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

Computer Systems Laboratory, Washington University
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
Technical Report No. 36

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

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

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
### GENERAL FACEPLATE SPECIFICATIONS

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

<table>
<thead>
<tr>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>0047</td>
<td>10-8-70</td>
<td></td>
<td>E</td>
<td>0249</td>
<td>1-24-72</td>
<td></td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0056</td>
<td>10-15-70</td>
<td></td>
<td>F</td>
<td>0256</td>
<td>2-22-72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0059</td>
<td>10-20-70</td>
<td></td>
<td>G</td>
<td>0277</td>
<td>12-7-72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0135</td>
<td>12-29-70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0235</td>
<td>12-13-71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MACROMODULAR SYSTEMS PROJECT

300.0-1
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).
<table>
<thead>
<tr>
<th>DOCUMENT</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>300.0</td>
<td>General Specifications</td>
</tr>
<tr>
<td>300.1</td>
<td>Single Height Shell</td>
</tr>
<tr>
<td>300.2</td>
<td>Double Height Shell</td>
</tr>
<tr>
<td>300.3</td>
<td>Triple Height Shell</td>
</tr>
<tr>
<td>300.4</td>
<td>Quadruple Height Shell</td>
</tr>
<tr>
<td>300.5</td>
<td>Faceplate Box Viscera Parts</td>
</tr>
<tr>
<td>300.6</td>
<td>V-Bus Subassembly</td>
</tr>
<tr>
<td>300.7</td>
<td>Code Switch Subassembly</td>
</tr>
</tbody>
</table>

- Other general sub-assemblies to be added as they are designed.

<table>
<thead>
<tr>
<th>DOCUMENT</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Type One Faceplate Box</td>
</tr>
<tr>
<td>302</td>
<td>Type Two Faceplate Box</td>
</tr>
<tr>
<td>303</td>
<td>Type Three Faceplate Box</td>
</tr>
<tr>
<td>304</td>
<td>Type Four Faceplate Box</td>
</tr>
<tr>
<td>305</td>
<td>Type Five Faceplate Box</td>
</tr>
</tbody>
</table>

- Other specific faceplate boxes to be added as they are designed.
### MANUFACTURERS AND PART NUMBERS

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

Resistor Allen Bradley Type BB

**ISSUE** 0047 10-8-70
B 0059 10-20-70
D 0235 12-13-71
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.
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.
Example:

```plaintext
>>> >>> >>> >>> >>> >>>
#
3A3
24D1 [Orange
#
4A3
23D1 [Red
#

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

This example directs the use of an orange-red twisted pair (see CAS-5). The orange wire connects pin 3 of connector A3 to pin 24 of connector D1. The red wire is similarly routed from 4A3 to 23D1. Two copper paths have been connected by one twisted pair.

Succeeding sections of this specification will describe the individual components to be interconnected.

IV. Wire Preparation

Two types of wire are used in the wiring subassembly. The first type is a single conductor #30 AWG Kynar insulated wirewrap wire (Brand Rex T-360). This wire will be crimped and soldered and is used in three colors: Red, Blue and Yellow.

The second type of wire is a twisted pair of two #30 AWG Polyethylene insulated wires which is used in 17 color
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.

   (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 piece 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
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.
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 ± .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 ± .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.
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.
<table>
<thead>
<tr>
<th>ISSUE</th>
<th>E.C.O.</th>
<th>0047</th>
<th>9207</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MACROMODULAR PROJECT**

**TITLE**

CONTACT INSERTION FIXTURE

<table>
<thead>
<tr>
<th>APPROVED</th>
<th>ENG</th>
<th>DRAWING NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCJ</td>
<td></td>
<td>300.0-16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BY</th>
<th>FOR</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>9207</td>
<td>PROD.</td>
<td>10-7-70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRAWN BY</th>
<th>CHECKED</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHO</td>
<td>9207</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-8-70</td>
</tr>
</tbody>
</table>
### 1-CELL FPB SHELL

#### Title Page

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

#### MACROMODULAR SYSTEMS PROJECT

<table>
<thead>
<tr>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>0055</td>
<td>10-23-70</td>
<td>RJA</td>
<td>E</td>
<td>0163</td>
<td>3-16-71</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0069</td>
<td>10-26-70</td>
<td>RJA</td>
<td>F</td>
<td>0236</td>
<td>12-11-71</td>
<td>TJK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0073</td>
<td>10-30-70</td>
<td>RJA</td>
<td>G</td>
<td>0239</td>
<td>12-21-71</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0084</td>
<td>11-18-70</td>
<td>RJA</td>
<td>H</td>
<td>0283</td>
<td>1-12-71</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0145</td>
<td>1-7-71</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 1-CELL FP8 SHELL

## PARTS LIST

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

### CHG. E.C.O. DATE APPR. | CHG. E.C.O. DATE APPR. | CHG. E.C.O. DATE APPR. |
---|---|---|
ISSUE | 0065 | 10-23-70 | RJA |
A | 0067 | 10-25-70 | RJA |

MACROMODULAR SYSTEMS PROJECT

300.1-2
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.
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.
DRILL NO. 41 CTRSNK. 82° x .187 FACE DIAM FOR 2-56 (2 HOLES)

DIMENSIONS: ± .005 U.O.N.
FINISH: CSL SPEC. MF1

MATERIAL: .160 ALUM. 2024-T351

BEND FORM FINGER
SECTION AA OPTION 1

MACHINE CUT FINGER
SECTION AA OPTION 2
O.030 ALUMINUM-3003 - H14
ALL DIMENSIONS ±.005 U.N.
FINISH: C5L SPEC MF1
1.500

.750

TAP 2-56

.125 STOCK

.250

.500 STOCK

BREAK EDGES

.020 X 45°

2 REQUIRED
MATERIAL: 6061-T6 ALUM
DIMENSIONS: ±.005 U.O.N.
TAP 2-56
2 PLCS

1.036
1.040
0.808
0.812

.307
.317

NO. 40 DRILL
2 HOLES

.370
.380

.0194
.0198

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

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST LOUIS, MISSOURI

MACROMODULAR PROJECT

PIVOT BRACKET

ISSUE 10-22-70 E.C.O. 0065 RJA

Drawn by:
WAC 300.1-10

Checked:
12-6-69
MAT'L: 0.040 S.S.- 304
BREAK THIS EDGE .020 MIN X 45°
BREAK .050 4 CORNERS

0.055 0.065

0.120 0.125

0.160 0.165

3.390 3.395

0.325 0.330

D: 1-8-71 E.C.O. 0145 RJA
ISSUE 10-22-70 E.C.O. 0065 RJA
CHANGE NO. DATE DESCRIPTION

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI
MACROMODULAR PROJECT

TITLE RAIL SLIDE

APPROVED ENG. DRAWN BY
BY FOR DATE

300.1-11

CHECKER DATE

12-6-69
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 1½ INACTIVE COILS)
LOAD = 1 POUND ± 10% AT .140 INCH
COMPRESSED LENGTH
(.028 MUSIC WIRE - APPROX.
4 ACTIVE COILS)

NOTE:
SPRING ENDS SHALL
BE SQUARED AND
GROUND.
(APPROX. 1/2 INACTIVE COILS)
BEND MINIMUM 5° AFTER ASSEMBLY OF OVERLAY CLIPS

CLIP REINFORCEMENT BARS

OVERLAY CLIPS

STRUT
BOX DIMENSIONS

MAT' L. TOLERANCES: ± 0.003 REF
## 2-CELL FPB SHELL

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

### MACROMODULAR SYSTEMS PROJECT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>-</td>
<td>1-24-72</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0260</td>
<td>4-4-72</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

300.2-1
## 2-CELL FPB SHELL
### PARTS LIST

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

### CHANGE HISTORY

<table>
<thead>
<tr>
<th>CHG.</th>
<th>ISSUE</th>
<th>DATE</th>
<th>APPR.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>–</td>
<td>1-24-72</td>
<td>RJA</td>
</tr>
<tr>
<td>A</td>
<td>0260</td>
<td>4-4-72</td>
<td>RJA</td>
</tr>
</tbody>
</table>

MACROMODULAR SYSTEMS PROJECT

300.2-2
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.
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.
DRILL NO. 41 CSINK 82° x 0.187
FACE DIA. 4 HOLES

BEFORE BEND

AFTER BEND

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

MATL: ALUM 2024-T351
FINISH: CSL SPEC MF
TOLERANCE U.D.N.

XXX ± 0.005
XX ± 0.010
X ± 0.01
X/64

ISSUE 1-20-72 RJA

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
TWO CELL EAR

CHANGE

DATE
DESCRIPTION

RJA

PROD 1-31-72

PLL

300.2-5

DEPT

DATE 12-21-71
DRILL NO. 4\textsuperscript{1} C\textsuperscript{1}BORE .156 X .100 DEEP
8 HOLES

MAT\textsuperscript{1}L .187 ALUM 6061-T6
FINISH: CSL SPEC MF 1

TOLERANCE U.O.N.
\begin{align*}
XXX & \pm .005 \\
x & \pm 0.10 \\
x & \pm \frac{1}{64}
\end{align*}
MAT'L: .030 ALUM 3003-H14

FINISH: CSL SPEC MF1

TOLERANCE U.O.N.

.XXX ± .005

.XX ± .010

\[ \frac{X \pm 1}{X 64} \]

1.546

.150

.030 STK

562
# Faceplate Box Viscera Parts

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

<table>
<thead>
<tr>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>0036</td>
<td>9-22-70</td>
<td>B</td>
<td>E</td>
<td>0255</td>
<td>2-8-72</td>
<td>C</td>
<td>J</td>
<td>0292</td>
<td>6-13-73</td>
<td>RJA</td>
</tr>
<tr>
<td>P</td>
<td>0052</td>
<td>10-1-70</td>
<td>F</td>
<td>F</td>
<td>0257</td>
<td>3-1-72</td>
<td>RJA</td>
<td>K</td>
<td>0300</td>
<td>11-7-73</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0059</td>
<td>10-20-70</td>
<td>G</td>
<td>G</td>
<td>0259</td>
<td>4-4-72</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0066</td>
<td>10-23-70</td>
<td>RJA</td>
<td>H</td>
<td>0280</td>
<td>1-8-73</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0229</td>
<td>11-1-71</td>
<td>RJA</td>
<td>I</td>
<td>0290</td>
<td>5-24-73</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MACROMODULAR SYSTEMS PROJECT
CONNECTOR BRACKET
0.062 S.S.-304

BREAK CORNERS

DRILL & TAP #3-48
3 PLCS.

0.245
0.250

0.395
0.405

0.583
0.587

0.901
0.905

1.024
1.028

0.123
0.127

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
FPB CONNECTOR BRACKET

ISSUE 9-23-70 P.C.O. 0036

CHANGE NO. DATE DESCRIPTION

APPROVED WAC DRAWN BY

ENG WC 300.5-2

DATE

9-14-70

PROD 9-23-70

CHECKED 9-14-70

DRW 9-23-70
FPB CONNECTOR BRACKET SCREW

DIM: ±.005
MATERIAL: SS

3-48 STND MACHINE SCREW THREAD
MATERIAL: ALUM 6062-T651
DIMENSIONS: ± .005
SCREW MACHINE STOCK
MATERIAL: .062 ALUM 2024-T3
DIMENSIONS: 2005 U.G.N
FINISH: CSL SPEC MF 1

BREAK LONG EDGES & Corners .020
TOLERANCE U.O.N.

| XXX | +-.005 |
| XX  | +.01   |
| X   | +.064  |

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

CENTER LINES OF ALL #50 HOLES PAIRS COINCIDENT 000 T.I.R. AND #30° DRILL #43
10 PLC'S

DRILL #43
10 PLC'S

DRILL #43
2 PLC'S

DRILL 5/16

.31
.231 TYP

.188 TYP

.31

2.000

4.5/2

.140

.650

1.325

.230

90°±.30°
MATERIAL: 187 ALUMINUM 6061-T6
DIMENSIONS: ± .005 U.O.N.
FINISH: CSL SPEC. MF 1

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULE PROJECT

TYPE 1 FACEPLATE

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

REAM .275 D ± .001
CTRBR. 3.323 x .30
CTRSHK 0.62 FROM
BOTTOM OF CTRBORE
4 HOLES

REMARK .275 D ± .001

DIA .3430

3 HOLE S

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

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULE PROJECT

TITLE

TYPE 1 FACEPLATE

DRAWN

DESIGNER

CHECKED

DRAWING NO.
MAT'L: 6061-T6
DIM: 2.005 UNI.
FINISH: CSL SPEC MF 1

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TYPE 3 FACEPLATE
MAT'L: .187 ALUM 6061-T6
DIM: ± .005 U.G.N.
FINISH: CSL SPEC MF 1

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
TYPE 4 FACEPLATE

ISSUE 9-23-70
ECQ 0036

CHANGE NO
DESCRIPTION

DATE

APPROVED
PROB.
WAC

REVISE NO
DATE

300.5-10
7-9-70
MATERIAL: .125 2326 BLUE, TRANSLUCENT PLEXIGLASS
TOLERANCES: ± 0.005 U.O.N.
TAP 2-56

.06

.125 STK

BREAK ALL EDGES

.19

.125

.250 STK

DRILL #52

.50

TOLERANCE U.O.N.

.XXX ± .005

.XX ± .01

\[ \frac{X}{X} ± \frac{1}{64} \]

MAT' L: 6061-T6 ALUM

FINISH: ALODINE

REQ'D: 5 FOR TYPE 1 FPB

3 FOR TYPE 2 FPB
CHAM. .010 MIN. x 45°
BOTH ENDS

.062 DIA. STK

1.57

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

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

F 3-2-72 E.C.O. 0257 RJA

CHANGE NO. DATE DESCRIPTION

APPROVED
RJA

ENG
RJA

DRAWING NO.
300.5-17

FOR DATE
PROD 3-2-72

DRAWN BY
PLL

CHECKED DATE
2-16-72
MAT'#: .187 ALUM 6061-T6
DIMENSIONS: ±.005 U.O.N.
FINISH: CSL SPEC MF-1

DRILL NO. 4.1 & C'BORE .1560 x .100 DEEP
4 HOLES

TAP 8-32

4.750
MATERIAL: ALUMINUM BAR STOCK 2024-T3
FINISH: ANODIZE
BREAK ALL EDGES .010 min

TAP 2-56 x ¾" DEEP
TAP 2-56 THRU
TAP 4-40 x ¼" DEEP

TOLERANCES U.O.N.

MACROMODULAR PROJECT

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

CONNECTOR STRUT - TYPE 1

CHANGE
NO.
DATE
DESCRIPTION

1 62573 ECO 290 RJA

APPROVED
ENGG.
DRAWING NO.

RJA
5-25-73

PCD
5-31-73
MAC
300.5-19
RJA
5-25-73
MATERIAL: ALUMINUM BAR STOCK 2024-T3
FINISH: ANODIZE
BREAK ALL EDGES .010 min

TOLERANCES U.O.N.

MATERIALS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
CONNECTOR, STRUT - TYPE 2

ENGR.
RJA

DRAWN BY
MAC
3005-20

CHECKED
RJA
5-25-73

BY
RJA
PROD
5-31-73

DATE
5-25-73

CHANGE
5-25-73

NO.
ECO 290

DATE
RJA

DESCRIPTION
DRILL .096 2 HOLES

1.575 1.775

1.125 .125

.500

.100

MATERIAL: .030 ALUMINUM 3003 H14
FINISH: ANODIZE

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

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT
TITLE
STRUT COVER

<table>
<thead>
<tr>
<th>CHANGE NO.</th>
<th>DATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5-24-73</td>
<td>ECO 290 RJA</td>
</tr>
</tbody>
</table>

RJA
ECO 290
RJA
5-24-73
I

RJA
PROD  5-31-73
DRAWN BY
MAC
300.5-21

RJA
CHECKED
5-24-73
PRESS FIT AND CENTER

1/16" CADMIUM PLATED
ROLL PIN 3/8" LONG

.300

.075

45°

.187 D ± .005

BREAK EDGE
BOTH ENDS

.600

MATERIAL: STAINLESS STEEL .187 Dia.

TOLERANCES
± .010 U.O.N.

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
INTERLOCK PIN

<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5-25-73</td>
<td>ECO 290 RJA</td>
</tr>
</tbody>
</table>

APPROVED
RJA

ENG
RJA

DRAWING NO.
300.5-22

RJA PROD 5-31-73
DRAWN BY
MAC

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.
HOLE SIZES:

HOLES MARKED WITH A "W" USE A NO. 72 DRILL (24 HOLES)
HOLES MARKED WITH A "X" USE A NO. 80 DRILL (4 HOLES)
HOLES MARKED WITH A "Y" USE A NO. 55 DRILL (12 HOLES)
HOLES MARKED WITH A "Z" USE A NO. 42 DRILL (4 HOLES)
MATERIAL: 1/16 PC STOCK (SINGLE SIDED)

DRILL #42 4 HOLES

K

11-7-73

ECO 0300

RJA

ISSUE

6-13-73

ECO 0292

RJA

COMPUTER SYSTEMS LABORATORY

WASHINGTON UNIVERSITY

ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TYPE 9 P.C. BOARD ROUTING OUTLINE

PROD

6-13-73

RJA

MAC

300.5-28

3-15-73
### V-BUS SUBASSEMBLY

<table>
<thead>
<tr>
<th>PAGE</th>
<th>TITLE</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>300.6-1</td>
<td>TITLE PAGE</td>
<td>ISSUE</td>
</tr>
<tr>
<td>300.6-2</td>
<td>V-BUS SUBASSEMBLY - ASSEMBLY SPECIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>300.6-3</td>
<td>V-BUS SUBASSEMBLY AND PARTS LIST</td>
<td></td>
</tr>
<tr>
<td>300.6-4</td>
<td>VERTICAL BUS BOARD ARTWORK AND BLANKING DIMENSIONS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE</td>
<td>0046</td>
<td>10-7-70</td>
<td></td>
</tr>
</tbody>
</table>

MACROMODULAR SYSTEMS PROJECT
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.
VERTICAL BUS BOARD

FPB CONNECTOR BRACKET

FPB CONNECTOR BRACKET SCREW

V-BUS CONNECTOR

PARTS LIST

<table>
<thead>
<tr>
<th>QTY</th>
<th>C.S.L. DOC.</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300.6-4</td>
<td>VERTICAL BUS BOARD</td>
</tr>
<tr>
<td>2</td>
<td>300.6</td>
<td>V-BUS CONNECTOR</td>
</tr>
<tr>
<td>2</td>
<td>300.6-5</td>
<td>FPB CONNECTOR BRACKET</td>
</tr>
<tr>
<td>4</td>
<td>300.6-5.1</td>
<td>FPB CONNECTOR BRACKET SCREW</td>
</tr>
</tbody>
</table>

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT
<table>
<thead>
<tr>
<th>PAGE</th>
<th>TITLE</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>300.7-1</td>
<td>TITLE PAGE</td>
<td>B</td>
</tr>
<tr>
<td>300.7-2</td>
<td>FUNCTION CODE SWITCH SUBASSEMBLIES - ASSEMBLY PROCEDURES</td>
<td>A</td>
</tr>
<tr>
<td>300.7-3</td>
<td>TYPE 1 FUNCTION CODE SWITCH SUBASSEMBLY</td>
<td></td>
</tr>
<tr>
<td>300.7-4</td>
<td>TYPE 2 FUNCTION CODE SWITCH SUBASSEMBLY</td>
<td></td>
</tr>
<tr>
<td>300.7-5</td>
<td>TYPE 3 FUNCTION CODE SWITCH SUBASSEMBLY</td>
<td>B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
<th>CHG.</th>
<th>E.C.O.</th>
<th>DATE</th>
<th>APPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>re-ise</td>
<td>0229</td>
<td>11-11-71</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0247</td>
<td>1-13-72</td>
<td>RJA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0292</td>
<td>6-13-73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MACROMODULAR SYSTEMS PROJECT

300.7-1
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 ± 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.
NOTE ORIENTATION

**FUNCTION CODE SWITCH BRACKET**

**TERMINAL 152**

**SENSE PIN**

**TRIP BLOCK**

**SENSE PIN SPRING**

---

### PARTS LIST

<table>
<thead>
<tr>
<th>QTY</th>
<th>CSL DOC.</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300.5-6</td>
<td>FUNCTION CODE SWITCH BRACKET</td>
</tr>
<tr>
<td>5</td>
<td>—</td>
<td>MICRO SWITCH NO. 3Sx1-T</td>
</tr>
<tr>
<td>5</td>
<td>—</td>
<td>SENSE PIN SPRING .120 OD, .016 WIRE DIA, ½ in. FREE LENGTH, 8½ POUNDS PER INCH</td>
</tr>
<tr>
<td>5</td>
<td>300.5-13</td>
<td>TRIP BLOCK</td>
</tr>
<tr>
<td>5</td>
<td>300.5-14</td>
<td>SENSE PIN</td>
</tr>
<tr>
<td>5</td>
<td>—</td>
<td>2-56 x 1/16 LG CUP POINT SOCKET HEAD SET SCREW CADMIUM PLATED</td>
</tr>
<tr>
<td>10</td>
<td>—</td>
<td>.086 BODY DIA x 9/32 LG SHALLOW OVAL HEAD NICKEL PLATED STEEL SEMI-TUBULAR RIVETS</td>
</tr>
</tbody>
</table>

---

**COMPUTER SYSTEMS LABORATORY**

WASHINGTON UNIVERSITY

ST. LOUIS, MISSOURI

**MACROMODULAR PROJECT**

**TITLE**

TYPE 1 FUNCTION CODE SWITCH SUBASSEMBLY

<table>
<thead>
<tr>
<th>APPROVED</th>
<th>ENQ</th>
<th>DRAWING NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BY</td>
<td>FOR</td>
<td>DATE</td>
</tr>
<tr>
<td>300.7-3</td>
<td>RJA</td>
<td></td>
</tr>
<tr>
<td>PROD. 11-2-71</td>
<td>RJA</td>
<td>300.7-3</td>
</tr>
</tbody>
</table>

**CHANGE NO.**

<table>
<thead>
<tr>
<th>DATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-13-72</td>
<td>E.C.O. 0247</td>
</tr>
<tr>
<td>11-11-71</td>
<td>E.C.O. 0229</td>
</tr>
<tr>
<td>11-11-71</td>
<td>RJA</td>
</tr>
</tbody>
</table>

**CHANGE DATE**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-11-71</td>
</tr>
</tbody>
</table>
NOTE ORIENTATION

FUNCTIONAL CODE SWITCH BRACKET

9/32 ± 1/64

TERMINAL 352

SENSE PIN

SENSE PIN SPRING

TRIP BLOCK

PARTS LIST

<table>
<thead>
<tr>
<th>QTY</th>
<th>CSL DOC.</th>
<th>PARTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300.5-6</td>
<td>FUNCTION CODE SWITCH BRACKET</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>MICRO SWITCH NO. 35X1-T</td>
</tr>
</tbody>
</table>
| 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 |

COMPUTER SYSTEMS LABORATORY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI

MACROMODULAR PROJECT

TITLE
TYPE 2 FUNCTION CODE SWITCH SUBASSEMBLY

APPROVED
BY
RJA

ENG
300.7-4

DRAWING NO.

CHECKED
PROD.
DATE
11-12-71
11-11-71
### PARTS LIST

<table>
<thead>
<tr>
<th>QTY.</th>
<th>CSL DOC.</th>
<th>PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300.5-6</td>
<td>Function Code Switch Bracket</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Micro Switch No. 3SX1-T</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Sense Pin Spring .120 OD, .016 wire dia. ½ in. free length, 8½ lbs. per inch.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>300.5-13</td>
<td>Trip Block</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>300.5-14</td>
<td>Sense Pin</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>2-56 x 1/16 lg Cup Point Socket Head Set Screw Cadmium Plated</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>.086 Body Dia. x 9/32 lg Shallow Oval Head Nickel Plated Steel Semi-tubular Rivets.</td>
<td></td>
</tr>
</tbody>
</table>
**FACEPLATE SPECIFICATIONS**

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.
<table>
<thead>
<tr>
<th>KEY WORDS</th>
<th>LINK A</th>
<th>LINK B</th>
<th>LINK C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macromodule Faceplate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macromodule Code Switch</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>