

STANDARD RELIABILITY PROGRAM FOR RELAYS

GM9111P

TABLE OF CONTENTS

1	SCOPE	7	ANNUAL COMPLIANCE AUDIT
		7.1	PROCEDURE
2	REFERENCED STANDARDS	7.2	DISTRIBUTION
3	GENERAL REQUIREMENTS	8	SAFETY
3.1	REFERENCE DOCUMENTS REQUIRED	9	GENERAL INFORMATION
3.2	RECORD RETENTION		
3.3	LOT DEFINITION AND SAMPLE SELECTION		
3.4	TEST DATA AND FORMS		
4	PRE-RELEASE REQUIREMENTS		APPENDIX A - GLOSSARY OF TERMS
4.1	DESIGN FAILURE MODE ANALYSIS		FIGURES
4.2	FAILURE PREVENTION ANALYSIS	1A	METHOD OF CONTROL - BATHTUB CURVE
4.3	INTERNAL PART APPROVAL REQUIREMENTS	1B	FREQUENCY OF CHECKS
4.4	DESIGN RELEASE AND RELIABILITY DEMONSTRATION TESTS	3.1.3	DESIGN RELEASE TEST SCHEDULE
4.5	APPLICATION NOMOGRAPH	4.2A	EXPECTED FPA DETAIL (TOP VIEW)
4.6	RELEASE DATA PACKAGE	4.2B	EXPECTED FPA DETAIL (END VIEW)
4.7	DOCUMENTATION AND MASTER SAMPLE SUBMITTALS	4.5	APPLICATION NOMOGRAPH
5	PROCESS CONTROLS	4.6	RELEASE DATA PACKAGE CHECKLIST
5.1	FREQUENCY OF CHECKS	5.3	RELAY CURVE PRODUCED ON FORCE DISPLACEMENT FIXTURE
5.2	REWORK	5.4A	PROCESS DATA CHECKLIST
5.3	EQUIPMENT	5.4B	PROCESS DATA CHECKLIST
5.4	PROCESS DOCUMENTATION	6.1.1	ACTION PLAN
6	RELIABILITY AUDITS	6.3.2A	RELIABILITY AUDIT DATA PACKAGE CHECKLIST
6.1	SHIFT AUDIT TEST	6.3.2B	RELIABILITY AUDIT DATA PACKAGE CHECKLIST
6.2	WEEKLY AUDIT TEST		
6.3	RELIABILITY AUDIT DATA PACKAGE		

STANDARD RELIABILITY PROGRAM FOR RELAYS GM9111P

1 SCOPE. This standard outlines reliability program requirements for relays. The principles of establishing process controls and reliability tests are shown in Figure 1A. The frequency and responsibility for these controls are outlined in Figure 1B.

The major components of this reliability program are:

- General Requirements (Section 3)
- Pre-Released Requirements (Section 4)
- Process Controls (Section 5)
- Reliability Audits (Section 6)
- Annual Compliance Audit (Section 7)

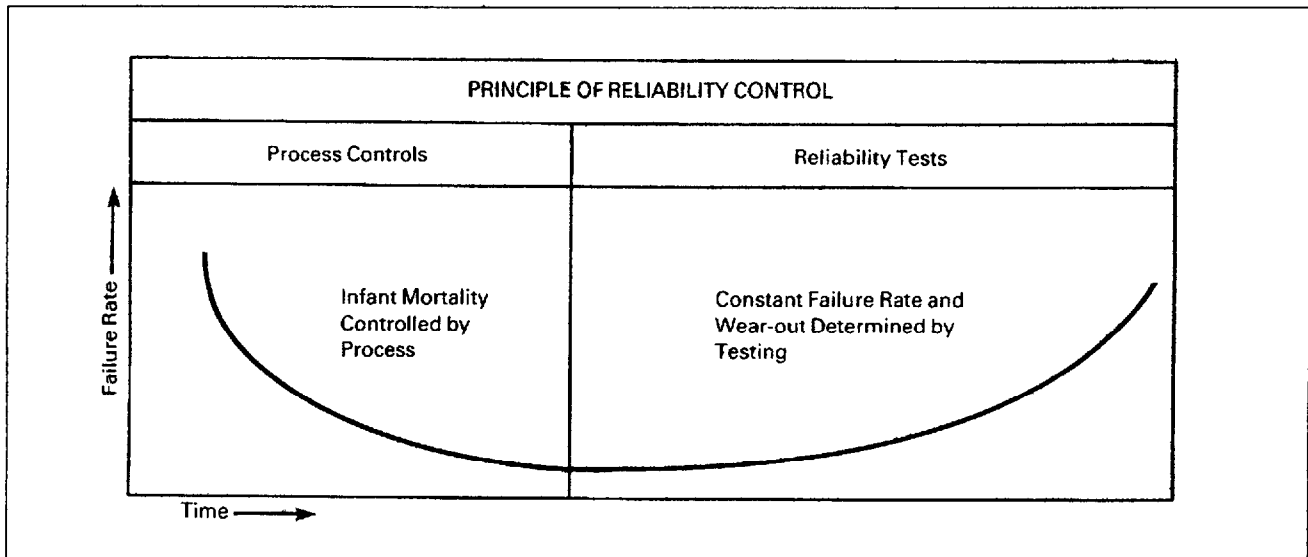


FIGURE 1A - METHOD OF CONTROL - BATHTUB CURVE

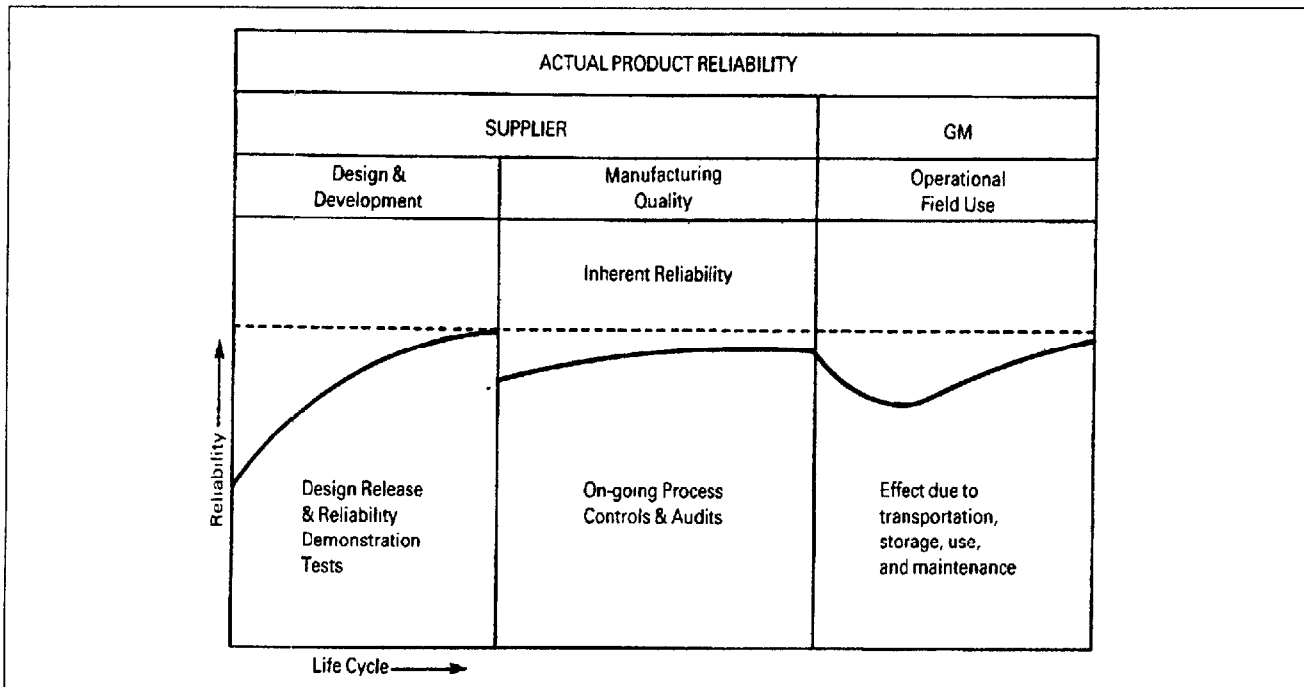


FIGURE 1B - FREQUENCY OF CHECKS

STANDARD RELIABILITY PROGRAM FOR RELAYS

GM9111P

2 REFERENCED STANDARDS.

GM9103P GM9104P GM9110P

3 GENERAL REQUIREMENTS.

3.1 REFERENCE DOCUMENTS REQUIRED.

3.1.1 Request for Quote/Purchase Order. The purchase order and subsequent instructions or amendments may establish procedures for sample submissions or reliability test requirements which supplement the minimum requirements outlined by this standard. (For example: CPC Reliability Specification Document No. 10076787.)

3.1.2 General Motors Part Drawing. The part drawing shall be used for dimensional requirements. The part drawing shall also include a circuit schematic and mating connector part number. The circuit schematic identifies the internal circuits for voltage drop, isolation resistance and other circuit checks.

3.1.3 General Motors Test Specification. The test specification may or may not be integral with the part drawing. The test specification shall identify the following parameters.

- a. The applicable tests and the order in which the tests are to be performed for Design Release Tests if different than Figure 3.1.3.
- b. Limits for release and reliability tests and the definitions under which those limits apply if different than outlined herein.
- c. A functional definition for the device to be tested if specific make/break sequences are required.

3.1.4 Materials and Process Standards (GM9103P). Perform all tests under the conditions stated in GM9103P, Procedure for Testing Relays, unless otherwise specified. (Subscription information for Materials and Process Standards are contained in the General Motors General Quality Standard for Purchased Material/Targets for Excellence.)

3.1.5 General Motors General Quality Standard for Purchased Material. Procedures for Traceability, Sample Submission (GP-3), Pilot Sample Submission (GP-4), and Failure Prevention Analysis (FPA) are contained in the General Motors Quality Standard for Purchased Material/Targets for Excellence.

3.2 RECORD RETENTION. In the event of test failure, appropriate action as outlined must be instituted. A system for assuring due care shall be established to assure sorted material meets all part requirements. Adequate due care procedures include the establishment of a Disposition of Variance system which requires Engineering, Manufacturing, Process, Industrial Engineering, and Quality Control representatives signatures on a document which specifically addresses: the number of pieces affected, the dimensional variance, the effect on performance,

corrective action, and whether revalidation is required. Such documents shall be maintained in a central file which is audited for compliance. General Motors Targets of Excellence specifies additional requirements for record retention where applicable.

3.3 LOT DEFINITION AND SAMPLE SELECTION.

A lot shall have been manufactured in a continuous time period, on an approved production line, with unchanged process. Lot identification shall be established prior to performing tests. A lot shall not overlap a production shift change.

3.3.1 Internal Part Traceability. The relay assembly area shall be physically isolated from all purchased and manufactured receiving areas (molding, stamping, etc.) which are not part of the assembly line such that all material must pass through physical and dimensional inspection before use. Individual lot numbers shall be assigned to each box, tray or pan of parts and a system to ensure traceability of sub-lots within final assemblies shall be established. If failures occur during reliability testing or testing of process test equipment, the lot system shall be used to establish which final assembly and raw material lots are suspect. Date codes shall not be used to establish lot identification for final assemblies unless supplemented by additional fields for individual manufacturing lines and for individual lots manufactured within one day.

NOTE: Just in time or material pull systems satisfy part traceability requirements provided all part numbers affected by the discrepant part can be identified and sorted.

3.3.2 Sample Selection, Shift Audits. Samples required for shift audits may be selected from shipping containers or from the end of line after the final tester at the rate of one at the start of shift and one every hour of production thereafter. Shift audits shall be performed for each operating line at this rate regardless of part number. Shift audit samples may be shipped after test. Since shift audit samples are collected at the beginning of each hour, no samples are collected during the last hour of production. This procedure will allow the shift audit test to be completed by the end of the shift.

3.3.3 Sample Selection, Weekly Audits. Samples required for weekly audits shall be selected from the shift audit samples which have completed test at a rate of one unit per shift per day. Whenever multiple lines or part numbers are present in the shift audit samples, a predetermined approved written rotational test plan shall be used to determine which line or part number will be sampled. This test plan shall be made available for inspection upon request.

3.4 TEST DATA AND FORMS. Minimum standards regarding test procedure, equipment used, and report forms are established in GM9103P. Data requirements for process and reliability tests are given in Sections 5 and 6 herein. Special "data package" checklists are provided and are an integral part of this specification.

STANDARD RELIABILITY PROGRAM FOR RELAYS GM9111P

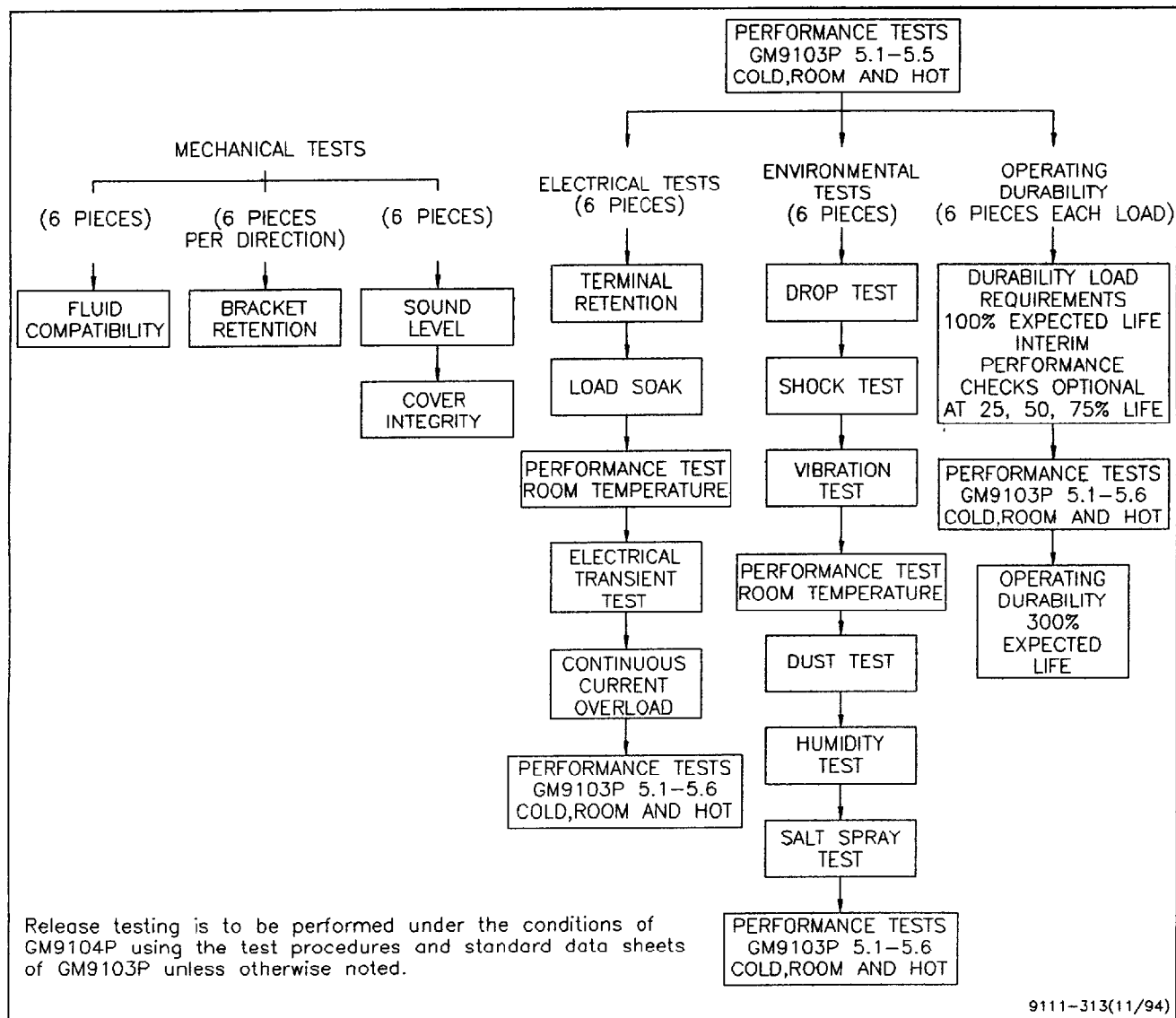


FIGURE 3.1.3 - DESIGN RELEASE TEST SCHEDULE

4 PRE-RELEASE REQUIREMENTS. Prior to production release, the component supplier must comply with the following requirements:

4.1 DESIGN FAILURE MODE ANALYSIS.

Design Failure Mode Analysis (DFMA) at a piece part level shall be completed and maintained in the Release Data Package. Reference to existing DFMA's may be made on relays which are similar enough in design and function that an analysis of one would apply to additional part numbers. Reference to existing DFMA's shall be made by cover letter itemizing new features, functions and failure mechanisms

attached to a copy of the original DFMA and filed in the Release Data Package.

4.2 FAILURE PREVENTION ANALYSIS.

Failure Prevention Analysis (FPA) at the piece part level shall be completed and maintained in the Reliability Audit Data Package. Figures 4.2A and 4.2B represent the level of detail expected in the FPA. Use the numbers listed in Figures 4.2A and 4.2B when listing the control characteristics on the FPA form, if applicable. FPA forms and procedure are contained in the General Motors Quality Standard for Purchased Material. Reference to existing FPA's may be made for similar devices as described in 4.1.

STANDARD RELIABILITY PROGRAM FOR RELAYS GM9111P

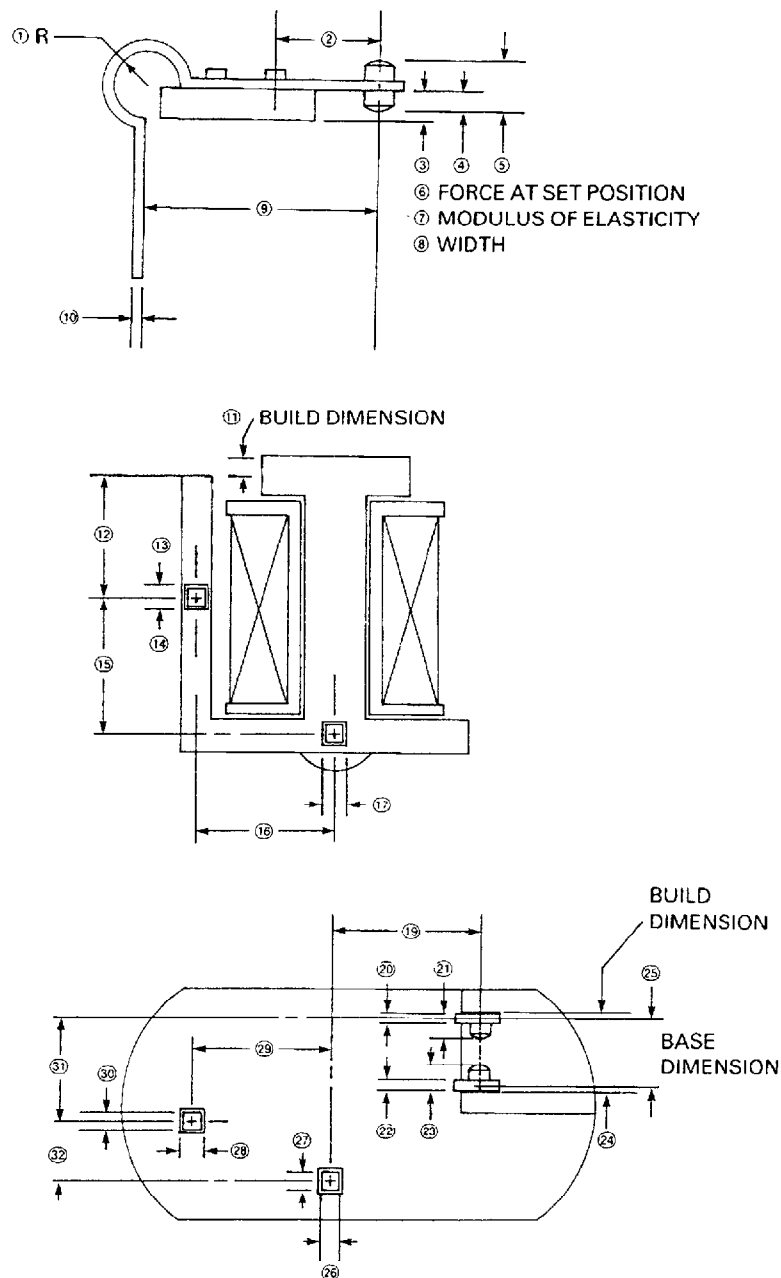


FIGURE 4.2A - EXPECTED FPA DETAIL (TOP VIEW)

STANDARD RELIABILITY PROGRAM FOR RELAYS

GM9111P

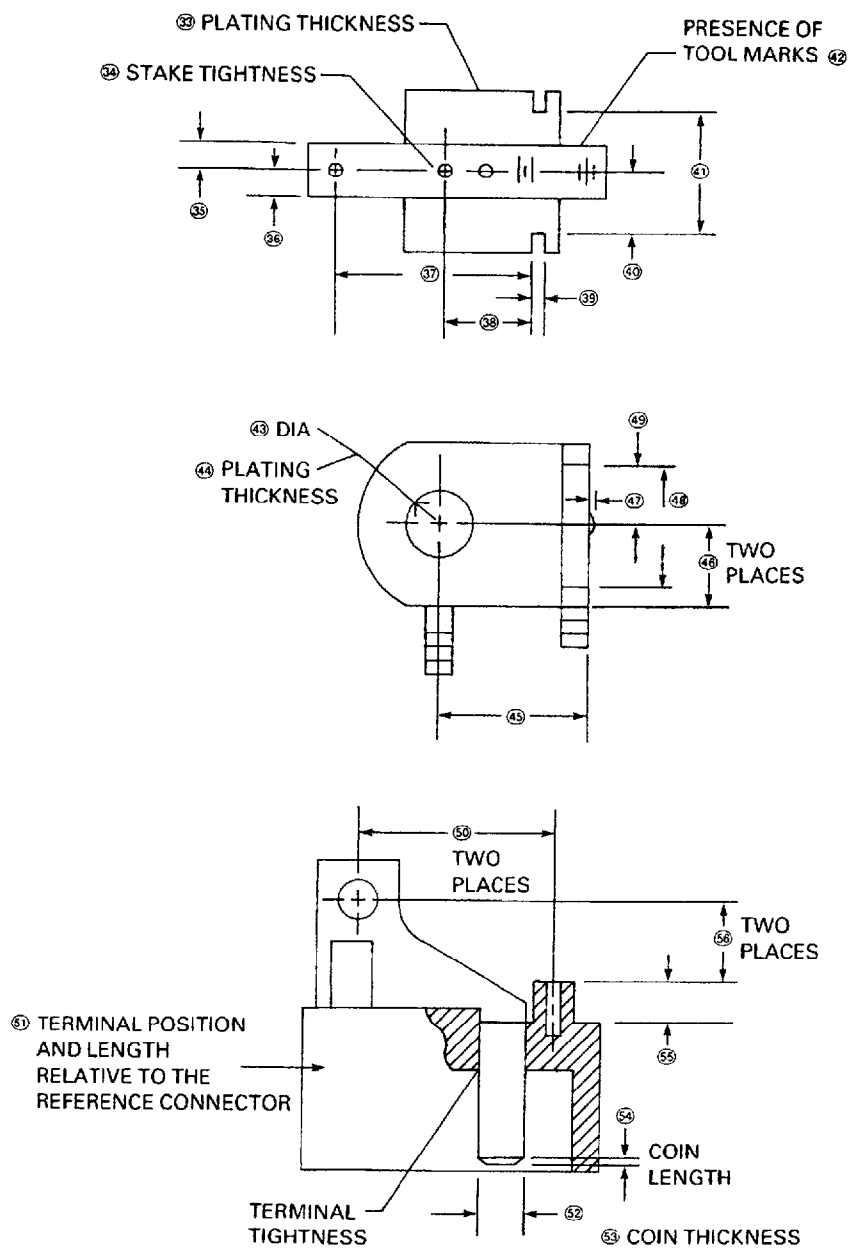


FIGURE 4.2B - EXPECTED FPA DETAIL (END VIEW)