TIME RESOLVED

AUDIO DOSIMETER SYSTEM

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

by

THE BENDIX CORPORATION
Environmental and Process Instruments Division
1400 Taylor Avenue
Baltimore, Maryland 21204

Final Report

on
Contract No. S0366041
Time Resolved Audio Dosimeter System

June 1976 to December 1977

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Reference to specific company names, products or services is for information purposes only and does not constitute endorsement by the Bureau of Mines.

CERTIFICATION OF THE ABSENCE OF PATENTS AND INVENTIONS

This statement certified that at the contract report date; no inventions have been developed from Contract S0366041. Consequently, no patents are pending.

James R. Cosby, Manager
Monitoring Instruments

REPORT DOCUMENTATION PAGE

1. Report No.	2.	3. Recipient's Accession No.

4. Title and Subtitle	5. Report Date
TIME RESOLVED AUDIO DOSIMETER	Published January 1978
	6.

7. Author(s)	8. Performing Organization Report No.
Gordon R. Sima	EIR 1159

9. Performing Organization Name and Address	10. Project/Task/Work Unit No.
Bendix Environmental & Process Instruments Division 1400 Taylor Avenue Baltimore, Maryland 21204	30-00399
	11. Contract or Grant No. S0366041
	13. Type of Report Final June 1976 to December 1977
12. Sponsoring Organization Name and Address Office of the Assistant Director - Mining Bureau of Mines Department of the Interior Washington, D. C. 20241	14.

15. Supplementary Notes

16. Abstract

This contract is concerned with the construction of a Time Resolved Audio Dosimeter System consisting of one readout unit and several dosimeter units. The Time Resolved Audio Dosimeter System was designed and developed by the Bureau of Mines with the purpose of this contract aimed at obtaining additional units for further field testing and evaluation. All construction was in accordance with the Bureau of Mines design and/or Bureau approved drawings produced during the course of this contract. This report contains a summary of the construction efforts, problems encountered, recommendations and all drawings produced under this contract.

17. Originator's Key Words	18. Availability Statement
Time Resolved Audio Dosimeter TRA Dosimeter Noise Dosimeter	

19. U. S. Security Classif. of the Report	20. U. S. Security Classif. of This Page	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIED	48	

FOREWARD

This report was prepared by The Bendix Corporation, Environmental and Process Instruments Division, 1400 Taylor Avenue, Baltimore, Maryland 21204, under USBM Contract Number S0366041. The contract was initiated under the Pittsburgh Mining and Safety Research Center Program. It was administered under the technical direction of PM&SRC with Dr. H. K. Sacks and Mr. R. C. Bartholomae acting as the Technical Project Officers. Mr. Daniel B. Dawkins was the contract administrator for the Bureau of Mines.

This report is a summary of the work recently completed as part of this contract during the period June 1976 to December 1977. This report was submitted by the authors in January 1978.

Table of Contents

I. INTRODUCTION:

In the continuing Bureau of Mines program of noise control in underground mines, the Bureau developed the Time Resolved Audio Dosimeter System. The Bureau, in its development of the Time Resolved System, produced working models of both the Dosimete and Readout units and had proven the concept of time resolved noise exposure measurements. In an effort to gain further field experience with the system, and to bring the Bureau developed system closer to a commercially manufacturable item, the Bureau contracted for the construction of five additional dosimeter units and one additional readout device. These were to be manufactured according to Bureau of Mines approved drawings of the system. The contract was divided into three separate efforts.

The first contract phase was the design effort, in which approved packaging and detailed mechanical design drawings were generated covering the time resolved system. During the Bureau development of the system, the dosimeter unit design had been virtually completed. The electronic design of the readout unit had also been completed, however, the readout mecanical design and packaging had not progressed beyond the prototype stage. All design drawings produced had to be approved by the Bureau prior to construction of the first system.

The next phase of the contract was the initial construction phase and consisted of the production of one time resolved dosimeter system from the Bureau approved drawings. The first system construction was to be approved by the Bureau prior to beginning the final phase of construction.

The final phase of the contract was the construction of additional dosimeter units. These were to be constructed in accordance with the approved drawing package.

II. DESIGN PHASE:

A. Dosimeter Unit Design:

The design of the Time Resolved Dosimeter unit, as developed by the Bureau, was virtually complete. The Bureau design included the electronics design, printed circuit card layouts, and packaging designs as shown on the Bureau of Mines Drawing No. C-6881 dated January 30, 1976. The primary dosimeter design effort under this contract was the production of several piece-part drawings to facilitate fabrication of individual dosimeter parts per the basic Bureau design. Several modifications to Bureau designed parts were made at this time in an effort to reduce manufacturing costs for individual items. The major changes to the Bureau design are summarized below with final approved drawings appearing in the drawing section of this report.

Drawing No. 2419643, Case

The dosimeter case was constructed from a single section of standard extruded aluminum tube which was cust, capped and welded to the required dimensions. In addition, the belt clip, mounting holes, and hardware were changed to a standard Bendix clip of similar design.

Drawing No. 2419644, Dosimeter Assembly

This assembly drawing details the mechanical assembly of the dosimeter unit including the printed circuit card guides and the internal support structure for the switches mounted on the interconnected frame (connector bracket). This detail was not present on the original Bureau Drawing No. C-6881.

Drawing No. 2419609, Cable Assembly

This drawing details the cable assembly used to interconnect the dosimeter and readout units. This assembly did not appear in the original Bureau drawing package of the system.

Drawings Nos. 2419611, 35, 36, 37, 38, 39, 40, 41, 42, 45 and 2419763

These drawings are all detail drawings of individual piece parts within the dosimeter unit. They were generated to facilitate manufacture of these parts by expanding upon the information available from Bureau of Mines Drawing C-6881.

All the above noted drawings were submitted to the Bureau for approval on August 27, 1976. Approval was received on September 9, 1976.

B. Readout Unit Design:

The Bureau of Mines design documentation covering the readout unit consisted primarily of electrical schematics with parts lists. This information is contained in Bureau Drawings C-6878, C-6879 and C-6880. The primary readout design effort under this contract was directed at the mechanical design required to package the readout unit into a fieldable system suitable for Bureau of Mines usage. The design drawings covering the Time Resolved Readout unit are summarized below.

Drawing No. 2419601, Panel Assembly

This two sheet drawing covers the entire readout electronics assembly with the exception of the plug-in circuit cards. It consolidates all of the power supply, panel wiring, and card rack wiring information contained in Bureau drawings C-6879 and C-6880. The design philosophy was to have all circuitry, except the four plug-in circuit cards, on one assembly with all interconnections easily traceable on one drawing.

Drawing No. 2419698 and 2419700

These drawings cover the power supply chassis and regulator mechanical assemblies. The wiring of these assemblies is integrated with that of the rest of the panel assembly and schematic information appears on Sheet 2 of Drawing 2419601.

Drawing No. 2419608, Readout Assembly

This drawing covers the overall readout unit assembly. It includes the complete panel assembly mounted in a waterproof carrying case.

The remainder of the drawings included in the system design package are individual piece-part drawings made in support of the major assemblies. Table I lists all of the Bendix-developed drawings pertaining to the Time Resolved Audio Dosimeter System. The list includes only those drawings developed by Bendix under this contract. It is understood that the complete Time Resolved Audio Dosimeter System design package includes these drawings, as well as several Bureau of Mines original drawings and parts lists, covering such items as printed circuit card artwork and assembly drawings, which remain under the control of the Bureau of Mines.

The readout unit drawings were submitted to Dr. Sacks of the Bureau for review on July 22, 1976. After several additions and corrections, the readout drawing package was formally submitted to the Bureau for approval on August 27, 1976. Approval of the drawing package was received on September 9, 1976.

III. CONSTRUCTION PHASE:

The construction phases of the contract began on September 9, 1976 with the approval of the TRA Dosimeter System drawing package. The first phase consisted of the construction of the readout unit and one dosimeter unit. Following Bureau approval of the first system, three additional dosimeter units were constructed.

The difficulties encountered in the construction of the first readout and dosimeter units were markedly different. It is for this reason that this report of construction, problems encountered, and recommendations will be separated with respect to readout and dosimeter units.

A. Dosimeter Construction Summary:

The first Time Resolved Audio Dosimeter unit construction began on September 9, 1976, with the Bureau's approval of the drawing package. Mechanical fabrication of piece parts for all five required dosimeters began on that date. Procurement of all purchased parts also began on the approval date. Some problems developed in ordering electronics parts for the dosimeter unit as many component part numbers were missing, incomplete, or the specified component was obsolete and unavailable. The Bureau was notified of the problems encountered, and it was decided to resolve all component problems at the time of first system approval submission. Dr. Sacks of the Bureau loaned Bendix etched printed circuit card blanks in an effort to help relieve the long lead times associated with new printed circuit card orders. Delivery of the first Time Resolved Audio Dosimeter and Readout units was made during January 1977. At this time, a meeting with Bureau personnel was held to review system construction. The meeting was held at Bruceton on February 15, 1977. The various problem areas discussed at that meeting are summarized in the Problems and Recommendations Sections of this report.

On September 20, 1977, approval of the first TRA Dosimeter system was received and construction began on the remaining units. On October 21, 1977, all remaining circuit card assemblies were shipped to the Bureau. On November 15, 1977, the final hardware shipment of dosimeter mainframes was made to the Bureau.

B. Readout Construction Summary:

The readout unit construction phase began on September 9, 1976, with the Bureau approval of the system drawing package. Parts procurement and mechanical fabrication began immediately. Fabrication of all mechanical parts for the readout unit was completed during October of 1976. However, delivery problems with key electronic components delayed final readout completion until early December 1976. The readout unit was shipped to the Bureau on January 26, 1977. The readout construction was reviewed and electrical checks performed by the Bureau and on February 15, 1977, a meeting was held at Bruceton to review system construction. The various problem areas discussed at that meeting are summarized in the Problems and Recommendations Sections of this report. By letter dated October 11, 1977, the readout unit was approved.

IV. PROBLEMS AND RECOMMENDATIONS, DOSIMETER:

This section of the report presents the major problems encountered in the construction of the Time Resolved Audio Dosimeter System. Where many individual problems were closely related, only the overall problem area and resultant recommendations are presented. The aim of this area of the report is to recommend those general changes required to transform the TRA Dosimeter design into a commercially manufacturable item.

A. Problem - Component Part Numbers and Parts Lists:

The greatest problems encountered with the initial construction of the first TRA Dosimeter system were centered in the area of parts definition. Part numbers of numerous electronic components as they appeared on the original Bureau drawings and parts lists were incomplete, and in some cases missing or in conflict with other parts lists covering the same assembly. This was brought to the Bureau's attention at the initial system review meeting held on February 15, 1977. As a result of this, the Bureau later issued updated drawings and parts lists which corrected many of the incomplete or conflicting part designations. This action, however, is not yet complete and many components are still incorrectly designated.

B. Recommendations - Part Numbers and Parts Lists:

Parts Lists - For all assemblies, duplicate parts lists should be eliminated and one controlling parts list established for each assembly. This controlling parts list should be a separate document and not included on assembly drawings. In no case should two different parts lists cover the same assembly as is currently the case with the dosimeter plug-in circuit cards.

Part Numbers - Controlling parts lists should contain only the most general and complete part number possible. A manufacturer's name should only be included where the part number or drawing number given applies to only one specific supplier. As an example, where possible, capacitors and resistors should be specified by the appropriate general military designation (such as RN60DXXXXFM) which completely specifies the components including value, tolerance, size, temperature coefficient, etc. This method of parts designation allows many parts suppliers to quote each item and avoids the problems associated with sole source pricing and availability. Semiconductors should be specified using the EIA or JEDEC registered numbers (1NXXXX and 2NXXXX designations) without reference to specific manufacturers.

C. Problem - Assembly Drawings:

There are no assembly drawings covering the dosimeter plug-in circuit cards. These drawings are required to define these assemblies as a great deal of required information is not available from the Bureau's current drawings, schematics, and parts lists. As an example, current drawings and parts lists covering circuit card no. 1A10A4 list only 37 items for this assembly. They totally fail to mention or include the location of approximately 100 separate wire jumper wires necessary to build this assembly. Also not mentioned are artwork designations and machining drawings covering the etched circuit card itself. This is typical of all circuit card assemblies in the system.

D. Recommendations - Assembly Drawings:

It must be realized that every separate piece comprising an assembly must be included and documented in the system drawings. Assembly drawings must be made for each circuit card which show the location of each component on the card. Each jumper wire must be treated as a separate component and its location clearly documented. Printed circuit artwork and machining masters now under the control of the Bureau should be included in the definition of the circuit cards, which must then be given their own part numbers to be included in the assembly parts lists as separate components.

The materials and assembly recommendations made by the Bureau during the course of this contract should also be added to the dosimeter mainframe assembly drawings. Such items as wire designations and insulation sleeving are still missing from these assembly drawings.

E. Problem - Jumper Wire Locations:

There are a very large number of separate jumper wires used in the assembly of the dosimeter plug-in circuit cards. Many of these connect printed circuit paths which show no circuit pad or other visible component location indicator to aid in proper jumper location. These wires are merely layed along, and soldered to, a section of otherwise continuous circuit track. Due to the very large number of jumper wires and dense packing on some boards, errors in jumper positioning are likely.

F. Recommendation - Jumper Wires:

The printed circuit artwork for the dosimeter plug-in cards should have some location designation for each end of every jumper wire. This may take the form of a drilled or undrilled pad marker which will be visible on assembly drawings of the card. This pad would then be referenced in the assembly drawings of the card indicating the proper connection points for each jumber wire. Assembly drawings would also show the preferred routing of each wire as required to avoid assembly problems.

G. Problem - Checkout Procedures:

No formal electrical checkout procedures are currently available from the Bureau for the overall TRA Dosimeter System, or for individual subassemblies such as the system plug-in circuit cards. Units constructed under this contract were built and shipped with no electrical checkout whatever, with all troubleshooting left to the Bureau of Mines. This resulted in a large number of subassembly manufacturing errors going undetected until final system checkout.

Simple visual inspections proved totally inadequate to discover all possible problems in the densely packaged dosimeter and readout units.

H. Recommendation - Checkout Procedures:

It is recommended that separate electrical checkout procedures be developed for each plug-in circuit card, the dosimeter mainframe assembly wiring and switching, and for the entire dosimeter and readout assemblies. Without these, any assurance of error-free construction of dosimeter units would be impossible and the Bureau would again be left with the entire troubleshooting burden.

I. Problem - Critical Parts Designation:

Certain components used in the TRA Dosimeter System are critical to the proper functioning of the system, and the accuracy of the results obtained. An example of these are the temperature stable capacitors specified for use on the RMS plug-in circuit board. Such components are usually expensive, low production volume components, which can be difficult to locate and/or require extremely long lead time for purchase. This was the case with the capacitors used on this contract. Sole source specification of such components is a serious problem.

J. Recommendation - Critical Components:

It is recommended that individual drawings be generated covering each specialized component in the TRA Dosimeter System and a general part number assigned. Each drawing should contain information as to maximum size, general class of component, and all critical component performance specifications applicable to the TRA Dosimeter System design. Also included in each drawing could be a "suggested source of supply" listing the manufacturer and part number of at least one commercially available component meeting the drawing specifications. This drawing would document only those characteristics of special components which are critical to TRA System performance. It also allows for choice of less expensive or otherwise more desirable components which meet or exceed all performance requirements for use in the TRA Dosimeter System without the sole source restriction.

V. PROBLEMS AND RECOMMENDATIONS, READOUT

There were few serious problems encountered in the construction of the TRA Dosimeter System readout unit. Most of the readout problems were in the area of electrical wiring errors which were not detected prior to shipment. Several of the problem areas noted with the dosimeter unit apply equally to the readout unit and will not be repeated. These include the Checkout Procedures Problems and Recommendations and the Critical Components Problems and Recommendations. The only problem unique to the readout unit is centered in the area of the plug-in circuit cards.

A. Problem - Readout Plug-In Circuit Cards:

Readout plug-in circuit cards are now hand wired units. Hand wiring of plug-in circuit boards is not recommended for future units as it is time consumming and expensive.

B. Recommendations - Readout Plug-In Circuit Cards:

It is recommended that printed circuit artwork and assembly drawings be developed covering the readout unit plug-in circuit cards. If any quantity of readout units are produced, the printed cards will provide a significant savings in construction labor and expense.

VI. GENERAL CONCLUSIONS:

The current intent of the Bureau of Mines is to use the TRA Dosimeter System as a precision research tool in its continuing program of noise control in underground mines. As such, high volume production of the unit is unlikely and some degree of complexity and individual unit tailoring can be tolerated in the desire for measurement precision. During the course of this contract, the circuitry of commercial sound level meters and dosimeters were evaluated by Bendix in an effort to recommend less complex (and lower cost) circuitry for the dosimeter unit. The Bureau indicated during this investigation that any replacement circuitry must be consisten with ANSI-S 1.4-1971 TYPE I accuracy in order to be acceptable. No suitable substitute circuitry was available as most commercial offerings are specified as ANSI-TYPE II accuracy while current commercial TYPE I circuitry offers little or no real cost and complexity advantages for low production numbers over the current TRA Dosimeter design. The effort was discontinued.

As an instrument designed for precision specialized monitoring of noise in underground mines, with very low unit production volume intended, the TRA Dosimeter System can function quite effectively as presently designed. Any effort to produce the TRA Dosimeter System in high volumes by a commercial manufacturing facility should include major design effort to incorporate the latest circuitry and labor saving construction techniques such as ribbon cable and connectors. In any event, it is highly recommended that advantage be taken of the lessons learned and the recommendations made in response to first system construction problems before any further construction takes place.

VII DRAWINGS AND PARTS LISTS:

This section of the report presents all of the drawings and parts lists produced by Bendix in the course of this contract. This in no way represents the complete TRA Dosimeter System drawing package as many of the control of the Bureau of Mines. Table I lists all Bendix produced drawings pertaining to the Time Resolved Audio Dosimeter System, separated with respect to the major system assemblies.

TABLE I

DOSIMETER UNIT

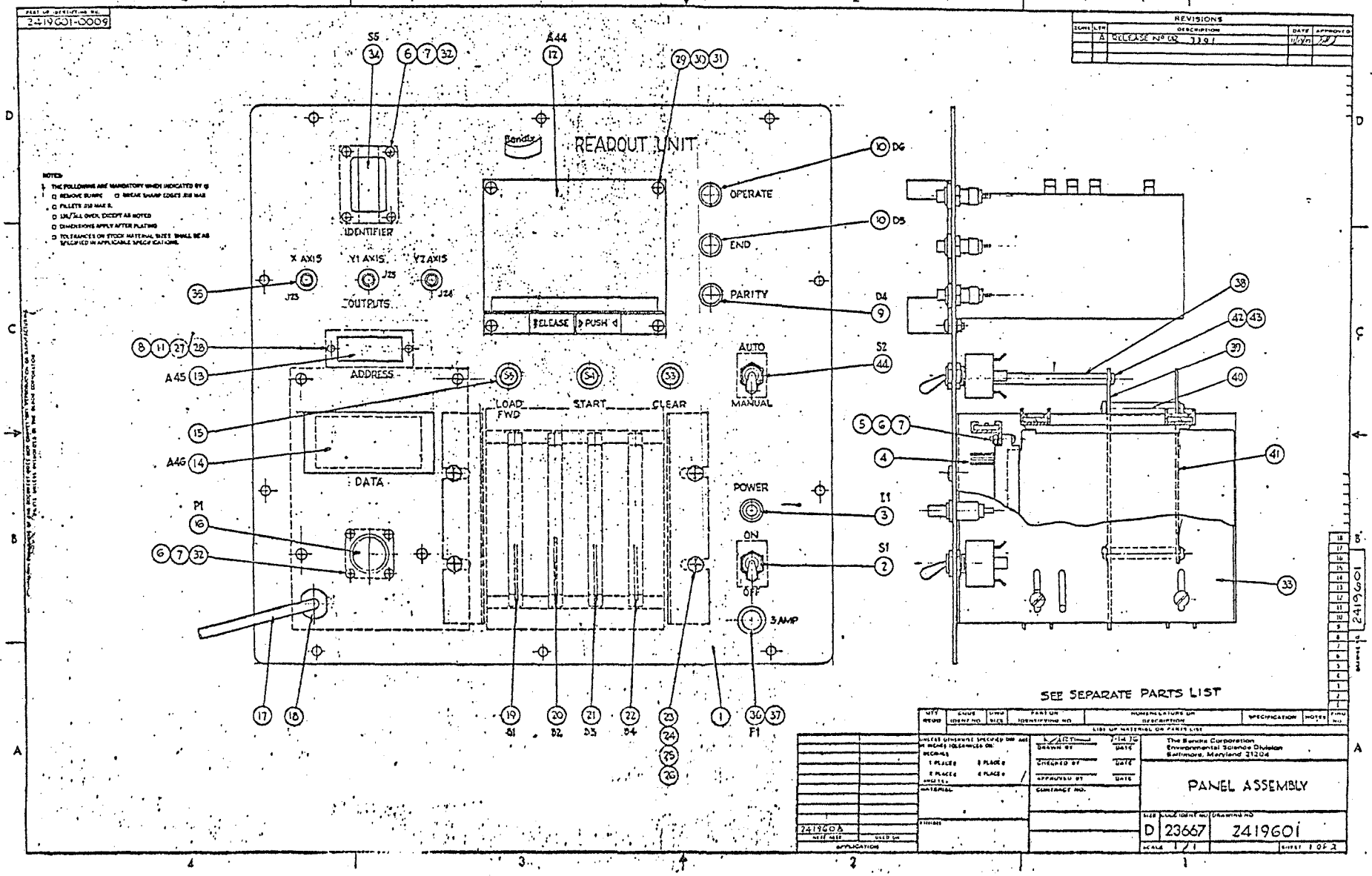
2419635	Board, Component
2419636	Rack, P.C. Board
2419637	Track, Card
2419638	Cap, Connector
2419639	Screw, Captive
2419640	Receptacle, Cable
2419641	Cover
2419642	Bracket, Connector
2419643	Case
2419644	Dosimeter Assembly
PL2419644	Dosimeter Assembly
2419645	Clip
2419763	Cap, Microphone

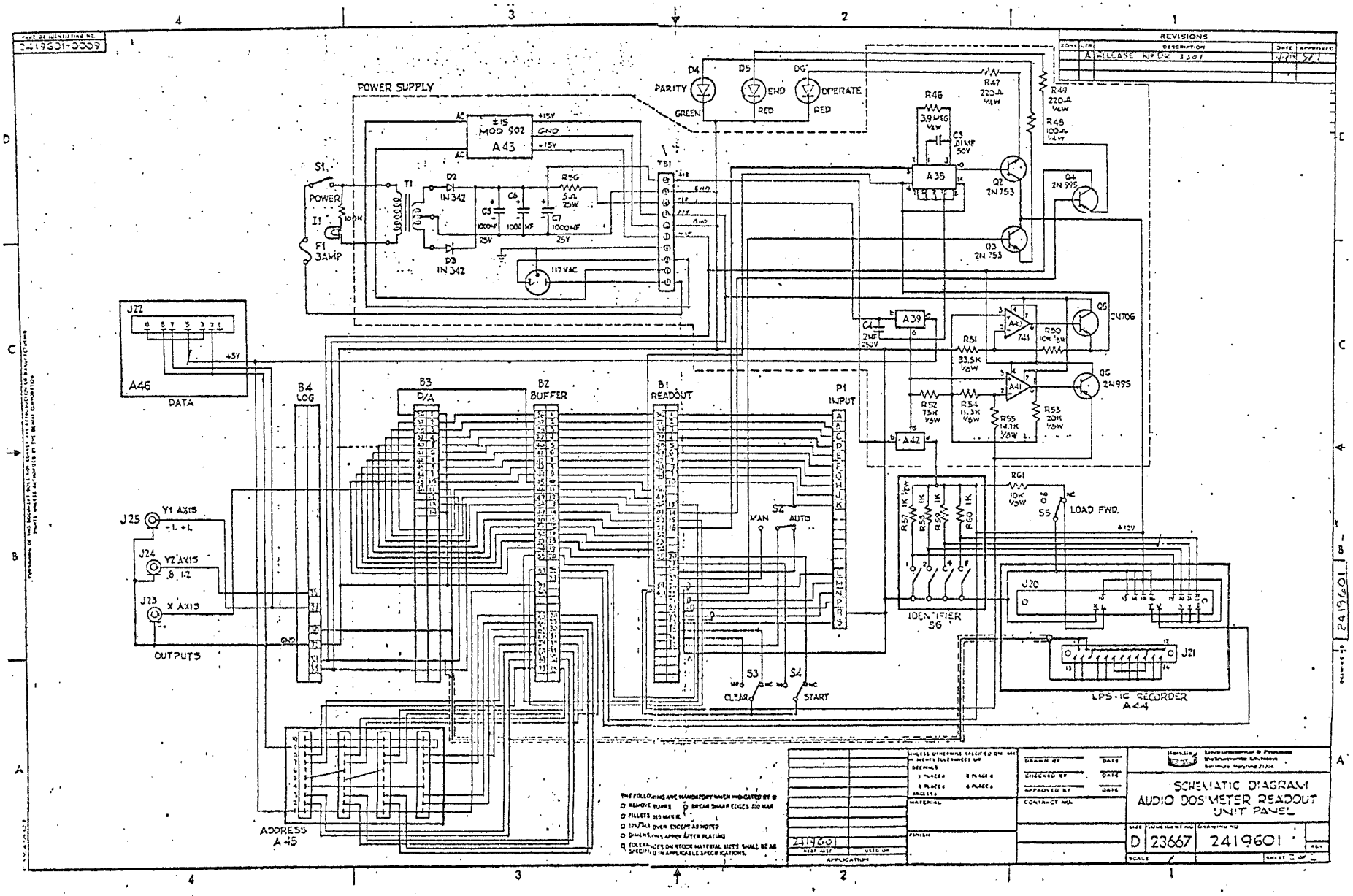
INTERCONNECTING CABLE

2419609	Cable Assembly
PL2419609	Cable Assembly
2419611	Cover

READOUT UNIT

2419601	Panel Assembly
PL2419601	Panel Assembly
2419602	Panel
2419603	Rack Modified, Card
2419604	Case, Carrying
2419608	Readout Assembly
PL2419608	Readout Assembly
2419698	Regulator Assembly
PL2419698	Regulator Assembly
2419699	Board, Component
2419700	Power Supply Assembly
PL2419700	Power Supply Assembly
2419701	Plate, Power Supply
2419864	Board Modified, Vector
2419867	Bracket, Connector


READOUT UNIT
Bendix
S5
A44
IDENTIFIER
X AXIS
Y1 AXIS
Y2 AXIS
J23
J25
J24
OUTPUTS
RELEASE
PUSH
OPERATE
END
PARITY
ADDRESS
A45
DATA
A46
LOAD FWD
START
CLEAR
AUTO
MANUAL
S2
POWER
ON
OFF
3 AMP
P1
S1
F1
DG
DS
D4
SEE SEPARATE PARTS LIST
PANEL ASSEMBLY
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204
2419601
2419601-0009


POWER SUPPLY
A43
MOD 902
PARITY
END
OPERATE
GREEN
RED
RED
A38
A39
A42
A46
DATA
B4
LOG
B3
D/A
B2
BUFFER
B1
READOUT
P1
INPUT
J25
Y1 AXIS
J24
Y2 AXIS
J23
X AXIS
OUTPUTS
ADDRESS
A45
MAN
AUTO
S2
S3
CLEAR
S4
START
S5
LOAD FWD.
IDENTIFIER
S6
J20
J21
LPS-1C RECORDER
A44
SCHEMATIC DIAGRAM
AUDIO DOSIMETER READOUT
UNIT PANEL
D
23667
2419601

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

PL 2419601

SH 1

REV A

LIST TITLE PANEL ASSEMBLY

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
1	2419602-0001	PANEL	PC		1		
2	MS35058-22	SWITCH	PC		1		
3	41-1-RED	IND LIGHT	PC		1	GRAYHILL	
4	RG-316	CONNECTOR	PC		4	VECTOR	
5	MS51957-17	SCREW	PC		8		
6	MS35338-135	LOCKWASHER	PC		16		
7	MS35649-244	NUT	PC		16		
8	MS51957-5	SCREW	PC		2		
9	249-7968-333250W	IND LIGHT	PC		1	DIALCO	
10	249-7868-333150W	IND LIGHT	PC		2	DIALCO	
11	MS35649-224	NUT	PC		2		
12	LPS-16-12-B-1-A	CASSETTE	PC		1	DATEL	
13	749-0204	READOUT	PC		1	DIALCO	
14	DPM820V2M	READOUT	PC		1	DATASCAN	
15	46-05-05	SWITCH	PC		3	GRAYHILL	
16	KPTO2E16-26P	CONNECTOR	PC		1	ITT	
17	3-1110-19	CABLE	PC		1		
18	SR6P4	BUSHING	PC		1	HEYCO	
19	C-6878-B1	PANEL READOUT	PCA		1	BU. MINES	

PREPARED BY MARTIN 7/15/76 CHECKED BY APPROVED BY

2416437-0001

INTERIM PARTS LIST

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CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

PL 24196011

SH 2 REV A

LIST TITLE PANEL ASSEMBLY

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
20	C-6878-B2	CARD EDGE	PC	A	1	BU. MINES	
21	C-6878-B3	CARD D/A	PC	A	1	BU. MINES	
22	C-6879-B4	CARD LOG AMP	PC	A	1	BU. MINES	
23	MS51958-62	SCREW	PC		4		
24	MS15795-841	WASHER	PC		4		
25	MS35338-138	LOCKWASHER	PC		4		
26	MS35650-304	NUT	PC		4		
27	MS15795-802	WASHER	PC		2		
28	MS35338-134	LOCKWASHER	PC		2		
29	MS51957-44	SCREW	PC		4		
30	MS35649-284	NUT	PC		4		
31	MS35338-137	LOCKWASHER	PC		4		
32	MS51957-15	SCREW	PC		8		
33	24196003-0001	RACK	PC		1		
34	300-3644-1	SWITCH	PC		1	DIGI SWITCH	
35	31-102	RECEPTACLE	PC		3	AMPHENOL	
36	34201ZAL	FUSEHOLDER	PC		1	LITTELFUSE	
37	MS90078-12	FUSE	PC		1		
38	8212-A-0632	SPACER	PC		4	AMATOM	

PREPARED BY _____ CHECKED BY _____ APPROVED BY _____

2414437-0001

INTERIM PARTS LIST

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CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

PL 2419601

SH 3

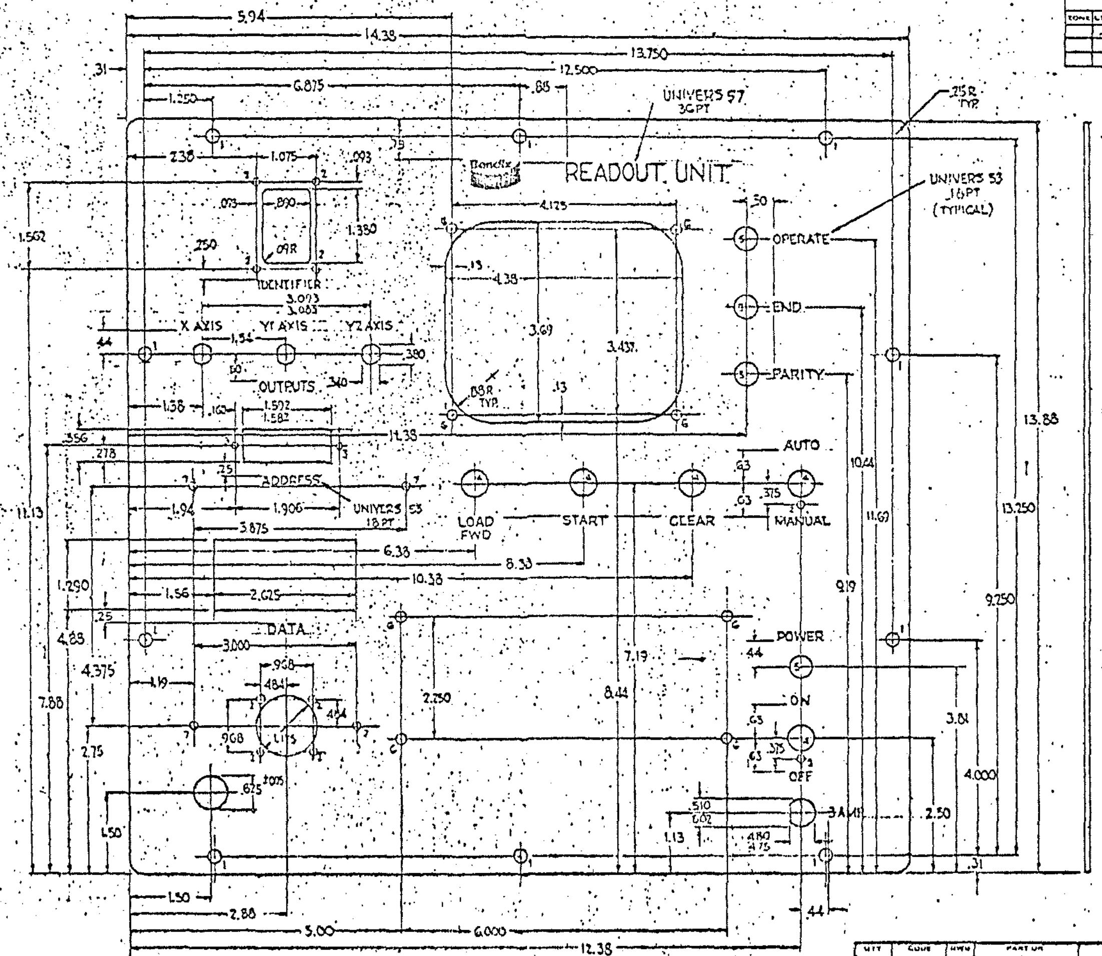
REV A

LIST TITLE PANEL ASSEMBLY

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ 0009	SPECIFICATION OR CODE IDENT NO	NOTES
39	2419700-0009	PC ASSEM	PC		1		
40	8230-A-0632	SPACER	PC		3	AMATOM	
41	2419698-0009	REGULATOR	PC		1		
42	MS51957-27	SCREW	PC		14		
43	MS35338-136	LOCKWASHER	PC		14		
44	MS35058-21	SWITCH	PC		1		

2414437-0001

PREPARED BY _____ CHECKED BY _____ APPROVED BY _____



NOTES:
1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
- ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
- ☐ FILLETS .010 MAX R
- ☐ 125/ALL OVER EXCEPT AS NOTED
- ☐ DIMENSIONS APPLY AFTER PLATING
- ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

2. HOLE SIZES:
   1- .250 $^{+.004}_{-.001}$ DIA 10 HOLES
   2- .136 $^{+.003}_{-.001}$ DIA 10 HOLES
   3- .109 $^{+.003}_{-.001}$ DIA. 4 HOLES.
   4- .516 $^{+.004}_{-.001}$ DIA 5 HOLES
   5- .406 $^{+.004}_{-.001}$ DIA 4 HOLES
   6- .209 $^{+.004}_{-.001}$ DIA 8 HOLES
   7- .156 $^{+.004}_{-.001}$ DIA 4 HOLES

3. FINISH - GOLD IRIDITE, PAINT FRONT SURFACE & EDGES WITH ZINC CHROMATE PRIMER PER MIL-P-8585. FOLLOWED BY ONE COAT OF SEMI-GLOSS ENAMEL PER TT-E-529, CLASS A OR B; COLOR Nº 26280 PER FED-STD-595

4. CHARACTERS SHALL BE SILK SCREENED ON IN BLACK & CENTERALLY LOCATED WITH RESPECT TO THERE RELATED HOLE.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE Nº DR 3301		

QTY REQD	CODE IDENT NO	NEW SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON: DECIMALS 1 PLACE ± 2 PLACE ±.03 3 PLACE ±.010 4 PLACE ± ANGLES ±

MATERIAL: .091 SHEET ALUMINUM ALLOY 5052-H34

FINISH: NOTE 3

DRAWN BY [signature] DATE 7-12-7?
CHECKED BY DATE
APPROVED BY DATE
CONTRACT NO.

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

PANEL

SIZE D | CODE IDENT NO 23667 | DRAWING NO 2419602
SCALE 1/1 | SHEET

NEXT ASSY 2419601 | USED ON
APPLICATION

2419602-0001

2419603-0001

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
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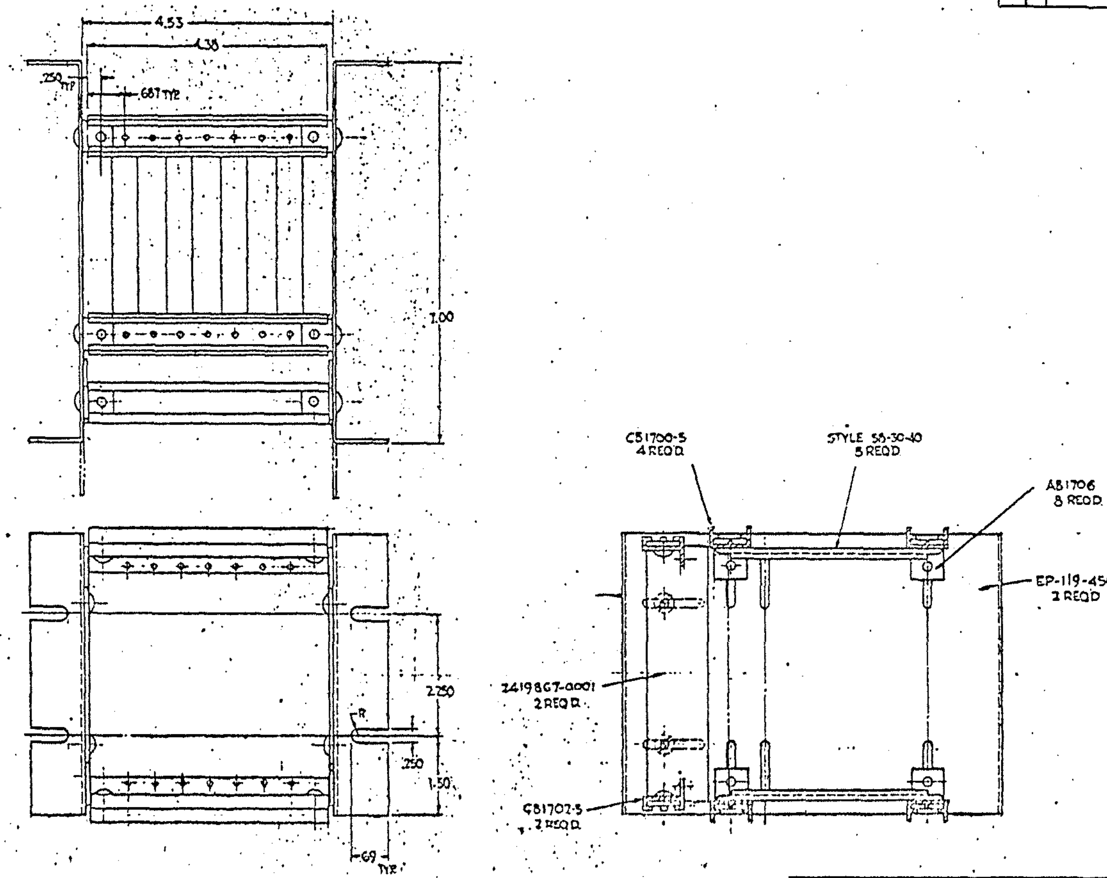


NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ⊗
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125/ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

2. MATERIAL:
   PURCHASE FROM -
   UNITRACK DIVISION
   CALABRO PLASTICS INC
   UPPER DARBY, PA.

QTY REQD	CODE IDENT NO	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES	FIND NO

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES TOLERANCES ON: DECIMALS 2 PLACES ±.010, 2 PLACES ±.02 ANGLES

DRAWN BY: [illegible] DATE: 7-13-73
CHECKED BY / DATE
APPROVED BY / DATE
CONTRACT NO.

MATERIAL: NOTE 2

FINISH

NEXT ASSY: 2419601 | USED ON | APPLICATION

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

RACK MODIFIED, CARD

SIZE: D | CODE IDENT NO: 23667 | DRAWING NO: 2419603

SCALE 1/1 | SHEET

2419604-0001

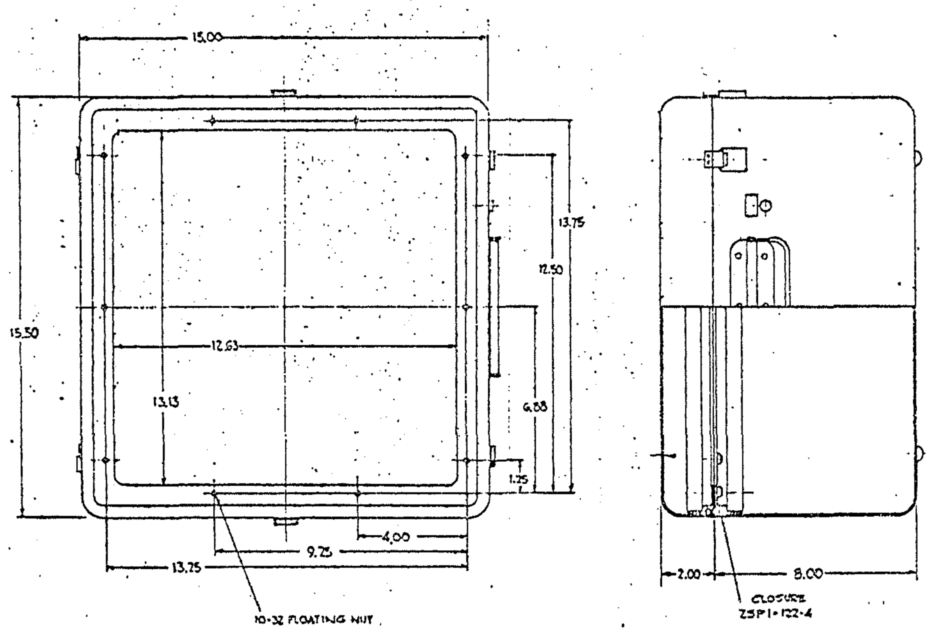
REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE Nº DR 2301		

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .016 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125/ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

2. PURCHASE FROM-
   ZERO MFG. CO
   MONSON, MASS
   P/N KJ1CA3208



QTY REQD	CODE IDENT NO	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES	FIND NO

LIST OF MATERIAL OR PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

DRAWN BY / DATE · CHECKED BY / DATE · APPROVED BY / DATE · CONTRACT NO.

MATERIAL: NOTE 2

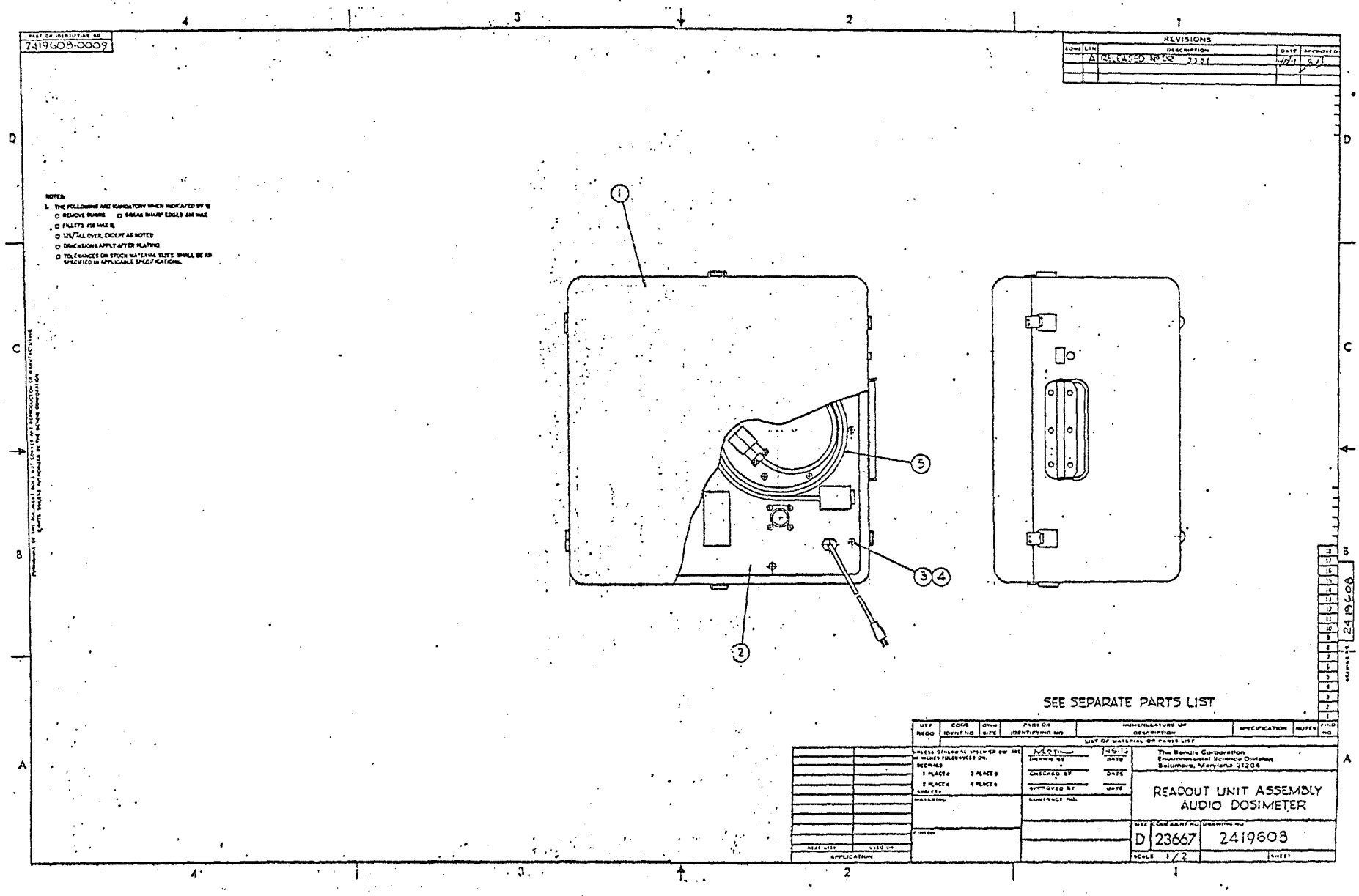
FINISH

CASE, CARRYING

SIZE: D · CODE IDENT NO: 23667 · DRAWING NO.: 2419604

SCALE 1/2 · SHEET

2419608 (NEXT ASSY) · APPLICATION


PART OR IDENTIFYING NO
2419608-0009
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
A
RELEASED NO. 23667
NOTES:
1. THE FOLLOWING ARE MANDATORY WHICH INDICATED BY ☒
REMOVE BURRS
BREAK SHARP EDGES .010 MAX.
FILLETS .010 MAX R.
.125/.250 OVER, EXCEPT AS NOTED
DIMENSIONS APPLY AFTER PLATING
TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
1
2
3
4
5
SEE SEPARATE PARTS LIST
QTY REQD
CODE IDENT NO
DWG SIZE
PART OR IDENTIFYING NO
NOMENCLATURE OR DESCRIPTION
SPECIFICATION
NOTES
FIND NO
LIST OF MATERIAL OR PARTS LIST
UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON:
DECIMALS
1 PLACE ±
2 PLACE ±
3 PLACE ±
4 PLACE ±
ANGLES ±
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DRAWN BY
CHECKED BY
APPROVED BY
CONTRACT NO.
DATE
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204
READOUT UNIT ASSEMBLY
AUDIO DOSIMETER
SIZE
CAGE IDENT NO
DRAWING NO
D
23667
2419608
SCALE 1/2
SHEET
2419608

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

PL 2419608-0009 SH 1 REV A

LIST TITLE READOUT UNIT ASSEMBLY AUDIO DOSIMETER

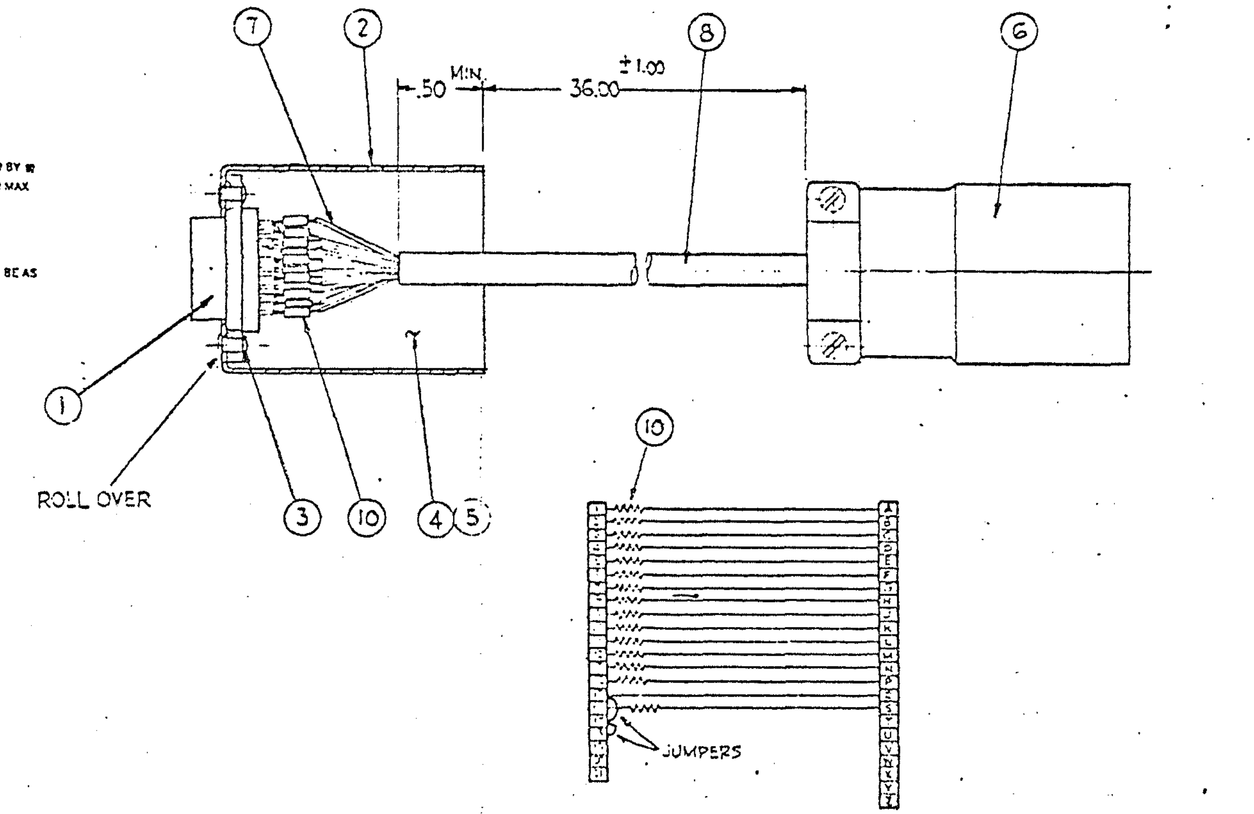
ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ 0009	SPECIFICATION OR CODE IDENT NO	NOTES
1	2419604-0001	CASE	PC		1		
2	2419601-0009	PANEL	PC	A	1		
3	MS51958-63	SCREW	PC		10		
4	MS35338-138	LOCKWASHER	PC		10		
5	2419609-0009	CABLE	PC	A	1		

PREPARED BY A. Artt 7-15-76 CHECKED BY ____ APPROVED BY ____

2414437-0001

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125√ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



SEE SEPARATE PARTS LIST

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE NPER - 3231		

QTY REQD	CODE IDENT NO	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES	FIND NO

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON DECIMALS 1 PLACE ± 2 PLACE ± 3 PLACE ± 4 PLACE ± ANGLES ±

MATERIAL

FINISH

DRAWN BY — DATE

CHECKED BY — DATE

APPROVED BY — DATE

CONTRACT NO.

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CABLE ASSEMBLY
INTERCONNECTING

SIZE C | CODE IDENT NO 23667 | DRAWING NO 2419309

SCALE 2/1 | SHEET

NEXT ASSY: 2419308 | USED ON

APPLICATION

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INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 330

APPROVAL

PL 2419609

SH 1

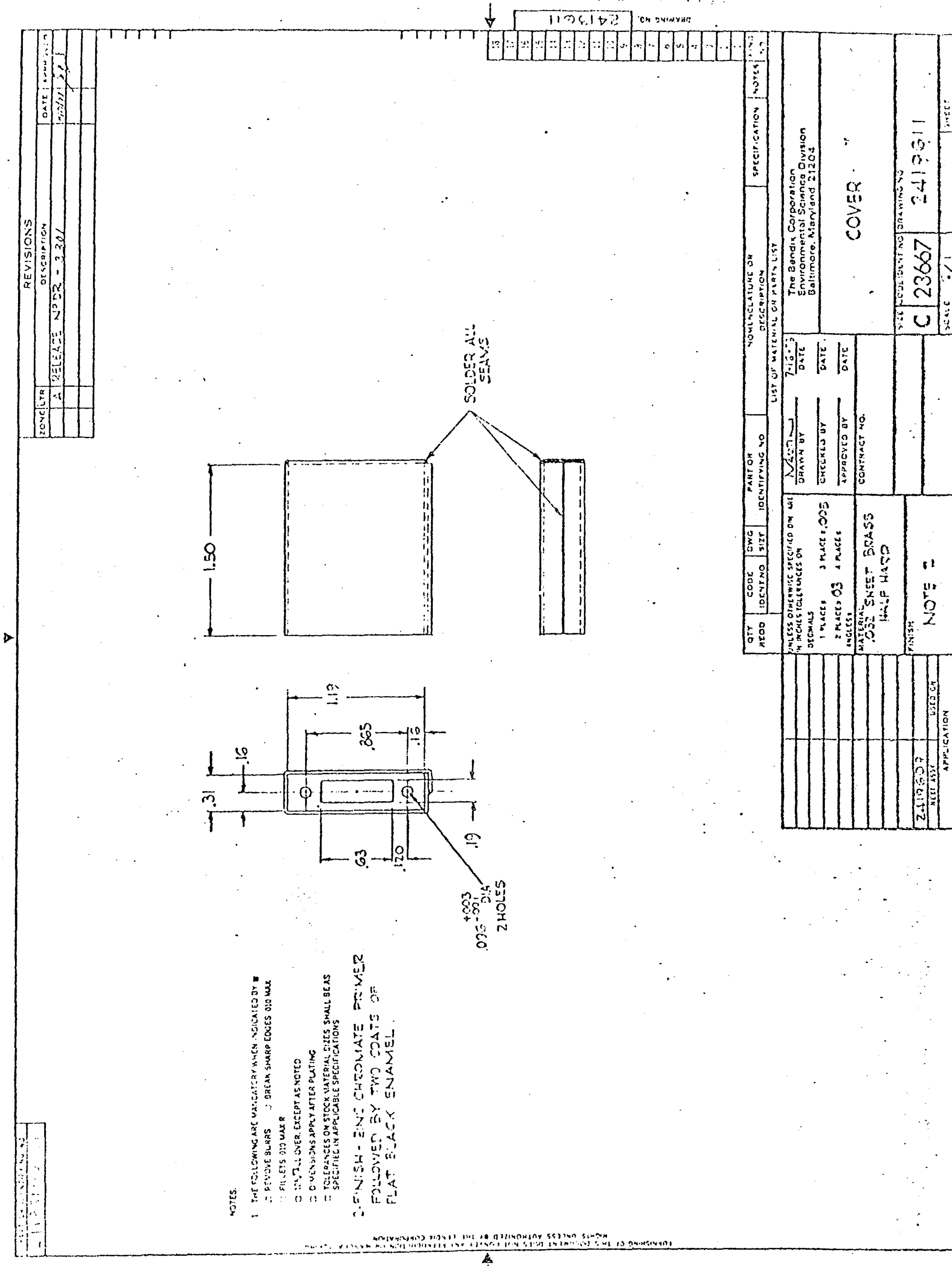
REV A

LIST TITLE CABLE ASSEMBLY INTERCONNECTING

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
1	DCDA21P	CONNECTOR	PC		1	CINCH	
2	2419611-0001	COVER	PC		1		
3	MS16535-66	RIVET	PC		2		
4	2850FT	POTTING	GL		AR	STYCAST	
5	9.1	CATALYST	QT		AR	STYCAST	
6	KPT06B16-26S	CONNECTOR	PC		1	ITT CANNON	
7	2411357-403	WIRE	FT		AR		
8	1147736-22	SLEEVING	FT		AR		
9	SW60WRAP2	SOLDER	LB		AR		
10	RC05GF103J	RESISTOR	PT		15		

PREPARED BY MARTIN 7-16-76 CHECKED BY APPROVED BY

2414437-0001


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
A | RELEASE NºDR - 3301
DRAWING NO. 2419611
SOLDER ALL SEAMS
1.50
1.19
.865
.16
.31
.63
.120
.19
+.003 / -.001 .093 DIA 2 HOLES
NOTES:
1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
REMOVE BURRS · BREAK SHARP EDGES .010 MAX
FILLETS .010 MAX R
FINISH OVER, EXCEPT AS NOTED
DIMENSIONS APPLY AFTER PLATING
TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS
2. FINISH - ZINC CHROMATE PRIMER FOLLOWED BY TWO COATS OF FLAT BLACK ENAMEL.
QTY REQD | CODE IDENT NO | DWG SIZE | PART OR IDENTIFYING NO | NOMENCLATURE OR DESCRIPTION | SPECIFICATION | NOTES
LIST OF MATERIAL OR PARTS LIST
UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON
DECIMALS 1 PLACES 2 PLACES .03 3 PLACES .005 4 PLACES
ANGLES
MATERIAL .032 SHEET BRASS HALF HARD
FINISH NOTE 2
DRAWN BY | DATE
CHECKED BY | DATE
APPROVED BY | DATE
CONTRACT NO.
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204
COVER
SIZE C | CODE IDENT NO 23667 | DRAWING NO 2419611
SCALE 2/1 | SHEET
2419607 NEXT ASSY | USED ON
APPLICATION

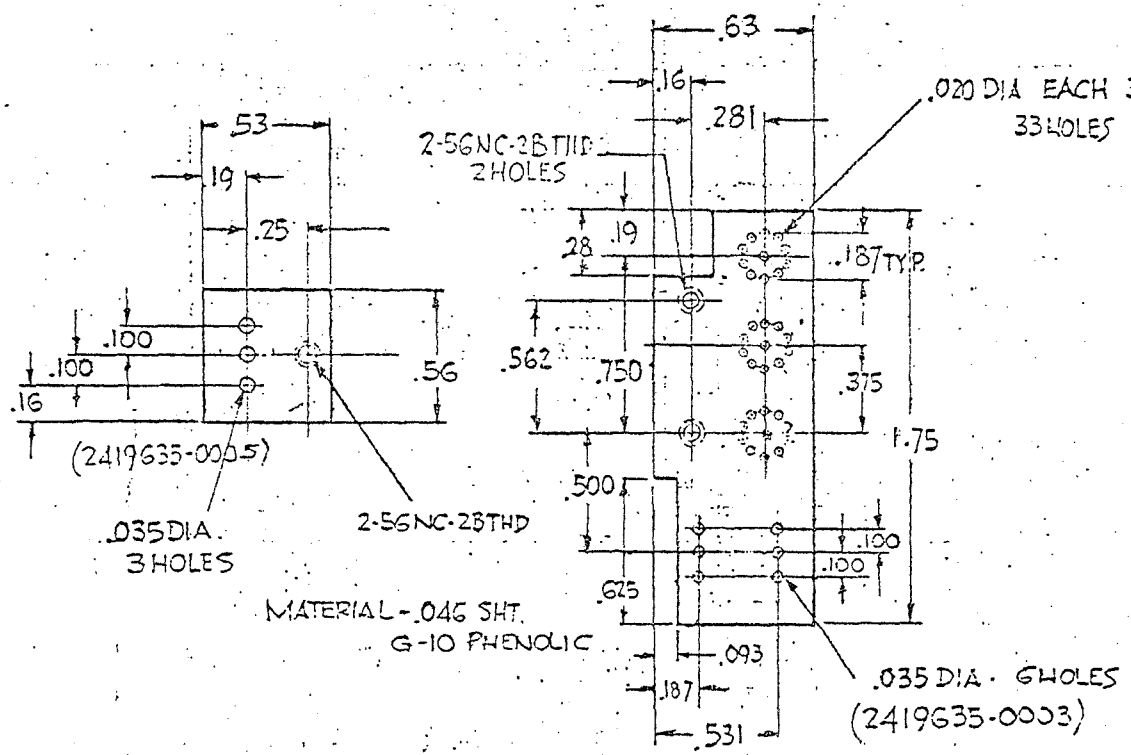
DRAWING NO. 2419635

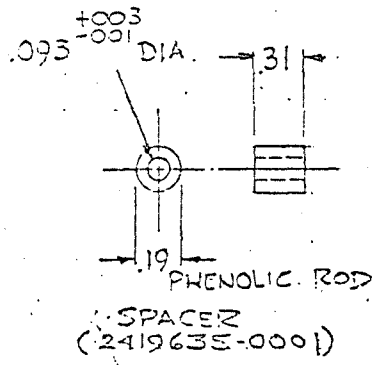
PART OR IDENTIFYING NO.
2419635-0005
2419635-0003
2419635-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR-3391	11/17/77	BR

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125 √ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.





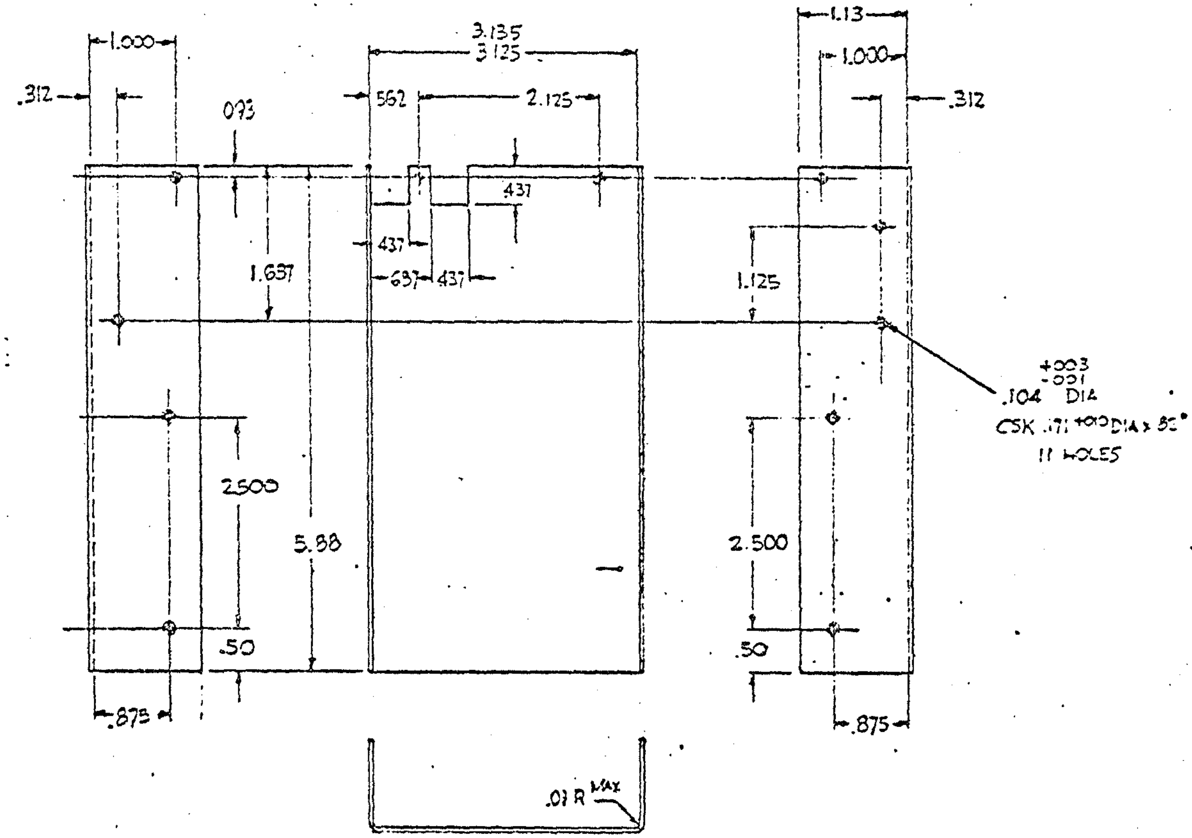
		UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES TOLERANCES ON: DECIMALS 2 PLACE ± .02 3 PLACE ± .010 4 PLACE ± ANGLES ±	DRAWN BY MARTIN DATE 7-22-76	The Bendix Corporation Environmental Science Division Baltimore, Maryland 21204
		MATERIAL	CHECKED BY DATE	BOARD, COMPONENT
2419644		FINISH	APPROVED BY DATE	SIZE B CODE IDENT NO. 23667 DRAWING NO. 2419635
NEXT ASSY	USED ON		CONTRACT NO.	SCALE 2/1 SHEET
APPLICATION				

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR-3317		

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☑
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125/ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS



QTY REQD	CODE IDENT NO	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES	FIND NO

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS: 1 PLACE ± ; 2 PLACE ± .02 ; 3 PLACE ± .010 ; 4 PLACE ± ; ANGLES ±

MATERIAL: .040 C.R. STEEL GRADE 24055 ASTM A109-65

FINISH: ZINC PLATE

DRAWN BY — DATE
CHECKED BY — DATE
APPROVED BY — DATE
CONTRACT NO.

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

RACK, P.C. BOARD

AUDIO PERIMETER

SIZE	CODE IDENT NO	DRAWING NO
C	23667	2419336

SCALE 1/1 SHEET

APPLICATION: NEXT ASSY 2419944 — USED ON

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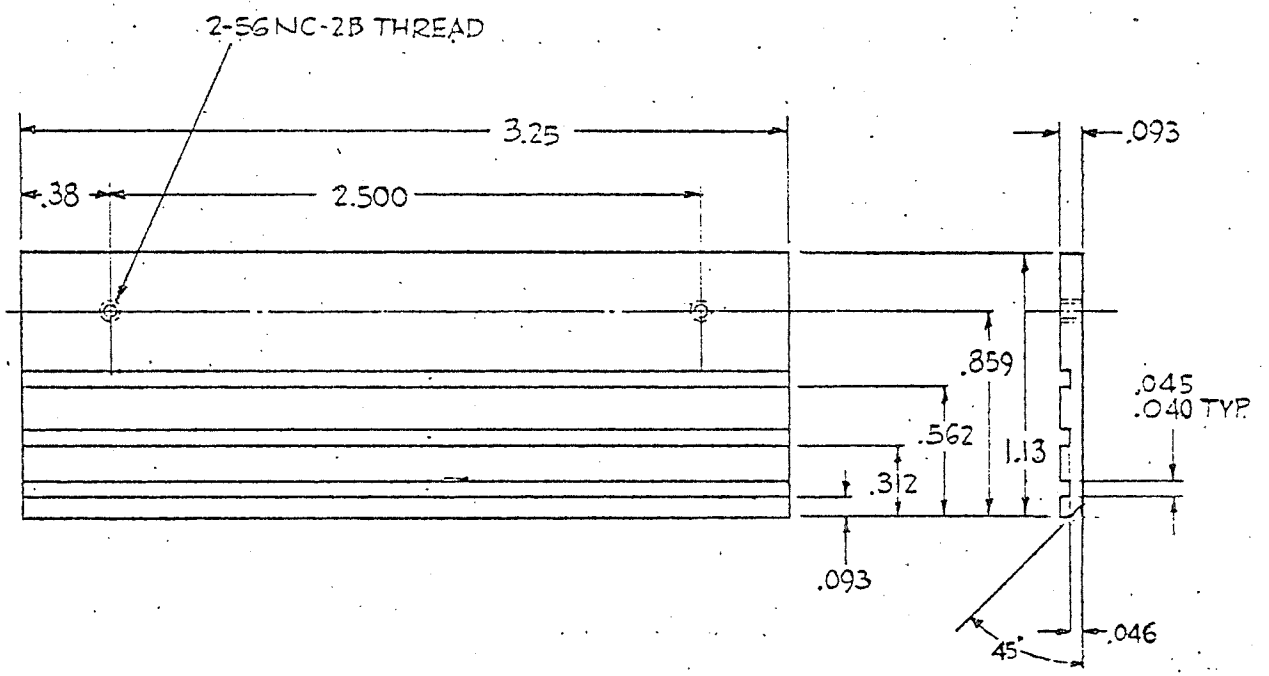
DRAWING NO. 2419637

PART OR IDENTIFYING NO.
2419637-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR - 3301	11/17/71	BRS

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125√ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



		UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES TOLERANCES ON. DECIMALS 2 PLACE ±.03 3 PLACE ±.005 4 PLACE ± ANGLES ±	MART DRAWN BY	7-23-76 DATE	The Bendix Corporation, Environmental Science Division, Baltimore, Maryland 21204
		MATERIAL EPOXY GLASS PHENOLIC G-10-865	CHECKED BY	DATE	TRACK, CARD.
2419644		FINISH	APPROVED BY	DATE	SIZE B / CODE IDENT NO. 23667 / DRAWING NO. 2419637
NEXT ASSY	USED ON		CONTRACT NO.		SCALE 2/1 / SHEET
APPLICATION					

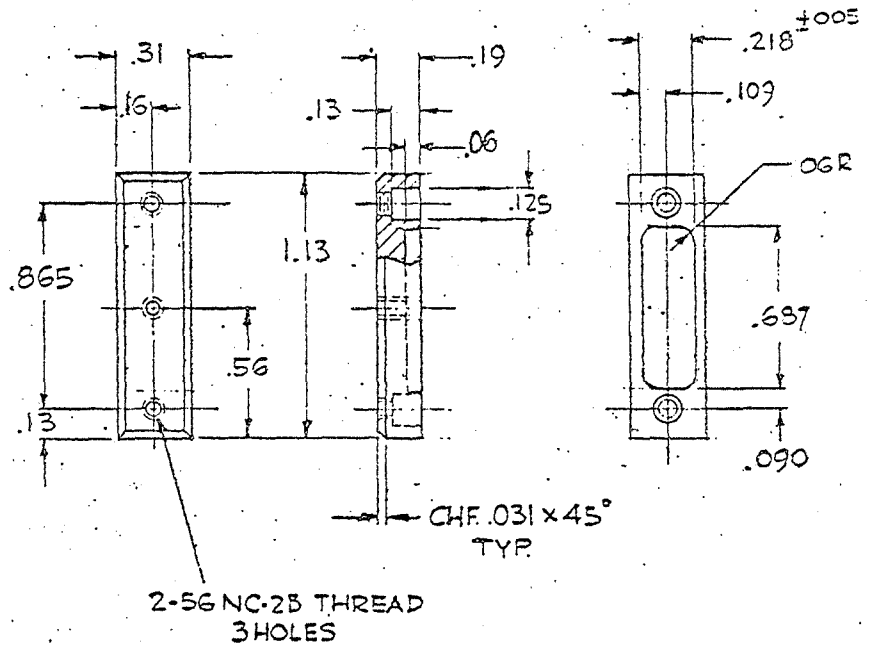
DRAWING NO. 2419638

PART OR IDENTIFYING NO.
2419638-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR 3301	11/2/77	

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ▯
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125√ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



	UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES. TOLERANCES ON: DECIMALS 2 PLACE ±.02 3 PLACE ±.010 4 PLACE ± ANGLES ±	MARTIN DRAWN BY 3-10-76 DATE	The Bendix Corporation Environmental Science Division Baltimore, Maryland 21204
		CHECKED BY DATE	CAP, CONNECTOR
	MATERIAL SHT. ALUM. ALLOY 5052-H32	APPROVED BY DATE CONTRACT NO	
2419644 NEXT ASSY USED ON	FINISH ANODIZE		SIZE B | CODE IDENT NO 23667 | DRAWING NO. 2419638
APPLICATION			SCALE 2/1 SHEET

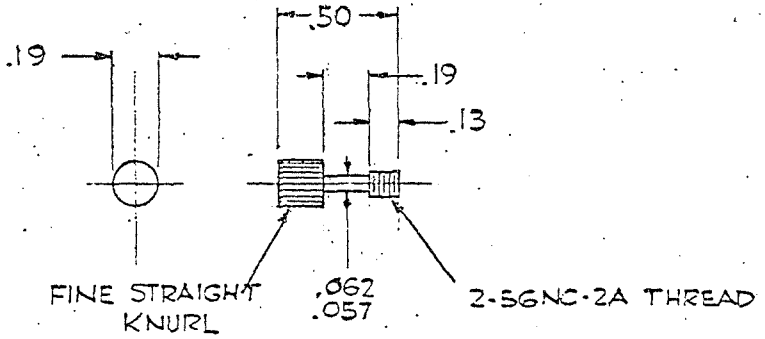
DRAWING NO. 2419639

PART OR IDENTIFYING NO.
2419639-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR-2301	11/17/77	

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☐ REMOVE BURRS ☒ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☒ 125√ ALL OVER, EXCEPT AS NOTED
   - ☒ DIMENSIONS APPLY AFTER PLATING
   - ☒ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



2419644	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES. TOLERANCES ON,
DECIMALS
2 PLACE ± .01 3 PLACE ±
4 PLACE ± ANGLES ±

MATERIAL: ST. ST. ROD - TYPE 303 OR 304

FINISH: PASSIVATE

DRAWN BY	MART	5-10-78 DATE
CHECKED BY		DATE
APPROVED BY		DATE
CONTRACT NO.		

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

SCREW, CAPTIVE

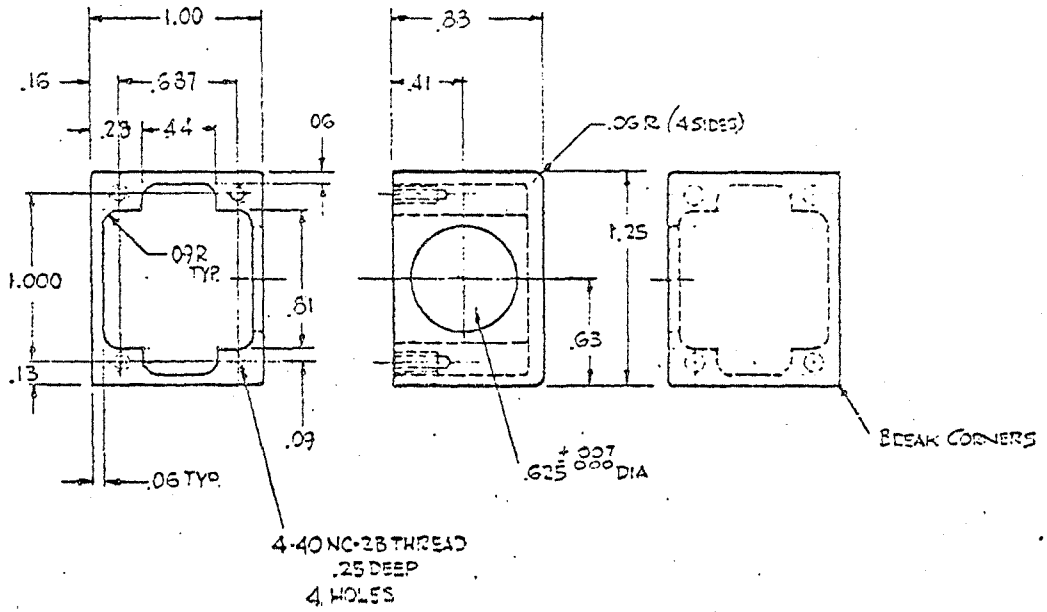
SIZE	CODE IDENT NO	DRAWING NO
B	23667	2419639

SCALE 2/1 SHEET

REVISIONS			
ZONE	LTR	DESCRIPTION	DATE / APPROVED
	A	NEW DWG D.R. - 2231	[illegible]

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ✱
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125 $\sqrt{}$ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS



QTY REQD	CODE IDENT NO	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTES	FIND NO

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON DECIMALS
1 PLACE ± 3 PLACE ± .005
2 PLACE ± .02 4 PLACE ± ANGLES ±

DRAWN BY [illegible] DATE 7-21-75
CHECKED BY DATE
APPROVED BY DATE

MATERIAL: ALUMINUM
FINISH: ANODIZE
CONTRACT NO.

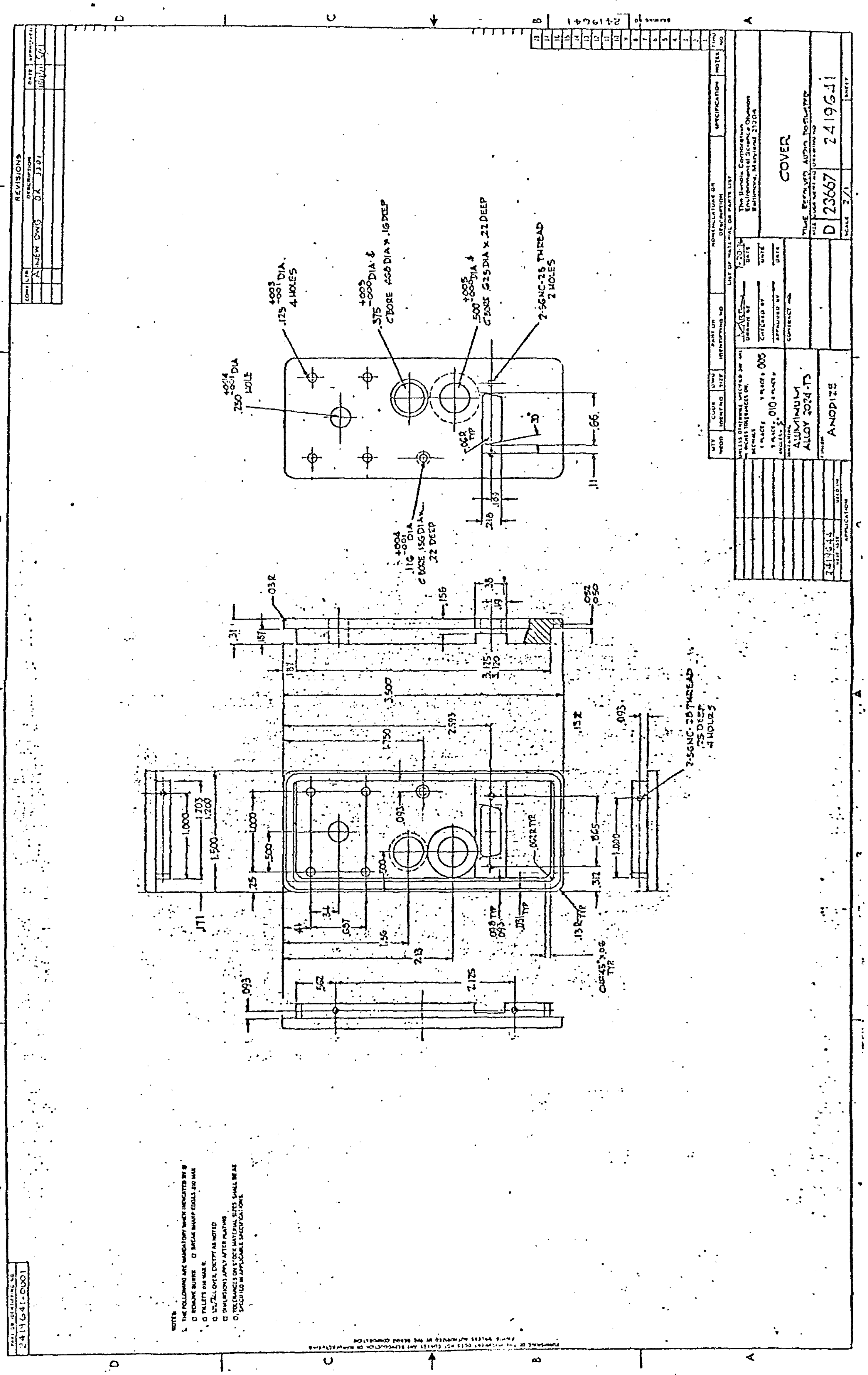
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

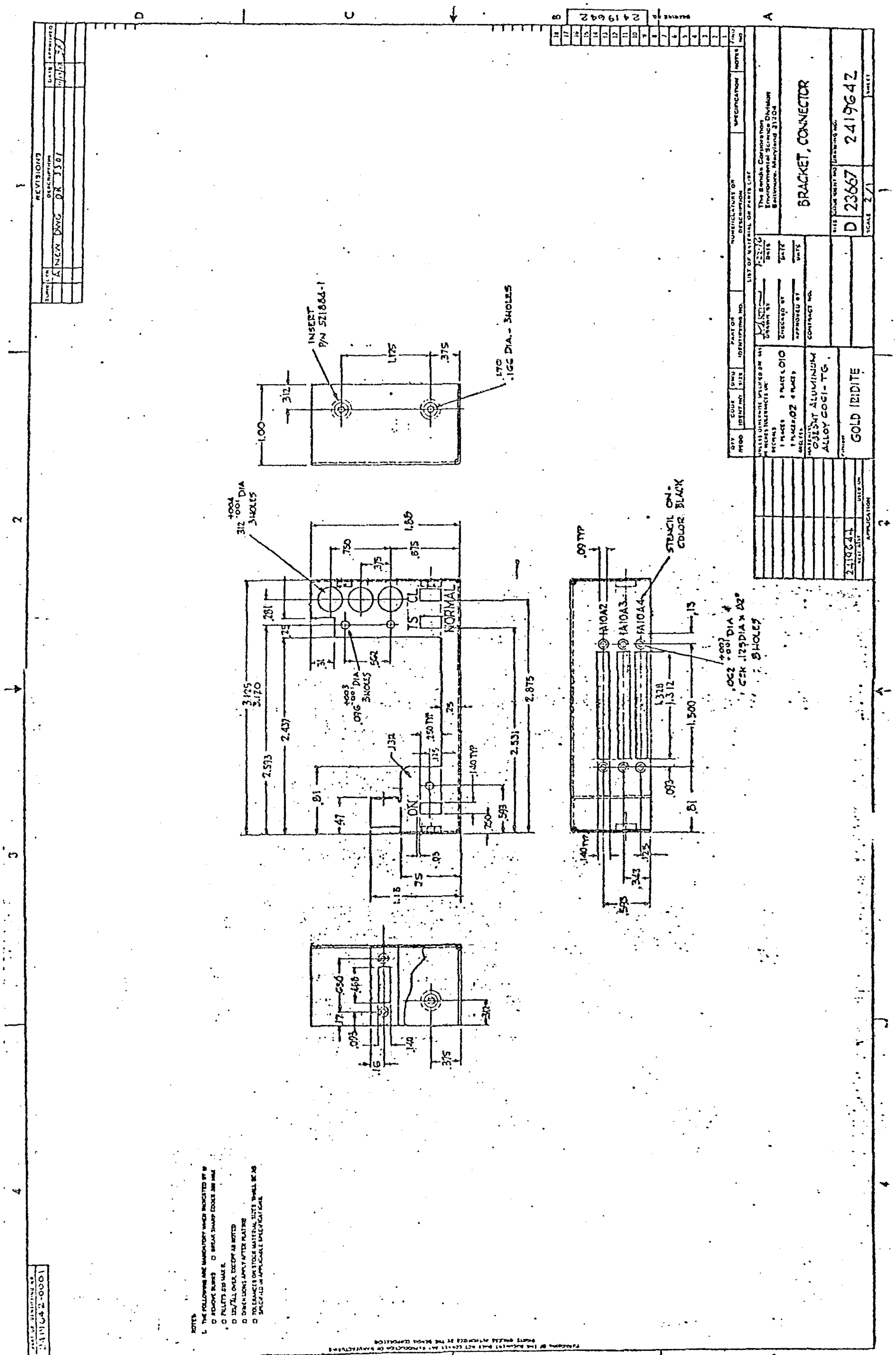
RECEPTACLE, CABLE

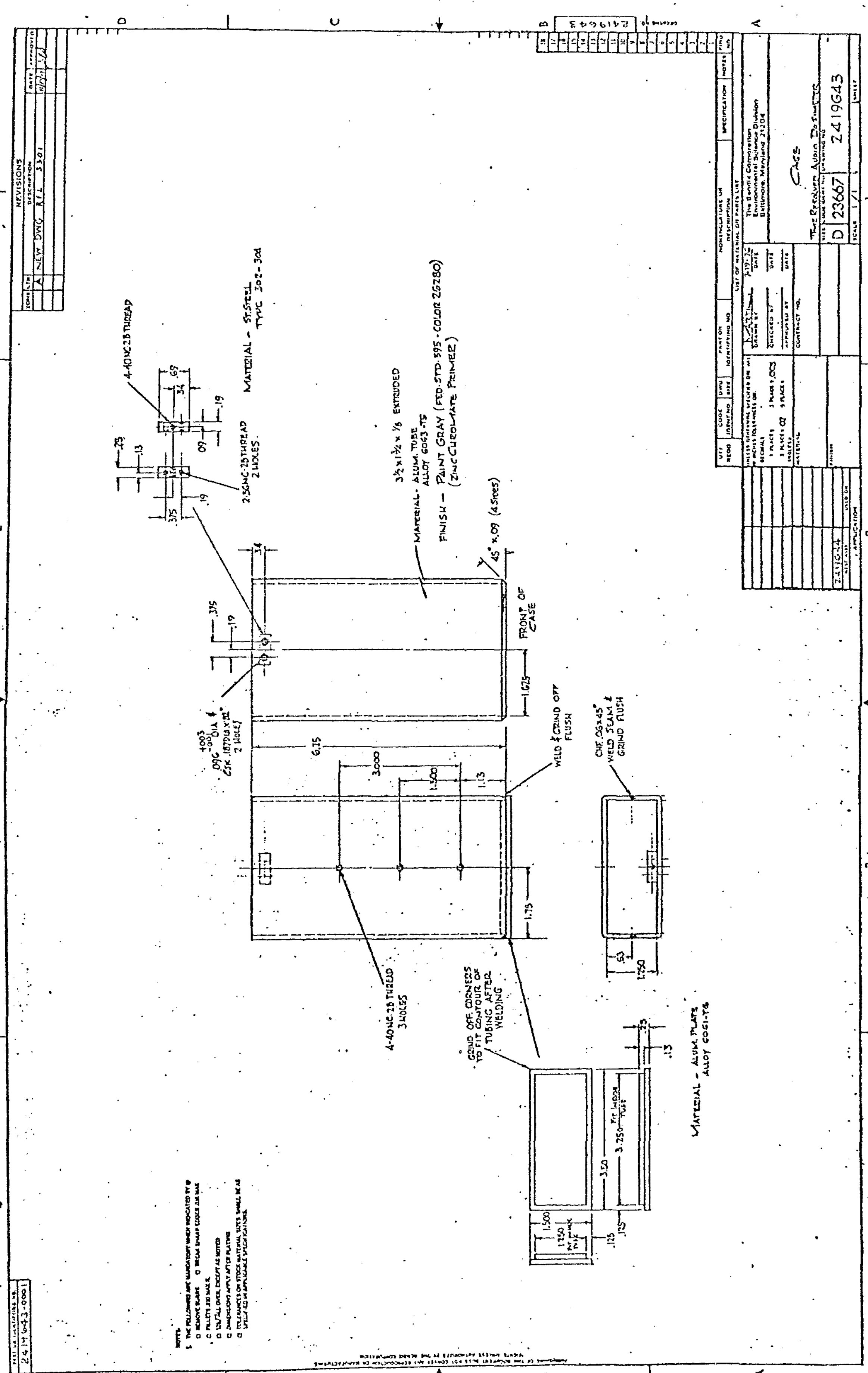
SIZE	CODE IDENT NO	DRAWING NO
C	23667	2419340

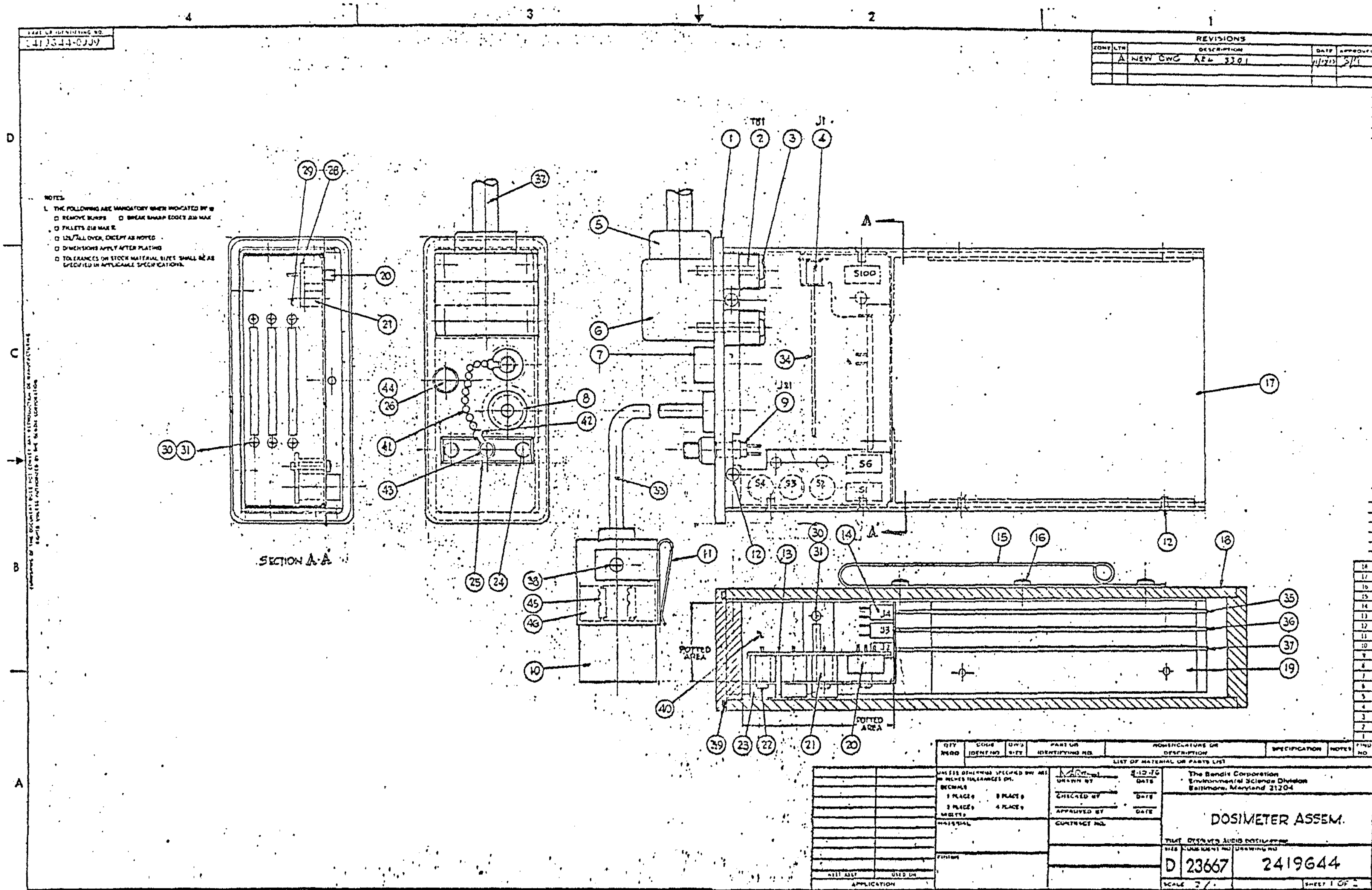
SCALE 2/1 SHEET

DRAWING NO 2419340


COVER
2419641
ALUMINUM ALLOY 2024-T3
ANODIZE


REVISIONS
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204
BRACKET, CONNECTOR
D 23667
2419642
GOLD IRIDITE
INSERT P/N 521886-1
STENCIL ON. COLOR BLACK
NORMAL
TS
CL
OK


REVISIONS
A NEW DWG REL 3301
2419643-0001
NOTES
4-40NC-2B THREAD
.25
.13
.375
.19
.69
.34
.09
2-56NC-2B THREAD 2 HOLES.
MATERIAL - ST.STEEL TYPE 302-304
.096 +.003 -.001 DIA ⊄ CSK .187DIA X 82° 2 HOLES
6.25
3.000
1.500
1.13
4-40NC-2B THREAD 3 HOLES
3½ x 1¾ x ⅛ EXTRUDED
MATERIAL - ALUM. TUBE ALLOY 6063-T6
FINISH - PAINT GRAY (FED-STD-595 - COLOR 26280) (ZINC CHROMATE PRIMER)
45° x .09 (4 SIDES)
GRIND OFF CORNERS TO FIT CONTOUR OF TUBING AFTER WELDING
1.75
1.625
FRONT OF CASE
WELD & GRIND OFF FLUSH
1.500
1.250 FIT INSIDE TUBE
.125
3.50
3.250 FIT INSIDE TUBE
CHF .06x45° WELD SEAM & GRIND FLUSH
.63
1.250
MATERIAL - ALUM. PLATE ALLOY 6061-T6
The Bendix Corporation Environmental Science Division Baltimore, Maryland 21204
CASE
THE RECEIVER AUDIO DOSIMETER
D 23667 2419643
SCALE 1/1
2419644



REVISIONS
A NEW DWG
NOTES:
1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
REMOVE BURRS
BREAK SHARP EDGES
FILLETS
ALL OVER, EXCEPT AS NOTED
DIMENSIONS APPLY AFTER PLATING
TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
SECTION A-A
TB1
J1
J21
S100
S6
S4
S3
S2
S1
J4
J3
J2
POTTED AREA
POTTED AREA
LIST OF MATERIAL OR PARTS LIST
The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204
DRAWN BY
DATE
CHECKED BY
APPROVED BY
CONTRACT NO.
MATERIAL
FINISH
DOSIMETER ASSEM.
D
23667
2419644
SHEET 1 OF

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 330 /

APPROVAL

PL 2419644- SH 1 REV A

LIST TITLE DOSIMETER ASSEM.

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
1	2419641-0001	COVER	PC		1		
2	411-3/4ST3	TERM STRIP	PC		2	KULKA	
3	MS51957-19	SCREW	PC		4		
4	EBTL050-8A1W1	CONNECTOR	PC		1	DALE	
5	1523	STRAIN REL	PC		1	GG ELECT	
6	2419640-0001	RECEPTACLE	PC		1		
7	282001	HOLDER	PC		1	LITTELFUSE	
8	1522	STRAIN REL	PC		2	GC ELECT	
9	DCDA21S	CONNECTOR	PC		1	TRW CINCH	
10	1560-2131	MICROPHONE	PC		1	GEN RADIO	
11	2419645-0001	CLIP	PC		1		
12	MS51959-2	SCREW	PC		11		
13	2419635-0003	BOARD	PC		1		
14	EBTL050-25A1W1	CONNECTOR	PC		3	DALE	
15	3-3900-30A	CLIP	PC		1		
16	MS51957-11	SCREW	PC		3		
17	2419636-0001	RACK PC BD	PC		1		
18	2419643-0001	CASE	PC		1		
19	2419637-0001	TRACK	PC		2		
20	MSS-104D	SWITCH	PC		3	ALCO	

PREPARED BY MARTIN 8-10-76 CHECKED BY APPROVED BY

2414437-0001

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 330 /
APPROVAL

PL 2419644-

SH 2 REV A

LIST TITLE DOSIMETER ASSEM.

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ 3000	SPECIFICATION OR CODE IDENT NO	NOTES
21	2419635-0001	SPACER	PC		3		
22	MS51957-6	SCREW	PC		2		
23	7.5AP36-10-1-10NC	SWITCH	PC		3	GRAYHILL	
24	2419639-0001	SCREW	PC		2		
25	2419638-0001	CAP	PC		1		
26	51-20-406-24	FASTENER	PC		1	SOUTHCO	
28	2419635-0005	BOARD	PC		1		
29	2419642-0001	BRACKET	PC		1		
30	0-80X.500 FLAT HD	SCREW	PC		8		
31	0-80	HEX NUT	PC		8		
32	5304-1778	CABLE	PC		1	NATIONAL MINE SERVICE CO	
33	8499	CABLE	PC		1	BELDEN	
34	C-6869-1A10A1	INVERTER	PC		1	BU. MINES	
35	C-6872-1A10A4	LOGIC	PC		1	BU. MINES	
36	C-6871-1A10A3	LOGIC	PC		1	BU. MINES	
37	C-6870-1A10A2	RMS	PC		1	BU. MINES	
38	MS51957-11	SCREW	PC		1		
39	2-037	O RING	PC		1	PARKER	
40	184 SYLGARD	POTTING	QT		AR	DOW CORNING	

2414437-0001

PREPARED BY _____ CHECKED BY _____ APPROVED BY _____

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 33.01
APPROVAL

PL 2419644- SH 3 REV A

LIST TITLE DOSIMETER ASSEM.

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
41	3606T13	CHAIN	IN		2.00	MCMASTER	
42	3606T29	COUPLING	PC		1	MCMASTER	
43	MS51957-2	SCREW	PC		2		
44	2-5-051	O-RING	PC		1	PARKER	
45	60804-1	RECEPTACLE	PC		2	AMP	
46	2419763-0001	CAP	PC		1		

PREPARED BY _____ CHECKED BY _____ APPROVED BY _____

2414437-0001

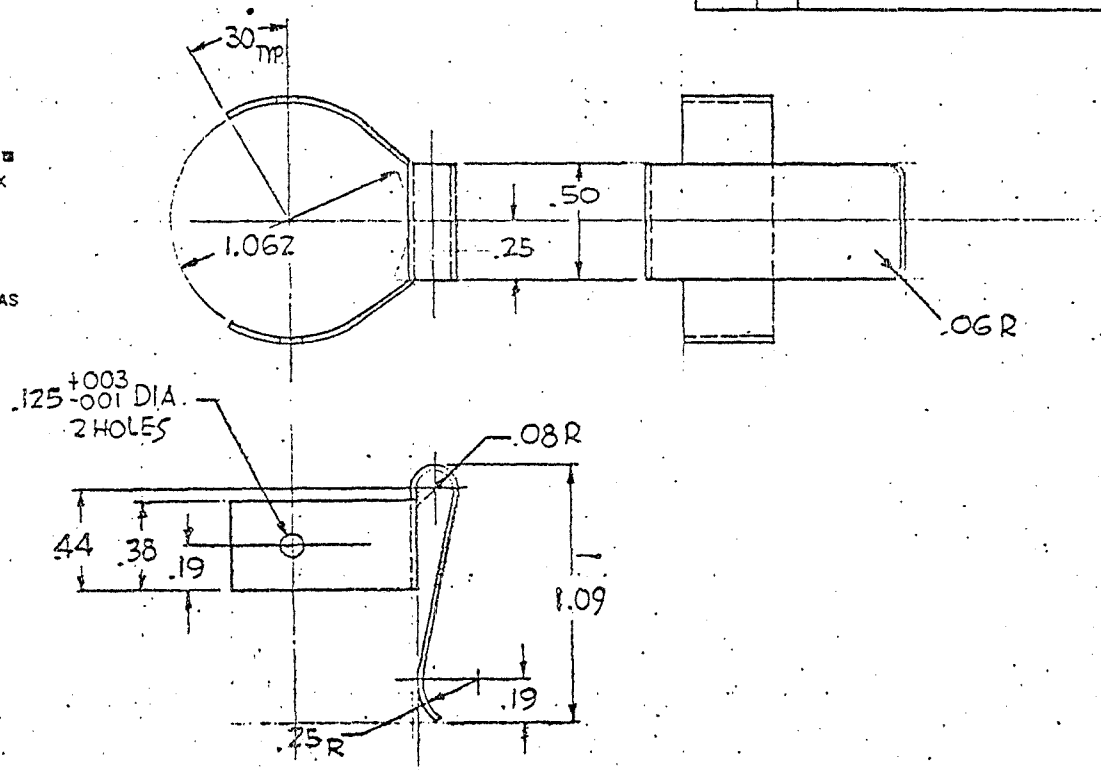
DRAWING NO. 2419645

PART OR IDENTIFYING NO.
2419645-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG DR-3301	11/17/77	

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125/ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



NEXT ASSY: 2419644	USED ON:	APPLICATION

UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES. TOLERANCES ON:
DECIMALS
2 PLACE ± .02 3 PLACE ± .010
4 PLACE ± ANGLES ±

MATERIAL .025 ANNEALED HIGH CARBON, SST. STEEL

FINISH HIGH LUSTER PER ASTM A177-67

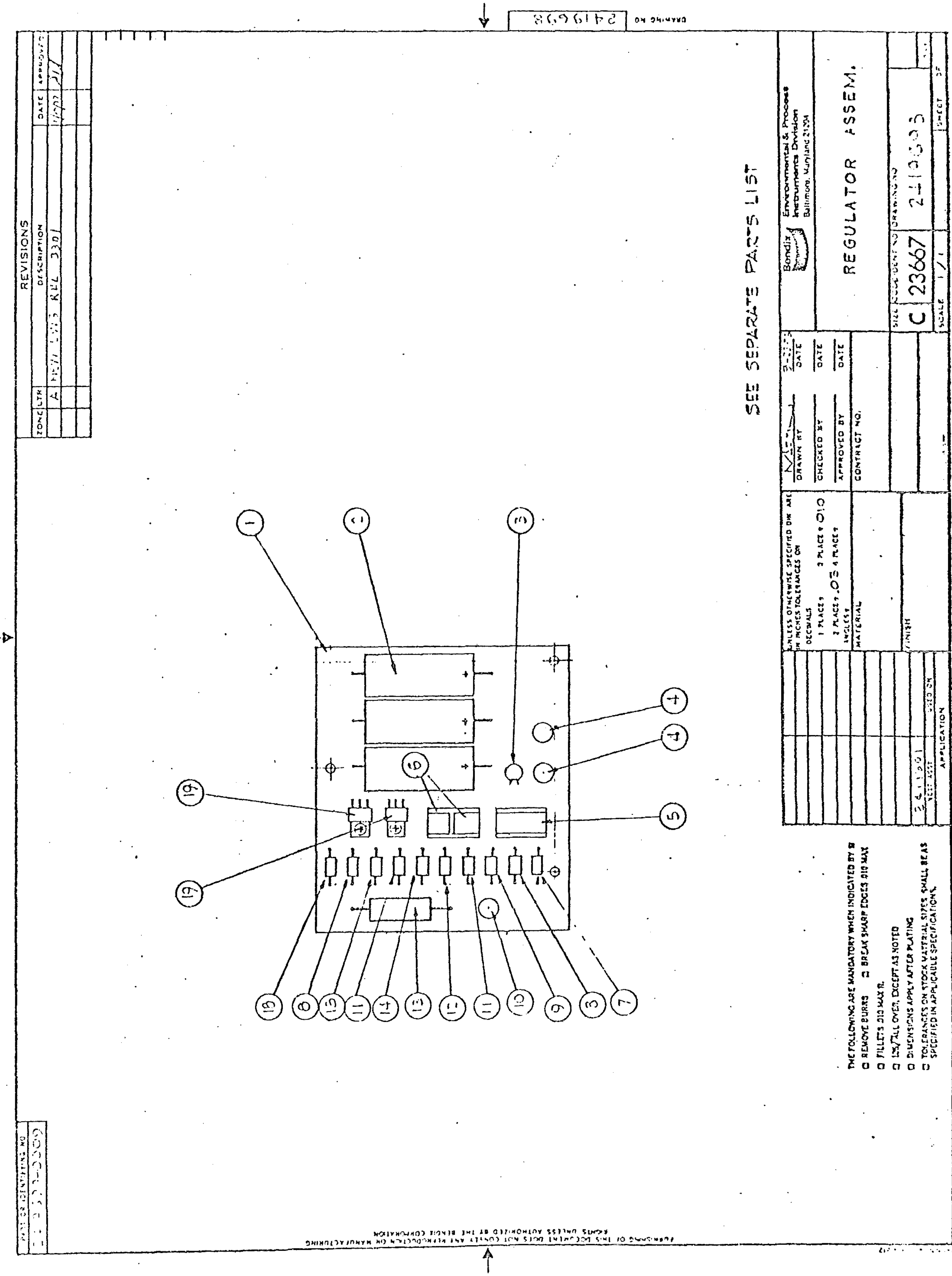
DRAWN BY	MARTIN	DATE 8-12-76
CHECKED BY		DATE
APPROVED BY		DATE
CONTRACT NO.		

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CLIP

SIZE	CODE IDENT NO.	DRAWING NO.
B	23667	2419645

SCALE 2/1 SHEET


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVED
SEE SEPARATE PARTS LIST
Bendix
Environmental & Process Instruments Division
Baltimore, Maryland 21204
REGULATOR ASSEM.
DRAWN BY
CHECKED BY
APPROVED BY
CONTRACT NO.
DATE
UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES TOLERANCES ON
DECIMALS
MATERIAL
FINISH
APPLICATION
C
23667
SCALE 1/1
SHEET
THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
REMOVE BURRS
BREAK SHARP EDGES .010 MAX.
DIMENSIONS APPLY AFTER PLATING
TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

PL 2419698-

SH 1 REV A

LIST TITLE REGULATOR ASSEM.

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ	SPECIFICATION OR CODE IDENT NO	NOTES
1	2419699-0001	BOARD	PC		1		
2	3BR-1000-25	CAPACITOR	PC		3	CORNELL-D	
3	3419-050E-103M	CAPACITOR	PC		1	AEROVOX	
4	2N753	TRANSISTOR	PC		2	TEXAS INST	1
5	CD4047AE	IC	PC		1	RCA	
6	MC1741	IC	PC		2	MOTOROLA	
7	RC07GF395J	RESISTOR	PC		1		
8	RC07GF221J	RESISTOR	PC		2		
9	RC07GF101J	RESISTOR	PC		1		
10	2N706	TRANSISTOR	PC		1	TEXAS INST	
11	RC07GF103J	RESISTOR	PC		2		
12	RN60C3322F	RESISTOR	PC		1	DALE	
13	V-146XR-7	CAPACITOR	PC		1	AEROVOX	
14	RN60C1132F	RESISTOR	PC		1	DALE	
15	1141975-905	WIRE	FT		AR		
16	RC07GF203J	RESISTOR	PC		1		
17	SN60WRAP2	SOLDER	LB		AR		
18	RC07GF753J	RESISTOR	PC		1		
19	2N995	TRANSISTOR	PC		2	ITT	
-							

PREPARED BY Martin 6-23-76 CHECKED BY _____ APPROVED BY _____

2414437-0001

PART OR IDENTIFYING NO.

2419699-001

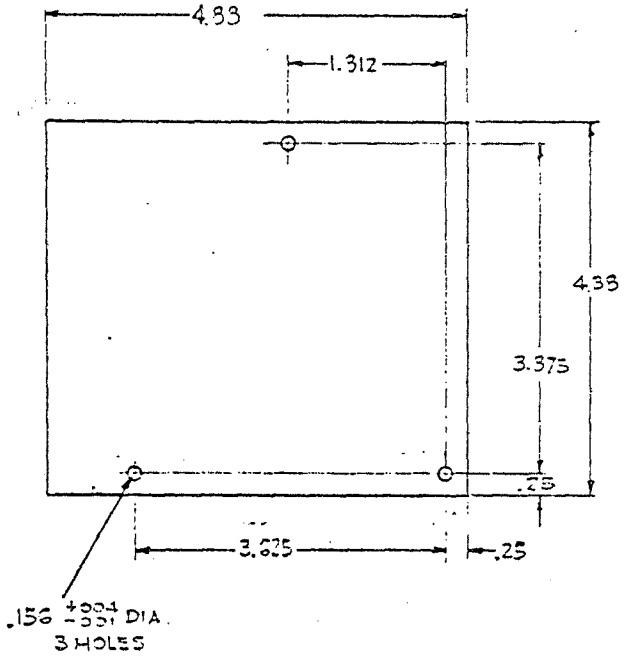
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG REL 3301	3/1/77	[illegible]

NOTES —

1- MATERIAL -

PRE-PUNCHED INSULATING BOARD
VECTOR ELECT. CO
P/N 169P79-062

.042 DIA. HOLES ON .100 CENTERS
EPOXY GLASS .062 THICK



42

DRAWING NO 2419699

THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
☐ FILLETS .010 MAX R.
☐ 125√ ALL OVER, EXCEPT AS NOTED
☐ DIMENSIONS APPLY AFTER PLATING
☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON
DECIMALS
1 PLACE ± | 3 PLACE ± .010
2 PLACE ± .03 | 4 PLACE ±
ANGLES ±

MATERIAL
NOTE 1

FINISH

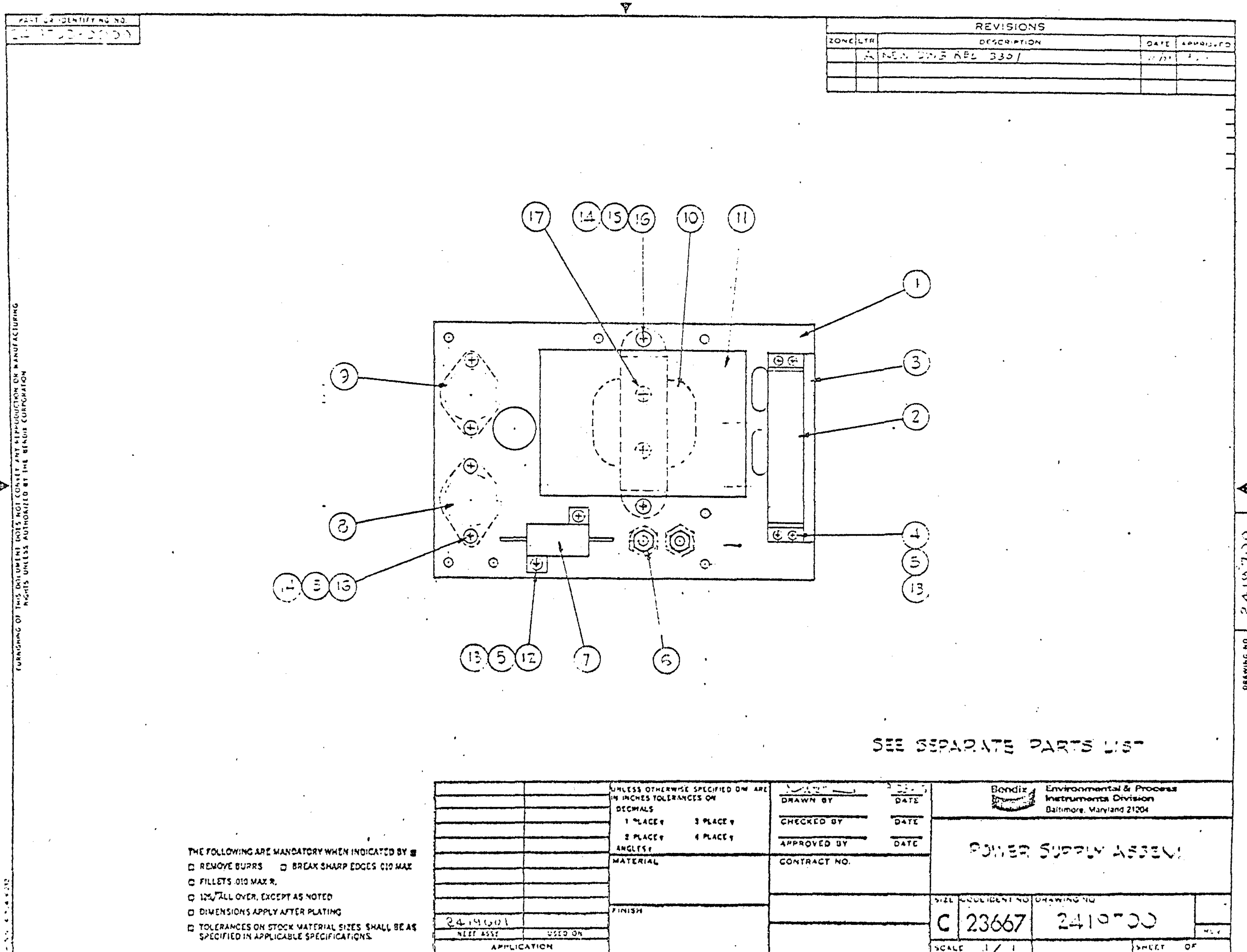
DRAWN BY | DATE
CHECKED BY | DATE
APPROVED BY | DATE
CONTRACT NO.

Bendix Environmental & Process Instruments Division
Baltimore, Maryland 21204

BOARD COMPONENT

SIZE	CODE IDENT NO	DRAWING NO
C	23667	2419699

SCALE 1/1 | SHEET OF


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVED
A NEW DWG REL 3351
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
SEE SEPARATE PARTS LIST
THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
□ REMOVE BURRS □ BREAK SHARP EDGES .010 MAX
□ FILLETS .010 MAX R.
□ 125/ALL OVER, EXCEPT AS NOTED
□ DIMENSIONS APPLY AFTER PLATING
□ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
2419601
NEXT ASSY USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON
DECIMALS
1 PLACE ±
2 PLACE ±
3 PLACE ±
4 PLACE ±
ANGLES ±
MATERIAL
FINISH
DRAWN BY DATE
CHECKED BY DATE
APPROVED BY DATE
CONTRACT NO.
Bendix Environmental & Process Instruments Division Baltimore, Maryland 21204
POWER SUPPLY ASSEM
SIZE C
CODE IDENT NO 23667
DRAWING NO 2419700
SCALE 1/1
SHEET OF
DRAWING NO 2419700
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INTERIM PARTS LIST

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CONTRACT NO 23667

RELEASE NO 3301

APPROVAL

SH REV

PL 2419700-0009

LIST TITLE POWER SUPPLY ASSEM.

ITEM OR FIND NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	UNIT OF MEAS	SUB PL	QU REQ 0000	SPECIFICATION OR CODE IDENT NO	NOTES
1	2419701-0001	PLATE	PCK		1		
2	410-111	BLOCK	PC		1	KULKA	
3	MS410-11-XP	MARKER	PC		1		
4	MS51957-17	SCREW	PC		4		
5	MS35649-244	NUT	PC		6		
6	1N342	DIODE	PC		2	TEXAS INST	
7	RH-25	RESISTOR	PC		1	DALE	
8	F7012K	TRANSISTOR	PC		1	FAIRCHILD	
9	LM309K	TRANSISTOR	PC		1	NATIONAL	
10	C1-752	TRANS	PC		1	CALECTRO	
11	MOD 902	POWER SUP	PC		1	ANALOG DEV	
12	MS51957-14	SCREW	PC		2		
13	MS35338-135	LOCKWASHER	PC		6		
14	MS51957-27	SCREW	PC		6		
15	MS35649-264	NUT	PC		6		
16	MS35338-136	LOCKWASHER	PC		6		
17	MS51959-27	SCREW	PC		2		
18	114197S-905	WIRE	FT		AR		
19	SN60WRAP2	SOLDER	LB		AR		

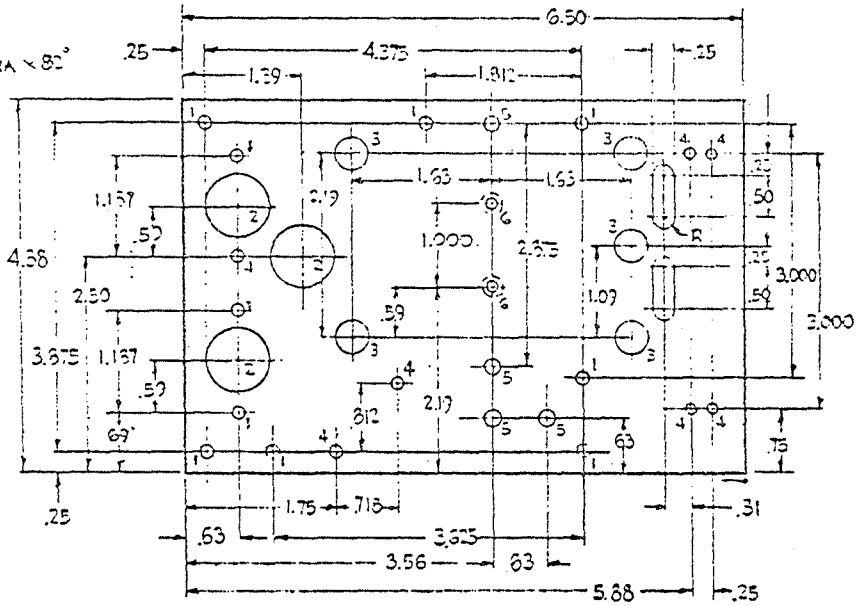
PREPARED BY A. Acton 9-23-76 CHECKED BY ____ APPROVED BY ____

2416437-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW PER REL 3301	[illegible]	

NOTES —

1. HOLE SIZES:
   1- .156 +.004 −.001 DIA. 11 HOLES
   2- .750 ±.010 DIA. 3 HOLES
   3- .375 ±.005 DIA 5 HOLES
   4- .125 +.003 −.001 DIA 6 HOLES
   5- .209 +.004 −.001 DIA 4 HOLES
   6 .125 +.004 −.001 DIA & .218 DIA × 82° C'SK 2 HOLES



THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
- ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
- ☐ FILLETS .010 MAX R.
- ☐ 125/ ALL OVER, EXCEPT AS NOTED
- ☐ DIMENSIONS APPLY AFTER PLATING
- ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

NEXT ASSY	USED ON
2419750	
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON
DECIMALS
1 PLACE ± 3 PLACE ± .010
2 PLACE ± .03 4 PLACE ±
ANGLES ±

MATERIAL SHEET ALUMINUM ALLOY 5052-H34

FINISH GOLD IRIDITE

DRAWN BY — DATE
CHECKED BY — DATE
APPROVED BY — DATE

CONTRACT NO.

Bendix Environmental & Process Instruments Division
Baltimore, Maryland 21204

PLATE, POWER SUPPLY.

SIZE	CODE IDENT NO	DRAWING NO
C	23667	2419701

SCALE 1/1 SHEET OF

DRAWING NO. 2419701

45

DRAWING NO. 2419763

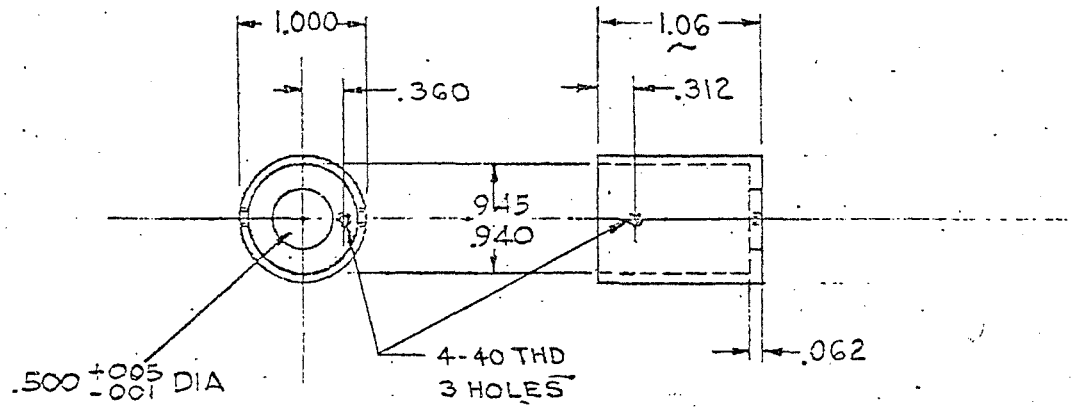
PART OR IDENTIFYING NO.
2419763-0001

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	NEW DWG REL 3301	11-2-71	

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125√ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



2419764	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON:
DECIMALS
2 PLACE ±.03 3 PLACE ±.010
4 PLACE ± ANGLES ±

MATERIAL ALUMINUM ROD ALLOY 2014-T3

FINISH CLEAR ANODIZE

DRAWN BY	Martin	10-27-71 DATE
CHECKED BY		DATE
APPROVED BY		DATE
CONTRACT NO.		

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

CAP, MICROPHONE

SIZE	CODE IDENT NO.	DRAWING NO.
B	23667	2419763

SCALE 1/1 SHEET

DRAWING NO. 2419864

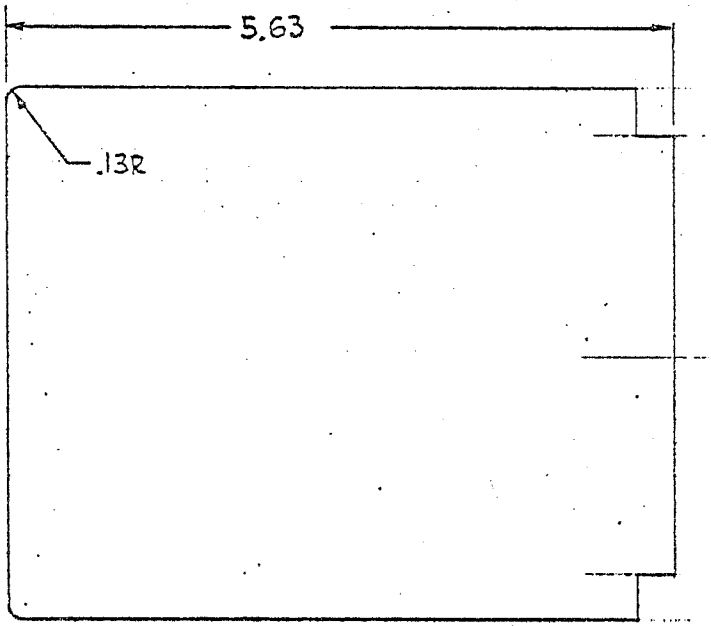
PART OR IDENTIFYING NO.
2419864-0001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE NO DR 3301	11/17/75	BTS

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☐
   - ☐ REMOVE BURRS
   - ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125√ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

2 - MATERIAL -
SUGGESTED SOURCE OF SUPPLY -
VECTOR ELECT. CO
SYLMAR, CALIFORNIA.
P/N 3719-1



NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON.
DECIMALS
2 PLACE ± 3 PLACE ±
4 PLACE ± ANGLES ±

MATERIAL: NOTE 2

FINISH

DRAWN BY	MARTIN	11-1-75 DATE
CHECKED BY		DATE
APPROVED BY		DATE
CONTRACT NO		

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

BOARD MODIFIED, VECTOR

SIZE	CODE IDENT NO	DRAWING NO
B	23667	2419864

SCALE 1/1 SHEET

DRAWING NO. 2419867

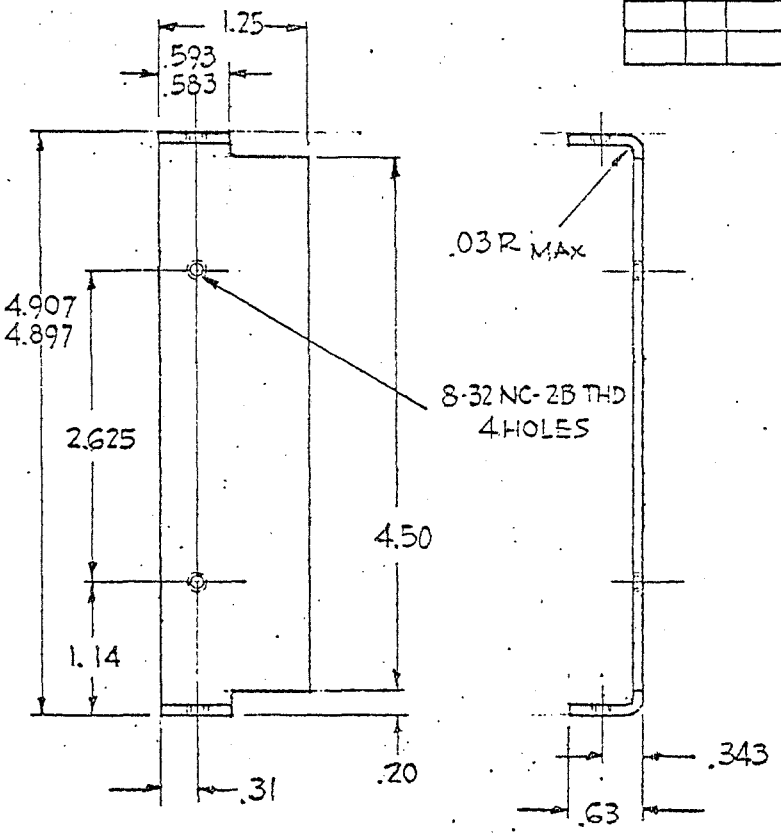
PART OR IDENTIFYING NO.
2419367-0001

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE N° DR 3301	11/22/77	

NOTES:

1. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☒ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ 125 √ ALL OVER, EXCEPT AS NOTED
   - ☒ DIMENSIONS APPLY AFTER PLATING
   - ☒ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.



NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES TOLERANCES ON
DECIMALS
2 PLACE ±.03 3 PLACE ± .010
4 PLACE ± ANGLES ±

MATERIAL .091 SHT ALUM ALLOY 5052-H32

FINISH GOLD IRIDITE

MARTIN 11-1-76
DRAWN BY DATE
CHECKED BY DATE
APPROVED BY DATE
CONTRACT NO

The Bendix Corporation
Environmental Science Division
Baltimore, Maryland 21204

BRACKET, CONNECTOR

SIZE	CODE IDENT NO	DRAWING NO
B	23667	2419367

SCALE 1/1 SHEET