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XM587E2/XM724 Electronic Time Fuzes

Developmental Test/Operational Test (DT/OT) II

Test Phase

by W. L. Aschenbeck

November 1979

Prepared by

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Under contract

DAAG39-77-C-0056

U.S. Army Electronics Research
and Development Command
Harry Diamond Laboratories
Adelphi, MD 20783

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This report documents the continuation of activities and accomplishments in the further development of the XM587E2 and XM724 Electronic Time (ET) Fuzes. The work was performed by Honeywell Inc., Defense Systems Division for Harry Diamond Laboratories (HDL) under contract DAAG39-77-C-0056. The hardware built under this effort provided quantities of fuzes for use in Development Test/Operational Test (DT/OT) II Testing, spare piece parts, dummy fuzes, training models of the fuzes and display

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20. Abstract

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FOREWORD

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1. INTRODUCTION

The XM587E2 and XM724 Fuzes are digital electronic time fuzes for use in ammunition for the 4.2-in. mortar, 105-mm howitzer, 155-mm howitzer, 175-mm gun, and the 8-in. howitzer. The overall length of the fuzes is 5.27 inches nominal, and the weight is 1.70 ± 0.4 pounds. The external configuration of the XM587E2 Fuze is shown in Figure 1 and the external configuration of the XM724 Fuze is shown in Figure 2.

The functional characteristics of the two fuzes differ slightly in that the XM587E2 Fuze provides electronic time function with point detonation backup and point detonation only, whereas, the XM724 Fuze provides electronic time function with a limited point detonation capability. Due to the differences in functional characteristics, there is a slight difference in the internal physical configurations of the fuzes.

In the XM587E2 Fuze, there is a point detonation backup firing pin on the bias spring. In the XM724 Fuze, the firing pin has been removed from the bias spring.

The only external difference between the XM587E2 and XM724 Fuzes is in the booster area -- the XM587E2 Fuze has a booster; the XM724 Fuze does not.

The following hardware items were to be built during this program.

315 (approximately) - Design Evaluation Group (DEG) lot of XM587E2 Fuzes.

666 (approximately) - Lot 1 XM587E2 Fuzes

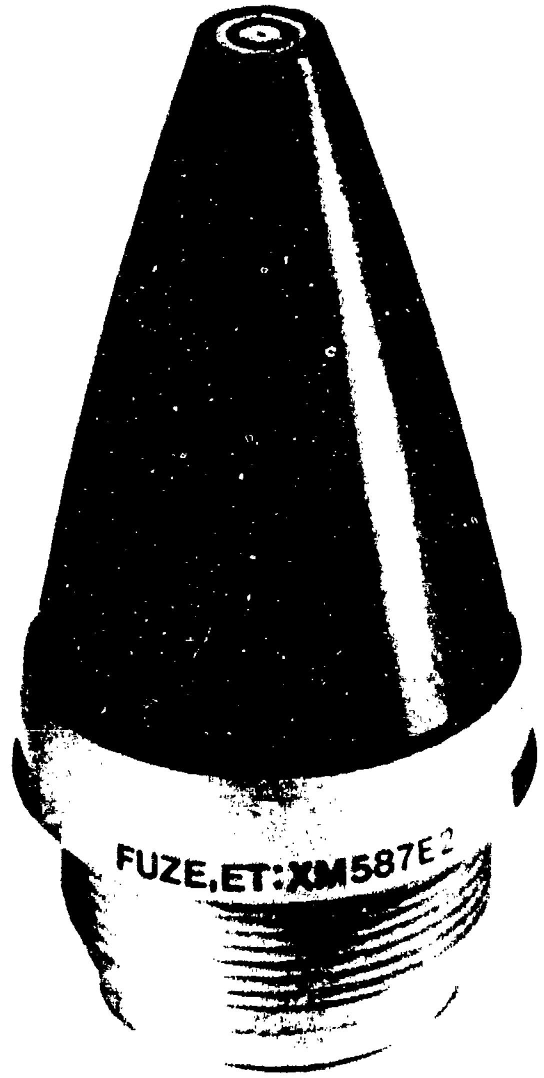


Figure 1. External configuration of the XM587E2 ET Fuze.

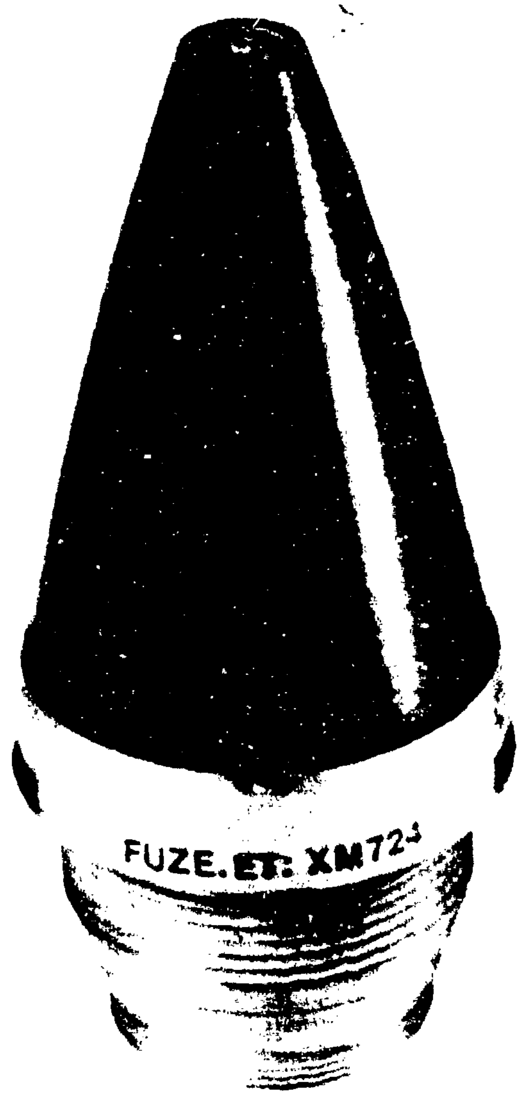


Figure 2. External configuration of the XM724 ET Fuze.

934 - Lot 2 XM587E2 Fuzes

1266 - Lot 2 XM724 Fuzes

24 - Lot 3 XM587E2 Fuzes

35 - Inert loaded XM587E2 Fuzes

1 - Display board of XM724 Fuze

10 - XM724 Fuzes sectioned to show the internal structure of the fuze

70 - XM724 training models of the XM724 Fuze

500 - Sets of fuze piece parts

300 - XM587E2 modified fuzes with electronics on a single printed circuit card.

This development effort included an investigation into the feasibility of simplifying the two hybrid circuits by the use of silicon monolithic circuit technology. This effort included the following subtasks:

- Complete design of a hybrid oscillator using a single silicon monolithic circuit chip for all active elements
- Building and testing of 25 models each of the interface circuit and the oscillator
- Building and testing of 200 models of the oscillator.

This effort also included two types of technical documentation: the publication of process description manuals and the technical data packages of the fuze hybrid integrated circuits and the modified XM587E2 Fuze.

The process description manuals included the following:

- Update of Volume 1: "Electronics and Nose Cone Assembly Final Fuze Assembly" (Revision B)
- Volume II: "Rear Fitting" (original)
- Volume III A: "XM587E2 Oscillator Hybrid Microcircuit" (original)

- Volume III B: "XM587E2 Interface Hybrid Microcircuit" (original)

The technical data package included the following:

- One set of drawings for Oscillator (P/N 11711625)
- One set of drawings for Interface Hybrid (P/N 11711610)
- One set of drawings for modified XM587E2 Fuze with single printed circuit board electronics

For completeness of this report on the DT/OT-II Phase, some sections of this report utilize information and data furnished by HDL. HDL also supplied some items of Government Furnished Materials (GFM) in support of the build effort.

2. SUMMARY

The following DT/OT-II models were delivered during this program:

- 45 Safing and Arming (S&A) fire-on-arming test models
- 310 XM587E2 (DEG) Fuzes
- 700 XM587E2 (lot 1) Fuzes
- 35 Inert XM587E2 Fuzes for safety tests
- 885 XM587E2 (lot 2) Fuzes
- 1227 XM724 (lot 2) Fuzes
- 24 XM587E2 (lot 3) Fuzes
- 285 modified XM587E2 Fuzes with all electronics on a single printed circuit card.

The following training aids were delivered during this program:

- Ten cut-away models of the XM724 Fuze
- One display board of the XM724 Fuze.

The following documentation was delivered during this program:

- Thirty-one engineering change proposals
- One set of level 3 drawings on the precision hybrid oscillator
- One set of level 3 drawings on the interface hybrid integrated circuit
- One set of level 1 drawings in the modified XM587 Fuze with all electronics on a single printed circuit card
- Updated issue of "Electronics and Nose Cone Assembly and Final Fuze Assembly" manufacturing process manual (Volume 1)

- New issue of "Rear Fitting" manufacturing process manual (Volume 2)
- New issue of "XM587E2 Oscillator Hybrid Microcircuit" process manual (Volume III A)
- New issue of "XM587E2 Interface Hybrid Microcircuit" process manual (Volume III B).

In addition to the final report, the following reports were submitted to HDL during this program:

- Monthly progress reports
- Lot summary inspection records
- Test and demonstration reports
- Final report on the "Development of Two Monolithic Integrated Circuits and a 10 Hz Tab Hybrid Microcircuit Oscillator" - (HDL-CR-77-0056-1)
- Lot summary inspection reports
- First article inspection reports
- Failure analysis reports.

Since field testing of the DT/OT/II fuzes was not within the scope of this program effort, only the contractor-conducted environmental testing is reported here. The following tabulation summarizes the first article approval testing and the Lot Acceptance Testing (LAT) performed during the build effort.

The S&A Mechanism (P/N 11720300) passed the approval tests without any problem. The lot 1 and lot 2 units passed the LAT without problem.

The Precision Oscillator (P/N 11711427) passed the first article approval tests without any problem. The lot 1 and lot 2 units passed the LAT without problems.

The Interface Hybrid Microcircuit (P/N 10990455) passed the first article approval test except for test subgroup B6 (solderability). The lot 2 units passed the LAT except for test subgroup C1 (57 millimeter gunfire).

Rear Fitting (P/N 11720291) passed the first article approval tests except for the positional tolerance of the power supply pins. Lot 1 rear fittings passed the LAT except for test M117 (waterproofness). Lot 2 rear fittings passed the LAT without any problem.

Electronics and Nose Cone Assemblies (P/N 11711430 - The DEG lot and lot 1 failed the LAT subroups A, (475 G mechanical pulse), A3 (-45°C) and B2 (30,000 G shock). The lot 2 units failed the LAT subgroups A1, A2 (+68°C) and B2 (30,000 G shock and 475G mechanical pulse).

XM587E2/XM724 Fuze - The DEG lot and lot 1 units passed all environmental tests per contract MOD P20003 except potting porosity. The lot 2 units passed all environmental tests per specification MIL-F-48700 and MIL-F-48702.

3. DESIGN BASELINE AND DESIGN CHANGES

DT/OT II FUZES - FOUR INTEGRATED CIRCUIT, TWO PRINTED CIRCUIT BOARD VERSION

The XM587E2 Fuze design baseline for this program was HDL Engineering Release Record (ERR) No. 587D1000. A copy of this ERR is included in this report as Appendix A. For the XM724 Fuze, the design baseline was HDL ERR No. 724D1000 and a copy of this ERR is included in this report as Appendix B. The XM744 Training Fuze design baseline was HDL ERR No. 744D1000. This ERR is included in this report as Appendix C.

Figure 3 shows a cut-away view of the XM587E2 ET Fuze. Figure 4 shows a cut-away view of the XM724 ET Fuze. The XM587 Fuze and the XM724 Fuze have essentially the same construction as shown in Figures 3 and 4. There are two differences between the fuzes; 1) the XM587 has a booster and booster cup while the XM724 does not and, 2) the bias spring used in the XM587 has a firing pin or tang while the bias spring used in the XM724 does not.

Major Design Changes

There were no major design changes in either the XM587 or the XM724 DT/OT II Fuzes built during this program.

Process Improvement Changes/ Documentation Changes

During the build of the DT/OT fuze models, changes were limited to process improvement and correction type changes only. The following tabulation lists the changes incorporated in DT/OT-II fuzes after the original baseline documentation release.

Part No.	Name	Description of Change	ECP No.
10990455	Interface Hybrid	Change marking sequence on package	724-MHR-005
11711256	Scaler	Correct typographical error	724-DAE-017

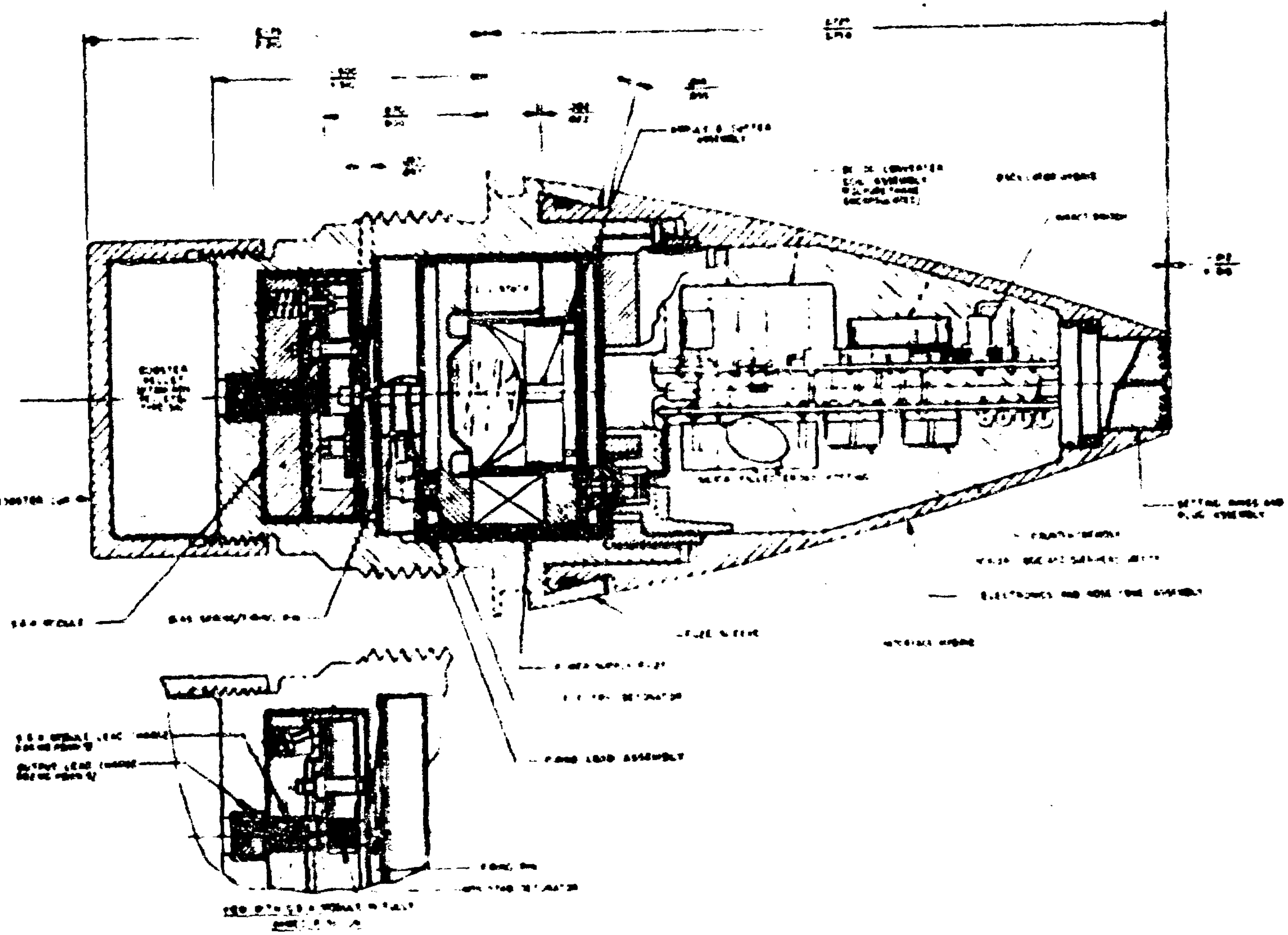


Figure 3. Cut-away view of XM587E2 Fuze (DT/OT II version).

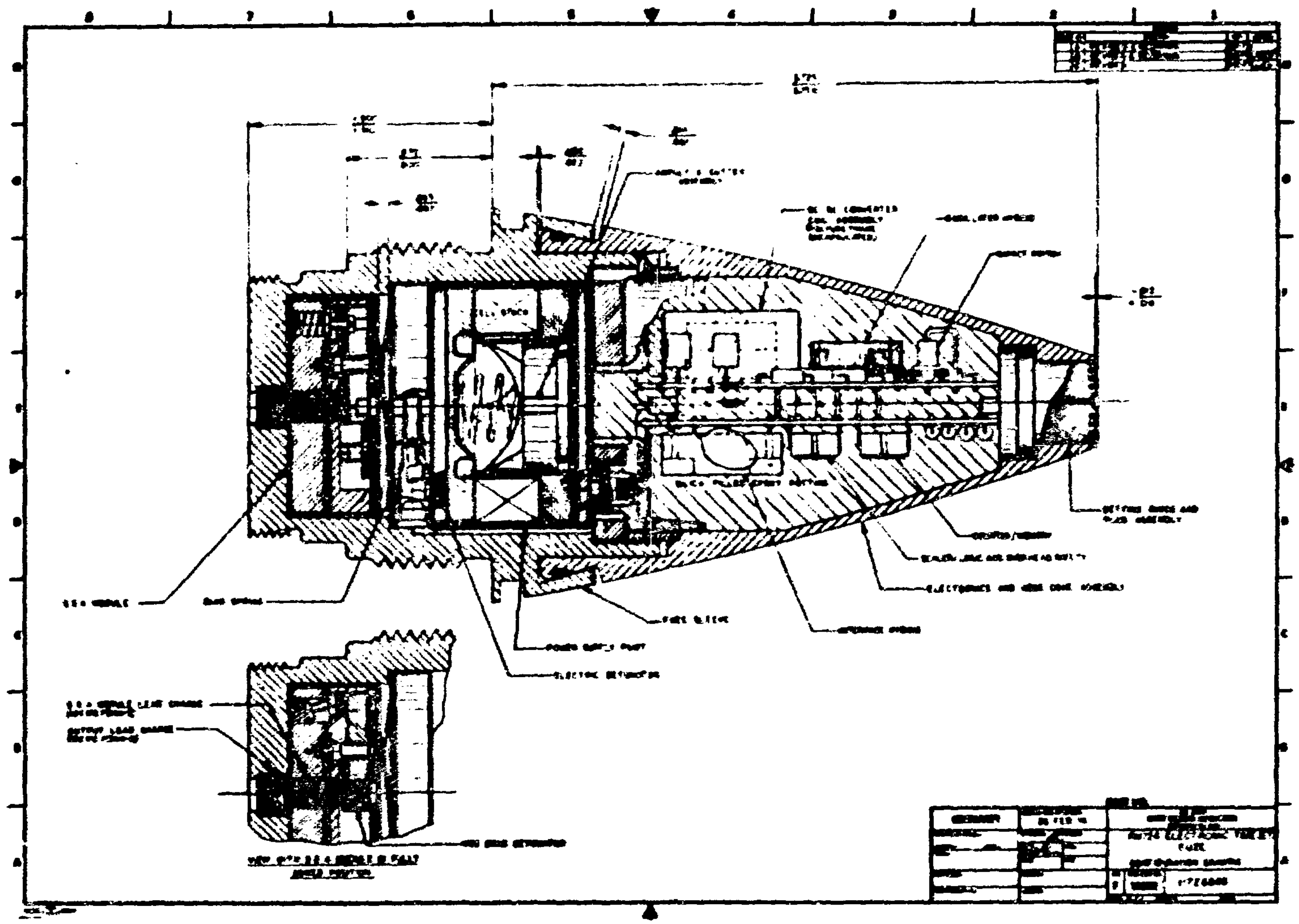


Figure 4. Cut-away view of XM724 Electronic Fuze (DT/OT II version).

Part No.	Name	Description of Change	ECP No.
11711268	XM724 Fuze	Correct booster cup thread interface	724-MHR-001
11711401	Schematic	Correct title	724-DAE-016
		Tighten resistor tolerances	724-DAE-032
11711402	Interconnect Diagram	Change title	724-DAE-016
11711406	Diode	Correct diode body size	724-MHR-022
11711408	Nose Cone	Add equipment application note	724-DAE-008
		Add alternate material	724-MHR-021
		Correct radius at $\boxed{0.188}$	724-MHR-032
11711409	Electronics Cover	Improve potting flow and fitment dimensions	724-MHR-018
11711410	Orientation Cup	Improve fitment dimensions	724-MHR-018
11711411	Printed Wiring Board No. 2	Change material call-out and correct artwork	724-DAE-021
		Correct ladder location on artwork	724-DAE-030
11711412	Printed Wiring Board No. 1	Change material call-out and correct artwork	724-DAE-021
11711413	Printed Wiring Board Assembly No. 1	Change orientation of Q2 and Q3	724-MHR-014
11711414	Printed Wiring Board Assembly No. 2	Add equipment application note	724-DAE-008
11711418	Coil Contact	Remove requirement for reflow of tin plate	724-MHR-025

Part No.	Name	Description of Change	ECP No.
11711424	Transistor	Change lead configuration from TO-18 to TO-92	724-MHR-014
11711427	Precision Oscillator	Change lead length and marking sequence	724-MHR-006
		Revise and correct notes	724-DAE-024
		Revise and redraw	587-DAE-007
		Correct resistor values	724-DAE-037
11711428	Electronics Assembly	Change printed wiring board callout	724-DAE-016
		Clarify heat stake and contact trim notes	724-MHR-018
11711430	Electronics and Nose Cone Assembly	Add equipment application note	724-DAE-008
		Change printed wiring board assembly callout	724-DAE-016
		Redraw and correct errors	724-DAE-028
		Add inspection criteria for transformer to classification of defects	724-MHR-020
		Redefine post pot trim requirements	724-MHR-028
11711433	XM587 Fuze (less booster)	Add equipment application note	724-DAE-008
		Correct 1.6 inch thread callout	724-MHR-001
		Correct reference to electronics and nose cone assembly	724-DAE-016

Part No.	Name	Description of Change	ECP No.
11711435	XM587 Fuze (loaded)	Add equipment application note	724-DAE-008
		Change reference to interconnect diagram - add weight notation	724-DAE-019
11711448	Transformer	Add specification for permability control and permit draft angle to ease potting operation	724-MHR-020
11711451	Contact Wire	Revise and redraw	587-DAE-005
		Add alternate material	724-MHR-024
11711478	Plug	Add lead-in chamfire to aid assembly	724-DAE-025
11711726	Pinion No. 1	Change Datum "B" to "A" to correct error	724-MHR-009
11711727	Gear No. 1	Change MIL-A-5541 to MIL-C-5541 to correct error	724-MHR-018
11720216	Power Supply	Add equipment application note	724-DAE-008
		Lengthen plastic posts	724-DAE-014
		Correct Specification references	724-DAE-018
		Eliminate unnecessary references	127-RDD-050
		Revise and redraw	127-DAE-052
		Simplify manufacture of battery	127-RDD-057
11711729	Firing Lead	Pre-form firing lead assembly to improve producibility	724-MHR-007

Part No.	Name	Description of Change	ECP No.
11711730	Insulation, Firing Lead	Revise dimensions for pre-formed firing lead to improve producibility	724-MHR-007
11720206	Booster Cup	Revise booster cup thread callout to correct error	724-MHR-001
11720291	Rear Fitting	Update data list to correct data package	721-DAE-001
		Update parts list to correct data package	724-DAE-007
		Update rear fitting specification control drawing to be compatible with piece part drawings	724-MHR-12
		Add note 10 special inspection equipment to complete tech data package	724-DAE-008
		Revise booster cup thread callout to correct error	724-MHR-001
11720299	Detonator Contact Insulator	Revise insulator, contact detonator to accept the plug detonation to match proof lot hardware	724-MHR-003
11720300	S&A	Add note 7 to page 23 to correct omission	724-DAE-008
		Relocate setback pin operation test in accordance with assembly sequence to clarify specification	724-MHR-023

Part No.	Name	Description of Change	ECP No.
11720300 (continued)		Increase max OD of S&A module to provide assembly tolerance	724-MHR-026
		Increase allowable time between removal from temperature chamber and testing to provide adequate time to place unit in test fixture	724-MHR-027
		Increase all function setback pin operational limit from 1100 to 1200 G's to be compatible with piece part requirements	724-MHR-033
11720301	S&A Subassembly	Revise roll pin height requirements to simplify assembly and inspection	724-MHR-011
11720305	Rotor Assembly	Change MIL-STD-10944 to MIL-G-10944 to correct error	724-DAE-18
11720308	Escape Wheel and Pinion	Change MIL-STD-10944 to MIL-G-10944 to correct error	724-DAE-18
11720330	Rotor Gear	Clarify rotor gear tooth profile to correct error	724-MHR-008
		Change MIL-STD-10944 to MIL-G-10944 to correct error	724-DAE-18
11720620	Detonator Block Assembly	Add plug detonator to the detonator block assembly to match proof lot hardware	724-MHR-003

Part No.	Name	Description of Change	ECP No.
11722622	Sleeve	Add note 6-special inspection equipment to complete the data package	724-DAE-008
		Revise booster cup thread call out to correct error	724-MHR-001
		Add optional construction to end of slot for firing lead to simplify manufacture	724-MHR-017
		Redraw to update to proper engineering format	724-DAE-025
		Revise tolerances to simplify manufacturing	724-MHR-30
11722636	Firing Lead and Battery Assembly	Update dimensions to agree with use of formed lead to simplify assembly	724-DAE-013
		Revise format to agree with proper engineering format	724-DAE-027
		Increase firing lead - power supply post tolerance to provide assembly tolerance	724-MHR-031
11726803	Thermoset Adhesive	Revise dimensions for preformed firing lead to improve producibility	724-MHR-007
		Update firing lead assembly to improve producibility	724-MHR-019

Part No.	Name	Description of Change	ECP No.
11726804	Firing Lead Assembly	Revise dimensions for preformed firing lead to improve producibility	724-MHR-007
		Update Firing Lead Assembly to improve producibility	724-MHR-019

"As Built" Configuration

As a result of the above listed changes, the "as built" configuration of the XM587E2 Fuze, the XM724 Fuze and the XM744 Training Fuze changed from the originally released baseline documentation. The "as built" configuration of the XM587 and XM724 Fuzes built in the DEG lot and lot 1 is shown in tabular form in Appendix D and the "as built" configuration of the XM587E2 and XM724 Fuzes built in lot 2 is shown in tabular form in Appendix E.

The "as built" configuration of the XM744 Training Fuzes built during this program is identical to baseline design listed in Appendix C except the training fuze Nosecones (P/N 11711403) were revision (K) and training fuze precision Oscillators (P/N 11711427) were revision (L).

The "as built" configuration of the XM587 (lot 3) Fuzes is identical to the configuration of the lot 2 Fuzes as defined in Appendix E with the following exceptions:

- Tantalum Capacitors C1 and C4 (reference 11711401) were conformally coated (0.005 to 0.007 inch thickness) with uralane 5750 (Furane Company).

- The C'Bore in the Nose Cone (reference 11711403) was opened up from 0.687 + 0.005 inch to 0.706 + 0.005 inch.

- A keyway slot 0.062 + 0.002 inch wide was cut in the sleeve (reference 11722622) on the basic radial position of the 0.051 + 0.002 inch hole. The depth of this slot was 0.400 - 0.010 inch from the end of datum "A".

- The Electronics and Nose Cone Assembly (reference 11711430) was keyed to the rear fitting assembly (during final assembly) with a stainless steel key. This key was 0.060 ± 0.001 inch thick, 0.330 + 0.005 inch long and 0.170 + 0.005 inch wide, and was made out of type 302 stainless steel.

DEVELOPMENT OF MODIFIED OR SINGLE
PRINTED CIRCUIT BOARD XM587 FUZE

The modified XM587 Fuze, or single printed circuit board version of the XM587 Fuze, was developed around the cost-reduced oscillator, interface and counter. These three cost-reduced integrated circuits were intended to replace the four integrated circuits of the DT/OT II version.

Figure 5 shows a cut-away view of the modified XM587 Fuze with all electronics mounted on a single printed circuit board .

The differences between the modified XM587 Fuze, single printed circuit board version, and the DT/OT II XM587 Fuze are all in the printed wiring board assembly of the electronics and nose cone assembly. A single printed circuit board assembly of the modified fuze (Reference Figure 5), replaces the two printed circuit boards of the DT/OT II version (Reference Figure 3). All other elements of the electronics and nose cone assembly remain the same as the DT/OT II version.

The Oscillator (P/N 11726813) used in the modified fuze is the cost-reduced tab hybrid microcircuit oscillator developed by Honeywell during this program (See Section 6 of this report).

The Interface Circuit (P/N 11726909) used in the modified fuze is the cost reduced hybrid unit developed by RCA Incorporated and was provided as GFM to this program.

The Counter (P/N 11711721) unit used in the modified fuze is the unit developed by NITRON Incorporated and was provided as GFM to this program.

The printed wiring board assembly for the modified fuze is shown in Figure 6. This assembly incorporates the following features:

- The outside dimensions of the printed wiring board are the same as those of Printed Wiring Board No. 2 (P/N 11711411) used on the DT/OT II Fuze except that it does not have the ladder connections.

- The printed wiring board mates with the Electronic Cover (P/N 11711409) and the Setting Ring and Plug Assembly (P/N 1171145) as per the DT/OT II design.

- Components have been located in a manner to facilitate automatic insertion.

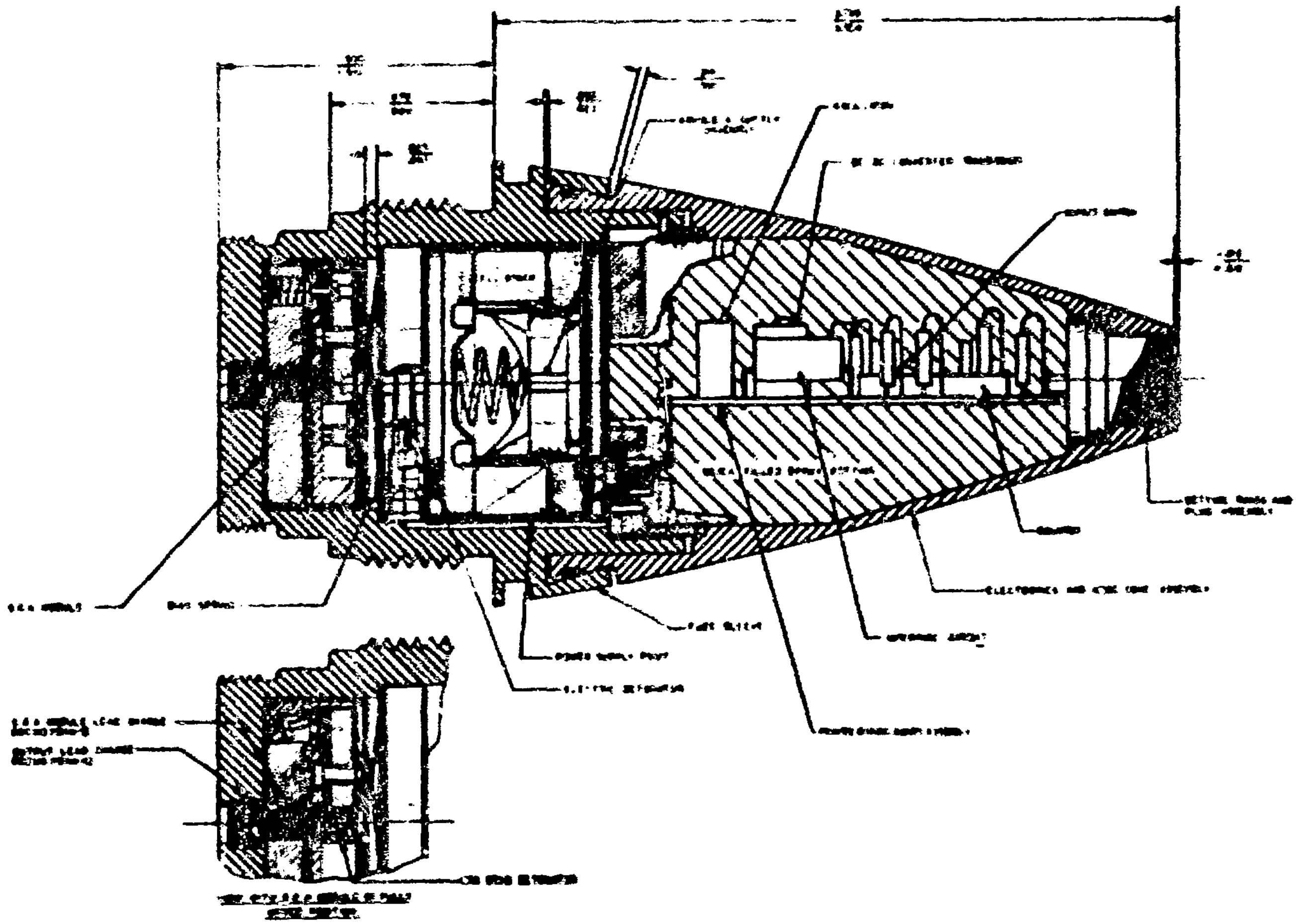


Figure 5. Cut-away view of the modified XM587E2 Electronic Fuze (single printed circuit board version).

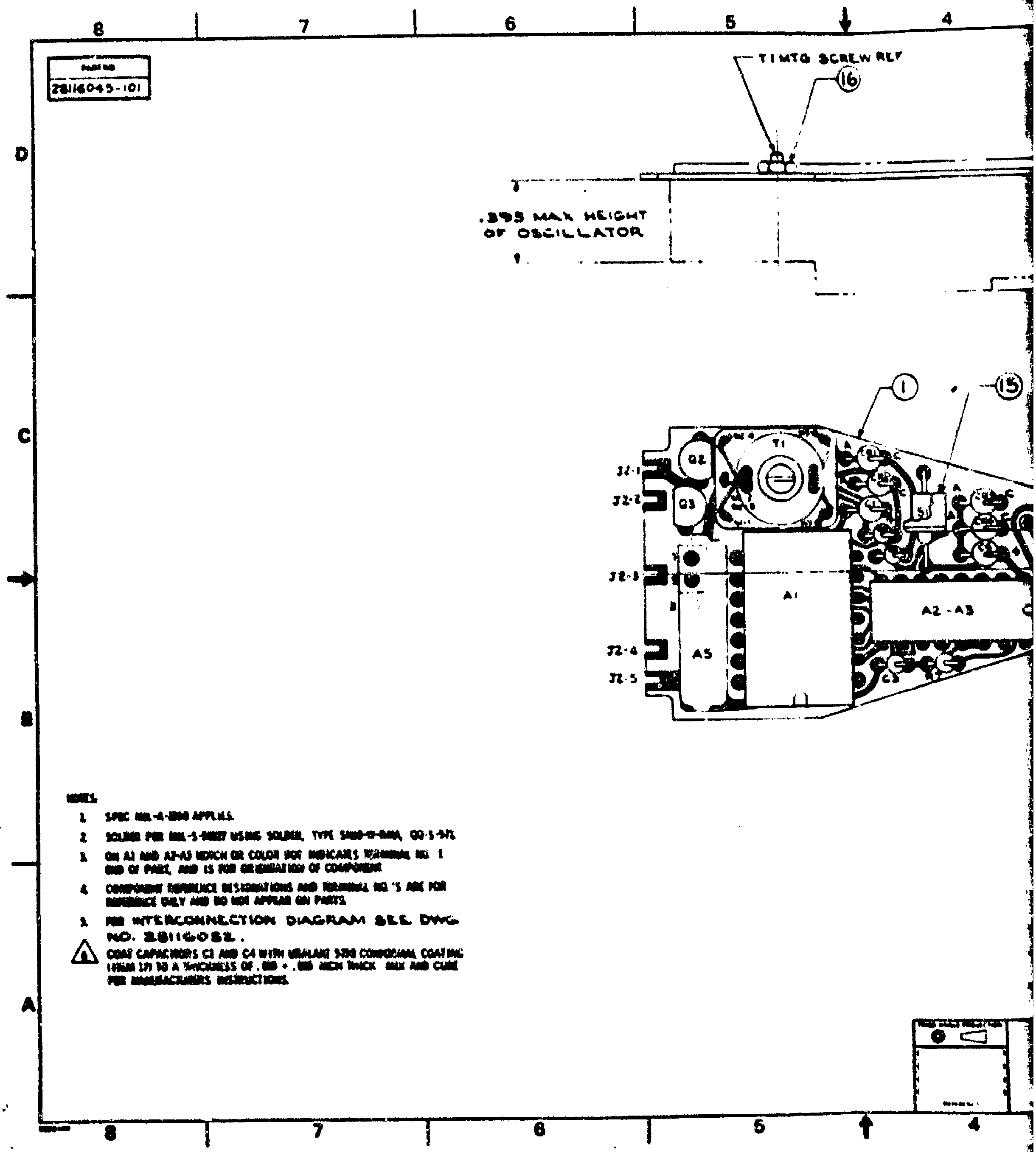
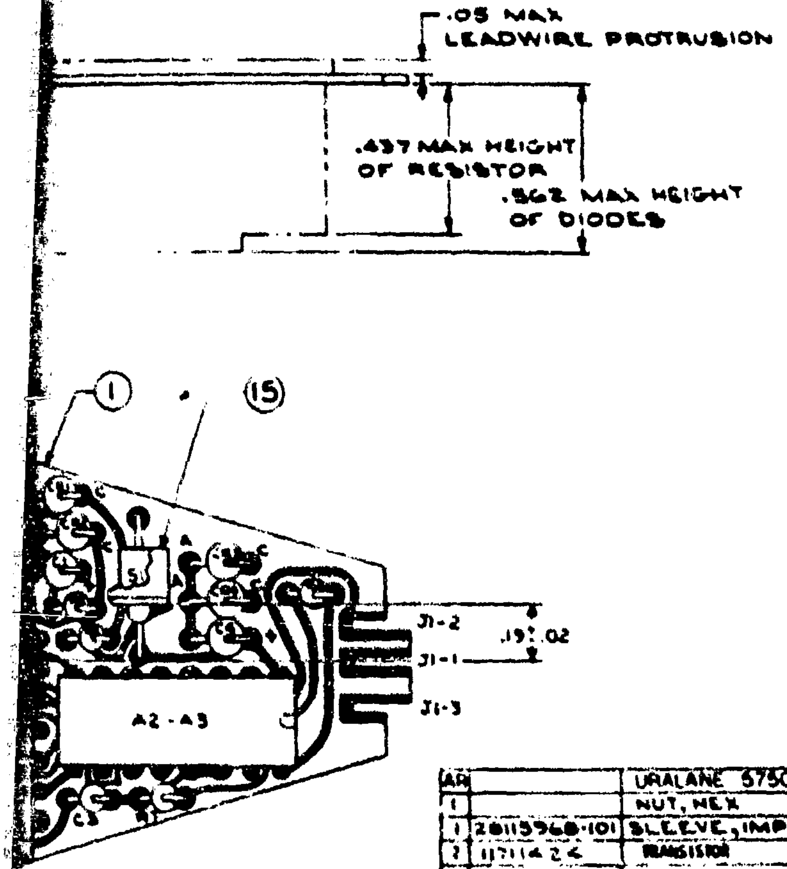


Figure 6. Printed wiring board assembly for mod

	A	[illegible]	[illegible]	[illegible]
	B	ADDED .19 ±.02 DIM	78-12-6	[illegible]
	C	E.O. 79H2022	79-1-8	[illegible]
	D	E.O. 79H2067	79-1-18	[illegible]



QTY	PART NO.	DESCRIPTION	REF	MATERIAL / NOTE	ITEM
AR		URALANE 5750		FURANE INC.	17
1		NUT, HEX		NO. 1-72UNF-2B STEEL	16
1	28115968-101	SLEEVE, IMPACT SWITCH			15
2	11711426	TRANSISTOR	Q2-Q5		14
1	[illegible]	RESISTOR, FIXED	R7	MIL-R-[illegible]	13
1	[illegible]	RESISTOR, FIXED	R5	MIL-R-[illegible]	12
2	11711405-9	RESISTOR, FIXED	R3, R4		11
1	T322[illegible]KD50AS	CAPACITOR	C4	[illegible] 50V KEMET ⚠6	10
1	11711240	CAPACITOR	C3	[illegible]	9
1	T322C225KD50AS	CAPACITOR	C1	2.2M 50V KEMET ⚠6	8
1	11711426	DIODE	CR1, CR2, CR3, CR4		7
1	[illegible]	IMPACT SWITCH	S1		6
1	[illegible]	TRANSFORMER, ENCAPSULATED	T1		5
1	11726813	OSCILLATOR	A6		4
1	11711721	COMBINATION SCALER/COUNTER	A2-A3		3
1	11726909	INTERFACE CIRCUIT			2
1	[illegible]	PRINTED WIRING BOARD, XM587			1

Honeywell

PRINTED WIRING BOARD ASSEMBLY XM587

DAAG39-77-C-0096

D 08536 28116045

XM587

78H3670 2 12-12-78 CONTROL C 215B

assembly for modified fuze.

2

- Transformer T1 was developed to limit the converter output voltage to less than 50 volts with a fuze battery voltage of 1.95 volts at high temperature. In addition, the transformer was developed to withstand encapsulation stresses and shock stresses up to 30,000 G's at 0.1 millisecond without the use of soft potting.

The design definition of the modified XM587 Fuzes is included in Appendix K. All fuze piece parts other than those on the printed wiring board assembly are identical to lot 2 piece parts. A key and keyway slot were used to lock the electronics and nose cone assembly to the rear fitting as in the lot 3 fuzes.

4. HARDWARE FABRICATION

The hardware fabrication in this contract involved the following major areas:

- Procurement of standard commercial components
- Procurement of piece parts and electronic components unique to the XM587/XM724 Fuzes
- Subassemblies
- Final fuze assembly.

PROCUREMENT OF STANDARD COMMERCIAL COMPONENTS

The procurement of the standard commercial parts for the XM587/XM724 Fuzes was routine. None of the commercial parts had an excessively long procurement lead time and no problems were encountered.

PROCUREMENT OF PIECE PARTS AND COMPONENTS UNIQUE TO THE XM587/XM724 FUZES

All of the piece parts and components which are unique to the XM587/XM724 Fuzes can be made using standard manufacturing techniques. Only two of the mechanical piece parts and one of the electrical components were procurement related problems due to technical difficulties at the vendors. These parts were the Sleeve (P/N 11722622), the Nose Cone (P/N 11711408) and the Transformer (P/N 11711448).

Late deliveries of the nose cone and sleeve jeopardized the lot 2 fuze delivery schedule. Delivery time on the sleeve ran up to 11 months against an estimated 5 months lead time commitment (by the vendor) prior to placement of the purchase order. The delivery time on the nose cone ran 7 months against a 3 month lead time commitment (by the vendor) prior to placement of the purchase order.

The cause for the delivery delays was poor process and quality controls at the vendors which resulted in excessively high scrap rates.

Minor delivery delays were experienced during procurement of the Transformer (P/N 11711448). These delays were caused by core damage problems encountered during removal of the transformer from the potting mold. The problems were corrected and the delays experienced did not impact the fuze delivery schedule.

SUBASSEMBLIES

The major subassemblies of the XM587/XM724 fuzes are the electronics and nose cone assembly and the rear fitting assembly (Figure 7).

ELECTRONICS AND NOSE CONE ASSEMBLY - DT/OT II, 2 PRINTED CIRCUIT BOARD VERSION

The DT/OT II Electronics and Nose Cone Assembly is shown in Figure 8. The major subassemblies of the electronics and nose cone assembly are the Printed Wiring Board Assemblies (P/N 11711413 and P/N 11711414) shown in Figure 9. These assemblies were individually tested at the board level before being assembled into the Electronics Assembly (P/N 11711428) also shown in Figure 9. The rejection rate for Printed Wiring Board No. 1 was 1.5 percent and the rejection rate for Printed Wiring Board No. 2 was 3 percent. The rejected board assemblies were re-worked.

No problems were experienced in the assembly of the printed wiring boards.

The Electronics Assemblies (P/N 11711428) were tested prior to assembly into the Electronics and Nose Cone Assembly (P/N 11711430). The rejection rate at this assembly point was 1 percent. A minor problem was experienced when the Electronics Assemblies (P/N 11711428) were pressed into the Nose Cone (P/N 11711408). The fitment between the Nose Cone and the Nose Plug (P/N 11711407) caused excessive squeeze on the "O" ring (P/N MS9386-015). This problem can be corrected on future builds by changing the "O" ring fitment counter in the nose cone as described in Section 8 of this report.

Potting porosity control was the only problem encountered in the potting operation on the electronics and nose cone assemblies. Potting porosity voids cannot be completely eliminated in this type of encapsulation and the requirement was waived on lot 2 units. Potting porosity will have to be redefined to a more practical level for future production programs. Less than 1 percent of the units were rejected for failure to meet the post-pot functional electrical tests.

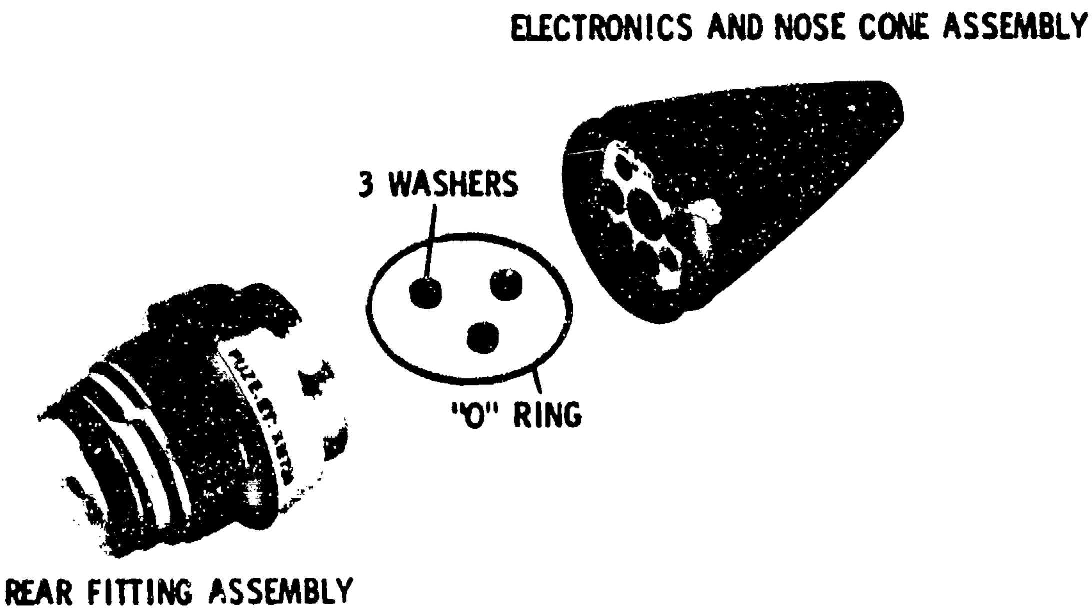


Figure 7. Exploded view of XM724 Electronic Fuze.

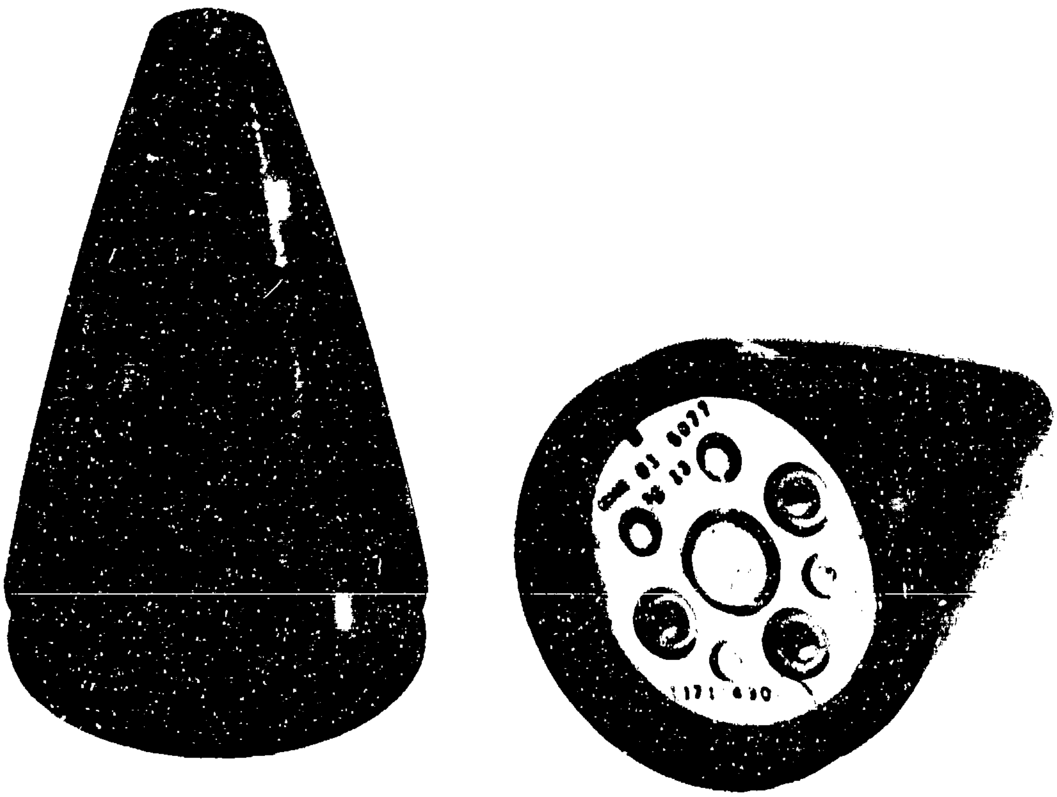


Figure 8. Electronics and nose cone assembly (P/N 11711430).

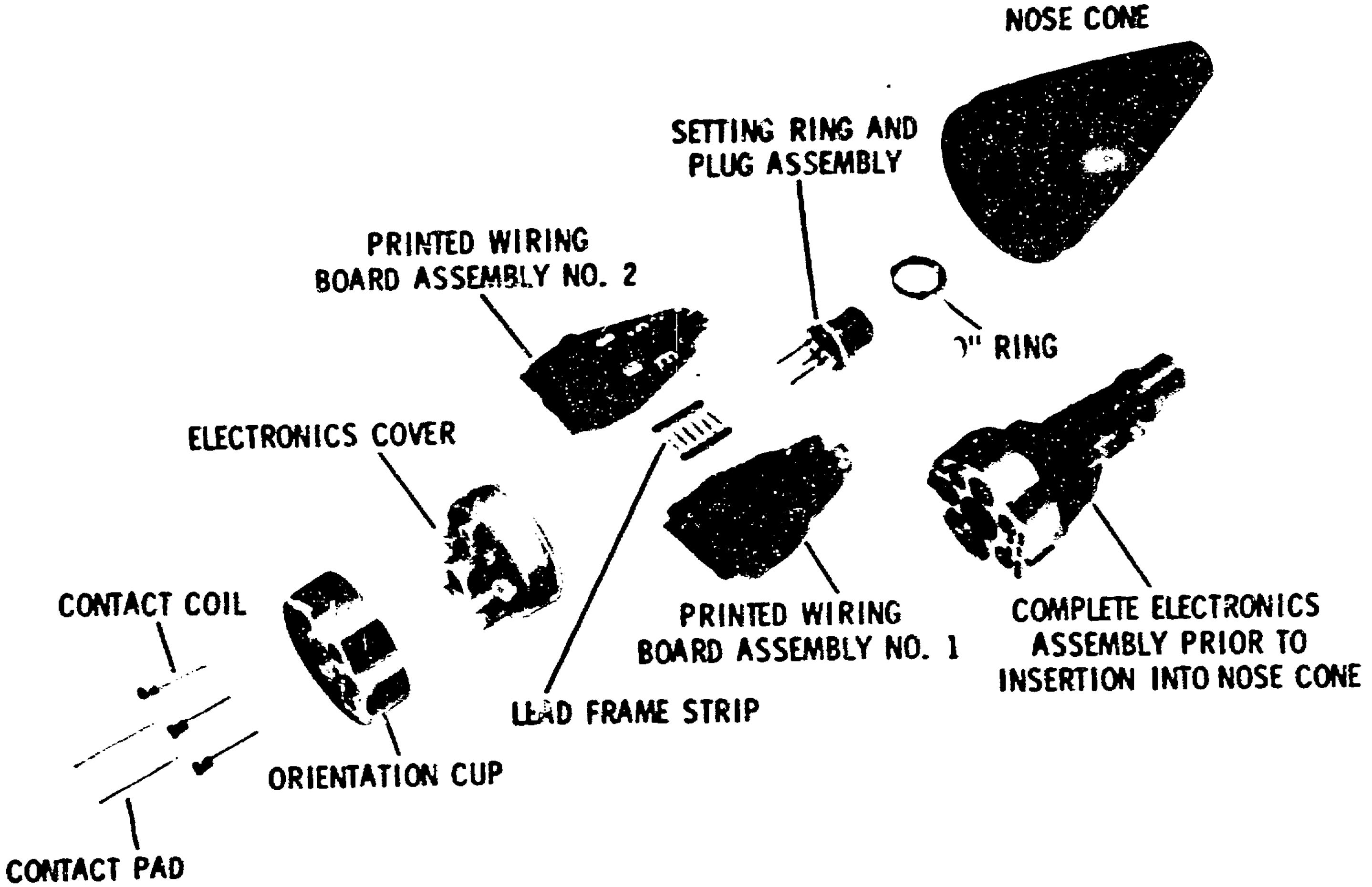


Figure 9. Exploded view of electronics and nose cone assembly.

REAR FITTING ASSEMBLY

Figure 10 shows the assembly sequence for the XM587E2/XM724 Rear Fitting. The rear fitting consists of four major subassemblies which are:

- S&A Module (P/N 11720300)
- Detonator Block Assembly (P/N 11722620)
- Firing Lead and Battery Assembly (P/N 11722636)
- Sleeve Subassembly (no part number)

SAFING AND ARMING MODULE SUBASSEMBLY

Approximately 3500 S&A modules were built under this contract to support the fuze delivery requirements. These S&A modules were built in accordance with the technical data package without any major deviation. Figure 11 shows the XM587/XM724 S&A module.

Figure 12 shows the assembly sequence for the S&A module. The first major subassembly is the S&A Module Lower Assembly (P/N 11720313). This subassembly forms the basic frame of the S&A. The next major subassembly is the S&A Module Subassembly (P/N 11720301) where the escapement mechanism and one of the two safing features (the two spinlocks) are assembled to the S&A module lower assembly. The S&A module subassembly is next assembled into the Can, S&A Module (P/N 11720302).

Functional testing of the S&A starts at this level with a 100 percent 5,000 rpm exercise or run-in. Next, each unit is subject to a 1,700 rpm arming test and it must arm between 23 and 32 turns of the S&A module. This test is followed by a 100 percent 1,100 rpm, no arm test which checks the safing capability of the two spinlocks.

The final assembly operation consists of installing the second safing mechanism, the setback pin. After installation of the setback pin each unit is subjected to a 5,000 rpm no arm test which checks the safing capability of the setback pin.

The previously described assembly sequence was followed for the three lots of S&A modules which were built to satisfy the delivery requirements of this contract. The assembly operations progressed smoothly throughout the contract without any major problem. The combined assembly losses at the 5,000 rpm exercise test, the 1,700 rpm all arm test, the 1,100 rpm no arm test, and the 5,000 rpm no arm test were in the order of 3 percent.

Block Detonator	P/N 11722620	
Clip Detonator	P/N 11718234	
Electric Detonator Assembly	P/N 11722405	
Contact Detonator	P/N 11720297	
Insulator Contact Detonator	P/N 11720299	Detonator Block Assembly P/N 11722620
Ground Pin Clip	P/N 11720214	
Washer Flat	MS 27183-4	
Plug, Detonator, Block	P/N 11711478	
Power Supply	P/N 11720216	
Firing Lead Assembly	P/N 11726804	Firing Lead and Battery Assembly P/N 11722636

Power Supply & Detonator Block Assembly
(No Part Number Assigned)

• Sleeve	P/N 11722622	
• Output Lead Assembly	P/N 11720258	Rear Fitting P/N 11720291
• Pin Spring	MS 171433	
• S&A Module	P/N 11720300	
• Spring Bias	P/N 11720296	

Figure 10. Rear-fitting assembly sequence.

Figure 11. XM587E2/XM724 S&A module.

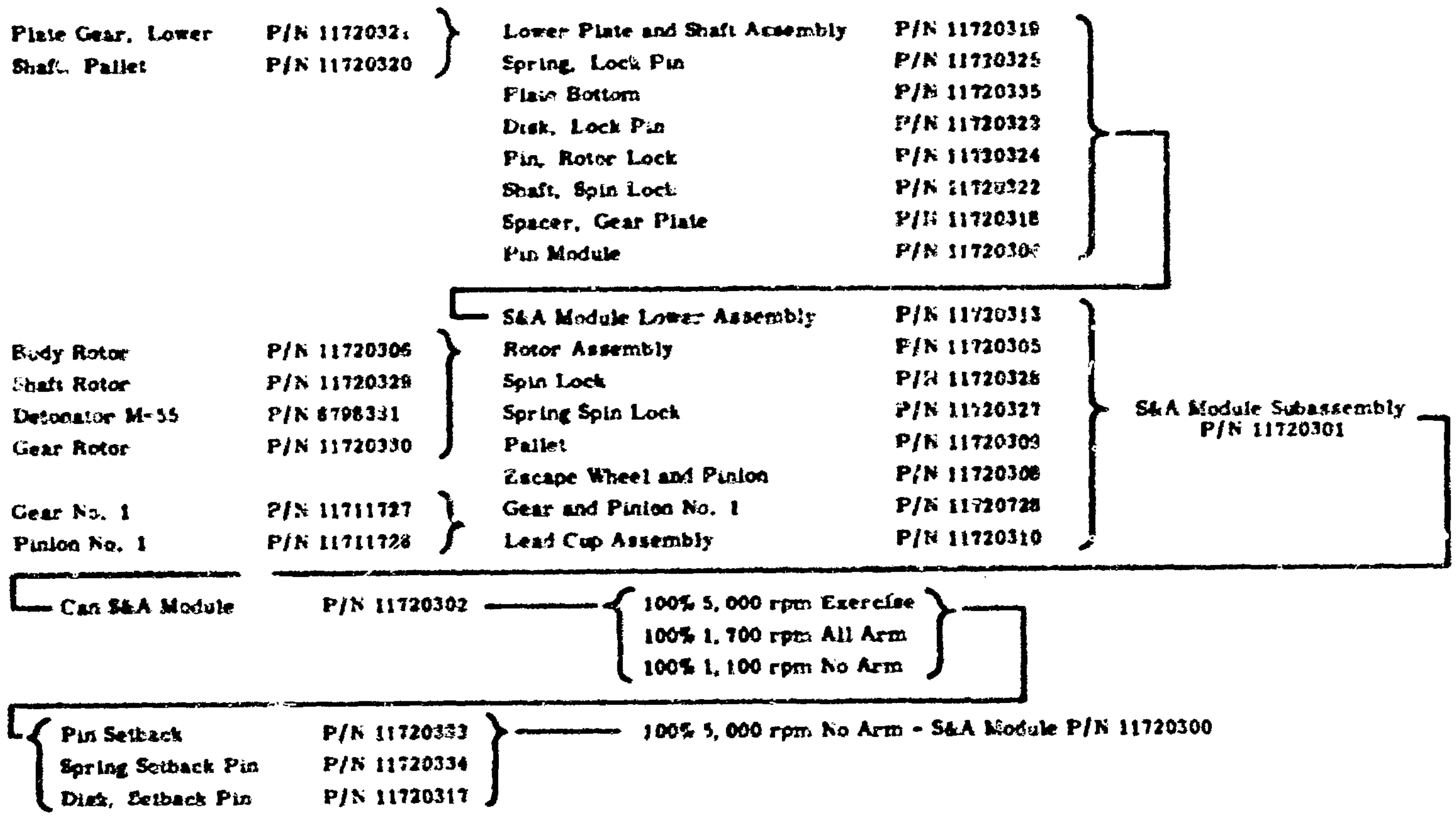


Figure 12. S&A module assembly sequence.

Upon completion of the previously described assembly and testing operations each lot of S&A modules was subjected to the specified first article and/or LAT. The three lots all passed the specified tests and were accepted without deviation. The detailed results of each of these tests have been previously reported in accordance with Contract Data Item A002 requirements.

A minor problem was experienced during the fabrication and testing of the second lot of S&A modules. The problem involved the specified setback pin operation test, M-106 (Reference Drawing 11720300). Five units from the 125 unit sample failed when the setback pin did not retract and lock-out at the specified 1,100 G's. Each unit from that lot was then subjected to this test to eliminate all of the defects. Eight additional defects were found as a result of this 100 percent screening operation.

After this screening operation another random sample of 125 units was selected and subjected to this test. All of the 125 units tested operated with the specified limit.

The 13 units which failed this test were subjected to failure analysis as follows:

A) Three units from the first five failures were disassembled and examined. No apparent reason for failures was found.

B) The 10 remaining failures were tested to determine the G level required to retract and lock-out the setback pin. The results of this test were as follows:

- 7 units functioned at 1,160 G's
- 2 units functioned at 1,430 G's
- 1 unit did not function at 1,800 G's.

The units which did not function at 1,160 G's were disassembled and analyzed to determine the cause of failure with the following results:

- 1 unit - no obvious failure mode
- 1 unit - damaged setback spring
- 1 unit - damaged setback pin

C) Twenty-five units were subjected to variable testing to determine the G level required to retract and lock-out the setback pin. The results of these tests are shown in Figure 13. This data shows that the set-back pin is biased toward the high side of the 800 to 1,000 G requirement.

D) The design of the setback pin/setback spring was also reviewed. The results of this review are plotted in Figure 14. This data also shows that the setback pin design is biased toward the high side of the requirement.

The above data was reviewed with HDL. Two corrections for this problem were recommended: A) revise the bias level of the setback spring and B) revise the upper limit of the requirements.

ECP-724-MHR-033, recommended changing the upper limit of the requirement from 1,100 G's to 1,200 G's.

DETONATOR BLOCK ASSEMBLY

The first operation of the detonator block assembly sequence is the installation of the Ground Pin Clip (P/N 11720214) and the Washer Flat (MS 27183-4) into the Block Detonator (P/N 11722620). This operation is followed by the installation of the Clip Detonator (P/N 11718234), Electric Detonator (P/N 11722405), Contact Detonator (P/N 11720297), Insulation Contact Detonator (P/N 11720299), and the Plug, Detonator, Block (P/N 11711478). At this point the detonator block assembly has been completed.

The above operations were performed in a screen room (on grounded benches) by operators wearing ground straps to prevent stray electrical currents from initiating the sensitive electric detonator.

FIRING LEAD AND BATTERY ASSEMBLY

The assembly process of the Firing Lead and Battery Assembly (P/N 11722626) is a straight forward operation consisting of assembling the Firing Lead Assembly (P/N 11726802) to the Power Supply (P/N 11720216).

At this point, a shorting bar is added to the top (3 pin side) of the firing lead and battery assembly between the through (⊥) and plus (+) pins of the power supply. The firing lead and battery can then

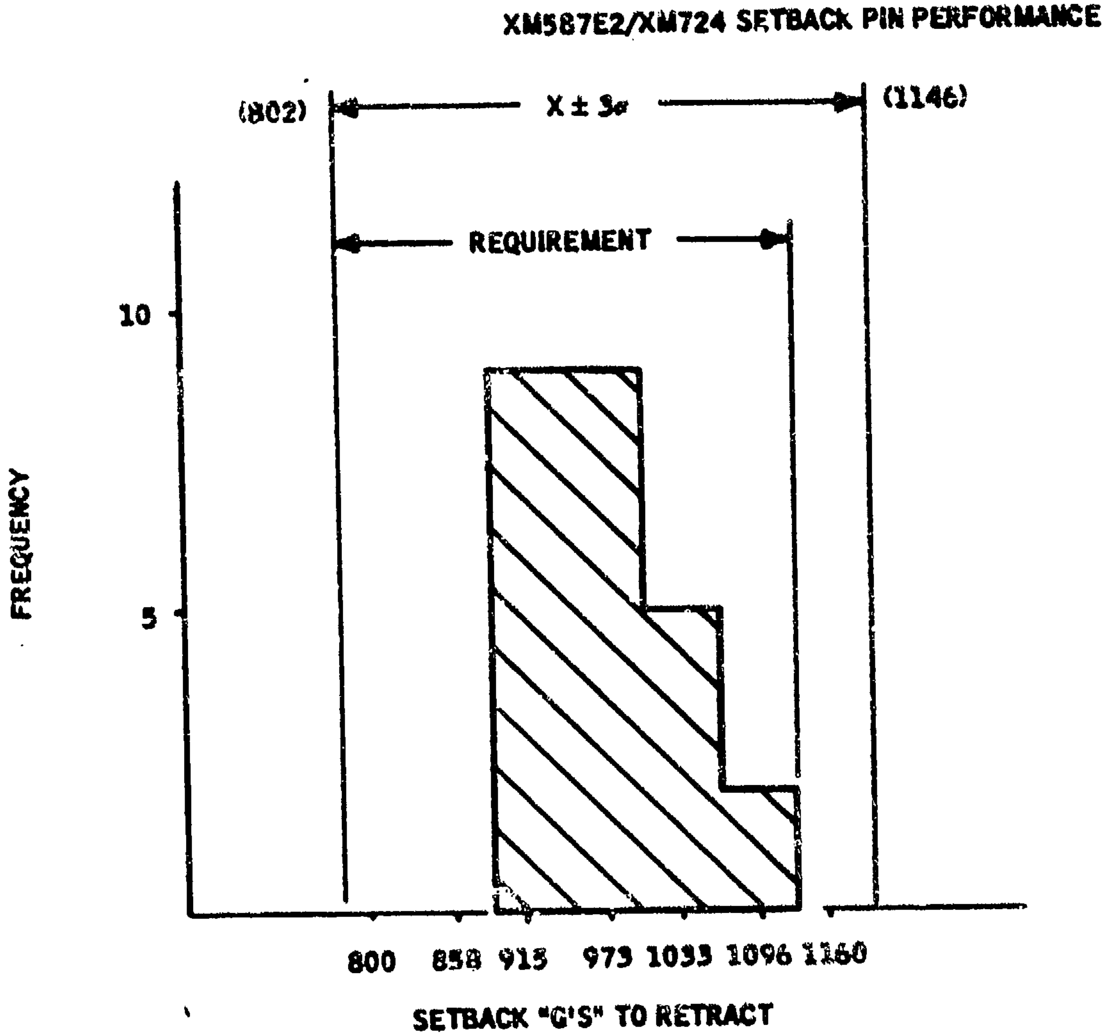


Figure 13. Setback pin operational test results.

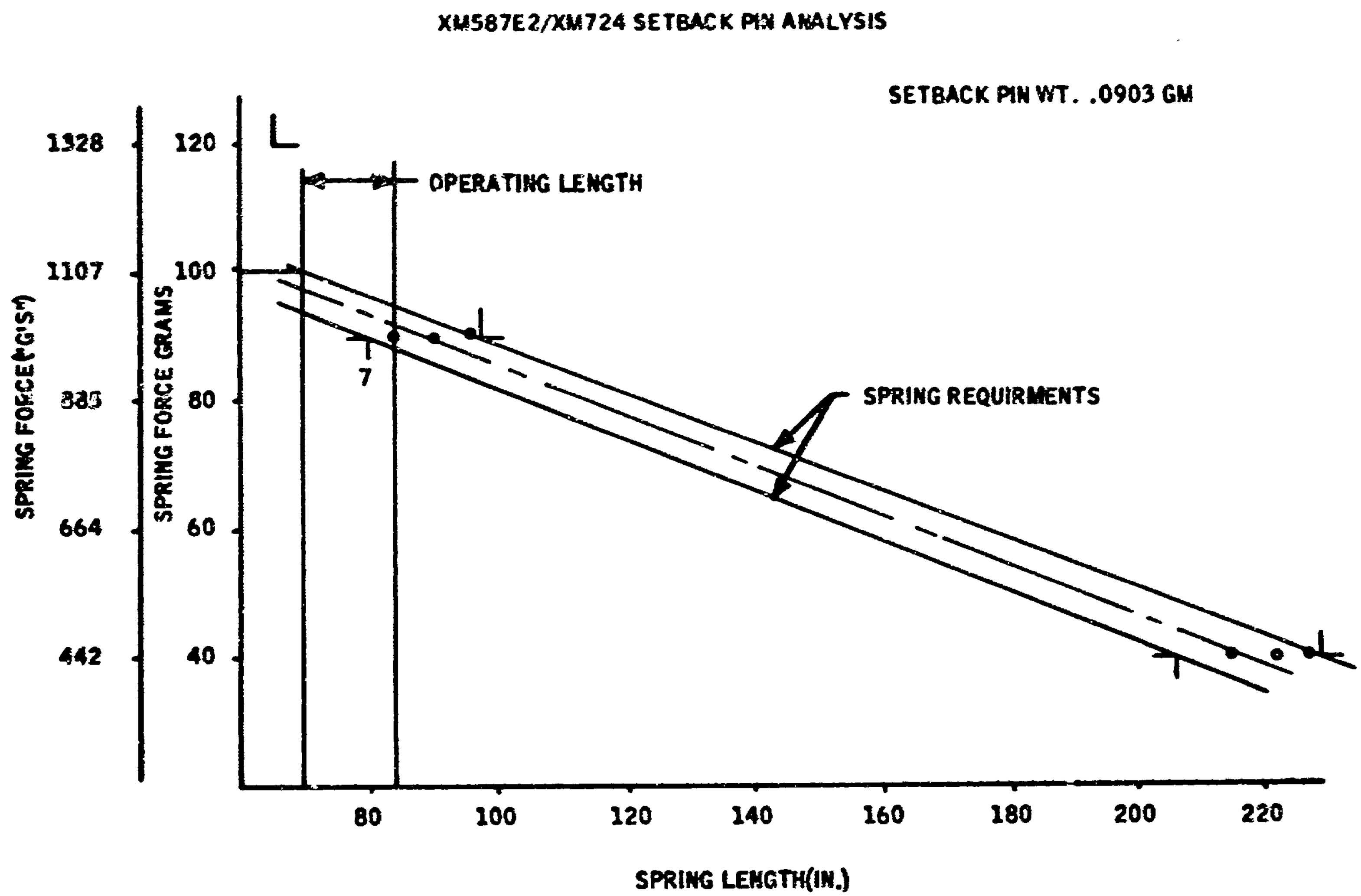


Figure 14. Setback pin operational analysis.

be assembled to the detonator block assembly to form the power supply and detonator block assembly with the shorting bar, thus, providing a dead short across the electric detonator, which prevents inadvertent initiation due to stray electrical currents. These assembly operations are also performed in a screen room (with grounded benches) by operators wearing ground straps. The shorting bar is removed after completion of the rear fitting just prior to final assembly of the fuze.

SLEEVE SUBASSEMBLY

The fourth subassembly is the sleeve subassembly. The first operation consists of inserting the Pin Spring (MS 171433) into the Sleeve (P/N 11722622). Next, the Output Lead Assembly (P/N 11720258) is assembled and staked into the sleeve. At this point, the specified water proofness test is conducted in accordance with the requirements of P/N 11720291.

FINAL REAR FITTING ASSEMBLY

The first operation consists of installing the S& A Module (P/N 11720300) into the Sleeve Subassembly (no part number defined). After the S& A is installed, a 200 percent visual inspection is performed to assure safe condition of the S& A module and proper orientation (brass gear plate side up). After this inspection, the Spring Bias (P/N 11720296) is installed followed by the Power Supply and Detonator Block Assembly (no part number defined). The power supply pins are then located with respect to the pin spring and the power supply is staked into place.

Upon completion of the previously described assembly, inspection and/or test operations, each lot of rear fittings was subjected to the specified first article and/or LAT. Each lot passed all of the specified tests with one minor exception. One lot failed the specified water proofness test. The units which failed were removed from the lot. A repair procedure consisting of placing additional RTV sealant at the sleeve - output lead assembly interface was instituted with HDL's concurrence.

Fire-on-arming tests were conducted on the completed rear fit..ng assemblies by HDL at their Bloom Point range. Forty-five fire-on-arming test vehicles (P/N 11720342) which were built and delivered under this contract in conjunction with the S& A module first article acceptance tests were subjected to 105 millimeter Howitzer firings.

The 45 units were divided into three groups of 15 units each. The three groups were then fired at high, low, and ambient temperatures. All of the units (100 percent) functioned at a range of from 160 feet to 180 feet from the muzzle of the weapon as shown in Figure 15. This converts to an arming range of approximately 26.5 to 29.0 turns to arm. The specified requirement is from 23 to 32 turns to arm.

FINAL FUZE ASSEMBLY - DT-OT II FUZES

The final assembly of either the XM587 or XM724 Fuze involved the joining of the Rear Fitting (P/N 11720291) to the Electronics and Nose Cone Assembly (P/N 11711430) by crimping a flange on the rear fitting sleeve to the nose cone. This joint is sealed with an "O" ring seal and three connector washers. The final assembly of the XM587 Fuze is completed with a booster and booster cup.

Figure 16 shows the elements included in the final assembly of the XM587E2 Fuze.

Figure 7 shows the elements included in the final assembly of the XM724 Fuze.

There were no problems encountered in the final assembly of either the XM587E2 Fuze or the XM724 Fuze.

MODIFIED XM587 FUZE-SINGLE PRINTED CIRCUIT BOARD VERSION

Electronics and Nose Cone Assembly - Modified XM587 Fuze - with Single Printed Circuit Board

The Printed Wiring Board Assembly (P/N 28116045), for the modified XM587 Fuze, is shown in Figure 17. Figure 18 shows an exploded view of the electronics and nose cone assembly.

No significant problems were experienced in the assembly of the printed wiring board assembly that were unique to the single board design.

The printed wiring board assemblies were individually tested at the board level, (28116045), before assembly into Electronics Assembly (P/N 28116150). The rejection rate at board level testing was 4 percent.

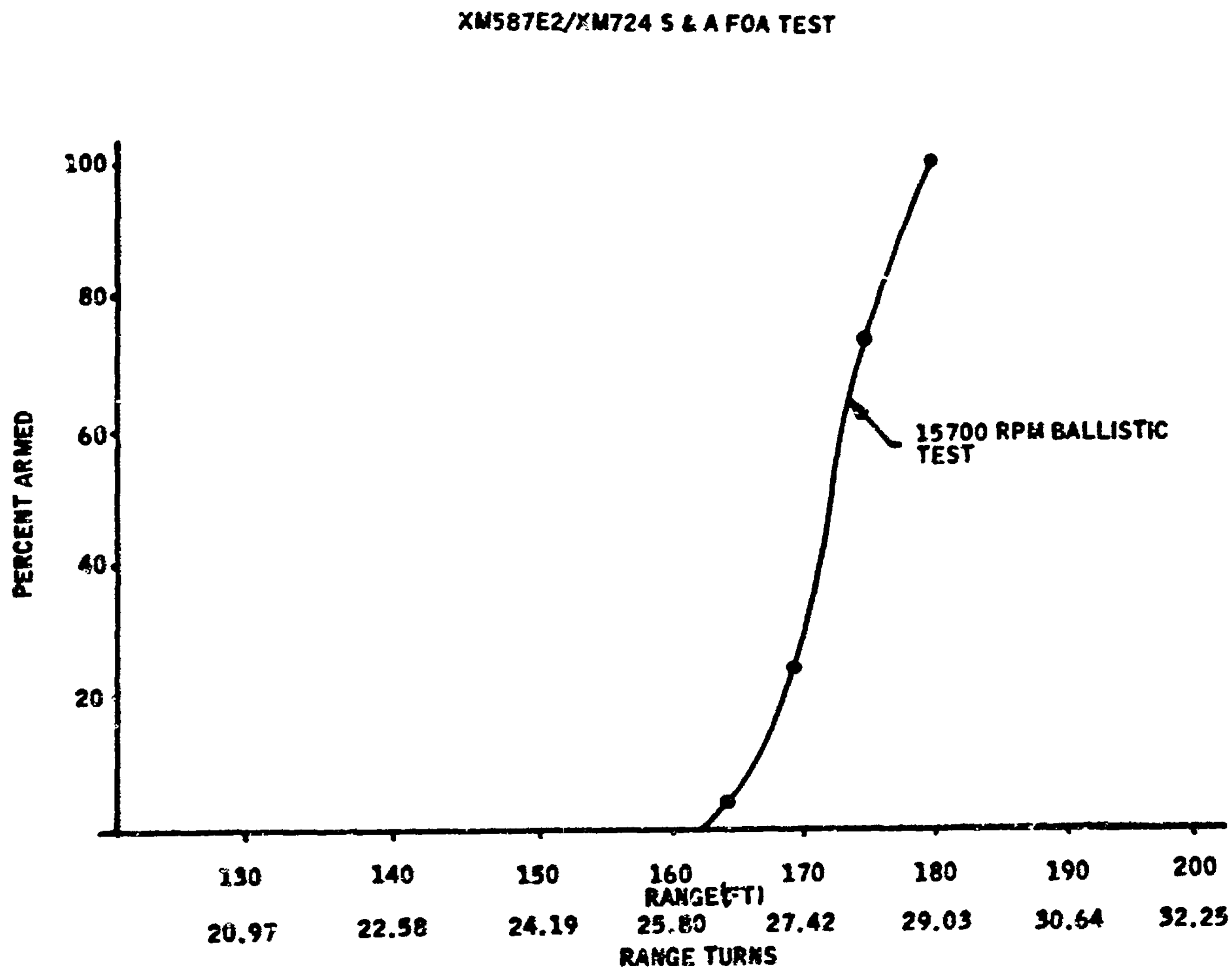


Figure 15. Fire on arming test results.

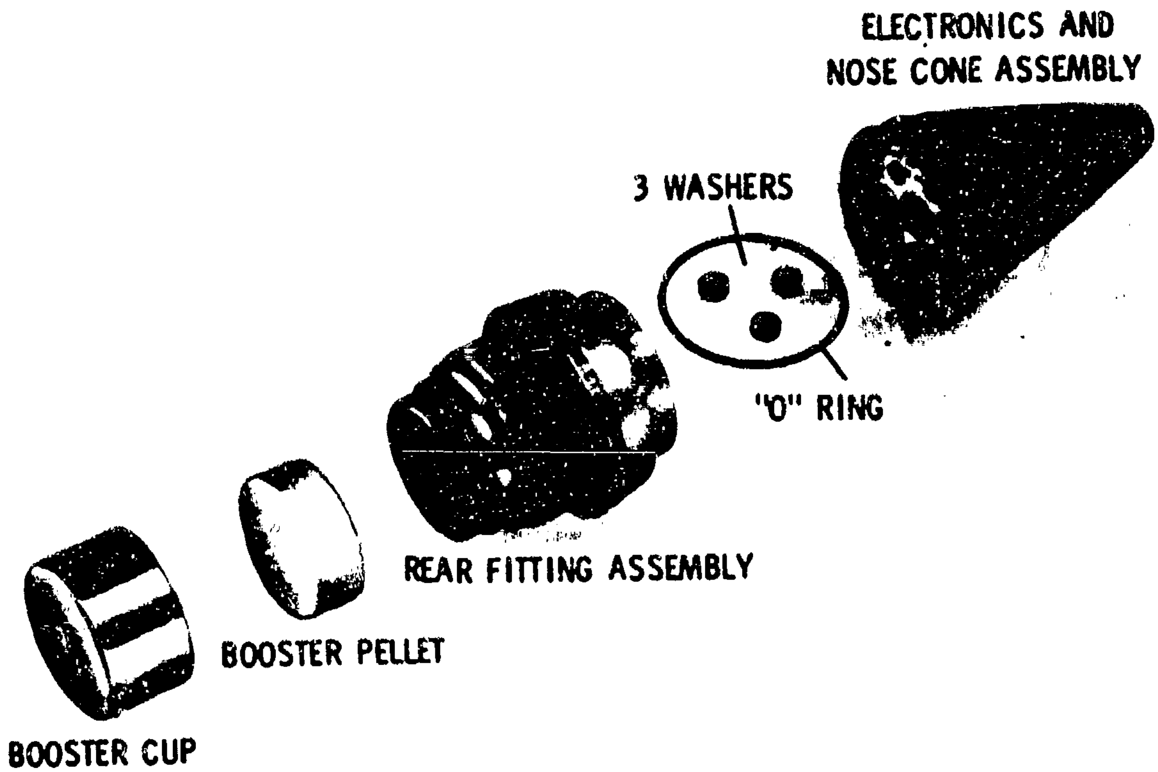


Figure 16. Exploded view of XM587E2 Electronic Fuze.

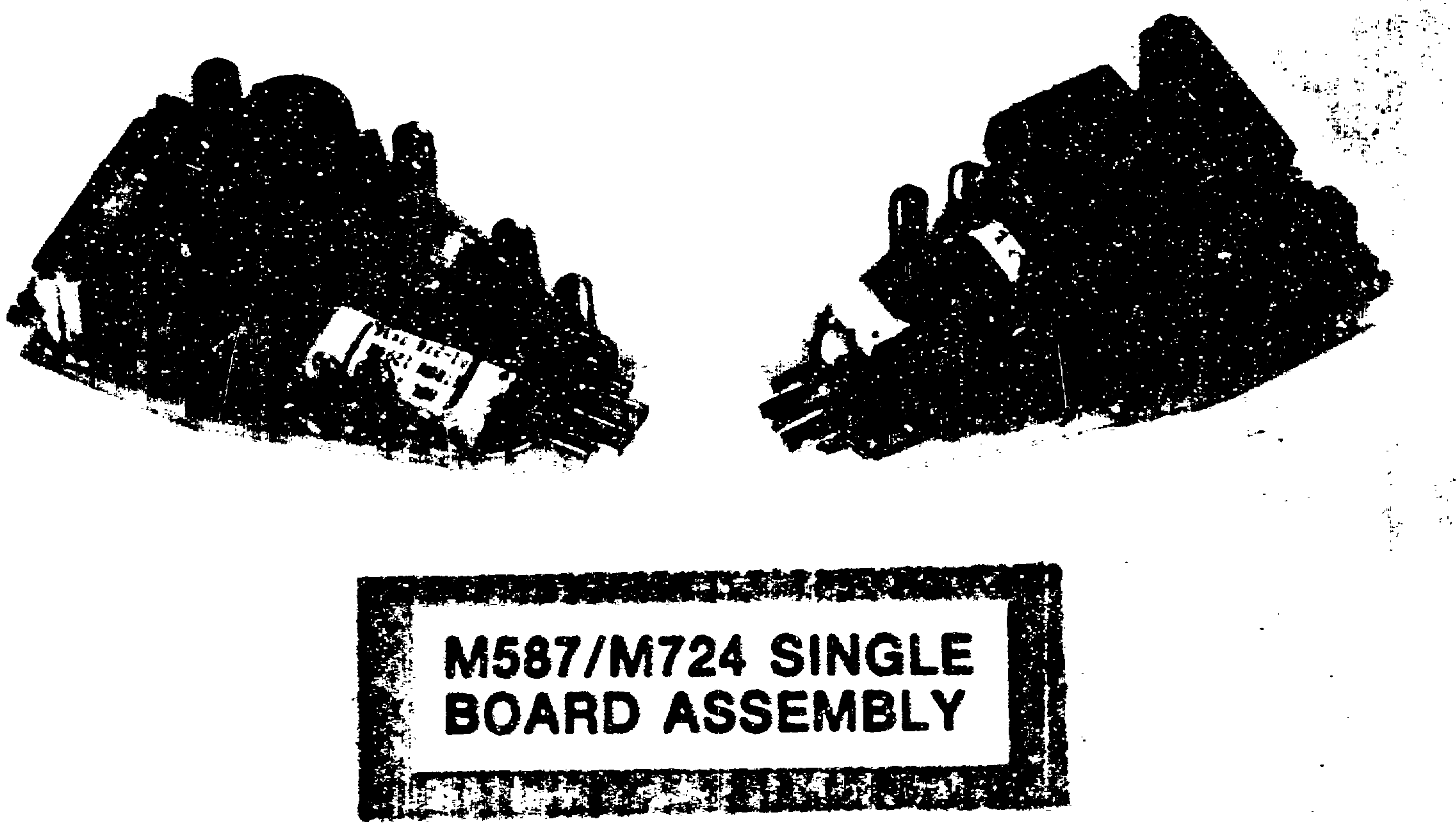


Figure 17. Printed wiring board assembly for modified XM587 Fuze.

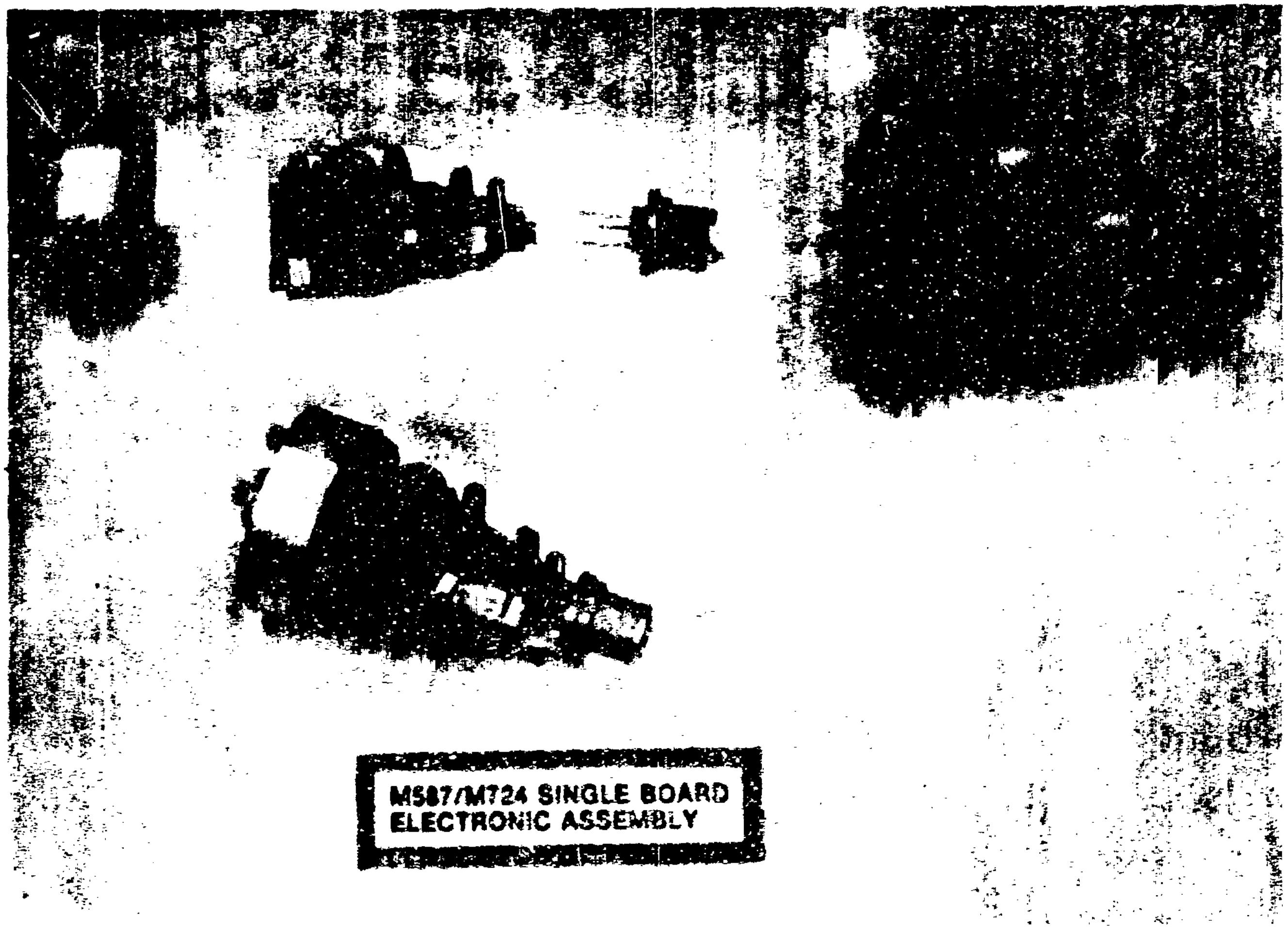


Figure 18. Exploded view of electronics and nose cone assembly for modified XM587 Fuze.

All Electronics and Nose Cone Assemblies (P/N 38116149) were tested per the specification requirements of "Electronics and Nose Cone Assembly" (11711430), Group A inspection, subgroup 1, with the exception that all tests scheduled at a power supply voltage of 1.8 volts were run at 1.95 volts. The rejection rate at acceptance testing of the nose cone assembly was less than 1 percent.

All delivered units met the specification requirements of 11711430 except for the input current measurements of tests 1.5F and 1.6F and the firing capacitor voltage tests of 1.5B and 1.6B.

A significant number of electronics and nose cone assemblies did not meet the input current specifications (1.5F and 1.6F) because of low input current. Specification test 1.5F requires a minimum input current of 400 MA at 1.2 volts input. Many nose cone assemblies drew lower input current, as low as 347 MA at 1.2 volts input. Specification test 1.6F requires a minimum input current of 550 Ma at 1.8 volts input. Many nose cone assemblies drew lower input current as low as 482 MA when tested at 1.95 volts. These out-of-specification conditions resulted from the greater efficiency of the converter transformer used in the modified fuze electronics assembly. They were not considered failures.

Tests 1.5B and 1.6B of specification 11711430 requires a minimum firing capacitor voltage of -21.9 volts. A significant number of nose cone assemblies did not meet the test 1.5B requirements with voltages down to -21.07 volts. Three units out of the 300 build quantity did not meet the 1.6B test requirements with voltages down to -21.69 volts. These out-of-specification conditions resulted from the lower voltage regulator characteristics of the new Interface Unit (P/N 11726909). They were not considered failures.

Final Assembly of Modified Fuze

The final assembly of the modified XM587 Fuze is exactly the same as the lot 3 fuzes. Only 1 unit failed electrical tests after final assembly crimping of the modified fuzes.

5. TEST PROGRAM

The test program conducted on the XM587E2/XM724 Fuzes and subassemblies built on this contract included first article tests, LAT, quality demonstration and evaluation tests, lot summary tests and Electro Static Discharge (ESD) resistance tests. The tests were conducted on major components, subassemblies and the final fuzes as listed in the following tabulation.

1) First Article Test

   a) Oscillator (lot 0001)

   b) Interface Hybrid (lot 0001)

   c) S&A Module

   d) Rear Fitting

2) Lot Acceptance Test

   a) Oscillator (lot 0002)

   b) Hybrid Interface (lot 0002)

   c) S&A Module (lot 1 and 2)

   d) Rear Fitting (lot 1 and 2)

   e) DEG Fuzes (final)

   f) Lot 1 Fuzes (final)

   g) Lot 2 Fuzes (final)

3) Quality Demonstration and Evaluation Tests

   a) DEG and lot 1 E-Heads

   b) Lot 2 E-Heads

   c) Modified XM587 E-Heads

4) Lot Summary

a) DEG

b) Lot 1

c) Lot 2

5) ESD Resistance Tests

a) ESD vulnerability of M587 Fuze (2 printed circuit boards)

b) ESD vulnerability of unpotted M587 Fuze (2 printed circuit boards)

c) ESD vulnerability of unpotted single board XM587E2 Fuze

d) EST vulnerability of potted single board XM587E2 Fuze

e) Interrogation versus real time function of a M587 Fuze scrambled by ESD.

FIRST ARTICLE TESTS

The first article test reports describe the inspection and functional test results conducted on the precision oscillator, interface hybrid, S&A module, and rear fitting.. Each first article test report is concerned with units built prior to the start of regular production. The reports summarize the listed characteristics that were dimensionally inspected as well as the results of functional testing required per each piece part specification. The precision oscillator, S&A module, and rear fitting assembly passed all first article tests. The interface hybrid passed all first article tests except "solderability". The solderability test requirement was waived on Lot 0001 units since all solder joints were 100 percent inspected.

The first article test data is included in this report as Appendix V.

LOT ACCEPTANCE TESTS (LAT)

The LAT reports describe samples of units from each production Lot, subjected to dimensional inspection and environmental and functional testing required per each piece part specification. The reports summarize test scores on typical sample of parts and assemblies during the course of production. A report on each production lot is included covering the precision oscillator, interface hybrid, S&A module, rear fitting assembly, and final fuze assembly. All test items passed the LAT with the exception of the interface hybrid which failed the 57 millimeter gunfire test and the DEG/lot 1 fuzes which failed the potting porosity test. The 57 millimeter gunfire test on the interface hybrid is advisory and the potting porosity test was waived on lot 2 fuzes.

The LAT data is attached to this report (Appendix F).

QUALITY DEMONSTRATION AND EVALUATION TESTS

The quality demonstration and evaluation test reports describe environmental and functional testing performed on the E-Head per requirements of Specification No. 11711430. Two separate reports were written, one covering the testing performed on the DEG and lot 1 set of E-Heads, and one summarizing the testing done on the lot 2 E-Heads. Each report contains the results of the E-Heads being electrically interrogated after preconditioning under harsh environments. The DEG and lot 1 "E" Heads failed due to precision oscillator failures. The lot 2 "E" Heads failed due to defective precision oscillators, MNOS counter memory units, and impact switches.

The quality demonstration and evaluation test data on lot 1 and lot 2 testing is attached to this report in Appendix F.

Evaluation Tests on Modified XM587 E-Heads

During production of the 300 modified XM587 fuzes (single board version), 44 units were tested at high and low temperature per Electronics and nose cone assembly, specification No. 11711430 (group A inspection subgroups 2 and 3). One unit did not pass the low temperature tests due to a poor solder joint. All other units passed the high and low temperature tests.

LOT SUMMARY

The lot summary inspection records are flow-diagram-reports which describe the fallout of deliverable end items for each lot production build. There are three separate reports (one for each of the three fuze lots delivered) covering the number of E-Heads produced, proceeding through the production process, inspection and testing operations culminating to the number of deliverable fuzes.

The lot summary inspection records are attached to this report in Appendix F.

ESD Resistance Tests

ESD resistance tests were conducted on both the two printed circuit board and the single printed circuit board versions of the XM587 electronics to evaluate the vulnerability of the fuze to static electrical discharges. Tests were conducted on complete fuzes to simulate field conditions and on electronics assemblies (both encapsulated and unencapsulated) to evaluate the vulnerability of the fuze to static damage during assembly.

The following specific tests were conducted:

- 10 - XM587E2 Fuzes (from Lot 2 production) were tested to failure with ESD strikes to the nose contacts (V_X and monitor line).
- 4 - XM587 Electronics Assemblies (P/N 11711430), without potting, were tested to failure with ESD strikes on the nose contacts (V_X and monitor line) to evaluate assembly vulnerability.
- 2 - Single Printed Circuit Board XM587 Electronics Assemblies (P/N 28116149), without potting, were tested to failure with ESD strikes on the nose contacts (V_X and monitor line) to evaluate assembly vulnerability.
- 2 - Single Printed Circuit Board XM587 Electronics Assemblies (P/N 28116149) were tested to failure with ESD strikes to the nose contacts (V_X and monitor line) to evaluate field vulnerability of the single board XM587E2 Fuze.
- 2 - Single Printed Circuit Board XM587 Electronics Assemblies (P/N 28116149), without potting, were tested to failure with ESD strikes on J2-2 (test point connection in electronics cover) to evaluate assembly vulnerability.
- 1 - XM587 Electronics Assembly (P/N 11711430) was exposed to ESD on the nose contacts (V_X and monitor line) until the interrogate time was scrambled and then functioned in real time to determine how a fuze with a scrambled interrogate time would timeout.

All tests were conducted per the test plan included in this report as Appendix J. ALL EDS's were controlled by storing positive or negative charges on a precision 100 pico farad capacitor. With the fuze body grounded, mercury wetted relay contacts transferred the charge to the circuit contact under test. All test data is given in Honeywell test report OEXM 28,930 (Appendix J).

SUMMARY OF ESD TEST RESULTS

Part I

Ten XM587E2 Fuzes were tested to failure under simulated field conditions and with ESD strikes to the nose contacts with the following results.

Fuze S/N	Failure Voltage Level and Polarity	Nose Contact where Failure Charge was Applied
8654	-5000	Vx
7754	-4000	Vx
8072	-4000	Vx
7962	-5500	Vx
7514	-3500	Vx
8179	-3500	Vx
7068	-3000	Vx
7692	-5500	Vx
7822	-5000	Monitor
7752	-5000	Monitor

NOTE: Each of these ten fuzes exhibited a scrambled interrogation condition, i.e., it interrogated a time other than set time, at some voltage below the failure point.

Part II

Four XM587 electronic assemblies, two printed circuit board units unpotted to simulate assembly conditions, were tested to failure with ESD strikes to the nose contacts with the following results:

Electronic Assembly S/N	Failure Voltage Level and Polarity	Nose Contact where Failure Charge was Applied
9089	-3500	Vx
9105	-4000	Monitor
9218	-3000	Vx
9247	-6500	Monitor

NOTE: Electronic Assembly (S/N 9218) was the only unit that exhibited a scrambled interrogative condition during this part of the test.

Part III

Two single Printed Circuit Board XM587 Electronic Assemblies (unpotted P/N 28116149 to simulate assembly conditions) were tested to failure with ESD strikes to the nose contacts with the following results:

Electronic Assembly S/N	Failure Voltage Level and Polarity	Nose Contact where Failure Charge was Applied
10147	-8000	Vx
10230	+1000	Monitor

NOTE: Both of these units exhibited scrambled interrogation during this part of the test. In addition, both units exhibited a hesitancy to set at voltages below the failure point (See test data in Appendix J).

Part IV

Two single Printed Circuit Board encapsulated XM587 Electronic Assemblies (P/N 28116149), were tested to failure with ESD strikes to the nose contacts to simulate assembly and field conditions with the following results:

Electronic Assembly S/N	Failure Voltage Level and Polarity	Nose Contact where Failure Charge was Applied
10162	-9000	Vx
10211	-9000	Vx

NOTE: Both of these units exhibited scrambled interrogation during this part of the test. In addition, both units exhibited a hesitancy to set at voltages below the failure point (See test data in Appendix J).

Part V

Two single Printed Circuit Board, unencapsulated XM587 Electronic Assemblies (P/N 28116149) were tested to failure with ESD strikes to test point J2-2 in the electronics cover to simulate assembly conditions with the following results:

Electronic Assembly S/N	Failure Voltage and Polarity
10232	-3500
10334	-5000

NOTE: Both of these units exhibited a hesitancy to set at some voltage below the failure voltage (See test data in Appendix J).

Part VI

One XM587 Electronics Assembly (P/N 11711430) was exposed to ESD strikes on the nose contacts until the interrogate time was scrambled and then functioned in real time to determine actual time out with the following results:

Assembly S/N	Set Time (seconds)	Scramble Voltage and Polarity	Circuit	Time Out (seconds)
9239	25	+2500	Monitor	25
	41	+4000	Vx	41

NOTES: 1)- After time out, which was not affected by scrambled interrogation, the unit still exhibited scrambled interrogation at both test conditions. 2) - When the unit was hit with +4000 volts on Vx during time out, function time was not affected. After this time out, interrogation was correct and unscrambled.

ESD TEST CONCLUSIONS

1. The two-printed circuit board XM587 Fuze is damaged by ESD strikes in the range of 3000 to 5500 volts.

2. The two-printed circuit board XM587 Electronic Assembly is damaged by ESD strikes in the same voltage range as the finished fuze. This indicates that the ESD vulnerability during assembly is essentially the same as in the final fuze.

3. The single-printed circuit board electronic assemblies (3 integrated circuit version) is damaged by ESD strikes in the range of 8000 to 10,000 volts at the nose contacts and 3500 to 5000 volts at test connector J2-2. Based on limited testing, the single-printed circuit board XM587 Fuze is less susceptible to ESD damage than the two-printed circuit board (4 integrated circuit version).

4. Based on a single test, a fuze with scrambled interrogation can timeout correctly.

6. DEVELOPMENT OF MONOLITHIC CIRCUITS TO REPLACE THE HYBRID INTERFACE AND HYBRID OSCILLATOR

This development effort was a study to determine the feasibility of simplifying the interface hybrid microcircuit and the hybrid oscillator microcircuit by using silicon monolithic circuit technology.

INTERFACE MONOLITHIC INTEGRATED MICROCIRCUIT

Development of the interface monolithic integrated microcircuit was discontinued after evaluation tests were completed on ten (first iteration) integrated circuit models. The test results indicated serious problems in the interface firing circuits and abnormally high parasitic voltages on all pins of the test units. Elimination of these problems is not possible within the state of monolithic capabilities at the present time. For this reason, the development of a silicon monolithic microcircuit to replace the present hybrid interface unit is not considered feasible at this time.

TAB HYBRID MICROCIRCUIT OSCILLATOR

The development of the monolithic integrated circuit amplifier for the hybrid oscillator consisted of two phases. The Phase I amplifier design met all of the circuit requirements and functioned properly when incorporated in the tab hybrid microcircuit oscillator, (TAB HMO). However, a simulated failure mode in the hybrid microcircuit oscillator allowed a 200 kHz parasitic oscillation. The phase II monolithic integrated circuit amplifier design included a modification which eliminated the positive feedback situation which caused the parasitic oscillation. Parasitic oscillation did not exist when simulating failure modes in the HMO utilizing the phase II amplifier design. The 10kHz (TAB HMO) utilizing tape technology for interconnections between the amplifier and the thick film conductors was successful.

Twenty-seven engineering prototypes were fabricated using the phase I amplifier and evaluated against the Group A and B tests of HDL Drawing No. 11726812. Two-hundred and ten first article test (TAB HMO's) were fabricated using the Phase I monolithic integrated circuit amplifier desing and 180 TAB HMO's were fabricated using the Phase II monolithic integrated circuit amplifier design. The engineering prototypes and the 210 piece sample of the TAB HMO's were fabricated using two different encapsulating techniques. Half of the TAB HMO's were encapsulated using epoxy only and the other half were encapsulated with a silicon barrier layer and epoxy. The 180 monolithic amplifier designs were encapsulated using a silicone barrier layer and epoxy. Superior electrical performance was realized on TAB HMO's which were encapsulated with the silicone barrier layer.

Three-hundred and ninety TAB HMO's (210 Phase I units and 180 Phase II units) were evaluated against Group A, B & C tests of HDL Drawing No. 11726813. The test results establish that the TAB HMO design is capable of meeting the electrical and environmental requirements of HDL Drawing No. 11726913. Selected materials and processes utilized in fabricating the TAB HMO will allow the low cost objective to be achieved.

Complete details on the developmental work included in this feasibility study are given in a separate report, "The Development of Two Monolithic Integrated Circuits and a 10kHz TAB Hybrid Microcircuit Oscillator", Report No. HDL-CR-79-056-1.

7. FAILURE ANALYSIS

Failure analysis was performed on all components and assemblies which failed acceptance testing and lot operating tests. In addition, failure analysis was conducted on sub-assemblies which failed critical production tests during the lot 2, lot 3 and modified XM587 Fuze builds.

DT/OT II FUZE FAILURE ANALYSIS

Failures During the DEG Lot and Lot 1 Build

During the final assembly and testing of the DEG Lot and Lot 1 "E" Heads, (Electronics and Nose Cone Assemblies P/N 11711430) 3 units failed the 100 percent acceptance tests and 19 units failed the LAT.

Failure Analysis of DEG Lot and Lot 1 Acceptance Test Failures

All 3 "E" Heads that failed during 100 percent acceptance testing failed due to defective oscillators. All oscillator failures were due to defective thermosonic bonds within the units. The first unit (from "E" Head S/N 1854) failed because of a lifted ball bond on a lead from oscillator internal component C1. This failure was at the substrate. The second unit (from "E" Head S/N 5038) failed because of two lifted ball bonds at the substrate on leads to Q2. The third unit (from "E" Head S/N 5150) failed due to a defective ball bond at the substrate on a lead to C3.

Failure Analysis of DEG Lot and Lot 1 LAT

The 19 "E" Heads which failed the LAT had all passed the 100 percent acceptance tests at ambient temperature after epoxy encapsulation. Because these "E" Heads were assembled using electronics assemblies remaining from a previous contract and new hybrids and transformers were being fabricated using improved process controls, detailed failure analysis was not conducted on all of these units. The following tabulation summarizes the failure analysis findings on these 19 units.

FAILURE ENVIRONMENT	"E" HEAD SERIAL NO.	CAUSE OF FAILURE
Ambient	1744	Not confirmed - probably a cracked transformer 11711448.
	5306	Leaky capacitor C_4 - Reference 11711401.
	5349	Failure would not repeat - indeterminate.
High Temperature	1609	Not confirmed - probably a cracked transformer.
Low Temperature	5172	Failure would not repeat - may have been a test fixture contact problem
	5186	Indeterminate
	5190	Indeterminate
	5200	Failure could not repeat - Indeterminate
	5207	Indeterminate
	5272	Indeterminate - may have had defective MNOS counter A3 (Reference 11711401)
Mechanical Shock	1310	Shock induced failure of C1, Reference 11711401.
	1390	Oscillator (P/N 11711427) defective.
	1191	Oscillator (P/N 11711427) defective.
	5143	Oscillator (P/N 11711427) defective.
	5183	Oscillator (P/N 11711427) defective and Interface Hybrid (P/N 10990455) was defective
	5198	Oscillator (P/N 11711427) defective

5326	Oscillator (P/N 11711427) defective
5331	Oscillator (P/N 11711427) defective
5349	Failure would not repeat.
5356	Oscillator (P/N 11711427) defective

Failures During The Lot 2 Build

During the fabrication of lot 2 fuzes, failure analysis was conducted on components which failed acceptance testing, electronic subassemblies which failed subassembly tests, "E" Heads which failed acceptance inspection and "E" Heads which failed LAT.

Failure Analysis of Component Failures

During the acceptance testing of oscillators and interface hybrid units to be used in the fabrication of lot 2 fuzes, 6 oscillators and 6 interface hybrid units failed acceptance tests. The following tabulation summarizes the failure analysis of these units.

1 oscillator failed due to a broken bond wire on the base of Q1 (Reference 11711631).

1 oscillator failure due to a lifted bond on capacitor C4.

4 oscillator failures could not be repeated.

1 interface unit failed due to a lifted bond wire on the emitter of Q8 (Reference 11711607).

1 interface unit failed due to a lifted bond wire on the base of Q6.

1 interface unit failed due to a defective zener CR2.

1 interface unit failed due to a defective bond between CR2 and the substrate.

1 interface had a cracked package but did not fail electrically.

1 interface unit failure could not be repeated.

Failure and action reports covering these failures are included in Appendix G.

Subassembly Failure Analysis

The following information summarizes the results of the failure analyses conducted on 83 printed wiring board subassemblies which failed electrical tests during lot 2 build. The 83 printed wiring boards were of the Printed Wiring Board No. 1 (11711413) or Printed Wiring Board No. 2 (11711414) type. These assemblies failed for the following general reasons:

Interface Hybrid (P/N 10990455) failures	21*
Scaler (P/N 11711256) failures	14*
Counter (P/N 10990466) failures	8*
Wrong assembly	8
Solder bridges between printed circuit tracks	11
Defective printed circuit boards (open tracks or copper shorts)	3
Defective Converter Transformer, (P/N 11711448) wrong polacity	1
Defective Oscillator (P/N 11711427)	4*
Impact Switch (P/N 11718418) failure	12*
Specification conflict (good unit)	2*
Contaminate on board	2
Defective Capacitor (P/N 11711401)	1*

Only those failures noted above with an "*" were failure analyzed for more detailed results. The results of these detailed failure analyses are discussed below.

Interface Hybrid Failures

Nineteen of the 21 interface hybrid failures represent two problems: a low regulated voltage problem and a failure to program the fuze. Six of the failed interface units failed due to a low regulated voltage. In all six cases, the low regulated voltage failure occurred at low battery input voltage when the unregulated voltage is approximately 28 volts. The interface hybrid units (for lot 2 fuzes) were tested at 50 volts. ECP 724-MHR-034 was submitted to correct the test specification on the interface hybrid unit to eliminate this type of failure. The second problem resulted from an inability to pass the programming information to the fuze. Thirteen interface units failed for this reason. Five of the 13 failed because of defective gold therm-arsonic ball bonds at capacitor C1. Eight of the 13 failed to pass programming information because of defective hybrid components or improper assembly as listed below:

Q10	-	Poor bond
CR23	-	Leaky
CR1	-	Leaky
CR20	-	Shorted
Q11	-	Bonded pad lifted
Q10	-	Broken lead
CR21	-	Lead missing (possibly caused by potting void).
CR1	-	Missing and Q10 broken lead (possibly caused by potting void).

The remaining two defective interface hybrid units failed because of defective wire bonding. One unit had the emitter and base bond wires interchanged on Q1 and the other unit had a defective bond wire on the zener diode.

Scaler Failures

The scalers used in lot 2 fuzes were GFM and failure analysis of the 14 failed scalers was handled by HDL.

Counter Failures

The counters used in lot 2 fuzes were GFM and failure analysis of the 8 failed counters was handled by HDL.

Defective Oscillators

The four defective oscillators failed because of defective bonds on bond wires to various internal components.

Impact Switch Failure

Twelve impact switches failed in a low resistant mode. The most prevalant cause of this type of failure was the displacement of the internal cone of the impact switch until it contacted the outer shell. This displacement (found in 7 switches) was caused by external damage to the impact switch.

Five impact switches failed because of contaminates found either inside or outside in the seal area. These 5 failed for the reasons tabulated below:

1 - Had solder balls in the seal groove

1 - Rosin had leaked into the switch

1 - Had a white powdery contaminate inside the switch

1 - Had several small white particles inside the switch

1 - Had a general contamination in the seal area

Failures Due To Specification Conflict

Two units which were good units failed because of tight specification limits. One unit had a test 1.5H (of Specification 11711430) reading of 294.9 milliseconds against a lower specification limit of 295 milliseconds. This out-of-specification condition of 0.1 milliseconds is not detrimental to fuze operation and the lower specification limit should be changed.

The second unit failed test 1.5F (of Specification 11711430) with an input current of 390.4 milliamperes against a lower spec limit of 400 milliamperes. This lower current is not detrimental to fuze operation and the lower specification limit should also be changed.

Defective Capacitor

One tantalum capacitor (C4 of 11711401) was found to be defective due to a separation of the cathode lead from the tantalum slug.

FAILURE ANALYSIS OF LOT 2 "E" HEAD ACCEPTANCE TEST FAILURES

During the 100 percent acceptance of 2450 lot 2 electronics and nose cone assemblies, 13 units failed the electrical functional tests. These 13 units have been failure analyzed. The following tabulation summarizes the findings of that failure analysis.

Number of Failed Units	Cause of Failure
4	Failed because of defective interface hybrid units. Three of these hybrids failed because of defective internal lead bonds to CR1. One failed because of a defective lead bond to C1.
1	Failed because of a defective hybrid oscillator. This hybrid failed because of two defective internal lead bonds and a broken lead wire.
2	Failed because of defective converter transformers. One transformer had a cracked pot core and the other had an open secondary winding.
1	Failed because of defective impact switch.
2	Units would not repeat the failure after the nose cone was removed. These units were temperature cycled and temperature shocked but the failures would not repeat.
1	Unit is considered good (although categorized a failure) due to an excessively severe specification. This unit failed test 1.6H of the Drawing No. 11711430 Group A Inspection Requirements. The DET function occurred after a delay of 294.9 milliseconds and the specification minimum is 295 milliseconds.
1	Unit would not repeat the originally reported failure. The unit would not fail even after it was temperature cycled and temperature shocked. This unit was not opened.
1	Unit which failed even after removal of the nose cone would not repeat the failure after potting material was removed from the area immediately above the counter and the interface hybrid unit. Temperature cycling and

temperature shocking would not re-establish the failure.

Failure and action reports covering these failures are included in Appendix G.

FAILURE ANALYSIS OF LOT 2 "E" HEAD LOT ACCEPTANCE TEST FAILURES

During LAT of lot 2 electronics and nose cone assemblies, four units failed high temperature tests, three units failed low temperature tests, five units failed mechanical shock tests (Reference 11711430 LAT Subgroups A2, A3 and B2), and 15 units failed the 475 G mechanical pulse test. The 12 units which failed high temperature, low temperature, and mechanical shock tests were failure analyzed. The following tabulation summarizes the failure analysis of those units. NOTE: The 15 units that failed the 475 G mechanical pulse test were judged to be impact switch failures and were not failure analyzed.

NUMBER AND ENVIRONMENT OF FAILURES	CAUSE OF FAILURE
3 ● High Temperature	Failed because of defective counters. Two of these units failed because of a low voltage breakdown on pin 16. The third unit failed because of wrong state initialization
1 ● High Temperature	Failed originally at high temperature but the failure would not repeat. This unit may have failed originally due to poor contact with the test equipment.
2 ● Low Temperature	Failed due to defective counters. Both counters drew excessively high current.
1 ● Low Temperature	Failed due to an open winding on the converter transformer and it also had a defective counter. The counter drew excessively high current.
3 ● Mechanical Shock	Failed due to defective oscillators. The oscillators failed due to broken internal lead wires or lead wire bonds.

NUMBER AND ENVIRONMENT OF FAILURES		CAUSE OF FAILURES
2	2 ● Mechanical Shock	Failed due to defective counters. The defective counters drew excessively high current.

Failure and action reports covering these failures are included in Appendix G.

MODIFIED XM587 - SINGLE BOARD VERSION - FAILURE ANALYSIS

Failure Analysis of "E" Head Subassembly Test Failures

The following information summarizes the results of failure analysis conducted on 12 Printed Wiring Board Assemblies (P/N 28116045) from the production build of 300. The assemblies failed for the following reasons:

Counter (P/N 11711721) failures	4
Interface (P/N 11726909) failures	4
Workmanship (solder short)	1
Impact Switch (P/N 11718418) failures	2
Oscillator (P/N 11726813)	1

Counter (P/N 11711721) Failures - - All 4 units failed due to defective drive lines (pin 16) of Counter (P/N 11711721). These drive lines exhibited low resistance conditions. The low resistance readings on these 4 units were: 250 ohms, 700 ohms, 250 ohms and 14000 ohms.

Interface (P/N 11726909) Failures - - Two interface units failed because of defective initializing circuits. The initializing circuits (pin 5 of the interface unit) functioned without delay.

One unit failed due to a defective Q10 circuit, (reference interface area of 11711401). The Q10 transistor would not pass signals.

One unit failed due to a lack of memory polarization pulses from pin 12.

Impact Switch (P/N 11718418) Failures - - Two units failed due to defective impact switches. The impact switches exhibited a low resistance condition which partially turned on the interface firing circuit and prevented charging of the firing capacitor. This condition, which is similar to problems experienced in the lot 2 build, was caused by either contamination or some physical damage to the switch. Because the failure disappeared when the impact switch was removed from the subassembly, no further failure analysis was conducted.

Oscillator (P/N 11726813) Failure Analysis - - One printed wiring board assembly failed due to a slow starting oscillator. The defective oscillator required 10-15 milliseconds to start.

FAILURE ANALYSIS OF ACCEPTANCE TEST FAILURES

Failure Analysis of "E" Head Acceptance Test Failures

Two Electronics and Nose Cone Assemblies (P/N 28116149) failed during acceptance testing. These units failed due to defective impact switches.

FAILURE ANALYSIS OF FINAL INSPECTION FAILURE

One fuze failed the final set/interrogate test after the "E" head was crimped to the rear fitting. This unit failed because of a defective initializing circuit in th Interface Unit (P/N 11726909).

FAILURE ANALYSIS OF EVALUATION TEST FAILURE

One electronics and nose cone assembly failed during the low temperature evaluation test due to a defective solder joint on one of the converter diodes. The converter (then operating as a single wave rectifier) could not provide enough power for low temperature operation.

8. PRODUCIBILITY IMPROVEMENT RECOMMENDATION

Honeywell recommends that two types of changes be considered for improving the overall producibility of the XM587E2/XM724 DT/OT II Fuze. The first type of producibility improvement recommendation covers dimensional or assembly changes that would not require additional developmental work prior to incorporation of the change. The second type of producibility improvement change would require prior developmental work.

CHANGES NOT REQUIRING DEVELOPMENTAL WORK

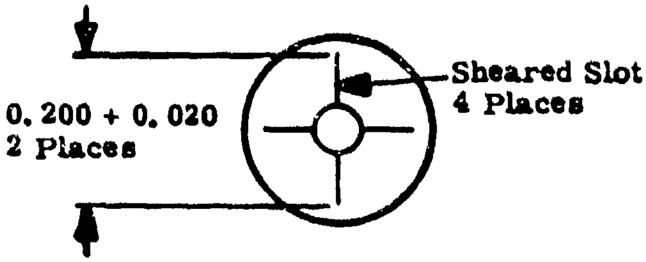
The following changes are recommended to simplify piece part fabrication or assembly of the XM587E2/XM724 Fuzes. These changes do not affect the essential design of the piece parts or assemblies nor do these recommendations add components that have not been shock qualified to the environmental levels of the XM587E2 Fuze.

Part or Assembly No.	Description	Recommended Change
11711404	Capacitor	Change from Sprague Type 196D to Kemet T322 or Sprague Type 158D to allow automatic insertion of capacitors. Coordinate with 11711411/11711412 changes.
11711408	Nose Cone	Change $0.060^{+0.000}_{-0.010}$ thickness to $0.060^{+0.000}_{-0.015}$ to allow adequate tolerance for boring and turning operation.
11711409	Electronics Cover	Create breakpoints or grooves in the potting fill tubes so tubes can be broken off after potting instead of milling them off. This would save time and prevent contamination.

Part or Assembly No.	Description	Recommended Change
11711411 and 11711412	Printed Circuit Boards	Layout board for automatic insertion of components.
11711413 and 11711414	Printed Wiring Board Assemblies	Change soldering note to allow flow soldering using Picatinny Arsenal Drawing No. 9287147 as a guide.
11711416	Setting Rings	Change material callout to "Half Hard Temper" instead of "Full Hard". Part cannot be drawn from "Full Hard" material. Add an alternate material: "Oxygen free copper alloy 102" to permit an alternate manufacturing process.
11711417	Contact Pad	Change $0.025^{+0.000}_{-0.005}$ to 0.025 ± 0.005, and $0.082^{+0.000}_{-0.002}$ to $0.082^{+0.005}_{-0.005}$, and 0.003 max R to 0.005 max R, to dimension part for cold heading.
11711428	Electronics Assembly	Change contact pad staking tolerance from 0.020 minimum to 0.010 minimum. Change contact pad and coil contact trim dimension from 0.180 - 0.040 (Zone E1) to 0.050 maximum, and dimension from surface of Printed Circuit Board similar to lead frame trim note in Zone E4. Change note 5 to read: "Trim contact pad and coil contact tang ends to dimension shown after soldering - 5 places" - to establish practical limits on assembly process.

Part or Assembly No.	Description	Recommended Change
11711430	Electronics and Nose Cone Assembly	On sheet 27, remove existing note 5 and incorporate a new note that requires functional compatibility with fuze setter/adapter gage (H 11711433 - G1). Remove Note 11 and reference to it. Change note 4c to read "After final cure, trim or break excess material so that epoxy and plastic tubes are flush to 0. 250 inch below surface "Y". Printed circuit cards must be covered with potting" - to allow breaking off of excess material.
11718418	Impact Switch	Add solderability plating requirement on leads. Add maximum stand-off dimension on the weld flash where the lead is welded to the cover on P/N 11718489. Stand off dimension should be 0. 055 inch to allow adequate seating of the impact switch on washer (NAS 549-3) in Assembly No. 11711413.
118234	Clip, Detonator	Change 0. 088 - 0. 010 to 0. 090 - 0. 020 to improve producibility.
11730206	Cup Booster	Add alternate material: alloy 2024- T 351 (per ASTM B211) - to permit use of a more readily available material.

Part or Assembly No.	Description	Recommended Change
11720214	Ground Pin Clip	Change 0.200 + 0.003 to 0.200 + 0.005, 0.020 ± 0.002 to 0.020 + 0.008, and 0.070 + 0.003 to 0.068 + 0.005 $\boxed{\oplus \mid A.005}$. Make 0.310 - 0.005 diameter datum $\boxed{A}$. Add alternate construction view as shown below. - to improve producibility of part.



Part or Assembly No.	Description	Recommended Change
11720253	Test Vehicle Assembly	Eliminate this assembly which is used only for FAAS vibration testing. Use a vibration fixture instead.
11720298	Block, Detonator	Eliminate 0.062 + 0.005 dimension and re-dimension the bottom of the 0.322 + 0.005 counterbore from the opposite side of the part. The new dimension to be 0.173 - 0.010 - to make the part more producible and aid assembly.
11720301	S&A Module Subassembly	Eliminate lower right hand module pin (view AA) to reduce the number of module pins used from 4 to 3. Four pins are not needed.

Part or Assembly No.	Description	Recommended Change
11720303	Upper Gear Plate	Eliminate the 0.060 + 0.005 diameter $\boxed{\oplus \mid A \mid B.003}$ diameter hole. This hole is not used except for FAAS. Hole can be specially drilled in test sample. Change note 4 to read: "... die breakage not to exceed 0.020 inch" - to improve producibility of part.
11722622	Sleeve	Change $0.195^{+0.010}_{-0.000}$ diameter to $0.185^{+0.020}_{-0.000}$ diameter. Change $1.66^{+0.00}_{-0.01}$ diameter to $1.66^{+0.00}_{-0.02}$ diameter. Change $1.87^{+0.00}_{-0.01}$ diameter to $1.87^{+0.00}_{-0.02}$ diameter. Change $0.020^{+0.010}_{-0.000}$ X $\boxed{45°}$ to $0.020^{+0.020}_{-0.000}$ X $\boxed{45°}$. Change $0.04^{+0.00}_{-0.02}$ R to $0.060^{+0.00}_{-0.04}$ R. Change $0.020^{+0.000}_{-0.010}$ R to 0.020 Max R. Change $0.617^{+0.000}_{-0.010}$ to $0.617^{+0.000}_{-0.015}$. To improve the producibility of the sleeve by increasing the tolerances on non-functional dimensions.

CHANGES REQUIRING DEVELOPMENTAL WORK

The following changes are recommended for inclusion in future developmental efforts on the XM587E2/XM724 Fuze. These changes will significantly improve the producibility of the fuze and reduce its cost. In addition, the changes on the transformer (P/N 11711448) will improve the environmental resistance of the fuze.

Part or Assembly No.	Description	Recommended Change
11711408	Nose Cone	Reduce depth of 1.862 diameter Counter bore from 0.785 $^{+0.010}_{-0.000}$ to 0.450 $^{+0.010}_{-0.000}$. Coordinate with orientation cup change.
11711409	Electronics Cover	Relocate hole for coil contact in center of 0.196 +0.005 diameter counter bore to facilitate automatic insertion. Coordinate with P/N-11711418 changes.
11711410	Orientation Cup	Eliminate walls of cup so that the resulting "orientation plate" can be made by a punch press operation. Coordinate with nose cone change, to reduce cost of fuze.
11711418	Coil Contact	Relocate 0.63 $^{+0.00}_{-0.03}$ long lead on axis of part (center of coils) to facilitate automatic insertion.
11711448	Transformer, Encapsulated	Redesign transformer to use smaller core, to eliminate nylon screw, and to eliminate potting problems associated with separate mold - to improve environmental resistance and producibility

9. DOCUMENTATION

The following documentation was provided during this program:

- Process manuals
- Technical data package on oscillator and interface units
- Technical data package on modified XM587 - single board unit.

PROCESS MANUALS

Volume 1, "Electronics and Nose Cone Assembly and Final Fuze Assembly" was updated to describe the manufacturing process for the electronics and nose cone assemblies and the final assembly of DT/OT II XM587E2/XM724 Fuzes. The latest revision (Revision B) includes general information about the electronics section and fuze final assembly and descriptions of the manufacturing process and quality assurance system. This revision also includes information on long lead time item problems and production problems experienced during the fabrication of the electronics assemblies and final assembly.

Volume 2, "Rear Fitting", describes the manufacturing process for the S&A mechanism and the rear fitting assembly used in the XM587E2/XM724 Fuzes. This new manual includes general information about the rear fitting assembly, the S&A, and a description of the manufacturing process. It also includes a critique of problems encountered in the fabrication of the S&A and rear fitting assemblies.

Volume 3A, "XM587 Oscillator Hybrid Microcircuit" describes the manufacturing process for the hybrid oscillator. This new manual includes general product information, specifications and parts lists, a manufacturing process description, process specifications, drawings, and pre-cap visual inspection specifications for the hybrid oscillator.

Volume 3B, "XM587 Interface Hybrid Microcircuit" describes the manufacturing process for the XM587 Interface Unit. This new manual includes general product information, specifications and parts lists, a manufacturing process description, process specifications, drawings and pre-cap visual inspection specifications for the hybrid unit.

TECHNICAL DATA PACKAGE FOR XM587/XM724 PRECISION OSCILLATOR AND INTERFACE HYBRID UNITS

The drawing package for the Interface (P/N 10990455) and Oscillator (P/N 11711427) Hybrid Microcircuits was upgraded to meet the requirements of MIL-STD-100. The drawing package consists of the thirty-four drawings listed below.

Drawing No.	Description
11711633	Thin Film Resistor Array, RA1
11711634	Thin Film Resistor Array, RA2
11711635	Oscillator Hybrid Subassembly
11711636	Precision Oscillator Schematic
11711637	Semiconductor Chip Specification
11711638	Substrate, Ceramic
11711639	Chip, Diode
11711640	Chip, Zener Diode
11711641	Chip, Zener Diode
11711642	Chip, Transistor
11711643	Chip, Transistor
11711644	Chip, Transistor
11711645	Chip, Transistor
11711646	Capacitor
11711647	Chip, Zener Diode
11711648	Terminal
11711649	Cover
11711650	Header

Drawing No.	Description
11711681	Capacitor
11711682	Capacitor
11711683	Capacitor
11711684	Substrate, Ceramic
11711685	Substrate, Silicon
11711614	Network Thick Film Interface Hybrid
11711615	Substrate
11711616	Signal Conditioning Circuits Schematic
11711617	Interface Hybrid Assembly
10990455	Interface Hybrid Encapsulated
11711619	Internal Visual Requirements for Hybrid Microcircuits for Shock Application
11711620	Networks, Thick Film, Visual Requirements for
11711621	Semiconductor Chip Specification, Hybrid Interface
11711427	Precision Oscillator, Hybrid
11711623	Substrate
11711624	Network, Thick Film

Copies of the upgraded drawings for the oscillator and the interface hybrid units are included in Appendix H.

TECHNICAL DATA PACKAGE FOR MODIFIED XM587E2 FUZE - SINGLE PRINTED CIRCUIT BOARD UNIT

The drawing package for the modified XM587E2 Fuze was prepared to the requirements of Level 1 of MIL-D-1000. The drawing package consists of only piece parts and assembly drawings unique to the modified fuze. The drawing package consists of the following drawings:

Drawing No.	Description
28115968	Sleeve, Impact Switch
28115969	Mounting Board, Bobbin Assembly
28115970	Bobbin Assembly
28115971	Transformer, Encapsulated
28116044	Printed Wiring Board, XM587 (3 sheets)
28116045	Printed Wiring Board Assembly, XM587
28116051	Key
28116052	Interconnection Diagram, Printed Wiring Board XM587
28116147	Fuze, ET: XM587E2 (Less Booster Pellet and Cup)
28116148	Fuze, ET: XM587E2 (Single Board Assembly
28116149	Electronics and Nose Cone Assembly/Single Printed Circuit Board
28116150	Electronics Assembly with single Printed Circuit Board

Copies of these drawings are included in this report as Appendix K.

V. CONCLUSIONS

The fabrication experience, inspection results, and test data taken during this program support the following conclusions regarding the XM587E2/XM724 Fuze and its components.

Item	
1	The DT/OT II hybrid oscillator is capable of meeting the oscillator first article and LAT.
2	The DT/OT II hybrid interface unit is capable of meeting the first article and LAT.
3	The S&A mechanism is capable of meeting first article and LAT.
4	The rear fitting assembly is capable of meeting first article and LAT.
5	The DT/OT II Electronics and Nose Cone Assemblies ("E" Heads) did not pass LAT due to problems with the hybrid oscillator, the MNOS counter, and the impact switch. There were excessive "E" Head failure because of oscillator failures during "E" Head LAT. The bond wire system of the oscillator did not withstand shock levels of 30,000 shock tests. There were excessive "E" Head failures because of MNOS counter failures during "E" Head LAT. The counter did not withstand high temperatures, low temperatures, and 30,000 G shock tests. There were excessive "E" Head failures because of impact switch failures during "E" Head LAT. The impact switch did not operate reliably at 475 G's. NOTE: Field test results indicate that the 30,000 G shock test requirement may be too stringent a requirement in light of the above listed "E" Head failures.
6	There are many producibility changes that can be made without specific development effort and which will significantly improve the producibility of the XM587E2/XM724 Fuze.

Item

7 The TAB HMO will meet the low unit product cost objective.

8 The electronics of the XM587E2 Fuze, incorporating the improved oscillator, interface and counter integrated circuits can be assembled on a single printed circuit card.

9 The single printed circuit board or modified XM587 is less vulnerable to ESD damage than is the DT/OT II version.

APPENDIX A

HDL ENGINEERING RELEASE RECORD

NO. 58701000

DESIGN BASELINE FOR THE XM587E2 FUZE

ENGINEERING RELEASE RECORD

1. ERR NO.	2. DATE	3. SHEET OF SHEETS
58701000	1 Feb 1977	1 of 5

4. DEVELOPMENT BASELINE ESTABLISHED OR CHANGED

[X] ~~FUNCTIONAL~~ [ ] ALLOCATED [ ] PRODUCT

5. TYPE OF RELEASE

[X] INITIAL [ ] CHANGE

6. ECP NO ________

DATE APPROVED ________

7. FUNCTIONAL ASSEMBLY NOMENCLATURE

8. SYSTEM/OR CONFIGURATION ITEM NOMENCLATURE

FUZE, ET: XM587E2

9. REMARKS/MISCELLANEOUS

10. DATA RELEASED OR REVISED

a CODE ID	DOCUMENT b TYPE	c NUMBER	d SH	NO. OF SHEETS	REVISION e LTR	f DATE	RELEASE IR	NAR	CHANGE CH	CAN	OTHER
19203	F	8864492	-	3	AC	8-25-75		X			
19202	B	10974339	-	1			X				
19202	B	10974351	-	1			X				
19202	B	10974352	-	1			X				
19202	SCD	10990455	-	26	G	12-30-76	X				
19202	SCD	10990466	-	23	J	1-27-77	X				
19202	B	11707713	-	1			X				
19202	B	11707728	-	1			X				
19202	C	11711234	-	1	D	1-5-76	X				
19202	C	11711240	-	1	A	12-17-74	X				
19202	C	11711242	-	1	C	1-5-76	X				
19202	SCD	11711256	-	19	C	1-27-77	X				
19202	B	11711274	-	1	-		X				
19202	B	11711275	-	1	-		X				
19202	B	11711276	-	1	-		X				
19202	F	11711283	-	1	A	7-7-75	X				
19202	F	11711401	-	2	L	1- -77	X				
19202	C	11711402	-	1	G	10-1-75	X				
19202	SCD	11711404	-	6	C	9-25-75	X				
19202	C	11711405	-	1	G	9-23-75	X				
19202	C	11711406	-	1	D	1-6-75	X				
19202	D	11711407	-	1	G	10-17-75	X				
19202	D	11711408	-	1	F	7-11-75	X				
19202	D	11711409	-	1	F	1-7-76	X				
19202	D	11711410	-	1	E	12-23-76	X				

11 SUBMITTED BY DATE

12 APPROVED BY

Norman Doctor 14 FEB 77

AMC Form 1724R
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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
58701000	1 Feb 1977	2 of 5

a. CODE ID	DOCUMENT				REVISION		h. RELEASE		i. CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d. SH. NO.	e. NO. OF SHEETS	f. LTR	g. DATE	IN	MAR	CH	CAN	
19202	D	11711411	-	2	D	8-7-75	X				
19202	D	11711412	-	3	E	8-11-75	X				
19202	D	11711413	-	1	E	9-23-75	X				
19202	D	11711414	-	1	F	10-16-75	X				
19202	C	11711416	-	1	D	9-23-75	X				
19202	B	11711417	-	1	D	10-16-75	X				
19202	C	11711418	-	1	C	7-21-75	X				
19202	D	11711419	-	1	C	7-14-75	X				
19202	C	11711420	-	1	B	7-11-75	X				
19202	B	11711421	-	1	B	11-14-74	X				
19202	C	11711422	-	1	B	8-25-75	X				
19202	C	11711423	-	1	C	7-11-75	X				
19202	D	11711424	-	1	E	7-21-75	X				
19202	D	11711425	-	1	E	10-16-75	X				
19202	SCD	11711427	-	22	G	1-4-77	X				
19202	F	11711428	-	1	K	12-23-76	X				
19202	SCD	11711429	-	6	B	7-14-75	X				
19202	SCD	11711430	-	27	S	1-20-77	X				
19202	SCD	11711431	-	6	B	7-14-75	X				
19202	SCD	11711432	-	13	B	7-14-75	X				
19202	F	11711433	-	1	K	12-8-76	X				
19202	IL	11711435	-	1	A	1-19-76	X				
19202	DL	11711435	-	8	C	1-19-76	X				
19202	PL	11711435	-	4	C	1-19-76	X				
19202	F	11711435	-	1	C	12-8-76	X				
19202	B	11711444	-	1	B	12-10-74	X				
19202	SCD	11711445	-	1	-		X				
19202	C	11711446	-	1	-		X				
19202	B	11711447	-	1	-		X				
19202	D	11711448	-	1	A	10-7-75	X				
19202	C	11711449	-	1	A	10-7-75	X				
19202	C	11711450	-	1	-		X				
19202	C	11711451	-	1	-		X				
19202	B	11711723	-	1	-		X				
19202	B	11711724	-	1	-		X				
19202	C	11711725	-	1	-		X				
19202	D	11711726	-	1	-		X				
19202	D	11711727	-	1	-		X				
19202	C	11711728	-	1	-		X				
19202	C	11718234	-	1	A	12-18-70		X			
19202	SCD	11718418	-	15	-			X			
19202	IL	11718418	-	1	-			X			
19202	DL	11718418	-	2	-			X			
19202	PL	11718418	-	1	-			X			
19202	B	11718490	-	1	B	9-20-73		X			
19202	C	11720206	-	1			X				
19202	B	11720213	-	1			X				
19202	B	11720214	-	1	A	11-25-74	X				
19202	SCD	11720216	-	26	G	1-4-77	X				
19202	IL	11720216	-	1	A	7-8-74	X				

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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
587D1000	1 Feb 1977	3 of 5

a. CODE ID	b. TYPE	c. NUMBER	d. SH	e. OF SHEETS	f. LTR	g. DATE	h. RELEASE IR	MAR	i. CHANGE CH	CAN	j. OTHER
19202	PL	11720216	-	3	C	11-22-76	X				
19202	DL	11720216	-	3	C	11-22-76	X				
19202	C	11720218	-	1	B	8-5-76	X				
19202	C	11720219	-	1	C	11-5-76	X				
19202	C	11720220	-	1	D	1-27-77	X				
19202	D	11720221	-	1	F	8-5-76	X				
19202	C	11720222	-	1	D	1-4-77	X				
19202	C	11720224	-	1	D	8-5-76	X				
19202	B	11720225	-	1	C	8-5-76	X				
19202	B	11720226	-	1	B	8-5-76	X				
19202	B	11720227	-	1	C	1-4-77	X				
19202	C	11720228	-	1	E	11-5-76	X				
19202	C	11720229	-	1	D	11-5-76	X				
19202	C	11720230	-	1	B	8-5-76	X				
19202	B	11720232	-	1	A	8-5-76	X				
19202	C	11720233	-	1	G	1-4-77	X				
19202	C	11720234	-	1	D	1-4-77	X				
19202	C	11720235	-	1	E	8-5-76	X				
19202	C	11720236	-	1	D	12-8-76	X				
19202	C	11720237	-	1	D	12-8-76	X				
19202	C	11720240	-	1	-		X				
19202	D	11720247	-	1	A	9-19-73	X				
19202	IL	11720253	-	1	-		X				
19202	DL	11720253	-	2	A	6-6-75	X				
19202	PL	11720253	-	1			X				
19202	D	11720253	-	1	A	9-24-73	X				
19202	C	11720258	-	1	C	9-23-75	X				
19202	B	11720279	-	1	-		X				
19202	B	11720280	-	1	A	10-8-74	X				
19202	SCD	11720291	-	16	H	1-18-77	X				SH 16 IS F SIZE DWG
19202	IL	11720291	-	1	A	5-6-75	X				
19202	DL	11720291	-	3	A	5-14-75	X				
19202	PL	11720291	-	2	-		X				
19202	C	11720292	-	1	A	8-10-76	X				
19202	B	11720293	-	1	-		X				
19202	B	11720294	-	1	-		X				
19202	B	11720295	-	1	A	6-5-75	X				
19202	D	11720296	-	1	D	12-4-75	X				
19202	D	11720297	-	1	-		X				
19202	D	11720298	-	1	-		X				
19202	C	11720299	-	1	-		X				
19202	SCD	11720300	-	23	D	12-30-76	X				SH 23 IS C SIZE DWG
19202	IL	11720300	-	1	-		X				
19202	PL	11720300	-	3	B	1-12-77	X				
19202	DL	11720300	-	4	C	12-23-76	X				
19202	F	11720301	-	1	A	12-23-76	X				
19202	C	11720302	-	1	A	9-25-73	X				
19202	D	11720303	-	1	E	9-23-75	X				
19202	C	11720304	-	1	-		X				

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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO.	DATE	SHEET OF SHEETS
58701000	1 Feb 1977	4 of 5

a. CODE ID	DOCUMENT				REVISION		RELEASE		CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d. No. of Sheets		e. LTR	f. DATE	IN	MAN	CH	CAN	
19202	D	11720305	-	1	B	1- -77	X				
19202	G	11720306	-	1	B	6-11-75	X				
19202	D	11720308	-	1	C	6-30-75	X				
19202	C	11720309	-	1	A	5-11-73	X				
19202	C	11720310	-	1	C	7-21-75	X				
19202	B	11720311	-	1	B	7-21-75	X				
19202	B	11720312	-	1	-		X				
19202	D	11720313	-	1	A	10-5-73	X				
19202	C	11720317	-	1	A	9-8-75	X				
19202	F	11720318	-	2	B	7-7-75	X				
19202	C	11720319	-	1	-		X				
19202	C	11720320	-	1	C	10-8-74	X				
19202	D	11720321	-	1	D	6-30-75	X				
19202	B	11720322	-	1	-		X				
19202	B	11720323	-	1	-		X				
19202	B	11720324	-	1	A	10-9-74	X				
19202	C	11720325	-	1	A	6-5-75	X				
19202	C	11730326	-	1	A	10-8-74	X				
19202	C	11720327	-	1	A	6-5-75	X				
19202	B	11720328	-	1	B	10-1-75	X				
19202	C	11720329	-	1	E	9-24-75	X				
19202	D	11720330	-	1	B	6-19-75	X				
19202	B	11720331	-	1	-		X				
19202	B	11720332	-	1	-		X				
19202	C	11720333	-	1	D	7-21-75	X				
19202	C	11720334	-	1	D	10-10-75	X				
19202	D	11720335	-	1	C	6-11-75	X				
19202	IL	11720342	-	1	-		X				
19202	DL	11720342	-	1	-		X				
19202	PL	11720342	-	2	-		X				
19202	F	11720342	-	1	A	12-23-76	X				
19202	D	11720344	-	1	-		X				
19202	C	11720346	-	1	-		X				
19202	C	11720347	-	1	B	2-23-76	X				
19202	C	11720348	-	1	A	7-21-75	X				
19202	B	11720349	-	1	A	7-17-75	X				
19202	B	11720350	-	1	A	7-17-75	X				
19202	C	11721241	-	1	E	8-15-76	X				
19202	C	11721262	-	1	D	8-5-76	X				
19202	C	11721265	-	1	C	12-9-76	X				
19202	B	11721271	-	1	B	8-5-76	X				
19202	B	11721272	-	1	A	8-5-76	X				
19202	D	11721280	-	2	C	8-5-76	X				
19202	A	11721263	-	1	C	11-5-76	X				
19202	C	11722405	-	19	A	3-21-75	X				
19202	D	11722620	-	1	A	10-9-74	X				
19202	B	11722621	-	1	-		X				
19202	D	11722622	-	1	F	12-22-76	X				
19202	B	11722623	-	1	A	7-16-75	X				
19202	B	11722624	-	1	A	7-19-75	X				

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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO.	DATE	SHEET OF SHEETS
58701000	1 Feb 1977	5 of 5

a. CODE ID	DOCUMENT				REVISION		h. RELEASE		i. CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d. [illegible]	e. [illegible]	f. LTR	g. DATE	IR	NAR	CN	CAN	
19202	B	11722625	-	1	B	2-23-76	X				
19202	B	11722626	-	1	B	2-23-76	X				
19202	B	11722627	-	1	A	7-16-75	X				
19202	B	11722628	-	1	B	2-23-76	X				
19202	C	11722629	-	1	A	2-23-76	X				
19202	B	11722630	-	1	-		X				
19202	D	11722631	-	1	A	2-23-76	X				
19202	D	11722632	-	1	B	2-23-76	X				
19202	D	11722633	-	2	-		X				
19202	F	11722634	-	2	-		X				
19202	C	11726805	-	1	-		X				
19202	C	11728234	-	1	-		X				

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APPENDIX B

HDL ENGINEERING RELEASE RECORD

NO. 72401000

DESIGN BASELINE FOR THE XM724 FUZE

ENGINEERING RELEASE RECORD

1. ERR NO. 72401000	2. DATE 1 Feb 1977	3. SHEET OF SHEETS 1 of 5

4. BASELINE ESTABLISHED OR CHANGED

[X] DEVELOPMENT [ ] ALLOCATED [ ] PRODUCT

5. TYPE OF RELEASE

[X] INITIAL [ ] CHANGE

6. ECP NO ______

DATE APPROVED ______

7. FUNCTIONAL ASSEMBLY NOMENCLATURE

8. SYSTEM/OR CONFIGURATION ITEM NOMENCLATURE

FUZE, ET: XM724

9. REMARKS/MISCELLANEOUS

10. DATA RELEASED OR REVISED

a. CODE ID	DOCUMENT b. TYPE	c. NUMBER	d.	NO. OF SHEETS	REVISION LTR	g. DATE	RELEASE IN	MAR	CHANGE CH	CAN	OTHER
19203	F	8864492	-	3	AC	8-25-75		X			
19202	B	10974339	-	1			X				
19202	B	10974351	-	1			X				
19202	B	10974352	-	1			X				
19202	SCD	10990455	-	26	G	12-30-76	X				
19202	SCD	10990466	-	23	J	1-27-77	X				
19202	B	11707713	-	1			X				
19202	B	11707728	-	1			X				
19202	C	11711234	-	1	D	1-5-76	X				
19202	C	11711240	-	1	A	12-17-74	X				
19202	C	11711242	-	1	C	1-5-76	X				
19202	SCD	11711256	-	19	C	1-27-77	X				
19202	IL	11711268	-	1	B	1-27-77	X				
19202	DL	11711268	-	7	C	1-27-77	X				
19202	PL	11711268	-	4	B	1-19-76	X				
19202	F	11711268	-	1	D	12-8-76	X				
19202	F	11711269	-	2	E	1-10-77	X				
19202	C	11711270	-	1	C	10-1-75	X				
19202	B	11711274	-	1	-		X				
19202	B	11711275	-	1	-		X				
19202	B	11711276	-	1	-		X				
19202	D	11711281	-	2	B	8-6-75	X				
19202	D	11711282	-	1	B	10-16-75	X				
19202	F	11711284	-	1	A	7-7-76	X				
19202	SCD	11711408	-	6	C	9-25-75	X				

11. SUBMITTED BY [illegible] DATE	12 APPROVED BY Norman Doctor 14 FEB 77

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26 Feb 1970

ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
72401000	1 Feb 1977	2 of 5

a. CODE ID	b. TYPE	c. NUMBER	d.	e. NO. OF SHEETS	f. LTR	g. DATE	h. RELEASE IR	NAR	i. CHANGE CN	CAN	j. OTHER
19202	C	11711405	-	1	G	9-23-75	X				
19202	C	11711406	-	1	D	1-6-75	X				
19202	D	11711407	-	1	G	10-17-75	X				
19202	D	11711408	-	1	F	7-11-75	X				
19202	D	11711409	-	1	F	1-7-76	X				
19202	D	11711410	-	1	E	12-23-76	X				
19202	D	11711412	-	3	E	8-11-75	X				
19202	D	11711413	-	1	F	9-23-75	X				
19202	C	11711416	-	1	D	9-23-75	X				
19202	B	11711417	-	1	D	10-16-75	X				
19202	C	11711418	-	1	C	7-21-75	X				
19202	D	11711419	-	1	C	7-14-75	X				
19202	C	11711420	-	1	B	7-11-75	X				
19202	B	11711421	-	1	B	11-14-74	X				
19202	C	11711422	-	1	B	8-25-75	X				
19202	C	11711423	-	1	C	7-11-75	X				
19202	D	11711424	-	1	E	7-21-75	X				
19202	D	11711425	-	1	E	10-16-75	X				
19202	SCD	11711427	-	22	G	1-4-77	X				
19202	F	11711428	-	1	K	12-23-76	X				
19202	SCD	11711429	-	6	B	7-14-75	X				
19202	SCD	11711430	-	27	S	1-20-77	X				
19202	SCD	11711431	-	6	B	7-14-75	X				
19202	SCD	11711432	-	13	B	7-14-75	X				
19202	B	11711444	-	1	B	12-10-74	X				
19202	SCD	11711445	-	1	-		X				
19202	C	11711446	-	1	-		X				
19202	B	11711447	-	1	-		X				
19202	D	11711448	-	1	A	10-7-75	X				
19202	C	11711449	-	1	A	10-1-75	X				
19202	C	11711450	-	1	-		X				
19202	C	11711451	-	1	-		X				
19202	B	11711723	-	1	-		X				
19202	B	11711724	-	1	-		X				
19202	C	11711725	-	1	-		X				
19202	D	11711726	-	1	-		X				
19202	D	11711727	-	1	-		X				
19202	C	11711728	-	1	-		X				
19202	C	11718234	-	1	A	12-18-70		X			
19202	SCD	11718418	-	15	-			X			
19202	IL	11718418	-	1	-			X			
19202	DL	11718418	-	2	-			X			
19202	PL	11718418	-	1	-			X			
19202	B	11718490	-	1	B	9-20-73		X			
19202	SCD	11720216	-	26	G	1-4-77	X				
19202	IL	11720216	-	1	A	7-8-74	X				
19202	DL	11720216	-	3	C	11-22-76	X				
19202	PL	11720216	-	3	C	11-22-76	X				
19202	C	11720218	-	1	B	8-5-76	X				
19202	C	11720219	-	1	C	11-5-76	X				

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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
72401000	3 Feb 1977	3 of 5

a. CODE ID	DOCUMENT: b. TYPE	c. NUMBER	d. NO. OF SHEETS		REVISION: f. LTR	g. DATE	h. RELEASED: NR	IND	i. CHANGED: CH	CLASS	j. OTHER
19202	C	11720220	-	1	D	1-27-77	X				
19202	D	11720221	-	1	E	8-5-76	X				
19202	C	11720222	-	1	D	1-4-77	X				
19202	C	11720224	-	1	D	8-5-76	X				
19202	B	11720225	-	1	C	8-5-76	X				
19202	B	11720226	-	1	B	8-5-76	X				
19202	B	11720227	-	1	C	1-4-77	X				
19202	C	11720228	-	1	E	11-5-76	X				
19202	C	11720229	-	1	D	11-5-76	X				
19202	C	11720230	-	1	B	8-5-76	X				
19202	B	11720232	-	1	A	8-5-76	X				
19202	C	11720233	-	1	G	1-4-77	X				
19202	C	11720234	-	1	D	1-4-77	X				
19202	C	11720235	-	1	E	8-5-76	X				
19202	C	11720236	-	1	D	12-8-76	X				
19202	C	11720237	-	1	D	12-8-76	X				
19202	C	11720240	-	1	-		X				
19202	D	11720247	-	1	A	9-19-73	X				
19202	IL	11720253	-	1	-		X				
19202	DL	11720253	-	2	A	6-6-75	X				
19202	PL	11720253	-	1			X				
19202	D	11720253	-	1	A	9-24-73	X				
19202	C	11720258	-	1	C	9-23-75	X				
19202	B	11720279	-	1	-		X				
19202	B	11720280	-	1	A	10-8-74	X				
19202	SCD	11720291	-	16	H	1-13-77	X				SH 16 IS F SIZE DWG
19202	IL	11720291	-	1	A	5-6-75	X				
19202	DL	11720291	-	3	A	5-14-75	X				
19202	PL	11720291	-	2	-		X				
19202	C	11720292	-	1	A	8-10-76	X				
19202	B	11720293	-	1	-		X				
19202	B	11720294	-	1	-		X				
19202	B	11720295	-	1	A	6-5-75	X				
19202	D	11720296	-	1	D	12-4-75	X				
19202	D	11720297	-	1	-		X				
19202	D	11720298	-	1	-		X				
19202	C	11720299	-	1	-		X				
19202	SCD	11720300	-	23	D	12-30-76	X				SH 23 IS C SIZE DWG
19202	IL	11720300	-	1	-		X				
19202	DL	11720300	-	4	C	12-23-76	X				
19202	PL	11720300	-	3	B	1-12-77	X				
19202	F	11720301	-	1	A	12-23-76	X				
19202	C	11720302	-	1	A	9-25-73	X				
19202	D	11720303	-	1	E	9-23-75	X				
19202	C	11720304	-	1	-		X				
19202	D	11720305	-	1	B	6-12-75	X				
19202	D	11720306	-	1	B	6-11-75	X				
19202	D	11720308	-	1	C	6-30-75	X				
19202	C	11720309	-	1	A	5-11-73	X				

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26 Feb 1970

ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
72401000	1 Feb 1977	4 of 5

a. CODE ID	DOCUMENT				REVISION		RELEASE		CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d.	e.	f. LTR	g. DATE	IR	MAR	CH	CAN	
19202	C	11720310	-	1	C	7-21-75	X				
19202	B	11720311	-	1	B	7-21-75	X				
19202	B	11720312	-	1	-		X				
19202	D	11720313	-	1	A	10-5-73	X				
19202	C	11720317	-	1	A	9-8-75	X				
19202	F	11720318	-	2	B	7-7-75	X				
19202	C	11720319	-	1	-		X				
19202	C	11720320	-	1	C	10-8-74	X				
19202	D	11720321	-	1	D	6-30-75	X				
19202	B	11720322	-	1	-		X				
19202	B	11720323	-	1	-		X				
19202	B	11720324	-	1	A	10-9-74	X				
19202	C	11720325	-	1	A	6-5-75	X				
19202	C	11720326	-	1	A	10-8-74	X				
19202	C	11720327	-	1	A	6-5-75	X				
19202	B	11720328	-	1	B	10-1-75	X				
19202	C	11720329	-	1	E	9-24-75	X				
19202	D	11720330	-	1	B	6-18-75	X				
19202	B	11720331	-	1	-		X				
19202	B	11720332	-	1	-		X				
19202	C	11720333	-	1	D	7-21-75	X				
19202	C	11720334	-	1	D	10-10-75	X				
19202	D	11720335	-	1	C	6-11-75	X				
19202	TL	11720342	-	1	-		X				
19202	DL	11720342	-	3	-		X				
19202	PL	11720342	-	2	-		X				
19202	F	11720342	-	1	A	12-23-76	X				
19202	D	11720344	-	1	-		X				
19202	C	11720346	-	1	-		X				
19202	C	11720347	-	1	B	2-23-76	X				
19202	C	11720348	-	1	A	7-21-75	X				
19202	B	11720349	-	1	A	7-17-75	X				
19202	B	11720350	-	1	A	7-17-75	X				
19202	C	11721241	-	1	E	8-15-76	X				
19202	C	11721262	-	1	D	8-5-76	X				
19202	C	11721265	-	1	C	12-9-76	X				
19202	B	11721271	-	1	B	8-5-76	X				
19202	B	11721272	-	1	A	8-5-76	X				
19202	D	11721280	-	2	C	8-5-76	X				
19202	B	11721283	-	1	C	11-5-76	X				
19202	C	11722405	-	19	A	3-21-75		X			
19202	D	11722620	-	1	A	10-9-74	X				
19202	B	11722621	-	1	-		X				
19202	D	11722622	-	1	F	12-23-76	X				
19202	B	11722623	-	1	A	7-16-75	X				
19202	B	11722624	-	1	A	7-19-75	X				
19202	B	11722625	-	1	B	2-23-76	X				
19202	B	11722626	-	1	B	2-23-76	X				
19202	B	11722627	-	1	A	7-16-75	X				
19202	B	11722628	-	1	B	2-23-76	X				

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ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ERR NO	DATE	SHEET OF SHEETS
72401000	1 Feb 1977	5 of 5

a. CODE ID	DOCUMENT				REVISION		h. RELEASE		i. CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d. SH OF SHEETS e.		f. LTR	g. DATE	IR	NAR	CH	CAN	
19202	C	11722629	-	1	A	2-23-76	X				
19202	B	11722630	-	1	-		X				
19202	D	11722631	-	1	A	2-23-76	X				
19202	D	11722632	-	1	B	2-23-76	X				
19202	D	11722633	-	2	-		X				
19202	F	11722634	-	2	-		X				
19202	C	11726805	-	1	-		X				
19202	C	11728234	-	1	-		X				

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26 Feb 1970

APPENDIX C

HDL ENGINEERING RELEASE RECORD

NO. 74401000

DESIGN BASELINE FOR THE XM744 TRAINING FUZE

ENGINEERING RELEASE RECORD

1. ERR NO.	2. DATE	3. SHEET OF SHEETS
7M4D1000	13 OCTOBER 1977	1 OF 2

4. BASELINE ESTABLISHED OR CHANGED: [X] FUNCTIONAL (DEVELOPMENT) [ ] ALLOCATED [ ] PRODUCT

5. TYPE OF RELEASE: [X] INITIAL [ ] CHANGE

6. ECP NO 744-DAE-001
DATE APPROVED 21 OCT 77

7. FUNCTIONAL ASSEMBLY NOMENCLATURE

8. SYSTEM/OR CONFIGURATION ITEM NOMENCLATURE
FUZE, TRAINING, ET: XM744

9. REMARKS/MISCELLANEOUS

10. DATA RELEASED OR REVISED

a. CODE ID	DOCUMENT b. TYPE	c. NUMBER	d.	e.	REVISION f. LTR	g. DATE	IG	HAR	CH	CAN	i. OTHER
19204	F	9264472	-	5	AC	3-5-75		X			
19203	KA	12992455	-	1				X			
19203	SCD	12919955	-	16	J	7-1-77		X			
19203	SCD	12919944	-	23	K	7-1-77		X			
19203	B	11727376	-	1	E	5-19-75		X			
19203	C	11711234	-	1	D	1-5-76		X			
19203	C	11711242	-	1	B	7-1-77		X			
19203	C	11711343	-	1	C	1-5-76		X			
19203	SCD	11711256	-	19	E	7-1-77		X			
19203	B	11711274	-	1				X			
19203	B	11711275	-	1				X			
19203	B	11711276	-	1				X			
19203	D	11711402	-	1	J	8-5-77		X			
19203	SCD	11711469	-	6	E	9-15-75		X			
19203	C	11711905	-	1	H	6-29-77		X			
19203	C	11711906	-	1	E	6-29-77		X			
19203	F	11711907	-	1	J	4-13-77		X			
19203	EA	11711908	-	1				X			
19203	F	11711908	-	1	J	6-29-77		X			
19203	F	11711909	-	1	H	7-1-77		X			
19204	D	11711910	-	1	G	6-15-77		X			
19203	D	11711911	-	2	H	4-13-77		X			
19203	D	11711912	-	3	H	4-13-77		X			
19203	EB	11711913	-	1	B	6-15-77		X			
19203	JL	11711913	-	1	H	6-29-77		X			

11. SUBMITTED BY
William [illegible]

12. APPROVED BY
Norman Dates 10/20/77

AMC Form 1724R
26 Feb 1970

ENGINEERING RELEASE RECORD

CONTINUATION SHEET

ENR NO.	DATE	SHEET OF SHEETS
744D1000	13 OCTOBER 1977	2 OF 2

a. CODE ID	DOCUMENT				REVISION		RELEASE		CHANGE		j. OTHER
	b. TYPE	c. NUMBER	d. SH NO	e. NO OF SHEETS	f. LTR	g. DATE	h. IN	NAR	CH	CAN	
19202	EA	11711914	–	1	B	6-21-77		X			
19202	D	11711914	–	1	H	6-21-77		X			
19202	C	11711916	–	1	R	6-29-77		X			
19202	E	11711917	–	1	U	10-16-75		X			
19202	C	11711918	–	1	E	8-11-77		X			
19202	D	11711919	–	1	C	7-19-75		X			
19202	C	11711920	–	1	B	7-11-75		X			
19202	B	11711921	–	1	B	11-9-74		X			
19202	C	11711922	–	1	C	6-29-77		X			
19202	C	11711923	–	1	C	7-11-75		X			
19202	D	11711924	–	1	F	8-10-77		X			
19202	D	11711925	–	1	T	7-1-77		X			
19202	EA	11711927	–	1	A	6-29-77		X			
19202	ED	11711927	–	22	J	6-16-77		X			
19202	F	11711928	–	1	N	6-29-77		X			
19202	ED	11711929	–	6	B	7-19-75		X			
19202	EA	11711930		1	A	6-29-77		X			
19202	ED	11711930	–	27	Y	8-12-77		X			
19202	CU	11711930	–	1	B	6-29-77		X			
19202	EL	11711930	–	1	B	6-29-77		X			
19202	ED	11711931	–	6	D	7-14-75		X			
19202	ED	11711932	–	13	A	7-14-75		X			
19202	B	11711944	–	1	C	7-1-77		X			
19202	B	11711945	–	1				X			
19202	C	11711946	–	1	A	6-29-77		X			
19202	B	11711947	–	1				X			
19202	D	11711948	–	1	B	6-29-77		X			
19202	C	11711949	–	1	B	7-1-77		X			
19202	C	11711950	–	1	A	7-1-77		X			
19202	C	11711951	–	1	B	8-12-77		X			
19202	ED	11718918	–	15	B	8-29-77		X			
19202	IL	11718918	–	1				X			
19202	DL	11718918	–	2				X			
19202	PL	11718918	–	1				X			
19202	EA	11718918	–	1				X			
19202	EU	11718918	–	1				X			
19202	EL	11718918	–	1				X			
19202	C	11722024	–	1	C	7-27-77		X			
19202	B	11722018	–	1	B	6-10-77		X			
19202	IL	11724906	–	1			X				
19202	PL	11724906	–	4			X				
19202	DL	11724906	–	8			X				
19202	F	11724906	–	1			X				
19202	F	11724907	–	1			X				
19202	F	11724908	–	1			X				
19202	D	11724909	–	1			X				
19202	C	11724910	–	1			X				
19202	F	11724911	–	1			X				
19202	C	11724911	–	1			X				

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26 Feb 1970

APPENDIX D

"AS BUILT" CONFIGURATION

OF THE

DESIGN EVALUATION GROUP LOT

AND

LOT 1

XM587E2 AND XM724 FUZES

DEG & LOT #1 "E" HEADS

'As Built' List Of Each Piece Part Used In The Build Of The DEG & Lot #1 E-Heads Transferred From Contract DAAG39-75-C-0157 To DAAG39-77-C-0056

P/N	Part Name	Revision Letter
10990466	NMOS Counter, Memory	G+01
11711234	Diode, Zener	C
11711240	Capacitor, Ceramic	A
11711242	Diode, Zener	B
11711256	MOS Scaler/Logic and O/H	A+01
11711281	PW Board #2	B
11711282	PW Board #2 ASM	B
11711404-1	Capacitor, Tantalum	C
11711404-2	Capacitor, Tantalum	C
11711405	Resistor, Composition	G
11711406	Diode	C
11711407	Nose Plug Electronics	G
11711408	Cone, Nose	F
11711409	Cover, Electronics	E
11711410	Cup, Orientation	D
11711411	Printed Wiring Board #2	D
11711412	PWB No. 1	E
11711416-1	Ring, Setting	D
11711416-2	Ring, Setting	D
11711417-1	Pad, Contact	D
11711417-2	Pad, Contact	D
11711418	Contact Coil	C
11711419	Strip, Lead Frame	C
11711420 .	Bobbin Assembly	B
11711421	Wire, Core	B

P/N	Part Name	Revision Letter
11711422	Bobbin, Core	B
11711423	Core, Coil	C
11711424	Transistor, High Current NPN	E
11711425	Setting Ring & Plug Assembly	E
11711427	Precision Oscillator, Hybrid	E+01
11711429	Base Mixture, Epoxy Resin	B
11711431	Hardener, Aromatic Amine	B
11711444	Washer, Connector	B
11711445	Potting Compound	-
11711446	Mounting Board, Bobbin Assembly	-
11711447	Post, Mounting Board	-
11711448	Transformer, Encapsulated	A
11711449	Ring, Brazing	A
11711450-1	Ring, Setting Assembly	-
11711450-2	Ring, Setting Assembly	-
11711610	Interface Hybrid	D
11711451	Wire, Contact	-
11718418	Impact Switch	-
NAS-549-3	Washer, Nonmet. - Insul., Elect.	-
MS9386-XX	'O'Ring	-

DEG & LOT #1 REAR FITTINGS

"As Built" list of piece parts used in the build of the DEG & Lot #1 Rear Fitting Assemblies on Contract DAAG39-77-C-0066.

Part #	Part Name	Revision Letter
MS27183-4	Flat Washer	-
MS51923-138	Spring Pin	C
11718234	Detonator Clip	A
11720206	Booster Grip	B
11720214	Ground Pin Clip	A
11720216	Power Supply	G
11720258	Output Lead Assy.	C
11720296-1	Bias Spring	D
11720296-2	Bias Spring	D
11720297	Detonator Contact	-
11720298	Detonator Block	-
11720299	Det. Cont. Insulator	A
11722405	Elec. Detonator	A
11722622	Sleeve	K
11711478	Det. Block Plug	A
11726804	Firing Assy. Lead	B

"As Built" list of Pierce Parts used in the build of the DEG & Lot #1 S & A Modules on Contract DAAG39-77-C-0056

P/N	Part Name	Revision Letter
11711728	Gear & Pinion #1	-
11720302	S&A Module Can	A
11720303	Upper Gear Plate	E
11720304	Module Pin	-
11720306	Rotor Body	B
11720308	Escape Wheel & Pinion Assy.	C
11720309	Pallet	A
11720310	Lead Cup Assy	C
11720317	S/B Pin Disc	A
11720318	Gear Plate Spacer	B
11720320	Pallet Shaft	C
11720321	Lower Gear Plate	D
11720322	Spinlock Shaft	-
11720323	Lock Pin Disc	-
11720324	Rotor Lock Pin	A
11720325	Lock Pin Spring	A
11720327	Spinlock Spring	A
11720328	Spinlock	B
11720329	Rotor Shaft	E
11720330	Rotor Gear	B
11720333	Setback Pin	D
11720334	S/B Pin Spring	D
11720335	Bottom Plate	C

DEG & LOT #1 HYBRIDS

"As Built" list of piece parts and assembly drawings used in the build of DEG & Lot #1 Interface Hybrids and Precision Oscillators on Contract DAAG39-77-C-0056.

Part #	Drawing Description	Revision Letter
10990455	Interface Hybrid Circuit	D
11707396	Foam Potting Compound	-
11711427	Precision Oscillator	E+01
11711605	Thickfilm Network	C+01
11711606	Substrate	-
11711607	Interface Hybrid Schematic	A+01
11711608	Interface Hybrid Assembly	E+-2
11711610	Encapsulated Interface Hybrid	D+01
11711611	Microcircuit Visual Requirements	A
11711612	Thickfilm Visual Requirements	A
11711613	Semiconductor Chip Specification	-
11711625	Precision Oscillator	D+01
11711626	Substrate	A
11711627	Thickfilm Network	B
11711628	Thinfilm Resistor Array #1	B+01
11711629	Thinfilm Resistor Array #2	B+02
11711630	Precision Oscillator Assembly	D+03
11711631	Precision Oscillator Schematic	A+03
11711632	Semiconductor Chip Specification	-

APPENDIX E

"AS BUILT" CONFIGURATION

OF LOT 2

XM587E2 AND XM724 FUZES

LOT #2 "E" HEADS AND FINAL FUZE

"As Built" list of assemblies and piece parts used in the build of Lot #2 E-Heads on contract DAAG39-77-C-0056.

Part Number	Part Name	Revision Letter
10990455	Interface Hybrid	H
10990466	MNOS Counter, Memory	J
11711234	Diode, Zener	D
11711240	Capacitor, Ceramic	A
11711242	Diode, Zener	C
11711256	MOA Scaler/Logic and O/H	D
11711268	Fuze, ET, XM724	H
11711269	Schematic, XM724	E
11711270	Interconnect DIA., XM724	C
11711275	ABS Molding Compound	-
11711276	O-Ring Grease	-
11711401	Schematic XM587E2	M
11711402	Interconnect Diagram	H
11711404-1	Capacitor, Tantalum	C
11711404-2	Capacitor, Tantalum	C
11711405	Resistor, Composition	G
11711406	Diode	E
11711407	Nose Plug Electronics	G
11711408	Cone, Nose	K
11711409	Cover, Electronics	G
11711410	Cup, Orientation	F
11711411	Printed Wiring Board #2	F
11711412	Printed Wiring Board #1	F
11711413	PW Board Assembly #1	G
11711414	PW Board Assembly #2	G
11711416-1	Ring, Setting	D

LOT #2 "E" HEADS AND FINAL FUZE (con't.)

11711416-2	Ring, Setting	D
11711417-1	Pad, Contact	D
11711417-2	Pad, Contact	D
11711418	Contact Coil	E
11711419	Strip, Lead Frame	C
11711420	Bobbin Assembly	B
11711421	Wire, Core	B
11711422	Bobbin, Core	B
11711423	Core, Coil	C
11711424	Transistor, High Current NPN	F
11711425	Setting Ring & Plug Assembly	E
11711427	Precision Oscillator, Hybrid	L
11711428	Electronics Assembly	M
11711429	Base Mixture, Epoxy Resin	B
11711430	Elec. & Nose Conf. & Assy.	Y
11711431	Hardener, Aromatic Amine	B
11711432	Potting Compound	B
11711433	Fuze, ET, XM587 (less booster)	N
11711435	Fuze, ET, XM587 (Loaded)	E
11711444	Washer, Connector	B
11711445	Potting Compound	-
11711446	Mounting Board, Bobbin Assy.	-
11711447	Post, Mounting Board	-
11711448	Transformer, Encapsulated	B
11711449	Ring, Brazing	A
11711450-1	Ring, Setting Assembly	-
11711450-2	Ring, Setting Assembly	-

11711451	Wire, Contact	B
11718418	Impact Switch	-
11718490	Adhesive, Rubber	B
11720206	Cup, Booster	A
11722485	XM587 Elect Time Fuze	C
11726868	XM724 Elect Time Fuze	C
NAS-549-3	Washer, Nonmet. - Insul., Elect.	-
MS9386-XX	'O' Ring	-

LOT #2 S&A's

"As Built" list of piece parts and assemblies used in the build of the Lot #2 S & A Modules on contract DAAG39-77-C-0056.

Part #	Part Name	Revision Letter
11711726	Pinion No. 1	A
11711727	Gear No. 1	A
11711728	Gear & Pinion #1	-
11720300	S & A Module	H
11720301	S & A Module Sub Assy.	B
11720302	S & A Module Can	A
11720303	Upper Gear Plate	E
11720304	Module Pin	-
11720305	Rotor Assembly	C
11720306	Rotor Body	B
11720308	Escape Wheel & Pinion Assy.	C
11720309	Pallet	A
11720310	Lead Cup Assy.	C
11720311	Lead Cup	B
11720312	Disc., Lead	-
11720313	S & A Module Lower Assy.	A
11720317	S/B Pin Disc.	A
11720318	Gear Plate Spacer	B
11720319	Lower Plate Assy.	-
11720320	Pallet Shaft	C
11720321	Lower Gear Plate	D
11720322	Spinlock Shaft	-
11720323	Lock Pin Disc.	-
11720324	Rotor Lock Pin	A

LOT #2 S&A's (con't.)

11720325	Lock Pin Spring	A
11720326	Shaft, Gear	A
11720327	Spinlock Spring	A
11720328	Spinlock	B
11720329	Rotor Shaft	E
11720330	Rotor Gear	D
11720333	Setback Pin	D
11720334	S/B Pin Spring	D
11720335	Bottom Plate	C

LOT #2 REAR FITTINGS

"As Built" list of piece parts and assemblies used in the build of the Lot #2 Rear Fitting assemblies.

Part #	Part Name	Revision Letter
MS27183-4	Flat Washer	-
MS51923-138	Spring Pin	C
11711478	Det. Block Plug	A
11711728	Lead, Firing	D
11718234	Detonator Clip	A
11720206	Booster Cup	B
11720214	Ground Pin Clip	A
11720216	Power Supply	P
11720258	Output Lead Assy.	C
11720279	Disc., Lead Output	-
11720280	Cup, Lead Output	A
11720291	Rear Fitting	N
11720296-1	Bias Spring	D
11720296-2	Bias Spring	D
11720297	Detonator Contact	-
11720298	Detonator Block	-
11720299	Det. Cont. Insulator	A
11722405	Elec. Detonator	A
1122620	Det. Block Assembly	B
11722622	Sleeve	L
11722636	Firing Lead and Battery Assembly	C
11722803	Adhesive Thermosat	B
11726804	Firing Assy. Lead	B

LOT #2 HYBRIDS

"As Built" list of piece parts and assembly drawings used in the build of Lot #2 Interface Hybrids and Precision Oscillators on Contract DAAG39-77-C-0056.

Part #	Drawing Description	Revision Letter
10990455	Interface Hybrid Circuit	H
11707396	Foam Potting Compound	E
11711427	Precision Oscillator	L
11711605	Thickfilm Network	D
11711606	Substrate	A
11711607	Interface Hybrid Schematic	B
11711608	Interface Hybrid Assembly	F
11711610	Encapsulated Interface Hybrid	E
11711611	Microcircuit Visual Requirements	A + 01
11711612	Thickfilm Visual Requirements	A
11711613	Semiconductor Chip Specification	A
11711625	Precision Oscillator	E
11711626	Substrate	A
11711627	Thickfilm Network	B
11711628	Thinfilm Resistor Array #1	C
11711629	Thinfilm Resistor Array #2	C
11711630	Precision Oscillator Assembly	F
11711631	Precision Oscillator Schematic	B
11711632	Semiconductor Chip Specification	A

LOT 2 WAIVERS AND DEVIATIONS

DEVIATIONS

DEV. #	TITLE	P/N	DATE SUBMITTED
D-0056-1	Substitute of visual inspection for probe test.	11720300 (S&A module)	22 March 1977
D-0056-5	Rear Fitting inspection requirement (alternate inspection method)	11720291 (Rear Fitting assem.)	17 November 1977
D-0056-7	Undersized and oversized S&A cavity depths	11722622 (sleeve)	3 January 1978

WAIVERS

WAIVER #	TITLE	P/N	DATE SUBMITTED
W-0056-1	Gaging center dist. with master gear	11720305 (Rotor assem.)	17 June 1977
W-0056-8	Nose Plug assembly more than 0.012 in. below Nose Cone	11711430 (elect & Nose Cone assem.)	1 March 1978

APPENDIX F

TEST REPORTS

FIRST ARTICLE TEST REPORT
DD FORM 1423 ITEM A00A
(LOT 0001) INTERFACE HYBRID (P/N 10990455)
CONTRACT DAAG39-77-C-0056

FIRST ARTICLE APPROVAL SAMPLE TEST RESULTS:

TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
Subgroup A1 (External Visual)	18	1	2	0
* Subgroup A2 (Operating Parameters)	158	4	5	2
Subgroup A3 (High Temperature Performance)	25	1	2	0
Subgroup A4 (Low Temperature Performance)	25	1	2	0
Subgroup B1 (Temperature Cycling)	25	1	2	0
Subgroup B2 (Shock)	25	1	2	0
Subgroup B3 (Constant Acceleration)	25	1	2	0
Subgroup B4 (High Temperature Storage)	25	1	2	0
Subgroup B5 (Lead Integrity)	8	0	1	0
** Subgroup B6 (Solderability)	8	0	1	5
*** Subgroup C1 (57MM Gun Fire)	25	1	2	3

NOTES:

* Unit Nos. 63 and 136 failed Subgroup A2 testing.

** This portion of FAAS tests is being waived according to Government Waiver #W-0056-5.

*** Not a requirement for acceptance per Paragraph 6.5 of Specification 10990455. Two of the failures (Units 126 and 00058) were marginal voltage failures, possibly caused by extraneous resistance induced by the long lead wires soldered to the part's pins. Only Unit #00160 was a complete unit failure.

DCAS Representative Donald M. Young 11/17/77

Honeywell Quality Representative T.S. Zeger 11/17/77

FIRST ARTICLE TEST REPORT
DD FORM 1423 ITEM A00A
(L01 0001) OSCILLATOR (P/N 11711427)
CONTRACT DAAG39-77-C-0056

FIRST ARTICLE APPROVAL SAMPLE TEST RESULTS:

TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
* Subgroup A1 (Operating Characteristics)	158	4	5	2
Subgroup A2 (Current)	25	1	2	0
Subgroup A3 (Electronic Shield and Visual)	18	1	2	0
Subgroup B1 (Temperature Cycling)	25	1	2	0
Subgroup B2 (Constant Acceleration)	25	1	2	0
Subgroup B3 (High Temperature Storage)	25	1	2	0
** Subgroup B4 (Shock)	25	1	2	1
Subgroup B5 (Solderability)	8	0	1	0
Subgroup B6 (Lead Integrity)	8	0	1	0
Subgroup C1 (Gun Fire)	38	1	2	0

NOTE:

* Unit Nos. 81 and 123 failed the ambient portion of the operating characteristics test.

** Two units failed the Preshock Electronic Interrogation -- Unit Nos. 81 and 88. Unit #81 should have been segregated out after the ambient portion of the operating characteristics test, while Unit #88 was damaged after passing the Subgroup A1 test. The units were replaced with Unit Nos. 157 and 158. Unit #99 failed Post-Shock Period Interrogation.

DCAS Representative [illegible]

Honeywell Quality Representative T.S. [illegible] 11/17/7[illegible]

FIRST ARTICLE INSPECTION REPORT
DD FORM 1423 ITEM A00A
S&A MODULE P/N 11720300
CONTRACT DAAG39-77-C-0056

FIRST ARTICLE LOT SIZE = 806

A. Classification of Defects Inspection Results:

1. S&A Module (Less Setback Pin) (P/N 11720300), Inspection Operation #0358 and 0558.

Categories	Defects	AQL	Sample Size	# Defects
M101	Arming (Low Limit)	.04	806	0
M102	Arming (High Limit)	.40	806	0
M103	Non-arming	.04	806	0
M104	Setback Pin Operation	.40	125	0

2. S&A Module (P/N 11720300), Inspection Operation # 0358 and 0558.

Categories	Defects	AQL	Sample Size	# Defects
M101	Quality of Crimp	1.0	80	0
M102	Quality of Stakes	1.0	80	0
M103	Max. O.D.	.65	80	0 *
M104	Max. Length	.65	80	0
M201	Marking	4.0	80	0

3. Preparation for Delivery, Inspection Operation # 0558.

Categories	Defects	AQL	Sample Size	# Defects
C1	Safe Position	100%	726	0
M101	Marking, Packing	Not Applicable		
M102	Records	Not Applicable		
M201	Packaging	Not Applicable		
M202	Packing	Not Applicable		

B. First Article Approval Sample Test Results: (Note: The FAAS tests were witnessed by HDL, DCAS and Honeywell Quality Representatives.)

Test Description	Sample Size	Accept #	Reject #	# Defects
Jolt	20	0	1	0
Jumble	20	0	1	0
5' Drop	20	0	1	0
TV	60	0	1	0
Setback Pin Operation	80	1	2	0
Non-arming	80	0	1	0
Arming				
• Low Limit	80	0	1	0
• High Limit	80	1	2	1 **
Firing	80	0	1	0
*** Arming Distance	45	0	1	0

* The units were deviated to 1.356" Max. O.D.

** One (1) armed at 34.0 turns at low temperature. Armed at 26.6 turns when re-tested at low temperature.

*** Test performed by Government.

FIRST ARTICLE INSPECTION REPORT
DD FORM 1423 ITEM A00A
REAR FITTING P/N 11720291
CONTRACT DAAG39-77-C-0056

First Article Lot Size = 325

A. Classification of Defects Inspection Results:

1. Rear Fitting Assembly (P/N 11720291), Inspection Operation #05-08

Categories	Defects	AQL	Sample Size	Defects	
C1	Rotor in S&A Module in Fully Safe Postion	100%	325	N/A	*
M101	2.00-12 UNS Thread	.65	80	N/A	*
M102	1.600-20 UNS Thread	.65	80	N/A	*
M103	1.860 Max. Dia.	.65	80	0	
M104	1.700 Min. Dia.	.65	80	0	
M105	1.510 Max. Intrusion	.65	80	0	
M106	.618 Max. Dimension	.65	80	0	
M107	1.634 Min. Dimension	.65	80	0	
M108	Wrench Slots Span & Width	.65	80	0	
M110	Position of Power Supply Pins	.65	80	33	****
M111	.215 Max. Power Supply Pin Height	.65	80	0	
M112	Elect. Detonator Resistance	.65	80	0	
M113	Power Supply Resistance	.65	80	0	
M114	S&A Module Inverted or Missing	100%	325	N/A	*
M115	Bias Spring Inverted or Missing	.65	80	N/A	*
M116	Firing Pin Present or Missing, as Applicable	.65	80	N/A	*
M117	Waterproofness	1.5(S4)	S E E	B E L O W	

B. First Article Approval Sample Test Results: (Note: The various tests were witnessed by HDL or DCAS, along with Honeywell Quality Representatives.)

	Test Description	Sample Size	Accept No.	Reject No.	No. Defects
	Waterproofness Test	32	1	2	0
(A)	5 Ft. Drop Test (Dropped Open End Down)	32	1	2	0
	Torque Test (Withstand 10 In.Lb.Torsional Force Without Radial Displacement)	32	1	2	6 **
	Elect. Det. Resistance (2.0 - 11.0 Ω Between Pins 'T' and '+')	32	1	2	0
	Battery Resistance	32	1	2	0
	(Greater than 100K Ω Between Pins '+' and '-')	32	1	2	0
	Firing Test	64	0	1	0

* Not Applicable - Tests were deviated according to Deviation #D-0056-3.

** Torque test failures were between the range 7.0 - 9.5 in. lbs. for the six units. (NOTE: This is an advisory test.)

**** Waived according to MAR #10300 with 100% X-ray inspection according to Waiver #W-0056-4. Reinspection revealed 11 of 325 fuzes with battery pin to mating coil problems.

(A) Five-foot drop test is advisory.

DCAS Representative Kenneth S. Perry 9/23/77

Honeywell Quality Representative Thomas S. Pazey 9/23/77

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
(LOT 0002) INTERFACE HYBRID (P/N 10990455)
CONTRACT DAAG39-77-C-0056

Lot Acceptance Test Results:

	Test Description	Sample Size	Accept No.	Reject No.	No. Defects
	Subgroup A1 (External Visual)	18	1	2	0
(1)	Subgroup A2 (Operating Parameters)	158	4	5	2
	Subgroup A3 (High Temperature Performance)	25	1	2	0
	Subgroup A4 (Low Temperature Performance)	25	1	2	0
(2)	Subgroup B1 (Temperature Cycling)	25	1	2	1
	Subgroup B2 (Shock)	25	1	2	0
(3)	Subgroup B3 (Constant Acceleration)	25	1	2	1
	Subgroup B4 (High Temperature Storage)	25	1	2	0
	Subgroup B5 (Lead Integrity)	8	0	1	0
	Subgroup B6 (Solderability)	8	0	1	0
(4)	Subgroup C1 (57mm Gunfire)	25	1	2	8

NOTE:

(1) Unit #41 failed Test V10A by being 0.01V. out of the specified limits.

Unit #44 failed Test V10A (0.26V. out of spec.) and Test V11A (0.1V. out of spec.)

(2) Unit #33 failed 9 of the 34 tests conducted upon it, none of which were marginal.

(3) Unit #91 failed 5 of the 34 tests conducted upon it, none of which were marginal.

(4) The eight units that failed (Units 136, 139, 143, 144, 147, 151, 153, and 161) were due to marginally low voltage readings for Test V7B or V7C. All units were marginally low by 0.21V. or less. It can be noted that a total of 38 units were subjected to the 57mm gunfire test. Per instructions by HDL, 25 units were selected as the required sample before post-fire electrical testing. Of the 38 tested units, there were 14 total failures, all stemming from failing the tests, and by the same margins, previously mentioned.

DCAS REPRESENTATIVE Kenneth S. Perry 5/22/78

HONEYWELL QUALITY REPRESENTATIVE Thomas S. Zagle 5/16/78

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
(LOT 0002) PRECISION OSCILLATOR (P/N 11711427)
CONTRACT DAAG39-77-C-0056

Lot Acceptance Test Results:

	TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
(1)	Subgroup A1 (Operating Characteristics)	158	4	5	2
	Subgroup A2 (Current)	25	1	2	0
	Subgroup A3 (Electronic Shield and Visual)	18	1	2	0
	Subgroup B1 (Temp Cycling)	25	1	2	0
	Subgroup B2 (Const. Acceleration)	25	1	2	0
	Subgroup B3 (High Temp Storage)	25	1	2	0
(2)	Subgroup B4 (Shock)	[illegible]	1	2	1
	Subgroup B5 (Solderability)	8	0	1	0
	Subgroup B6 (Lead Integrity)	8	0	1	0
(3)	Subgroup C1 (Gun Fire)	33	1	2	0

NOTES:

(1) Unit No. 150 failed at ambient temperature due a marginally high starting voltage. Unit started at .027V. higher than max. limit.

Unit No. 3 failed at +71°C. and -50°C. due to its output voltage being marginally low. The unit s output was a maximum of 0.3V. outside of specification.

(2) Unit No. 94 failed shock testing for its period being marginally over specification due to drift by .0031µS

(3) One test vehicle was not recovered after 57mm gunfire test at HDL, which contained five of the 38-piece sample.

DCAS REPRESENTATIVE Kenneth S. Perry 5-3-78

HONEYWELL QUALITY REPRESENTATIVE Thomas S. Zager 5-3-78

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
REAR FITTING (P/N 11720291) LOT I
CONTRACT DAAG39-77-C-0056

Lot Size = 751

A. Classification of Defects Inspection Results:

1. Rear Fitting Assembly (P/N 11720291), Inspection Operation #05-05

Categories	Defects	AQL	Sample Size	Defects
C1	Rotor in S&A Module in Fully Safe Position	100%	751	N/A *
M101	2.00 - 12 UNS Thread	.65	80	N/A *
M102	1.600 - 20 UNS Thread	.65	80	N/A *
M103	1.860 Max. Dia.	.65	80	N/A **
M104	1.700 Min. Dia.	.65	80	0
M105	1.510 Max. Intrusion	.65	80	0
M106	.618 Max. Dimension	.65	80	0
M107	1.634 Min. Dimension	.65	80	0
M108	Wrench Slots Span and Width	.65	80	0
M110	Position of Power Supply Pins	.65	80	0
M111	.215 Max. Power Supply Pin Height	.65	80	0
M112	Elect. Detonator Resistance	.65	80	0
M113	Power Supply Resistance	.65	80	0
M114	S&A Module Inverted or Missing	100%	751	N/A *
M115	Bias Spring Inverted or Missing	.65	80	N/A *
M116	Firing Pin Present or Missing, as Applicable	.65	80	N/A *
M117	Waterproofness	1.5(S4)	32	4 ***

B. Lot Acceptance Functional Test Results: (NOTE: The various tests were witnessed by DCAS and Honeywell Quality Representatives.)

Test Description	Sample Size	Accept No.	Reject No.	No. Defects
(A)5-Foot Drop Test (Dropped Open End Down)	32	1	2	0
Torque Test (Withstand 10 in. lb. Torsional Force Without Radial Displacement)	32	1	2	0
Elect. Det. Resistance (7.0 - 11.0 Ohms Between Pins 'T' and '+')	32	1	2	0
Battery Resistance (Greater than 100K Ohms Between Pins '+' and '-')	32	1	2	0
Firing Test	32	0	1	0 ****

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
REAR FITTING (P/N 11720291) LOT I
CONTRACT DAAG39-77-C-0056

NOTES:

* Not Applicable - Deviated according to Deviation #D-0056-5.

** Not Applicable - Deviated according to Deviation #D-0056-4

*** Not Applicable - Waived according to Waiver #W-0056-6

**** Due to the Rear Assembly failing the waterproofness inspection, an extra layer of RTV compound was applied around the Lead Cup output hole to ensure that the units were sealed. A comparative study was conducted to determine the effect the additional layer of RTV would have on output discharge. This was done by comparing the dents blasted into a 2024-T4 aluminum witness block, between the test units of the DEG lot and the test units of the Lot 1 group. For the DEG lot, the mean dent depth was .0873 in. with a std. dev. of .0181; for the Lot 1 group, the mean dent depth was .0895 in. with a std. dev. of .0178. This information leads to the conclusion that the addition of the RTV layer should not affect the function of the explosive train.

DCAS Representative Kenneth A. Pung 11/29/77

Honeywell Quality Representative Thomas L. Zogu 11/29/77

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
REAR FITTING (P/N 11720291) LOT 2
CONTRACT DAAG39-77-C-0056

Lot Size = 932 (XM587E2)

Lot Size = 1241 (XM724)

(2) A. Classification of Defects Inspection Results for XM587E2:

1. Rear Fitting Assembly (P/N 11720291), Inspection Operation #05-05

	CATEGORIES	DEFECTS	AQL	SAMPLE SIZE	DEFECTS
(1)	C1	Rotor in S&A Module in Fully Safe Position	100%	932	0
	M112	Elect. Det. Resist.	.65	80	0
	M113	Power Supply Resist	.65	80	0
(1)	M114	S&A Module Inverted or Missing	100%	932	0
(1)	M115	Bias Spring Inverted or Missing	.65	932	0
(1)	M116	Firing Pin Present or Missing	.65	932	0
	M117	Waterproofness	1.5 (S4)	32	0

(2) B. Classification of Defects Inspection Results for XM724:

1. Rear Fitting Assembly (P/N 11720291), Inspection Operation #05-05

	CATEGORIES	DEFECTS	AQL	SAMPLE SIZE	DEFECTS
(1)(4)	C1	Rotor in S&A Module in Fully Safe Position	100%	1241	1
	M112	Elect. Det. Resistance	.65	125	0
	M113	Power Supply Resist.	.65	125	0
(1)	M114	S&A Module Inverted or Missing	100%	1241	0
(1)	M115	Bias Spring Inverted or Missing	.65	1241	0
	M116	Firing Pin Present or Missing	.65	N/A	N/A
	M117	Waterproofness	1.5 (S4)	32	0

(3) C. Lot Acceptance Functional Test Results for XM587E2/XM724:

	TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
(A)	5-Foot Drop Test (Dropped Open End Down)	13	1	2	0
	Torque Test (Withstand 10 in. lb. Torsional Force Without Radial Displacement)	13	1	2	0
	Elect. Det. Resistance (2.0 - 11.0 Ohms Between Pins 'T' and '+')	13	1	2	0
	Battery Resistance (Greater Than 100K Ohms Between Pins '+' and '-')	13	1	2	0
	Firing Test	13	0	1	0

NOTES:

(1) Per agreement with HDL, a 100% visual inspection was conducted by HDL, DCAS, and Honeywell Quality Representatives during Rear Fitting assembly and before staking, in lieu of 100% X-ray inspection after staking to speed up the manufacturing operation.

(2) Per agreement with HDL to speed up the manufacture of Rear Fittings, Defects 101 through 111 of 4.4.5.1.4 of Control Drawing 11720291 were deleted as redundant, with inspections for the external interface characteristics performed at the final fuze level.

(3) Both lots were combined for functional testing. A review of Sampling Plan 1853 with an AQL of 1.0 reveals no difference between the required sample size if the lots were split or combined. It was mutually agreed upon by HDL and Honeywell that splitting the lot would cause a redundant functional test. Since the number of available Rear Fittings was critically near to the number of Fuzes Honeywell was contractually obligated to deliver, both parties (Honeywell and HDL) agreed to combine the two sub-lots (XM587 and XM724) to save as many Rear Fittings as possible.

(4) Defective unit was found without Spinlock Spring on S&A. Unit was removed from lot.

DCAS REPRESENTATIVE Kenneth S. Pung 3/7/78

HONEYWELL QUALITY REPRESENTATIVE Thomas L. Zage 3/9/78

Lot 1

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
S&A MODULE (P/N 11720300)
CONTRACT DAAG39-77-C-0056

Lot Size = 1076

A. Classification of Defects Inspection Results:

1. S&A Module (Less Setback Pin) P/N 11720100, Inspection Operation #01 - 55.

Categories	Defects	AQL	Sample Size	Defects
M101	Arming (Low Limit)	.06	1076	0
M102	Arming (High Limit)	.40	1076	0
M103	Non-Arming	.06	1076	0

2. S&A Module Assembly (P/N 11720300) Inspection Operation #05-55.

Categories	Defects	AQL	Sample Size	Defects
C1	Rotor Safe Position	100%	1076	0
M101	Quality of Crimp	1.0	80	0
M102	Quality of Stakes	1.0	80	0
M103	Max.Outside Dia.	.65	80	0
M104	Max.Overall Length	.65	80	0
M105	Setback Pin Disk Stake	.65	80	0
M106	Setback Pin Operation	.40	125	0
M201	Marking	4.0	80	0

B. Functional Test Results: (NOTE: The various tests were witnessed by HADL or DCAS, along with Honeywell Quality Representatives.)

Test Description	Sample Size	Accept No.	Reject No.	No. Defects
Setback Pin (800g)	*32	1	2	0
Setback Pin (1100g)	*32	1	2	0
Non-Arming (1100 RPM)	*32	0	1	0
Ambient Temp. Arming				
(Low Limit)	32	0	1	0
(High Limit)	32	1	2	0
Firing	32	0	1	0
** Low Temp. Arming				
(Low Limit)	32	0	1	0
(High Limit)	32	1	2	1
Firing	32	0	1	0
High Temp. Arming				
(Low Limit)	32	0	1	0
(High Limit)	32	1	2	0
Firing	32	0	1	0

NOTES:

* Three separate samples, each of which were 32 units, were subjected to Setback Pin testing at both 800g's and 1100g's, and also non-arming tests at 1100 RPM's. The accept number and reject number are the same for each sample of 32. The defects numbers indicates the defects found in each group of 32 units per each test, i.e., three groups of 32 for Setback pin, etc.

** The low temperature tests were conducted twice on the group of 32 units segregated for that functional test. The first low temp. tests were halted after 26 units had been subjected to spin tests and two had armed prematurely. An in-depth investigation revealed that the failures were caused by two faulty areaconcerning the Spin Test Fixture. The Evaluation Test Fixture had a calculated three turns of error-induced by 1 (the Simulated Setback Pin was allowing 10% of total Rotor radial movement, giving the Rotor a "head start" to arm, 2) the Rotor was subject to false triggering of the stop signal due to D.C. coupling of the counter with a photo cell in the stop circuit. The problems were corrected and the same S&A modules were subjected to low temperature spin tests, resulting in acceptance.

DCAS Representative Kenneth A Pyng 11/21/77
Honeywell Quality Representative Tom Call 11/21/77

LOT ACCEPTANCE TEST REPORT
DD FORM 1423 ITEM A002
S&A MODULE (P/N 11720300) LOT 2
CONTRACT DAAG39-77-C-0056

Lot Size = 2048

A. Classification of Defects Inspection Results:

1. S&A Module (less Setback Pin) P/N 11720300, Inspection Operation #03-58

Categories	Defects	AQL	Sample Size	Defects
M101	Arming (Low Limit)	.04	2048	0
M102	Arming (High Limit)	.40	2048	0
M103	Non-Arming	.04	2048	0

2. S&A Module Assembly (P/N 11720300) Inspection Operation #05-58

Categories	Defects	AQL	Sample Size	Defects
C1	Rotor Safe Position	100%	2048	0
M101	Quality of Crimp	1.0	125	0
M102	Quality of Stakes	1.0	125	0
M103	Max. Outside Dia.	.65	125	0
M104	Max. Overall Length	.65	125	0
M105	Setback Pin Disk Stake	.65	125	0
M106	Setback Pin Oper.	.40	125	0
M201	Marking	4.0	125	0

B. Functional Test Results: (NOTE: The various tests were witnessed by HDL or DCAS, along with Honeywell Quality Representatives.)

Test Description	Sample Size	Accept No.	Reject No.	No. Defects
Setback Pin (800g)	* 32	1	2	0
Setback Pin (1100g)	* 32	1	2	0
Non-Arming (1100 RPM)	* 32	0	1	0
Ambient Temp. Arming				
(Low Limit)	32	0	1	0
(High Limit)	32	1	2	0
Firing	32	0	1	0

Test Description	Sample Size	Accept No.	Reject No.	No. Defects
Low Temp. Arming				
(Low Limit)	32	0	1	0
** (High Limit)	32	1	2	1
Firing	32	0	1	0
High Temp. Arming				
(Low Limit)	32	0	1	0
(High Limit)	32	1	2	0
Firing	32	0	1	0

NOTES.

* Three separate samples, each of which was 32 units, were subjected to Setback Pin testing a both 800g's and 1100g's, and also non-arming tests at 1100 RPM's. The Accept Number and Reject Number are the same for each sample of 32. The Defect Numbers indicate the defects found in each group of 32 units per each test, i.e., three groups of 32 for Setback Pin, etc.

** The unit which failed the High Limit (advisory) specification of the low temperature arming phase during lot acceptance testing was tested twice and armed at 67 revolutions and 44 revolutions.

DCAS Representative Kenneth S. Perry 1-23-78

Honeywell Quality Representative Thomas A. Ziegler 1-23-78

DEG LOT TEST REPORT
DD FORM 1423 ITEM A003
FUZE, ELECTRONIC TIME: M587E2
CONTRACT DAAG39-77-C-0056

DESIGN EVALUATION GROUP ENVIRONMENTAL TEST RESULTS:

TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
* 5-Foot Drop Test (Dropped in five different orientations -- one per orientation)	5	0	1	0
7-Foot Drop Test (Units all contained in one Ammo Can, all base down)	8	0	1	0
** Crimp Joint Test (Pulled to Destruction)	2	N/A	N/A	N/A
*** Potting Compound Porosity (12 sections no more than an inch on any face)	2	0	1	2

NOTE:

* Units subjected to the five and seven-foot drop test were disassembled and inspected to make sure fuze was unarmed.

** Unit #05387 was pulled to a tensile load of 9,400 lbs. before crimp failure. Unit #05156 was pulled to a tensile load of 8,980 lbs. before crimp failure.

*** Both Units #05156 and #05387 exhibited voids in the potting compound greater than 1/16" up to ¼" in diameter. However, it can be noted that the voids were found at the base of the plastic electronics cover at the point where the potting compound is injected into the E-head. No vilds were found around any of the electronic piece-parts and assembly.

DCAS Representative Kenneth D. King 11/17/77

Honeywell Quality Representative T.S. Zager 11/17/77

LOT 1 TEST REPORT
ENVIRONMENTAL TESTS PER FIGURE 3
FUZE, ELECTRONIC TIME: XM587E2
CONTRACT DAAG39-77-C-0056

MODIFICATION P20003

LOT 1 GROUP ENVIRONMENTAL TEST RESULTS:

TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
* 5-FOOT DROP TEST (DROPPED IN FIVE DIFFERENT ORIENTATIONS -- TWO PER ORIENTATION)	10	0	1	0
JOLT & JUMBLE TEST	12	0	1	0
** CRIMP JOINT TEST (PULLED TO DESTRUCTION)	8	N/A	N/A	N/A
*** POTTING COMPOUND POROSITY TEST (12 SECTIONS NO MORE THAN AN INCH ON ANY FACE)	8	0	1	8

NOTES:

* UNITS SUBJECTED TO THE FIVE FOOT DROP TEST AND JOLT & JUMBLE TEST WERE DISASSEMBLED AND INSPECTED TO MAKE SURE THE FUZES WERE UNARMED. INSPECTION INCLUDED CHECKING THE SPINLOCKS AND SETBACK PIN OF THE S&A MODULE TO MAKE SURE THE ROTOR WAS IN A SAFE POSITION, CHECKING THE ELECTRIC DETONATOR RESISTANCE, CHECKING THE BATTERY RESISTANCE, AND INTERROGATING THE E-HEADS ON THE E-HEAD STATION.

** ALL UNITS WERE PULLED TO CRIMP FAILURE. THE EIGHT UNITS FAILED UNDER A TENSILE LOAD OF 6800 TO 9140 LBS., WITH AN AVERAGE OF 7852.5 LBS. AND STD. DEVIATION OF 671.5

*** ALL EIGHT UNITS EXHIBITED VOIDS IN THE POTTING COMPOUND GREATER THAN 1/16"UP TO 1/4" IN DIAMETER AT THE BASE OF THE PLASTIC ELECTRONICS COVER, AT THE POINT WHERE THE POTTING COMPOUND IS INJECTED INTO THE E-HEAD. ONE UNIT EXHIBITED A VOID 1/8" IN DIAMETER NEAR THE OSCILLATOR.

DCAS REPRESENTATIVE Kenneth A Perry 12/19/77
HONEYWELL QUALITY REPRESENTATIVE [illegible]

LOT ACCEPTANCE TEST REPORT
LOT 002 FUZE (ENVIRONMENTAL ONLY)
FUZE, ELECTRONIC TIME: XM587/XM724
MIL-F-48700 & 48702, FIGURE 2
CONTRACT DAAG39-77-C-0056

FUZE ENVIRONMENTAL TEST RESULTS:

TEST DESCRIPTION	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NUMBER OF DEFECTS
(1) 5-Foot Drop Test (Dropped in Five Different Orientations - One Per Orientation)	5	0	1	0
Jolt and Jumble Test	6	0	1	0
Salt Fog	4	0	1	0

All units subjected to either the five-foot drop test, jolt/jumble test, or salt fog test were disassembled and inspected to make sure the fuzes were unarmed. Inspection included checking the spinlocks and setback pin of the S&A module to make sure the rotor was in a safe position, checking the electric detonator resistance, checking the battery resistance, and subjecting each E-head to a set/interrogation sequence, using the X436E1 Fuze Setter.

NOTE:

(1) The S&A module contained in the fuze subjected to the aft end down drop had its setback pin retracted. Since both spinlocks were still engaged and the rotor was in a safe position, the fuze was considered an acceptable unit.

DCAS REPRESENTATIVE Kenneth G. Pung 3/27/78

HONEYWELL QUALITY REPRESENTATIVE Thomas S. Zagle 3/27/78

QUALITY DEMONSTATION & EVALUATION REPORT
DD FORM 1423, ITEM A008
DEG & LOT 1 E-HEADS, (P/N 11711430)
CONTRACT DAAG39-77-C-0056

	TEST ITEM	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
(1)	SUBGROUP A1 (Long timeout @ ambient temperature)	105	2	3	2
(2)	SUBGROUP A1 (475g Mech. Pulse)	105	2	3	19
(3)	SUBGROUP A2 (Long timeout @ 68°C ± 2°C)	52	2	3	1
(4)	SUBGROUP A3 (Long timeout @ 45°C ± 2°C)	52	2	3	6
	SUBGROUP B2 (Thermal Shock)	18	1	2	0
(5)	SUBGROUP B1 (475g Mech. Pulse)	18	1	2	1
(6)	SUBGROUP B2 (30,000g Shock)	18	1	2	9
	SUBGROUP B2 (475g Mech. Pulse)	18	1	2	0

NOTES:

(1) Unit #17 failed due to leaky C4 capacitor. Unit #70 failed due to marginally high current readings which indicate a cracked transformer.

(2) All failures were XM687E2 E-Heads. All failed to detonate after repeated 475g pulse shocks.

(3) Unit #69 failed due to marginally high current readings which indicate a cracked transformer.

(4) The failure mode for units 6, 7, and 9 were multifaceted, i.e. more than one electronic component failed in each of the units. Units 16 and 51 marginally failed the long timeout protion during electrical testing (Test 1.9B). Upon reinvestigation of these units in failure analysis, they functioned properly. First malfunction can be attributed to bad contact interface between E-Heads and test equipment. Unit #26 catastrophically failed test 1.9H. Failure in M11 stage of MNOS counter.

NOTES: (cont.)

(5) Failure was a XM587 E-head which also failed the 475g AMB. pulse test.

(6) Units 37, 39, 41, 43, [illegible], 91, and 95 failed due oscillator breakdown. Unit 89 exhibited induced leakage in C1 after shock but healed after further testing. Unit 36 failed due to oscillator's intermittant operation.

DCAS Representative Kenneth A. Pung 3/23/78

Honeywell Quality Representative T. S. Rogers 3/23/78

QUALITY DEMONSTRATION AND EVALUATION REPORT
DD FORM 1423, ITEM A00B
LOT 2 E-HEADS (P/N 11711430)
CONTRACT DAAG19-77-C-0056

TEST ITEM	SAMPLE SIZE	ACCEPT NO.	REJECT NO.	NO. DEFECTS
Subgroup A (Long Timeout @ Ambient Temperature)	105	2	3	0
(1) Subgroup A1 (475g Mech. Pulse)	105	2	3	15
(2) Subgroup A2 (Long Timeout @ 68°C. ± 2°C.)	52	2	3	4
(3) Subgroup A3 (Long Timeout @ -45°C. ± 2°C.)	52	2	3	3
Subgroup B (Thermal Shock)	18	1	2	0
(1) Subgroup B1 (475g Mech. Pulse)	18	1	2	2
(4) Subgroup B2 (30,000g Shock)	18	1	2	5
(1) Subgroup B2 (475g Mech. Pulse)	18	1	2	7

NOTES:

(1) All failed units would not discharge firing capacitor voltage after repeated shocks.

(2) Three of the four failures were traced to the counter/memory (Unit Serial Nos. 7031, 7205, and 8146).

One of the four exhibited an intermittent failure mode. Upon investigation in Failure Analysis Lab, the setting rings showed nickel oxide bleeding through gold plating, causing poor contact areas (Unit Serial No. 8160).

(3) Two of three failures were traced to the counter/memory (Unit Serial Nos. 7964 and 7996). One of three units failed because of a cracked transformer (Unit Serial No. 8106).

(4) Three of five failures were traced to bad oscillators (Unit Serial Nos. 8904, 9028, and 9149). Two of five failures were traced to bad counter/memories (Unit Serial Nos. 9004 and 9173).

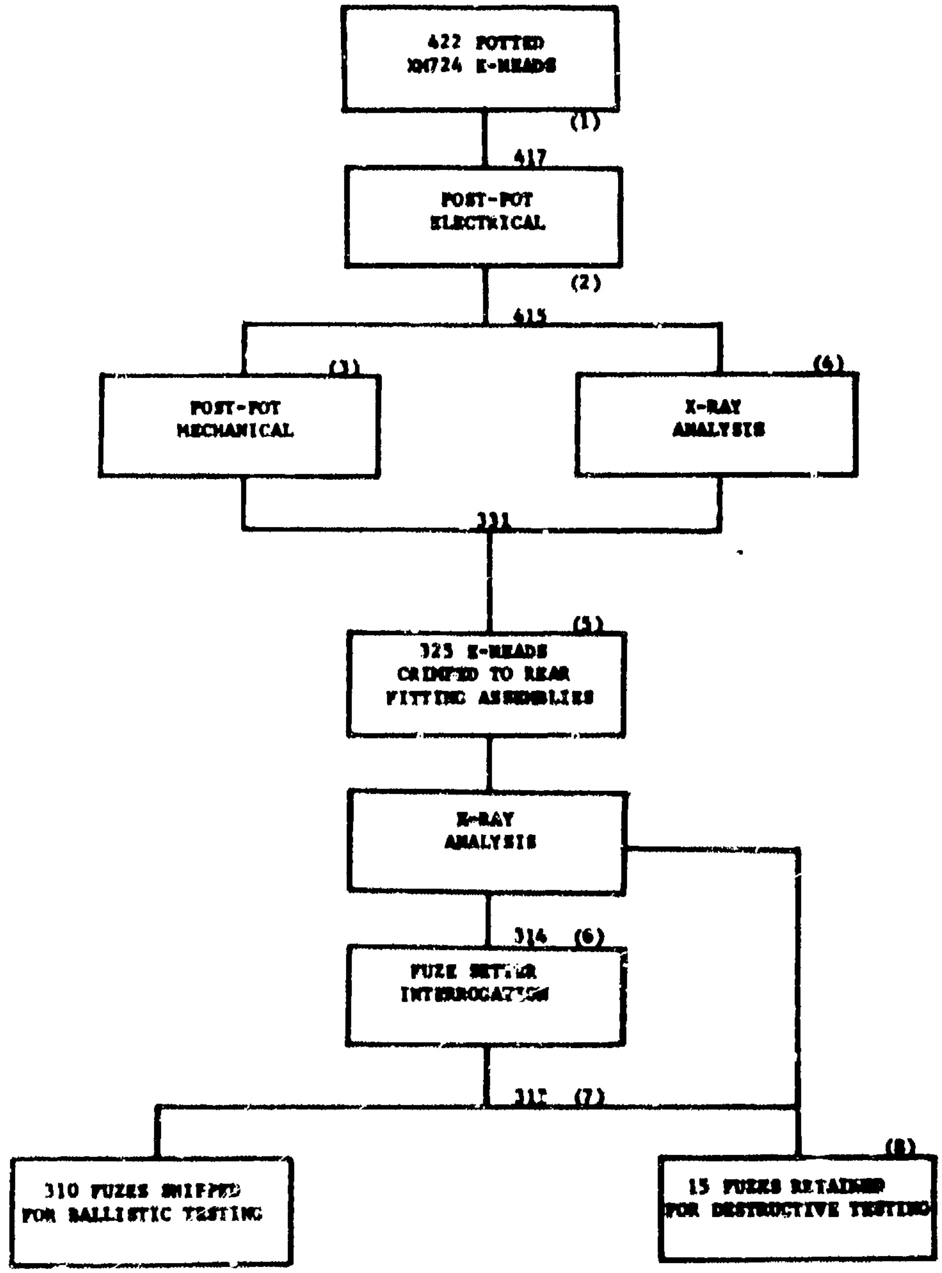
DCAS REPRESENTATIVE Kenneth G. Long 5 3 78

HONEYWELL QUALITY REPRESENTATIVE Thomas S. Eagle 5-3-78

LOT SUMMARY INSPECTION RECORD
(JUNE 1977 - SEPTEMBER 1977)

PRODUCT QUALITY REPORT DATA ITEM A002
CONTRACT DAAG39-77-C-0056

A total of 422 XM724 E-heads were encapsulated. The following flow diagram depicts the yield at each inspection/test operation.



(1) Five E-heads lost during potting process, four of which exhibited damaged O-rings and one of which was over potted.

(2) Two E-heads were rejected by the automatic fuze test station.

(3) A total of 32 E-heads were rejected for various mechanical reasons:

a) Five E-heads had nose plugs below .012 or .018 above ogive.

b) One E-head traveler was missing.

c) Seven E-heads exhibited damaged contact coils.

d) Three E-heads had potting material more than .150 in. below Surface "Y" in center fill tube.

e) 13 E-heads had potting material more than .150 in. below Surface "Y" in small fill tubes.

f) Three E-heads exceeded .472 in. length maximum from ogive inner lip to orientation cup surface.

(4) 58 E-heads were removed due to cracks in the encapsulated transformer. Six E-heads from this number were already rejected for mechanical reasons.

(5) Six good E-heads were set aside for the LAT sample.

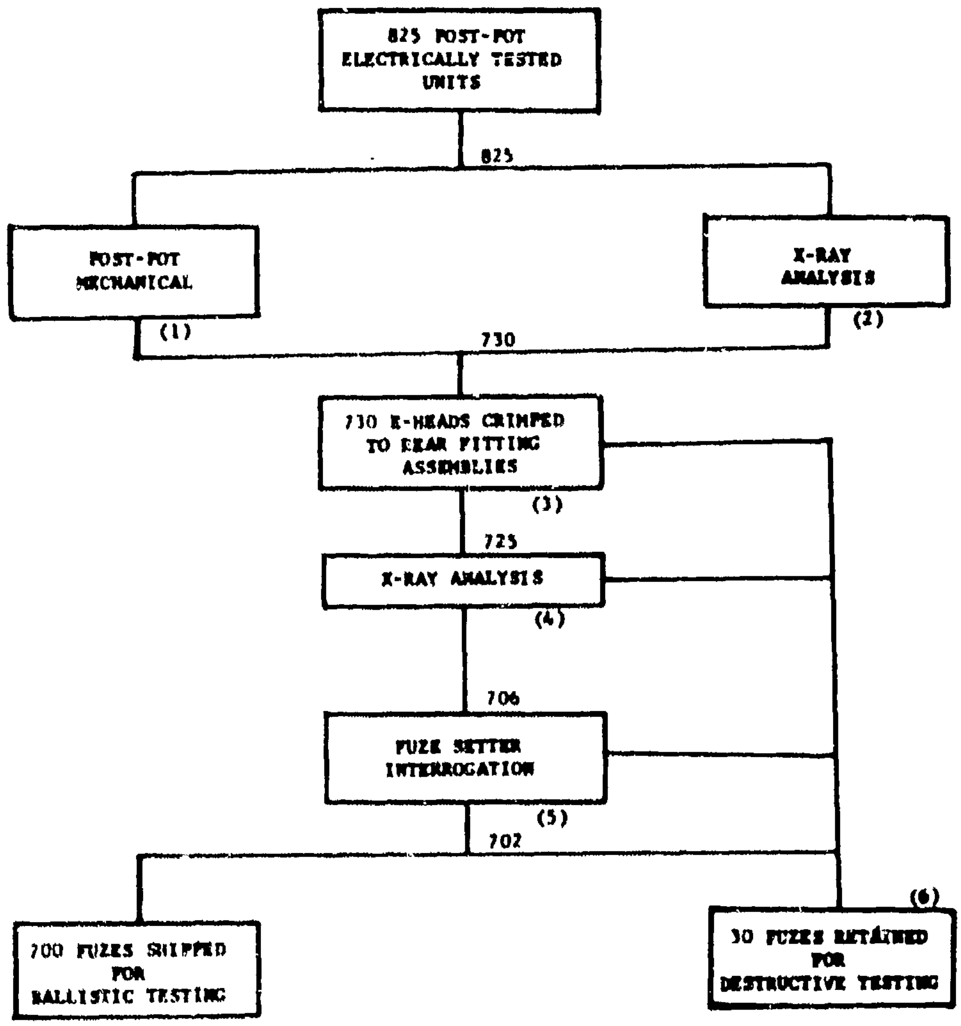
(6) 11 fuzes rejected due to mating problems between the battery pins and E-head contact coils.

(7) One fuze rejected by fuze setter would not set to point detonation.

(8) Three good fuzes drawn at random from DHC lot to supplement the total of 12 fuzes rejected in Items (6) and (7).

LOT SUMMARY INSPECTION RECORD
(SEPTEMBER 1977 - NOVEMBER 1977)
PRODUCT QUALITY REPORT DATA ITEM A008
CONTRACT DAAG39-77-C-0056

A total of 825 XM587E2 E-heads passed electrical post-pot testing. The following flow diagram depicts the yield at each inspection/test station:



(1) TOTAL OF SEVEN (7) E-HEADS WERE REJECTED DURING THE MECHANICAL POST-POT INSPECTION. ALL SEVEN (7) E-HEADS COULD NOT BE MATCHED WITH THEIR UNIQUE TRAVELER.

(2) A TOTAL OF 88 E-HEADS WERE SORTED FROM THE LOT FOR EXHIBITING CRACKED TRANSFORMER CORES.

(3) FIVE (5) FUZES WERE REJECTED AFTER BEING CRIMPED BECAUSE OF THE FOLLOWING REASONS:

- A) TWO (2) E-HEADS HAD DAMAGED SETTING RINGS.
- B) ONE (1) FUZE HAD AN ALREADY-USED SERIAL NO.
- C) ONE (1) FUZE WAS O/S ON THE 3.76 LENGTH.
- D) ONE (1) FUZE EXHIBITED DAMAGED THREADS.

(4) A TOTAL OF 19 FUZES WERE SORTED FROM THE LOT AFTER X-RAY ANALYSIS FOR THE FOLLOWING REASONS:

- A) THREE (3) FUZES CONTAINED BATTERIES WITH LOW SOLDER FILLED PINS.
- B) SIXTEEN (16) FUZES SHOWED MATING PROBLEMS BETWEEN THE BATTERY PINS AND E-HEAD CONTACT COILS.

(5) FOUR (4) FUZES WOULD NOT SET, TWO (2) OF WHICH BECAUSE THE OGIVE WAS OUT-OF-TOLERANCE.

(6) TWO (2) GOOD FUZES WERE DRAWN AT RANDOM FROM THE DELIVERABLE 702 XM587 LOT 1 UNITS. THE REST OF THE FUZES USED FOR DESTRUCTIVE TESTING WERE DRAWN FROM ITEMS (3), (4), AND (5).

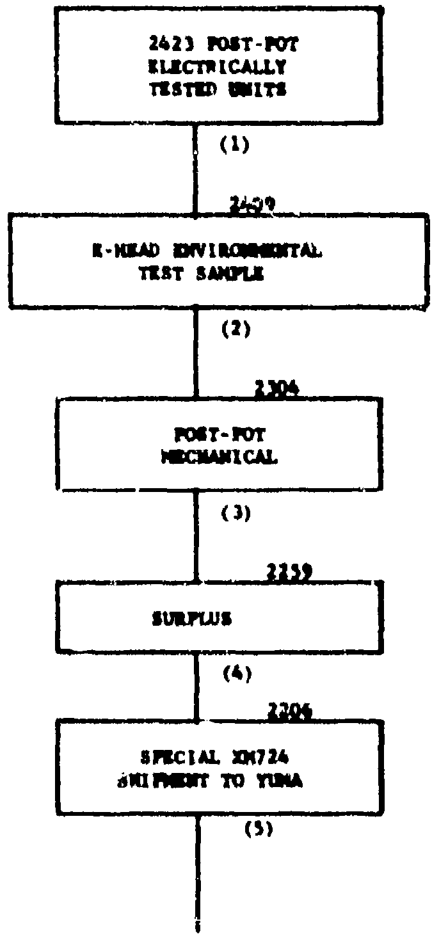
LOT SUMMARY INSPECTION RECORD

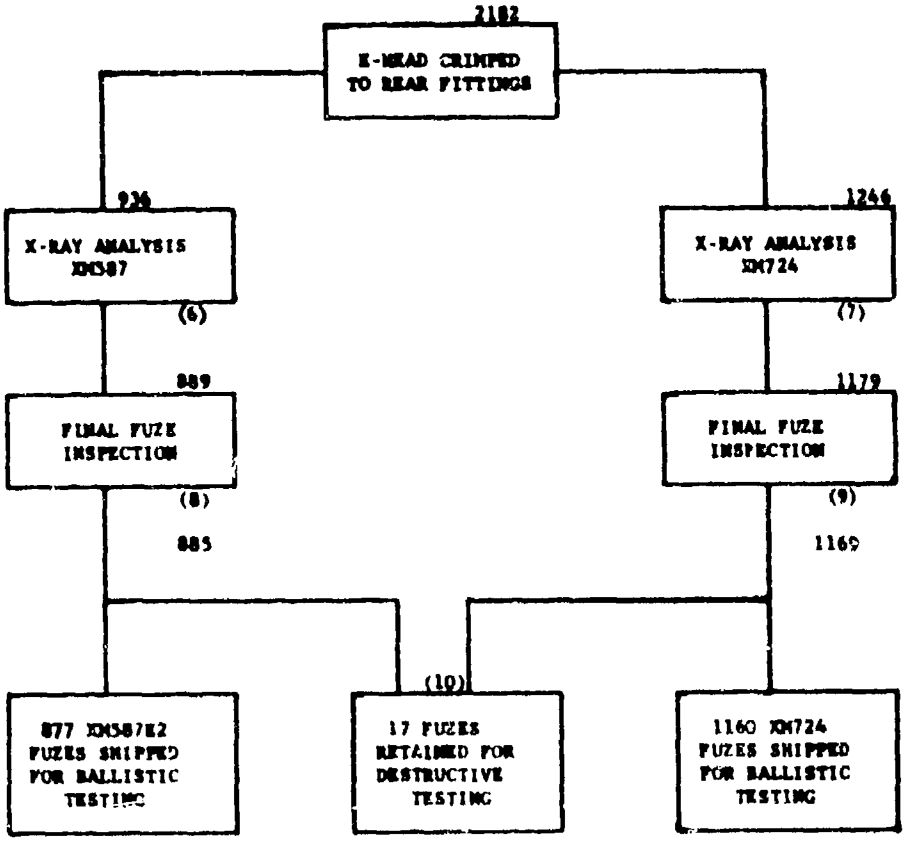
(DECEMBER 1977 - MARCH 1978), LOT 2

PRODUCT QUALITY REPORT DATA ITEM A002

CONTRACT DAAG39-77-C-0036

A total of 2423 XM587E2 E-Heads were subjected to Electrical Post-Pot Testing. The following flow diagram depicts the yield at each inspection/test station.





NOTES:

(1) A total of 14 E-Heads were rejected electrically because of the following:

a) 1 showed contaminant on setting ring.

b) 1 was marginally below spec. tolerance (Time for scalar going low to time of d·t. fn.).

c) 12 exhibited either oscillator, interface, or scalar problems.

(2) 105 units were randomly selected to be subjected to operating tests per para. 4.4.6 of spec. 11711430.

(3) 45 units were rejected for the setting ring assembly being below the .012 below flush maximum tolerance to the tip of the nose cone.

(4) 53 surplus units were removed from lot due to the shortage of rear fittings. They were disposed of as follows:

a) 43 to hold room.

b) 10 used as shock comparison, samples to see if they would fail after 25,000g shock.

(5) 24 XM724 Fuses were built, inspected, and shipped as a sublot of Lot 2 Fuse delivery requirements, for special ballistic testing at the Yuma test facility.

(6) A total of 47 fuses were removed from the lot for the following reasons:

a) 1 had no electric detonator.

b) 37 had insufficient battery pin to contact mating coil contact.

c) 9 had no record of being X-Rayed.

(7) A total of 67 Fuses were removed from thelot for the following reasons:

a) 31 same as note 6b.

b) 36 same as note 6c.

(8) 4 units were removed because of the following:

a) 1 exheeded 3.76 max. overall length from seating shoulder to nose cone tip.

b) 1 was missing 1.600 - 20 uns thread.

c) 2 would not set and interrogate properly.

(9) 10 units were removed because of the following:

a) 1 same as note 8c.

b) 9 had missing travellers.

(10) 8 XM587 and 9 XM724 Fuses were drawn from lot for destructive testing. 15 are required while 2 are spares.

APPENDIX G

FAILURE AND ACTION REPORTS

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

68920

Interface Hybrid	10990455	51		12 6 78
Honeywell	XM 587	HDL	DAAG39-77-C-0056	
Ambient	Lot 2 Acceptance Test			
Constant Acceleration				

Failed lot acceptance electrical test

The failure was verified and the interface was opened. The cause of the failure was a broken bond wire on the Emitter of Q8.

Interface Hybrid	10990455	91		Honeywell	

Insure that the silastic potting compound just covers the bondwires.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

Item Name – Interface Hybrid	Part No. 10990455	Serial No. 41	Ref. Des.	No. 60920 — Day 12, Month 6, Year 78
Mfr. Honeywell	System XM 587	Customer HDL	Contract or Development No. DAAG39-77-C-0056	
Test Environment: Ambient	Operation being performed: Lot 2 Acceptance Test			

Detected during: 1 ☐ Receiving 2 ☐ R&D 3 ☒ Acceptance 4 ☐ Qualification 5 ☐ Preproduction 6 ☐ Evaluation 7 ☐ Field Use 8 ☐ Maintenance 9 ☐

Description of Failure:

Failed Lot acceptance Test V10A

Disposition: 1 ☐ Repaired 2 ☒ Scrapped 3 ☐ Adjusted 4 ☐ Replaced 5 ☐ Continue tests 6 ☐ Return to 7 ☐

Failure History:

Failure Analysis Results:

The failure was verified and the interface was opened. The zener voltage was found to be 26.6 volts instead of 25 volts.

Actual Failed Item – Name: Interface Hybrid	Part No. 10990455	Serial No. 41	Ref. Des.	Mfr. Honeywell	Mfr. Part No.

Corrective Action:

Continue 100% electrical inspection of the Hybrid

Responsibility: 1 ☒ Design 2 ☐ Test 3 ☐ Vendor 4 ☐ Workmanship 5 ☐ Process 6 ☐ Maintenance 7 ☐

Effect of Failure: 1 ☐ Critical 2 ☒ Major 3 ☐ Minor

Honeywell

Reliability

FAILURE AND ACTION REPORT

68920

Interface Hybrid	10990455	44		12 6 78
Honeywell	M 587	HDL	DAAG39-77-C-0056	
Ambient	Lot 2 Acceptance Test			
None				

Failed lot acceptance test V10A and V11A

The failure was verified and the interface was opened. The cause of the failure was a defective bond between CR2 and the substrate.

Interface Hybrid	10990455	44		Honeywell	

This is the first defective substrate bond found no corrective action necessary.

Honeywell

Reliability

FAILURE AND ACTION REPORT

68920

Interface Hybrid	10990455	33		12 6 78
Honeywell	XM 587	HDL	DAAG-77-C-0056	
Ambient	Lot 2 Acceptance Test			
Temperature Cycling				

Failed lot acceptance electrical test

The failure was verified and the interface was opened. A lifted bond on the base of Q6 was found which prevented the voltage regulator from operating.

Interface Hybrid	10990455	33		Honeywell	

Insure that the silastic potting compound just covers the bond wires.

Honeywell

FAILURE AND *ACTION* REPORT

Hybrid Oscillator	11711427	1156	--	12 6 78
Honeywell	XM 587	HDL	DAAG39-77-C-0056	

Ambient

Lot 2 Acceptance Tests

30,000 g shock

Failed lot acceptance test TS4

The unit operated normally; however, an internal visual found a lifted bond on capacitor.

Hybrid Oscillator	11711427	1156	Honeywell

The long term corrective action is to replace the oscillators with an oscillator without bond wires.

Honeywell

Reliability

FAILURE AND ACTION REPORT

68921

Hybrid Oscillator	11711427	620		12 6 78
Honeywell	XM 587	HDL	DAAG39-77-C-0056	
Ambient	Lot 2 Acceptance Test			

Failed Lot Acceptance Test VA

The unit operated normally; the failure could not be verified.

No corrective action possible, since the failure could not be verified.

Honeywell

Reliability

FAILURE AND ACTION REPORT

68921

Hybrid Oscillator	11711427	2365		12 6 78
Honeywell	XM 587	HDL	DAAG39-77-C-0056	
71°C & -50°C	Lot 2 Acceptance Test			

Description of Failure

Failed lot acceptance Test VOA

Failure Analysis Results

The unit operated normally; the failure could not be verified.

Corrective Action

No corrective action possible, since the failure could not be verified.

Honeywell

FAILURE AND ACTION REPORT

71111

Hybrid Interface	10990455	95		12 6 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0096	
Ambient	Lot 1 Acceptance Test			
High Temperature Storage				

No electrical failure; however, the package is cracked.

No cause for the crack in the package could be determined.

No corrective action possible since the root cause of failure could not be determined.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71112

Hybrid Interface	10990455	63		12 6 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Ambient	Lot 1 Acceptance Test			

Failed ambient electricals but now works in a breadboard

The unit checks out good. The failure could not be duplicated.

No corrective action possible since failure could not be duplicated.

Honeywell

FAILURE AND ACTION REPORT

71113

Hybrid Oscillator	11711427	99		12 6 78
Honeywell	XM 587	HDL	DAAG39-77-C-0056	

Lot 1 Acceptance Test

Failed Lot Acceptance Post shock test.

The failure was verified and the hybrid was opened. A broken bond wire was found on the base of Q1.

Hybrid Oscillator	11711427	99		Honeywell	

The short term fix is to limit the shock level to a more realistic limit. The long term solution is to replace the oscillator with a unit that does not have bond wires.

Honeywell

Reliability

FAILURE AND ACTION REPORT

Hybrid Oscillator	11711427	88		71114 12 6 78
Honeywell	XM 587	Harry Diamond Lab	DAAG39-77-C-0056	
Ambient	Lot I Acceptance Test			

Detected during: 3 ☒ Acceptance

Disposition: 2 ☒ Scrapped

Description of Failure:

Failed electrical pre-shock test but operates now.

Failure Analysis Results:

Unit checks out good. The failure could not be duplicated.

Corrective Action:

No corrective action possible since failure could not be duplicated.

Honeywell

FAILURE AND ACTION REPORT

71115

Hybrid Oscillator | 11711427 | 123 | 12 6 78

Honeywell | XM 587 | HDL | DAAG39-77-C-0056

Lot 1 Acceptance Test

Fail lot acceptance electrical test. It takes about 200 ms to run properly.

The reported faulure could not be verified; however, an abnormal wave form was seen. The unit was opened after which it operated normally for 1 second then went dead. There were no visual defects found.

Hybrid Oscillator | 11711427 | 123 | Honeywell

Report failure could not be isolated; therefore, no corrective action possible.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71122

E-Head	11711430	7847		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
		71122	-	

Description of Failure

The fuze failed to program.

Quality

Failure Analysis Results

The failure was confirmed in the lab. The nose cone was removed and the ladder exposed. The oscillator output was locked at -22.8 volts. A new oscillator was substituted and the fuze functioned normally. The oscillator was opened to determine the cause of failure. Two lifted bonds and a broken leadwire were found in the oscillator.

Precision Oscillator	11711427		A5	Honeywell
PWB Assy No. 1	11711413			Honeywell

Corrective Action

Replace the present oscillator with an oscillator that does not have bond wires is the long term solution. In the short term continue 100% screen after potting.

Honeywell

FAILURE AND ACTION REPORT

71123

E-Head	11711430	1314		14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Balloting Test	Lot Acceptance Tests			
		71123		

The fuze fails to program.

HDL

The failure was confirmed in the F.A. Lab. The oscillator output was found locked at -23.5 volts. With a substitute oscillator the fuze functions normally. The oscillator was opened to determine the cause of failure. Multiple lead wires were found broken in the oscillator.

Precision Oscillator	11711427		A5	Honeywell
PWB Assy No. 1	11711413			Honeywell

Replace the present oscillator with an oscillator that does not have bond wires in the long term solution. In the short term reduce the shock value to a more realistic level.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71124

E-Head	11711430	8210		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
		71124	-	

The fuze fails to program.

Quality

The fuze failed to set. During the programing cycle a negative voltage failed to appear on A2 pin 9. This was caused by a defective interface which was removed and confirmed bad on the production test set. The interface was opened and a lifted bond at CR1 was found.

Interface Hybrid Assy	11711608		A1	Honeywell	
PWB Assy No. 2	11711414			Honeywell	

Continue 100% screen after post-pot.

Honeywell FAILURE AND *ACTION* REPORT

71125

F-Head	11711430	9149.		20 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Shock Test	Lot Acceptance Tests			
		71125	-	

The fuze will not set or run.

Quality

The failure was duplicated in the lab. The oscillator was found locked at -23.5 volts. The fuze functioned normally after a new oscillator was substituted into the circuit. The oscillator was opened to determine the failure cause. Multiple broken leadwires and a lifted bond were found in the oscillator.

Precision Oscillator	11711427		A5	Honeywell	
PWB Assy No. 1	11711413			Honeywell	

Replace the present oscillator with an oscillator that does not have bond wires is the long term solution. In the short term reduce the shock value to a more realistic level of 22,000 gs.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71126

E-Head	11711430	9028		
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Shock Test	Lot Acceptance Tests			
		71126	-	

The fuze will not set or run.

Quality

The failure was duplicated in the lab. The oscillator was found locked at 0.0 volts. The fuze functioned normally after a new oscillator was substituted into the circuit. The oscillator was opened to determine the cause of failure. Several broken bonds were found in the oscillator.

Precision Oscillator	11711427		A5	Honeywell	
PWB Assy No. 1	11711413			Honeywell	

Corrective Action Summary

Replace the present oscillator with an oscillator that does not have bondwires is the long term solution. In the short term reduce the shock value to a more realistic level of 22,000 gs.

Honeywell

Reliability

FAILURE AND ACTION REPORT

No.	71127
End Item	E-Head
Part No.	11711430
Serial No.	8904
Date (Day Month Year)	20 4 78
Mfr.	Honeywell
System	XM587
Customer	Harry Diamond Lab
Contract or Development No.	DAAG39-77-C-0056
Test Environment	Shock Test
Operation being performed	Lot Acceptance Tests
Test Report No./Log No.	71126
Lot No.	-
Detected during	3 Acceptance

Description of Failure:

The fuze will not set or run.

Dept.: Quality

Failure Analysis Results:

The failure was duplicated in the lab. The oscillator was found locked at -23.3 volts. The fuze functioned normally after a new oscillator was substituted into the circuit. The oscillator was opened to determine the cause of failure. Several broken bondwires and a lifted bond were found in the oscillator.

Actual Failed Item - Name	Part No.	Serial No.	Ref. Des.	Mfr.	Mfr. Part No.
Precision Oscillator	11711427		AS	Honeywell	
PWB Assy No. 1	11711413			Honeywell	

Corrective Action:

Replace the present oscillator with an oscillator that does not have bond wires is the long term solution. In the short term reduce the shock value to a more realistic level of 22,000 gs.

Responsibility: 1 Design, 3 Vendor, 5 Process

Effect of Failure: 2 Major

Engineer — Reliability

Honeywell

FAILURE AND *ACTION* REPORT

E-Head	11711430	8243		8 4 78
Honeywell	XM587	Harry Diamond Lab		
Post-Pot	Acceptance Test			
	71128	-		

71128

The fuze fails to program.

Quality

The fuze fails to program. During the programing cycle a negative voltage failed to appear on A/ pin 9. This was caused by a defective interface which was removed and confirmed bad on the production test set. The interface was opened and a lifted bond of CR1 was found.

Interface Hybrid Assy	11711608		A1	Honeywell	
PWB Assy No. 2	11711414			Honeywell	

Continue 100% screen after post-pot.

Honeywell

Reliability

FAILURE AND ACTION REPORT

E-Head	11711430	7530		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
	71129	-		

No. 71129

Description of Failure:

The fuze failed to program.

Dept.: Quality

Failure Analysis Results:

The fuze failed to set During the programing cycle a large negative voltage failed to appear on A2 pin 9. This was caused by a defective interface, which was removed and confirmed bad on the production test set. The interface was opened and a lifted bond at CR1 was found.

Interface Hybrid Assy	11711608		A1	Honeywell
PWB Assy No. 2	11711414			Honeywell

Corrective Action:

Continue 100% screen after post-pot.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71130

E-Head	11711430	8068		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
	71130	-		

The fuze failed to program.

Quality

The failure was confirmed in the lab. Two problems in the fuze were isolated. The reset delay pulse on A1 pin 5 was not present. The other problem was that A3 pin 6 breaks down at 4 volts. The interface was removed and confirmed bad on the production test set. The protection diode on pin 6 of A3 could have been blown because of a static discharge during the failure analysis. The interface was opened and a broken lead wire to capacitor C1 was found.

Interface Hybrid Assy	11711608		A1	Honeywell	
PWB Assy No. 2	11711414			Honeywell	

Continue 100% screen after post-pot.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71131

E-Head	11711430	1879		Day 14, Month 4, Year 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Balloting Test	Lot Acceptance Tests			
		71131		

Description of Failure

The unit did not supply sufficient energy in the detonation pulse.

Reported by: HDL

Failure Analysis Results

The failure was confirmed in the F.A. Lab. The firing capacitor was confirmed good by examination of the charging wave form. The failure was isolated to a internal short in the SCR circuitry in the interface hybrid. Upon removal of the interface hybrid from the fuze the failure disappeared. It is possible that the firing capacitor was defective only under a rapid discharge. This can not be confirmed since the capacitor was destroyed in removing the interface.

Item - Name	Part No.	Serial No.	Ref. Des.	Mfr.	Mfr. Part No.
Capacitor	11711404		C1		
PWR Assy No. 2	11711414			Honeywell	

Corrective Action

Since the root cause of failure was not found, no meaningful corrective action can be taken.

Honeywell

Reliability

FAILURE AND ACTION REPORT

F-Head	11711430	7205		71132 — 14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
High Temp. 68°C	Lot Acceptance Tests			
		71132		

The fuze fails to program.

Quality

The failure was confirmed in the F.A. Lab. The failure of the counter to provide an arm signal during programming prevents the fuze from setting; however, the counter does provide an arm signal during a real time run. Through an examination of the output of A3 pin 4 it was determined that stage M1 is initialized in the wrong state. This delays the arm signal output two scaler counts which prevents the fuze from setting.

Counter	10990466		A3	NCR
PWB Assy No. 2	11711414			Honeywell

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell Reliability

FAILURE AND ACTION REPORT

F-Head	11711430	8144		14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
High Temp. 68°C	Lot Acceptance Tests			
		71133		

Report No. 71133

Description of Failure

The fuze intermittently fails to program. Also the fuze does not run properly in real time.

Quality

Failure Analysis Results

The fuze would not program in the F.A. Lab. The failure was isolated to a low voltage scaler input to the counter. The circuit path was cut between the counter and the scaler. The low voltage was caused by an excessive current draw by the input of the counter.

Counter	10990466		A1	HDL	
PWB Assy No. 2	11711414			Honeywell	

Corrective Action

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71134

Item Under Test - Name	E-Head
Part No.	11211430
Serial No.	7031
Day / Month / Year	14 / 4 / 78
Mfr.	Honeywell
System	XM587
Customer	Harry Diamond Lab
Contract or Development No.	DAAG39-77-C-0056
Test Environment	High Temp. 68°C
Operation being performed	Lot Acceptance Tests
Test Report No.	71134
Dept.	Quality

Description of Failure

The unit will not set.

Failure Analysis Results

The fuze would not program in the F.A. Lab. The failure was isolated to a low voltage scaler input to the counter. The circuit path was cut between the counter and the scaler. The low voltage was caused by an excessive current draw by the input of the counter.

Name	Part No.	Ref. Des.	Mfr.
Counter	10990466	A3	NCR
PWB Assy. No. 2	11711414		Honeywell

Corrective Action

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell FAILURE AND *ACTION* REPORT 71135

E-Head	11711430	7996		20 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Cold Temp. -45°C	Lot Acceptance Tests			
	71135			

The fuze will not set or run.

Quality

The failure was duplicated in the lab. The fuze draws over 680 ma at 1.2 volts with jumps of over 100 ma. The unregulated voltage line (L2) was found to draw 34 ma at 25 volts. The high current draw was traced to the counter.

Counter	10900466		A3	MFR	
PWB Assy No. 2	11711414			Honeywell	

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71136

E-Head	11711430	7964		20 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Cold Temp. -45°C	Lot Acceptance Tests			
		71136		

The fuze will not set or run.

Quality

The failure was duplicated in the lab. The fuze draws over 955 ma at 1.2 volts. We substituted a -15 volt power supply for the converter assembly at L2. The unit draws 60 ma at -15 volts. The high current draw was traced to the counter.

Counter	10990466		A3	NCR
PWB Assy No. 2	11711414			Honeywell

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell

FAILURE AND *ACTION* REPORT

71137

E-Head	11711430	9004		20 4 78
Honeywell	20587	Harry Diamond Lab	DAAG39-77-C-0056	
Shock Test	Lot Acceptance Tests			
		71137		

The fuze will not set or run.

Quality

The failure was duplicated in the lab. The fuze draws high current 690 ma at -1.2 volts. With a substitute -25 volt power supply the fuze draws between 20-50 ma with rapid fluctuations. The high current was traced to the counter.

Counter	10990466		A3	NCR	
PWB Assy No. 2	11711414			Honeywell	

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71138

Item Name	E-Head
Part No.	11711430
Serial No.	9173
Day / Month / Year	20 / 4 / 78
Mfr.	Honeywell
System	XM587
Customer	Harry Diamond Lab
Contract or Development No.	DAAG39-77-C-0056
Test Environment	Shock Test
Operation being performed	Lot Acceptance Tests
Test Report No.	71138
Detected during	3 ☒ Acceptance
Disposition	2 ☒ Scrapped
Dept.	Quality

Description of Failure

The fuze will not set or run.

Failure Analysis Results

The failure was duplicated in the lab. The fuze draws high current 920 ma at -1.2 volts. The fuze draws 39 ma using a substitute -25 volt power supply. The high current was isolated to the counter.

Actual Failed Item - Name	Part No.	Serial No.	Ref. Des.	Mfr.	Mfr. Part No.
Counter	10990466		A3	NCR	
PWB Assy No. 2	11711414			Honeywell	

Corrective Action

The counter is Government furnished material. HDL is responsible for corrective action on the counter.

Responsibility: 1 ☒ Design; 3 ☒ Vendor

Effect of failure: 2 ☒ Major

Engineer · Supervisor · Quality · Reliability

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71139

E-Head	11711430	8726		14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test		71139	

Description of Failure

The time from J2-2 going low to DET function at J2-3 was .1 msec too fast.

Dept.: Quality

Failure Analysis Results

This problem is not with the fuze but with the electrical specification for the fuze. No electrical failure analysis was performed on the unit.

Corrective Action

Alter the specification to move realistic limits for test 1.6 (H).

Engineer — Supervisor — Quality — Reliability

Honeywell

Reliability

FAILURE AND ACTION REPORT

No. 71141

Item under test – Name: E-Head	Part No.: 11711430	Serial No.: 8344		Day 8, Month 4, Year 78
Honeywell	System: XM587	Customer: Harry Diamond Lab	Contract or Development No.: DAAG39-77-C-0056	
Test Environment: Post-Pot	Operation being performed: Acceptance Test	Accumulated hours/cycles:		
Previous Environment:		Test Report No./Log No.: 71141	Lot No.:	

Detected during: 1 Receiving; 2 R&D; 3 [x] Acceptance; 4 Qualification; 5 Preproduction; 6 Production; 7 Field Use; 8 Maintenance; 9

Description of Failure:

The capacitor voltage is only -13.8 volts.

Disposition: 1 Repaired; 2 [x] Scrapped; 3 Adjusted; 4 Replaced; 5 Continue tests; 6 Return to; 7

Reported by: Originator | Supervisor | Dept.: Quality | Customer Representative

Failure History:

Failure Analysis Results:

The nose cone was removed and the ladder exposed. The regulated voltage was measured at -22.2 volts with a capacitor voltage of -13.8 volts. Ladder #3 was severed which is the impact switch input to the interface hybrid. The capacitor voltage returned to normal. The failure cause is a leaky impact switch.

Actual Failed Item – Name: Impact Switch	Part No.: 11718418	Serial No.:	Ref. Des.:	Mfr.: GFM	Mfr. Part No.:
Next Assembly – Name: PWR Assy No. 1	Part No.: 11711413	Serial No.:	Ref. Des.:	Mfr.:	Mfr. Part No.:

Corrective Action Summary

Corrective Action:

The Impact Switch is Government furnished material. HDL is responsible for corrective action on the Impact Switch.

Responsibility: 1 Design; 2 Test; 3 [x] Vendor; 4 Workmanship; 5 Process; 6 Maintenance; 7

Effective Date

Corrective Action Approved by:

Analysis and Corrective Action: Originator | Supervisor | Date | Reliability

Effect of failure: 1 Critical; 2 [x] Major; 3 Minor

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71142

E-Head	11711430	7430		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
	71142			

Description of Failure:

The fuze failed to set.

Quality

Failure Analysis Results:

The fuze would not set on the automatic test equipment; however, it would progmam properly on the manual test set. After cleaning the contact rings the unit functioned properly on the automatic tester on an intermittent basis. The contact rings and pad provide only an intermittent contact due to a black contaminent on the surface. An analysis failed to find any contaminent capable of an intermittent contact failure.

Actual Failed Item - Name	Part No.	Serial No.	Ref. Des.		
Nose Plug	11711425				

Corrective Action:

The root cause of the failure could not be determined; therefore the only corrective action is to change the software of the automatic tester to alert the operator of a possible contact problem.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71143

E-Head	11711430	8116		Day 8, Month 4, Year 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
		71143		

Description of Failure

The fuze failed to set.

Dept.: Quality

Failure Analysis

The fuze intermittently fails to function properly. The unit has been subjected to 8 thermal cycles from -50°F to 150°F and still fails only intermittently. The failure cause could not be isolated.

Preventive Action

No corrective action possible.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71146

E-Head	11711430	8763		8 / 4 / 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
		71144		

The fuze failed to program.

Quality

The failure was confirmed in the lab. The nose cone was removed and the ladder was exposed. The failure never reoccurred, even after 8 thermal shock cycles from -50°F to 150°F. The failure cause could not be isolated.

No corrective action possible.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71145				
E-Head	11711430	1531		14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Balloting Test	Lot Acceptance Tests			
	71145			

This unit failed at 1.2 volts during tests at HDL. It was good at 1.5 volts.

Reported by: HDL

The fuze was tested and checked good in the F.A. Lab. The fuze was subjected to 8 thermal cycles and it still checks good. The failure could not be duplicated.

No corrective action possible.

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

71146

E-Head	11711430	8160		14 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
High Temp. 68°C	Lot Acceptance Tests			
	71146			

Description of Failure

The fuze fails to program.

Quality

Failure Analysis Results

The failure was not confirmed in the F.A. Lab. The unit was thermal cycled 8 times. The unit still operates properly. The failure could not be duplicated.

Corrective Action

No corrective action possible.

Honeywell

Reliability

FAILURE AND ACTION REPORT

71147

E-Head	11711430	7702		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0058	
Post-Pot	Lot Acceptance Test			
	71147			

Acceptance [x]

Description of Failure

The fuze failed to program.

Disposition: Scrapped [x]

Dept.: Quality

Failure Analysis Results

The failure was duplicated in the lab. To determine the cause of failure the potting was removed in selected areas. After the potting removal the failure change. The fuze now errored at the end of the program cycle instead of near the beginning. Also in removing the potting the output stage of A3-6 was damaged. This pin now breaks down at a -2 volts. This is the cause of the present failure; therefore, except for the blown output A3-6, the fuze functions normally. The fuze was thermal cycled several times trying to induce the orginal failure without success.

Corrective Action

No corrective action possible.

Effect of Failure: Major [x]

Honeywell

Reliability

FAILURE AND *ACTION* REPORT

E-Head	11711430	8106		71148 — 20 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Cold Temp -45°C	Lot Acceptance Tests			
	71148			

Description of Failure

The fuze will not set or run.

Quality

Failure Analysis Results

The fuse was found to have two problems. The unit had a defective converter assembly, which was caused by an open in the transformer secondary. The other problem is a defective counter, which fails to provide an arm pulse in real or fast time. The counter was removed and confirmed defective on the production test set.

Transformer	11711448		T1	Custom Coils	
Counter	10990466		A3	NCR	

Corrective Action

Redesign the transformer to reduce the mechanical stresses caused by the potting on the transformer assembly. The counter is Government Furnished Material. HDL is responsible for corrective action on the counter.

Honeywell

Reliability

FAILURE AND ACTION REPORT

No. 71149

E-Head	11711430	8555		14 4 78
Honeywell	DM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
	71149	-		

16. Description of Failure

The unit fails to operate in real time.

Operation: 3 ☒ Acceptance

Disposition: 2 ☒ Scrapped

Dept.: Quality

26. Failure Analysis Results

The failure was confirmed in the F.A. Lab. The unregulated voltage was at 1.2 volts. After substituting a new converter assembly the fuze performs properly. The failure in the defective converter was isolated to an open in the secondary of the transformer.

Actual Failed Item - Name	Part No.	Serial No.	Ref. Des.	Mfr.	Mfr. Part No.
Transformer	11711448		T1		
PWB Assy No. 1	11711413			Honeywell	

Corrective Action

Redesign the transformer to reduce the mechanical stresses caused by the potting on the transformer assembly.

Responsibility: 1 ☒ Design

Honeywell

FAILURE AND ACTION REPORT

71350

E-Head	11711430	7955		8 4 78
Honeywell	XM587	Harry Diamond Lab	DAAG39-77-C-0056	
Post-Pot	Acceptance Test			
		71350	-	

The fuze draws excessive current.

Quality

The high current draw, 920 ma at 1.2 volts, was confirmed in the lab. The failure was isolated to a defective converter assembly. The transformer in the converter assembly was found to have a cracked core.

Transformer	11711448				
PWB Assy No. 1	11711413			Honeywell	

Redesign the transformer to reduce the mechanical stresses caused by the potting on the transformer assembly.

APPENDIX H

TECHNICAL DATA PACKAGE ON HYBRID OSCILLATOR AND INTERFACE UNIT

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

INTERNAL VISUAL REQUIREMENTS FOR HYBRID MICROCIRCUITS FOR SHOCK APPLICATIONS

THIS DOCUMENT HAS BEEN RELEASED FOR PRELIMINARY PROCUREMENT INITIATED BY HARRY DIAMOND LABORATORIES AND IS SUBJECT TO FINAL REVIEW AND CORRECTION

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

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS — FRACTIONS — ANGLES —

ORIGINAL DATE OF DRAWING 78-7-27

DRAFTSMAN D.D. | CHECKER

MATERIAL | HEAT TREATMENT | FINAL PROTECTIVE FINISH | SUBMITTED | APPROVED

U.S. ARMY
HARRY DIAMOND LABORATORIES
WASHINGTON D.C. 20438

INTERNAL VISUAL REQUIREMENTS FOR HYBRID MICROCIRCUITS, FOR SHOCK APPLICATIONS

SIZE	CODE IDENT NO.	
A	19202	11711619

SCALE — | UNIT WT | SHEET 1 OF 18

AMXDO 932AV

1.0 <u>SCOPE</u>

1.1 This document establishes the requirements for the visual examination and acceptance criteria for hybrid microcircuits intended for use in 30,000 g shock applications.

1.2 <u>Purpose</u> - The intent of this document is to establish criteria for examining the internal materials, construction and workmanship of Precision Oscillator 11711427 and Interface Hybrid Circuit 10990455. This document is similar to MIL-STD-883, Method 2017 and will be used prior to capping or encapsulation to detect and eliminate devices with internal defects which could lead to device failures in normal application.

2.0 <u>APPLICABLE DOCUMENTS</u>

2.1 The following documents, of the issue in effect, form a part of this document to the extent specified herein.

STANDARDS

<u>Military</u>

MIL-STD-883	Test Methods and Procedures for Microelectronics
MIL-STD-750	Test Methods for Semiconductor Devices

SPECIFICATIONS

<u>Harry Diamond Laboratories</u>

11711427	Precision Oscillator
11711620	Networks, Thick film, Visual requirements for
10990455	Interface Hybrid Circuit

3.0 <u>REQUIREMENTS</u>

3.1 <u>Equipment</u>

3.1.1 Microscopes with the capability of 30X to 70X magnification (low magnification), and 75X to 150X magnification (high magnification).

A microscope with magnification of 10X may be used for a general overview inspection.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 2

AMXDO 932AV-1

3.2 <u>Procedure</u>

3.2.1 <u>General</u> - The device shall be examined in a suitable sequence of observations within the specified magnification range to determine compliance with the requirements of the applicable drawing. Discrete active devices shall be examined in accordance with Para. 3.2.5.1. Passive chip components shall be inspected in accordance with Para 3.2.5.2. Thick and thin film networks shall be examined in accordance with Para. 3.2.5.3. If a specified visual inspection is in conflict with circuit design topology or construction, documented in the specific device documentation, the latter shall prevail.

3.2.2 <u>Sequence of Inspection</u> - The order in which criteria are presented is not a required order of examination. The inspection criteria of Para. 3.2.5.1, 3.2.5.2, 3.2.5.3 may be performed prior to die, chip, or substrate attachment.

3.2.3 <u>Inspection Control</u> - In all cases, examination prior to final preseal inspection shall be performed under the same quality program that is required at the final preseal inspection station. Care shall be exercised after inspections per 3.2.2 to insure that defects created during subsequent handling will be detected and rejected at final preseal inspection. During the time interval between internal visual inspection and preparation for sealing, devices shall be stored in a controlled environment. Devices shall be in covered containers when transferred from one controlled environment to another.

3.2.4 <u>Magnification</u> - "High magnification" inspection shall be performed perpendicular to the substrate surface with the device under illumination normal to the substrate surface. "Low magnification" inspection shall be performed with either a monocular, binocular or stereo microscope, and the inspection performed within an angle of 30 degrees from the perpendicular to the substrate surface with the device under suitable illumination.

3.2.5 <u>Examination</u> - Internal visual examination as required in 3.2.5.1 through 3.2.5.7 shall be conducted on each hybrid microcircuit. The magnifications required for each inspection shall be those identified in the particular test method used.

3.2.5.1 <u>Microcircuit and Semiconductor Die or Chips</u> - All microcircuit and semiconductor devices shall be examined in accordance with MIL-STD-883 method 2010 Para. 3.2.1 Metallization Defects, 3.2.2 Diffusion and Passivation Layer(s) Faults and 3.2.3 Scribing and Die Defects. Transistor and diode semiconductor die may be visually inspected in accordance with method 2072 of MIL-STD-750, Para. 3.1.1 Die Metallization Defects, 3.1.2 Oxide and Diffusion Faults and 3.1.3 Scribing and Die defects in lieu of the above specification.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 3

AMXDO 932AV-1

3.2.5.2 Passive Chip Components (capacitors, resistors) - "Magnification 30Xto 70X." No device shall be acceptable which exhibits the following:

3.2.5.2.1 Peeling or lifting of metallized terminals.

3.2.5.2.2 Bridging between metallized terminals which leaves less than 1.0 mil separation.

3.2.5.2.3 Nonconformance to outline drawing.

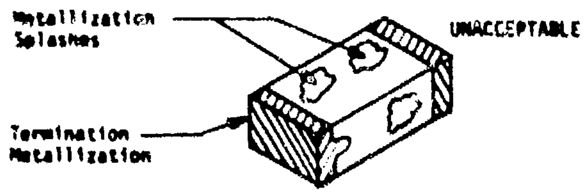
3.2.5.2.4 Lifting, blistering, or peeling of insulation.

3.2.5.2.5 Ceramic Chip Capacitors - A minimum magnification of 30X is required. No device shall be acceptable which exhibits the following:

3.2.5.2.5.1 Crack that is more than 50 percent of width on a side or extends around an edge.

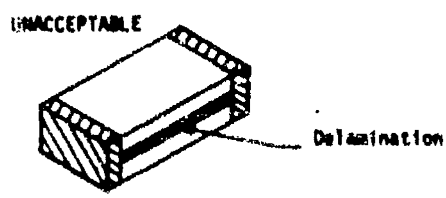
3.2.5.2.5.2 Any capacitors which are warped in excess of 10 degrees at the center line.

3.2.5.2.5.3 Excess flow and splashes of metallization material leaving less than 10 mils separation between the terminals.



3.2.5.2.5.4 Evidence of delaminations in the body of the capacitor.

(A delamination is defined as a separation between the plate layers that has not been vitrified together.)



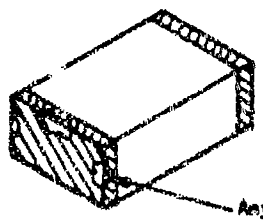
SIZE	CODE IDENT NO.	
A	19202	11711619
SCALE	REV	SHEET 4

AMXDO FORM 932AV-1

3.2.5.2.5 Ceramic Chip Capacitors (Continued)

3.2.5.2.5.8 Voids in the termination metallization which reduce the metallization of any given edge by more than 10%.

UNACCEPTABLE



3.2.5.3 Thick and Thin Film Resistors

3.2.5.3.1 Thick Film Resistors-Shall be examined in accordance with 11711620.

3.2.5.3.2 Thin Film Resistors - A minimum magnification of 70X is required. Thin Film metallization defect criteria of 3.2.5.1 applies to the resistor terminations. In addition, any device exhibiting the following shall not be acceptable.

3.2.5.3.2.1 Any distinct change in color that indicates a change in thickness of the resistor material within 0.3 mil of the resistor/conductor termination.

3.2.5.3.2.2 Insulating layer that does not completely cover resistive material due to misalignment.

3.2.5.3.2.3 Less than 2.0 mils between any trimmed resistor area and conductor.

3.2.5.3.2.4 Trimmed resistor width less than 1.0 mil whether by trimming, voiding, or scratching or a combination thereof.

3.2.5.3.2.5 Resistor patterns which do not overlap the conductor along the entire width of the resistor by a minimum of .25 mil.

SIZE	CODE IDENT NO.	
A	19202	11711619
SCALE	REV	SHEET 6

3.2.5.3.2.6 Any cracks in the resistor element.

3.2.5.3.2.7 Separation between any two resistors or resistor and conductor combination that is less than 0.3 mil, whether caused by misalignment, photolithographic defects, screening defects, smears, or other causes.

3.2.5.3.2.8 Void(s) or necking down that leaves less than 75 percent of the resistor width undisturbed.

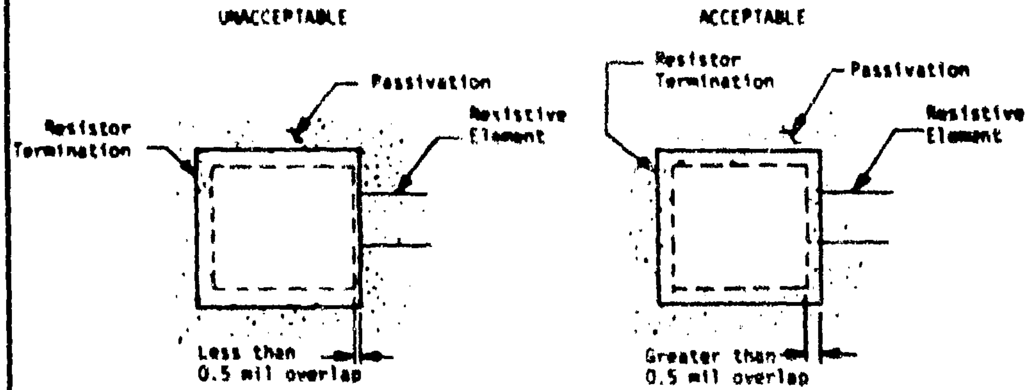
3.2.5.3.2.9 Resistor material left in the kerf (trimmed area) of a resistor.

3.2.5.3.2.10 Evidence of resistor repair.

3.2.5.3.2.11 Evidence of voids or pinholes in the passivation over the thin film resistor element.

3.2.5.3.2.12 Evidence of cracking or crazing of the passivation at the resistive element to resistor termination interface.

3.2.5.3.2.13 Less than 0.5 mil overlap of the passivation onto the resistor termination.



3.2.5.3.2.14 Passivation which reduces the bonding site area to less than 4 mils by 4 mils.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 7

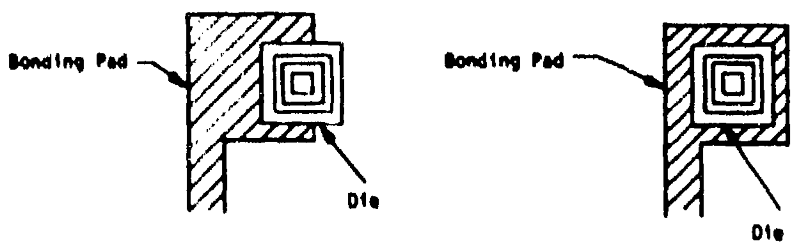
AMXDO 932AV-1

3.2.5.4 Component Assembly to Substrate

3.2.5.4.1 Die Bonding - A minimum magnification of 30X is required. No units shall be acceptable which exhibit the following:

3.2.5.4.1.2. A die not located within the boundaries of its bonding pad.

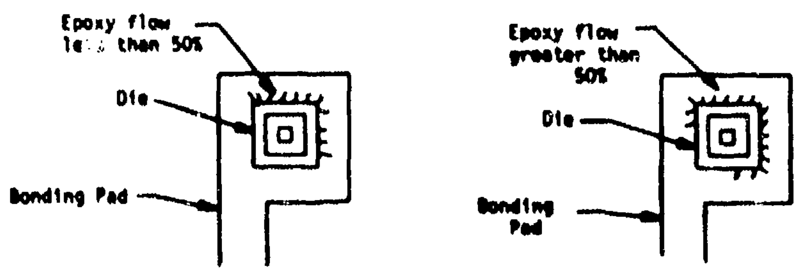
UNACCEPTABLE ACCEPTABLE



3.2.5.4.1.3 Improperly oriented die.

3.2.5.4.1.4 Any epoxy mount in which the epoxy is not visible around 75% of the die periphery, unless the epoxy covers 50% of the die periphery and is continuous on two sides.

UNACCEPTABLE ACCEPTABLE

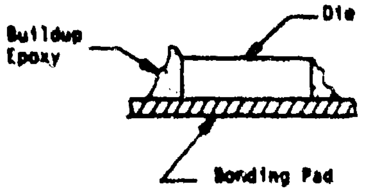


SIZE	CODE IDENT NO.	
A	19202	11711619
SCALE	REV	SHEET

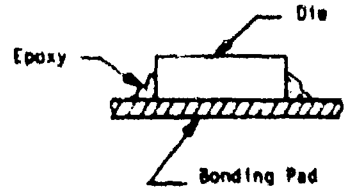
3.2.5.4.1 Die Bonding (Continued)

3.2.5.4.1.5 Any conductive epoxy build-up which is higher than the top surface of the die.

UNACCEPTABLE

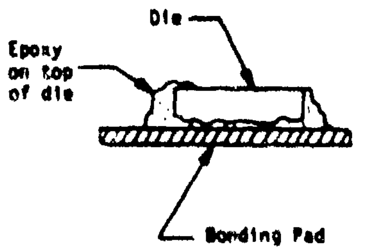


ACCEPTABLE

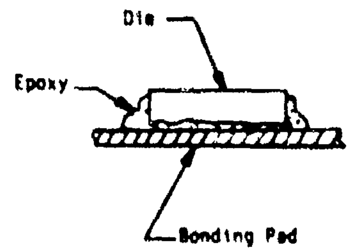


3.2.5.4.1.6 Any conductive epoxy on the top surface of the die.

UNACCEPTABLE



ACCEPTABLE



3.2.5.4.1.7 Any conductive epoxy flow from the die which approaches closer than 2 mils to other substrate elements, interconnects or bonding sites.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 9

AMXDO 932AV-1

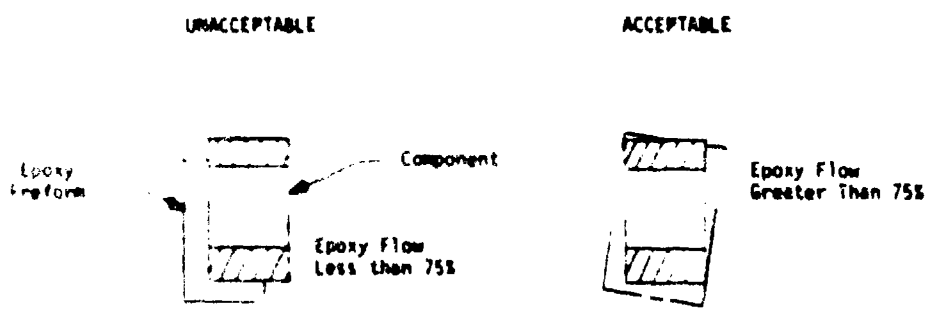
3.2.5.4.1 Die Bonding (Continued)

3.2.5.4.1.8 Bubbles and/or voids in the epoxy which occupy more than 20% of the die periphery.

3.2.5.4.1.9 Cracks in the epoxy around the perimeter of the die greater than 5.0 mils in length or 10% of the contact periphery.

3.2.5.4.2 Component Mounting (Chip Capacitor) - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.4.2.1 Organic polymer (epoxy) adhesive mounted components in which polymer flow is not visible around 75% of the component body.



3.2.5.4.2.2 Any crack in the organic polymer adhesive around the component body greater than 5 mils in length.

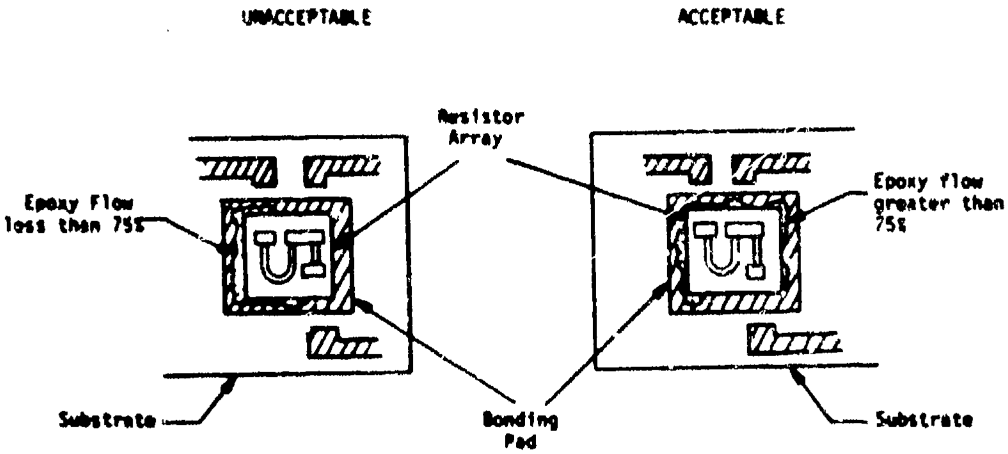
SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 10

AMXDO 93RAV-1

3.2.5.4.3 Thin Film Resistor Array Mounting - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.4.3.1 Any thin film resistor array mount in which epoxy flow is not visible around 75% of the bonded substrate.

Resistor Array Mount to Substrate



3.2.5.4.3.2 Extraneous epoxy on the surface of the thin film resistor array.

3.2.5.4.3.3. Bubbles and/or voids in the epoxy which occupy more than 20% of the total perimeter of the bonding pad.

3.2.5.4.3.4. Misorientation of the thin film resistor array.

3.2.5.4.4 Wire Bonding - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.4.4.1 Ball Bonds

3.2.5.4.4.1.1. Ball bonds that are less than 2.0 times or greater than 6.0 times the wire diameter.

3.2.5.4.4 Wire Bonding (Continued)

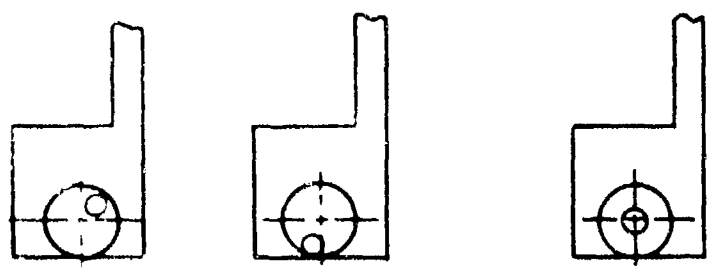
3.2.5.4.4.1.2 Ball bonds where more than 50% of the bond is outside the bonding pad area on silicon die or extends over an area that is not fully passivated.

3.2.5.4.4.1.3. Ball bonds that are not within the confines of the circuit metallization pads (thick and thin film) or package interconnect when viewed from above.

3.2.5.4.4.1.4. Rebonding by placing a ball on top of a previously bonded ball.

3.2.5.4.4 1.5 Ball bonds where the center of the ball is not within the exit wire diameter.

UNACCEPTABLE ACCEPTABLE



Center of ball not within exit wire diameter

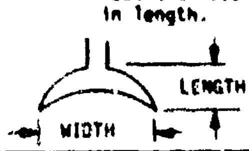
Center of ball within exit wire diameter

3.2.5.4.4.1.6 Evidence of rebonding on an active device which produces missing or damaged metallization in excess of 50% of the original area.

3.2.5.4.4.1.7 Intermetallic formation extending more than 0.1 mil around the periphery of any gold ball bond.

3.2.5.4 4.2 Stitch Bonds

3.2.5.4.4.2.1 Stitch (tailless crescent) bonds that are less than 1.2 or more than 5.0 times the wire diameter in width or less than 0.5 times or more than 3.0 times the wire diameter in length.



SIZE	CODE IDENT NO.	
A	19202	1171161.
SCALE	REV	SHEET 12

3.2.5.4.4 Wire Bonding (Continued)

3.2.5.4.4.2 Stitch Bonds (Continued)

3.2.5.4.4.2.2 Stitch bonds that are not within the confines of the circuit metallization pads (thick and thin film) or package interconnect when viewed from above.

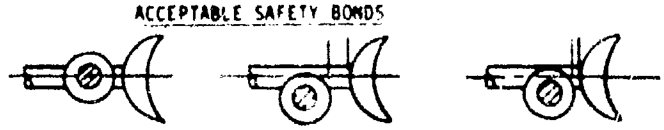
3.2.5.4.4.2.3 Evidence of rebonding which produces missing or damaged metallization in excess of 50% of the design area.

3.2.5.4.4.3 Safety Bonds - Safety ball bonds over all (stitch) bonds shall be inspected per the following criteria except criteria 3.2.5.4.4.3.2 shall be deleted for 2 mil wire (when viewed from vertical or within 30 degrees of vertical):

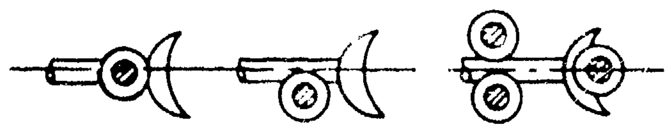
3.2.5.4.4.3.1 Greater than 50% of the wire shall be covered by the ball, except for 2.0 mil wires where 75% of the stitch bond shall be covered.

3.2.5.4.4.3.2 A portion of the stitch bond shall be visible 180 degrees from the side where the wire starts under the ball.

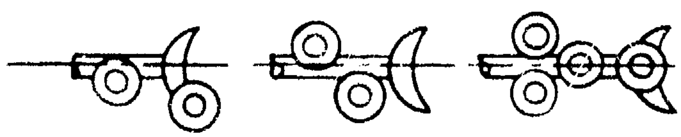
ACCEPTABLE SAFETY BONDS



UNACCEPTABLE SAFETY BONDS



ACCEPTABLE REWORKED BONDS



SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 13

AMXDO Form 932AV-1

3.2.5.4.4 Wire Bonding (Continued)

3.2.5.4.4.3.3 The safety ball shall be 2 to 6 wire diameters.

3.2.5.4.4.3.4 The safety ball shall be completely within the confines of the bonding pad.

3.2.5.4.4.3.5 Any remaining wire material longer than 5 wire diameters on the end of a safety ball shall be removed or bonded within the confines of the same bonding pad without a safety ball.

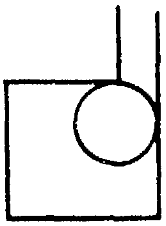
3.2.5.4.4.4 General

3.2.5.4.4.4.1 Bonds placed so that the separation between bonds, or between the bond and adjacent metallization which are not connected, is less than 0.3 mils.

3.2.5.4.4.4.2 A bond placed such that part of the bond is over the edge of the die or such that no undisturbed oxide is visible between the bond and the edge of the chip.

3.2.5.4.4.4.3 Bond in the junction area (or point where metallization exits from the bond pad) which does not exhibit a line of undisturbed metallization visible between the periphery of the bond and at least one side of the junction (or one side of the connecting stripe) when viewed from above.

UNACCEPTABLE - Bond completely Closes Junction



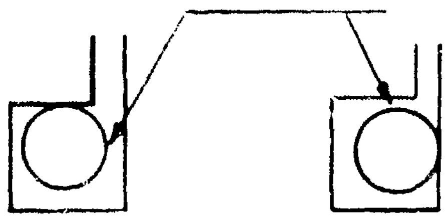
SIZE	CODE IDENT NO.	
A	19202	11711619
SCALE	REV	SHEET 14

AMXDO FORM 952AV-1

3.2.5.4.4 Wire Bonding (Continued)

3.2.5.4.4.4.3 (Continued)

ACCEPTABLE - Line of Metallization Visible



3.2.5.4.4.4.4 Wire tails which extend over (when viewed from above) or make contact with any metallization not covered by passivation and not connected to the wire, or wire tails which exceedfive wire diameters in length at the pad, or four wire diameters in length at the package interconnect.

3.2.5.4.5 Internal Lead Wires

3.2.5.4.5.1 A wire loop displaced (when viewed from the top) such that the distance between the wire path and the ideal straight line path is greater than 10 wire diameters.

3.2.5.4.5.2 Excessive loop or sag in any wire such that it appears to come closer than 5 wire diameters beyond a distance of 10 mils from the die surface to another wire, pad, package post, die or any portion of the package.

3.2.5.4.5.3 Nicks, cuts, crimps, scoring, or neckdown of the bonding wire which reduces the wire diameter by more than 25%.

3.2.5.4.5.4 Wires that cross each other when viewed from above or wires that come closer than 5 wire diameters beyond a distance of 10 mils from the bonding site unless both wires start and terminate on the same bonding sites.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 15

AMXDO 932AV-1

3.2.5.4.5 Internal Lead Wires (Continued)

3.2.5.4.5.5. Wires not bonded in accordance with the applicable assembly drawing of the device.

3.2.5.4.5.6. Lead wires that are taut.

3.2.5.5 Substrate Mounting

3.2.5.5.1 Substrate mounting for part number 10990455.

- A minimum magnification of 10X is required. No units shall be acceptable which exhibit the following:

3.2.5.5.1.1 Terminal pins not mounted against the substrate or within the confines of the mounting pads.

3.2.5.5.1.2 Poor solder workmanship.

3.2.5.5.1.2.1 Flaking of the solder material.

3.2.5.5.1.2.2. Balling of the solder material that does not exhibit a fillet.

3.2.5.5.1.2.3 Voids in the fillet.

3.2.5.5.1.2.4 Excess solder build up.

3.2.5.5.1.2.5 Cold solder joints.

3.2.5.5.2.2 Presence of any residual flux.

3.2.5.5.2 Substrate mounting for part number 11711427.

- A minimum magnification of 30X is required. No units shall be acceptable which exhibit the following:

3.2.5.5.2.1 Misorientation of the substrate.

3.2.5.5.2.2 Epoxy fillet not visible around 80% of the designated terminal posts.

3.2.5.5.2.3. Bubbles and/or voids in the epoxy which occupy more than 10% of the terminal post circumference.

3.2.5.5.2.4 Any crack in the epoxy.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 16

AMXDO 932AV-1

3.2.5.6 Foreign Material - NOTE: Material shall be considered attached when it cannot be removed by a nominal gas blow (approximately 20 Psig.). Conductive foreign material is defined as any substance which appears opaque under all conditions of lighting and magnification used in routine visual inspection.

3.2.5.6.1 Dice - (Foreign Material) - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.6.1.1 Unattached foreign material on the surface of the die within the package.

3.2.5.6.1.2 Attached conductive foreign material that appears to bridge any two unpassivated metallization areas of a die.

3.2.5.6.2 General - (Foreign Material) - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.6.2.1 Unattached foreign material within the package.

3.2.5.6.2.2 Attached conductive foreign material that appears to bridge any two unpassivated thick film or thin film material areas, two package leads, or any lead to package metallization.

3.2.5.7 General - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.5.7.1 Cracking, chipping, or discoloration of any components or material unless allowed by another section of this specification.

3.2.5.7.2 Foreign deposits or residues on or within the package unless allowed by another section of this specification.

3.2.5.7.3 Cracked or broken glass seals in packages.

3.2.5.7.4 Bent, broken, or missing package leads.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Process Control - Each completed hybrid circuit shall be inspected prior to encapsulation

4.2 Acceptance - Acceptance of a hybrid microcircuit shall be based on satisfactory compliance with section 3.0.

SIZE	CODE IDENT NO	
A	19202	11711619
SCALE	REV	SHEET 17

AMXDO 932AV-1

5.0 PREPARATION FOR DELIVERY

5.1 This section is not applicable to this specification.

6.0 NOTES

6.1 Safety - The materials or processes referred to may be hazardous. The responsibility for safety rests with the user.

SIZE	CODE IDENT NO	
A	19202	11711615
SCALE	REV	SHEET 18

AMXOO 932AV-1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

VISUAL REQUIREMENTS FOR THICK FILM NETWORKS

THIS DOCUMENT HAS BEEN RELEASED FOR PRELIMINARY PROCUREMENT INITIATED BY HARRY DIAMOND LABORATORIES AND IS SUBJECT TO FINAL REVIEW AND CORRECTION

REV STATUS OF SHEETS	REV									
	SHEET	1	2	3	4	5	6	7	8	9

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS — FRACTIONS — ANGLES —	ORIGINAL DATE OF DRAWING 78-7-27	U.S. ARMY HARRY DIAMOND LABORATORIES WASHINGTON, D.C. 20438
MATERIAL —	DRAFTSMAN D.D. CHECKED [illegible] ENGR [illegible]	NETWORKS, THICK FILM VISUAL REQUIREMENTS FOR
HEAT TREATMENT —	SUBMITTED	SIZE A · CODE IDENT NO. 19202 · 11711620
FINAL PROTECTIVE FINISH —	APPROVED	SCALE — · UNIT WT · SHEET 1 OF 9

AMXDO FORM 932AV

1.0 SCOPE

1.1 This document establishes the requirements for the visual examination and acceptance criteria for thick film networks.

2.0 APPLICABLE DOCUMENTS

2.1 The following documents, of the exact issue shown, form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

SPECIFICATIONS

MIL-M-38510A	Microcircuits, General Specification for

3.0 REQUIREMENTS

3.1 Equipment

3.1.1 Microscopes with the capability of 30X - 70X magnification. A microscope with magnification of 10X may be used for a general overview inspection.

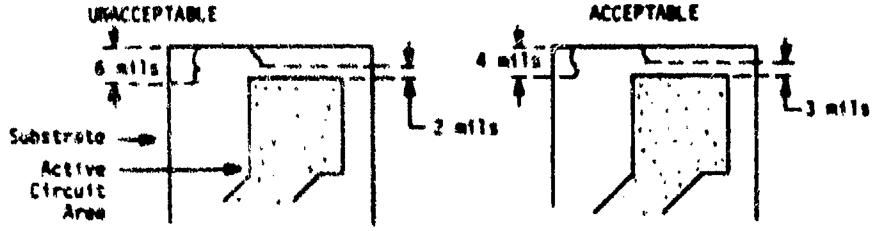
3.2 Examination - Thick film networks shall be examined at specified magnification to determine compliance with the specified criteria.

3.2.1 Substrates - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.1.1 Any evidence of substrate warpage in excess of 4 mils per inch

3.2.1.2 Any crack, chipout, or pitting within the active circuit area.

3.2.1.3 Any crack outside the active circuit area that exceeds 5 mils in length or points toward the active circuit area within 3 mils of the active area.

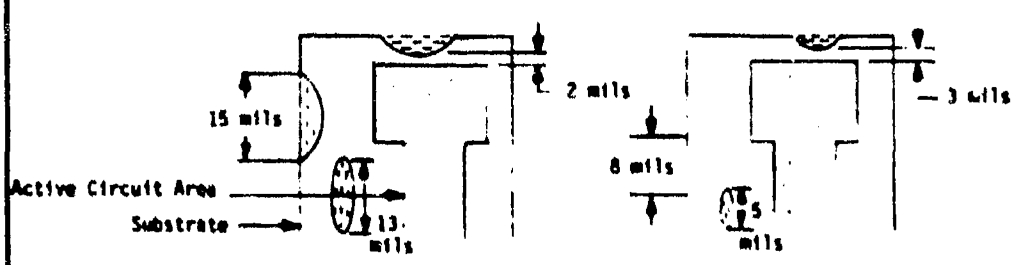


SIZE	CODE IDENT NO	
A	19202	11711620
SCALE	REV	SHEET 2

AMXDO 932AV-1

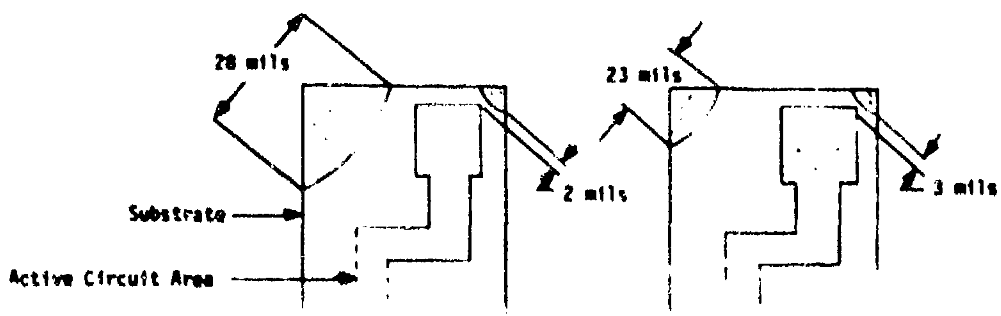
3.2.1.4 Any chipout or pitting outside the active area that exceeds 10 mils in its longest dimension or is within 3 mils of the active circuit area.

UNACCEPTABLE ACCEPTABLE



3.2.1.5 Any corner chipout which exceeds 25 mils across its diagonal or which extends within 3 mils of the active circuit area.

UNACCEPTABLE ACCEPTABLE



SIZE	CODE IDENT NO	
A	19202	11711620
SCALE	REV	SHEET 3

AMXDO 5982AV-1

3.2.1.6 Any crack which does not originate at an edge.

3.2.2 Thick Film Metallization - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

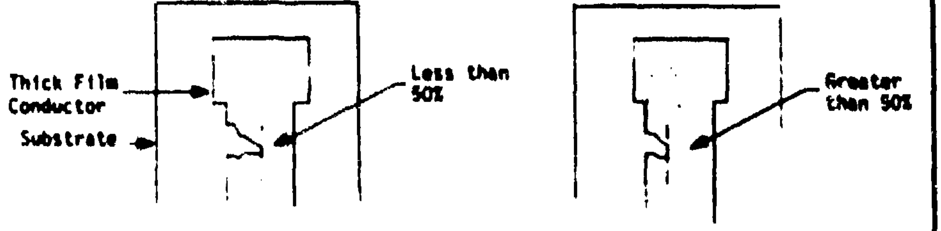
3.2.2.1 Any conductor pattern which has excessively ragged edges, or exhibits evidence of poor adhesion, peeling, lifting or blistering. Excessively ragged edges are those which have an unevenness with a peak to peak amplitude greater than 1.5 mils measured over a minimum of two peaks in each direction.

3.2.2.2 Pinholes or voids shall not be concentrated in one area and shall not exceed 10 percent of the area of a solder pad.

3.2.2.3 Any distinct color change in the metallization indicating exposure to excessive heat and/or the presence of chemical or corrosive action. Any evidence of metallization corrosion.

3.2.2.4 Any scratch or void in the conductor metallization which exposes the underlying substrate and leaves less than 50 percent of the undisturbed conductor pattern.

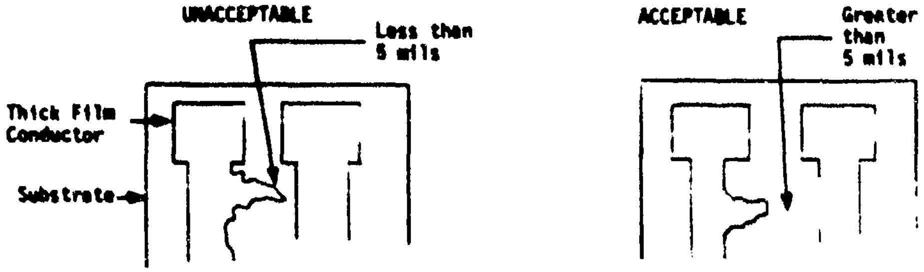
UNACCEPTABLE ACCEPTABLE



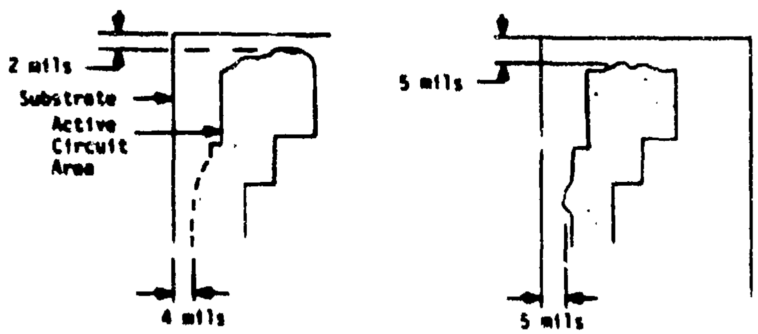
SIZE	CODE IDENT NO.	
A	19202	11711620
SCALE	REV	SHEET 4

AMXDO 98AV-1

3.2.2.5 Any region in which the spacing between two conductors is reduced to less than 5 mils, or one quarter of the undisturbed spacing, whichever is less, whether caused by smears, misalignment, solder flow, metal tool marks, or other defects.



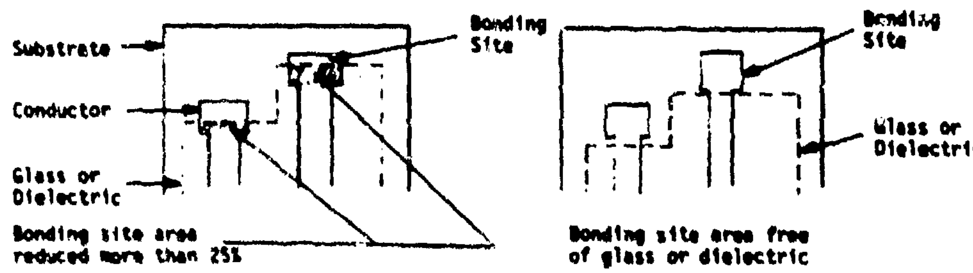
3.2.2.6 Any conductor which is within 5 mils of the edge of the substrate (unless specified by drawing).



SIZE	CODE IDENT NO	
A	19202	11711620
SCALE	REV	SHEET 5

3.2.2.7 Bonding pads or sites which are reduced in area by more than 25 percent by scratches, voids, or excess flow or misregistration of insulating glass or dielectric.

UNACCEPTABLE ACCEPTABLE

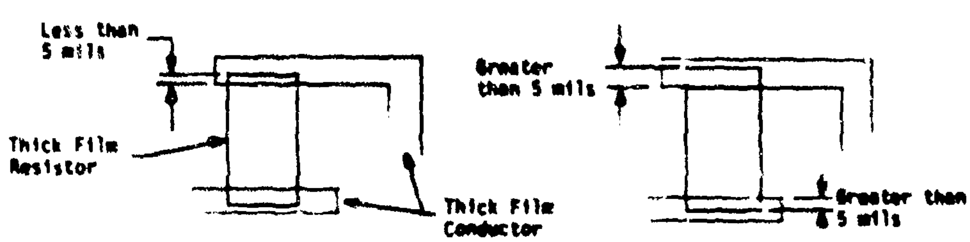


3.2.3 Thick Film Resistors - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.3.1 Resistor patterns which have excessively ragged edges or exhibit evidence of poor adhesion, peeling, blistering, non-uniform thickness, or mechanical damage such as scratches, cracks, voids, or chipout areas. Excessively ragged edges are those which have an unevenness with a peak to peak amplitude greater than 2.5 mils measured over two peaks in each direction.

3.2.3.2 Resistor patterns which do not overlap the conductor termination by a minimum of 5 mils at either end.

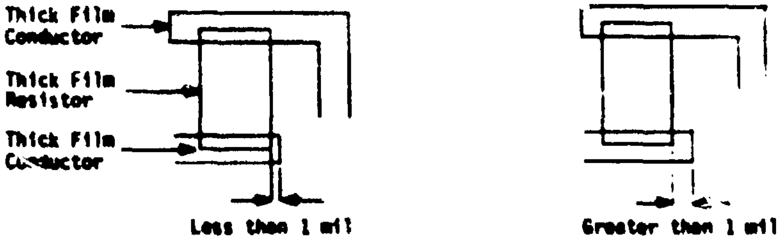
UNACCEPTABLE ACCEPTABLE



SIZE	CODE IDENT NO.	
A	19202	11711620
SCALE	REV	SHEET 6

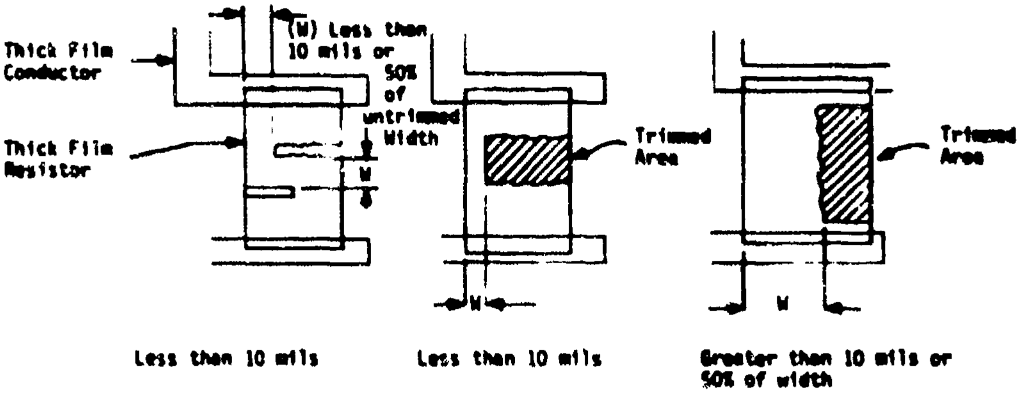
AMXDO Form 98BAV-1

3.2.3.3 Any resistor which does not have conductor overlap at the edge of the resistor pattern by a minimum of 1 mil.



3.2.3.4 Excessive "bleed" of resistor material or misalignment of patterns such that the conductor pattern is not visible at each end of the resistor.

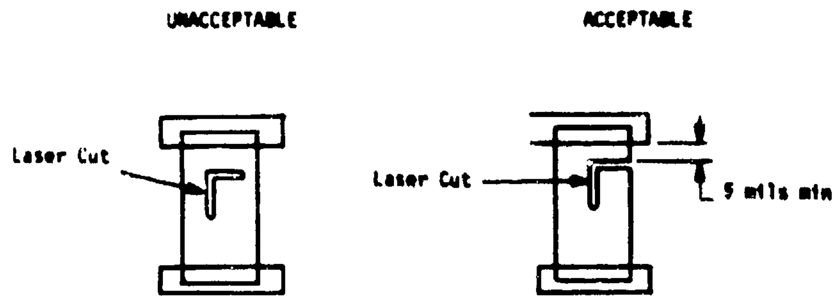
3.2.3.5 Any resistor in which the trimmed width (W) is less than 10 mils or 50% of the untrimmed resistor width. Any resistor which has trimmed areas closer than 10 mils.



SIZE	CODE IDENT NO.	
A	19202	11711620
SCALE	REV	SHEET 7

AMXDO FORM 982AV-1

3.2.3.5 Any resistor in which the abraded area or laser cut does not begin at the edge of the resistor pattern or is trimmed such that less than 5 mils clearance exists between trimmed resistor area and conductor termination.



Laser Trimming

3.2.3.6 Resistor material left in the kerf (trimmed area) of a resistor.

3.2.3.7 A scratch or void in the contact area reducing the resistor termination width by more than 25%.

3.2.4 Thick Film Insulating Glass - A minimum magnification of 30X is required. No unit shall be acceptable which exhibits the following:

3.2.4.1 A void in the insulating glass which exposes underlying conductor or resistor material in areas where uninsulated jumper wires or component leads may contact the glass surface.

3.2.4.2 Severe bubbling of the insulating glass.

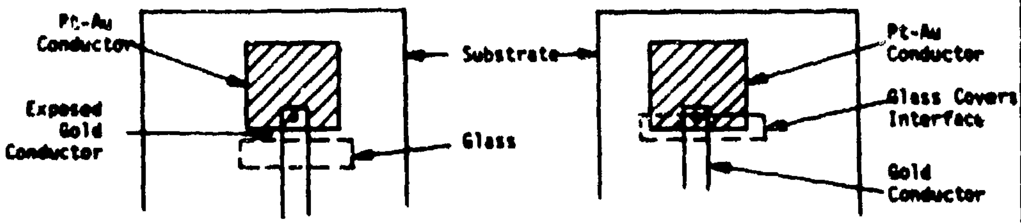
3.2.4.3 Cracking or fissuring of the insulating glass.

SIZE	CODE IDENT NO.	
A	19202	11 11620
SCALE	REV	SHEET 8

AMXDO FORM 932AV-1

3.2.4.4 Insulating glass used as a solder dam which does not completely cover the interface area between solderable (Pt-Au) and unsolderable (Au) conductors.

UNACCEPTABLE ACCEPTABLE



3.3 Workmanship - The work shall be done in a neat and orderly manner using the correct equipment and materials.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Process Control - Statistical sampling of the thick film networks shall be conducted using the lot tolerance percent defective (LTPD) method as described in MIL-M-38510A Appendix (B). A LTPD or lambda value of (5) shall apply.

4.2 Acceptance - Acceptance of a thick film network shall be based on satisfactory compliance with section 3.0.

5.0 PREPARATION FOR DELIVERY

5.1 This section is not applicable to this specification.

6.0 NOTES

6.1 Safety - The materials or processes referred to may be hazardous. The responsibility for safety rests with the user.

SIZE	CODE IDENT NO	
A	19202	11711620
SCALE	REV	SHEET 9

AMXDO 1 Nov 80 932AV-1

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES

TYPE	BV_{CEO} @ I_C		I_{CBO} @ V_{CB}		h_{FE} @ I_C & V_{CE}			$V_{CE(SAT)}$ @ I_C & I_b		
	VOLTS MIN	ma	na MAX	VOLTS	MIN	ma	VOLTS	VOLTS MAX	ma	ma
PNP	35	20	50	40	50	.5-20	5	.3	20	2
NPN	35	20	50	40	50	.5-20	5	.3	20	2

NOTES:

1. MIL-A-2550 APPLIES.
2. ALL DEVICES SHALL BE FULLY PASSIVATED.
3. CHIP BACK SURFACES SHALL BE SUITABLE FOR CONDUCTIVE EPOXY ATTACHMENT.
4. BONDING PADS SHALL BE ADEQUATE FOR GOLD BALL BONDING WITH .0005 INCH DIAMETER BALL PLACED .0005 INCH OFF TARGET IN ANY DIRECTION PER 11711619, PARAGRAPH 3.2.5.4.4.
5. METALLIZATION SHALL BE SUITABLE FOR ULTRASONIC GOLD BALL WIRE BONDING.
6. TRANSISTORS SHALL BE RETANGULAR WITH A MAXIMUM EDGE DIMENSION OF 0.020 INCH.

THIS DOCUMENT IS BEING RELEASED FOR PRELIMINARY PROCUREMENT INITIATED BY HARRY DIAMOND LABORATORIES AND IS SUBJECT TO FINAL REVIEW AND CORRECTION

SPECIFICATION CONTROL DRAWING

PART NO. 11711621

79-8-1

U.S. ARMY HARRY DIAMOND LABORATORIES WASHINGTON, D.C. 20438

SEMICONDUTOR CHIP SPECIFICATIONS; HYBIRD INTERFACE

SIZE B | CODE IDENT NO 19202 | 11711621

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES

TYPE	BV_{CEO} @ I_C		h_{FE} @ I_C & V_{CE}			$r_{bb'}$ & f_T @ I_C & V_{CE}				I_Z	V_Z	Z_Z
	VOLTS MIN	mA	MIN	mA	VOLTS	ohms MAX	MHZ MIN	mA	VOLTS	uA	VOLTS ±5%	OHMS MAX
PNP	40	10	100	.01-1.0	5	50	30	.5	5			
NPN	40	10	100	.01-1.0	5	100	30	.5	5			
ZENER										100	12	2000

NOTES:

1. MIL-A-2550 APPLIES.
2. ALL DEVICES SHALL BE FULLY PASSIVATED.
3. CHIP BACK SURFACES SHALL BE SUITABLE FOR CONDUCTIVE EPOXY ATTACHMENT.
4. BONDING PADS SHALL BE ADEQUATE FOR GOLD BALL BONDING WITH .0035 INCH DIAMETER BALL PLACED .0005 INCH OFF TARGET IN ANY DIRECTION PER 11711619 PARAGRAPH 3.2.5.4.4.
5. METALLIZATION SHALL BE SUITABLE FOR ULTRASONIC GOLD BALL WIRE BONDING.
6. TRANSISTORS SHALL BE RECTANGULAR WITH A MAXIMUM EDGE DIMENSION OF 0.020 INCH.
7. ZENER DIODE SHALL BE RECTANGULAR WITH A MAXIMUM EDGE DIMENSION OF 0.025 INCH.

SPECIFICATION CONTROL DRAWING

PART NO. 11711637

U.S. ARMY
HARRY DIAMOND LABORATORIES

78-8-1

SEMICONDUCTOR CHIP SPECIFICATIONS: HYBRID OSCILLATOR

SIZE	CODE IDENT NO	
B	19202	11711637

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783 FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES

NOTES:

1. MIL-A-[illegible] APPLIES.
2. MATERIAL: CERAMIC SUBSTRATE, [illegible]% OR [illegible]% AL_2O_3 (ALUMINA)
3. APPROVED SOURCE(S) OF SUPPLY:

   MINNESOTA MINING AND MFG. CO.
   TECHNICAL CERAMIC PRODUCTS DIV.
   CHEROKEE BLVD. AND MANUFACTURERS RD.
   CHATTANOOGA, TN [illegible]
   FSCM NO. [illegible]
   PART NO. ALSIMAG [illegible]

4. IDENTIFICATION OF THE APPROVED SOURCE(S) HEREIN IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM DESCRIBED ON THE DRAWING.

THIS DOCUMENT HAS BEEN RELEASED FOR PRELIMINARY PROCUREMENT PURPOSES BY HARRY DIAMOND LABORATORIES AND IS SUBJECT TO FINAL REVIEW AND CORRECTION

SOURCE CONTROL DRAWING

PART NO. 11711638

78-8-1

U.S. ARMY
HARRY DIAMOND LABORATORIES
WASHINGTON, D.C. [illegible]

SUBSTRATE, CERAMIC

SIZE	CODE IDENT NO	
B	77202	1171[illegible]8

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATIONS SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: DIODE CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

   FAIRCHILD CAMERA AND INSTRUMENT CORP.
   SEMICONDUCTOR DIV.
   464 ELLIS ST.
   MOUNTAIN VIEW, CA 94042
   FSCM NO. 07263
   PART NO. FDC4856

4. 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 ITEM DESCRIBED ON THE DRAWING.

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SOURCE CONTROL DRAWING

PART NO. 11711639

U.S. ARMY
HARRY DIAMOND LABORATORIES
WASHINGTON, D.C. 20438

CHIP, DIODE

SIZE	CODE IDENT NO.	
B	19202	11711639

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. [illegible] APPLIES.
2. MATERIAL: ZENER DIODE CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

   MOTOROLA INC.
   SEMICONDUCTOR PRODUCTS GROUP
   [illegible] E. MC DOWELL RD.
   PHOENIX, AZ. [illegible]
   FSCM NO. [illegible]
   PART NO. [illegible]

4. 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 ITEM DESCRIBED ON THE DRAWING.

SOURCE CONTROL DRAWING

PART NO. 11711640

78-S-1

HARRY DIAMOND LABORATORIES

CHIP, ZENER DIODE

SIZE	CODE IDENT NO	
B	19202	11711640

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES

NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: ZENER DIODE CHIP
3. APPROVED SOURCE(S) OF SUPPLY

   MOTOROLA INC.
   SEMICONDUCTOR PRODUCTS GROUP
   5005 E. MC DOWELL Rd.
   PHOENIX, AZ. 85008
   FSCM NO. 04713
   PART NO. MZC8.2B5

4. 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 ITEM DESCRIBED ON THE DRAWING

SOURCE CONTROL DRAWING

PART NO. 11711641

78-8-1

U.S. ARMY
HARRY DIAMOND LABORATORIES

CHIP, ZENER DIODE

SIZE	CODE IDENT NO.	
B	19202	11711641

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: TRANSISTOR CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

MOTOROLA INC.	SEMICONDUCTOR SERVICES, INC.
SEMICONDUCTOR PRODUCTS GROUP	ONE HARRISON AVE.
5005 E. MC DOWELL RD.	SALEM, MA 01970
PHOENIX, AZ 85008	FSCM NO. 52[illegible]
FSCM NO. 04713	PART NO. 2N5354
PART NO. [illegible]	

4. 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 ITEM DESCRIBED ON THE DRAWING.

SOURCE CONTROL DRAWING

PART NO. 11711642

78-8-1

US ARMY HARRY DIAMOND LABORATORIES WASHINGTON, DC

CHIP, TRANSISTOR

B | 19203 | 11711642

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND [illegible], FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: TRANSISTOR CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

MOTOROLA INC.
SEMICONDUCTOR PRODUCTS GROUP
5005 E. MC DOWELL RD.
PHOENIX, AZ. [illegible]
FSCM NO. 04713
PART NO. 2NC3730

SEMICONDUCTOR SERVICES, INC.
ONE HARRISON AVE.
SALEM, MA. 01970
FSCM NO. [illegible]
PART NO. [illegible]

4. 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 ITEM DESCRIBED ON THE DRAWING.

SOURCE CONTROL DRAWING

PART NO. 11711643

78-8-1

U.S. ARMY
HARRY DIAMOND LABORATORIES

CHIP, TRANSISTOR

B | [illegible] | 11711643

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-[illegible] APPLIES.
2. MATERIAL: TRANSISTOR CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

   MOTOROLA INC.
   SEMICONDUCTOR PRODUCTS GROUP
   [illegible] E. MC DOWELL RD.
   PHOENIX, AZ. [illegible]
   FSCM NO. [illegible]
   PART NO. [illegible] CHIP

4. IDENTIFICATION OF THE APPROVED SOURCE(S) HEREIN IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM DESCRIBED ON THIS DRAWING.

SOURCE CONTROL DRAWING

PART NO. 11711644

U.S. ARMY
HARRY DIAMOND LABORATORIES

CHIP, TRANSISTOR

B | [illegible] | 11711644

NOTES:

1. [illegible] APPLIES.
2. [illegible] TRANSISTOR CHIP
3. APPROVED SOURCE(S) OF SUPPLY:

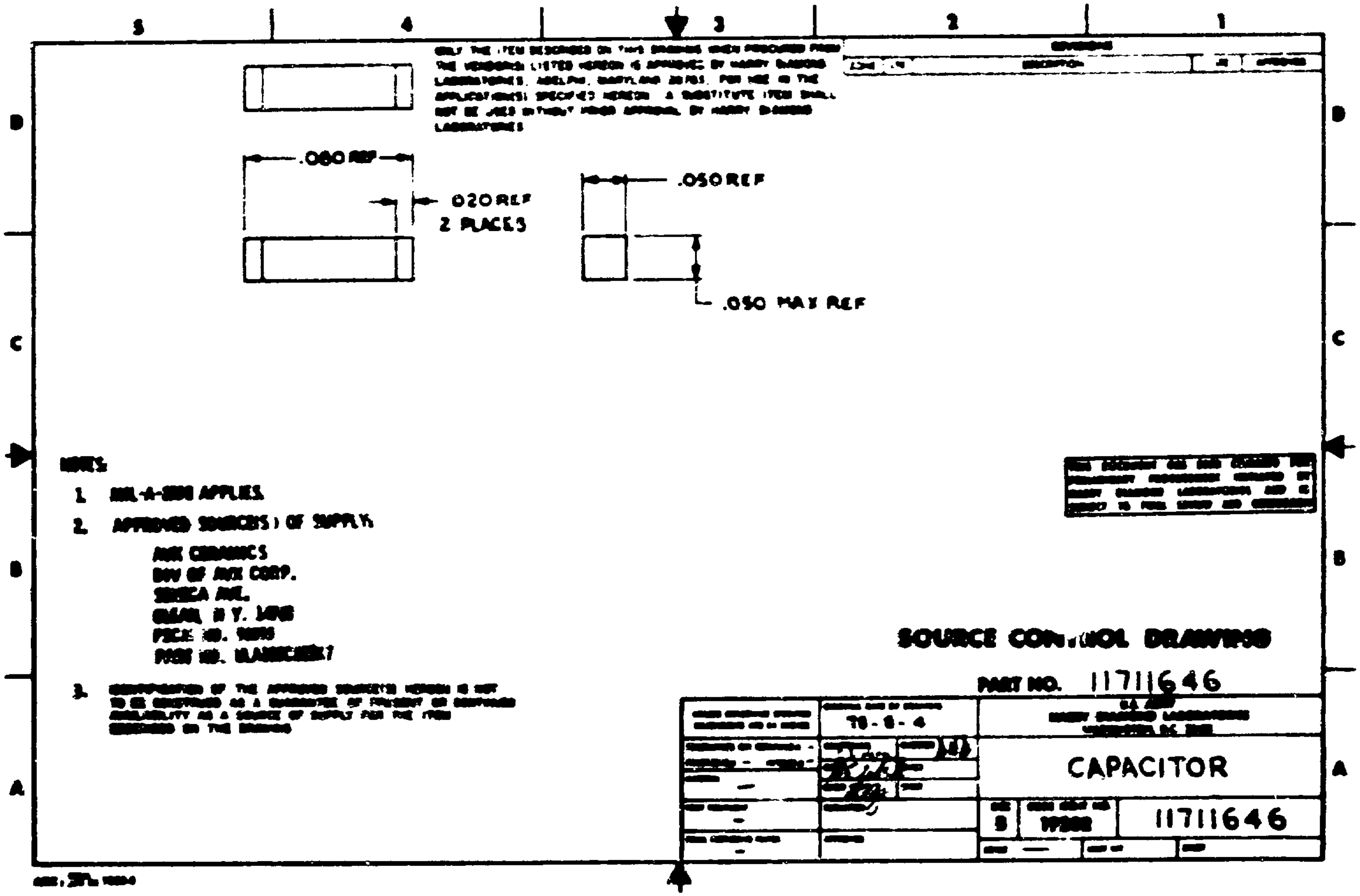
   [illegible]

4. [illegible]

SOURCE CONTROL DRAWING

PART NO. 11711645

78-8-1	CHIP, TRANSISTOR
B	11711645


.080 REF
.020 REF
2 PLACES
.050 REF
.050 MAX REF
NOTES:
2. APPROVED SOURCE(S) OF SUPPLY:
AVX CERAMICS
DIV OF AVX CORP.
SOURCE CONTROL DRAWING
PART NO. 11711646
CAPACITOR
11711646

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND [illegible], FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-[illegible] APPLIES.
2. MATERIAL: ZENER DIODE CHIP
3. APPROVED SOURCE(S) OF SUPPLY:
   MOTOROLA INC.
   SEMICONDUCTOR PRODUCTS GROUP
   [illegible] E. MC DOWELL RD.
   PHOENIX, AZ [illegible]
   FSCM NO. [illegible]
   PART NO. MZC3.[illegible]
4. 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 ITEM DESCRIBED ON THE DRAWING.

SOURCE CONTROL DRAWING

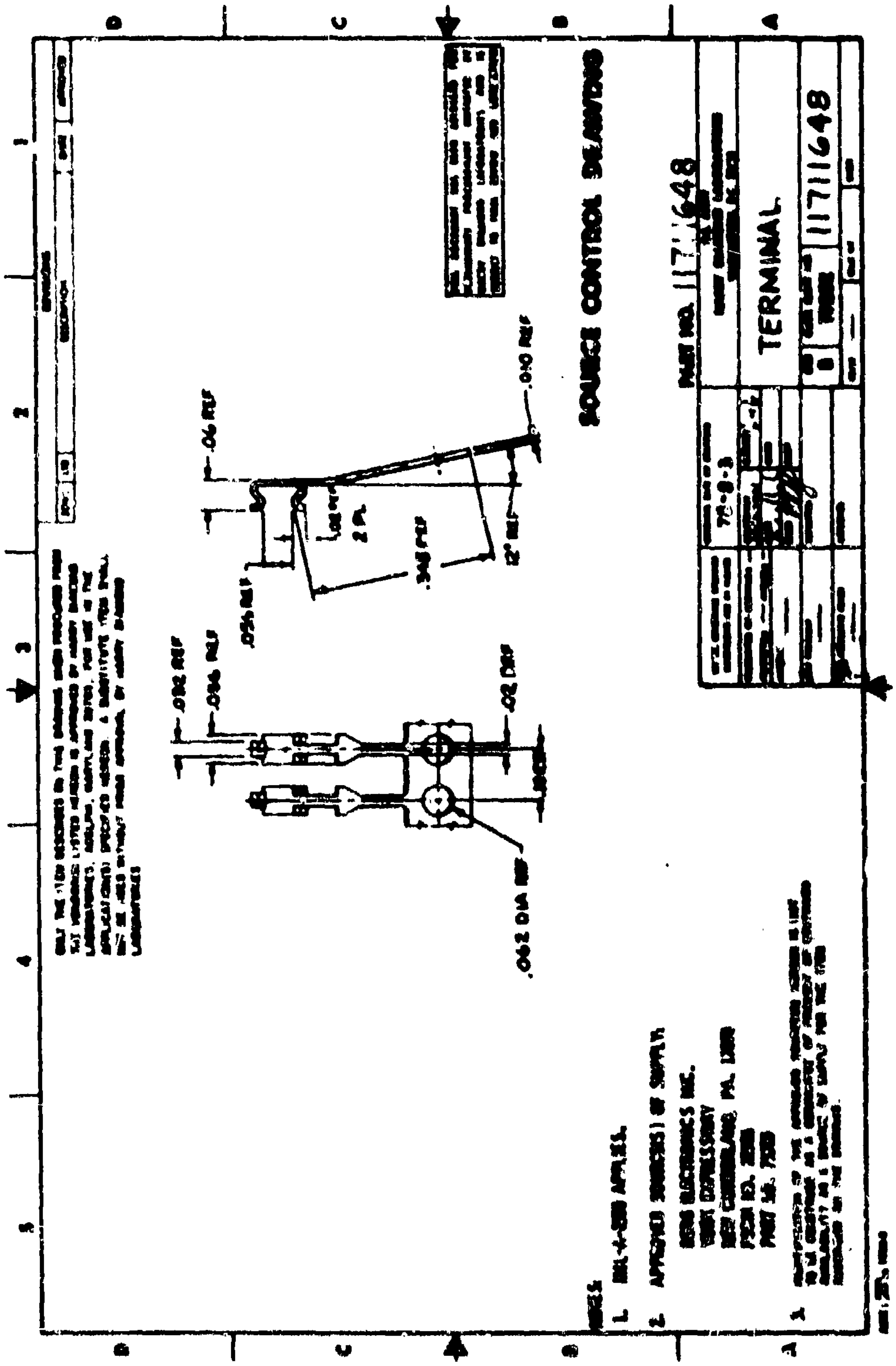
PART NO. 11711647

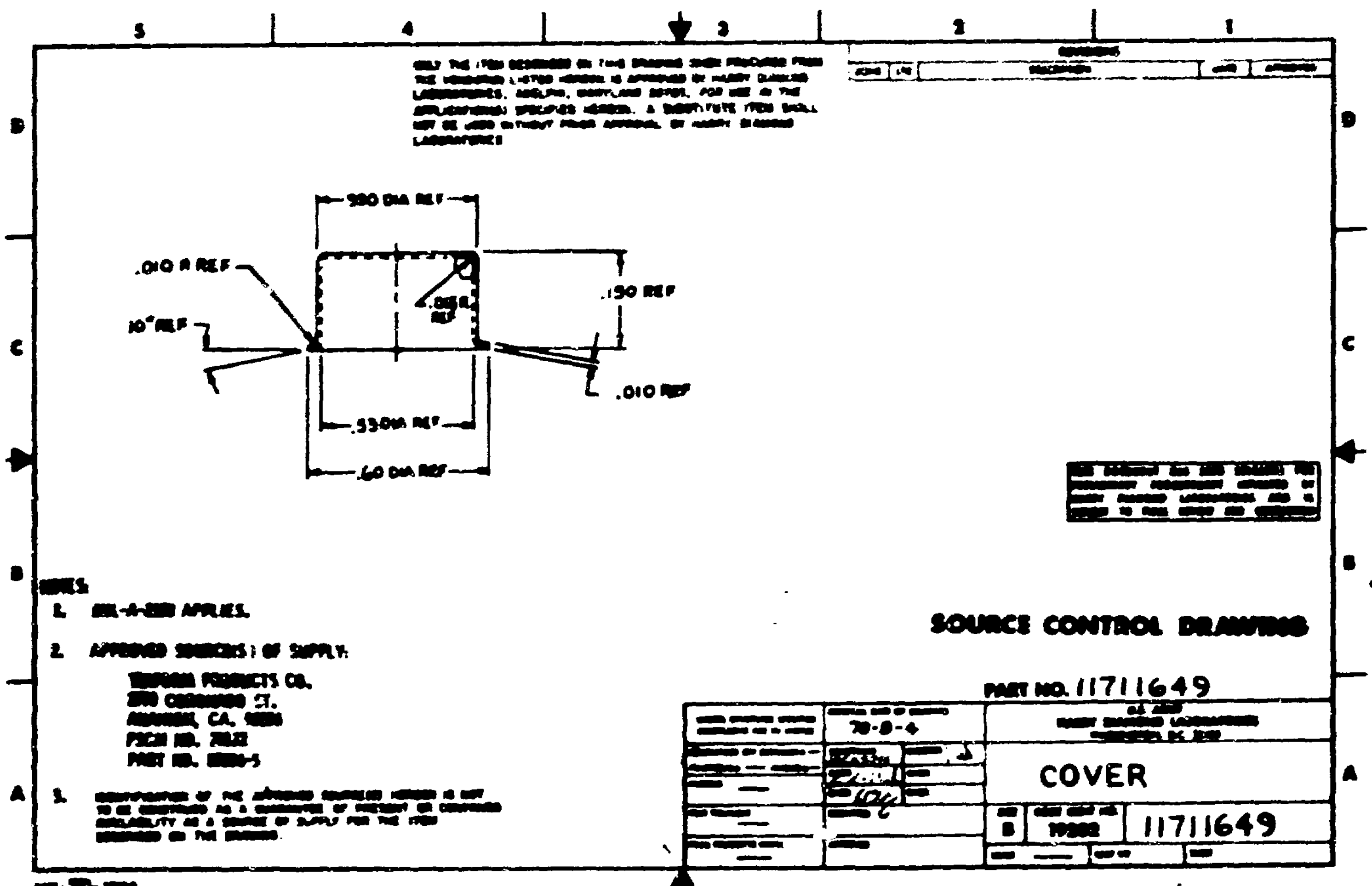
78-8-1

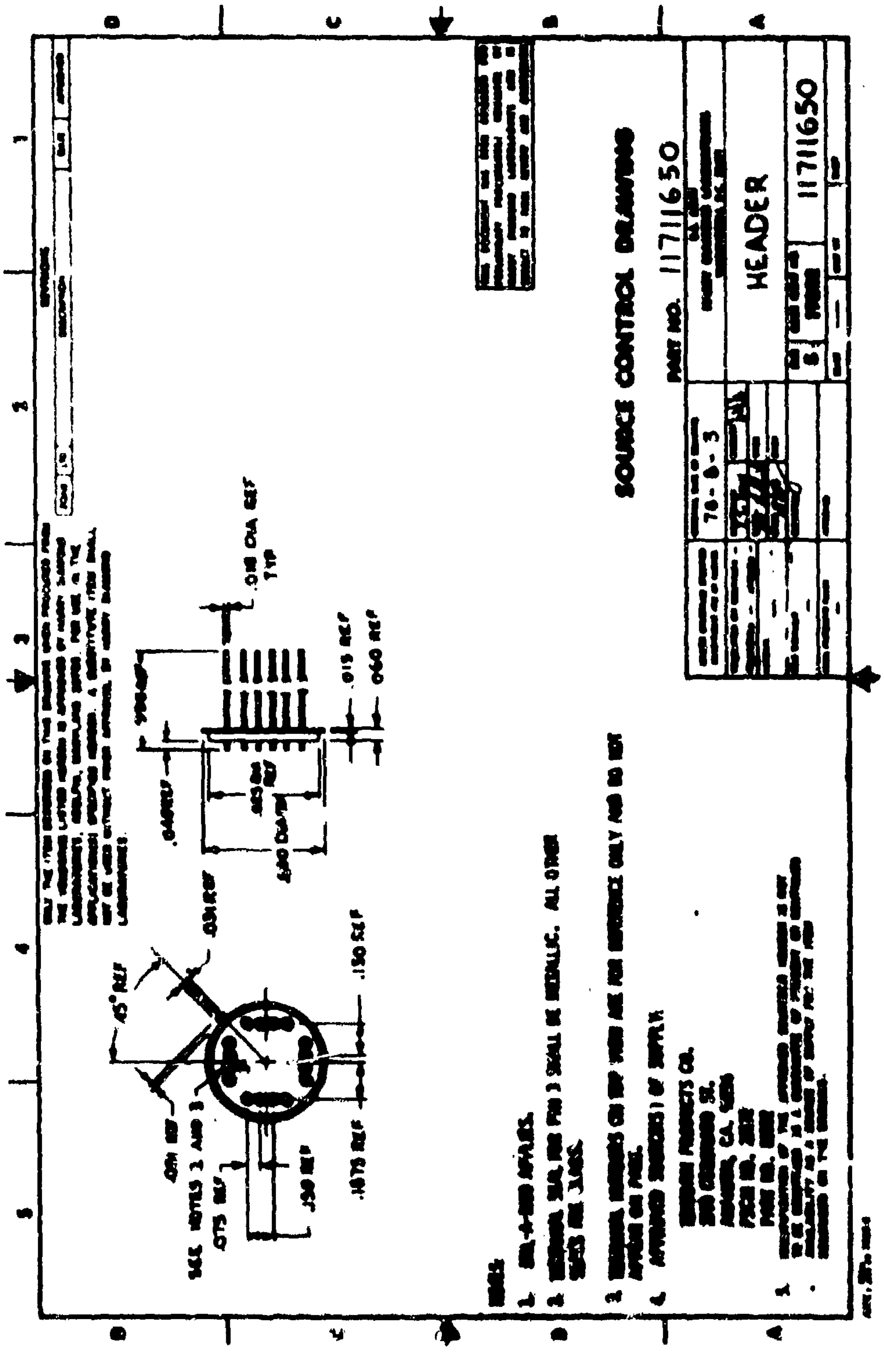
U.S. ARMY
HARRY DIAMOND LABORATORIES

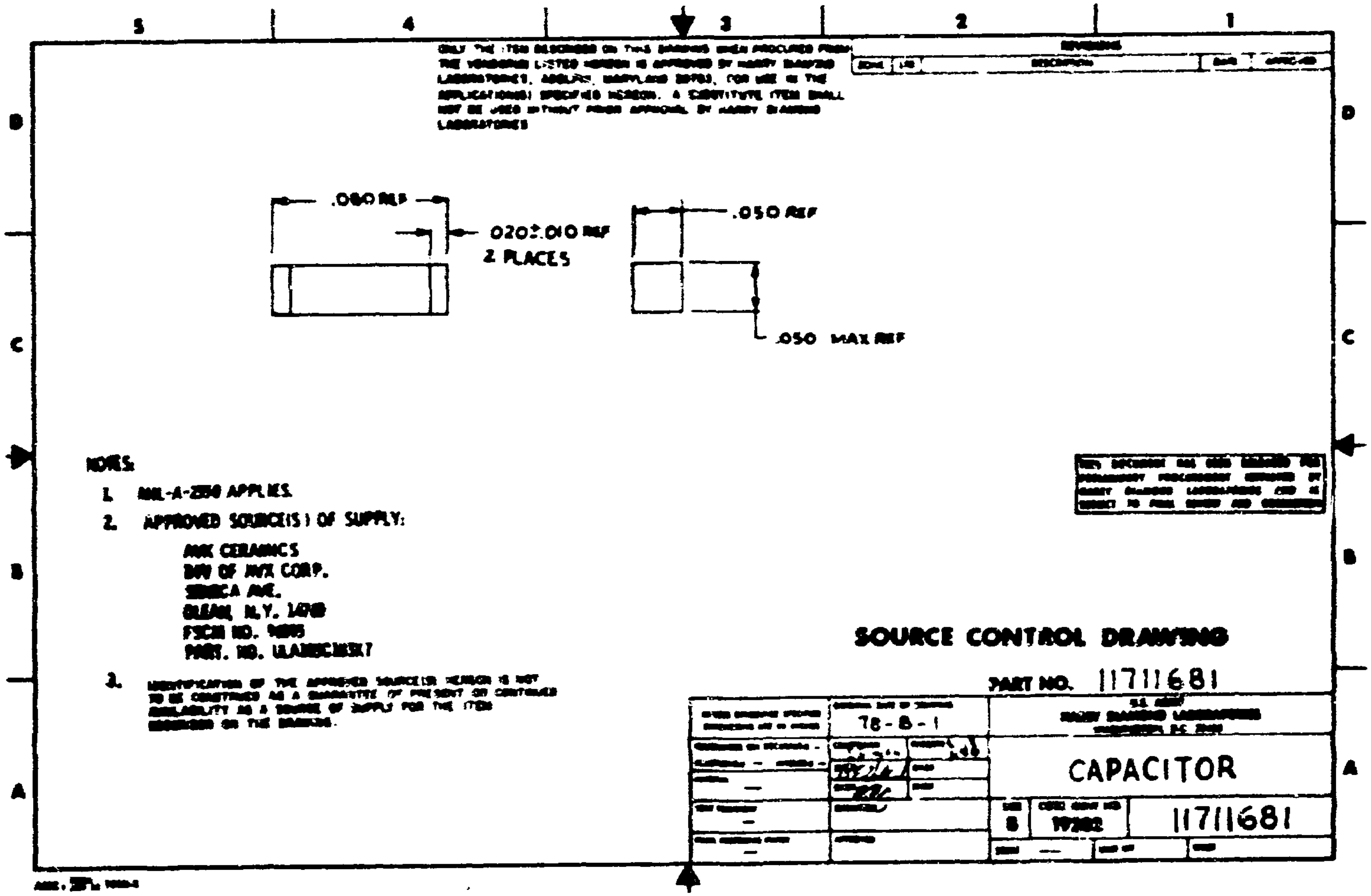
CHIP, ZENER DIODE

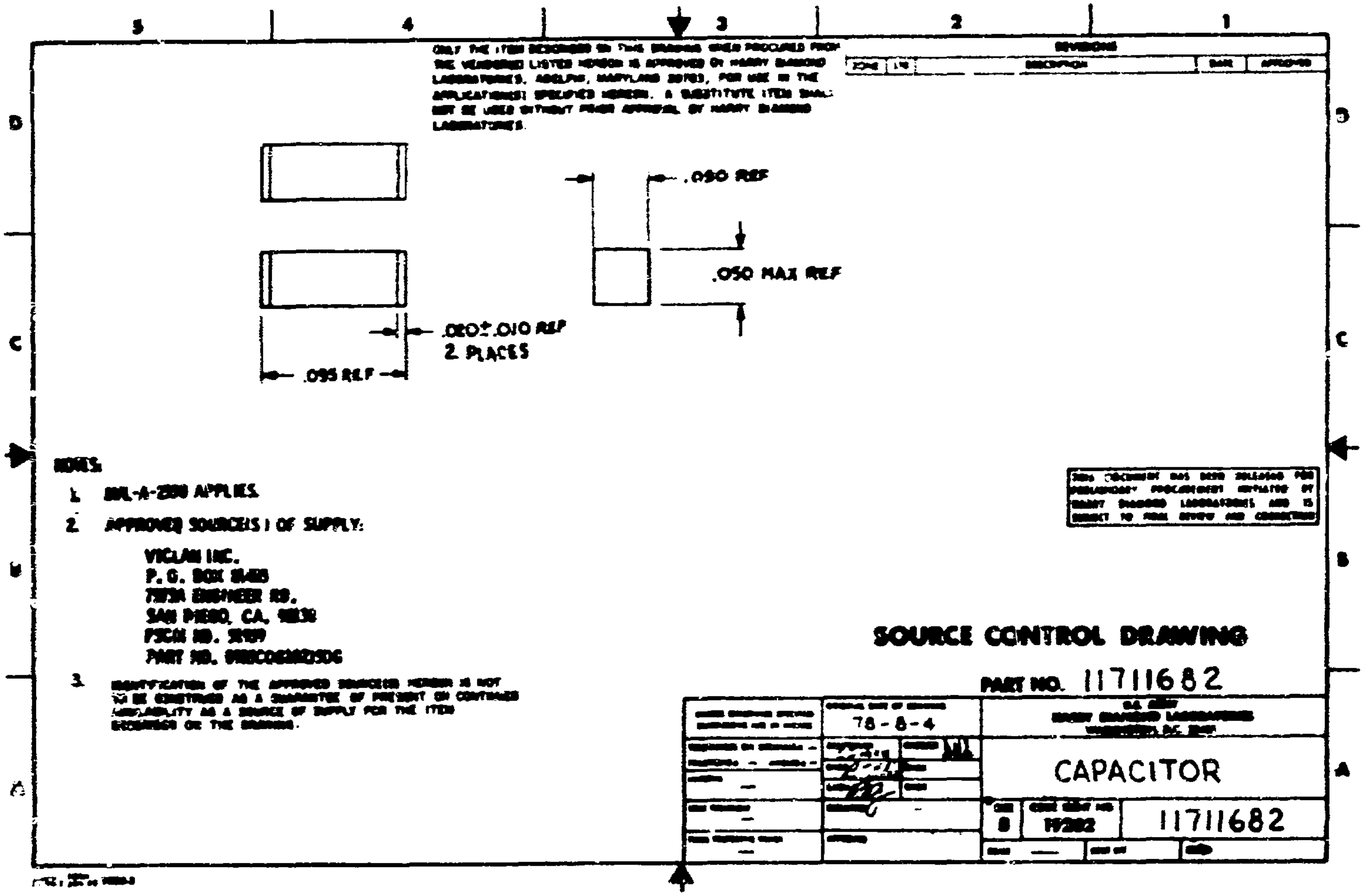
B | 11711647

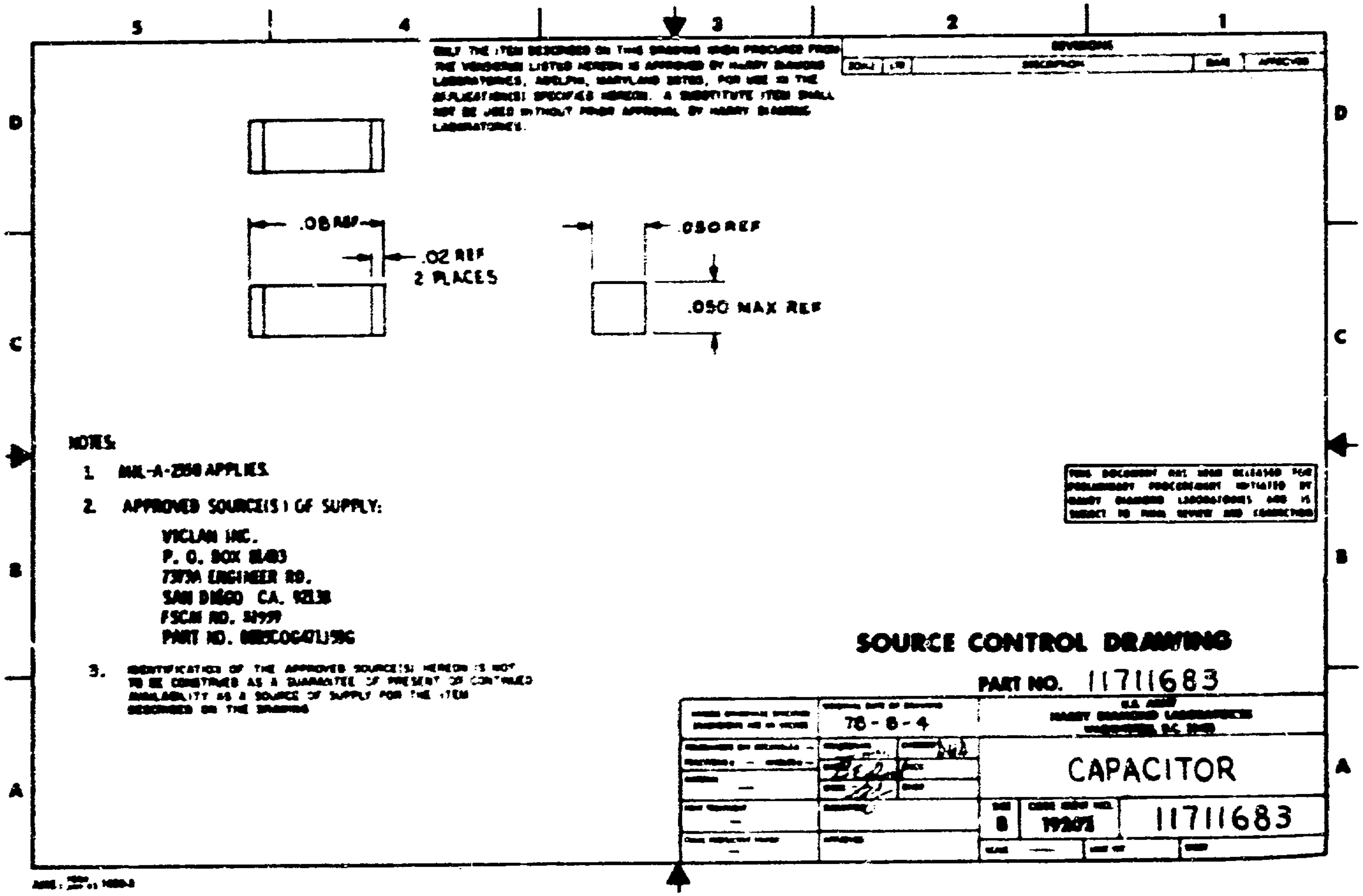

SOURCE CONTROL DRAWING
TERMINAL
11711648
.042 DIA REF
.040 REF
.06 REF
.032 REF
.348 REF
2 PL


.010 R REF
10° REF
.150 REF
.010 REF
.530 DIA REF
.60 DIA REF
NOTES:
1. APPLIES.
2. APPROVED SOURCE(S) OF SUPPLY:
SOURCE CONTROL DRAWING
PART NO. 11711649
78-8-4
COVER
11711649


SOURCE CONTROL DRAWING
PART NO. 11711650
HEADER
11711650
78-8-3
NOTES
.018 DIA REF TYP
.015 REF
.060 REF
.150 REF
.1875 REF
.150 REF
.075 REF
45° REF


.080 REF
.020±.010 REF
2 PLACES
.050 REF
.050 MAX REF
NOTES:
1. MIL-A-2550 APPLIES.
2. APPROVED SOURCE(S) OF SUPPLY:
AVX CERAMICS
DIV OF AVX CORP.
OLEAN, N.Y.
PART. NO.
SOURCE CONTROL DRAWING
PART NO. 11711681
78-8-1
CAPACITOR
B
11711681


.050 REF
.050 MAX REF
.020±.010 REF
2 PLACES
.095 REF
NOTES:
1. MIL-A-2300 APPLIES.
2. APPROVED SOURCE(S) OF SUPPLY:
VICLAN INC.
3.
SOURCE CONTROL DRAWING
PART NO. 11711682
78-8-4
CAPACITOR
B
11711682



.08 REF
.02 REF
2 PLACES
.050 REF
.050 MAX REF
NOTES:
1. MIL-A-2550 APPLIES.
2. APPROVED SOURCE(S) OF SUPPLY:
VICLAN INC.
P. O. BOX 81483
7373A ENGINEER RD.
SAN DIEGO CA. 92138
FSCM NO.
PART NO.
3. 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 ITEM DESCRIBED ON THE DRAWING
SOURCE CONTROL DRAWING
PART NO. 11711683
78-8-4
U.S. ARMY
CAPACITOR
B
11711683

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NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: CERAMIC SUBSTRATE, 996 ALUMINA
3. APPROVED SOURCE(S) OF SUPPLY:

   MATERIALS RESEARCH CORP.
   ROUTE 303
   ORANGEBURG, N.Y. 10962
   FSCM NO. [illegible]
   PART NO. SUPERSTRATE 996A

4. 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 ITEM DESCRIBED ON THE DRAWING.

THIS DOCUMENT HAS BEEN RELEASED FOR [illegible] HARRY DIAMOND LABORATORIES [illegible] SUBJECT TO FINAL REVIEW AND CORRECTION

SOURCE CONTROL DRAWING

PART NO. 11711684

U.S. ARMY
HARRY DIAMOND LABORATORIES
WASHINGTON, D.C. [illegible]

78-8-1

SUBSTRATE, CERAMIC

SIZE B | CODE IDENT NO. 19202 | 11711684

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY HARRY DIAMOND LABORATORIES, ADELPHI, MARYLAND 20783, FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY HARRY DIAMOND LABORATORIES.

NOTES:

1. MIL-A-2550 APPLIES.
2. MATERIAL: SILICON SUBSTRATE
3. APPROVED SOURCE(S) OF SUPPLY:

   GENERAL DIODE CORP.
   50 EAMES ST.
   FRAMINGHAM, MA. 01701
   PART NO. 111 OXIDIZED SILICON

4. 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 ITEM DESCRIBED ON THE DRAWING.

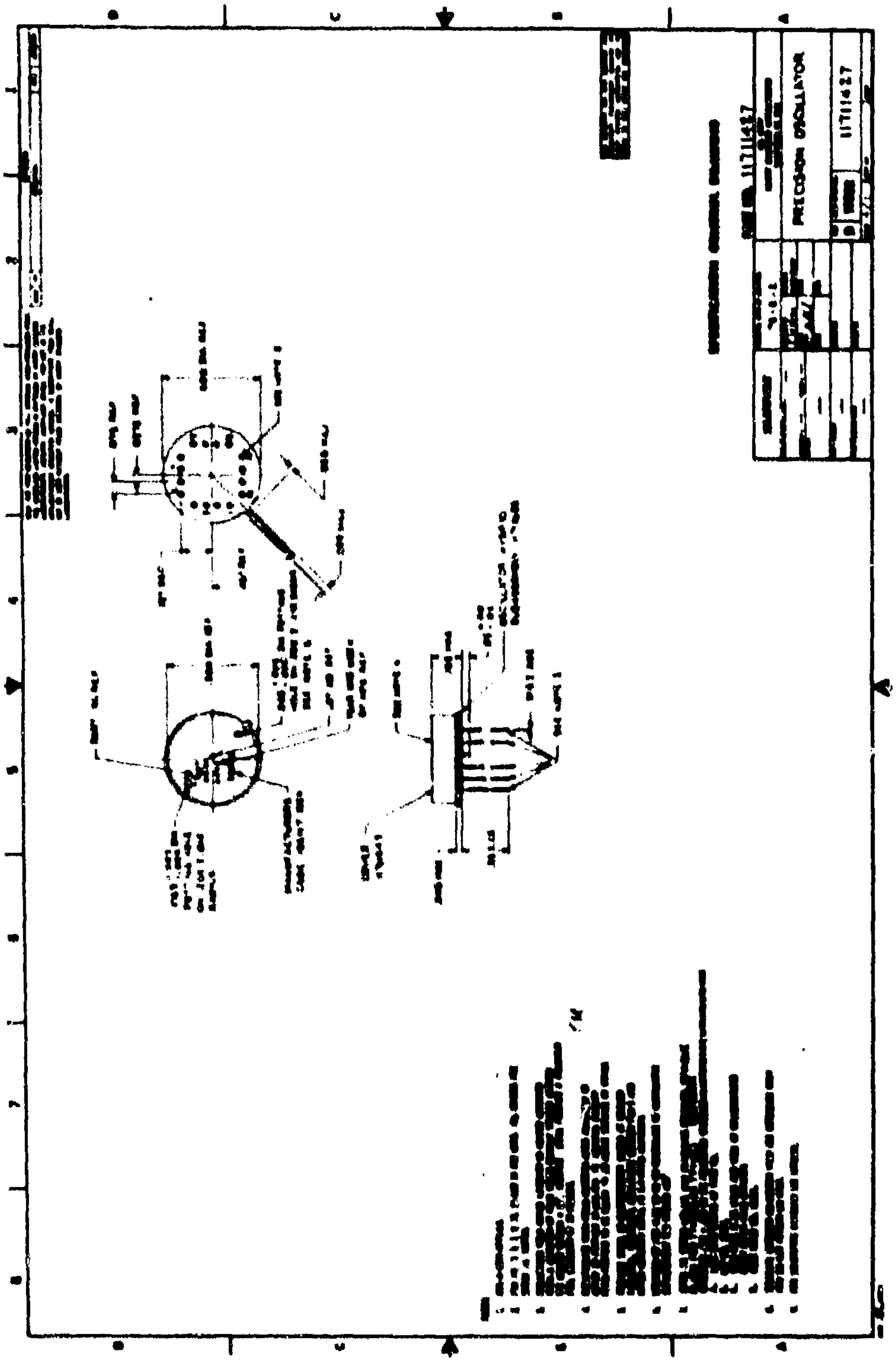
SOURCE CONTROL DRAWING

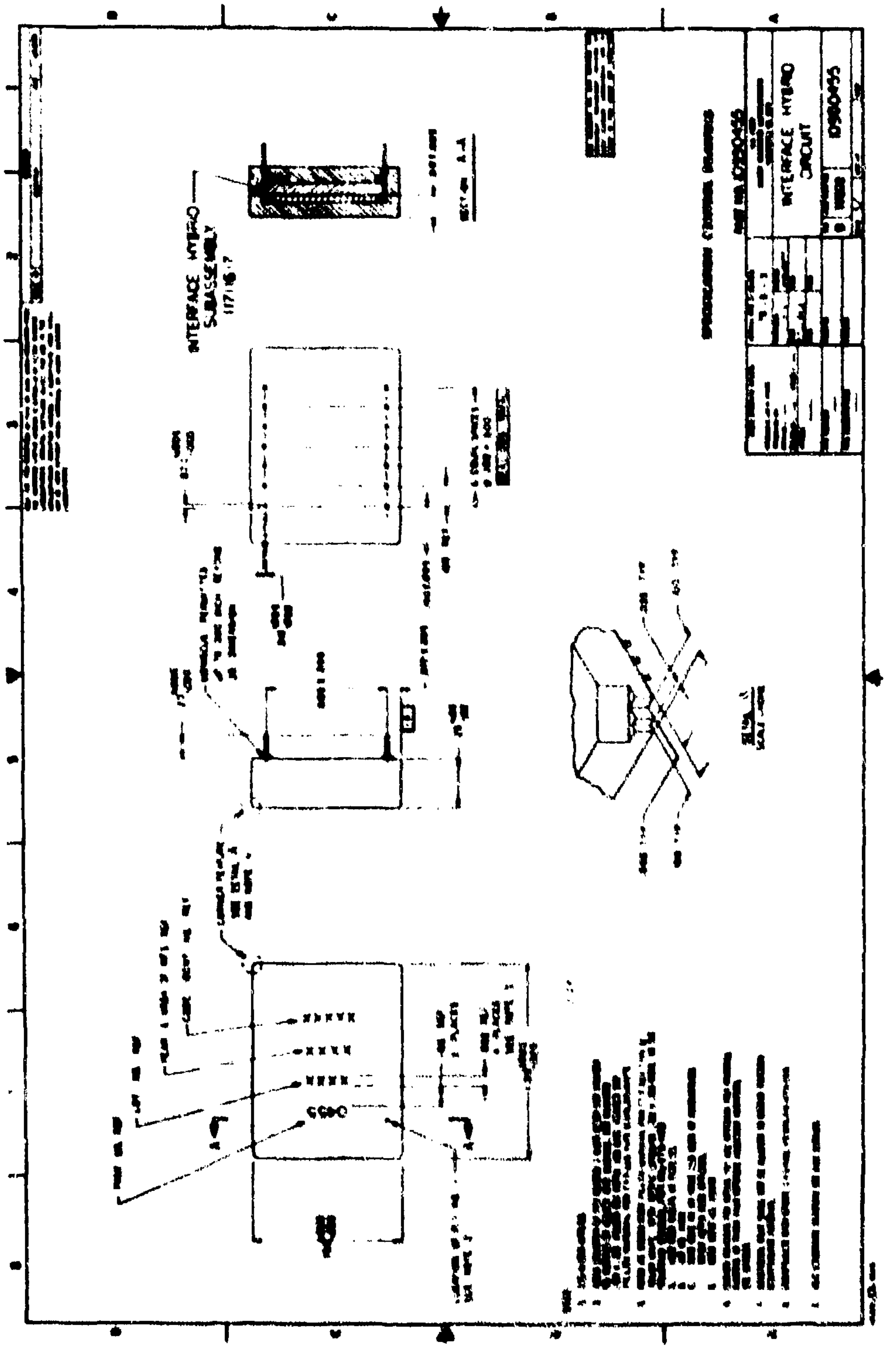
PART NO. 11711685

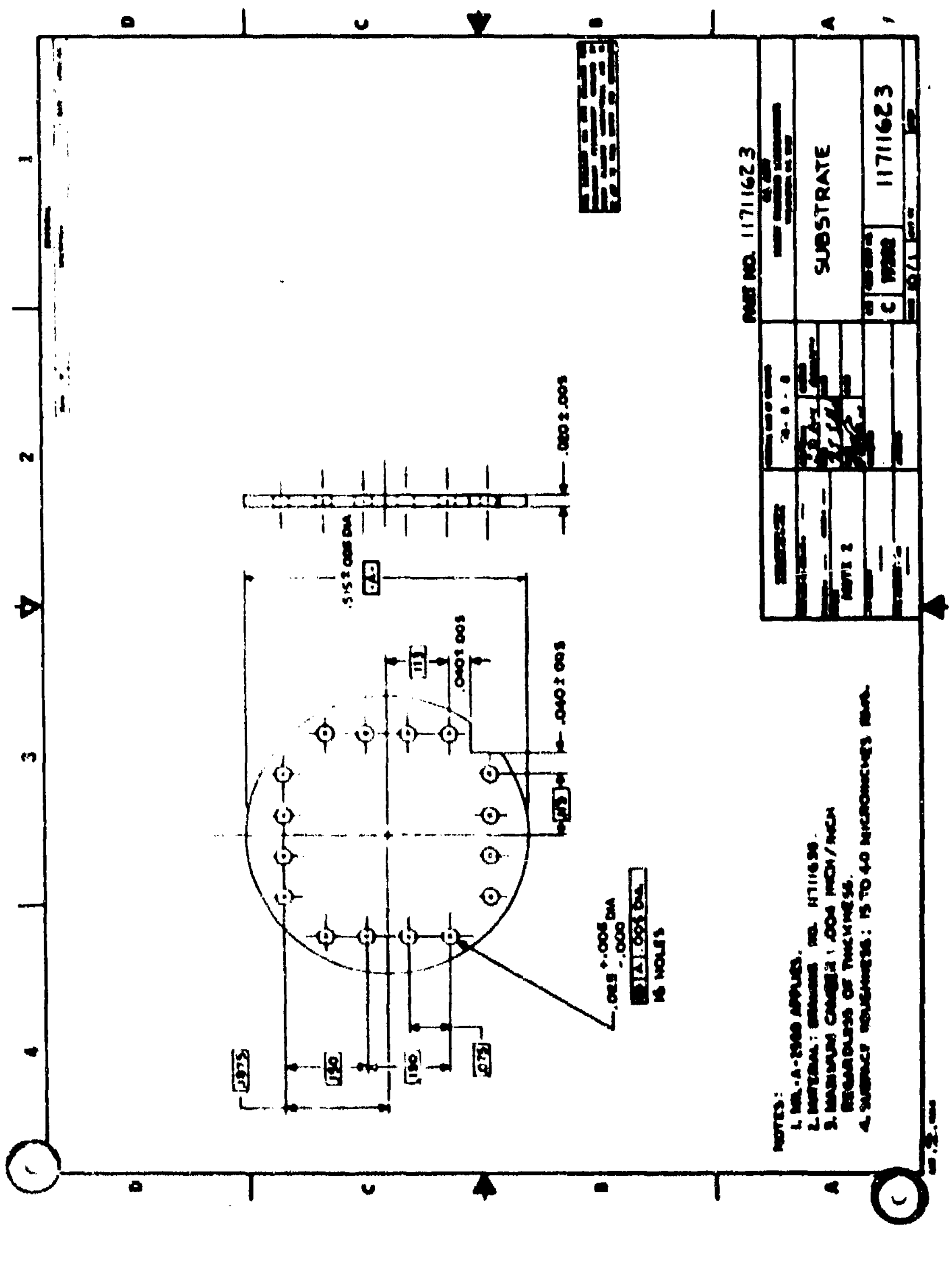
HARRY DIAMOND LABORATORIES

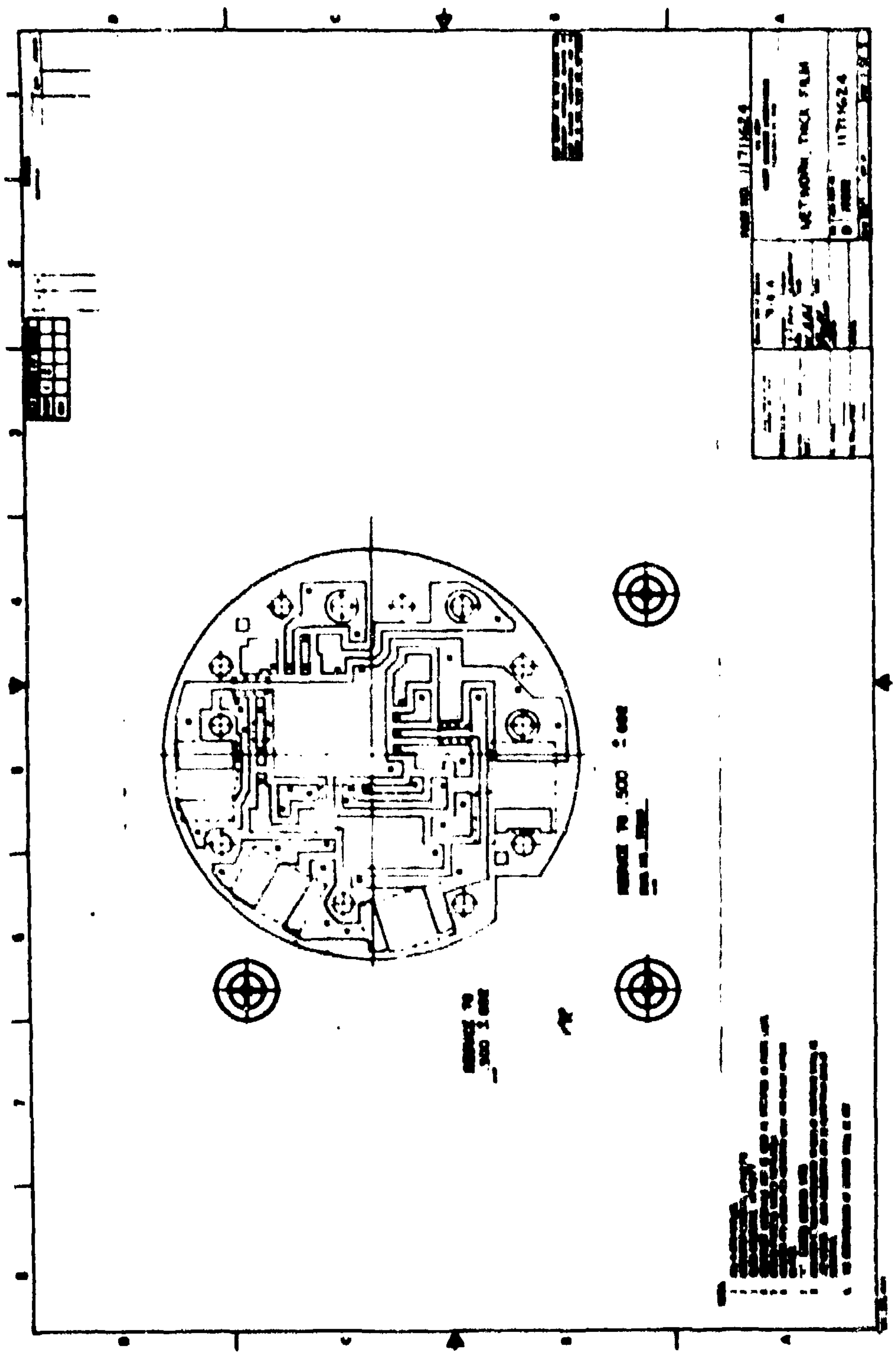
SUBSTRATE, SILICON

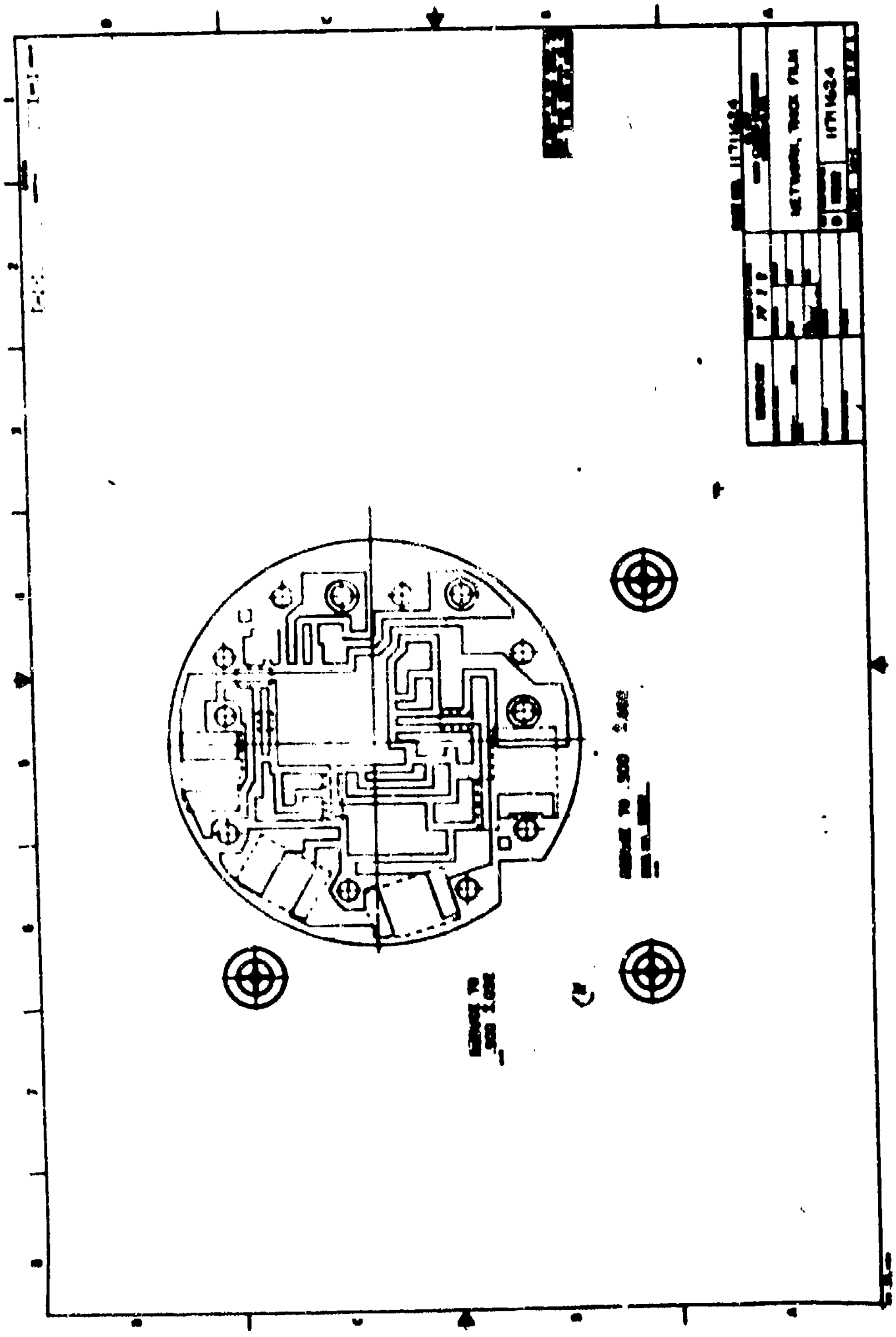
B | 11711685

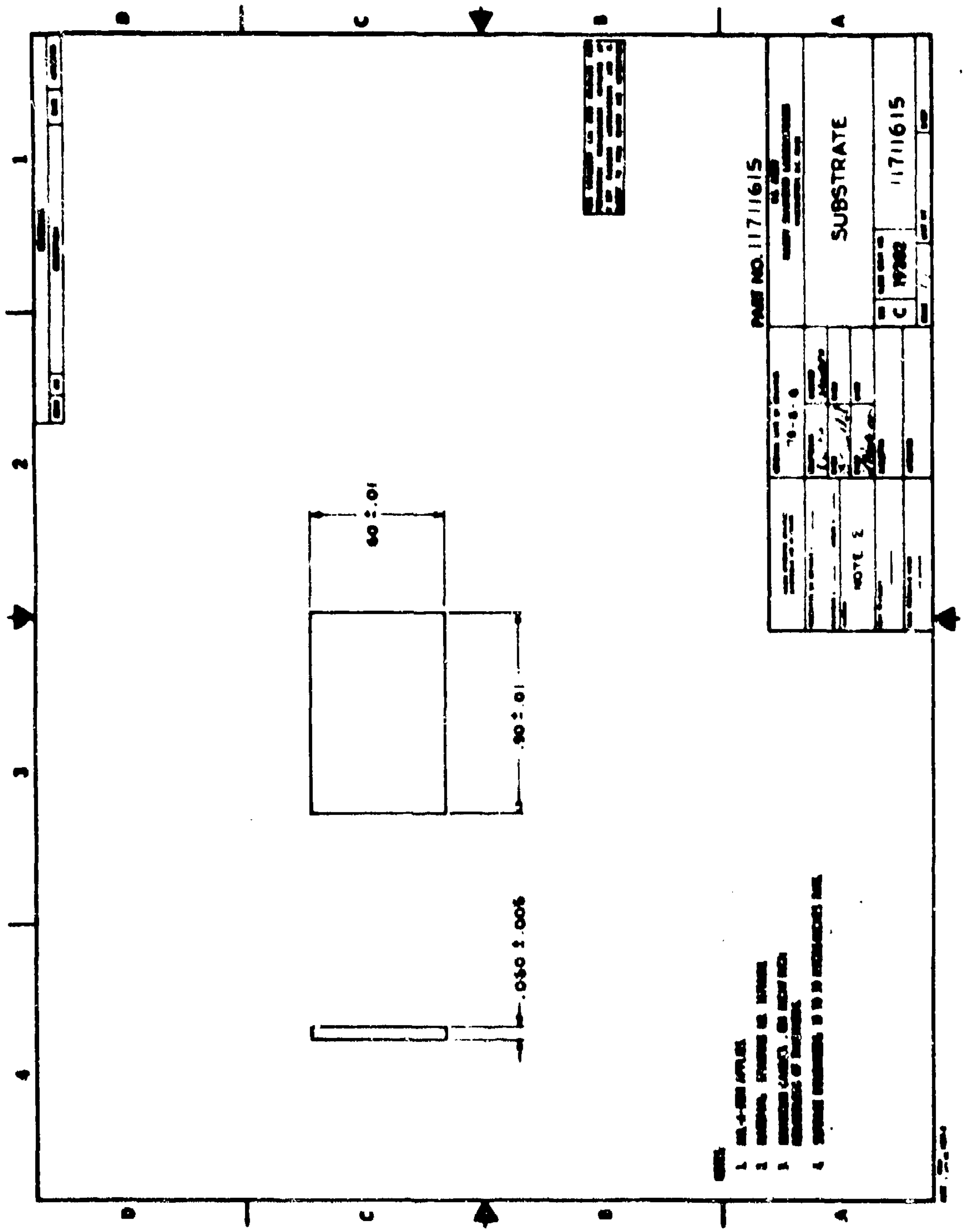

PRECISION OSCILLATOR
11711427

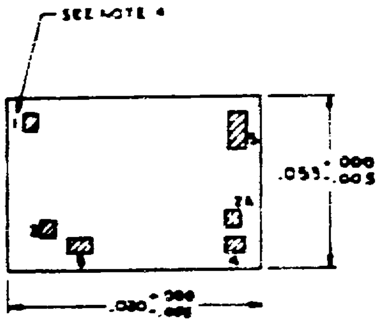

INTERFACE HYBRID SUBASSEMBLY
INTERFACE HYBRID CIRCUIT

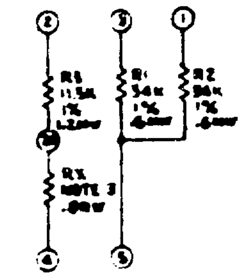

PART NO. 11711623
SUBSTRATE
11711623


NETWORK, THICK FILM


NETWORK, THICK FILM
11714624


PART NO. 11711615
SUBSTRATE
11711615
.80 ± .01
.80 ± .01
.030 ± .005
NOTE 2





SCHEMATIC DIAGRAM

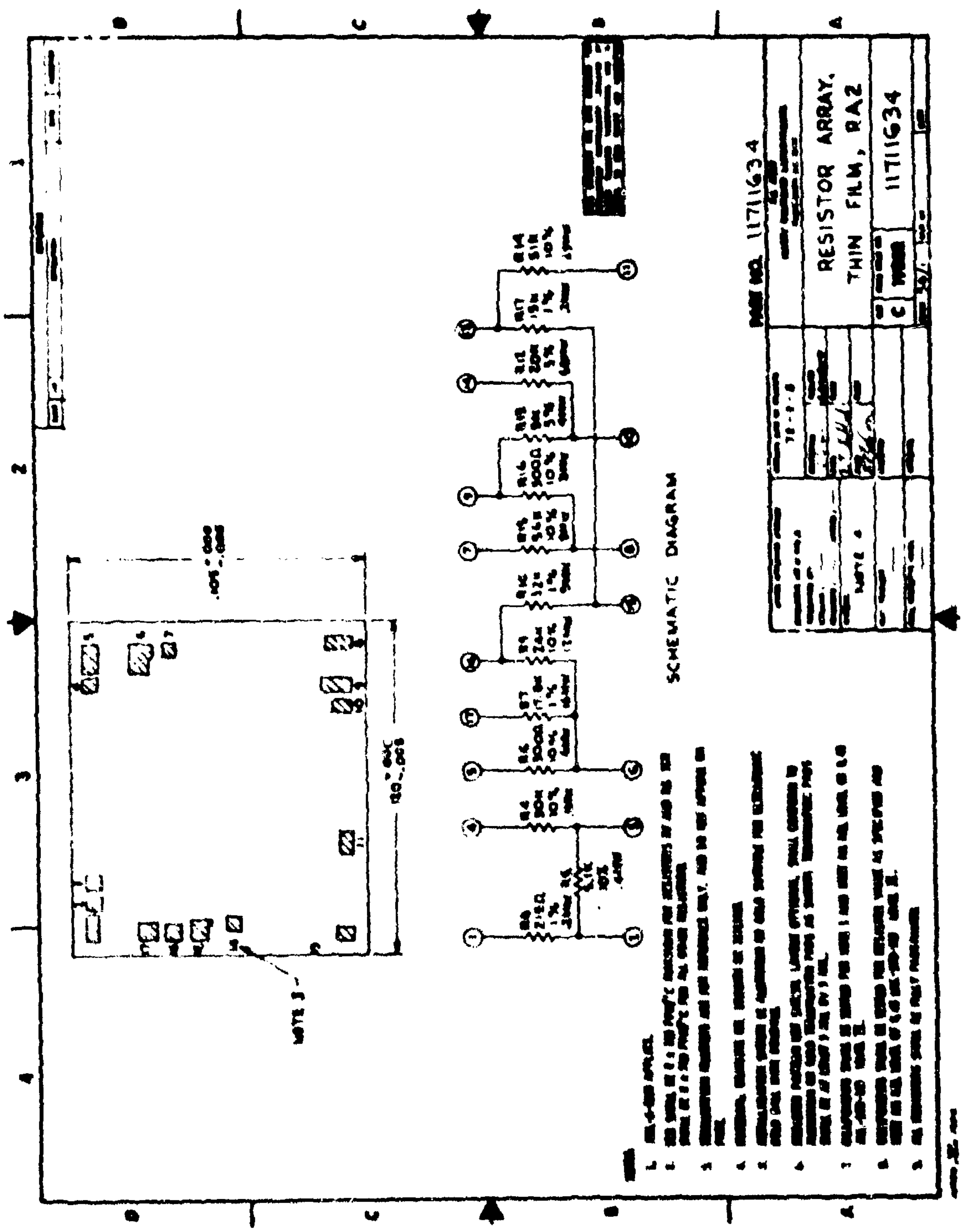
NOTES:
1. MIL-A-2880 APPLIES.
2. TCR SHALL BE 0 ± 5 PPM/°C.
3. RX SHALL HAVE A MAXIMUM VALUE OF 2.0 K OHMS, AND SHALL BE TRIMMABLE TO 8.0K OHMS MINIMUM.
4. TERMINATION NUMBERS ARE FOR REFERENCE ONLY, AND DO NOT APPEAR ON PART.
5. MATERIAL DRAWING NO 11711684 OR 11711685
6. METALLIZATION SHOWN IS ALUMINUM OR GOLD SUITABLE FOR ULTRASONIC GOLD BALL WIRE BONDING.
7. RESISTOR PATTERN NOT SHOWN, LAYOUT OPTIONAL, SHALL CONFORM TO ALUMINUM OR GOLD TERMINATION PADS AS SHOWN. TERMINATION PADS TO BE AT LEAST 5 MIL SQ.
8. COMPONENTS SHALL BE TESTED PER NOTE 1 AND MEET AN AQL LEVEL OF 0.40 PER MIL-STD-105 LEVEL II.
9. COMPONENTS SHALL BE TESTED FOR RESISTOR VALUE AT SPECIFIED AND MEET AN AQL LEVEL 0.40 PER MIL-STD-105 LEVEL II.
10. ALL RESISTORS SHALL BE FULLY PASSIVATED.

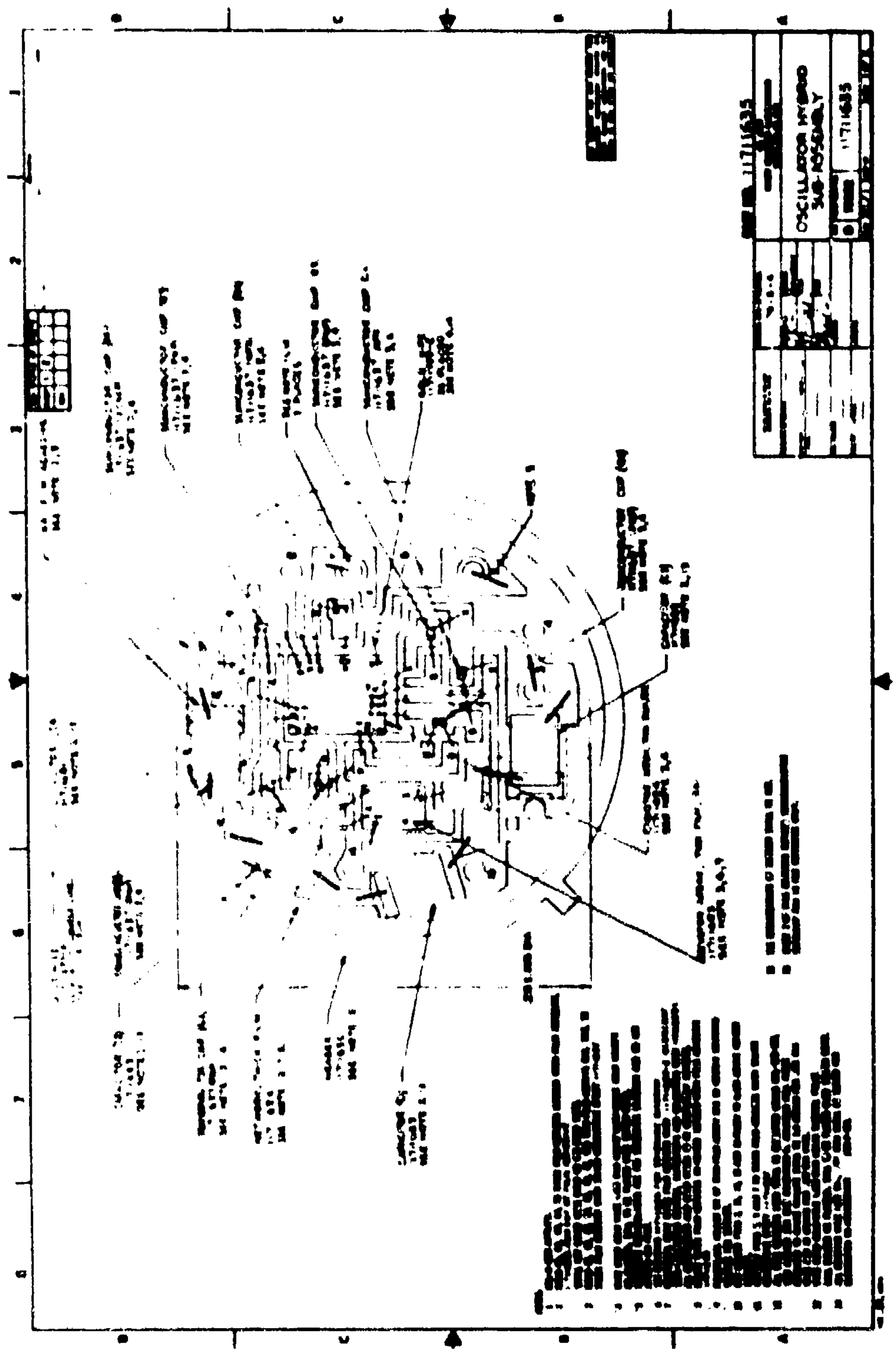
NOTE 3

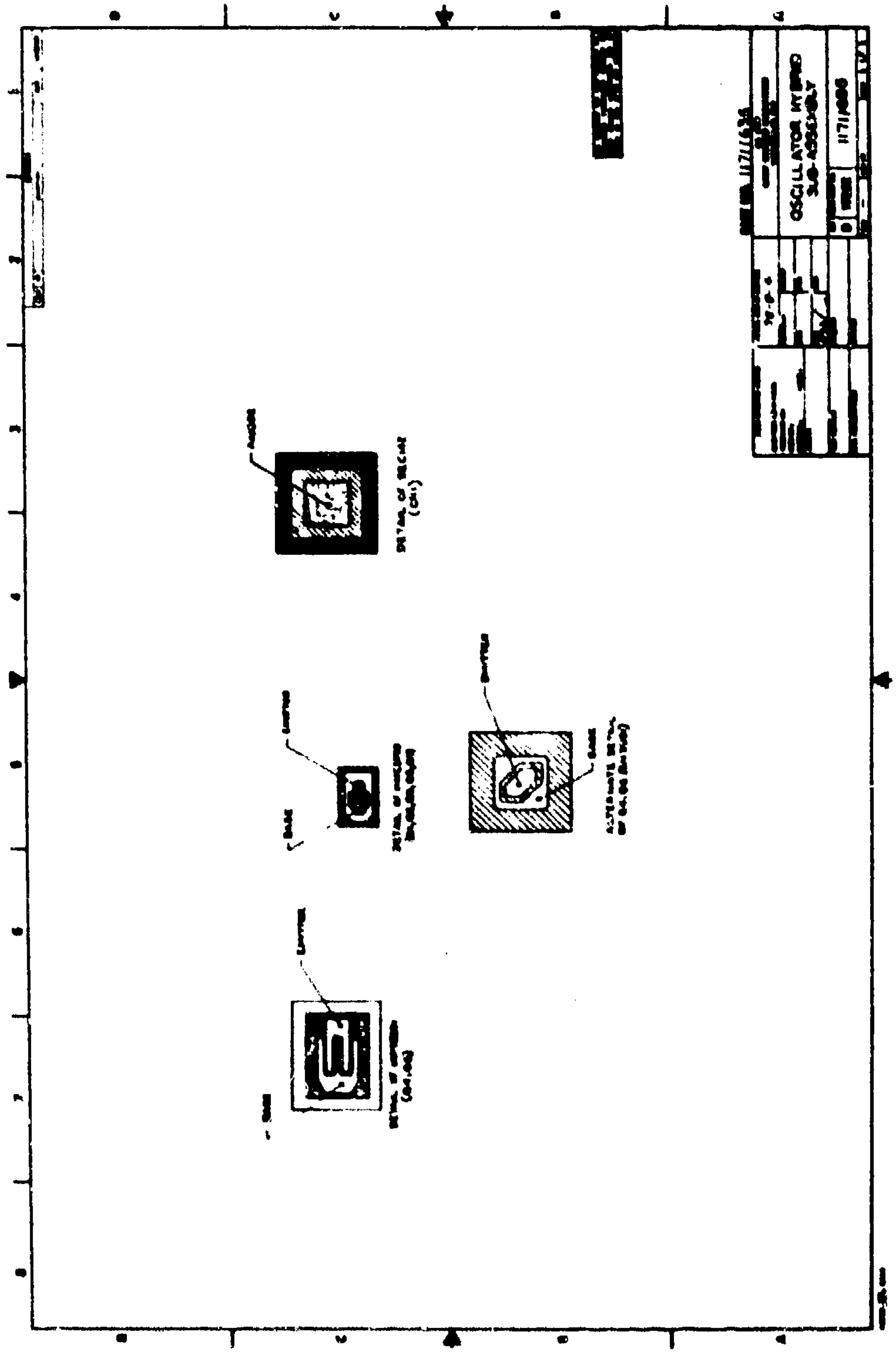
PART NO. 11711G33

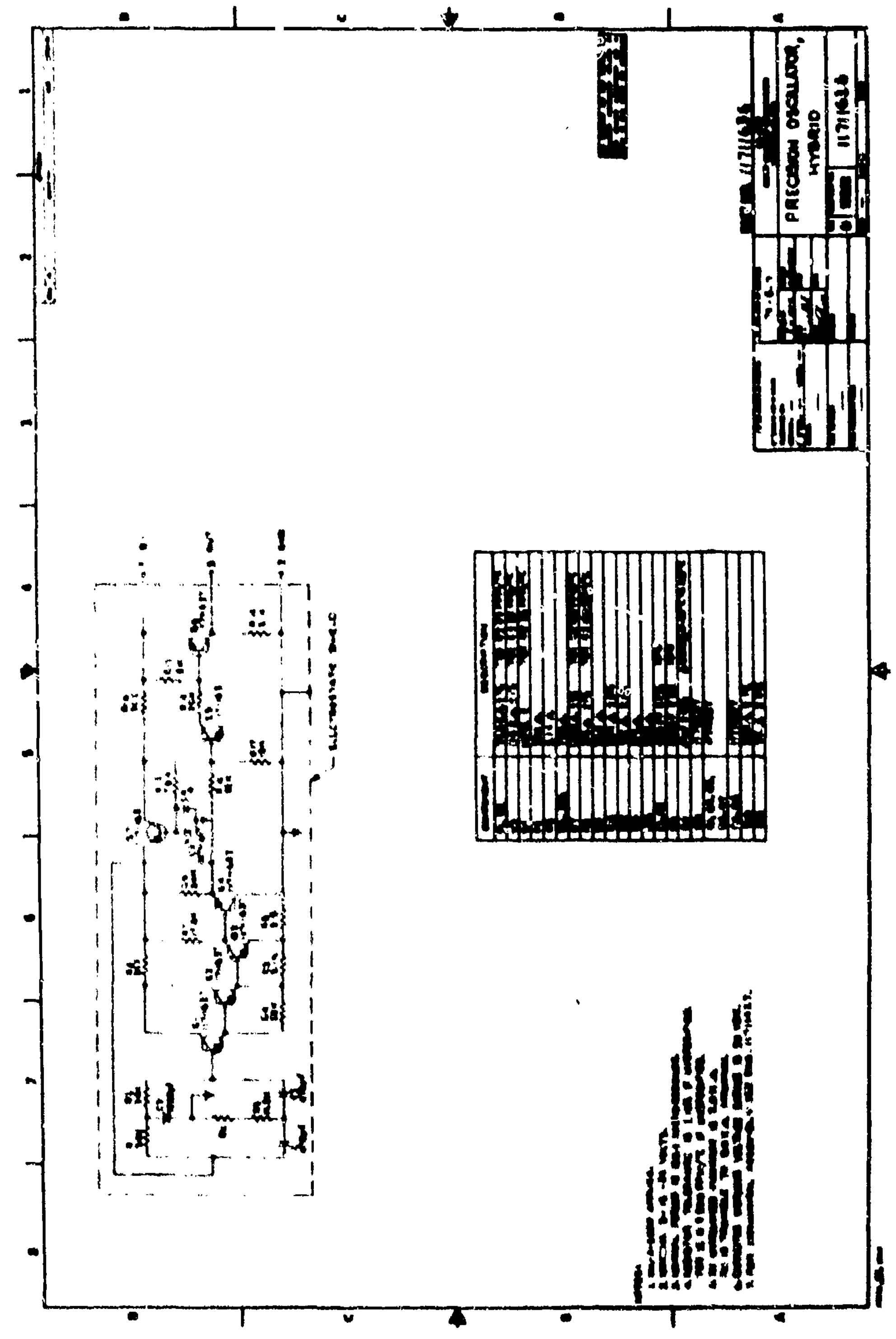
RESISTOR ARRAY, THIN FILM, RA1

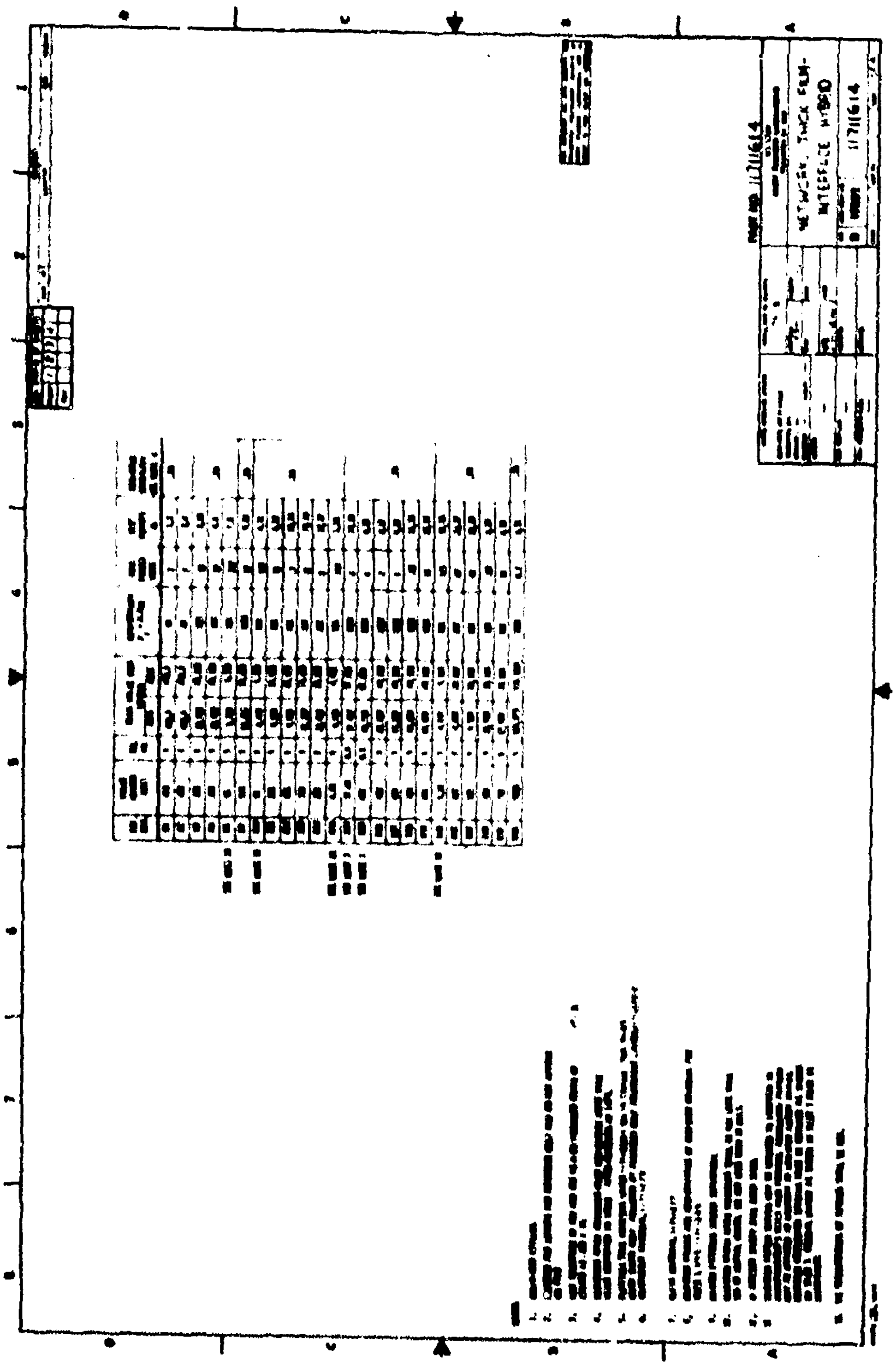
C | 11711G33

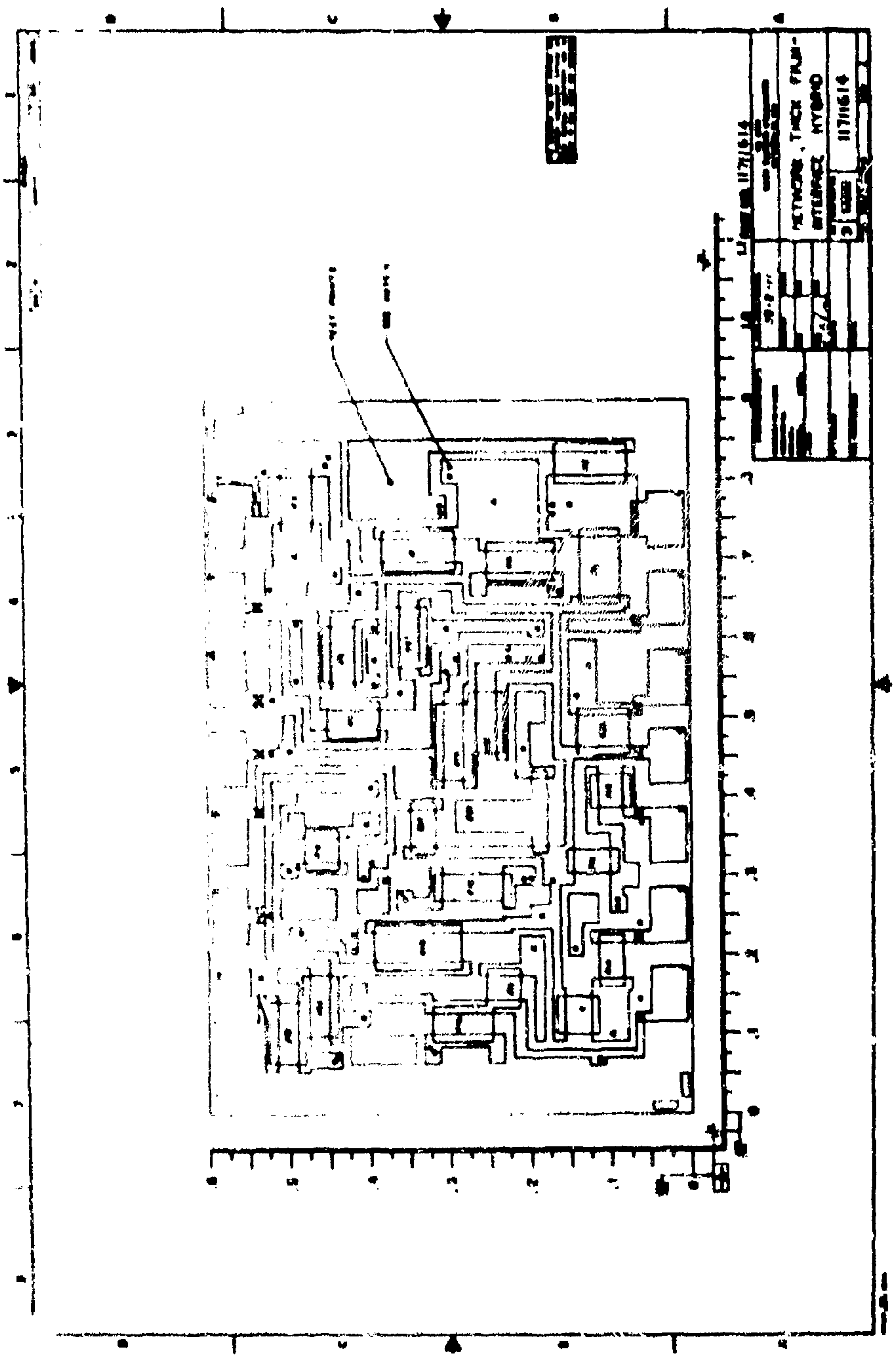

SCHEMATIC DIAGRAM
NOTE 3
PART NO. 11711634
RESISTOR ARRAY, THIN FILM, RA2
11711634

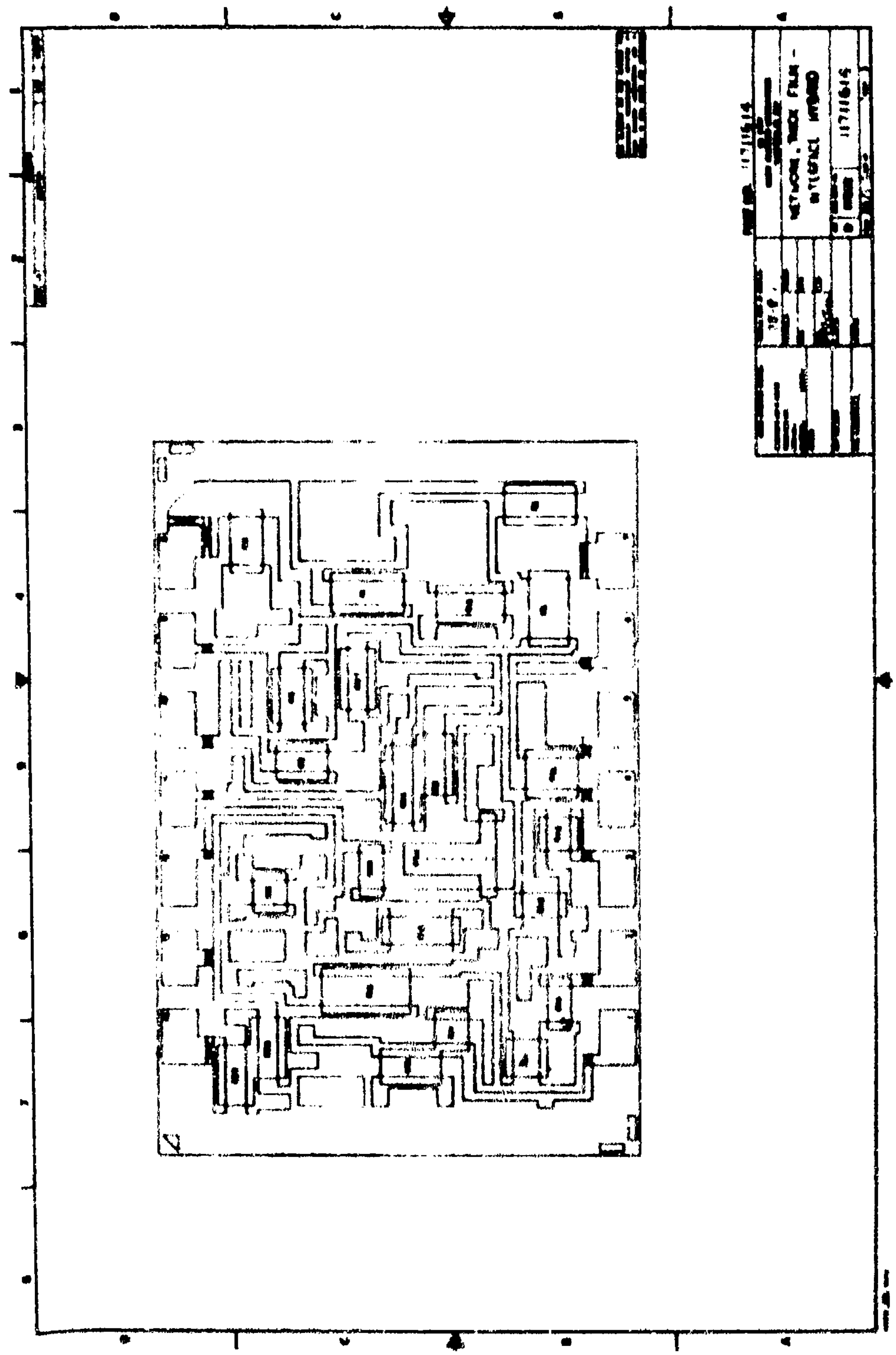

OSCILLATOR HYBRID
SUB-ASSEMBLY

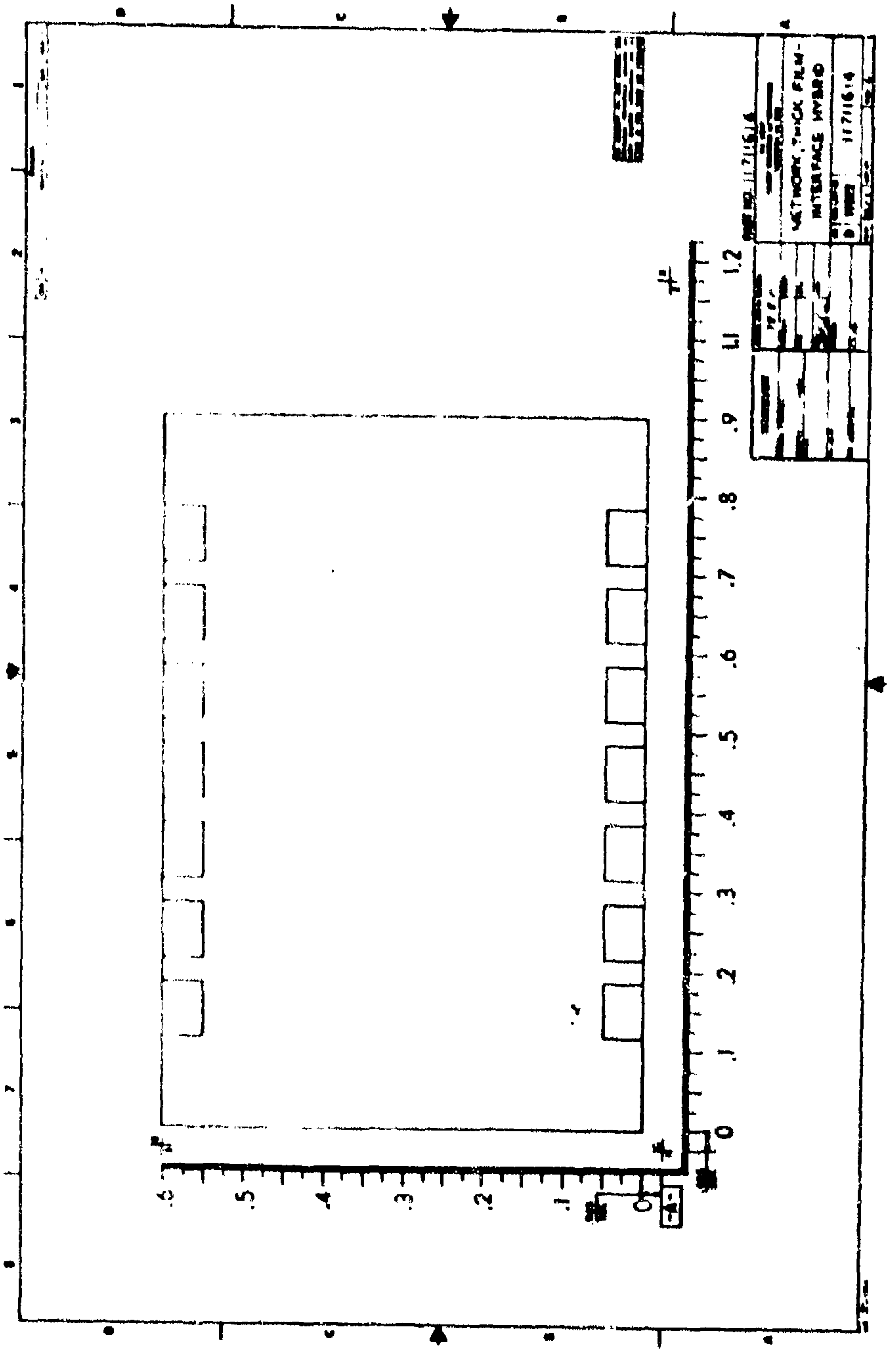

OSCILLATOR, HYBRID
SUB-ASSEMBLY

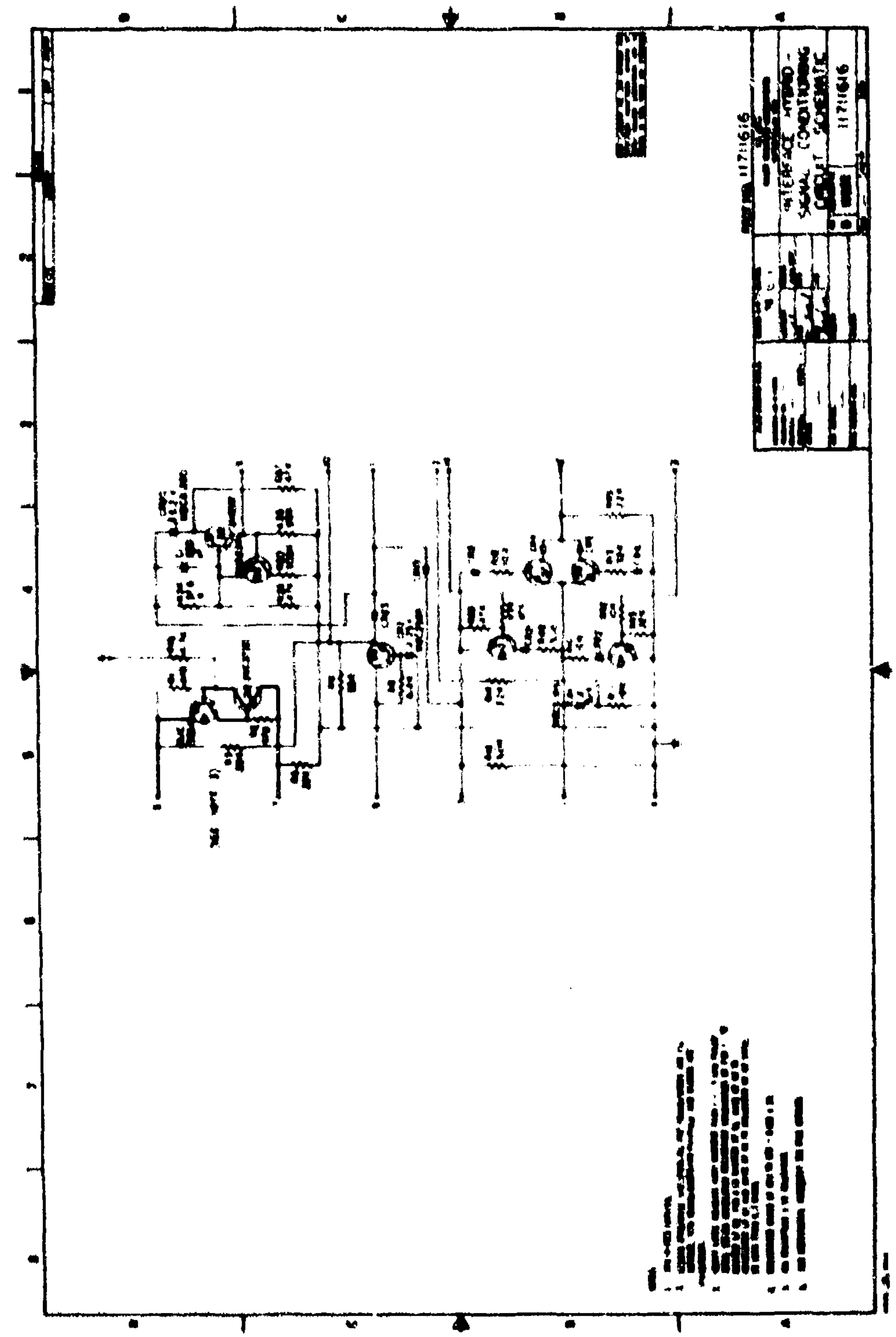

PRECISION OSCILLATOR, HYBRID

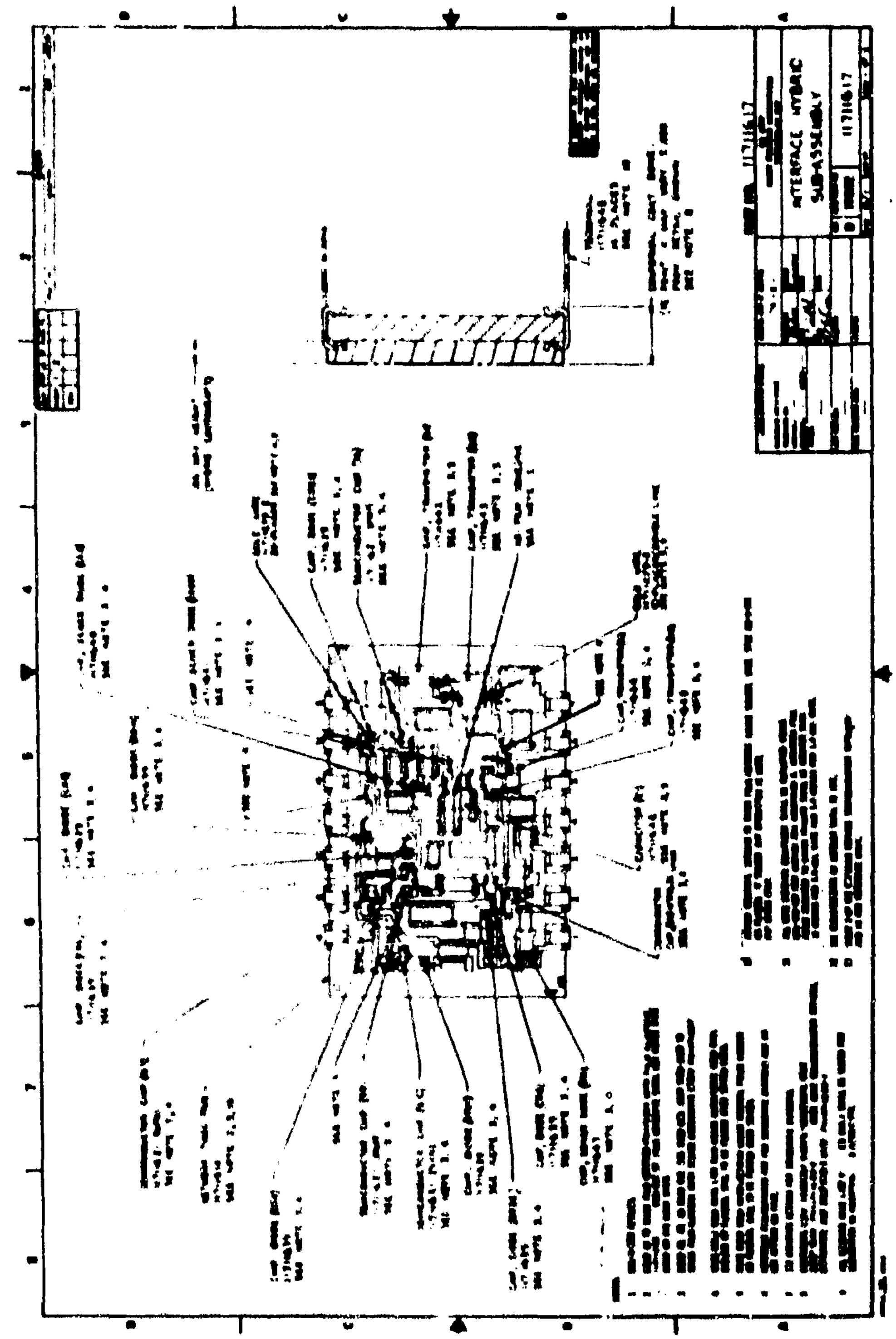

NETWORK, THICK FILM-
INTERFACE HYBRID
11711614

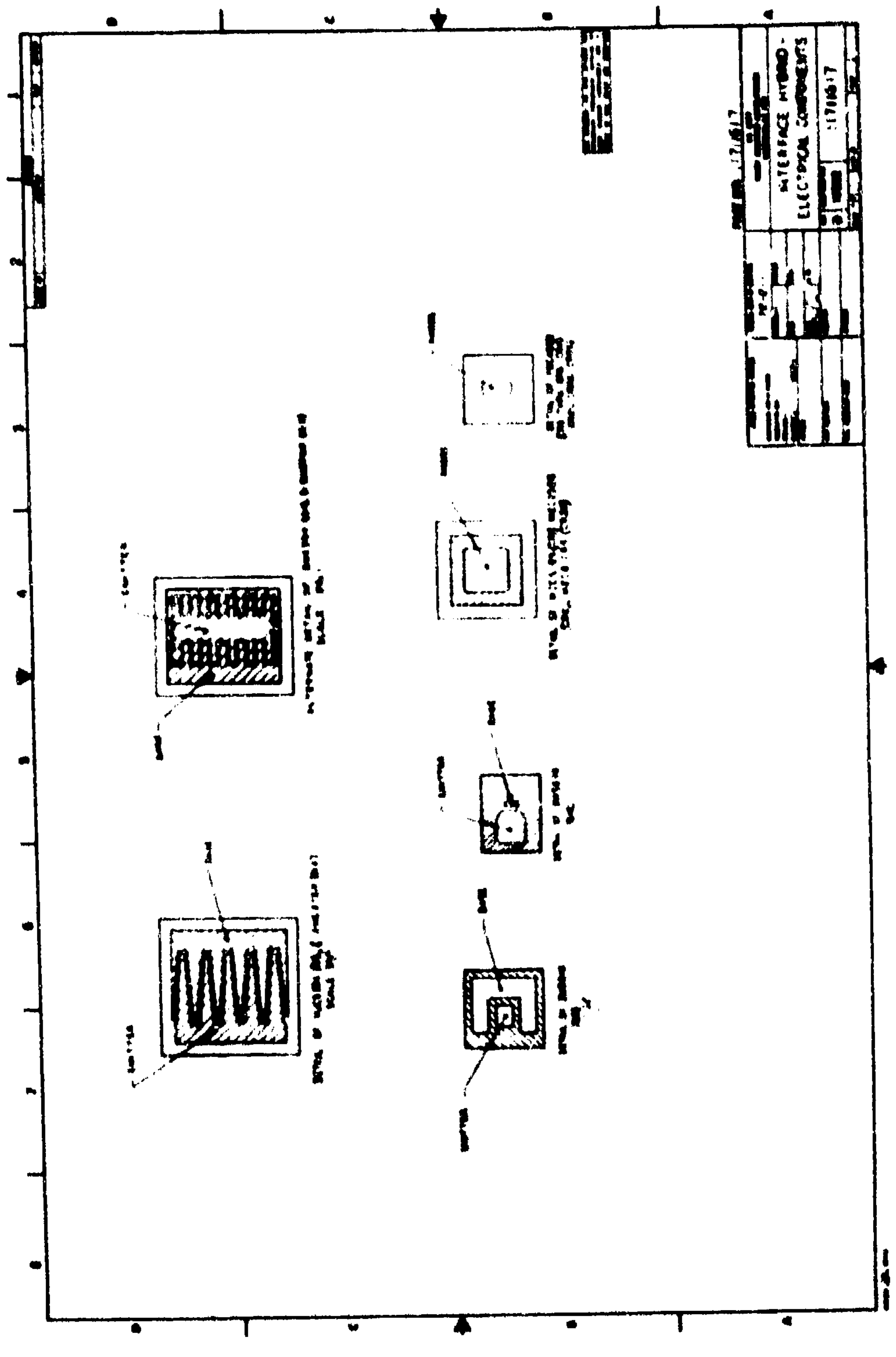

NETWORK, THICK FILM-INTERFACE, HYBRID
11711614


NETWORK, THICK FILM -
INTERFACE HYBRID
11711646


NETWORK, THICK FILM-
INTERFACE HYBRID
11711614


11711616
INTERFACE HYBRID - SIGNAL CONDITIONING CIRCUIT SCHEMATIC
11711616


INTERFACE HYBRID
SUBASSEMBLY


INTERFACE HYBRID - ELECTRICAL COMPONENTS

APPENDIX I

ESD TEST PLAN

HONEYWELL ESD TEST REPORT OEXM 28, 930

XM587 ESD TEST PLAN

Purpose: To evaluate the ESD vulnerability of the four I.C. XM587 fuze electronic assembly (two board "E" head) and the three I.C. electronic assembly (single board "E" head).

Part I: ESD vulnerability test on the completed XM587 fuze (four I.C. model).

This test will be run on electrically acceptable units left over from Lot 2. All tests will be run with a 100 pf capacitor charged to various voltage levels and discharged through a 1500 ohm resistor using mercury wetted relay contacts. The fuze under test will be grounded during charge and discharge of the capacitor.

Step 1: Test fuze with XM36 fuze setter to make sure it sets and interrogates correctly. Select nominal time.

2: Charge capacitor to 200 v (+) and discharge to monitor line.

3: Stabilize fuze by discharging monitor line and V_X through a 1 megohm resistor to ground.

4: Interrogate fuze, if OK, reset to a nominal time different from that used in Step 1 or previous test. Interrogate.

5: Repeat Steps 2-4 for (-) polarity.

6: Repeat Steps 2-5 for V_X line.

7: Increase capacitor voltage to the next increment and repeat Steps 2-6 until a failure occurs or the 15K v limit is reached. Complete all tests at the voltage level of the failure using new fuzes as necessary. Then reduce capacitor voltage one increment and repeat tests. Increase voltage one increment if failure does not occur at a particular voltage level, decrease the voltage one increment if failure does occur. Continue until the most susceptible line and polarity have been established along with the breakdown voltage level. It is anticipated that at least ten fuzes will be spent in this test.

NOTE: 1) Voltage increments are 200 volts up to 1 KV, 500 volts up to 5 KV, then 1 KV up to 15 KV. 15 KV is the upper limit of this test.

2) Improper interrogation (or scrambling), after a static discharge is to be noted but it is not a failure. A failure is inability to set.

Part II: ESD vulnerability of the potted four I.C. "E" head. This test will be conducted on completed electronic assemblies left over from Lot 2 placed in nose cones but not potted. The nose cone and orientation cup will be grounded to J2-5 of the electronics cover and the ESD test set-up.

Tests will be conducted to verify which line is the most susceptible to ESD damage at a particular voltage level and polarity. It is anticipated that approximately five board level assemblies will be used in this test.

Tests will follow the pattern of the tests conducted in Part I, but will start with a voltage one step lower than the established failure point. Voltage will be increased in one step increments until failure level has been established.

Part III: ESD vulnerability test of the three I.C. XM587 fuze electronics assembly (single board unit).

This test will be conducted on completed electronic assemblies placed in nose cones but not potted. The nose cone and orientation cup will be grounded to J2-5 of the electronics cover and the ESD test set-up.

Tests will be along the pattern of Part I, using a minimum number of board assemblies.

Part IV: Establish the correlation between the ESD vulnerability of the unpotted three I.C. fuze electronic assembly and the potted "E" head.

These tests will be conducted on a minimum number of potted "E" heads. The nose cones and orientation cups of the "E" heads will be grounded to J2-5 and the test set-up.

Tests will follow the pattern of Part I, but will start at a voltage 1 KV lower than the established failure point of Part III. The voltage will be increased in one (1) increments steps until the failure level has been verified.

Part V: Vulnerability test of the three I.C. fuze electronics to ESD strikes on the J2-2 test point on electronics cover.

These tests will be conducted on two unpotted single P.C. Board "E" heads. The nose cone and orientation cups of the "E" heads will be grounded to J2-5 and the test set. ESD strike will be to J2-2.

Tests will follow the pattern of Part 1 but will start at 50 volts until a failure point is established.

Part VI: Real time function of XM587 electronics assembly, 11711430, after its interrogation time has been scrambled by ESD strikes on the nose contacts (V_X and monitor line).

This test will follow the pattern of Part 1, but will not continue to failure of the assembly. When the interrogation time is scrambled, the fuze electronics assembly will be functioned in real time to determine how the fuze functions, i.e., compared to the original set time or the scrambled time.

One fuze electronics section will be tested, with ESD strikes, sufficient to scramble the interrogation, on both monitor line and V_X.

Honeywell

☐ AVIONICS DIVISION

☒ DEFENSE SYSTEMS DIVISION

ACTIVITY NUMBER	DATE Reissue
OEXM 28,930	27 June 1979
DEVELOPMENT NUMBER	PAGE
M3864-AB-1000-1000	1 of 11

ENGINEERING TEST REPORT

ISSUED BY	CONTRACT NUMBER
D&E LABS - HOPKINS	DAAK39-77-C-0056

COPY LIST:

W. Aschenbeck MN11-2100
M.F. Ernst MN11-1040
E. Morey MN11-1040
*J. Wallschlaeger MN11-1040

* Uniterm Copy

* Front Sheet Only

KEYWORDS:

Fuze, XM587
Fuze, Electronic
ESD Test

ATTACHMENTS:

None

ITEMS TESTED:

Twenty-one (21) Electronics Assembly, Fuze XM587, P/N 11711430 & 11711433 and P/N 28116143, manufactured by Honeywell.

OBJECTIVE:

Perform Electrostatic Discharge (ESD) Testing.

1) Start test at 200 V and increment upward to 15 KV or until failure occurs.
   a) 200 V increments from 200 V to 1 KV.
   b) 500 V increments from 1 KV to 5 KV.
   c) 1 KV increments from 5 KV to 15 KV.
2) Apply ESD pulse through a 1500 ohm resistor.
   a) Apply between monitor pin and case-ground.
   b) Apply opposite polarity.
   c) Repeat between V_x pin and case-ground.
3) ESD pulse to be supplied by discharging a 100 picofarad capacitor through mercury wetted contacts.
4) The fuze time shall be set and interrogated using an XM36 fuze setter.
   a) Set fuze time.
   b) Interrogate.
   c) Apply applicable ESD pulse.
   d) Discharge Monitor and V_x lines through 1 megohm resistor.

DATA BOOK NUMBER	PAGE	TEST STARTED	TEST COMPLETED
0-2300	110	4-9-79	5-14-79
REQUESTED BY: W. Aschenbeck	DATE: 4-9-79	WRITTEN BY: E.R. Morey	
DEPARTMENT: Engineering		APPROVED: M.F. Ernst	

HE-44 REV 4/78

e) Interrogate.

f) Set new fuze time and repeat from b) above.

g) Inability to set new time is considered failure.

CONCLUSIONS:

Applying the ESD pulse produced erroneous readings but did not affect the actual fuze time-out (see data).

PROCEDURE:

The units were divided into six groups for testing:

Group 1 - P/N 11711433, XM587 Fuze, two board, (encapsulated units).

Group 2 - P/N 11711430, two board, un-encapsulated units.

Group 3 - P/N 28116143, single board, un-encapsulated units.

Group 4 - P/N 28116143, single board, encapsulated units.

Group 5 - P/N 28116143, single board, un-encapsulated units.

Group 6 - P/N 11711430, two board, un-encapsulated unit.

The ESD pulses were applied between pin J2-2 and case-ground on the Group 5 units and not the Monitor or V_x pin.

When an erroneous reading was obtained on the Group 6 unit, the unit was connected to a power source and the actual time-out was observed. In addition, the ESD pulse in some cases was applied to the unit during the actual time-out (see data).

The ground pin and the case were wired together on the test fixture and a piece of conductive foam was inserted between the base plate and the case (cone) on the fuze.

The fuze time was set and then read (interrogated) using the fuze setter. The fuze was placed in the fixture and the applicable ESD pulse applied to the appropriate pin. The pin was then grounded through a one megohm resistor for a few seconds.

The fuze was removed from the fixture and the fuze setting again read using the fuze setter. A new setting was then tried and if the fuze interrogated correctly, the next ESD pulse was applied. If an incorrect reading was obtained, testing on that unit was halted.

Only one voltage level, one polarity, and one pin was used for each ESD pulse test.

DATA:

TABLE I. ESD DATA, P/N 11711433 (encapsulated)

S/N	V	Monitor (Gr)						Vx (R)					
		- Pulse			+ Pulse			- Pulse			+ Pulse		
		SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
8654	200	10.0	10.03	10.03	11.0	11.04	11.04	12.0	12.04	12.04	13.0	13.04	13.05
	400	14.0	14.04	14.05	15.0	14.95	14.95	16.0	15.95	15.96	17.0	16.96	16.96
	600	18.0	17.96	17.96	19.0	18.97	18.97	20.0	19.97	19.97	21.0	20.97	20.97
	800	22.0	21.98	21.98	23.0	22.98	22.98	24.0	23.98	23.98	25.0	24.99	24.99
	1 KV	26.0	25.99	25.99	27.0	25.99	26.99	28.0	28.00	28.00	29.0	29.00	29.00
	1.5 KV	30.0	30.00	30.00	31.0	31.01	31.01	32.0	32.01	32.01	33.0	33.01	33.01
	2 KV	34.0	34.02	34.02	35.0	35.02	35.02	36.0	36.02	36.02	37.0	37.03	37.03
	2.5 KV	38.0	38.03	38.03	39.0	39.03	39.03	40.0	40.04	40.04	41.0	41.04	41.04
	3 KV	42.0	42.05	42.05	43.0	43.05	43.05	44.0	43.95	43.95	45.0	44.96	44.96
	3.5 KV	46.0	45.96	45.96	47.0	46.96	46.96	48.0	47.97	47.97	49.0	48.97	48.97
	4 KV	50.0	49.97	49.97	51.0	50.96	△	52.0	51.98	51.98	53.0	52.98	52.99
	4.5 KV	54.0	53.99	53.99	55.0	54.99	54.99	56.0	56.00	56.00	57.00	57.00	57.00
	5 KV	58.0	58.00	58.00	59.0	59.01	△	60.0	60.01	△	61.0△	LE	
7754	3 KV	10.0	10.01	10.01	11.0	11.04	△	12.0	11.97	11.97	13.0	13.00	13.00
	3.5 KV	14.0	14.03	14.03	15.0	14.96	△	16.0	15.99	15.99	17.0	17.02	17.02
	4 KV	18.0	18.05	18.05	19.0	18.98	△	20.0	20.01	△	21.0△		
8072	2.5 KV	10.0	10.03	10.03	11.0	10.96	10.96	12.0	12.00	12.00	13.0	13.03	13.03
	3 KV	14.0	13.36	13.96	15.0	14.99	△	16.0	16.03	16.03	17.0	16.96	16.96
	3.5 KV	18.0	17.99	17.99	19.0	19.03	△	20.0	19.96	19.96	21.0	20.99	20.99
	4 KV	22.0	22.02	22.02	23.0	22.95	△	24.0	23.99	△	25.0△		
7962	3 KV	10.0	10.05	10.05	11.0	10.97	△	12.0	12.00	12.00	13.0	13.02	△
	3.5 KV	14.0	14.05	14.05	15.0	14.97	△	16.0	15.99	15.99	17.0	17.02	10
	4 KV	18.0	18.04	18.04	19.0	18.96	△	20.0	19.99	19.99	21.0	21.01	21.01
	4.5 V	22.0	22.04	22.04	23.0	22.96	△	24.0	23.99	23.99	25.0	25.01	△
	5 KV	26.0	26.03	26.04	27.0	26.96	△	28.0	27.98	27.98	29.0	29.01	△
	5.5 KV	30.0	30.03	30.03	31.0	30.95	△	32.0	31.98	△	33.0△		

TABLE 1. ESD DATA, P/N 11711433

		Monitor						Vx					
		- Pulse			+Pulse			- Pulse			+ Pulse		
S/N	V	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
7514	2.5KV				10.0	9.95	9.95						
	3KV	11.0	10.97	10.97	12.0	11.98	△6	13.0	12.99	13.00	14.0	14.01	14.01
	3.5KV	15.0	15.02	15.02	16.0	16.04	△6	17.0	17.05	△3	18.0 △4		
8179	2.5KV				10.0	9.96	9.96						
	3KV	11.0	11.01	11.01	12.0	11.96	11.96	13.0	13.00	13.00	14.0	14.05	14.05
	3.5KV	15.0	15.00	15.00	16.0	16.04	16.04	17.0	16.99	△3	18.0 △4		
7068	2.5KV				10.0	10.03	10.03						
	3KV	11.0	10.96	10.96	12.0	12.00	△13	13.0	13.03	△3	14.0 △4		
7692	2.5KV	10.0	10.03	10.03	11.0	10.95	10.95	12.0	11.98	11.98	13.0	13.00	13.00
	3KV	14.0	14.02	14.02	15.0	15.[illegible]	15.05	16.0	15.97	15.97	17.0	16.99	16.99
	3.5KV	18.0	18.01	18.01	19.0	19.04	△13	20.0	19.96	19.96	21.0	20.98	20.98
	4KV	22.0	22.00	22.00	23.0	23.03	23.03	24.0	24.05	24.05	25.0	24.97	24.97
	4.5KV	26.0	25.99	25.99	27.0	27.02	27.02	28.0	28.04	28.04	29.0	28.96	28.96
	5KV	30.0	29.98	29.98	31.0	31.01	△14	32.0	32.03	32.03	33.0	32.95	32.95
	5.5KV	34.0	33.97	33.97	35.0	35.00	△13	36.0	36.02	△3	37.0 △4		
7822	2.5KV	10.0	10.05	10.05	11.0	11.00	△18	12.0	11.95	11.95	13.0	13.01	13.0
	3KV	14.0	13.96	13.96	15.0	15.01	△17	16.0	15.97	15.97	17.0	17.02	17.02
	3.5KV	18.0	17.97	17.98	19.0	19.03	△6	20.0	19.98	19.98	21.0	21.04	21.04
	4KV	22.0	21.99	21.99	23.0	23.05	△6	24.0	24.00	24.00	25.0	24.95	24.95
	4.5KV	26.0	26.01	26.01	27.0	26.96	△6	28.0	28.02	△18	29.0	28.97	28.97
	5KV	30.0	30.03	△1	31.0 △4								

TABLE 1. ESD DATA, P/N 11711433
(encapsulated)

		Monitor						Vx					
		- Pulse			+ Pulse			- Pulse			+ Pulse		
S/N	ESD (V)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
7752	2.5 KV	10.0	9.97	9.97	11.0	10.98	10.98	12.0	11.98	11.98	13.0	12.99	12.99
	3 KV	14.0	13.99	14.00	15.0	15.00	△6	16.0	16.01	16.01	17.0	17.01	17.01
	3.5 KV	18.0	18.02	18.02	19.0	19.03	△20	20.0	20.03	20.03	21.0	21.04	21.04
	4 KV	22.0	21.95	21.95	23.0	22.95	△6	24.0	23.96	23.96	25.0	24.97	24.97
	4.5 KV	26.0	25.97	25.97	27.0	26.98	△6	28.0	27.99	27.99	29.0	28.99	28.99
	5 KV	30.0	30.00	△3	31.0 △								

Notes for Two Board Potted Units (Live)

△1	P	△6	P	△11	P	△16	7.72
	26.19		P		26.34		11.10
	26.89		P		26.34		11.10
	26.89	△7	LE	△12	26.57	△17	P
△2	26.89		LE		26.57		27.17
	26.89		LE		26.57		27.17
	78.27	△8	P	△13	17.40	△18	L 28.02
△3	LE		13.34		17.40		L 28.02
	LE		13.34		17.40	△19	LP
	LE	△9	14.17	△14	26.30		LE
△4	Displays LE while setting		19.13		29.57		LE
			19.13		29.57	△20	25.87
△5	P	△10	26.34	△15	32.75		25.87
	P		26.34		33.36		25.87
	1.14		26.34		33.36		

TABLE 2. ESD DATA, P/N 11711430
(unencapsulated)

		Monitor						Vx					
		- Pulse			+ Pulse			- Pulse			+ Pulse		
S/N	ESD (V)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
9085	2KV	10.0	10.01	10.02	11.0	11.01	11.01	12.0	12.00	12.00	13.0	12.99	12.99
	2.5KV	14.0	13.98	13.98	15.0	14.97	14.97	16.0	15.96	15.96	17.0	17.05	17.05
	3KV	18.0	18.04	18.05	19.0	19.04	19.04	20.0	20.03	20.03	21.0	21.02	21.02
	3.5KV	22.0	22.01	22.01	23.0	23.00	23.00	24.0	23.99	△	25.0 △		
9105	2.5KV	10.0	9.96	9.96	11.0	10.97	10.97	12.0	11.97	11.97	13.0	12.98	12.98
	3KV	14.0	13.98	13.98	15.0	14.99	14.99	16.0	15.99	15.99	17.0	17.00	17.00
	3.5KV	18.0	18.01	18.01	19.0	19.01	19.01	20.0	20.02	20.02	21.0	21.02	21.02
	4KV	22.0	22.03	△	23.0 △								
	3KV	10.0	10.05	10.05	11.0	11.00	△	12.0	12.04	△	13.0 △		
9247	2KV	10.0	9.99	9.99	11.0	10.99	11.00						
	2.5KV	12.0	12.00	12.00	13.0	13.01	13.01						
	3KV	14.0	14.02	14.02	15.0	15.03	15.04						
	3.5KV	16.0	16.04	16.04	17.0	17.05	17.05						
	4KV	18.0	17.96	17.96	19.0	18.97	18.97						
	4.5KV	20.0	19.98	19.98	21.0	20.99	20.99						
	5KV	22.0	21.99	21.99	23.0	23.00	23.00						
	5.5KV	24.0	24.01	24.01	25.0	25.02	25.02						
	6KV	26.0	26.03	26.03	27.0	27.04	27.03						
	6.5KV	28.0	28.04	△	29.0 △								

NOTES:

△ LE
LE
LE

△ LE

△ LP
LP
P

△ E
△ P
P
P

△&△ Sometimes letters by themselves, othertimes with times listed, other times letters followed by numbers on next interogation.

TABLE 3. ESD DATA, P/N 28116149
(unencapsulated)

		Monitor						Vx					
		− Pulse			+ Pulse			− Pulse			+ Pulse		
S/N	V	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
10147	200	10.0	10.04	10.04	11.0	11.03	11.03	12.0	12.03	12.03	13.0	13.02	13.02
	400	14.0	14.01	14.01	15.0	15.01	15.01	16.0	16.00	16.00	17.0	17.00	17.00
	600	18.0	17.99	17.99	19.0	18.98	18.98	20.0	19.98	19.98	21.0	20.97	20.97
	800	22.0	21.96	21.96	23.0	22.96	22.96	24.0	24.05	24.05	25.0	25.04	25.04
	1KV	26.0	26.04	26.04	27.0	27.03	27.03	28.0	28.02	28.02	29.0	29.02	29.02
	1.5KV	30.0	30.01	30.01	31.0	31.00	31.01	32.0	32.00	32.00	33.0	32.99	32.99
	2KV	34.0	33.99	33.99	35.0	34.98	34.98	36.0	35.97	35.97	37.0	36.97	36.97
	2.5KV	39.0	37.96	37.96	39.0	39.05	△	40.0	40.05	40.05	41.0	41.04	41.04
	3KV	42.0	42.03	42.03	43.0	43.03	△	44.0	44.02	44.02	45.0	45.01	△
	3.5KV	46.0	46.01	46.01	47.0	47.00	47.00	48.0	48.00	48.00	49.0	48.99	48.99
	4KV	50.0	49.98	49.98	51.0	50.98	50.98	52.0	51.97	51.97	53.0	52.96	52.96
	4.5KV	54.0	53.96	53.96	55.0	55.05	55.05	56.0	56.04	56.04	57.0	57.04	57.04
	5KV	58.0	58.03	58.03	59.0	59.02	59.02	60.0	60.02	60.02	61.0	61.01	61.01
	6KV	62.0	62.00	62.01	63.0	63.00	63.00	64.0	63.99	63.99	65.0	64.99	64.99
	7KV	66.0	65.98	65.98	67.0 △	66.97	66.97	68.0	67.97	67.97	69.0	68.96	68.96
	8KV	70.0 △	69.95	69.95	71.0	71.05	71.05	72.0 △	72.04	△	73.0 △		
10230	2.5KV	10.0	10.03	10.03	11.0	11.04	11.04	12.0	12.05	12.04	13.0	12.96	12.96
	3KV	14.0	13.97	8	15.0	14.99	14.99	16.0	16.00	16.00	17.0	17.01	17.01
	3.5KV	18.0	18.02	18.03	19.0	19.03	19.03	20.0	20.05	20.05	21.0	20.96	△
	4KV	22.0	21.97	21.97	23.0 △	22.98	22.96	24.0 △	23.99	23.99	25.0	25.01	25.01
	4.5KV	26.0	26.02	26.02	27.0	27.03	27.03	28.0	28.04	28.05	29.0 △	28.95	28.95
	5KV	30.0	29.97	29.97	31.0 △	30.98	30.98	32.0 △	31.99	31.99	33.0	33.00	[illegible]
	6KV	34.0	34.02	34.02	35.0	35.03	35.03	36.0 △	36.04	36.04	37.0 △	37.05	37.05
	7KV	38.0 △	37.96	37.97	39.0 △	38.98	38.98	40.0	39.99	39.99	41.0 △	41.00	40.99
	8KV	42.0	42.01	42.01	43.0 △	43.02	43.02	44.0 △	44.03	44.04	45.0 △	45.05	45.05
	9KV	46.0	45.95	45.96	47.0 △	46.97	46.97	48.0 △	47.98	47.98	49.0 △	49.00	48.99
	10KV	50.0 △	50.00	50.01	51.0 △	51.01	51.01	52.0 △					

OCXM 28,930
Page 7 of 11

TABLE 4. ESD DATA, P/N 28116149
(encapsulated)

		Monitor						Vx					
		- Pulse			+Pulse			- Pulse			+ Pulse		
S/N	ESD (V)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)	SET (Sec)	PRE (Read)	POST (Read)
10162	200	10.0	10.01	10.01	11.0	11.02	△	12.0	12.03	12.03	13.0	13.04	13.04
	400	14.0	13.95	13.95	15.0	14.96	14.96	17.0	16.98	16.98	18.0	17.99	17.99
	600	19.0	19.00	19.00	20.0	20.01	20.01	21.0	21.02	21.02	22.0	22.03	22.03
	800	23.0	23.04	23.04	24.0	23.95	23.95	25.0	24.96	24.96	26.0	25.98	25.98
	1 KV	27.0	26.99	26.99	28.0	28.00	28.00	29.0	29.01	29.01	30.0	30.02	30.02
	1.5 KV	31.0	31.03	31.03	32.0	32.04	32.04	33.0	32.95	32.95	34.0	33.96	33.96
	2 KV	35.0	34.97	34.97	36.0	35.98	35.98	37.0	36.99	36.99	38.0	38.00	38.00
	2.5 KV	39.0	39.01	39.01	40.0	40.02	△	41.0	41.03	41.03	42.0	42.04	42.04
	3 KV	43.0	42.95	42.95	44.0	43.96	△	45.0	44.97	44.97	46.0	45.98	45.99
	3.5 KV	47.0	47.00	47.00	48.0	48.01	48.01	49.0	49.02	49.02	50.0	50.03	50.03
	4 KV	51.0	51.04	51.04	52.0	51.95	51.95	53.0	52.96	52.96	54.0	53.97	53.97
	4.5 KV	55.0	54.98	54.98	56.0	55.99	55.99	57.0	57.00	57.00	58.0	58.01	58.01
	5 KV	59.0	59.02	59.02	60.0	60.03	60.03	61.0	61.04	61.04	62.0	61.95	61.95
	6 KV	63.0	62.96	62.96	64.0	63.97	63.97	65.0	64.98	64.98	66.0	66.00	66.00
	7 KV	67.0	67.01	67.01	68.0	68.02	68.02	69.0	69.03	69.03	70.0	70.04	70.04
	8 KV	71.0	71.05	71.05	72.0	71.96	71.96	73.0	72.97	72.97	74.0	73.98	73.98
	9 KV	75.0	74.99	74.99	76.0	76.00	76.00	77.0	77.01	△	△		

(Continued) TABLE 4. ESD DATA, P/N 28116149
(encapsulated)

S/N	ESD (V)	Monitor - Pulse SET (Sec)	Monitor - Pulse PRE (Read)	Monitor - Pulse POST (Read)	Monitor + Pulse SET (Sec)	Monitor + Pulse PRE (Read)	Monitor + Pulse POST (Read)	Vx - Pulse SET (Sec)	Vx - Pulse PRE (Read)	Vx - Pulse POST (Read)	Vx + Pulse SET (Sec)	Vx + Pulse PRE (Read)	Vx + Pulse POST (Read)
10211	5KV	10.0	10.05	10.05	11.0	10.95	10.95	12.0	11.95	11.95	13.0	12.96	12.96
	6KV	14.0	13.96	13.96	15.0	14.97	14.97	16.0 △	15.97	15.97	17.0	16.97	16.98
	7KV	18.0 △	17.98	17.98	19.0	18.98	18.98	20.0	19.99	19.99	21.0 △	20.99	20.99
	8KV	22.0	22.00	22.00	23.0 △	23.00	23.00	24.0 △	24.00	24.00	25.0 △	25.00	25.01
	9KV	26.0 △	26.01	26.01	27.0	27.02	△	28.0 △	28.02	28.01	△	28.01	

NOTES: Part III & IV

△1 P
P
P

△2 LE but sets
LE

△3 L but sets
△4 LE
LE

△5 LP
LP
LP

△6 Redone Monitor + @ 200 V & 16.0 Sec's
- OK (read 15.97)

△7 LE

TABLE 5. ESD DATA, P/N 2811614
(unencapsulated)

J2-2

S/N	EST (V)	- Pulse SET (SEC)	- Pulse PRE (READ)	- Pulse POST (READ)	+ Pulse SET (SEC)	+ Pulse PRE (READ)	+ Pulse POST (READ)
10232	50	10.0	10.03	10.03	11.0	11.02	11.02
	100	12.0	12.02	12.02	13.0	13.01	13.01
	200	14.0	14.00	14.00	15.0	15.00	15.00
	400	16.0	15.99	15.99	17.0	16.98	16.98
	600	18.0	17.97	17.98	19.0	18.97	18.97
	800	20.0	19.96	19.96	21.0	20.95	20.96
	1 KV	22.0	21.95	21.95	23.0	23.04	23.04
	1.5 KV	24.0	24.03	24.03	25.0	25.03	25.03
	2 KV	26.0	26.02	26.02	27.0	27.01	27.01
	2.5 KV	28.0	28.01	28.01	29.0	29.00	29.00
	3 KV	30.0	29.99	29.99	31.0	30.99	30.99
	3.5 KV	32.0	31.98				
10334	1 KV	10.0	9.98	9.98	11.0	10.99	10.99
	1.5 KV	12.0	11.99	11.99	13.0	13.00	13.00
	2 KV	14.0	14.01	14.01	15.0	15.02	15.02
	2.5 KV	16.0	16.02	16.02	17.0	17.03	17.03
	3 KV	18.0	18.04	18.04	19.0	19.05	19.05
	3.5 KV	20.0	19.96	19.96	21.0	20.96	20.96
	4 KV	22.0	21.97	21.97	23.0	22.98	22.98
	4.5 KV	24.0	23.99	23.99	25.0	24.99	24.99
	5 KV	26.0	26.00				

NOTES:

E		E	
E		15.02	
E		E	
23.0		17.03	
P		E	
P		20.96	
P			

TABLE 6. ESD DATA, P/N 11711430
(uneucapsulated)

S/N	SET (Sec)	READ (Sec)	ESD VOLTAGE (KV) & CALARITY Monitor	ESD VOLTAGE (KV) & CALARITY V_x	READ (Sec)
9293	20	20.02	2-		20.01
	21	20.96	2+		20.95
	22	22.01		2-	22.01
	23	22.95		2+	22.94
	24	24.00	2.5-		23.99
	25	25.06	2.5+		1/
	26	25.96	2.5+		1/
	27	27.04		2.5-	27.03
	28	27.98		2.5+	27.97
	29	29.03	3-		29.02
	30	29.97	3+		29.96
	31	31.02		3-	31.01
	32	31.96		3+	31.95
	33	33.01	3.5-		33.00
	34	34.05	3.5+		34.05
	35	35.00		3.5-	34.99
	36	36.04		3.5+	36.03
	37	36.99	4-		36.98
	38	38.03	4+		38.03
	39	38.98	2.5+		2/
	40	40.03		4-	40.02
	41	40.97		4+	3/
	42	42.01		4	4/
	25	25.04	2.5+		5/

NOTES:

1/ Read P three times. Unit was run and timed out but monitoring circuit was incorrect thus preventing a time out reading.

2/ ESD voltage applied during actual time out run. Unit timed out at 39 seconds.

3/ Read P three times. Unit was run and timed out at 41 seconds. Unit interorated P three times after run and then timed out 41.00 again.

4/ ESD voltage applied during actual time out run. Unit timed out at 42 seconds and read 42.01.after.

5/ Unit was run twice before application of ESD voltage and timed out at 25 seconds both times. Following ESD application, unit read P three times. Unit was run again and timed out at 25 seconds.

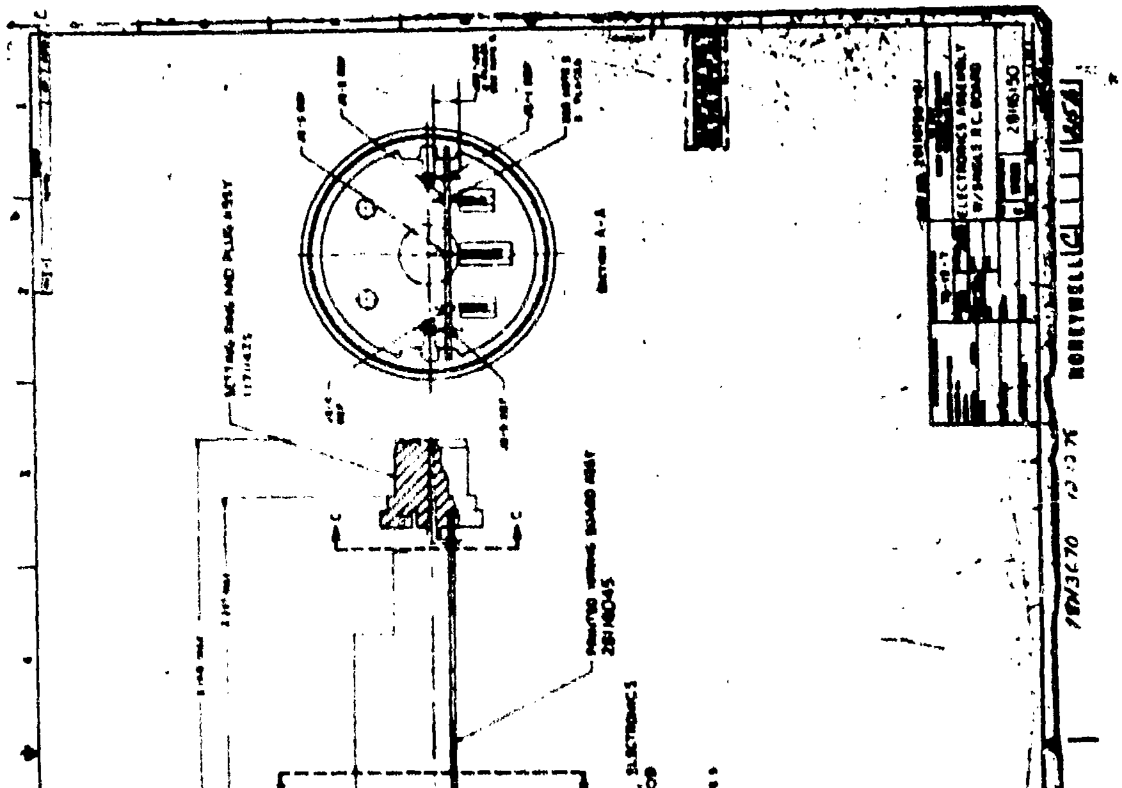
APPENDIX J

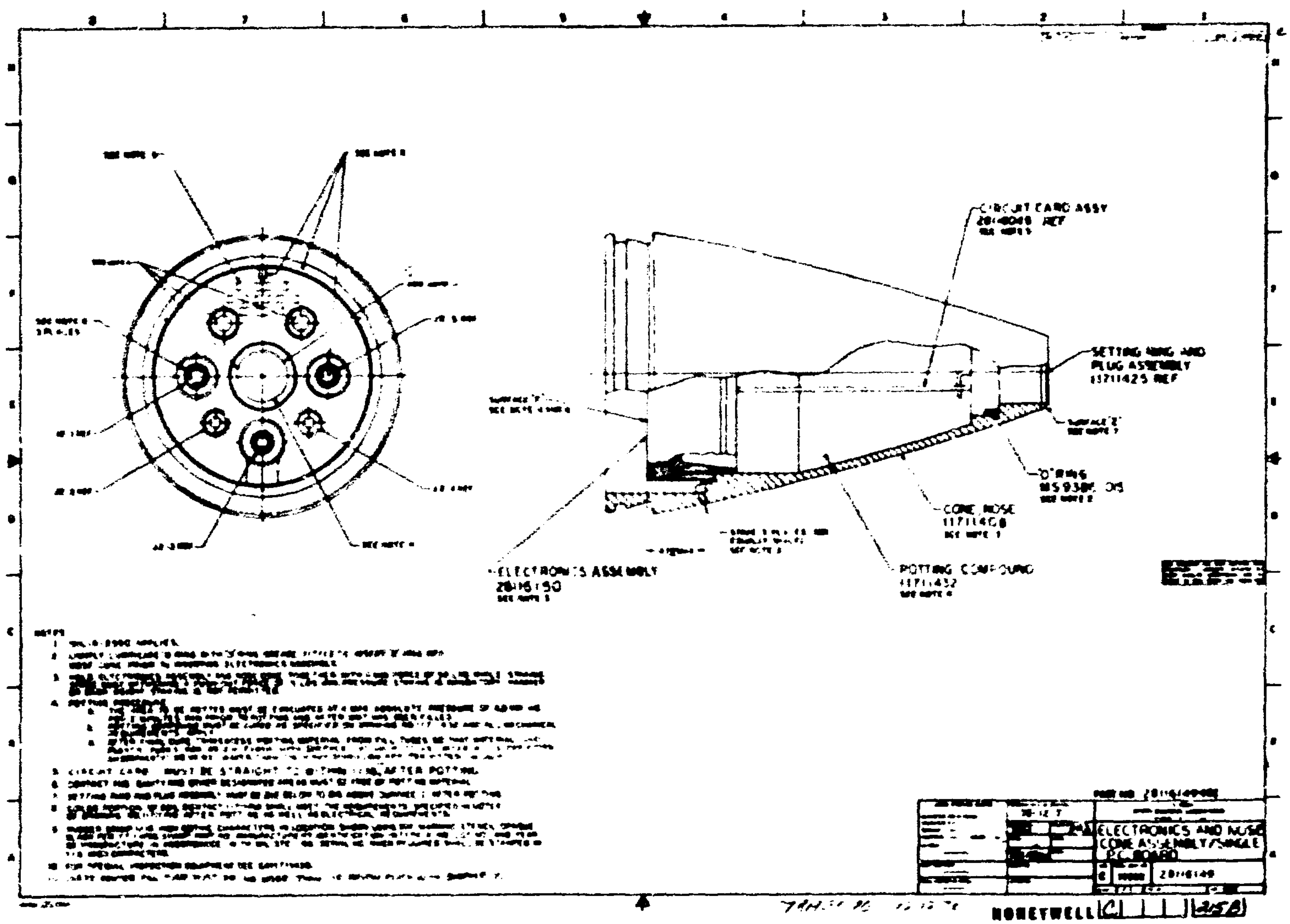
TECHNICAL DOCUMENTATION PACKAGE

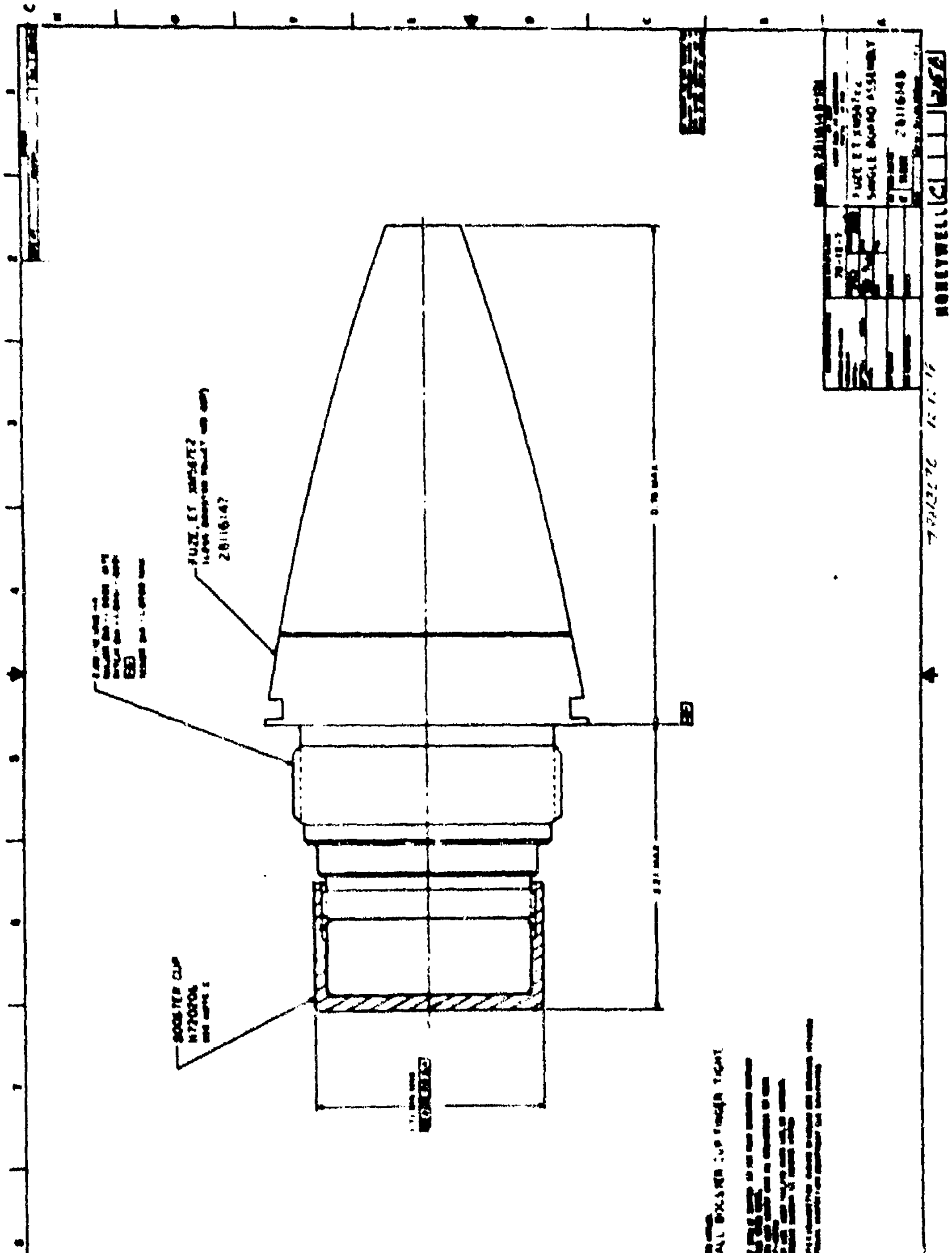
OF

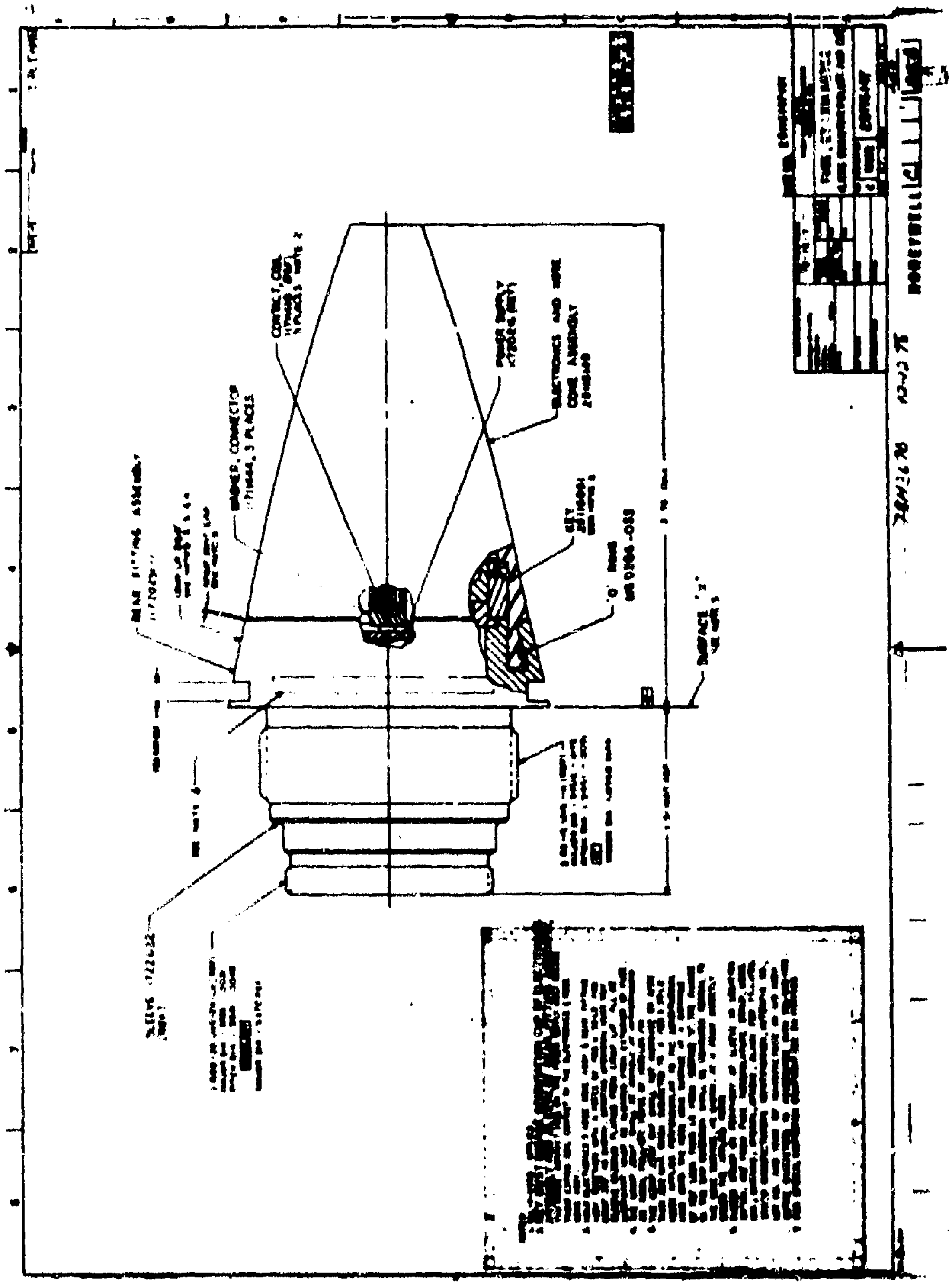
PARTS UNIQUE TO THE

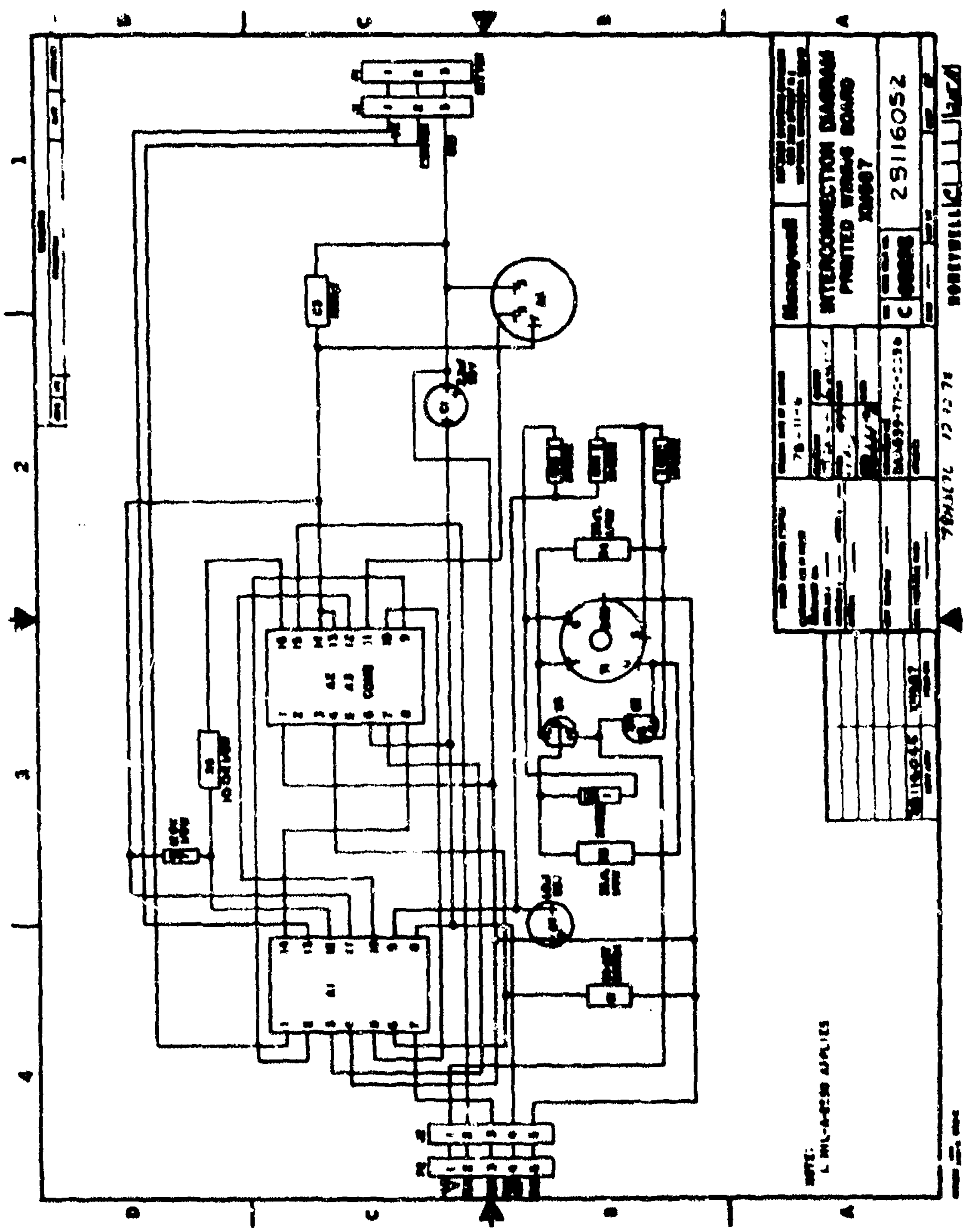
MODIFIED XM587 FUZE

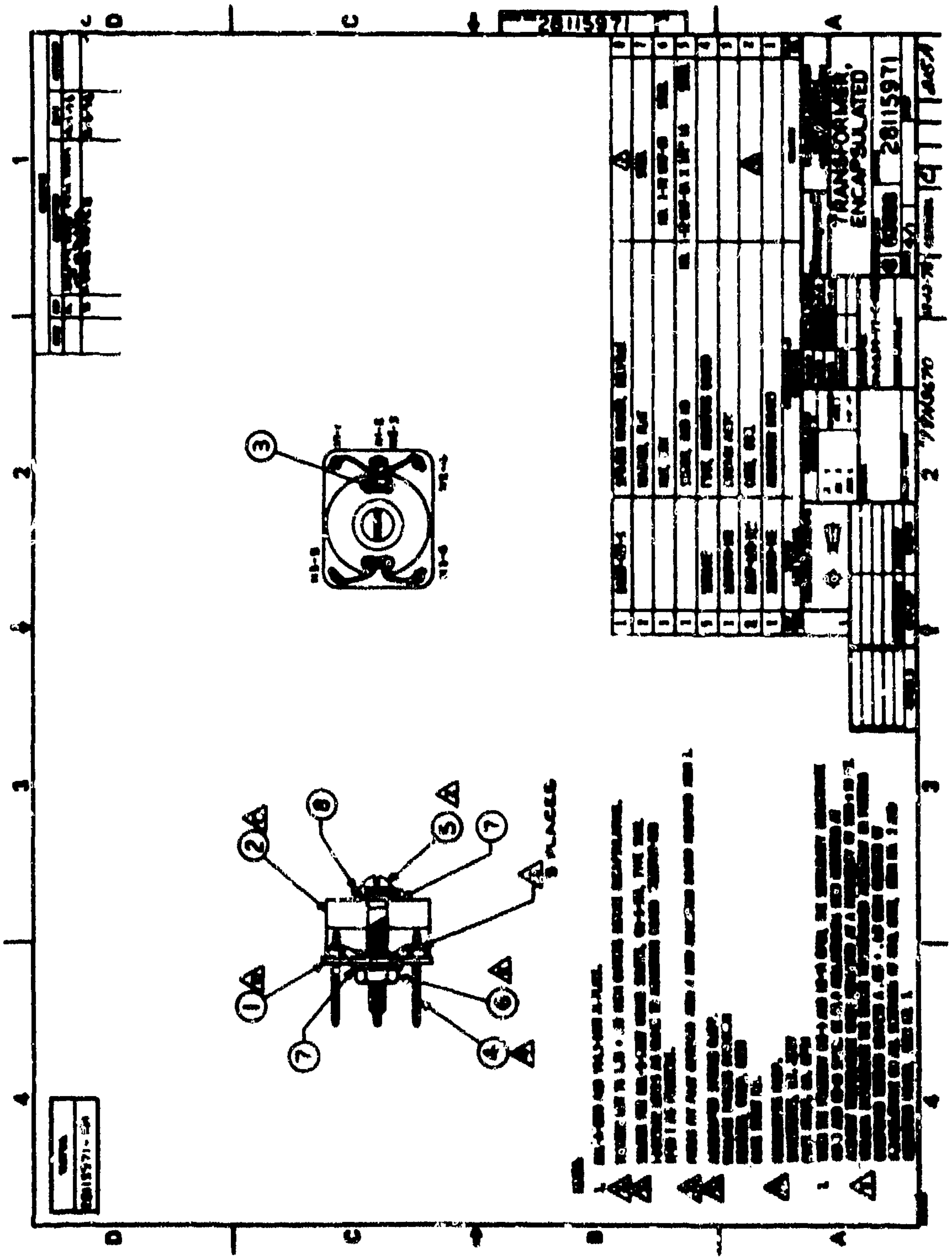

HONEYWELL

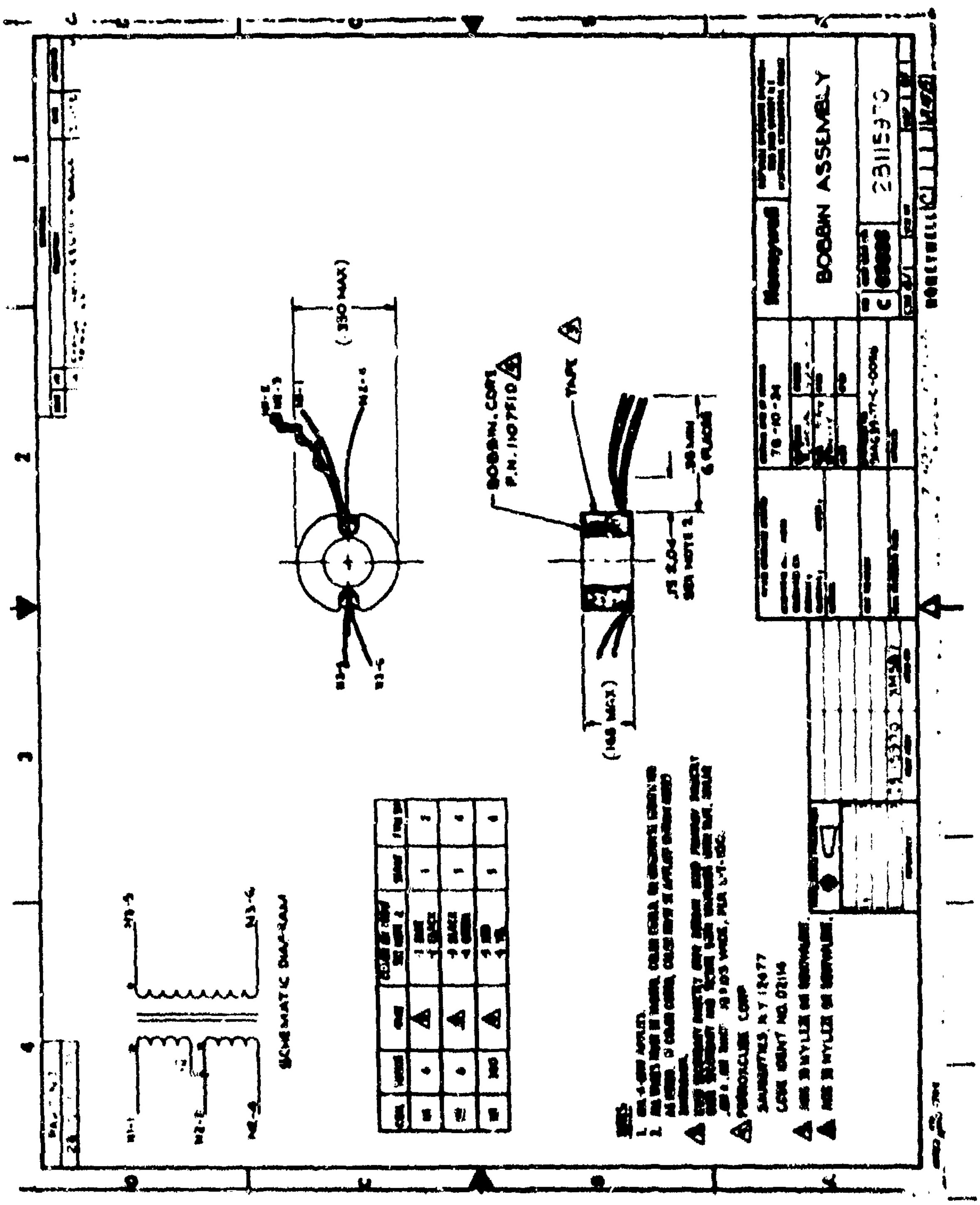

CIRCUIT CARD ASSY
SETTING RING AND PLUG ASSEMBLY
11711425 REF
O RING
CONE NOSE
POTTING COMPOUND
ELECTRONICS ASSEMBLY
28116150
NOTES
ELECTRONICS AND NOSE CONE ASSEMBLY/SINGLE PC BOARD
HONEYWELL

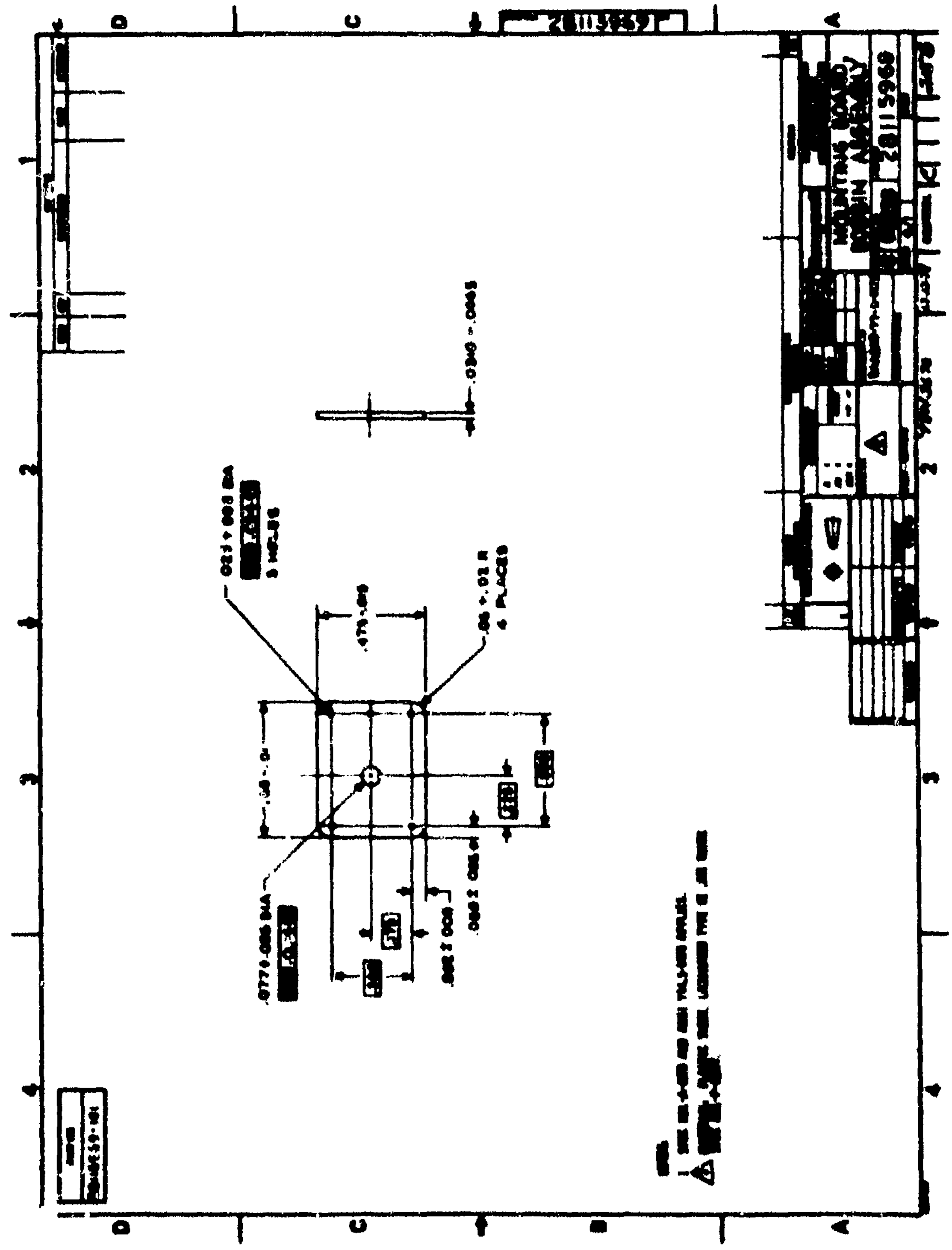

BOOSTER CUP
INSTALL BOOSTER CUP FINGER TIGHT
HONEYWELL


REAR FITTING ASSEMBLY
WASHER, CONNECTOR
3 PLACES
CONTACT, COIL
POWER SUPPLY
ELECTRONICS AND WIRE
CONE ASSEMBLY
KEY
'O' RING
SURFACE 'Z'
HONEYWELL

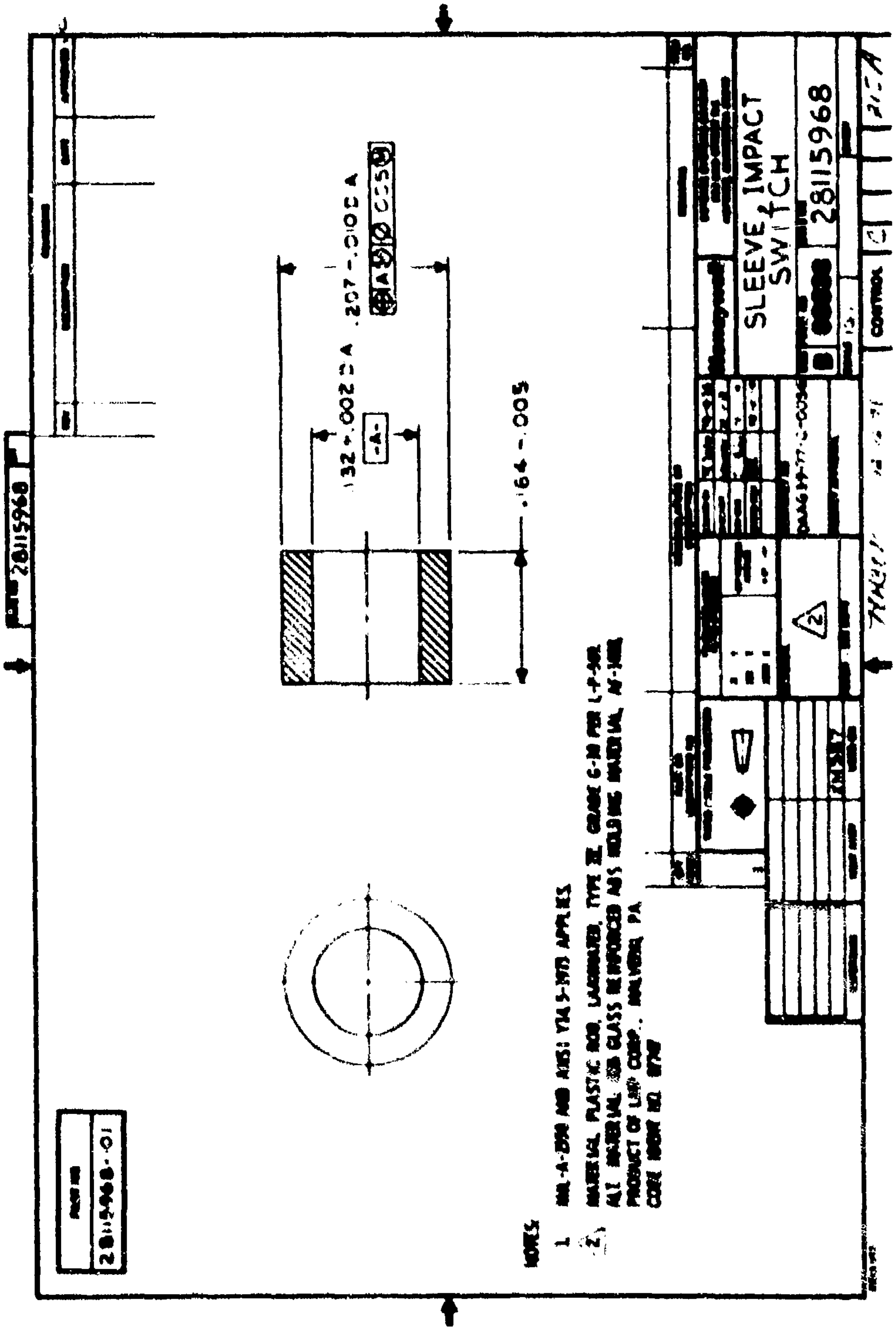

INTERCONNECTION DIAGRAM
PRINTED WIRING BOARD
25116052

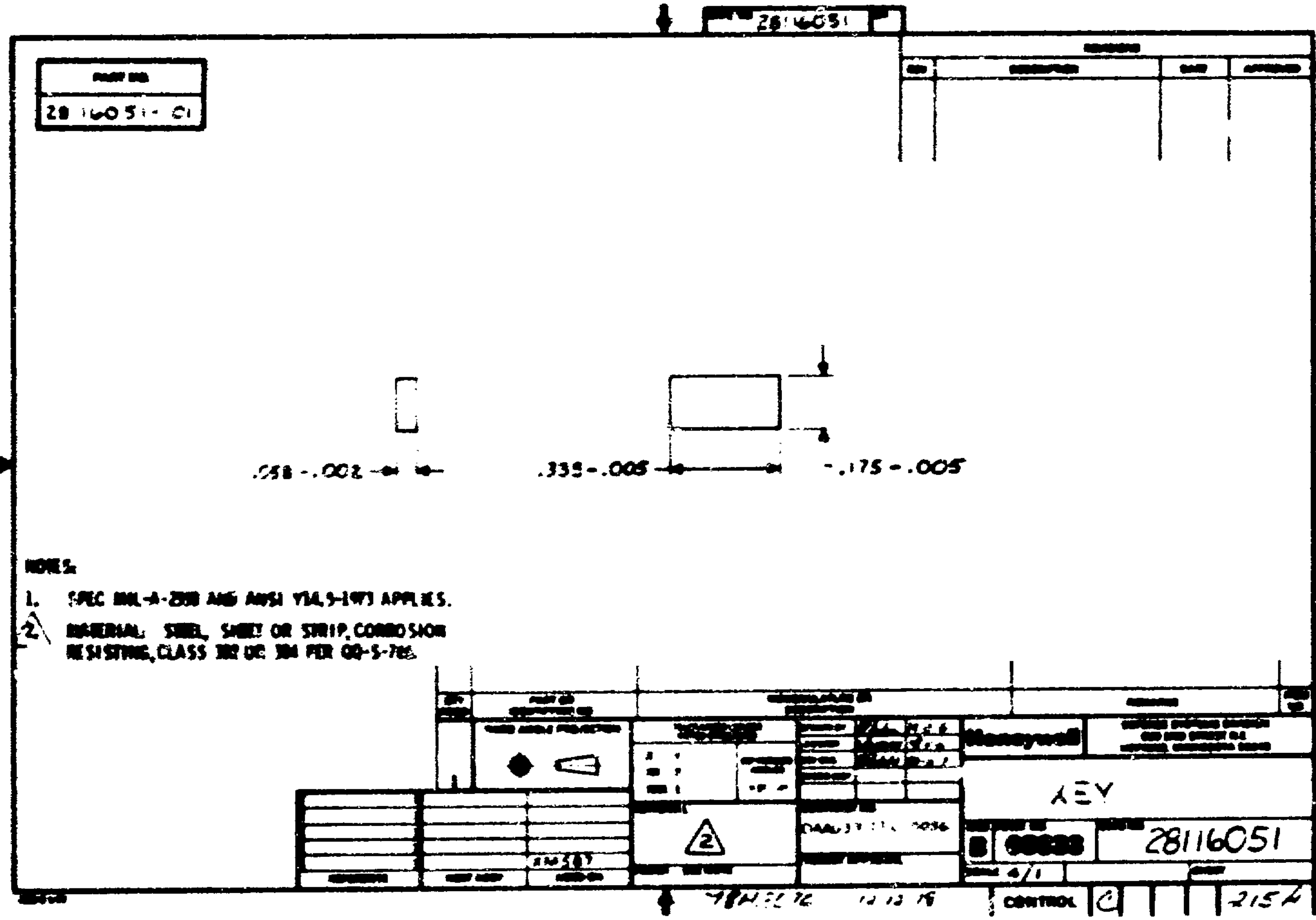

TRANSFORMER, ENCAPSULATED
28115971
3 PLACES


BOBBIN ASSEMBLY
SCHEMATIC DIAGRAM
TAPE
(.350 MAX)

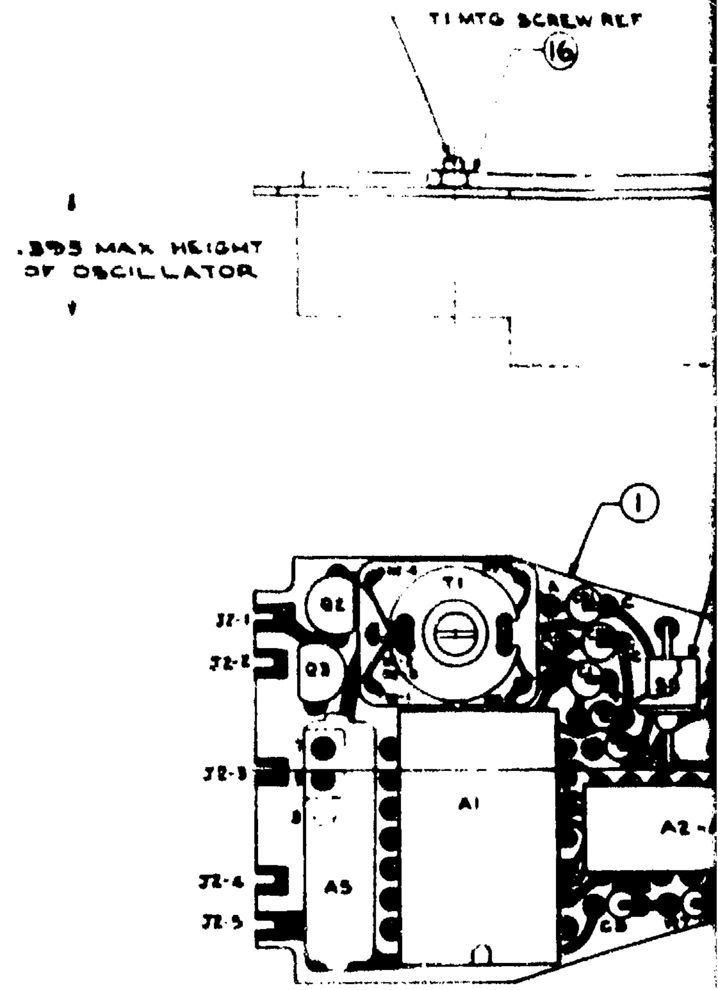


28115969


SLEEVE, IMPACT SWITCH
28115968
28115968-01
-A-
.164 -.005
NOTES:


28116051
PART NO.
28116051-01
.058 -.002
.335 -.005
.175 -.005
NOTES:
1. SPEC MIL-A-2550 AND ANSI Y14.5-1973 APPLIES.
2. MATERIAL: STEEL, SHEET OR STRIP, CORROSION RESISTING, CLASS 302 OR 304 PER QQ-S-766.
Honeywell
KEY
28116051
4/1
CONTROL
C
215A

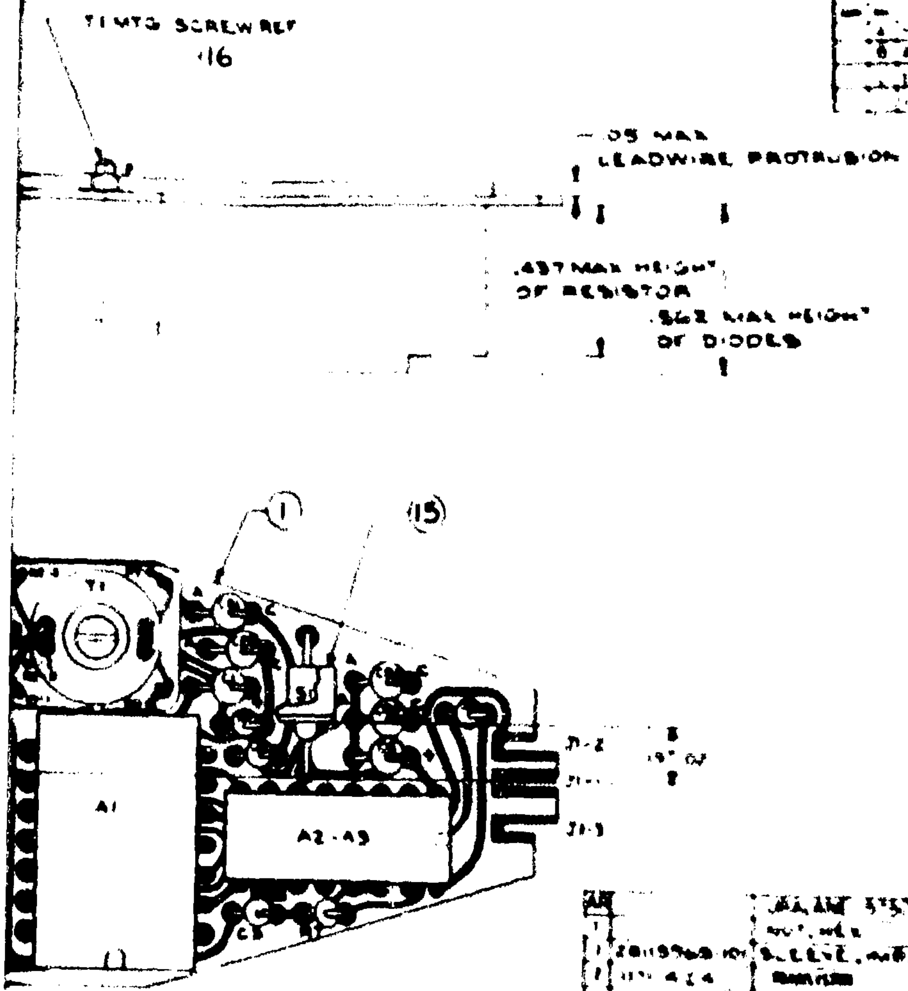
PART NO
2B116045 - 3



NOTES

1. SPEC MIL-A-2[illegible] APPLIES
2. SOLDER PER MIL-S-[illegible] USING SOLDER, TYPE [illegible], QQ-S-571
3. ON A1 AND A2-A3 NOTCH OR COLOR DOT INDICATES TERMINAL NO. 1 END OF PART, AND IS FOR ORIENTATION OF COMPONENT
4. COMPONENT REFERENCE DESIGNATIONS AND TERMINAL NO.'S ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON PARTS.
5. FOR INTERCONNECTION DIAGRAM SEE DWG. NO. 2B116052.
6. COAT CAPACITORS C1 AND C4 WITH [illegible] CONFORMAL COATING (ITEM 17) TO A THICKNESS OF .0[illegible] - .0[illegible] INCH THICK. MIX AND CURE PER MANUFACTURER'S INSTRUCTIONS.

28116045



QTY	PART NO.	NOMENCLATURE	SYMBOL	MATERIAL	ITEM
		JAM NUT 5757		PLANE INC	17
1		NUT, HEX		NO. 1-72UNF-2B STEEL	16
1	28115960-101	SLEEVE, IMPACT SWITCH			15
1	[illegible] 4 2 4	[illegible]	[illegible]		14
1	[illegible]	[illegible]	[illegible]	[illegible]	13
1	[illegible]	[illegible]	[illegible]	[illegible]	12
1	[illegible]11400-9	[illegible]	[illegible]		11
1	[illegible]	CAPACITOR	[illegible]	LOK 10 REMELT	10
1	[illegible]1240	CAPACITOR	[illegible]	[illegible]	9
1	[illegible]	CAPACITOR	[illegible]	LOK 10 REMELT	8
1	[illegible]	[illegible]	[illegible]		7
1	[illegible]	[illegible]	[illegible]		6
1	[illegible]	[illegible]	[illegible]		5
1	[illegible]726612	[illegible]	[illegible]		4
1	[illegible]721	[illegible] SCALER/COUNTER	[illegible]		3
1	[illegible]726909	INTERFACE CIRCUIT			2
1	[illegible]	PRINTED WIRING BOARD, XM587			1

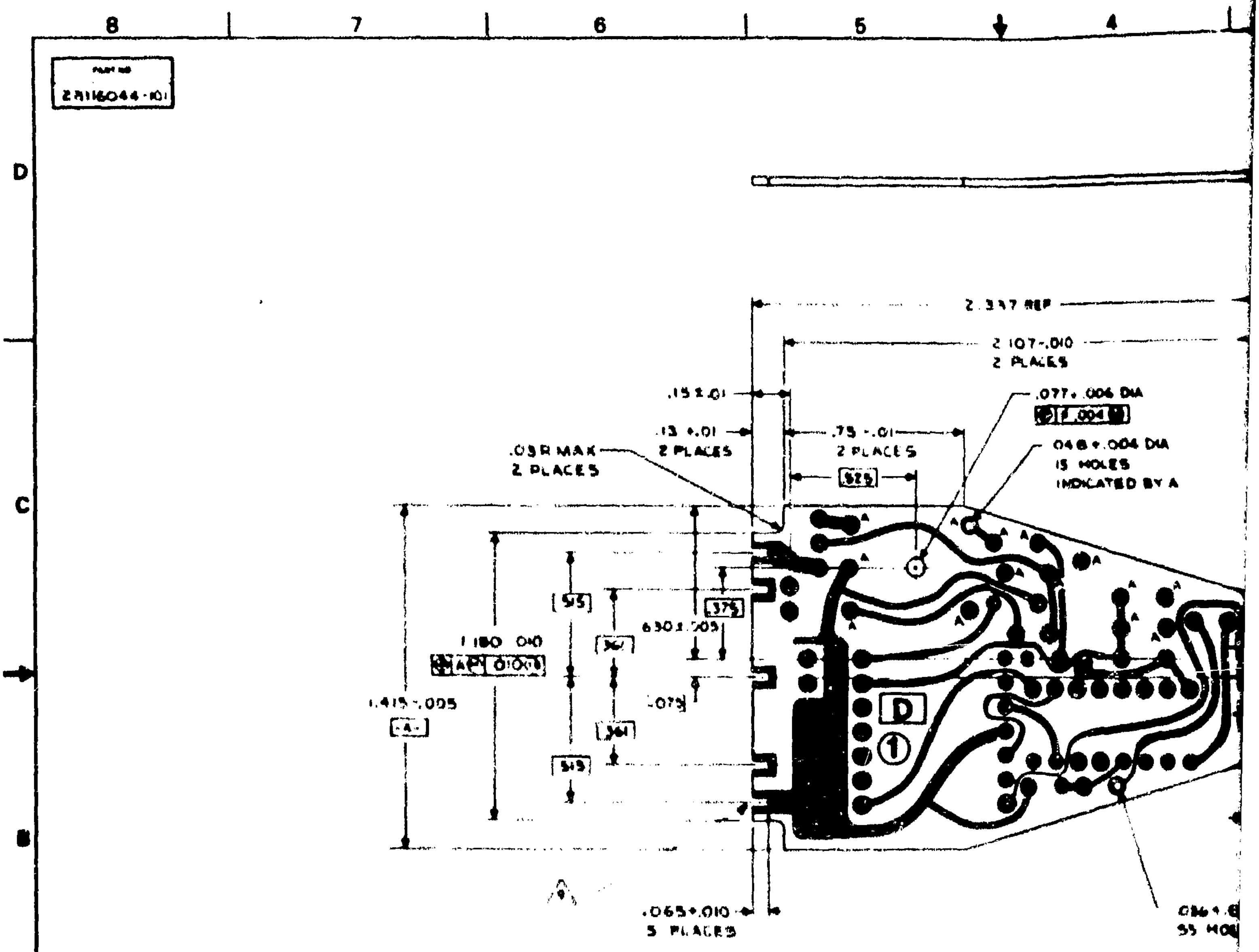
Honeywell

PRINTED WIRING BOARD ASSEMBLY XM587

28116045

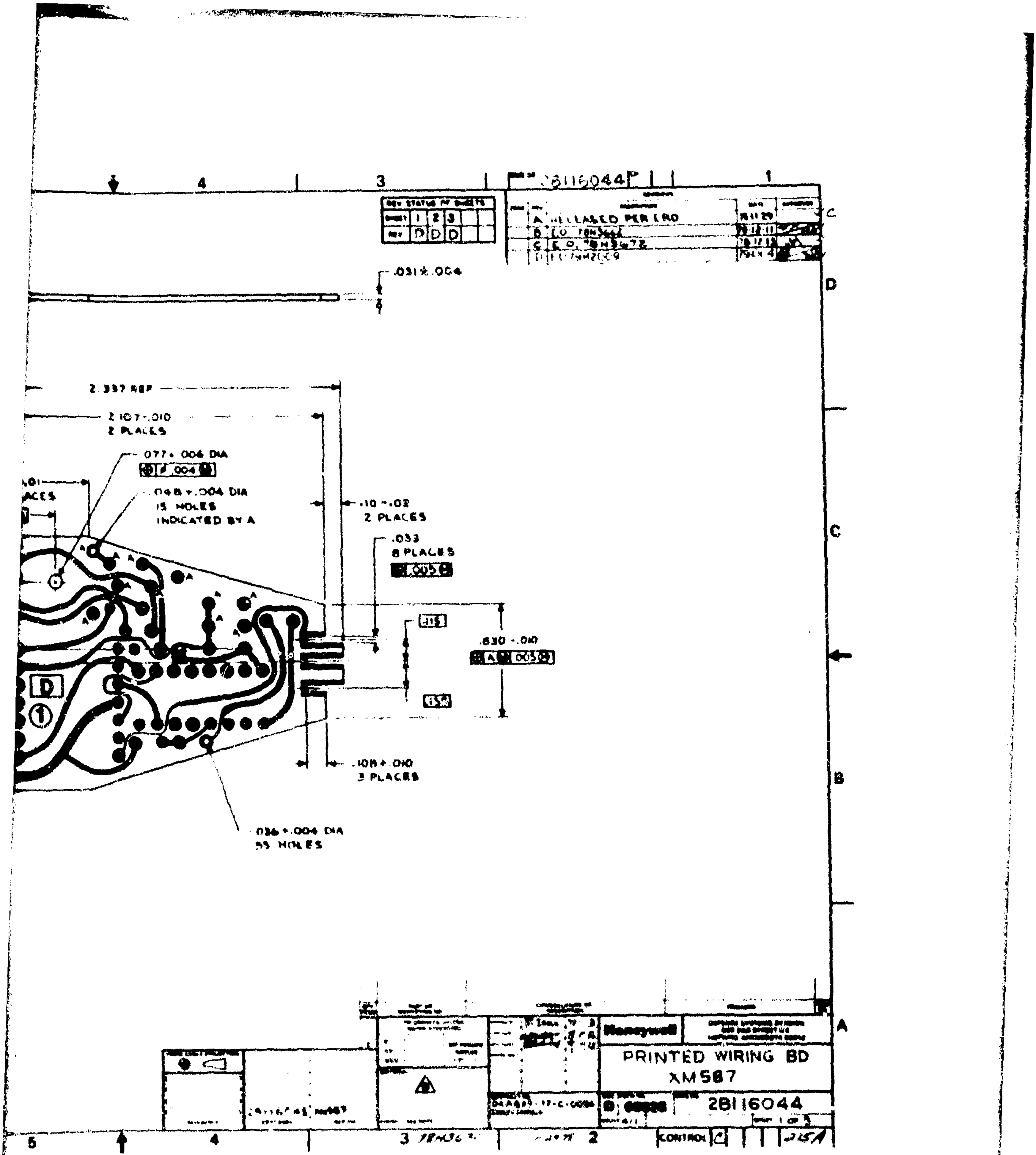
XM587

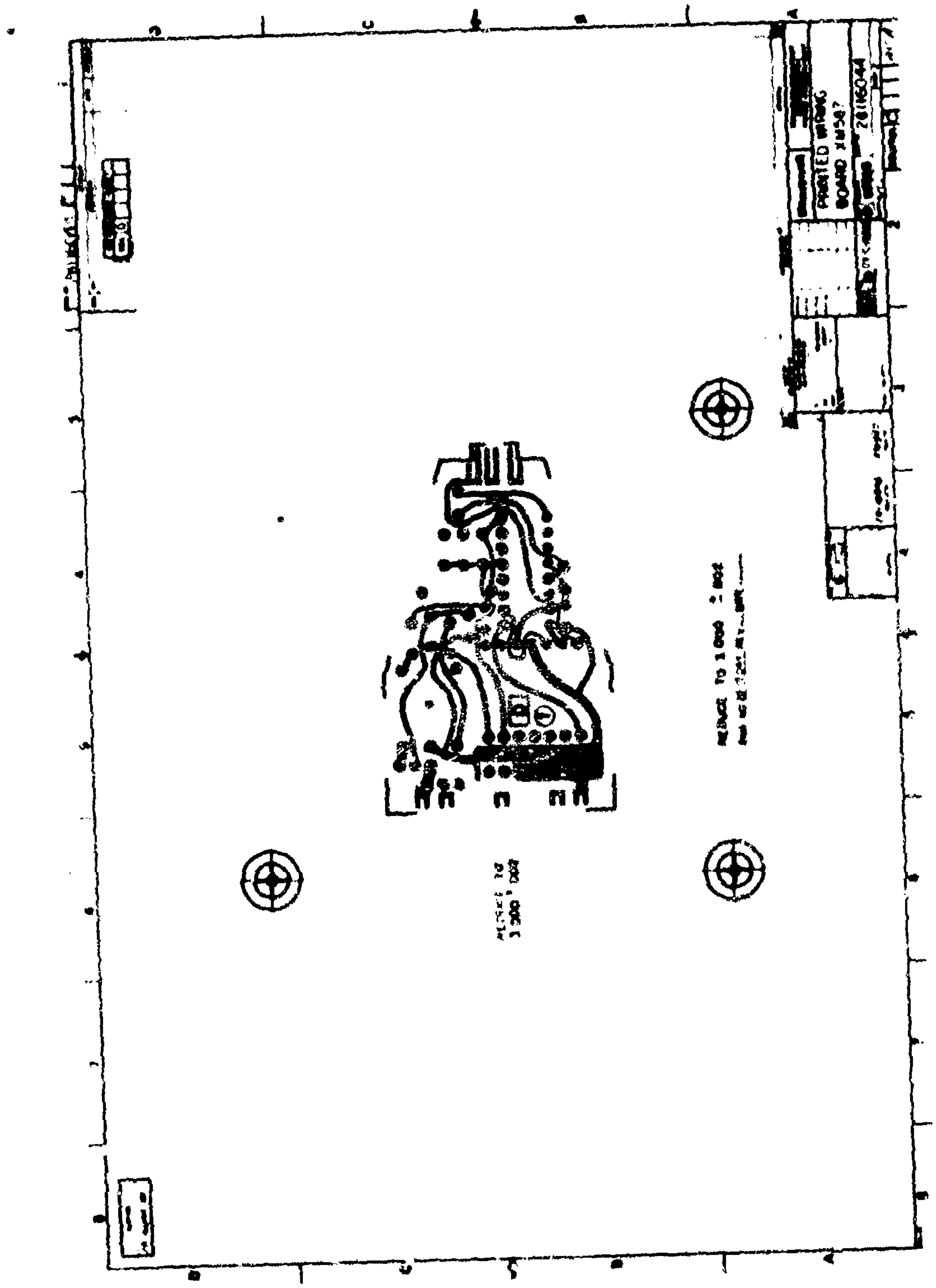
2

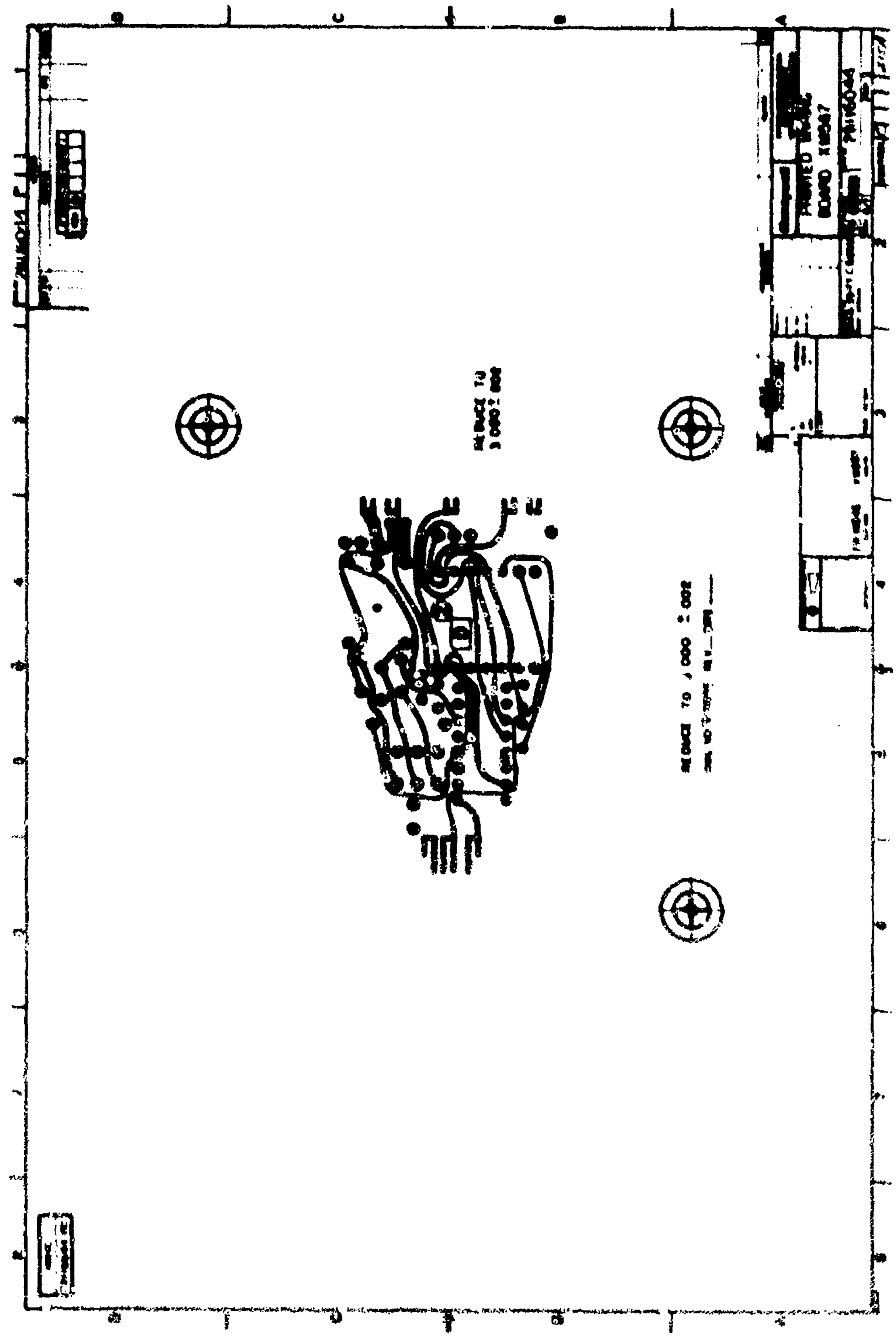


NOTES:
1 SPEC MIL-A-[illegible], ANSI Y14.5-1973 AND MIL-STD-275 APPLY
2 UNDIMENSIONED HOLE LOCATIONS WITHIN PRINTED WIRING ARE TO BE .[illegible] GRID INTERSECTIONS WITH A [illegible] TOLERANCE ZONE.
3 SHEETS 2 AND 3 OF THIS DRAWING ARE DIMENSIONALLY STABLE TEMPLATES TO BE USED TO PRODUCE [illegible]-101.
4 CONDUCTIVE PATTERN SHALL BE TIN-LEAD PLATED USING [illegible] TIN AND [illegible] MIN THICK. PLATING SHALL BE REFLOWED AS PER MIL-STD-275.
5 HOLES AND SLOTS SHALL BE PLATED-THRU WITH COPPER [illegible] MIN THICK.
6 DIMENSIONAL LIMITS APPLY AFTER PLATING.
7 NUMBER INSIDE "O" INDICATES SIDES 1 AND 2 OF BOARD. LETTER INSIDE "□" INDICATES LATEST REVISION OF CONDUCTIVE PATTERN ON EACH SIDE OF THE PART.
8 MATERIAL: PLASTIC SHEET, LAMINATED, COPPER CLAD, TYPE [illegible], SPEC MIL-P-[illegible].
9 ALTERNATE SHAPE OF SLOT MAY HAVE RADIUS ON CLOSED END (6 PLACES)
10 BOARD EDGES SHALL BE CLEAN CUT WITH NO CHIPPING, CRACKING, DELAMINATION OR DRAG IN EXCESS OF DIMENSIONAL TOLERANCE AS PER MIL-P-[illegible]

8 7 6 5 4


28116044
REV STATUS OF SHEETS
A RELEASED PER ERO
B E.O. 78M3662
C E.O. 78M3672
D E.O. 79M2029
.031±.004
2.337 REF
2.107-.010
2 PLACES
.077+.006 DIA
.048+.004 DIA
15 HOLES
INDICATED BY A
.10-.02
2 PLACES
.033
8 PLACES
.630-.010
.108+.010
3 PLACES
.036+.004 DIA
55 HOLES
Honeywell
PRINTED WIRING BD
XM587
DAAA09-77-C-0086
28116044
CONTROL


PRINTED WIRING
BOARD XM567
2816044



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