIGURE 4-41)

A multi-detail drawing delineates two or more uniquely identified parts on the same drawing. Items which can be simply defined are placed on a single drawing.

REQUIREMENTS:

a. A multi-detail drawing is a single drawing prepared to describe parts usually related to one another.

b. Each part on a multi-detail drawing shall meet all the requirements of a mono-detail drawing, aside from being the only item depicted on the drawing.

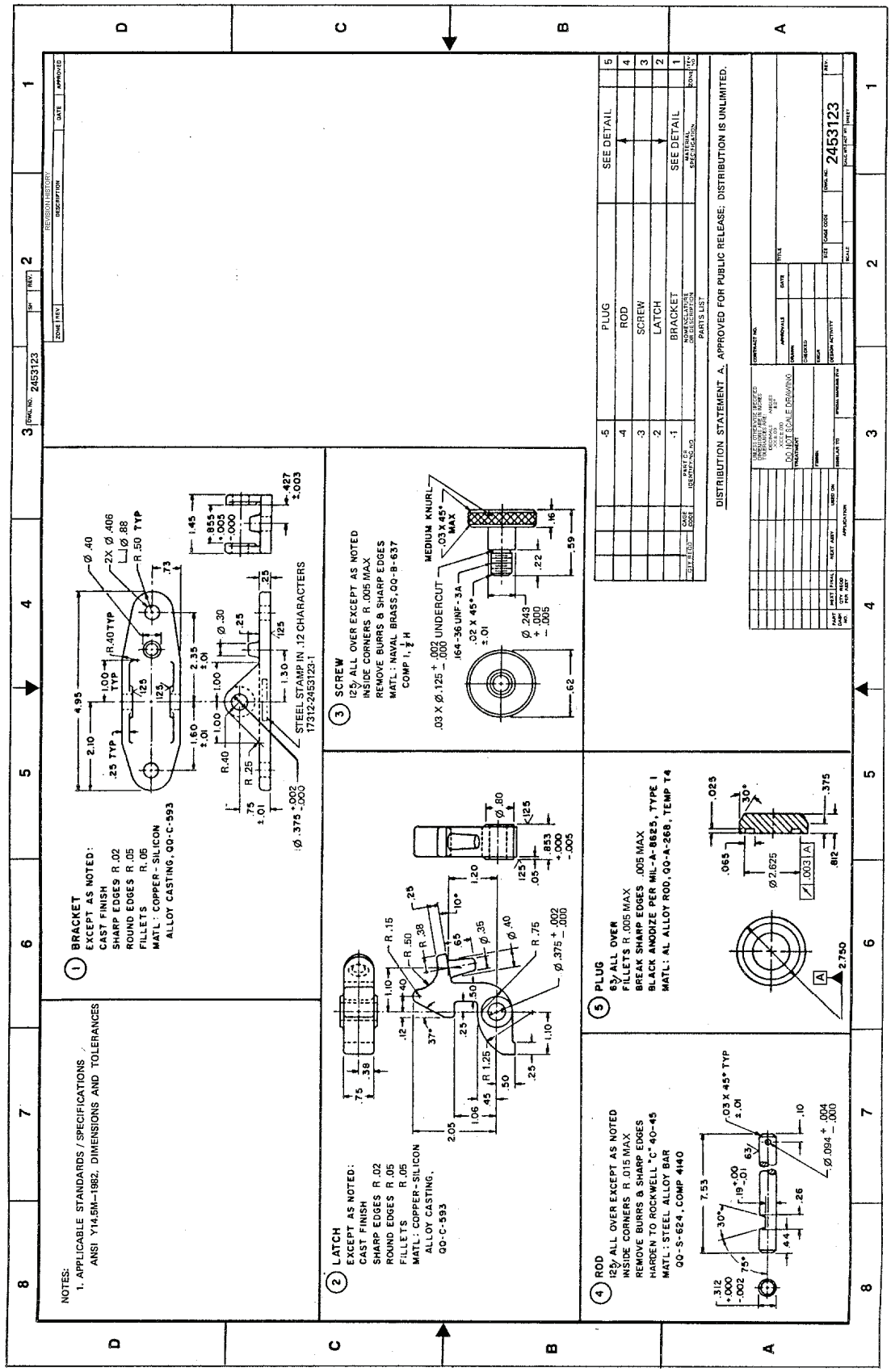
c. Item identification is accomplished by a suffix identifier (dash) number assignment for each separate item.

NOTE: The decision to use a multi-detail drawing should be made cautiously. When revising or tabulating a multi-detail drawing, the drawing is affected in the following ways:

(1) The same revision status applies to all details on a multi-detail drawing; therefore, a change to one detail of the drawing may affect the associated records of all other details (material control data, manufacturing planning, microfilm, etc.)

(2) When tabulating individual parts that are detailed and defined on the drawing, additional details or tabulation blocks are added to detail or define the differences. Each individual tabulated item must be uniquely identified. Tabulating may affect the sequence in the assignment of unique identifiers for each item.

Some significant benefit(s) should outweigh these potential disadvantages, as well as such others as diminished clarity and usefulness resulting from increased drawing complexity.



MULTI-DETAIL DRAWING
FIGURE 4-41

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

NUMERICAL CONTROL (N/C) DRAWING

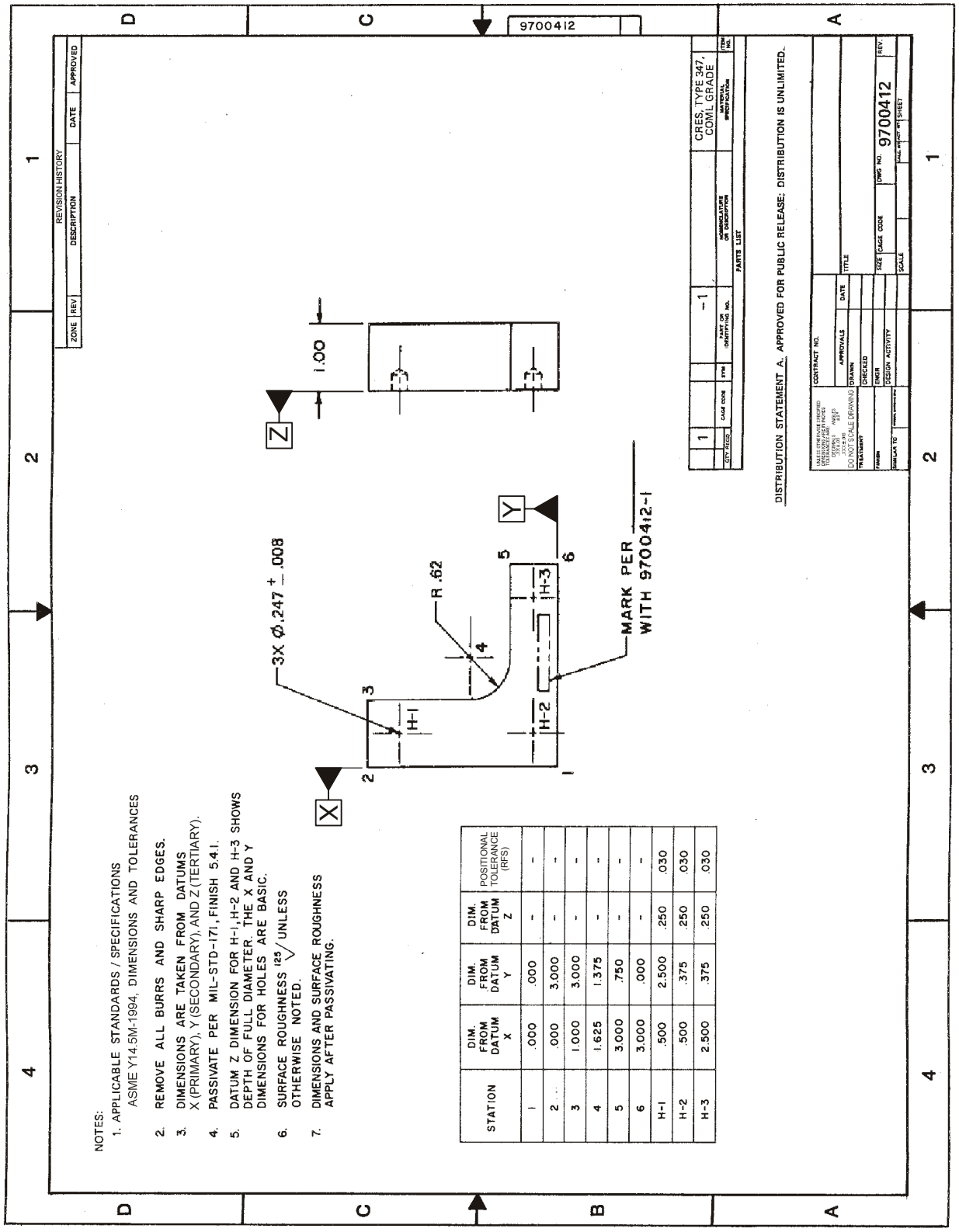
DESCRIPTION & USE: (See FIGURE 4-42)

A numerical control drawing shows the complete physical and functional engineering and product requirements of an item which will be partially or totally produced by numerical control means. This type of drawing is prepared for parts which are to be fabricated on numerically controlled machines.

REQUIREMENTS:

The drawing shall convey, directly or by reference, all engineering requirements for the part(s). For items capable of production by N/C or conventional methods, the information shall be sufficient to permit manufacture by either method.

Integrate any special dimensioning requirements of numerical control machine planning and operation without compromising design requirements. Use the applicable decimal system (inch or mm) for location of features such as machined surfaces, holes, slots, etc. Features are normally defined in a rectangular coordinate system. Axes on the drawing shall intersect at an origin and should be common with the datum of the part view. The part view should preferably be drawn in the first quadrant (see ASME Y14.3) so that positive values will result when the programmer prepares the program or model. Present required information to facilitate preparation of the control media in the most economical form and optimize use of basic dimensioning practices.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

NUMERICAL CONTROL DRAWING
FIGURE 4-42

OPTICAL ELEMENTS DRAWING

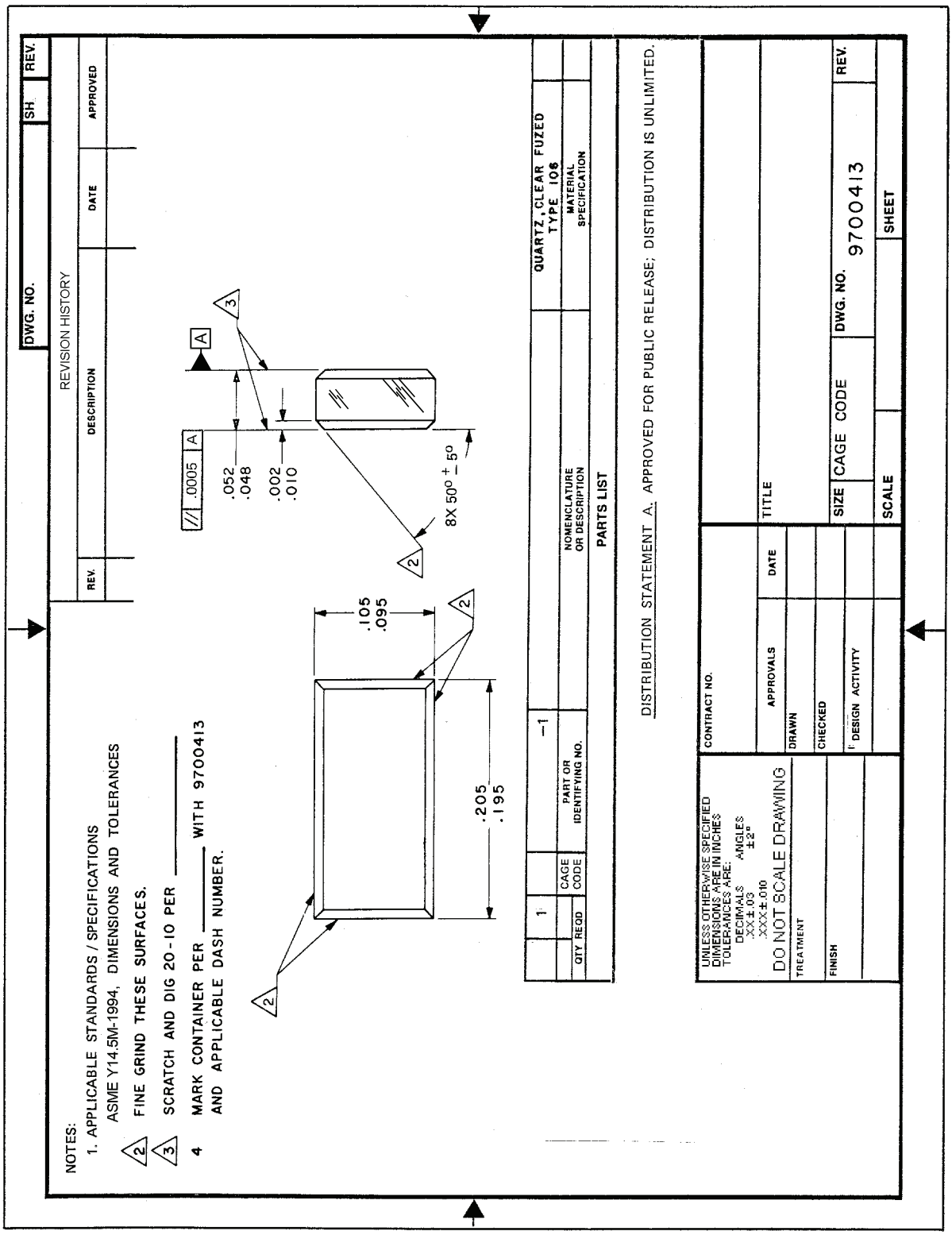
DESCRIPTION & USE: (See FIGURE 4-43)

An Optical Elements Drawing shows the design and fabrication information of optical lenses, prisms, or mirrors to depict optical elements or parts. The Optical Element Drawing depicts an uncompounded lens constructed of a single piece.

REQUIREMENTS:

a. Prepare Optical Element Drawings to show light source travel from left to right. When another direction of light transmission must be made, an arrow shall be shown along the optical axis to indicate the direction of light.

b. For additional information, see ASME Y14.18M (INACTIVE).



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

OPTICAL ELEMENTS DRAWING
FIGURE 4-43

OPTICAL SYSTEMS DRAWING

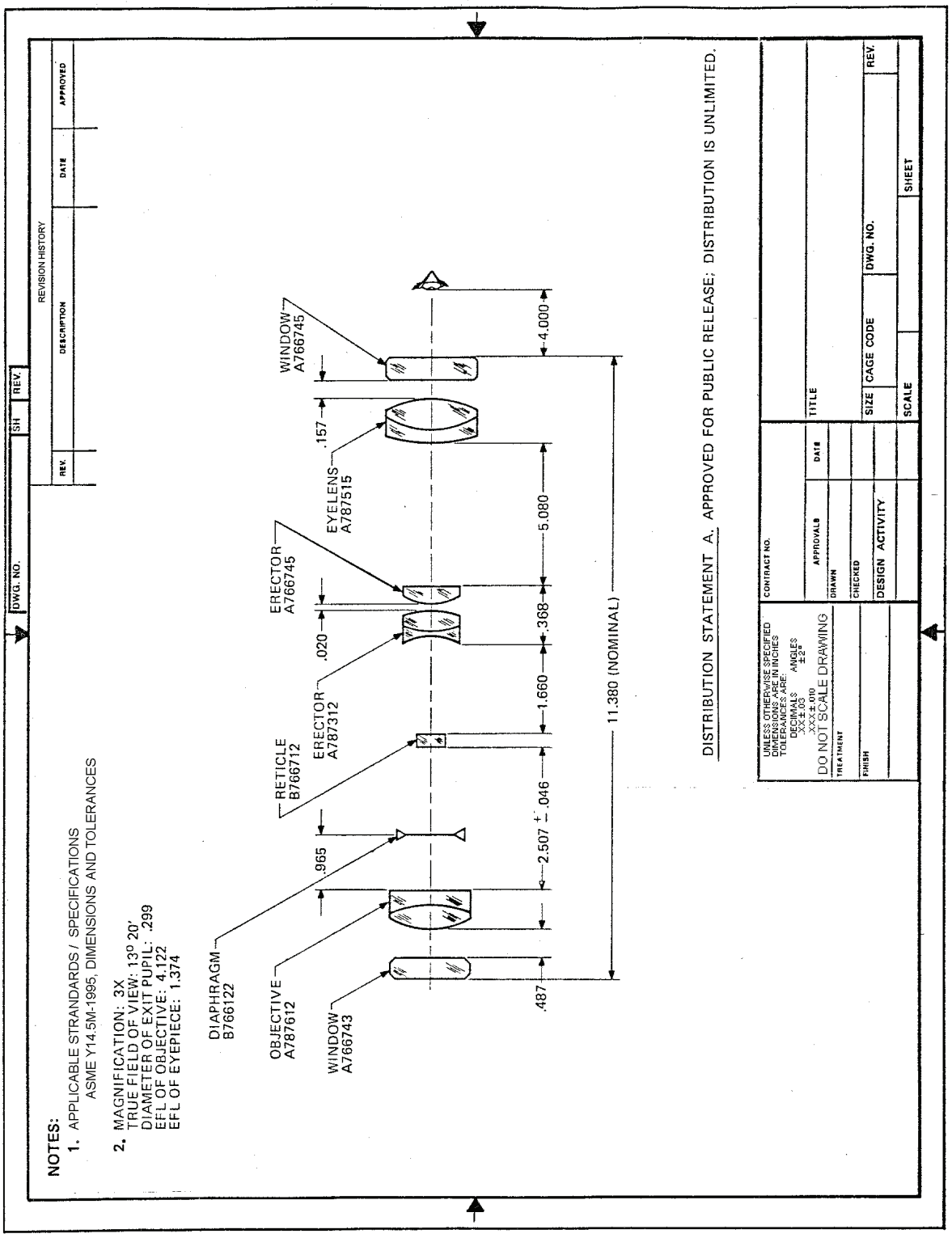
DESCRIPTION & USE: (See FIGURE 4-44)

An Optical Systems Drawing shows the relative position of all the optical components in an assembled instrument or device. These drawings must agree with major or subassembly drawings for optical instruments or devices.

REQUIREMENTS:

Where practicable these drawings shall be oriented so that light passing through the system in a normal direction travels from left to right. When another direction of light transmission is required, an arrow shall be used to indicate the light transmission direction.

Where the light path through a system reverses itself or travels in several different planes, sufficient auxiliary views shall be provided so that the true length of any portion of the light path may be readily determined. The light path shall not be reversed back on itself.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

OPTICAL SYSTEMS DRAWING
FIGURE 4-44

OUTLINE ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-45)

Outline Assembly Drawings are used for the installation of units and provide overall dimensions to show size and location of points necessary in locating and fastening each unit in place. These drawings are often called Installation Drawings.

REQUIREMENTS:

a. Amount of clearance required operating and service the unit is given in an Outline Assembly Drawing.

b. Dimensions essential to making electrical, air and other connections are provided in Outline Assembly Drawings.

c. Notes may be included to indicate weight of the unit, the electrical and cooling requirements, and may also include any special notes of caution.

TYPES OF OUTLINE ASSEMBLY DRAWINGS:

Note:
Each of the above drawings are depicted separately.

OUTLINE ASSEMBLY DRAWING
FIGURE 4-45

PACKAGE CONTENT DRAWING

DESCRIPTION & USE: (See FIGURE 4-46)

A Package Content Drawing is a drawing prepared to provide a package PIN and appropriate package nomenclature for stock identification of commercial or military material packaged for convenience of handling, storage, issue, or functional selectivity in logistic support operations. Package content drawings are prepared for that packaging which constitutes a synthetic grouping or combination of items which in themselves do not constitute a functioning, engineering, or production assembly. Representative examples of such groupings are engine and container units.

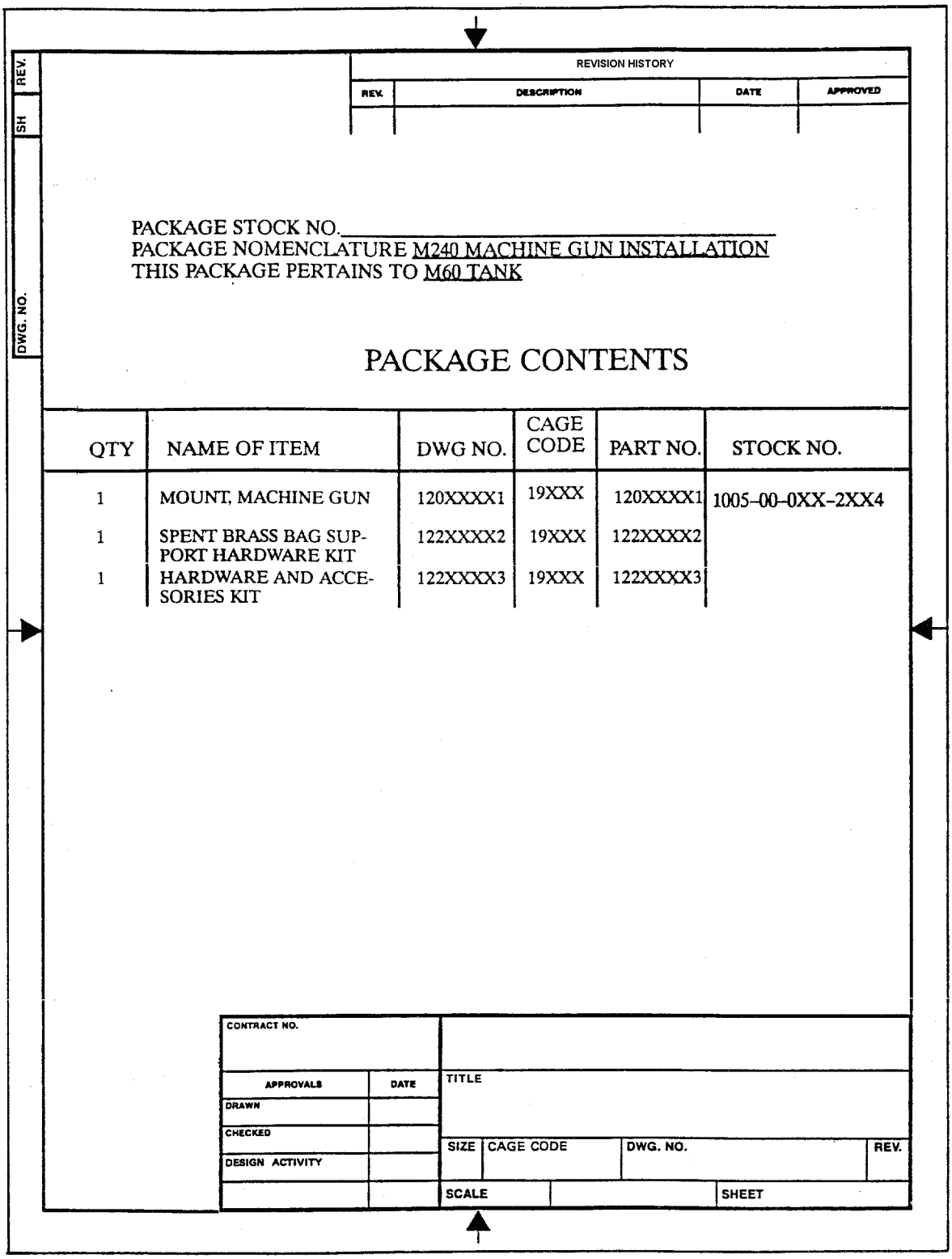
REQUIREMENTS:

Entries shall be as follows.

a. PACKAGE STOCK NO.: The National Stock Number assigned to the package.

b. PACKAGE NOMENCLATURE: The nomenclature of the package.

c. THIS PACKAGE PERTAINS TO: The nomenclature and model number or, if model number does not apply, the part number of the system/subsystem to which the package applies.



REV. | SH | DWG. NO.

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APPROVED

PACKAGE STOCK NO._____
PACKAGE NOMENCLATURE M240 MACHINE GUN INSTALLATION
THIS PACKAGE PERTAINS TO M60 TANK

PACKAGE CONTENTS

QTY	NAME OF ITEM	DWG NO.	CAGE CODE	PART NO.	STOCK NO.
1	MOUNT, MACHINE GUN	120XXXX1	19XXX	120XXXX1	1005-00-0XX-2XX4
1	SPENT BRASS BAG SUPPORT HARDWARE KIT	122XXXX2	19XXX	122XXXX2	
1	HARDWARE AND ACCESSORIES KIT	122XXXX3	19XXX	122XXXX3	

CONTRACT NO.		
APPROVALS	DATE	TITLE
DRAWN		
CHECKED		SIZE / CAGE CODE / DWG. NO. / REV.
DESIGN ACTIVITY		
		SCALE / SHEET

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PACKAGE CONTENT DRAWING
FIGURE 4-46

PHOTO ASSEMBLY OR INSTALLATION DRAWING

DESCRIPTION AND USE: (See FIGURE 4-47)

A photo assembly drawing presents pictorial information by means of half-tone or color photographs of a finished model in place of conventional orthographic line-drawings. Its use is helpful in acquainting a person(s), with or without engineering background, with the item as to its assembly, function, installation, etc.

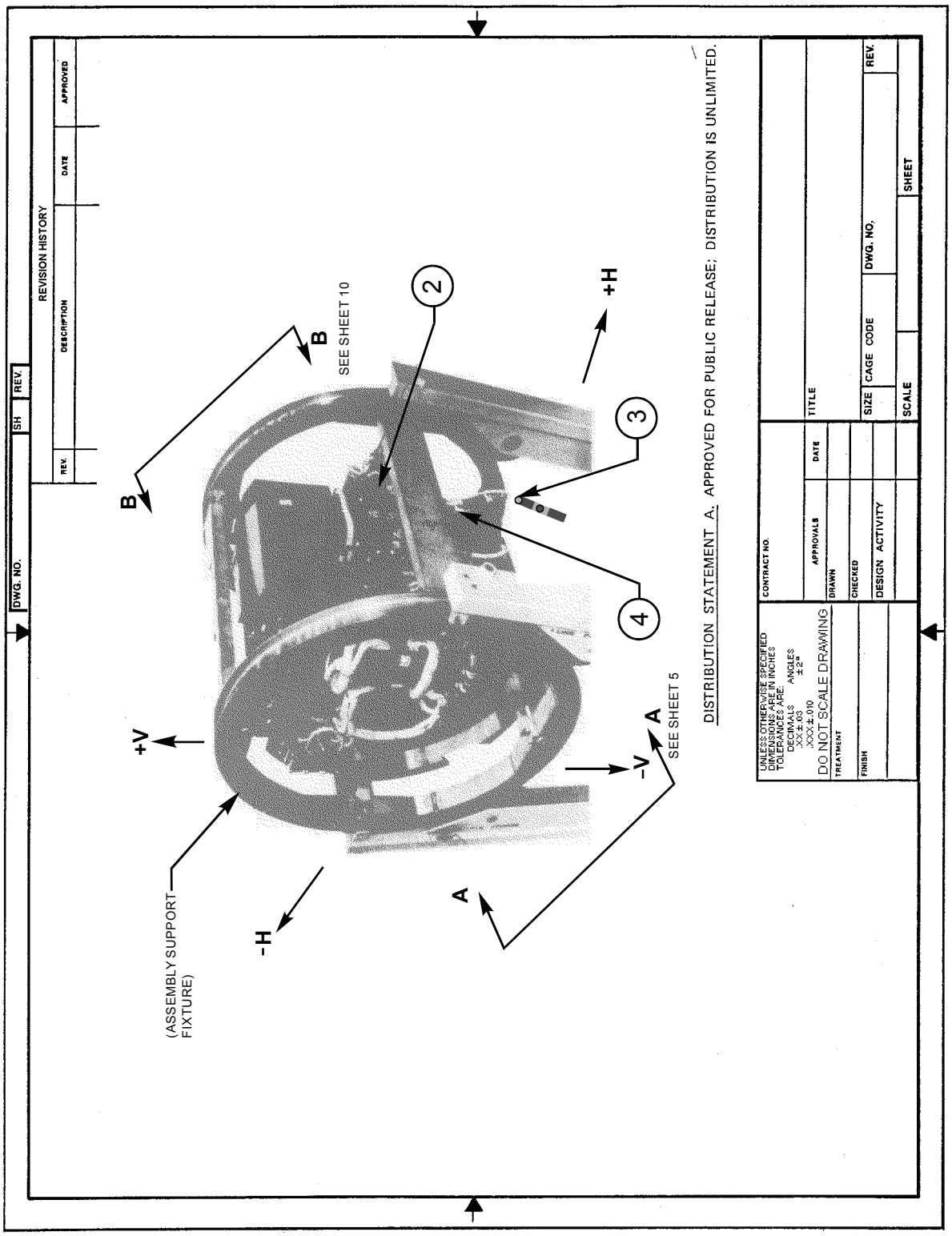
NOTE: Microfilming of photo assembly drawings is not acceptable. Delivery of full size photo masters is required and is usually so specified in the contract.

REQUIREMENTS:

a. Carefully compose views to show maximum information. Generally, views should be normal to a major plane of the equipment, using a white background.

b. Paste-up, air brushing, and some superimposed line work may be necessary for clarity and quality artwork.

c. For manually-prepared drawings, screen half (1/2) tone images, using 65 line, on .004 thick matte surface Mylar to which the drawing format is added in the printing process.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PHOTO ASSEMBLY DRAWING
FIGURE 4-47

PICTORIAL DRAWING

DESCRIPTION & USE: (See FIGURE 4-48)

Pictorial Drawings are widely used for assembly drawings, piping diagrams, service and repair manuals, sales catalogs and technical training manuals. These drawings are particularly useful for the non technical person who needs a quick information and understanding of the drawing.

A Pictorial Drawing conveys a general description of the configuration and location of major elements. It is not normally used to control design.

However, Pictorial (Axonometric) Drawings and axonometric drawing views may be used and annotated per the new rules in SECTION 26 of this manual, which covers Digital Data Sets and 3D Solid Modeling. Section 26 is based on ASME Y14.41-2003 in which many new techniques and tools have been developed to allow axonometric (pictorial) views to be used with the same authority as orthographic views. MIL-DTL-31000c also includes coverage on these practices. Thus, ASME Y14.41-2003 and MIL-DTL-31000C explicitly allow using pictorial views and digital 3D solid models to define engineering requirements and as part of a Technical Data Package.

REQUIREMENTS:

Pictorial Drawings include as applicable;

a. Sufficient views so that a general understanding of the configuration and location of major units is conveyed.

b. Overall, locating and other general reference dimensions necessary to describe the configuration.

c. Identities of major elements and orientation to other references.

d. Reference to applicable documents for support information, system specifications and other associated information.

TYPES OF DRAWINGS IN THE PICTORIAL DRAWING CATEGORY:

NOTE:
Each of the above drawings are depicted separately.

PICTORIAL DRAWING
FIGURE 4-48

PIPING DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-49)

A hydraulic, pneumatic or fluid piping diagram which shows by symbols and inter-connections the elements, sequence and function of a fluid/air-handling system.

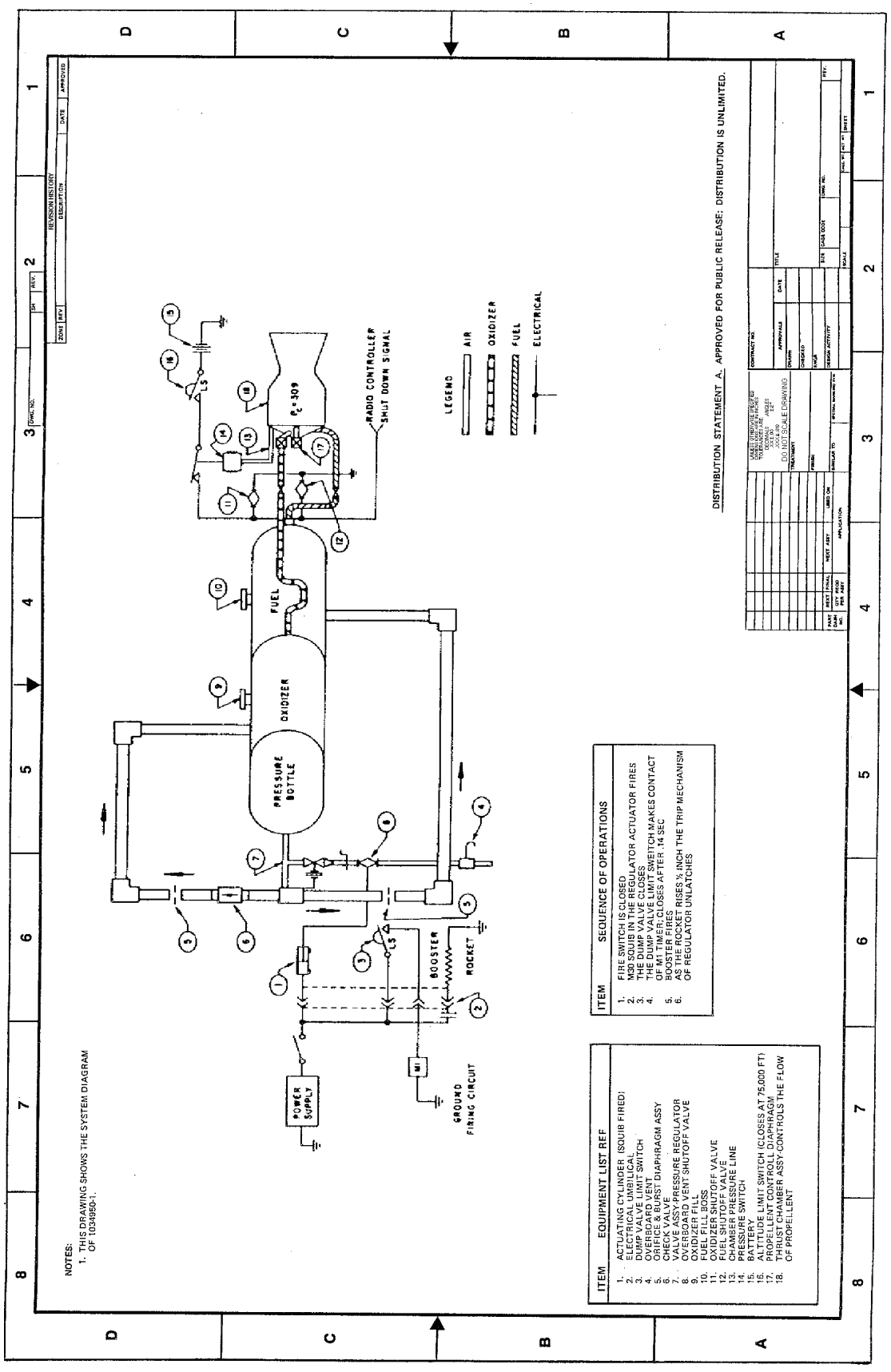
REQUIREMENTS:

Show sufficient detail to explain (a) the arrangement of the piping, valves, etc., or (b) operational sequence. Symbolic line representation may be used to distinguish functions of various parts. When the objective is to show arrangement the following characteristics may be shown: routing of fluids, physical locations and arrangement of elements, pipe diameters, types and sizes of fittings, flow, pressure, volume, etc.

Use the following symbology standards:

MIL-STD-17/1	Mechanical Symbols (non-aerospace) (CNCLD: No S/S)
MIL-STD-17/2	Mechanical Symbols for Aeronautical, Aerospace, & Spacecraft (CNCLD: No S/S)
ANSI Y32.4	Graphic Symbols for Plumbing (INACTIVE: No S/S)
ANSI Y32.10	Graphic Symbols for Fluid Power Diagrams (INACTIVE: No S/S)
SAE AS1290	Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems
NAS944	Symbols, Hydraulic Test Equipment Drafting

Where a symbol is not standardized by one of these documents, decode it directly on the diagram drawing as part of the general notes.



PIPING DIAGRAM
FIGURE 4-49

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

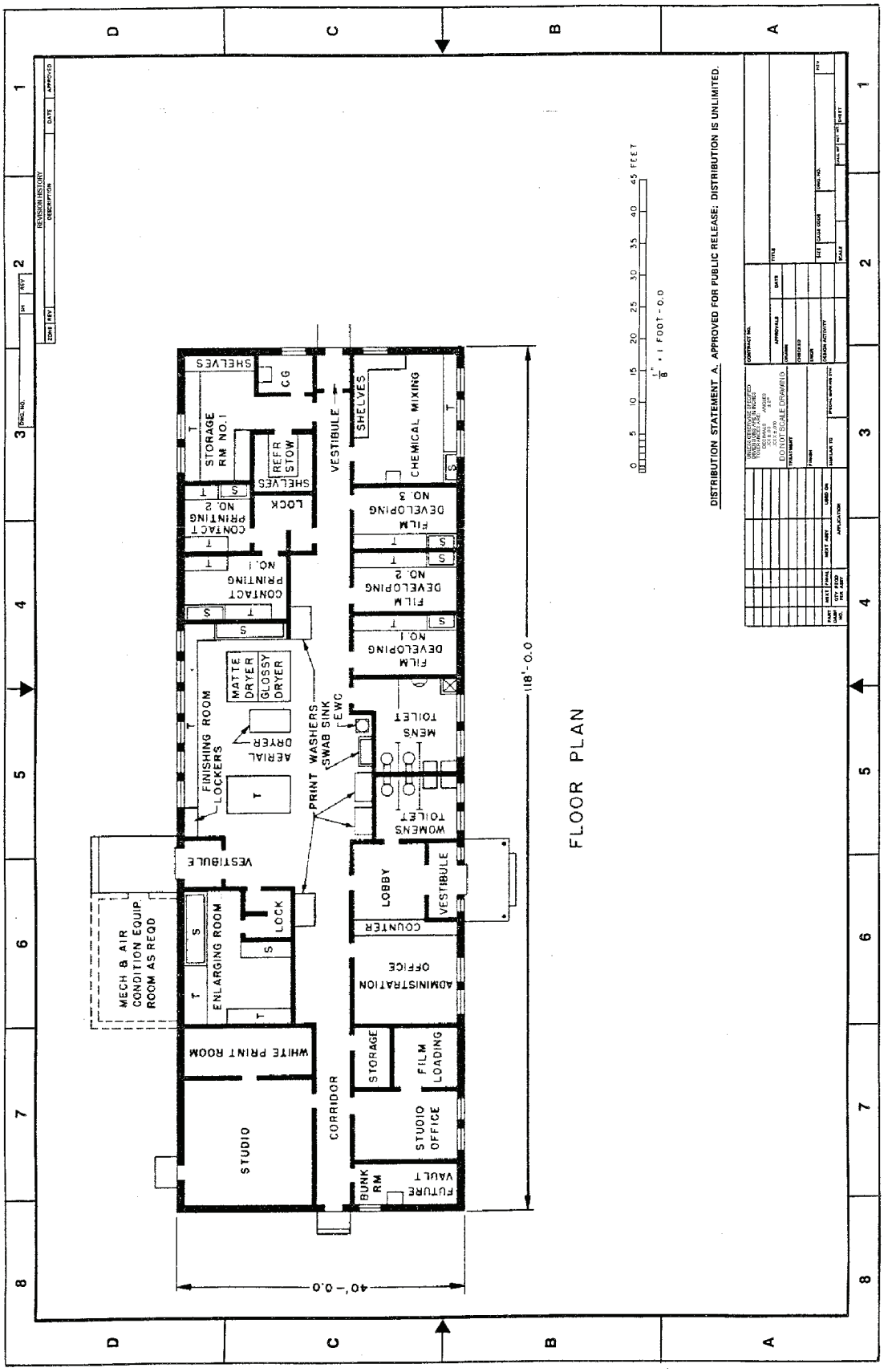
PLAN DRAWING

DESCRIPTION & USE: (See FIGURE 4-50)

A plan drawing depicts a horizontal projection of a structure, showing the layout of the foundation, floor, deck, roof, or utility system.

REQUIREMENTS:

As applicable, a plan drawing shall show shapes, sizes and materials of the foundation; its relation to the superstructure and its elevation with reference to fixed datum plane; location of walls, partitions, bulkheads, stanchions, companionways, openings, columns, stairs, shapes and sizes of roofs, parapet walls, drainage, skylights, ventilators, etc. Specify materials of construction and the arrangement of structural framing. The location of equipment or furniture may be indicated. A plan drawing for utilities may have individual layouts for heating, plumbing, air conditioning, electrical or other utility systems.



PLAN DRAWING
FIGURE 4-50

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

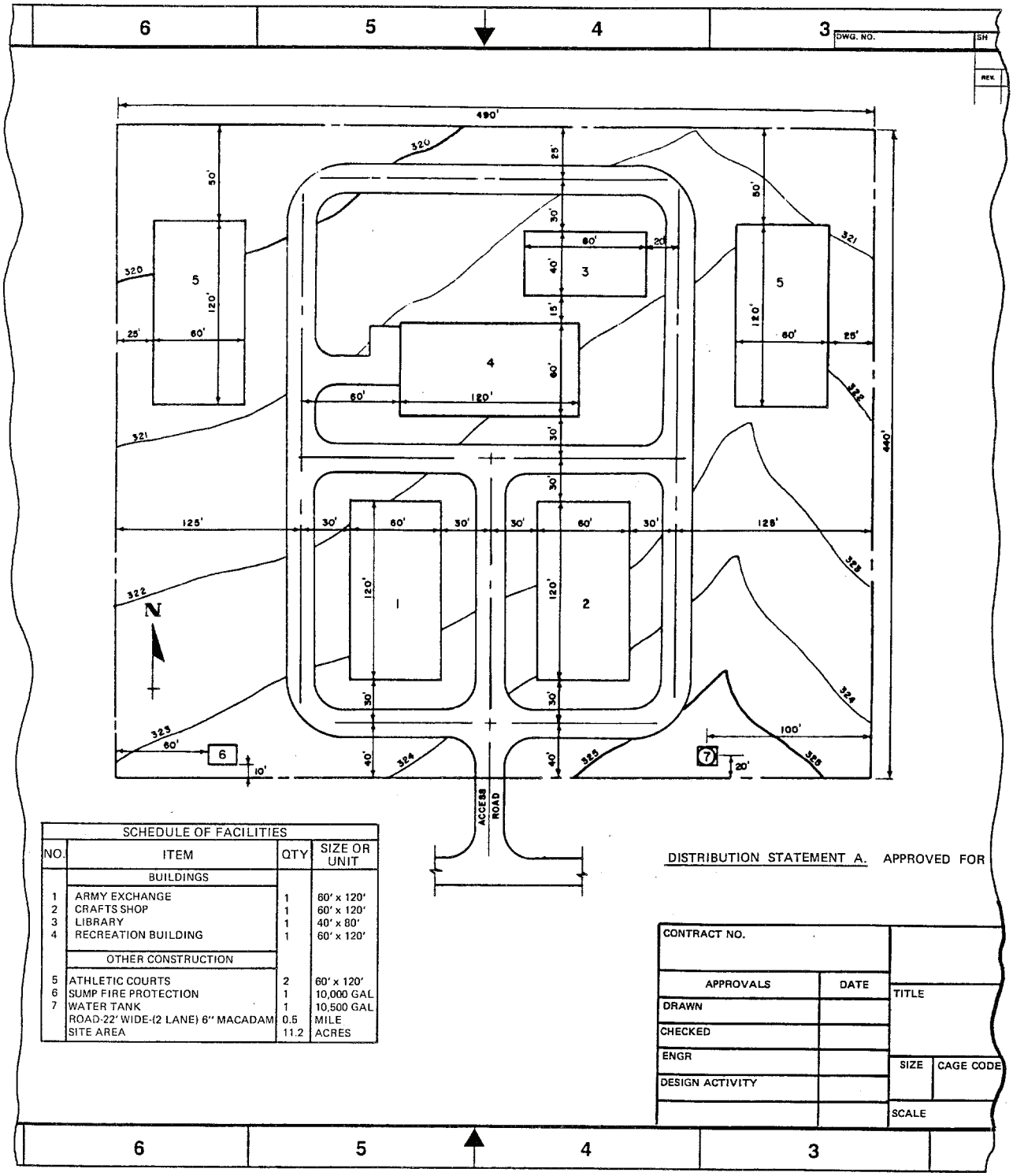
PLOT (PLAT) PLAN DRAWING

DESCRIPTION & USE: (See FIGURE 4-51)

A plot plan drawing depicts areas on which structures are clearly indicated with detailed information regarding their relationship to other structures, existing and proposed utilities, topography, boundary lines, roads, walks, fences, etc.

REQUIREMENTS:

The plot (plat) plan drawing shall show property lines and locations, contours and profiles, shrubbery, existing and new utilities, sewer and waterlines, building lines, location of proposed structures, existing structures, approaches, finished grades and other pertinent data.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

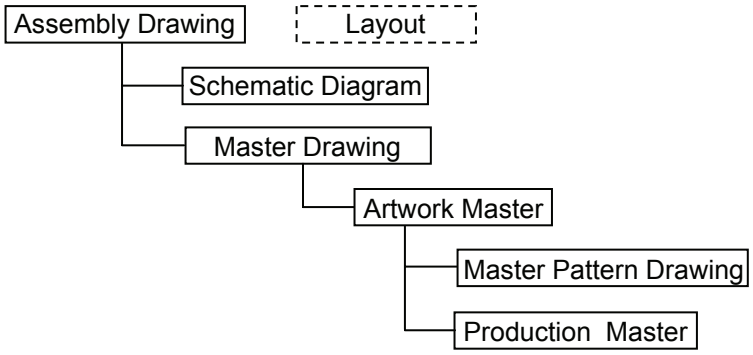
PLOT (PLAT) PLAN DRAWING
FIGURE 4-51

PRINTED-BOARD (CIRCUIT BOARD) ASSEMBLY DRAWING, RIGID, FLEX or a COMBINATION THEREOF AND DESCRETE WIRING BOARD DRAWING SETS

DESCRIPTION & USE: (See FIGURE 4-52)

Printed-Board (Circuit Board) Assembly Drawings establish the basis from which all parts and electronic components are procured and assembled to perform a specific function. The term “board” including all types of dielectrical base materials, (e.g. rigid, flex, or a combination thereof), on which separately manufactured components have been added. It may or may not have plug-in connecting facilities either attached to the board or integral etched, printed or deposited contacts. The term “printed” applies to all circuitry patterns which are etched, deposited, screened, or bonded to the base material. The term “discrete wiring” applies to circuitry patterns that are defined by the routing and terminating of the discrete wires to form point to point electrical connections.

A typical drawing set may include, as applicable, an assembly drawing, schematic diagram, master pattern drawing, artwork, artwork master, and production master. A typical drawing relationship is shown below. The assembly and master drawing establishes item identification for the assembly and board respectively.



Printed board drawing sets are prepared to describe and control printed wiring or circuit boards and assemblies. See IPC-D-249, IPC-2221A, and IPC-2222 for design requirements and IPC-D-325 for drawing requirements.

Discrete wiring boards sets are prepared to describe and control discrete wiring boards and assemblies. Boards may be single-sided, double-sided or multilayer. A discrete Wiring Board Assembly Drawing is a document that shows a discrete wiring board, separately manufactured components, and any information necessary to describe the joining of them together in order to perform a specific function. See IPC-DW-425 for design and drawing requirements.

Printed patterns may be omitted; when included, however, it may be necessary to use a reproducible pattern suitable for microfilming.

REQUIREMENTS:

The Printed-Board (Circuit Board) Assembly Drawing should include the following as required:

a. Identification of parts (electrical items, removable hardware, clips, brackets, etc.) materials and processes required for the assembly.

b. Component mounting and installation requirements which must be controlled such as part height after soldering.

c. Cleanliness requirements.

d. Location and identification of materials or components (or both).

e. Component orientation, polarity symbols, reference designations, terminal identification and index marks.

f. Applicable ordering data.

g. Structural details when required for support and rigidity.

h. Electrical insulating requirements.

i. Identification and traceability marking requirements.

j. Electrostatic discharge protection requirements.

k. Special solder plug requirements.

l. Eyelets and terminals.

m. Lead forming requirements.

n. Type of conformal coating, masking requirements and spot bonding.

o. Solder mask.

p. Reference document identification (schematic diagram number.)

q. Jumper wires, if necessary.

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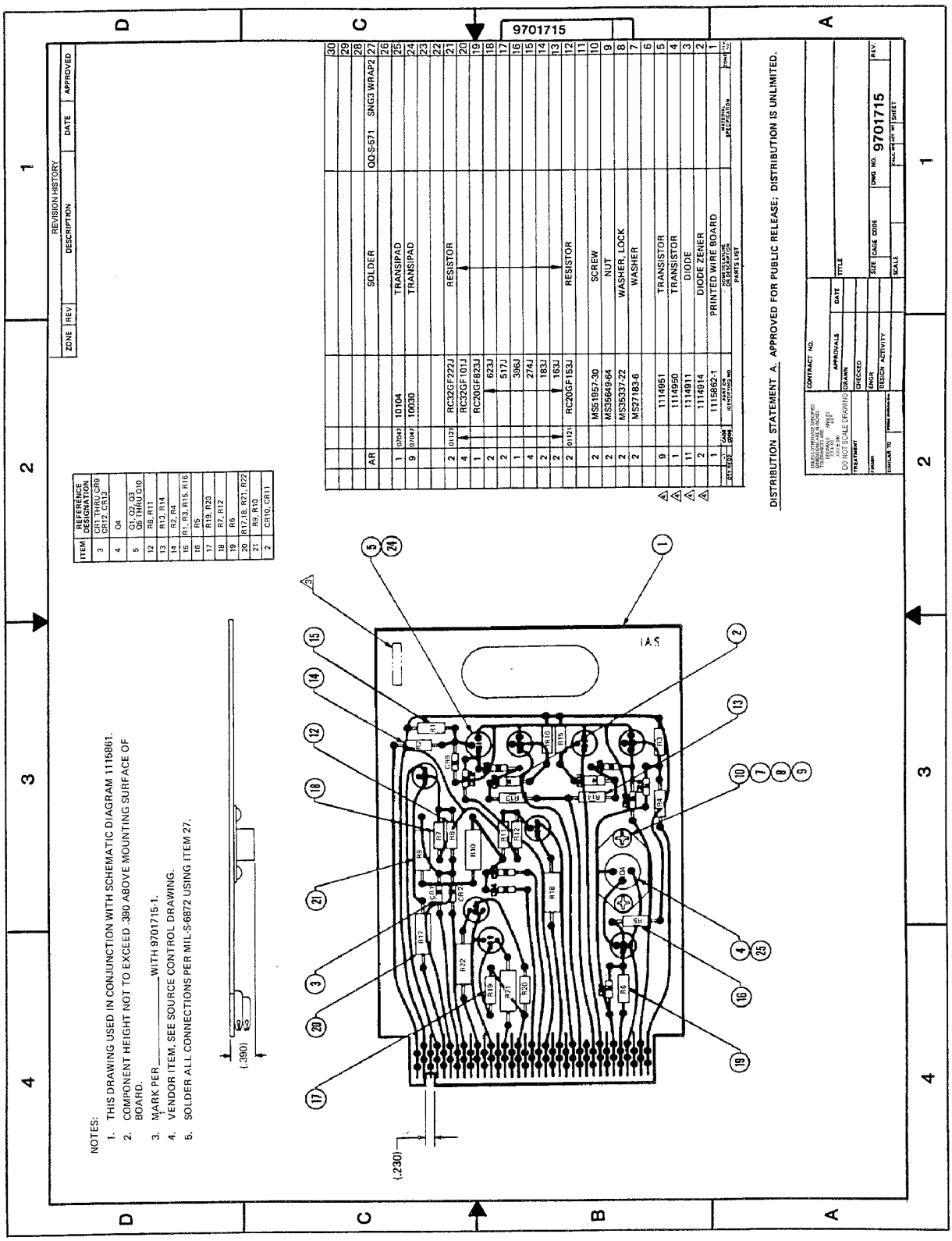

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PRINTED-BOARD (CIRCUIT BOARD) ASSEMBLY DRAWING
FIGURE 4-52

PRINTED-BOARD DETAIL DRAWING

DESCRIPTION & USE: (See FIGURE 4-53)

Printed Board Detail Drawing is a detail description of the circuit board in conjunction with related notes describing the dimensional requirements of the board. Applicable specifications covering material, finish and other engineering requirements are specified. The artwork (an exact copy or likeness) that is required to produce the wiring pattern and markings is also shown.

REQUIREMENTS:

Printed Board Detail Drawing provides the complete engineering description of a printed Board (circuit board) including as applicable:

a. The type, size, and shape of the printed-board.

b. The size, location, and tolerance of all holes therein. The drawing differentiates between plated and unplated holes and states whether dimensions apply before or after plating.

c. Etchback allowances, when required or permitted.

d. Identification and traceability marking requirements.

e. Dielectric separation between layers.

f. Shape and arrangement of both conductor and nonconductor patterns defined on each layer of the printed-board. Copies of the production masters or copies of the artwork may be used to define these patterns.

g. Separate views of each conductor layer.

h. Any and all pattern features not controlled by the hole sizes and location shall be dimensioned either specifically or by reference to the grid system (see n.).

i. Processing allowances that were used in the design of the printed- board.

j. All notes either included on the first sheet(s) of the master drawing or by specifying the location of the notes on the first sheet.

k. Conductor layers numbered consecutively starting with the component side as layer 1. If there are no conductors or lands on the component side, the next layer shall be layer 1. For assemblies with components on both sides, the most densely populated side shall be layer 1.

l. Identification marking location, method, size, material, priority of marking specified and extent of applicability per MIL-STD-1285, MIL-STD-2118, IPC-2221A, and IPC-2222 as applicable.

m. Size, shape, and location of reference designation and legend markings, if required (see h.).

n. A modular grid system to identify all holes, test points, lands, and overall board dimensions with modular units of length of 0.100, 0.050, 0.025, or other multiples of 0.005 inch in that order of preference. For design where the majority component locations are metric-based (SI), the basic modular units of length shall be 2.0, 1.0, 0.5, or other multiples of 0.1 mm in that order of preference. The grid system shall be applied in the X and Y axes of the Cartesian coordinates. The grid shall not be reproduced on the master drawing; but may be indicated using grid scales or X, Y control dimensions.

o. Dimensions for critical pattern features which may affect circuit performance because of distributed inductance or capacitance effects within the tolerance required for circuit performance.

p. All terms used on the master drawing shall be in conformance with the definitions of ANSI/IPC-T-50.

q. Deviations to standard IPC-2221A and IPC-2222 shall be approved before proceeding. Each proposed master drawing shall be furnished to the Government Agency and when approved shall be documented on the master drawing.

r. Minimum conductor width and spacing and distance to board edges of the finished printed- board.

s. Maximum rated voltage (maximum voltage between the two nonconnected adjacent conductors with the greatest potential difference) for type 3 boards only.

t. Plating and coating material(s) and thickness(es).

u. Identification of test points required by the design, including test tabs.

v. Applicable fabrication specification identifier with date(s), revision letter, and amendment number in accordance with IPC-2221A and IPC-2222.

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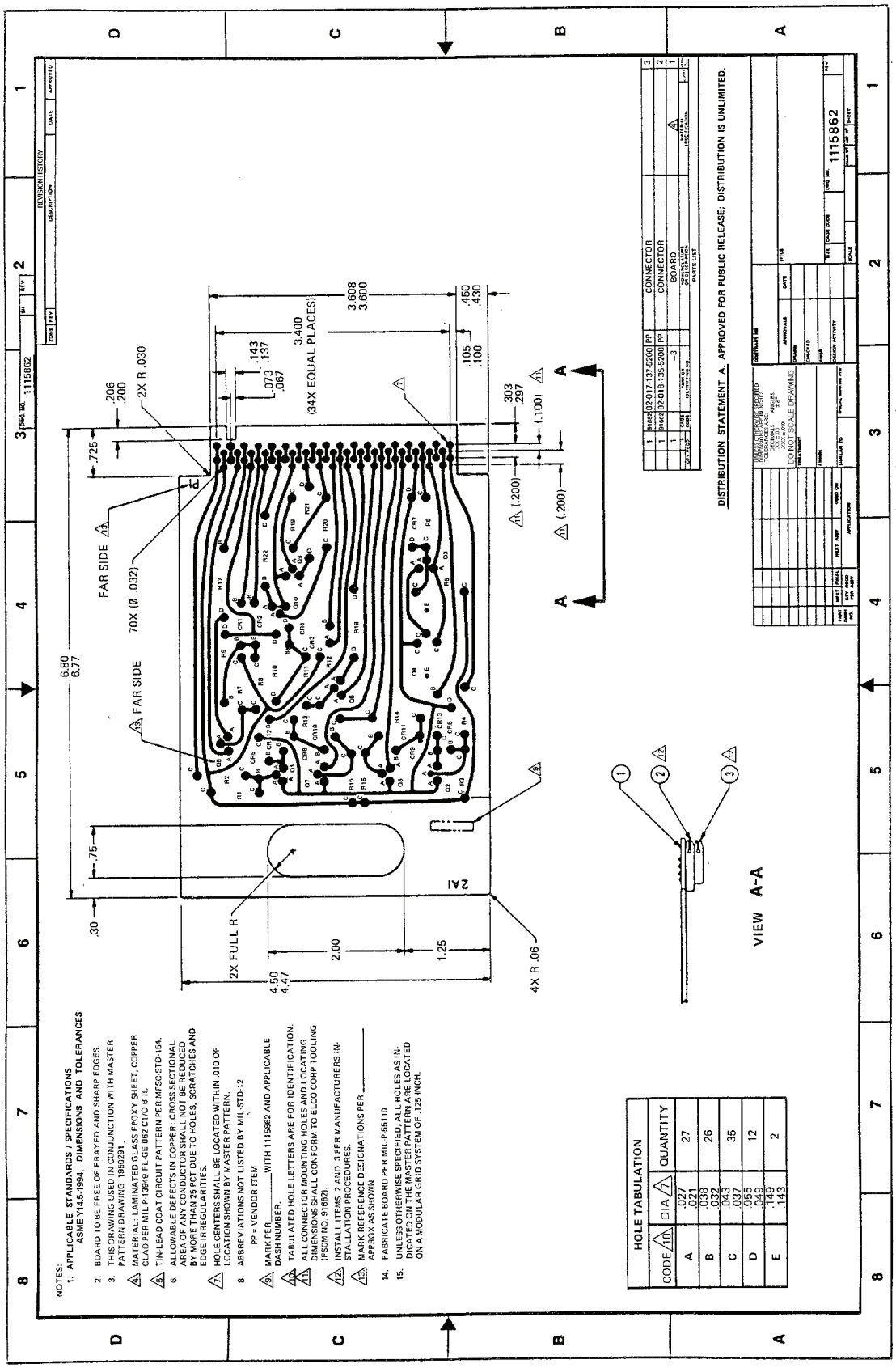

PRINTED-BOARD DETAIL DRAWING
FIGURE 4-53

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PRINTED-BOARD ARTWORK MASTER
(Stable Base Artwork)

DESCRIPTION & USE: (See FIGURE 4-54)

Master Patterns are precision scale between 2X and 8X undimensioned master drawings. The master pattern scale chosen should make a Master Pattern 34 X 44 inch or less ("E" size). They are prepared on a base material such as film or glass that is dimensionally stable under varying conditions of temperature, humidity, aging and handling. The master drawing shall be prepared in accordance with the requirements of IPC-2221A and IPC-2222. The generation of artwork and measurement techniques shall be in accordance with IPC-D-310.

These precision scale drawings are used:

a. Produce board-wiring or printed circuit boards (cards) within the accuracy established by the board detail drawings.

b. Establish and control the configuration of the conductor or circuit and marking patterns when these details are not included in the board detail drawings.

c. Artwork Master drawings are used to make 1/1 scale photographic reproductions used in fabrication.

NOTE: An Artwork Master Drawing is not required when the Printed-Board Detail Drawing includes conductor or circuit pattern and marking master details.

REQUIREMENTS:

Printed-Board Artwork Master drawings include as applicable:

a. A drawing that shows the dimensional limits or grid locations applicable to any or all parts of a printed board, (circuit) rigid or flexible.

b. Arrangement of conductive and nonconductive patterns or elements.

c. Location, size and type of holes.

d. Views of conductor or circuit patterns and marking requirements of each specific surface and specify from which side of the board the pattern is viewed. These views may be located on the same sheet or subsequent sheets of multisheet drawings.

e. Conductor layer identification, numbered consecutively starting with the component side as layer 1. If there are no conductors or lands on the component side, the next layer shall be layer 1. For assemblies with components on both sides, the most densely populated side shall be layer 1.

f. Horizontal and vertical control dimensions and tolerances with registration marks corresponding to those on the master drawing for each view.

g. Separate master patterns may be used when the complexity of the design is such that the location of holes and conductor or circuit pattern cannot be readily determined. Such drawing views must be appropriately identified and suggested organization of the multisheet drawing is;

    (1) Hole-locating master (if applicable).

    (2) Conductor or circuit patterns in sequence from top to bottom.

    (3) Marking master.

h. Artwork masters do not include tape, cut-and-strip materials, or any other type of materials (including decals) which could shift or separate during extended storage. They may, however, be prepared from artwork which use such materials.

i. The note “FOR MANUFACTURING PURPOSES THIS DRAWING SHALL BE REPRODUCED ON STABLE BASE MATERIAL.” shall appear on the drawing.

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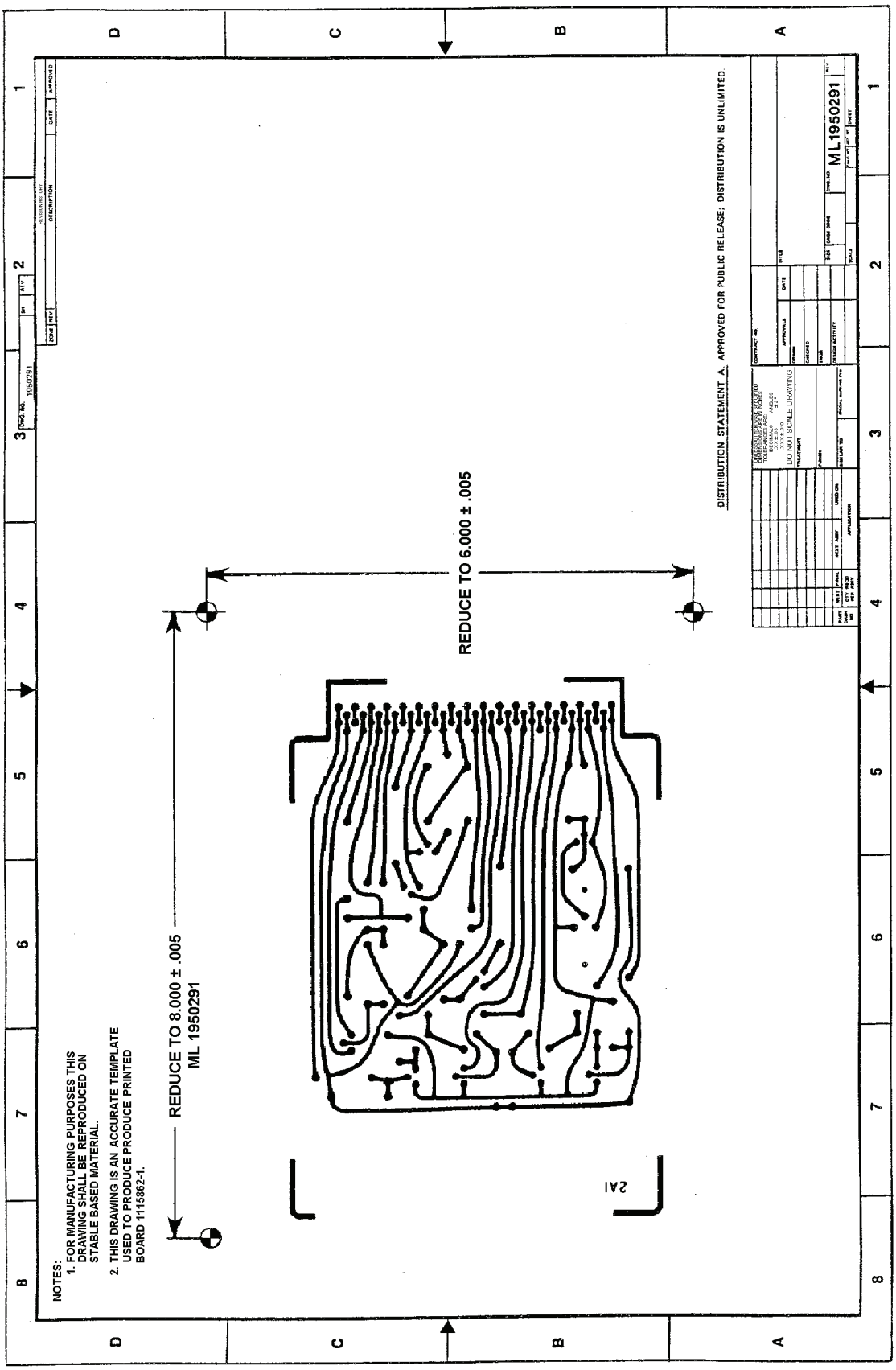


THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PRINTED-BOARD ARTWORK MASTER (STABLE BASE ARTWORK)
FIGURE 4-54

PRINTED-BOARD PRODUCTION MASTER

DESCRIPTION & USE: (See FIGURE 4-55)

When specified in a contract or purchase order, a Production Master of each layer of the printed-wiring board shall be provided as part of the drawing set, otherwise the manufacturer shall prepare the production master.

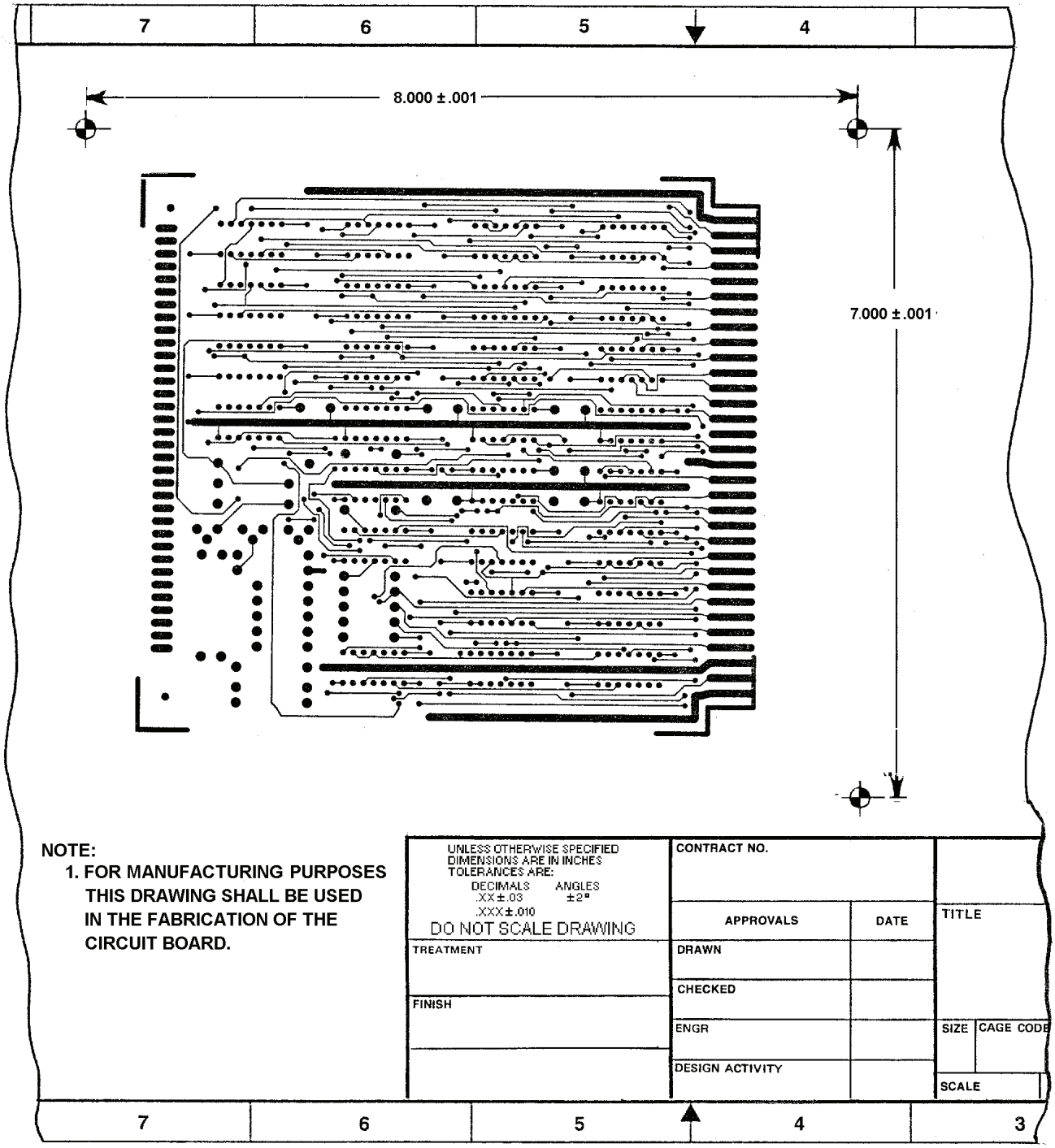
A Production Master is a 1/1 scale photographic reproduction of the Printed-Board Artwork Master drawing (Stable Base artwork) for use in the fabrication of the circuit board.

REQUIREMENTS:

a. Production Master Drawings do not include tape, cut-and-strip materials, or any other type of materials (including decals) which could shift or separate during extended storage. They may, however, be prepared as reproducible copies of artwork which use such materials.

b. Unless otherwise specified on the drawing Production Masters are depicted as photographically opaque areas on a white or clear background (a positive image).They shall be suitable for reproduction using normal black and white reproduction methods.

c. The note "FOR MANUFACTURING PURPOSES THIS DRAWING SHALL BE USED IN THE FABRICATION OF CIRCUIT BOARD" shall appear on the drawing.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PRINTED-BOARD PRODUCTION MASTER
FIGURE 4-55

PROPOSAL DRAWING

DESCRIPTION & USE: (See FIGURE 4-56)

A drawing that is prepared for the presentation of a new design concept to a prospective customer. It does not contain sufficient information for fabrication.

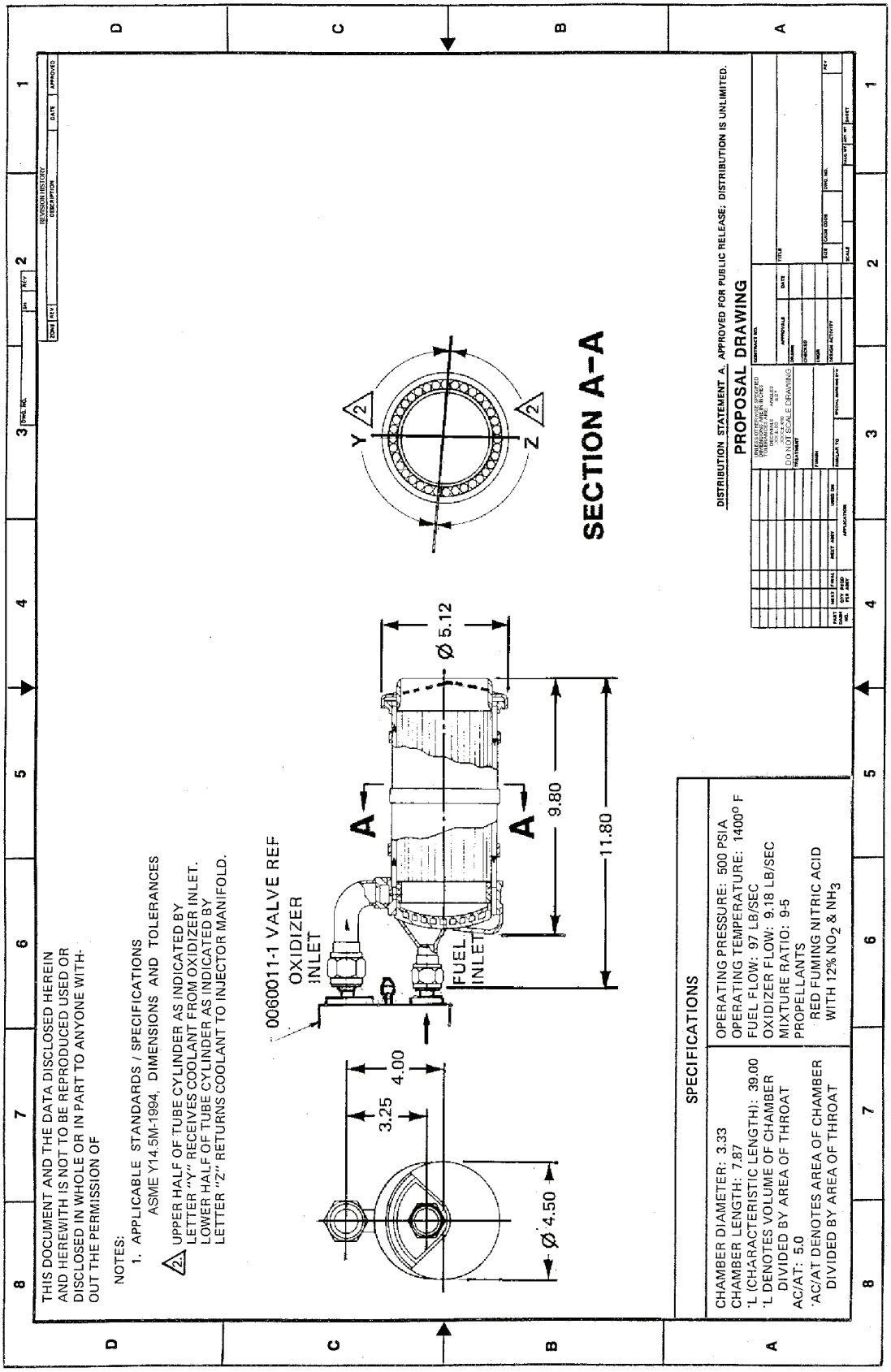
REQUIREMENTS:

a. Prepare drawings on the design activity standard format and utilize the drawing number system.

b. Identify the drawing with the term "PROPOSAL DRAWING" above the title block in .25 inch high letters.

c. Show appropriate proprietary notice.

d. The drawing should be prepared to the highest quality.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PROPOSAL DRAWING
FIGURE 4-56

SCHEMATIC DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-57)

Schematic Diagrams portray by means of graphic symbols the connections, components and functions of a specific electronic circuit scheme, a mechanical action, or a transfer of energy.

REQUIREMENTS:

A schematic diagram includes as applicable:

a. Symbolic representation of each element in the scheme as appropriate for electrical, electronic, logic, mechanical, etc. applications.

b. Values of part identification.

c. Reference designations when applicable.

TYPES OF DRAWINGS IN THE SCHEMATIC DIAGRAM CATEGORY:

NOTE:
Each of the above Schematic Diagrams are depicted separately.

SCHEMATIC DIAGRAM
FIGURE 4-57

SELECTED ITEM DRAWING

DESCRIPTION & USE: (See FIGURE 4-58a & 4-58b)

A selected item drawing establishes further requirements or restrictions of an existing item under control of another design activity or defined by a nationally recognized standard, a design or a vendor's item for fit, tolerance, performance or reliability within the limits prescribed for that item. This drawing type generally permits selection to be performed by any competent inspection or test facility including those of the original manufacturer, the selecting design activity, or a third party.

REQUIREMENTS:

a. A selected item drawing is prepared when it is feasible to select from an existing group of existing items which as applicable;

    1) meet the required characteristics for a particular application;

    2) pass additional tests or inspections imposed by the using design activity for characteristics not normally specified for the original item;

    3) survive burn-in or run-in requirements.

b. A selected item drawing shall not be prepared to select items that were developed by the design activity.

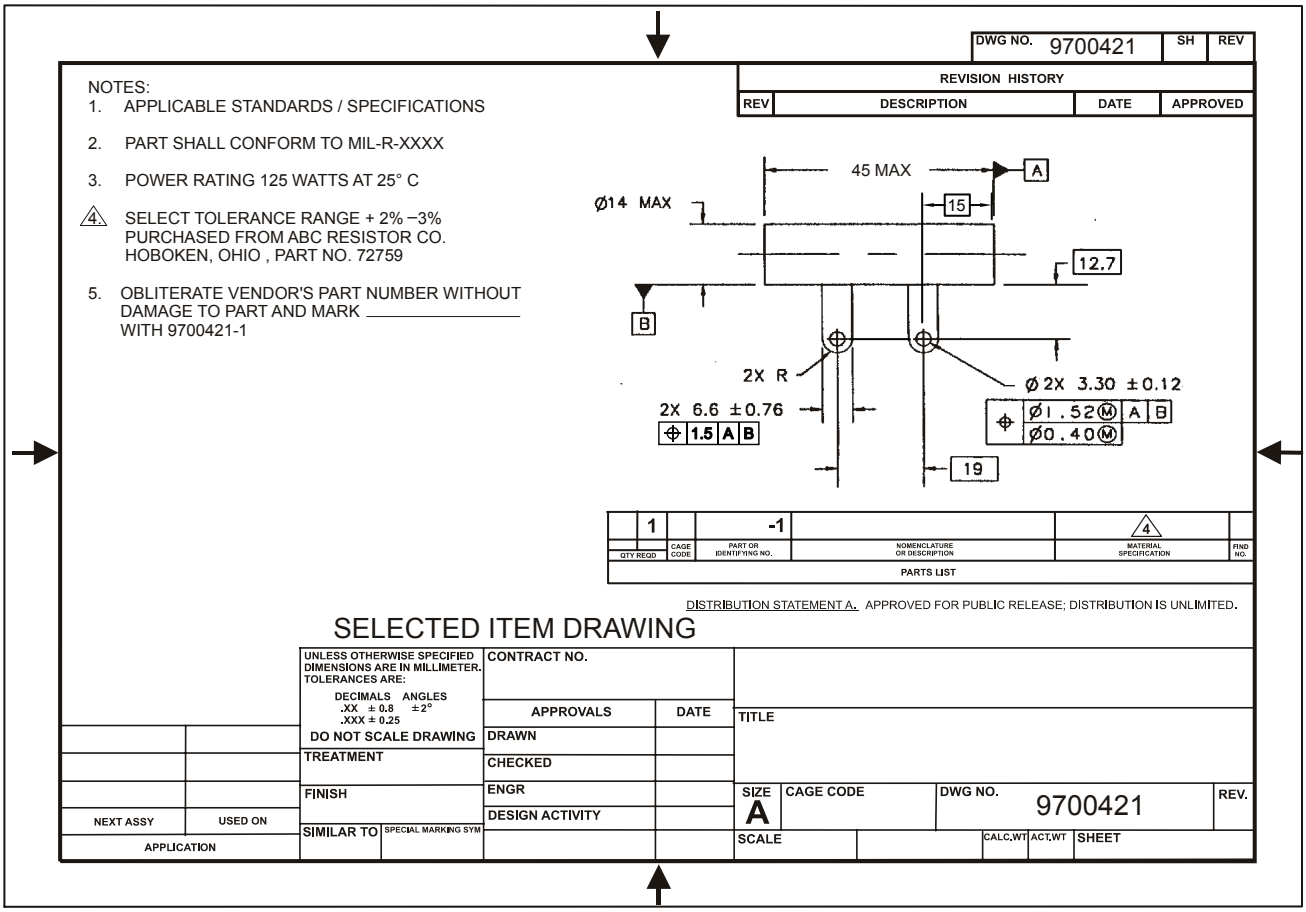
c. Specify in the selected item parts list the part number of the unselected (original) item. Also show the Commercial And Government Entity (CAGE) Code if the part number of the unselected item was assigned by a vendor.

d. Specify obliteration of the item's unselected part number. Specify marking with the selected part number, preceded by the design activity Commercial and Government Entity (CAGE) Code. See Section 11 and MIL-STD-130. Re-identification marking requires that the original item identification being replaced shall be removed or obliterated, if this can be done without damage to the item. (However, microcircuit re-identification markings shall be in addition to the existing original marking and shall be visibly separate from and in no way interfere with the existing marking.)

e. Drawing submission must include, not only the selected item drawing, but also a document which completely defines the unselected item. If the originating design activity drawing is available, this may be submitted; if not, prepare a Vendor Item Control Drawing (VICD) (Formerly Specification Control Drawing (SCD) or Source Control Drawing (SOCD) If the unselected item and its selection process are simple, they may be combined on a single drawing.

f. Add the notation "SELECTED ITEM DRAWING" above the title block in .25 inch high letters.

NOTE: A selected item may be defined on the using assembly drawing provided requirements (a) through (e) above are met and the item is noted SELECTED ITEM.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SELECTED ITEM DRAWING (MECHANICAL SELECTION)
FIGURE 4-58a

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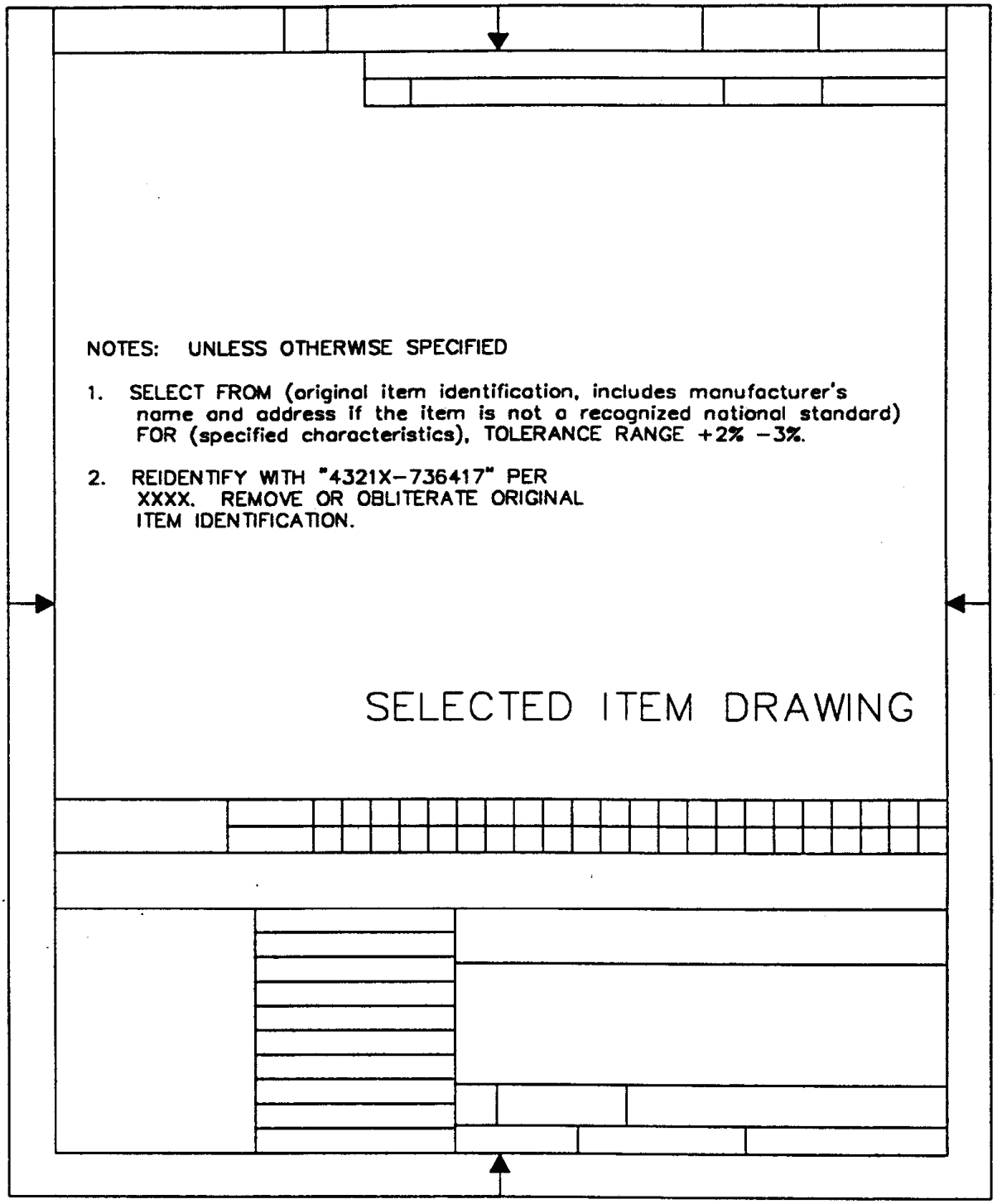


THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED

SELECTED ITEM DRAWING (ELECTRICAL SELECTION)
FIGURE 4-58b

SEPARABLE ASSEMBLY DRAWING

DESCRIPTION & USE:(See FIGURE 4-59)

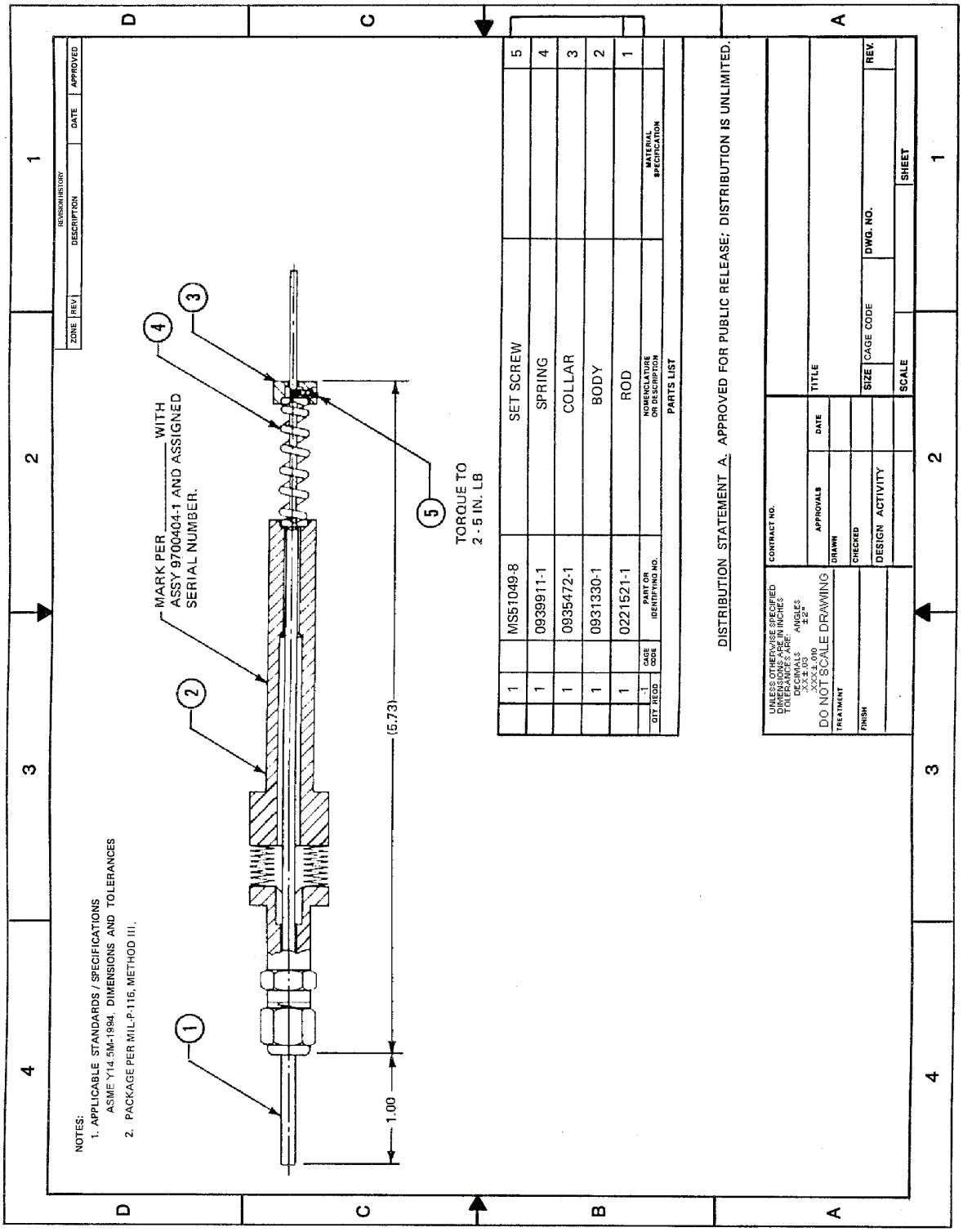
A separable assembly drawing shows the assembled relationship of two or more items where at least one of the items is capable of disassembly for servicing or replacement without causing destruction of any of the items for its designed use. The parts are normally identified and stocked as an assembly.

REQUIREMENTS:

a. Present sufficient views to show the relationship between each part composing the assembly.

b. Cite associated lists, installation drawings, wiring and schematic diagrams, etc., as applicable.

c. When an installation drawing is called out in the associated parts list, include a flag note as follows: "FOR INSTALLATION, REFER TO DRAWING XXXX."



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SEPARABLE ASSEMBLY DRAWING
FIGURE 4-59

SHIP EQUIPMENT (MARINE ITEM) DRAWING

DESCRIPTION & USE: (See FIGURE 4-60)

Ship Equipment (marine item) Drawings depict components, equipment and systems such as pumps, radar systems, etc. that may be used on one or more ships.

REQUIREMENTS:

Ship Equipment Drawings must be considered for each application in three divisions as follows:

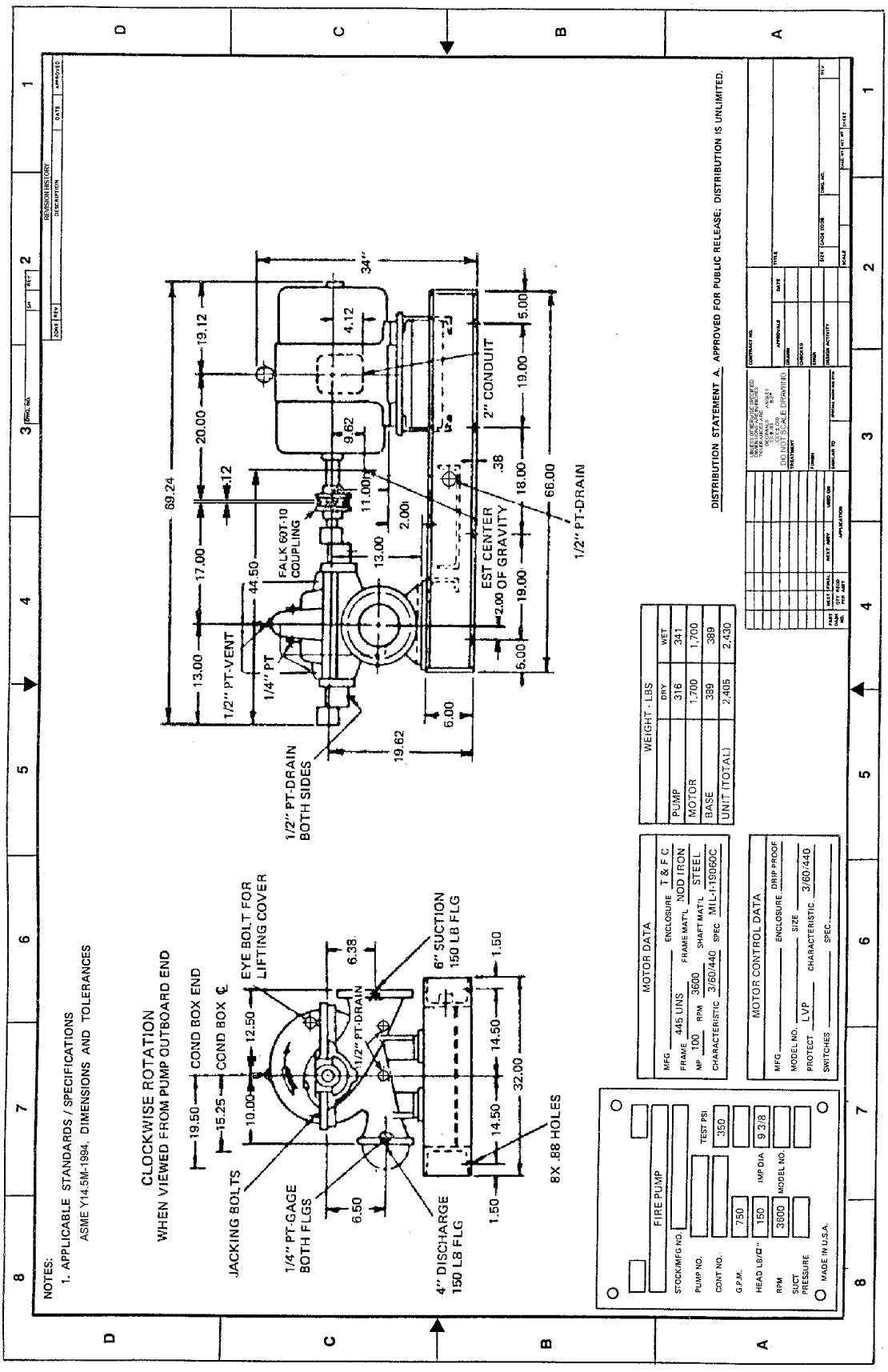
a. Equipment drawings previously accepted for shipboard use and also approved for the particular application.

b. (Same statement as a.) but not approved for the particular application.

c. Equipment drawings not previously accepted for shipboard use.

The net weight and also the operating weight with fluids, where applicable, shall be indicated. Also included the vertical, longitudinal, and transverse location of the center of gravity (wet or dry as appropriate) of each separate ship installed unit or assembly weighing 100 pounds or more shall be shown on the Outline Drawing, Assembly Drawing, Manufacture's Drawings or Installation Drawing.

Weights of units and assemblies shown on ship construction drawings shall be entered in the Parts Lists (PL) according to the requirements of SECTION 10 and PARAGRAPHS 10.7.3.6 and 10.11.6.2 (Column 20) herein this manual.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SHIP EQUIPMENT (MARINE ITEM) DRAWING
FIGURE 4-60

SINGLE-LINE SCHEMATIC DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-61)

The Single-Line Diagram (One-Line diagram) shows the course of an electrical/ electronics circuit, or system of circuits, and elements thereof using single lines to show an AC or DC system, symbols and notes. A single line diagram conveys basic information about the operation of the circuit, but omits much of the detailed information normally shown on schematic diagrams.

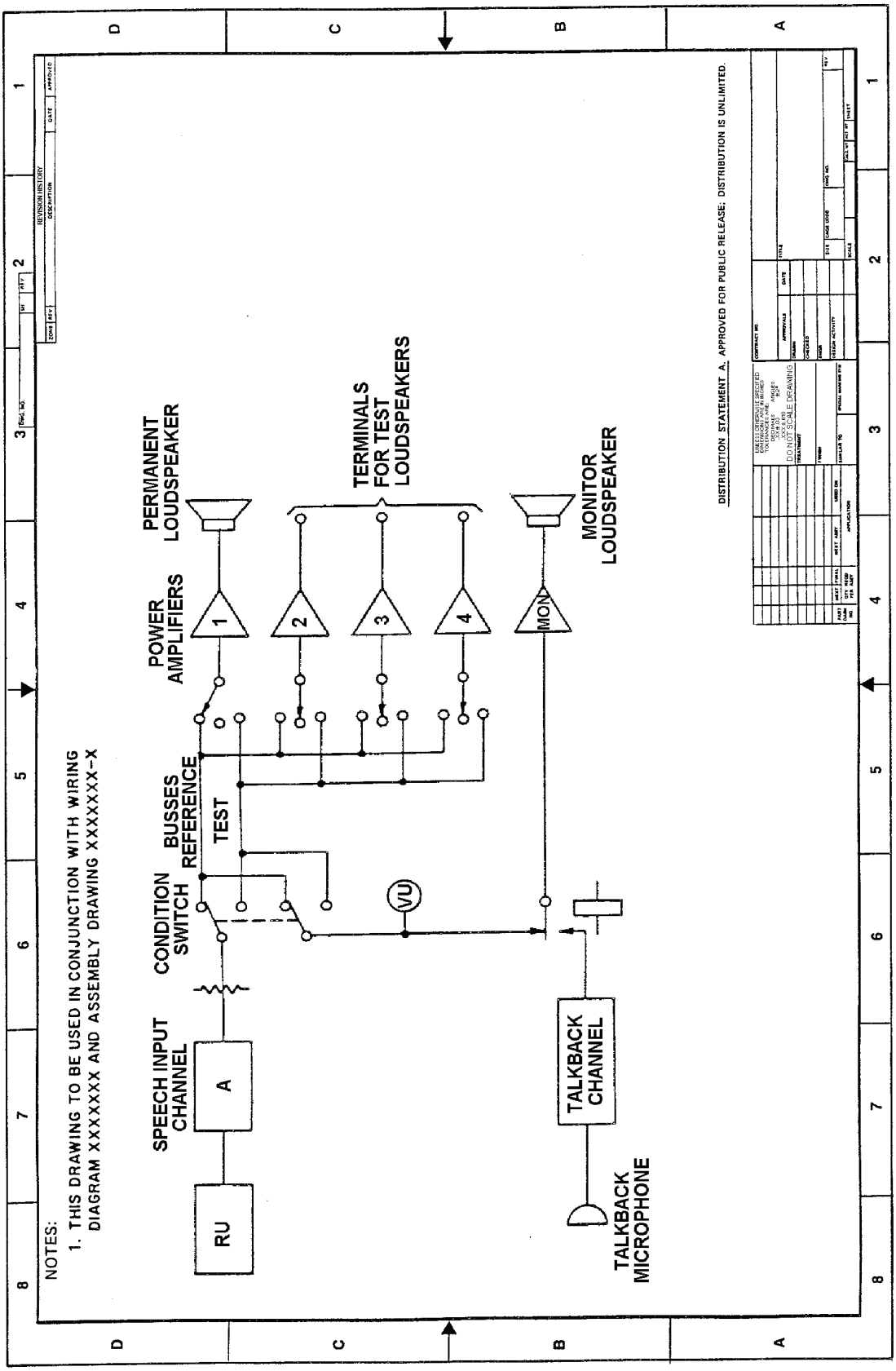
REQUIREMENTS:

A Single-Line Diagram includes, as applicable:

a. Connections of major elements of a circuit represented by single line and graphic symbol in accordance with ANSI/IEEE STD 91/91A and 315.

b. The course of the main circuits and connection of major components shown in the most direct path and logical sequence.

c. Electrical characteristics which are essential to an overall understanding of the system.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SINGLE LINE SCHEMATIC DIAGRAM
FIGURE 4-61

SOFTWARE DRAWING

DESCRIPTION & USE: (See FIGURE 4-62)

Drawings defining software that will be or are intended as resident in a firmware device shall be prepared as Software Drawings for the master media and Altered Item Drawings for the firmware.

REQUIREMENTS:

a. A software drawing describes the characteristics of the software and its master media used for programming each applicable device or assembly. Bit patterns will not be defined as truth tables but rather identified as to supplied as a duplicate of the master media in digital form. The notation SOFTWARE DRAWING shall be placed above the title block in .25 inch high letters.

b. The drawing shall specify the type of media (for example, magnetic tape or disk), media PIN, and version identification of the software. In addition, the media characteristics (for example, type, number tracks, density and size) and the characteristics and formats of the information stored on the media shall be fully described. Any other information necessary to completely describe how the master media is to be used shall also be included. The PIN of the master media shall be shown as a suffix identifier (dash) number of the software drawing. If more than one version of the software is to be installed or used, the drawing shall provide separate suffix identifier (dash) numbers for each version. The PIN of the master media shall be referenced in the general notes.

NOTES:

1. ASSEMBLIES SHALL BE PROGRAMMED BY LOADING FROM THE MASTER MEDIA USING THE PROGRAMMING INSTRUCTIONS CONTAINED IN TABLE 1.
2. ITEM IDENTIFICATION: APPLY THE FOLLOWING MARKING:
   19200-123XXX8-(APPLICABLE SUFFIX IDENTIFIER NUMBER - SEE TABLE)
   MFR-(MANUFACTURER'S CAGE CODE)
3. APPLY LABEL TO PART. OBLITERATE ORIGINAL PART NUMBER.
4. THE MASTER MEDIA HAS THE FOLLOWING CHARACTERISTICS:
   A–NUMBER OF TRACKS: 41
   B–DENSITY: DSDD
   C–SIZE: 5¼ INCHES
   D–BLOCKING: A HEX SPACE
   E–FORMAT: MSDOS VERSION 3.2 COMPATIBLE
   F–IDENTIFICATION: SEE TABLE 1

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED

FIELDED SOFTWARE VERSION IDENTIFICATION	MASTER MEDIA PIN	PROGRAMMING INSTRUCTIONS IDENTIFICATION & DATE
FIELD REV02	123XXXX8-3	XXXXXX, REV 2, YRMODA
CONT REV1B	123XXXX8-2	
CONT REV1A	123XXXX8-1	

TABLE 1

SOFTWARE DRAWING

CONTRACT NO.			
APPROVALS	DATE	TITLE: COMPUTER SOFTWARE CSCI XXXXXX	
DRAWN			
CHECKED			
ENGR			
DESIGN ACTIVITY			
		SIZE / CAGE CODE / DWG NO. 123XXXX8 / REV.	
		SCALE / CALC. WT / ACT. WT / SHEET	

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

SOFTWARE DRAWING
FIGURE 4-62

SOURCE CONTROL DRAWING (SOCD)

DESCRIPTION & USE: (See FIGURE 4-63)

A Source Control Drawing depicts an existing commercial or vendor-developed items procurable from a specialized segment of industry that exclusively provides the performance, installation and interchangeable characteristics required for one or more specific critical applications. The drawing provides a list of approved sources of supply and the vendors item identification for the item(s) that have been qualified and approved for use in critical applications. If an item can be completely defined for all applications, use a Vendor Item Control Drawing. This type of drawing is used when it is necessary to limit the source(s) of supply for an item to be used in a critical application because a specific supplier's item has proved satisfactory in qualification testing or in use on an end item, also there is not satisfactory experience with similar items from other supplier or it is impractical to isolate the function or physical characteristics which determine the item's suitability.

NOTE: "Critical application" as used herein refers to those uses where failure of the item would result in one or more of the following conditions: (a) endanger life or cause personal injury; (b) loss or damage to equipment; (c) degrade the performance to a point that would jeopardize its capacity to fulfill its intended function.

Single source of supply drawings shall be subject to the approval of the design activity and approved only after search for additional sources and confirmation made of the existence of one currently available source.

Do not use a Source Control Drawing unless absolutely necessary.

QUALIFICATION PROVISIONS FOR SOURCE CONTROL DRAWINGS

Qualification provisions for source control drawings are required pursuant Public Law 98-525, Title XII, Defense Procurement Act of 1984. The procedure contained herein is to be followed prior to and during the process of approving sources of supply for inclusion on source control drawings. The detail provided also impacts drawing maintenance and the essential requirement of insuring spare part availability and logics support. Issues or inquiries pertaining to sources of supply or the associated approval process for a particular source control drawing should be directed to the Government design Activity as identified by the Commercial and Government Entity (CAGE) Code (previously referred to FSCM) indicated in the drawing. Source control drawings are generated only with the specific approval of the Government Design Activity. The application of qualification procedure, process and instruction in an equitable manner, independent of program management or product, necessitates candidate manufacturer access to a focal point within the design activity. The focal point must be responsive to industry request for qualification with specific procedural instruction, capable of directing candidate suppliers to appropriate Government approved or operated laboratories for testing, knowledgeable in the invoking of qualification provisions and conveniently accessible and communicative to manufacturers, contractors, program managers and user industries or Government activities.

Existing single source-source control drawings shall be periodically (every two years unless otherwise specified by the design activity) reviewed for possible conversion to other than source control if still required in support of procurement. If still required as source control drawings, additional sources of supply shall be developed.

Matters related to Manufacturer's and Government obligations, qualification authority, advertising, publicity, application for qualification, limited rights data, test data, facilities survey, changes in product, cost of testing, availability of data, addition/deletion of source of supply, etc., are detailed in MIL-STD-100 and ASME Y14.100 and Appendices.

REQUIREMENTS:

a. A Source Control Drawing (SOCD) shall disclose, to the extent necessary to insure interchangeability of purchased Items configuration, dimensions of envelope, mounting and mating dimensions, interface dimensional characteristics, nuclear effects, and performance and environmental requirements.

NOTE: Preparation requirements for a "source control drawing" are identical to a "vendor item control drawing" except for identification of critical application(s), qualification and approval requirements, item identification, approved sources of supply in lieu of suggested sources of supply, and required notation.

b. Quality conformance inspection or Quality Assurance Provisions (QAPs) shall be detailed on a separate document and referenced on the source control drawing.

c. The name and address or manufacturer's Commercial And Government Entity (CAGE) Code and the item identification number of each item that has been tested and approved shall be listed under the heading "APPROVED SOURCE(S) OF SUPPLY."

d. When a source control item has repairable parts, those parts shall be identified and/or listed on the drawing. Separate government drawings shall be prepared for repair parts not already covered by other government drawings, government or recognized non-Government specifications or standards.

e. Source Control Drawing (SOCD) numbers along with applicable suffixes establish PINs. As the source control item identification. When more than one vendor is listed on a Source Control Drawing (SOCD) for items that are repairable and repair parts are not interchangeable between the vendors, each vendor item shall be assigned a suffix identifier (dash) of the Source Control Drawing (SOCD).

f. The notation "SOURCE CONTROL DRAWING" shall appear above the title block in.25 inch high letters.

g. Two general notes shall state:

NOTE 1: ONLY ITEMS DESCRIBED ON THIS DRAWING ARE APPROVED FOR USE IN THE APPLICATION(s) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE QUALIFYING ACTIVITY.

NOTE 2: IDENTIFICATION OF THE APPROVED SOURCE(s) HEREON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEMS DESCRIBED ON THE DRAWING.

h. On the using assembly, identify the item by its Source Control Drawing and suffix identifier (dash) number. Also add a general note, "VENDOR ITEM (SOCD) SEE SOURCE CONTROL DRAWING."

i. Altered items, selected items, and Federal, Military and recognized industry standard items shall not be delineated on Source Control Drawings.

j. MARKING: Specify the design activity Commercial and Government Entity (CAGE) Code and source control part number to be marked as the primary identifier and administrative control number (e.g. CAGE Code, the notation SOCD, and the PIN) which will serve as a cross reference to vendor part number. See SECTION 11 and MIL-STD-130. The vendor's identification and part number need not be removed.

k. When another supplier's item is tested and qualified, it may be added to the drawing provided it is approved for all stated applications. A drawing revision action is required to add or remove a supplier.

l. Source Control Drawings (SOCDs) shall not be used to depict microcircuits (Federal Supply Class 5962). Microcircuits shall be depicted on Standardized Military Drawings (SMDs).

m. Preparation of Source Control Drawings (SOCDs) requires prior approval of the Government Design Activity.

n. Disclosure requirements are otherwise the same as for Vendor Item Control Drawings (VICDs), Formerly Specification Control Drawings (SCD).

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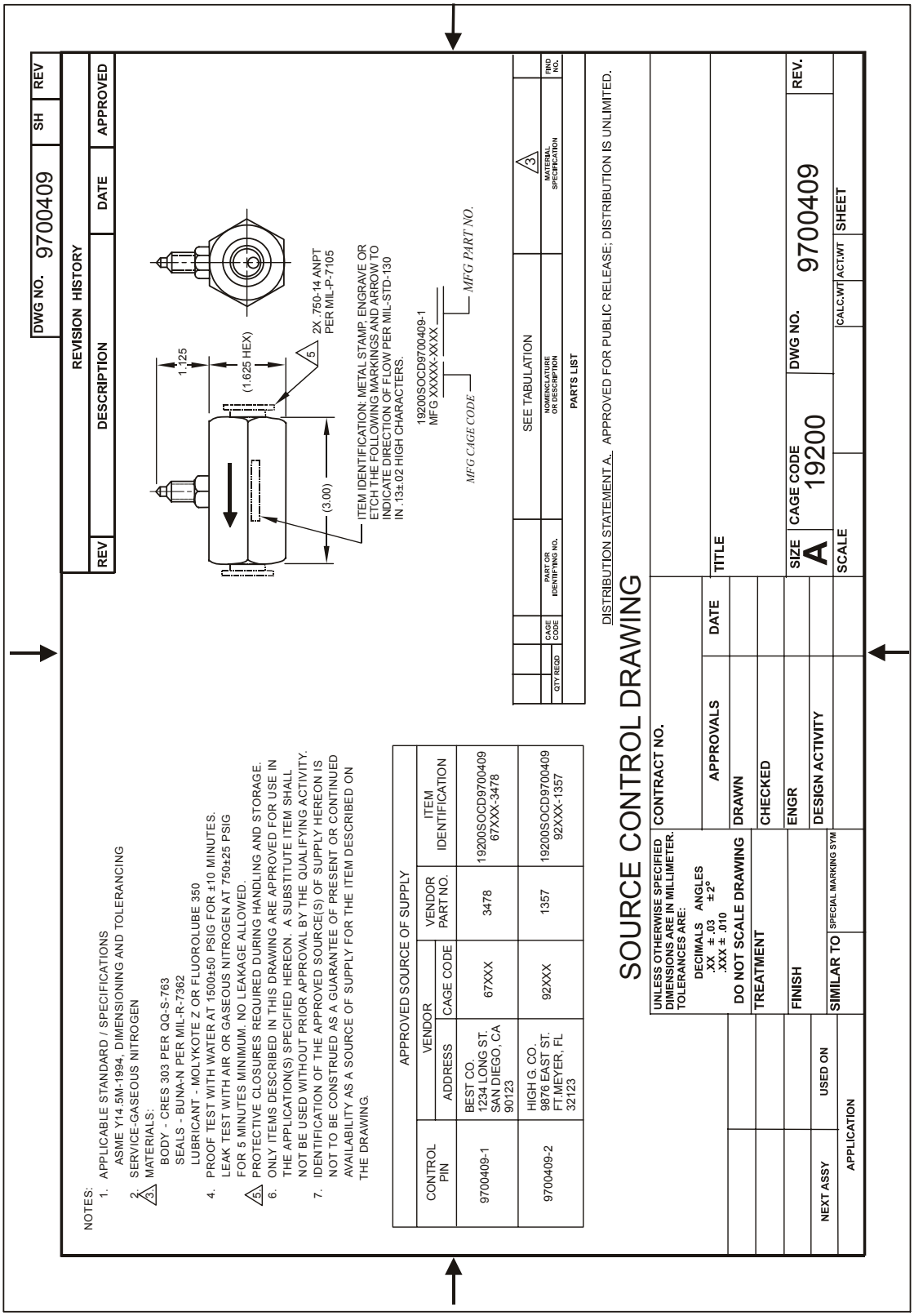


THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED SOURCE CONTROL DRAWING (SOCD)

FIGURE 4-63

STANDARDIZED MILITARY DRAWING

DESCRIPTION & USE: (See FIGURE 4-64)

SMDs shall be prepared in lieu of source control and vendor item control drawings for microcircuits.(Federal Supply Class FSC 5962) SMDs shall depict Government requirements for an existing commercial item which provides specified performance and has been screened and tested to MIL-STD-883 for a military application. The use of source control drawings in lieu of SMD is subject to the review and approval of the procuring activity.

A standardized military drawing (SMD) shall disclose the applicable configuration, envelope dimensions, mounting and mating dimensions, interface dimensional characteristics, specified performance requirements, nuclear effects, and inspection and acceptance test requirements for microcircuits in a military application. Guidance concerning SMDs is contained in MIL-HDBK-780.

Standardized Military Drawings (SMD) are currently confined to the design and procurement of microcircuits that are applicable to Federal Supply Class FSC 5962.

Preparation and application of Standardized Military Drawings (SMD) are subject to the approval of the applicable Program Office.

A Department of Defense Organization known as Military Parts Control Advisory Groups (MPCAG) provides advice to the military departments and military contractors on the selection of parts in assigned commodity classes, and collects data on nonstandard parts for developing and updating military specifications and standards.

Items conforming to the SMD are intended for use when Military Specifications do not exist and qualified military items that will perform the required function are not available. When a military specification exists and the item covered by the SMD has been qualified for listing on the applicable Qualified Products List (QPL), the item covered by the SMD will be inactivated. The applicable QPL item will be the preferred item for all new applications.

REQUIREMENTS:

a. When a search reveals that a QPL or SMD does not exist for a microcircuit in the Department of Defense Index of Specifications and Standards (DODISS) QPL listing or MIL-BUL-103 listing of SMDs, and application for a new SMD with approval of the applicable Program Office shall be made to the Military Parts Control Advisory Group (MPCAG).

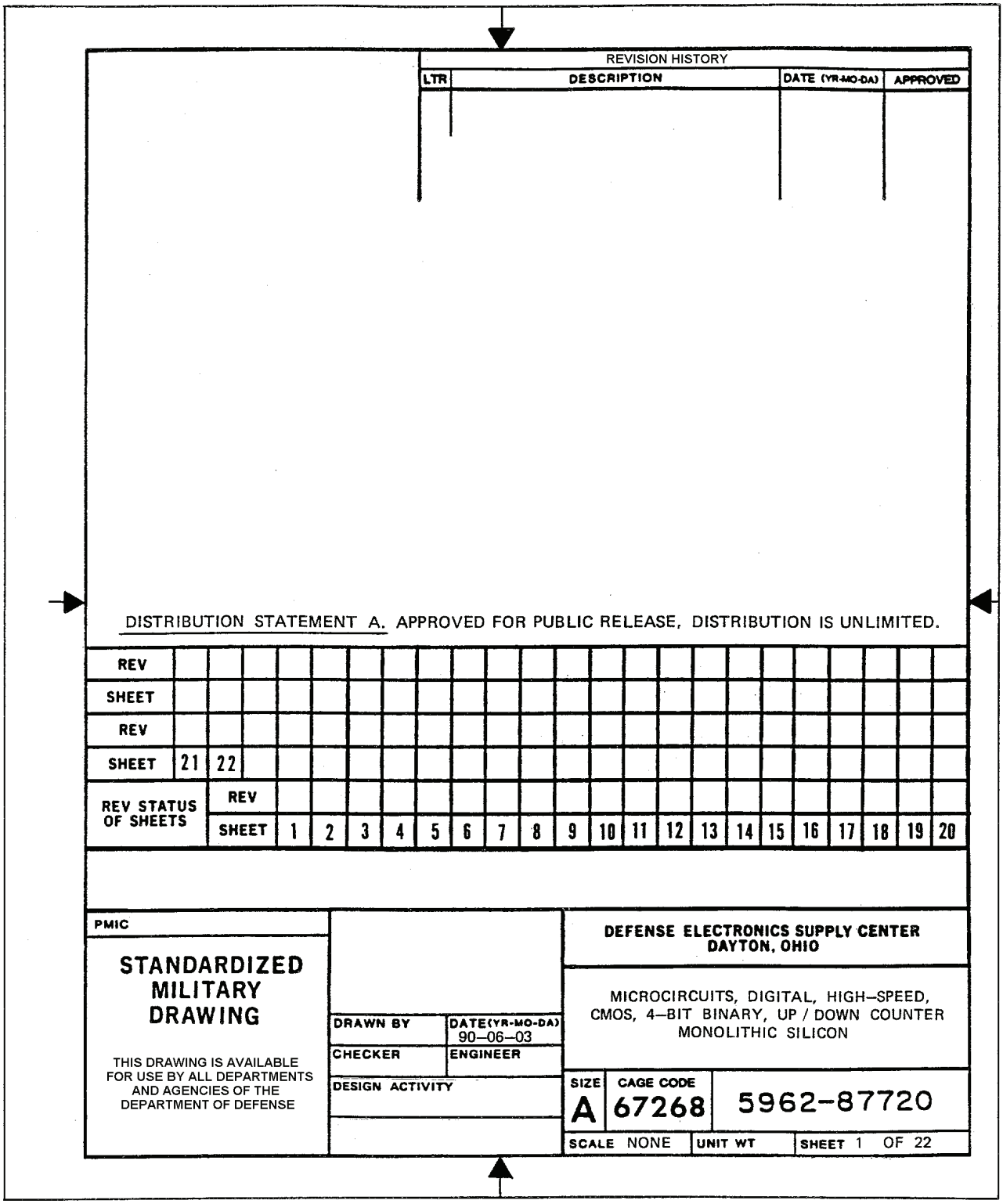
b. A Part Approval Request with a Drawing Preparation Package shall consist of the following:

    1) Drawing Number
    2) All known Sources of Supply
    3) Initial drawing preparation
    4) (4) SMD's are related to the Configuration Management and Parts Control Programs and are documented in accordance with MIL-DTL-31000 and ASME Y14.100 for book form drawings. Non-Standard microcircuits parts approval is obtained through the procedures of MIL-HDBK-965. A complete sample drawing is delineated in MIL-HDBK-780.

c. An SMD contains six numbered sections, titled and numbered as shown below:

    1) Scope
    2) Applicable Documents
    3) Requirements
    4) Quality Assurance Provisions
    5) Packaging
    6) Notes

d. A Certificate of Compliance (C of C). A “C of C” is a document by which an authorized official of the microcircuit manufacturer certifies that the microcircuit being supplied to the applicable SMD by the vendor meets Item Requirements as stated therein. The “C of C” is delivered by the vendor to the MPCAG with the final submittal of the SMD. See MIL-HDBK-780



REVISION HISTORY

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

DISTRIBUTION STATEMENT A. APPROVED FOR PUBLIC RELEASE, DISTRIBUTION IS UNLIMITED.

REV																						
SHEET																						
REV																						
SHEET	21	22																				
REV STATUS OF SHEETS	REV																					
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

PMIC

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

DRAWN BY	DATE(YR-MO-DA) 90-06-03
CHECKER	ENGINEER
DESIGN ACTIVITY	

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO

MICROCIRCUITS, DIGITAL, HIGH-SPEED, CMOS, 4-BIT BINARY, UP / DOWN COUNTER MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-87720

SCALE NONE	UNIT WT	SHEET 1 OF 22

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

STANDARDIZED MILITARY DRAWING TITLE SHEET
FIGURE 4-64 (CONTINUED NEXT PAGE)

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1. SCOPE

1.1 SCOPE. THIS DRAWING DESCRIBES DEVICE REQUIREMENTS FOR CLASS B MICROCIRCUITS IN ACCORDANCE WITH 1.2.1 OF MIL-STD-883, "PROVISIONS FOR THE USE OF MIL-STD-883 IN CONJUNCTION WITH COMPLIANT NON-JAN DEVICES."

1.2 PART NUMBER. THE COMPLETE PART NUMBER SHALL BE AS SHOWN IN THE FOLLOWING EXAMPLE:

5962-87720	01	E	X
DRAWING NUMBER	DEVICE TYPE (1.2.1)	CASE OUTLINE (1.2.2)	LEAD FINISH PER MIL-M-38510

1.2.1 DEVICE TYPE(S). THE DEVICE TYPE(S) SHALL IDENTIFY THE CIRCUIT FUNCTION AS FOLLOWS:

DEVICE TYPE	GENERIC NUMBER	CIRCUIT FUNCTION
01	54HC191	4-BIT SYNCHRONOUS BINARY UP/DOWN COUNTER WITH PRESET

1.2.2 CASE OUTLINE(S). THE CASE OUTLINE(S) SHALL BE AS DESIGNATED IN APPENDIX C OF MIL-M-38510 AND AS FOLLOWS:

OUTLINE LETTER	CASE OUTLINE
E	D-2 (16-LEAD, 1/4" X 7/8"), DUAL-IN-LINE PACKAGE
2	C-2 (20-TERMINAL, .350" X .350"), SQUARE CHIP CARRIER PACKAGE

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CAGE CODE 67268	5962-87720
		REVISION LEVEL	SHEET 2

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STANDARDIZED MILITARY DRAWING CONTINUATION SHEET
FIGURE 4-64 (CONTINUED FROM PREVIOUS PAGE)

TABULATED ASSEMBLY DRAWING

DESCRIPTION & USE: (See FIGURE 4-65)

A tabulated assembly drawing shows how a single assembly drawing can by tabulation of component parts; create additional assemblies without creating separate drawings. The same principle employed by tabulated detail drawings is used and each assembly shall clearly delineate the difference between each tabulated assembly.

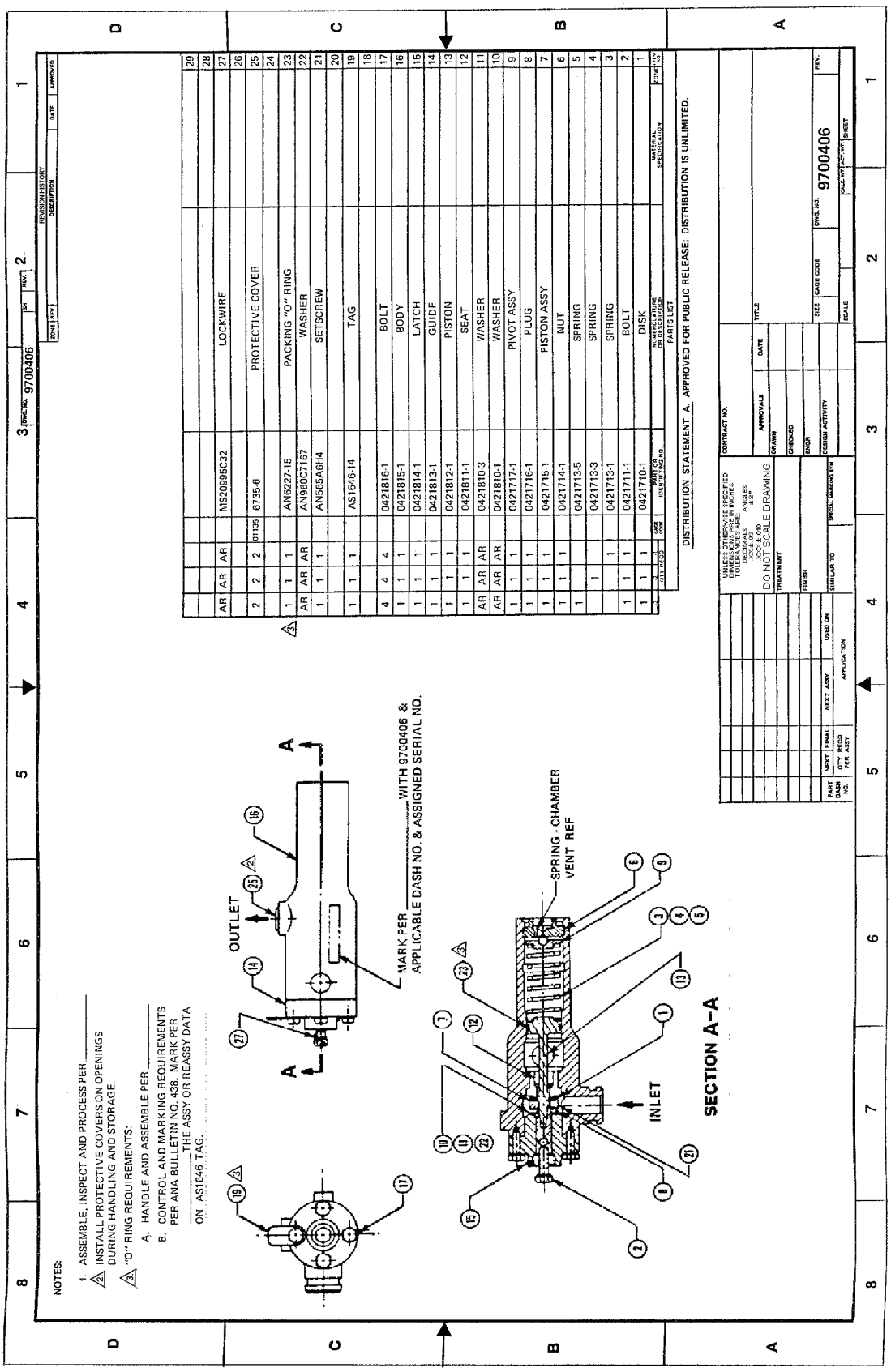
REQUIREMENTS:

a. Use Parts List to specify the differences in the part and material requirements for each assembly.

b. Assign a uniquely identifying assembly suffix identifier (dash) number to each assembly normally -1 identifies the assembly shown.

c. Each view which shows variable information must be labeled with applicable part number(s) callouts.

d. A General Note, “INSTALL PER (*INSTALLATION DRAWING NUMBER),* when applicable.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

TABULATED ASSEMBLY DRAWING
FIGURE 4-65

TABULATED MONO-DETAIL DRAWING

DESCRIPTION & USE: (See FIGURE 4-66)

A tabulated detail drawing that gives complete information for the manufacture of two or more items which have similar configuration, but vary in dimension, material, finish, etc. Precludes the preparation of a separate drawing for each part by tabulating the variable features or characteristics.

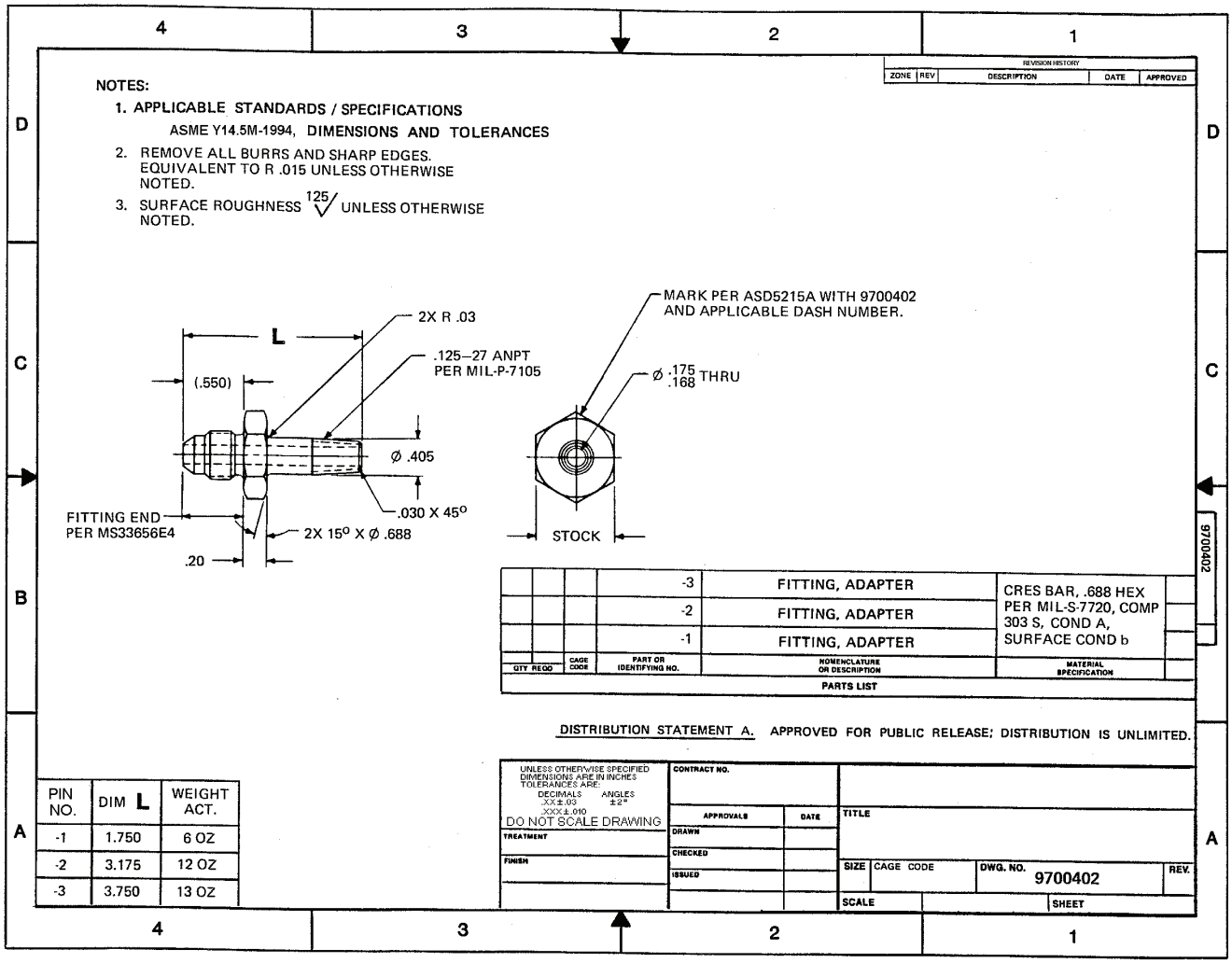
REQUIREMENTS:

a. Draw one item to scale, representing the -1 part if possible.

b. Place a tabulation block on the field of the drawing with column headings appropriate for tabulation of the variables, e.g., "L" for length, “W" for width, “D" for diameter, and other characteristics as applicable.

c. Other letters such as "A", "B", "C", etc., may be used for other variables.

d. Assign a uniquely identifying part suffix identifier (-) number to each part.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY
THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATED THE TYPE OF DRAWING BEING DESCRIBED.

TABULATED MONO-DETAIL DRAWING
FIGURE 4-66

TEXTILE DRAWING

DESCRIPTION & USE: (See FIGURE 4-67)

A textile drawing shows the design and fabrication information of an item constructed from fabrics.

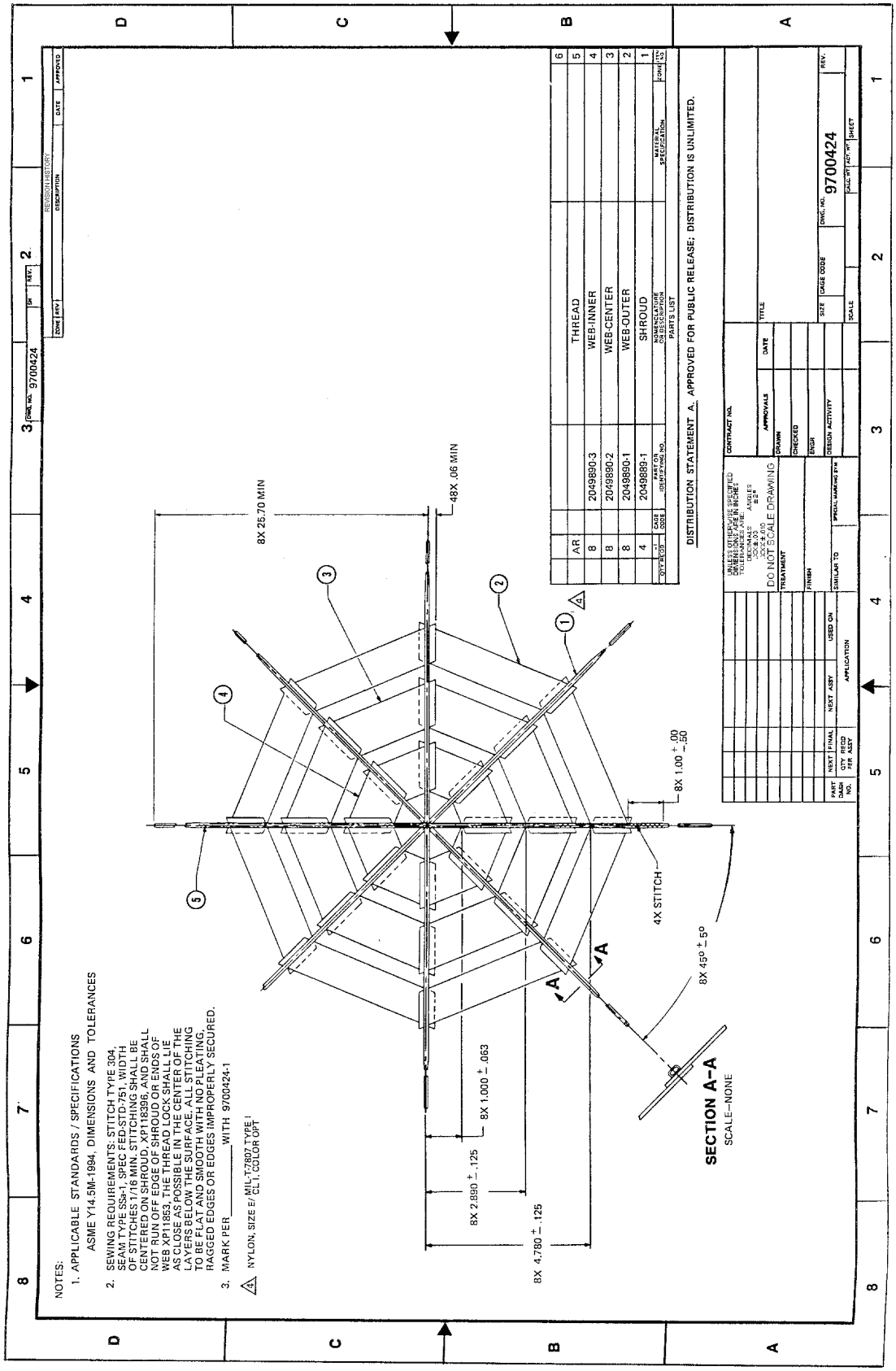
REQUIREMENTS:

a. a. Include sufficient information for the fabrication of the item, including dimensionsof the finished item and dimensioned flat patterns when possible.

b. Draw the item and flat patterns full size when possible.

c. Seams and stitching should be left to the discretion of the fabricator unless design or contractual requirements require they be specified.

d. Use bulk material callout procedure for fabric articles.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

TEXTILE DRAWING
FIGURE 4-67

TUBE BEND DRAWING

DESCRIPTION & USE: (See FIGURE 4-68)

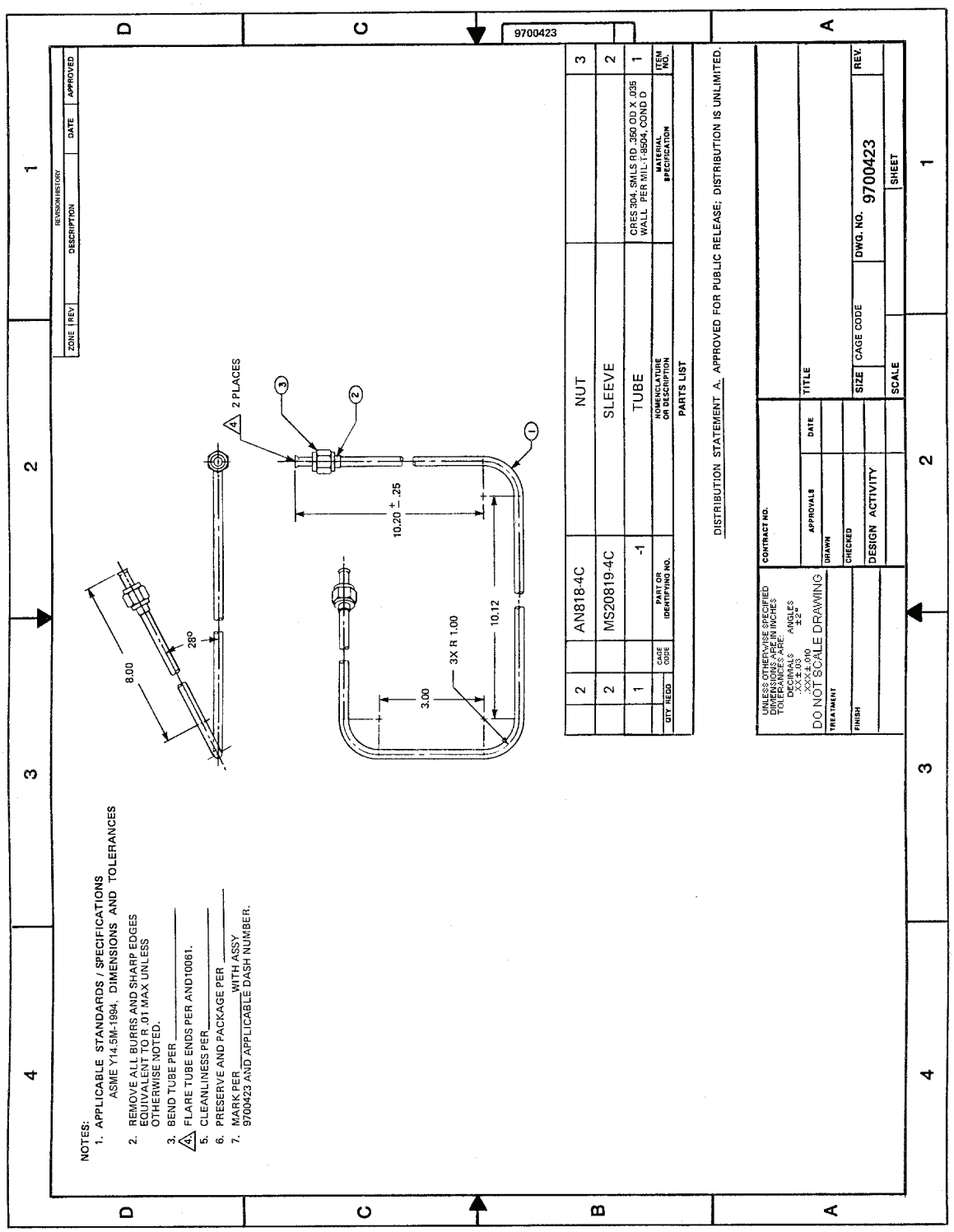
A tube bend drawing shows, by means of pictorial or tabular delineation, or combinations thereof, complete bend data required for the fabrication of a rigid metal tube.

REQUIREMENTS:

a. Disclose all material, types of ends, identification and quantity of fittings, bend radii and angles, intersection points, intermediate and overall lengths, tolerances, free or restrained state and other data required for the fabrication and acceptance of the item delineated.

b. If it is impractical to determine the bend data before assembly, a tube assembly drawing may be prepared showing a straight tube of approximate developed length and its fittings. A general note shall reference an installation or assembly drawing for forming.

c. Configuration may be shown in pictorial or tabular form depending upon complexity.



SCALE OF TITLE AND REVISION BLOCKS HAVE BEEN EXAGGERATED FOR CLARITY.

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TUBE BEND DRAWING
FIGURE 4-68

UNDIMENSIONED DRAWING

DESCRIPTION & USE: (See FIGURE 4-69)

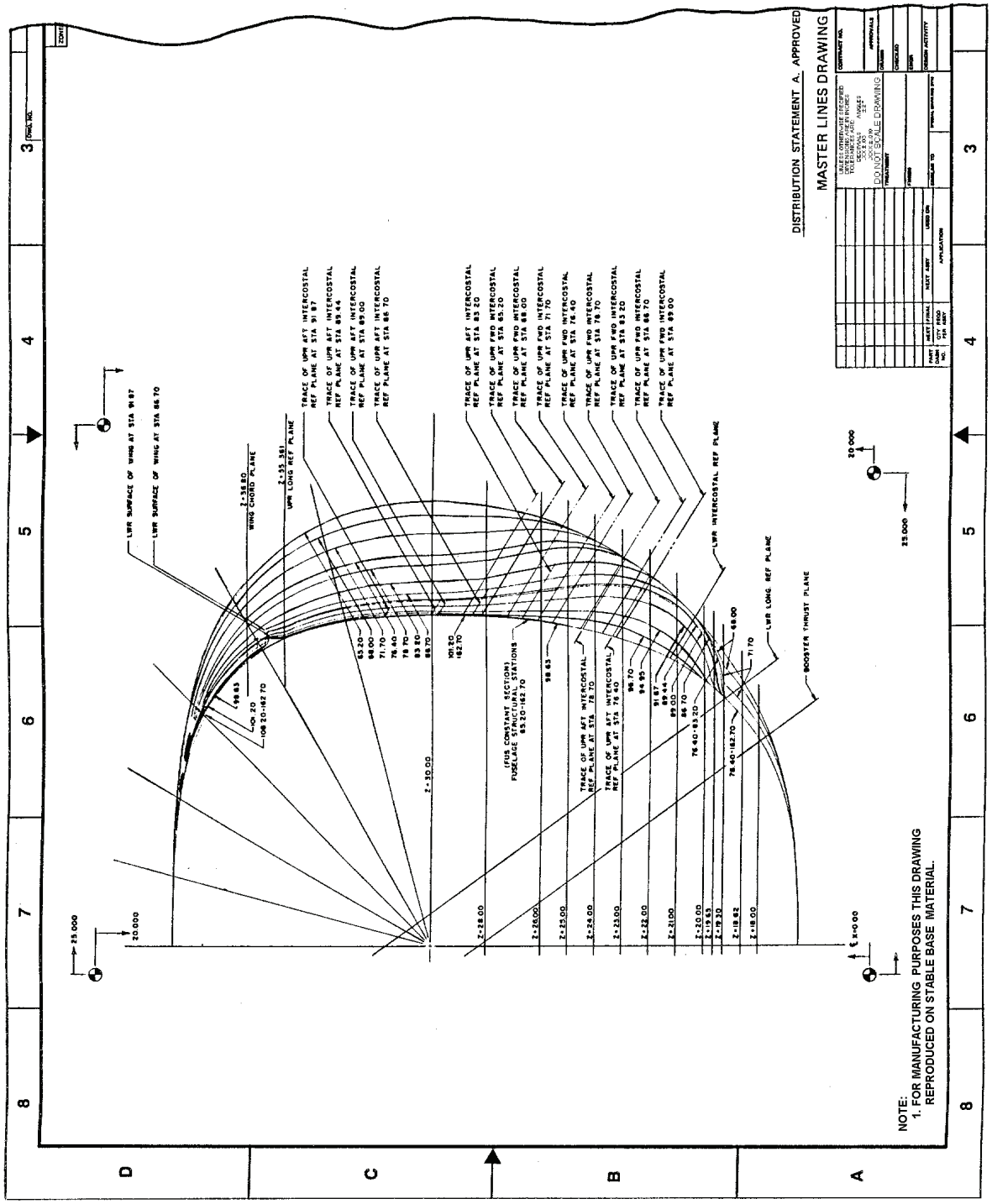
An undimensioned master drawing which depicts, to a precise scale on environmental stable material, loft line information, a template, a pattern, panels, reticules, special scales, sheet metal parts, cable assemblies and other items for which dimensioned detail drawings would be impractical. Drawings shall be accurate to the highest extent possible for photographic generation of parts or templates, without conventional dimensions & tolerances.

REQUIREMENTS:

a. Include information necessary to fabricate parts within necessary manufacturing limits, as for any detail part.

b. Make drawings to high quality standards, with sharp, clear, opaque line work.

c. Draw on dimensionally stable material only.



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UNDIMENSIONED DRAWING
FIGURE 4-69

VENDOR ITEM CONTROL DRAWING (VICD)
(FORMERLY "SPECIFICATION CONTROL DRAWING (SCD)")

DESCRIPTION & USE: (See FIGURE 4-70)

A design activity control drawing which depicts and controls the performance and configurations of a “commercial item* or a “vendor developed item” advertised or cataloged as available on an unrestricted basis on order as an "off-the-shelf" item or an item which, while not commercially available, is procurable on order from a specialized segment of industry. The drawing, under the heading "Suggested Source(s) of Supply" shall list two (2) or more known sources along with their associated CAGE Code, name, address and manufacturer's item identification number unless, after suitable search, it is determined that there is only one (1) source.

a. Vendor developed items are those products of industries which normally provide customer application engineering services for a commercial product line and their products are commercially available from a specialized segment of industry. Typical examples of such items are: special motors, synchros, transformers, potentiometers, hydraulic valves, carburetors, potted servo-amplifiers, key-boards, tape readers.

b. Altered items, selected items and items depicted in Federal, Military and recognized industry association standards or specifications shall not be delineated on Vendor Item Control Drawings.

c. Privately developed items defined as patented, proprietary or with limited rights shall only be used in accordance with contract requirements and prior approval of the Government Design Activity.

REQUIREMENTS:

a. Disclose as applicable, configuration, dimensions of envelope, mounting and mating dimensions, interface dimensional characteristics and limits thereto. In addition, as necessary, inspection requirements, performance, reliability, maintainability, environmental and other functional requirements, to insure identification and adequate reprocurement of an interchangeable item. If an electrical or electronic (or other engineering) circuit is involved, a schematic and connection or other appropriate diagrammatic disclosure shall be included, providing sufficient information for making external connections. Qualification testing prior to purchase is not a prerequisite for inclusion of another vendor source as long as all specified requirements are met. If qualification and approval is necessary, a "SOURCE CONTROL DRAWING" shall be used to define the item.

b. Testing and acceptance criteria shall be delineated on a separate existing specification or Quality Assurance Provision (QAP) and referenced on the Vendor Item Control Drawing (VICD).

c. Vendor Item Control Drawings shall not be used to depict microcircuits (Federal Supply Class 5962). Microcircuits shall be depicted on Standardized Military Drawings (SMDs).

d. Preparation of Vendor Item Control Drawings (VICDs) requires prior approval of the Government Design Activity.

e. Vendor Item Control Drawings may be prepared only for items which will not normally require replacement of any of their component parts during the life of the item. Any exception to this requirement will require that separate drawings be prepared for each repair part not already covered by other drawings, Government or non-government specifications and standards.

f. Vendor Item Control Drawings (VICD) shall not be prepared in circumstances where a detailed Military Standard (MS) would be more appropriate.

g. Do not specify any requirements other than those normally met by the vendor's item; use altered or selected item drawings instead.

h. Marking: Specify the design activity Commercial and Government Entity (CAGE) code and Vendor item control part number to be marked as the primary identifier and administrative control number which will serve as a cross reference to vendor part number. See Section 11 and MIL-STD-130. The vendor's identification and part number need not be removed.

i. Under the heading "SUGGESTED SOURCE(s) OF SUPPLY" list the name, address, Commercial and Government Entity (CAGE) Code and item identification number of each known vendor.

j. Add the notation "VENDOR ITEM CONTROL DRAWING" (Formerly SPECIFICATION CONTROL DRAWING) above the title block in .25 inch high letters.

k. The following note shall appear in the general notes column of the drawing:

"IDENTIFICATION OF THE SUGGESTED SOURCE(S) OF SUPPLY HEREON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUE AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM(S)".

l. On the using assembly Parts List, itemize the specification control item by the specification control part number, together with a note, "VENDOR ITEM SEE VENDOR ITEM CONTROL DRAWING (VICD)". (Formerly SPECIFICATION CONTROL DRAWING.)

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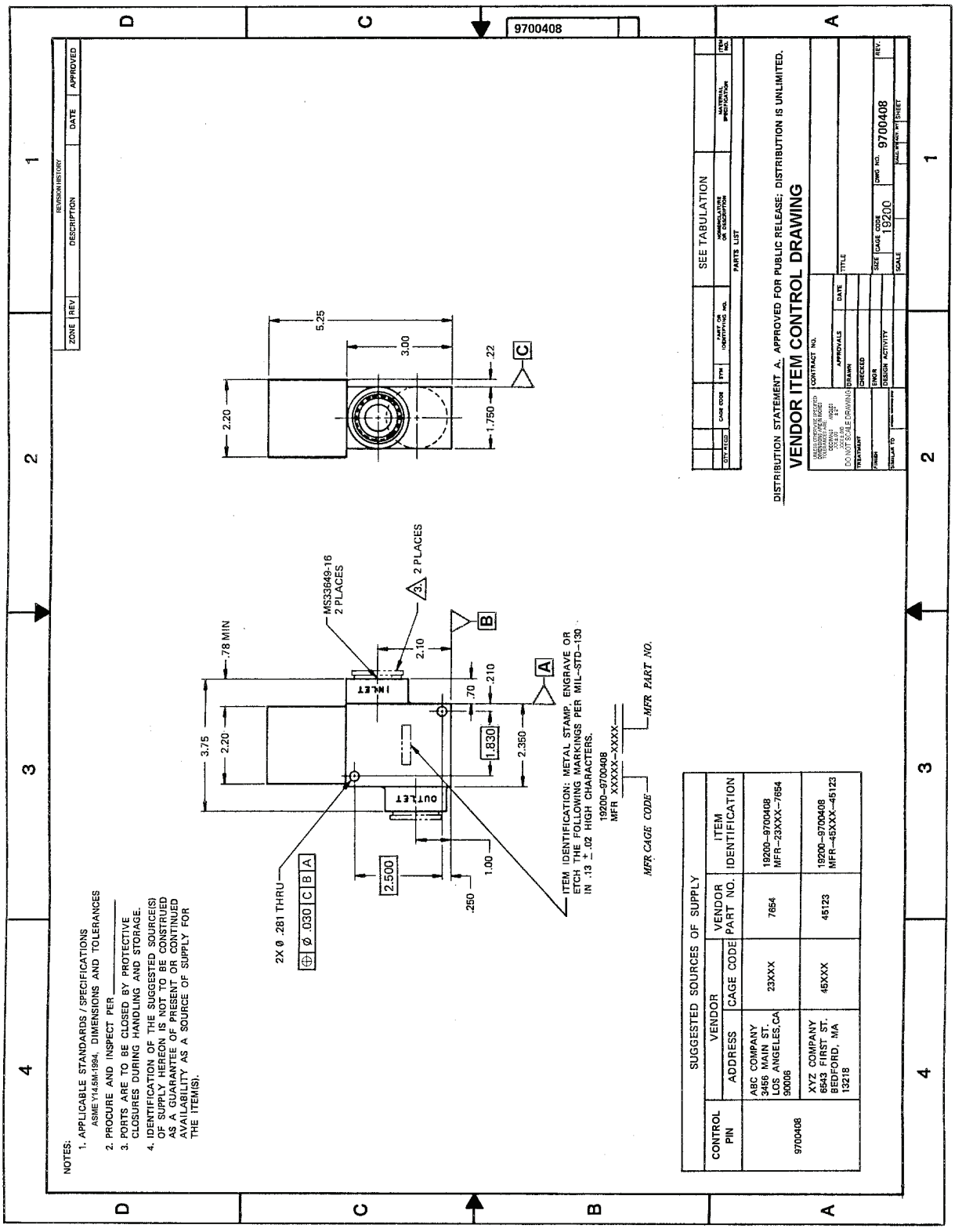


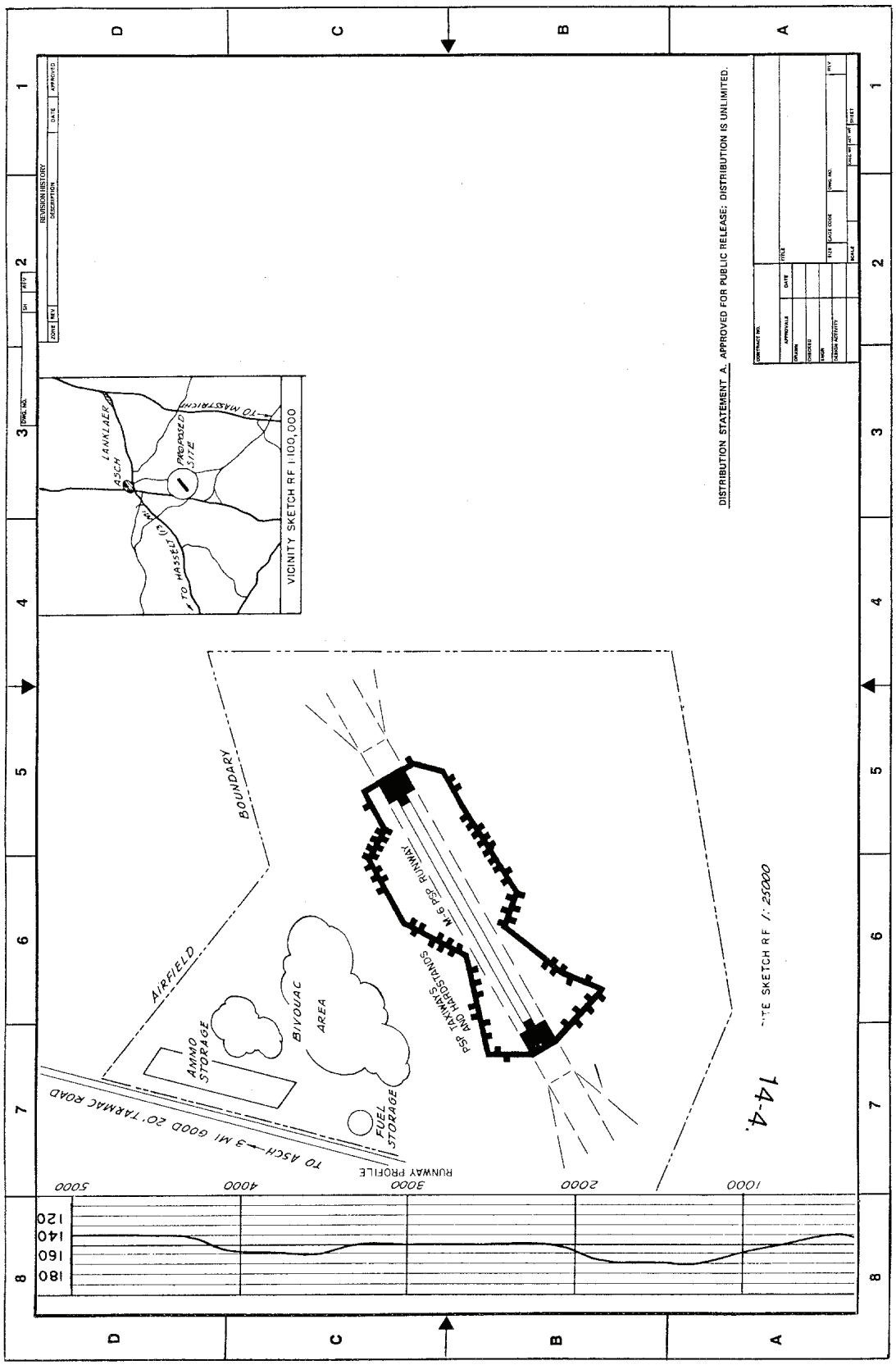
THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

VENDOR ITEM CONTROL DRAWING
FORMERLY "SPECIFICATION CONTROL DRAWING")
FIGURE 4-70

VICINITY PLAN (SITE) DRAWING

DESCRIPTION & USE: (See FIGURE 4-71)

A Vicinity Plan Drawing (or vicinity map used with construction drawings) delineates the relationship of a site to features of the surrounding area, such as town, bodies of water, railways, highways, etc.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

VICINITY PLAN (SITE) DRAWING
FIGURE 4-71

WIRING/CONNECTION DIAGRAM

DESCRIPTION & USE: (See FIGURE 4-72)

Wiring/Connection Diagrams show the general physical arrangement of electrical connection and wires between circuit elements in an installation or assembly. It may show internal or external connections, or both, which have one termination inside and one outside the assembly in such detail as is needed to make or trace connections that are involved.

NOTE: The preparation of a separate Wire List (WL) in accordance with ASME Y14.34M. See SECTION 10 herein. Or A Wiring List may be prepared as combination with the Wiring/Connection Diagram. (example shown)

REQUIREMENTS:

A Wiring/Connection Diagram includes as applicable:

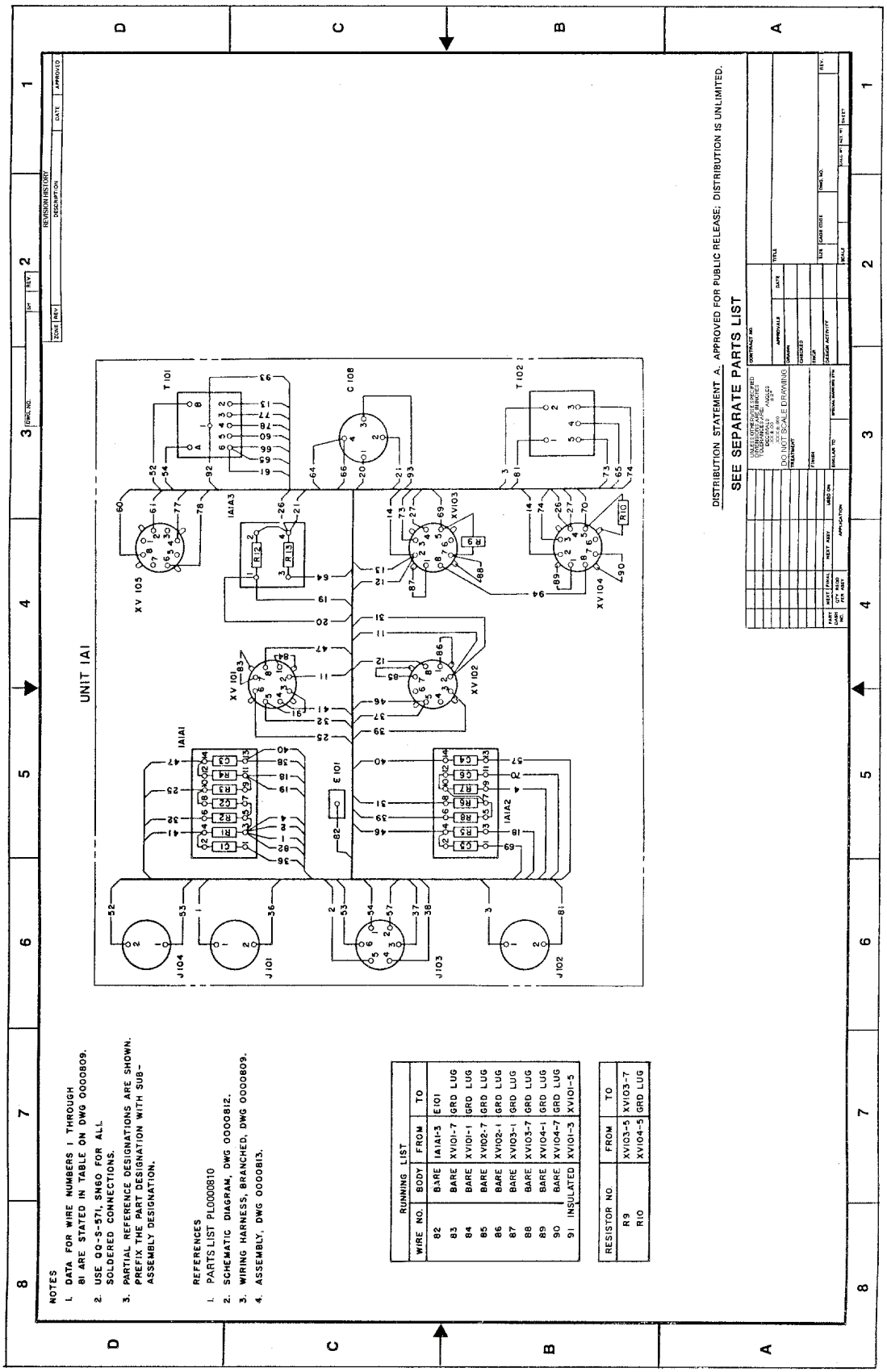
a. Physical arrangement and relationship of circuit elements and their connections.

b. Items are identified by reference designations in accordance with IEEE STD 200 (INACTIVE) IEEE 315.

c. Terminal arrangements clearly identified.

d. Wires numbered for identifications.

e. Wire and termination descriptions.



NOTE: SEE FIGURE 73 FOR RELATED WIRING HARNESS DRAWING

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

WIRING/CONNECTION DIAGRAM
FIGURE 4-72

WIRING HARNESS DRAWING

DESCRIPTION & USE: (See FIGURE 4-73)

A Wiring Harness Drawing shows all necessary dimensions to define the harness form and termination points. In lieu of dimensions, a grid system, or vertical and horizontal graphic scales may be provided or undimensional full scale drawings may be used. A Wiring Harness Drawing is prepared when it is determined that a harness is to be fabricated as a separate item, as opposed to individually connecting conductors during assembly.

Included in the general notes should be instructions, or reference thereto, for the preparation of the harness, associated Schematic Diagram and the Wiring/Connection diagram.

REQUIREMENTS:

A Wiring Harness Drawing is prepared as either a detailed or simplified drawing.

a. DETAILED WIRING HARNESS DRAWING as applicable:

    1) Pictorial views.

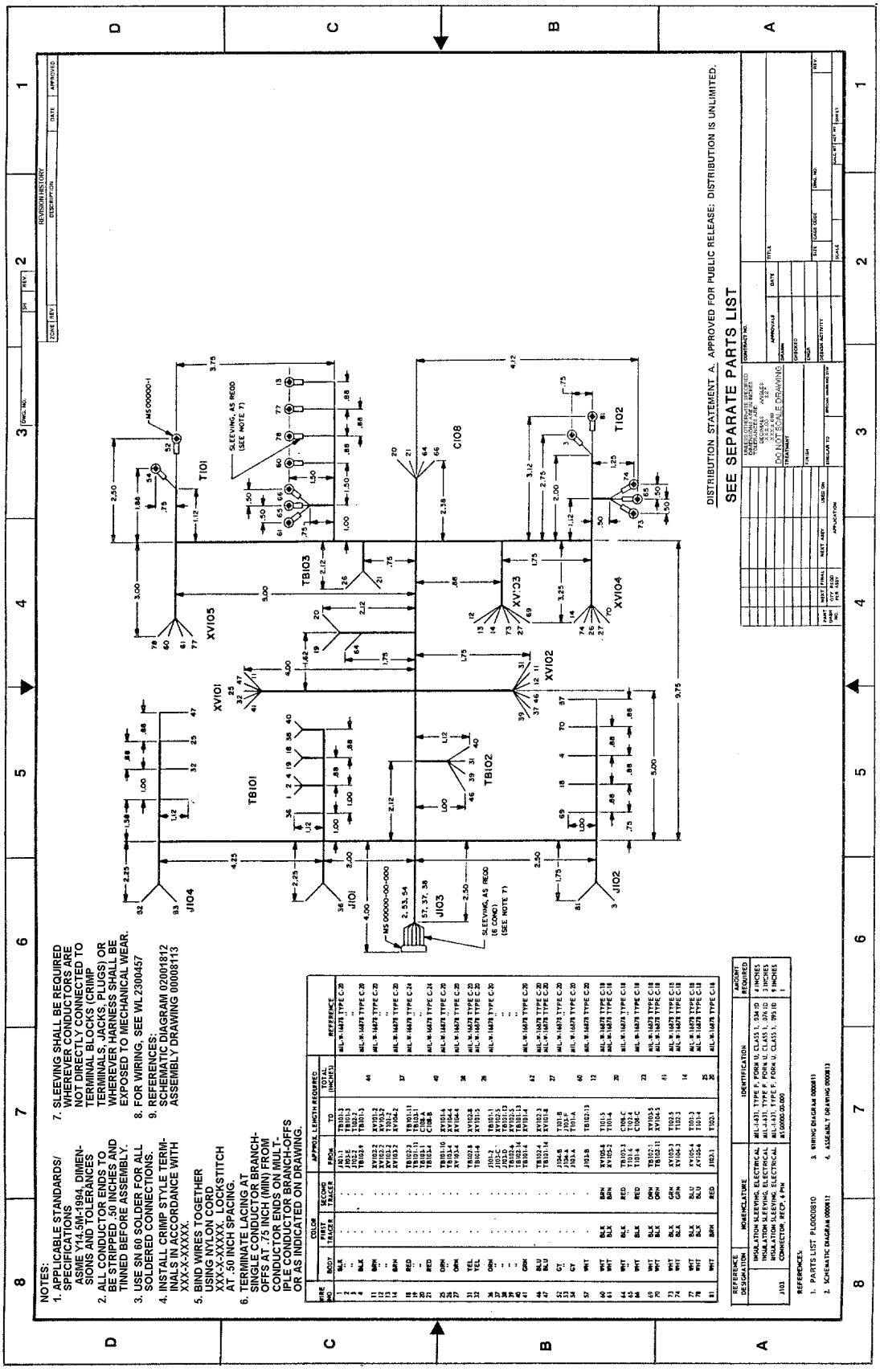
    2) A Wire Table of wire numbers or color codes, circuit references designations in accordance with IEEE STD 200 (INACTIVE) and IEEE 315 (FROM - TO DATA), wire lengths, wire type and gage, termination methods and other related data.

    3) Instructions for fabrication of the harnesses, minimum bend radii for conductors and cross-references to the associated assembly drawings and electrical diagrams.

    4) Parts (connectors, terminal lugs, etc) and bulk materials (wire, sleeving, jacketing, twine, etc) required for the fabrication of the harness specified in the parts list.

    5) Applicable processes. Items used to install the harness (for example, cable clamps), which are not an integral part of the harness, are itemized in the using assembly or installation drawings.

b. SIMPLIFIED WIRING HARNESS DRAWING satisfies the requirements for a detailed wiring harness drawing, except that the pictorial may be omitted and the note HARNESS CONFIGURATION TO BE DETERMINED FROM ASSEMBLY included. The assembly drawing then specifies any critical routing or dimensional requirements. (The requirements for this drawing may be satisfied by a wiring list with a parts list.)



WIRING HARNESS DRAWING
FIGURE 4-73

WIRING (RUNNING) LIST

DESCRIPTION & USE: (See FIGURE 4-74)

A Wiring List is the forerunner to ASME Y14.34 associated Wire List (WL) (See SECTION 10 herein for an engineering drawing which consists of tabular data and instructions necessary to establish wiring connections within or between units of an equipment or between equipments, sets or assemblies of a system. A Wiring List is another form of Wiring/Connection or Wire/Interconnection Diagram. Book Form Drawing formats lend themselves to delineation of Wiring Lists.

REQUIREMENTS:

Wiring List includes as applicable:

a. Location identification and termination methods for each end of the wire.

b. A description of each wire (e.g. type, size, color, etc.)

c. Hookup for items with wire leads.

d. Material (wire, sleeving, etc.) and process requirements for connections when they are not specified on the related assembly drawing.

e. Reference to applicable assembly drawing, connection diagram, interconnection diagram, or wiring harness drawing.

NOTES:

1. APPLICABLE STANDARDS / SPECIFICATIONS
   ASME Y14.5M-1994, DIMENSIONS AND TOLERANCES
2. SEE APPLICABLE ASSEMBLY DRAWING AND _____ WIRING SPECIFICATION FOR WIRING PROCEDURES AND INTERPRETATION.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION (S).
4. ABBREVIATIONS PER MIL-STD-12.

POINT-TO-POINT WIRING LIST

WIRE NO.	DESCRIPTION	COLOR CODE	TOTAL LENGTH	COMPONENT CONNECTION FROM	COMPONENT CONNECTION TO	REMARKS	ASSEMBLY DWG NO.	ASSEMBLY ITEM NO.
1	WHT/GRN/BLU/GRA	9568	28.0	J1	E5	JACKET FOR WIRE NO. 1	414	30
1A	NO. 26 WHT	9		J1– A	E5	MAG CURRENT PULSE		
1F	NO. 24 WHT/BLK	90	3.0	SHIELD 1	E1	SHIELD GROUND	414	47
1S	NO. 24 WHT/BLK	90	3.0	SHIELD 1	J1– 0	SHIELD GROUND	414	47
2	WHT/GRN/VIO/GRA	9576	27.0	J1	E4	JACKET FOR WIRE NO. 2	414	31
2A	NO. 26 WHT	9		J1– C	E4	OPEN MAG		
2F	NO. 24 WHT/BLK	90	3.0	SHIELD 2	E6	SHIELD GROUND	414	47
2S	NO. 24 WHT/BLK	90	3.0	SHIELD 2	J1– 0	SHIELD GROUND	414	47
3	NO. 24 WHT/BLK/ORN	903	19.0	J1– E	T4– 3	60 VAC	414	56
4	NO. 24 WHT/RED/GRN	925	19.0	J1– F	T4– 4	60 VAC	414	58
5	NO. 20 WHT/BLK/BLU	906	15.0	J1– G	T4– 8	THYRATRON FIL 1	414	35
6	NO. 20 WHT/BLK/BLU	906	15.0	J1– H	T4– 8	THYRATRON FIL 2	414	35
7	NO. 20 WHT/BRN/RED	912	15.0	J1– G	T4– 9	THYRATRON RTN 1	414	36
8	NO. 20 WHT/BRN/RED	912	15.0	J1– H	T4– 9	THYRATRON RTN 2	414	36
9	NO. 24 WHT/BLK/BRN/VIO	9017	16.0	J1 J	K1– X2	FIL RELAY RTN	414	53
10	NO. 22 WHT/BRN/ORN/GRA	9138	13.0	J1– K	T1– 3	PH A (SW)	414	38
11	NO. 22 WHT/BRN/GRN/GRA	9158	13.0	J1– L	T1– 4	PH B (SW)	414	39
12	NO. 22 WHT/BRN/BLU/GRA	9168	13.0	J1– M	T1– 6	PH C (SW)	414	40
13	WHT/YEL/BLU/VIO	9467	15.0	J1–	A1–	JACKET FOR WIRE NO. 14	414	27
14	NO. 26 WHT	9		J1– P				

SIZE	CAGE CODE	DWG. NO.	REV.
A			
SCALE		SHEET	

NOTE: ILLUSTRATED IS PAGE TWO (2) OF A MULTIPAGE DOCUMENT IN BOOK FOR SEE SECTION 6 FOR PAGE ONE (1) FORMAT.

THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

WIRING (RUNNING) LIST
FIGURE 4-74

PROCUREMENT CONTROL DRAWING

(Added: Not in Alphabetical Sequence)

DESCRIPTION & USE: (See FIGURE 4-75)

A Procurement Control Drawing provides criteria for performance, acceptance, and identification of purchased items by disclosing the engineering design characteristics required;

(a) For control of interfaces.
(b) To ensure repeatability of performance.

A Procurement Control Drawing may be prepared for use in a commercial environment in lieu of another type of control drawing (Vendor Item Control, Source Control, Altered Item, Selected Item, Envelope Drawing or Identification Cross Reference Drawing) to provide minimum details necessary for commercial applications.

A Procurement Control Drawing specifies criteria for;

(a) A purchased item.
(b) The alteration of a purchased item defined by a nationally recognized standard.
(c) The selection of a purchased item or an item defined by a nationally recognized standard.
(d) The development and qualification of a new item.
(e) Item identification of a new item or reidentification of an item.

REQUIREMENTS:

A Procurement Control Drawing includes as applicable:

(a) Performance requirements to ensure that performance characteristics critical to the intended applications are met.

(b) Envelope dimensions to ensure physical interchangeability in using assemblies.

(c) Interface characteristics to ensure functional interchangeability in using assemblies.

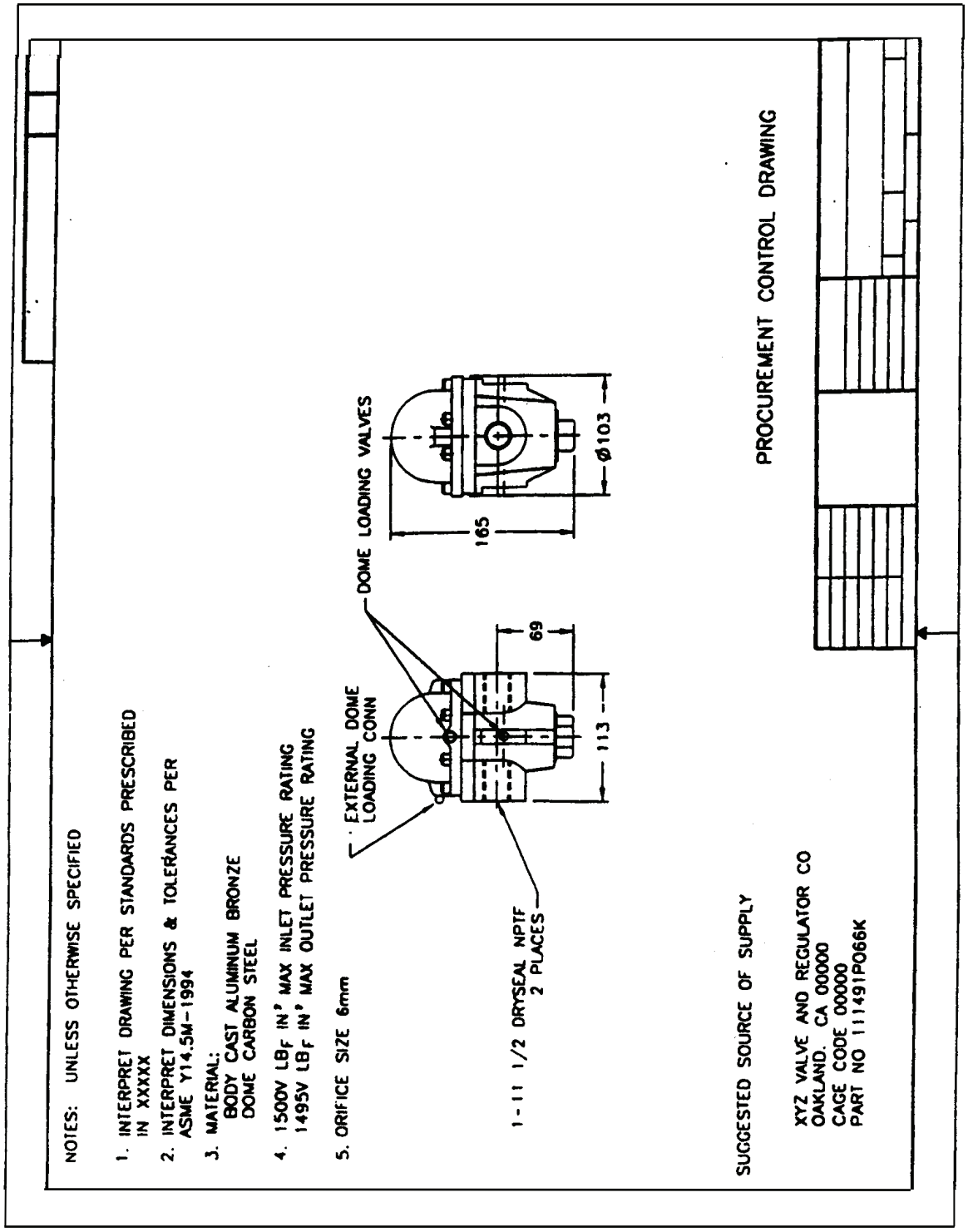
(d) Qualification requirements necessary to verify that performance requirements and physical and functional interchangeability can be provided by each proposed source.

(e) Identification requirements including marking instructions, lot serialization, etc.

(f) Procurement data (approved or suggested sources, qualification required for procurement of item from alternate sources, etc.

(g) Acceptance criteria to verify that requirements established by (a) through (f) are met by each item or lot of items received by the purchaser and to identify any variations between items or lots of items.

(h) A Procurement Control Drawing shall include the notation PROCUREMENT CONTROL DRAWING above or adjacent to the drawing Title block in .25 inch high letters.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED.

PROCURMENT CONTROL DRAWING
FIGURE 4-75

IDENTIFICATION CROSS REFERENCE DRAWING

(Added: Not in Alphabetical Sequence)

DESCRIPTION & USE: (See FIGURE 4-76)

An Identification Cross Reference Drawing is an administration type drawing which assigns unique identifiers to provide a cross reference to the original incompatible identifier. This drawing does not establish item identification. It is prepared to provide compatible identifiers for nationally recognized standards, customer furnished equipment, etc., when the original identifier is to long, contains characters unacceptable for data processing, is identified by description only, etc.

REQUIREMENTS:

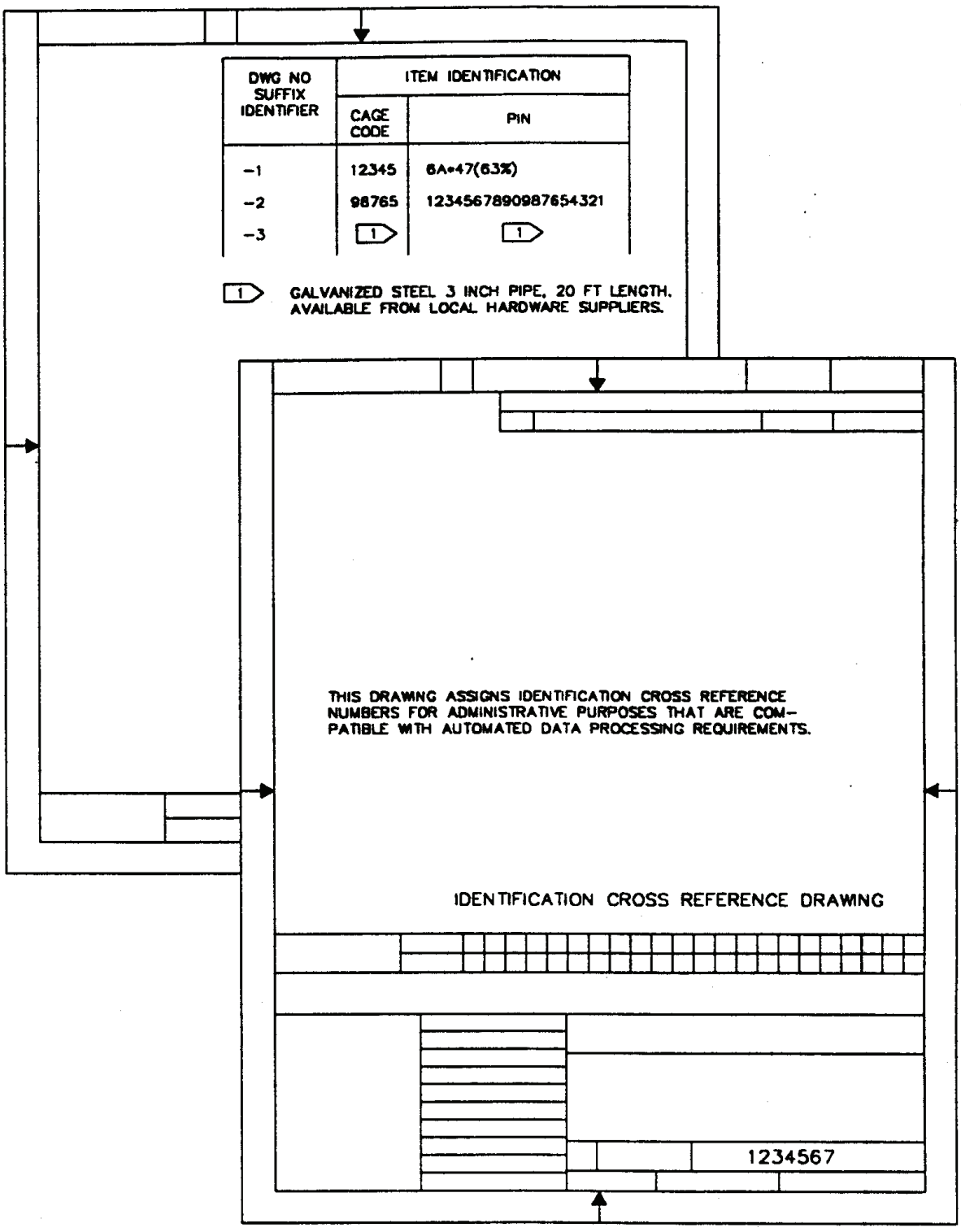
An Identification Cross Reference Drawing shall include:

(a) Assignment of the compatible identifier.

(b) Cross reference to the original item identification or description.

(c) The notation IDENTIFICATION CROSS REFERENCE DRAWING shall be placed above or adjacent to the Title block in .25 high letters.

The Identification Cross Reference Drawing shall not specify any engineering or design requirements beyond those already contained in the drawings, specifications, etc., governing the original item.



THIS SAMPLE DRAWING IS INFORMATIONAL ONLY AND COMPLETE TO THE DEGREE NECESSARY TO ILLUSTRATE THE TYPE OF DRAWING BEING DESCRIBED

IDENTIFICATION CROSS REFERENCE DRAWING
FIGURE 4-76

DESIGN PARAMETER DRAWING

(Added: Not in Alphabetical Sequence)

DESCRIPTION & USE: (See FIGURE 4-77)

The Design Parameters Drawing is primarily intended for use with or in support of a Performance Specification (e.g. MIL-PRF-123456) or other requirements document. It establishes item identification when design disclosure drawings are not created and delivered to the customer. However, it may in prepared independent of a performance specification. The Design Performance Drawing discloses features and characteristics which are critical to the delineation of the geometric, functional, operational, performance, quality, and safety requirements of an item. The Design parameters Drawing provides a graphic description of requirements for design development /evaluation or item production, as applicable or it provides sufficient information for the development of Design Disclosure Drawings.

A Design Parameter Drawing is prepared to:

(a) Supplement specifications (e.g. Performance Specifications [MIL-PRFs]) utilized for design definition and development.
(b) Establish design objectives and parameters.
(c) Establish a configuration baseline for the generation of design disclosure documentation.
(d) Retain design intent of an item for historical reference.
(e) Acquire an item without the requirement for full design disclosure.

The Design Parameters Drawing should be prepared early on for major interface items for a graphic means to convey design intent for production, design development, the creation of a design disclosure package, and historical reference. Unlike the Envelope Drawing, it will not be converted into any other drawing type regardless of its use.

REQUIREMENTS:

Although full design disclosure is not required, sufficient information is provided to support design development and the follow-on procurement of interchangeable items, such as:

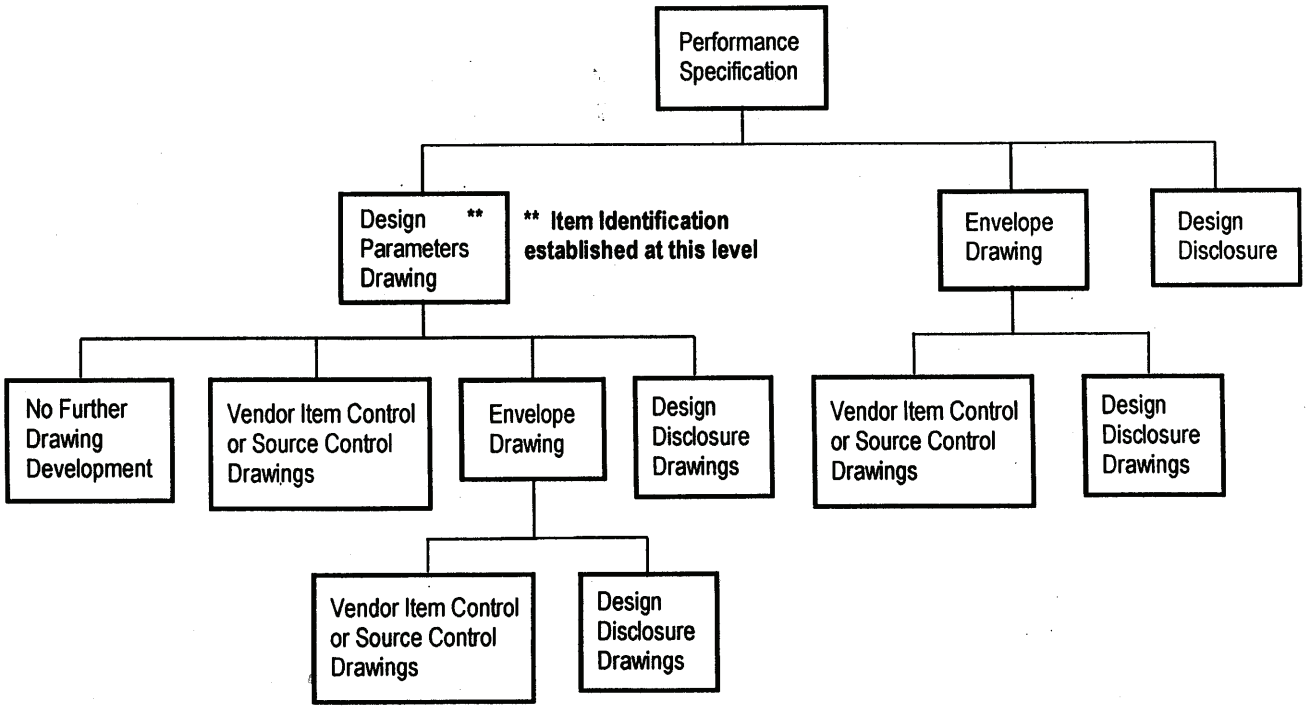
(a) Geometric definition of features including mounting, mating, and volume utilizing the necessary size, form, and location controls.
(b) Physical, performance, installation, reliability, safety, and interchangeability requirements.
(c) Material requirements including hardness and protective coatings.
(d) Quality requirements including test and inspection.
(e) Schematic, connection, or other appropriate diagrams.
(f) The mating connection locations (s), and connection diagram(s) to provide information for external connectors when required.
(g) Reference to other documentation, if necessary.

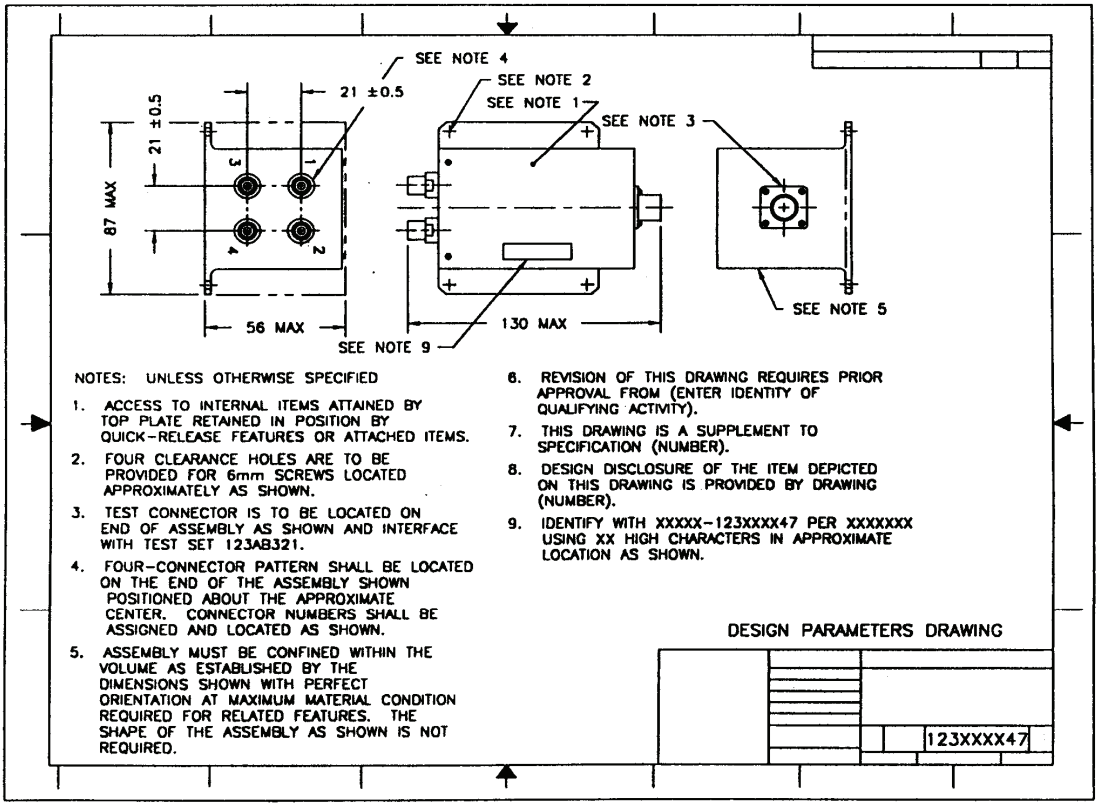
The drawing shall include the notation DESIGN PARAMETERS DRAWING above or adjacent to the Title block in .25 inch high letters.

When a Design Parameters Drawing is generated in conjunction with a performance specification (PRF), a general note is added to the drawing as follows,

THIS DRAWING IS A SUPPLEMENT TO SPECIFICATION_ *performance (PRF) number*_

DEVELOPMENT OPTIONS





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DESIGN PARAMETERS DRAWING

FIGURE 4-77

NOTES: