

Washington University School of Medicine

Digital Commons@Becker

Technical Reports

Institute for Biomedical Computing

2-1974

Macromodular Computer Design, Part 2, Volume 10, Parameter Switches, Mini Console, and L.E.D. Data Indicator

Computer Systems Laboratory, Washington University

Follow this and additional works at: https://digitalcommons.wustl.edu/bcl_techreports

Recommended Citation

"Macromodular Computer Design, Part 2, Volume 10, Parameter Switches, Mini Console, and L.E.D. Data Indicator," Computer Systems Laboratory, Washington University (1974). *Technical Reports*. Paper 15. https://digitalcommons.wustl.edu/bcl_techreports/15

This Technical Report is brought to you for free and open access by the Institute for Biomedical Computing at Digital Commons@Becker. It has been accepted for inclusion in Technical Reports by an authorized administrator of Digital Commons@Becker. For more information, please contact vanam@wustl.edu.

MACROMODULAR
COMPUTER DESIGN
PART 2
MANUFACTURING DESCRIPTION

VOLUME X

PARAMETER SWITCHES, MINI CONSOLE,
AND L. E. D. DATA INDICATOR

Technical Report No. 39

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. 39

PART 2 - MANUFACTURING DESCRIPTION
VOL. X-PARAMETER SWITCHES, MINI CONSOLE, AND
L.E.D. DATA INDICATOR

This work has been supported by the Advanced Research Projects Agency of the Department of Defense under Contract SD-302 and by the Division of Research Facilities and Resources of the National Institutes of Health under Grant RR-00396.

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Advanced Research Projects Agency or the U.S. Government.

Computer Systems Laboratory
Washington University
St. Louis, Missouri

ABSTRACT

The assembly procedure for the Parameter Switch, Mini Console, and LED Data Indicator is given here along with the parts lists and description of special tools required for proper assembly.

INDEX

PARAMETER SWITCH

PAGES 351-1 thru 351-35

MINI-CONSOLE

PAGES 354-1 thru 354-24

TAP BOX

PAGES 355-1 thru 355-9

L.E.D. DATA INDICATOR

PAGES 356-1 thru 356-25

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY

351

PARAMETER SWITCH

PAGE	TITLE	CHANGE
351-1	TITLE PAGE	ISSUE
351-2	PARTS LIST	
351-3 thru 351-25	ASSEMBLY SPECIFICATIONS	
351-4	PARAMETER PLUG - OVERALL VIEW	
351-9	CONNECTOR TO BRACKET ORIENTATION	
351-10	SPECIAL TOOLS	
351-12	SWITCH CONTACT REMOVAL	
351-13	LTN-3 LEAD BENDING	
351-14	FIRST ASSEMBLY STACK	
351-15	LOWER SWITCH SCHEMATIC	
351-16	LOWER SWITCH CLOSEUP	
351-18	COMPLETED LOWER SWITCH BOTTOM VIEW	
351-21	SECOND SWITCH SCHEMATIC	
351-22	TOP SWITCH ALIGNMENT SLID BACK	
351-26	COMPLETED WIRING SIDE VIEW	
351-27	CASE HALF ASSEMBLY	
351-28	ASTRO-348 PARTS IDENTIFICATION	
351-29	PARAMETER PLUG CASE DESIGN	
351-30	PARAMETER PLUG CONNECTOR MOUNTING BRACKET	
351-31	PARAMETER PLUG LOCK NUT	
351-32	LTN-3 PACKAGE OUTLINE	
351-33	SCHEMATIC OF RINGOUT BOX	
351-34	PARAMETER SWITCH SCHEMATIC	
351-35	MECHANICAL SKETCH OF RINGOUT BOX	

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
Issue	-	1-5-72	<i>rcj</i>								

PARAMETER PLUG
PARTS LIST

Qty.	Manufacturer	Part	Reference
1	Amphenol	Astro 348 Rear Nut	
1	Amphenol	Astro 348 Shell & Insert Assembly (Modified)	351-28
1	Amphenol	Astro 348 Membrane Seal	351-28
1	Amphenol	Astro 348 Contact Retention Disc	351-28
2	Amphenol Cadre	Case Half	351-29
1	-	Connector Bracket	351-30
1	-	Lock Nut	351-31
4	Interswitch	MB031/A07 Thumbwheel Switch	
2	Interswitch	M2x40 Threaded Rods	
4	Interswitch	M2 Slotted Nuts	
4	Sprague	LTN-3 Resistor Capacitor Networks	351-32
1	Ampex	Diode Type 013-694 Selected by Ampex	
1	ITT	Type 1N270 Diode (Selected)	
	Brand Rex	#26 AWG Kynar Insulated wire wrap wire white and gray	
	Belden	#22 AWG Solid Tinned Bare Bus Wire	
37	ALPHA etc. Amphenol	Thin Wall Teflon Tubing for diode leads Female Contacts, ASTRO-348-100-5000S-02	
4		2-56 x 1/4 S.S.F.H. Socket Screws	
		<u>Special Tools</u>	
1		Slotted Screwdriver	351-10
1		Turret Wrench	351-10
1		Spacing Jig	351-10
1		Assembly Fixture and dummy blocks	351-10

CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>gcj</i>

PARAMETER PLUG
ASSEMBLY SPECIFICATION

I. INTRODUCTION

The Parameter Plug is used as a static 12 bit input device. The desired data value is set into a bank of four thumbwheel switches mounted in a plug-in case. See page 351-4 for an overall view. The ASTRO-348 connector on the rear of the case allows communication with any data input port in a Macromodular computer.

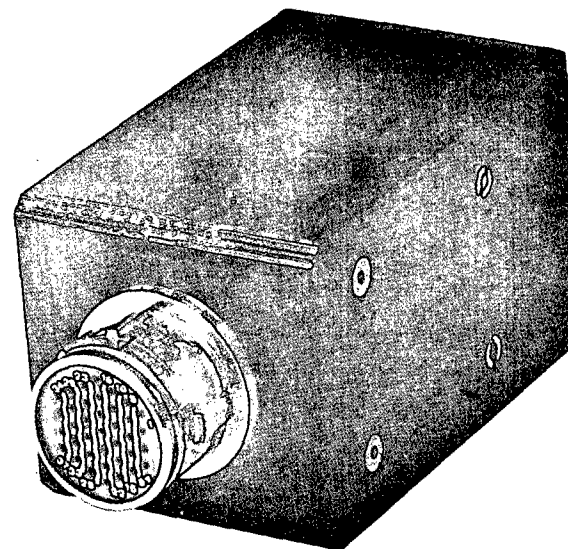
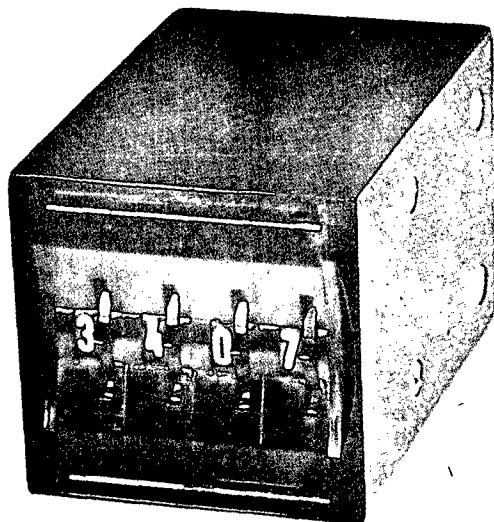
This specification will describe the internal components and the assembly sequence.

II. COMPONENTS

The ASTRO-348 Connector is made up of a subset of parts from a 348-40E14-37S1 connector. The parts are named on the parts list, and the entire subset may be purchased from Amphenol by special negotiation. Note that the front shell assembly has a groove, and the locking ring flange has been removed. See 351-28 for parts identification.

The plastic case is made from two identical halves. The case half is detailed on drawing 351-29 which shows decorative detail suitable for machining. The molded case halves from Amphenol Cadre have a copy of the decorative framing found on Interswitch Division Plates.

CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>mcj</i>



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

PARAMETER PLUG - OVERALL VIEW

			<p>COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI</p> <p>MACROMODULAR PROJECT</p>	<p>TITLE PARAMETER PLUG - OVERALL VIEW</p>														
<p>ISSUE</p>	<p>1-7-72</p>	<p><i>gcj</i></p>		<table border="1"> <tr> <th colspan="3">APPROVED</th> </tr> <tr> <td>BY</td> <td>FOR</td> <td>DATE</td> </tr> <tr> <td><i>gcj</i></td> <td>PROD</td> <td>1-8-72</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	APPROVED			BY	FOR	DATE	<i>gcj</i>	PROD	1-8-72				<p>ENG. <i>GCJ</i></p> <p>DRAWN BY <i>GWP-DLS</i></p> <p>CHECKED <i>gcj</i></p>	<p>DRAWING NO. 351-4</p>
APPROVED																		
BY	FOR	DATE																
<i>gcj</i>	PROD	1-8-72																
<p>CHANGE NO.</p>	<p>DATE</p>	<p>DESCRIPTION</p>				<p>DATE 1-7-72</p>												

The Connector Support Bracket (351-30) and the Lock Nut (351-31) serve to align and capture the ASTRO-348 connector. The tapped holes in the bracket also serve to retain the case halves.

The Interswitch MB031/A07 thumbwheel switch is a standard binary output switch with mechanical stops at 0 and 7.

The Sprague LTN-3 resistor-capacitor networks are fully detailed in Document 010. The case outline is shown on 351-32 for reference.

The Ampex diode (part #013-694) is selected by the manufacturer. The forward drop shall be between 0.85 and 0.94 volts at a current of 0.350 amperes. The type 1N270 germanium diode shall be selected for forward voltage drop. The forward drop shall be between 0.245 and 0.275 volts at a current of 0.001 amperes. See 351-6 for sketch of diode selection procedure.

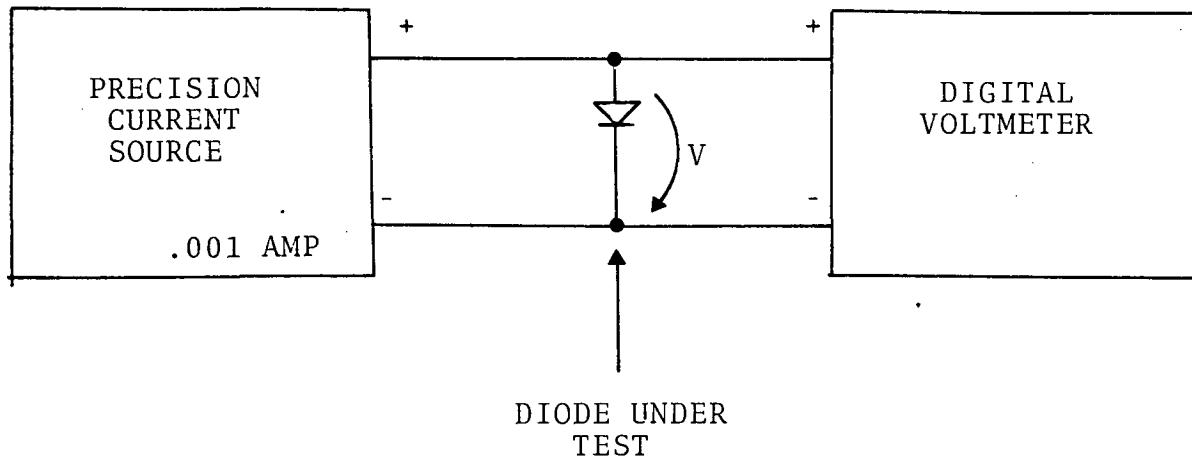
CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>mcj</i>

PARAMETER SWITCH

1N270 DIODE

SELECTION PROCEDURE

The forward drop (V) shall be between 0.245 and 0.275 volts at a current of 0.001 amperes.



CHG.	E.C.O.	DATE	APPR.
ISS	-	1-5-72	<i>DCJ</i>

SOLDERING

All soldering shall be performed with a temperature controlled iron. The Weller W-TCP with a 700°F tip is acceptable. Resistance and SCR controlled irons are not acceptable.

The solder used shall be nominally 60% tin and 40% lead with a non-corrosive rosin core. A small diameter (#22 wire guage) solder is preferable. (Ersin Multicore)

WIRE STRIPPING

The #26 wire wrap wires shall be stripped on both ends with a modified NO NIK stripper. (Blue Handle 0.021 inch NO-NIK Stripper. CLAUSS Cutlery Co., Fremont, Ohio.) The modification consists of a machined wire stop which gives a strip length of $.150 \pm .025$ inches.

CRIMPING

Crimping standards and tooling are covered in the 370 document. Adjust the crimping tool to accomodate the #26 wire used for the Parameter devices.

ASSEMBLY SEQUENCE

Prepare wires from #26 AWG White and Gray wire wrap wire.

2	short gray wires	$1.5 \pm .062$ inches
13	Gray wires	$2.5 \pm .062$ inches
13	White wires	$2.5 \pm .062$ inches

CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>scj</i>

Strip both ends of all wires using modified NO-NIK stripper.

Reserve one 2.5 inch gray wire, and crimp ASTRO-348 female contacts on one end of all remaining wires.

Insert crimped contacts and empty-uncrimped contacts into the contact retention disc as follows:

DESCRIPTION	ASTRO-348 Contact Positions
BLANK PINS	1, 2, 3, 4, 6, 7, 18, 19, 34, 35
WHITE WIRES	5, 9, 11, 13, 15, 17, 21, 24, 26, 28, 31, 33, 37
GRAY WIRES	8, 10, 12, 14, 16, 20, 23, 25, 27, 30, 32, 36
SHORT GRAY WIRES	22, 29

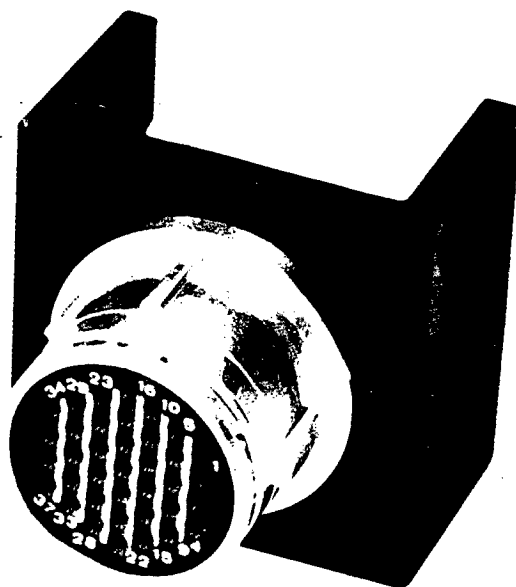
Place membrane seal over contacts.

Assemble an ASTRO-348 Shell into a Connector Support Bracket with a Lock Nut. (351-9) Securely tighten the Lock Nut using the special turret wrench (351-10). Hold the bracket in a vise for this operation - the nut must be tight. The only correct orientation is shown on 351-9.

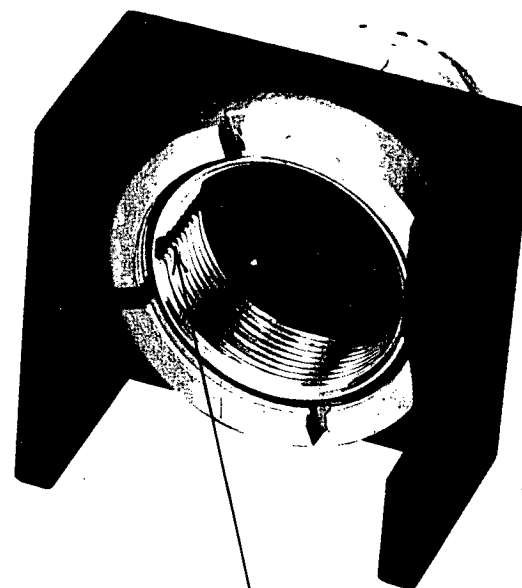
Insert the contact retention disc and associated wires into the connector shell with a rear nut, and tighten the rear nut securely with channel lock pliers. Dress the two short gray wires and one end of the reserved long gray wire against the lip of the rear nut and solder all three.

Insert connector assembly into socket of the electrical ring-out box. (351-33 and 35)

CHG.	E.C.O.	DATE	APPR.
Iss	-	1-5-72	rcj



NUMBERS ARE UPRIGHT IN
ONLY ONE OF THREE
POSSIBLE ROTATIONAL POSITIONS



NOTE RELATIVE POSITION
OF SLOT AND U-SHAPED
BRACKET

				COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE CONNECTOR TO BRACKET ORIENTATION	
						APPROVED BY: <i>GCJ</i> FOR: <i>PROD</i> DATE: <i>1-7-72</i>	
						ENG. <i>GCJ</i> DRAWN BY: <i>GWRDLS</i>	
						CHECKED: <i>GCJ</i> DATE: <i>1-7-72</i>	
ISSUE <i>1-7-71</i> <i>GCJ</i>				MACROMODULAR PROJECT		DRAWING NO. <i>351-9</i>	
CHANGE NO.	DATE	DESCRIPTION					

ASSEMBLY
FIXTURE

DUMMY BLOCKS

SLOTTED
SCREWDRIVER

SPACING
JIG

TURRET
WRENCH

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

SPECIAL TOOLS

ISSUE

1-7-72

gcj

CHANGE
NO.

DATE

DESCRIPTION

APPROVED

BY

FOR

DATE

gcj

PROD.

1-8-72

ENG

GCJ

DRAWN BY
MBP

CHECKED

gcj

DRAWING NO.

351-10

DATE

1-7-72

Prepare 4 thumbwheel switches (MB031/A07) by removing the contact from pin 6 and the alignment pins from the leftmost switch. Use diagonal cutting pliers and cut as shown on 351-12. WARNING - Do not touch the remaining contacts of the thumbwheel switches. All operations shall be performed in a manner which protects the contacts from mechanical damage.

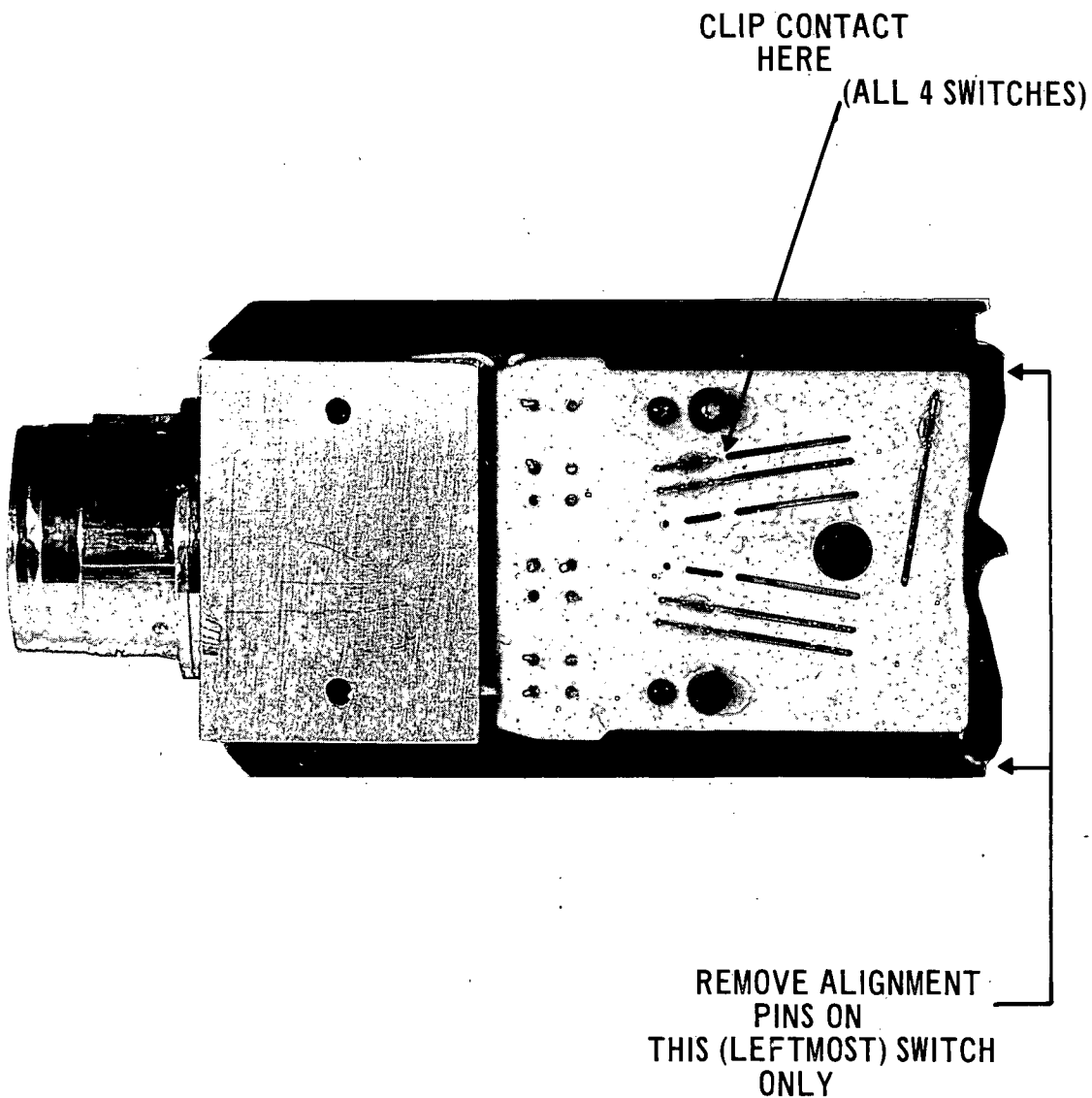
Prepare 4 LTN-3 networks by bending the leads as shown on 351-13. Three of the networks are bent toward the printed pin numbers, and one is bent in the opposite direction. During assembly, these will be designated (TOWARD: LTN-3) and (AWAY: LTN-3).

The distance between body and bend is determined by the spacer tool as illustrated (351-10 and 13).

Place two thumbwheel switches and two dummy blocks into the assembly fixture - 351-14 apply light pressure. Position 4 #22 AWG bare wires (2.250 long) into holes 3,4,5 and 6 nearest the body of the switches. Solder the wires to the lower switch, and trim the upper ends to about 1/16 inch above the upper switch board. Do not trim the lower ends until the LTN-3 has been installed.

Remove upper switch and replace with dummy block. Position one (TOWARD: LTN-3) network with the bend in the leads 1/8 inch above the surface of the board of the lower switch. (Lead 1 of

CHG.	E.C.O.	DATE	APPR.
ISS.	-	1-5-72	<i>DCJ</i>



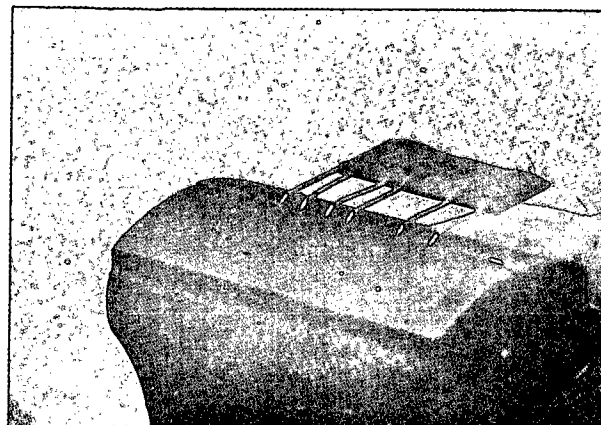
COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

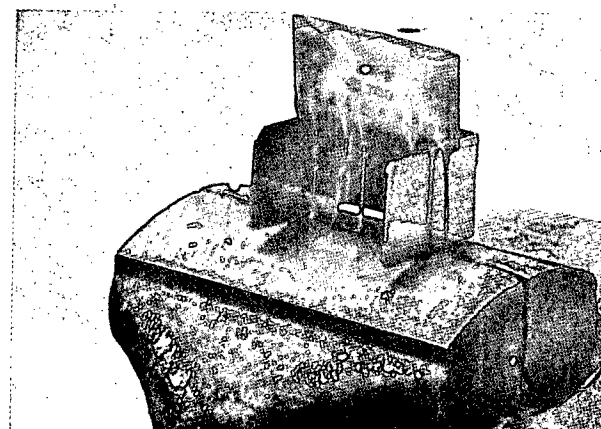
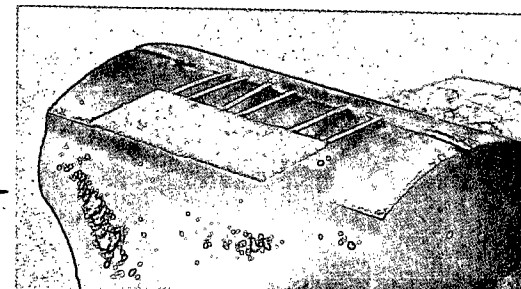
SWITCH CONTACT REMOVAL

ISSUE	1-7-72	<i>gcj</i>	APPROVED			ENG	DRAWING NO.
			BY	FOR	DATE	GCJ	351-12
CHANGE NO.	DATE	DESCRIPTION	<i>gcj</i>	PROD.	1-8-72	DRAWN BY	
						CHECKED	DATE
						<i>gcj</i>	1-7-72



AWAY BENDING

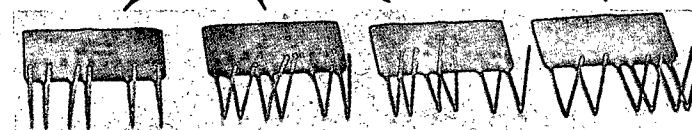
TOWARD BENDING



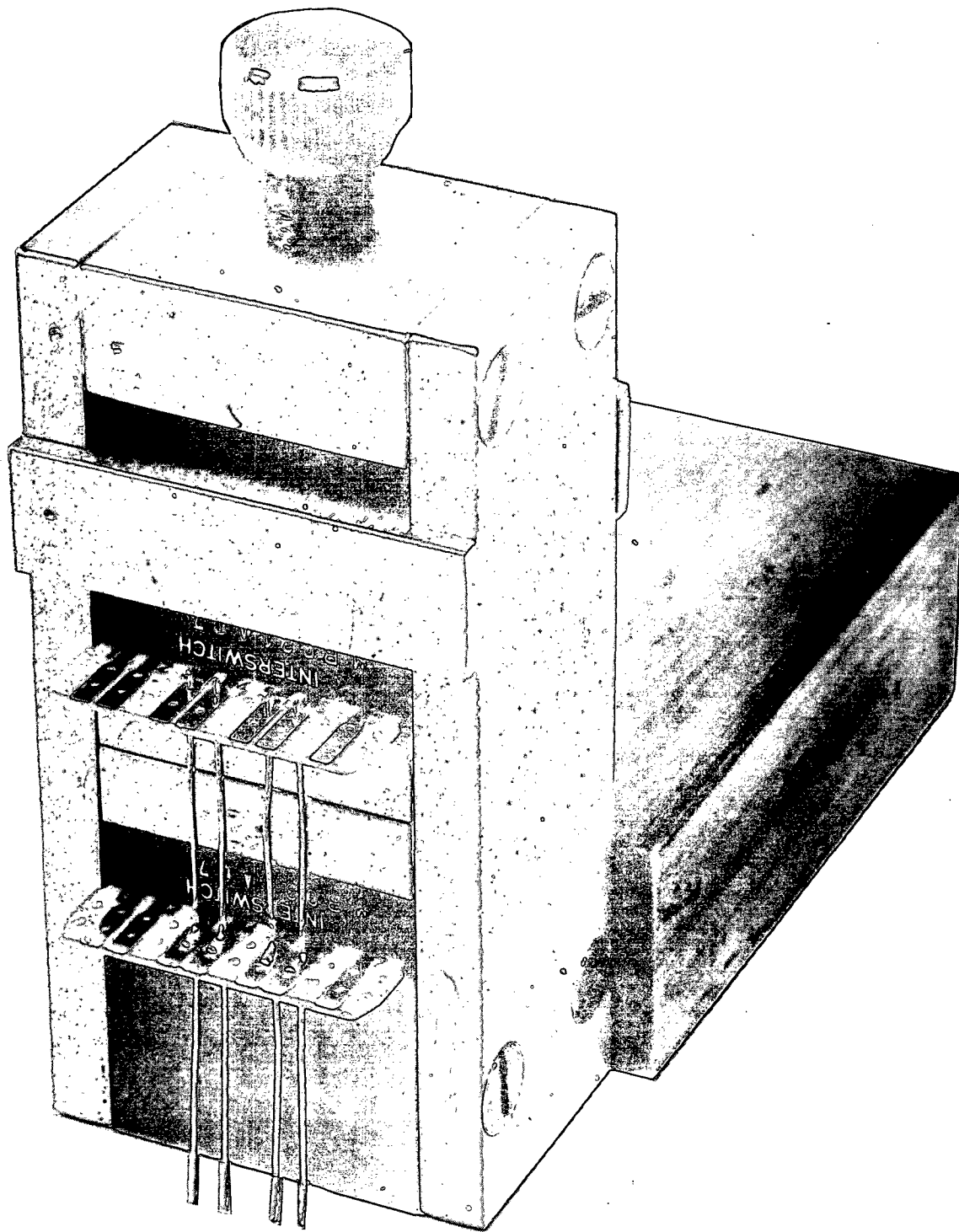
SPACING BEFORE BEND

TOWARD : LTN-3

AWAY : LTN-3



				COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE LTN-3 LEAD BENDING.			
						APPROVED BY <i>GCJ</i> FOR PROD DATE 1-8-72		ENG. GCJ DRAWN BY GWP	DRAWING NO. 351-13
ISSUE 1-8-72 <i>GCJ</i>				MACROMODULAR PROJECT		CHECKED <i>GCJ</i>		DATE 1-8-72	
CHANGE NO.	DATE	DESCRIPTION							



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

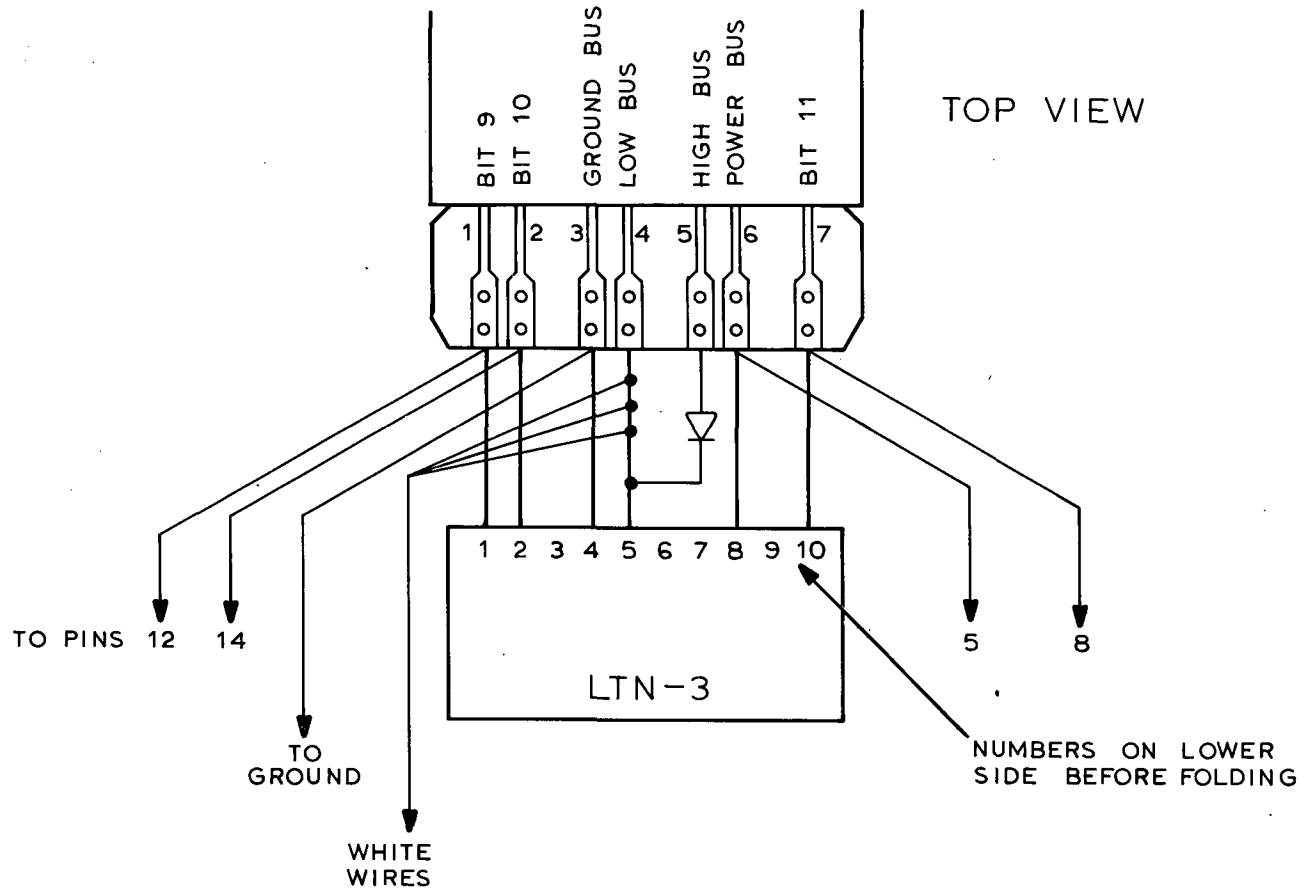
TITLE

FIRST ASSEMBLY STACK

ISSUE	1-8-72	<i>mcj</i>
CHANGE NO.	DATE	DESCRIPTION

APPROVED			ENG	DRAWING NO.
BY	FOR	DATE	GCJ	351-14
<i>mcj</i>	PROD.	1-8-72	DRAWN BY	
			GWP	
			CHECKED	DATE
			<i>mcj</i>	1-8-72

LOWER SWITCH SCHEMATIC



DIODE IS SELECTED
1N270

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

LOWER SWITCH SCHEMATIC

APPROVED

ENG

DRAWING NO.

BY

FOR

DATE

GCJ

351-15

ISSUE

1-7-72

GCJ

PROD.

1-8-72

DRAWN BY
PLL

CHECKED
GCJ

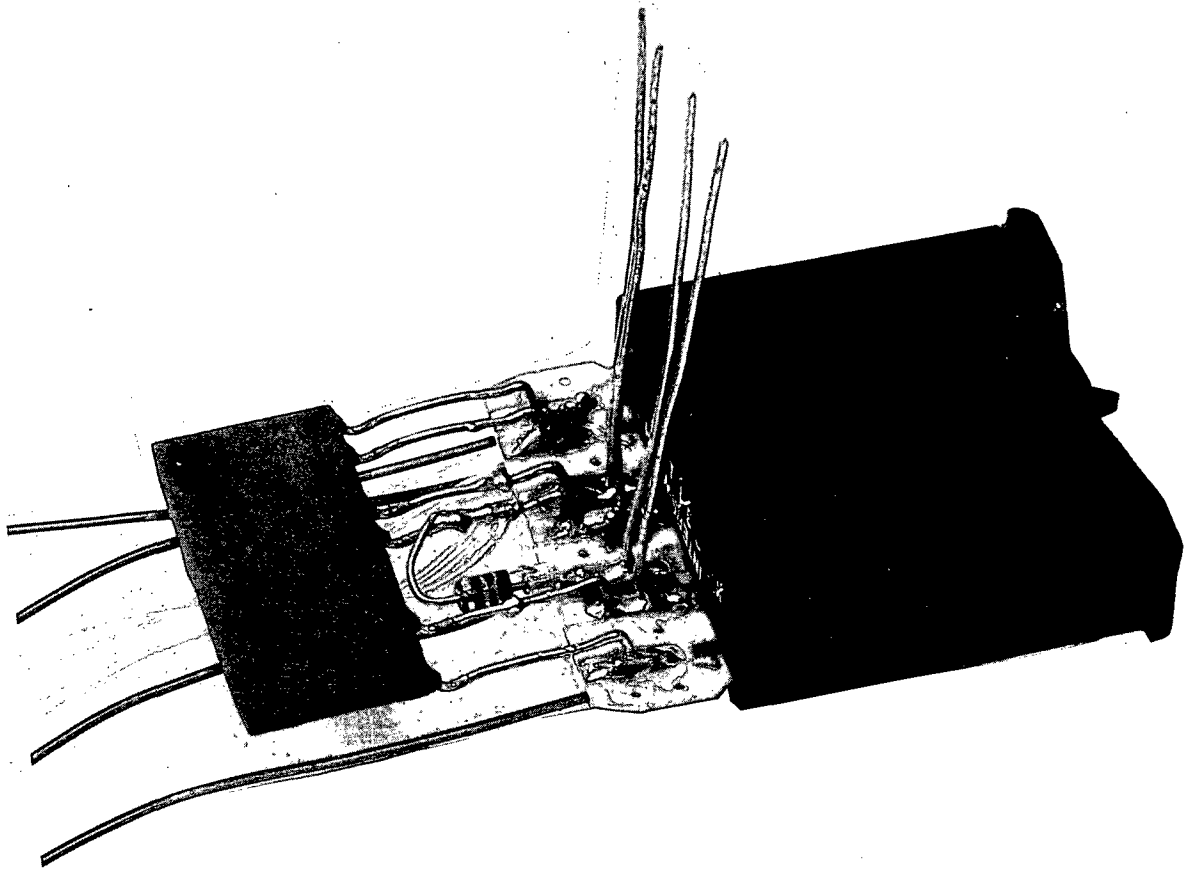
DATE

1-4-72

CHANGE
NO.

DATE

DESCRIPTION



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

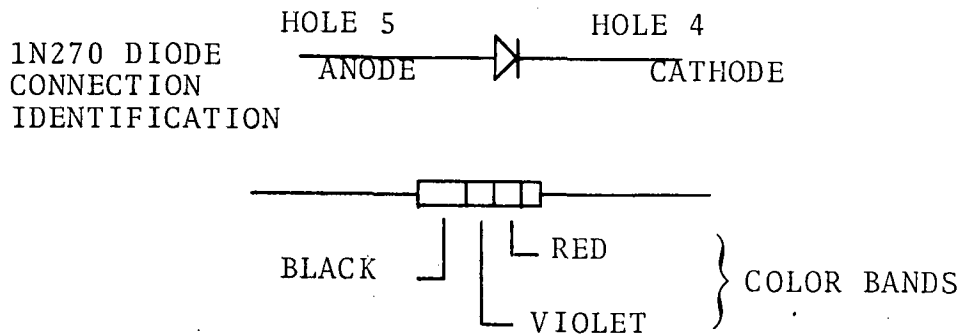
LOWER SWITCH CLOSE UP

			APPROVED			ENG GCJ	DRAWING NO. 351-16
ISSUE	1-8-72	<i>gcj</i>	BY <i>gcj</i>	FOR PROD	DATE 1-8-72	DRAWN BY GWP	
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>gcj</i>	DATE 1-8-72

the network goes into hole 1 of the switch. (351-15). Refer to 351-16 for a completed view of the next few assembly steps.

Solder the network to the switch, and trim the leads flush with the lower side of the switch printed circuit board. Trim the 4 #22 Bus leads at this point.

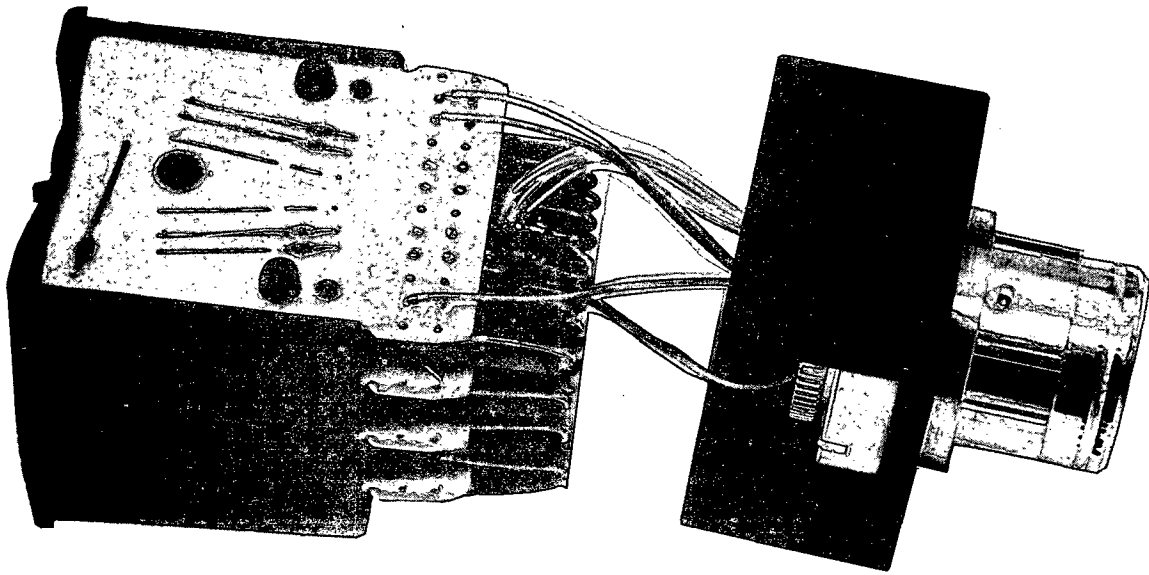
A 1N270 diode is connected to Hole 5 of the circuit board and the anode lead is soldered to lead 5 of the LTN-3 (Lead 5 of the LTN-3 is already connected to hole 4 of the circuit board. The body of the diode shall be dressed parallel to the leads of the LTN-3 network. (351-16 and 18)



Using the electrical ring-out box, find the following three gray wires and solder them in holes 1,2, and 7 of the switch circuit board. These, and the following wires are dressed under the LTN-3 network (351-18).

Binary Bit	Astro 348 Pin	Lower Switch Hole
9	12	1
10	14	2
11	8	7

CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>mcj</i>



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
COMPLETED LOWER SWITCH
BOTTOM VIEW

ISSUE	1-8-72	<i>GCJ</i>
CHANGE NO.	DATE	DESCRIPTION

APPROVED			ENG	DRAWING NO.
BY	FOR	DATE	GCJ	351-18
<i>GCJ</i>	PROD	1-8-72	DRAWN BY GWP	
			CHECKED <i>GCJ</i>	DATE 1-8-72

Find the long gray wire soldered to the rear nut, and solder the free end to lead 4 of the LTN-3 network. (Ground)

Find the white wire from pin 5 of the ASTRO-348 connector and solder to lead 8 of the LTN-3 (-5.2 volts).

Take any three of the remaining white wires and solder them to lead 5 of the LTN-3. (The cathode end of the 1N270 is already soldered to this lead) (LOW BUS) Gently fold LTN-3 network over wiring as shown on side view picture 351-22 and bottom view picture 351-18. Refer to lower switch schematic 351-15 and pictures for views of the completed lower switch assembly.

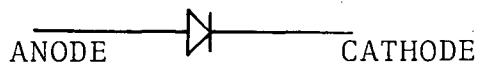
CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>mcj</i>

Note that the connector support bracket will slide through the opening in the assembly fixture.

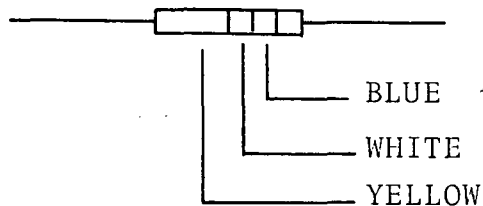
Slide LOWER SWITCH ASSEMBLY back on assembly fixture, remove dummy blocks and position SECOND SWITCH on the four bus wires. Add two dummy blocks and slide the collection into the fixture; apply light pressure.

Solder the four bus leads, and position one (TOWARD: LTN-3) network as for LOWER SWITCH. Trim LTN-3 leads to 1/8" from bend and solder the network leads.

Take Ampex 013-694 diode and solder cathode end to Hole 5. Insulate anode lead with teflon sleeving and solder to lead 4 of the LTN-3. Dress the diode body parallel as before.



AMPEX 013-694 Diode
CONNECTION
IDENTIFICATION

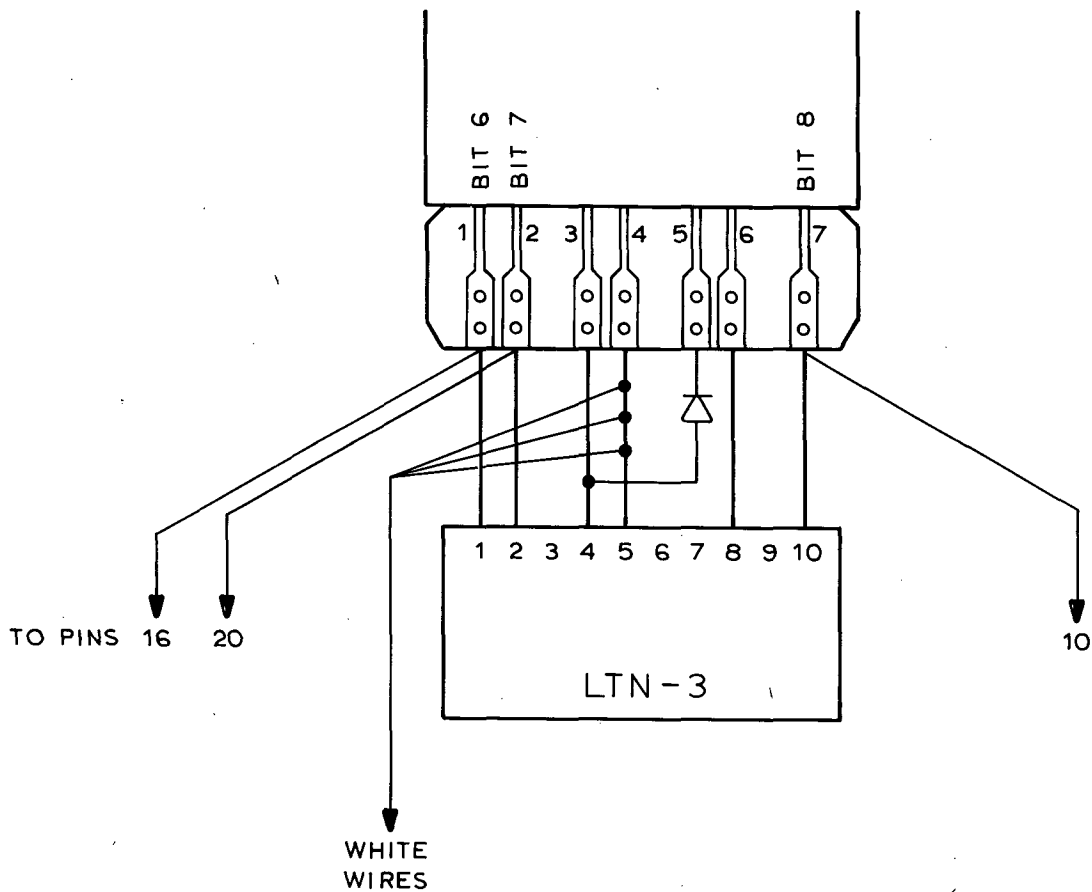


Find the following three gray wires and solder to holes 1,2 and 7 of the switch printed circuit board

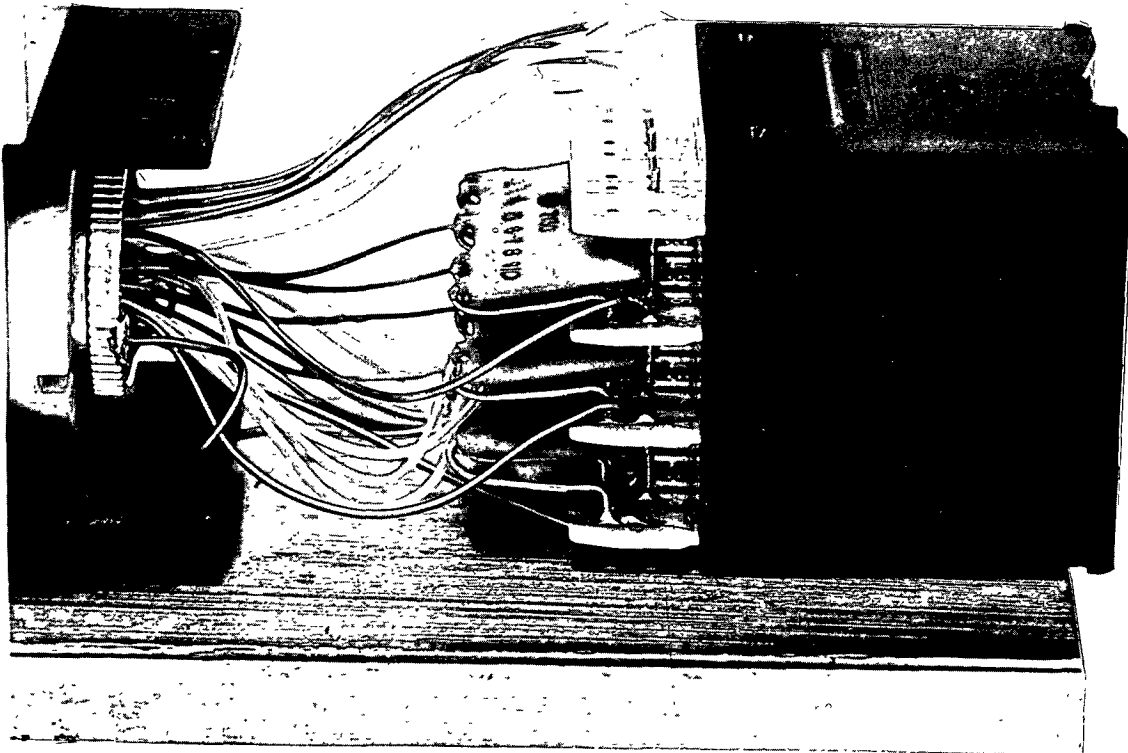
Binary Bit	Astro 348 Pin	Second Switch Hole
6	16	1
7	20	2
8	10	7

CPG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>gcy</i>

SECOND SWITCH SCHEMATIC



COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE SECOND SWITCH SCHEMATIC		
ISSUE	1-7-72	<i>gcj</i>	APPROVED		ENG
			BY	FOR	DATE
			<i>gcj</i>	PROD	1-8-72
					DRAWN BY
					PLL
CHANGE NO.	DATE	DESCRIPTION		CHECKED	DATE
				<i>gcj</i>	1-5-72



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
TOP SWITCH ALIGNMENT,
SLID BACK

				APPROVED		ENG GCJ	DRAWING NO.
				BY GCJ	FOR PROD	DATE 1-8-72	351-22
ISSUE		1-8-72	DCJ		DRAWN BY DLS		
CHANGE NO.	DATE	DESCRIPTION		CHECKED GCJ		DATE 1-8-72	

Solder any three white wires to lead 5 of the LTN-3.

Note that 3 white wires are soldered on each switch level.

Gently fold the LTN-3 over the wiring.

Slide the two switch assembly out of the fixture and remove the dummy blocks. Position the THIRD SWITCH on the four bus wires, add one dummy block and slide the collection into the fixture - apply pressure.

Solder the four bus wires to the circuit board. Position one (TOWARD: LTN-3) as before and solder and trim the leads.

Find the following gray wires and solder.

Binary Bit	Astro 348 Pin	Third Switch Hole
3	23	1
4	25	2
5	27	7

Gently fold the LTN-3 over the wiring.

Slide the collection out of the fixture, remove dummy block and position TOP SWITCH on the bus wires. (351-22) Return collection to pressure in fixture.

Solder the four bus wires. Position the (AWAY: LTN-3) network with the bend in the leads flush with the lower surface of the top switch circuit board. Solder the leads. (NOTE: all four LTN-3 networks have lead 1 in hole 1 and lead 10 in hole 7)

Find the remaining three gray wires and solder.

CHG.	E.C.O.	DATE	APPR.
Iss	-	1-5-72	<i>gcj</i>

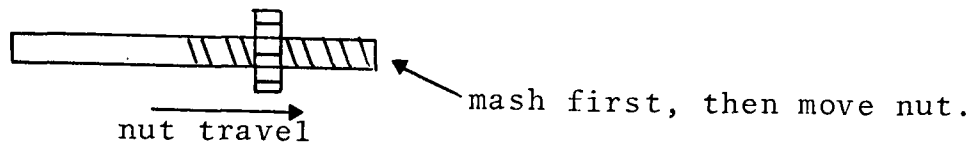
Binary Bit	Astro 348 Pin	Top Switch Hole
0	36	1
1	30	2
2	32	7

Solder the three remaining white wires to lead 5 of the LTN-3 network and gently fold the network over the wiring.

Disconnect ring-out box connector and slide the switch and connector assembly through the fixture - Picture 351-26 shows the device at this stage.

Assemble a case half to the lower side of the device. (exposed circuit board side). Place two M2x40 threaded rods with nuts through the switches and case half and secure with 2 M2 slotted nuts.

NOTE: prepare one end of each threaded rod by masking gently with pliers. Then back thread a nut onto the end.



This will freeze the nut on one end and make assembly of the top end easier. See picture 351-27.

Push the connector assembly toward the switches - taking care to tuck-in any wiring or components that impede travel.

CHG.	E.C.O.	DATE	APPR.
Iss.	-	1-5-72	<i>scf</i>

Do not allow LTN-3 leads to touch metal of connector support bracket. When the connector bracket is aligned with the case holes - insert two 2-56 flat head screws and tighten.

Remove the slotted nuts from the top switch and position the upper case half. Install the slotted nuts and two more 2-56 screws to complete the assembly.

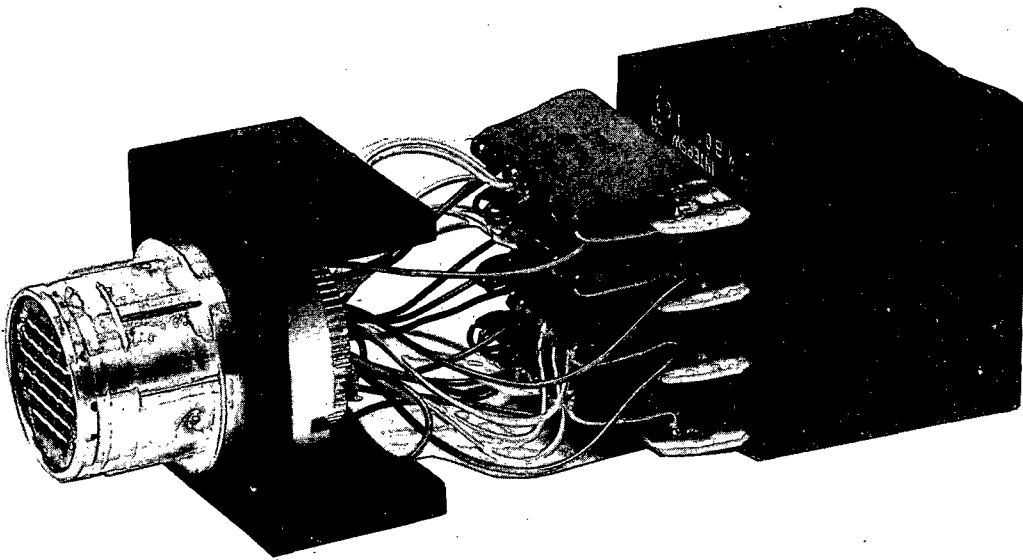
TESTING

The completed assembly will be tested by the Computer Systems Laboratory. The Parameter switch shall be tested for all eight numbers on each switch. In addition the following patterns shall be verified.

0000	}	Worst case patterns
7777		
2525		
5252		
0707		
7070		

The Parameter Switch under test shall be plugged into an adapter which has 15K resistors from each DATA BIT LOW line to pin 5 (-5.2v). This asserts DATA ZERO in the absence of an input.

CHG.	E.C.O.	DATE	APPR.
Iss	-	1-5-72	<i>scj</i>

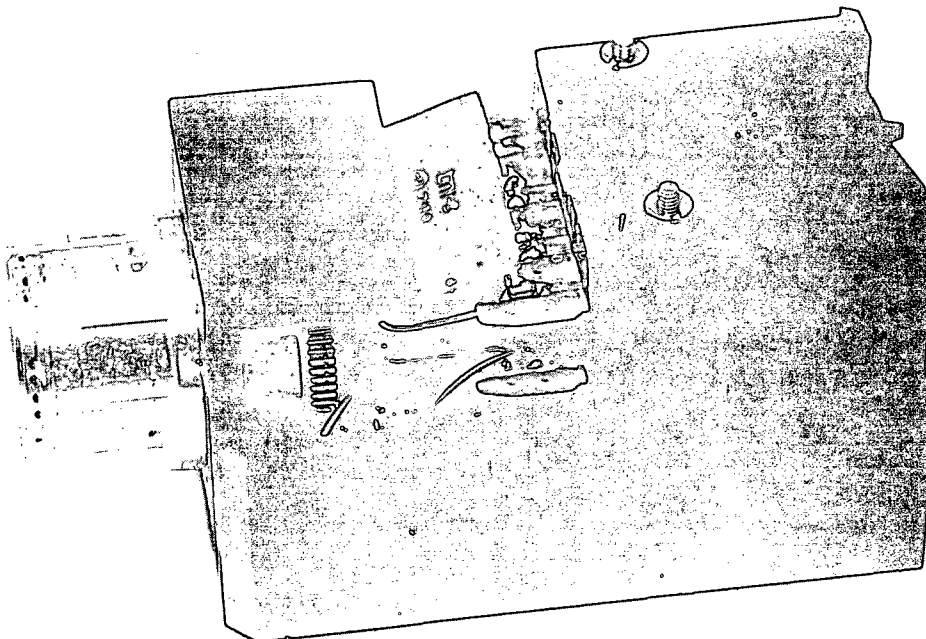


COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE COMPLETED WIRING
SIDE VIEW

				APPROVED		ENG	DRAWING NO.
				BY	FOR	DATE	351-26
				GCJ	PROD	1-8-72	
ISSUE	1-8-72	GCJ				DRAWN BY	
CHANGE NO.	DATE	DESCRIPTION				CHECKED	DATE
						GCJ	1-8-72



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

CASE HALF ASSEMBLY

APPROVED

ENG

GCJ

DRAWING NO.

351-27

BY

FOR

DATE

DRAWN BY

DLS

CHECKED

DATE

1-8-72

PROD

1-8-72

GCJ

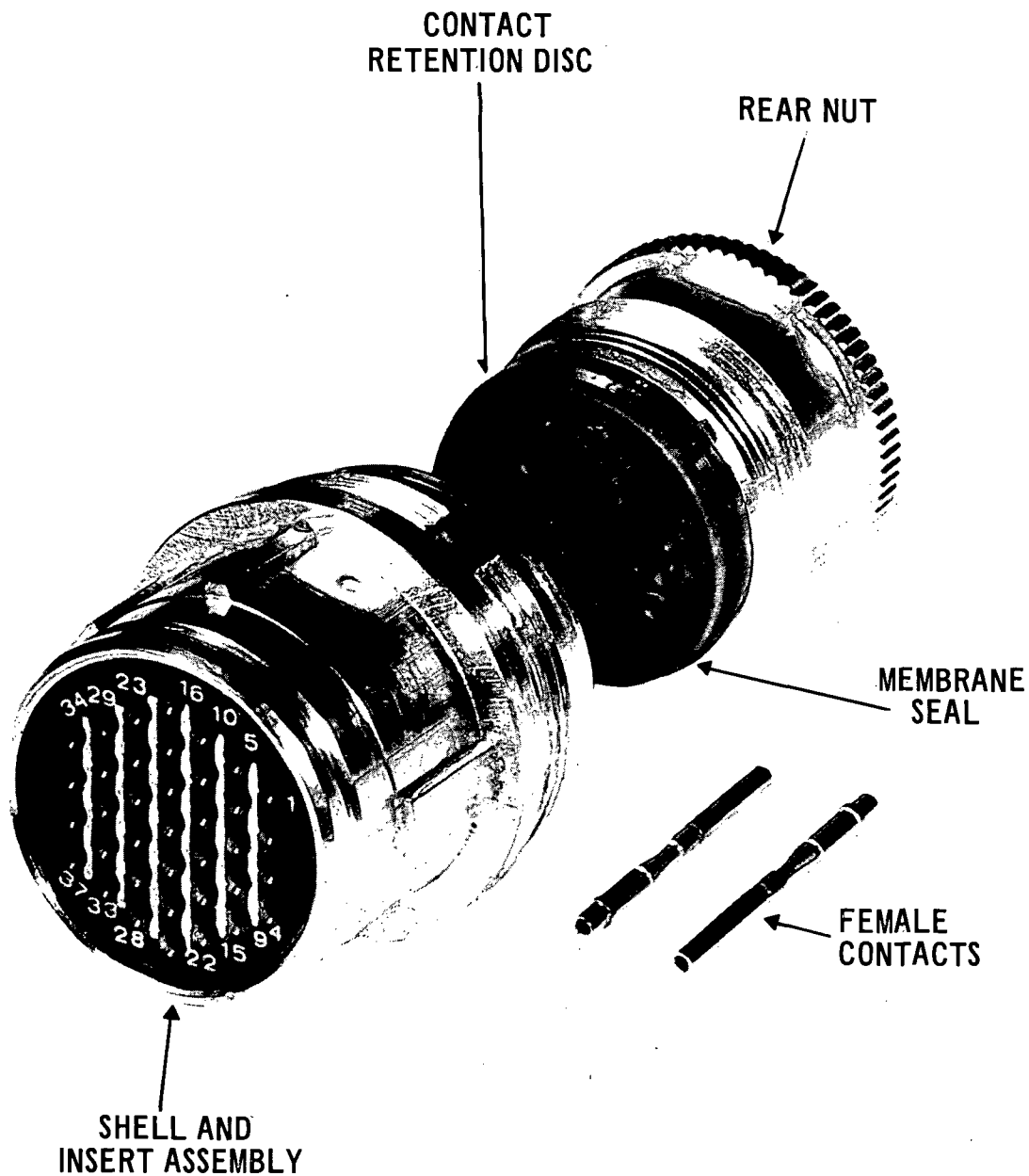
ISSUE 1-8-72

GCJ

CHANGE
NO.

DATE

DESCRIPTION

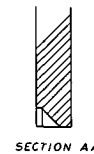
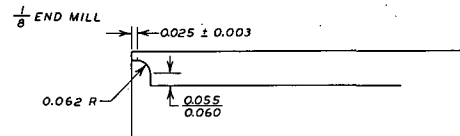
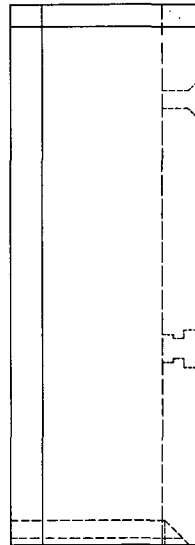


COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

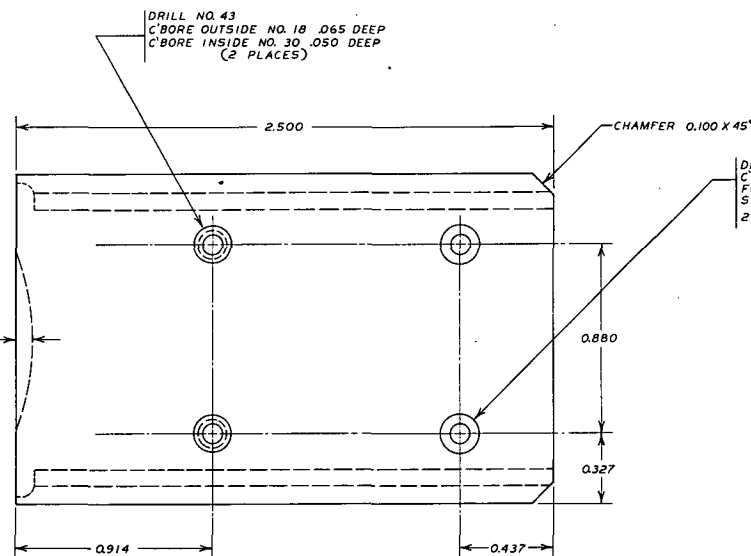
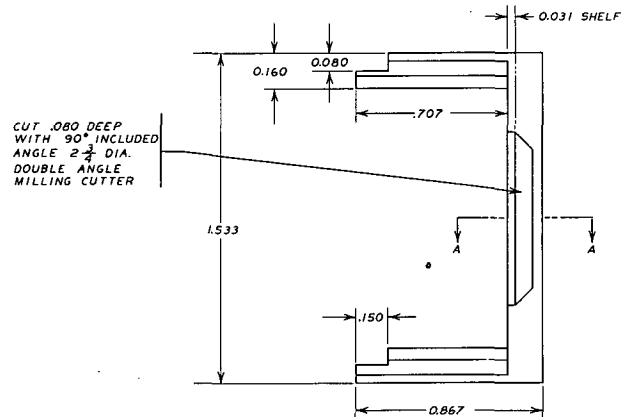
TITLE
ASTRO-348 PARTS IDENTIFICATION

ISSUE	1-5-72	<i>gcj</i>	APPROVED			ENG <i>GCJ</i>	DRAWING NO. 351-28
			BY <i>gcj</i>	FOR PROD.	DATE 1-5-72	DRAWN BY MBP	
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>gcj</i>	DATE 1-5-72

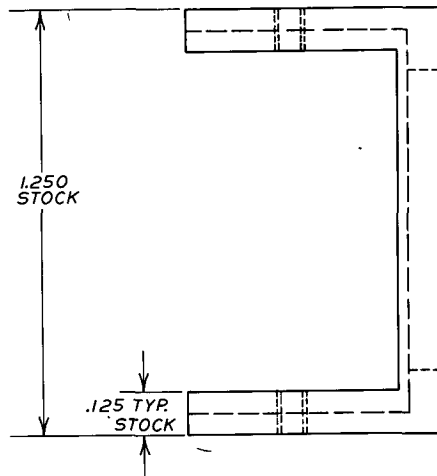


SECTION AA

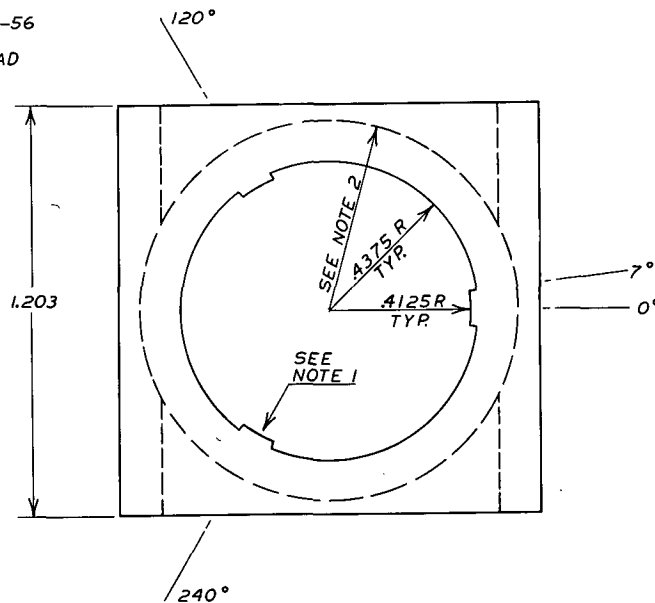
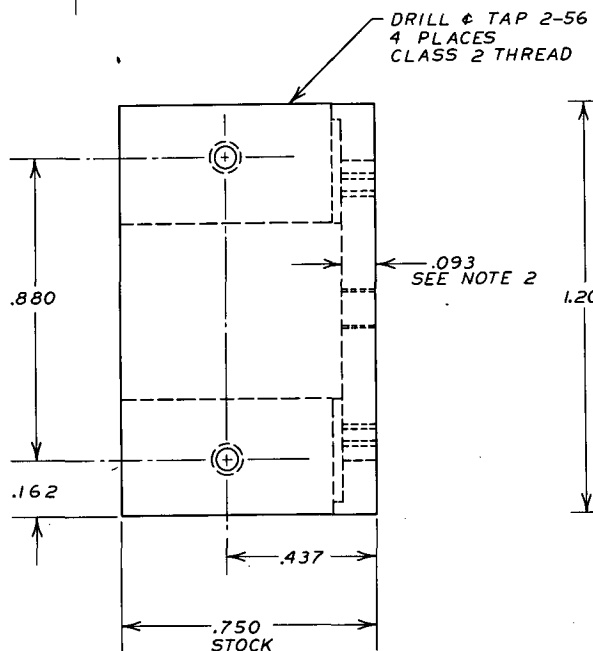
MATERIAL: BLACK CYCOLAC (ABS)
DIMENSIONS: ± .005 U.O.N.



ISSUE 1-5-72		E.C.O. 0241	
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE PARAMETER PLUG CASE DESIGN			
APPROVED	BY	DATE	DRAWING NO.
GCJ	PROJ	10-27-70	351-29
CHECKED	BY	DATE	
GCJ	10-27-70		



TAB OUTLINES NOT
SHOWN IN THIS VIEW



NOTES:

1. CENTERS OF TABS ARE 120 DEGREES APART AND TABS 14 DEGREES WIDE. THIS IS A WIDTH OF 0.100 MEASURED AT THE INNER RADIUS.
2. CUT WITH 1/8 DIAMETER END MILL. STOCK MUST BE HELD IN FIXTURE TO PREVENT DEFLECTION OF SIDE WALLS. DEPTH OF CUT MUST BE REFERENCED TO BACK WALL IN ORDER TO PRESERVE 0.093 DIMENSION.

DIMENSIONS: ± 0.005 U.O.N.

STOCK: 1.250 X 0.750 X 0.125

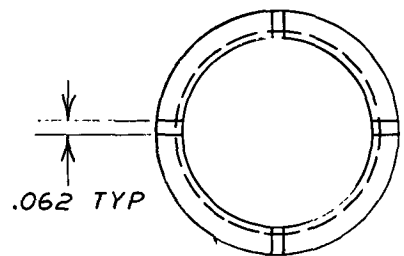
EXTRUDED CHANNEL 6061-T6

FINISH: BLACK ANODIZE

SCALE: APPROX. 4X

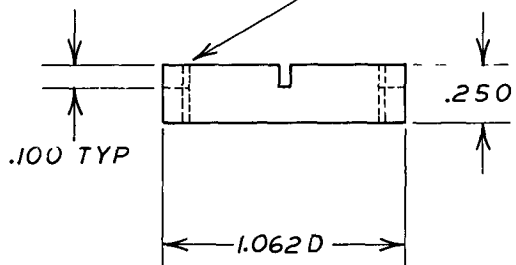
DO NOT SCALE

ISSUE 1-5-72 E.C.O. 0241 <i>Scj</i>			
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY			
WASHINGTON UNIVERSITY			
ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE			
PARAMETER PLUG			
CONNECTOR MOUNTING BRACKET			
APPROVED	ENG.	DRAWING NO.	
BY	FOR	DATE	
<i>Scj</i>	PROD	11-1-72	351-30
CHECKED	DATE		
<i>Scj</i>	10-24-70		



.062 TYP

$\frac{7}{8}$ - 28 UN2B THREAD



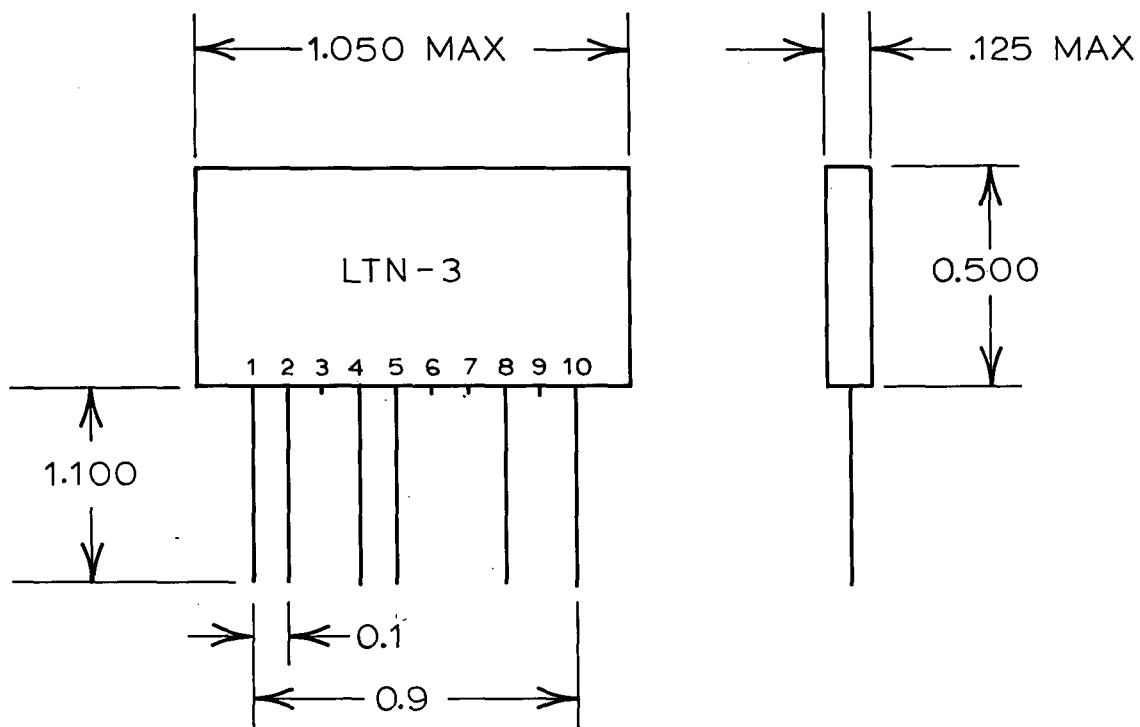
.100 TYP

.250

1.062 D

MATERIAL: 2011-T3 ALUM
ALL DIMENSIONS ± 0.005
FINISH: NATURAL

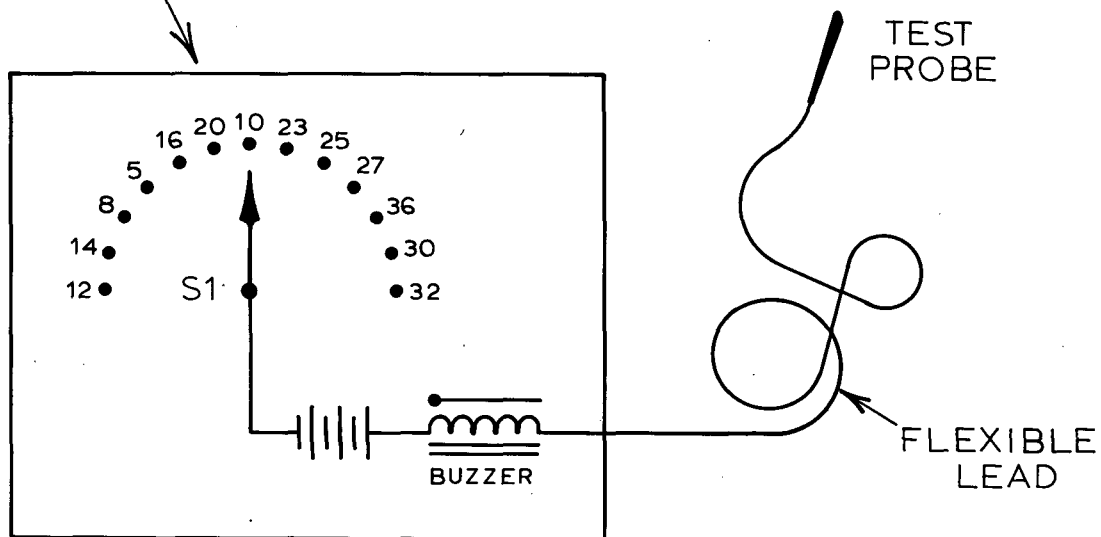
ISSUE		1-5-72		E.C.O. 0241 <i>GCJ</i> <i>ono</i>	
CHANGE NO	DATE	DESCRIPTION			
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS MISSOURI					
MACROMODULAR PROJECT					
TITLE PARAMETER PLUG LOCK NUT					
APPROVED			ENG	DRAWING NO	
BY	FOR	DATE	<i>GCJ</i>	351-31	
<i>GCJ</i>	PROP	11-1-70	DRAWN BY	<i>PLL</i>	
CHECKED			DATE	10-24-70	
<i>GCJ</i>					



LEADS MISSING IN POSITIONS 3,6,7, & 9.

COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE LTN-3 PACKAGE OUTLINE		
			APPROVED		ENG G C J
			BY <i>ref</i>	FOR PROD	DATE 1-8-72
					DRAWN BY P L L
					CHECKED <i>ref</i>
ISSUE	1-7-72	<i>ref</i>	DRAWING NO. 351-32		
CHANGE NO.	DATE	DESCRIPTION	DATE 1-4-72		

NUMBERS REFER TO PINS IN
THE ASTRO - 348 CONNECTOR



S1 13 POSITION ROTARY SWITCH

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

SCHEMATIC OF RINGOUT BOX

APPROVED

ENG

DRAWING NO.

BY

FOR

DATE

G C J

351-33

PROD

1-8-72

DRAWN BY
P L L

CHECKED

DATE

G C J

1-4-72

ISSUE

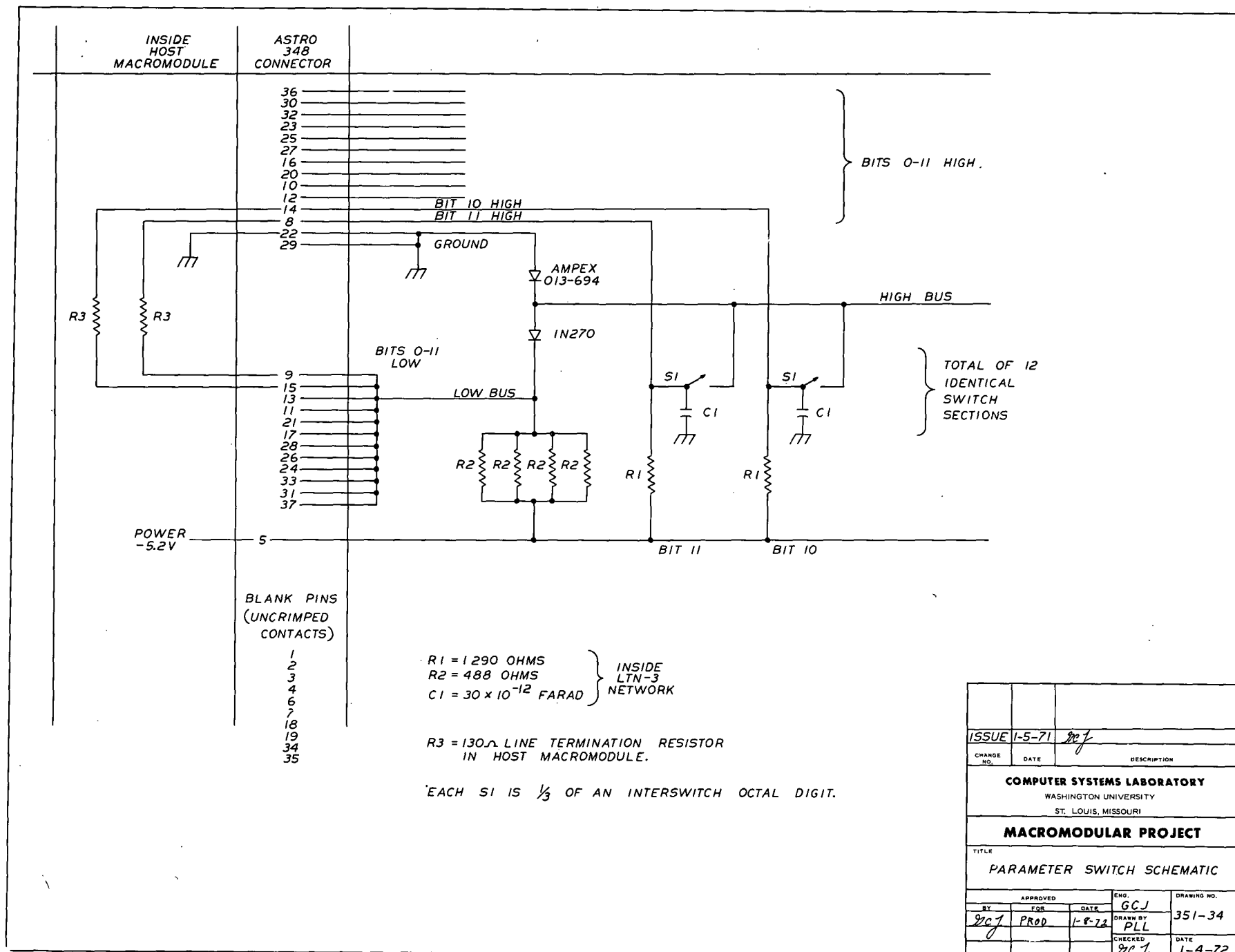
1-7-72

G C J

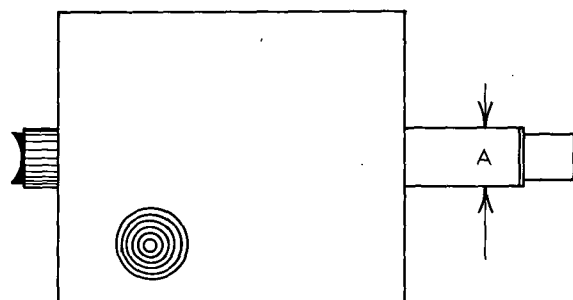
CHANGE
NO.

DATE

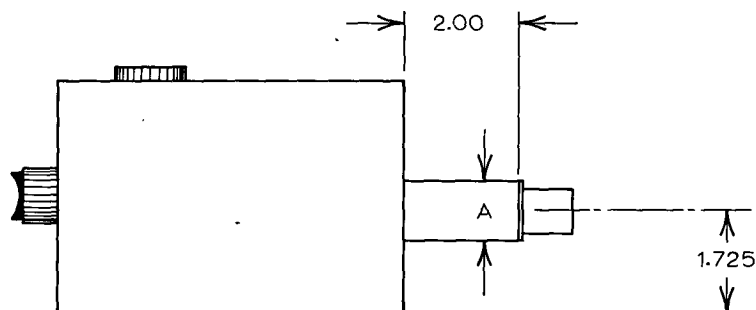
DESCRIPTION



ISSUE	1-5-71	GCJ
CHANGE NO.	DATE	DESCRIPTION
COMPUTER SYSTEMS LABORATORY		
WASHINGTON UNIVERSITY		
ST. LOUIS, MISSOURI		
MACROMODULAR PROJECT		
TITLE		
PARAMETER SWITCH SCHEMATIC		
APPROVED	ENG.	DRAWING NO.
BY	FOR	DATE
GCJ	PROD	1-8-72
CHECKED	DATE	
GCJ	1-4-72	



DIMENSION A EQUAL TO FLANGE DIMENSIONS (1.125)
OF ASTRO 348 BULKHEAD CONNECTOR.



ISSUE		1-7-72	ref
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE			
MECHANICAL SKETCH OF RINGOUT BOX			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	
ref	PROD	1-8-72	351-35
CHECKED		DATE	
ref		1-6-72	

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY

354

MINICONSOLE

PAGE	TITLE	CHANGE
354-1	TITLE PAGE	ISSUE
354-2	PARTS LIST	
354-3	GENERAL DESCRIPTION	
354-4 thru 354-10	ASSEMBLY PROCEDURE	
354-11	OVERALL VIEW	
354-12	SWITCH AND LED DRIVER CIRCUITS	
354-13	TURRET WRENCH	
354-14	ASTRO 348 PARTS IDENTIFICATION	
354-15	MINI-CONSOLE CASE DESIGN	
354-16	CONNECTOR MOUNTING BRACKET	
354-17	LOCK NUT	
354-18	CONNECTOR TO BRACKET ORIENTATION	
354-19	MINICONSOLE FACEPLATE	
354-20	FACEPLATE-REAR VIEW	
354-21	PRINTED CIRCUIT BOARD ASSEMBLY AND CONNECTIONS	
354-22	REAR SECTION, PC BOARD, FACEPLATE ORIENTATION	
354-23	COAXIAL CONNECTOR	
354-24	CASE HALF ASSEMBLY	

CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR	CHG.	E.C.O.	DATE	APPR.
ISSUE		8/11/72	<i>JUR</i>								

MINI CONSOLE PARTS LIST

Manufacturer	Mechanical Parts	Quantity	PT# or Refer to
CSL	Faceplate	1	354-19
Amphenol Cadre	Rear Connector Mounting Bracket	1	354-16
" "	Case Half	2	354-15
" "	Lock Nut	1	354-17
Amphenol	Astro 348 Rear Nut	1	354-14
"	Astro 348 Shell & Insert Assembly (Modified)	1	354-14
"	Astro 348 Membrane Seal	1	354-14
"	Astro 348 Contact Retention Disc	1	354-14
"	Female Contacts, ASTRO 348-100 5000S-02	37	354-14
AMP	Female Coaxicon #329055	2	
C&K Comp	#7101 PB Switch	1	
	2-56 x 1/4" S.S.F.H. Socket Screws	8	

Electronic

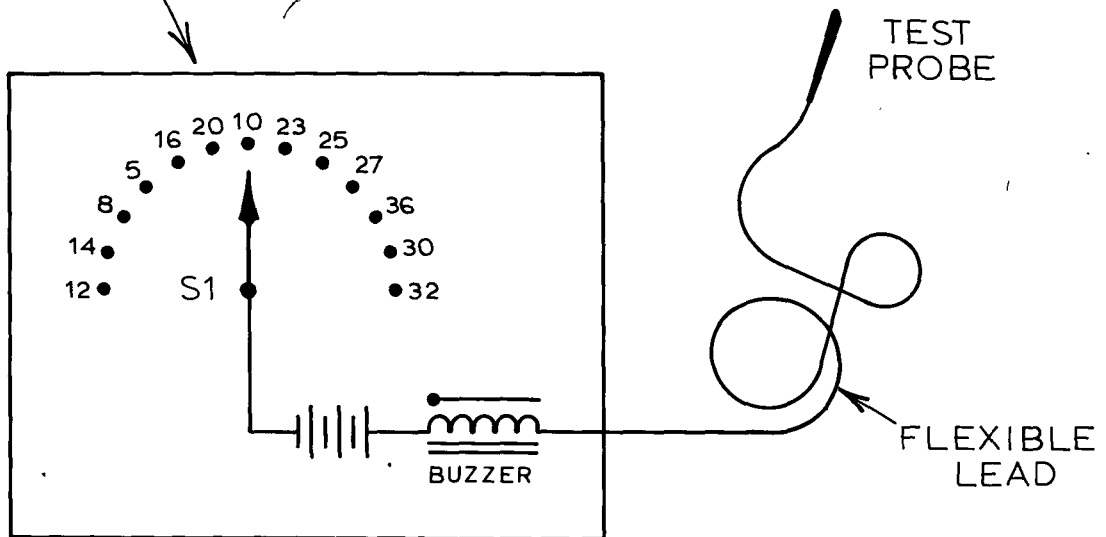
Monsanto	MV5023 Light Emitting Diode	2	
CSL	WCL 0146-1 PC Board	1	
Motorola	MC1235L MECL IC	1	
"	MPS3640 Transistor	2	
Hewlett-Packard	82-2900 Diode	2	
Mallory	4.7 μ f 10 WVDC Tantalum Capacitors	2	
	TAC 475 M010P02		
OHMITE	5.1 K Ohm 1/8 W. 5% Carbon	2	
"	1.5 K Ohm " " "	3	
"	1 K Ohm " " "	2	
"	750 Ohm " " "	1	
"	510 Ohm " " "	2	
"	390 Ohm " " "	1	
"	150 Ohm " " "	1	
Electra Midland	57.6 Ohm 1/8 W. 1% film	2	
Brand Rex	#30 AWG Kynar Insulated Wire Wrap Wire		
"	Blue		
"	Red		
"	Green/White Twisted Pair (optional)		

Special Tools

Turret Wrench	1	354-13
---------------	---	--------

CHG.	E.C.O.	DATE	APPR.
ISS.		8/11/72	TUR

NUMBERS REFER TO PINS IN
THE ASTRO-348 CONNECTOR



S1 13 POSITION ROTARY SWITCH

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

SCHEMATIC OF RINGOUT BOX

ISSUE	DATE	DESCRIPTION	APPROVED			ENG	DRAWING NO.
			BY	FOR	DATE	G C J	
1-7-72			9CJ	PROD	1-8-72	DRAWN BY PLL	351-33
CHANGE NO.	DATE					CHECKED 9CJ	DATE 1-4-72

MINI-CONSOLE GENERAL DESCRIPTION

The mini-console allows an operator to monitor and control the state of macromodule control signals. Each mini-console, as shown in Dwg. #354-11, consists of two independent sections. On top is a control cable input and a pair of indicators. The lower indicator is on when the input control signal is in the preset state and the upper indicator is on when the control signal is in the non-preset state. Neither indicator will be on if there is no input cable connected or if the module that the cable comes from is not powered or has blown a fuse. Both indicators will be on if the control signal is switching rapidly enough or if the mini-console input is connected to a macromodule input instead of an output.

The lower half of the mini-console has a control output connector and a toggle switch. The control output is in the preset state when the toggle switch is down and is in the non-preset state when the toggle switch is up. A switch filter is included so that a single "clean" transition is produced each time the toggle switch is operated.

The mini-console is plugged into any otherwise unused data input or output to provide mechanical support and to supply its power. A quick check of mini-console operation can be made by connecting its input and output together and checking that the indicators follow the switch position.

CHG.	E.C.O.	DATE	APPR.
ISS.		8/11/72	<i>TLR</i>

MINI-CONSOLE ASSEMBLY PROCEDURE

CHG.	I.C.O.	DATE	APPR.
ISS.		8/11/72	<i>LUR</i>

COMPONENTS

The ASTRO-348 Connector is made up of a subset of parts from a 348-40E14-37S1 connector. The parts are named on the parts list, and the entire subset may be purchased from Amphenol by special negotiation. Note that the front shell assembly has a groove, and the locking ring flange has been removed. See 354-14 for parts identification.

The plastic case is made from two identical halves. The case half is detailed on drawing 354-15 which shows decorative detail suitable for machining.

The Connector Mounting Bracket (354-16) and the Lock Nut (354-17) serve to align and capture the ASTRO-348 connector. The tapped holes in the bracket sides serve to retain the case halves.

SOLDERING

All soldering shall be performed with a temperature controlled iron. The Weller W-TCP with a 700°F tip is acceptable. Resistance and SCP controlled irons are not acceptable.

The solder used shall be nominally 60% tin and 40% lead with a non-corrosive rosin core. A small diameter (#22 wire gauge) solder is preferable. (Ersin Multicore)

WIRE STRIPPING AND CRIMPING

The #30 crimped wires shall be stripped on one end with a modified NO NIK stripper. (Green Handle 0.014 inch NO-NIK Stripper. CLAUSS Cutlery Co., Fremont, Ohio.) The modification consists of a machined wire stop which gives a strip length of 0.125--0.150 inches.

Crimping standards and tooling are covered in the 370 document. Adjust the crimping tool to accomodate the #30 ga. wire used for the FPB-348 devices.

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 Buchanan hand tool 612-596 with contact locator 613-381. Equivalent automatic tooling is preferable. Crimp settings of (4) 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.

Wire wrapped wires shall be stripped to a length of 0.875 on one end. The ends of all wires to be soldered should be stripped a minimum of 0.250 inches and soldered with the insulation as close as possible to the P.C. board. Final clipping of finished wires should be as close to the solder joint as possible.

REAR SECTION ASSEMBLY

Cut one red and one blue piece of #30 AWG Kynar wire three inches in length. Strip one end of each wire using the tool referred to in "Wire Stripping and Crimping."

Crimp the stripped ends into ASTRO 348 female pins.

Strip the free ends of the two wires you have just crimped 0.250 inches. These ends will later be soldered to the P.C. board.

Insert wired crimped contacts and empty uncrimped contacts into the contact retention disc as follows:

DESCRIPTION	ASTRO-348 Contact Positions
BLANK PINS	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37
RED WIRE	5
BLUE WIRE	22

Place membrane seal over contacts.

Assemble an ASTRO-348 Shell into a Connector Support Bracket with a Lock Nut. (354-18). Tighten the Lock Nut securely using the special current wrench (354-13). Hold the bracket in a vise for this operation - the nut must be tight. The only correct orientation is shown on 354-18.

Insert the wired contact retention disc into the connector shell and tighten securely with lock pliers. Set the completed rear section aside until called for.

ASSEMBLE FACEPLATE

The Faceplate should be assembled as shown on page 354-20.

The two LED retention flanges should be pressed by hand, into the specified holes with the flanges to the front. The two LED's shall then be inserted into the retention flanges from the rear until they snap securely into place, with their negative and positive leads aligned horizontally. (The negative or double shouldered lead shall be placed on the left side of the Faceplate as viewed from the front.) The next step is to snap on the rear locking ring. This is done by placing it equally over the rear of the retention flange and pressing straight down until the ring touches the metal surface. (You will notice the locking ring is tapered. The ring must be

installed with the narrow end down toward the metal.) The two negative leads of the LED's shall then be wire wrapped together with a section of red wire as noted in reference #354-20. Two 3" blue wires should be prepared for wire wrapping. They will now be wrapped to the positive LED leads. The free ends will be soldered to the P.C. board later.

The toggle switch CK7101PB shall be installed next. The switch shall have either N.O. contact in the down position. The lower locking nut of the switch shall be raised approximately 1/16" above the switch base. This is to allow the threaded extension to be flush with the outside nut when the lock-washer and nut is in the tightened position. Using a short piece of stripped 30 ga. red wire; wire wrap one end to the lower negative LED (double shoulder). The other end shall be soldered to the center pole of the switch. To the lower N.O. contact solder a blue wire as referred to on page 354-20. The other end shall be attached to the P.C. board later.

ASSEMBLY of COAXICONS

All wires for this connector are stripped $0.250 \pm .031$ inches. The wires are crimped using AMP crimp die 69231-2 in hand tool 45707-2 or pneumatic tool 69356-2. The wires must be carefully held during the crimp cycle to prevent slippage. These connectors are press fitted with an arbor press, after crimping, into the faceplate. The orientation of these connectors is important. They must be installed as shown in Dwg# 354-11 and #354-20.

ASSEMBLY of P.C. BOARD WCL0146-1

The lined or printed side of the board shall be interpreted as the signal side. The other side shall be considered the component side.

The package P1 (M1235) shall be placed on the component side of the P.C. board with pin 1 inserted in the appropriate hole. (On the signal side a small 1 is printed to assure proper alignment of the MECL package). It

shall then be soldered into position using the soldering procedure as outlined on page 2.

The installation of the other components shall be as shown in drawing #354-21, observing the related positions and polarities of the diodes and capacitors. Any vertical components shall not have two bare leads facing each other to prevent accidental circuit failure.

FINAL CONNECTION

The three separate sections shall be placed in the positions indicated by dwg. #354-22. Note the position of the P.C. board.

The loose ends of the wires from the front and rear sections shall now be attached to the P.C. board. They shall be brought directly to the board and soldered on the signal side. All precautions must be taken to assure no cold joints or pits result from soldering. These wires shall be attached to the board as shown in drawing #354-21.

FINAL ASSEMBLY

The rear section shall then be placed in the left shell half and secured with 2, 2-56 x 1/4" SS.F.H. socket screws. The board shall then be placed, angled, in the housing and the faceplate set in position. The board shall be allowed to lie loosely between the rear section and the faceplate. The faceplate shall then be fastened into position with 2, 2-56 x 1/4" SS.F.H. socket head screws as shown in dwg. #354-23.

The right shell half may then be fastened into position with the required screws.

TESTING

The mini-console may be tested by applying - 5.2 VDC to pin #5 and ground to pin #22 of the ASTRO 348 connector.

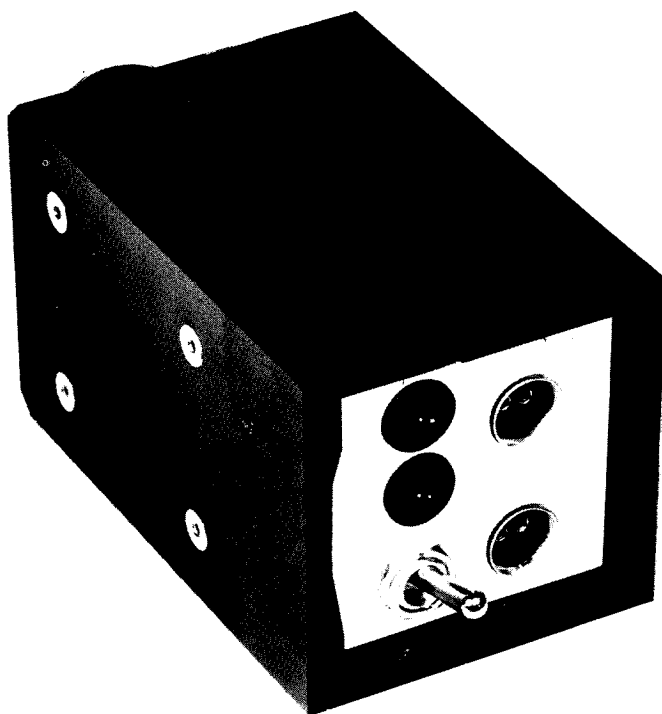
A macromodule control cable may then be connected from the lower coaxicon to the upper coaxicon.

If the mini-console is working properly the LED illuminated will follow the switch position as indicated in the table.

Table #

Switch Position	LED ON
UP	TOP
DOWN	BOTTOM

FRONT VIEW



REAR VIEW

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

MINI CONSOLE
OVERALL VIEW

APPROVED

ENG

FUR

DRAWING NO.

354-11

BY

FOR

DATE

FUR

PROD

8-11-72

DRAWN BY

GWP

CHECKED

DATE

8-8-72

[Signature]

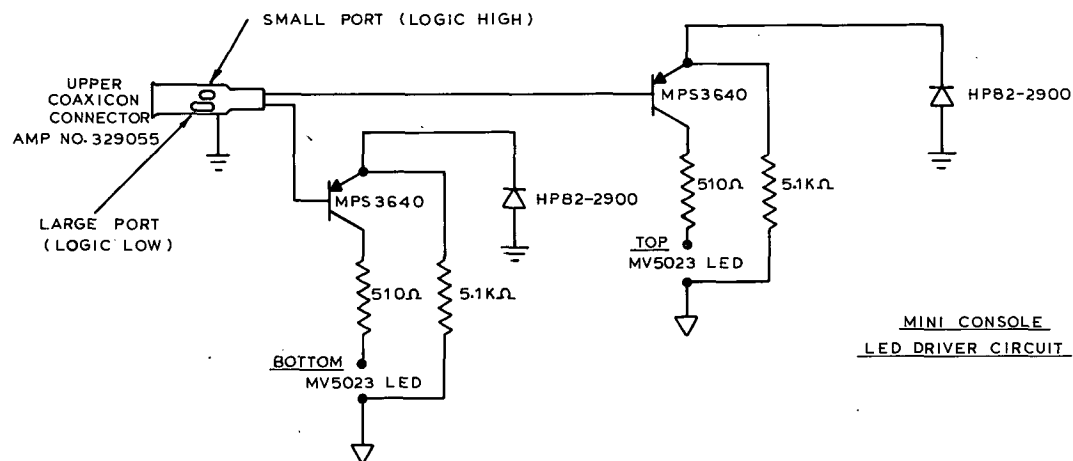
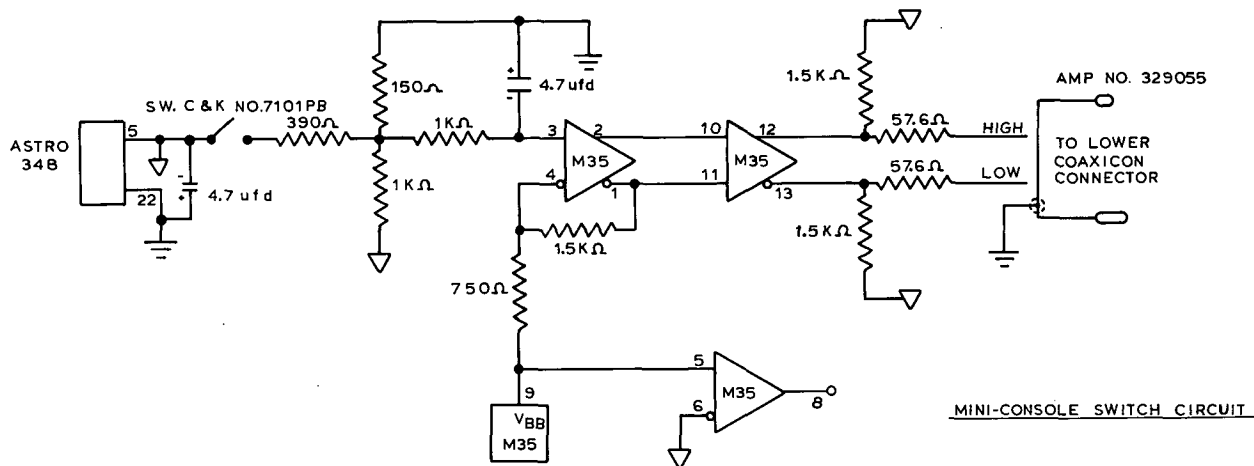
ISSUE

8-11-72

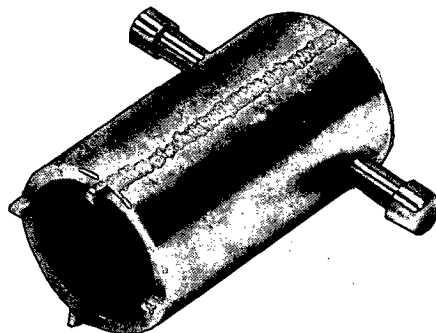
CHANGE
NO.

DATE

DESCRIPTION



ISSUE	8-11-72		
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY • ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE MINI CONSOLE SWITCH & LED DRIVER CIRCUITS			
APPROVED		ENG. FUR	DRAWING NO.
BY	FOR	DATE	
FOR	PROD	8-11-72	
CHECKED		DATE	
		4-28-72	



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

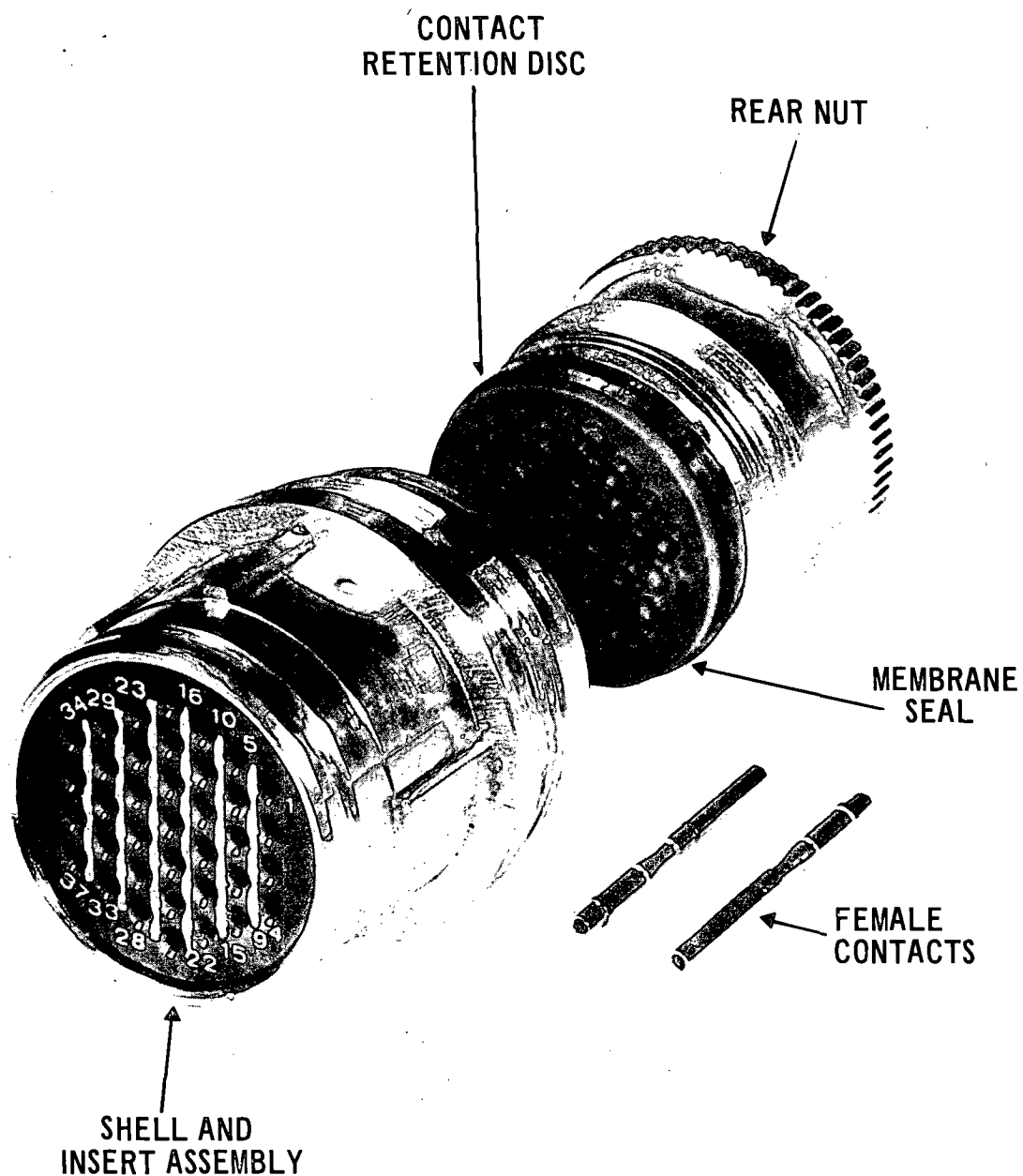
MACROMODULAR PROJECT

TITLE

MINI CONSOLE
TURRET WRENCH

ISSUE	8-11-72	
CHANGE NO.	DATE	DESCRIPTION

APPROVED			ENG	DRAWING NO.
BY	FOR	DATE	GCJ	
TUR	PROD	8-11-72	DRAWN BY	354-13
			PLL	
			CHECKED	DATE
			B	8-7-72

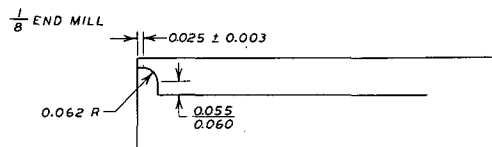
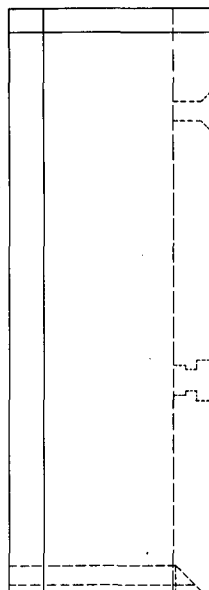


COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
ASTRO-348 PARTS IDENTIFICATION
MINI-CONSOLE

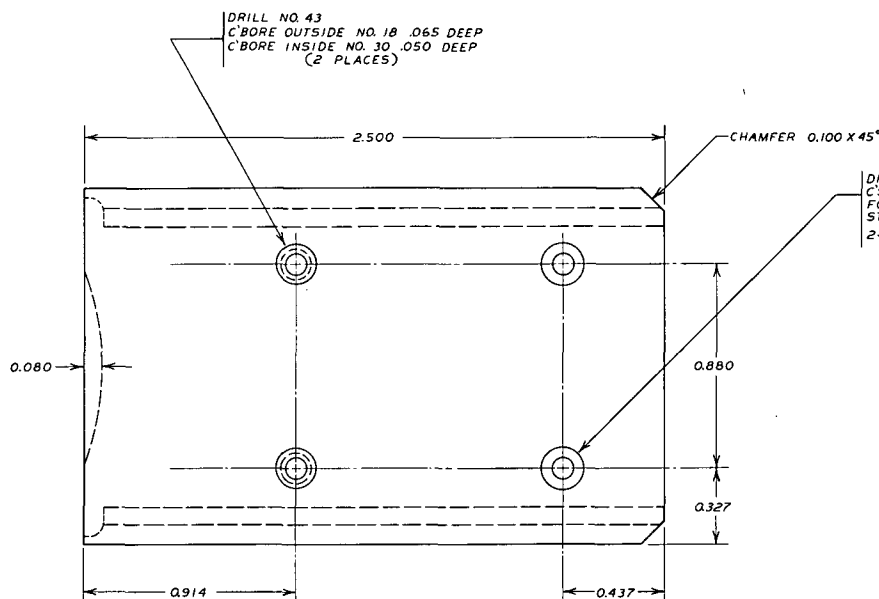
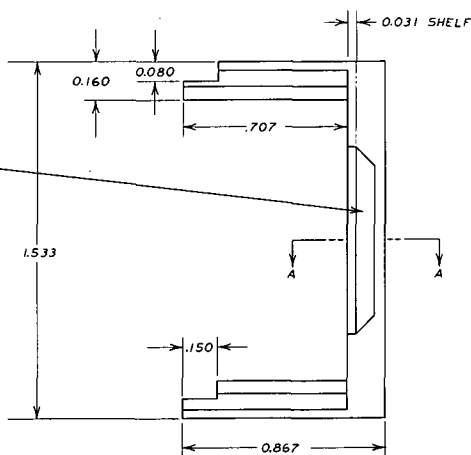
ISSUE	8-11-72		APPROVED			ENG GCJ	DRAWING NO. 354-14
			BY <i>LUR</i>	FOR PROD.	DATE 8-11-72	DRAWN BY MBP	
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>LB</i>	DATE 8-8-72



SECTION AA

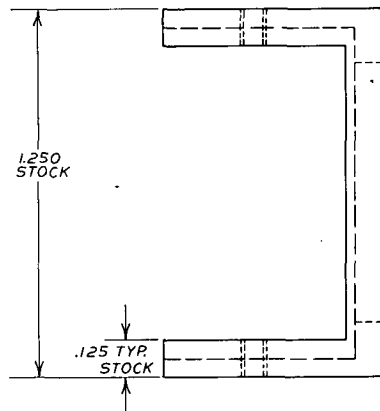
MATERIAL: BLACK CYCOLAC (ABS)
DIMENSIONS: ± .005 U.O.N.

CUT .080 DEEP
WITH 90° INCLUDED
ANGLE 2-1/4" DIA.
DOUBLE ANGLE
MILLING CUTTER

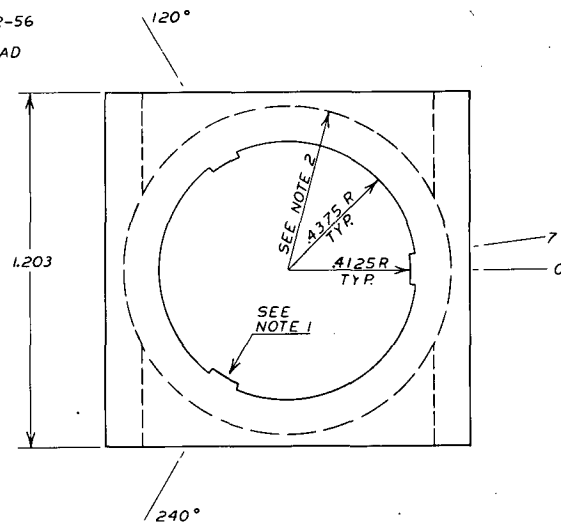
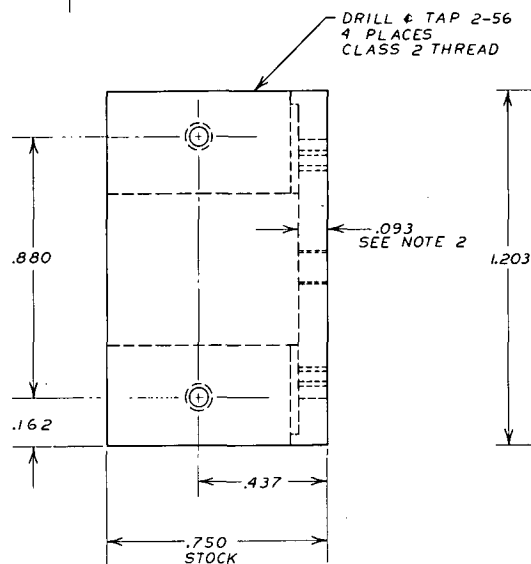


DRILL NO. 43
C'SINK 82° .180 FACE DIA.
FOR 2-56 SOCKET FLAT HEAD
STAINLESS SCREW
2-56-1/4 (2 PLACES)

ISSUE	8-11-72	
CHANGE NO.	DATE	DESCRIPTION
COMPUTER SYSTEMS LABORATORY		
WASHINGTON UNIVERSITY		
ST. LOUIS, MISSOURI		
MACROMODULAR PROJECT		
TITLE		
MINI-CONSOLE: CASE DESIGN		
APPROVED	FILE	DRAWING NO.
FOR	GCJ	354-15
BY	PL	
DATE	8-11-72	
CHECKED		
DATE	8-8-72	



TAB OUTLINES NOT
SHOWN IN THIS VIEW



NOTES:

1. CENTERS OF TABS ARE 120 DEGREES APART AND TABS 14 DEGREES WIDE. THIS IS A WIDTH OF 0.100 MEASURED AT THE INNER RADIUS.
2. CUT WITH 1-1/8 DIAMETER END MILL. STOCK MUST BE HELD IN FIXTURE TO PREVENT DEFLECTION OF SIDE WALLS. DEPTH OF CUT MUST BE REFERENCED TO BACK WALL IN ORDER TO PRESERVE 0.093 DIMENSION.

DIMENSIONS: ± 0.005 U.O.N.

STOCK: 1.250 X 0.750 X 0.125

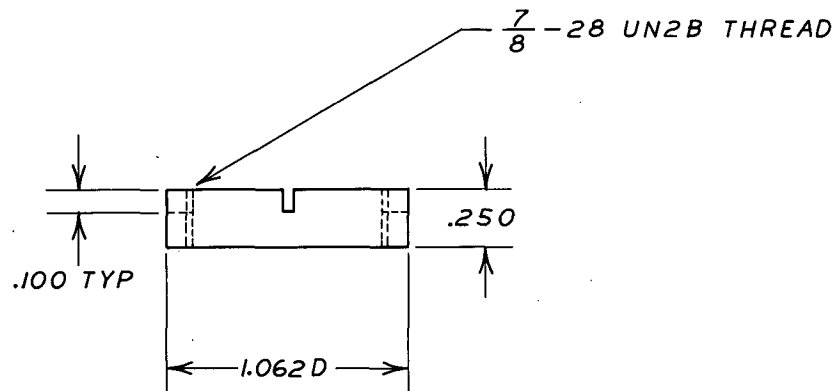
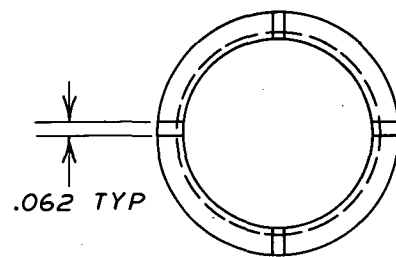
EXTRUDED CHANNEL 6061-T6

FINISH: BLACK ANODIZE

SCALE: APPROX. 4X

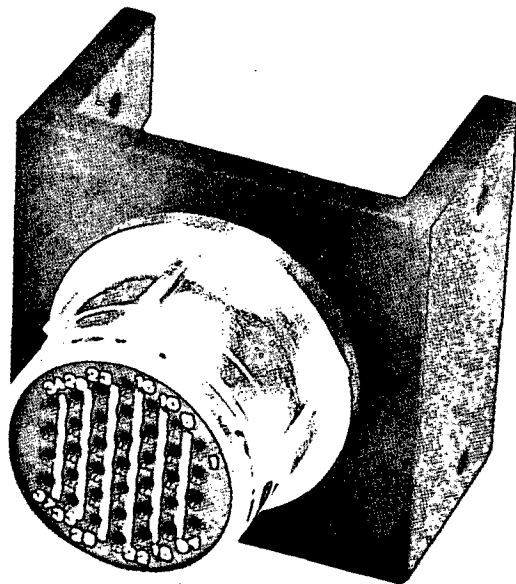
DO NOT SCALE

ISSUE B-11-72			
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY			
WASHINGTON UNIVERSITY			
ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE			
MINI-CONSOLE:			
CONNECTOR MOUNTING BRACKET			
APPROVED	ENG.	DATE	EXPIRATION
BY: TGM	G C J	8-11-72	354-16
FOR: PROD	PL L		
RECD		DATE	
		8-8-72	

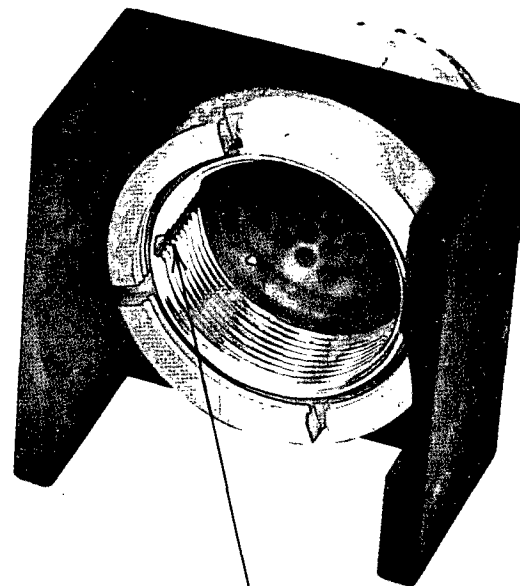


MATERIAL: 2011-T3 ALUM
ALL DIMENSIONS ± 0.005
FINISH: NATURAL

ISSUE 8-11-72			
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE MINI-CONSOLE: LOCK NUT			
APPROVED		ENG.	DRAWING NO.
BY	FOR	DATE	
JWR	PROD	8-11-72	354-17
		DRAWN BY	
		PLL	
		CHECKED	DATE
		8-8-72	

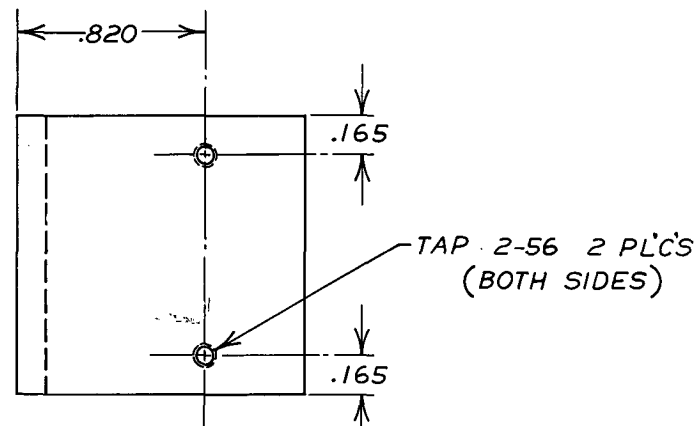
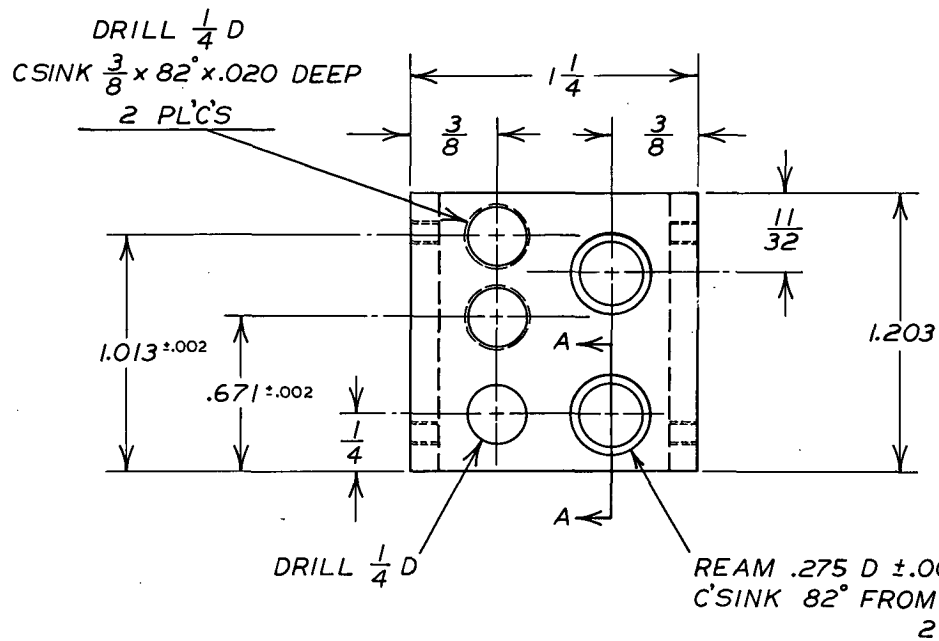


NUMBERS ARE UPRIGHT IN
ONLY ONE OF THREE
POSSIBLE ROTATIONAL POSITIONS

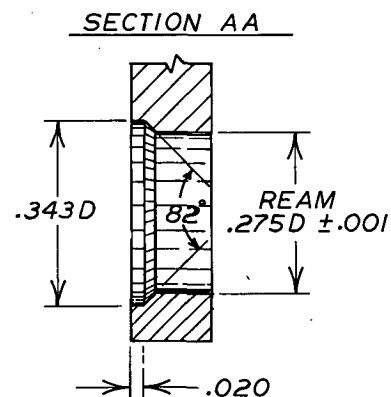


NOTE RELATIVE POSITION
OF SLOT AND U-SHAPED
BRACKET

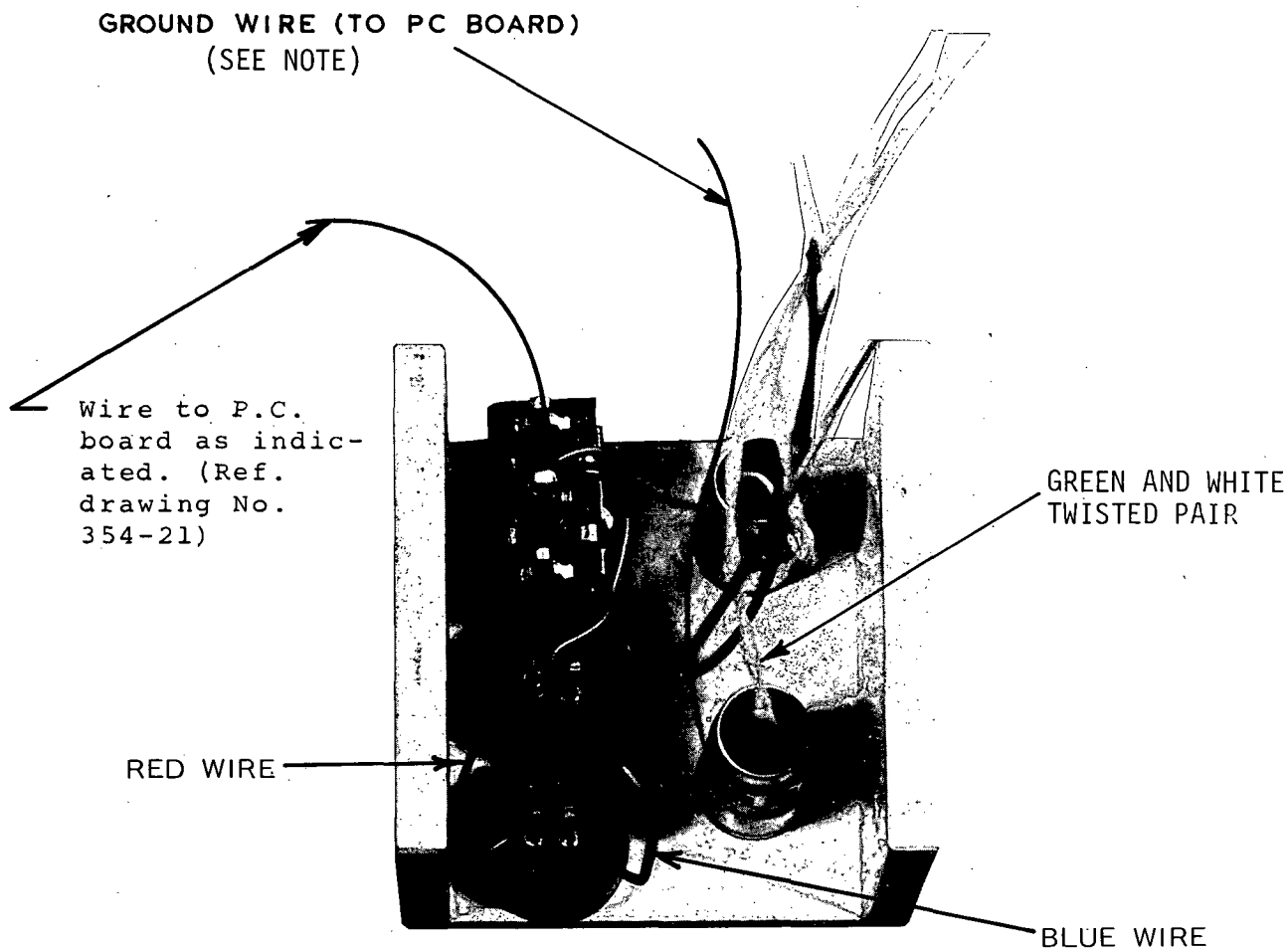
		COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE MINI-CONSOLE: CONNECTOR TO BRACKET ORIENTATION	
				APPROVED BY <i>JMK</i> FOR <i>PROD</i> DATE <i>8-11-72</i>	
ISSUE <i>8-11-72</i>				ENG. <i>GCJ</i> DRAWN BY <i>GWRDLS</i>	
		MACROMODULAR PROJECT		CHECKED <i>[Signature]</i> DATE <i>8-8-72</i>	
CHANGE NO.	DATE	DESCRIPTION			



MAT'L: $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{8}$ EXTRUDED ALUM CHANNEL
 FINISH: CLEAR ANODIZE
 DIMENSIONS: $\pm .005$ U.O.N.



ISSUE	8-11-72	
CHANGE NO.	DATE	DESCRIPTION
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		
MACROMODULAR PROJECT		
TITLE MINI-CONSOLE FACEPLATE		
APPROVED		ENG.
BY	FOR	DATE
FUR	PROD	8-11-72
DRAWN BY		DATE
PLL		4-26-72
CHECKED		DATE
M.P.B.		4-26-72



NOTE: WIRE IS 30 AWG BLUE KYNAR. STRIP 5/8" ON THIS END AND SOLDER ONTO COAXICON CASES.

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

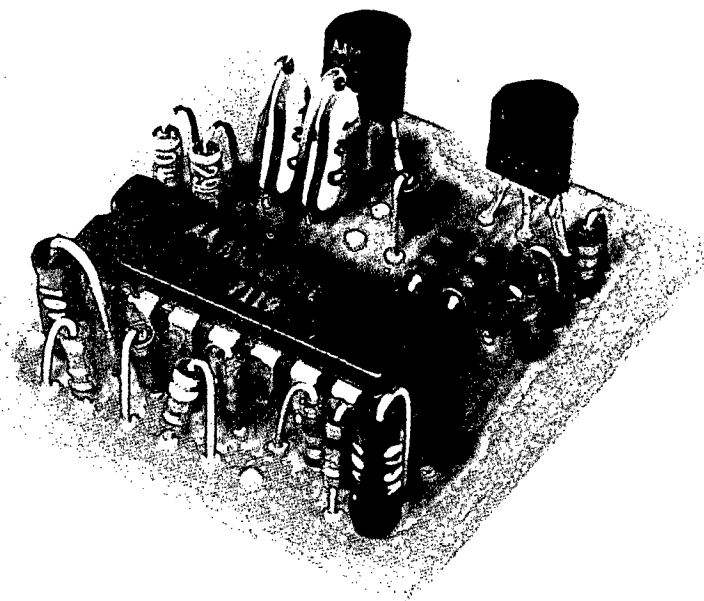
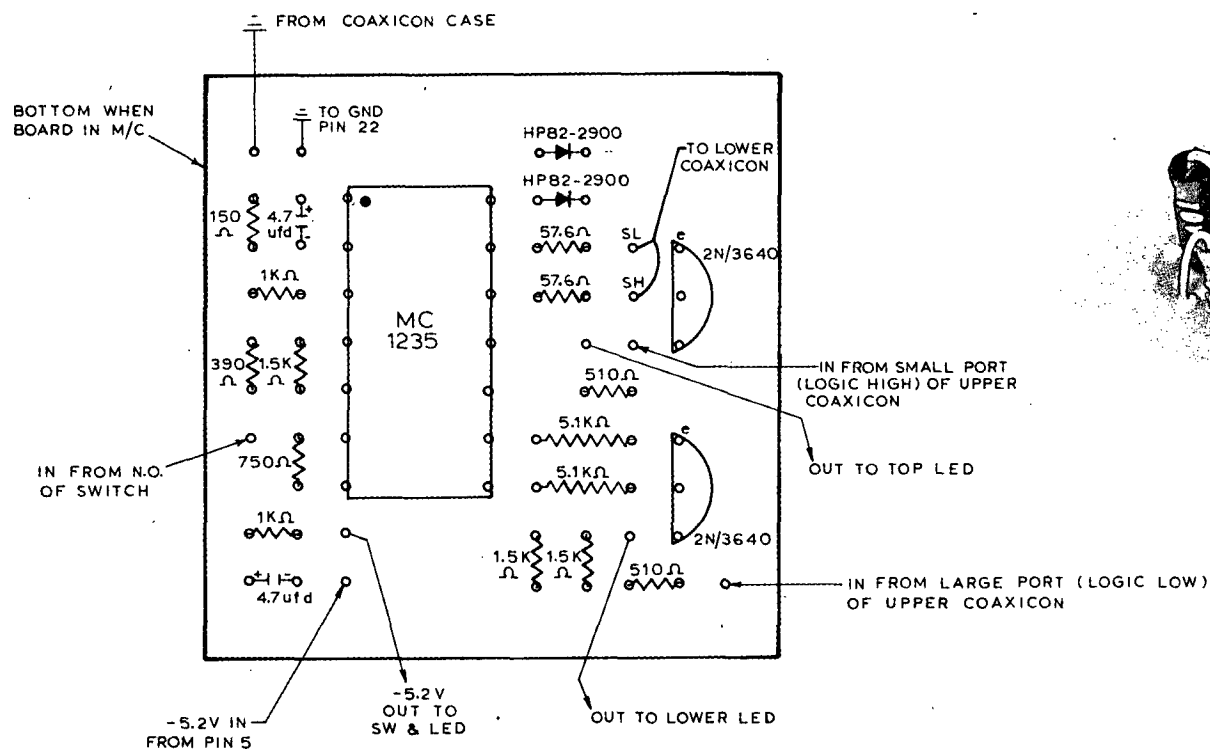
MACROMODULAR PROJECT

TITLE

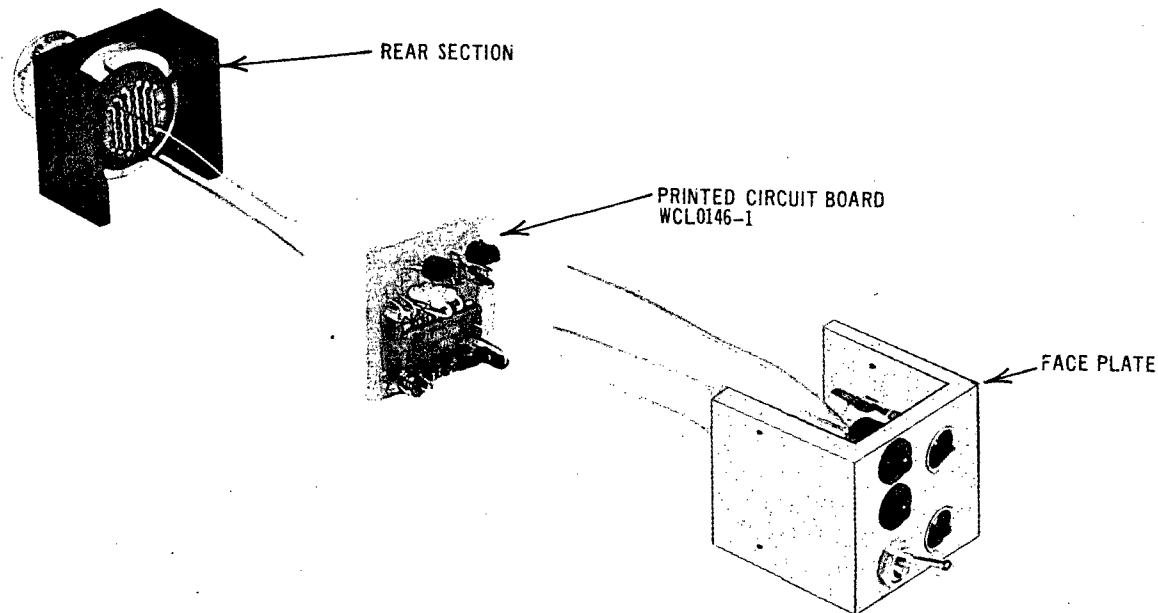
MINI CONSOLE
FACEPLATE - REAR VIEW

ISSUE	8-10-72		APPROVED			ENG	FUR	DRAWING NO. 354-20
			BY <i>CHUR</i>	FOR <i>PROD</i>	DATE 8-11-72	DRAWN BY CAH		
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>[Signature]</i>	DATE	7/17/72

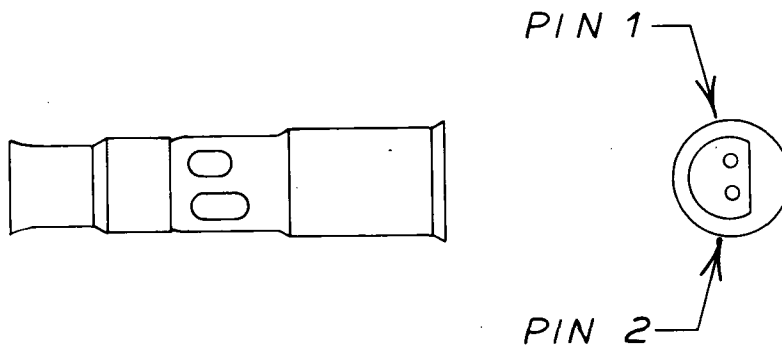
PRINTED CIRCUIT BOARD WCL0146-1



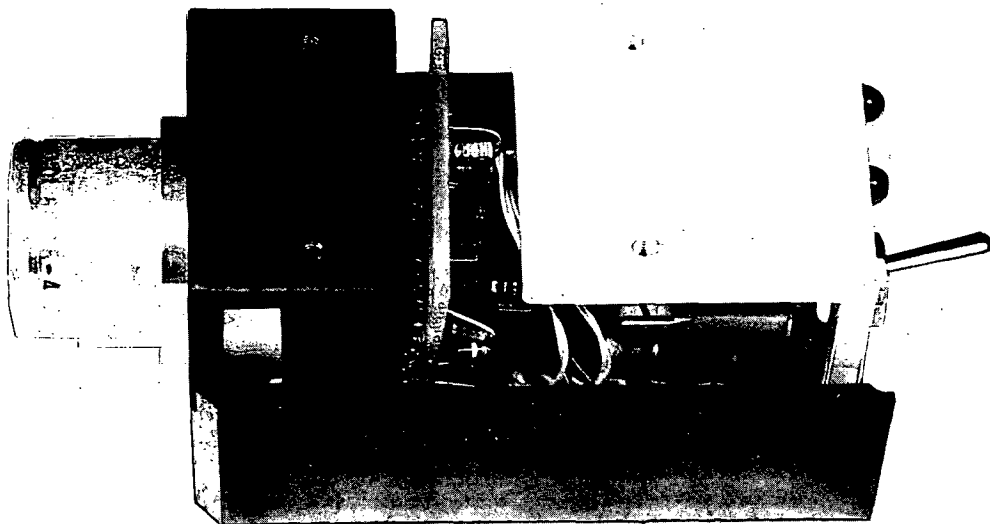
			COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY 2001 MASON DR	MINI-CONSOLE : PRINTED CIRCUIT BOARD ASSEMBLY				
ISSUE	8-11-72		MACROMODULAR PROJECT	APPROVED			ENG. FUR	DESIGN NO.
				BY	FOR	DATE	DESIGNED BY	354-21
				THUR	PROD	8-11-72	PLL	
CHANGE NO.	DATE	DESCRIPTION		REVISED BY			DATE	
							8-8-72	



			COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE MINI CONSOLE REAR SECTION, PC BOARD, FACEPLATE ORIENTATION			
					APPROVED BY: <i>LNR</i> FOR: <i>PROD</i> DATE: <i>8-11-72</i>		ENG. <i>FUR</i> DRAWN BY: <i>CAH</i>	DRAWING NO. 354-22
ISSUE: <i>8-11-72</i>			MACROMODULAR PROJECT				CHECKED: <i>EB</i>	DATE 7-17-77
CHANGE NO.	DATE	DESCRIPTION						



COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT				
			TITLE MINI CONSOLE COAXICON CONNECTOR				
			APPROVED			ENG FUR	DRAWING NO.
			BY FUR	FOR PROD	DATE 8-11-72	DRAWN BY PLL	354-23
ISSUE 8-11-72						CHECKED	DATE
CHANGE NO.	DATE	DESCRIPTION					8-9-72



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

**MINI CONSOLE
CASE HALF ASSEMBLY**

ISSUE	8-11-72		APPROVED			ENG FUR	DRAWING NO. 354-24
			BY <i>FUR</i>	FOR <i>PROD</i>	DATE <i>8-11-72</i>	DRAWN BY GWP	
CHANGE NO.	DATE	DESCRIPTION				CHECKED <i>[Signature]</i>	DATE 7/17/72

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY

355

TAP BOX

PAGE	TITLE	CHANGE
355 - 1	TITLE PAGE	ISSUE
355 - 2	PARTS LIST	
355 - 3	INTRODUCTION	
355 - 4	ASSEMBLY PROCEDURE	
355 - 5	WIRING CHART	
355 - 6	TESTING PROCEDURE	
355 - 7	TAP BOX ASSEMBLY	
355 - 8	COAXICON CONNECTOR PIN DESIGNATION	
355 - 9	DRILLING DIMENSIONS	

CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.	CHG.	E.C.O.	DATE	APPR.
ISS		10-23-72	LUR								

PARTS LIST

1	BOX NO. 2417, POMONA ELECTRONICS CO. INC.
4	COAXICON CONNECTORS, AMP NO. 329055
4	PROBE CONNECTORS, TEKTRONIX NO. 131-0258-00
9"	AWG. NO. 30 GREEN KYNAR, BRAND - REX
9"	AWG. NO. 30 WHITE KYNAR, BRAND - REX
4"	AWG. NO. 24 BUSS WIRE, BELDEN

ISS

10-23-72 : *LJR*

INTRODUCTION

The tap box is assembled from a basic predrilled Pomona Utility Box. The top has been drilled and reamed to accept 4 female coaxicon connectors and 2 Tektronix probe receptacles on each end. These connectors are jumpered within to provide a continuous control path for macromodule computer control signals. At the same time this control path is tapped by two Tektronix probe connectors at each end. The probe connectors allow access to the high and low levels during system operation. With one box a person is able to observe two control signals at a time by inserting a probe of the appropriate size into the desired HIGH or LOW taps.

CHG.	E.C.O.	DATE	APPR.
ISS		10-23-72	ELK

ASSEMBLY PROCEDURE

Using #30 AWG Kynar Insulated Wire prepare 8 pieces (4 white - 4 green) in the following manner.

Cut 4 pieces of each color approximately 2 1/4 inches in length. Strip both ends of each wire (using a NO NIK .014 dark green handled stripping tool which may be acquired from Clauss Cutlery Co., Freemont, Ohio) approximately $0.250 \pm .031$ inches. The green and white wires are inserted into their respective connector positions (see dwg. #355-7 & wiring chart pg. #355-5) and crimped using die #69231-2 in AMP hand tool #45707-2 or pneumatic tool 36365-2. The wire must be carefully held during the crimp cycle to prevent slippage. The connectors may now be set aside until called for later.

Insert the 4 Tektronix probe connectors in the holes provided for them in the Pomona Utility Box. Using the nuts provided, tighten them securely in place.

With an arbor press, insert the 4 coaxicon connectors into the top of the utility box paying strict attention to the orientation in DWG #355-7. The appropriate wires for high and low shall be attached to their respective Tektronix probe receptacles. Two wires of the same color shall go to the indicated probe.

A single 2 inch piece of #24 AWG Buss Wire shall electrically connect the outside of each coaxicon connector and the fastening nut at the rear of the Tektronix probe connectors for grounding purposes. (See dwg. #355-7) This wire must be soldered to the coaxicon cases, and fastening nuts. This operation must be done to both tap halves.

CHG.	E.C.O.	DATE	APPR.
ISS		10-23-72	LJR

WIRING CHART

Wire Color	AMP Pin #	Tektronix Probe
GREEN	2 (Large Port)	LOW
WHITE	1 (Small Port)	HIGH
BUSS WIRE	CASE	CASE NUT

CHG.	F.C.O.	DATE	APPR.
ISS		10-23-72	TLR

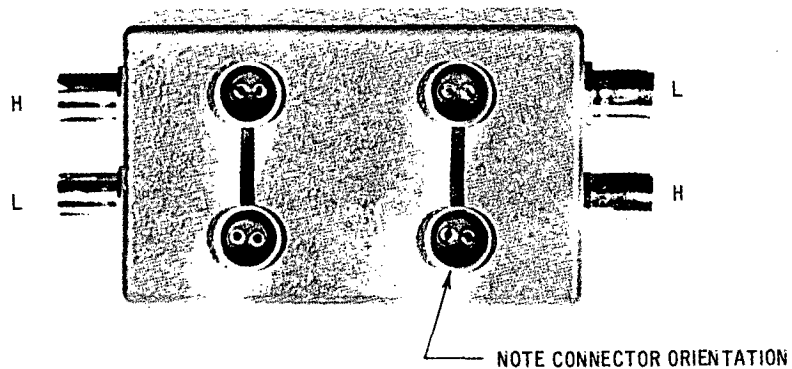
TESTING PROCEDURE

Using an ohm meter or light circuit check for continuity between the 3 high connections, 3 low connections and the grounds on each ckt. side. (None of the three should indicate short between each other but common between themselves.)

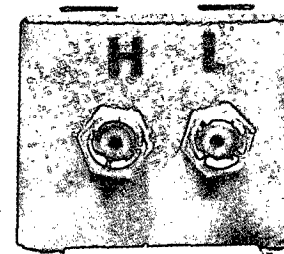
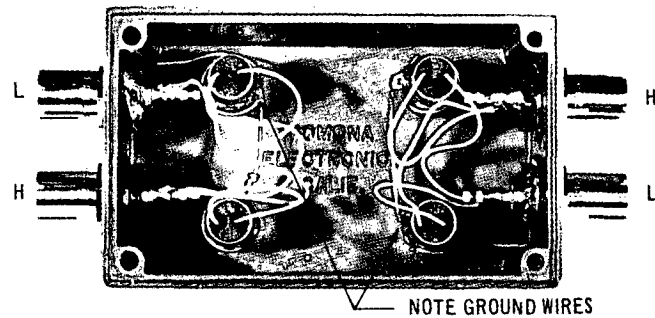
If the circuit checks, fasten the bottom plate to the box with the 4 screws provided.

CHG.	E.C.O.	DATE	APPR.
ISS		10-23-72	LJR

TOP VIEW

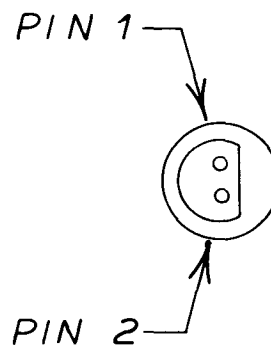
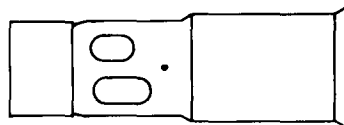


BOTTOM VIEW



SIDE VIEW

ISSUE	10-23-72	TWR	<p>COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI</p>	<p>TITLE TAP BOX ASSEMBLY</p>						
				<p>APPROVED</p> <table border="1"> <tr> <td>BY</td><td>FOR</td><td>DATE</td></tr> <tr> <td>TWR</td><td>PROD</td><td>10-23-72</td></tr> </table>			BY	FOR	DATE	TWR
BY	FOR	DATE								
TWR	PROD	10-23-72								
CHANGE NO.	DATE	DESCRIPTION	<p>MACROMODULAR PROJECT</p>	<p>CHECKED TWR</p>			<p>DATE 10-23-72</p>			



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

Coaxicon Connector
Pin Designation

APPROVED

ENG
G B

DRAWING NO.

355-8

BY

FOR

DATE

TUR

PROD

10-23-72

DRAWN BY
PLL

CHECKED

DATE

TUR

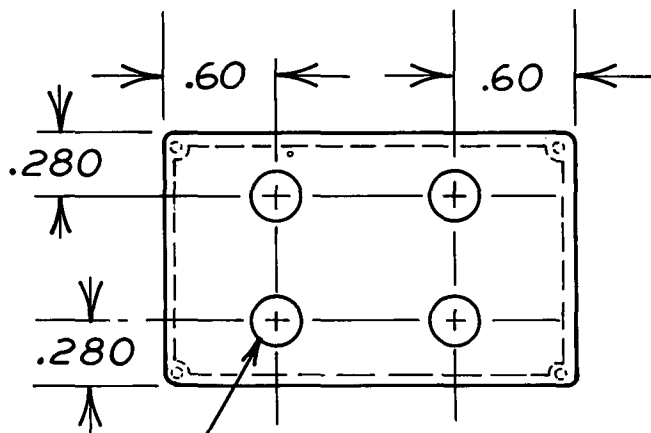
10-25-72

ISSUE
CHANGE NO.

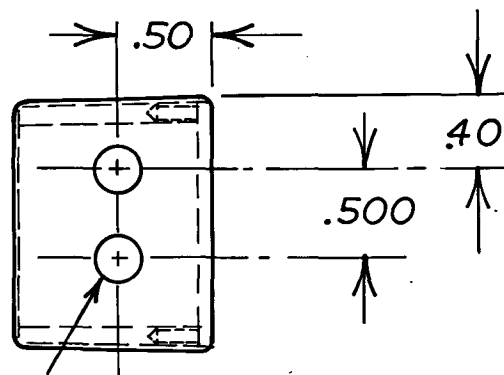
10-25-72
DATE

TUR

DESCRIPTION



REAM .275D
4 HOLES



DRILL .250D 2 HOLES
(BOTH SIDES)

DIMS: $\pm .005$

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

TAP BOX
DRILLING DIMENSIONS

APPROVED

ENG

DRAWING NO.

BY

FOR

DATE

GLB

355-9

THUR

PROD

10-23-72

DRAWN BY
PLL

ISS

10-23-72

THUR

CHANGE
NO.

DATE

DESCRIPTION

CHECKED
THUR

DATE
5-2-72

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY

356

Light Emitting Diode
Data Indicator

PAGE	TITLE	CHANGE
356-1	TITLE PAGE	A
356-2	PARTS LIST	
356-3	SPECIAL TOOLS	
356-4	INTRODUCTION	
356-5	OVERALL VIEW	
356-6 thru 356-13	L.E.D. DATA INDICATOR ASSEMBLY PROCEDURE	
356-14	L.E.D. PRINTED CIRCUIT BOARD AND ASSEMBLY JIG ORIENTATION	
356-15	COMPONENT IDENTIFICATION L.E.D. DRIVER BOARD	
356-16	COMPONENT IDENTIFICATION L.E.D. CURRENT REGULATOR BOARD	A
356-17	L.E.D. SANDWICH ASSEMBLY	
356-18	REAR SECTION - SANDWICH AND FACEPLATE ORIENTATION	
356-19	DATA INDICATOR FACEPLATE	
356-20	ASTRO 348 PARTS IDENTIFICATION	
356-21	CONNECTOR TO BRACKET ORIENTATION	
356-22	CONNECTOR MOUNTING BRACKET	
356-23	LOCK NUT	
356-24	CASE DESIGN	
356-25	L.E.D. CASE HALF ASSEMBLY	

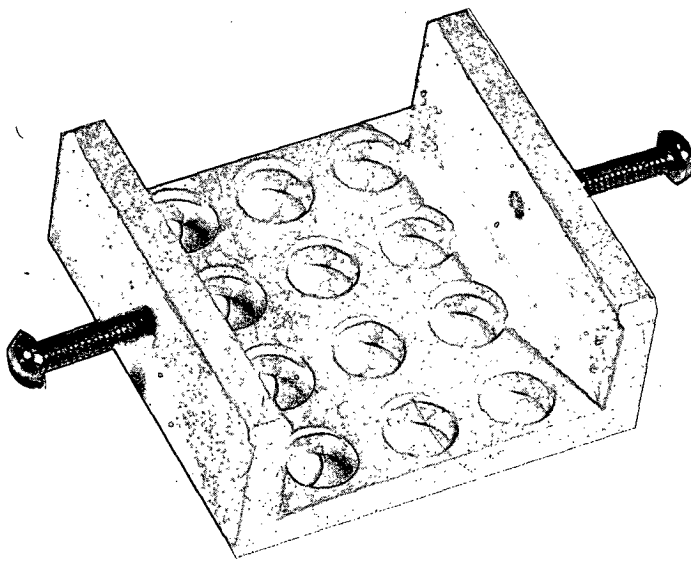
CHG.	E.C.O.	DATE	APPR.
ISS.		10-17-72	<i>TJR</i>
A	0279	1-8-73	<i>TJR</i>

L. E. D. DATA INDICATOR

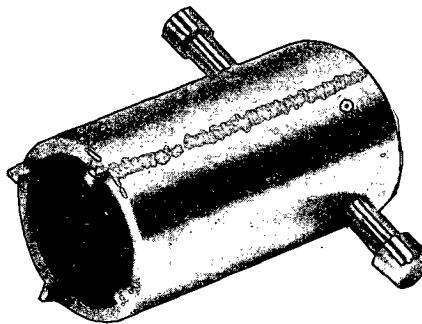
Parts List

QUANTITY	MANUFACTURER	PART	REFERENCE
1	Motorola	MD8001	----
12	Motorola	MPS3640	----
12	Monsanto	MV5023 Light Emitting Diode	----
1	Motorola	2N4402	----
25	Ohmite	510 Ohm 1/8 Watt Carbon 5% Resistor	----
1	Ohmite	620 Ohm 1/8 Watt Carbon 5% Resistor	----
1	Ohmite	1K Ohm 1/8 Watt Carbon 5% Resistor	----
1	Ohmite	2K Ohm 1/8 Watt Carbon 5% Resistor	----
2	Ohmite	5.1K Ohm 1/8 Watt Carbon 5% Resistor	----
1	Mallory	1 μ fd tantalex TAS105M035P1A	----
1	Electra Midland	Jumper	----
1	----	Printed Circuit Board	WCL0088-2
1	----	Printed Circuit Board	WCL0089-2
1	---	Printed Circuit Board	WCL0148-2
1	---	Data Indicator Faceplate	356-19
1	---	Connector Mounting Bracket	356-22
1	Amphenol	Astro 348-40E14-37S1 Connector	356-20
1	---	Lock Nut	356-23
2	Amphenol Cadre	Case Half	356-24
37	Amphenol	Female Contacts Astro 348-100-5000-02	----
2	---	2-56 x 3/16 S.S.F.H. Screws	----
8	---	2-56 x 1/4 S.S.F.H. Socket Screws	----

CHG.	E.C.O.	DATE	APPR.
Issue		10-17-72	<i>ZUR</i>



L. E. D.
ASSEMBLY JIG
(CSL)



TURRENT WRENCH
(CSL)

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

SPECIAL TOOLS

Issue

10-12-72

TUR

CHANGE
NO.

DATE

DESCRIPTION

APPROVED

BY

FOR

DATE

TUR

PROD

10-12-72

ENG

GLB

DRAWN BY
GWP

CHECKED

[Signature]

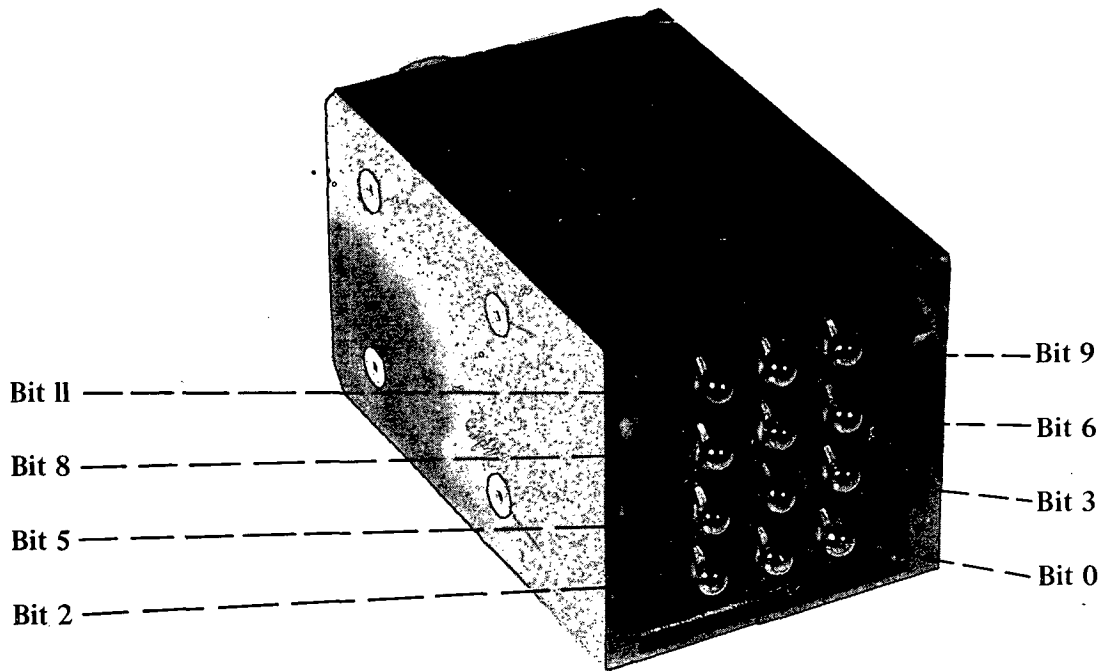
DRAWING NO.

356-3

DATE

10-12-72

INTRODUCTION

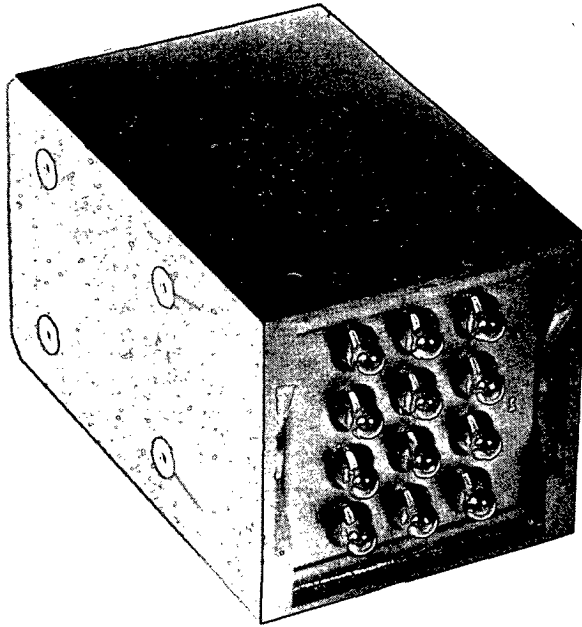


12 Bit Light Emitting Diode Data Indicator

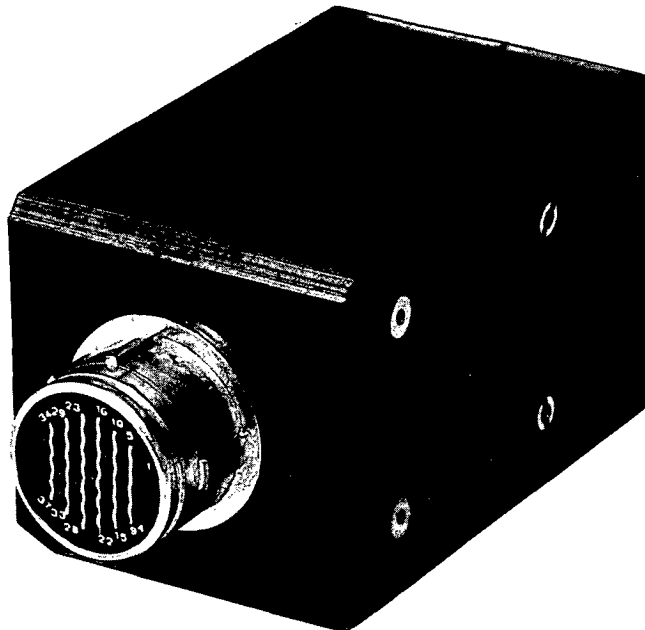
The 12 Bit "L.E.D." Data Indicator is a compact instant reading data indicator that may be plugged into any data output to indicate the value of each of the output bits.

The "L.E.D.'s" are grouped by threes to facilitate conversion by the user to OCTAL; with the most significant OCTAL digit on top. Thus a four digit OCTAL number may be read from top to bottom.

CHG.	E.C.O.	DATE	APPR.
ISSUE		10-12-72	4/R



FRONT VIEW



REAR VIEW

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE

L.E.D. DATA INDICATOR
OVERALL VIEW

Issue			10-12-72			FUR			
CHANGE NO.			DATE			DESCRIPTION			
APPROVED						ENG		DRAWING NO.	
BY		FOR		DATE		F.U.R.		356-5	
FUR		PROD		10-12-72		DRAWN BY			
						G.W.P.			
CHECKED						DATE			
[Signature]						10-12-72			

L.E.D. FACEPLATE ASSEMBLY

Insert 12 Light Emitting Diodes into P.C. Board WCL-0148-2 as shown in Drawing No. 356-14. Align the leads vertically with the double shouldered lead inserted in the negative common path.

Insert the PC board with the diodes in the assembly jig as shown in Drawing No. 356-14. Turn in the jig screws carefully to capture the assembled pieces. (Do not touch the common path line with the left jig screw). Solder* the negative (-) leads to the common path and the leads connected to the (+) terminals to the PC board.

Prepare 12 Blue wires (No. 30 AWG Kynar) 3" in length. Strip 0.875 from each wire and wrap one wire to each single shouldered (+) L.E.D. terminal. Strip the loose ends 0.187 for future soldering to the L.E.D. sandwich. Clip the L.E.D. ends, after the wiring and soldering so as not to exceed 0.250 inches in length.

Remove the completed mounting board from the jig and place it in a black finished faceplate exactly as it was in the assembly jig as shown in Drawing No. 356-14. Insert the mounting board in the faceplate bracket until the L.E.D. shoulders touch the metal. Install the two 2-56 x 3/16 S.S.F.H. screws so that they hold the L.E.D. mounting board in place from behind.

*Soldering

All soldering shall be performed with a temperature controlled iron. The Weller W-TCP with a 700° F tip is acceptable. Resistance and SCR controlled irons are not acceptable.

The solder used shall be nominally 60% tin and 40% lead with a noncorrosive rosin core. A small diameter (No. 22 wire guage) solder is preferable. (Ersin Multi-core)

CHG.	E.C.O.	DATE	APPR.
ISS		10-23-72	IMR

Remaining Wires

At this point it is best to make up the rest of the wires necessary to complete the L.E.D. Data Indicator Assembly.

Prepare 13 blue and 1 red No. 30 AWG Kynar wires 3.000 inches in length. These wires for Astro 348 connector pins, shall be stripped 0.125 - 0.150 inch on one end. For this procedure a NO-NIK -- .014 -- dark green handled stripping tool should be acquired from Clauss Cutlery Co.

Crimp the Astro 348 connector pins to the stripped ends of the wires. The crimp should be made using Buchanan hand tool No. 612-596; with contact locator No. 613-381. (Crimp settings of 4 have proved satisfactory but tool variability requires some test be made before a policy is adopted. The test criterion is that the crimped joint shall have 70% of the tensile strength of the wire being used.)

The free end of each wire should be stripped 0.187 with the same type NO-NIK tool. This end will later be soldered to the L.E.D. sandwich.

Also at this time another single red wire No. 30 AWG Kynar, 3.000 inches long, should be prepared. Strip one end 0.187 and the other end 0.875. This wire shall be used for wire wrapping the connection to the faceplate common path.

ASSEMBLY PROCEDURE FOR L.E.D. SANDWICH

Solder 12 MPS3640 Transistors into place on WCL0089-2. The necessary orientation is shown in Drawing No. 356-15. These transistors must not exceed 5/16 inch in height as measured from the component side of the P.C. Board.

Next solder the jumper required to WCL0089-2. Leave the free end unclipped until later.

Solder the 510 ohm resistors to WCL0089-2. Allow 1/32 inch space between the board and the end to be soldered.

Trim the free ends of the 510 ohm resistors so they represent a stair case to ease the stacking of the two P.C. boards as shown in Drawing No. 356-15.

Set this board aside until later.

Solder the Motorola MD8001 to the component side of WCL0088-2. Orientation of pin No. 1 should be noted as in Assembly Drawing No. 356-16.

Solder the 2N4402 to the component side of WCL0088-2. Note the emitter orientation.

Insert the Mallory 1 μ fd Tantelex capacitor into the proper holes indicated on Assembly Drawing No. 356-16. Attention to polarity of the capacitor is imperative.

Solder the rest of the resistors to WCL0088-2 as indicated in Assembly Drawing No. 356-16.

Locate the following wires:

1. One red 3.000 inch 30 ga. Kynar wire with a crimped Astro 348 contact and the free end stripped 0.187.
2. One blue 3.00 inch 30 ga. Kynar wire with a crimped Astro 348 contact and the free end stripped 0.187.

3. one red 3.00 inch 30 ga. Kynar wire with one end stripped 0.187 inch and the other end stripped 0.875 inch.

The next step is to take both red wires and solder their 0.187 bare ends into the -5.2 pad on WCL0088-2. The Astro 348 crimped pin will later be inserted into the rear connector and the 0.875 end of the 3.00 inch red wire will be wrapped to the L.E.D. Mounting board.

The blue wire should now be soldered to its ground pad on WCL0088-2. Its Astro 348 pin will later be inserted in the rear connector.

Place WCL0088-2 above WCL0089-2 and align the 510 ohm resistors with the inside row of the double pads on WCL0088-2. The jumper must be aligned with its hole on WCL0088-2 at this time as shown in Drawing No. 356-17.

Ease WCL0088-2 down over WCL0089-2 with its component side up. Compress the boards until the inside distance is $\frac{3}{8}$ inch. Check to see that each resistor is aligned properly.

Solder the resistors to the top and bottom sides of WCL0088-1. Care must be taken to prevent the filling of the outside holes with solder. They will be used later for attaching the L.E.D. and bit connections. Solder the jumper to complete the final operation.

Set the sandwich aside until called for later.

REAR ASSEMBLY PROCEDURE

Components

The Astro 348 connector is made up of a subset of parts from a 348-40E14-37S1 connector. Note that the front shell assembly has a groove, and the locking ring flange has been removed. (See Drawing No. 356-20) for parts identification.

The plastic case is made from two identical halves. The case is detailed on Drawing No. 356-24.

The connector mounting bracket (Drawing No. 356-22) and the Lock Nut (Drawing No. 356-23) serve to align and capture the Astro 348 connector. The tapped holes in the bracket also serve to retain the case halves.

Assembly

Assemble an Astro 348 shell into a connector mounting bracket with a lock nut. (See Drawing No. 356-21. Securely tighten the Lock Nut using the special turret wrench (Drawing No. 356-3). Hold the bracket in a vise for this operation - - the nut must be tight. The only correct orientation is shown in Drawing No. 356-21.

Insertion in Connector

Insert 12 crimped contacts with blue wires and empty uncrimped contacts into the Astro 348 retention disc as indicated on page 356-11.

One red and one blue have been soldered to the L.E.D. sandwich already - - they will be inserted when the final assembly is made.

REAR SECTION "348" PIN CONNECTIONS

Blank Pins	1, 2, 3, 4, 6, 7, 8, 10, 12, 14, 16, 18, 19, 20, 23, 25, 27, 29, 30, 32, 34, 35, 36
Red Wire	5 (power)*
Blue Wires	9, 11, 13, 15, 17, 21, 22* (ground), 24, 26, 28, 31, 33, 37

* will be inserted when final assembly is started

ADJOINMENT OF REAR SECTION, SANDWICH AND FACEPLATE

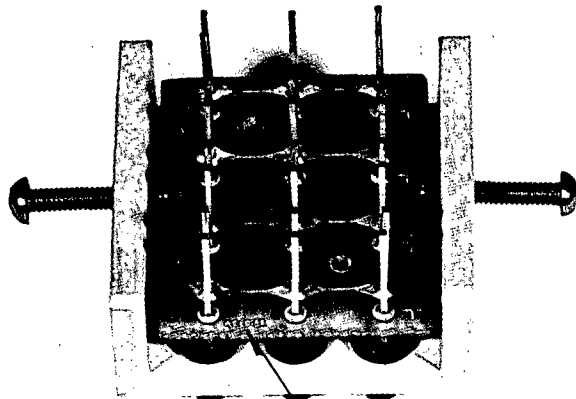
1. Set the three sections as illustrated in Drawing No. 356-18.
 - A. Notice that when viewed from the rear the Bit 0 L.E.D. is in the lower left corner of the mounting board and the part No. of the board is upright. (refer to page 356-6 and 356-14).
 - B. The sandwich should be setting on the short side with the MD8001 at the top facing front.
 - C. The rear section should be setting on its 1/8 inch walls and the large boss position to the right. (The numbers on the connector should be upright at this time.)
2. Insert the pin crimped to the red wire on the sandwich in the No. 5 position of the rear connector.
3. Insert the pin crimped to the blue wire in the No. 22 position of the rear connector.
4. Wire wrap the other red wire to the Bit No. 9 (-) negative lead to complete the common path.
5. Turn to assembly drawing No. 356-16 and note the L.E.D. and Pin connections and 356-4 for L.E.D. Bit positions.
6. Beginning with the blue wire connected to the L.E.D. in the Bit No. 11 position, bring the wire directly to board No. WCL0088-2. Insert the wire from the component side and solder to the pad on the other side.
7. Locate the blue wire attached to pin No. 9 of the Astro 348 connector. Bring this wire forward and around P.C. board WCL0089-2. Insert the wire directly into WCL0088-2 from the other side and solder the bare end to the pad on the componet side.

8. For greatest ease in making the rest of the connections it is suggested the assembler work down and across the bottom finishing with the Bit No. 5 connection. This will prevent the accidental burning of another wire's insulation.
9. After final wiring and inspection the assembly should be placed in the plastic shell as shown in Drawing No. 356-25 and the 8 - 2 - 56 x 1/4" S.S.F.H. screws installed.

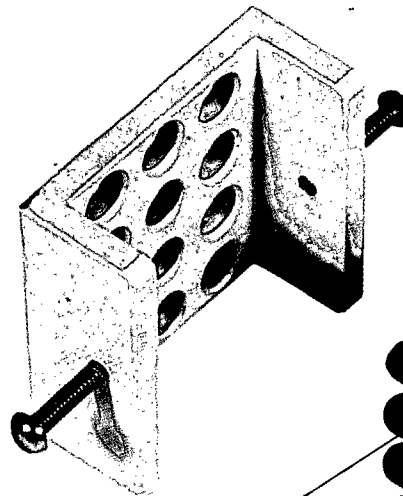
Check Out

The best method for testing the completed L.E.D. indication unit is to insert it in to a Macro Module data output port or interface port that may be controlled by a computer, switches or parameter plug. The lights should follow the input pattern as it is varied.

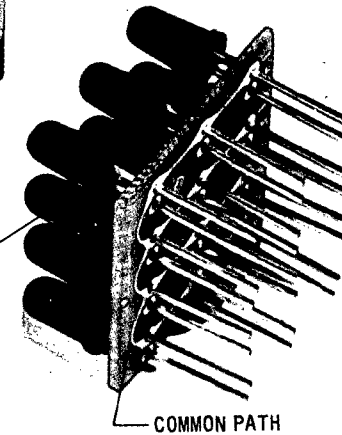
ASSEMBLY JIG



NOTE
PART NO. WCL-0148 ORIENTATION



NOTE
L.E.D. LEAD
ORIENTATION



COMMON PATH

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
L.E.D. P.C. BOARD AND
ASSEMBLY JIG ORIENTATION

APPROVED		
BY	FOR	DATE
SKR	PROD	10-12-72

ENG. GB

DRAWN BY
GWP

CHECKED
SKR

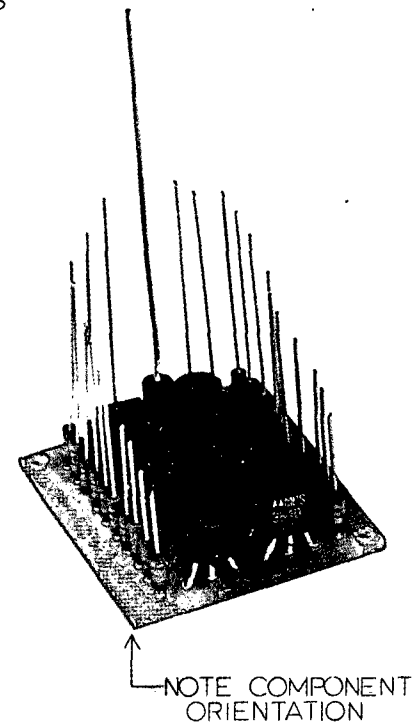
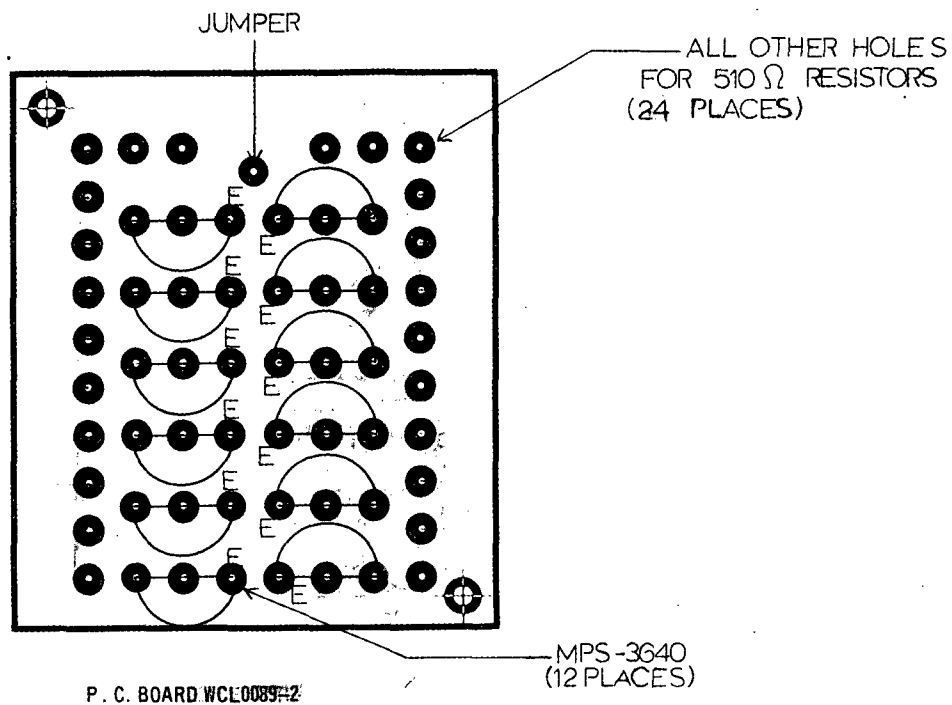
DRAWING NO.

356-14

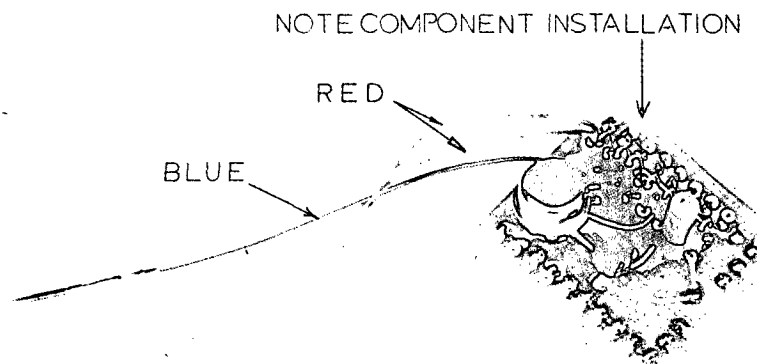
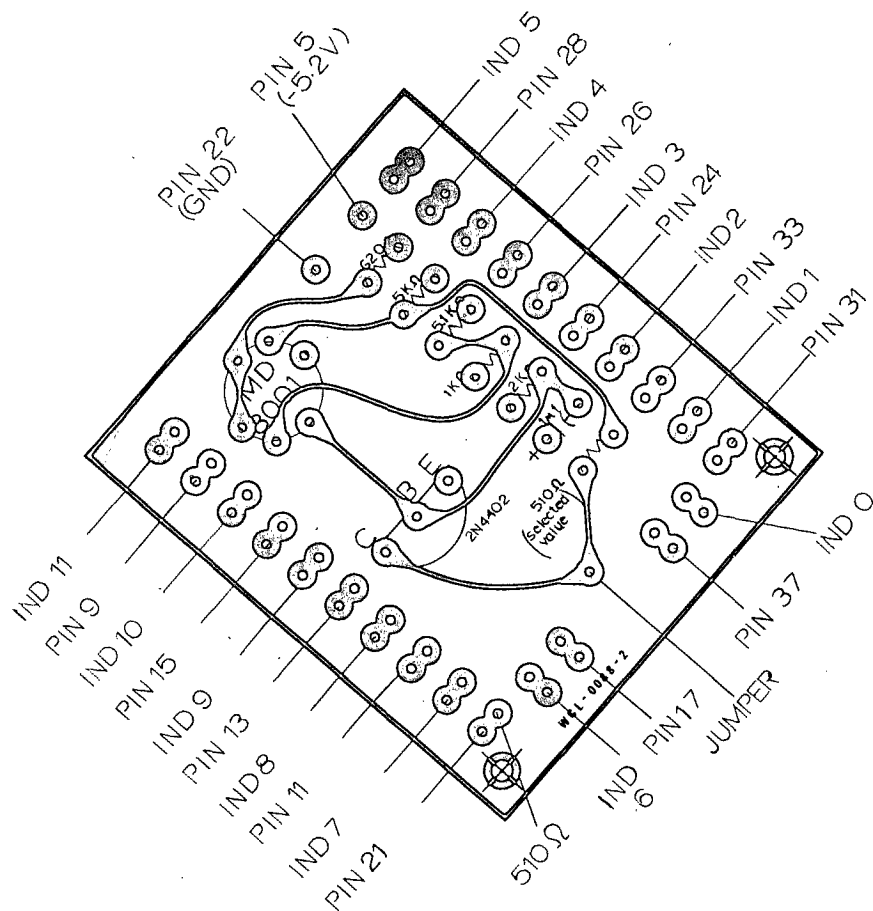
DATE
10-12-72

ISSUE 10-12-72 SKR

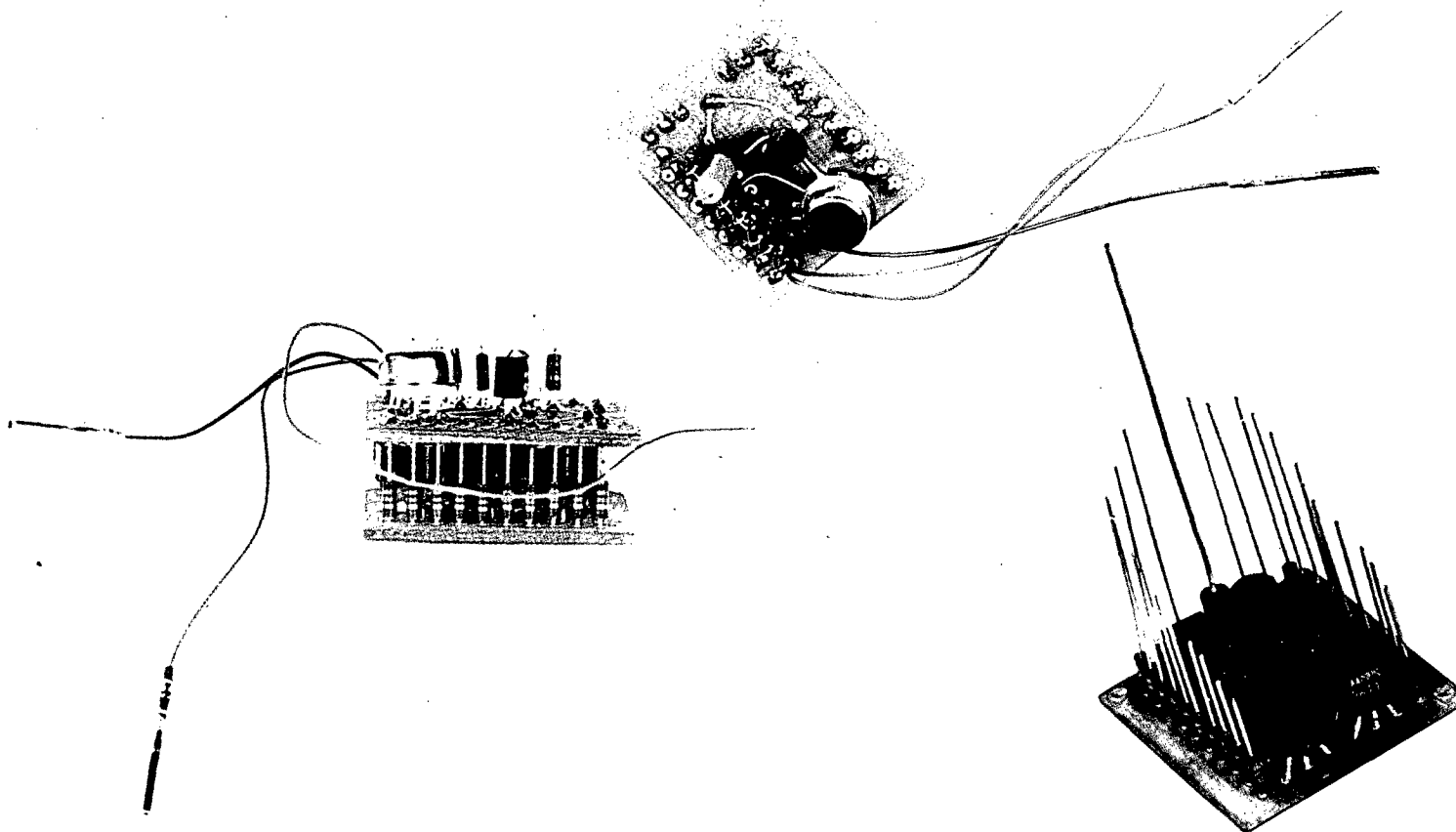
CHANGE NO.	DATE	DESCRIPTION



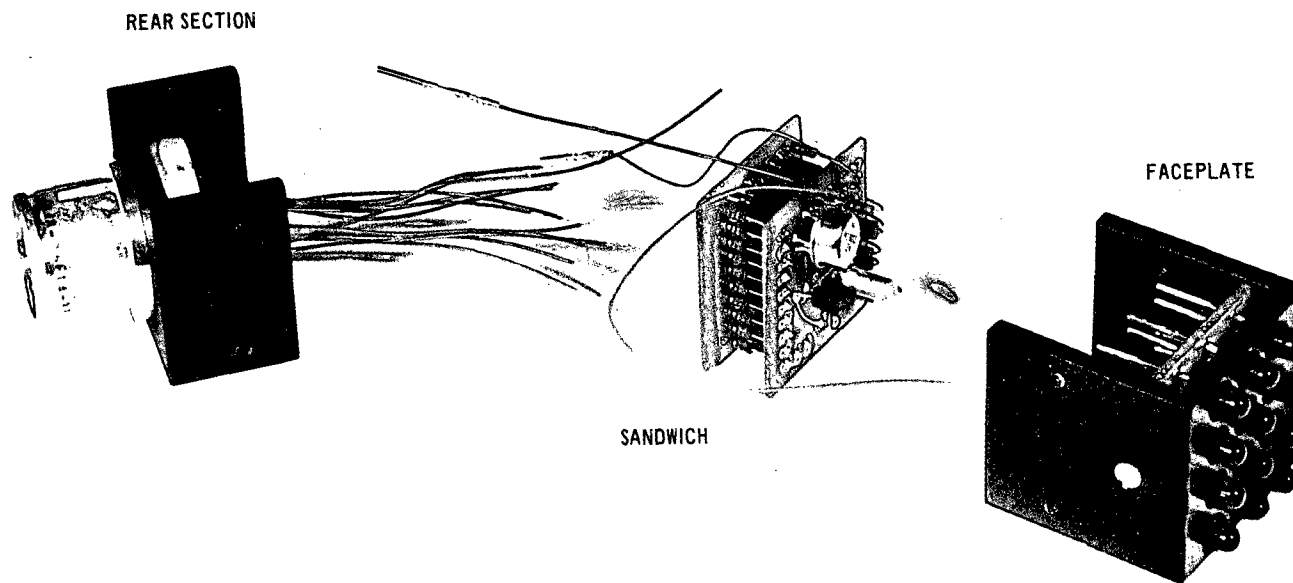
ISSUE 10-12-72 <i>JWR</i>		DESCRIPTION	COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE COMPONENT IDENTIFICATION L.E.D. DRIVER BOARD			
			MACROMODULAR PROJECT		APPROVED BY <i>JWR</i> FOR <i>PROD</i> DATE 10-12-72		ENG. GB	DRAWING NO. 356-15
CHANGE NO.	DATE	DESCRIPTION			CHECKED <i>JWR</i>		DATE 10-12-72	



				COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE COMPONENT IDENTIFICATION L.E.D. CURRENT REGULATOR BOARD				
A	1-8-73	E.C.O. 0279	TUX			APPROVED BY <i>FUR</i> FOR PROD DATE 10-12-72			ENG. <i>FUR</i> DRAWN BY <i>GWP</i>	DRAWING NO. 356-16
ISSUE	10-12-72	12 NR			MACROMODULAR PROJECT		CHECKED <i>BE</i>			DATE 10-12-72
CHANGE NO.	DATE	DESCRIPTION								



		COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE L.E.D. SANDWICH ASSEMBLY			
				APPROVED BY <i>ENR</i> FOR <i>PROD</i> DATE <i>10-12-72</i>		ENG. <i>F.U.R.</i>	DRAWING NO. <i>356-17</i>
ISSUE <i>10-24-72</i> <i>TJNR</i>		MACROMODULAR PROJECT		DRAWN BY <i>G.W.P.</i>		CHECKED <i>GB</i>	
CHANGE NO.	DATE			DESCRIPTION	DATE <i>10-24-72</i>		



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

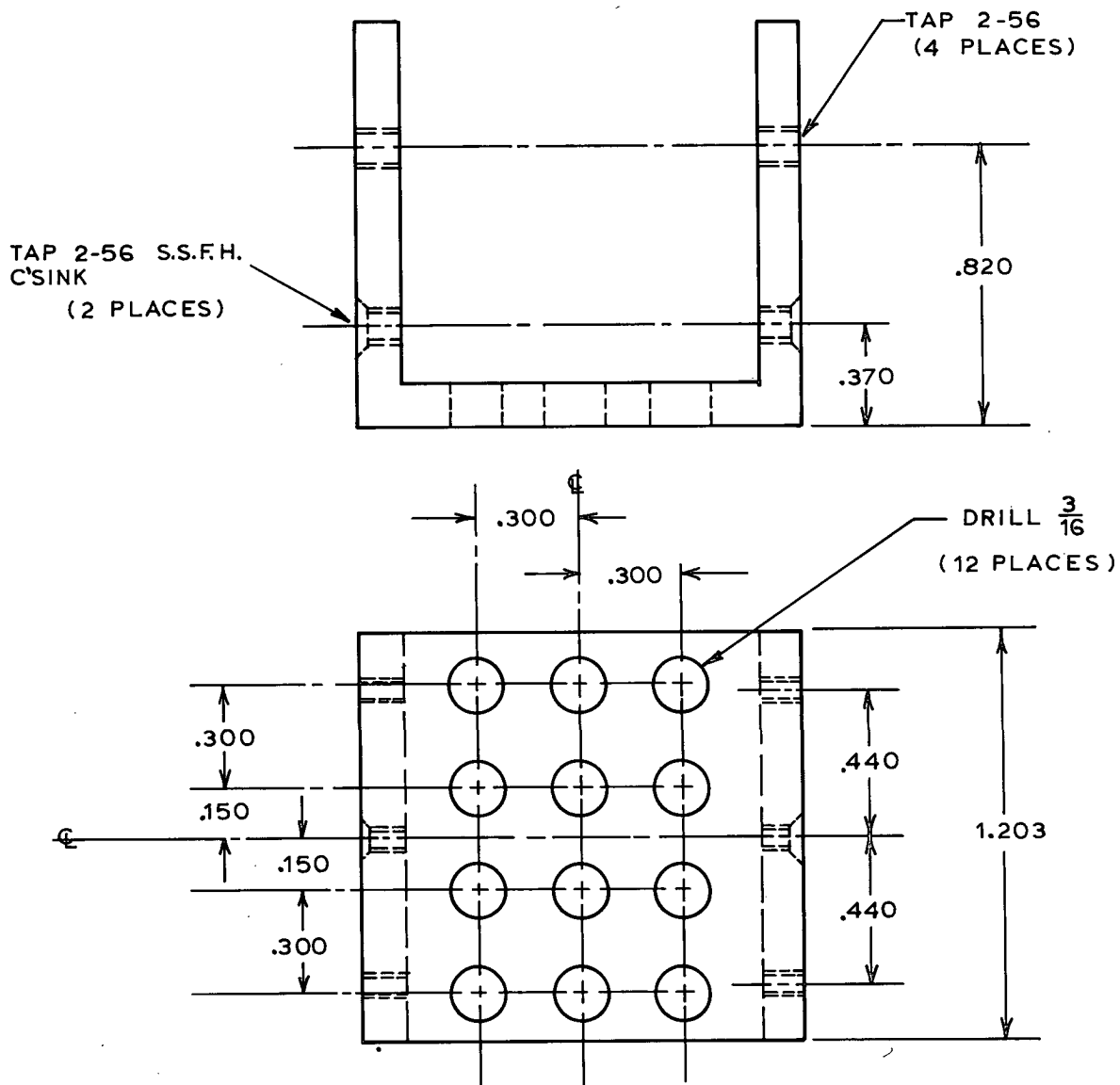
MACROMODULAR PROJECT

TITLE REAR SECTION - SANDWICH - AND FACEPLATE
ORIENTATION

APPROVED			ENG. F.U.R.	DRAWING NO. 356-18
BY	FOR	DATE		
FUR	FRD	10-12-72	DRAWN BY GWP	
			CHECKED CB	DATE 10-12-72

ISSUE 10-12-72 TVA

CHANGE NO.	DATE	DESCRIPTION



MAT'L: $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{8}$ ALUM CHAN

FINISH: BLACK ANODIZE

DIMS: $\pm .005$ U.O.N.

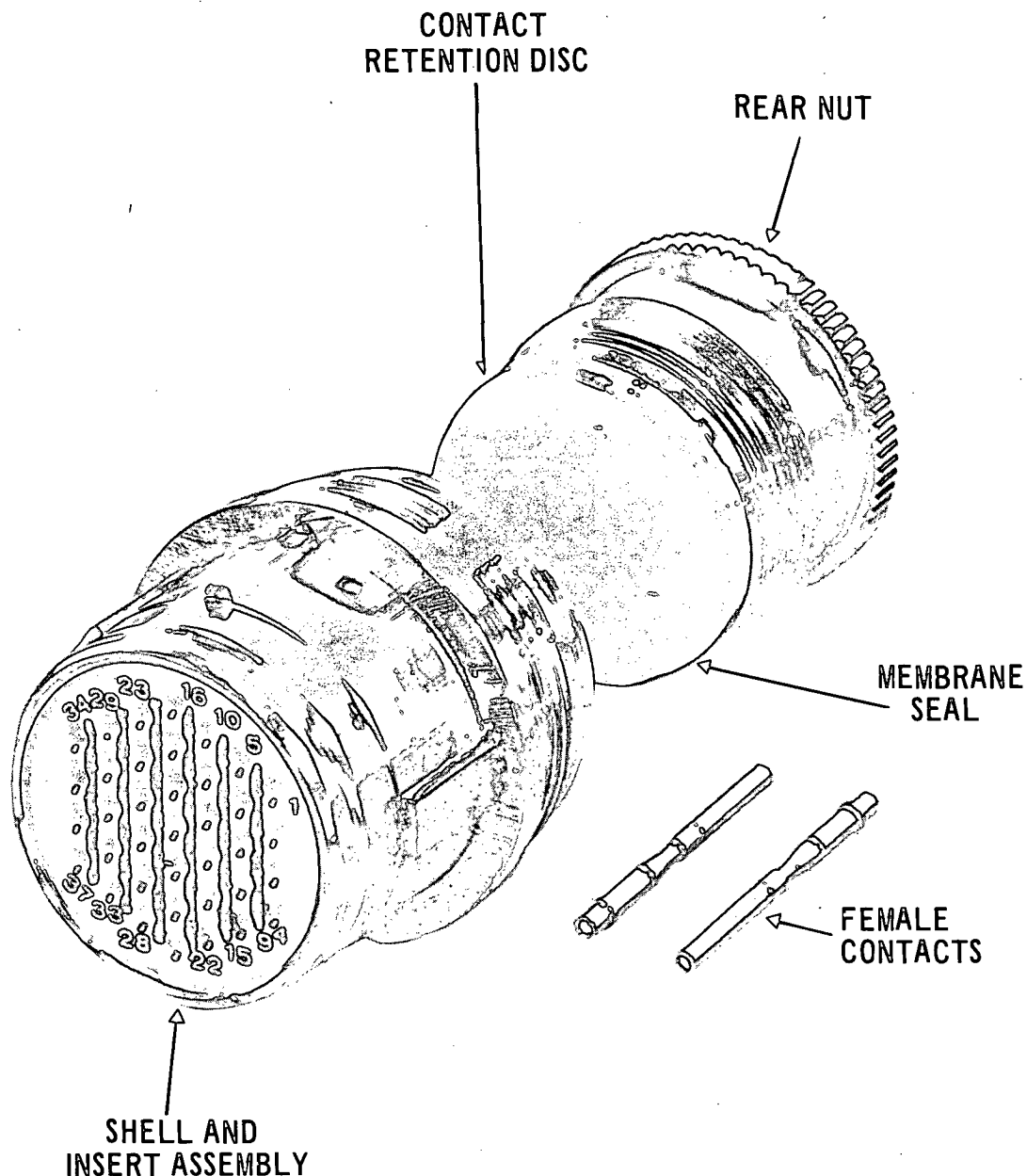
COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

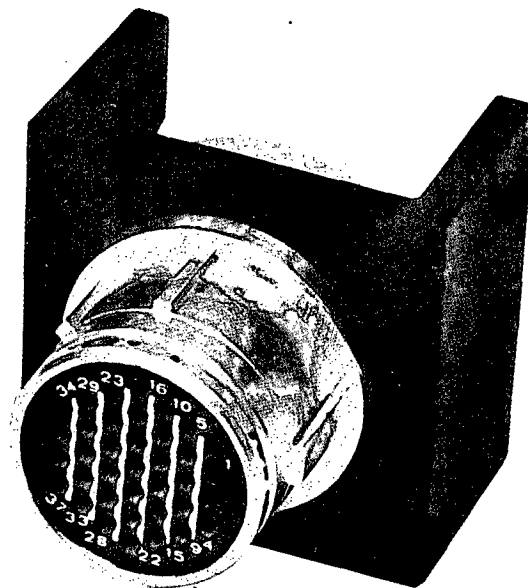
TITLE

DATA INDICATOR : FACEPLATE

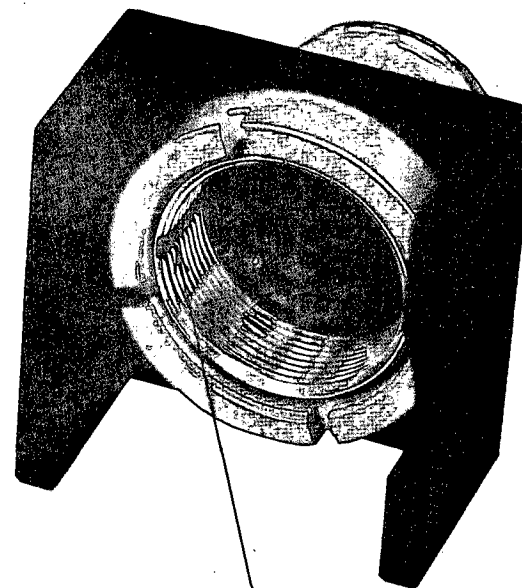
ISSUE	DATE	DESCRIPTION	APPROVED			ENG	DRAWING NO.
			BY	FOR	DATE	GLB	
1	10-12-72	TJR	TJR	PROD	10-12-72	PLL	356-19
CHANGE NO.	DATE	DESCRIPTION				CHECKED	DATE
						TJR	6-6-72



COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			MACROMODULAR PROJECT		
			TITLE ASTRO-348 PARTS IDENTIFICATION		
			APPROVED BY <i>JUR</i> FOR PROD. DATE <i>8-11-72</i>		
			ENG GCJ		DRAWING NO. 356-20
ISSUE <i>8-11-72</i>			DRAWN BY MBP		
CHANGE NO.			CHECKED <i>LB</i>		DATE 8-8-72
DATE			DESCRIPTION		

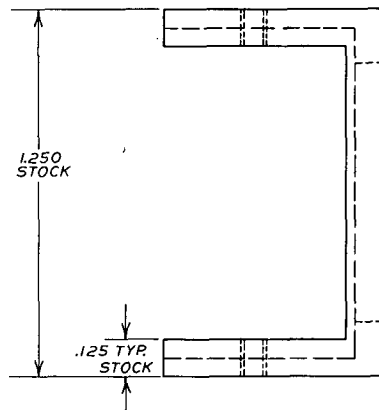


NUMBERS ARE UPRIGHT IN
ONLY ONE OF THREE
POSSIBLE ROTATIONAL POSITIONS

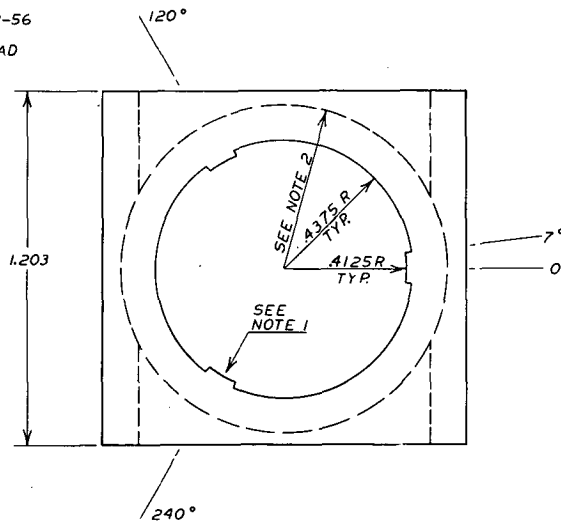
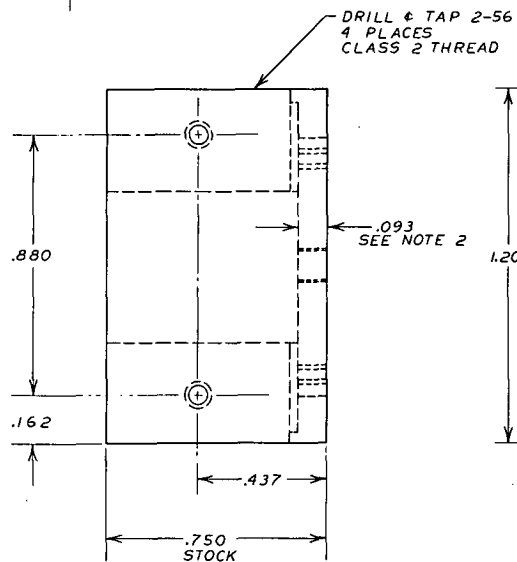


NOTE RELATIVE POSITION
OF SLOT AND U-SHAPED
BRACKET

		COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI		TITLE CONNECTOR TO BRACKET ORIENTATION			
				APPROVED BY <i>ZUR</i> FOR <i>PROD</i> DATE <i>8-11-72</i>		ENG. <i>GCJ</i> DRAWN BY <i>GWRDLS</i> CHECKED <i>[Signature]</i>	DRAWING NO. 356-21
ISSUE <i>8-11-72</i>		MACROMODULAR PROJECT				DATE 8-8-72	
CHANGE NO.	DATE			DESCRIPTION			



TAB OUTLINES NOT
SHOWN IN THIS VIEW



NOTES:

1. CENTERS OF TABS ARE 120 DEGREES APART AND TABS 14 DEGREES WIDE. THIS IS A WIDTH OF 0.100 MEASURED AT THE INNER RADIUS.
2. CUT WITH 1-1/8 DIAMETER END MILL. STOCK MUST BE HELD IN FIXTURE TO PREVENT DEFLECTION OF SIDE WALLS. DEPTH OF CUT MUST BE REFERENCED TO BACK WALL IN ORDER TO PRESERVE 0.093 DIMENSION.

DIMENSIONS: ± 0.005 U.O.N.

STOCK: 1.250 X 0.750 X 0.125

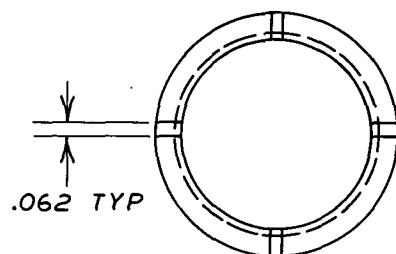
EXTRUDED CHANNEL 6061-T6

FINISH: BLACK ANODIZE

SCALE: APPROX. 4X

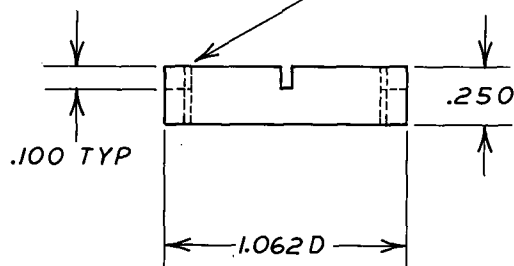
DO NOT SCALE

ISSUE 8-11-72			
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE CONNECTOR MOUNTING BRACKET			
BY 244	DATE 8-11-72	ENG. GCJ	DRAWING NO. 356-22
PROD		DRAWN BY PLL	
CHECKED		DATE 8-8-72	



.062 TYP

$\frac{7}{8}$ - 28 UN2B THREAD



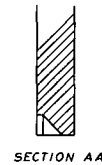
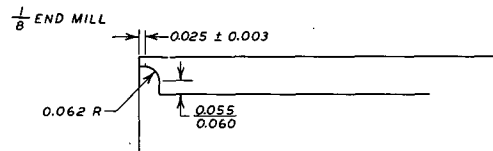
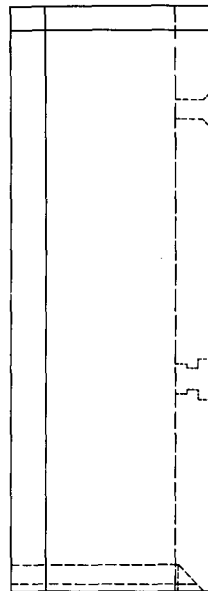
.100 TYP

.250

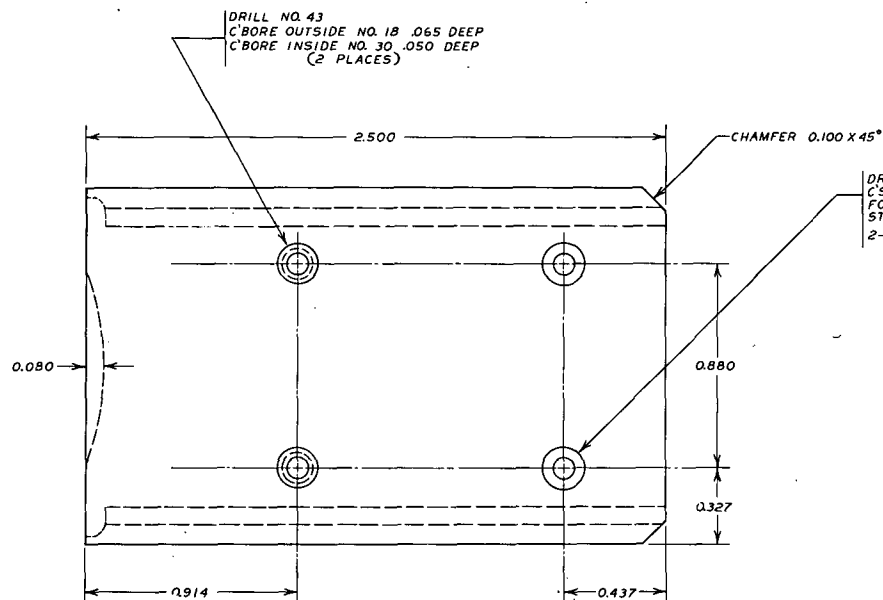
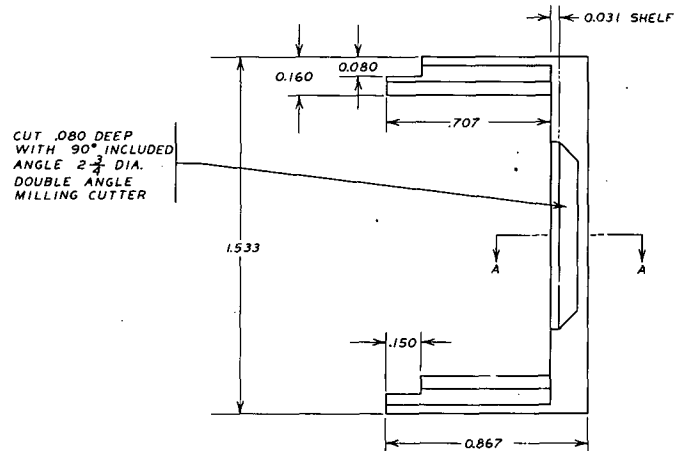
1.062 D

MATERIAL: 2011-T3 ALUM
ALL DIMENSIONS \pm 0.005
FINISH: NATURAL

ISSUE		8-11-72	
CHANGE NO.	DATE	DESCRIPTION	
COMPUTER SYSTEMS LABORATORY WASHINGTON UNIVERSITY ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE			
LOCK NUT			
APPROVED			ENG.
BY	FOR	DATE	G.C.J. 356-23
JUR	PROD	8-11-72	
DRAWN BY			PLL 8-8-72
CHECKED			
			DATE
			8-8-72

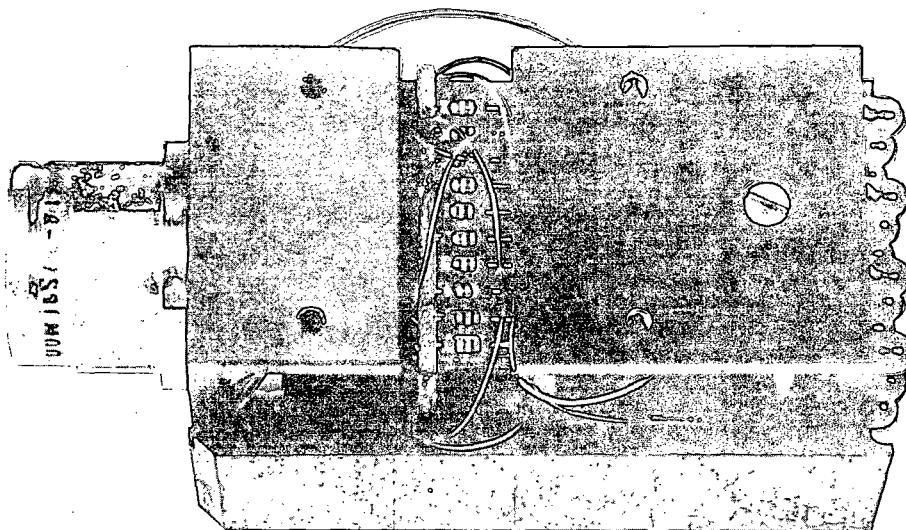


MATERIAL: BLACK CYCOLAC (ABS)
DIMENSIONS: ± .005 U.O.N.



DRILL NO. 43
C'SINK 82° .180 FACE DIA.
FOR 2-56 SOCKET FLAT HEAD
STAINLESS SCREW
2-56-1/4 (2 PLACES)

ISSUE 8-11-72			
CHANGE	DATE	DESCRIPTION	
1-25			
COMPUTER SYSTEMS LABORATORY			
WASHINGTON UNIVERSITY			
ST. LOUIS, MISSOURI			
MACROMODULAR PROJECT			
TITLE			
CASE DESIGN			
BY	APPROVED	DATE	DRAWING NO.
GCJ		8-11-72	356-24
PROJ.		PL 1	
CHECKED		DATE	
		8-8-72	



COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE L.E.D. CASE HALF ASSEMBLY

Issue	10-12-72		APPROVED			ENG F.U.R.	DRAWING NO. 356-25
			BY JMR	FOR PROD	DATE 10/12/72	DRAWN BY G.W.P.	
CHANGE NO.	DATE	DESCRIPTION				CHECKED [Signature]	DATE 10-12-72

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)

1. ORIGINATING ACTIVITY (Corporate author) Computer Systems Laboratory Washington University St. Louis, MO		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
		2b. GROUP	
3. REPORT TITLE PARAMETER SWITCHES, MINI CONSOLE AND LED DATA INDICATOR			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report 4/1/65 through 12/31/73			
5. AUTHOR(S) (First name, middle initial, last name) Fred U. Rosenberger, Editor			
6. REPORT DATE February, 1974		7a. TOTAL NO. OF PAGES 93	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. DOD (ARPA) Contract SD-302		9a. ORIGINATOR'S REPORT NUMBER(S) Volume X of Part 2	
b. PROJECT NO. ARPA Project Code No. 655		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) Technical Report No. 39	
c.			
d.			
10. DISTRIBUTION STATEMENT Distribution of this document is unlimited.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY ARPA - Information Processing Techniques, Washington, D.C.	
13. ABSTRACT The assembly procedure for the Parameter Switch, Mini Console, and LED Data Indicator is given here along with the parts lists and description of special tools required for proper assembly.			

DD FORM 1473

REPLACES DD FORM 1473, 1 JAN 64, WHICH IS
OBSOLETE FOR ARMY USE.UNCLASSIFIED
Security Classification

