
# VPI® II

# Vital Processor Interlocking Control System

# Chassis Configuration



Chassis Configuration Manual
**P2511B, Volume 2**


# VPI® II

# Vital Processor Interlocking Control System

# Chassis Configuration



Chassis Configuration Manual
**Alstom Signaling Inc.**

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| i thru vi | May/11 |
| 1-1 thru 1-14 | May/11 |
| 2-1 thru 2-4 | May/11 |
| 3-1 thru 3-64 | May/11 |
| 4-1 thru 4-8 | May/11 |

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# PREFACE

## NOTICE OF CONFIDENTIAL INFORMATION



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## ABOUT THE MANUAL

This manual is intended to describe the Alstom Vital Processor Interlocking Control System, (VPI® II) chassis configuration, including part numbers and chassis illustrations. This manual is part of a 5 volume set of manuals. The set is summarized in Section 1.

The information in this manual is arranged into sections. The title and a brief description of each section follow:

**Section 1 – VPI II CHASSIS:** This section provides an overview of VPI II system chassis related options including part numbers and a brief explanation of their application.

**Section 2 – CIRCUIT BOARD KEYING:** This section provides the keying information for the VPI II circuit boards.

**Section 3 – MODULES AND CABLES:** This section provides examples of VPI II hardware, associated equipment, and connector plugs.

**Section 4 – SPECIAL TOOLS:** This section shows the special tools used for the VPI II chassis.

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## MANUAL SPECIAL NOTATIONS

In the Alstom manuals, there are three methods used to convey special informational notations to the reader. These notations are warnings, cautions, and notes. Both warnings and cautions are readily noticeable by boldface type two lines beneath the caption.

Warning

A warning is the most important notation to heed. A warning is used to tell the reader that special attention needs to be paid to the message because if the instructions or advice is not followed when working on the equipment then the result could be either serious harm or death. The sudden, unexpected operation of a switch machine, for example, or the technician contacting the third rail could lead to personal injury or death. An example of a typical warning notice follows:

**WARNING**

DISCONNECT MOTOR ENERGY WHENEVER WORKING ON SWITCH LAYOUT OR SWITCH MACHINE. UNEXPECTED OPERATION OF MACHINE COULD CAUSE INJURY FROM OPEN GEARS, ELECTRICAL SHOCK, OR MOVING SWITCH POINTS.

Caution

A caution statement is used when an operating or maintenance procedure, practice, condition, or statement, which if not strictly adhered to, could result in damage to or destruction of equipment. A typical caution found in a manual is as follows:

**CAUTION**

Turn power off before attempting to remove or insert circuit boards into a module. Boards can be damaged if power is not turned off.

Note

A note is normally used to provide minor additional information to the reader to explain the reason for a given step in a test procedure or to just provide a background detail. An example of the use of a note follows:

**NOTE**

A capacitor may be mounted on the circuit board with a RTV adhesive. Use the same color RTV.

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## TABLE OF CONTENTS

**Topic** **Page**

## TABLE OF CONTENTS (CONT.)

**Topic** **Page**

## LIST OF FIGURES

**Description** **Page**

## LIST OF FIGURES (CONT.)

**Description** **Page**

## LIST OF TABLES

**Description** **Page**

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# 1. SECTION 1 – VPI II CHASSIS

## 1.1. INTRODUCTION

This manual provides an overview of chassis related options including part numbers and a brief explanation of their application. Be aware that the chassis configurations provided are examples only, refer to the book of plans for your location to determine the components used in your configuration. Note that all part numbers are Alstom numbers unless otherwise noted.

See P2511B, Volume 1 for capacity overview and hardware criteria.

## 1.2. GENERAL

This section provides an overview of VPI II system chassis related options including part numbers and a brief explanation of their application.

## 1.3. MANUAL SET ORGANIZATION

This manual is part of a 5 volume set supporting the VPI II system. The set is organized as follows:

- Volume 1, Installation, Operation, and Theory Manual includes general overview of the field installation and setup of the VPI II system; including capacity guidelines and allowable VSC/CSEX board combinations, system operation, and theory of operation.
- Volume 2, Chassis Configuration, is this document. It describes the chassis configuration including cables and power supplies.
- Volume 3, Vital Subsystem, includes the Vital subsystem board drawings, signature headers and proms, and board reference data.
- Volume 4, Non-Vital Subsystem, includes non-vital subsystem board drawings and board reference data.
- Volume 5, Maintenance and Troubleshooting, describes system maintenance and troubleshooting, including discussion of diagnostics and references for the applicable software and hardware manuals.

## 1.4. PLUG COUPLED CHASSIS

The VPI II plug coupled chassis includes internal cable harness assemblies. These assemblies connect the VPI II PCB I/O point(s) to a series of AMP type M-series plug couplers, mounted on the rear panel of the chassis. The rear panel also contains a 14-pin type M-series plug coupler for the 5 VDC power connection and provisions for up to four 60-way ribbon cable connectors for connecting to expansion chassis.

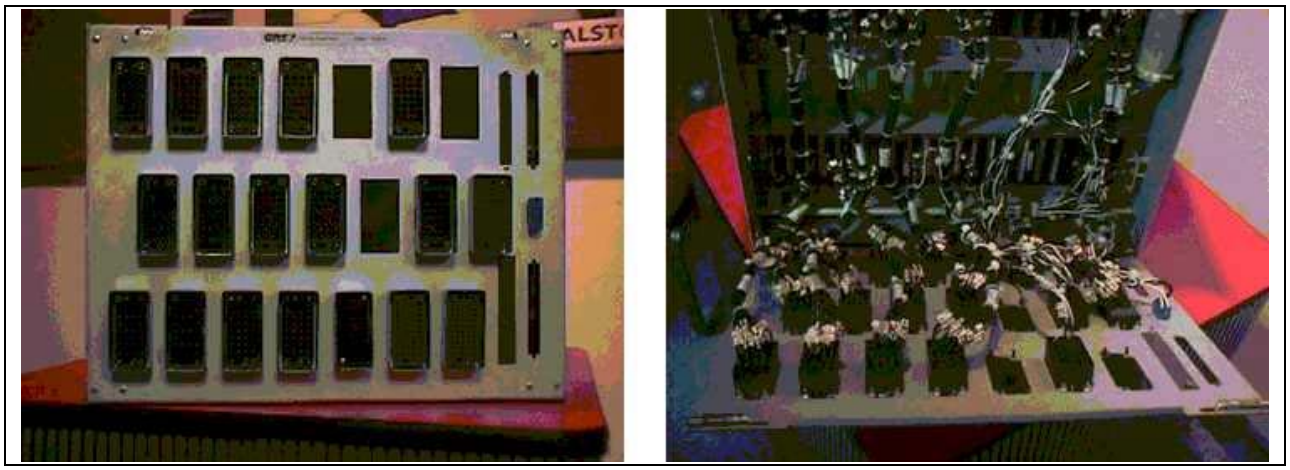


Figure 1–1. Plug Coupled Chassis

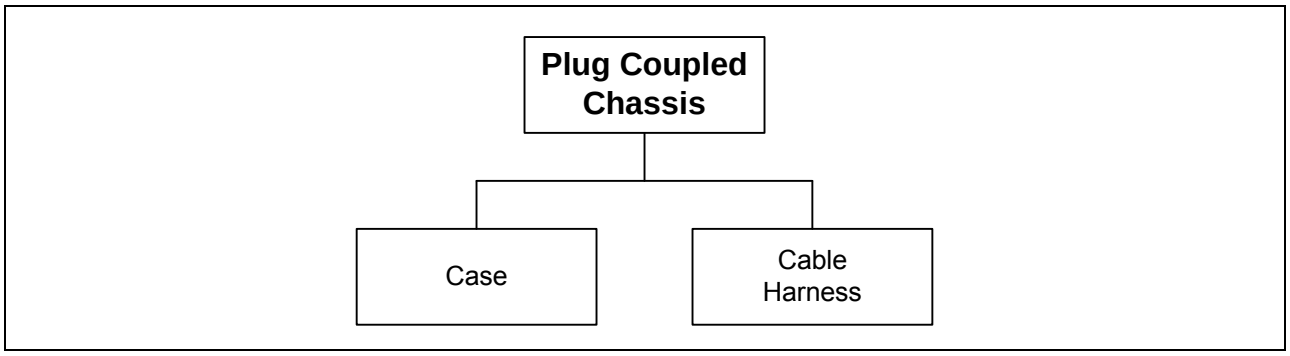



Figure 1–2. Plug Coupled Chassis Components

### 1.4.1. Case

The VPI II plug coupled chassis is available in two basic case configurations. One to four chassis can be used to complete a single system. The system may be a mixture of the two types of chassis. The two basic types are the split motherboard and the continuous motherboard that busses the center connector (P2) of the printed circuit boards together. Each chassis contains 21 printed circuit board slots.

The split motherboard version of the chassis is configured to connect the P2 connector traces from chassis slots one through five together and slots 6 through 21 together. Since the VPI II system uses the P2 connector as the I/O bus, this allows Vital and non-vital I/O to be housed in the same chassis. For example, the first five chassis slots could be used to house non-vital I/O and the non-vital processor. Slots from 6 to 21 could contain Vital I/O along with the Vital I/O controller (I/O bus).

**NOTE**

Other system boards may also be required to configure a proper operating system and several other arrangements could be possible.

**NOTE**

A VPI II System performing non-vital functions can be configured with either a Code System Emulator Extended 3 or 4 (CSEX3 or CSEX4) non vital processor board. This manual uses the generic term CSEX unless a function is specific to CSEX3 or CSEX4. See P2511B, Volume 4 for discussions of the two boards.

The continuous motherboard version of the plug coupled module connects all the slots (1 –21) of the P2 connector together. This requires that all the I/O housed in the module be either Vital or non-vital. In addition, a CSEX board can be housed in this module with Vital I/O as long as no non-vital I/O is also housed in the module.

An extra deep, plug coupled chassis is offered to provide more space for internal cables such as the 38216-497-XX cable assemblies. For those systems with large numbers of I/O’s this makes access to the back of the motherboard and 5 VDC power filter easier.

Table 1–1. Plug Coupled Chassis Part Numbers

| Description | Part Number |
|---|---|
| Plug coupled chassis with split motherboard (5/16 slots), 5 VDC power filter and 38216-404 Bus Extension Cable | 31506-015-01 |
| Plug coupled chassis with continuous motherboard (21 slots), 5 VDC power filter and 38216-404 Bus Extension Cable | 31506-015-11 |
| Extra deep plug coupled chassis with rear cover, split motherboard, and 5 VDC power filter | 31506-015-15 |
| Extra deep plug coupled chassis with rear cover, continuous motherboard, and 5 VDC power filter | 31506-015-16 |

### 1.4.2. Cables

The chassis require specific cable assemblies based on the PCB configuration. Up to four 60-way ribbon cables, located on the rear panel, are required for the main system bus, see Table 1–4. These cables connect the main system boards together. The number of positions or slots required for this cable is dependant upon the number of main boards being installed. The boards connected by this main bus are CSEX, VRD, CPU II, IOB and VSC. The VRD board takes 2 slots.

Cable harnesses are also required to connect the PCB edge connectors to the plug couplers on the rear cover of the chassis. There are 21 available plug coupler locations on the rear panel. Blank plates are used to cover the unused locations. There are several variations of output and input cables to provide a variety of arrangements of plug couplers and board configurations.

To connect up to four VPI II systems, bus extension and module cables are used. See Figure 1–3 for an example arrangement. In this example P/N 38216-404-xx cable is used in the system module connected off the top connector of the I/O bus board to "extend" the system bus to the other modules. The same series cable is used in each extension module to create the system busses. An I/O bus, CSEX, or VSC board can be installed in any one of the extension modules to continue the extension. The 4-foot cables (P/N 38216-403-01in the example) are used to connect between the modules. The 38216-395-xx is only used in the system module for the system bus. A 31166-201-07 System Bus board could be used instead and supports 7-slots.

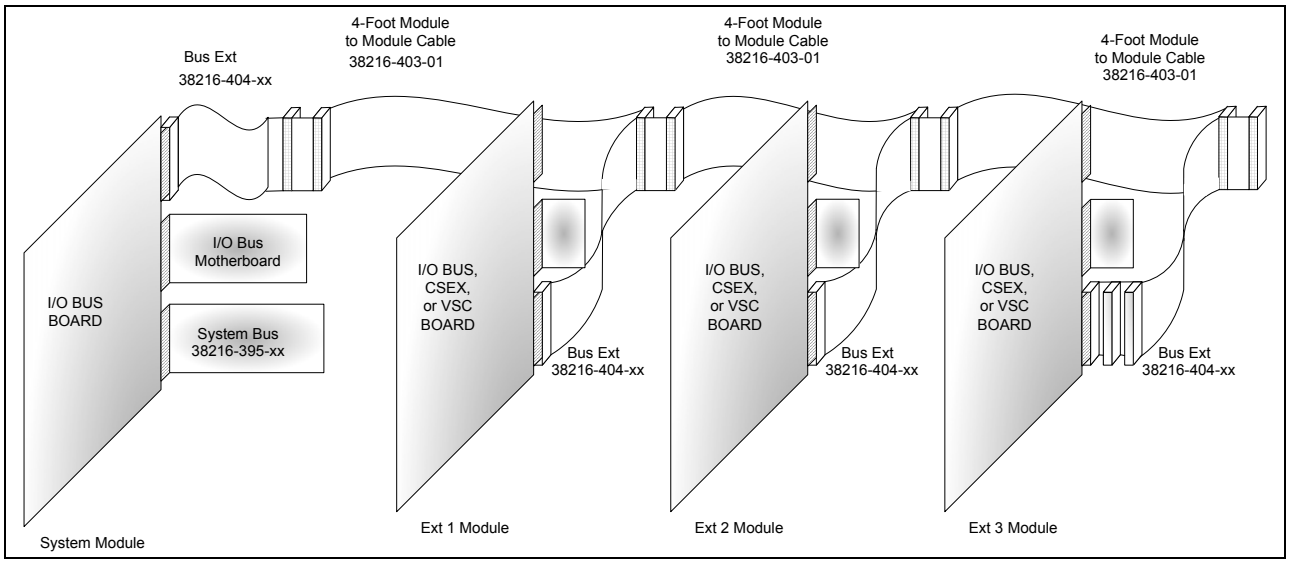



Figure 1–3. Example Expanded System

## 1.5. DIRECT WIRED CHASSIS

The direct wired chassis is configured to allow the I/O wiring to be economical by directly inserting wire into the PCB edge connectors in the chassis. This chassis configuration does not allow for quick removal of the chassis from a wired rack. However, all the PCBs can be removed and no active electronic components are left in the chassis. This version is intended for applications where the rack housing this chassis provides a plug-coupled connection to the other interlocking equipment.

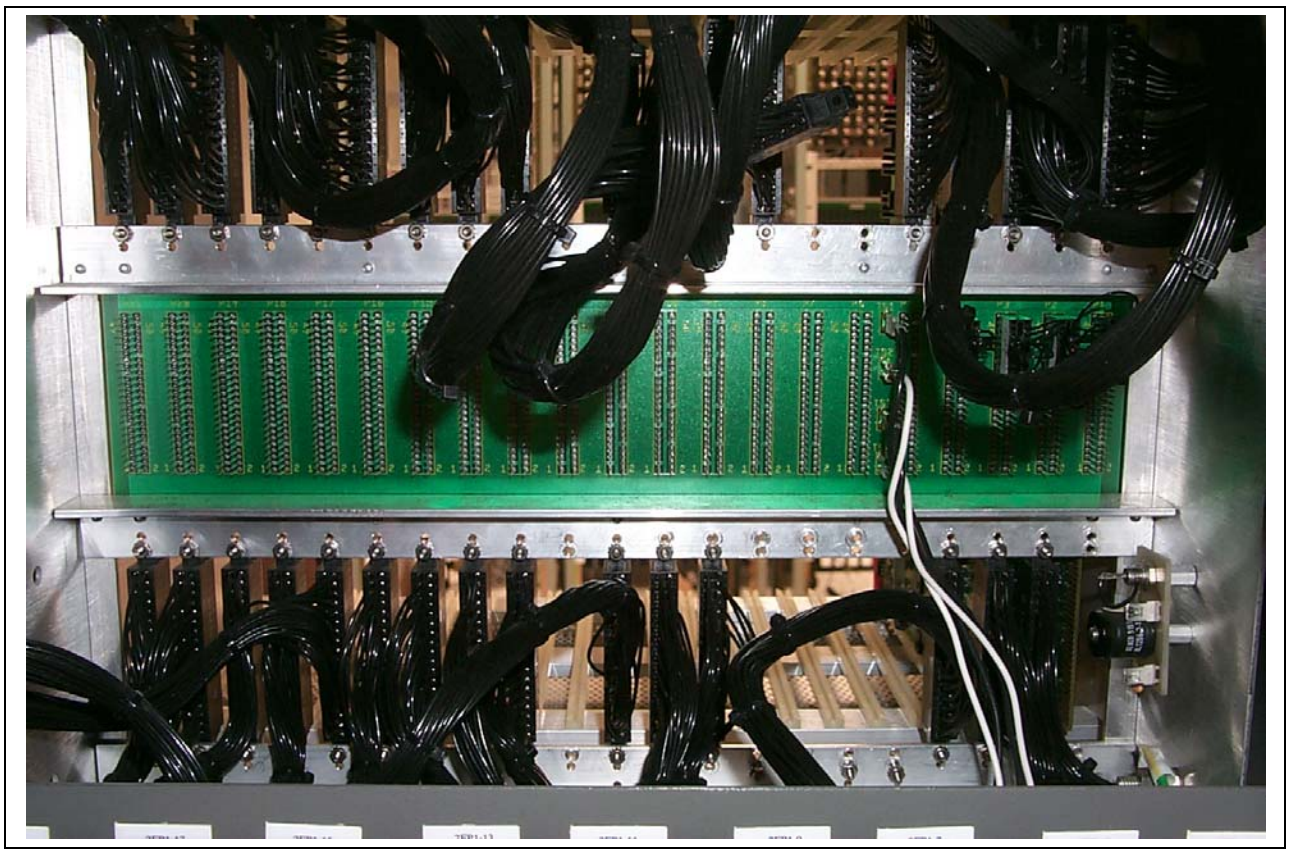


Figure 1–4. Direct Wired Chassis

### 1.5.1. Case

The VPI II direct wired chassis is available in two basic case configurations. One to four chassis can be used to complete a single system. The system may be a mixture of the two types of chassis. The two basic types are the split motherboard and the continuous motherboard that busses the center connector (P2) of the printed circuit boards together. All chassis contain 21 printed circuit board slots.

The split motherboard version of the chassis is configured to connect the P2 connector traces from chassis slots one through five together and slots 6 through 21 together. Since the VPI II system uses the P2 connector as the I/O bus, this allows Vital and non-vital I/O to be housed in the same chassis. For example, the first five chassis slots could be used to house non-vital I/O and the non-vital processor. Slots from 6 to 21 could contain Vital I/O along with the Vital I/O controller (I/O bus).

**NOTE**

Other system boards may also be required to configure a proper operating system and several other arrangements could be possible.

This chassis can also be supplied with an optional rear panel. This panel is used to provide connection points for diagnostic equipment connections; chassis to chassis ribbon cable connections and power supply connections.

The continuous motherboard version of the direct wired module connects all the slots (1 –21) of the P2 connector together. This requires that all the I/O housed in the module be either Vital or non-vital. In addition, a CSEX board can be housed in this module with Vital I/O as long as no non-vital I/O is also housed in the module.

Table 1–2. Direct Wired Chassis Part Numbers

| Description | Part Number |
|---|---|
| Direct wired chassis with rear panel, split motherboard, and 5 VDC power filter<br>Note: use with 38216-404-KN bus ext. cables | 31506-015-02 |
| Direct wired chassis with split motherboard, 5 VDC power filter, NO rear panel or rear cover | 31506-015-03 |
| Direct wired chassis with rear panel, continuous motherboard, and 5 VDC power filter | 31506-015-12 |
| Direct wired chassis with continuous motherboard, 5 VDC power filter, NO rear panel or rear cover | 31506-015-13 |
| Direct wired chassis with rear panel, split motherboard, and 5 VDC power filter<br>Note: use with 38216-504-KN bus exp. cables | 31506-015-14 |
| Direct wired deep chassis with rear panel, split motherboard, and 5 VDC power filter | 31506-015-15 |
| Direct wired deep chassis with rear panel, continuous motherboard, and 5 VDC power filter | 31506-015-16 |

### 1.5.2. Cables

The chassis require specific cable assemblies based on the PCB configuration. Up to four 60-way ribbon cables, located on the rear panel, are required for the main system bus, see Table 1–4. These cables connect the main system boards together. The number of positions or slots required for this cable is dependant upon the number of main boards being installed. The boards connected by this main bus are CSEX, VRD, CPU II, IOB and VSC. The VRD board takes 2 slots.

## 1.6. COVERS

The VPI II chassis can be supplied with optional covers. The front cover is a hinged aluminum cover on which the PCB label is generally mounted. The chassis can also be supplied with either a top or bottom screen or both. This screen is generally used to prevent items from falling into the PCB area of the equipment.

Table 1–3. Interface PCB Cover Part Numbers

| Description | Part Number |
|---|---|
| Front Cover | 58605-043-02 |
| Top/Bottom Screen Cover | 50253-354-00 |

## 1.7. INTERCONNECTIONS

### 1.7.1. P1 Interconnections

P1 interconnection is the System Bus (connects CPU II, VRD, VSC, IOB, CSEX).

Table 1–4. Ribbon Cables for System Bus P1 Interconnections

| Part Number | Description |
|---|---|
| 38216-395-01 | 6 slot |
| 38216-395-02 | 5 slot |
| 38216-395-03 | 2 slot (2 inch) |
| 38216-395-04 | 2 slot (18 inch) |
| 38216-395-05 | 7 slot |
| 38216-395-06 | 8 slot |
| 38216-395-07 | 9 slot |
| 38216-395-08 | 10 slot |
| 38216-395-09 | 11 slot |
| 38216-395-10 | 12 slot |

System Bus PC Board (P/N 31166-201-07) duplicates the functionality of ribbon cable P/N 58216-395-01.

### 1.7.2. P2 Interconnection

Split motherboard P/N 59473-743-01 has a bus split between slots 5 and 6. It is used with a mixed chassis containing a combination of Vital and non-vital boards or a chassis containing two subsystems of non-vital boards.

**NOTE**

Do not use Motherboard Jumper Cable P/N 38216-402-01 to create a backplane for all Vital and all non-vital chassis; use the continuous motherboard (P/N 31166-166-01).

Continuous backplane P/N 31166-166-01 has no bus split. It is used with either an all Vital I/O chassis or an all non-vital I/O chassis

### 1.7.3. P3 Interconnection

The main chassis P3 interconnection via ribbon cables is used for interfacing between the main chassis (I/O Bus board only) and expansion chassis. A system can consist of multiple chassis by expanding the system bus from the main chassis to the expansion chassis.

Table 1–5. Ribbon Cables

| Main Chassis Connector | Exp Mod Edge Connector | Part Number |
|---|---|---|
| 1 Connector | 1 Connector | 38216-404-01 |
| 1 Connector | 2 Connector | 38216-404-02 |
| 2 Connector | 1 Connector | 38216-404-03 |
| 2 Connector | 2 Connector | 38216-404-04 |
| 2 Connector | 3 Connector | 38216-404-05 |
| 1 Connector | 3 Connector | 38216-404-06 |
| 2 Connector | 6 Connector | 38216-404-07 |
| 1 Connector | 6 Connector | 38216-404-08 |

## 1.8. CABLE AND BACK PLANE CONNECTORS

Cable P/N 38216-392-00 is the cable that runs from board edge to rear plug couplers (Amp type ‘M’).

Table 1–6. Cable Complete, P/N 38216-392

| Board | Board Edge Connector (Qty) Description | Back Plane Connector (Qty) Description | Coupler Row | Part Number |
|---|---|---|---|---|
| Vital Relay Driver | (1) 36-pin Board Edge | (1) 28-way Plug Coupler | Bottom | 38216-392-01 |
| CSEX,VSC | (1) 36-pin Board Edge | (1) 50-way Plug Coupler | Top | 38216-392-02 |
| Vital Relay Driver | (1) 36-pin Board Edge | (1) 28-way Plug Coupler | Middle | 38216-392-03 |
| CSEX, VSC | (1) 36-pin Board Edge | (1) 50-way Plug Coupler | Middle | 38216-392-04 |
| Vital Relay Driver | (1) 36-pin Board Edge | (1) 28-way Plug Coupler | Top | 38216-392-05 |
| CSEX, VSC | (1) 36-pin Board Edge | (1) 50-way Plug Coupler | Bottom | 38216-392-06 |
| CRG | (1) 20-pin Board Edge | (1) 28-way Plug Coupler | Bottom | 38216-536-01 |
| CRG | (1) 20-pin Board Edge | (1) 28-way Plug Coupler | Middle | 38216-536-02 |
| CRG | (1) 20-pin Board Edge | (1) 28-way Plug Coupler | Top | 38216-536-03 |

**NOTE**

38216-392-01, -03, -05 are 4-conductor cables; 38216-392-02, -04, -06 are 36-conductor cables.

Table 1–7. Cable Complete, P/N 38216-393

| Board | Board Edge Connector (Qty) Description | Back Plane Connector (Qty) Description | Part Number |
|---|---|---|---|
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 50-pin Plug Coupler, 10.5" | 38216-393-01 |
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 50-pin Plug Coupler, 6.875" | 38216-393-02 |
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 50-pin Plug Coupler, 2.5" | 38216-393-03 |

Table 1–8. Cable Complete, P/N 38216-394

| Board | Board Edge Connector (Qty) Description | Back Plane Connector (Qty) Description | Part Number |
|---|---|---|---|
| Vital Output | (2 × 3) 36-pin Board Edge | (3) 28-way Plug Coupler | 38216-394-01 |
| Vital Input | (2 × 2) 36-pin Board Edge | (3) 28-way Plug Coupler | 38216-394-02 |
| Vital Output | (2 × 2) 36-pin Board Edge | (3) 28-way Plug Coupler | 38216-394-03 |

Table 1–9. Cable Complete, P/N 38216-497

| Board | Board Edge Connector (Qty) Description | Back Plane Connector (Qty) Description | Coupler Row | Part Number |
|---|---|---|---|---|
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 75-way Plug Coupler | Bottom | 38216-497-01 |
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 75-way Plug Coupler | Middle | 38216-497-02 |
| Non-Vital I/O | (2) 36-pin Board Edge | (1) 75-way Plug Coupler | Top | 38216-497-03 |

Table 1–10. Plug Coupler Mating Connectors (AMP Type 'M')

| Mating Connector | Part Number | AMP # |
|---|---|---|
| 28-way Plug Coupling | 58920-124-00 | 205689-2 |
| 50-way Plug Coupling | 58920-112-00 | 203622-2 |
| 75-way Plug Coupling | 58920-116-00 | 201331-1 |

**NOTE**

When any of these connectors are used with Cable Assemblies 38216-392-01, -03, -05, only four pins should be placed in the mating connector (do not insert extra pins). This is necessary to maintain Vital spacing.

## 1.9. POWER SUPPLY

The complete power supply assembly comes on a 'B2' mounting plate. Various Melcher DC-DC converters are used, depending on the power requirements.

Table 1–11. Melcher DC-DC Converters

| Power Supply | Input Voltage | Output Voltage/Current | Part Number |
|---|---|---|---|
| (1) Single IN/Single OUT | 8-35 VDC | 5.1 VDC/8A | 42560-273-01 |
| (2) Single IN/Single OUT | 8-35 VDC each | 5.1 VDC/8A | 42560-273-02 |
| (1) Single IN/Single OUT | 20-100 VDC | 5.1 VDC/25A | 42560-273-03 |
| (1) Single IN/Dual OUT | 8-35 VDC | 15 VDC/1.7A, 15 VDC/1.7A | 42560-273-04 |
| (2) Single IN/Single OUT | 8-35 VDC each | 12 VDC/4A | 42560-273-05 |
| (1) Single IN/Single OUT | 8-35 VDC | 12 VDC/4A | 42560-273-06 |
| (1) Single IN/Dual OUT | 8-30 VDC | 12VDC/4A, 5VDC/8A | 42560-273-07 |
| Single IN/Single OUT | 7-30 VDC | 5VDC/8A | 42560-273-08 |
| Single IN/Dual OUT | 8-30 VDC | 5.1VDC/8A | 42560-287-01 |
| (1) Single IN/Dual OUT | 8-30 VDC | 5.1VDC/25A | 42560-287-02 |
| Single IN/Single OUT | 8-35 VDC | 12 VDC/10A | 42560-287-03 |
| Single IN/Single OUT | 8-35 VDC | 12 VDC/4A | 42560-287-05 |
| Single IN/Single OUT | 8-35 VDC | 5.1VDC/20A | 42560-287-09 |
| Single IN/Single OUT | 8-35 VDC | 5.1VDC/8A | 42560-287-10 |

## 1.10. MISCELLANEOUS

Table 1–12. Miscellaneous Components

| Description | Part Number |
|---|---|
| Extender Board for IOB, CPU II | 59473-744-01 |
| Extender Board for DI, SBO, DBO, ACO, LDO, NVI, NVIDSW, NVO, NVOAC, NVR, NVTWC-MOD, NVTWC-MUX, NVTWC-FSK, CRG | 59473-745-01 |
| Extender Board for boards VRD, CSEX, VSC, FSVT | 59473-746-01 |
| Diagnostic Control Cable | 38216-452-00 |
| Diagnostic Control Panel | 42560-285-01 |
| 5 Volt Filter Board | 31166-490-01 |
| 100 Ohm Type B Relay for VRD | 56001-787-05 |
| 14-way connector | 58920-113-00 |
| Amp Terminal Crimp Tool (AMP No. 90285-1) | 24745-149-00 |
| Amp Terminal Crimp Tool (AMP No. 583649-6) | 24745-074-00 |
| Amp Terminal Extraction Tool (AMP No. 465195-1) | 59688-003-00 |
| Interface Board, CPU2 | 31166-499-01 |
| Interface Board, CSEX4 | 31166-500-01 |
| Interface Board Cable | 38216-589-00 |

# 2. SECTION 2 – CIRCUIT BOARD KEYING

## 2.1. INTRODUCTION

This section provides the keying information for the VPI II circuit boards.

## 2.2. GENERAL

All circuit boards used in the VPI II system are mechanically keyed to a specific slot in the VPI II module.

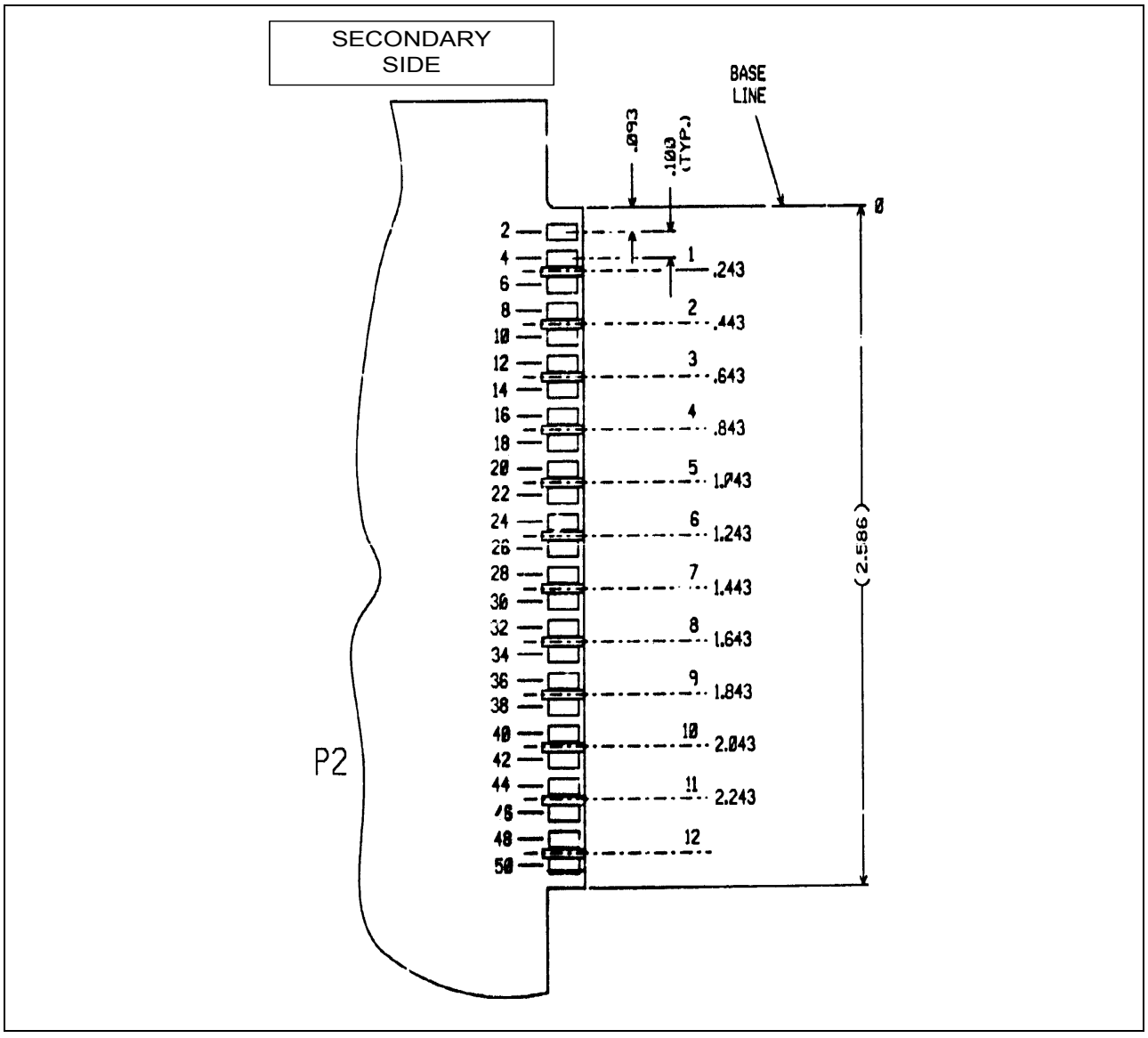
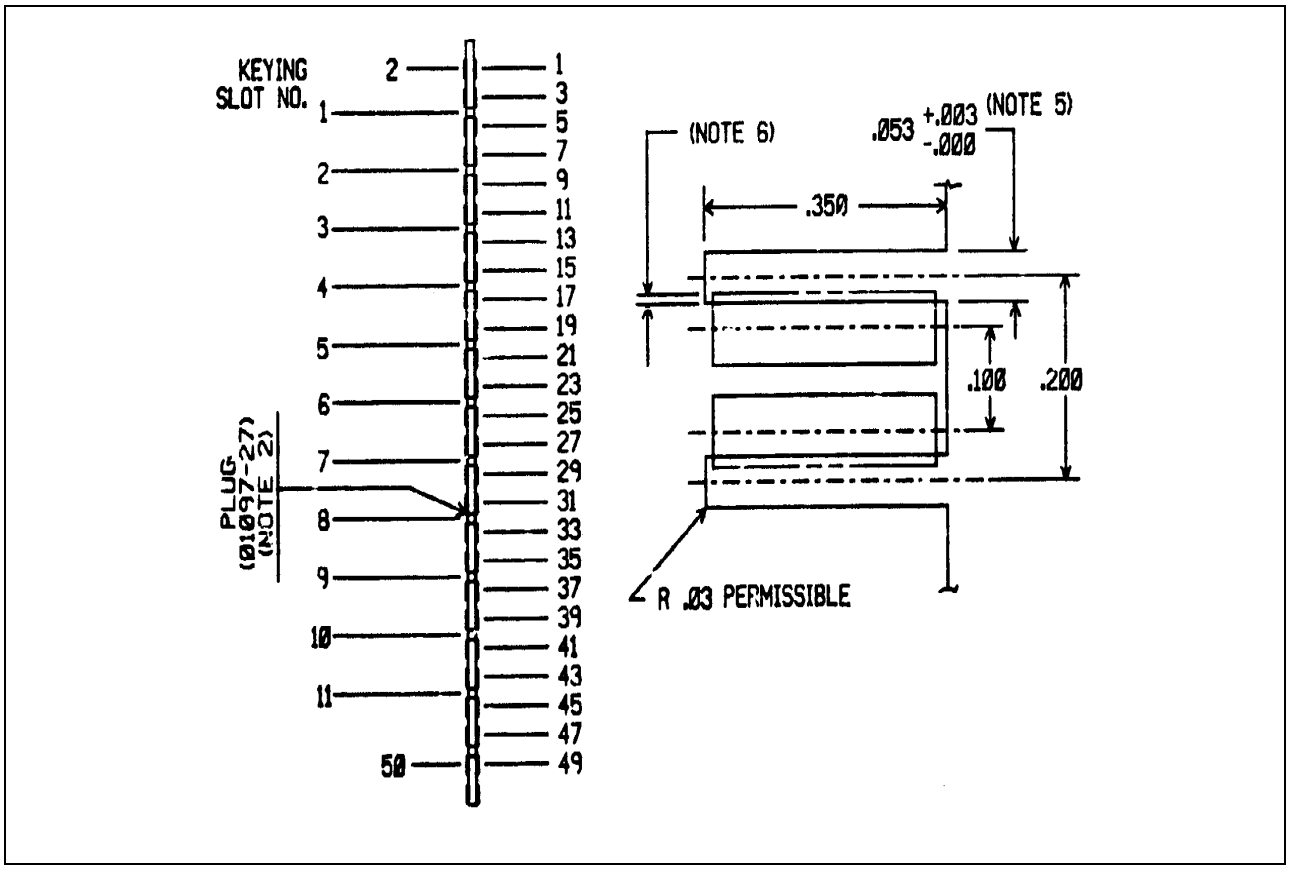



Figure 2–1. Registration Keying of Circuit Board




Note 1: Spaces 1 through 11 only are used for registration.
Note 2: Insert plug (01097-027), narrow end first as far as it goes into keying plug slot.
Note 3: Minimum finger dimension after slotting -0.050 inches.
Note 4: Numbering shown from secondary side. P1 and P3 not shown.
Note 5: Keying slots to be milled in per dimensions shown.
Note 6: Code indicates the location of keys. See registration code chart.

Figure 2–2. Registration Keying Numbering

Vital and non-vital PC board keying information is provided in Table 3–1.

Table 2–1. Vital and Non-Vital PC Board Keying

| Board Type | Keying Code |
|---|---|
| CPU II (P/N 31166-374-01, -02) | 2-4-5 |
| VRD (P/N 59473-740-02) | 3-4 |
| VSC (P/N 59473-939-10 to -18) | 2-8 |
| CRG (P/N 31166-261-03) | 2-11 |
| CRG (P/N 31166-261-04) | 3-10 |
| IOB (P/N 59473-827-01) | 2-3 |
| DI (P/N 59473-867-01 , -02) | 1-2 |
| DI (P/N 59473-867-03) | 1-8 |
| DI (P/N 59473-867-04, -05) | 3-7 |
| DI (P/N 59473-867-07) | 5-11 |
| SBO (P/N 59473-739-01, -02) | 1-3 |
| DBO (P/N 59473-747-01, -02) | 1-4 |
| DBO (P/N 59473-747-03) | 4-8 |
| DBO-50V (P/N 59473-977-01, -02) | 2-10 |
| LDO (P/N 59473-749-02, -03, -04) | 1-5 |
| LDO2 (P/N 31166-340-01, -02) | 8-10 |
| ACO (P/N 59473-937-01, -02, -03) | 1-10 |
| FSVT (P/N 59473-894-01, -02) | 3-6 |
| CSEX3 (P/N 31166-175-02, -03) | 1-3-5-7-8-11 |
| CSEX4 (P/N 31166-417-01) | 1-3-5-7-8-11 |
| NVI (P/N 59473-757-02) | 1-6 |
| NVI (P/N 59473-757-03) | 2-6 |
| NVIDSW (P/N 31166-276-01, -02) | 6-10 |
| NVIDSW (P/N 31166-276-03, -04) | 6-9 |
| NVO (P/N 59473-785-01, -03) | 1-7 |
| NVO (P/N 59473-785-02, -04, -05) | 2-7 |
| NVOAC (P/N 59473-936-01, -02) | 1-9 |
| NVO-SNK (P/N 31166-123-01) | 1-4 |
| NVR (P/N 31166-238-01) | 7-9 |
| NVR (P/N 31166-238-02) | 7-10 |

Table 2–1. Vital and Non-Vital PC Board Keying (Cont.)

| Board Type | Keying Code |
|---|---|
| NVTWC-MOD (P/N 31166-099-02) | 6-8 |
| NVTWC-MUX (P/N 31166-100-02) | 5-10 |
| NVTWC-FSK (P/N 31166-119-02 to -06 | 6-11 |

# 3. SECTION 3 – MODULES AND CABLES

## 3.1. INTRODUCTION

This section provides examples of VPI II hardware, associated equipment, and connector plugs.

See P2511B, Volume 3 for Vital boards and P2511B, Volume 4 for non-vital boards.

## 3.2. GENERAL

Illustrations of example VPI II supporting hardware, except for circuit boards, appear on the following pages. The illustrations are arranged in this general order: cases, motherboards, internal and external module cables, connector plugs, extender boards, and Vital VRD relay.

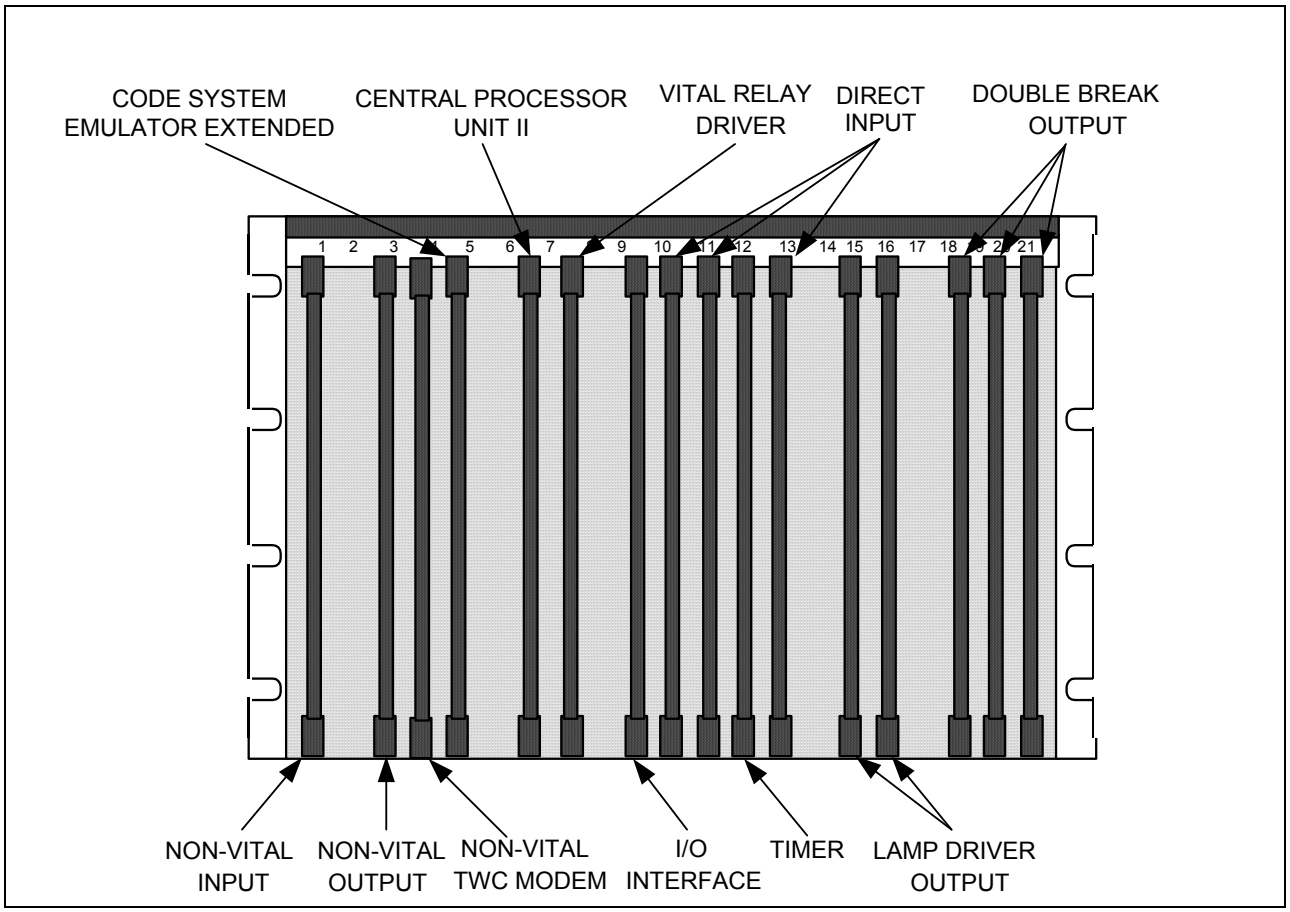



Figure 3–1. Example Board Placement for Single Chassis VPI II System

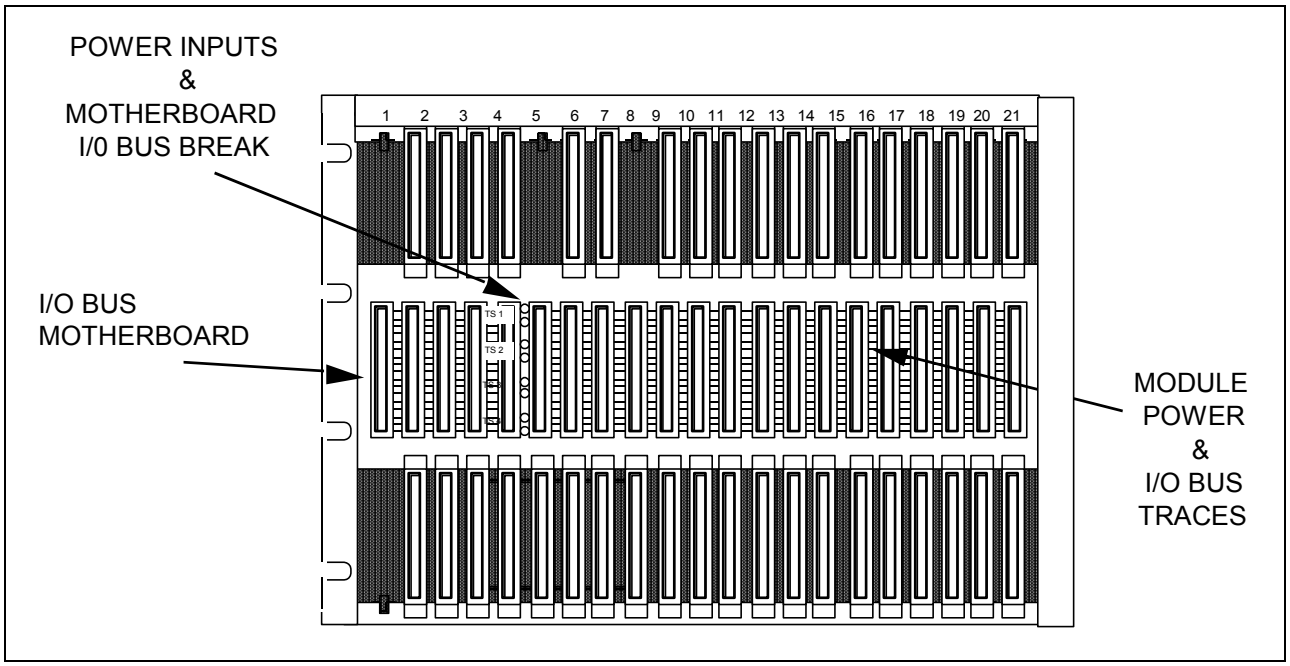



Figure 3–2. Example VPI II Module Chassis

## 3.3. SYSTEM MODULE EXAMPLE

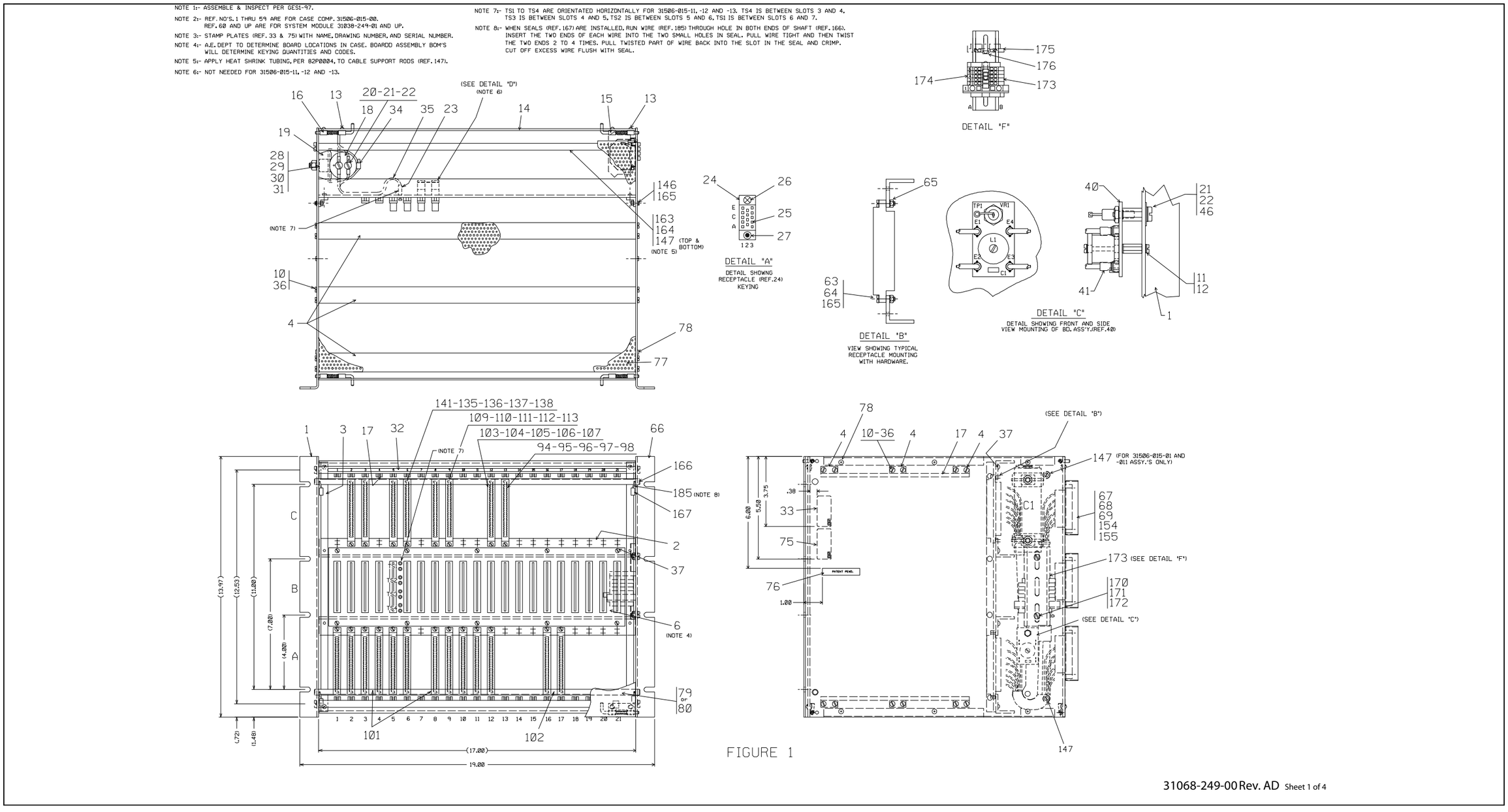
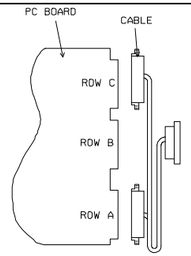



FIGURE 1

31068-249-00 Rev. AD Sheet 1 of 4

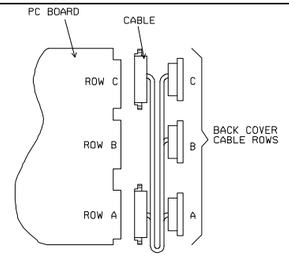
Figure 3–3. System Module, P/N 31038-249-00 (Sheet 1 of 4)



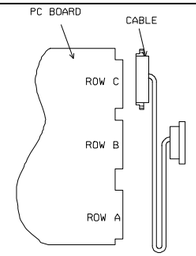

TYP. CABLE 38216-393 GR'S.
LOCATION FOR BD.ASS'YS.
59473-785
59473-757
59473-936

TYPICAL CABLE 38216-497 GR.'S
LOCATION FOR BD. ASSEMBLY'S

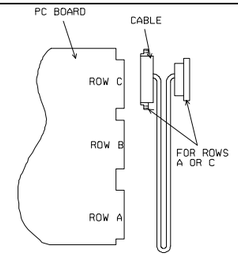
31166-099
31166-100
31166-106
31166-119



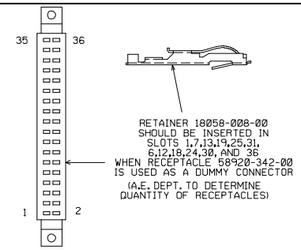

TYP. CABLE 38216-394 GR'S.
LOCATION FOR BD. ASS'YS.
59473-738
59473-739
59473-747
59473-749
59473-867

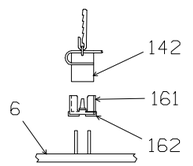



TYP. CABLE 38216-392 GR'S.
LOCATION FOR BD. ASS'YS.
59473-741
59473-740
59473-938
59473-939
31166-049

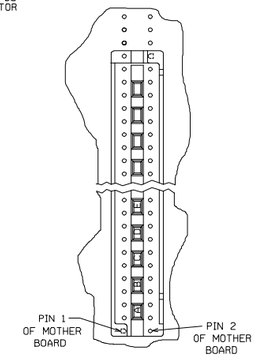



TYP. CABLE 38216-404 GR'S.
LOCATION FOR BD. ASS'YS.

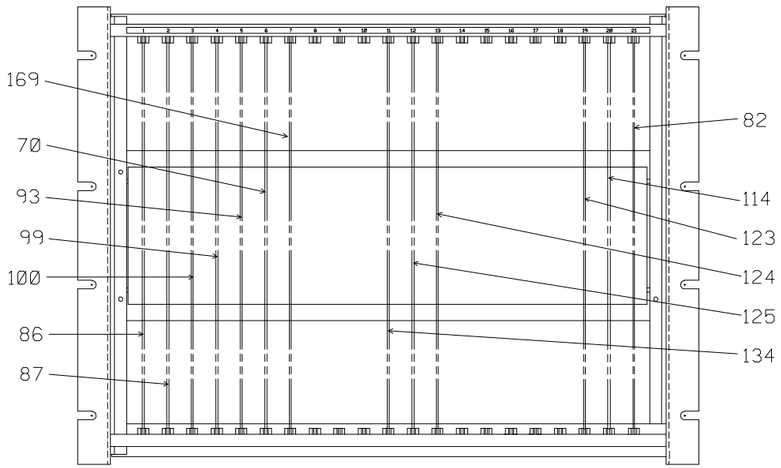



DETAIL "D"
(NOTE 6)




REAR VIEW OF MOTHER BOARD
SHOWING LOCATION OF PIN 1
OF MOTHER BOARD IN RELATION
TO RECEPTACLE




FRONT VIEW

BOARDS SHOWN FOR REFERENCE ONLY.
ACTUAL LOCATIONS DETERMINED A.E.DEPT.

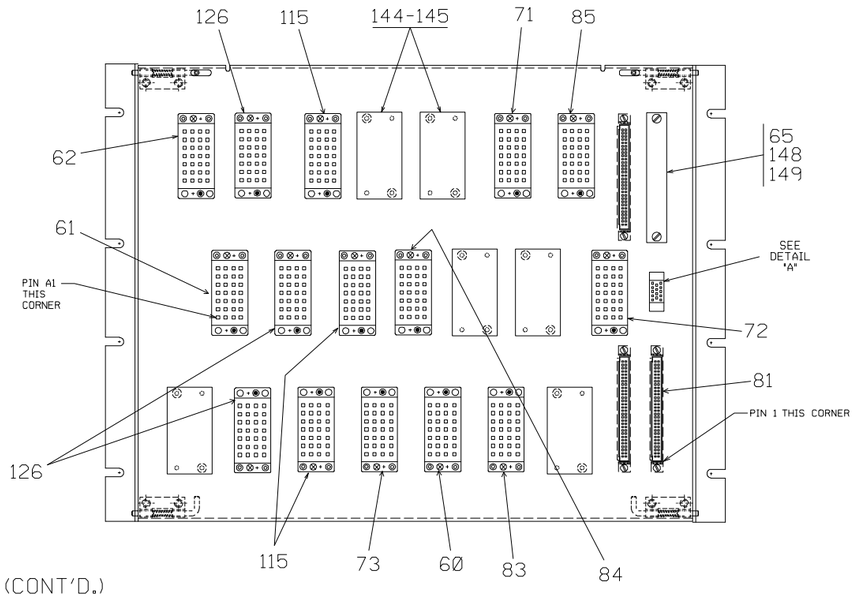
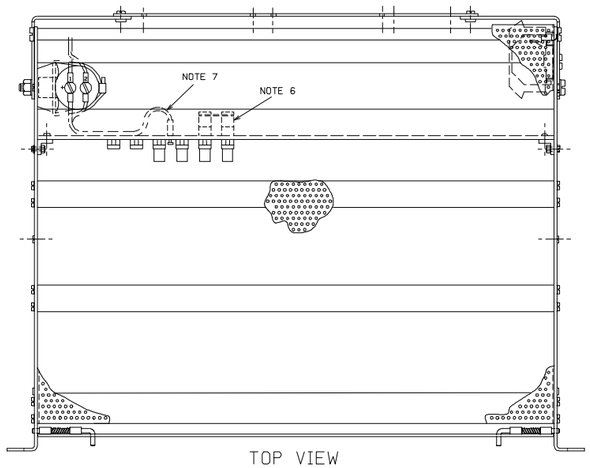



FIGURE 1 (CONT'D.)

31068-249-00 Rev. AD Sheet 2

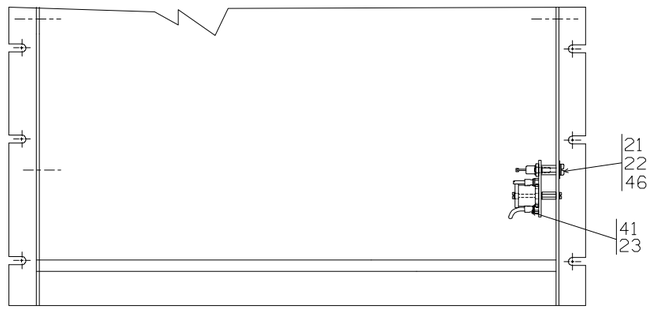
Figure 3–3. System Module, P/N 31038-249-00 (Sheet 2 of 4)

NOTE: BACK PLATE 31038-249-02 ONLY.



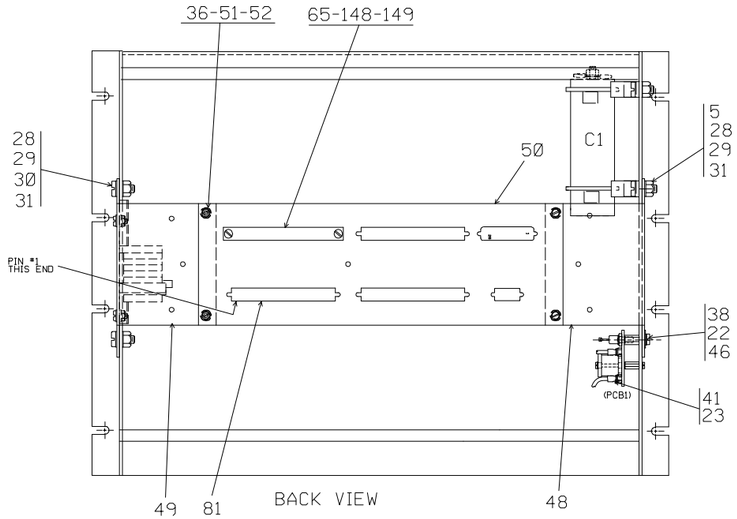

TOP VIEW

FIGURE 2
OTHERWISE SAME AS FIG.1



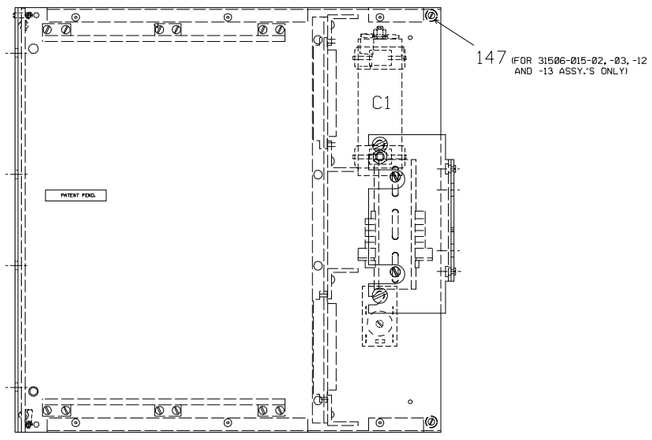

BACK VIEW

FIGURE 3
OTHERWISE SAME AS FIG.2




BACK VIEW

FIGURE 2
OTHERWISE SAME AS FIG.1

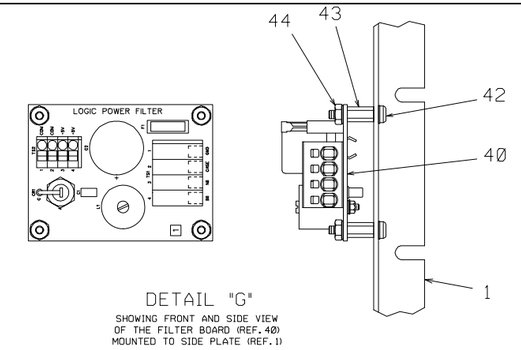



RIGHT VIEW

FIGURE 2
OTHERWISE SAME AS FIG.1

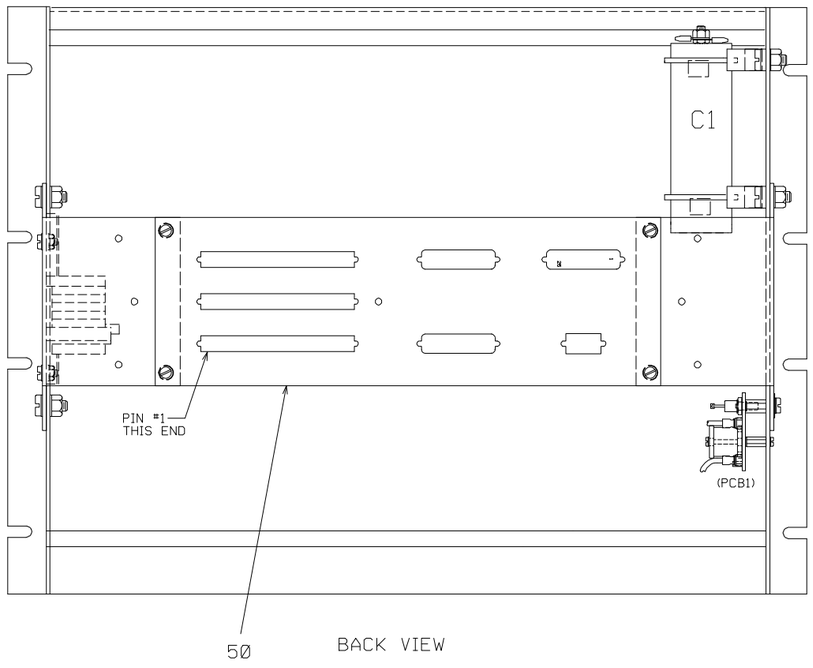
31068-249-00 Rev. AD Sheet 3

Figure 3–3. System Module, P/N 31038-249-00 (Sheet 3 of 4)




DETAIL "G"

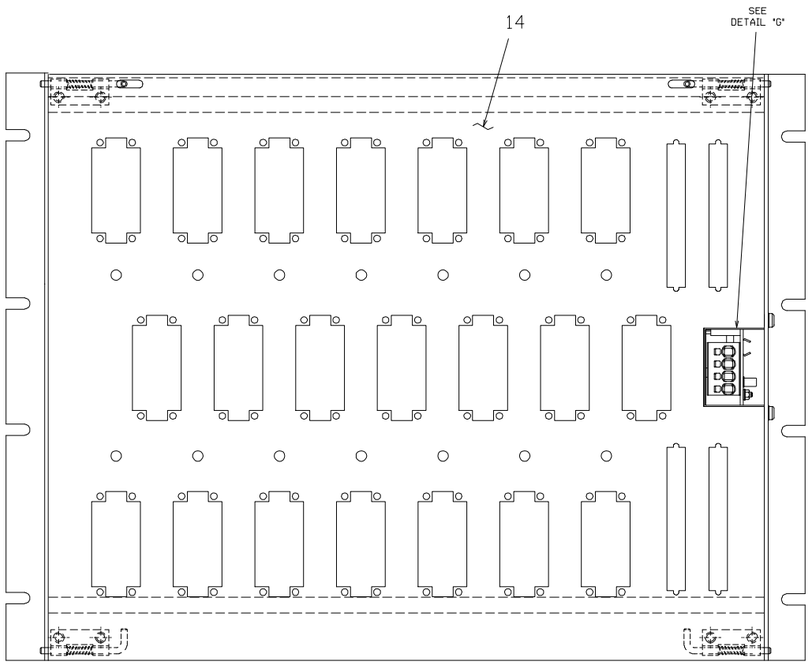
SHOWING FRONT AND SIDE VIEW
OF THE FILTER BOARD (REF. 40)
MOUNTED TO SIDE PLATE (REF. 1)




BACK VIEW

FIGURE 4

OTHERWISE SAME AS FIG.2




BACK VIEW

FIGURE 5

SHOWING REAR COVER (REF. 14) UNPOPULATED
AND CUTOUT FOR LOGIC POWER FILTER CONNECTION
(OTHERWISE SAME AS FIG.2)

31068-249-00 Rev. AD Sheet 4

Figure 3–3. System Module, P/N 31038-249-00 (Sheet 4 of 4)

Table 3–1. System Module Parts List, P/N 31038-249-XX

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 1 | Plate, Side | 2 | 41885-223-00 |
| 2 | Angle, Receptacle Mtg. | 4 | 55696-062-00 |
| 3 | Angle, Mtg | 2 | 55696-061-00 |
| 4 | Guide Mtg | 6 | 01096-064-ON |
| 6 | Board Assembly, Mother | 1 | 59473-743-01 |
| 10 | Screw, .138-32 x .50 Lg Self Tapping | 24 | 07606-016-ON |
| 11 | Washer, .112 ID, .270 OD, .019 Thk Lock | 1 | 53029-066-00 |
| 12 | Screw, .112-40 x .31 Lg Pan Hd | 1 | 03604-010-ON |
| 13 | Rivet, .125 x .23 Pop | 8 | 34496-031-00 |
| 14 | Cover, Rear | 1 | 50253-353-00 |
| 15 | Hinge, Pull-Pin Release (Right) | 2 | 53666-017-00 |
| 16 | Hinge, Pull-Pin Release (Left) | 2 | 53666-016-00 |
| 17 | Guide, Card | 42 | 01096-063-ON |
| 18 | Capacitor, 2600µF/50V | 1 | 58281-370-00 |
| 19 | Cable Mount, Nylon | 2 | 00641-074-00 |
| 20 | Terminal, .190 Ring, #16-14 Wire | 4 | 59825-059-00 |
| 21 | Screw, .190-32 x .31 Lg Pan Hd | 3 | 03610-110-ON |
| 22 | Washer, .190 ID, .381 OD, .025 Thk Lock | 3 | 53029-069-00 |
| 23 | Terminal, .250 Faston, #18-14 Wire | 8 | 59825-078-00 |
| 24 | Receptacle, 14-Way "M" (SEE AD61-41) | 1 | 58920-113-00 |
| 25 | Terminal, Pin #14 Wire (SEE AD061-41) | 4 | 00997-012-ON |
| 26 | Stud, Male (SEE AD061-41) | 1 | 08885-171-00 |
| 27 | Stud, Female | 1 | 08885-172-00 |
| 28 | Nut, .250-20, .19 Thk Hex | 2 | 01272-008-ON |
| 29 | Washer, .250 ID, .478 OD, .028 Thk Lock | 2 | 53029-075-00 |
| 30 | Screw, .250-20 x .50 Lg Pan Hd | 2 | 03615-016-ON |
| 31 | Washer, .266 ID, .500 OD, .031 Thk Flat | 2 | 01250-011-ON |
| 32 | Strip, Marker | 1 | 57617-121-00 |
| 33 | Plate, Name | 1 | 00401-765-00 |
| 34 | Tie, Cable 7.5 Lg | 4 | 01232-001-ON |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 35 | Tie, Cable 3.9 Lg | 10 | 01232-000-ON |
| 36 | Washer, .156 ID, .312 OD, .032 Thk Flat | 24 | 01250-004-ON |
| 37 | Rivet, .125 x .357 Pop | 18 | 34496-032-00 |
| 40 | Board Assembly, 5V Filter | 1 | 59473-819-01 |
| 41 | Terminal, #18-14 Wire, .250 Faston | 4 | 59825-137-00 |
| 46 | Washer, .190 ID, .562 OD, .040 Thk Flat | 1 | 01250-010-ON |
| | Cable, #14 Tw Pr (Per 82A0006) | 6.00 | 65156-175-01 |
| | Circuit | --- | 40185-501-00 |
| 66 | Case Comp (W/Rear Panel W/ split backplane) | 1 | 31506-015-01 |
| 66 | Case Comp (W/Rear Panel, W/O Rear Cover W/ split backplane) | 1 | 31506-015-02 |
| 66 | Case Comp (W/O Rear Panel, W/O Rear Cover W/ split backplane) | 1 | 31506-015-03 |
| 75 | Plate, Name | 1 | 00401-765-00 |
| 76 | Label (Pat. Pend.) | 1 | 37947-032-00 |
| 146 | Screw, .112-40 x .50 Lg Hex w/Serrated Washer | 8 | 53141-021-00 |
| 147 | Rod, Cable Support | 2 | 59712-007-00 |
| 163 | Washer, .112 ID, .270 OD, .019 Thk Lock | 4 | 53029-066-00 |
| 164 | Screw, .112-40 x .313 Lg Pan Hd | 4 | 03604-010-ON |
| 165 | Nut, .112-40 x .11 Thk Keps | 8 | 18466-002-00 |
| | Arrangement Plan | | 59591-827-00 |
| | Tubing, .500 Shrink Blk (Per 82P0004) | 3 | 81411-001-01 |
| THE FOLLOWING PARTS ARE TO BE SPECIFIED AS REQUIRED | | | |
| | Wire, #26 Solid Tefzel(Per 82A0006) | 20 | 80559-068-01 |
| | Jumper, Daisy Chain Type | 50 | 01196-023-ON |
| 77 | Cover, Top/Bottom | | 50253-354-00 |
| 78 | Rivet, .125 x .294 Pop (6 Per Ref. 77) | | 34496-054-00 |
| 80 | Cover Comp. (Aluminum) | | 58605-043-02 |
| 86 | Board Assembly, Non-Vital (Output) | | 59473-785-01 or-02 |
| 87 | Board Assembly, Non-Vital (Input) | | 59473-757-02 or-03 |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 60 | Cable Comp, Row A ( Back Cover) | | 38216-393-01 |
| 61 | Cable Comp, Row B ( Back Cover ) | | 38216-393-02 |
| 62 | Cable Comp, Row C (Back Cover ) | | 38216-393-03 |
| (1 REF. 60, 61, 62 IS REQUIRED FOR EACH REF. 86, 87, OR 169) | | | |
| 70 | Board Assembly, CSEX3 | | 31166-175-02, -03 |
| 70 | Board Assembly, CSEX4 | | P/N 31166-417-01 |
| 71 | Cable Comp., Row C | | 38216-392-02 |
| 72 | Cable Comp., Row B (Back Cover) | | 38216-392-04 |
| 73 | Cable Comp., Row A (Back Cover) | | 38216-392-06 |
| (1 REF. 71, 72, OR 73 IS REQUIRED FOR EACH REF. 70 AND FOR EACH REF. 74) | | | |
| 74 | Board Assembly, VSC (No. Spec By AE Dept) | | 59473-938 KN |
| 82 | Board Assembly, VRD | | |
| 83 | Cable Comp., Row A(Back Cover) | | |
| 84 | Cable Comp., Row B (Back Cover) | | |
| 85 | Cable Comp., Row C | | |
| (1 REF. 83, 84, OR 85 IS REQUIRED FOR EACH REF. 82) | | | |
| 94 | Receptacle, 60-Way | | 58920-252-00 |
| (REF. 99 IS COMPRISED OF 59473-742-01 AND 40025-XXX-01 AND 40025-XXX-02 SYSTEM SOFTWARE) | | | |
| 99 | Board Assembly, CPU II | | 31166-374-01 or -02 |
| 100 | Board Assembly, I/O Bus | | 59473-827-01 |
| 169 | Board Assembly, Non-Vital (AC Out) | | 59473-936-01 |
| 101 | Cable Comp. (Main Buss Cable) (No. Spec. By AE Dept) (-01 = 6 Pos., -02 = 5 Pos.) (1 Ref. 101 Req'd for each Ref. 99) | | 38216-395 KN |
| 102 | Cable Comp. (CPU-CPU Cable) (1 Ref. 102 Req'd for 2 Ref. 99) | | 38216-395-03 |
| 114 | Board Assembly Vital Input (No. Spec. By AE Dept) (-01 - Filtered, -02 - Standard, -03- Rectified) | | 59473-867 KN |
| 115 | Cable Comp., Input (1/2 Per Ref. 114) | | 38216-394-02 |
| 123 | Board Assembly, SBO (No. Spec by A.E. Dept.) | | 59473-739 KN |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 124 | Board Assembly, DBO (No. Spec by A.E. Dept.) | | 59473-747 KN |
| 125 | Board Assembly, LDO (No. Spec by A.E. Dept.) | | 59473-749 KN |
| 127 | Board Assembly, ACO | | 59473-937 KN |
| 126 | Cable Comp., Output (1/3 Per Each Ref.123 or 124 or 125 or 127) | | 38216-394-01 |
| 134 | Board Assembly, Timer (No. Spec. By A.E. Dept) | | 59473-894 KN |
| 139 | Receptacle, Dual 18 (1 Per Ref. 134 Bd. Edge Row C) | | 58920-342-00 |
| 140 | Retainer (12 Per Ref. 134) | | 18058-008-00 |
| 142 | Cable Comp. (MB JPR Slot 5/6) [RESTRICTED USE] (If slots 5 & 6 need to be connected, use 31506-015-11, -12, -13 which contain continuous backplane) | | 38216-402-01 |
| 143 | Plug, Keying (Per AD047-11)(2 or 3 Per Bd. Assy) | | 01097-027-ON |
| 144 | Cover (Coupler Holes, Rear Cover) | | 56029-088-00 |
| 145 | Ring, (2 Per Each Ref. 144) | | 05713-083-00 |
| 148 | Cover (Expansion Buss Receptacle) | | 56029-089-00 |
| 149 | Screw, .112-40 x .44 Lg Pan Hd | | 03604-014-ON |
| 161 | Receptacle, Keying Header (2 Per Ref. .142) | | 58920-339-00 |
| 162 | Retainer, (4 Per Ref. 142) | | 18058-013-00 |
| 63 | Screw, .112-40 x .63 Lg Pan Hd (4 Per PC Board Slot) | | 03604-020-ON |
| 64 | Washer, .112 ID, .250 OD, .025 Thk Flat | | 01250-002-ON |
| 65 | Nut, .112-40 x .11 Thk Keps. (Plus 2 Per Ref. 149) (4 Per PC Board Slot) | | 18466-002-00 |
| 67 | Shell | | 59367-010-00 |
| 68 | Stud, Male Per A.E. Dept. Arrangement Plan See AD061-34 | | 08885-171-00 |
| 69 | Stud, Female Per A.E. Dept. Arrangement Plan See AD061-34 | | 08885-172-00 |
| 154 | Stud, Male Per A.E. Dept. Arrangement Plan See AD061-34 | | 08885-196-00 |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 155 | Stud, Female Per A.E. Dept. Arrangement Plan See AD061-34 | | 08885-197-00 |
| 81 | Cable Expansion Buss, (No. Spec. By AE Dept) (-01- Single; -02 = Double) Flat Cable Module to Module | | 38216-404 KN |
| 170 | Screw, .164-32 x .38 Lg Pan Hd | | 03608-012-ON |
| 171 | Washer, .168 ID, .381 OD, .023 Thk Lock | | 53029-062-00 |
| 172 | Nut, .164-32 x .13 Thk Hex | | 01272-005-ON |
| 173 | Strip, Terminal | | 29173-197-00 |
| 174 | Tag, Marker | | 59539-648-00 |
| 175 | Terminal Block | | 29407-075-00 |
| 176 | Jumper | | 20129-017-00 |
| NOTE: FOR INTERCONNECTION OF MODULES USE CABLE 38216-403-01, FOR MODULE POWER SUPPLY SEE 42560-273-01 (SINGLE), -02 (DOUBLE) | | | |
| 159 | Signature Header, Board Assembly "Vital Input"(No. Spec. By Alstom) (-01 upwards for I/O Buss Boards Ref. 100; -16 downwards for Input Boards Ref. 114) | | 59473-871 KN |
| 160 | Signature Prom, Integrated Circuit. "Vital Output"(Nos. Spec. By Alstom)(-01 upward for each Output Board Ref. 123,124,125 and 127) | | 39780-003 KN |
| 166 | Shaft | As Req'd | 47544-085-00 |
| 167 | Seal (2 per Ref. 166) | As Req'd | 35285-000-00 |
| 185 | Wire, w/Cotton Twist (Per 80J0005) | As Req'd | 80599-004-01 |
| SOME OR ALL OF THE FOLLOWING PARTS ARE REQUIRED TO COMPLETE CIRCUIT BOARD ASSEMBLIES ABOVE THE BASE (-01) LEVEL. | | | |
| THE FOLLOWING PARTS MAY BE REQUIRED PER EACH REF. 70 CSEX3 CIRCUIT BOARD ASSEMBLY. | | | |
| | Jumper, (17 per Ref 70) | | 01196-012-ON |
| | IC, Unprogrammed EPROM(27C128)(2 Per Ref 70) | | 01169-646-ON |
| | IC, Ram 32K x 8 (2 Per Ref 70) | | 01169-525-ON |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| | IC, Unprogrammed EPROM (27C512)(2 per Ref 70) | | 01169-563-ON |
| THE FOLLOWING MAY BE REQUIRED PER EACH REF. 74 VSC BOARD. | | | |
| | IC, EPROM (27C128)(2 Per Ref 74) | | 01169-646-ON |
| THE FOLLOWING MAY BE REQUIRED PER EACH REF. 99 CPU/PD BOARD. | | | |
| | IC, EPROM (27H010) (2 Per Ref 99) | | 01169-648-ON |
| THE FOLLOWING CABLES ARE REQUIRED WHEN PLATE ASSEMBLY (DIAGNOSTIC CONTROL PANEL) 42560-285-01 IS REQUIRED. | | | |
| | Row A | | 38216-452-01 |
| | Row B  Rear cover | | 38216-452-02 |
| | Row C | | 38216-452-03 |
| 177 | NVTWC MODEM (NON FSK) | 1 | 31166-099-02 |
| 178 | NVTWC MUX (NON FSK) | 1 | 31166-100-01 |
| 179 | NVI (6 volt) | 1 | 31166-106-01 |
| 180 | NVTWC MODEM (NON Manchester FSK) | 1 | 31166-119-02 |
| 181 | NVTWC MODEM (Manchester FSK) | 1 | 31166-119-03 |
| 182 | Cable Comp, Row A (Back Cover) | 1 | 38216-497-01 |
| 183 | Cable Comp, Row B (Back Cover) | 1 | 38216-497-02 |
| 184 | Cable Comp, Row C (Back Cover) | 1 | 38216-497-03 |
| 1 REF. 182, 183, OR 184 IS REQUIRED FOR EACH REF. 171, 178, 179, 180, OR 181. | | | |
| 66 | Case Comp (W/Rear Panel  W/ continuous backplane) | 1 | 31506-015-11 |
| 66 | Case Comp (W/Rear Panel, W/O Rear Cover W/ continuous backplane) | 1 | 31506-015-12 |
| 66 | Case Comp (W/O Rear Panel, W/O Rear Cover W/ continuous backplane) | 1 | 31506-015-13 |
| 66 | Case Comp (W/ Rear Panel, W/O Rear Cover W/ split backplane) | 1 | 31506-015-14 |
| 66 | Case Comp (DEEP)(W/ Rear Cover, W/split backplane) | 1 | 31506-015-15 |

Table 3–1. System Module Parts List, P/N 31038-249-XX (Cont.)

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 66 | Case Comp RTU (DEEP)(W/ Rear Cover, W/ Continuous backplane) | 1 | 31506-015-16 |
| WHEN EITHER 3156-015-15 OR 31506-015-16 IS REQUIRED, DELETE CABLE SUPPORT RODS 59712-007-00 (ITEM 7) AND TUBING 81411-001-01 (ITEM 12). ALSO, ADD THE FOLLOWING: | | | |
| 77 | Cover, Top/Bottom (DEEP) | 2 | 50253-404-00 |
| 78 | Rivet, .125 x .294 POP | 16 | 34496-054-00 |

## 3.4. SYSTEM MODULE CIRCUIT

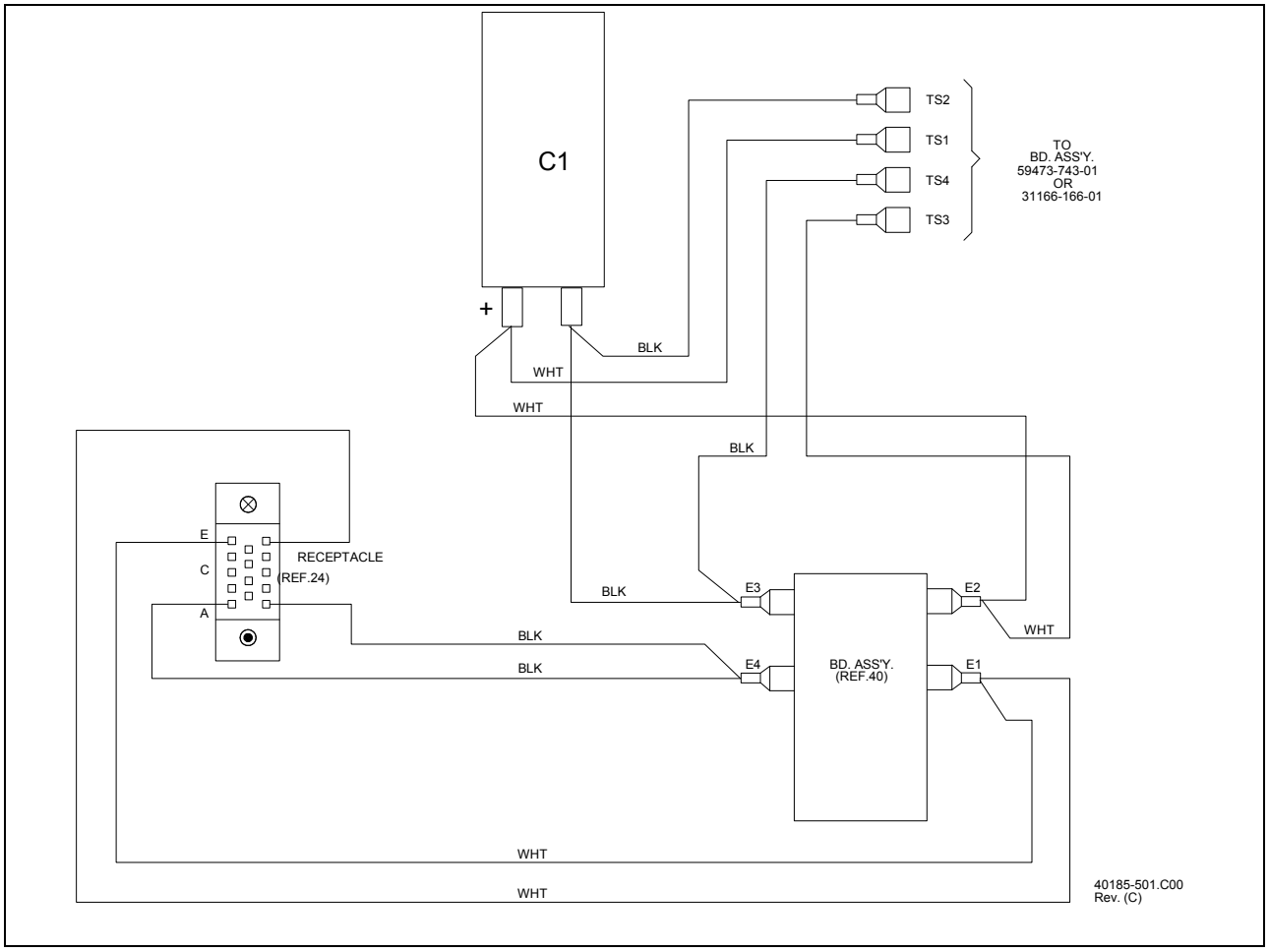



Figure 3–4. System Module Circuit

## 3.5. CABLE, MOTHERBOARD JUMPER, P/N 38216-402-01

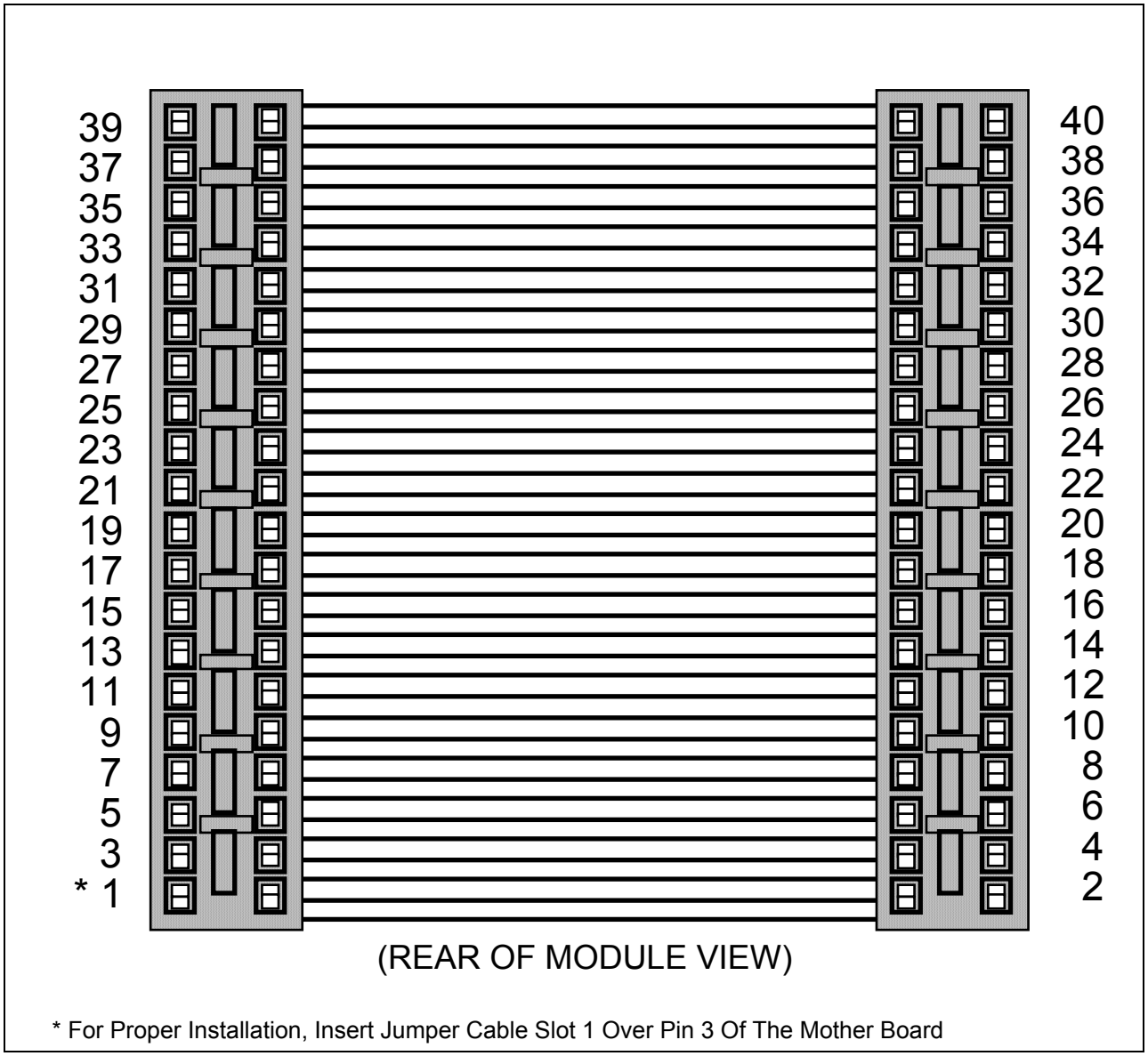



Figure 3–5. Cable, Motherboard Jumper, P/N 38216-402-01

## 3.6. MOTHERBOARD, CONTINUOUS BACKPLANE CIRCUIT, P/N 31166-166-01

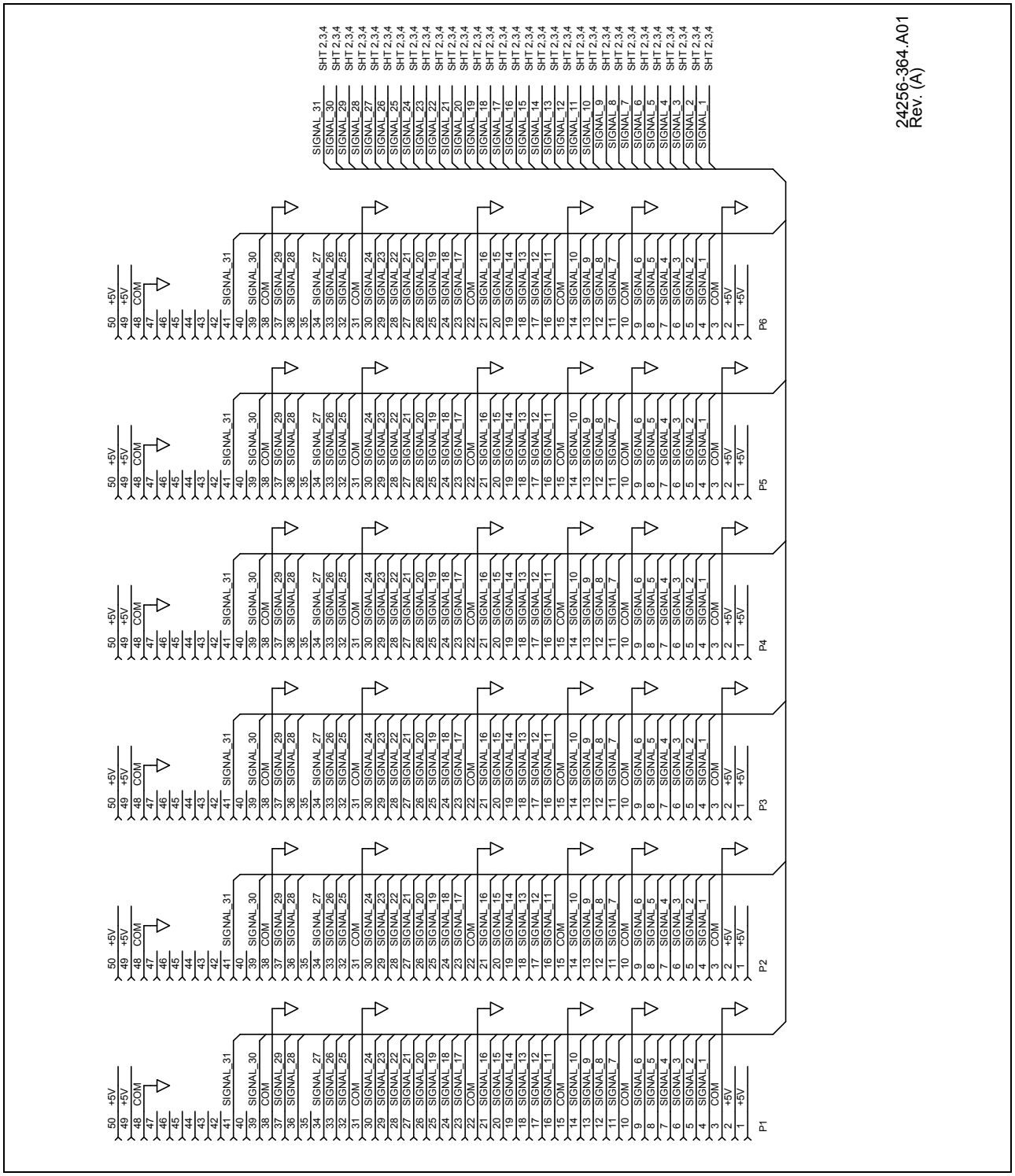



Figure 3–6. Motherboard, Continuous Backplane Circuit, P/N 31166-166-01
(Sheet 1 of 4)

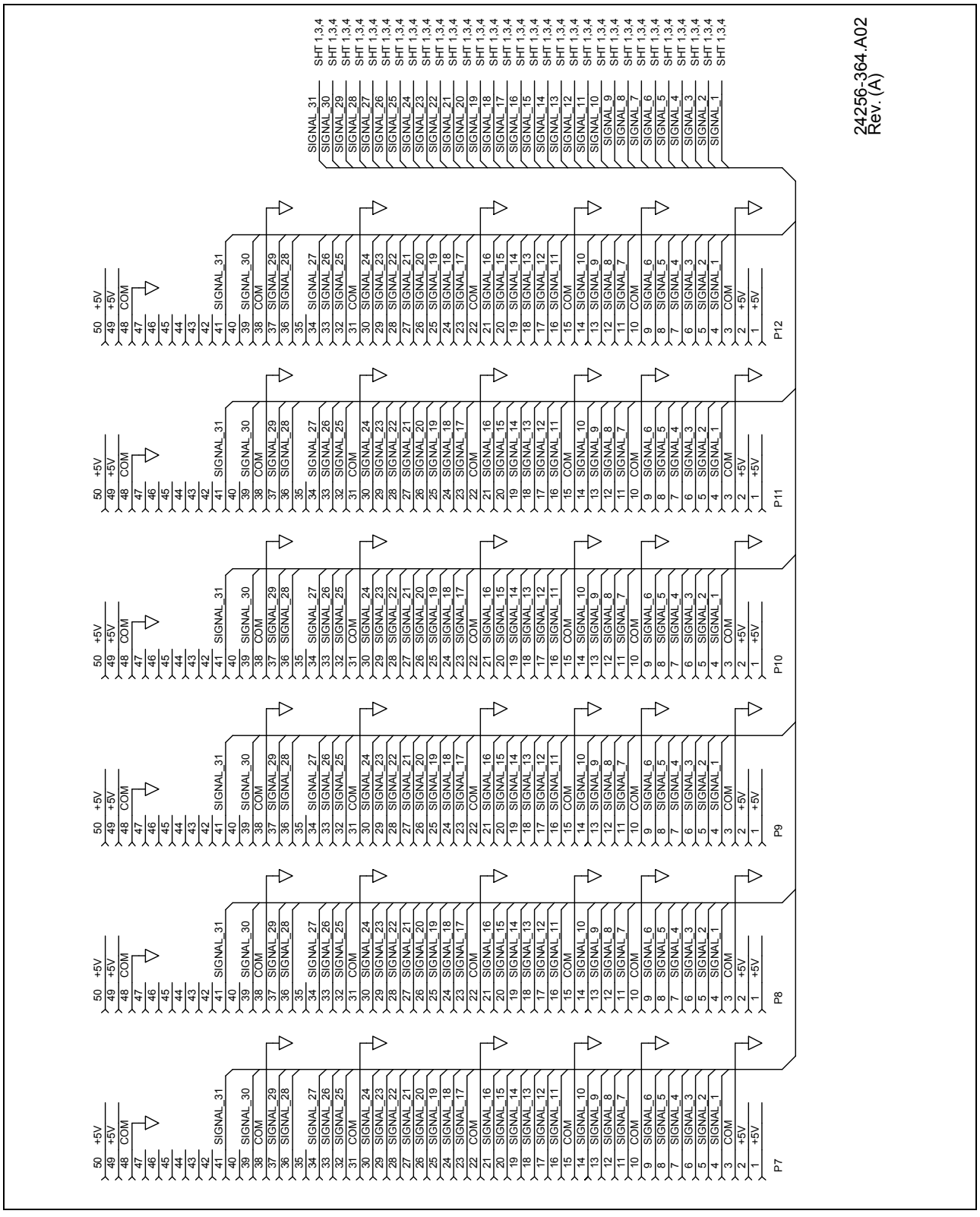



Figure 3–6. Motherboard, Continuous Backplane Circuit, P/N 31166-166-01
(Sheet 2 of 4)

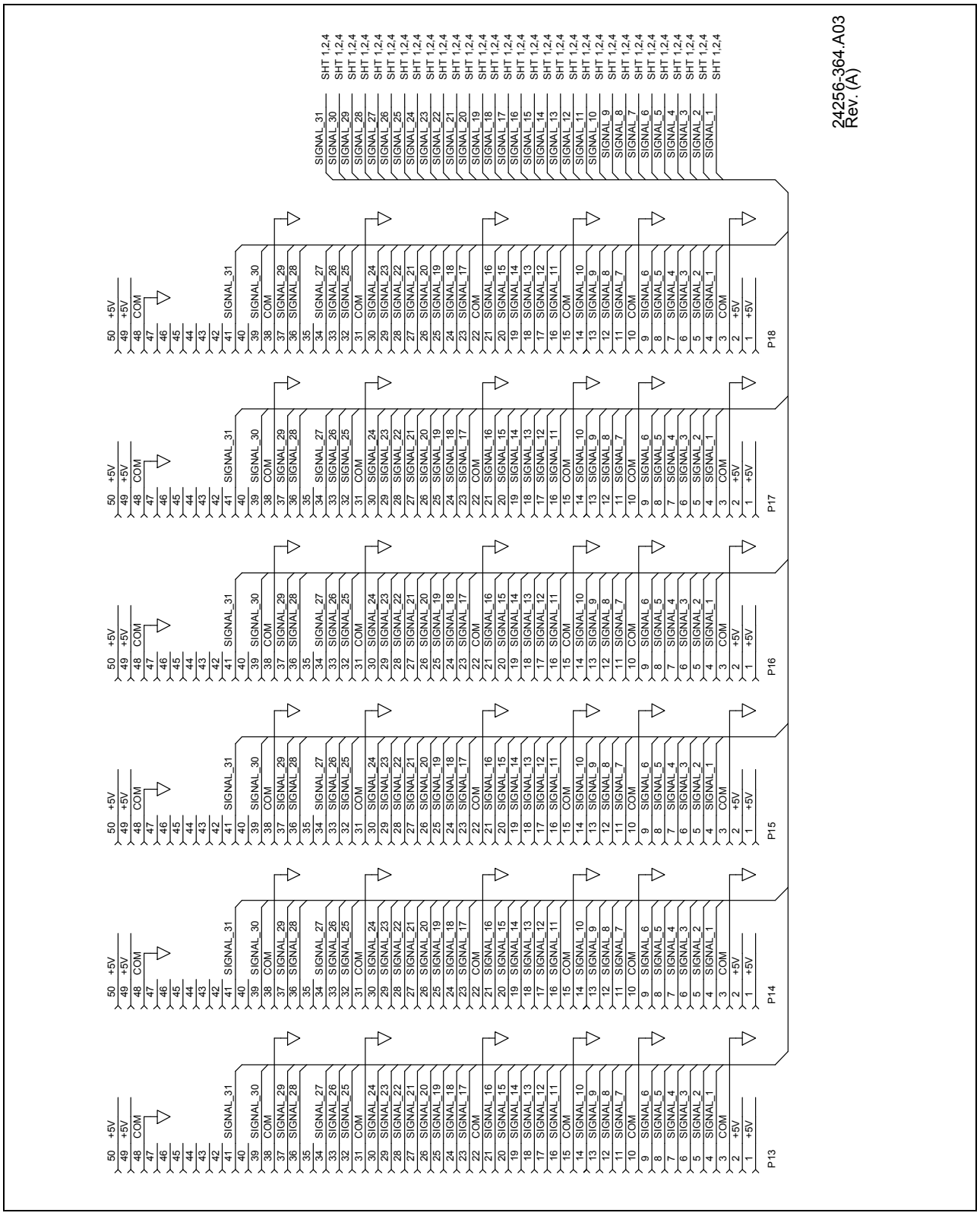



Figure 3–6. Motherboard, Continuous Backplane Circuit, P/N 31166-166-01 (Sheet 3 of 4)

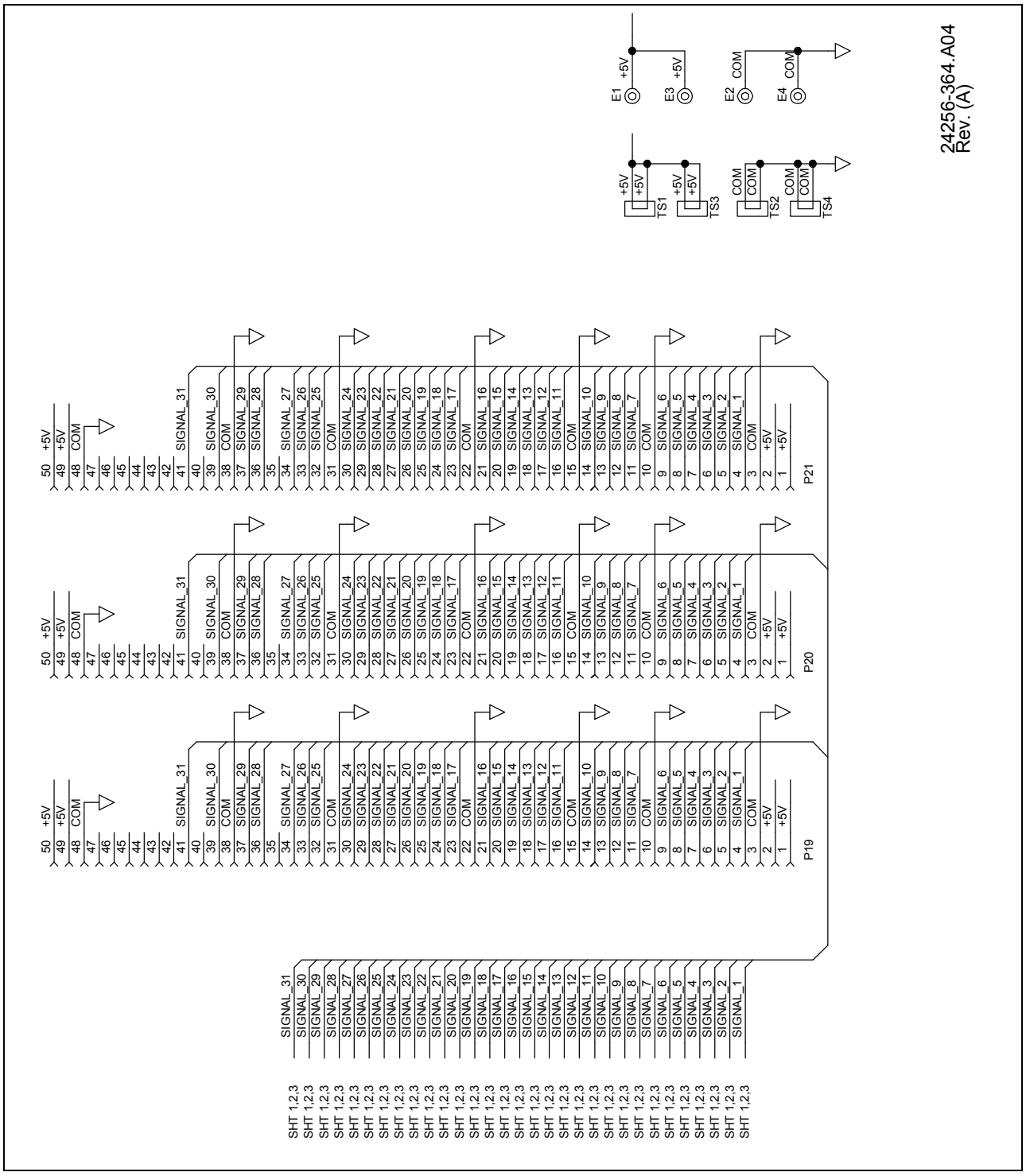



Figure 3–6. Motherboard, Continuous Backplane Circuit, P/N 31166-166-01
(Sheet 4 of 4)

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## 3.7. MOTHERBOARD ASSEMBLY (B1), P/N 59473-743-01

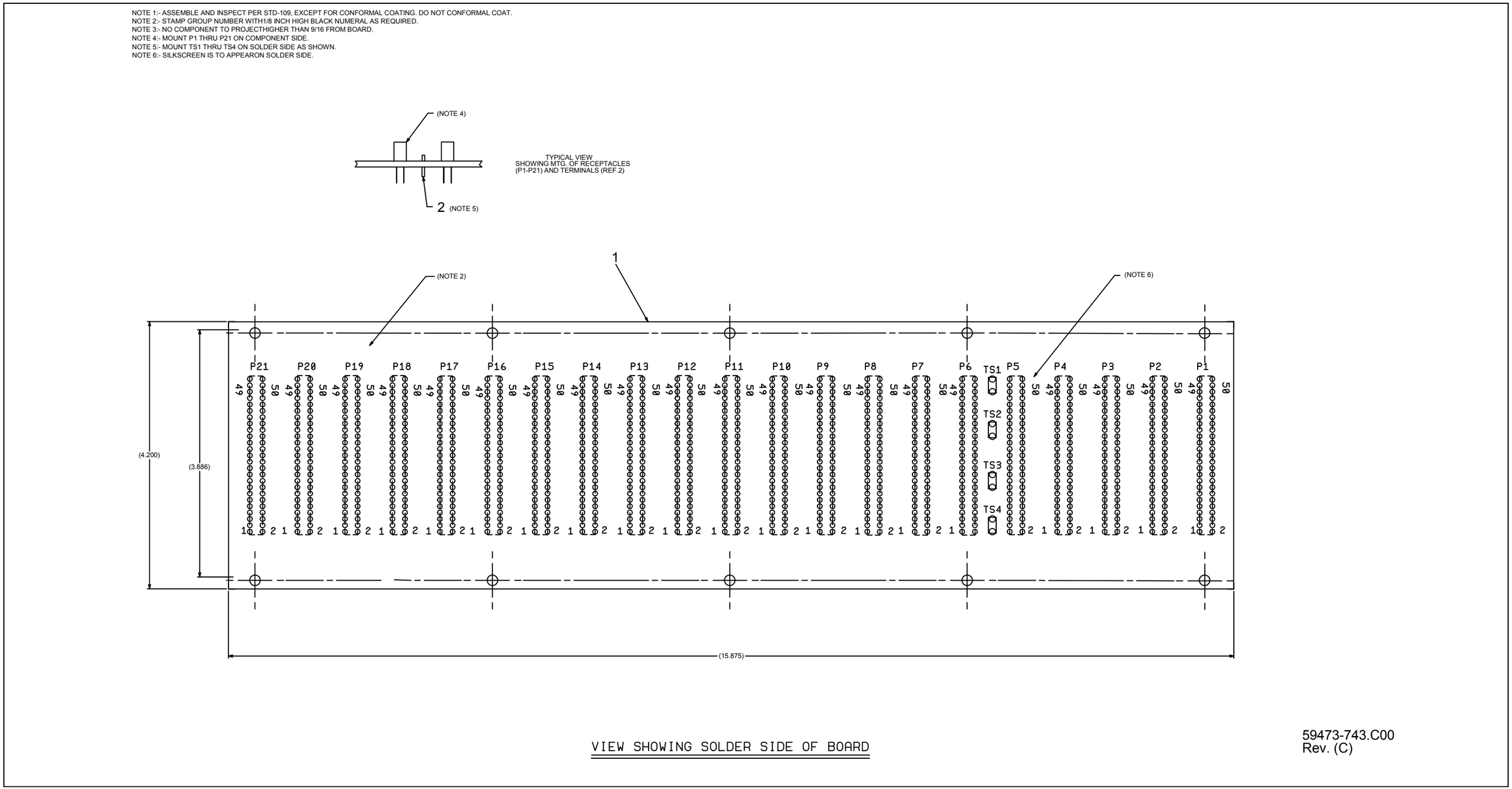


Figure 3–7. Motherboard Assembly (B1), P/N 59473-743-01

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Table 3–2. Motherboard Assembly (B1) Parts List, P/N 59473-743-01

| Ref. | Description | Qty. | Part Number |
|---|---|---|---|
| 1 | Board (Printed) | 1 | 59474-998-00 |
| 2 | Terminal, Faston (TS1 - TS4) | 4 | 05389-031-00 |
| | Receptacle, 50-Way (P1 - P2) | 21 | 58920-348-00 |

## 3.8. MAIN BUS BOARD ASSEMBLY, P/N 31166-201-07

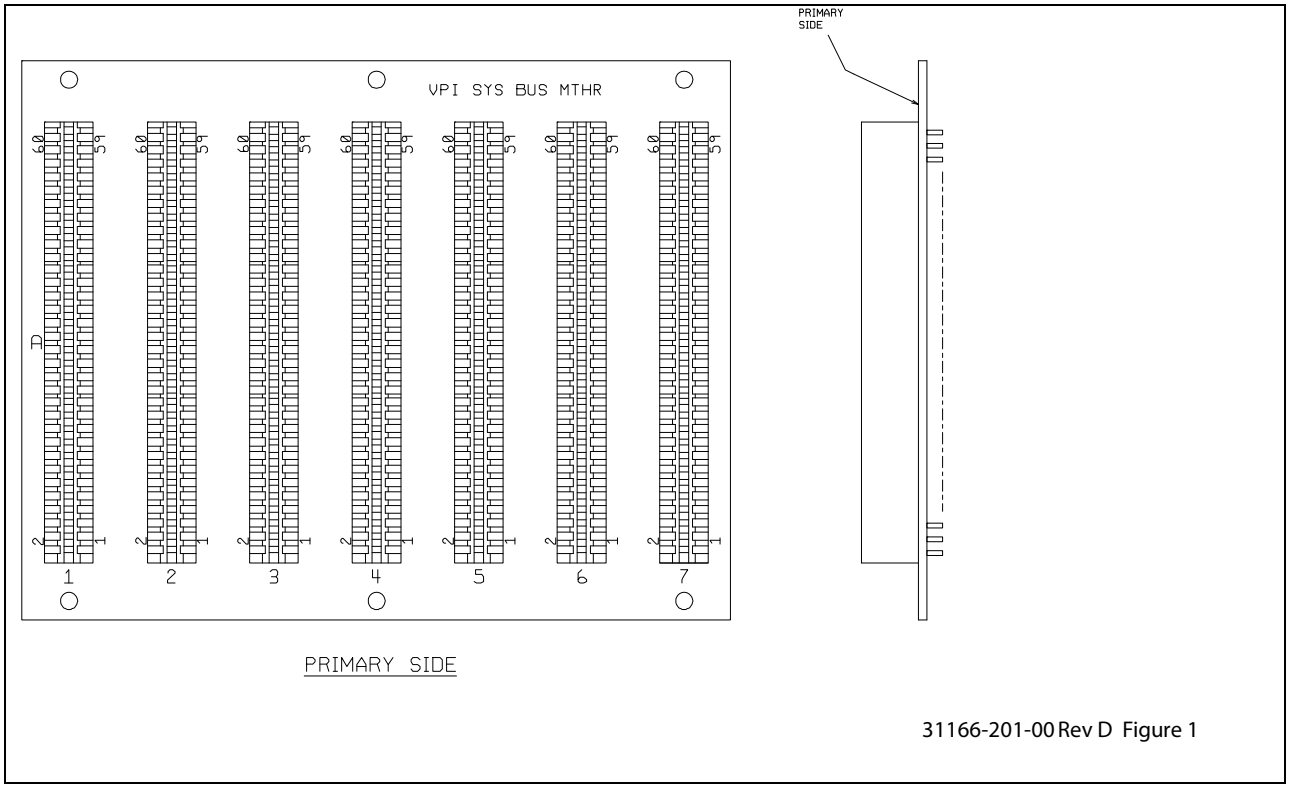


Figure 3–8. Main Bus Board Assembly, P/N 31166-201-07

## 3.9. MAIN BUS BOARD ASSEMBLY, P/N 31166-201-04

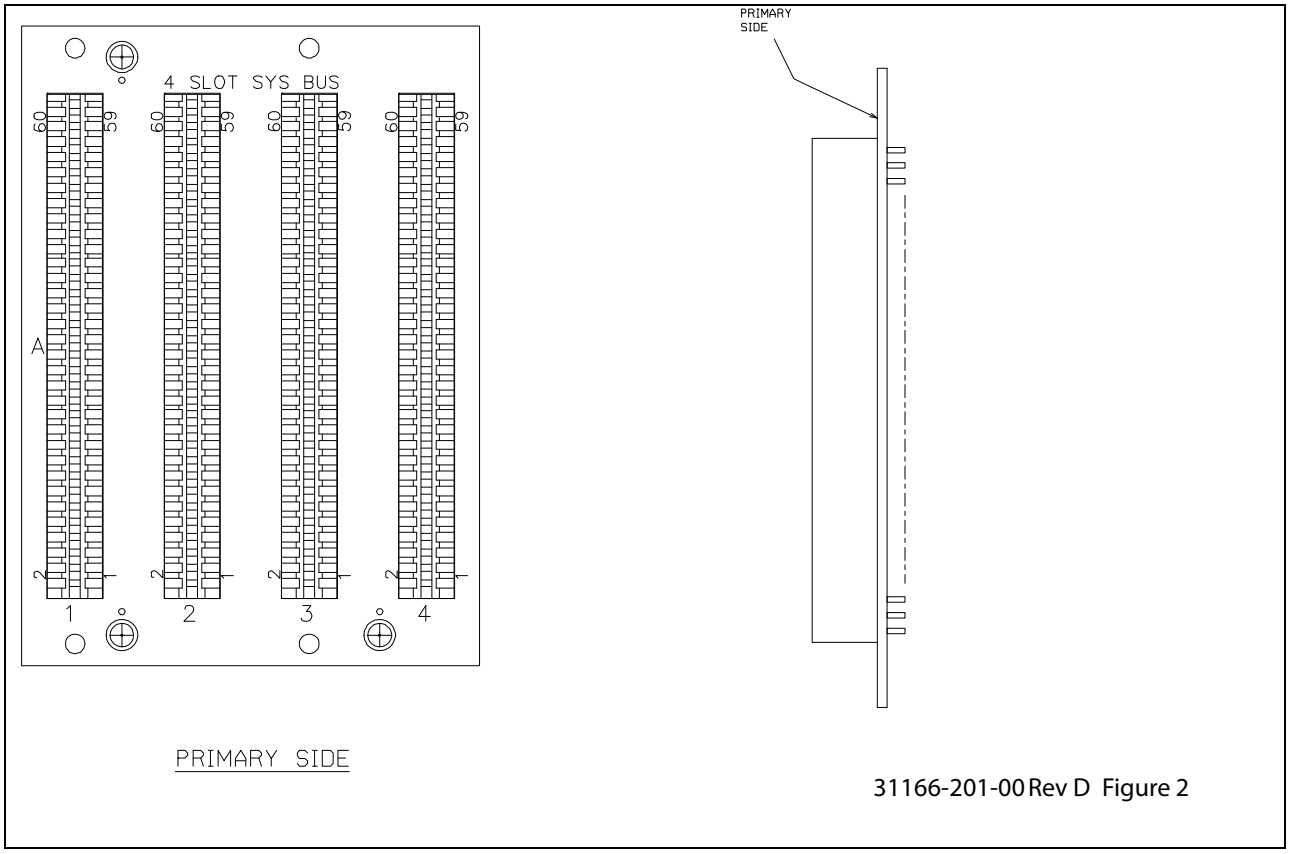


Figure 3–9. Main Bus Board Assembly, P/N 31166-201-04

## 3.10. MAIN BUS BOARD ASSEMBLY, P/N 31166-201-05

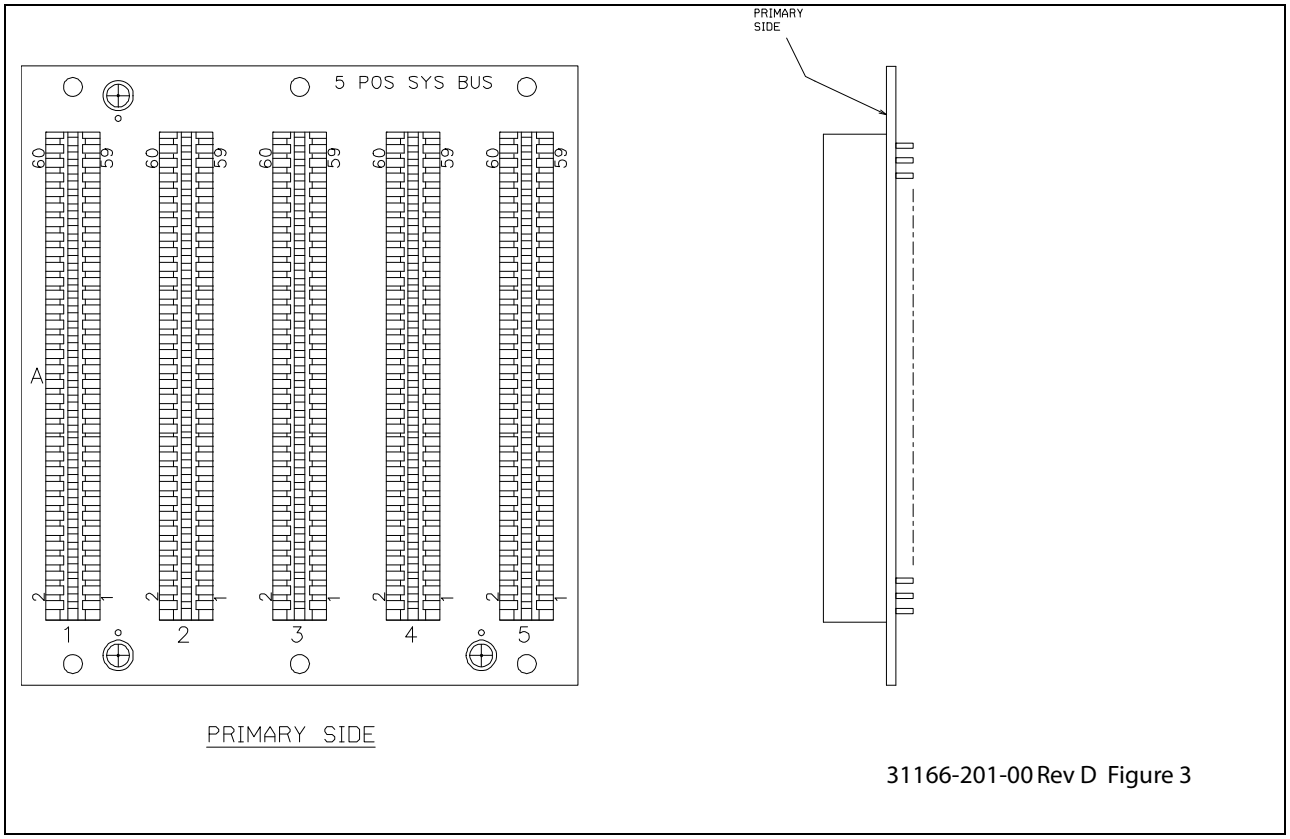


Figure 3–10. Main Bus Board Assembly, P/N 31166-201-05

## 3.11. VITAL AND NON-VITAL MOTHERBOARD INTERFACE CONNECTIONS

Table 3–3. Vital and Non-Vital Motherboard Interface Connections

| Pin No. | Description (Vital I/O) | Description (Non-Vital I/O) |
|---|---|---|
| 1 | +5V | +5V |
| 2 | +5V | +5V |
| 3 | 5V COM | 5V COM |
| 4 | IODB0 | NVDB0 |
| 5 | IODB1 | NVDB1 |
| 6 | IODB2 | NVDB2 |
| 7 | IODB3 | NVDB3 |
| 8 | IODB4 | NVDB4 |
| 9 | IODB5 | NVDB5 |
| 10 | 5V COM | 5V COM |
| 11 | IODB6 | NVDB6 |
| 12 | IODB7 | NVDB7 |
| 13 | IODB8 | EMSEL/ |
| 14 | IODB9 | NVA0 |
| 15 | 5V COM | 5V COM |
| 16 | IODBA | NVA1 |
| 17 | IODBB | NVA2 |
| 18 | IODBC | NVA3 |
| 19 | IODBD | NVA4 |
| 20 | IODBE | NVA5 |
| 21 | IODBF | NVA6 |
| 22 | 5V COM | 5V COM |
| 23 | ENIORD/ | NVIORD/ |
| 24 | ENIOWR/ | CLR.IREQ/ |
| 25 | T-OUTC3 | NVA7 |
| 26 | TIMC4 | NVA8 |
| 27 | IOAB1 | NVA9 |
| 28 | IOAB2 | NVA10 |
| 29 | IOAB3 | NVA11 |

Table 3–3. Vital and Non-Vital Motherboard Interface Connections (Cont.)

| Pin No. | Description (Vital I/O) | Description (Non-Vital I/O) |
|---|---|---|
| 30 | IOAB4 | NVA12 |
| 31 | 5V COM | 5V COM |
| 32 | CLR/ | NVA13 |
| 33 | 125 KHZ CLK | NVIOWR/ |
| 34 | OUTC1/ | POLL/ |
| 35 | SEL DISABLE ON-OFF/ (See Note 1) | 5V COM |
| 36 | DISABLE ON-OFF/ | NVMRD/ |
| 37 | IODT-R/ | NVMWR/ |
| 38 | 5V COM | 5V COM |
| 39 | RCHK CLK | INT/REQ/ |
| 40 | SEL 1 (See Note 2) | Not Used |
| 41 | OUTC2/ | PROG |
| 42 | SEL 2 (See Note 2) | MISC SEL 2 |
| 43 | SEL 3 (See Note 2) | MISC SEL 3 |
| 44 | ADD SEL 0 (See Note 3) | ADD SEL 0 (See Note 3) |
| 45 | ADD SEL 1 (See Note 3) | ADD SEL 1 (See Note 3) |
| 46 | ADD SEL 2 (See Note 3 | ADD SEL 2 (See Note 3 |
| 47 | ADD SEL 3 (See Note 3) | ADD SEL 3 (See Note 3) |
| 48 | 5V COM | 5V COM |
| 49 | +5V | +5V |
| 50 | +5V | +5V |

**NOTE**

1. SEL DISABLE ON-OFF/ signal is wire wrapped to pin 36 when an output board requires pin 35 output current checking. This function is used with the lamp drive outputs to permit hot and cold filament tests.

2. SEL 1 is wire wrapped to SEL 2 to select the lower data bus. SEL 1 is wire wrapped to SEL 3 to select the upper data bus. This is only for the Vital output boards.

3. Pins are wire wrapped to 5V COM as required for the board address.

Table 3–4. Motherboard Power Supply Interface

| Power Supply Connections | Terminal Labels | Motherboard Pins Connected |
|---|---|---|
| Filtered 5 Volt | TS1, TS3 | 1, 2, 49, 50 |
| Common | TS2, TS4 | 3, 10, 15, 22, 31, 38, 48 |

Split and Continuous Backplanes - Split backplane terminals (TS1 through TS4) are located between slots 5 and 6. Continuous backplane terminals are located as follows: TS1 between slots 6 and 7, TS2 between slots 5 and 6, TS3 between slots 4 and 5, and TS4 between slots 3 and 4.

Grounding Considerations for all Chassis - The Filter Board (31166-490-01) is grounded to the chassis via its mounting hardware. The Motherboard (P/N 59473-743-01 or P/N 31166-166-01) is also grounded to the chassis via its mounting hardware. Each chassis is also grounded to the rack shelf. The rack is then connected to earth ground.

## 3.12. FILTER BOARD, 5V, P/N 31166-490-01

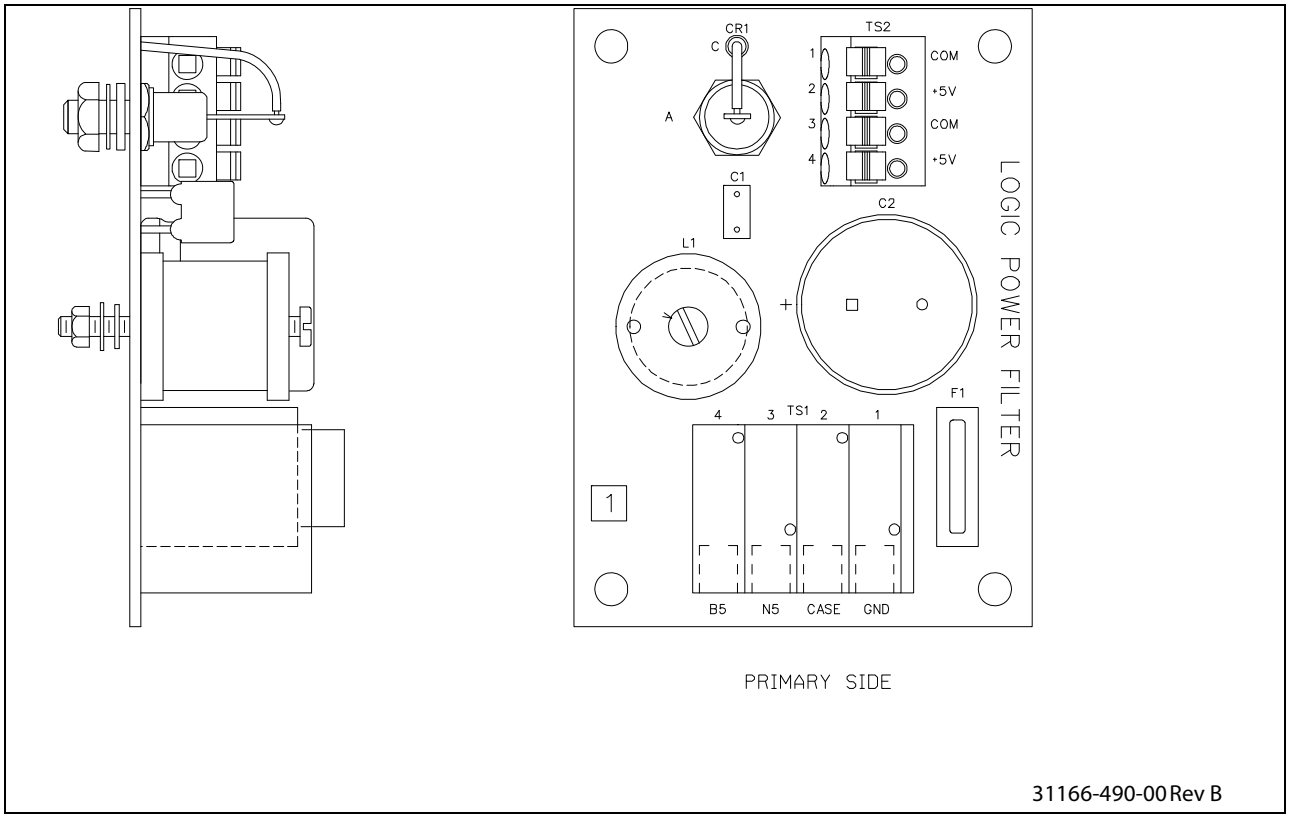


Figure 3–11. Filter Board, 5V, P/N 31166-490-01

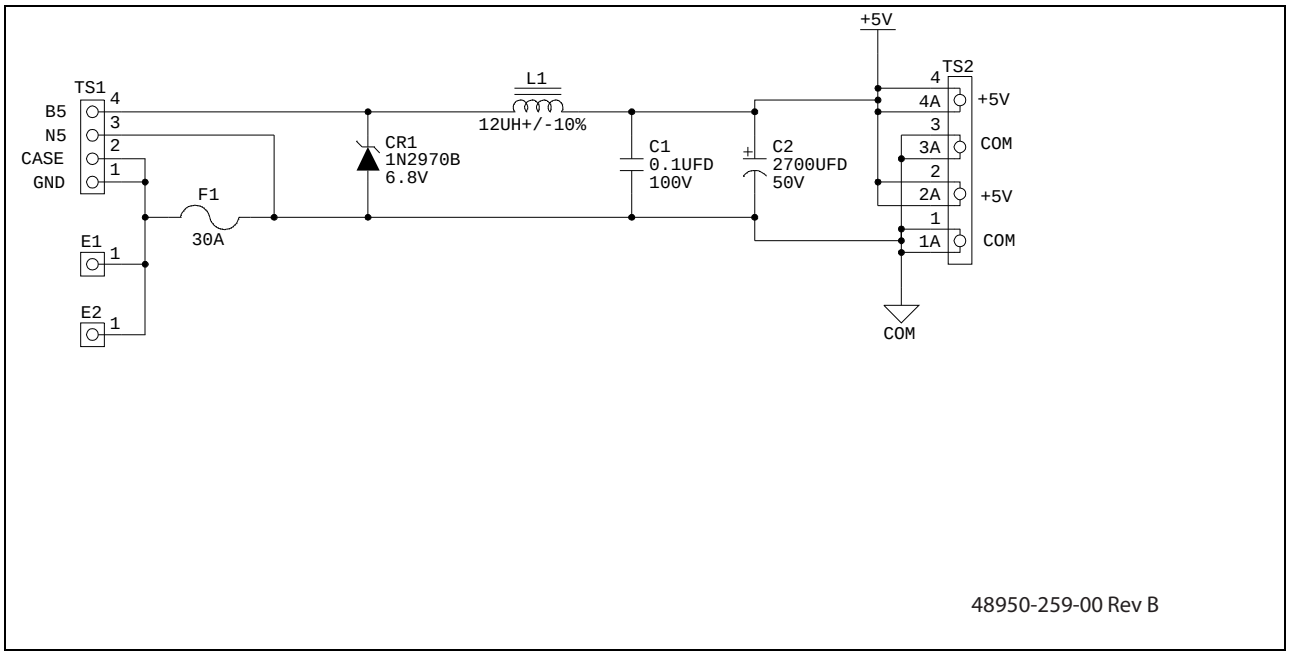


Figure 3–12. Circuit, Filter Board, 5V, P/N 31166-490-01

## 3.13. CABLE, BOARD EDGE CONNECTOR, P/N 38216-392-01 THRU -06

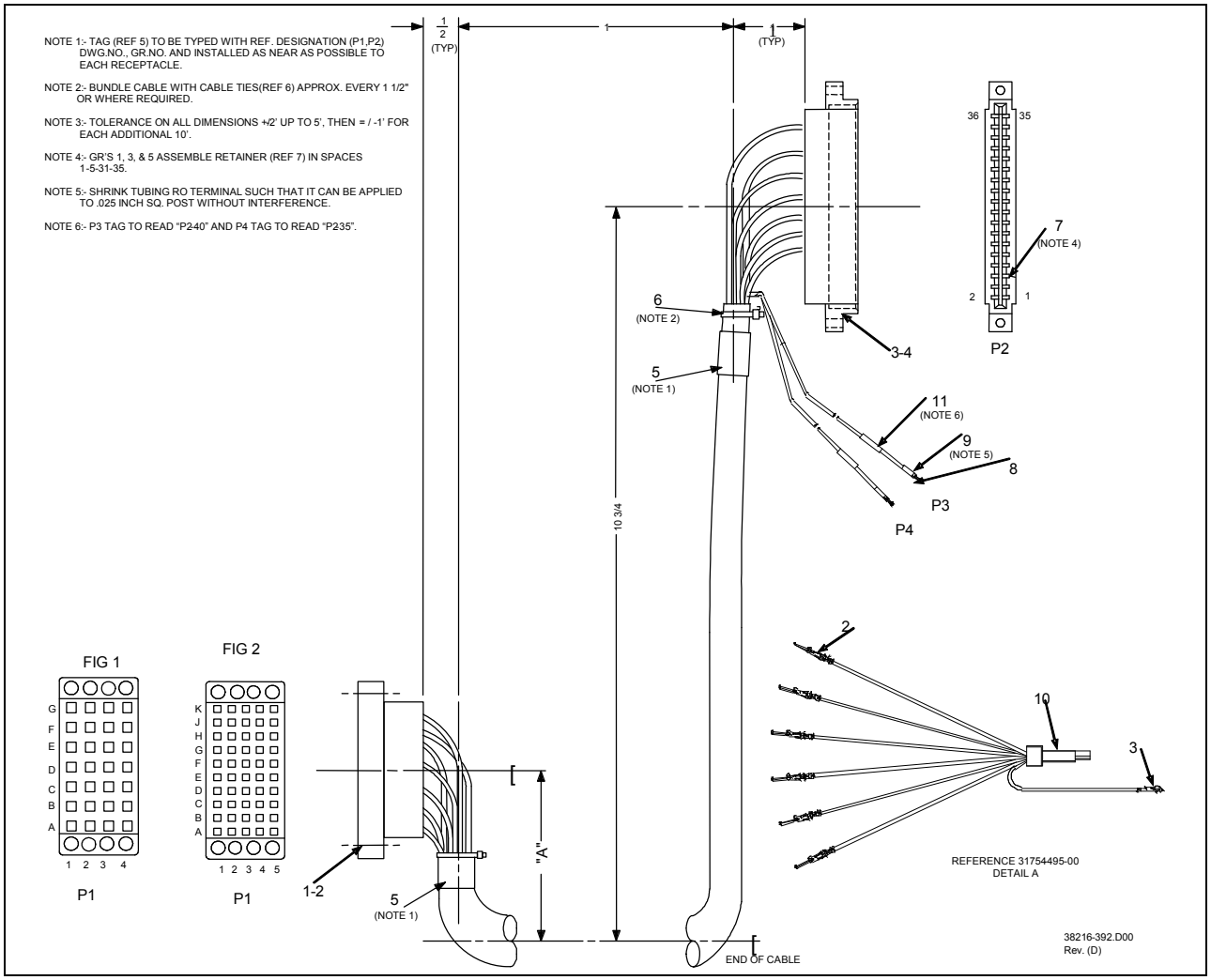


Figure 3–13. Cable, Board Edge Connector, P/N 38216-392-01 thru -06

| FROM P1- | WIRE | TO P2- | FROM P1- | WIRE | TO P2- |
|---|---|---|---|---|---|
| C1 | | 1 | F4 | | 22 |
| B5 | | 2 | C4 | | 23 |
| C3 | | 3 | F5 | | 24 |
| D1 | | 4 | A2 | | 25 |
| C5 | | 5 | G1 | | 26 |
| D3 | | 6 | A3 | | 27 |
| D2 | | 7 | G2 | | 28 |
| D5 | | 8 | A5 | | 29 |
| E5 | | 9 | G3 | | 30 |
| E2 | | 10 | B1 | | 31 |
| E1 | | 11 | G4 | | 32 |
| E3 | | 12 | B3 | | 33 |
| A1 | | 13 | G5 | | 34 |
| E4 | | 14 | B4 | | 35 |
| D4 | | 15 | H1 | | 36 |
| F1 | | 16 | | | |
| C2 | | 17 | | | |
| F2 | | 18 | | | |
| A4 | | 19 | | | |
| F3 | | 20 | | | |
| B2 | | 21 | | | |

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Rev. (C)

Figure 3–14. Wire Tables for Cables, P/N 38216-392-01 thru -06

## 3.14. CABLE, NON-VITAL I/O, P/N 38216-393-01 THRU -03

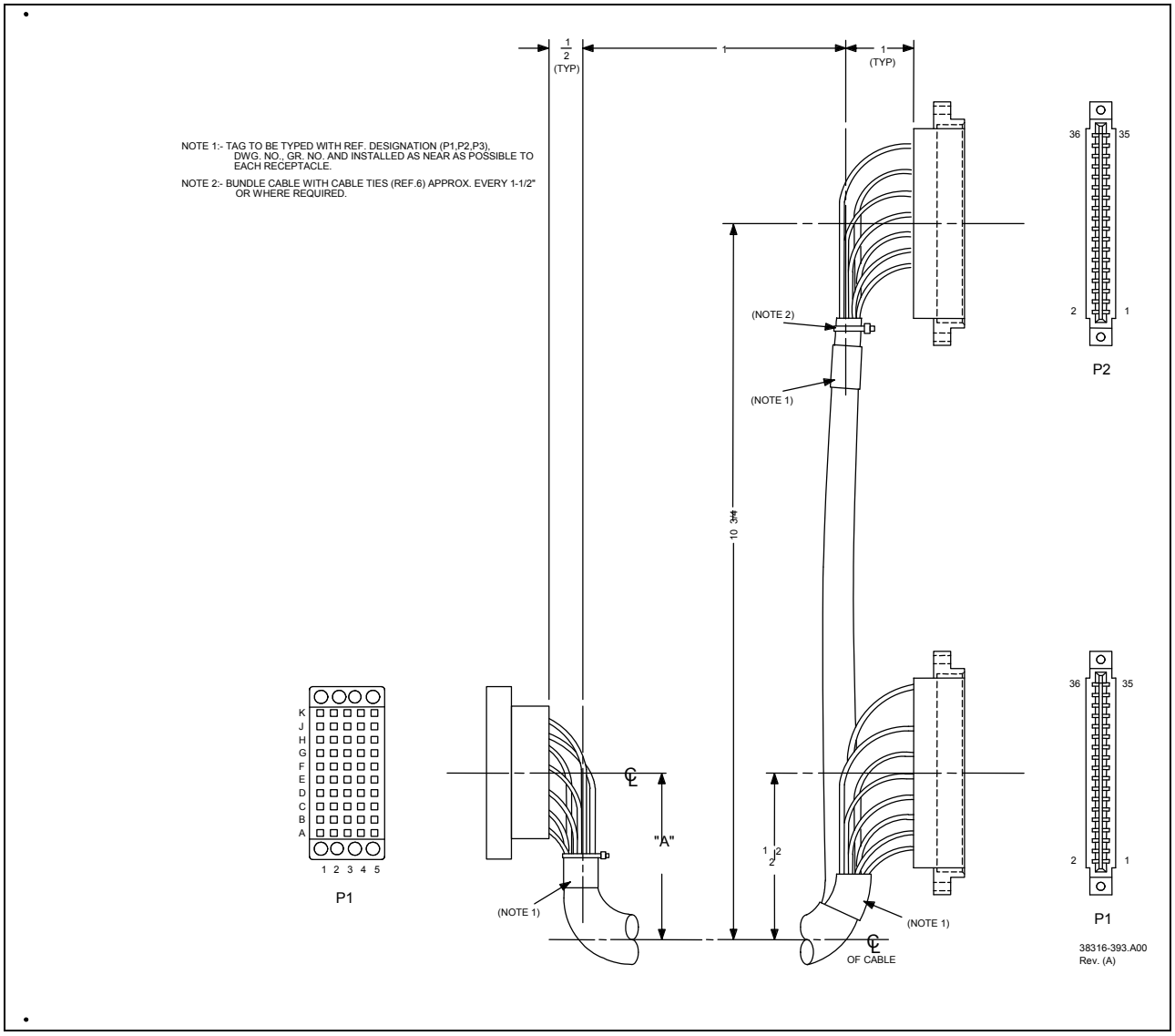


Figure 3–15. Cable, Non-Vital I/O, P/N 38216-393-01 thru -03

| FROM P1- | WIRE | TO P2- | FROM P1- | WIRE | TO P3- |
|---|---|---|---|---|---|
| K1 | —— | 34 | K3 | —— | 34 |
| J1 | —— | 32 | J3 | —— | 32 |
| H1 | —— | 30 | H3 | —— | 30 |
| G1 | —— | 29 | G3 | —— | 29 |
| F1 | —— | 26 | F3 | —— | 26 |
| E1 | —— | 25 | E3 | —— | 25 |
| D1 | —— | 22 | D3 | —— | 22 |
| C1 | —— | 21 | C3 | —— | 21 |
| A1 | —— | 35 | A3 | —— | 35 |
| B1 | —— | 36 | B3 | —— | 36 |
| K2 | —— | 18 | K4 | —— | 18 |
| J2 | —— | 17 | J4 | —— | 17 |
| H2 | —— | 14 | H4 | —— | 14 |
| G2 | —— | 13 | G4 | —— | 13 |
| F2 | —— | 10 | F4 | —— | 10 |
| E2 | —— | 9 | E4 | —— | 9 |
| D2 | —— | 6 | D4 | —— | 6 |
| C2 | —— | 5 | C4 | —— | 5 |
| A2 | —— | 19 | A4 | —— | 19 |
| B2 | —— | 20 | B4 | —— | 20 |

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Rev. (B)

Figure 3–16. Wire Tables for Cables, P/N 38216-393-01, -02 and -03

## 3.15. CABLE, VITAL I/O, P/N 38216-394-01 THRU -03

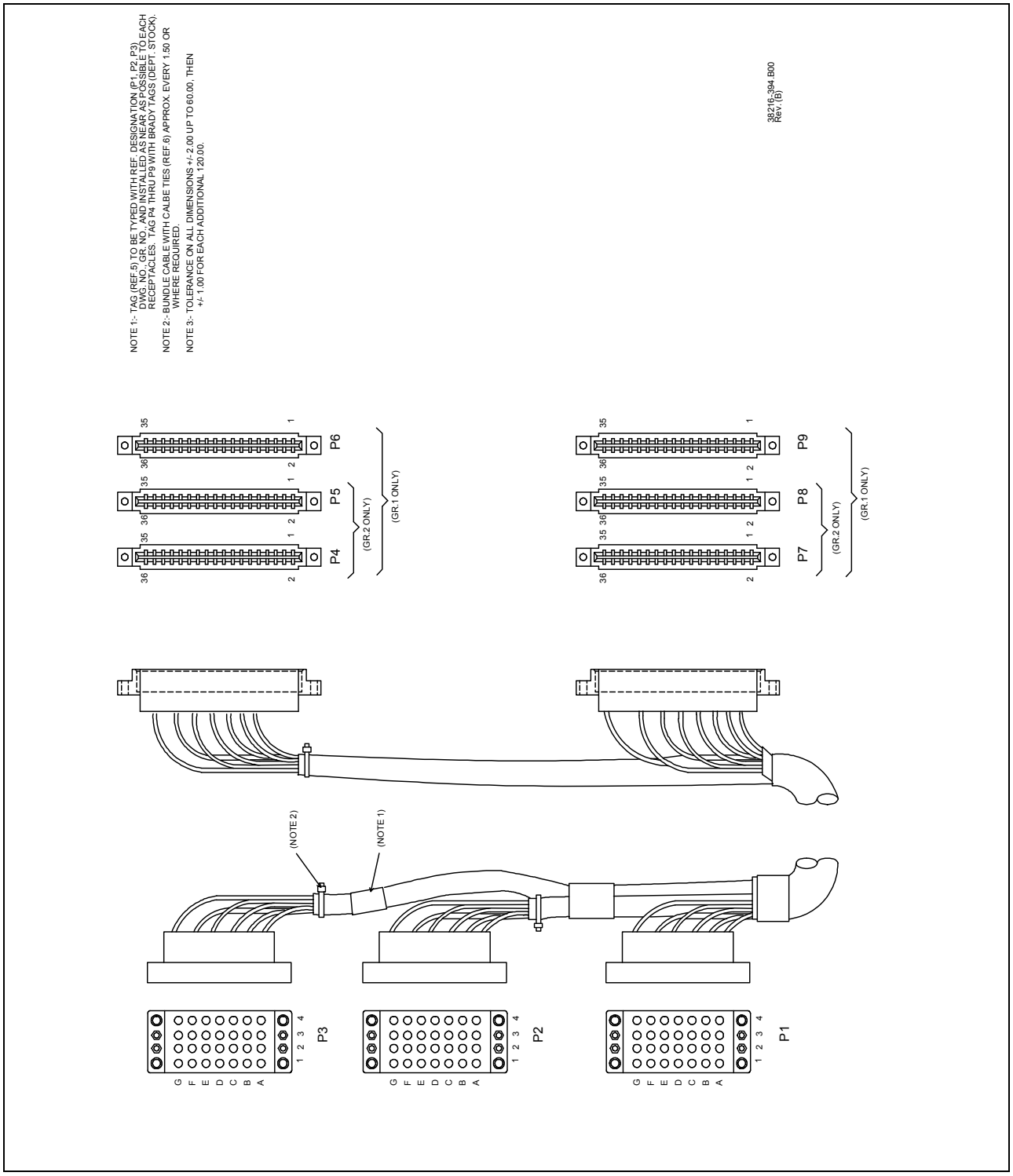



Figure 3–17. Cable, Vital I/O, P/N 38216-394-01 thru -03

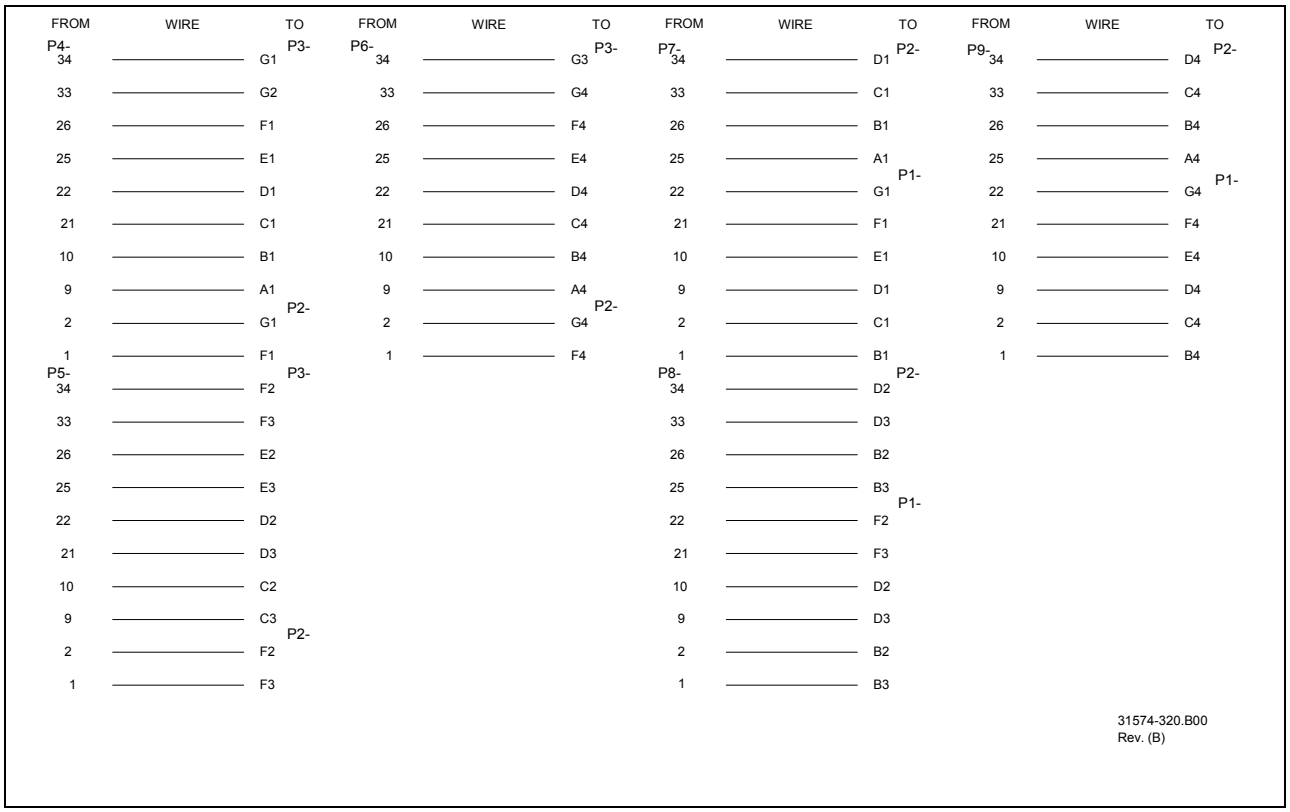



Figure 3–18. Wire Tables for Cable, P/N 38216-394-01

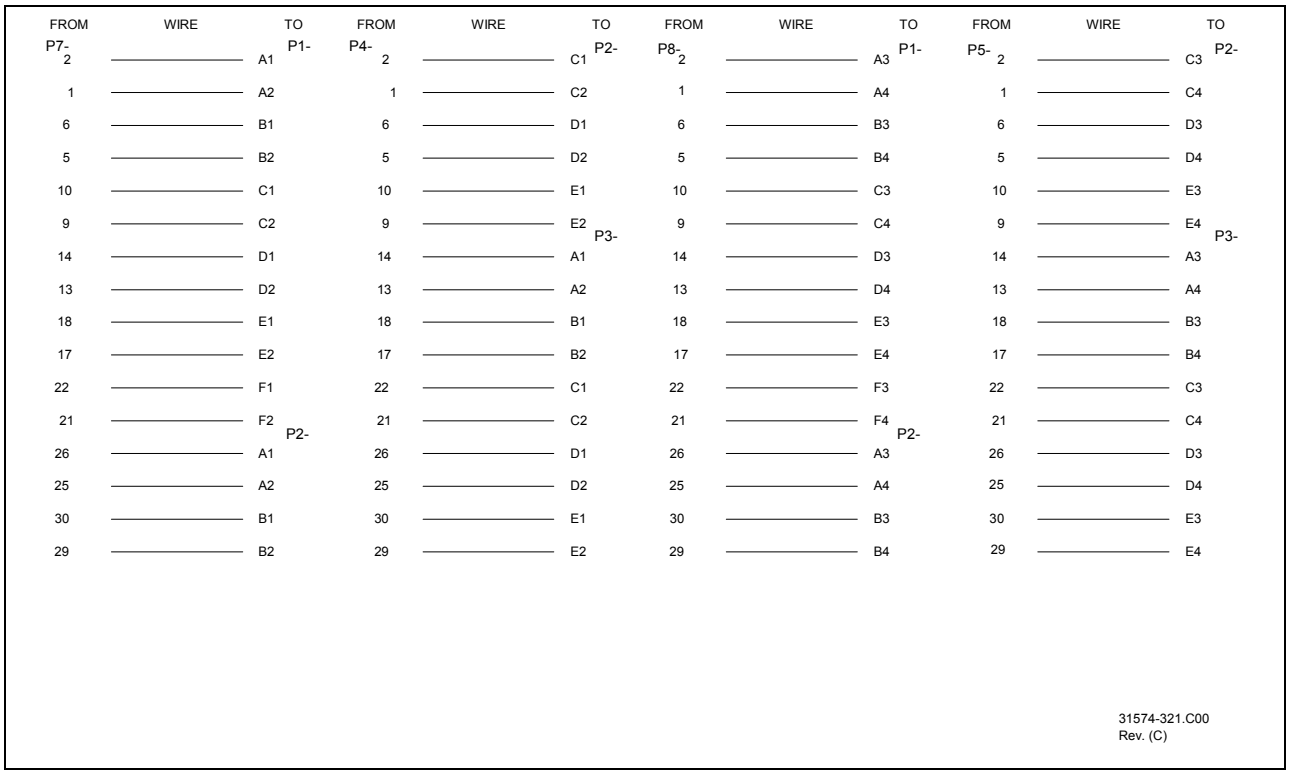



Figure 3–19. Wire Tables for Cable, P/N 38216-394-02

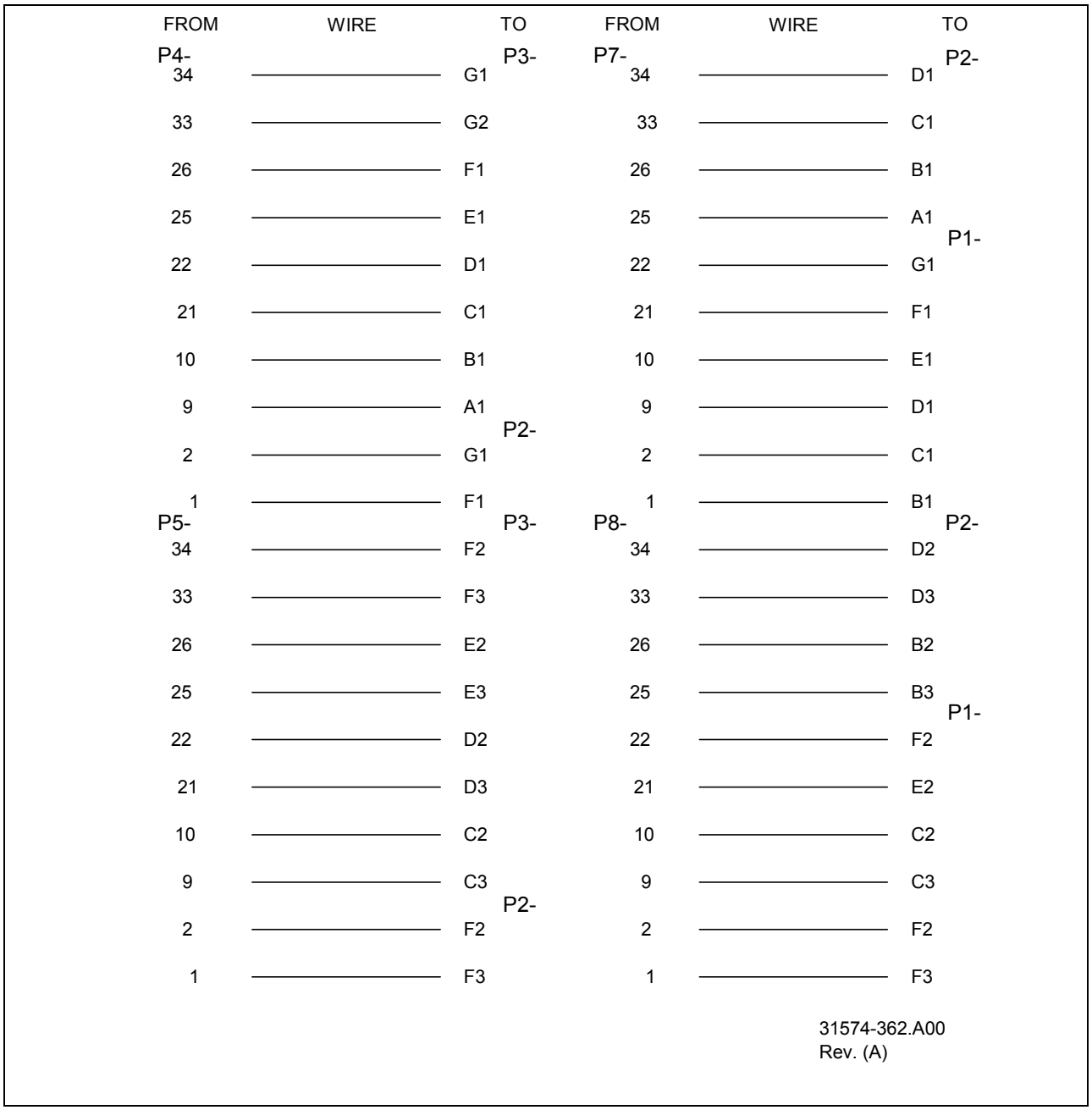



Figure 3–20. Wire Tables for Cable, P/N 38216-394-03

## 3.16. CABLE, SYSTEM BUS, P/N 38216-395-01 THRU -10

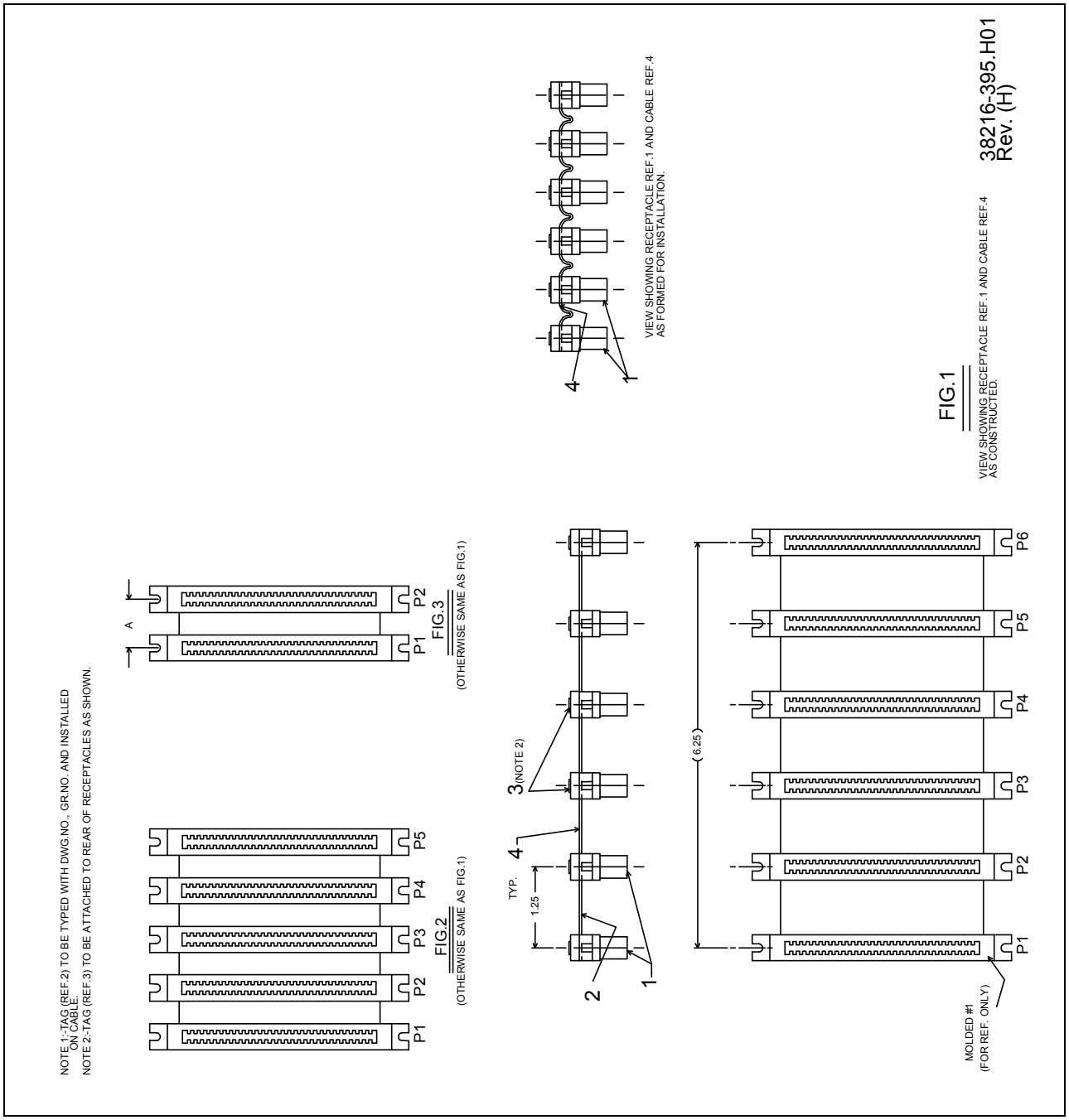



Figure 3–21. Cable, System Bus, P/N 38216-395-01 thru -10 (Sheet 1 of 2)

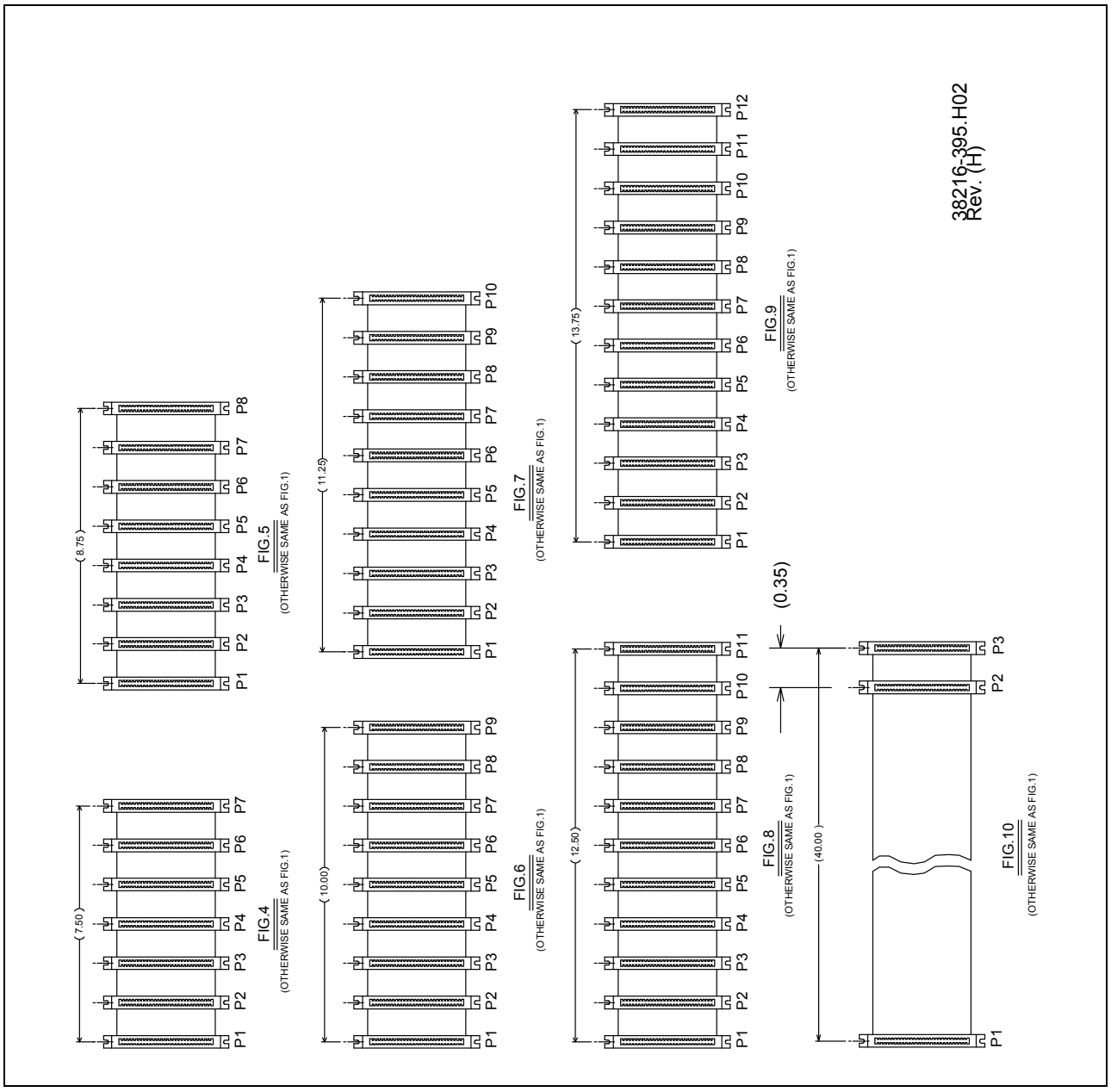



Figure 3–21. Cable, System Bus, P/N 38216-395-01 thru -10 (Sheet 2 of 2)

## 3.17. CABLE, MODULE TO MODULE, P/N 38216-403-01

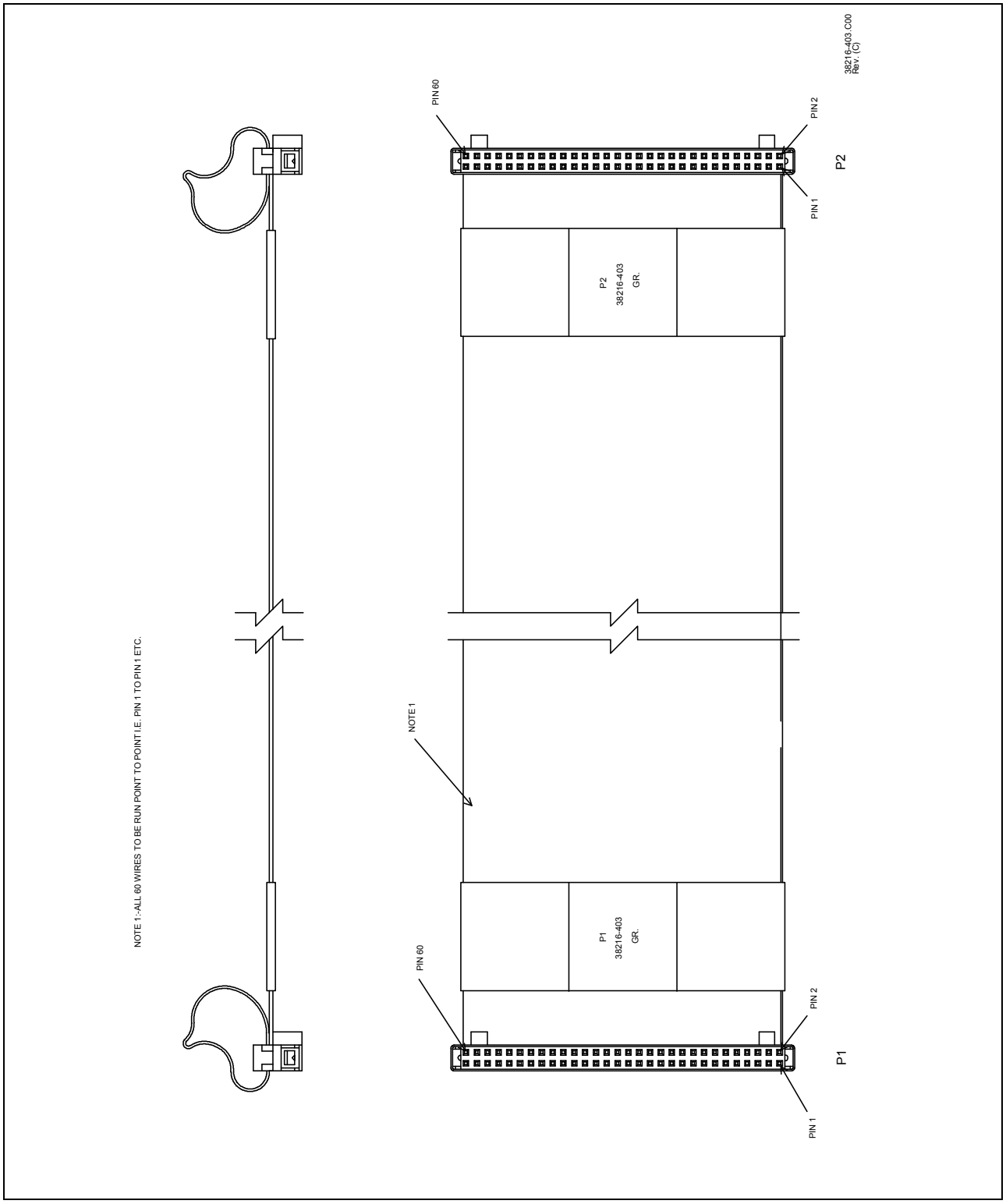



Figure 3–22. Cable, Module to Module, P/N 38216-403-01

## 3.18. CABLE, EXPANSION, P/N 38216-404-01 THRU -08

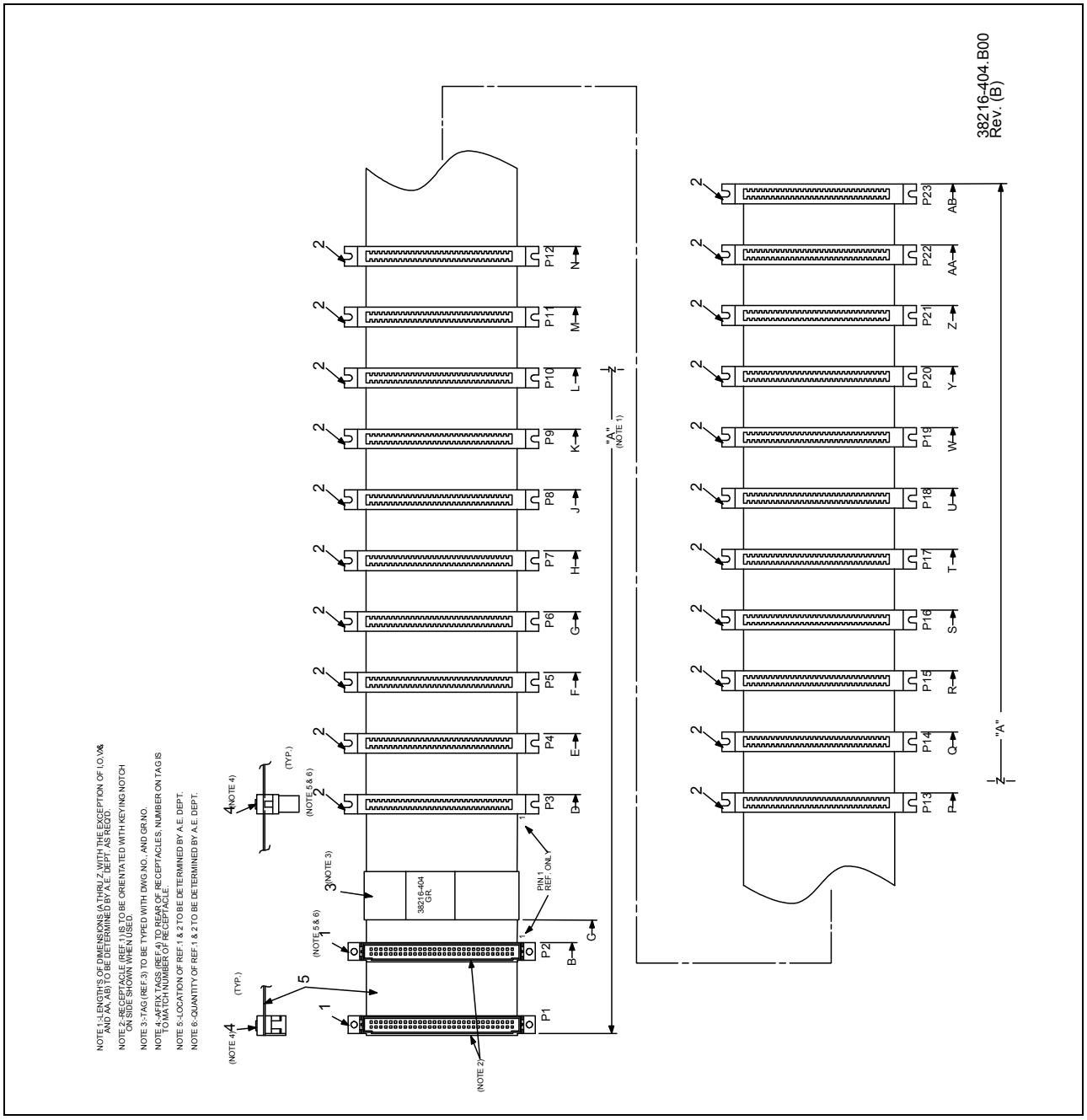



Figure 3–23. Cable, Expansion, P/N 38216-404-01 thru -08

## 3.19. CABLE, NON-VITAL I/O, P/N 38216-497-01 THRU -03

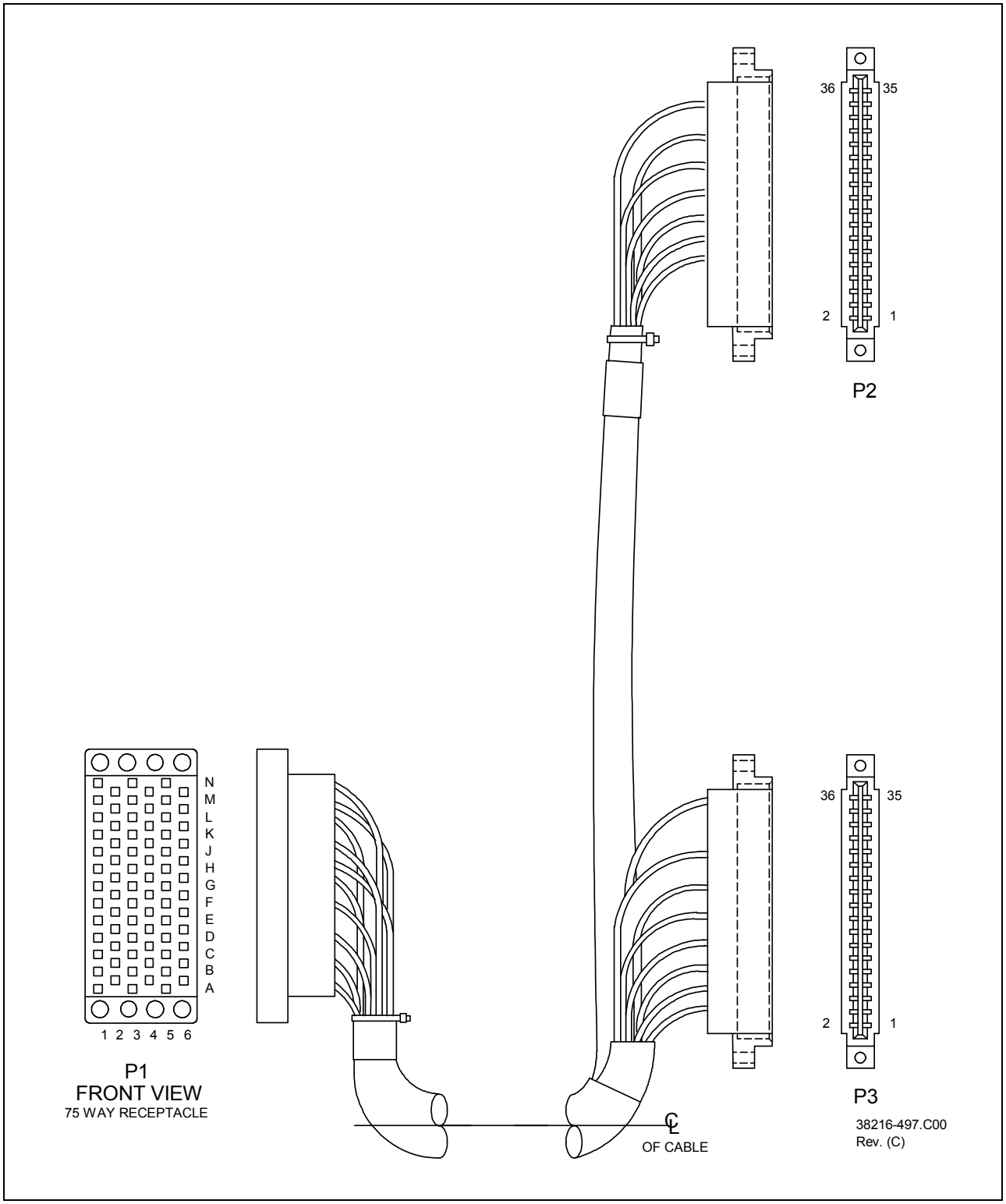



Figure 3–24. Cable, Non-Vital I/O, P/N 38216-497-01 thru -03

| FROM | WIRE | TO | FROM | WIRE | TO | FROM | WIRE | TO | FROM | WIRE | TO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P2-1 | | G1 P1- | P2-19 | | K1 P1- | P3-1 | | A1 P1- | P3-19 | | D1 P1- |
| 2 | | G2 | 20 | | K2 | 2 | | A2 | 20 | | D2 |
| 3 | | G3 | 21 | | K3 | 3 | | A3 | 21 | | D3 |
| 4 | | G4 | 22 | | K4 | 4 | | A4 | 22 | | D4 |
| 5 | | G5 | 23 | | K5 | 5 | | A5 | 23 | | D5 |
| 6 | | G6 | 24 | | K6 | 6 | | A6 | 24 | | D6 |
| 7 | | H1 | 25 | | L1 | 7 | | B1 | 25 | | E1 |
| 8 | | H2 | 26 | | L2 | 8 | | B2 | 26 | | E2 |
| 9 | | H3 | 27 | | L3 | 9 | | B3 | 27 | | E3 |
| 10 | | H4 | 28 | | L4 | 10 | | B4 | 28 | | E4 |
| 11 | | H5 | 29 | | L5 | 11 | | B5 | 29 | | E5 |
| 12 | | H6 | 30 | | L6 | 12 | | B6 | 30 | | E6 |
| 13 | | J1 | 31 | | M1 | 13 | | C1 | 31 | | F1 |
| 14 | | J2 | 32 | | M2 | 14 | | C2 | 32 | | F2 |
| 15 | | J3 | 33 | | M3 | 15 | | C3 | 33 | | F3 |
| 16 | | J4 | 34 | | M4 | 16 | | C4 | 34 | | F4 |
| 17 | | J5 | 35 | | M5 | 17 | | C5 | 35 | | F5 |
| 18 | | J6 | 36 | | M6 | 18 | | C6 | 36 | | F6 |

31574-435.A00
Rev. (A)

Figure 3–25. Wire Tables for Cable, P/N 38216-497-01 thru –03

## 3.20. CONNECTOR, PLUG, 14-WAY, P/N 58920-113-00

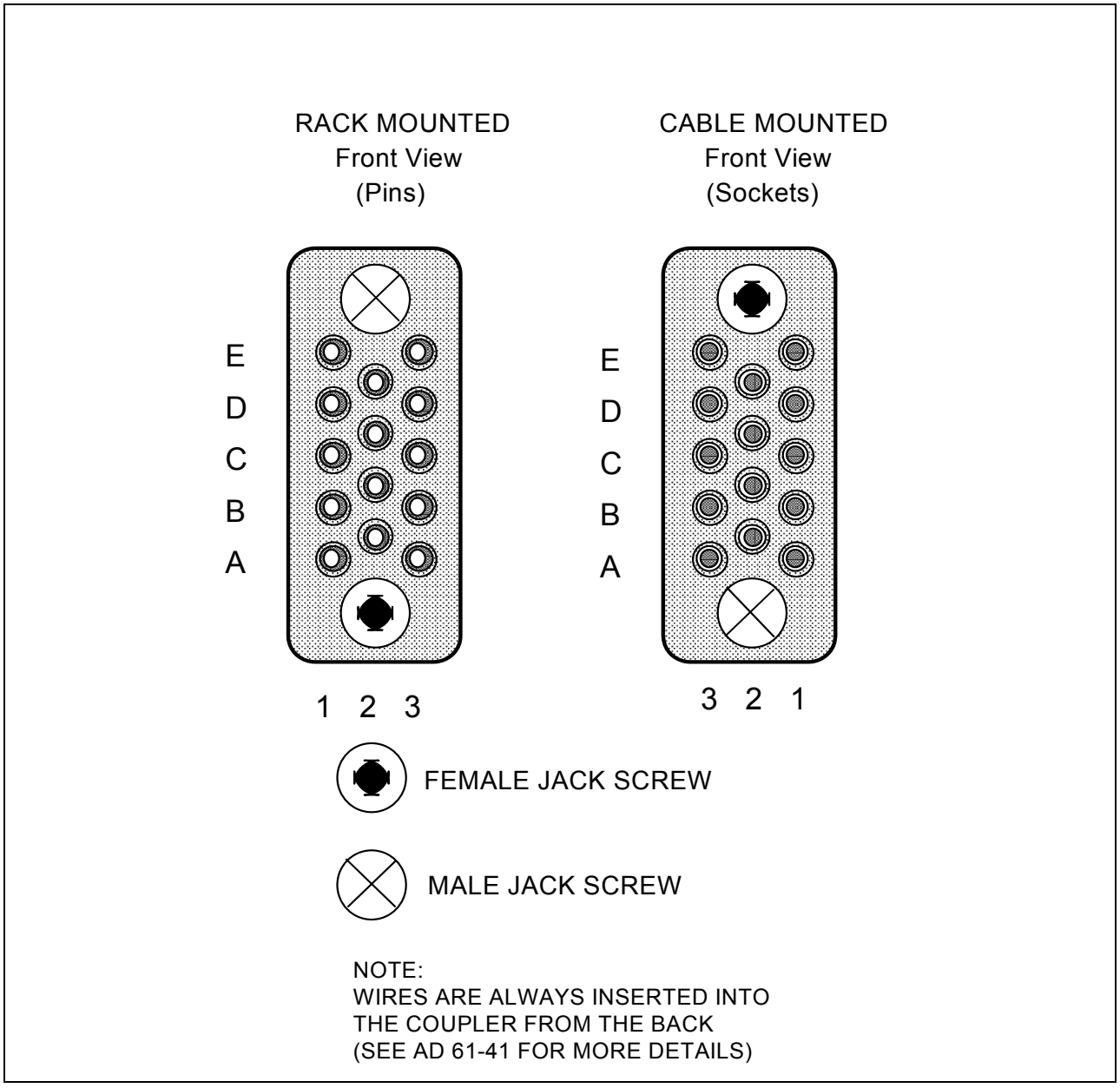



Figure 3–26. Connector, Plug, 14-Way, P/N 58920-113-00

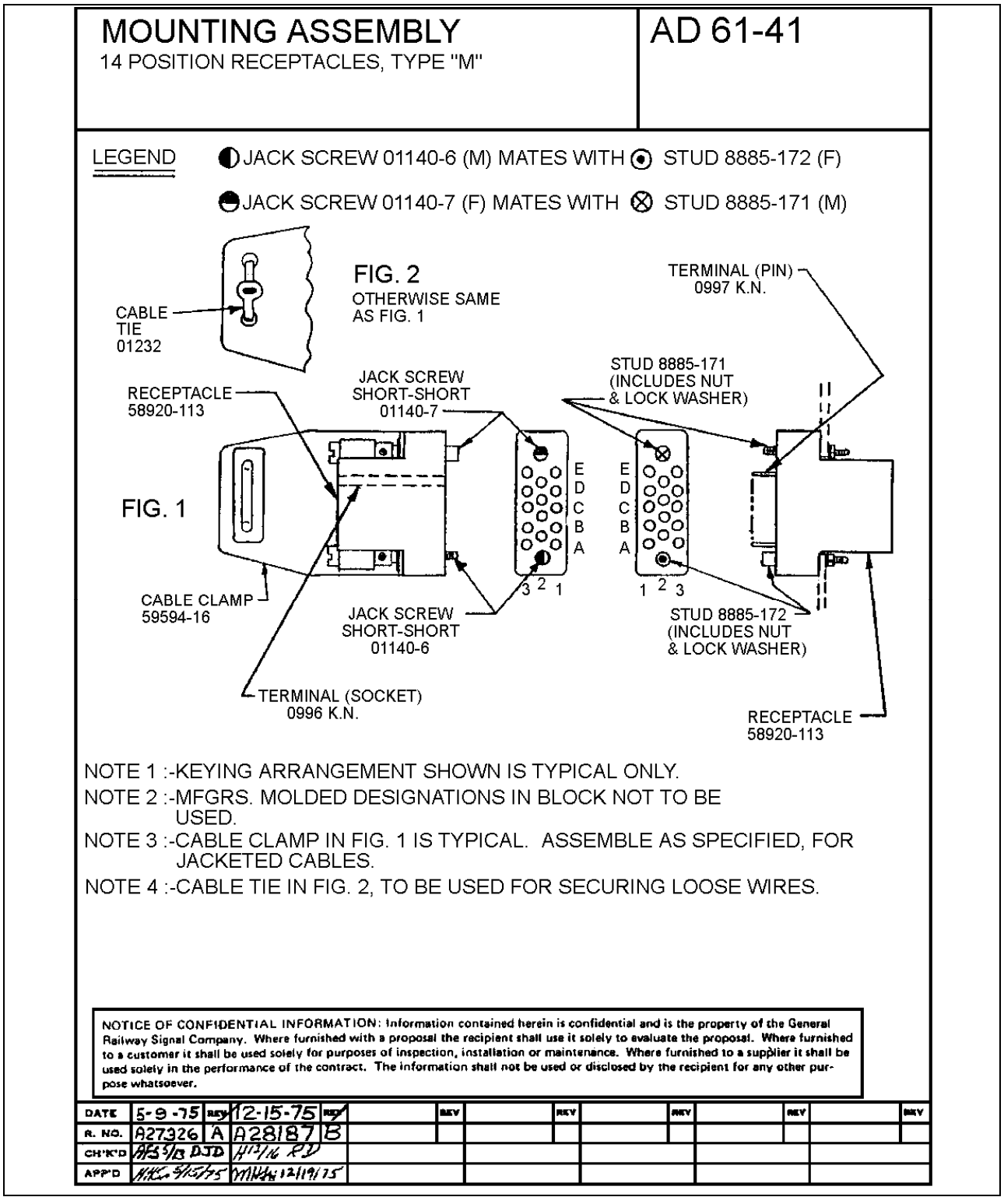



Figure 3–27. Connector, Plug, 14-Way Mounting Assembly, AD61-41

## 3.21. CONNECTOR, PLUG, 28-WAY, P/N 58920-124-00

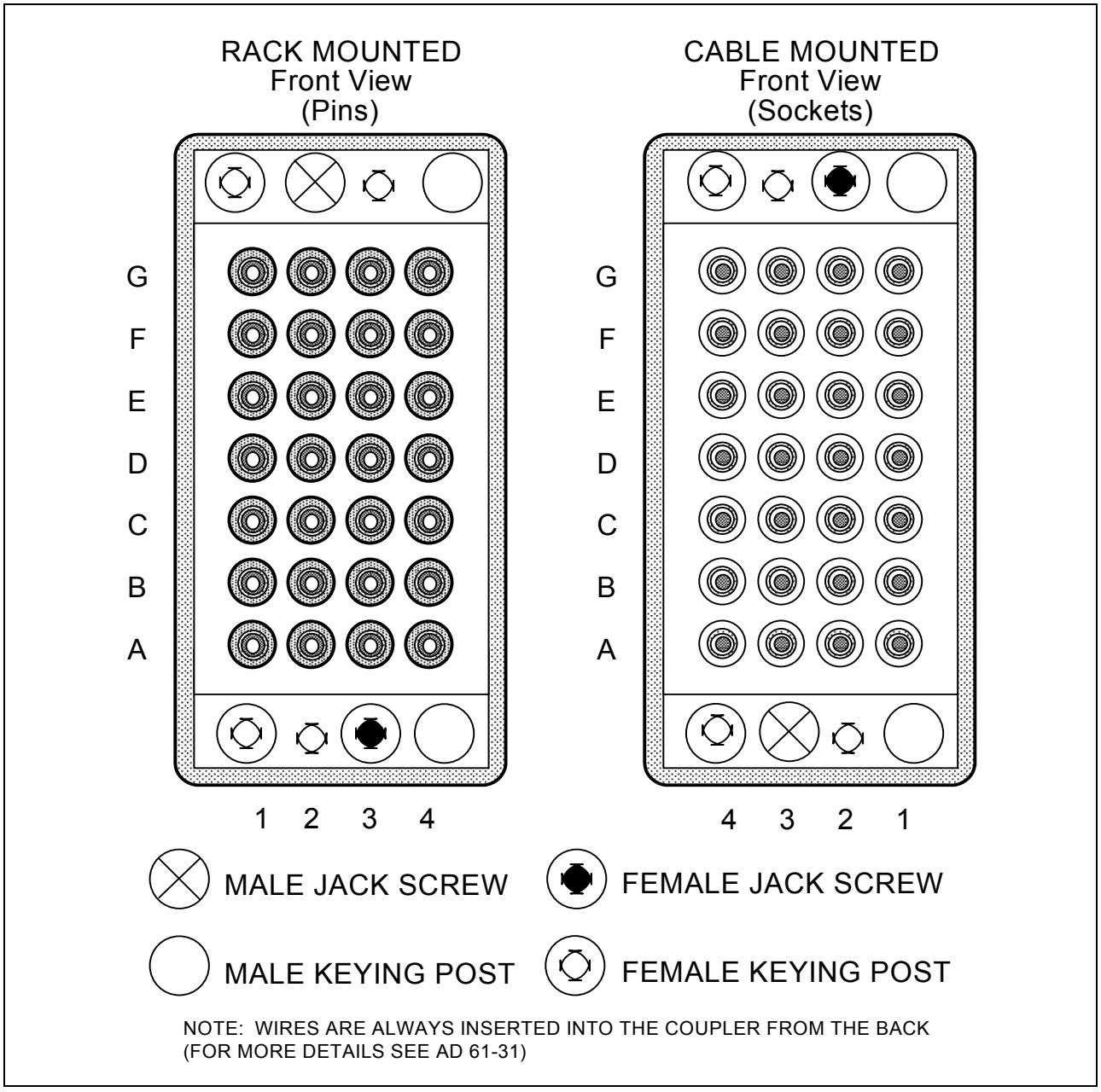



Figure 3–28. Connector, Plug, 28-Way, P/N 58920-124-00

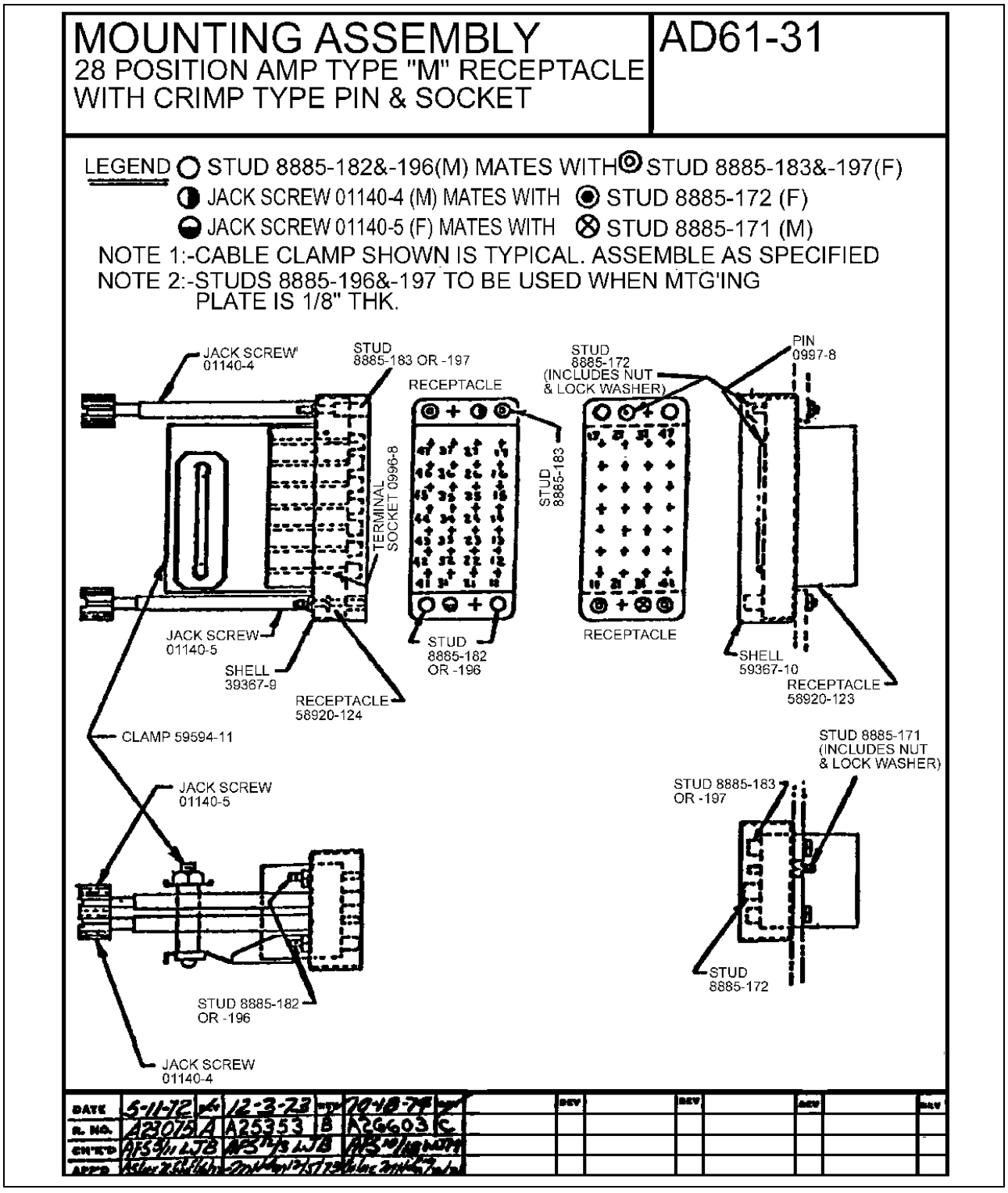



Figure 3–29. Connector, Plug, 28-Way, Mounting Assembly, AD61-31

## 3.22. CONNECTOR, PLUG, 50-WAY, P/N 58920-112-00

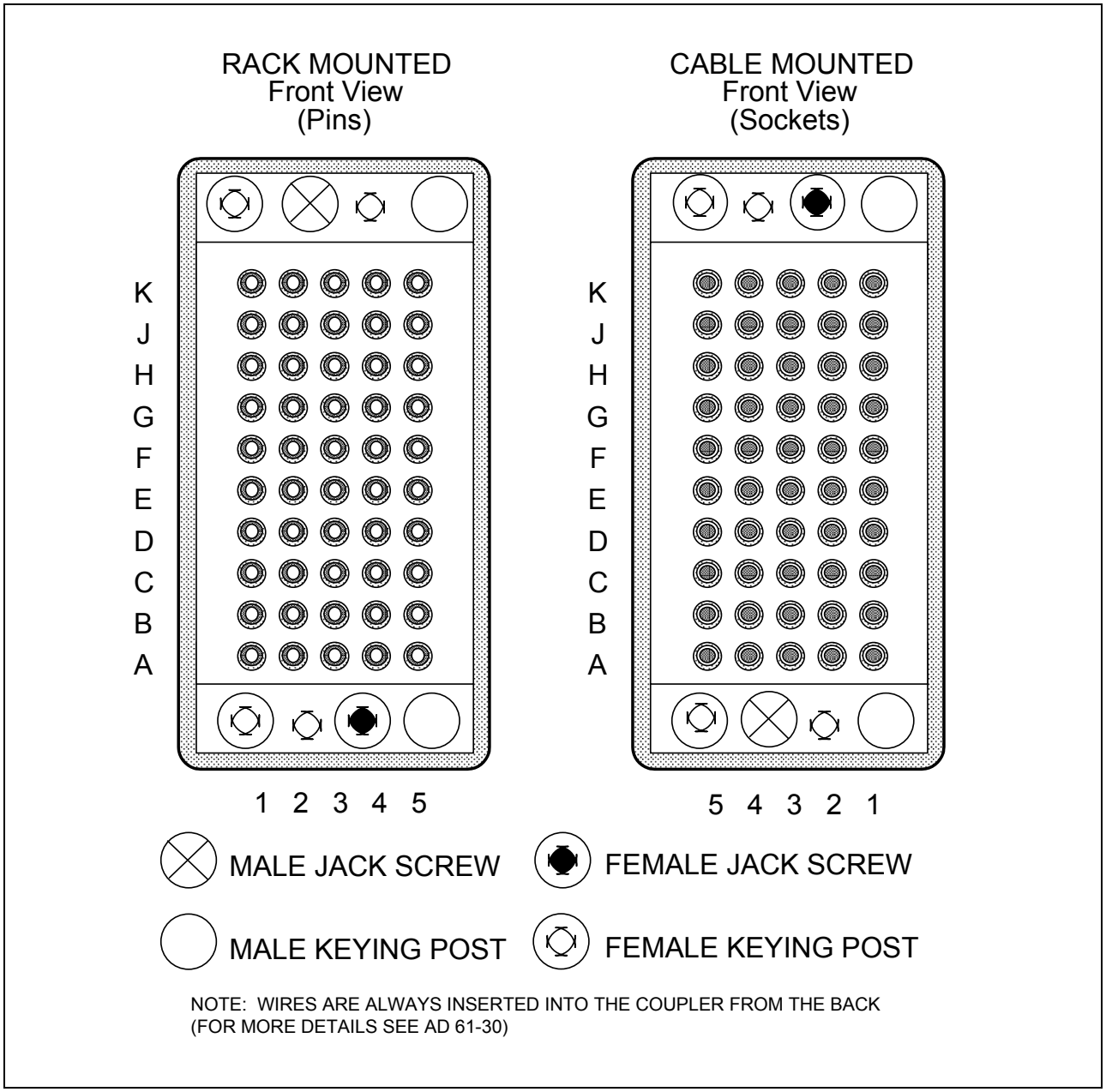



Figure 3–30. Connector, Plug, 50-Way, P/N 58920-112-00

## 3.23. CONNECTOR, PLUG, 75-WAY, P/N 58920-116-00

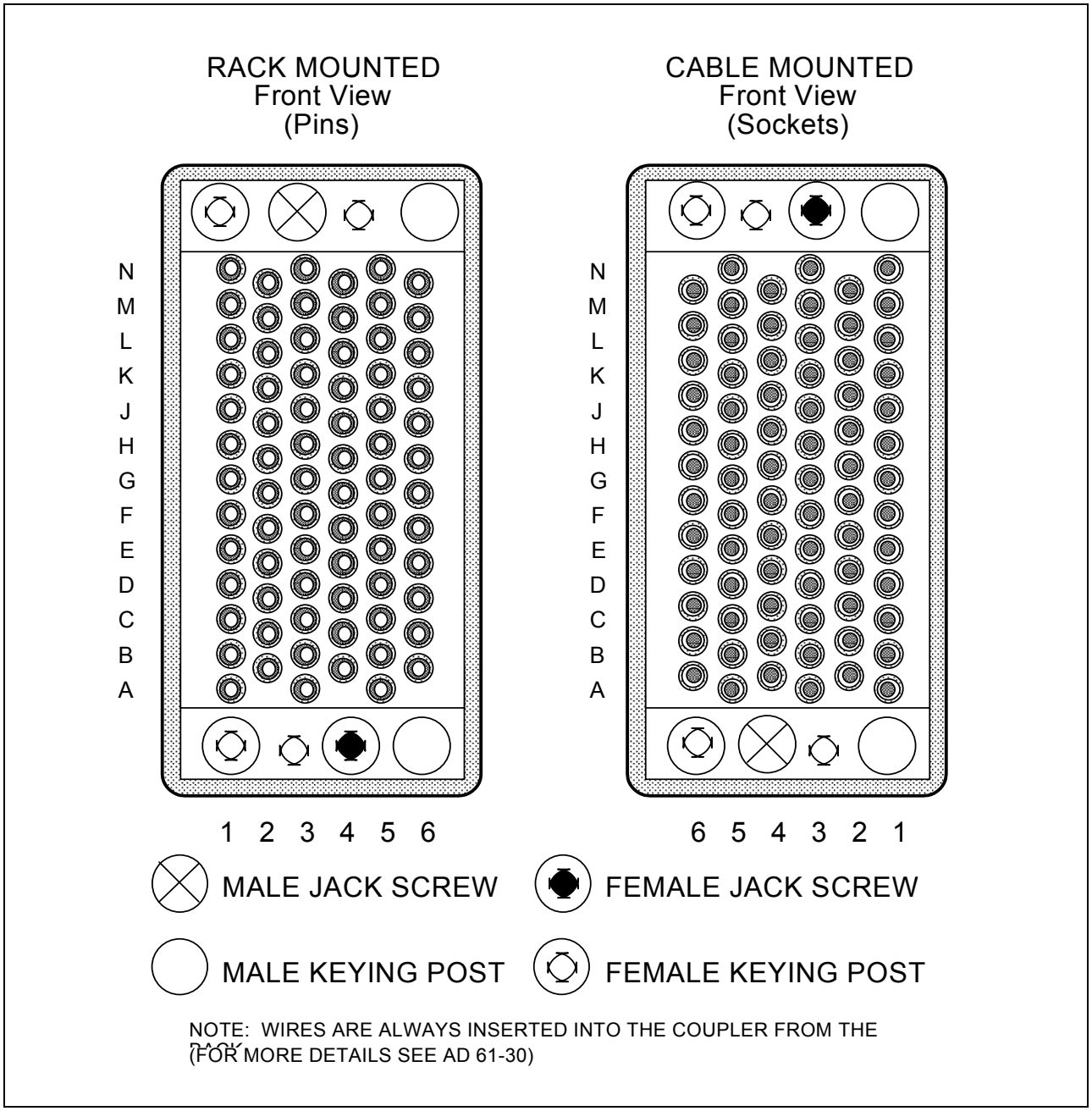



Figure 3–31. Connector, Plug, 75-Way, P/N 58920-116-00

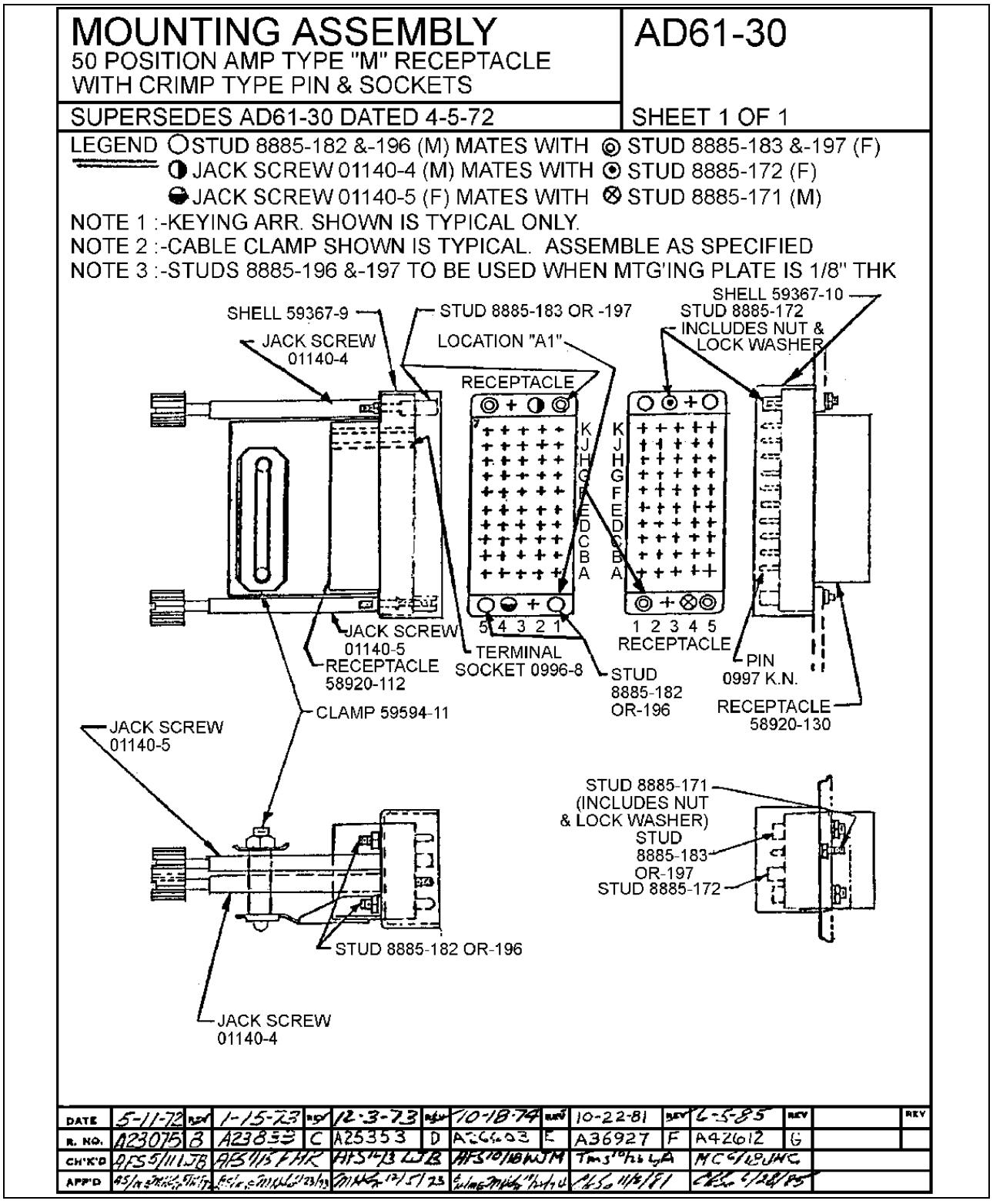



Figure 3–32. Connector, Plug, 50-Way and 75-Way, Mounting Assembly, AD61-30

## 3.24. RECEPTACLE KEYING PLAN FOR SYSTEM MODULE, P/N 31038-249-00

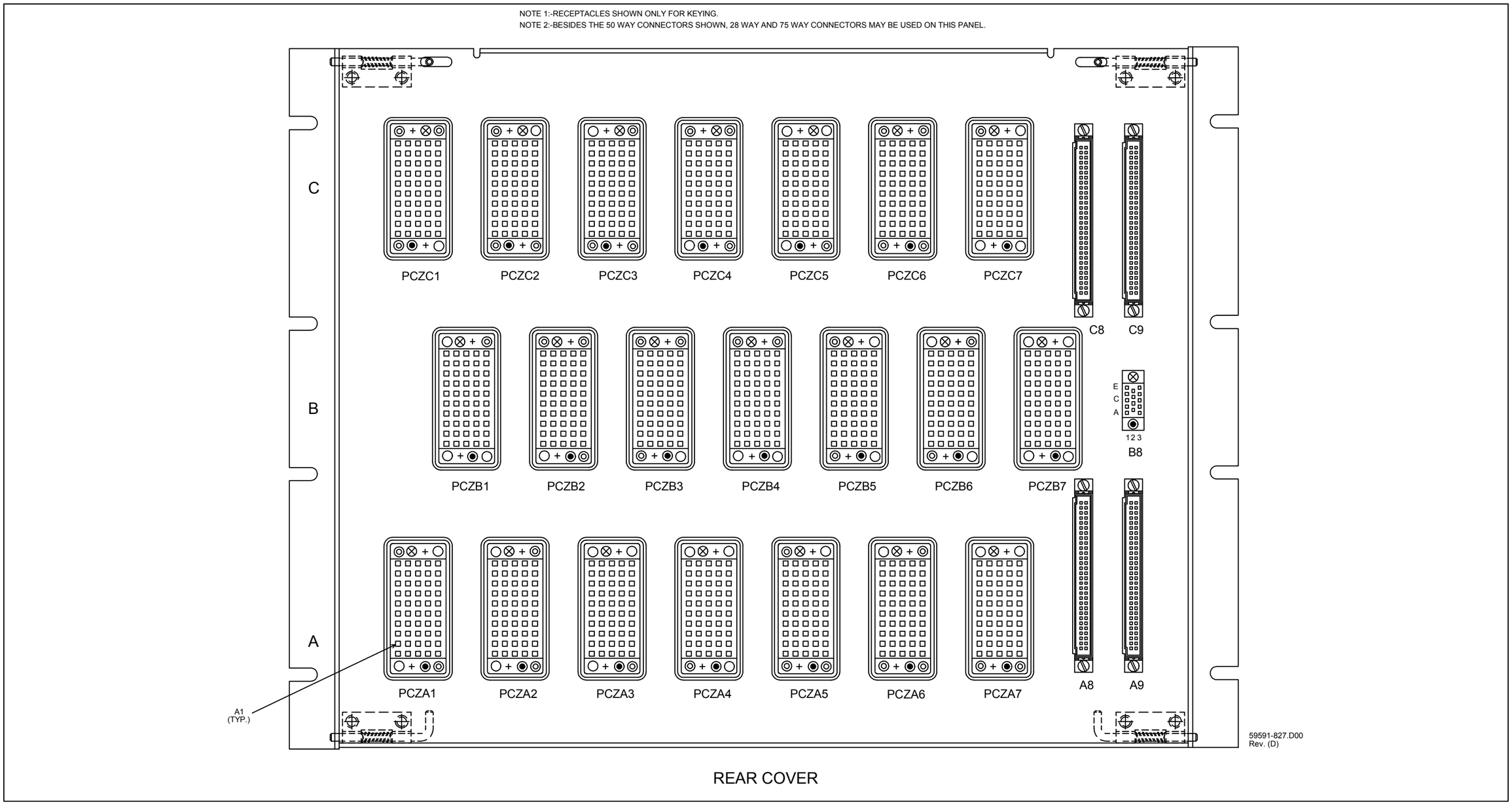



Figure 3–33. Receptacle Keying Plan for System Module, P/N 31038-249-00

## 3.25. 28-WAY CONNECTOR COMPLETE, P/N 42758-127-01 THRU -25

NOTE 1:- REFER TO AD61-31 FOR ASSEMBLY U-BOLT SHALL FACE CENTER OF CONNECTOR BLOCK. NUTS & U-BOLT THD. ENDS SHALL BE WITHIN OVERALL CONNECTOR.

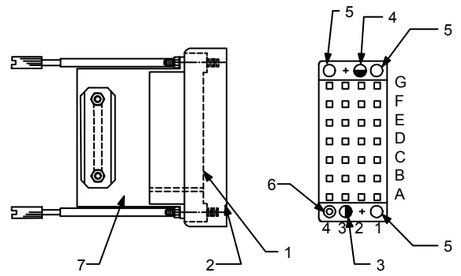



FIG. 1

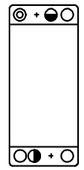


FIG. 2

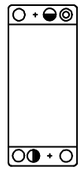


FIG. 3

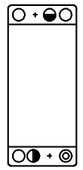


FIG. 4

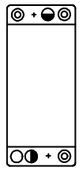


FIG. 5

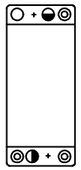


FIG. 6

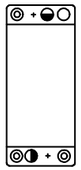


FIG. 7

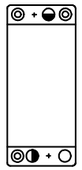


FIG. 8

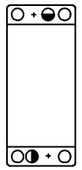


FIG. 9

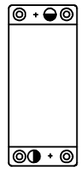


FIG. 10

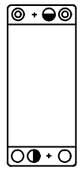


FIG. 11

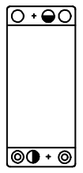


FIG. 16

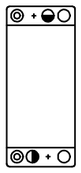


FIG. 17

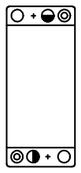


FIG. 18

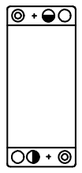


FIG. 19

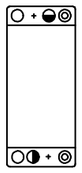


FIG. 20

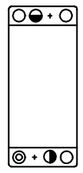


FIG. 21

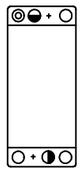


FIG. 22

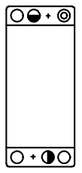


FIG. 23

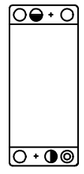


FIG. 24

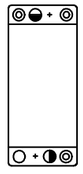


FIG. 25

42758-127.A00
Rev. (A)

Figure 3–34. 28-Way Connector Complete, P/N 42758-127-01 thru -25

## 3.26. 50-WAY CONNECTOR COMPLETE, P/N 42758-093-01 THRU -25

NOTE 1:- REFER TO AD61-30 FOR ASSEMBLY U-BOLT SHALL FACE CENTER OF CONNECTOR BLOCK. NUTS & U-BOLT THD. ENDS SHALL BE WITHIN OVERALL CONNECTOR.

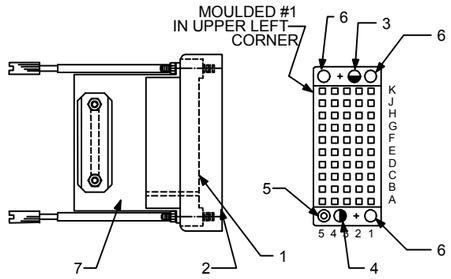



FIG. 1

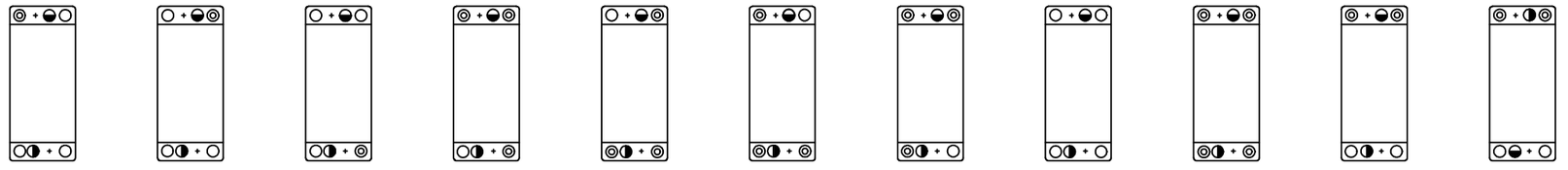


FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7 FIG. 8 FIG. 9 FIG. 10 FIG. 11 FIG. 12

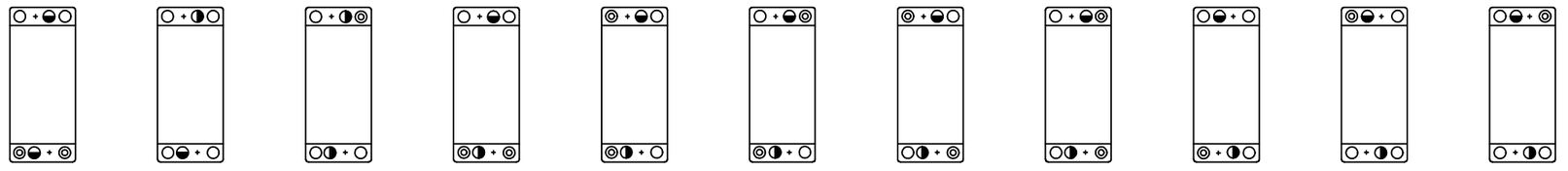


FIG. 13 FIG. 14 FIG. 15 FIG. 16 FIG. 17 FIG. 18 FIG. 19 FIG. 20 FIG. 21 FIG. 22 FIG. 23

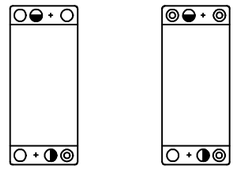


FIG. 24 FIG. 25

42758-093.C00
Rev. (C)

Figure 3–35. 50-Way Connector Complete, P/N 42758-093-01 thru -25

## 3.27. 75-WAY CONNECTOR COMPLETE, P/N 42758-134-01 THRU -25

NOTE 1:- REFER TO AD61-30 FOR ASSEMBLY. U-BOLT SHALL FACE CENTER OF CONNECTOR BLOCK. NUTS AND U-BOLT THD. ENDS SHALL BE WITHIN OVERALL CONNECTOR.

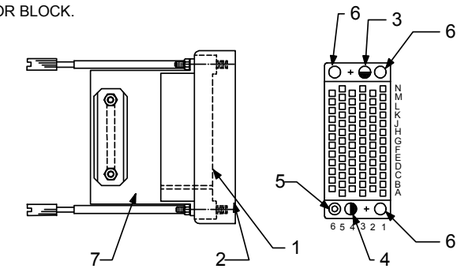



FIG. 1



FIG. 2

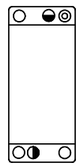


FIG. 3

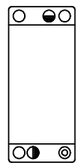


FIG. 4

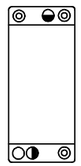


FIG. 5

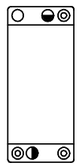


FIG. 6

FIG. 7

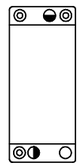


FIG. 8

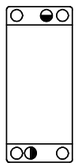


FIG. 9

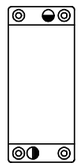


FIG. 10

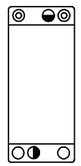


FIG. 11

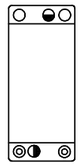


FIG. 16

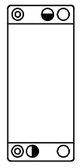


FIG. 17

FIG. 18

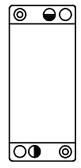


FIG. 19

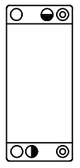


FIG. 20

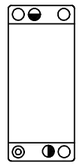


FIG. 21

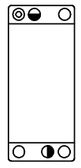


FIG. 22

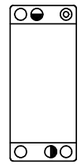


FIG. 23

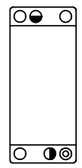


FIG. 24

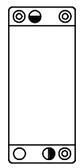
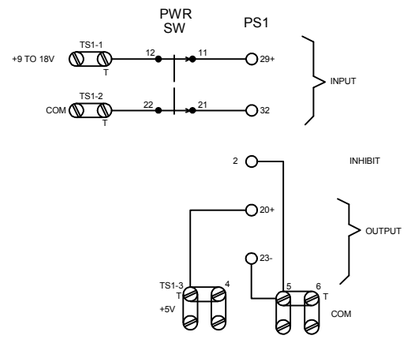


FIG. 25

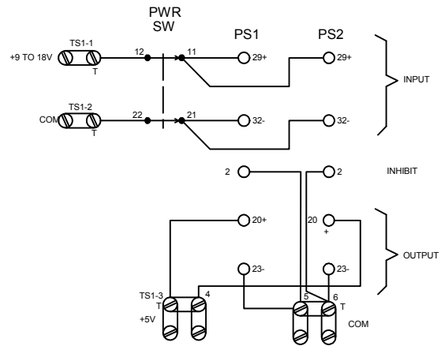
42758-134.A00
Rev. (A)

Figure 3–36. 75-Way Connector Complete, P/N 42758-134-01 thru -25

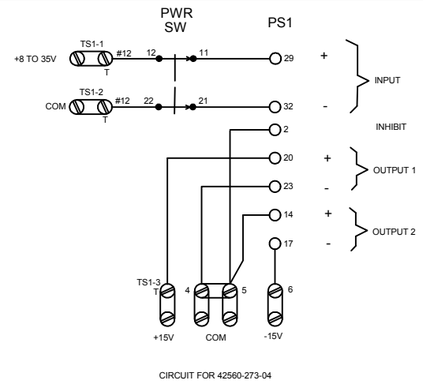
## 3.28. DC/DC CONVERTER, P/N 42560-273-01 THRU -08




CIRCUIT FOR ONE POWER SUPPLY
42560-273-01




CIRCUIT FOR TWO POWER SUPPLIES
42560-273-02




CIRCUIT FOR 42560-273-04

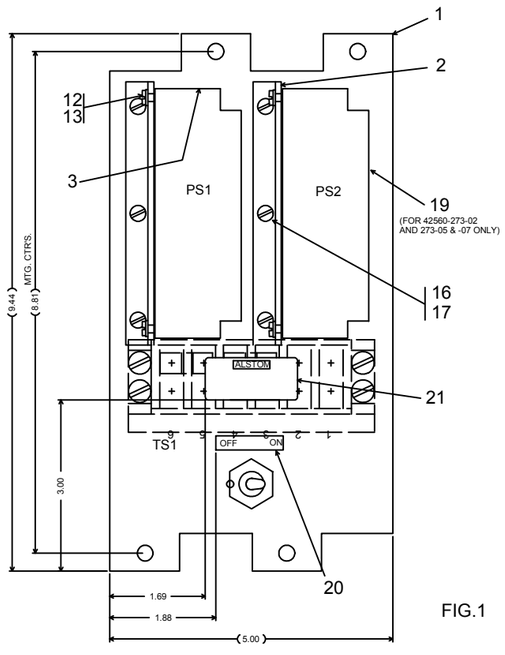
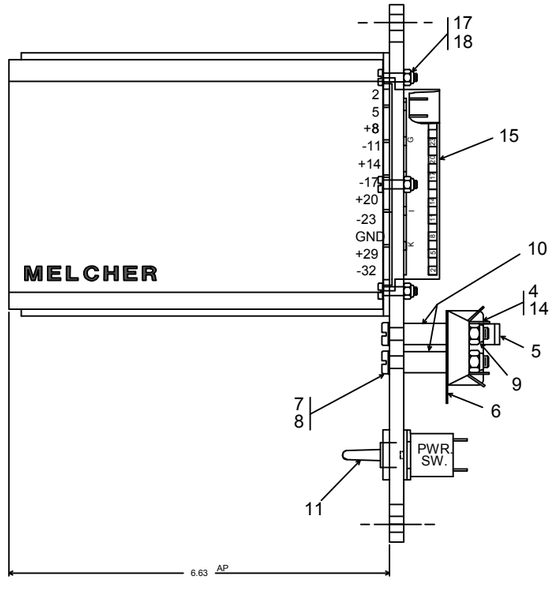
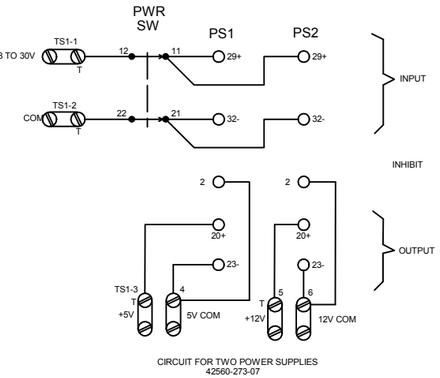



FIG.1



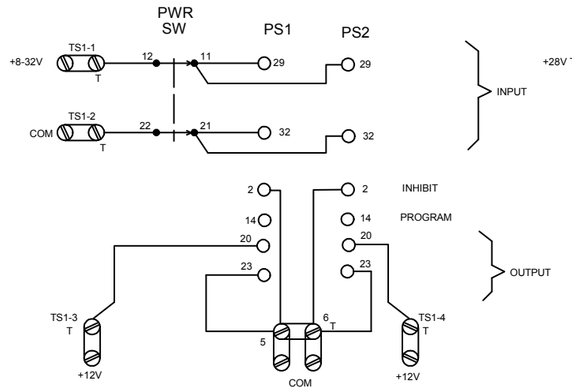




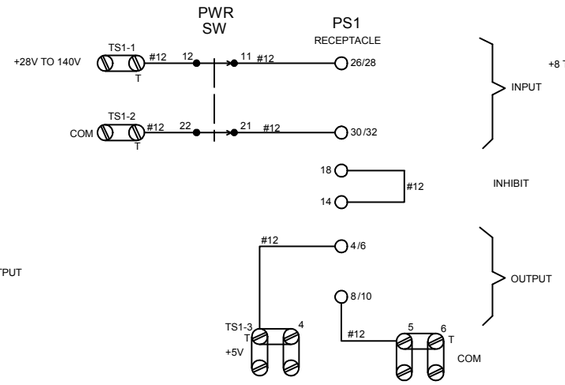

CIRCUIT FOR TWO POWER SUPPLIES
42560-273-07

42560-273.P01
Rev. (P)

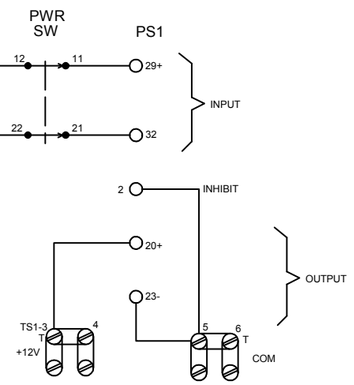
Figure 3–37. DC/DC Converter, P/N 42560-273-01 thru -08 (Sheet 1 of 3)




CIRCUIT FOR 42560-273-05




CIRCUIT FOR 42560-273-03




CIRCUIT FOR 42560-273-06

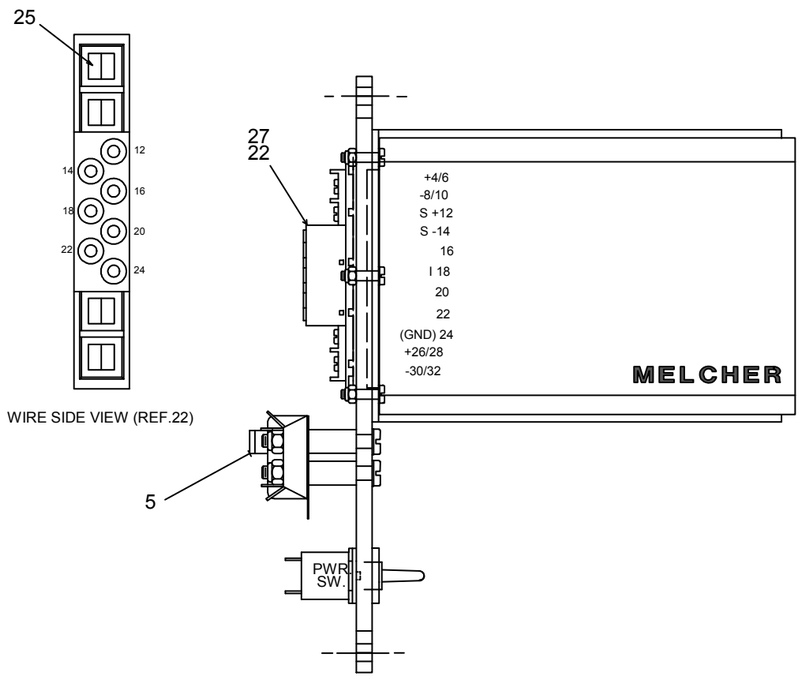
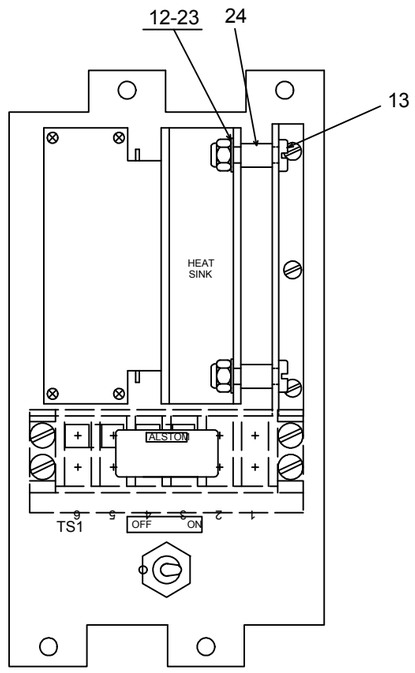



FIG.2

FOR 42560-273-03 ONLY
(OTHERWISE SAME AS FIG.1)




42560-273.P02
Rev. (P)

Figure 3–37. DC/DC Converter, P/N 42560-273-01 thru -08 (Sheet 2 of 3)

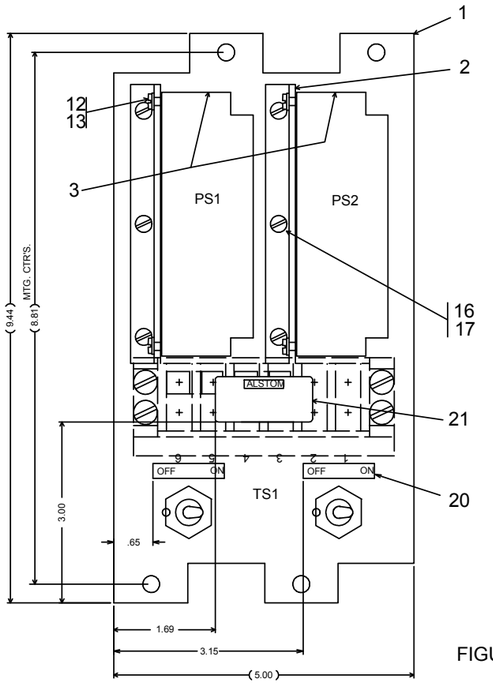
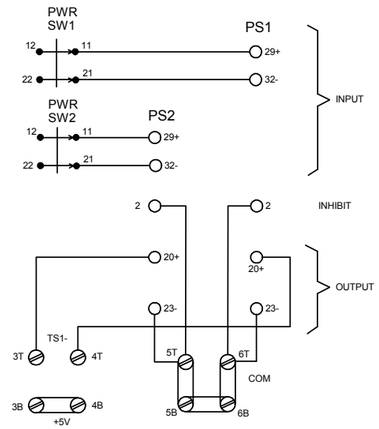
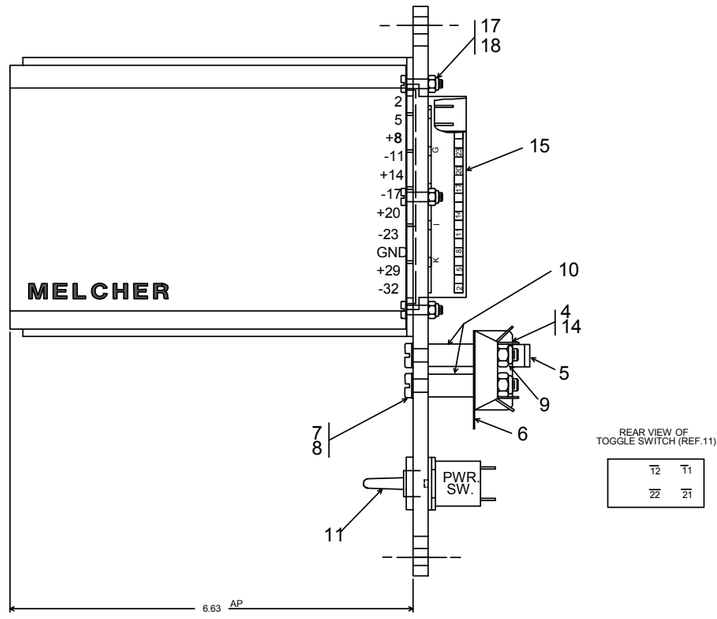



FIGURE 3




CIRCUIT FOR TWO POWER SUPPLIES
42560-273-08




42560-273.P03
Rev. (P)

Figure 3–37. DC/DC Converter, P/N 42560-273-01 thru -08 (Sheet 3 of 3)

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## 3.29. EXTENDER BOARDS

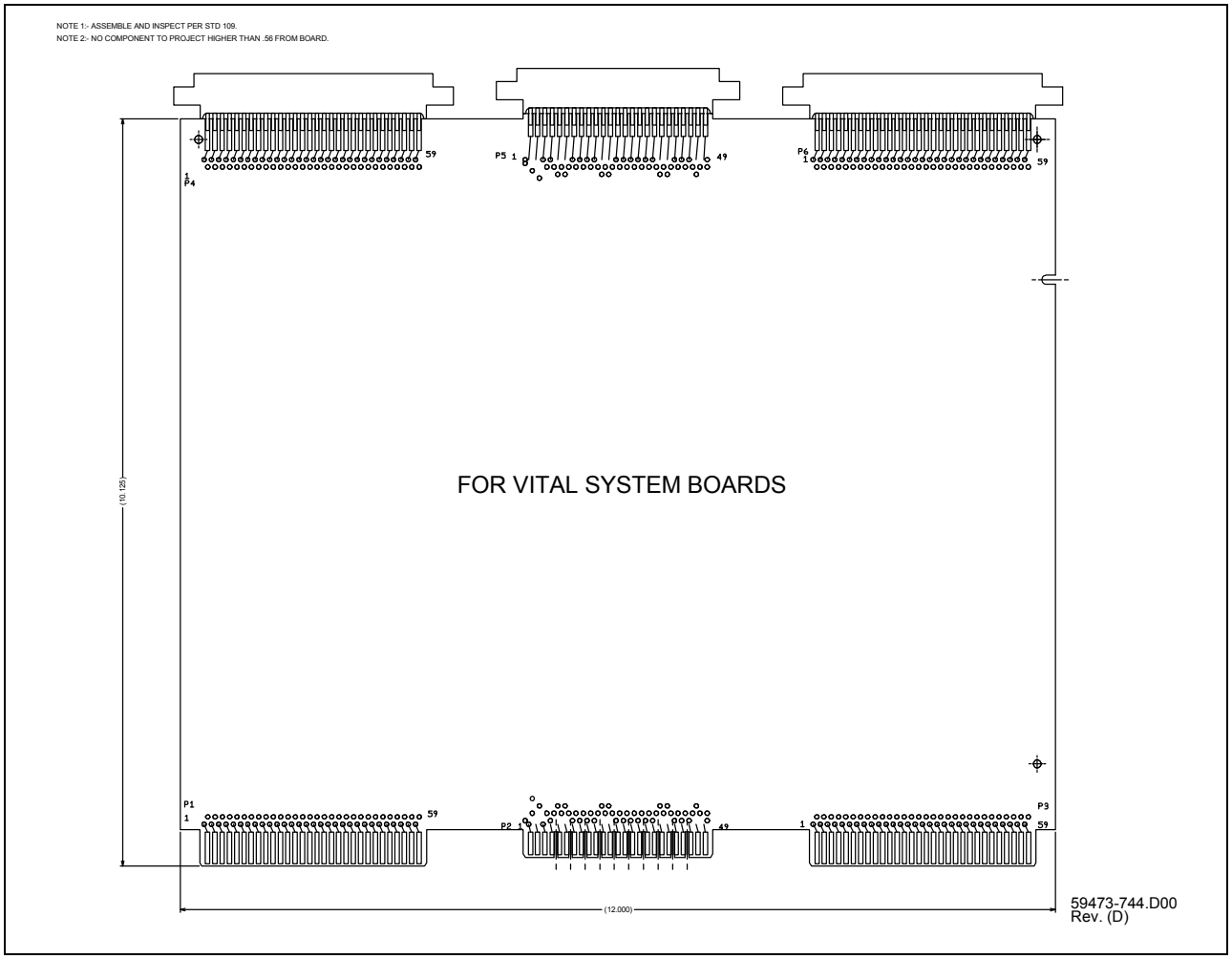



Figure 3–38. Extender Board, P/N 59473-744-01

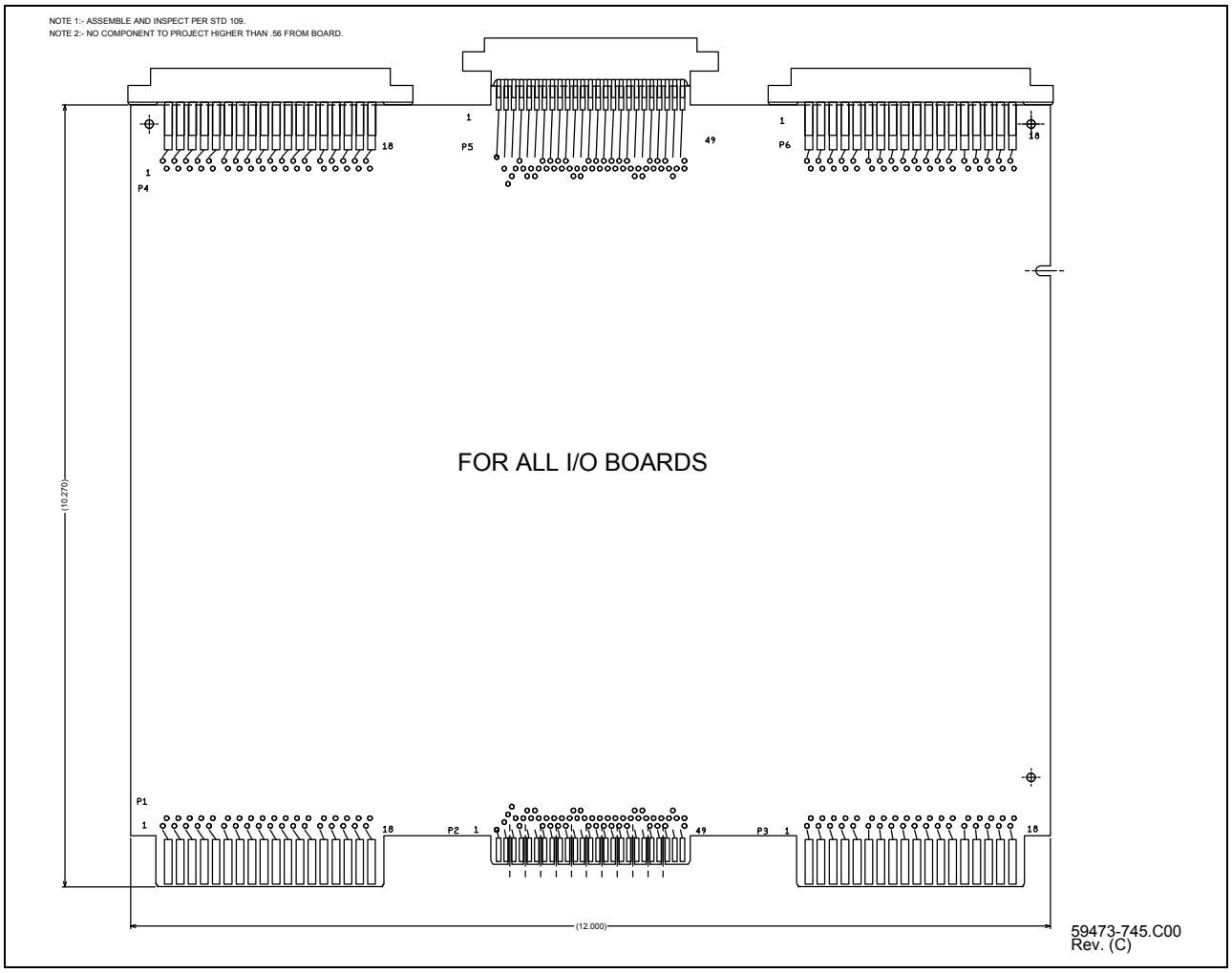



Figure 3–39. Extender Board, P/N 59473-745-01

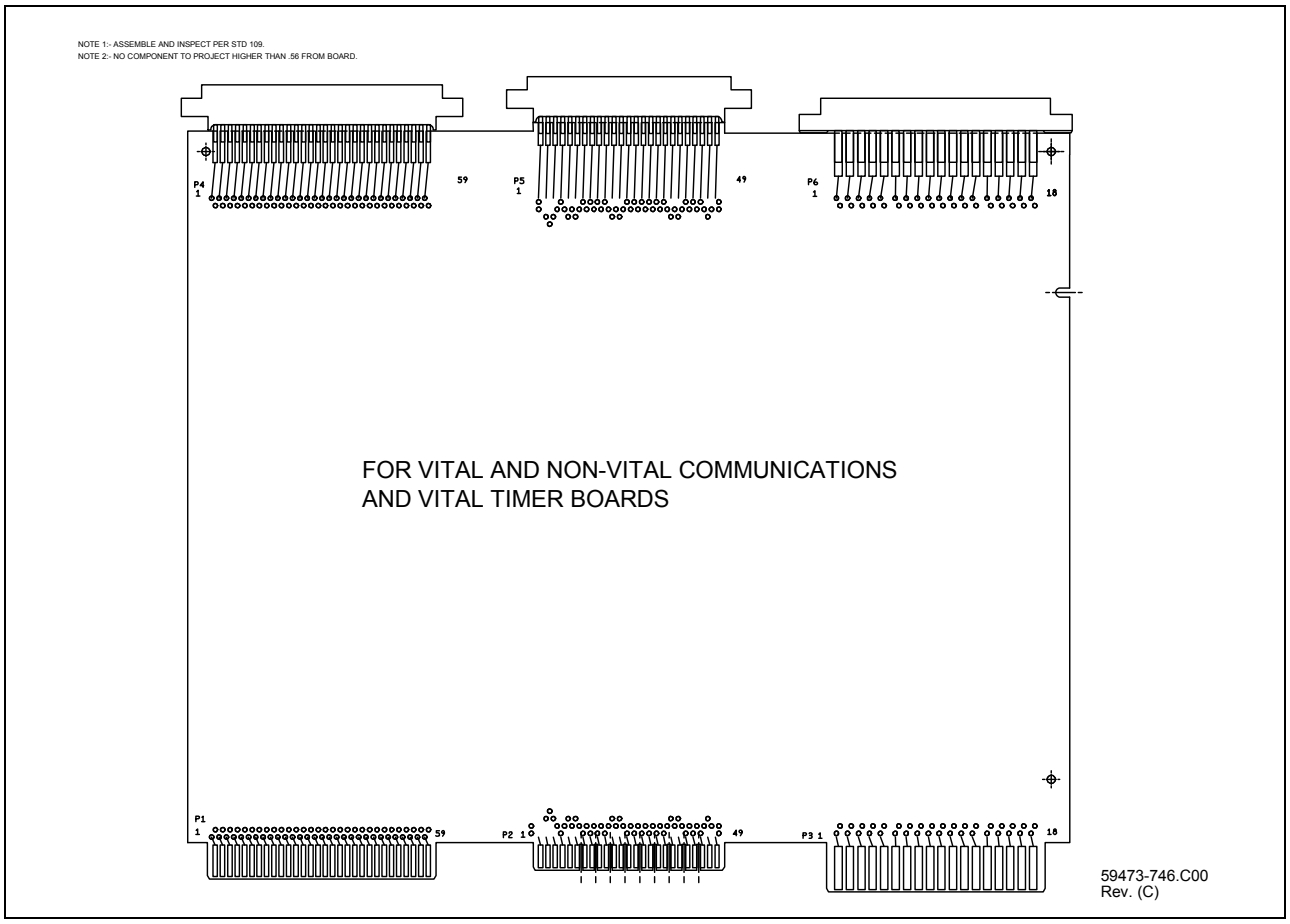



Figure 3–40. Extender Board, P/N 59473-746-01

## 3.30. RELAY, B1 NEUTRAL, REGULAR RELEASE, 100 OHM (USED WITH VRD BOARD), P/N 56001-787-05

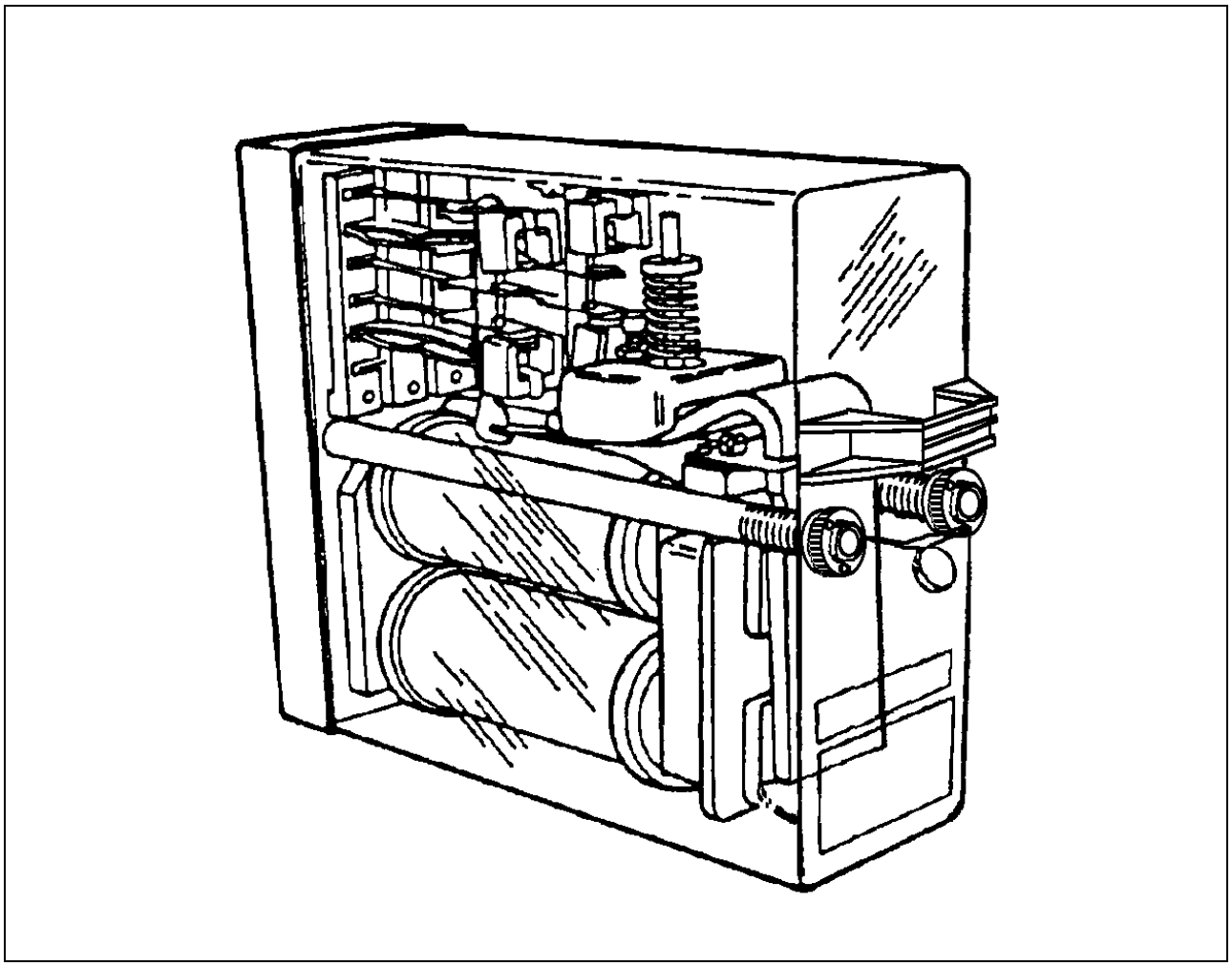


Figure 3–41. Relay, B1 Neutral, Regular Release, 100 Ohm (Used with VRD Board), P/N 56001-787-05

# 4. SECTION 4 – SPECIAL TOOLS

## 4.1. INTRODUCTION

This section shows the special tools used for the VPI II chassis.

## 4.2. GENERAL

Table 4–1 provides list of special tools required to assemble or repair the 28-, 36-, 50-, and 75-way connectors, and the communications DB-9 and DB-25 connectors. The table includes part numbers and references to Figures 4–1 through 4–12. To see the drawing for the Special Tool, go to the reference column and cross-reference the figure number to the corresponding drawing number within this section.

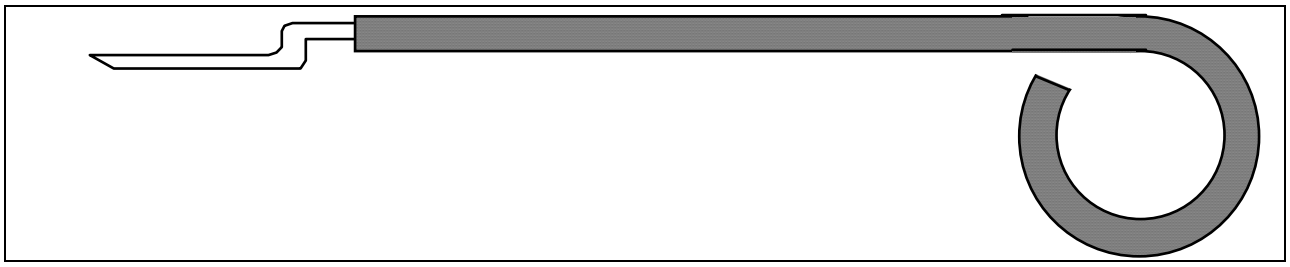
In some cases, a particular tool may require a separate die for various terminal types or wire sizes. Therefore, it may be necessary to reference more than one part number for a hand crimping tool or extractor. When more than one number is used, the person ordering must find out what gauge wire and corresponding part number is being used to order the correct crimping die.

Some VPI II racks may have connections from the entrance racks to the rear plane of the VPI II Module made as direct wiring and not with wires terminated in plug couplers. Over time, perhaps some of the wires may have been pulled on, leaving the wires either loose or pulled out of the crimp terminal. If this is the case, then 16-20 gauge wires can be reattached to the module with the proper size terminals and crimping tools.

The following pages in this section show the special tools required to assembly or repair the 28-, 36-, 50-, and 75-way connectors, plus the communications DB-9 and DB-25 connectors.

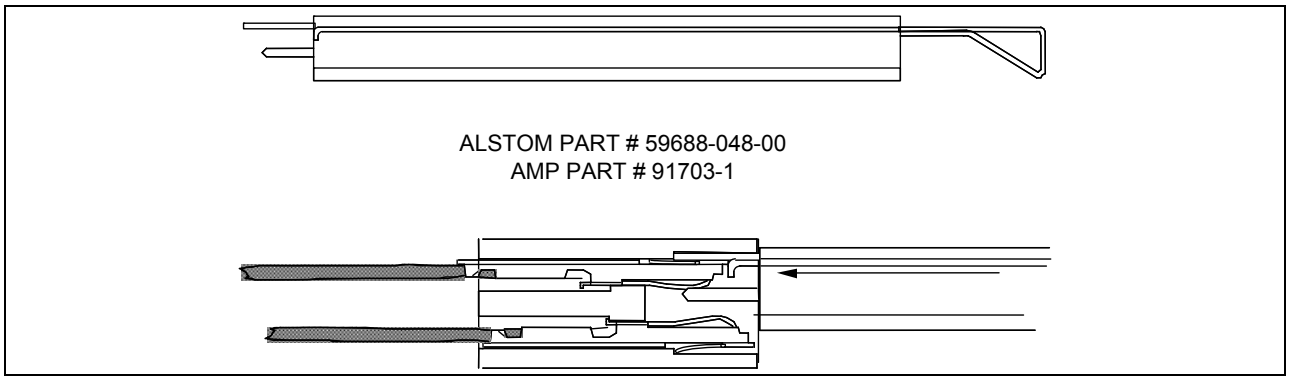
Table 4–1. Special Wiring Tools

| Figure Ref. | Description | Part Number | OEM Supplier | Terminal Part Number |
|---|---|---|---|---|
| 4–1 | Extractor, B Relay Terminal | 59688-000-00 | N/A | 55871-019-00 |
| 4–2 | Amp Terminal Extraction Tool | 59688-048-00 | AMP 91703-1 | 55871-076-00<br>55871-082-00<br>55871-145-00<br>55871-150-00<br>55871-153-00<br>55871-176-00 |
| 4–3 | Extractor, Type M | 59688-005-00 | AMP 305183 | 00996-007-ON<br>00996-009-ON<br>00997-009-ON<br>00997-011-ON |
| 4–4 | Extractor, Gold Leaf | 59688-009-00 | AMP 465195-1 | 55871-053-00<br>55871-048-00 |
| 4–5 | Insertion/Extractor, #24-20 | 59688-018-00 | AMP 91285-1 | 55871-089-00<br>55871-090-00 |
| 4–6 | Hand Crimp Tool, Shield Crimping Die (3 sizes) .144 to .162, .168 to .185, .186 to .201 | ---<br>--- | T&B WT740<br>T&B 301G, 301H, 301J | 00923-012-ON |
| 4–7 | Hand Crimp Tool, Type M, #22-20 | 24745-048-00 | AMP 90067-4 | 00996-007-ON<br>00996-009-ON<br>00997-009-ON<br>00997-011-ON |
| 4–8 | Hand Crimp Tool, AMP | 24745-074-00 | AMP 583649-6 | 55871-076-00 |
| 4–9 | Hand Crimp Tool, Type C, #24-20 | 24745-087-00 | AMP 90302-1 | 55871-089-00<br>55871-090-00 |
| 4–10 | Hand Crimp Tool, Twin Leaf | 24745-126-00 | AMP 90264-1 | 55871-150-00<br>55871-076-00 |
| 4–11 | Hand Crimp Tool, Ring, #22-16 | 24745-145-00 | AMP 59824-1 | 59825-233-00 |
| 4–12 | Hand Crimp Tool, AMP | 24745-149-00 | AMP 90285-1 | 55871-145-00<br>55871-153-00 |



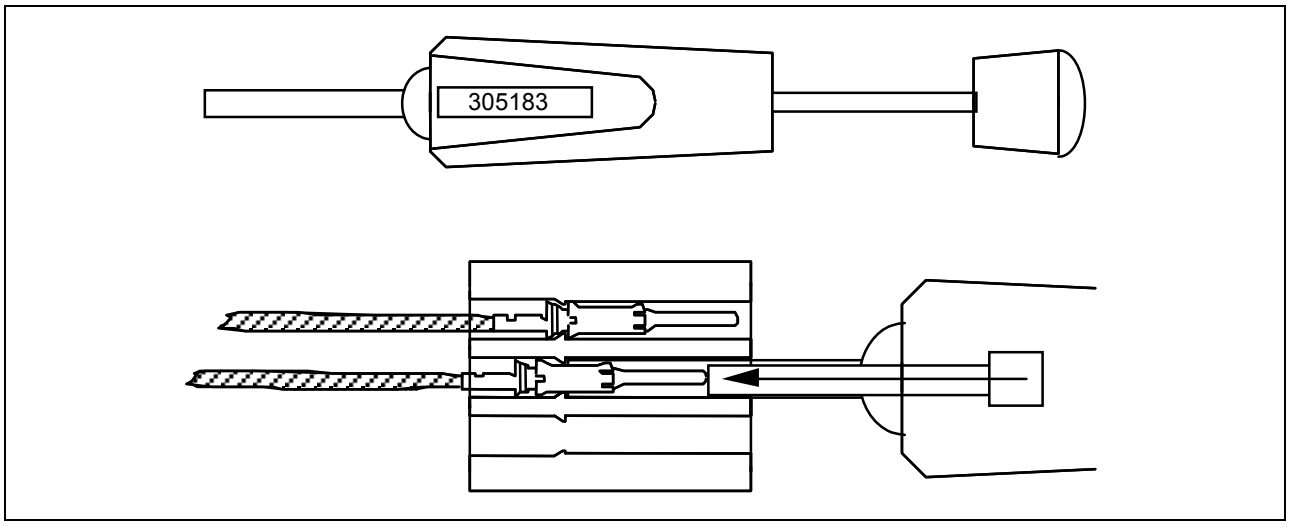
Note: This tool for Alstom terminal P/N 55871-019-00

Figure 4–1. Extractor, B Relay Terminal, P/N 59688-000-00



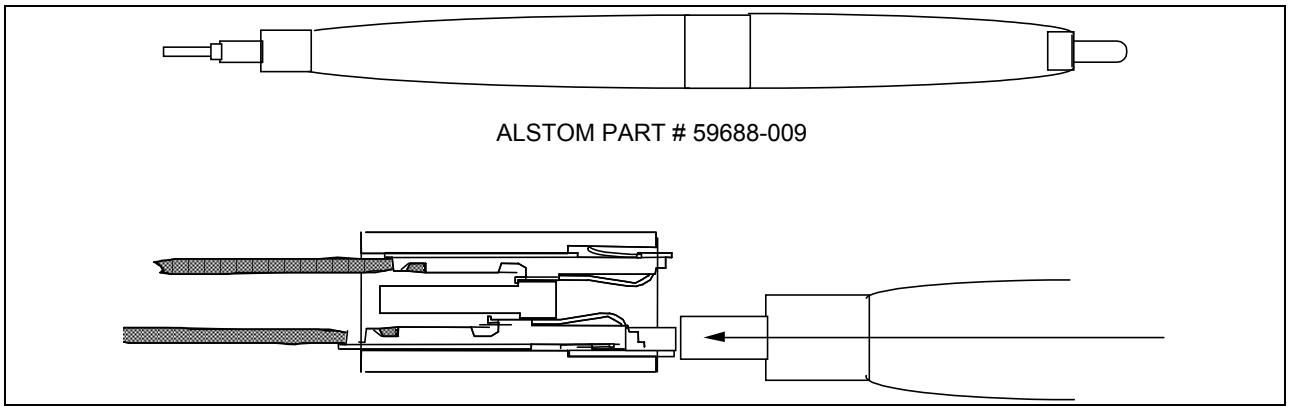

Note: This tool for Alstom terminal P/N 55871-076-00, 55871-082-00, 55871-145-00, 55871-150-00, 55871-153-00, and 55871-176-00

Figure 4–2. Extractor, Gold Leaf, P/N 59688-048-00



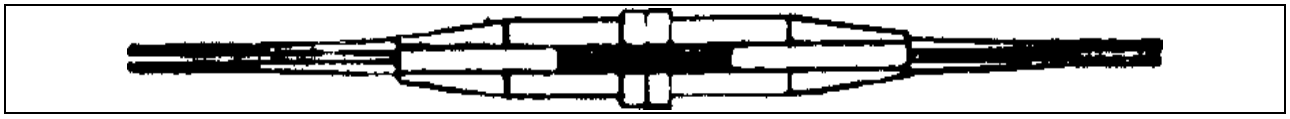

Note: This tool for Alstom terminals P/N 00996-007-ON, P/N 00996-009-ON, P/N 00997-009-ON and P/N 00997-011-ON

Figure 4–3. Extractor, Type M, P/N 59688-005-00



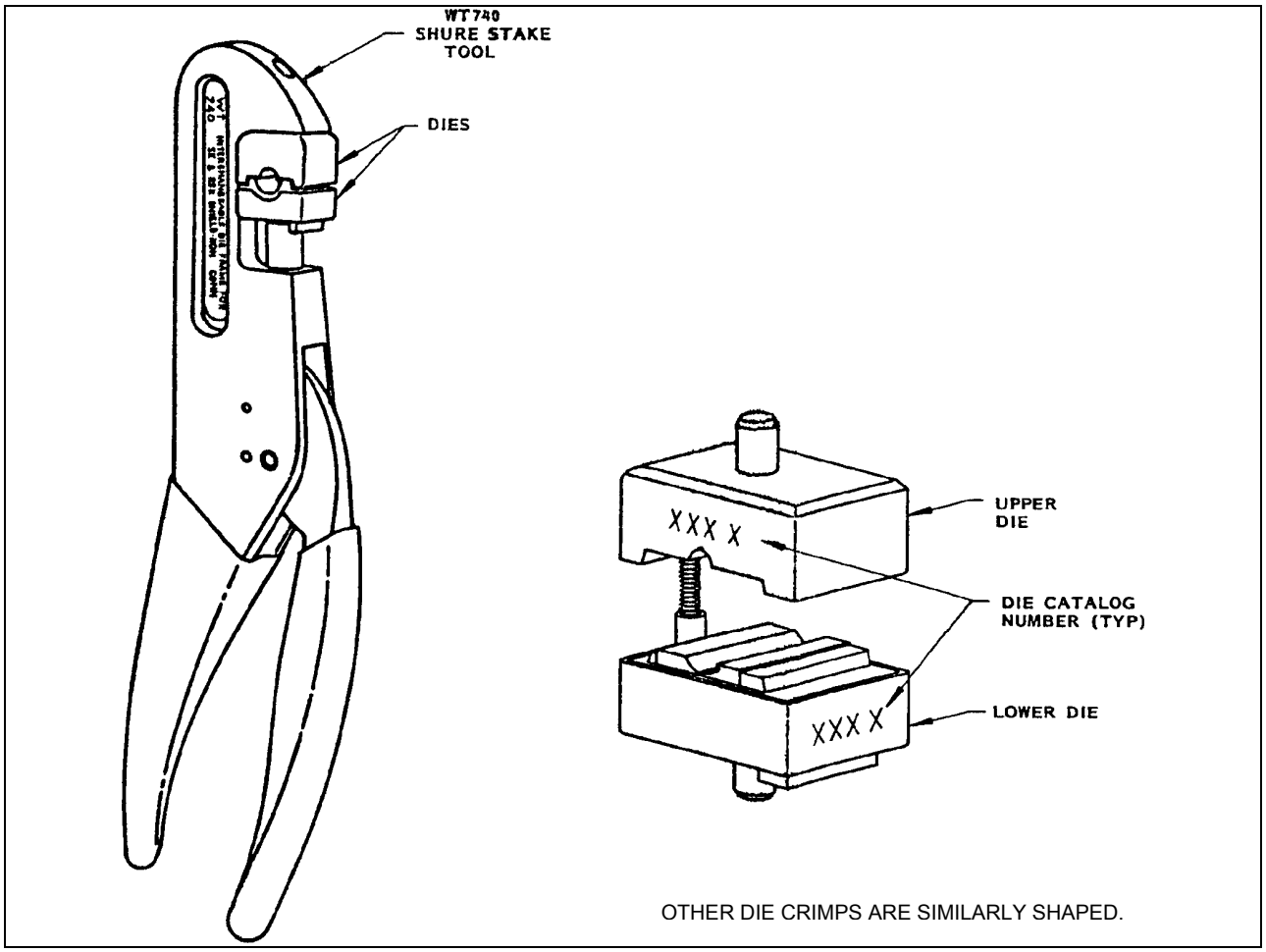

Note: This tool for Alstom terminal P/N 55871-053-00 and P/N 55871-048-00

Figure 4–4. Extractor, Gold Leaf, P/N 59688-009-00



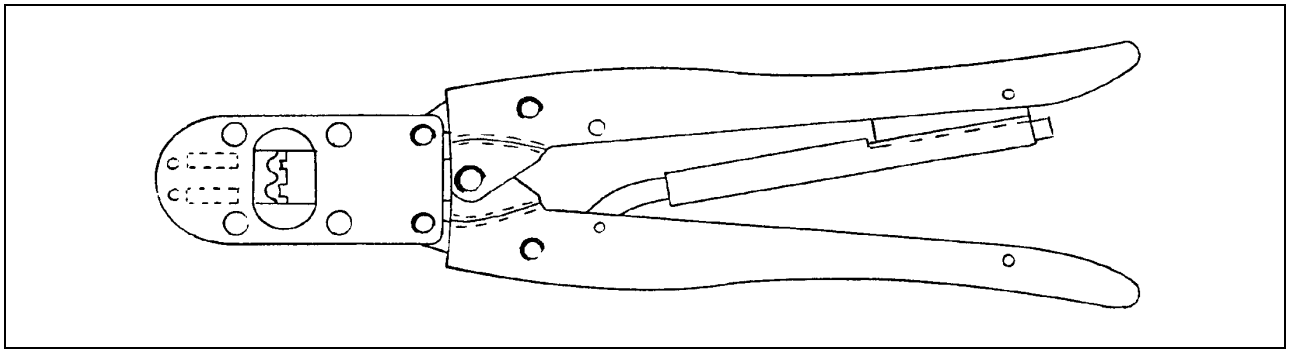
Note: This tool for Alstom terminal P/N 55871-089-00 and P/N 55871-090-00

Figure 4–5. Insertion/Extractor, #24-20, P/N 59688-018-00



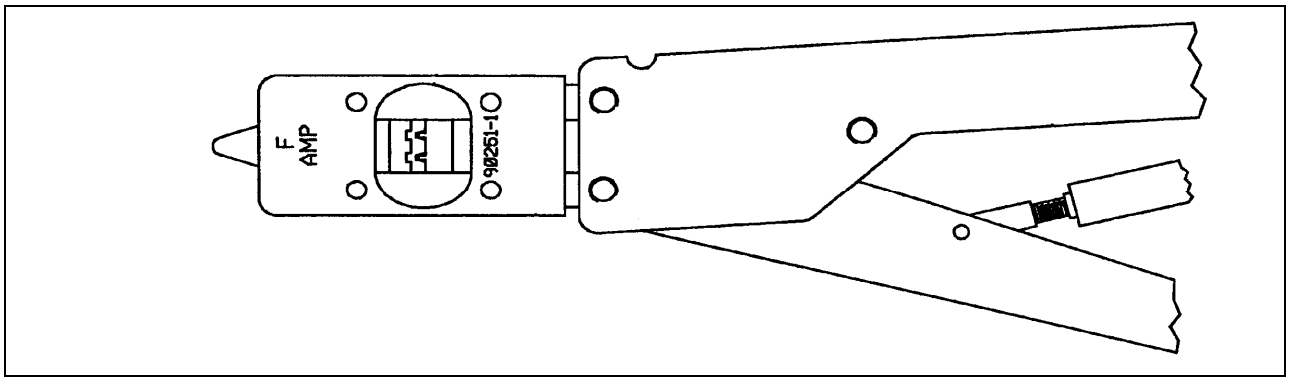

Note: This tool for Alstom terminal P/N 00923-012-ON

Figure 4–6. Thomas and Betts Shield Hand Crimp Tool WT740 with Crimping Die



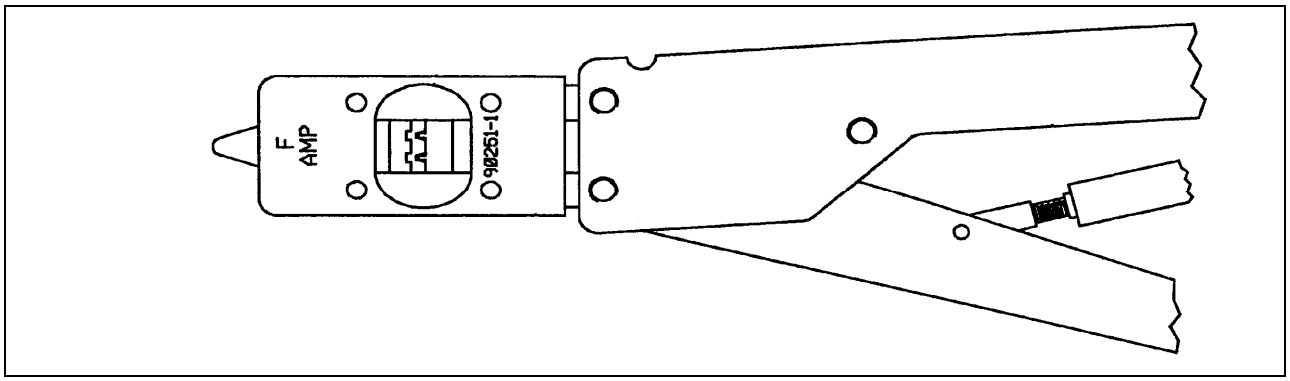
Note: This tool for Alstom terminals P/N 00996-007-ON, P/N 00996-009-ON, P/N 00997-009-ON and P/N 00997-011-ON

Figure 4–7. Hand Crimp Tool, Type M #22-20, P/N 24745-048-00



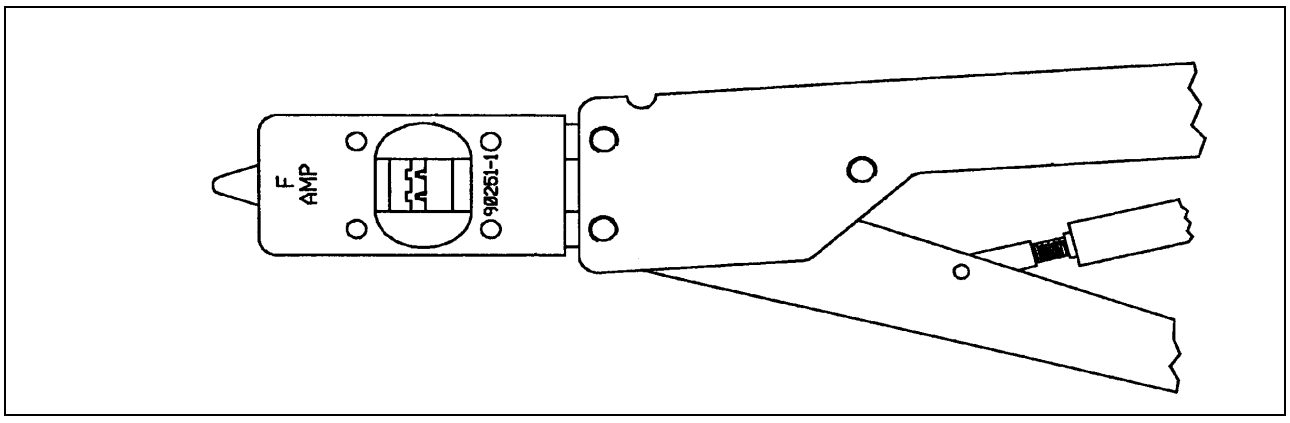

Note: This tool for Alstom terminal P/N 55871-076-00

Figure 4–8. Hand Crimp Tool, P/N 24745-074-00



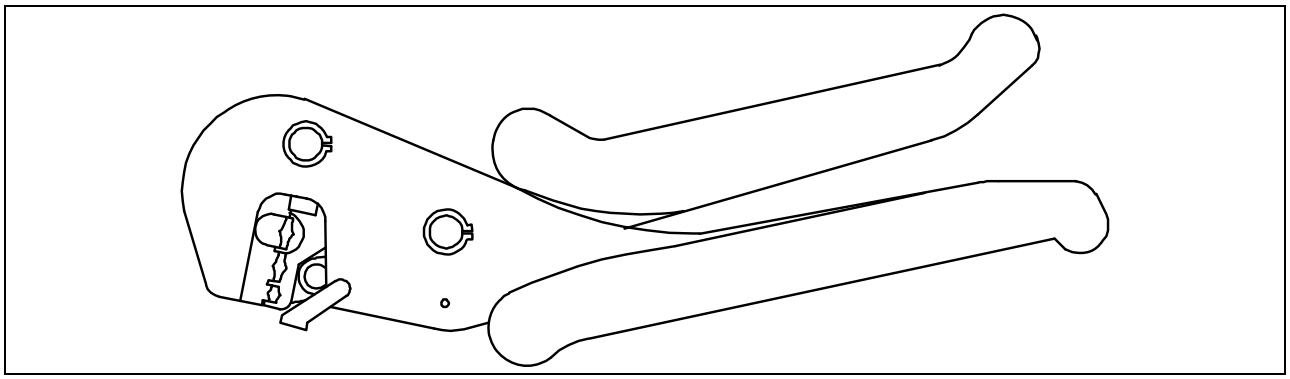

Note 1: This tool for Alstom terminals P/N 55871-089-00 and P/N 55871-090-00

Figure 4–9. Hand Crimp Tool, Type C, P/N 24745-087-00



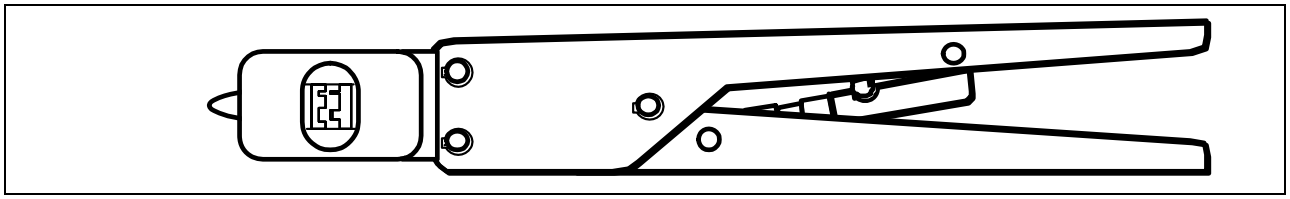

Note: This tool for Alstom terminal P/N 55871-150-00 and P/N 55871-076-00

Figure 4–10. Hand Crimp Tool, Twin Leaf, P/N 24745-126-00



Note: This tool for Alstom terminals P/N 59825-233-00

Figure 4–11. Hand Crimp Tool, Ring #22-16, P/N 24745-145-00



Note: This tool for Alstom terminals P/N 55871-145-00 and P/N 55871-153-00

Figure 4–12. Hand Crimp Tool, P/N 24745-149-00

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