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# Macromodular Computer Design, Part 2, Volume 07, Faceplate Specifications

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MACROMODULAR  
COMPUTER DESIGN  
PART 2  
MANUFACTURING DESCRIPTION

VOLUME VII  
FACEPLATE SPECIFICATIONS

*Technical Report No. 36*

FINAL REPORT - FEBRUARY, 1974  
CONTRACT SD-302 (ARPA)  
COMPUTER SYSTEMS LABORATORY  
WASHINGTON UNIVERSITY  
ST. LOUIS, MISSOURI

MACROMODULAR COMPUTER DESIGN  
FINAL REPORT - CONTRACT SD-302  
FEBRUARY, 1974

**Technical Report No. 36**

PART 2 - MANUFACTURING DESCRIPTION -  
VOL. VII-FACEPLATE SPECIFICATIONS

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Computer Systems Laboratory  
Washington University  
St. Louis, Missouri

ABSTRACT

Specifications for the construction of Macromodular Faceplate Box assemblies are contained in this report. Also included are all electrical and mechanical specifications for common subassemblies. Certain general assembly techniques are specified.

INDEX

GENERAL FACEPLATE SPECIFICATIONS  
PAGES 300.0-1 thru 300.0-16

1-CELL FPB SHELL  
PAGES 300.1-1 thru 300.1-19

2-CELL FPB SHELL  
PAGES 300.2-1 thru 300.2-8

FACEPLATE BOX VISCERA PARTS  
PAGES 300.5-1 thru 300.5-28

V-BUS SUBASSEMBLY  
PAGES 300.6-1 thru 300.6-4

FUNCTION CODE SWITCH SUBASSEMBLIES  
PAGES 300.7-1 thru 300.7-5

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**300.0**

**GENERAL FACEPLATE SPECIFICATIONS**

PAGE	TITLE	CHANGE
300.0-1	TITLE PAGE	G
300.0-2	INTRODUCTION	C
300.0-3	OUTLINE OF FACEPLATE DOCUMENTATION	B, D
300.0-4	MANUFACTURERS AND PART NUMBERS	B
300.0-5 thru 300.0-13	GENERAL FACEPLATE BOX WIRING SPECIFICATIONS	A, E, F, G
300.0-14	ASTRO 348 COMPONENT IDENTIFICATION	F
300.0-15	REAR CONNECTOR ORIENTATION AND PIN NUMBERING	
300.0-16	CONTACT INSERTION FIXTURE	

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISSUE	0047	10-8-70	<i>SCJ</i>	E	0249	1-24-72	<i>A.??</i>				
A	0056	10-15-70	<i>SCJ</i>	F	0256	2-22-72	<i>WAB</i>				
B	0059	10-20-70	<i>WAB</i>	G	0277	12-7-72	<i>SCJ</i>				
C	0136	12-29-70	<i>SCJ</i>								
D	0235	12-13-71	<i>SCJ</i>								

GENERAL SPECIFICATIONS FOR MANUFACTURE  
OF MACROMODULAR FACEPLATE BOXES

I. Introduction:

The Macromodular Faceplate Box is a connector and wire harness assembly encased in a mechanically functional shell. The shell supports the connectors and protects the wiring, while providing a modular quick-connect-disconnect facility. The wiring harness serves to interconnect a set of general, system wide connectors to a set of connectors which are specific to the function being performed.

The complete manufacturing specifications are contained in a system of documents as outlined on the next page.

II. The 300.0 Document

This document contains general information concerning workmanship, standards, and explanations of notation used in the various manufacturing descriptions.

On many drawings, specific components are called out by name--such as V-Bus Connector. These names are correlated with specific manufacturers, part numbers, and/or drawings in a table on page 300.0-4.

Other relevant specifications (such as CAS-5) are contained in document 010 (General Standards).

OUTLINE OF FACEPLATE DOCUMENTATION

DOCUMENT	SUBJECT
300.0	General Specifications
300.1	Single Height Shell
300.2	Double Height Shell
300.3	Triple Height Shell
300.4	Quadruple Height Shell
300.5	Faceplate Box Viscera Parts
300.6	V-Bus Subassembly
300.7	Code Switch Subassembly
-	} Other general sub-assemblies to be added as they are designed.
-	
-	
301	Type One Faceplate Box
302	Type Two Faceplate Box
303	Type Three Faceplate Box
304	Type Four Faceplate Box
305	Type Five Faceplate Box
-	} Other specific faceplate boxes to be added as they are designed.
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ISSUE 0047 10-8-70  
 B 0059 10-20-70

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MANUFACTURERS AND PART NUMBERS

CSL NAME	IDENTIFICATION
FPB Rear Connector	} AMP 3-202844-5 Box Contact } Connector (AMP 750 Series) 90 Pin
V-Bus Connector	AMP 1-202844-1 Box Contact Connector (AMP 750 Series) 90 Pin
Coaxicon Ferrule	AMP 329055 Twin Standard Coaxicon AMP 329056 Shield Ferrule for Twin Std. Coaxicon
Code Switch	Honeywell Microswitch 3SX1-T
ASTRO 348 Rear Nut ASTRO 348 Contact Retention Disc ASTRO 348 Inter- facial Seal ASTRO 348 Receptacle shell	} Amphenol Connector Division } ASTRO 348-20E14-37P1 (201)
ASTRO 348 Male Contact Retention Grommet	Amphenol ASTRO 348-100-5000P-02 Amphenol 169-254 Viton O-ring.
Vlier Spring Plunger	Vlier NS51N Spring Plunger Vlier Manuf. 8900 Santa Monica, L.A. Calif. 130 OHM 5% 1/8Watt Carbon Composition Resistor Allen Bradley Type BB
R6	

ISSUE	0047	10-8-70	<i>907</i>
B	0059	10-20-70	<i>add</i>
D	0235	12-13-71	<i>7175</i>

# GENERAL FACEPLATE BOX WIRING SPECIFICATION

## I. Introduction

This document describes specifications and techniques which are common to the several types of faceplate box wiring subassemblies.

## II. Workmanship

These assemblies use sub-miniature connectors, small gauge wire, and small hardware. Some care is therefore necessary to protect the individual parts as they pass from one assembly operation to the next.

Soldering technique must be carefully supervised. All connections are to be made with a temperature controlled iron (600° F) such as the Weller W-TCP. The solder used shall have a nominal composition of 60% Tin and 40% Lead. All flux residues must be removed, and the residues from Chlorinated Hydrocarbon cleaners must also be removed to prevent corrosion of the connector contacts.

Other areas of workmanship standards will be covered in later sections of this specification.

## III. Wiring Lists

The connections in a faceplate box wiring subassembly are detailed by a point to point wiring list. The wiring lists have symbols which separate individual copper paths and delimit pairs of copper paths which are to be wired with a single twisted pair.

ISSUE	0047	10-8-70
A	0056	10-15-70

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*rcj*

Component pin numbers are represented in the following manner:

(Pin Number) (Component Type) (Component Number)

Example: 31A3 is pin 31 of connector A3, connector A is an AMP Box Connector and it is in position three. The various component types will be individually explained in later sections.

The symbol # appearing in the margin identifies a copper path. All connection points between two (#) symbols are to be connected together.

Example: #  
1A3  
3G7 [Blue  
3G8 [Blue  
#

The example represents a single blue wire which is connected from pin 1 of connector A3 to pin 3 of Connector G7. In addition a single blue wire is connected from 1A3 to 3G8. The three connection points and two wires represent one copper path.

Much of the wiring is in the form of color-coded twisted pairs. Two copper paths appearing between the row of symbols (>>>>>>>>>>) are wired with one pair.



combinations. This wire was made by Brand Rex and is described in CSL document CAS-5.

All wires used in the wiring subassembly shall be 6.500 ± .250 inches long before stripping and termination. The stripping dimensions for any given wire or pair are given for each individual type of termination in later sections of this document.

All wires shall be stripped with an automatic mechanical stripper. The stripped wire shall be smooth, straight, and free from nicks, scratches or mechanical deformation.

It is important that the twisted pairs remain twisted with the original lay length. For the long lay pairs such as (Yellow-Slate) it is permissible to give the ends of the pair an extra twist to prevent unravelling.

#### V. Resistors

Resistors are considered to have two leads, and a unique number is assigned to each lead. The resistors are numbered as follows:

Example:

1R601

2R601

1. First numeral -- indicates lead one or lead two of one resistor.
2. Letter R ----- indicates that component is a resistor.
3. Single numeral (6) -- Indicate type of resistor.  
(6) represents a 130 ohm 1/8 watt 5% carbon composition resistor.

4. Two digit number (01) -- Sequence number of component, may run from 01 to 99.

The following sequence from a wiring list will serve as an example:

```
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

1D1   Red

1R601

#

2D1   Slate

2R601

#

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

This directs that the first 130 ohm resistor (R601) be connected from pin 1 of connector D1 to pin 2 of connector D1. The color code may be ignored, and teflon sleeving shall be used to insulate the exposed leads.

VI. Rear Connectors

The components designated by an A on the wiring lists (A3, A4) are AMP 750 SERIES BOX CONTACT CONNECTORS, AMP Catalog 941.

Wires which are terminated to the AMP 3-202844-5 are to be stripped .125 ± .031 inches. The bare end of the wire is to be fed into the terminal tail and bent over 180° with the insulation resting in the U shape of the terminal. The wire is to be soldered, and no solder shall wick into the contact.

The solder meniscus shall not extend past the square perforation nearest the connector body. The solder joint shall be visually inspected before the following step is executed.

The joint shall be cleaned and covered by a tight fitting peice of polyolefin shrink tubing. The shrink tubing shall be .300 to .350 inches long.

The pin numbering stencilled on the connector block must be IGNORED. The pin numbers are defined on Drawing 300.0-15.

#### VII. ASTRO 348 Connectors

The connectors identified with a D on the wiring lists are members of the Amphenol ASTRO-348 family. The 14-37 configuration shown in this document is a special version with some of the environmental sealing parts left out. In the future, a standard version of this connector will probably be used, so the differences are noted here to avoid obsolescence of the documentation. The standard bulkhead connector has the part number 348-40E14-37P1.

The standard connector can be installed by following the instructions in the Amphenol ASTRO-348 Technical Manual. The special connector documented here [Amphenol ASTRO 348-20E14-37P1 (201) Mod.] has a clear chromate finish instead of the standard olive drab. The modified connector has an unswaged rear nut and contact retention disk, so all parts are handled

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F	0256	2-22-72	WAT

separately as shown later in document 300.0. The modified connector does not have the silicone rubber insert in the rear nut, so the pin numbers must be read from the front.

The modified connector shall be assembled in the following sequence:

1. Mount the receptacle shell on the faceplate with the standoffs (Dwg. 300.5-4) and fillister head 2-56 screws.
2. Crimp the contacts per instructions given below, and insert the contacts into the contact retention disc, using a simple holding fixture to support the disc.
3. Apply an interfacial seal, insert the disc assembly into the receptacle shell, and hand tighten the rear nut. A picture on a later page identifies the individual parts.

Wires for these connectors shall be stripped 0.125--0.150 inches. The tight stripping tolerance is necessary to insure that the insulation will tuck into the rear sleeve of the contact for mechanical support. The wires are crimped into the ASTRO-348 contacts using a Buchanan No. 612596 hand tool with contact locator Buchanan No. 613381. Equivalent automatic tooling is preferable. Crimp settings of (2) have proved satisfactory with two hand tools, but tool variability requires that some tests be made before a production setting is adopted. The test criterion is that the crimped joint shall have 70% of the tensile strength of the wire being crimped.

The yellow wire to pin 5 of the D connectors and the green wire to pin 29 may be combined into a yellow-green twisted pair. If this is not done, a single blue wire should be used on pin 29.

CHG.	F.C.N.	DATE	APPR.
F	0256	2-22-72	<i>AKS</i>
G	0277	12-7-72	<i>DCJ</i>



### VIII. Amp Coaxicon Connectors

The connectors identified by a G in the wiring list are versions of the Amp Twin Standard Coaxicon. The pins are 1, 2, and 3 as follows:

Pin 1 Opposite Small Port - I on Plastic Insert

Pin 2 Opposite Large Port - II on Plastic Insert

Pin 3 Wire inserted under shield ferrule

All wires for this connector are stripped 0.250 inches  $\pm$  .031 inches. The wires are crimped using Amp crimp die 69231-2 in hand tool 45707-2 or pneumatic tool 69365-2. The wires must be carefully held during the crimp cycle to prevent slippage. These connectors are press fit with an arbor press after crimping.

The orientation of these connectors is important, and is noted on each faceplate, see 301-9 for example.

### IX. Code Switches

The Honeywell Microswitches (indicated by an S in the wiring lists) are wired with single Kynar-insulated wires which are stripped 0.250  $\pm$  .031 inches. The wires are wrapped around the turret terminals of the switches and soldered. All solder flux must be removed and this assembly must be handled carefully to prevent breakage of the fine wires.

The switch orientations and pin numbering are shown in document 300.7.

NO.	P.C.O.	DATE	APPR.
E	0249	1-25-72	NTK.

X. Electrical Testing

After the wiring subassembly has been fully assembled into the metal shell, suitable adapting connectors shall be mated with the appropriate front and rear connectors of the faceplate box and the following electrical tests shall be performed.

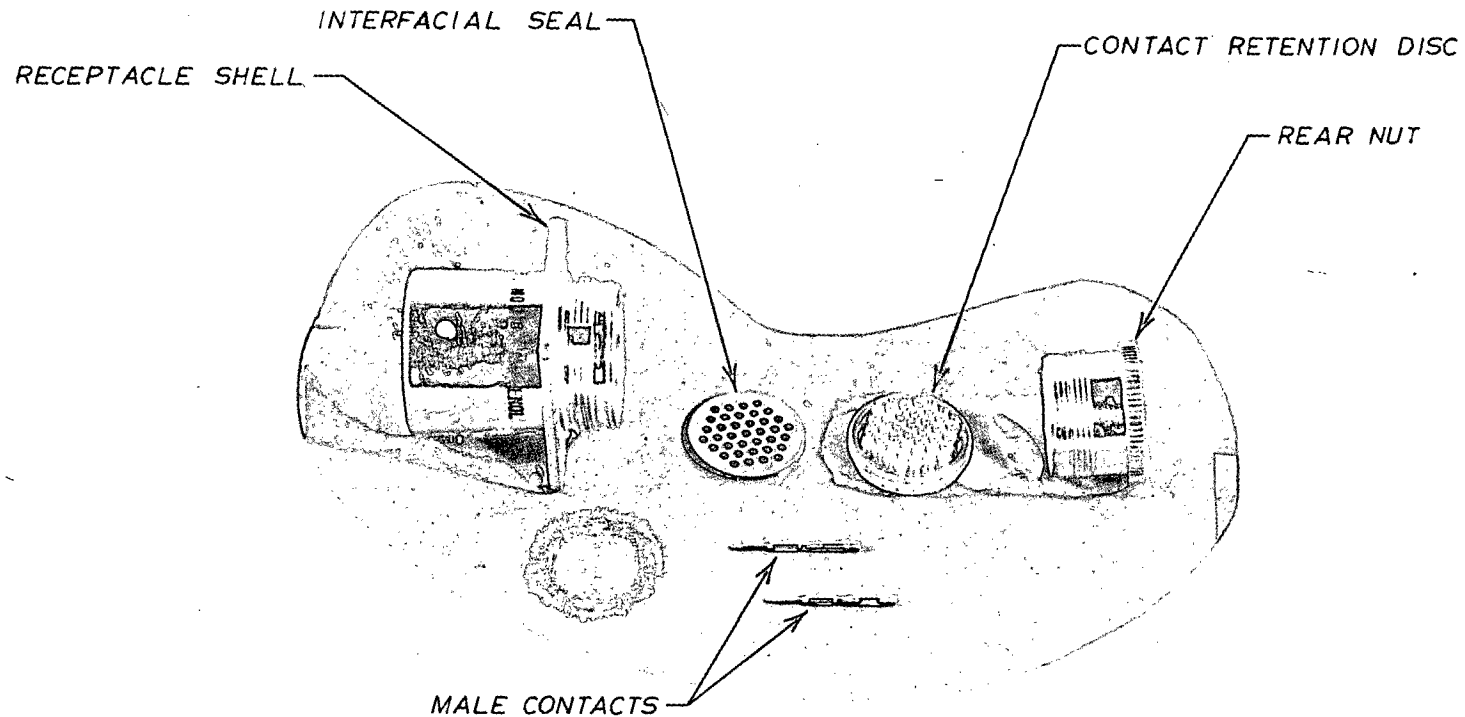
1. Continuity:

All copper paths called out on the wiring list for the type under test shall be verified to have a resistance of less than one-half ohm.

2. Shorts:

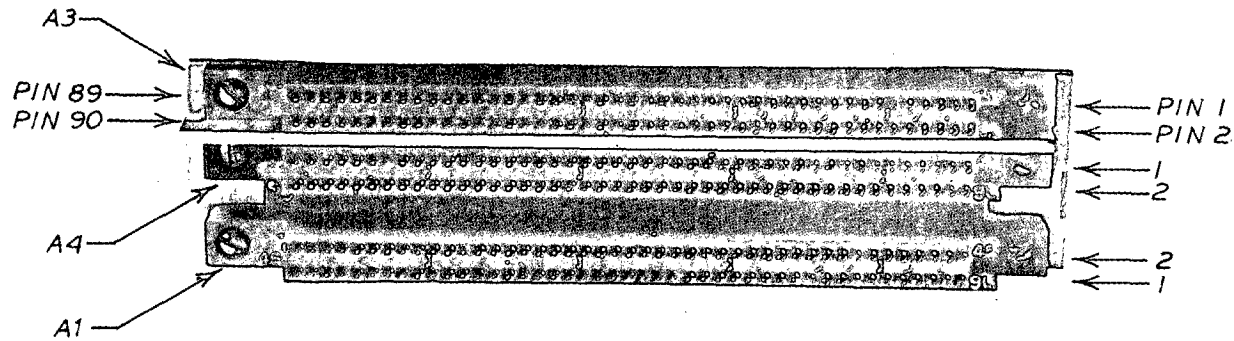
Each copper path shall be isolated from all other copper paths by a resistance greater than one megohm. Ground wires are an exception to this requirement since they are not grouped into an explicit copper path. Therefore, all wires to pin 3 of the AMP Coaxicon, and the 6 inch wires with ground lugs will be common to each other and the metal shell.

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ISSUE	0047	10-8-70	gcj
C	0136	12-29-70	gcj



CONNECTOR  
348 20E14-37PI (201) SPECIAL

		<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE <b>ASTRO 348 COMPONENT IDENTIFICATION</b>	
F	2/22/72	E.C.O. 0256 <i>wab</i>		APPROVED	
ISSUE	10-8-70	E.C.O. 0047 <i>gef</i>		BY	FOR
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		<b>MACROMODULAR PROJECT</b>		<i>gef</i>	PROD
				5-23-70	
				CHECKED	DATE
				<i>gef</i>	5-22-70
				ENG. <b>GCJ</b>	DRAWING NO. <b>300.0-14</b>
				DRAWN BY <b>PLL</b>	



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TITLE  
**REAR CONNECTOR ORIENTATION AND PIN NUMBERING**

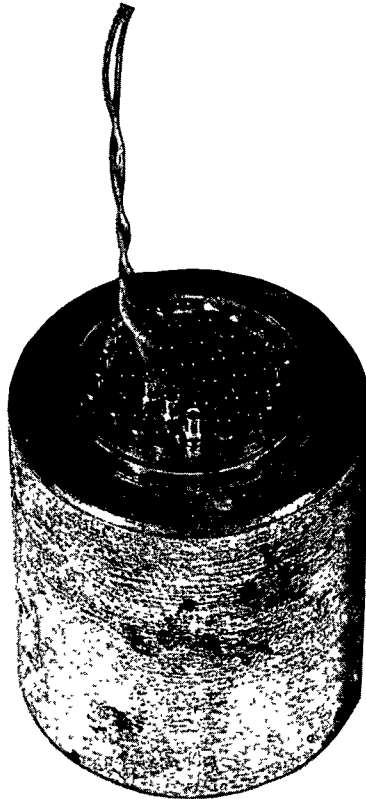
**MACROMODULAR PROJECT**

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<i>907</i>	<i>PRDP</i>	<i>5-23-70</i>

ENG. <i>RCJ</i>
DRAWN BY <i>PIJ</i>
CHECKED <i>907</i>

DRAWING NO.  <b>300.0-15</b>
DATE  <i>5 22 70</i>

CHANGE NO.	DATE	DESCRIPTION
<b>ISSUE</b>	<b>10-8-70</b>	<b>E.C.O. 0047</b> <i>907</i>



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			TITLE CONTACT INSERTION FIXTURE				
			APPROVED			ENG GCJ	DRAWING NO
			BY GCJ	FOR PROD.	DATE 10-7-70	DRAWN BY DHO	300.0-16
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**300.1**

1-CELL FPB SHELL

PAGE	TITLE	CHANGE
300.1-1	TITLE PAGE	H
300.1-2	1-CELL FPB SHELL PARTS LIST	A
300.1-3 300.1-4	ONE CELL FACEPLATE BOX MANUFACTURE AND SPECIFICATIONS	
300.1-5	1-CELL EAR	G
300.1-6	STRUT PAIR	B
300.1-7	COVER PLATE PAIR	
300.1-8	OVERLAY CLIP	H
300.1-9	CLIP REINFORCEMENT BAR	
300.1-10	PIVOT BRACKET	
300.1-11	RAIL SLIDE	D
300.1-12	RAIL SLIDE SPRING	A
300.1-13	EAR SPRING	A, E
300.1-14	STRUT PAIR SUBASSEMBLY	F
300.1-15	ASSEMBLY-INSPECTION DRAWING OVERLAY CLIP BEND AT ASSEMBLY	
300.1-16	ASSEMBLY-INSPECTION DWG. EAR AND SHIM REPLACEMENT	
300.1-17	ASSEMBLY-INSPECTION DWG. OVERLAY CLIP ASSEMBLY	
300.1-18	ASSEMBLY-INSPECTION DWG. STRUT AND COVER PLATE ASSEMBLY	C
300.1-19	1-CELL FPB SHELL ASSEMBLY	G

CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR.
ISSUE	0065	10-23-70	RJA	E	0163	3-16-71	RJA				
A	0069	10-26-70	RJA	F	0236	12-11-71	TR				
B	0073	10-30-70	RJA	G	0239	12-21-71	RJA				
C	0084	11-18-70	RJA	H	0283	1-12-73	RJA				
D	0145	1-7-71	RJA								

# 1-CELL FPB SHELL PARTS LIST

QTY.	C.S.L. DOC.	PART
2	—	VLIER #NS-51N SPRING PLUNGER
4	—	3/32 X 1.4 CADMIUM PLATED ROLL PIN
14	—	2-56 X 1.4 FLATHEAD SOCKET CAP SS SCREW
2	300.1-5	1 CELL EAR
1	300.1-6	STRUT PAIR
1	300.1-7	COVER PLATE PAIR
2	300.1-8	OVERLAY CLIP
2	300.1-9	CLIP REINFORCEMENT BAR
2	300.1-10	PIVOT BRACKET
2	300.1-11	RAIL SLIDE
2	300.1-12	RAIL SLIDE SPRING
2	300.1-13	EAR SPRING

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISSUE	0055	10-23-70	<i>RJA</i>								
A	0057	10-26-70	<i>RJA</i>								

ONE CELL FACEPLATE BOX  
MANUFACTURE AND SPECIFICATIONS

The intent of this document (300.1) is to set forth manufacturing and assembly specifications for parts relating to the faceplate box (FPB). In addition, options are presented for fabrication techniques employed in component manufacture. To this end, the following has been broken into two sections--section one deals with individual components of the faceplate box, while section two treats assembly specifications that must be met for acceptable units. Sections one and two are related by the fact that adherence to component tolerance specifications should result in acceptable assemblies. The manufacturer must assure himself of this by analysis of component and assembly documentation, his tooling and characteristics of his production processes.

Component Manufacture

From experience gained in limited production of faceplate components, certain parts have identified themselves as candidates for alternative manufacturing processes.

One of the most critical parts in the faceplate box assembly is the cell ear. This part serves the function of retaining the faceplate box in a frame cell while forces are applied that tend to push it out. In order that this function be served, the 75° angle of the ear fingers must be carefully controlled in manufacture. Two methods of fabrication have been indicated on drawing no. 300.1-5. Option 1 involves a bending process to change by 15° a machined right angle corner. Option 2 employs a machining process that generates the desired 75° angle. Either method is acceptable as long as the specified tolerances are maintained.

ISSUE 0065

10-23-70

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Drawing no. 300.1-7 is the cover plate pair. These covers are formed from .090 thick aluminum stock. The 90° angles at the corners indicate zero radius bends. This restriction may be relaxed somewhat as long as this corner does not interfere with the .015 break on the strut pair corners (drawing no. 300.1-6). In addition, the countersink for the 2-56 flat head screws on the covers must be deep enough to completely recess the heads if the outside bend radius is increased.

### Assembly Specifications

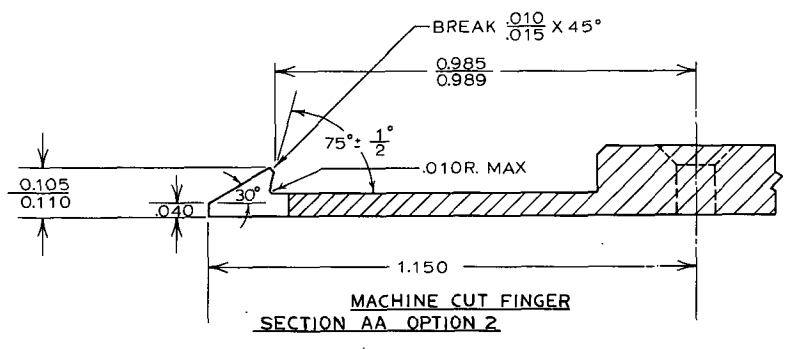
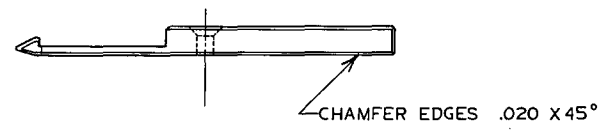
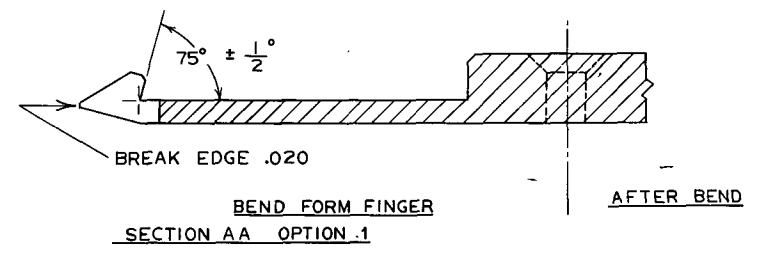
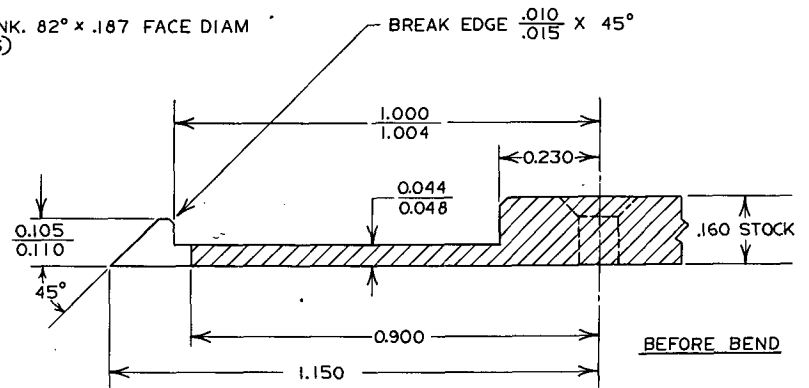
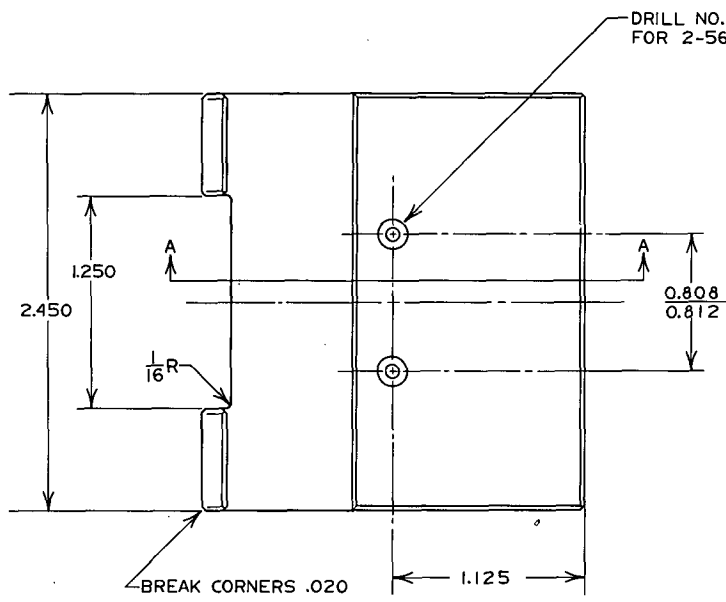
Drawings 300.1-15, 300.1-16, 300.1-17, and 300.1-18 are various views of assembled faceplate box components. These drawings indicate maximum and minimum finished dimensions as well as assembly techniques to be applied in manufacture.

Drawing 300.1-18 is the rear view of the strut pair and cover plate pair assembled. The slot width formed by the space between upper and lower covers should be inspected at the connector end of the box due to the fact that this slot tapers somewhat toward the overlay clip which is retained by the covers.

A section through the front of a complete box appears in drawing 300.1-17. This drawing indicates assembled dimensions of the overlay clip with respect to the strut end.

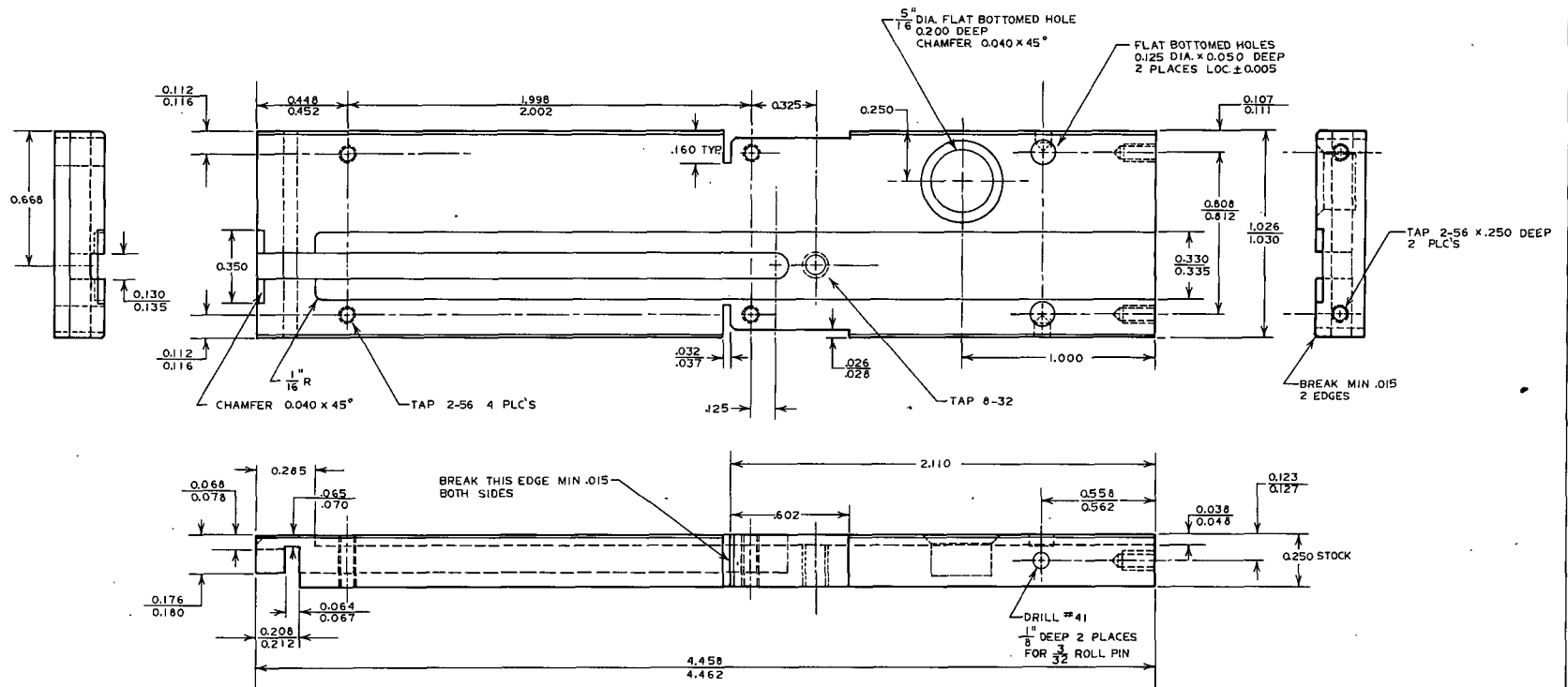
The ear placement on the finished box is critical to the proper functioning of the box. It is therefore necessary to insure finished ear placement dimensions and tolerance. Drawing 300.1-16 shows the required spacing between ears on a completed box. This dimension may be controlled by the addition of brass shims between the pivot bracket and ear. Shim size is indicated on this same drawing.

ISSUE	NO.	DATE	BY
0065		10-23-70	RJA



MATERIAL: .160 ALUM. 2024-T351  
 DIMENSIONS: ± .005 U.Q.N.  
 FINISH: CSL SPEC. MF I

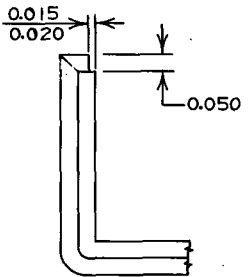
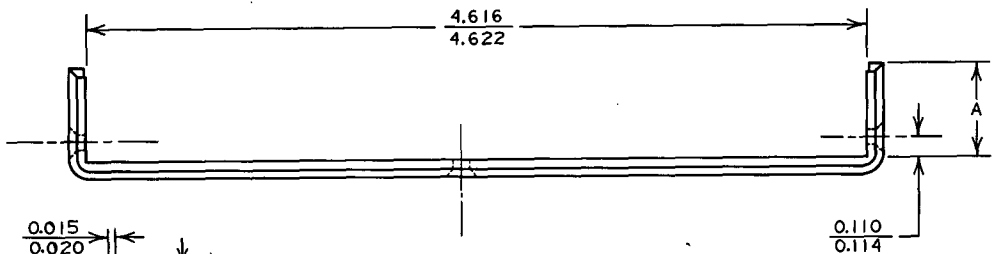
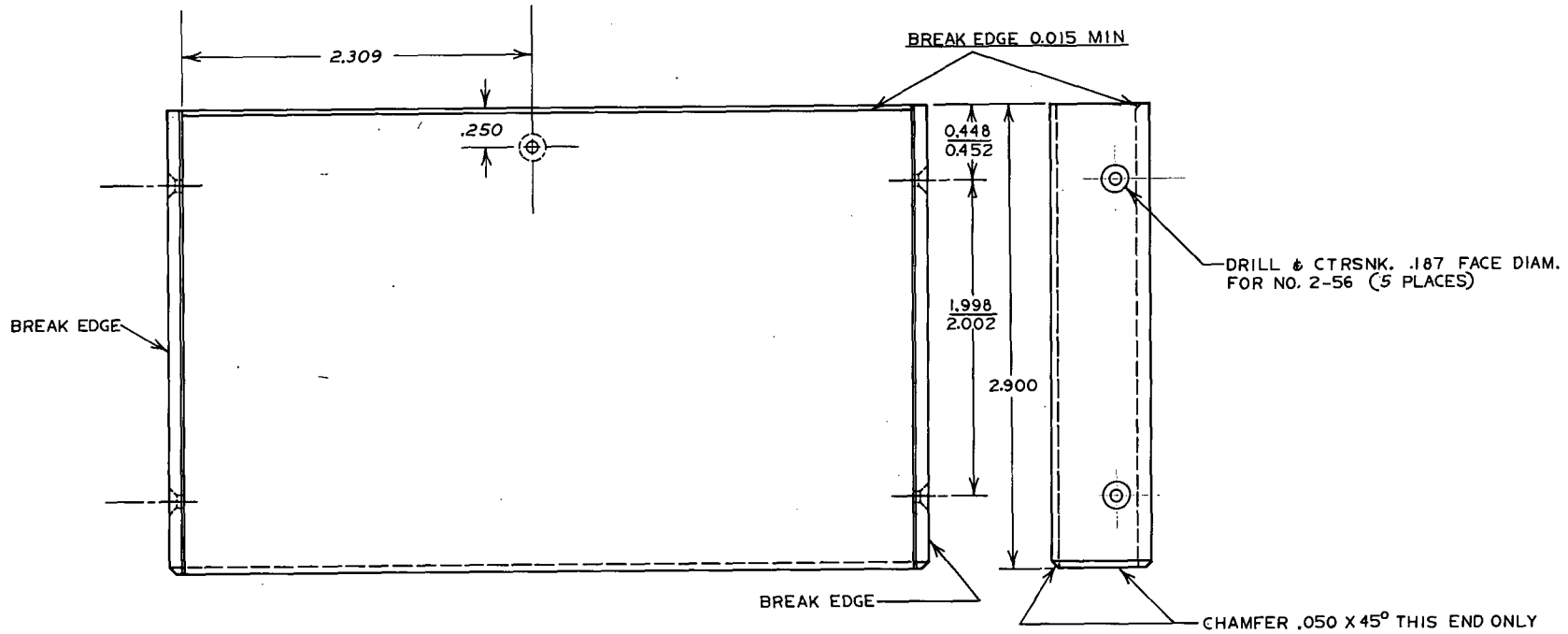
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ISSUE	10-22-70	E.C.O. 0065 RJA
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<b>MACROMODULAR PROJECT</b>		
TITLE I-CELL EAR		
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WAC	PLL	2-5-70
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WAC	5-8-70	
DRAWING NO.	300.1-5	



0.250 ALUMINUM - 6061-T6  
1 LEFT HAND REQ'D.  
1 RIGHT HAND REQ'D.

ALL DIMENSIONS ± .005 U.O.N.  
FINISH: CSL SPEC. MF 1

REV	DATE	DESCRIPTION
B	10-30-70	E.C.O. 0073 AJA
ISSUE	10-22-70	E.C.O. 0065 AJA
CHANGE NO.	DATE	DESCRIPTION
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
MACROMODULAR PROJECT		
STRUT PAIR		
DESIGNED BY	DATE	APPROVED BY
WAC	300.1-6	
WAC	12-5-69	

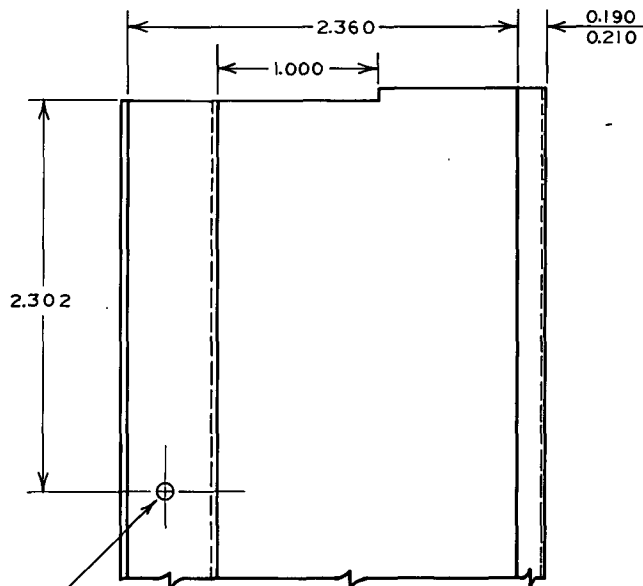
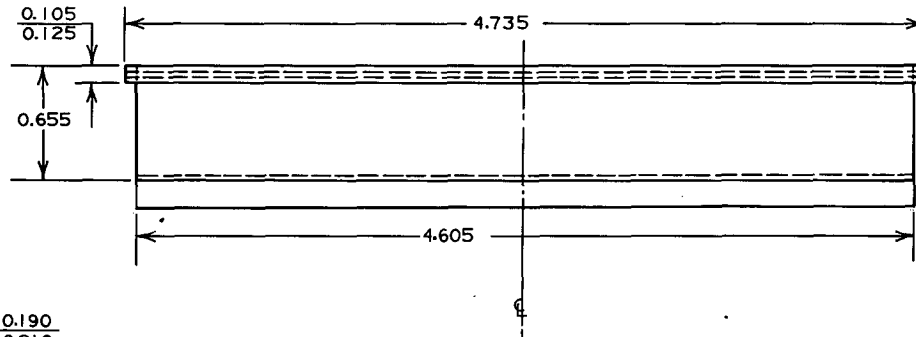
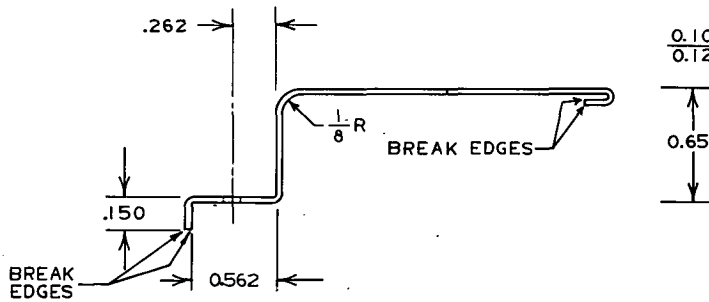


	TOP	BOTTOM
A	$\frac{0.542}{0.546}$	$\frac{0.224}{0.228}$

FINISH: CSL SPEC MF I

0.090 ALUMINUM - 3003-H14  
 1 TOP PLATE REQ'D.  
 1 BOTTOM PLATE REQ'D.

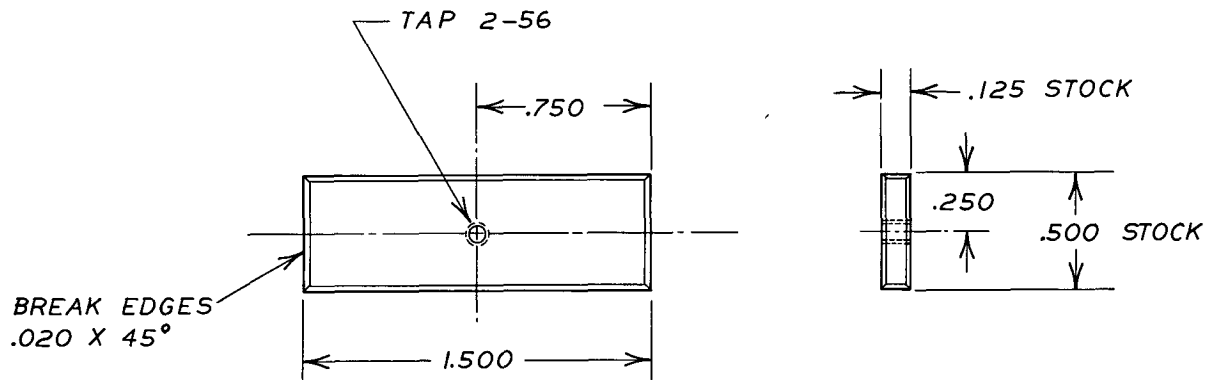
ISSUE 10-22-70		E.C.O. 0065 RJA	
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE COVER PLATE PAIR			
APPROVED		ENG	DRAWING NO.
BY	FOR	DATE	
Ref	PROD	6-5-70	300.1-7
CHECKED		DATE	
WAC		12-5-69	



DRILL NO. 41

0.030 ALUMINUM-3003 - H14  
 ALL DIMENSIONS ±.005 U.O.N.  
 FINISH: CSL SPEC MF1

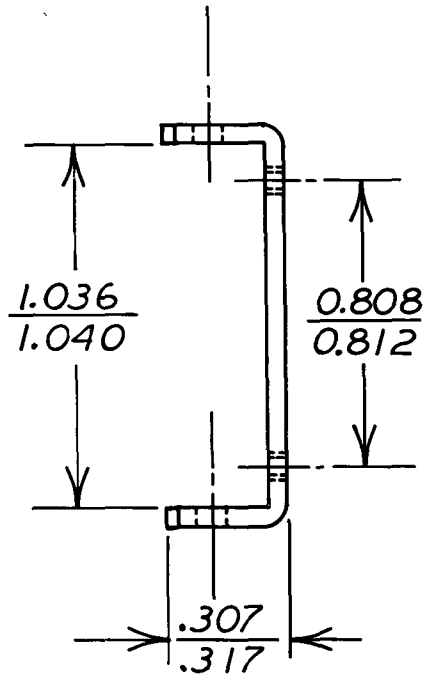
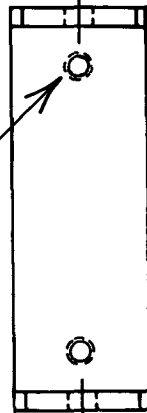
H	1-12-70	E.C.O. 0283	RJA	
ISSUE	10-22-70	E.C.O. 0065	RJA	
CHANGE NO.	DATE	DESCRIPTION		
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI				
<b>MACROMODULAR PROJECT</b>				
TITLE				
OVERLAY CLIP				
BY	APPROVED FOR	DATE	ENG	DRAWING NO.
<i>PLL</i>	<i>PRD</i>	<i>6-5-70</i>	WAC	300.1-8
			DRAWN BY	
			PLL	
			CHECKED	DATE
			<i>WLB</i>	12-6-69



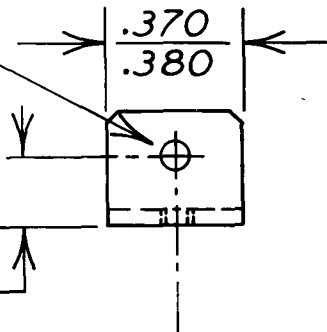
2 REQUIRED  
MATERIAL: 6061-T6 ALUM  
DIMENSIONS:  $\pm .005$  U.Q.N.

ISSUE		10-22-70	ECO 0065 RJA
CHANGE NO	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
CLIP REINFORCEMENT BAR			
APPROVED		ENG	DRAWING NO
BY	FOR	DATE	
			RJA
			300.1-9
		DRAWN BY	
		PLL	
		CHECKED	DATE
		RJA	10-21-70

TAP 2-56  
2 PLCS

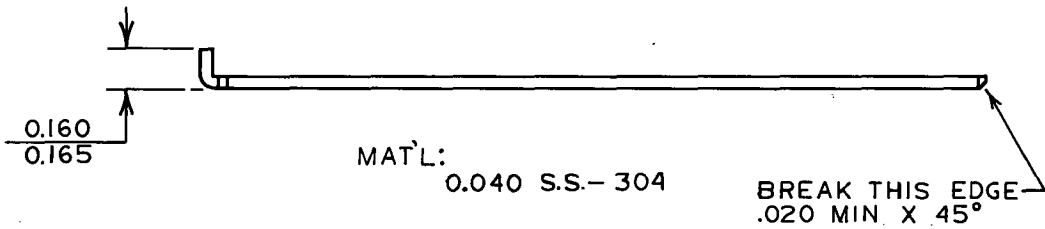
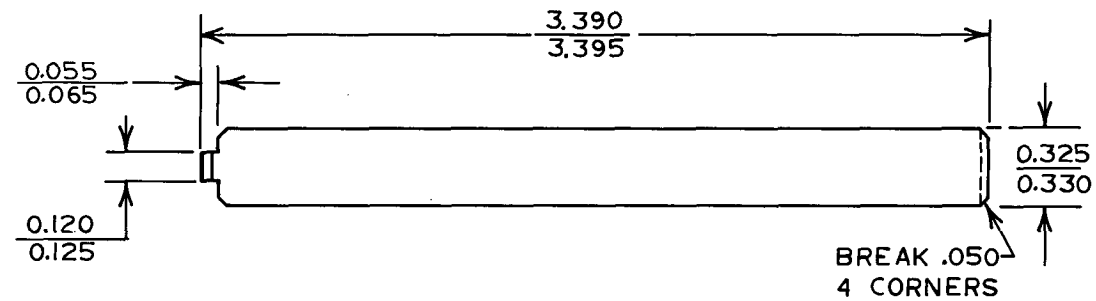


NO. 40 DRILL  
2 HOLES



MAT'L: .040 S.S. - 304  
BREAK CORNERS .050

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST LOUIS, MISSOURI			MACROMODULAR PROJECT			
			TITLE PIVOT BRACKET			
		APPROVED		ENG WAC	DRAWING NO	
		BY BLJ	FOR PROD	DATE 6-16-70	300.1-10	
ISSUE 10-22-70		E.C.O. 0065 RJA		DRAWN BY PLL		
CHANGE NO	DATE	DESCRIPTION			CHECKED allg	DATE 12-6-69

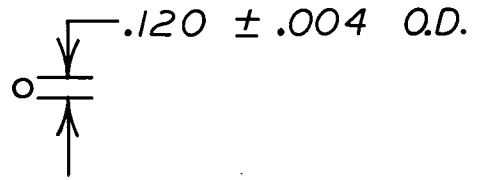
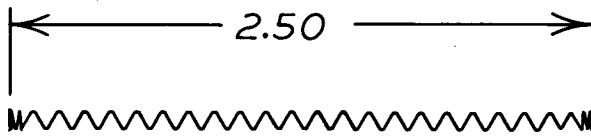


MAT'L: 0.040 S.S.- 304

BREAK THIS EDGE .020 MIN. X 45°

D	1-8-71	E.C.O. 0145	RJA
ISSUE	10-22-70	E.C.O. 0065	RJA
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
RAIL SLIDE			
APPROVED			ENG. WAC
BY	FOR	DATE	DRAWING NO.
<i>907</i>	PROD	6-5-70	300.1-11
DRAWN BY			DATE
PLL			12-6-69
CHECKED			
<i>WAC</i>			

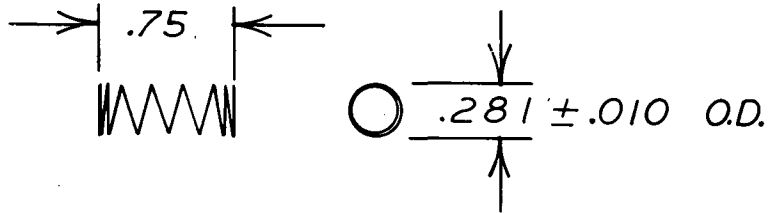




LOAD = 2 POUNDS ± 10% AT 1.5 INCHES  
 COMPRESSED LENGTH.  
 (.016 MUSIC WIRE - APPROX.  
 40 ACTIVE COILS)

NOTE:  
 SPRING ENDS SHALL BE  
 SQUARED AND GROUND.  
 (APPROX 1 1/2 INACTIVE COILS)

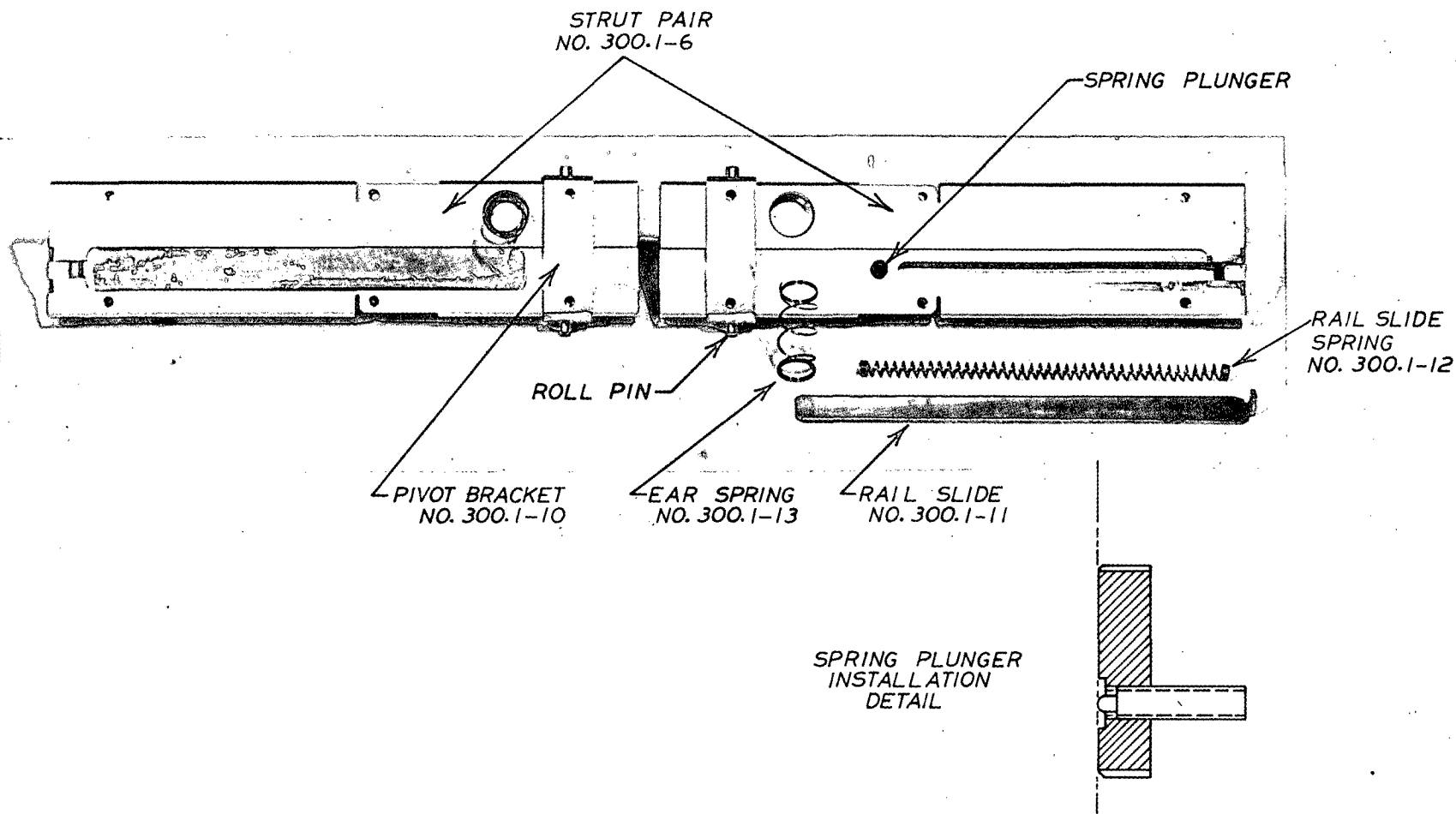
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			<b>MACROMODULAR PROJECT</b>			
			TITLE <b>RAIL SLIDE SPRING</b>			
			APPROVED		ENG <b>WAC</b>	DRAWING NO. <b>3001-12</b>
			BY <b>YCF</b>	FOR <b>PROD</b>	DATE <b>6-16-70</b>	DRAWN BY <b>PLL</b>
					CHECKED <b>WAC</b>	DATE <b>4-2-70</b>
CHANGE NO.	DATE	DESCRIPTION				
<b>A</b>	<b>10-26-70</b>	<b>E.C.O. 0067 RJA</b>				
<b>ISSUE</b>	<b>10-22-70</b>	<b>E.C.O. 0065 RJA</b>				



LOAD = 1 POUND  $\pm$  10% AT .140 INCH  
 COMPRESSED LENGTH  
 (.028 MUSIC WIRE - APPROX.  
 4 ACTIVE COILS)

NOTE:  
 SPRING ENDS SHALL  
 BE SQUARED AND  
 GROUND.  
 (APPROX.  $1\frac{1}{2}$  INACTIVE COILS)

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT				
			TITLE EAR SPRING				
			APPROVED			ENG WAC	DRAWING NO.
E	3-16-71	E.C.O. 0163 RJA	BY	FOR	DATE	DRAWN BY PLL	300.1-13
A	10-26-70	E.C.O. 0067 RJA	SCJ	PROD	6-16-70		
ISSUE	10-22-70	E.C.O. 0065 RJA				CHECKED WAC	DATE 6-5-70
CHANGE NO.	DATE	DESCRIPTION					



			<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE <b>STRUT PAIR SUBASSEMBLY</b>					
			<b>MACROMODULAR PROJECT</b>		APPROVED			ENG. WAC	DRAWING NO. 300.1-14	
F	12-14-71	E.C.O. 0236			nTK	BY	FOR	DATE	DRAWN BY	
ISSUE	10-22-70	E.C.O. 0065			RJA	SCJ	PROD.	6-5-70	PLL	
CHANGE NO.	DATE	DESCRIPTION					CHECKED WAC	DATE 6-5-70		

CLIP REINFORCEMENT  
BARS

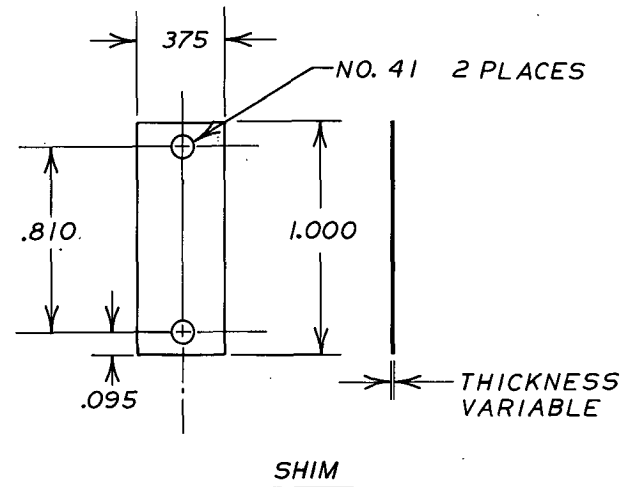
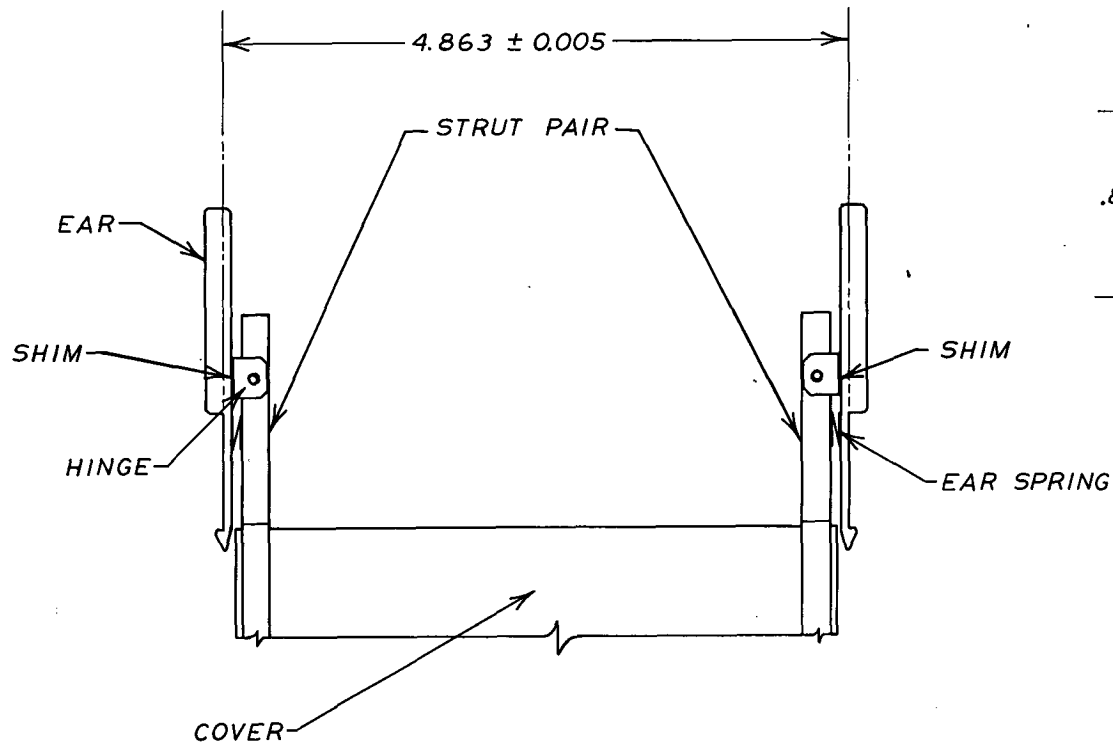
STRUT

BEND MINIMUM 5° AFTER  
ASSEMBLY OF OVERLAY CLIPS

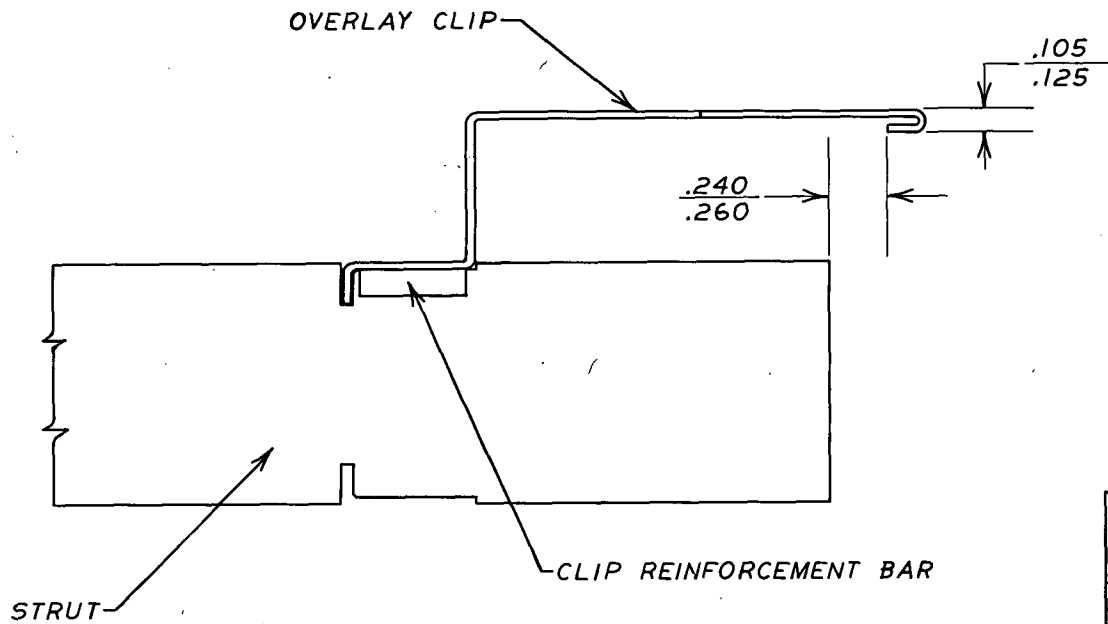
5° MIN.

OVERLAY CLIPS

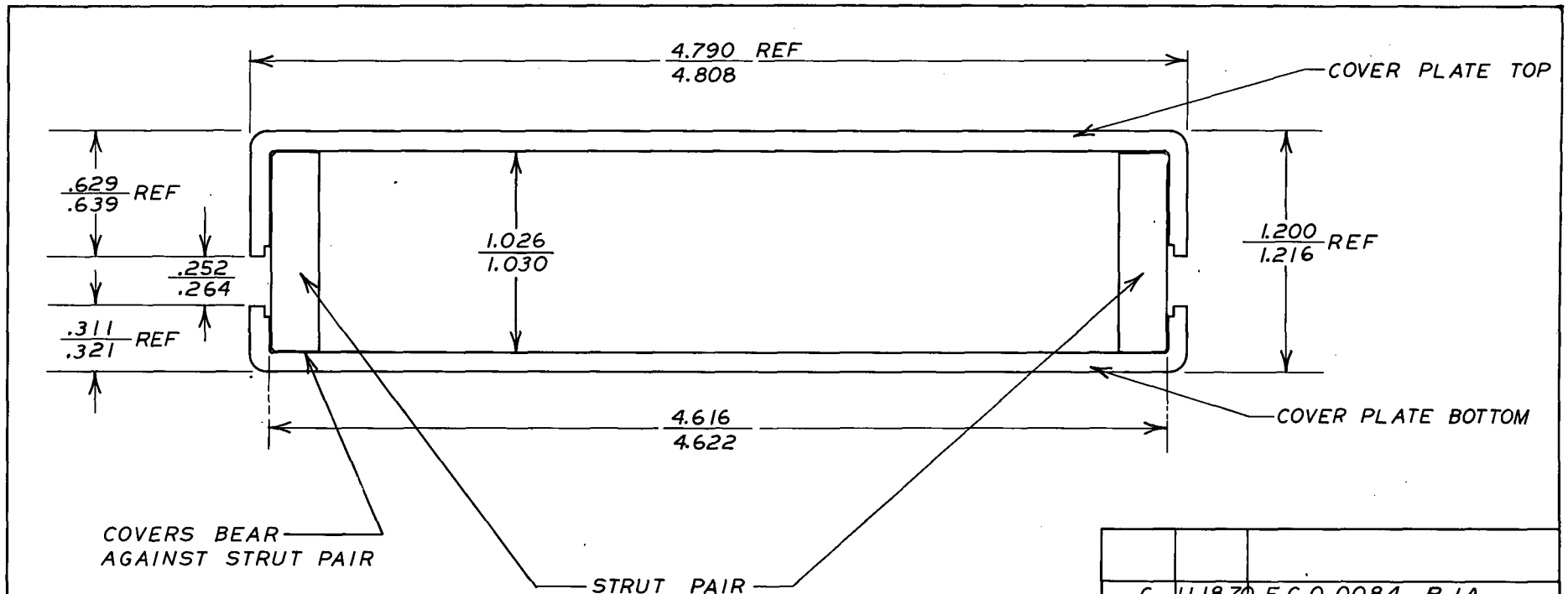
ISSUE		10-22-70	E.C.O. 0065		RJA
CHANGE NO.	DATE	DESCRIPTION			
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI					
<b>MACROMODULAR PROJECT</b>					
TITLE <b>ASSEMBLY-INSPECTION DWG.          OVERLAY CLIP BEND AT ASSEMBLY</b>					
APPROVED			ENG.	DRAWING NO.	
BY	FOR	DATE	RJA	300.1-15	
<i>PLL</i>	PROD.	10-23-70	DRAWN BY	PLL	
			CHECKED	DATE	
			RJA	10-22-70	



ISSUE		10-22-70	E.C.O. 0065		RJA
CHANGE NO.	DATE	DESCRIPTION			
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI					
<b>MACROMODULAR PROJECT</b>					
TITLE					
ASSEMBLY-INSPECTION DWG. EAR & SHIM PLACEMENT					
APPROVED			ENG.	DRAWING NO.	
BY	FOR	DATE	RJA	300.1-16	
	PROD.	10-23-70	DRAWN BY		
			PLL		
			CHECKED	DATE	
			RJA	10-21-70	



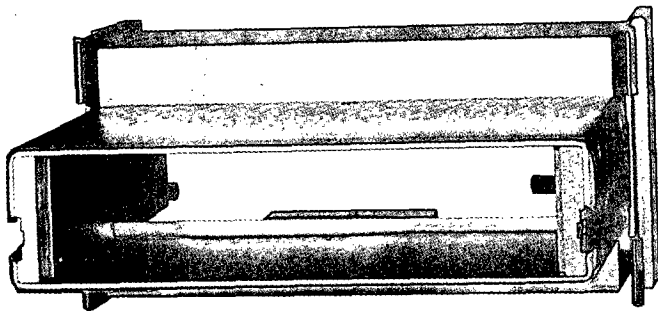
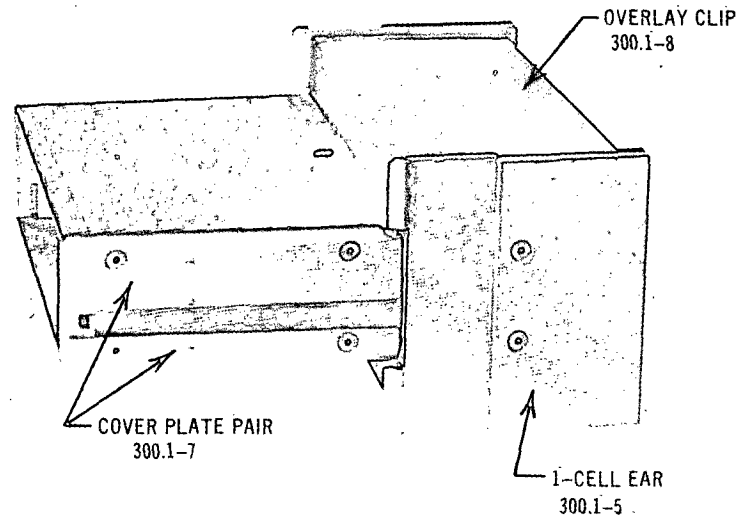
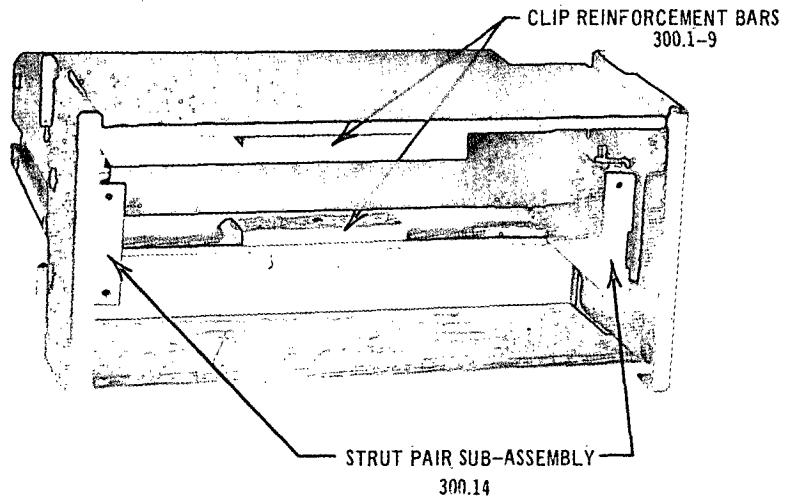
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CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE <b>ASSEMBLY-INSPECTION DWG.</b> <b>OVERLAY CLIP ASSEMBLY</b>			
APPROVED	FOR	DATE	ENG.
			RJA
BY	PROD.	DATE	DRAWING NO.
<i>WJE</i>		10-23-70	300.1-17
CHECKED			DATE
RJA			10-22-70



BOX DIMENSIONS

MAT'L. TOLERANCES: ± 0.003 REF

	C	11-18-70	E.C.O. 0084	RJA
	ISSUE	10-22-70	E.C.O. 0065	RJA
CHANGE NO.		DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b>				
WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI				
<b>MACROMODULAR PROJECT</b>				
TITLE				
ASSEMBLY-INSPECTION DWG STRUT & COVER PLATE ASSEMBLY				
APPROVED			ENG.	DRAWING NO.
BY	FOR	DATE	RJA	300.1-18
WES	PROD.	10-23-70	PLL	
			CHECKED	DATE
			RJA	10-22-70



			<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE <b>I-CELL FPB SHELL ASSEMBLY</b>					
			<b>MACROMODULAR PROJECT</b>		APPROVED		ENG. WAC	DRAWING NO.		
					BY <i>lab</i>		FOR PROD	DATE 6-5-70	300.1-19	
									CHECKED RJA	
CHANGE NO.	DATE	DESCRIPTION					DATE		10-23-70	



**COMPUTER SYSTEMS LABORATORY**  
WASHINGTON UNIVERSITY

**300.2**

2-CELL FPB SHELL

PAGE	TITLE	CHANGE
300.2-1	TITLE PAGE	<b>A</b>
300.2-2	2-CELL FPB SHELL PARTS LIST	A
300.2-3	TWO CELL FACEPLATE BOX MANUFACTURE AND SPECIFICATIONS	
300.2-4		
300.2-5	TWO CELL EAR	
300.2-6	TWO HIGH FACEPLATE	
300.2-7	MULTI HEIGHT FACEPLATE BOX WIRING GUARD	
300.2-8	2-CELL FPB SHELL ASSEMBLY	

CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR.
ISSUE	-	1-24-72	<i>RJA</i>								
A	0260	4-4-72	<i>RJA</i>								

## 2-CELL FPB SHELL PARTS LIST

QTY.	C.S.L. DOC.	PART
4	-	VLIER #NS-51N SPRING PLUNGER
8	-	3.32 x 1/4 CADMIUM PLATED ROLL PIN
28	-	2-56 x 1/4 FLATHEAD SOCKET CAPP S.S SCREW
2	300.2-5	TWO CELL EAR
1	300.2-6	TWO HIGH FACEPLATE
1	300.2-7	MULTI HEIGHT FACEPLATE BOX WIRING GUARD
2	300.1-6	STRUT PAIR
2	300.1-7	COVER PLATE PAIR
2	300.1-8	OVERLAY CLIP
2	300.1-9	CLIP REINFORCEMENT BAR
4	300.1-10	PIVOT BRACKET
4	300.1-11	RAIL SLIDE
4	300.1-12	RAIL SLIDE SPRING
4	300.1-13	EAR SPRING

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISSUE	-	1-24-72	<i>RJA</i>								
A	0260	4-4-72	<i>RJA</i>								

TWO CELL FACEPLATE BOX  
MANUFACTURE AND SPECIFICATIONS

The intent of this document (300.2) is to set forth manufacturing and assembly specifications for parts relating to the 2-cell faceplate box (FPB). In addition, options are presented for fabrication techniques employed in component manufacture. To this end, the following has been broken into two sections--section one deals with individual components of the faceplate box, while section two treats assembly specifications that must be met for acceptable units. Sections one and two are related by the fact that adherence to component tolerance specifications should result in acceptable assemblies. The manufacturer must assure himself of this by analysis of component and assembly documentation, his tooling and characteristics of his production processes.

Component Manufacturer

From experience gained in limited production of faceplate components, certain parts have identified themselves as candidates for alternative manufacturing processes.

One of the most critical parts in the faceplate box assembly is the cell ear. This part serves the function of retaining the faceplate box in a frame cell while forces are applied that tend to push it out. In order that this function be served, the 75° angle of the ear fingers must be carefully controlled in manufacture. Two methods of fabrication have been indicated on drawing no. 300.1-5. Option 1 involves a bending process to change by 15° a machined right angle corner. Option 2 employs a machining process that generates the desired 75° angle. Either method is acceptable as long as the specified tolerances are maintained.

REV.	REV.	DATE	BY
ISSUE	1	1-24-72	RJA

Drawing no. 300.1-7 is the cover plate pair. These covers are formed from .090 thick aluminum stock. The 90° angles at the corners indicate zero radius bends. This restriction may be relaxed somewhat as long as this corner does not interfere with the .015 break on the strut pair corners (drawing no. 300.1-6). In addition, the countersink for the 2-56 flat head screws on the covers must be deep enough to completely recess the heads if the outside bend radius is increased.

Assembly Specifications

Drawings 300.1-15, 300.1-16, 300.1-17, and 300.1-18 are various views of assembled faceplate box components. These drawings indicate maximum and minimum finished dimensions as well as assembly techniques to be applied in manufacture.

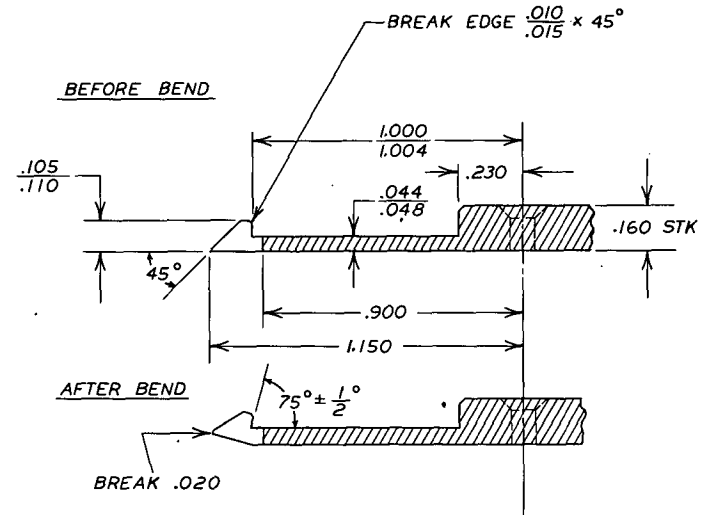
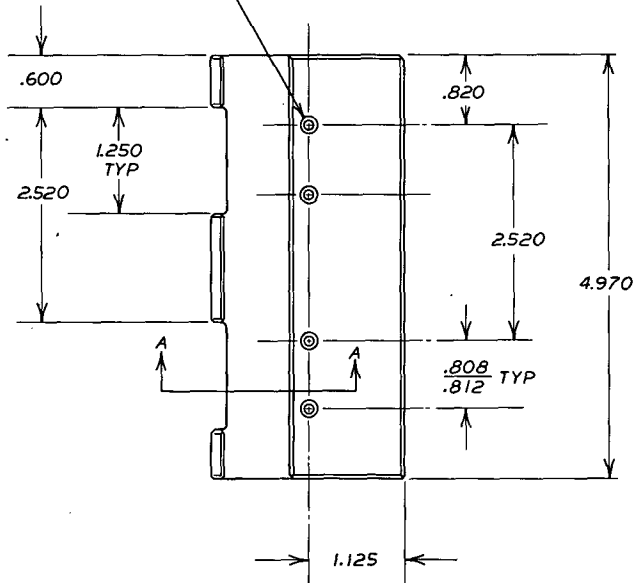
Drawing 300.1-18 is the rear view of a strut pair and cover plate pair assembled. The slot width formed by the space between upper and lower covers should be inspected at the connector end of the box due to the fact that this slot tapers somewhat toward the overlay clip which is retained by the covers.

A partial section through the front of a box appears in drawing 300.1-17. This drawing indicates assembled dimensions of the overlay clip with respect to the strut end.

The ear placement on the finished box is critical to the proper functioning of the box. It is therefore necessary to insure finished ear placement dimensions and tolerance. Drawing 300.1-16 shows the required spacing between ears on a completed box. This dimension may be controlled by the addition of brass shims between the pivot bracket and ear. Shim size is indicated on this same drawing.

CHG.	E.C.O.	DATE	APPR.
ISSUE	-	1-24-72	RJA

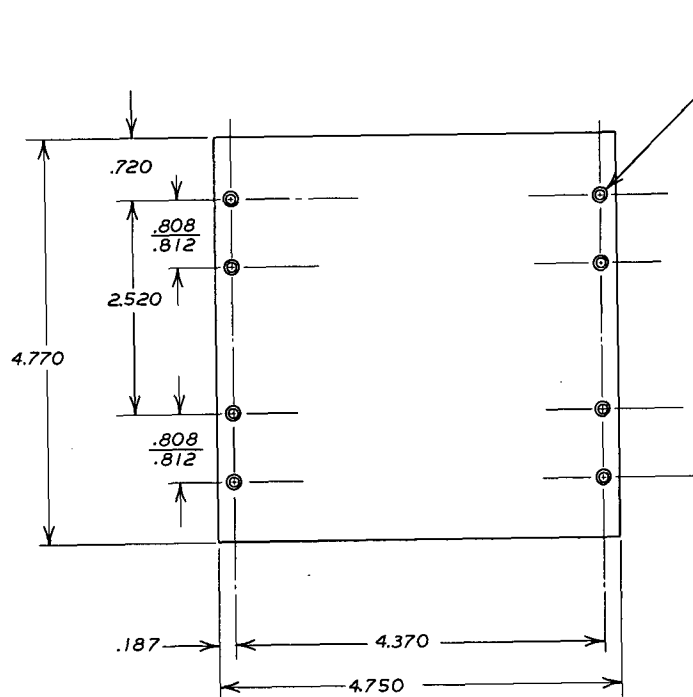
DRILL NO. 41 CSINK 82° x .187  
FACE DIA. 4 HOLES



SECTION AA  
OPTION 1 BEND FORM FINGER  
SEE DWG. 300.1-5 FOR OPTION 2  
MACHINE CUT FINGER

MAT'L: ALUM 2024-T351  
FINISH: CSL SPEC MF 1  
TOLERANCE U.O.N.  
.XXX ± .005  
.XX ± .010  
 $\frac{X+1}{X-64}$

ISSUE	1-20-72	RJA	
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE <b>TWO CELL EAR</b>			
APPROVED	FOR	DATE	ENG.
RJA	PROD	1-31-72	RJA
			DRAWING NO.
			300.2-5
			DRAWN BY
			PLL
			CHECKED
			QW
			DATE
			12-21-71



DRILL NO. 41 C'BORE .156 x .100 DEEP  
8 HOLES

MAT'L .187 ALUM 6061-T6

FINISH: CSL SPEC MF 1

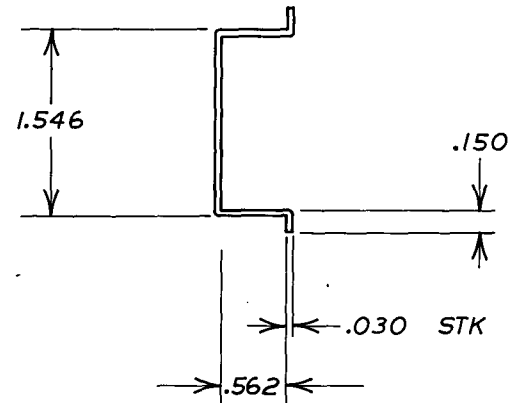
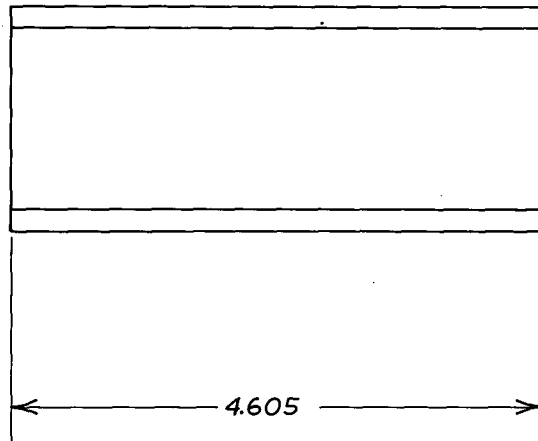
TOLERANCE U.O.N.

.XXX ± .005

.XX ± .010

$\frac{X}{X} \pm \frac{1}{64}$

ISSUE		1-20-72	RJA
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
TWO HIGH FACEPLATE			
APPROVED	FOR	DATE	ENG.
RJA	PROD	1-31-72	RJA
			DRAWN BY
			PLL
			CHECKED
			GM
			DRAWING NO.
			300.2-6
			DATE
			12-20-71



MAT'L: .030 ALUM 3003-H14

FINISH: CSL SPEC MF 1

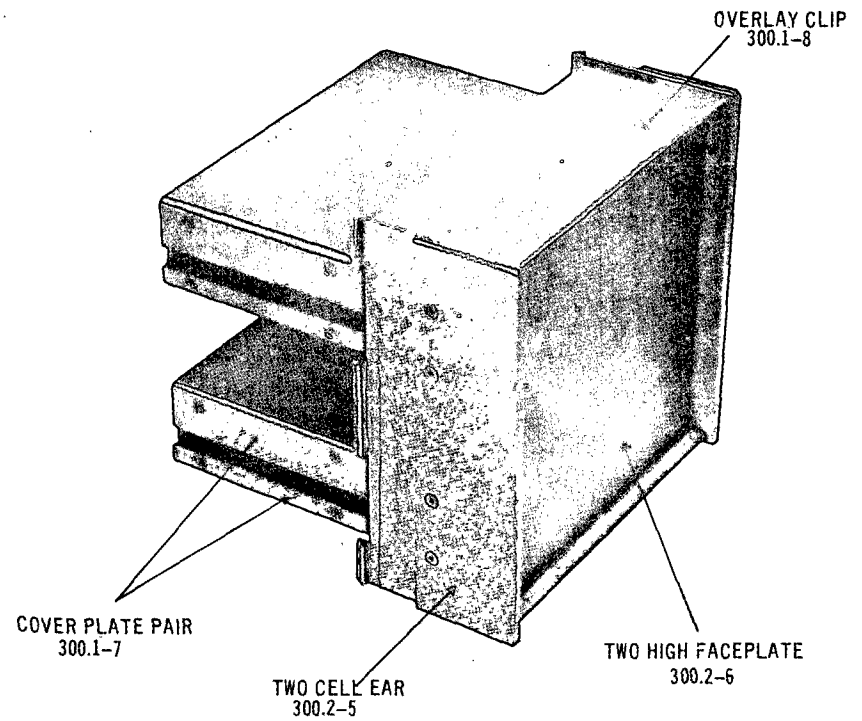
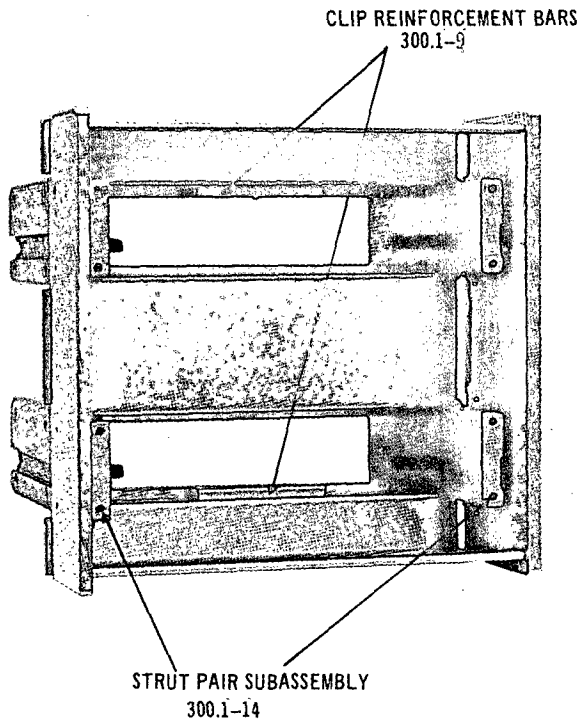
TOLERANCE U.O.N.

.XXX ± .005

.XX ± .010

$\frac{X}{X} \pm \frac{1}{64}$

ISSUE		1-20-72	RJA
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
<b>MULTI HEIGHT FACEPLATE          BOX WIRING GUARD</b>			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	
RJA	PROD	1-31-72	300.2-7
		DRAWN BY	
		PL L	
		CHECKED	DATE
		GMY	12-20-71



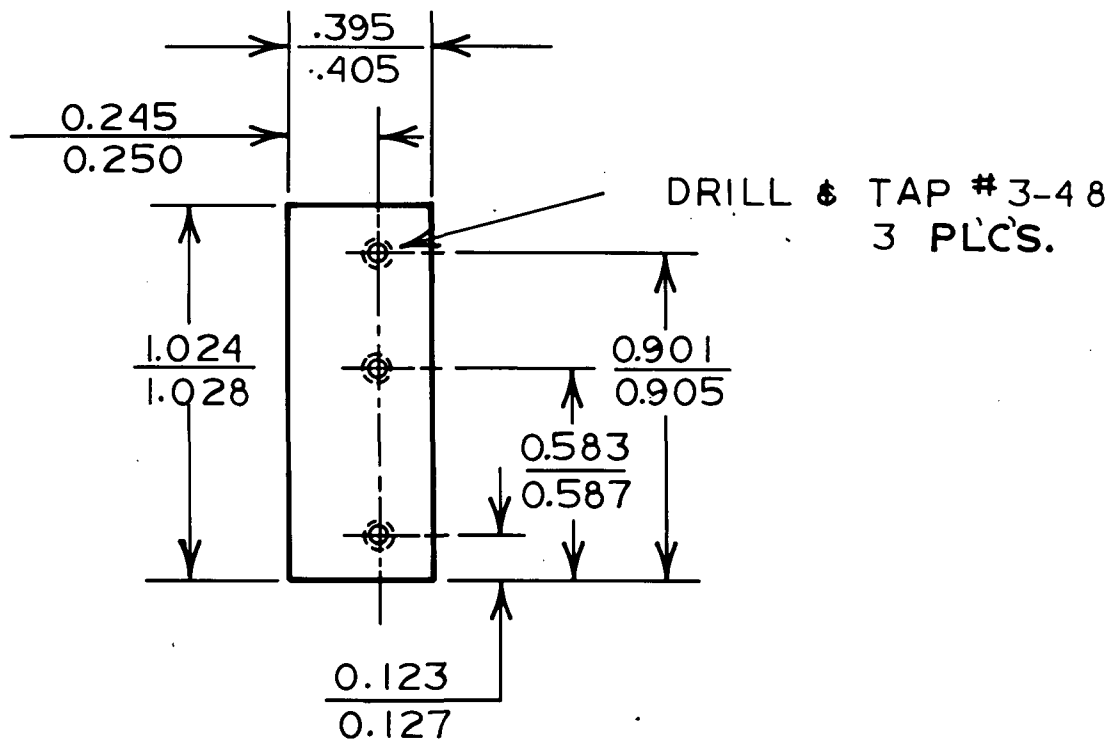
		<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE <b>2-CELL FPB SHELL ASSEMBLY</b>	
		<b>MACROMODULAR PROJECT</b>		APPROVED	
				BY FOR DATE	
ISSUE	-	1-24-72 <i>RJA</i>		ENG. <i>RJA</i>	
CHANGE NO.	DATE	DESCRIPTION		DRAWN BY <i>MBP</i>	
				CHECKED <i>GM</i>	
				DATE 1-24-72	
				DRAWING NO. 300.2-8	



FACEPLATE BOX VISCERA  
PARTS

PAGE	TITLE	CHANGE
300.5-1	TITLE PAGE	<b>K</b>
300.5-2	FPB CONNECTOR BRACKET	
300.5-3	FPB CONNECTOR BRACKET SCREW	
300.5-4	ASTRO STANDOFF	
300.5-5	FPB KEY	
300.5-6	FUNCTION CODE SWITCH BRACKET	D, G, E
300.5-7	TYPE 1 FACEPLATE	D
300.5-8	TYPE 2 FACEPLATE	C, D
300.5-9	TYPE 3 FACEPLATE	
300.5-10	TYPE 4 FACEPLATE	
300.5-11	TYPE 5 FACEPLATE	A
300.5-12	FPB REAR CONNECTOR FILLER STRIP	B
300.5-13	TRIP BLOCK	D
300.5-14	SENSE PIN	D
300.5-15	TYPE 6 FACEPLATE	E
300.5-16	TYPE 7 FPB REAR CONNECTOR FILLER STRIP	F
300.5-17	TYPE 8 FPB FILLER	F
300.5-18	ONE HIGH FACEPLATE FOR TYPE 7 AND 8 FPB	F
300.5-19	CONNECTOR STRUT TYPE 1	I
300.5-20	CONNECTOR STRUT TYPE 2	I
300.5-21	STRUT COVER	I
300.5-22	INTERLOCK PIN	J
300.5-23	TYPE 10 FILLER STRIP	J
300.5-24	TYPE 10 FACEPLATE	J
300.5-25	TYPE 1A FACEPLATE	K
300.5-26	TYPE 9 FACEPLATE	K
300.5-27	TYPE 9 FPB PC BOARD	K
300.5-28	TYPE 9 FPB PC BOARD ROUTING OUTLINE	K

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISSUE	0036	9-23-70	RJA	E	0255	2-8-72	RJA	J	0292	6-13-73	RJA
F	0052	10-11-70	RJA	F	0257	3-1-72	RJA	K	0300	11-7-73	
B	0059	10-20-70	RJA	G	0259	4-4-72	RJA				
C	0056	10-23-70	RJA	H	0280	1-8-73	RJA				
D	0229	11-1-71	RJA	I	0290	5-24-73	RJA				

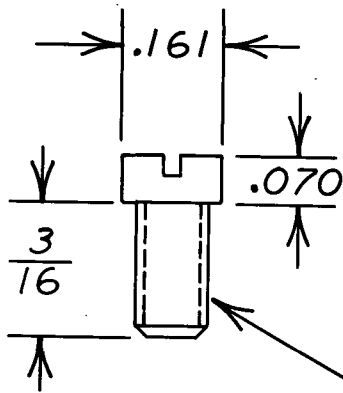


CONNECTOR BRACKET

0.062 S.S.-304

BREAK CORNERS

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE FPB CONNECTOR BRACKET		
			APPROVED		ENG WAC
			BY <i>bcj</i>	FOR Prod.	DATE 9-23-70
			DRAWN BY PLL		DRAWING NO. 300:5-2
ISSUE 9-23-70 E.C.O. 0036 <i>bcj</i>			CHECKED <i>bcj</i>		DATE 9-14-70
CHANGE NO.	DATE	DESCRIPTION			

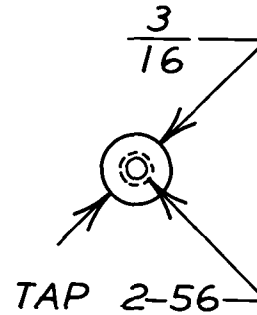
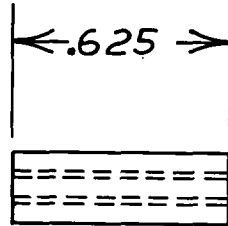


3-48 STND MACHINE  
SCREW THREAD

DIM:  $\pm .005$

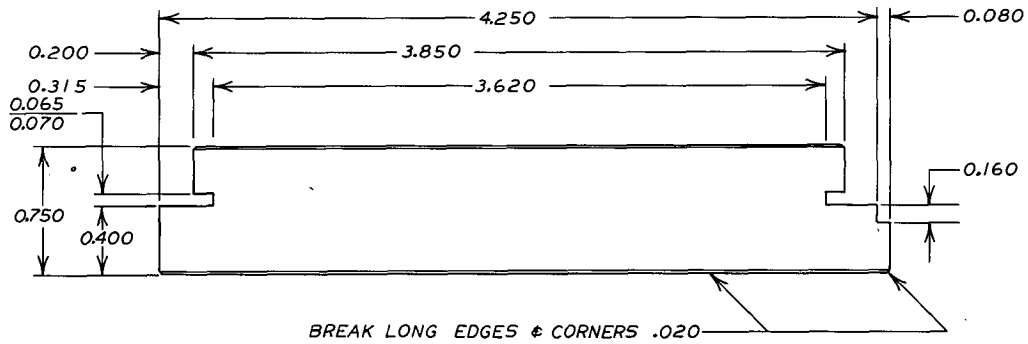
MATERIAL: SS

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE FPB CONNECTOR BRACKET SCREW		
			APPROVED		ENG WAC
			BY <i>JCF</i>	FOR Prod.	DATE 9-23-70
					DRAWING NO. 300.5-3
					DRAWN BY PLL
ISSUE	9-23-70	E.C.O. 0036	<i>JCF</i>		CHECKED <i>JCF</i>
CHANGE NO.	DATE	DESCRIPTION			DATE 9-14-70



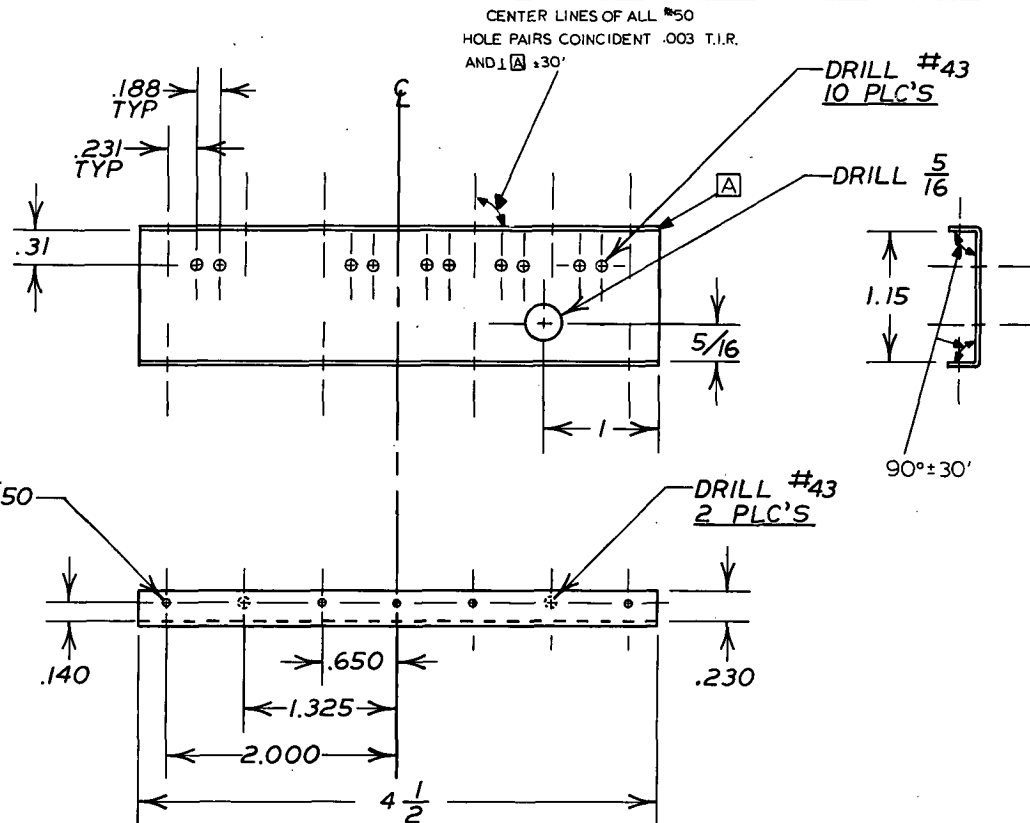
MATERIAL: ALUM 6062-T651  
 DIMENSIONS: ± .005  
 SCREW MACHINE STOCK

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE ASTRO STAND-OFF		
		APPROVED		ENG WAC	DRAWING NO.
BY	FOR	DATE	DRAWN BY		300.5-4
<i>Dej</i>	<i>Prod.</i>	<i>9-23-70</i>	PLL		
CHANGE NO.	DATE	DESCRIPTION			
<i>ISSUE</i>	<i>9-23-70</i>	<i>E.C.O. 0036 Dej</i>			
			CHECKED	DATE	
			<i>Dej</i>	<i>9-14-70</i>	



MATERIAL: .062 ALUM 2024-T3  
 DIMENSIONS: ±005 U.O.N  
 FINISH: CSL SPEC MF 1

ISSUE 9-23-70		CHG. E.C.O. 0036		<i>scj</i>	
CHANGE NO.	DATE	DESCRIPTION			
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI					
<b>MACROMODULAR PROJECT</b>					
TITLE					
FPB-KEY					
APPROVED		ENG.		DRAWING NO.	
BY	FOR	DATE	WAC	300.5-5	
<i>scj</i>	PROD	5-23-70	PLL		
CHECKED		DATE			
<i>WLB</i>		5-19-70			

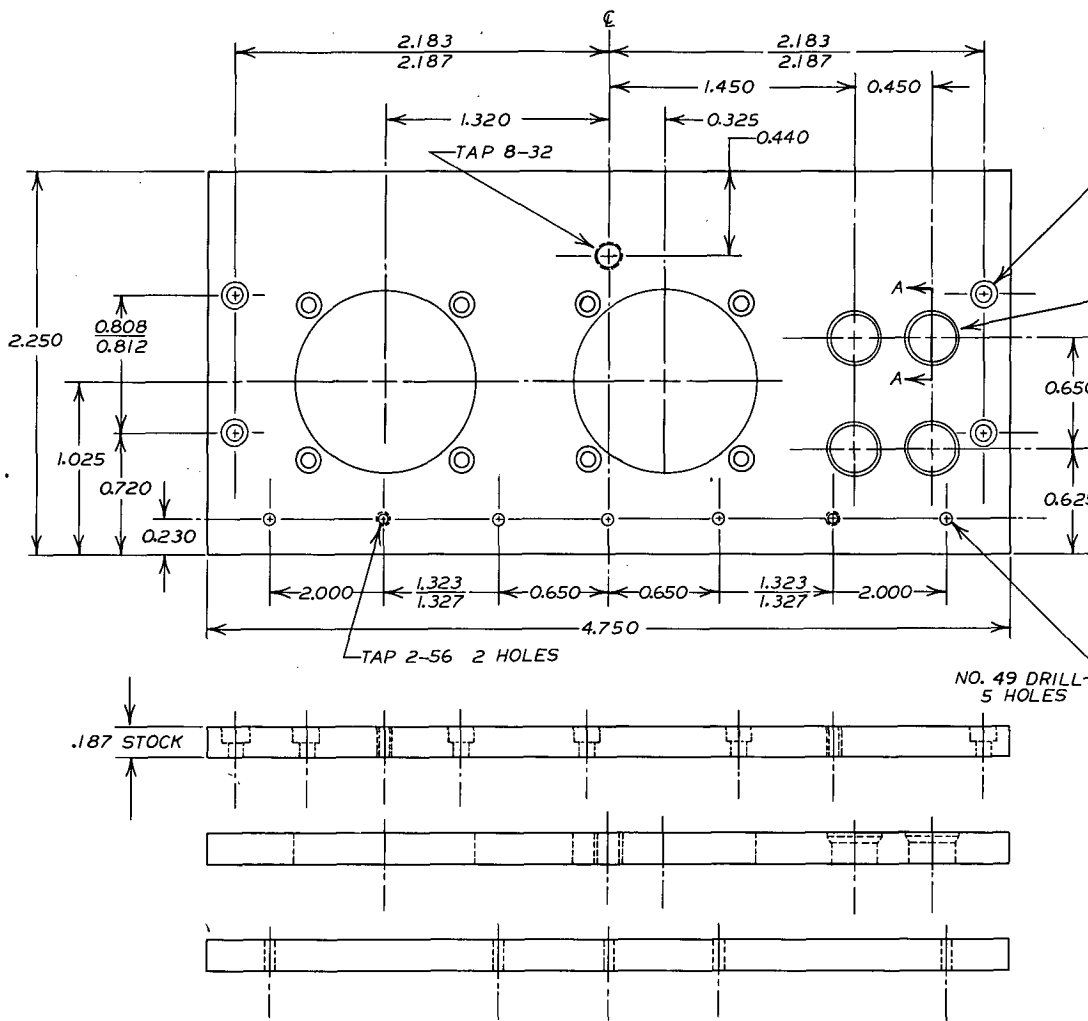


TOLERANCE U.O.N.

.XXX  $\pm .005$   
 .XX  $\pm .01$   
 X  $\pm \frac{1}{64}$   
 X

MAT'L: 3003-H14 ALUM .040 THICK  
 FINISH: ALODINE  
 REQ'D: 1

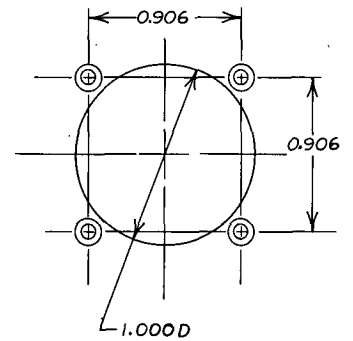
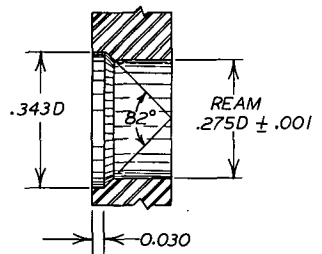
H	1-8-73	ECO. 0280	RJA
G	4-4-72	ECO. 0259	RJA
D	10-27-71	ECO. 0229	HTK
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b>			
WASHINGTON UNIVERSITY			
ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
FUNCTION CODE SWITCH BRACKET			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	300.5-6
	PROD	10-25	
		DRAWN BY	9-29-71
		DHO	
		CHECKED	DATE
			9-29-71



DRILL NO. 41 & CTRBR. .156 D X 0.100 DEEP  
12 HOLES

REAM .275 D ± .001  
CTRBR. .343 D X .030  
CTRSNK 82° FROM  
BOTTOM OF CTRBORE  
4 HOLES

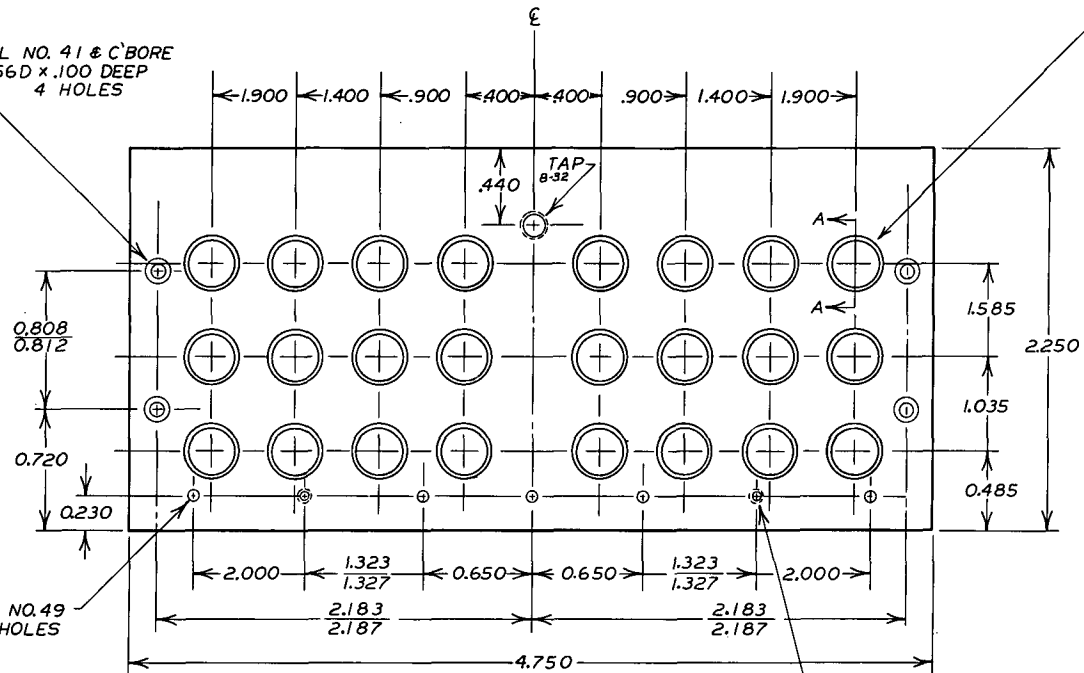
SECTION AA



MATERIAL: .187 ALUMINUM 6061 - T6  
DIMENSIONS: ± .005 U.O.N.  
FINISH: CSL SPEC. MF 1

CHANGE NO.	DATE	DESCRIPTION
D	10-29-71	E.C.O. 0229 RJA
ISSUE	9-23-70	E.C.O. 0036 JCF
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE <b>TYPE 1 FACEPLATE</b>		
APPROVED BY	FOR	DATE
WAC	PROD.	6-24-70
ENG. NO.	DRAWING NO.	
WAC	300.5-7	
DRAWN BY	DATE	
PLL		
CHECKED	DATE	
WAC	5-19-70	

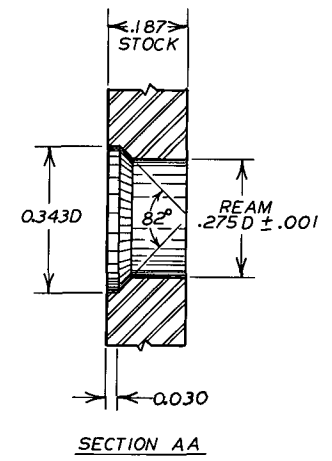
DRILL NO. 41 & C'BORE  
.156D x .100 DEEP  
4 HOLES



DRILL NO. 49  
5 HOLES

TAP 2-56  
2 HOLES

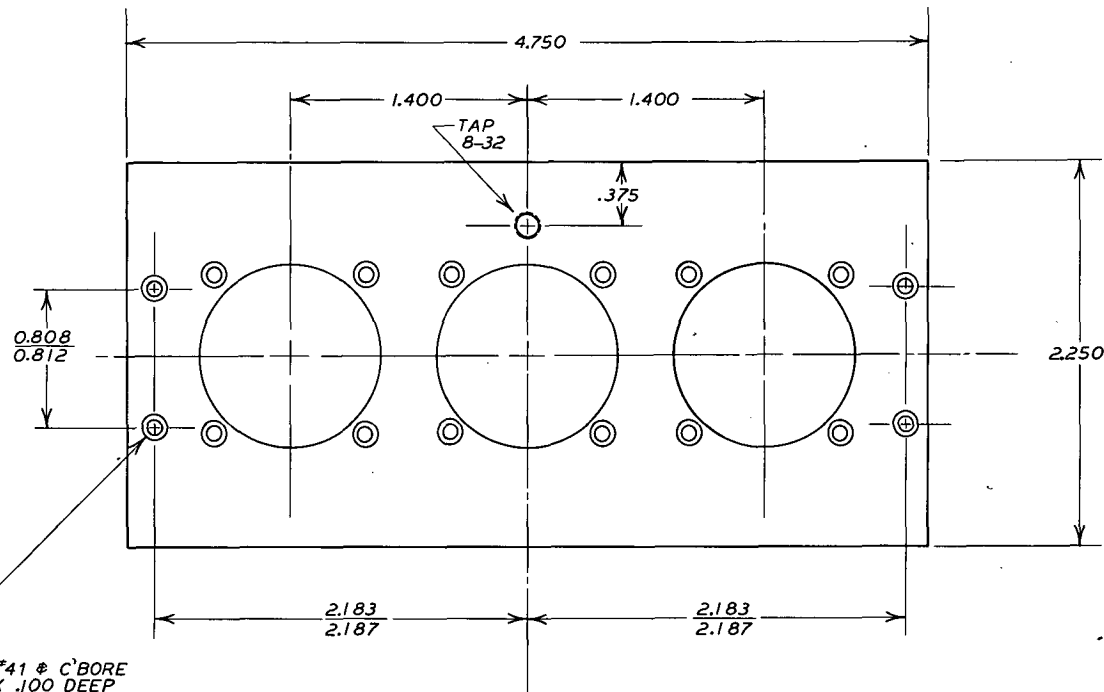
REAM .275D ± .001 C'BORE .343D x .030  
C'SINK 82° FROM BOTTOM OF C'BORE  
24 HOLES



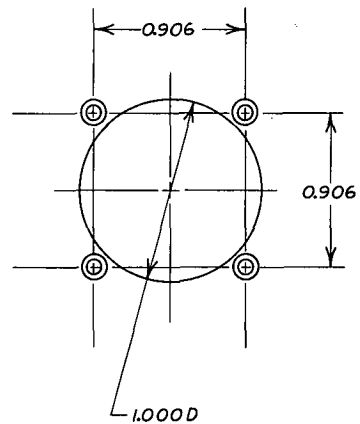
MAT'L: .187 ALUM 6061-T6  
DIM: ±.005 U.O.N.  
FINISH: CSL SPEC MF 1

CHANGE NO.	DATE	DESCRIPTION
D	10-29-71	E.C.O. 0229 RJA
C	10-23-70	E.C.O. 0066 RJA
	ISSUE 9-23-70	E.C.O. 0036 <i>bcf</i>
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE <b>TYPE 2 FACEPLATE</b>		
BY	FOR	DATE
<i>bcf</i>	PROD.	7-24-70
APPROVED	ENG.	DRAWING NO.
	WAC	300.5-8
CHECKED	DRAWN BY	DATE
<i>WLS</i>	PLL	5-27-70



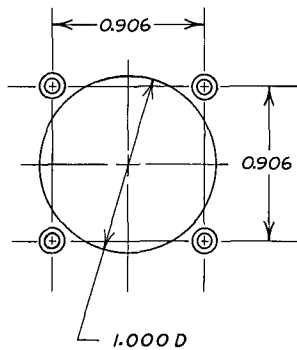
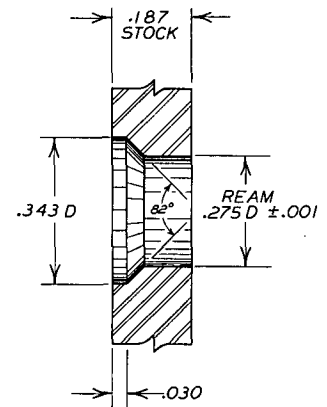
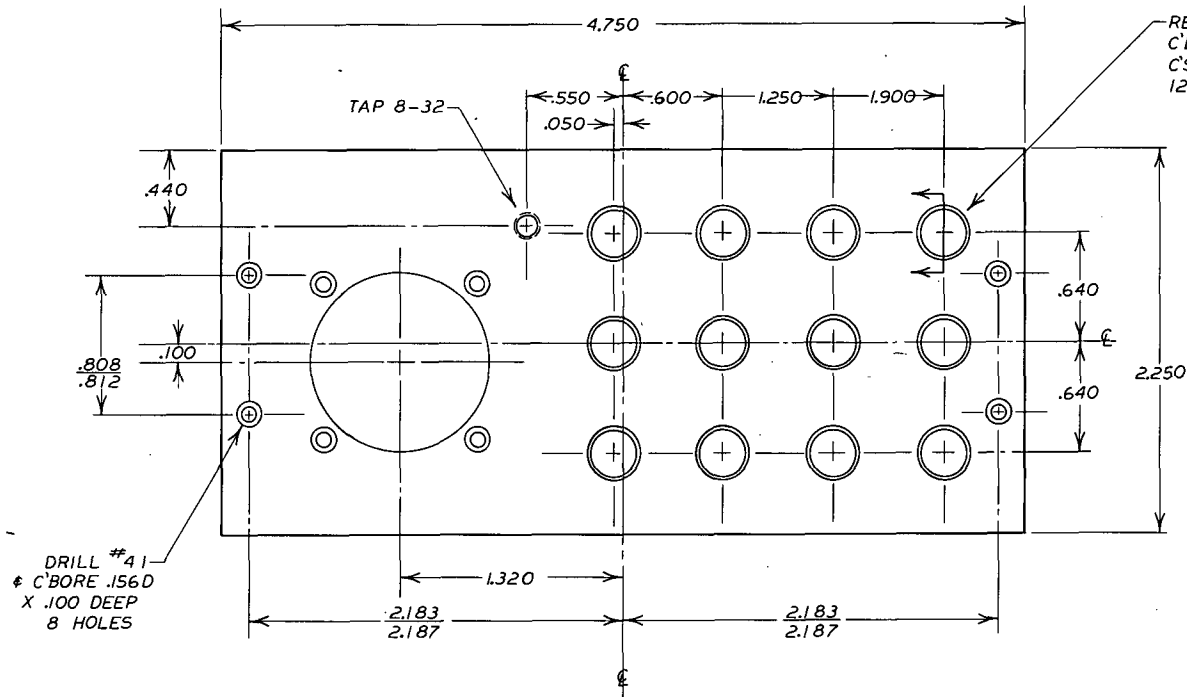


DRILL #41  $\Phi$  C'BORE  
.156D X .100 DEEP  
16 HOLES



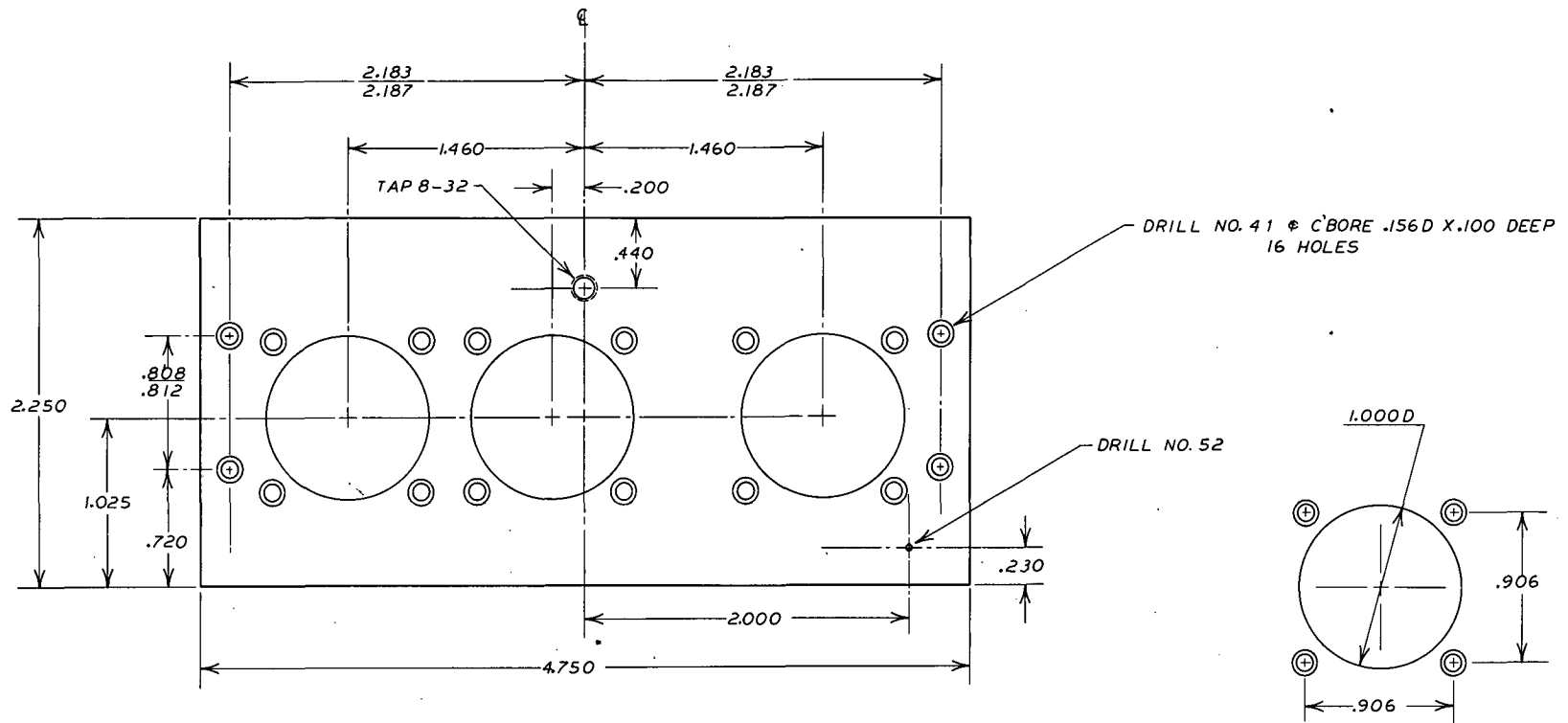
MAT'L: .187 ALUM 6061-T6  
DIM:  $\pm$ .005 U.O.N.  
FINISH: CSL SPEC MF 1

ISSUE 9-23-70		E.C.O. 0036		<i>gcf</i>	
CHANGE NO.	DATE	DESCRIPTION			
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI					
<b>MACROMODULAR PROJECT</b>					
TITLE					
TYPE 3 FACEPLATE					
APPROVED			ENG.	DRAWING NO.	
BY	FOR	DATE	WAC	300.5-9	
<i>gcf</i>	PROD	7-24-70	DRAWN BY	PBL	
			CHECKED	DATE	
			<i>WAC</i>	7-9-70	



MAT'L: .187 ALUM 6061-T6  
DIM: ± .005 U.O.N.  
FINISH: CSL SPEC MF 1

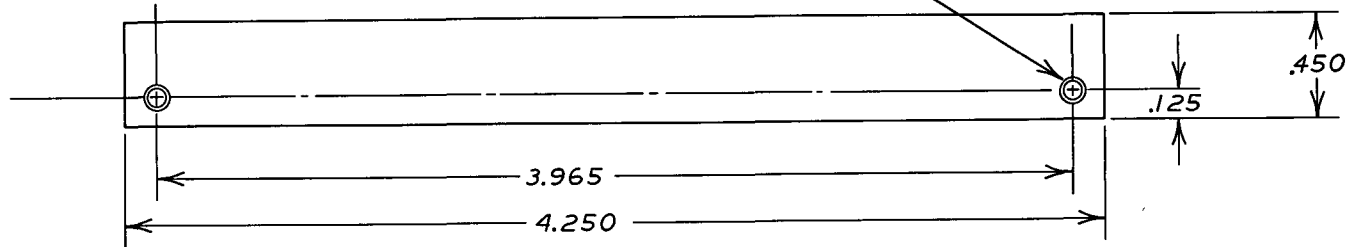
ISSUE 9-23-70 E.C.O. 0036 <i>gcz</i>			
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE TYPE 4 FACEPLATE			
APPROVED		ENG. WAC	DRAWING NO.
BY <i>gcz</i>	FOR PROD.	DATE 7-21-70	300.5-10
DRAWN BY PLL		CHECKED WAC	DATE 7-9-70



MATERIAL: .187 ALUM 6061-T6  
 DIMENSIONS: ± .005 U.O.N.  
 FINISH: CSL SPEC MF-1

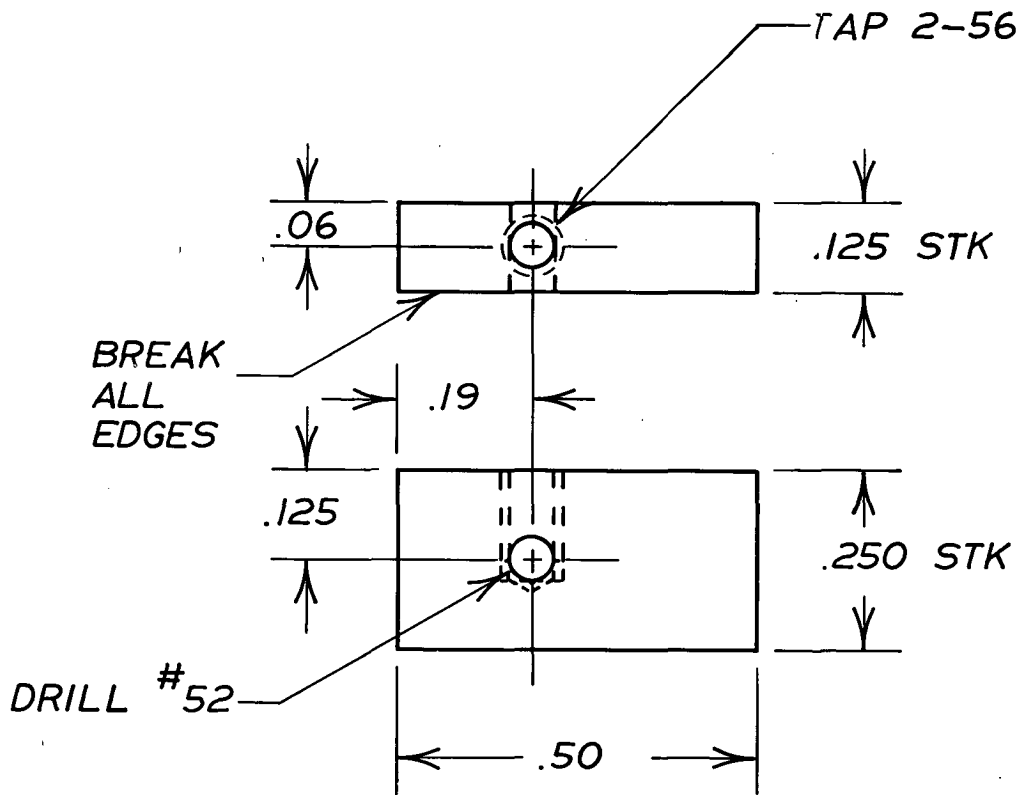
CHANGE NO.	DATE	DESCRIPTION
A	10-11-70	E.C.O. 0052 <i>gcj</i>
ISSUE	9-23-70	E.C.O. 0036 <i>gcj</i>
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE <b>TYPE 5 FACEPLATE</b>		
APPROVED	ENG.	DRAWING NO.
BY <i>gcj</i>	FOR <i>PROD</i>	DATE <i>9-23-70</i>
CHECKED <i>gcj</i>	DATE <i>8-27-70</i>	

DRILL NO. 35 C'BORE  
 .187 X .075 DEEP 2 HOLES



MATERIAL: .125 2326 BLUE, TRANSLUCENT PLEXIGLASS  
 TOLERANCES: ± 0.005 U.O.N.

B	10-20-70	E.C.O. 0059	<i>Wab</i>
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE <b>FPB REAR CONNECTOR          FILLER STRIP</b>			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	
<i>Wab</i>	PROD.	10/29/70	300.5-12
		DRAWN BY	
		PLL	
		CHECKED	DATE
		RJA	10-19-70



TOLERANCE U.O.N.

.XXX ±.005

.XX ±.01

$\frac{X}{X} \pm \frac{1}{64}$

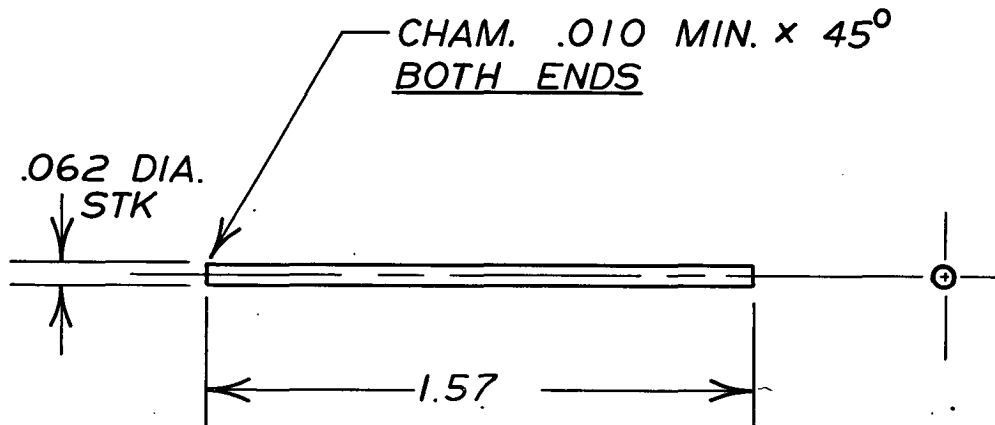
MAT'L: 6061-T6 ALUM

FINISH: ALODINE

REQ'D: 5 FOR TYPE 1 FPB

3 FOR TYPE 2 FPB

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			<b>MACROMODULAR PROJECT</b>			
			TITLE <b>TRIP BLOCK</b>			
			APPROVED		ENG <i>RJA</i>	DRAWING NO. <b>300.5-13</b>
			BY	FOR		
			<i>PROD</i>		DRAWN BY <i>DHO</i>	
CHANGE NO.	DATE	DESCRIPTION			CHECKED	DATE <b>9-28-71</b>

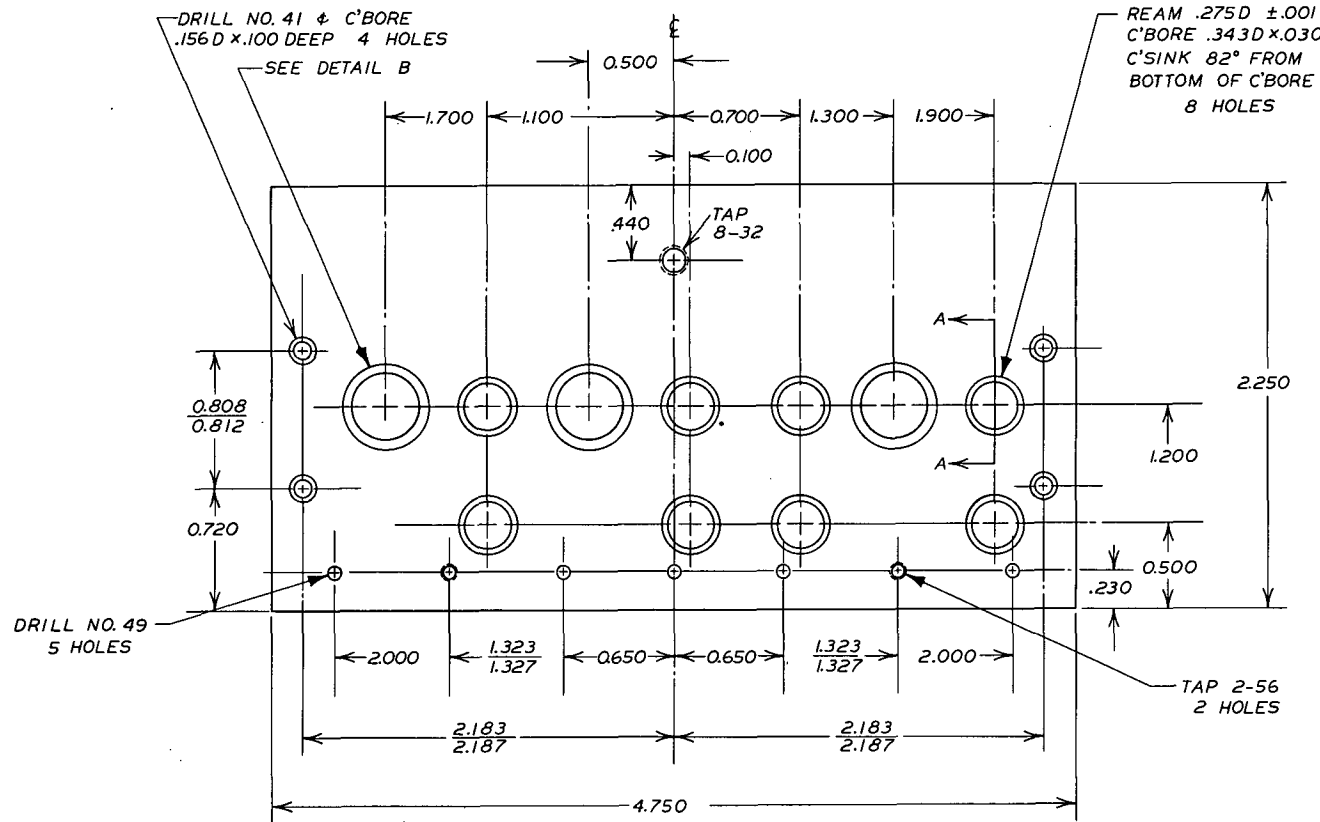


TOLERANCE U.O.N.

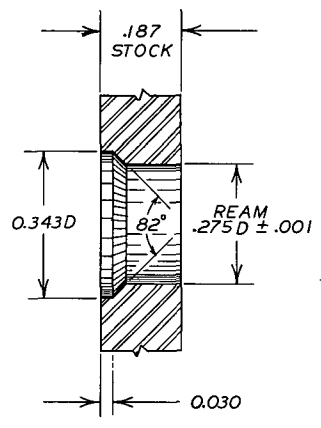
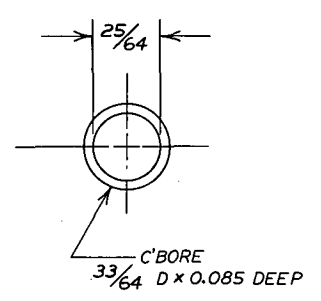
.XXX ±.005  
.XX ±.01

MAT'L: .062 DIA. S.S. ROD  
FINISH: AS MACHINED  
REQ'D: 5 FOR TYPE 1 FPB  
3 FOR TYPE 2 FPB

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE <b>SENSE PIN</b>		
			APPROVED		ENG <b>RJA</b>
			BY	FOR	DATE
				<b>PROD</b>	
			DRAWN BY		DRAWING NO. <b>300.5-14</b>
			<b>DHO</b>		
CHANGE NO.	DATE	DESCRIPTION	CHECKED		DATE <b>9-28-71</b>



DETAIL B

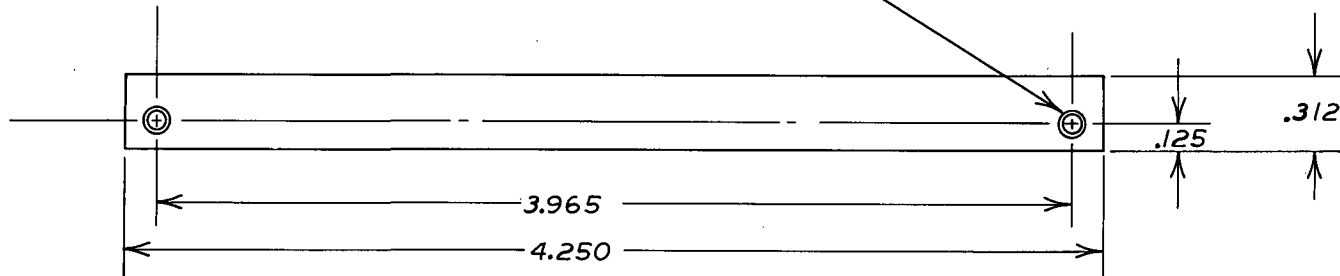


SECTION AA

MATL: .187 ALUM 6061-T6  
 DIMENSIONS: ±.005 U.O.N.  
 FINISH: CSL SPEC MF 1

E	2-8-72	E.C.O. 0255
CHANGE NO.	DATE	DESCRIPTION
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE		
TYPE 6 FACEPLATE		
APPROVED	ENG.	DRAWING NO.
BY: <i>COM</i>	FUR	300.5-15
FOR: <i>PRO</i>	DATE: 15 Feb 72	DRAWN BY: <i>PLL</i>
CHECKED: <i>RJA</i>	DATE: 11-1-71	

DRILL NO. 35 C'BORE  
 .187 X .075 DEEP 2 HOLES

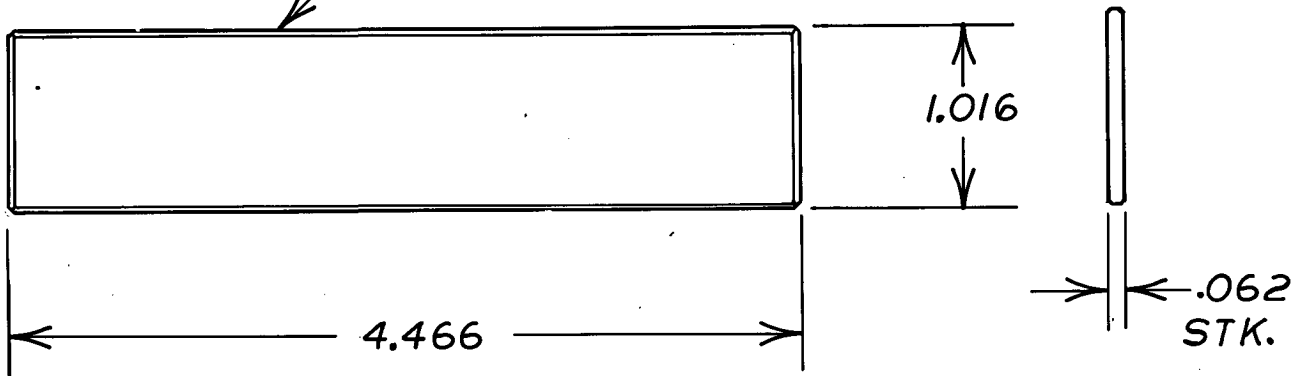


MAT'L: .125 2326 BLUE TRANSLUCENT PLEXIGLASS  
 TOLERANCES: ±.005 U.O.N.

F		3-2-72	E.C.O. 0257 RJA	
CHANGE NO.	DATE	DESCRIPTION		
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI				
<b>MACROMODULAR PROJECT</b>				
TITLE TYPE 7 FPB REAR CONNECTOR FILLER STRIP				
APPROVED			ENG.	DRAWING NO.
BY	FOR	DATE	RJA	300.5-16
RJA	PROD	3-2-72	DRAWN BY PLL	
			CHECKED	DATE
			2/17	2-16-72

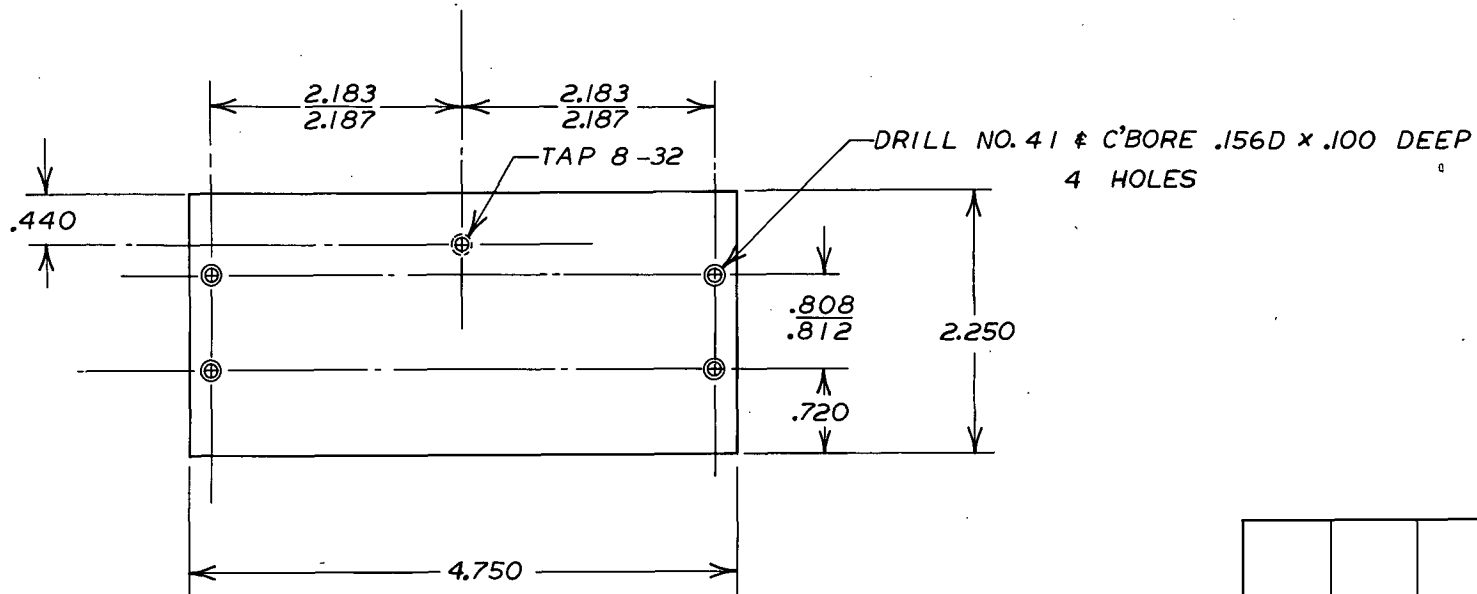


BREAK SHARP CORNERS  
& EDGES



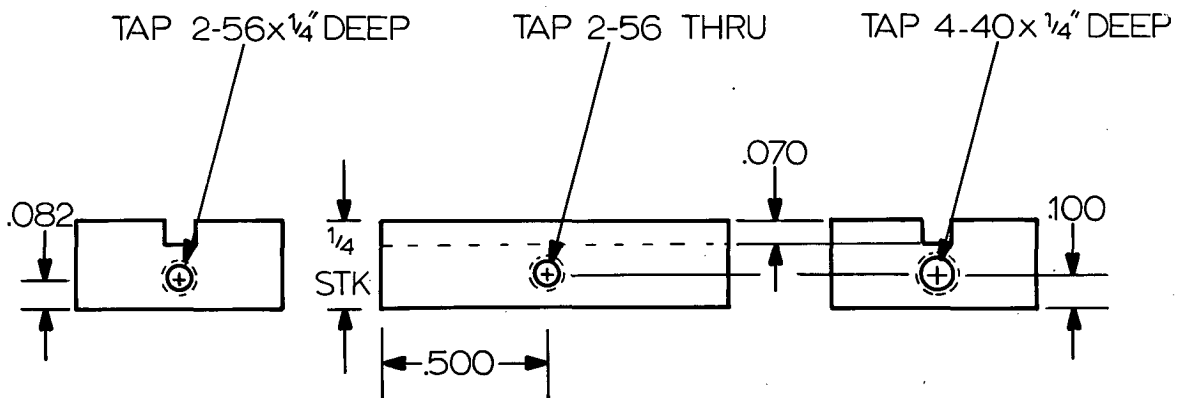
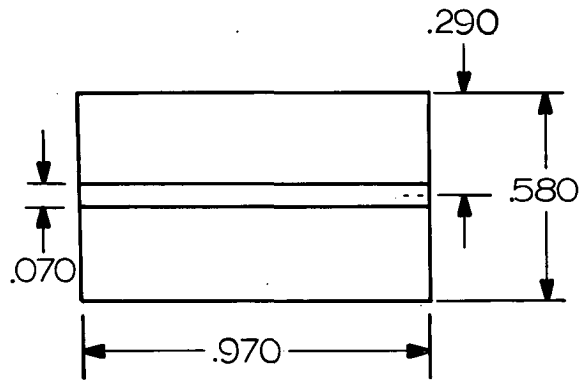
MAT'L: .062 ALUM 2024-T6  
 FINISH: CLEAR ANODIZE  
 TOLERANCES: ± .010 U.O.N.

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE TYPE 8 FPB FILLER		
			APPROVED		ENG RJA
			BY RJA	FOR PROD	DATE 3-2-72
					DRAWING NO. 300.5-17
F 3-2-72 E.C.O. 0257 RJA					DRAWN BY PLL
CHANGE NO.	DATE	DESCRIPTION			CHECKED [Signature]
					DATE 2-16-72



MAT'L: .187 ALUM 6061-T6  
 DIMENSIONS: ±.005 U.O.N.  
 FINISH: CSL SPEC MF-1

F		3-2-72 E.C.O. 0257 RJA	
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE ONE HIGH FACEPLATE FOR TYPE 7 & 8 FPB			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	300.5-18
RJA	PROD	3-2-72	
		DRAWN BY	
		PLL	
		CHECKED	DATE
			2-17-72



MATERIAL: ALUMINUM BAR STOCK 2024-T3

FINISH: ANODIZE

BREAK ALL EDGES .010 min

TOLERANCES U.O.N.

.XXX ±.005  
 .XX ±.010  
 X<sup>1</sup>/<sub>X</sub> ± 1/64

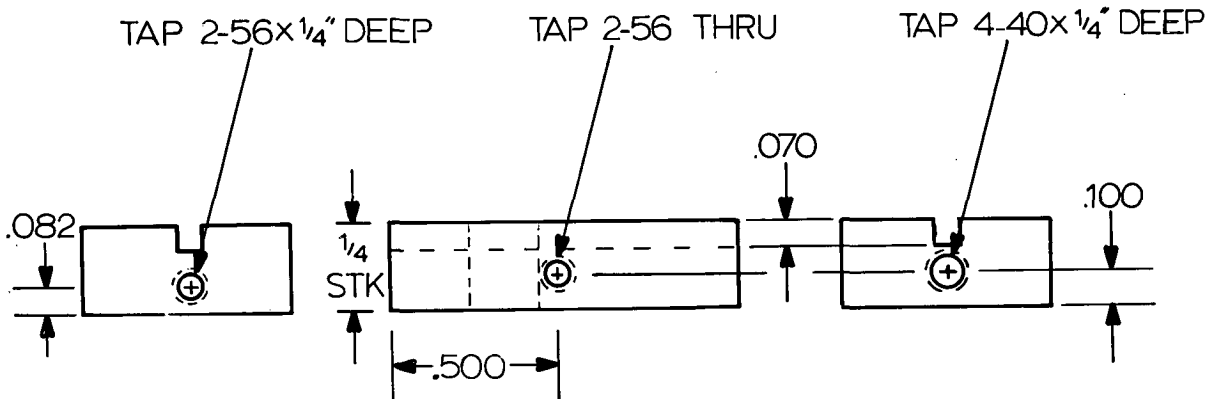
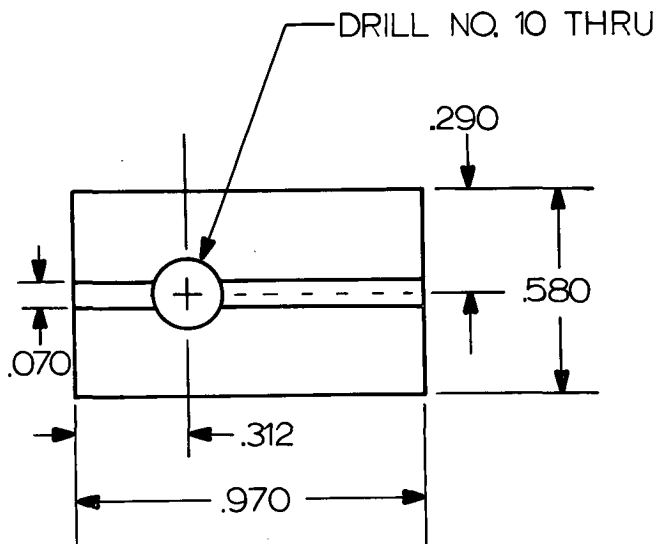
COMPUTER SYSTEMS LABORATORY  
 WASHINGTON UNIVERSITY  
 ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE  
 CONNECTOR STRUT - TYPE 1

I	5-25-73	ECO 290 RJA
CHANGE NO.	DATE	DESCRIPTION

APPROVED			ENG	DRAWING NO.
BY	FOR	DATE	RJA	300.5-19
RJA	PROD	5-31-73	DRAWN BY MAC	
			CHECKED RJA	DATE 5-25-73



MATERIAL: ALUMINUM BAR STOCK 2024-T3

FINISH: ANODIZE

BREAK ALL EDGES .010 min

TOLERANCES U.O.N.

.XXX ±.005

.XX ±.010

X/1X ± 1/64

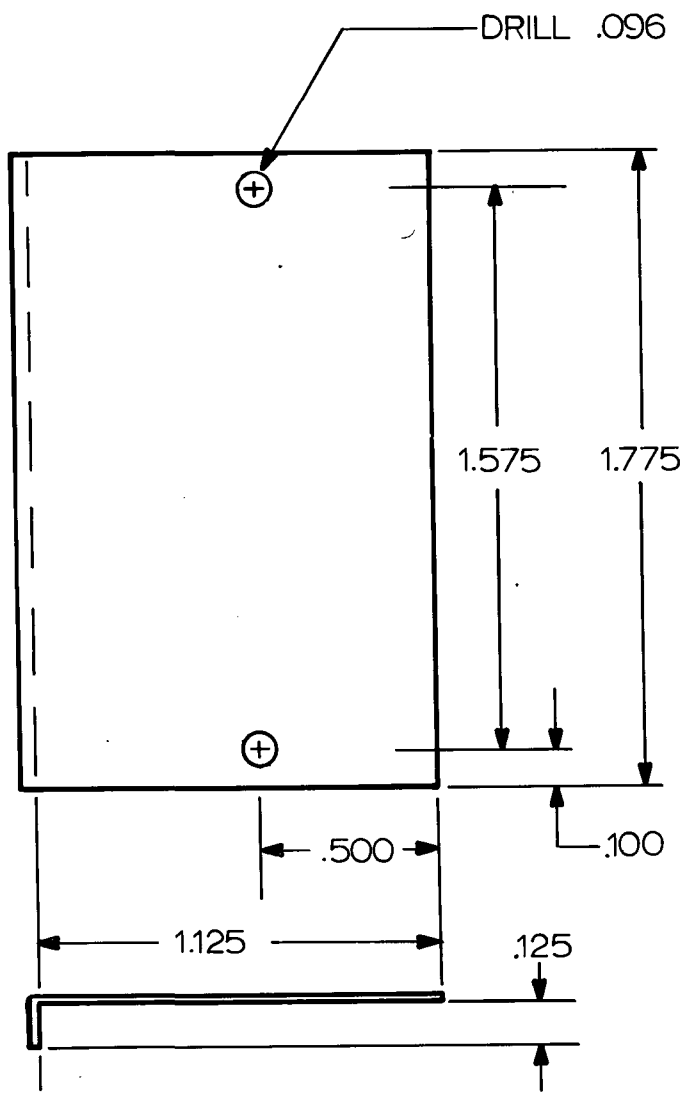
COMPUTER SYSTEMS LABORATORY  
WASHINGTON UNIVERSITY  
ST. LOUIS, MISSOURI

**MACROMODULAR PROJECT**

TITLE  
CONNECTOR STRUT - TYPE 2

CHANGE NO.	DATE	DESCRIPTION
I	5-25-73	ECO 290 RJA

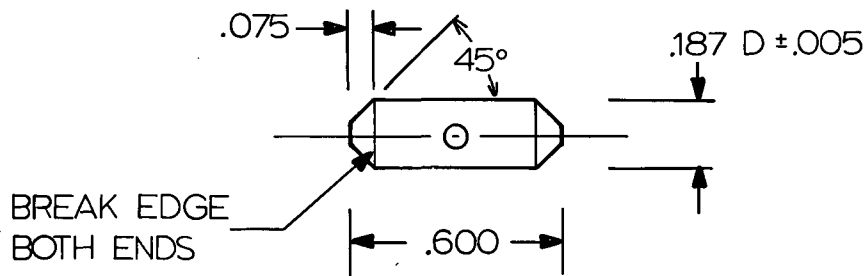
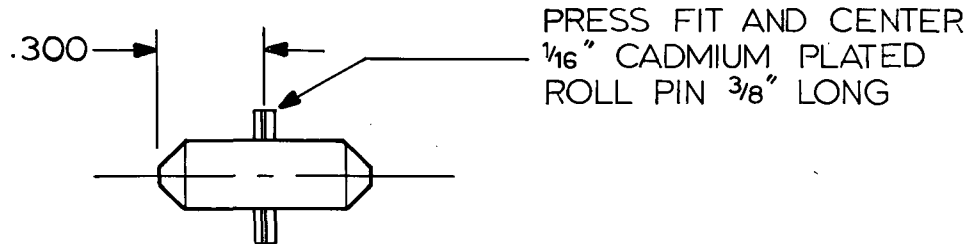
APPROVED			ENG RJA	DRAWING NO.
BY RJA	FOR PROD	DATE 5-31-73	DRAWN BY MAC	300.5-20
			CHECKED RJA	DATE 5-25-73



MATERIAL: .030 ALUMINUM 3003 H14  
 FINISH: ANODIZE

TOLERANCES U.O.N.  
 .XXX ±.005  
 .XX ±.010  
 X<sub>1</sub>X ± 1/64

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT				
			TITLE STRUT COVER				
I	5-24-73	ECO 290 RJA	APPROVED			ENG RJA	DRAWING NO. 300.5-21
			BY RJA	FOR PROD	DATE 5-31-73		
CHANGE NO.	DATE	DESCRIPTION	DRAWN BY MAC			CHECKED RJA	DATE 5-24-73

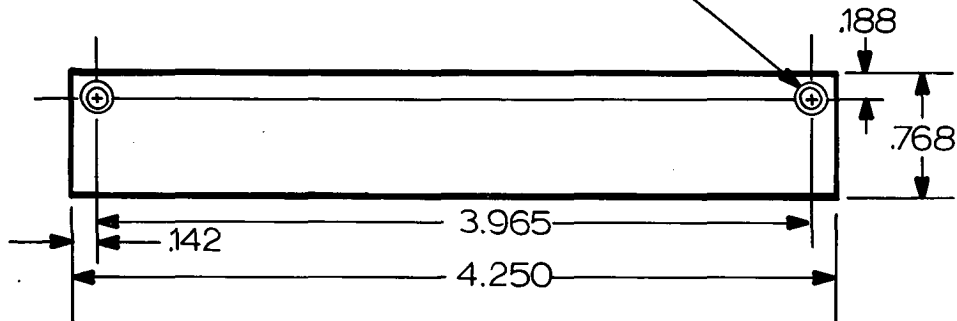


MATERIAL: STAINLESS STEEL .187 Dia.

TOLERANCES  
±.010 U.O.N.

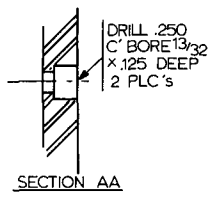
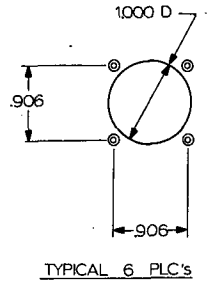
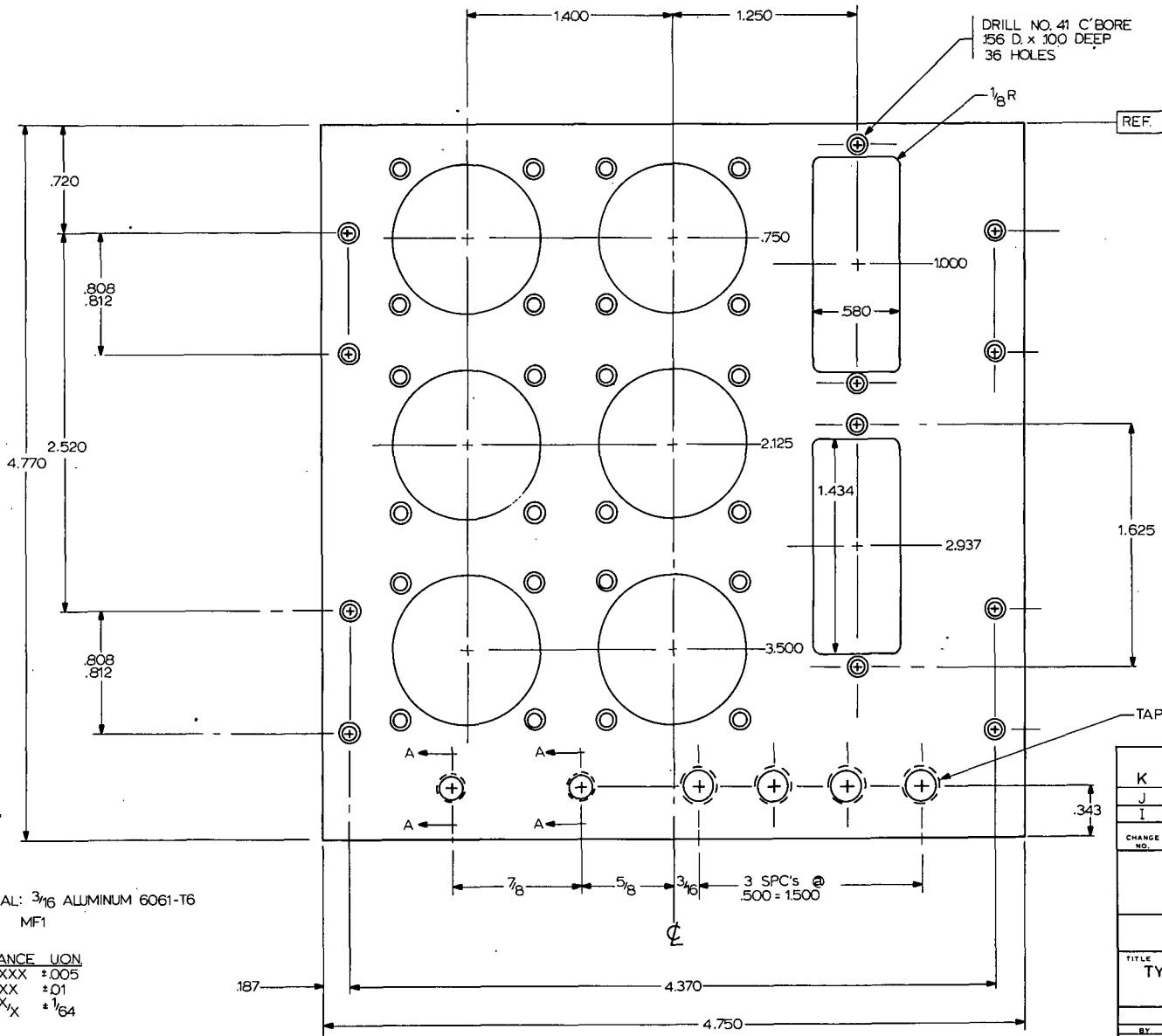
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			<b>MACROMODULAR PROJECT</b>			
			TITLE INTERLOCK PIN			
I	5-25-73	ECO 290 RJA	APPROVED		ENG RJA	DRAWING NO. 300.5-22
			BY RJA	FOR PROD	DATE 5-31-73	
CHANGE NO.	DATE	DESCRIPTION			CHECKED RJA	DATE 5-25-73

DRILL NO. 35 C'BORE  
 .187 x .075 DEEP 2 HOLES



MATERIAL: 125 BLACK PLEXIGLASS  
 TOLERANCES: ±.005 U.O.N.

<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			<b>MACROMODULAR PROJECT</b>				
			TITLE <b>TYPE 10 FPB FILLER STRIP</b>				
			APPROVED			ENG <b>RJA</b>	DRAWING NO. <b>300.5-23</b>
			BY <b>RJA</b>	FOR <b>PROD</b>	DATE <b>5-31-73</b>	DRAWN BY <b>MAC</b>	
CHANGE NO. <b>J</b>	DATE <b>6-13-73</b>	DESCRIPTION <b>ECO 0292</b>				CHECKED <b>RRA</b>	DATE <b>5-24-73</b>
<b>I</b>	<b>5-24-73</b>	<b>ECO 290 RJA</b>					

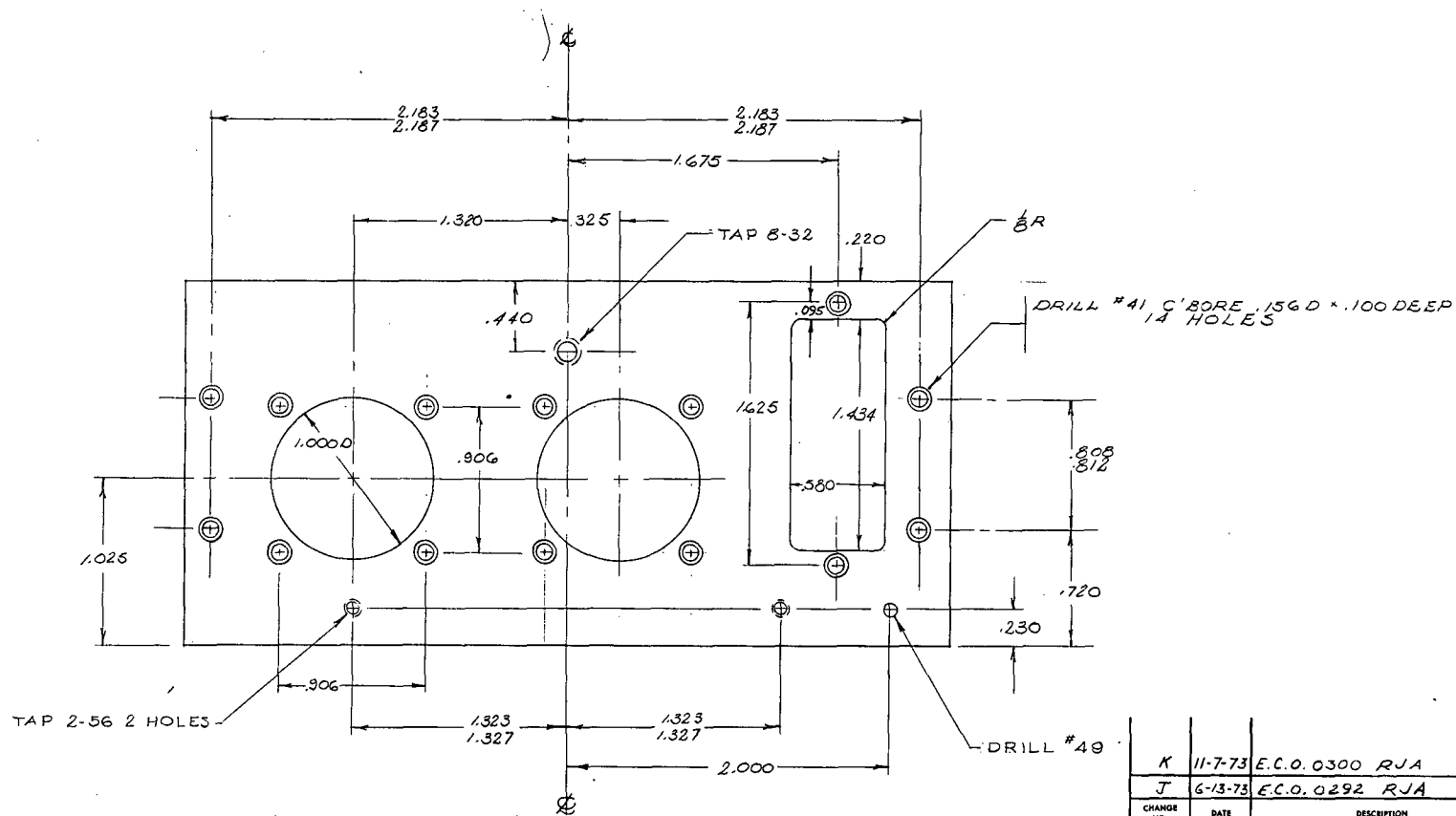


MATERIAL: 3/16 ALUMINUM 6061-T6  
FINISH: MF1

TOLERANCE UNON  
.XXX ±.005  
.XX ±.01  
X/X ±1/64

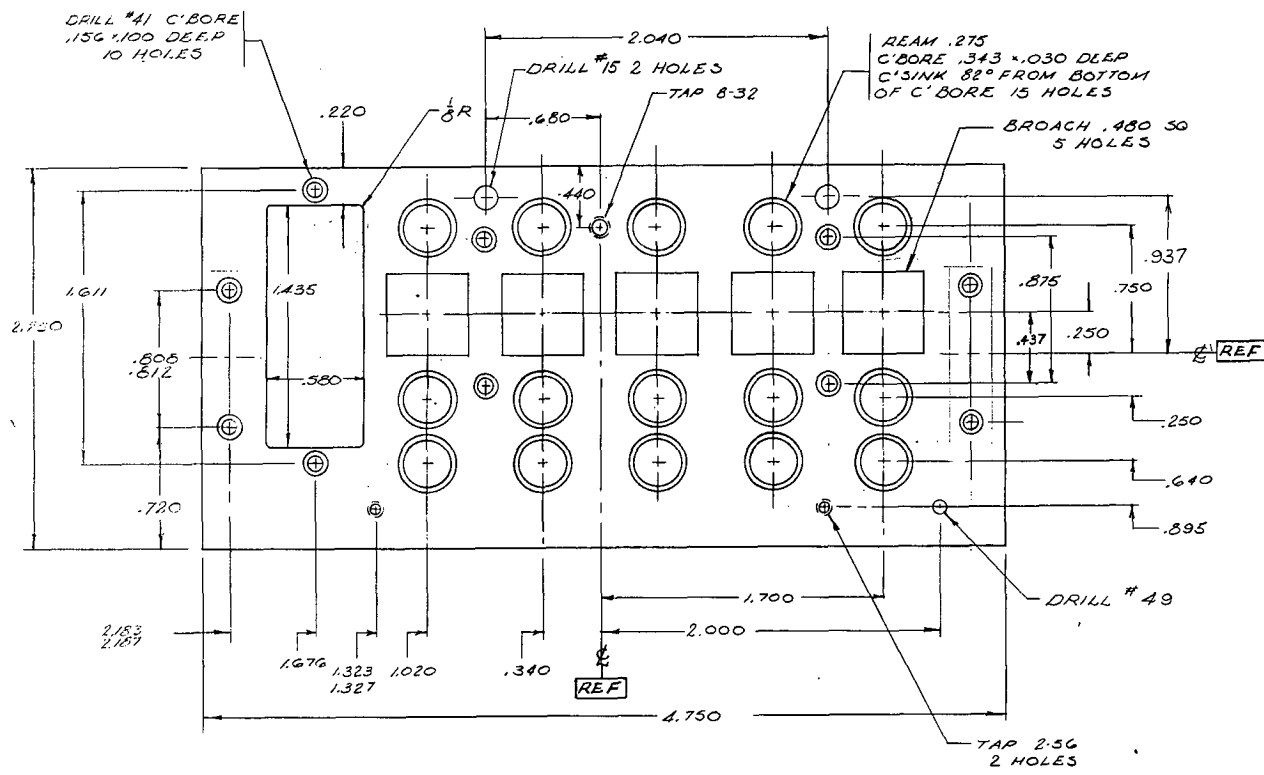
CHANGE NO.	DATE	DESCRIPTION
K	11-7-73	E.C.O. 0300 RJA
J	6-13-73	ECO 0292 RJA
I	5-30-73	ECO 290 RJA
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE TYPE 10 FACEPLATE		
APPROVED	DATE	ENG. RJA
BY RJA	FOR PROD	DATE 5-31-73
DRAWN BY MAC		DRAWING NO. 300.5-24
CHECKED RJA		DATE 5-30-73





MAT'L .187 ALUM. 6061-T6  
 DIMENSIONS UNO ±.005  
 FINISH : CSL SPEC MFI

CHANGE NO.	DATE	DESCRIPTION
K	11-7-73	E.C.O. 0300 RJA
J	6-13-73	E.C.O. 0292 RJA
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
<b>MACROMODULAR PROJECT</b>		
TITLE TYPE IA FACEPLATE		
APPROVED		ENG
BY	FOR	DATE
RJA	PROD	6-13-73
DRAWN BY		DATE
RJA		2-6-73
CHECKED		DATE
GJM		2-6-73
DRAWING NO.		
300.5-25		

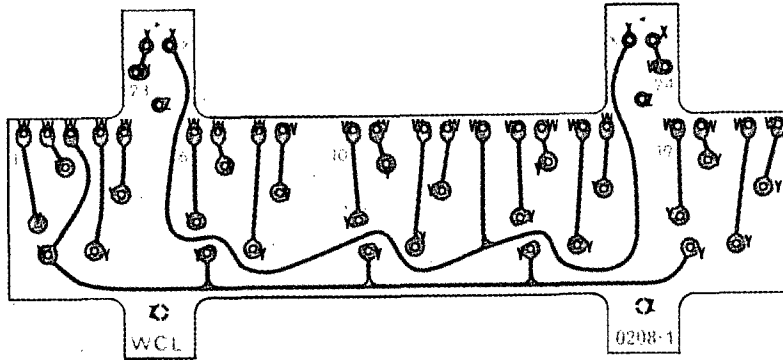


MAT'L 6061-T6 ALUM (.187)

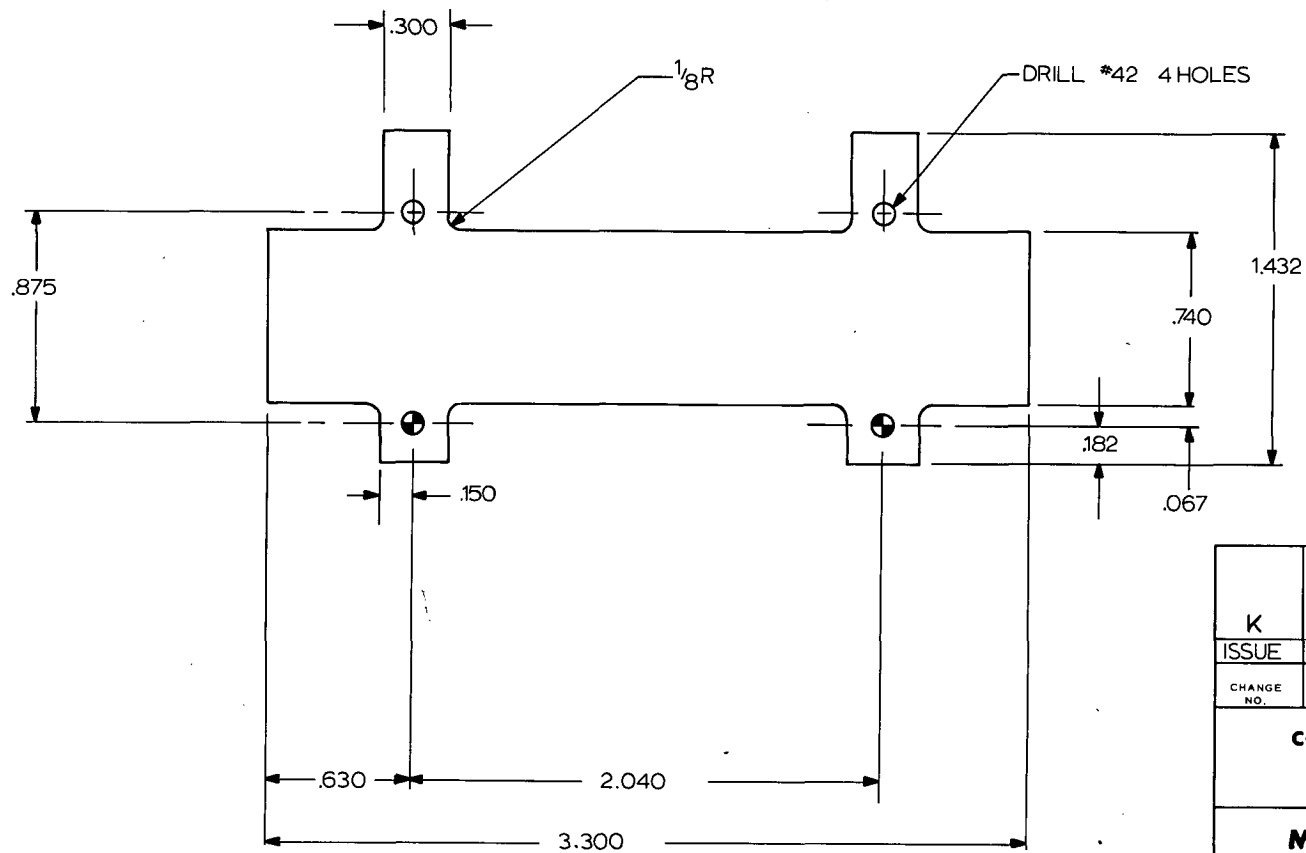
K	11-7-73	E.C.O. 0300	RJA
J	6-13-73	ECO 0292	RJA
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE TYPE 9 FACEPLATE			
APPROVED			ENG RJA
BY	FOR	DATE	DRAWING NO.
RJA	PROD	6-13-73	300.5-26
DRAWN BY RJA			DATE
CHECKED <i>GM</i>			7-27-72

HOLE SIZES:

- HOLES MARKED WITH A "W" USE A NO. 72 DRILL (24 HOLES)
- HOLES MARKED WITH A "X" USE A NO. 60 DRILL (4 HOLES)
- HOLES MARKED WITH A "Y" USE A NO. 55 DRILL (25 HOLES)
- HOLES MARKED WITH A "Z" USE A NO. 42 DRILL (4 HOLES)



			<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE TYPE 9 FPB P.C. BOARD			
K	11-7-73	ECO 0300	<b>MACROMODULAR PROJECT</b>		APPROVED		ENG.	DRAWING NO.
	6-13-73	ECO 0292			BY	FOR	DATE	MLP
ISSUE		RJA	RJA	PROD	6-18-73	DRAWN BY		
CHANGE NO.	DATE	DESCRIPTION				CHECKED		DATE
						MLP		6-13-73



MATERIAL:  $\frac{1}{16}$  PC STOCK (SINGLE SIDED)

K	11-7-73	ECO 0300 RJA	
ISSUE	6-13-73	ECO 0292 RJA	
CHANGE NO.	DATE	DESCRIPTION	
<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
<b>MACROMODULAR PROJECT</b>			
TITLE			
TYPE 9 P.C. BOARD ROUTING OUTLINE			
APPROVED			ENG.
BY	FOR	DATE	RJA
RJA	PROD	6-13-73	DRAWN BY
			MAC
			CHECKED
			MLP
			DATE
			3-15-73
			DRAWING NO.
			300.5-28

V-BUS SUBASSEMBLY

PAGE	TITLE	CHANGE
300.6-1	TITLE PAGE	ISSUE
300.6-2	V-BUS SUBASSEMBLY - ASSEMBLY SPECIFICATIONS	
300.6-3	V-BUS SUBASSEMBLY AND PARTS LIST	
300.6-4	VEIRTICAL BUS BOARD ARTWORK AND BLANKING DIMENSIONS	

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISSUE	0046	10-7-70	<i>JNE</i>								

# V-BUS SUBASSEMBLY

## Assembly Specification

### I. Introduction

The V-Bus subassembly consists of two connectors, a printed circuit board, and two support brackets as shown on the overall view (Dwg. 300.6-3). The printed circuit board is defined by drawing 300.6-4 and the support brackets by drawing 300.5-2. The special connector bracket screws are shown on drawing 300.5-3. Refer to document 300.0 for identification of the V-Bus connectors.

### II. Assembly Procedure

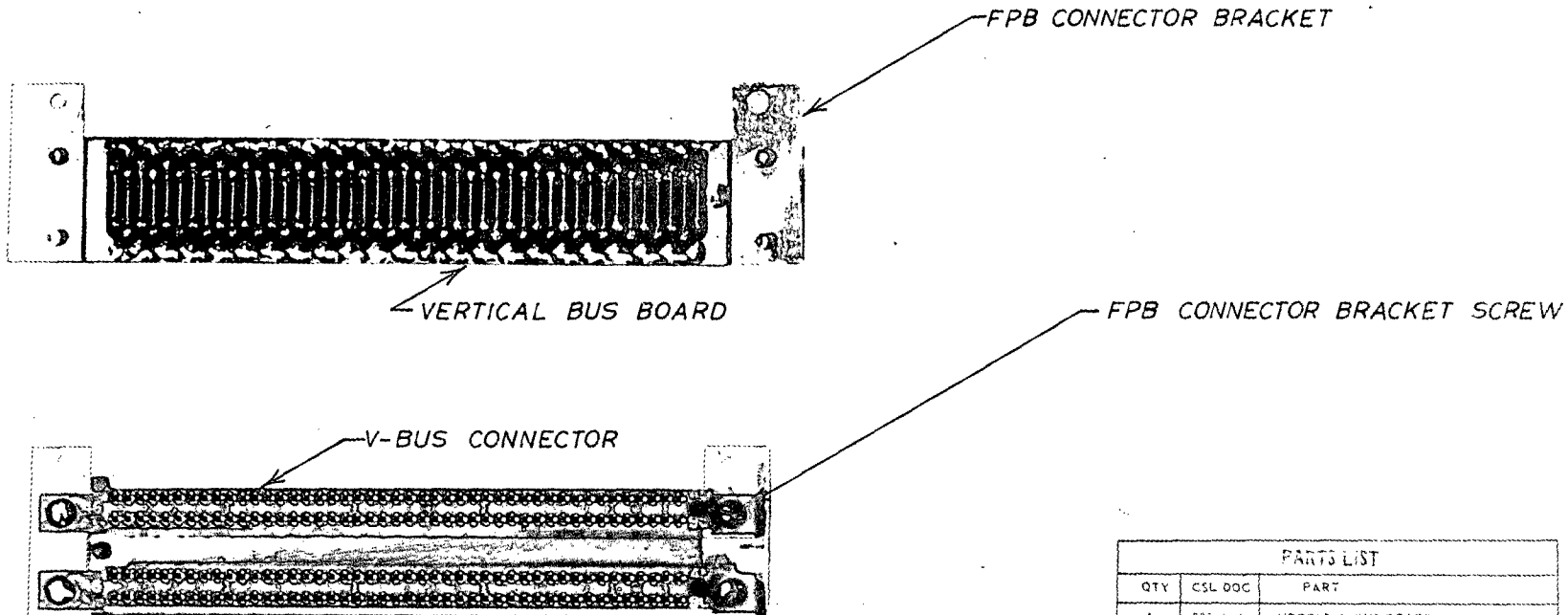
The two connectors shall be applied to the circuit board, and held in place by masking tape, or other suitable means. The two support brackets are then to be attached to the connectors with the special screws called out in the parts list. The assembly may now be soldered.

### III. Soldering

The assembly may be hand soldered or wave soldered. Hand soldering shall be done only with a temperature controlled soldering iron (Weller W-TCP iron with a 600 degree Fahrenheit tip or equivalent). In the case of wave soldering, care should be exercised to preserve the alignment and seating position of the circuit board.

The connectors must be flush with the surface of the circuit board at the three points of contact on each connector block. The distance between any one of these contact points and the circuit board shall be less than 0.010 inch after assembly. The solder used shall be of nominally 60% tin and 40% lead. Any convenient flux may be used provided that all flux residues are removed from the finished assembly. No flux shall be allowed to enter the connectors, and the flux cleaning process shall leave no residue on the connector block or gold contact pins.

CHG.	E.C.O.	DATE	APPR.
ISSUE	0046	10-7-70	<i>gcj</i>



PARTS LIST		
QTY	CSL DOC	PART
1	300.5-4	VERTICAL BUS BOARD
2	300.6	V-BUS CONNECTOR
2	300.5-2	FPB CONNECTOR BRACKET
4	509.5-7	FPB CONNECTOR BRACKET SCREW

			<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			TITLE <b>V-BUS SUB-ASSEMBLY AND PARTS LIST</b>			
			<b>MACROMODULAR PROJECT</b>			APPROVED		ENG. <b>WAC</b>	DRAWING NO. <b>300.5-3</b>
ISSUE <b>10-7-70</b> E.C.O. <b>0046</b> <i>gcj</i>						BY <i>gcj</i>	FOR <b>PROD.</b>	DATE <b>5-23-70</b>	
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>WAC</i>		DATE <b>10 7 70</b>	

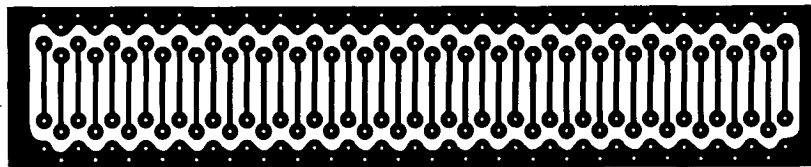
PTS0082-1



SIDE FACING CONNECTOR

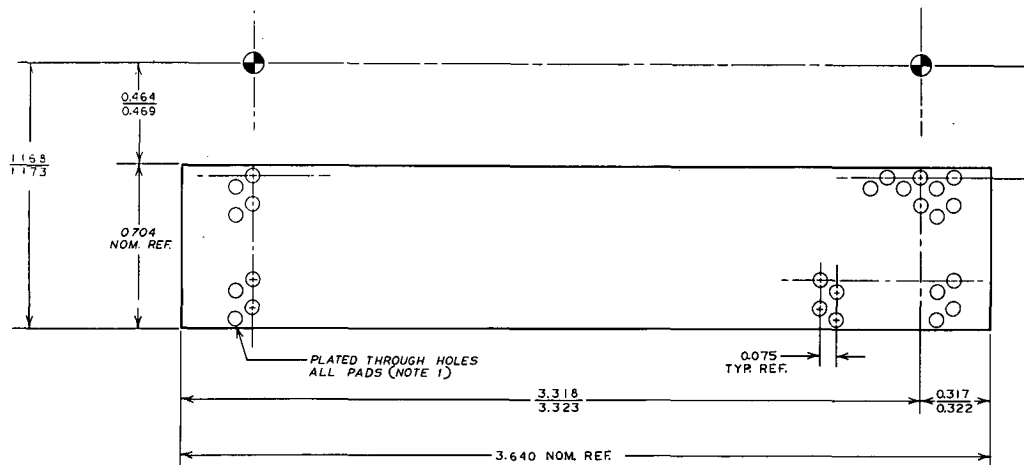
REV © 1-580029

NOTE: ARTWORK SUPPLIED AS  
4:1 CRONAFLEX PRINT



EXPOSED SIDE

BOARD BLANK DIMENSIONS



NOTE 1: 180 HOLES PLATED THROUGH  
TYPE 'B'

NOTE 2: REFER TO CSL SPECIFICATION  
PC-1

ISSUE	10/7/68	E.C.O.	004	BGCJ
DATE		DESCRIPTION		
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI				
MACROMODULAR PROJECT				
TITLE VERTICAL BUS BOARD ARTWORK AND BLANKING DIMENSIONS				
APPROVED	DATE	BY	CHKD BY	DRAWING NO.
BGCJ	PRD	10-6-70	PL	300.6-4
				DATE
				10-2-70



FUNCTION CODE SWITCH  
SUBASSEMBLIES

PAGE	TITLE	CHANGE
300.7-1	TITLE PAGE	<b>B</b>
300.7-2	FUNCTION CODE SWITCH SUBASSEMBLIES - ASSEMBLY PROCEDURES	
300.7-3	TYPE 1 FUNCTION CODE SWITCH SUBASSEMBLY	A
300.7-4	TYPE 2 FUNCTION CODE SWITCH SUBASSEMBLY	
300.7-5	TYPE 3 FUNCTION CODE SWITCH SUBASSEMBLY	B

CHG.	E.C.O.	DATE	APPR	CHG	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR.
re-iss	0229	11-11-71	<i>RJA</i>								
A	0247	1-13-72	<i>RJA</i>								
B	0292	6-13-73									

## Function Code Switch Subassemblies

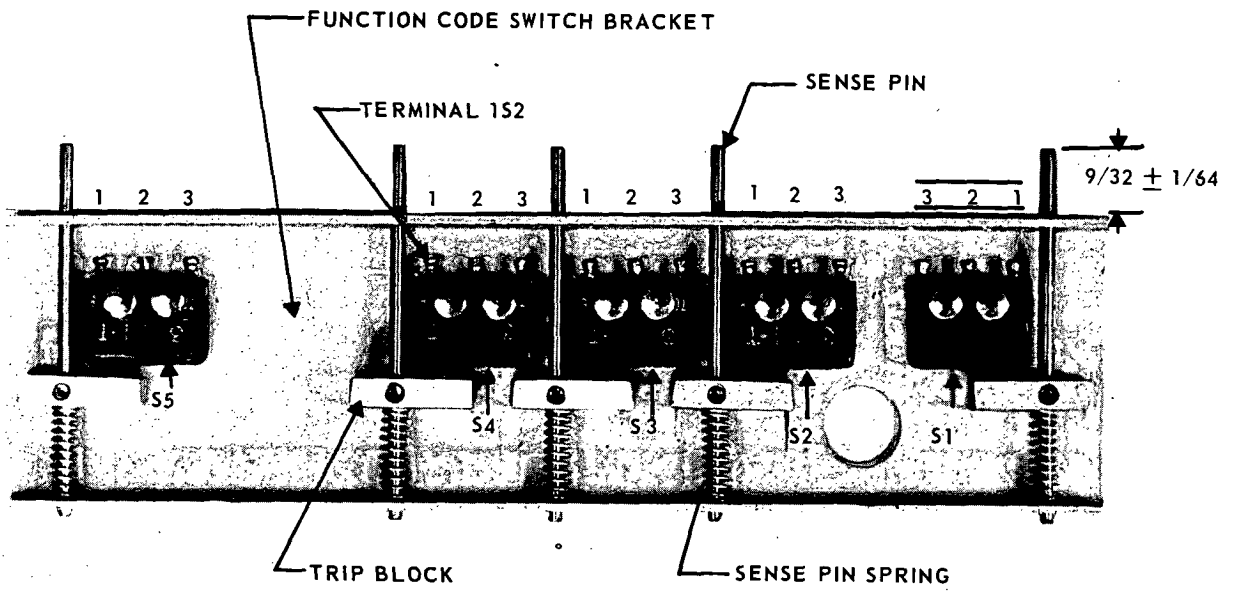
### Assembly Procedure

This document (300.7) describes the Function Code Switch Subassemblies of all types. To assemble a specified type, the procedure to be followed for each switch position required by the subassembly is:

- 1) Rivet microswitches to bracket with shallow head rivets being careful not to damage the switch and making sure that they are placed in the proper orientation.
- 2) At each switch location thread a sense pin through the bracket, a trip block and a spring as indicated on 300.7-3 & 300.7-4.
- 3) Adjust the sense pin extension from the front surface of the bracket to  $9/32 \pm 1/64$  in.
- 4) Secure the sense pin to the trip block by firmly tightening the set screw in the trip block.
- 5) After all switches and activating mechanisms have been assembled and adjusted verify proper on/off operation of each switch.

CHG.	E.C.O.	DATE	APPR
re-iss	0229	11-11-71	RJA

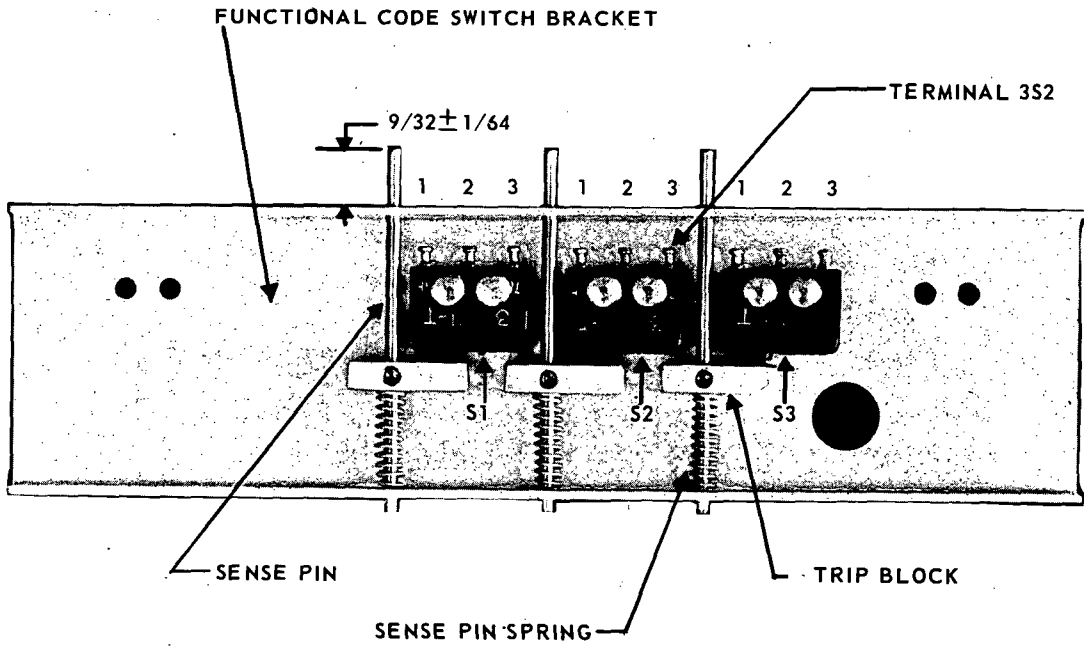
NOTE ORIENTATION



PARTS LIST		
QTY	CSL DOC.	PART
1	300.5-6	FUNCTION CODE SWITCH BRACKET
5	—	MICRO SWITCH NO. 35X1-T
5	—	SENSE PIN SPRING .120 OD, .016 WIRE DIA, 1/2 in. FREE LENGTH, 8 1/2 POUNDS PER INCH
5	300.5-13	TRIP BLOCK
5	300.5-14	SENSE PIN
5	—	2-56 x 1/16 LG CUP POINT SOCKET HEAD SET SCREW CADMIUM PLATED
10	—	.086 BODY DIA x 9/32 LG SHALLOW OVAL HEAD NICKEL PLATED STEEL SEMI-TUBULAR RIVETS

<b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			<b>MACROMODULAR PROJECT</b>				
			TITLE TYPE 1 FUNCTION CODE SWITCH SUBASSEMBLY				
			APPROVED		ENG	DRAWING NO. 300.7-3	
A	1-13-72	E.C.O. 0247	BY	FOR	DATE		RJA DRAWN BY MBP
re-iss	11-11-71	E.C.O. 0229	<i>RJA</i>	PROD.	11-12-71		
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>RJA</i>	DATE 11-11-71

NOTE ORIENTATION



PARTS LIST		
QTY	CSL DOC.	PARTS
1	300,5-6	FUNCTION CODE SWITCH BRACKET
3	—	MICRO SWITCH NO. 3SX1-T
3	—	SENSE PIN SPRING .120 OD, .016 WIRE DIA, ½ in. FREE LENGTH, 8½ POUNDS PER INCH.
3	300,5-13	TRIP BLOCK
3	300,5-14	SENSE PIN
3	—	2-56 x 1/16 LG CUP POINT SOCKET HEAD SET SCREW CADMIUM PLATED
6	—	.086 BODY DIA. x 9/32 LG SHALLOW OVAL HEAD NICKEL PLATED STEEL SEMI-TUBULAR RIVETS

<p><b>COMPUTER SYSTEMS LABORATORY</b> WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI</p>			<p><b>MACROMODULAR PROJECT</b></p>			
			<p>TITLE TYPE 2 FUNCTION CODE SWITCH SUBASSEMBLY</p>			
re-iss	11-11-71	E.C.O. 0229	APPROVED		ENG	DRAWING NO.
			BY	FOR	DATE	
CHANGE NO.	DATE	DESCRIPTION	BY	FOR	DATE	CHECKED
			<i>RCJ</i>	PROD.	11-12-71	<i>RCJ</i>
						DATE
						11-11-71



UNCLASSIFIED  
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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13. ABSTRACT  Specifications for the construction of Macromodular Faceplate Rox assemblies are contained in this report. Also included are all electrical and mechanical specifications for common subassemblies. Certain general assembly techniques are specified.			

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Macromodule Faceplate Macromodule Code Switch						

