RCP-MP32 Control Panel

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Document No. 81-9059-0400-0 Rev. B

Manual Updates:

08/31/97 Manual released for initial printing as REV A.

03-05-01 Rev B: Deleted Printing Specification per ECO CE00113. GLT

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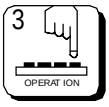
1.1 Manual Overview

This manual provides detailed instructions for installing and operating the PESA RCP-MP32 Control Panel. This manual is divided into seven sections as shown. Sections 3 and 4 contain operational and functional descriptions of the RCP-MP32 Control Panel and its associated circuit cards.

Section 1, **INTRODUCTION**, summarizes the manual, describes the product, presents a list of terms, and provides the panel specifications.

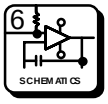
Section 2, **INSTALLATION**, provides installation and setup instructions.



Section 3, **OPERATION**, describes system operation procedures.

Section 4, **FUNCTIONAL DESCRIPTIONS**, presents an in-depth description of each component.

Section 5, **MAINTENANCE**, explains procedures for maintenance.



Section 6, **SCHEMATICS**, gives a complete package of technical documents such as schematics, and assembly drawings.

Section 7, **PARTS LIST**, provides a detailed list of system parts and components.

1.2 General Description

The RCP-MP32 is designed to provide an economical solution for installations requiring fast, intuitive operation. It is a button per source, destination, or level control panel featuring direct take operation for up to eight levels of control. This control panel is recommended for use in switching applications where a large number of sources and destinations are required. The RCP-MP32 Control Panel has 134 configurable data keys--any of which can be configured as a source, destination, or level.

The data keys on the front of RCP-MP32 Control Panel are divided into four pages of 32 keys each. Page one provides access to data keys 1-32, Page two provides access to data keys 33-64, page three provides access data keys 65-96, and page four provides access to data keys 97-128. The Page Key enables the selection of the data key page. Labeled LEDs on the front panel of RCP-MP32 provide a visible indication of the selected data key page.

There are two control push-buttons on the far right side of the front of the control panel; the push-buttons are the PROT/LOCK Key and the CLEAR/ADDR Key. The PROT/LOCK Key enables the operator to protect or lock the selected destination. The CLEAR/ADDR Key enables the operator to clear the preset or to display the control panel's address in binary code on the top row of data key LEDs.

The RCP-MP32 Control Panel is packaged in a standard 19 inch, one rack unit (1 RU) chassis. The unit is powered by a 7.5VDC Plug-in-the-Wall Power Supply and communicates with the system controller via a Standard RS485 Interface.

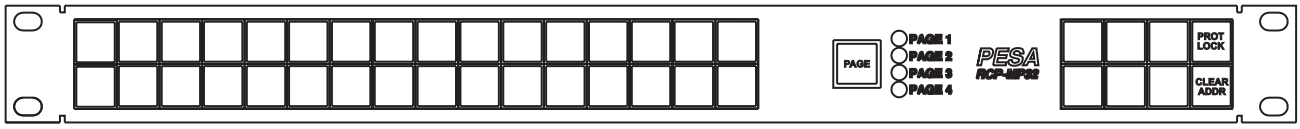


Figure 1-1 RCP-MP32 Control Panel (Front View)

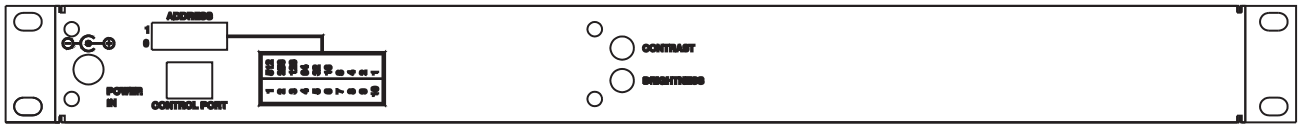


Figure 1-2 RCP-MP32 Control Panel (Rear View)

1.3 Specifications

GENERAL	
Mounting	1RU
Push-buttons	Illuminated and Legend-able
INPUT	
Communications Port	RS485
POWER	
Voltage Requirements	+7.5VDC @ 800mA
MECHANICAL	
Physical Dimensions	19"W X 3"D X 1.75"H 482.6mm X 76.2mm X 24.45mm
ENVIRONMENTAL	
Temperature	0°C to 40°C
Humidity	20% to 90% (Non-Condensing)

2.1 Introduction

This section details the RCP-MP32 Control Panel installation procedures. The following topics are discussed:

- Receipt Inspection
- Location and Mounting
- Polling Address
- Control Panel and Controller Interconnection
- Wiring the Control Panel Connector
- Terminating Cable Runs
- Power Connections
- Switch Cap Assembly

2.2 Receipt Inspection

The RCP-MP32 Control Panel is inspected and tested prior to shipment from the PESA factory. Upon receipt, please inspect the unit for shipping damage. If damage is detected, notify the carrier immediately and hold all packing material for inspection. If assistance is required, please contact PESA Customer Service at the telephone number listed in the front of this manual.

After unpacking, compare all parts received against the packing list. If the unit is undamaged and all components have been received, proceed with installation.

2.3 Location and Mounting

The RCP-MP32 Control Panel has been designed to fit in a standard E.I.A. 19" equipment rack and use one rack units of space (1.75"). An installation area should be selected where the ambient temperature will not exceed 40°C, and where air can circulate freely. The control panel should be mounted in an area convenient to control and power connections. Sufficient space must be provided behind the equipment rack to allow for the control and power cables.

When the RCP-MP32 Control Panel is supplied as part of a system including interconnecting cables, rack layout drawings are usually provided. While adherence to the rack layout drawings is not required, it will ensure that the interconnection cables are the proper lengths. All mounting holes should be utilized and the hardware be securely tightened.

2.3 Location and Mounting Continued:

All interconnection cables should be strain relieved and secured to the equipment racks or other supporting structures. Failure to provide adequate cable support may result in cables separating from connectors. If cables are to be run under elevated flooring, they should be laid out in cable racks if possible and tied to the cable racks as a guide. If cables are run along the floor, do not allow then to lay in the work area behind the racks. Stepping or tripping on the cables may result in connections being pulled free or wire breakage inside the insulation. Figure 2-1 illustrates the chassis installation.

To install the RCP-MP32 Control Panel in an equipment rack take the following steps:

1. Align the control panel chassis with a slotted opening in the rack.

2. Install the bottom screws first.

3. Install the top two screws.

4. Tighten all four screws securely.

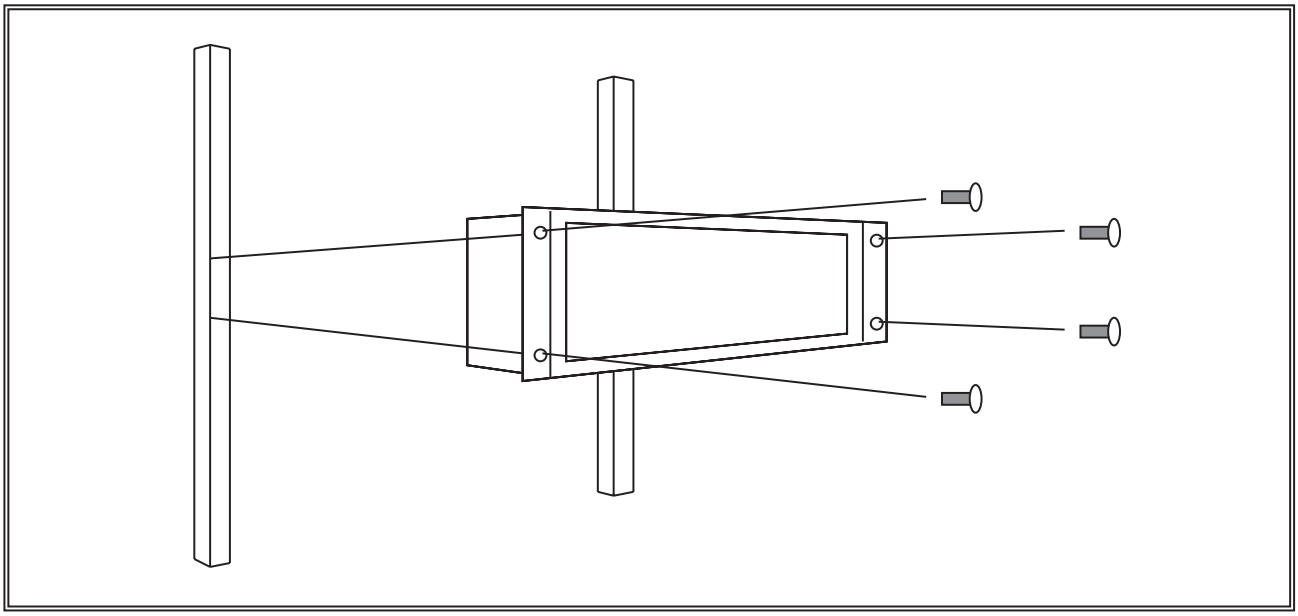


Figure 2-1 Control Panel Chassis Installation

2.4 Polling Address

For the system controller to identify a particular control panel, a specific device number or polling address must be assigned to each panel. Sequential binary numbers (1 thorough 1023) are used for this purpose. The appropriate binary number is entered into the control panel by setting an internal 10-position DIP switch to the selected binary number. The DIP switch is located on the Remote CPU Board and is accessible from the rear of the unit. The panel address is normally assigned and entered at the factory if the panel is purchased as part of a system and a design guide has been completed by the user. If the panel is purchased separately, the user may be required to set the panel address.

EXAMPLE: To select polling address 21, set switches 6, 8, and 10 in the "ON" or "1" position. See Figure 2-2.

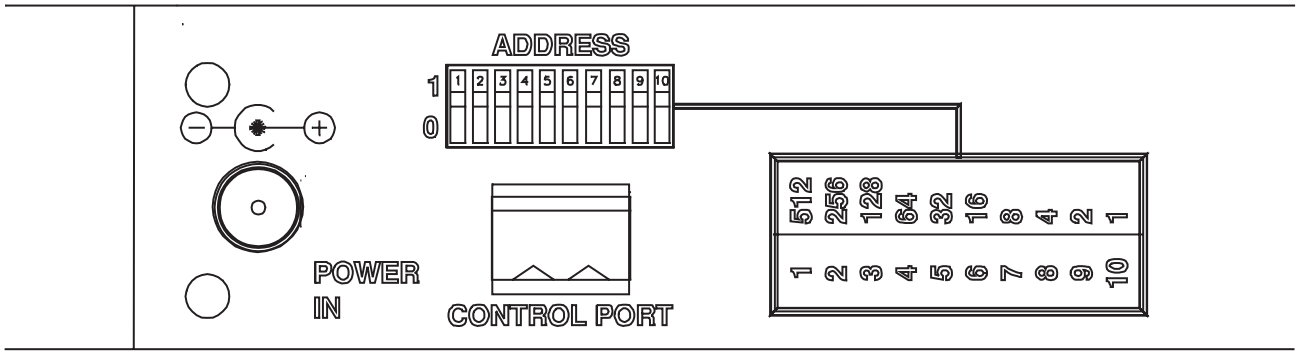
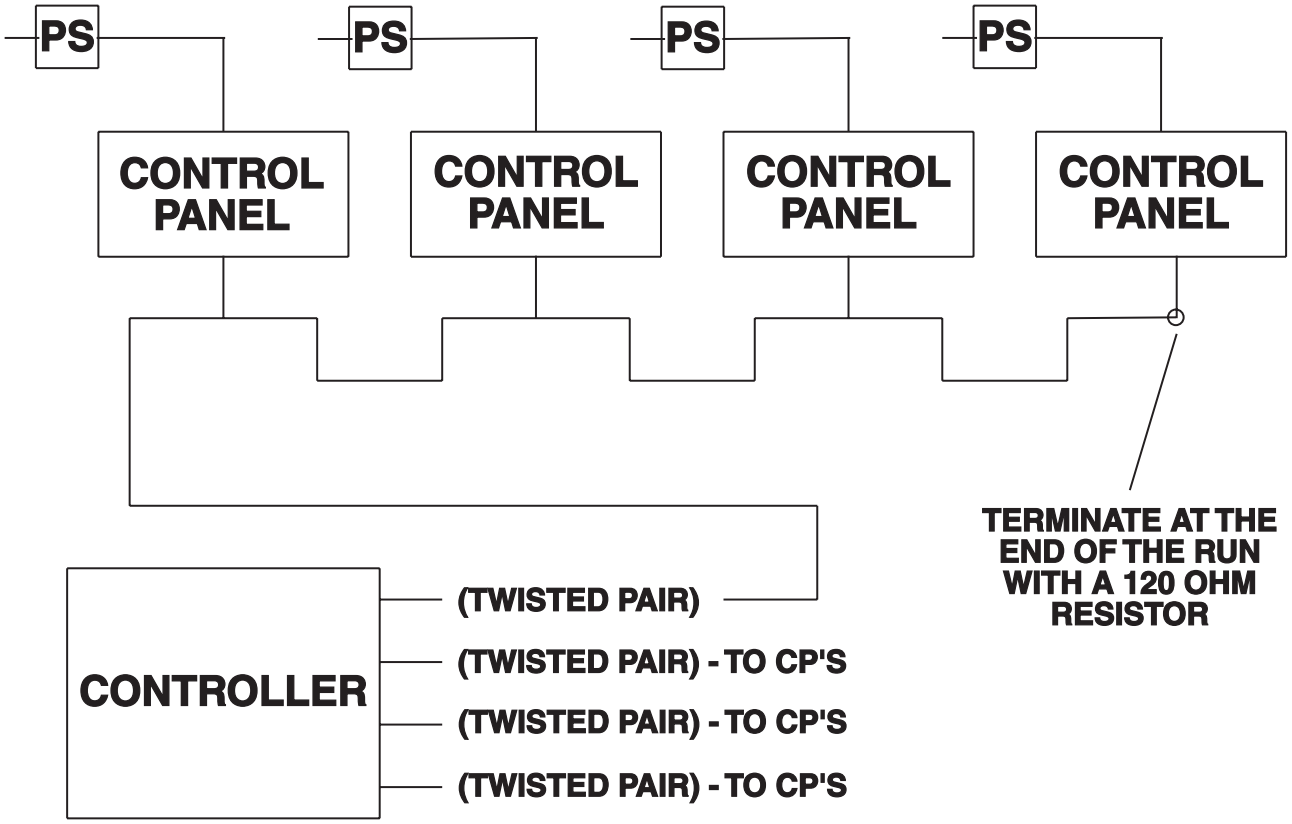


Figure 2-2 DIP Switch Location

2.5 Control Panel/Controller Interconnection

Each control panel has a single 3-pin MTA connector located on its rear panel which is utilized for system communications to and from the controller. Control panels are daisy-chained to a communications port on the rear panel of the system controller or to a communications port on the rear panel of the routing switcher containing the system controller. Use shielded twisted pair cable for all control panel communication port connections. See Figure 2-3.

2.5 Control Panel/Controller Interconnection Continued:



CP = CONTROL PANEL

Figure 2-3 Typical Control Panel Controller Interconnection

2.6 Wiring the Control Panel Connector

Should an additional panel be added to your system, it will be necessary to wire the connector using shielded twisted pair cable and a 3-pin MTA connector using the following instructions. See Figure 2-4.

1. Remove approximately 1.5" of insulation from each of the two cables.

2. Remove approximately 0.5" of insulation from the black and red wires.

3. Twist together and insert the two black wire into position one. Crimp down using a screwdriver.

4. Twist together and insert the two shield wires into position two. Crimp down using a screwdriver.

2.6 Wiring the Control Panel Connector Continued:

5. Twist together and insert the two red wires into position three. Crimp down using a screwdriver.

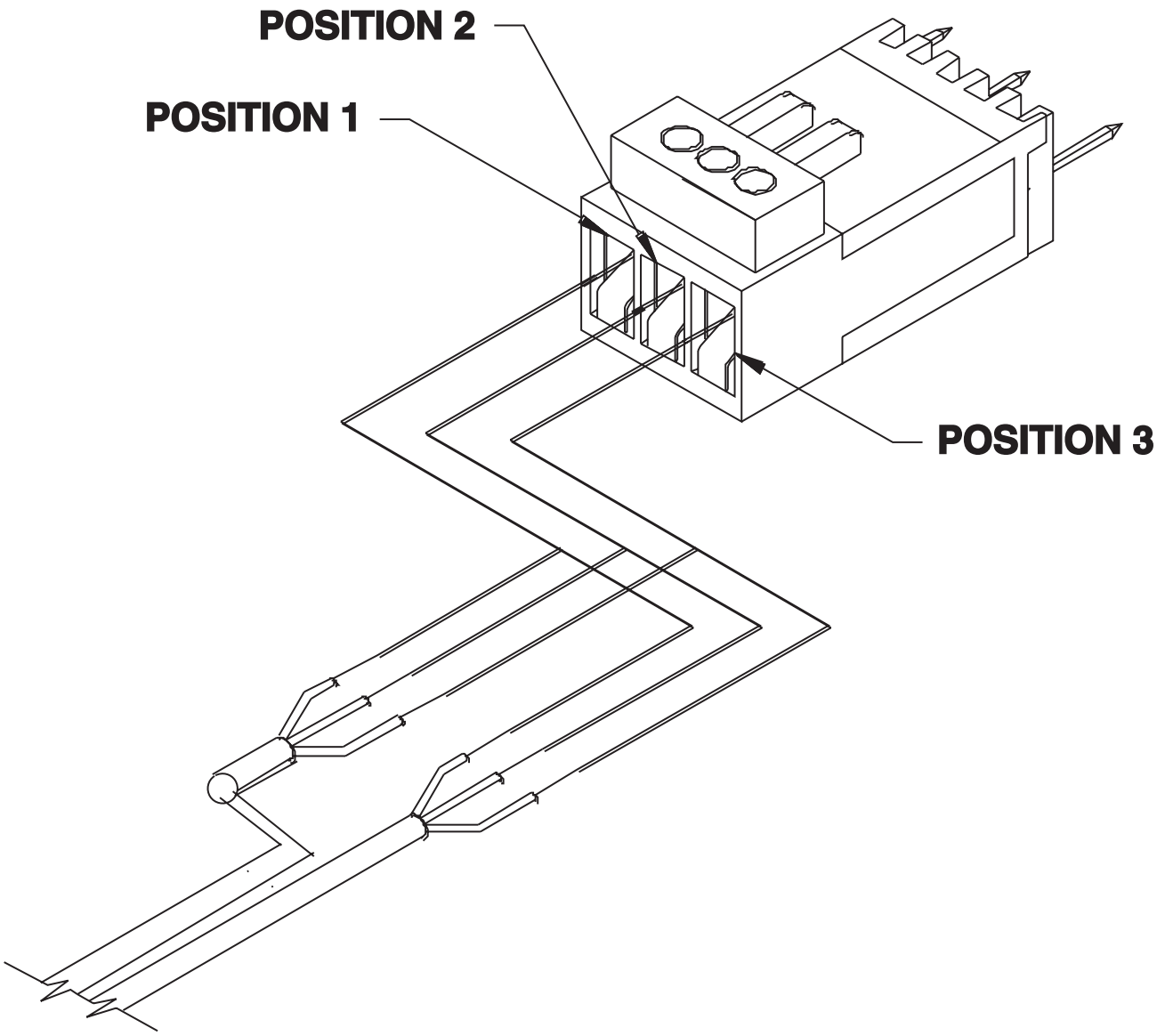


Figure 2-4 Wiring the Control Panel Connector

2.7 Terminating Cable Runs

Each cable run should be terminated with a 120 ohm, 1/4 watt 5% resistor. The cable is terminated internally at the controller. See Figure 2-5.

1. Un-crimp the black and red leads in positions one and three.
2. Insert the resistor leads into positions one and three along with the black and red leads.
3. Crimp down using a screwdriver.
4. The shield wire remains in position two.

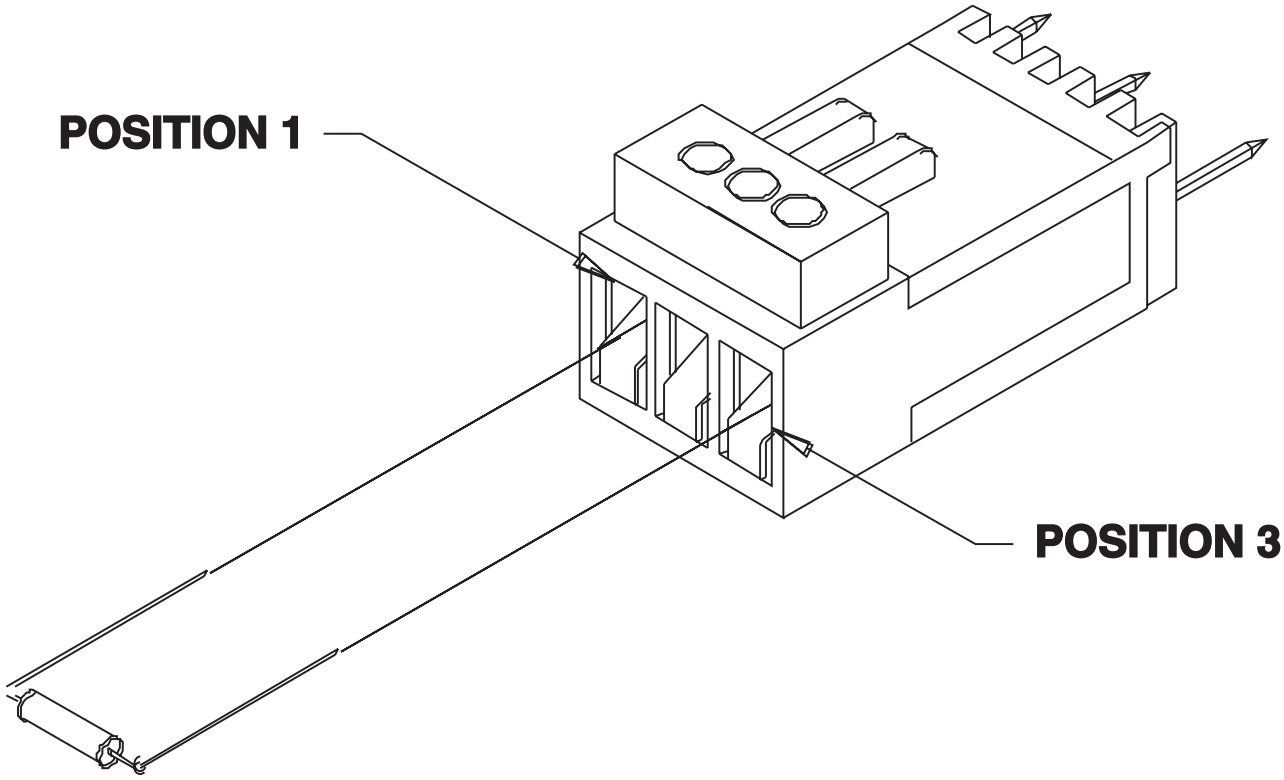


Figure 2-5 Terminating Cable Runs

2.8 Power Connections

Power for the RCP-MP32 Control Panel is supplied an external 7.5 VDC, 800 mA power supply.

2.8 Power Connections Continued:

Remove the power supply from the box it was shipped in and check to insure that no damage has occurred in shipping. Verify that the power supply is rated for the proper AC voltage (i.e. 115 VAC or 230 VAC) before connection to the AC line voltage. The power connector can now be plugged into the **POWER IN** connector on the rear of the control panel. The power supply will immediately power the unit upon connection to the AC line voltage. See Figure 2-6.

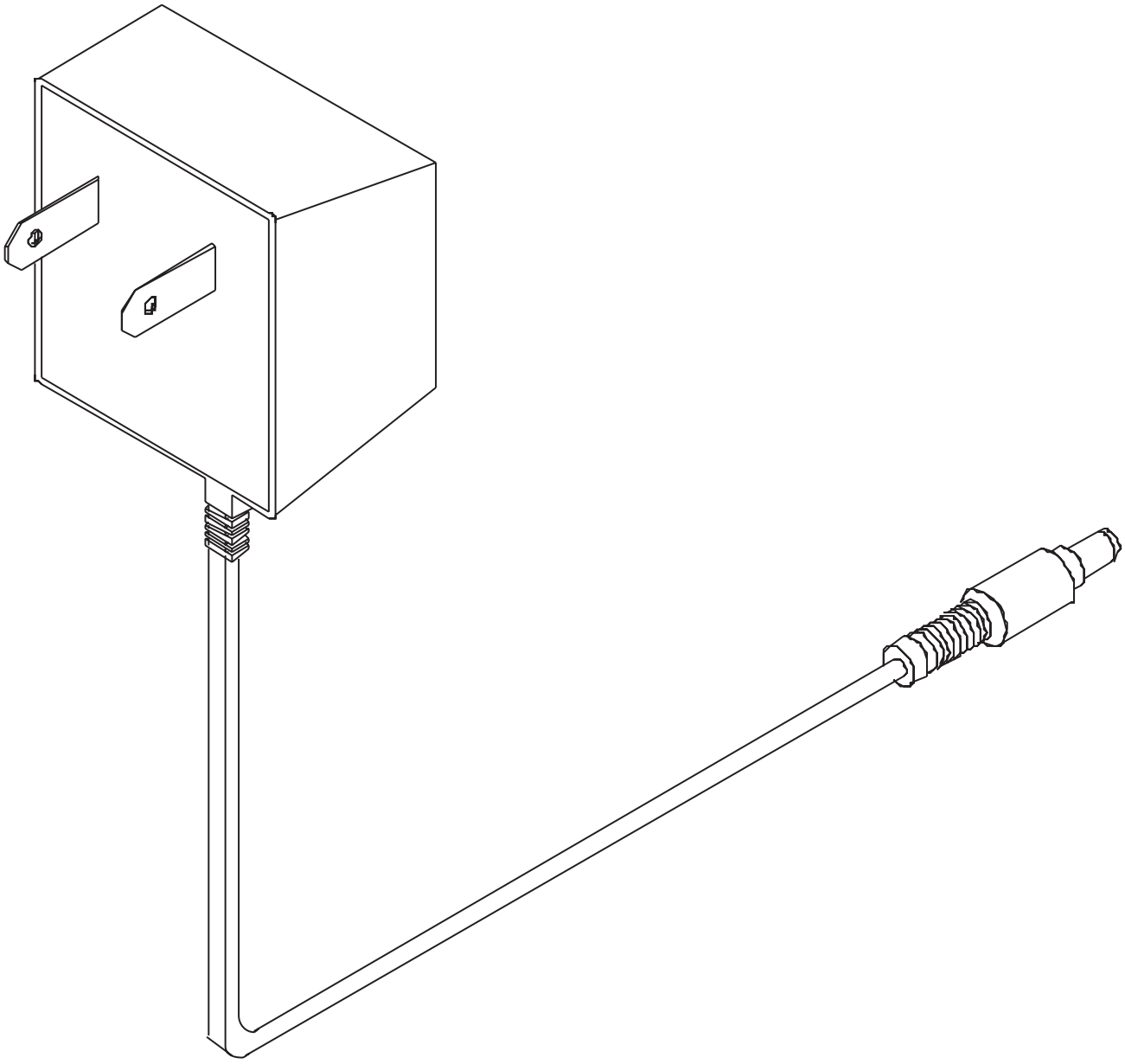


Figure 2-6 Typical Control Panel Power Supply

2.9 Switch Cap Assembly

The RCP-MP32 Control Panel is equipped with re-legendable switches. If it becomes necessary, due to configurations changes, to change the switch labels (legends) take the following steps to disassemble the switch cover to gain access to the switch legend while referring to Figure 2-7:

1. Using a small straight-edge screwdriver, carefully pry the sides of the clear legend cap (first the right side and then the left side if necessary) until the legend cap is freed from the switch base.

2. Once the legend cap is freed from the switch base, gently tap the clear legend cap to remove the legend retaining cap and the legend.

Once the legend is replaced, the following steps to reassemble the switch while referring to Figure 2-7:

1. Place the new legend into the clear cap with its right and left sides aligned with the right and left sides of the clear cap (the sides with the retaining tabs).

2. Once the new legend is correctly placed into the clear cap, insert the legend retaining cap into the clear cap.

3. Once the legend and the legend retaining are inserted into the clear cap, align the right and left sides (the sides with the tabs) with the right and left sides of the switch base.

4. When the clear cap is properly aligned with the switch base, press the clear cap onto the switch base until it snaps into place.

2.9 Switch Cap Assembly Continued:

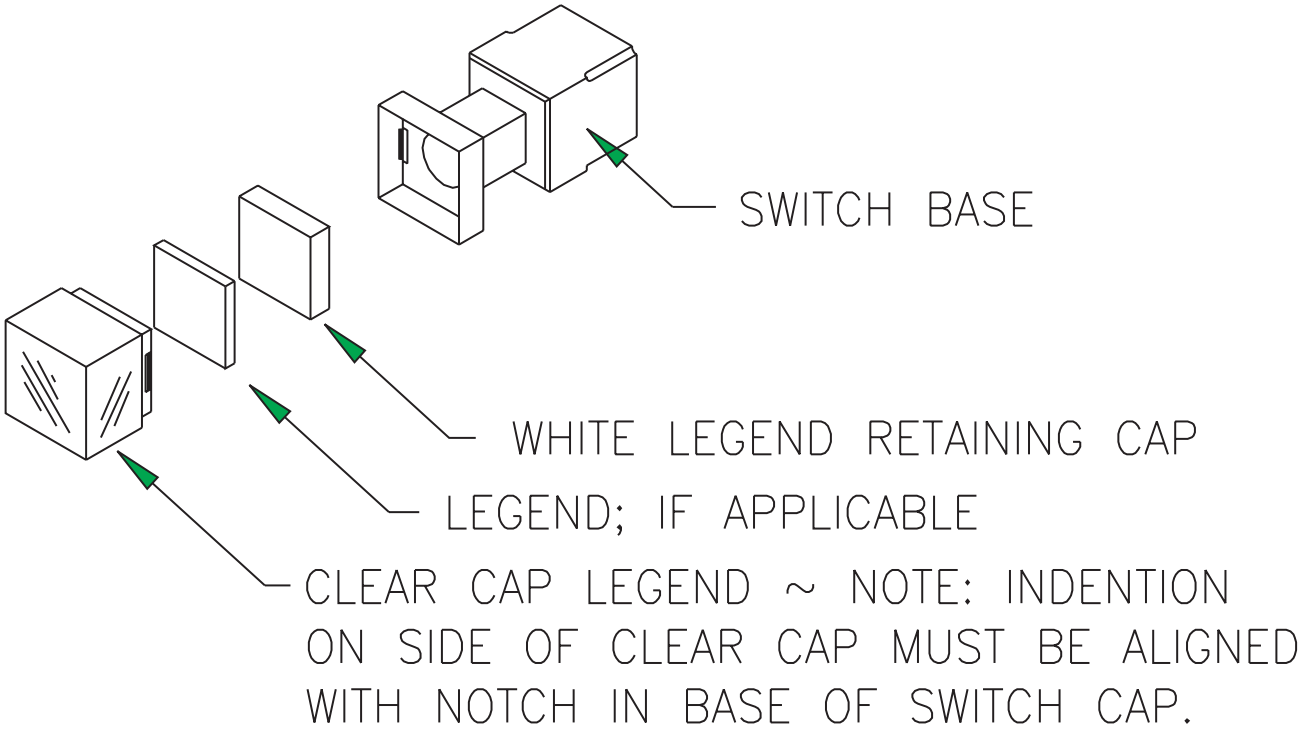


Figure 2-7 Switch Cap Assembly

3.1 Introduction

The RCP-MP32 Control Panel is designed to be controlled by the 3500 Controller. Operation of the RCP-MP32 Control Panel requires that it be configured at the system controller utilizing the Win3500 Control System. *Refer to the Operations Section of the Win3500 Control System Manual for configuration instructions.*

General

All RCP-MP32 Control Panels in a routing switcher system are custom configured at the factory prior to shipment. The information needed to configure the control panels comes from the System Design Guide filled out by the customer. However, if the system configuration changes, the RCP-MP32 Control Panels can be re-configured on site using the control system configuration software.

3.2 Breakaway Operation

Breakaway allows you to select a source on a specific level to be taken to a destination on that level. Breakaways can be accomplished in the Direct Take Mode.

To Make a Breakaway Switch:	**Results:**
Depress Data Key associated with level(s) you wish to breakaway.	Data Key(s) selected light to show level selection(s). Data Key whose associated input matches the current status on the selected level(s) will be illuminated.
Depress the Data Key associated with the input you desire on the level(s) selected.	The destination controlled by the panel will be switched to the input assigned to the Data Key pressed for each level selected.
To Return to Follow Operation:	**Results:**
Depress Data Key(s) associated with active levels.	Data Key LEDs are extinguished and associated levels are no longer selected for breakway operation.
	In Follow Operation the Data Key whose source matches the current status is illuminated.

3.3 Key Types

Data Keys - There are 32 data keys located towards the left side of the control panel and six data keys located towards the right side of the control panel. The data keys are associated with assigned sources, destinations, or levels. The source, destination, or level assigned to each data key is configurable at the system controller. Thirty-two data keys are defined for each page (32 X 4 = 128 data keys plus six fixed page independent data keys for a total of 134 data keys).

Function Keys - Two function keys are located to the far right side of the control panel: PROT/LOCK and CLEAR/ADDR. Each function key works as a toggle; the primary function is listed first, followed by the secondary function. **NOTE: The primary function is executed when the key is held down less than two seconds. The secondary function is executed when the key is held down more than two seconds.** A third function key (PAGE Key) and four LEDs representing the page currently selected for data key operation are located to the left of the PROT/LOCK and CLEAR/ADDR Keys.

3.4 Mode of Operation

Direct Take - Selects source to be switched to the destination controlled by the control panel by depressing associated data keys. Switch requests are sent immediately. Direct Take is the RCP-MP32 Control Panel's default mode of operation. Pressing the CLEAR Key while in Direct Take will clear break-away levels.

3.5 Panel Configuration

Panel Name: Any eight alpha-numeric characters. Currently used only by the controller configuration program to provide a user friendly method of referring to each control panel.

Panel Address: Decimal number from 1 to 1023 which is used to distinguish each panel on the panel communications bus. Address must match the dip switch setting on the rear of the panel.

3.5 Panel Configuration Continued:

Requestor Code: Decimal number from 1 to 65535 which is used to distinguish the ownership of locks and protects. For example, if two or more panels are assigned the same requestor code and one of the control panels locks or protects a destination the other control panels with the same assigned requestor code and an equal or higher lock priority code may unlock or unprotect the destination. The assignment of the same requestor code to two or more control panels allows all of the panels with same requestor code assigned to take switches on a protected destination if the destination was protected by one of the panels.

Lock Priority: Lock priorities are used when a panel attempts to set or clear a destination protect or lock. Only the panel which set a protect or lock or a panel of higher priority can un-protect or unlock a destination once it is locked. Lock priorities range from 0 (master) to 255. The default setting is master.

Status Level: Level to be statused when the panel is in the Follow Mode.

Status Method: The way the panel displays status is determined on whether the panel is set for "Follow" (changing all levels assigned to the panel) or "Breakaway" (changing only the selected levels) operation. While in the Follow Mode, the panel is statused by the default status level.

Destination: Destination to be controlled by the panel when first powered up.

Levels of Control List: List of levels to be controlled by the panel. Any level not assigned in the Levels of Control List will not be accessible to or affected by panel operations.

Data Key List: List containing the assignment of all data keys as configured by the user. The RCP-MP32 Control Panel's 134 data keys can be configured as source, destination, or level keys.

3.6 Statusing

NOTE: If the destination being controlled by the panel matches the destination assigned to a destination data key, the destination data key's LED will be illuminated.

3.6 Statusing Continued:

Status by Default Status Level

LED Illuminated Solid (not blinking) - The current status matches the source assigned to the data key for the default status level and the source(s) assigned to the data key for other levels either match the status on the default status level or are not configured.

LED Blinking - The current status matches the source assigned to the data key for the default status level and the source(s) assigned to the data key for at least one other level does not match the status on the default status level.

No LED Illuminated - The current status does not match the source assigned to any data key on the default status level.

Breakway Statusing

LED Illuminated Solid (not blinking) - The current status matches the source assigned to the data key for the highest priority level selected (level 1 is the highest priority level) and the source(s) assigned to the data key for other levels selected either match the current status or are not configured.

LED Blinking - The current status matches the source assigned to the data key for the highest priority level selected (level 1 is the highest priority level) but the source(s) assigned to the data key for at least one other selected level does not match the current status.

No LED Illuminated - The current status does not match the source assigned to any data key on the highest priority level selected (level 1 is the highest priorty level).

3.7 Direct Take Mode

Data Keys - In this mode, data keys are associated with sources, destinations, and levels. Pressing a source data key will switch the source assigned to the data key on all selected levels to the destination controlled by the panel. Pressing a destination data key will change the destination controlled by the panel. The method of statusing used by the panel is determined by the configuration at the system controller and whether break-away levels are currently selected. Pressing a level data key will cause the panel to go into the break-away mode.

3.7 Direct Take Mode Continued:

PROTECT/LOCK Key:

PROTect - Protects the destination controlled by the panel. Any switch request attempting to affect this destination made at any location other than this panel will be disallowed. PROT/LOCK LED illuminates to show that the destination controlled by the panel is protected.

LOCK - Locks the destination controlled by the panel. Any switch request attempting to affect this destination will be disallowed. PROT/LOCK LED blinks to show that the destination controlled by the panel is locked.

When the control panel is unlocked, pressing the PROT/LOCK Key quickly will take the panel into protect. Pressing the PROT/LOCK Key for more than two seconds will take the panel into lock. When the control panel is already protected or locked, pressing the PROT/LOCK Key quickly will clear the protect or lock.

CLEAR/ADDRESS Key:

CLEAR - Clears any selected levels and exits the control panel from the break-away mode of operation.

ADDRess - Displays the panel address on the top row of data key LEDs while the key is depressed. The address will be displayed in binary format. The LSB is the right-hand data key in the top row.

PAGE Key:

PAGE - Allows the user to select which page of 32 data keys to access. The page LEDs will illuminate to indicate which page is active. If a page of data keys has not configured, than the page is skipped. The PAGE Key LED will pulse when pressed.

4.1 Introduction

The RCP-MP32 Control Panel contains two printed circuit board assemblies; a MP32 Switchcard Assembly and a Remote CPU Assembly. The Remote CPU Assembly contains a microprocessor that controls the panel's operation and communicates with the routing switching system controller. The MP32 Switchcard Assembly contains the push-buttons and indicators used by the system operator to control the routing switcher system.

4.2 MP32 Switchcard Assembly

The switchcard for the RCP-MP32 Control Panel contains circuitry to provide a switchcard ID for the CPU board, scan a keyboard, and light the keyboard LEDs. The following is a description of each of these circuits.

Switchcard ID

The MP32 Switchcard provides a six-bit ID available to be read by the CPU board. This ID is available on J2, pins 23-28. Each of the ID bits (ID0-ID5) are either floating or grounded by the switchcard. Floating pins are pulled high by pullup resistors on the CPU board. The CPU may use these bits to detect what switchcard is attached.

Keyboard Scan

The MP32 Switchcard contains circuitry capable of scanning up to 64 pushbuttons. The scan circuit is arranged as an eight row by eight column array. While the circuitry is capable of serving 64 pushbuttons, the RCP-MP32 Control Panel has circuitry for 41 pushbuttons. To scan the keyboard, the microprocessor on the CPU board performs read cycles that enable SEL1. This occurs for addresses in the range of 800h to FFFh. SEL1 provides a low-active chip select for a 3 to 8 line decoder (U2 pin 5). A second low-active chip select is provided by address bit A3 at U2 pin 4. The three least significant address bits (A0-A2) are connected to the input of the decoder (U2 pins 1, 2, and 3). One of the eight low-active outputs of the decoder is selected by placing the appropriate address on the input of the decoder. Since partial decoding is used, the keyboard circuitry is mapped to several addresses within the SEL1 address range.

4.2 MP32 Switchcard Assembly Continued:

Keyboard Scan Continued:

The software in the CPU only uses the lowest available addresses to access the keyboard. Table 4-1 contains the addresses used to access each row of the keyboard circuit.

Table 4-1 Keyboard Memory Map

ADDRESS	ROW	PIN
800h	KB_ROW0	U2 pin # 15
801h	KB_ROW1	U2 pin # 14
802h	KB_ROW2	U2 pin # 13
803h	KB_ROW3	U2 pin # 12
804h	KB_ROW4	U2 pin # 11
805h	KB_ROW5	U2 pin # 10
806h	KB_ROW6	U2 pin # 9
807h	KB_ROW7	U2 pin # 7

Although the RCP-MP32 Control Panel only uses rows 0-5, the CPU still scans all eight rows. Each row of pushbuttons contains up to eight individual switches. Example: KB_ROW0 will simultaneously enable pushbuttons S1-S8. If any of these switches are pressed, the low-active signal will be passed through the pushbutton contacts to one of the eight column signals (KB_COL0-KB_COL7). If the pushbutton is not pressed, the switch contacts are broken and the column signal will be pulled high by resistor pack RP1. The SEL1 signal also enables U3 to place the KB_COL signals on the data bus. Thus, by performing a read cycle at address 800h, the CPU can determine the state of pushbuttons S1-S8 by looking at the state of data bits D0-D7. If S1 is pressed, then D0 will be low. Likewise, if S2 is pressed, D1 will be low. The status of the entire keyboard array may be determined by performing successive reads of each row of the array.

4.2 MP32 Switchcard Assembly Continued:

LED Driver

The MP32 Switchcard contains circuitry capable of lighting up to 68 pushbuttons. The RCP-MP32 Control Panel uses only 45 of these LEDs, one per pushbutton plus one for each page LED. The drives for the LEDs is provided by U1 and U5. The CPU sends a serial data stream to U1 and U5 by using the LED_DATA (U1 and U5 pin 25) and LED_CLOCK (U1 and U5 pin 24) signals. The LED_SEL0 chip select (U1 pin 26) must be asserted (low active) to select the first LED driver chip (U1). The LED_SEL1 chip select (U5 pin 26) must be asserted (low active) to select the second LED driver chip (U5). The output current used to drive each LED is enabled by the brightness pin of the LED driver (U1 and U5 pin 21). The LED_DATA line is latched into U1 on the rising edge of LED_CLOCK while LED_SEL0 is asserted. The LED_DATA line is latched into U5 on the rising edge of LED_CLOCK while LED_SEL1 is asserted.

4.3 MP32 Remote CPU Assembly

The Remote CPU Assembly contains all of the circuitry necessary to communicate with the system controller and to interface with the Switchcard Assembly. The circuitry on the Remote CPU Assembly may be divided into the following sections: Power Supply, Microprocessor, Clock, Reset, Memory, LED Driver Support, RS-485 Communications, I/O, and Miscellaneous. The following paragraphs explain each section in detail.

Power Supply

The power supply circuit on the Remote CPU Assembly consists of a 7805 +5V regulator and filter capacitors. Unregulated DC voltage (7. 5 to 9 VDC) is supplied by an external power supply via J3. The voltage regulator (U7) reduces the voltage to 5. 0 VDC. C10, C11, and C12 provide filtering for the input and output of the regulator. Bypass capacitors (0. 1 uF) are scattered about the assembly to provide power supply bypassing for the individual integrated circuits (ICs). The regulated voltage is available to the Switchcard Assembly on both J1 and J2, pins 31 and 32. The unregulated voltage (Vext) is available to the Switchcard Assembly on both J1 and J2, pins 29 and 30.

4.3 MP32 Remote CPU Assembly Continued:

Microprocessor

The heart of the Remote CPU Assembly is the Motorola 68HC11 microprocessor (U1). This IC contains the microprocessor and peripheral circuitry used to operate the control panel. In addition, the 68HC11 contains a PROM loaded with the software used to operate the control panel. The 68HC11 is operated in the expanded multiplexed mode. In this mode port B (U1 pin 35-42) provides the upper address byte (A8-A15). Port C (U1 pins 9-16) provides both the lower address byte (A0-A7) and the data byte (D0-D7). U2 is used to latch the lower address byte. Figure 4-1 shows an idealized timing diagram for external bus cycles.

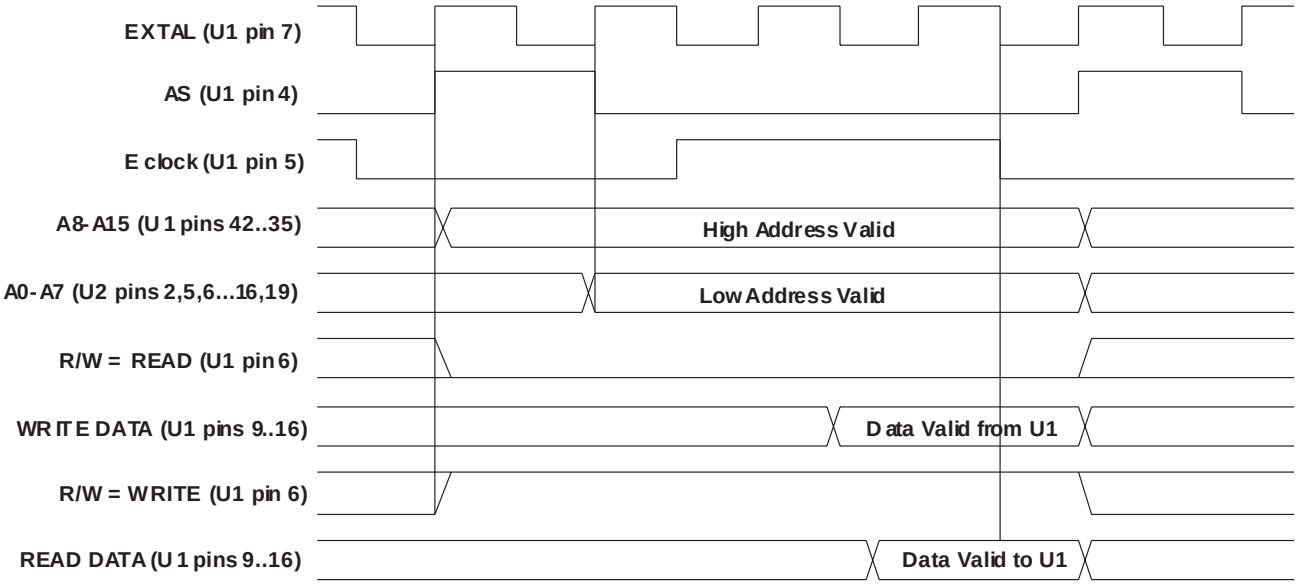


Figure 4-1 Idealized Bus Cycle Timing Diagram

During the first half of the bus cycle, port C presents the lower address byte (A0-A7). This information is latched into U2 on the falling edge of the address strobe, AS (U1 pin 4 to U2 pin 11), and remains stable until the beginning of the next bus cycle when AS is driven high by the processor. During the last half of the bus cycle port C presents data during write cycles and accepts data from an external device during read cycles. The address bus (A0-A15), the data bus (D0-D7), AS, R/W, and E clock are available to the Switchcard Assembly via J1.

4.3 MP32 Remote CPU Assembly Continued:

Clock

The master system clock is provided by oscillator U6 pin 8. SYSCLK is available to the processor (U1 pin 7) and the Switchcard Assembly via J2 pin 10. The frequency of SYSCLK is 7. 3728 MHz. This value was chosen to provide an appropriate frequency for the baud rate generator inside the 68HC11. The 68HC11 internally divides SYSCLK by four to derive the bus operating frequency. U1 pin 5 is the E clock used to synchronize all external bus cycles. The frequency of the E clock is 1. 8432 MHz (SYSCLK/4). The E clock is used to derive control signals on the Remote CPU Assembly and is available to the Switchcard Assembly via J1 pin 28.

Reset

As with all microprocessors, the 68HC11 requires initialization during power-up. The 68HC11 requires that the RESET pin (U1 pin 17) be held low for 4064 cycles of E clock (2. 2 mS @ 1. 8432 MHz E clock). In addition the RESET pin must be held low while VDD is below legal limits to protect the internal EPROM register contents. A Maxim MAX690 chip (U5) performs the reset function for the 68HC11. The MAX690 monitors the supply voltage and asserts RESET (U5 pin 7) whenever VCC falls below 4.5 VDC. The RESET signal is guaranteed to be asserted for a minimum of 50 mS after VCC rises above 4.75 VDC. This is more than adequate to meet the 2. 2 mS requirement of the 68HC11. The RESET signal is available to the Switchcard Assembly via J2 pin 11.

Memory

The Remote CPU Assembly contains 8K of static RAM (U3). The RAM is selected when both CS1 (U3 pin 20) and CS2 (U3 pin 26) are asserted. CS1 is low active and is driven by address bit A15. Whenever A15 is low, CS1 is asserted. This occurs for addresses in the range of 0000h to 7FFFh. CS2 is high active and is asserted when address bit A14 is high and E clock is high (note the AND gate formed by U8 pins 1, 2, and 3 followed by inverter stage U8 pins 4, 5, and 6). CS2 is active for addresses in the range of 4000h to 7FFFh. This encloses an address space of 16K. Since U3 is only 8K in length, it is dually mapped at base addresses of 4000h and 6000h. This means that the same location in the RAM may be accessed either at 4000h or at 6000h. The write enable pin WE (U3 pin 27) is driven low during the last half of the write cycles by U8 pin 8. This WE is also available to the Switchcard Assembly via J1 pin 25.

4.3 MP32 Remote CPU Assembly Continued:

LED Driver Support

The 68HC11 processor uses the internal synchronous peripheral interface (SPI) under software control to drive Switchcard Assembly's LED circuitry. LED_DATA is presented as serial bit stream on U1 pin 23 and is available to the Switchcard Assembly via J2 pin 7. LED_CLOCK is presented on U1 pin 24 and is available to the Switchcard Assembly via J2 pin 8. The Switchcard Assembly's circuitry should accept LED_DATA on the rising edge of LED_CLOCK. To allow multiple LED drivers to be serviced, the Remote CPU Assembly provides four select lines labelled LED_SEL0 through LED_SEL3. These active low signals are presented at U1 pins 27-30 and are available to the Switchcard Assembly via J2 pins 1-4. The data stream generated is compatible with that required by National MM5450 LED driver chips.

RS485 Communications

Communication between the panel and the system controller is accomplished by the 68HC11 internal serial communications interface (SCI). The SCI is an asynchronous receiver/transmitter, sometimes referred to as a UART. The RS485 standard is used for the electrical interface between control panels and the system controller. A 75ALS176 (U4) chip is used convert between RS485 and the levels required by the SCI. Transmit data (TXD) is presented by the SCI on U4 pin 21. This signal drives the input to the RS485 transceiver on U4 pin 4. Data received from the system controller is converted to the appropriate levels by the RS485 transceiver and is presented on U4 pin 1. This received data (RXD) signal is then fed to the SCI receiver at U1 pin 20. Since the RS485 interface requires the transmitter to be tri-stated when not is use, a third signal is required to enable/disable the RS485 transmitter. The processor provides the TX_ENABLE signal under software control at U1 pin 25. This signal is connected to the RS485 transceiver at U4 pin 3. When TX_ENABLE is asserted (high), U4 drives the RS485 bus (U4 pins 6 and 7 to J4 pins 1 and 3). When TX_ENABLE is negated (low), U4 ceases driving the bus and allows other devices to drive the bus. During reset, the TX_ENABLE signal from the processor is initialized to an input and is not driven to a particular state. A pull-down resistor (R2) has been added to ensure that U4 does not drive the RS485 bus during power-up or other reset conditions. A shield connection is provided for the RS485 bus on J4 pin 2. The shield is connected to ground through R1.

4.3 MP32 Remote CPU Assembly Continued:

I/O

Circuitry is included on the Remote CPU Assembly to support I/O expansion via J1 and J2. Decoder U9 provides eight chip select signals (SEL0 through SEL7) for use by I/O devices. U9 is selected when A14 and A15 are both low and E is high. This occurs during the last half of each external bus cycle addressing in the range of 0000h to 3FFFh. Table 4-1 lists the active address range for each select signal. Currently, Remote CPU Assembly uses two of these eight signals for on-board circuitry. SEL6 is used to select eight bits of the address DIP switch S1. When SEL6 is asserted, U10 places the state of signals SWX3 through SWX10 on the data bus. If the corresponding switch for each bit is closed, a logic low is presented. If the switch is open, pull-up resistor RP1 presents a logic high. SEL7 is used to select the remaining two bits of the address switch and the six bit ID field from the Switchcard Assembly. The ID field is driven by the Switchcard Assembly. A logic low is generated by grounding the ID pin. A logic high is generated by leaving the ID pin floating. Pull-up resistor RP3 generates the logic high when a pin is floating.

Table 4-2 Decoder Addressing

SIGNAL	START	END
SEL0	0000h	07FFh
SEL1	0800h	0FFFh
SEL2	1000h	17FFh
SEL3	1800h	IFFFh
SEL4	2000h	27FFh
SEL5	2800h	2FFFh
SEL6	3000h	37FFh
SEL7	3800h	3FFFh

Miscellaneous

The Remote CPU Assembly provides some special function signals for use by the Switchcard Assembly. On J2 pin 9 resides a signal named DSP_RS. This signal is a register select signal for the Switchcard Assembly's LCD display. The processor interrupt request line (IRQ) is currently not used, but is available for use by the Switchcard Assembly on J2 pin 12.

5.1 General

The RCP-MP32 Control Panel is a solid state electro-mechanical devices designed to give long, trouble free service with minimum maintenance requirements. If problems do occur, follow the troubleshooting procedure provided. If additional technical assistance is required, refer to the general assistance and service information in the front of this manual.

NOTICE

THIS EQUIPMENT CONTAINS STATIC SENSITIVE DEVICES. IT IS RECOMMENDED THAT A GROUNDED WRIST STRAP AND MAT BE USED WHILE MAKING REPAIRS.

5.2 Preventive Maintenance

There is little need for performing preventive maintenance on the RCP-MP32 Control Panel other than the normal care which should be given to any high quality electronic equipment.

5.3 Test Equipment

The test equipment recommended for servicing the RCP-MP32 Control Panel is listed in Table 5-1. Equivalent test equipment may be used.

Table 5-1 Test Equipment Table

EQUIPMENT	FUNCTION
Oscilloscope - 20MHz or Higher	Waveform Monitoring and Tracing
VOM - 20,000 Ohm per Volt or Higher	Voltage and Resistance Measurements

5.4 Corrective Maintenance

The following paragraphs provide information to assist the servicing technician in the maintenance of the RCP-MP32 Control Panel. The functional description (Section 4) contains assembly and circuit level information to help identify specific problems.

5.4 Corrective Maintenance Continued:

Factory Repair Service

If desired, equipment items or assemblies may be returned to the PESA factory (transportation prepaid) for repair. Refer to the General Assistance and Service Information Sheet found in the front of this manual. Call the PESA Service Department (the phone number is listed on Service Information Sheet) for a RMA number prior to shipping an equipment item to the PESA factory for repair.

NOTE

PACK THE EQUIPMENT SECURELY AND LABEL WITH THE CORRECT ADDRESS. PROPER PACKAGING SAVES MONEY. THE SMALL AMOUNT OF EXTRA CARE AND TIME IT TAKES TO CUSHION A PART OR UNIT PROPERLY MAY PREVENT COSTLY DAMAGE WHILE IN TRANSIT. MAKE CERTAIN THAT THE ADDRESS IS BOTH LEGIBLE AND COMPLETE. FAILURE TO DO SO OFTEN RESULTS IN DELAY OR EVEN LOSS.

Troubleshooting

Troubleshooting the RCP-MP32 Control Panel requires the routing switcher system to be used as a test fixture. The RCP-MP32 Control Panel will not function except as part of routing switcher system. The only troubleshooting which can be accomplished without opening the control panels is to check input power (from plug-in power supply).

To open a control panel for troubleshooting, remove the front cover and disassemble the unit as far as required to gain access to the component side of the circuit assemblies. Place the disassembled panel on a nonconductive surface and arrange the parts so the unit can be operated. You must be able to operate the push-buttons and observe the resulting status indicators. You must also have sufficient access to the circuit assemblies to measure voltage or observe waveforms.

Procedure: Put the RCP-MP32 Control Panel through the operating sequence as described in operation section of this manual. Refer to Section 3.

If the control panel is unresponsive, there may be a power problem of the microprocessor on the Remote CPU Assembly is not operating.

5.4 Corrective Maintenance Continued:

Troubleshooting Continued:

1. Refer to the **Power Distribution** discussion in Section 4. Refer to the **Remote CPU Assembly Schematic** in Section 6 if it is necessary to make voltage checks at the chip or component level.

2. If the power functioning properly, the microprocessor is not functioning. The microprocessor requires a clock, a power-up reset, and communications from the system controller. Refer to the Remote CPU Assembly functional description in Section 4.

For partial failures:

1. Push-button switches fail to initiate the desired operation. Refer to the Remote CPU Assembly functional description in Section 4. **NOTE:** If a source input fails to function it may be a blocked input. Check the system configuration at the system controller.

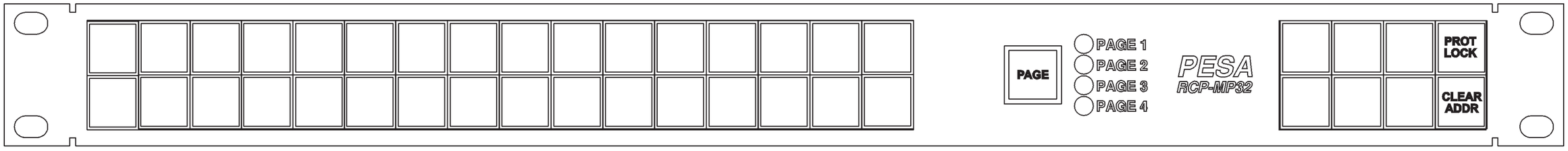
2. Control indicators fail to light. Refer to the LED Driver discussion in the functional description section.

3. Almost any type of functional failure can be caused by a memory failure. This type of failure can easily be checked if a substitute chip is available.

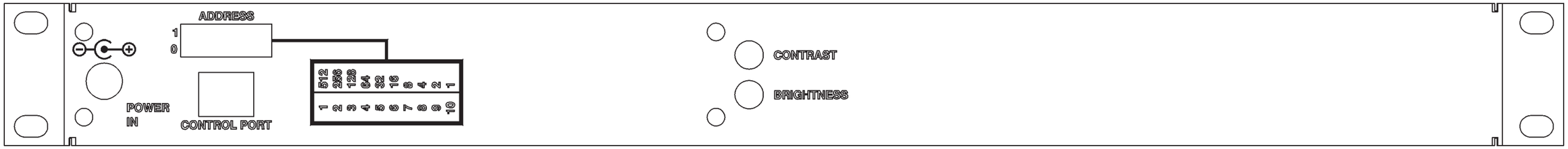
6.1 Schematics

General

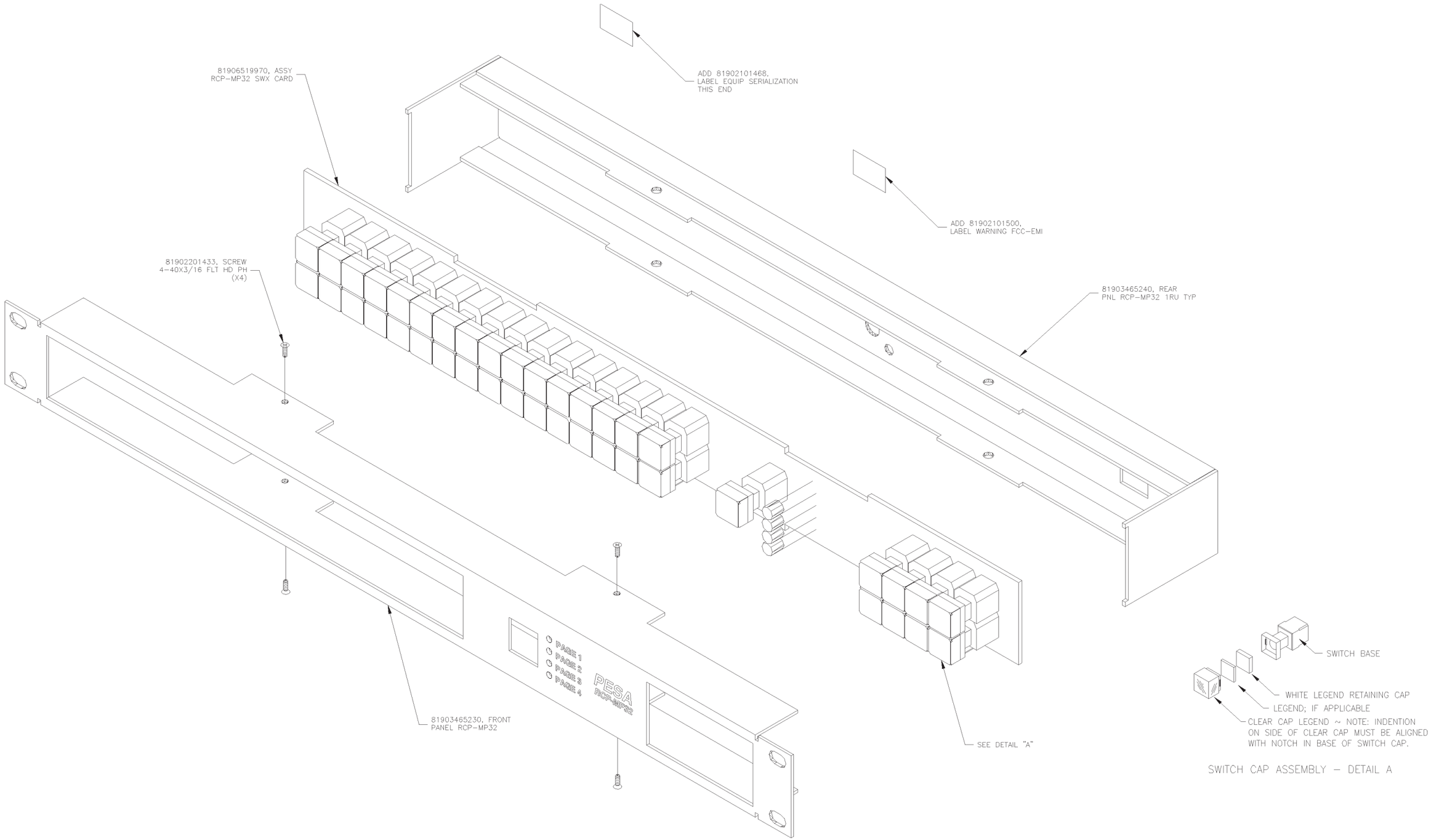
This section contains the schematic diagrams and parts location diagrams for the RCP-MP32 Control Panel. Please refer to this section when troubleshooting the equipment or replacing defective parts.



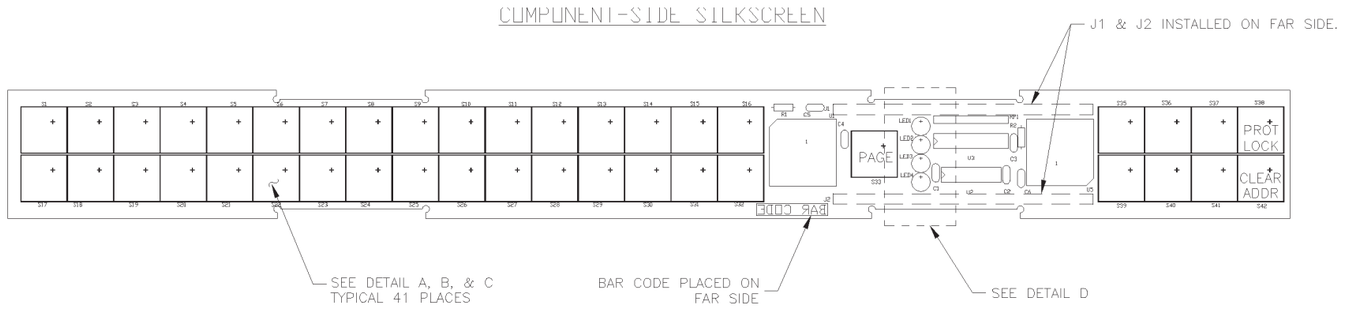
RCP-MP32 Control Panel (Front View)

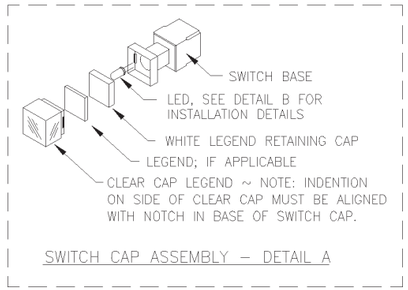


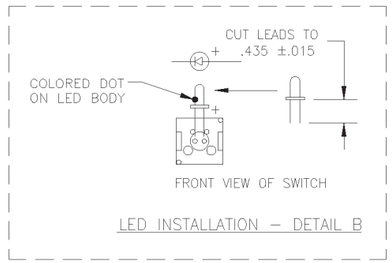
RCP-MP32 Control Panel (Rear View)

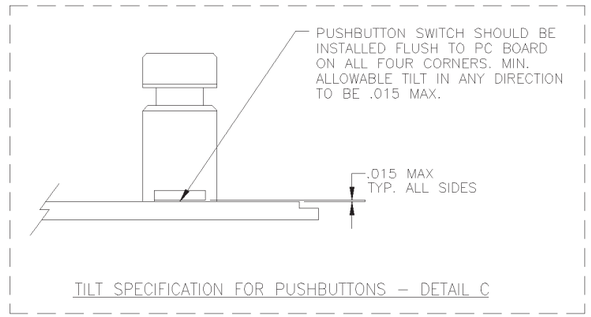


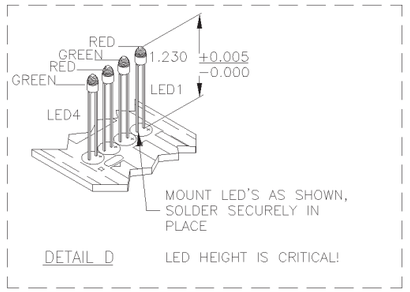
Configuration Drawing • RCP-MP32 Control Panel Assembly (REV 01) • CD63-0791

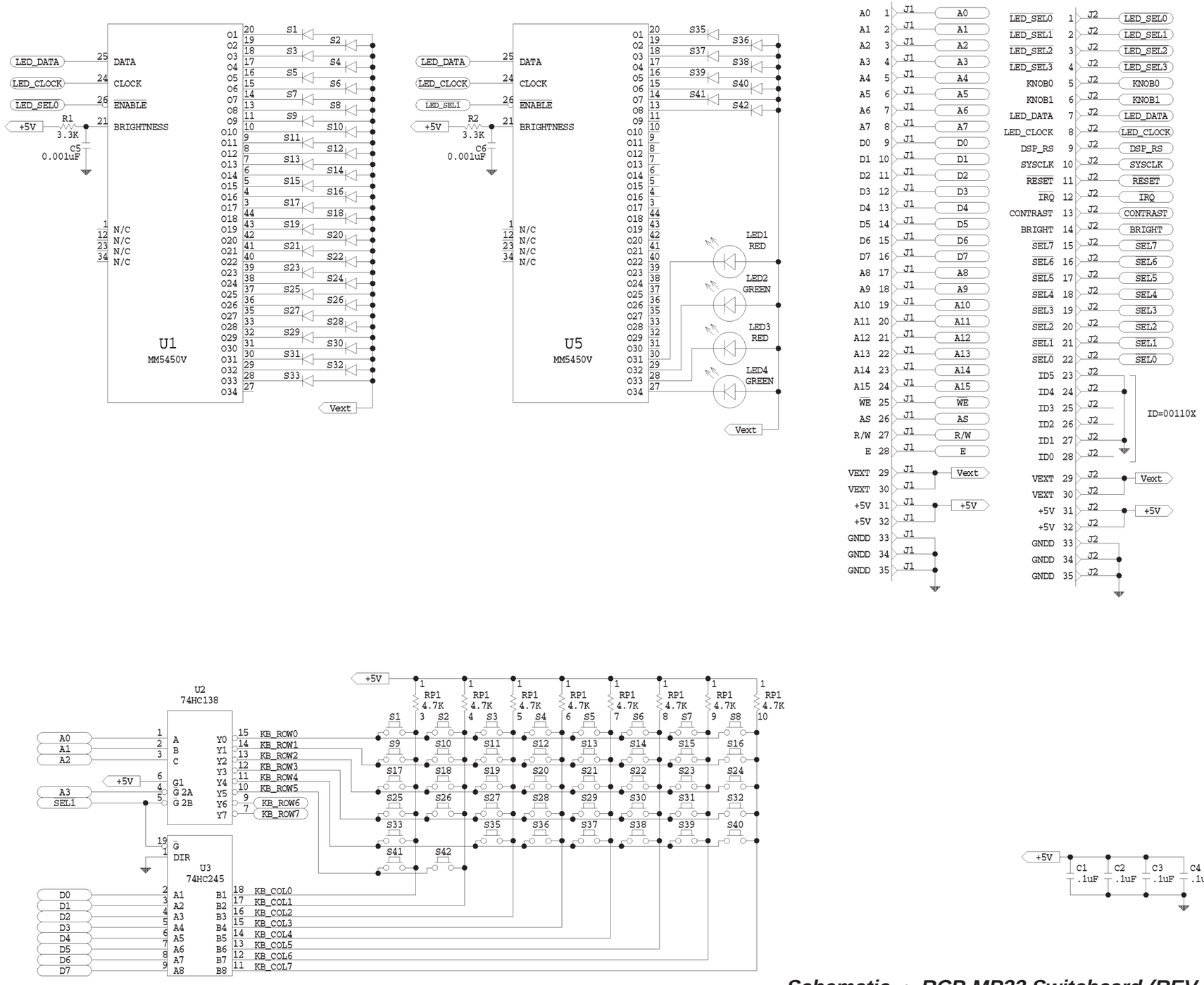

COMPONENT-SIDE SILKSCREEN
J1 & J2 INSTALLED ON FAR SIDE.
PAGE
PROT LOCK
CLEAR ADDR
BAR CODE
SEE DETAIL A, B, & C TYPICAL 41 PLACES
BAR CODE PLACED ON FAR SIDE
SEE DETAIL D


SWITCH BASE
LED, SEE DETAIL B FOR INSTALLATION DETAILS
WHITE LEGEND RETAINING CAP
LEGEND; IF APPLICABLE
CLEAR CAP LEGEND ~ NOTE: INDENTION ON SIDE OF CLEAR CAP MUST BE ALIGNED WITH NOTCH IN BASE OF SWITCH CAP.
SWITCH CAP ASSEMBLY – DETAIL A


CUT LEADS TO .435 ±.015
COLORED DOT ON LED BODY
FRONT VIEW OF SWITCH
LED INSTALLATION – DETAIL B

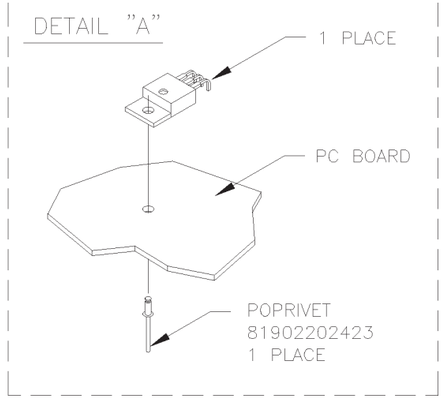

PUSHBUTTON SWITCH SHOULD BE INSTALLED FLUSH TO PC BOARD ON ALL FOUR CORNERS. MIN. ALLOWABLE TILT IN ANY DIRECTION TO BE .015 MAX.
.015 MAX TYP. ALL SIDES
TILT SPECIFICATION FOR PUSHBUTTONS – DETAIL C

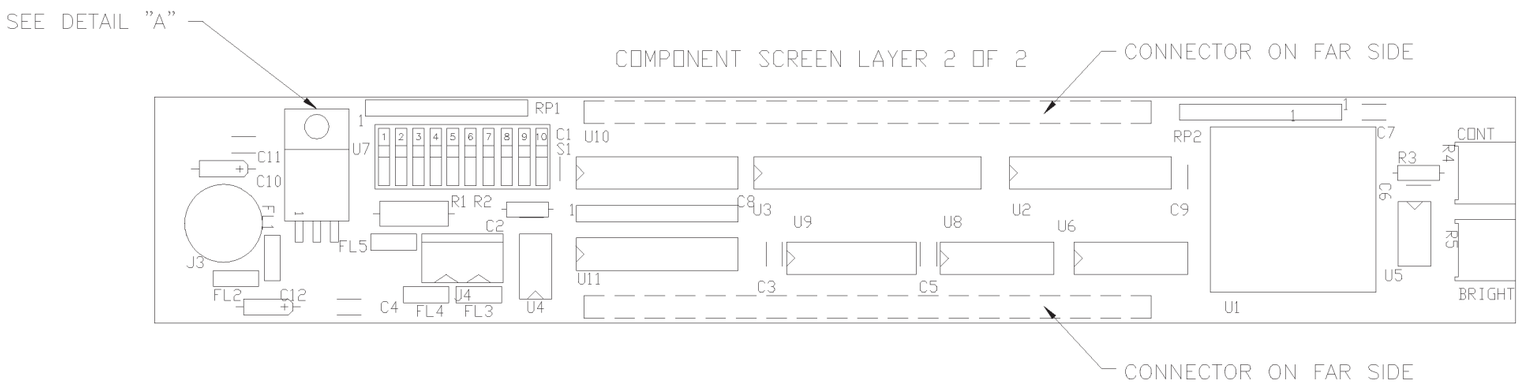

RED
GREEN
RED
GREEN
1.230 +0.005 -0.000
LED1
LED4
MOUNT LED'S AS SHOWN, SOLDER SECURELY IN PLACE
DETAIL D
LED HEIGHT IS CRITICAL!

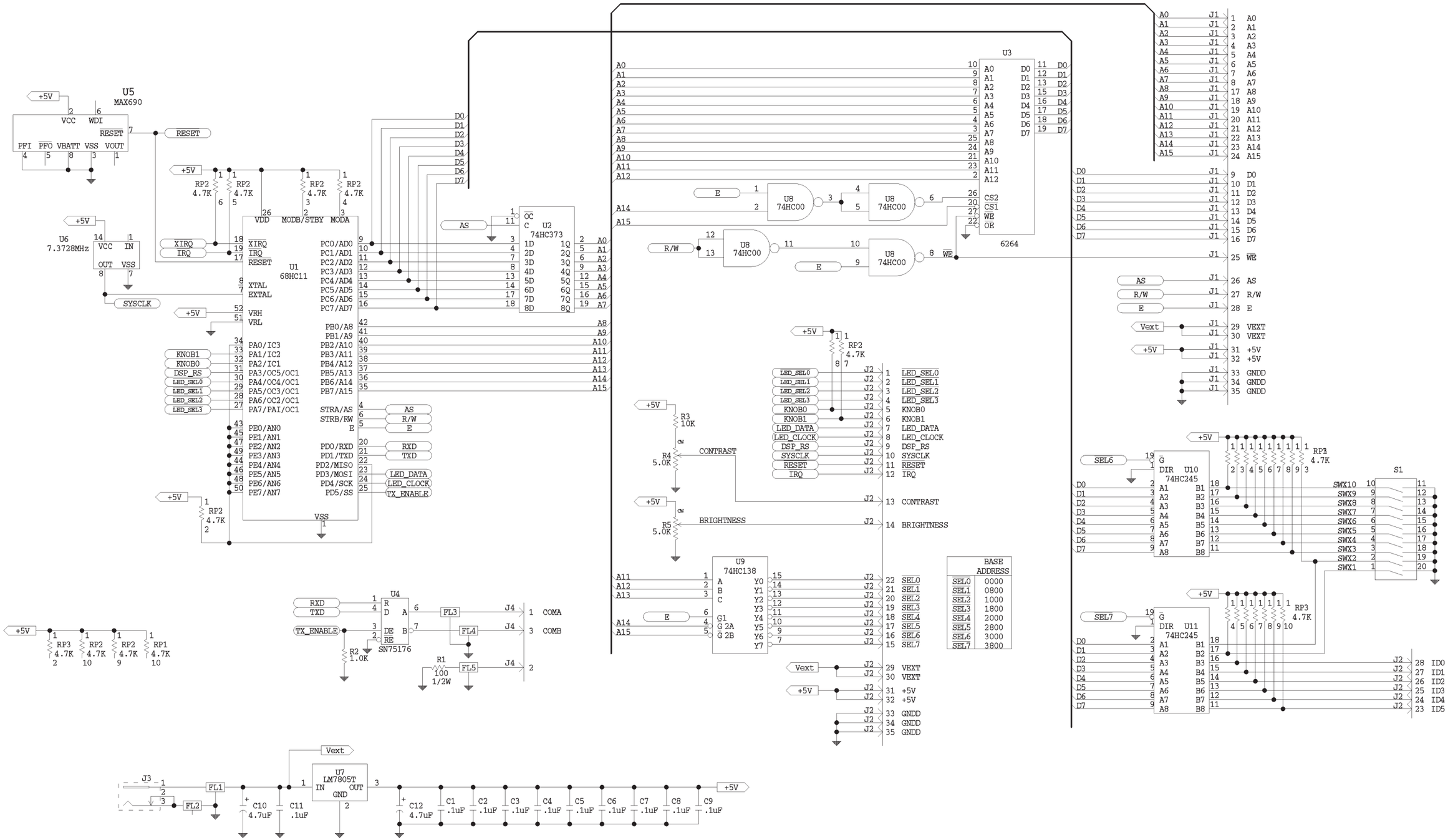


Schematic • RCP-MP32 Switchcard (REV 01) • SC33-1407


COMPONENT SCREEN LAYER 1 OF 2
J1
J2
ADD REVISION LABEL
TO NEAR SIDE.


DETAIL "A"
1 PLACE
PC BOARD
POPRIVET
81902202423
1 PLACE


SEE DETAIL "A"
COMPONENT SCREEN LAYER 2 OF 2
CONNECTOR ON FAR SIDE
CONNECTOR ON FAR SIDE
RP1
U7
C1
U10
S1
C11
C10
FL1
J3
FL2
C12
R1 R2
C2
FL5
C4
FL4
FL3
U4
U4
C8
U3
U9
U8
U2
U6
C9
U11
C3
C5
RP2
C7
R3
C6
U5
U1
CONT
R4
R5
BRIGHT



Schematic • Remote CPU Assembly (REV C) • SC33-1190

7.1 Parts List

General

The Parts List in this section have been grouped according to each assembly associated with the RCP-MP32 Control Panel. Refer to each list by name of card, board, or section of the equipment requiring replacement parts.

RCP-MP32 Control Panel Assembly (REV 01) - 81906520000

81901201468	LABEL EQUIP SERIALIZATION	1	EA
81902101500	LABEL WARNING FCC-EMI	1	EA
81902201433	SCREW 4-40 X 3/16 FLAT HEAD PHIL	4	EA
81902202696	SCREW 4-40 X 7/16 SIMM PAN HEAD	4	EA
81902907800	CONN 3-POS W/STRAIN RELIEF	1	EA
81903465230	FRONT PANEL RCP-MP32	1	EA
81903465240	REAR PANEL RCP-MP32 1RU TYPE	1	EA
81906515410	REMOTE CPU ROTARY MB CARD	1	EA
81906515550	SOFT ASSY RCP PANELS	1	EA
81906519970	ASSY RCP-MB32 SWX CARD	1	EA
CD63-0791	CON DWG TOP BILL RCP-MP32	REF	
SS49-0747	DOC REAR SCREEN RCP-48X	REF	
SS49-0887	DOC FRONT PANEL RCP-MP32	REF	

RCP-MP32 Switchcard (REV 02) - 81906519970

81900200783	RESISTOR 3.3K 5% 1/4W	R1 R2	2	EA
81900600958	SIP 4.7K 10-PIN 9-RESISTOR	RP1	1	EA
81900700055	CAP 0.1MF 50V CERAMIC RADIAL	C1 C2 C3 C4	4	EA
81900700238	CAP 0.001MF 1000V CERAMIC	C5 C6	2	EA
81901604314	IC 74HC245 CMOS BUSTRANSV	U3	1	EA
81901604827	IC 1 OF 8 DECODER/MUTLIPLEXER	U2	1	EA
81901606870	IC 5450 34 SEGMENT LED DRIVER	U1 U5	2	EA
81902101930	LENS ASSY BKC-6	REF: S1-S41	41	EA
81902104890	LEGEND SET CONTROL PANEL		1	EA
81902105050	LABEL BARCODE 1.5" X 0.25"		1	EA
81902414070	PCB RCP-MB32 SWITCH CARD		1	EA
81902900584	SWITCH PCB T-5K-M-NO	S1-S41	41	EA
81902907400	CONN SOCKET PLCC 44-PIN	REF: U1 U5	2	EA
81902907430	CONN RECEPTACLE 35 X 1	J1 J2	2	EA
81903200301	LED YELLOW U-BRITE	REF: S1-S41	41	EA
81903200343	LED GREEN DIFF 20MA T13/14	LED2 LED4	2	EA
81903200350	LED RED DIFF 20MA T13/14	LED1 LED3	2	EA
CA25-1407	DOC RCP-MB32 SWITCH CARD		REF	
DD52-1407	DOC RCP-MB32 SWITCH CARD		REF	
SC33-1407	DOC RCP-MB32 SWITCH CARD		REF	

Remote CPU Assembly (REV D) - 81906515410

81900200668	RESISTOR 1K 5% 1/4W	R2	1	EA
81900200908	RESISTOR 10K 5% 1/4W	R3	1	EA
81900300427	RESISTOR 100 OHM 5% 1/4W	R1	1	EA
81900500125	POT 5K	R4 R5	2	EA
81900600958	SIP 4.7K 10-PIN 9-RESISTOR	RP1 RP2 RP3	3	EA
81900700055	CAP 0.1MF 50V CERAMIC RADIAL	C1-C9 C11	10	EA
81900900309	CAP 4.7MF 20V TANT AXIAL	C10 C12	2	EA
81901601187	REG MC7805C +5V 1A TO-220	U7	1	EA
81901604314	IC 74HC245 CMOS BUSTRANSV	U10 U11	2	EA
81901604579	IC 74HC373 OCTAL D LATCH	U2	1	EA
81901604827	IC 1 OF 8 DECODER/MULTIPLEXER	U9	1	EA
81901604850	IC 74HC00 2-IN NAND QUAD	U8	1	EA
81901606061	IC MAX690CPA POWER SUP MON	U5	1	EA
81901606820	IC 8K X 8 SRAM 150NS	U3	1	EA
81901606830	IC 7.3728MHZ OSCILLATOR	U6	1	EA
81901606880	IC 75ALS176 RS485 TRANSCV	U4	1	EA
81902202423	RIVET 1/8" DIA CLOSED		1	EA
81902411900	PCB CPU ASSY RCP		1	EA
81902900543	SWITCH 10-POS DIP PC MT	S1	1	EA
81902905991	SOCKET 52-PIN PLCC PC MT	REF: U1	1	EA
81902906353	CONN 3-POS MALE POLAR STAR	J4	1	EA
81902907420	CONN HEADER 35X1 UNSHROUND	J1 J2	2	EA
81902907460	CONN POWER JACK PCB MOUNT	J3	1	EA
81903900740	FILTER EMI SUPPRESSION	FL1-FL5	5	EA
CA25-1190	DOC REMOTE CPU RCP PANELS		REF	
DD52-1190	DOC REMOTE CPU RCP PANELS		REF	
SC33-1190	DOC REMOTE CPU RCP PANELS		REF	

CPU Software Assembly (REV B) - 81906515550

81901606730	IC 68HC11E9 SINGLE CHIP	1	EA
81902104930	LABEL WHITE ½" X ¾" REC	1	EA
81905602970	SOFT SOURCE CODE CPU	REF	
81906202460	DOC SOFT SPEC SHEET CPU	REF	