PESA Switching Systems

RCP-XY

PESA Switching Systems
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PESA Switching Systems

RCP–XY Control Panel

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1.1 Manual Overview

This manual provides detailed instructions for installing and operating the PESA RCP–XY. This manual is divided into seven sections as shown.

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

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

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

Section 4, **FUNCTIONAL DESCRIPTIONS**, presents an in-depth description of each RCP–XY 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–XY is a Rotary XY panel with a full complement of features allowing access to all outputs for full matrix control or only a selected subset for limited control. Selections are made with a Rotary Selector with 16 user-programmable pushbuttons for instant access. These pushbuttons can be configured to represent sources or destinations. The RCP–XY can be configured to operate in a variety of modes depending on the specific requirements of the user. Full XY, Limited XY, or Singlebus operation is supported.

The RCP–XY has a large display area for viewing of panel DESTINATION, STATUS, LEVEL, and PRESET.

Full function operation modes include PRESET, LEVEL, DESTINATION, SALVO, TAKE, and CHOP. The panel also supports source limiting, permitting the user to configure the panel to allow or deny access to selected sources.

The RCP–XY comes packaged in a standard 19" one rack unit chassis requiring three inches of depth.

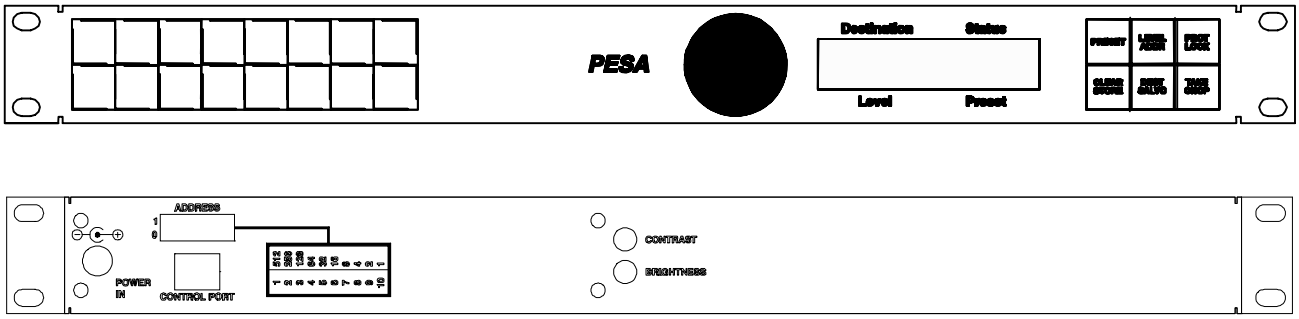


Figure 1–1 RCP–XY Front and Rear Views

1.3 Specifications

GENERAL	
Mounting	Standard 19" Rack
Pushbuttons	Illuminated and Legendable
INPUT	RS485
POWER	
Voltage Requirements	+7. 5Vdc @ 800mA
MECHANICAL	
One Rack Unit	**19"W x 3"D x 1 3/4"H 482.6mmx76.2mmx44.45mm**
ENVIRONMENTAL	
Temperature	0°C to 40°C
Humidity	20% to 90% Non-Condensing

2.1 Introduction

This section details RCP–XY installation procedures. The following topics are discussed:

- Receipt Inspection
- Location and Mounting
- Polling Address
- Control Panel/Controller Interconnection
- Power Connections

2.2 Receipt Inspection

The RCP–XY was inspected and tested prior to leaving 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–XY has been designed to fit in a standard E.I.A. 19" equipment rack and uses 1 rack unit of space (1 3/4"). An area should be selected where temperature does not exceed 40°C inside the equipment rack, and where air can circulate freely. The unit should be mounted in an area convenient to control and power connections. Sufficient space must be provided behind the rack to allow for the control and power cables. When the RCP–XY is supplied as part of a system including interconnecting cables, a rack layout drawing is usually provided. While adherence to this drawing is not required, it will ensure that the cables are of proper length. All mounting holes should be utilized and hardware tightened securely. All cable should be strained relieved and secured to racks or other supporting structures. Failure to provide adequate cable support can result in cables separating from connectors. If cable runs are to be stored under an elevated floor, they should be tied to the racks as a guide. If cables are run along the floor, do not allow them 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.

2.3 Location and Mounting Continued:

Figure 2–1 illustrates chassis installation.

To install the RCP–XY chassis follow these steps:

1. Align the chassis with the slotted opening in the rack.
2. Install the bottom screws first.
3. Install the two top screws
4. Tighten all four screws securely.

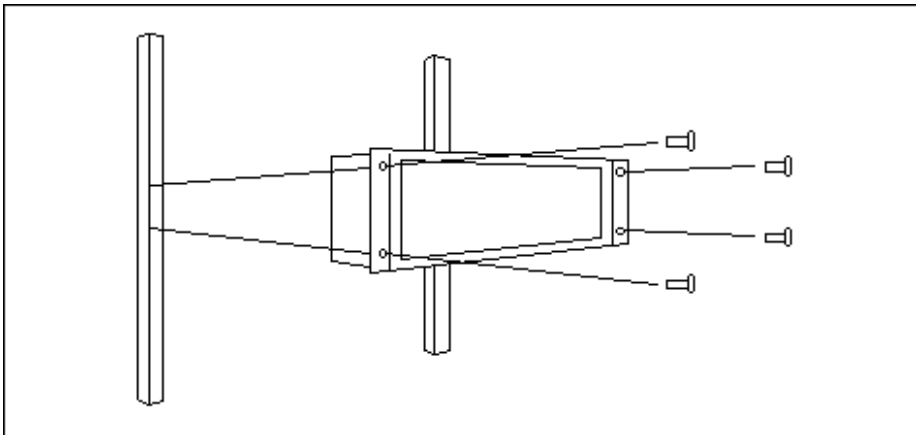


Figure 2–1 RCP–XY Chassis Installation

2.4 Polling Address

For the controller to identify a particular control panel, a specific device number or polling address must be assigned to each panel. Sequential binary numbers (1 thru 128) are used for this purpose. Systems requiring more than 128 panels are possible with enhanced controllers, refer to your Pesa Sales Representative for details. The appropriate binary number is entered into the control panel by setting an internal 10-position DIP switch to the 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.

2.4 Polling Address Continued:

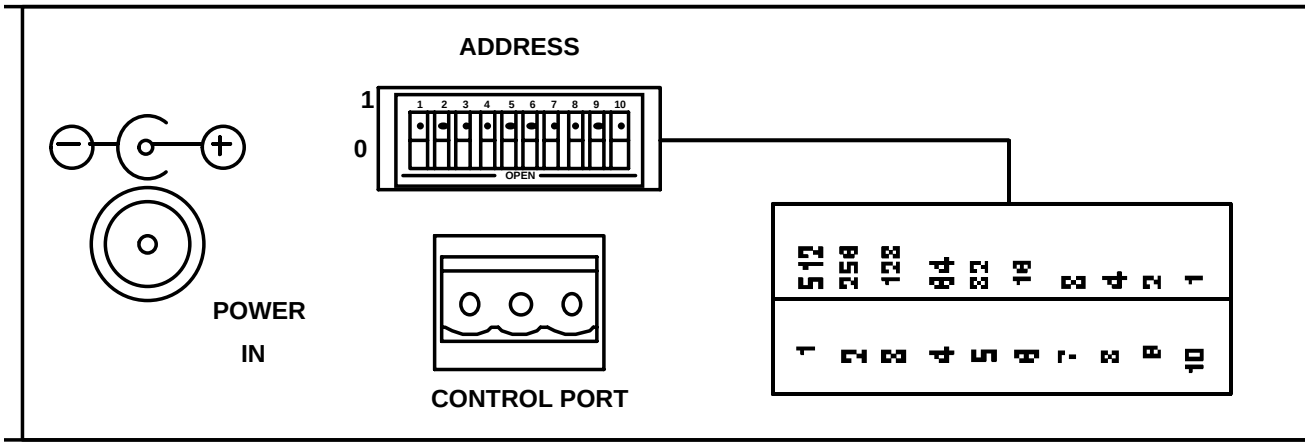


Figure 2–2 DIP Switch Location

2.5 Control Panel/Controller Interconnection

Each panel has a single 3-pin MTA connector located on the rear panel. Control panels are daisy chained to a port on the rear of the Controller. Use shielded twisted pair cable. See Figure 2–3.

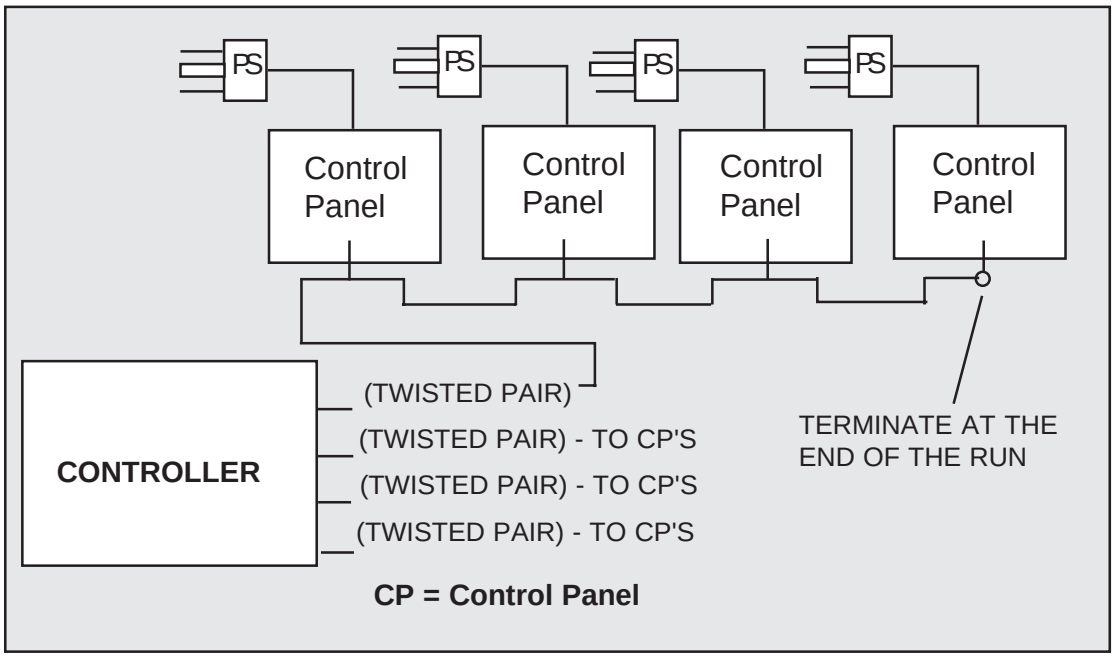


Figure 2–3 Typical Control Panel Controller Interconnection

2.6 Wiring the Control Panel Connector

Should an additional control 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. See Figure 2–4.

1. Remove approximately 1 1/2" of insulating jacked from each of the two wires.
2. Remove approximately 1/2" of insulation from the black and red wires.
3. Twist together and insert the two black wire ends into positon 1. Crimp down using a screw driver.
4. Twist together and insert the two shield wires into position 2. Crimp down using a screwdriver.
5. Twist together and insert the two red wire ends into position 3. Crimp down using a screwdriver.

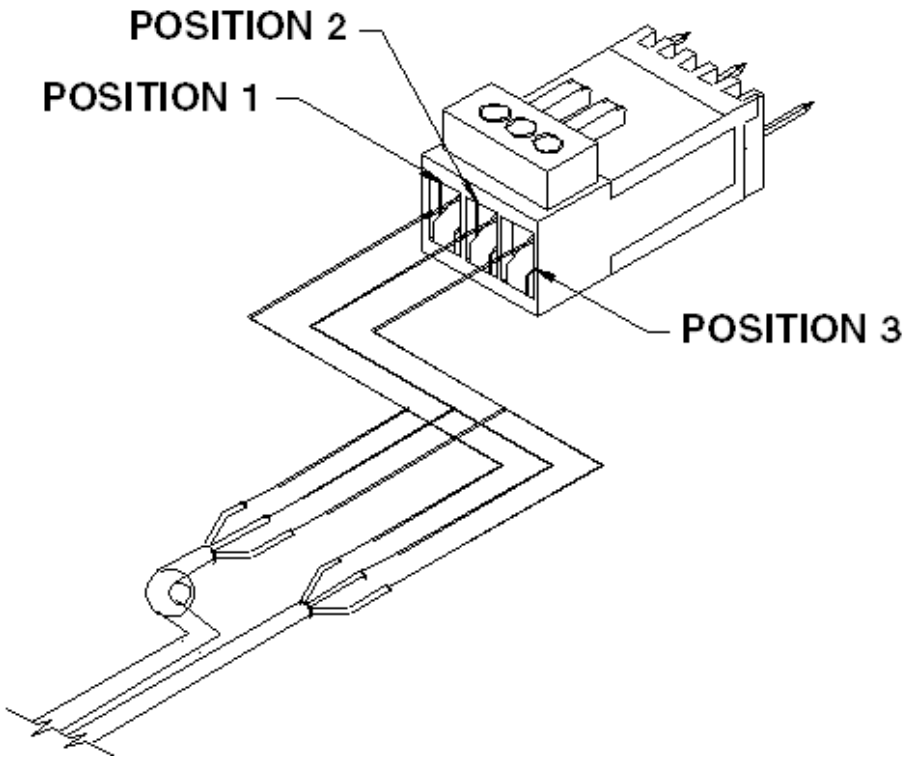


Figure 2–4 Wiring the Control Panel Connector

2.7 Terminating Cable Runs

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

1. Uncrimp the black and red leads in position 1 and 3.
2. Insert the resistor ends into position 1 and position 3 along with the black and red leads.
3. Crimp down using a screwdriver.
4. The shield wire remains in position 2.

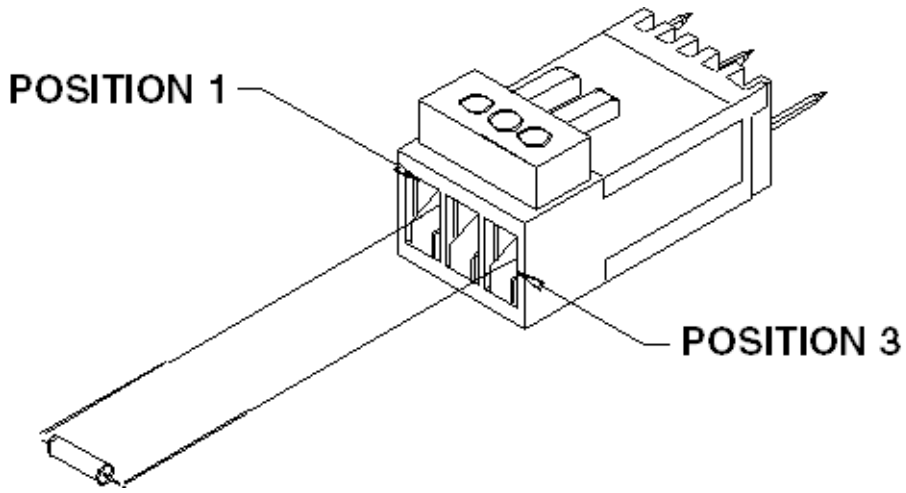


Figure 2–5 Terminating Cable Runs

2.8 Power Connections

Power for the RCP–241 is supplied by an external 7.5 Vdc, 800 mA power supply.

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 voltage. The power connector can now be plugged into the **POWER IN** position on the RCP–241. The Power Pack will immediately power the unit upon connections to AC Voltage. See Figure 2–6.

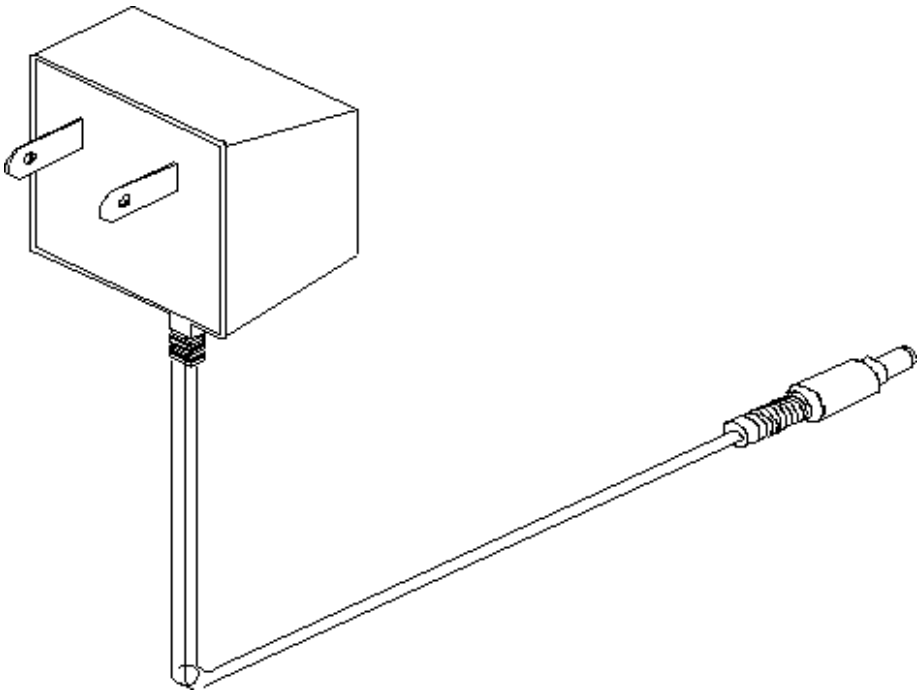


Figure 2–6 Typical Panel Power Supply

3.1 Operations of the RCP–XY

Introduction

Operations of the RCP–XY require that it be configured at the controller console with the appropriate polling addressing assigned. Connections and power up procedures should be performed on each panel controlled. *Refer to the Operations Section in your controller manual for setup.*

General

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

3.1 Operations of the RCP–XY Continued:

Breakaway Operation

Breakaway allows you to select an input on a specific level to be taken to an output on that level. Use the following steps:

To Make a Breakaway Switch:	**Results:**
Depress the PRESET Key	Enters the Preset Select Mode.
Depress the CLEAR Key	Clears the contents of the Preset Registers.
Depress the LEVEL Key	LEVEL Key lights. The Rotary Knob is used to scroll through the available levels.
Scroll through the names of the available levels using the Rotary Knob until you reach your desired level.	The level names are shown in the Level Display. The "All Levs" selection represents all levels assigned to the panel. This is the default level selection.
Depress the LEVEL Key again	Returns to the Preset Select Mode. The LEVEL light blinks to show a breakaway condition if not in "All Levs".
Select the desired input on the breakaway level by scrolling through the valid input selections using the Rotary Knob or by entering a selection using the Data Keys.	The input name selected will be shown in the Preset Display. Invalid input names entered will blink.
Depress the TAKE Key	Takes the inputs selected in the Preset on-line on all levels selected.
Steps 4-7 above can be repeated as long as the user wishes to continue to breakaway input selections on the selected level.	

3.1 Operations of the RCP–XY Continued:

Split Operation

Split operation is like Breakaway operation but it allows you to perform a breakaway on more than one level simultaneously.

To Make a Split Breakaway:	**Results:**
Depress the PRESET Key	Enters the Preset Select Mode.
Depress the CLEAR Key	Clears the contents of the Preset Registers.
Depress the LEVEL Key	LEVEL Key lights. The Rotary Knob is used to scroll through the available levels.
Scroll through the names of the available levels using the Rotary Knob until you reach your desired level.	The level names are shown in the Level Display. The "All Levs" selection represents all levels assigned to the panel. This is the default level selection.
Depress the LEVEL Key again	Returns to the Preset Select Mode. The LEVEL light blinks to show a breakaway condition.
Select the desired input on the breakaway level by scrolling through the valid input selections using the Rotary Knob or by entering a selection using the Data Keys	The input name selected will be shown in the Preset Display. Invalid input names entered will blink.
Repeat steps 3-6 again	Enters a breakaway input selection on all levels desired.
Depress the LEVEL Key	Returns to the Level Select Mode.
Scroll the currently selected level to the All Levs selection	All levels with a breakaway input selection will be affected.
Depress the TAKE Key	Takes all levels with a breakaway input selection on-line.

Key Types:

Data Keys - The panel has 16 Data Keys located towards the left of the panel and arranged as 2 rows of 8 keys each. Data Keys are configurable at the controller as Source, Soft Source, Destination, Soft Destination, Salvo, Soft Salvo or Category/Index Keys.

Rotary Knob - The panel has a rotary knob which allows the user to scroll through valid Source, Destination, Salvo or Level selections depending on the active mode of operation of the panel.

Function Keys - The panel has 6 function keys located on the far right side of the panel. Most of the function keys are associated with 2 possible functions. **NOTE: The primary function is executed when the key is held down less than 1 second. The secondary function is executed when the key is held down more than 1 second.** Each Function Key works as a toggle. If a function is currently enabled, pressing the associated Function Key in the same fashion as before (less than or greater than 1 second) will disable it.

The RCP-XY has 7 Modes of Operation:

Direct Take - Selects sources to be switched to the destination controlled by the panel by pressing associated Source or Soft Source Data Keys. Switch requests are sent immediately. Direct Take is the default mode. Deselecting all other modes will return you to Direct Take. The LEVEL/ADDR Key is either not illuminated if the panel is in All Levs, or blinking if you have selected a breakaway level(s). In addition, you may change the destination controlled by the panel by pressing a Destination or Soft Destination Data Key. Likewise, you may execute a salvo by pressing a Salvo or Soft Salvo Data Key. You may select sources in the Preset Display by scrolling the Rotary Knob.

Preset Select - Selects sources to be switched to the destination controlled by the panel when the next TAKE/CHOP Key is pressed. Sources selected are loaded into the Preset and shown by name in the Preset Display; on-line status is not affected until a Take is executed. You enter the Preset Select Mode by pressing the PRESET Key. The PRESET LED is illuminated in this mode. You may select source(s) by scrolling the Rotary Knob, pressing Source or Soft Source Data Keys, or by entering the name of the desired source using Category/Index Data Keys. You may Take this Preset Source selection on-line by pressing Take. No Data Key LEDs are illuminated when in Preset Select Mode.

Level Select - Selects which levels are to be affected when loading preset sources or when Taking switches on-line. You enter the Level Select Mode by pressing the LEVEL/ADDR Key for less than 1 second. The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled. **Example:** You are in Preset Select Mode and wish to load a breakaway source selection into your preset on a particular level. You are already in Preset Select and source desired for breakaway level is assigned to a Data Key.
1. Press the LEVEL/ADDR Key to enable Level Select Mode.
2. Scroll to the level desired with the Rotary Knob until the name is displayed in the Level Display.
3. Press the Data Key assigned the source desired for the level selected. Source assigned to the Data Key is loaded into the Preset on the level selected.

The Level Display always shows the name of the level currently selected. When no level is selected for breakaway, the Level Display will show "All Levs" (all levels available to panel). If any level is selected, the level name will be displayed. Only one level may be selected at a time. Level names are configurable at the controller.

Store - Stores the current selection for Preset Source, Destination, or Salvo to an appropriately configured Soft Data Key. Sources may only be stored to Soft Source Data Keys, destinations to Soft Destination Data Keys and salvoes to Soft Salvo Data Keys. You enter the Store Mode by first entering a valid selection in the appropriate mode of operation (Preset, Destination, or Salvo Select). Press and hold the CLEAR/STORE Key for more than 1 second to enter Store Mode. **NOTE:** Pressing the CLEAR/STORE key for *less* than 1 second can clear the selection. The CLEAR/STORE Key LED blinks while in this mode. Exit the Store Mode by either successfully storing your selection to a Soft Data Key or by pressing and holding the CLEAR/STORE Key for more than 1 second again. Pressing the CLEAR/STORE Key in Direct Take Mode will place the panel into Store Preset Mode.

Destination Select - Selects which destination group the panel should control. Enter the Destination Select Mode by pressing the DEST/SALVO Key for less than 1 second. The DEST/SALVO Key LED is illuminated in this mode. You may select destination(s) by scrolling the Rotary Knob, pressing Destination or Soft Destination Data Keys or by entering the name of the desired destination using Category/Index Data Keys. Whenever a valid destination is entered, the panel immediately switches control from the previously controlled destination to the new selection. The name of the destination selected is shown in the Destination Display. You may Take this Preset Source selection to the new destination by pressing TAKE. Any Destination or Soft Destination Data Key matching the currently controlled destination will be illuminated in this mode. Exit the Destination Select Mode by pressing the DEST/SALVO Key again.

Salvo Select - Selects a salvo to be executed. Enter the Salvo Select Mode by pressing and holding the DEST/SALVO Key for more than 1 second. The DEST/SALVO LED blinks in this mode. You may select salvoes by scrolling the Rotary Knob, pressing Salvo or Soft Salvo Data Keys or by entering the name of the desired salvo using Category/Index Data Keys. The name of the salvo selected is shown in the Preset Display. You may execute the salvo by pressing the TAKE/CHOP Key. No Data Keys are illuminated in this mode. Exit the Salvo Select Mode by pressing and holding the DEST/SALVO Key for more than 1 second again.

Chop - The panel will alternately switch (every 1/2 second) the destination currently being controlled between the current on-line Source and the Preset Source. Enter the Chop Mode by pressing and holding the TAKE/CHOP Key for more than 1 second. The TAKE/CHOP Key LED blinks when the panel is in Chop. Exit the Chop Mode by pressing the TAKE/CHOP Key again.

Panel Configuration:

Address: Decimal number from 1 to 128 which is used to distinguish each panel on the panel communications bus. Address must match the dip switch settings on the rear of the panel. Systems requiring more than 128 panels are possible with enhanced controllers; refer to your PESA Sales Representative for details.

Panel Name: Any 8 alphanumeric characters. Currently used only by the controller configuration program to provide a user-friendly method of referring to each panel.

Priority: Choice of 3 priorities: Master, Supervisory or Non-Supervisory. Priorities are used when panel attempts to set or clear a destination Protect or Lock. Only the panel which set a Protect or Lock or someone of higher priority can un-Protect or un-Lock a destination once it is Locked. Default setting is Non-Supervisory.

Status Method: The panel displays status differently based on whether the panel is set for All Levs (changing all levels assigned to panel) or Breakaway (changing only selected levels) operation. In addition, you may select between 2 methods of displaying status when in All Levs (NOTE: these methods only apply when the panel is set for All Levs operation). Refer to page 3.7 for additional statusing information.

1. Group Status: Panel will display status based on the Source Group which changed the current destination. If the panel receives status due to a breakaway change request or due to a change made elsewhere in the system, the panel will display the status of the Default Status Level (refer to the Controller Operations Manual for more details).

2. Default Status Level Status: Panel will always display the status of the Default Status Level.

Default Status Level: Level to be statused when panel is in All Levs operation and status is not determined by the Group Status (refer to the preceding Status Method description).

Default Destination Group: Destination group to be controlled by panel when first powered up.

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

Include Source List: List of all source groups accessible by this panel.

Exclude Source List: List of any source groups to be inaccessible from the panel. There list is not required if no source group to be excluded from panel is included in the "Include Source List".

Include Destination List: List of all destination groups controllable by this panel.

Exclude Destination List: List of any destination groups to be excluded from control by this panel. The list is not required if no destination group to be excluded from panel is included in the "Include Destination List".

Salvo List: List of all salvoes the panel can execute.

Key Assignment List: List containing the assignment of all 16 Data Keys as configured by the user. Each Data Key is individually configurable as one of the following:

1. **Source Selection**
   A. Non Soft (not locally reconfigurable)
   B. Soft (locally reconfigurable)
2. **Destination Selection**
   A. Non Soft (not locally reconfigurable)
   B. Soft (locally reconfigurable)
3. **Salvo Selection**
   A. Non Soft (not locally reconfigurable)
   B. Soft (locally reconfigurable)
4. **Category/Index Selection**

Statusing:

Status by Group Status

Status Display - The name shown in the Status Display represents the source switched to the destination currently controlled by the panel. If "ALL LEVS" is displayed in the Level Display and an "*" character is at the end of the Status/Preset Display, then a source on at least one level is different in the Status/Preset Registers. The "*" character represents a split condition. To view the source assigned on each level, enter the Level Select Mode and scroll through each level. As you scroll through the levels, the displays will change to show the source assigned for the level currently selected. If the panel receives a status due to changes made elsewhere in the system or due to a breakaway switch request, the panel will attempt to display the name of the source on the Default Status Level. If the destination currently selected has no output on the Default Status Level, the panel will status the next highest priority level which has an output.

Data Keys:

LED Illuminated Solid (not blinking) - The current status matches the source(s) assigned to the Data Key.

LED Blinking - The current status matches the source(s) assigned to the Data Key on some but not all levels.

No LED Illuminated - The current status does not match the source(s) assigned to any Data Key.

Status by Default Status Level

Status Display - The name shown in the Status Display represents the source switched to the destination controlled by the panel on the Default Status Level. If "ALL LEVS" is displayed in the Level Display and an "*" character is at the end of the Status/Preset Display, then a source on at least one level is different in the Status/Preset Registers. The "*" character represents a split condition. To view the source assigned on each level, enter the Level Select Mode and scroll through each level. As you scroll through the levels, the displays will change to show the source assigned for the level currently selected. If the destination currently selected has no output on the Default Status Level or their is no source information to display (initial boot-up condition) or a level cannot be selected as the Display Level, the panel will show "********" in the display.

Status by Default Status Level Cont.

Data Keys:

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.

Breakaway Statusing

Status Display - Name shown represents the source switched to the destination currently controlled by the panel on the currently selected level. To determine the status of each level controlled by the panel, enter the Level Select Mode and scroll through each level. As you scroll through the levels, the display will change to show the source switched to the output controlled by the panel for the level currently selected. If the destination currently selected has no output on the currently selected level, the panel will blank the Status Display. "********" will be displayed if there is no source information to display (initial boot-up condition), or a Display Level cannot be selected.

LED Illuminated Solid (not blinking) - The current status matches the source assigned to the Data Key for the level selected.

No LED Illuminated - The current status does not match the source assigned to any Data Key on the level selected.

Statusing Continued:

Error Statusing

The panel will display an Error number whenever an error is detected on the level currently being displayed (i.e. "ERROR 1", "ERROR 2", etc.). Error 1 indicates a Confidence Error on the output being controlled. Error 2 indicates a Readback Error meaning the source readback from the router was not the same as the source requested.

Blocked Input Statusing

The panel will display a "BLOCKED" message in the Status Display when a switcher change request is denied due to the requested input being blocked from the requested output.

Direct Take Mode:

Source and Soft Source Data Keys: Switches the source(s) assigned to the Data Key on all selected levels to the destination currently controlled by the panel. The method of statusing used by the panel is determined by configuration at the controller and whether breakaway levels are currently selected:

Destination and Soft Destination Data Keys: Changes the destination currently controlled by the panel to the destination group assigned to the Data Key pressed.

Salvo and Soft Salvo Data Keys: Executes the salvo assigned to the Data Key pressed. Salvos will not be executed while in the Salvo Select Mode.

Category/Index Data Key: No effect. Category/Index Data Keys are only active in Preset Select, Destination Select and Salvo Select Modes of operation.

PRESET Key: Exits Direct Take Mode and enters the Preset Select.

LEVEL/ADDR Key:

LEVEL - Activates the Level Select Mode. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details).

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being controlled by the panel. Any switch request attempting to affect this destination made at any location other than this panel will be disallowed. The PROT/LOCK LED is illuminates to show the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An "*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - Clears the Preset Source for the level(s) selected (all levels if in "ALL LEVS").

STORE - Enters the Store Preset Mode.

DEST/SALVO Key:

DEST - Exits the Direct Take Mode and enters Destination Select Mode.

SALVO - Exits the Direct Take Mode and enters Salvo Select Mode.

TAKE/CHOP Key:

TAKE - Toggles Preset and On-Line Sources: 1) sends a switcher change request to Take the Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since Take toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

CHOP - Continuously toggles Preset and On-Line Sources every 1/2 second (refer to preceding Take description).

Rotary Knob - Scrolls Preset Source selection to the next source accessible to panel for the level(s) selected (all levels if in All Levs). Sources are presented in alphabetical order. NOTE: For a valid source name to displayed, it must be a current Source Group that is included in the panel's Include Sources List.

Preset Select Mode:

Source and Soft Source Data Keys: Loads the Preset with the source(s) assigned to the Data Key pressed on all levels selected. Updates the Preset Display to show the name of the source(s) loaded.

Destination and Soft Destination Data Keys: No effect.

Salvo and Soft Salvo Data Keys: No effect.

Category/Index Data Key: If a Category has already been selected, the Index assigned to the Data Key pressed (if any) is appended to the Preset Source name displayed in the Preset Display. If the name displayed is a valid source name for the level(s) selected or a valid group name if the panel is in "All Levs", the name is displayed solid (not blinking). Otherwise, the panel the name entered blinks. NOTE: For a valid source name to be displayed, it must be a current Source Group that is in the panel's Include Sources List.

PRESET Key: Exits Preset Select Mode and returns to Direct Take Mode.

LEVEL/ADDR Key:

LEVEL - If Level Select Mode is active, exits Level Select. Otherwise, activates Level Select Mode. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details).

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being 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 the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An "*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - Clears the Preset Source for the level(s) selected (all levels if in All Levs).

STORE - Enters the Store Mode if the Preset contains a valid source selection on any level.

DEST/SALVO Key:

DEST - Exits the Preset Select Mode and enter Destination Select Mode.

SALVO - Exits the Preset Select Mode and enter Salvo Select Mode.

TAKE/CHOP Key:

TAKE - Toggles Preset and On-Line Sources: 1) sends a switcher change request to Take the Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since Take toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

CHOP - Continuously toggles Preset and On-Line Sources once every 1/2 second.

Rotary Knob: Scrolls Preset Source selection to the next source accessible to panel for the level(s) selected (all levels if in All Levs). Sources are presented in alphabetical order. NOTE: For a valid source name to be displayed, it must be a current Source Group that is in the panel's Include Sources List.

Level Select Mode:

Source and Soft Source Data Keys: Switches the source(s) assigned to the Data Key on all selected levels to the destination currently controlled by the panel only in Direct Take and Chop Modes. The method of statusing used by the panel is determined by configuration at the controller and whether breakaway levels are currently selected.

Destination and Soft Destination Data Keys: Changes the destination currently controlled by the panel to the destination group assigned to the Data Key pressed if not in Preset Select or Salvo Select Modes.

Salvo and Soft Salvo Data Keys: No effect.

Category/Index Data Key: No effect. Category/Index Data Keys are only active in Preset Select, Destination Select, and Salvo Select Modes.

PRESET Key: If you are already in Preset Select Mode, exits and returns you to the Direct Take Mode. Otherwise, exits Direct Take Mode and enters Preset Select.

LEVEL/ADDR Key:

LEVEL - Exits the Level Select Mode. If level selection is currently set for "All Levs", extinguishes the LEVEL/ADDR LED. If any level is selected for breakaway, the LEVEL/ADDR LED blinks. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details).

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being 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 the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An"*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - Since Level Select Mode coexists with other modes, the Clear function depends on the other active mode of operation:

1. Direct Take = Clears the Preset Source for the level(s) selected (all levels if in All Levs).
2. Preset Select = Clears Preset Source selection for level(s) currently selected.
3. Destination Select = Clear current Destination selection.
4. Salvo Select = Clear current Salvo selection.
5. Store = No effect.
6. Chop = No effect.

Store - Since Level Select Mode coexists with other modes, the Store function depends on the other active mode of operation:

1. Direct Take = Enters Store Preset Mode.
2. Preset Select = If a valid Preset Source has been selected, enter the Store Mode.
3. Destination Select = If a valid Destination has been selected, enter the Store Mode.
4. Salvo Select = If a valid Salvo has been selected, enter the Store Mode.
5. Store = Exit the Store Mode.
6. Chop = No effect.

Level Select Mode Continued:

DEST/SALVO Key:

DEST - If you are already in Destination Select Mode, exits and returns you to Direct Take Mode. Otherwise, enters the Destination Select Mode.

SALVO - If you are already in Salvo Select Mode, exits and returns you to Direct Take Mode. Otherwise, enters the Salvo Select Mode.

TAKE/CHOP Key:

TAKE - Toggles Preset and On-Line Sources: 1) sends a switcher change request to the Take Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since Take toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

CHOP - Continuously toggles Preset and On-Line Sources every 1/2 second (refer to preceding Take description).

Rotary Knob: Scrolls Level selection to the next level controllable by panel or All Levs for all levels. Levels are presented in the order of priority: level 1, level 2, etc. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled.

Store Mode:

Data Keys:

Source Store - You were in the Preset Select Mode, selected a valid Preset Source, pressed and held the CLEAR/STORE Key for more than 1 second. Pressing any Data Key configured as a Soft Source will Store the contents of the Preset to the Data Key on all levels. Pressing any other type of Data Key has no effect. After successfully Storing the source definition into the Soft Source Data Key, the panel exits the Store Mode and returns to the Preset Select Mode. Alternately, you may decide not to Store the Preset Source to a Data Key and exit from the Store Mode by pressing and holding the CLEAR/STORE Key for more than 1 second.

Destination Store - You were in the Destination Select Mode, selected a valid Destination and pressed and held the CLEAR/STORE Key for more than 1 second. Pressing any Data Key configured as a Soft Destination will Store the current destination controlled by the panel to the Data Key. Pressing any other type of Data Key has no effect. After successfully Storing the destination definition into the Soft Destination Data Key, the panel exits the Store Mode and returns to the Destination Select Mode. Alternately, you may decide not to Store the destination to a Data Key and exit from the Store Mode by pressing and holding the CLEAR/STORE Key for more than 1 second.

Salvo Store - You were in the Salvo Select Mode, selected a valid Salvo and pressed and held the CLEAR/STORE Key for more than 1 second. Pressing any Data Key configured as a Soft Salvo will Store the Salvo selected to the Data Key. Pressing any other type of Data Key has no effect. After successfully Storing the salvo into the Soft Salvo Data Key, the panel exits the Store Mode and returns to the Salvo Select Mode. Alternately, you may decide not to Store the salvo to a Data Key and exit from the Store Mode by pressing and holding the CLEAR/STORE Key for more than 1 second.

PRESET Key: Exits the Store Mode and enters the Preset Select Mode.

LEVEL/ADDR Key:

LEVEL - If the LEVEL/ADDR LED is not already illuminated, enters the Level Select Mode without leaving Store Mode. Otherwise, exits the Level Select Mode without leaving the Store Mode. If upon exiting the level selection is currently set for "All Levs", extinguishes the LEVEL/ADDR LED. If upon exiting any level is selected for breakaway, the LEVEL/ADDR LED blinks. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details).

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being 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 the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An "*" is displayed before the destination name if the destination is protected. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - No effect.

STORE -

1. Source Store---Exits the Store Mode and returns to Preset Select Mode.
2. Destination Store---Exits the Store Mode and returns to Destination Select Mode.
3. Salvo Store---Exits the Store Mode and returns to Salvo Select Mode.

Store Mode Continued:

DEST/SALVO Key:

DEST - Exits Store Mode and enters Destination Select Mode.

SALVO - Exits Store Mode and enters Salvo Select Mode.

TAKE/CHOP Key:

TAKE -

Source Store - Returns you to the Preset Select Mode. Toggles Preset and On-Line Sources: 1) sends a switcher change request to Take the Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since Take toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

Destination Store - Returns you to the Destination Select Mode. Toggles Preset and On-Line Sources: 1) sends a switcher change request to the Take Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since Take toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

Salvo Store - Returns you to the Salvo Select Mode. Executes the salvo currently selected and displayed in the Preset Display.

Chop -

Source Store - Takes panel to Chop Mode. Continuously toggles Preset and On-Line Sources every 1/2 second.

Destination Store - Takes panel to Chop Mode. Continuously toggles Preset and On-Line Sources every 1/2 second.

Salvo Store - Executes Salvo, returns to Salvo Select Mode.

Rotary Knob: Scrolls to the next level selection if Level Select Mode is active. Otherwise, no effect.

Salvo Select Mode:

Source and Soft Source Data Keys: No effect.

Destination and Soft Destination Data Keys: No effect.

Salvo and Soft Salvo Data Keys: Loads the salvo associated with the Data Key pressed into the Preset.

Category/Index Data Key: If a Category has already been selected, changes the Index assigned to the Data Key pressed (if any) to the salvo name displayed in the Preset Display. If the name displayed is a valid salvo name, the name will show solid (not blinking). Otherwise, the name entered will blink.

PRESET Key: Exits Salvo Select Mode and enters the Preset Select Mode.

LEVEL/ADDR Key:

LEVEL - If the Level Select Mode is active, exits Level Select. Otherwise, activates the Level Select Mode. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details). NOTE: For a valid salvo name to be displayed, it must be a current Salvo that is in the panel's Salvo List.

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being controlled by the panel. Any switch request attempting to affect this destination made at any location other than this panel will be disallowed. The PROT/LOCK LED illuminates to show the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. The PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An"*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - Clears the salvo selection from the Preset Display.

STORE - If the salvo name displayed is a valid salvo (not blinking), enters the Store Mode.

DEST/SALVO Key:

DEST - Exits the Salvo Select Mode and enters the Destination Select Mode.

SALVO - Exits the Salvo Select Mode and returns to the Direct Take Mode.

TAKE/CHOP Key:

TAKE - If a valid Salvo Name is selected in the Preset Display (name displayed is not blinking) then sends a request to execute the Salvo. If no valid salvo is currently selected, no effect.

CHOP - If a valid Salvo Name is selected in the Preset Display (name displayed is not blinking) then sends a request to execute the Salvo. If no valid salvo is currently selected, no effect.

Rotary Knob: Scrolls Salvo selection to the next salvo executable by panel. Salvoes are presented in alphabetical order. NOTE: For a valid salvo name to be displayed, it must be a current Salvo that is in the panel's Salvo List.

Destination Select Mode:

Source and Soft Source Data Keys: No effect.

Destination and Soft Destination Data Keys: Changes the destination controlled by the panel to the destination assigned to Data Key pressed. Updates the Destination Display to show the name of the newly selected destination.

Salvo and Soft Salvo Data Keys: No effect.

Category/Index Data Key: If a Category has already been selected, then changes the Index assigned to the Data Key pressed (if any) to the destination name displayed in the Destination Display. The name will show solid (not blinking) if it is a valid destination. If not, the name entered will blink. NOTE: For a valid destination name to be displayed, it must be a current Destination Group that is in the panel's Include Destinations List.

PRESET Key: Exits Destination Select Mode and enters the Preset Select Mode.

LEVEL/ADDR Key:

LEVEL - If the Level Select Mode is active, exits Level Select. Otherwise, activates Level Select Mode. IMPORTANT: The Level Select Mode differs from all other modes in that it can coexist with other modes. The action taken when the knob is turned, however, always applies to level selection as long as the Level Select Mode is enabled (refer to Level Select Mode description for further details).

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Protects the destination currently being controlled by the panel. Any switch request attempting to affect this destination made at any location other than this panel will be disallowed. The PROT/LOCK LED illuminates to show the destination currently being controlled by the panel is Protected. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

LOCK - Locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. The PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An "*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - Clears the destination selection from the Destination Display.

STORE - If the destination name displayed is a valid destination (not blinking), enters the Store Mode.

DEST/SALVO Key:

DEST - Exits the Destination Select Mode and returns to the Direct Take Mode.

SALVO - Exits the Destination Select Mode and enters the Salvo Select Mode.

TAKE/CHOP Key:

TAKE - Toggles Preset and On-Line Sources: 1) sends a switcher change request to the Take Preset Source to the currently controlled destination on the levels selected, 2) saves the current On-Line Source to the Preset on the levels selected. Since TAKE toggles the On-Line and Preset Sources, pressing TAKE again returns the On-Line Status to its previous state.

CHOP - Continuously toggles Preset and On-Line Sources every 1/2 second.

Rotary Knob: Scrolls Destination selection to the next destination controllable by the panel. Destinations are presented in alphabetical order. NOTE: For a valid destination name to be displayed, it must be a current Destination Group that is in the panel's Include Destinations List.

Chop Mode:

Source and Soft Source Data Keys: Exits the Chop Mode and returns the panel to the Direct Take Mode. Takes the Source assigned to the Data Key on-line on the levels currently controlled by the panel. In this mode, if either source currently being "Chopped" between is associated with a Data Key, that Data Key LED will illuminate.

Destination and Soft Destination Data Keys: Exits the Chop Mode and returns the panel to the Direct Take Mode. Changes the destination currently being controlled by the panel to the destination assigned to the key pressed.

Salvo and Soft Salvo Data Keys: Exits the Chop Mode and returns the panel to the Direct Take Mode. Executes the salvo associated with the Data Key pressed.

Category/Index Data Keys: No effect.

PRESET Key: Exits the Chop Mode and enters the Preset Select Mode.

LEVEL/ADDR Key:

LEVEL - No effect.

ADDR - Displays the panel address in the Preset Display while the key is held down.

PROT/LOCK Key:

PROT - Exits Chop Mode and protects the destination currently being controlled by the panel. Any switch request attempting to affect this destination made at any location other than this panel will be disallowed. An "!" is displayed before the destination name if the destination is protected. E.g. "!VTR1".

CHOP - Exits Chop Mode and locks the destination currently being controlled by the panel. Any switch request attempting to affect this destination will be disallowed. The PROT/LOCK LED blinks to show the destination currently being controlled by the panel is Locked. An"*" is displayed before the destination name if the destination is locked. E.g. "*VTR1".

CLEAR/STORE Key:

CLEAR - No effect.

STORE - No effect.

DEST/SALVO Key:

DEST - Exits the Chop Mode and enters the Destination Select Mode.

SALVO - Exits the Chop Mode and enters the Salvo Select Mode.

TAKE/CHOP Key:

TAKE - Exits Chop Mode and returns the state of the destination currently controlled by the panel to the on-line status it was in before entering the Chop Mode.

CHOP - Exits Chop Mode and returns the state of the destination currently controlled by the panel to the on-line status it was in before entering the Chop Mode.

Rotary Knob: No effect.

4.1 Introduction

The RCP–XY panel consists of two printed circuit boards. The CPU board contains a microprocessor that controls the panel's operation and communicates with the control system. The Switchcard contains pushbuttons and indicators used by the operator to control the routing switcher. The following is a detailed description of each of these boards.

4.2 CPU Board

The CPU board contains all circuitry necessary to communicate with the system controller and to interface to a front panel switchcard. The circuitry on the CPU board 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 CPU board 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 and C12 provide filtering for the input and output of the regulator, respectively. Bypass capacitors (.1 uF) are scattered about the board to provide power supply bypassing for individual chips. The regulated voltage is available to external board on both J1 and J2, pins 31 and 32. The unregulated voltage is available to external board on both J1 and J2, pins 29 and 30.

Microprocessor

The heart of the CPU board is the Motorola 68HC11 microprocessor (U1). This IC contains the microprocessor and peripheral circuitry used to operate the panel. In addition, the 68HC11 contains a PROM with the software used to operate the panel. The 68HC11 is operated in the expanded multiplexed mode. In this mode port B (U1 pins 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.

4.2 CPU Board Continued:

Microprocessor Continued:

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 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 external board via J1.

Clock

The master system clock is provided by oscillator U6 pin 8. SYSCLK is available to the processor (U1 pin 7) and to external boards 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 CPU board and is available to external boards 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 internal EEPROM 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 external boards via J2 pin 11.

4.2 CPU Board Continued:

Memory

The CPU board 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 and C000h to FFFFh. U3 is selected when both CS1 and CS2 are asserted. This occurs 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 write cycles by the U8 pin 8. This WE signal is also availably to external boards via J1 pin 25.

LED Driver Support

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

4.2 CPU Board Continued:

RS-485 Communications

Communication between the panel and the system controller is accomplished by the 68HC11 internal Serial Communication Interface (SCI). The SCI is an asynchronous receiver/transmitter, sometimes referred to as a UART. The RS-485 standard is used for the electrical interface between panels and the system controller. A 75ALS176 (U4) chip is used to convert between RS-485 and the levels required by the SCI. Transmit data (TXD) is presented by the SCI on U1 pin 21. This signal drives the input to the RS-485 transceiver on U4 pin 4. Data received from the system controller is converted to the appropriate levels by the RS-485 transceiver and presented on U4 pin 1. This received data (RXD) signal is then fed to the SCI receiver at U1 pin 20. Since the RS-485 interface requires the transmitter to be tri-stated when not in use, a third signal is required to enable/disable the RS-485 transmitter. The processor provides the TX_ENABLE signal under software control at U1 pin 25. This signal is connected to the RS-485 transceiver at U4 pin 3. When TX_ENABLE is asserted (high), U4 drives the RS-485 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 RS-485 bus during power-up or other reset conditions. A shield connection is provides for the RS-485 bus on J4 pin 2. The shield is connected to ground through R1.

I/O

Circuitry is included on the CPU board to support I/O expansion via J1 and J2. Decoder U9 provides eight chip select signals SEL0..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. The following table lists active address range for each select signal. Currently, the CPU board 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..SWX10 on the data bus. If the corresponding switch for each bit is closed, a logic low is presented. If the switch is open, pullup 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 an external board. The ID field should be driven by an external board. A logic low is generated by grounding the ID pin. A logic high is generated by leaving the ID pin floating. Pullup resistor RP3 generates the high logic when a pin is floating.

4.2 CPU Board Continued:

I/O Continued:

Signal	Start	End
SEL0	0000h	07FFh
SEL1	0800h	0FFFh
SEL2	1000h	17FFh
SEL3	1800h	1FFFh
SEL4	2000h	27FFh
SEL5	2800h	2FFFh
SEL6	3000h	37FFh
SEL7	3800h	3FFFh

Miscellaneous

The CPU board provides some special function signals for use by external boards. R3/R4 provide a contrast adjustment for LCD displays. The CONTRAST signal is available for use by external boards on J2 pin 13. Likewise, R5 provides a brightness control signal for use by external boards. It is available on J2 pin 14. J2 pin 9 is a signal named DSP_RS. This signal is a register select signal for external LCD displays. The processor interrupt request line IRQ is not currently used, but is available for use by external board on J2 pin 12. The CPU board accepts input from a rotary encoder in the form of two signals named KNOB0 and KNOB1. The CPU software expects quadrature-encoded signals to indicate direction of travel from the rotary encoder. These two signals are present on J2 pins 5 and 6.

4.3 Switchcard

RCP–XY Switchcard

The switchcard for the RCP–XY panel contains circuitry to provide a switchcard ID for the CPU board, scan a keyboard, light the keyboard LEDs, interface to an LCD display, interface to a rotary encoder, and interface to an optional I/O board. The following is a description of each of these circuits.

4.3 Switchcard Continued:

Switchcard ID

The RCP–XY switchcard provides a six-bit ID available to be read by the CPU board. This ID is available on J2, pins 23-28. The least significant bit (ID0) is provided by the optional I/O board on J4 pin 5. If the I/O board is not installed, then ID0 is pulled high by a pullup resistor on the CPU board. If the I/O board is installed, then the ID0 pin is grounded. The CPU may use this bit to detect the presence or absence of the I/O board. The remainder of the ID bits (ID1-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 RCP–XY 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–XY has circuitry for 34 pushbuttons and uses only 22 of these pushbuttons plus a set of switch contacts in the rotary encoder. 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. The software in the CPU only uses the lowest available addresses to access the keyboard. The following table contains the addresses used to access each row of the keyboard circuit.

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

4.3 Switchcard Continued:

Keyboard Scan Continued:

Although the RCP–XY only uses rows 0-4 and row 7, 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.

LED Driver

The RCP–XY switchcard contains circuitry capable of lighting up to 34 pushbuttons. The RCP–XY uses only 22 of these LEDs, one per pushbutton. The drive for each LED is provided by U1. The CPU sends a serial data stream to U1 by using the LED_DATA (U1 pin 25) and LED_CLOCK (U1 pin 24) signals. The LED_SEL0 chip select (U1 pin 26) must be asserted (low active) to select the LED driver chip. The output current used to drive each LED is enabled by the brightness pin of the LED driver (U1 pin 21). This pin is driven by the system E clock to provide 50% duty cycle drive current for each LED that is turned on. The LED_DATA line is latched into U1 on the rising edge of LED_CLOCK while LED_SEL0 is asserted.

4.3 Switchcard Continued:

LCD Display

The RCP–XY switchcard contains circuitry for interfacing to an LCD display (DSP1). Because of the relatively slow timing parameters needed to write to this display, additional circuitry was added to slow down the write cycle to the display. The low-active select line SEL3 is used to address the display circuit. SEL3 is asserted for addresses in the range of 1800h to 1FFFh. All writes to any address in this range cause the data bus to be latched into U5 on the rising edge of SEL3. Since U5 is edge triggered, the output of U5 will remain valid until the next rising edge of SEL3. Data is latched into the LCD display on the falling edge of the flip-flop Q output (U6 pin 5). Address bits A1 and A2 are used to provide additional address decoding for the display. A1 and A2 must be low (see U7 pins 2 and 13) to enable DSP1. In conjunction with SEL3, these conditions result in a base address of 1800h for DSP1.

It should be noted that since the write cycle to an LCD display is not completed until the end of the next bus cycle, back-to-back writes to the display are not possible. The software must make sure that there is at least one bus cycle between successive writes to a display. Because of the timing characteristics of the display, circuitry to support reads as well as writes becomes very cumbersome and costly. Because of this, the display is write-only. The R/W line of the display is tied to ground (write). The CPU board provides a register select line DSP_RS to the display on pin 4.

Contrast adjustment is made to the display by applying a varying voltage to pin 3. This pin is controlled by a voltage source on the CPU board. Brightness control for the LED backlight is provided by a variable current source (Q1/Q2). A variable voltage is provided by the CPU board to the base of Q2. The emitter of Q1 will be two base-emitter junction drops (approximately 1.3V) below the base of Q2. A maximum base voltage of 5 V results in approximately 3.7 V across R6. With R6 = 36 ohms, Ohm’s law yields approximately 100 mA through the emitter/collector of Q1 and the cathode of the LED in DSP1 (pin 16). Since this current will be relatively independant of the value of the voltage on the anode of the LEDs, the unregulated power supply Vext is used to power the LEDs (pin 15). This offloads the LED current from the +5 V regulator on the CPU board.

4.3 Switchcard Continued:

Rotary Encoder Interface

The RCP–XY provides an interface to a rotary encoder via J3. Power is provided on J3 pins 6 and 1. J3 pins 4 and 5 are the quadrature-encoded signals back from the encoder. Schmitt trigger U4 and pullup resistors R1 and R2 helps to condition the signals. The encoder also provides a set of switch contacts on J3 pins 2 and 3. These contacts are connected to the keyboard scan circuitry on KB_ROW7 and KB_COL7 and are scanned just as the pushbuttons on the panel.

I/O Board Interface

Connector J4 provides the signals necessary to interface to an optional I/O board. The connector provides +5 Vdc (pin 1) and ground (pin 6) to power the external board. In addition, data bit D0 (pin 2), address bit A0 (pin 3), and chip select SEL5 (pin 4) are present on the connector. Pin 5 of the connector is connected to ID0, and is used to detect the presence or absence of the external board (see Switchcard ID, above).

5.1 General

THE RCP–XY Control Panel is a solid state electro-mechanical device 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 the manual.

5.2 Preventive Maintenance

There is little need for preventive maintenance on the RCP–XY other than the normal care which should be given to any quality electronic equipment.

5.3 Test Equipment

The test equipment recommended for servicing the RCP–XY is listed below. Equivalent test equipment may be used.

EQUIPMENT	FUNCTION
Oscilloscope - 20 MHz or Tracing	Waveform Monitoring and higher
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 maintenance of the RCP–XY. The functional description (Section 4) contains board/circuit level information to help identifying specific problems.

5.4 Corrective Maintenance Continued:

Factory Repair Service

If desired, equipment or boards may be returned to the factory (transportation prepaid) for repair. Refer to the General Assistance and Service information sheet in the front of this manual.

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.

Adjustment/Alignment

The RCP–XY provides adjustments for LCD Display brightness and contrast. Adjust per user preference.

Troubleshooting

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

To open the 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 boards. Place the disassembled panel on a non-conducting surface and arrange the parts so the unit can be operated. You must be able to operate the pushbuttons and observe the resulting status indicators. You must also have sufficient access to the boards to measure voltage or observe waveforms.

Procedure: Put the RCP–XY through the operating sequence described in the operation section. Refer to Section 3.

5.4 Corrective Maintenance Continued:

Troubleshooting Continued:

If the Panel is nonresponsive, there may be a power problem or the CPU is not operating.

1. Refer to the POWER DISTRIBUTION discussion in Section 4. Refer to the remote CPU schematic in Section 6 if it is necessary to make voltage checks at the chip or component level.

2. If power is functioning properly, the CPU is not operating. The CPU requires a clock, a power-up reset, communications from the Controller. Refer to the CONTROL PANEL REMOTE CPU, RESET CIRCUIT, and RS485 Communications discussions in the functional section.

For partial failures:

1. Pushbutton switches fail to initiate desired operation. Refer to the PUSHBUTTON SWITCH MATRIX discussion, in Section 4.

If a source input fails to function it may be a blocked input. Check the system configuration at the controller.

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

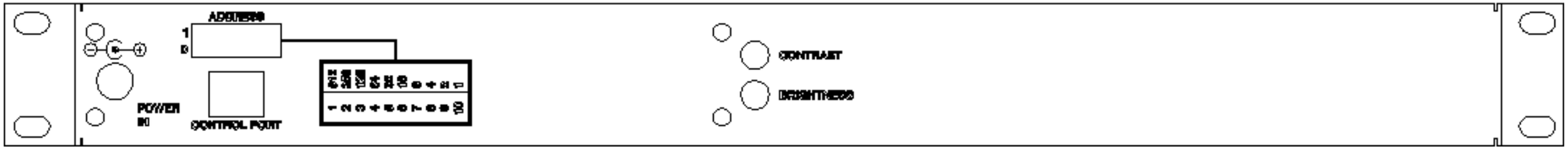
3. Almost any type of functional failure can be caused by a memory failure. This type of failure can easily be checked if a substitute chip is available.

6.1 Schematics

General

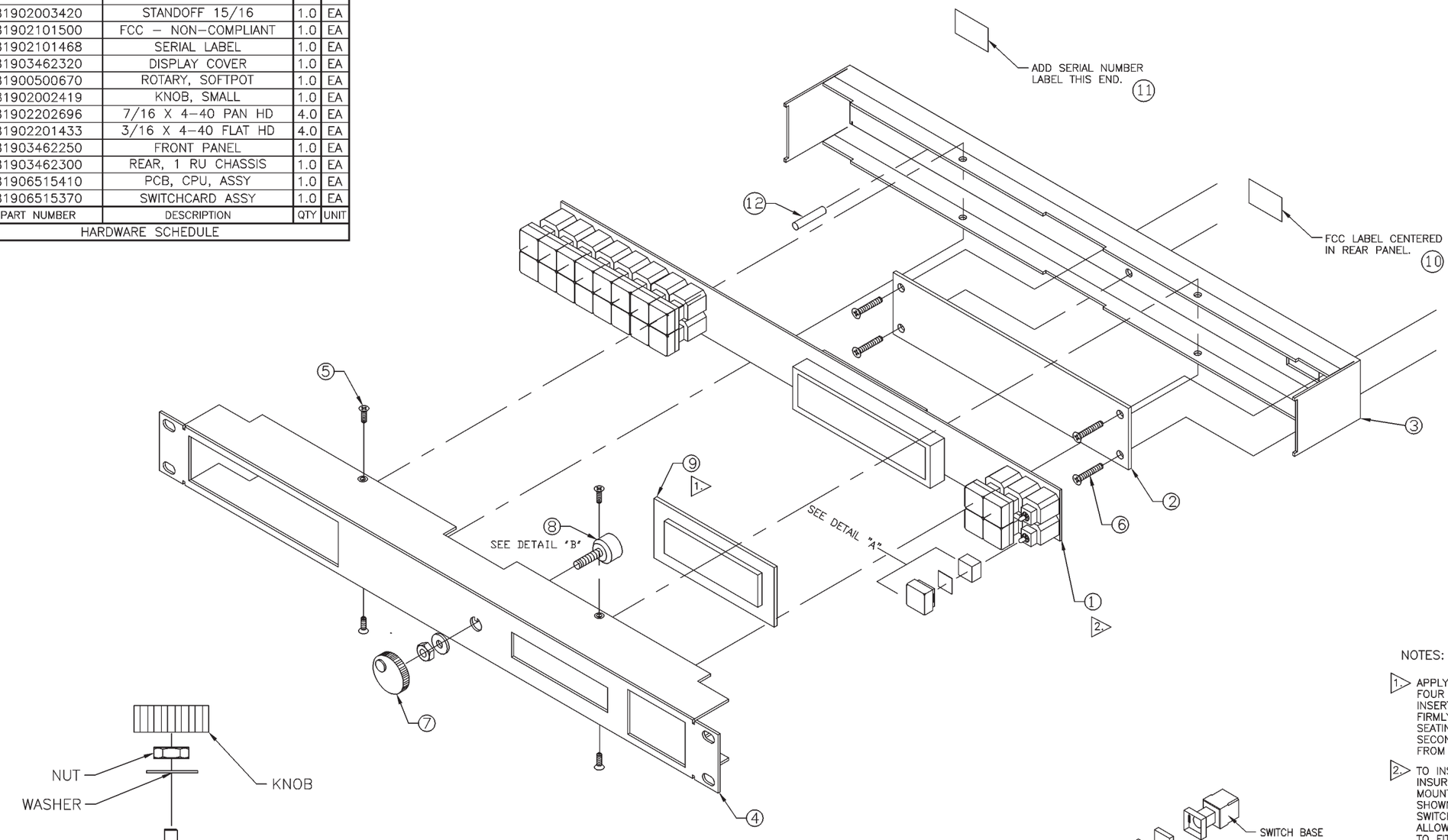
This section contains the schematic diagrams and parts location diagrams for the RCP–XY. Refer to this section when trobleshooting the equipment or replacing defective parts.

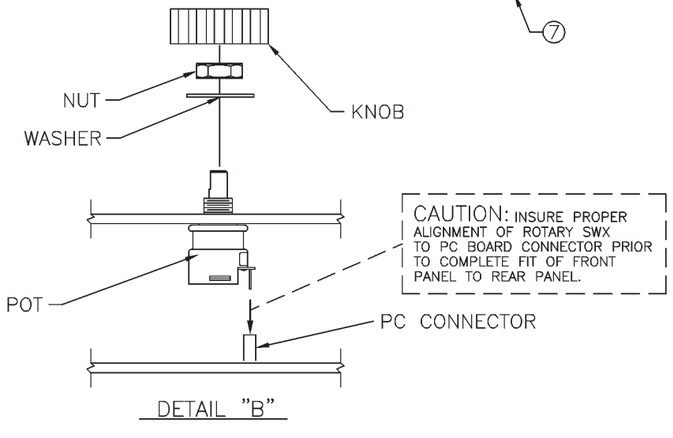
RCP–XY Front View

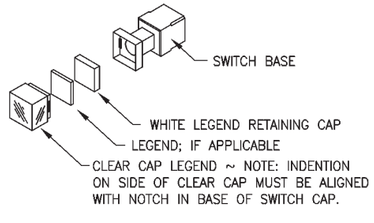


RCP–XY Rear View

12	81902003420	STANDOFF 15/16	1.0	EA
11	81902101500	FCC – NON–COMPLIANT	1.0	EA
10	81902101468	SERIAL LABEL	1.0	EA
9	81903462320	DISPLAY COVER	1.0	EA
8	81900500670	ROTARY, SOFTPOT	1.0	EA
7	81902002419	KNOB, SMALL	1.0	EA
6	81902202696	7/16 X 4–40 PAN HD	4.0	EA
5	81902201433	3/16 X 4–40 FLAT HD	4.0	EA
4	81903462250	FRONT PANEL	1.0	EA
3	81903462300	REAR, 1 RU CHASSIS	1.0	EA
2	81906515410	PCB, CPU, ASSY	1.0	EA
1	81906515370	SWITCHCARD ASSY	1.0	EA
NO	PART NUMBER	DESCRIPTION	QTY	UNIT
HARDWARE SCHEDULE				





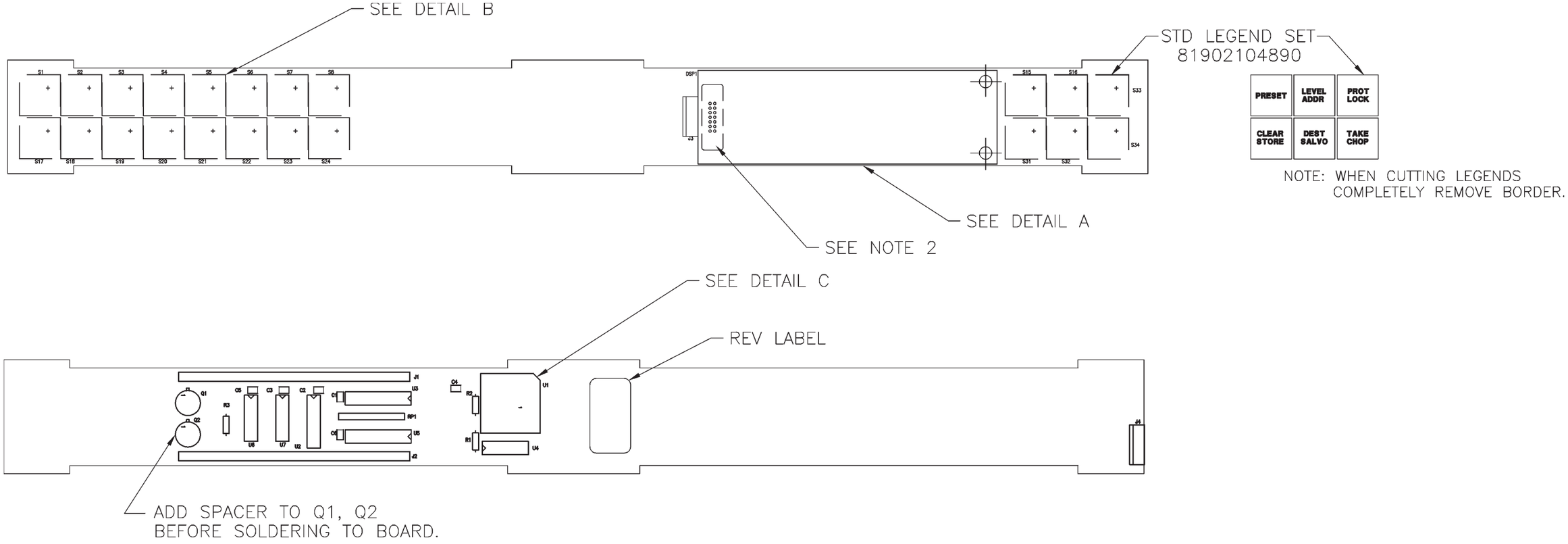


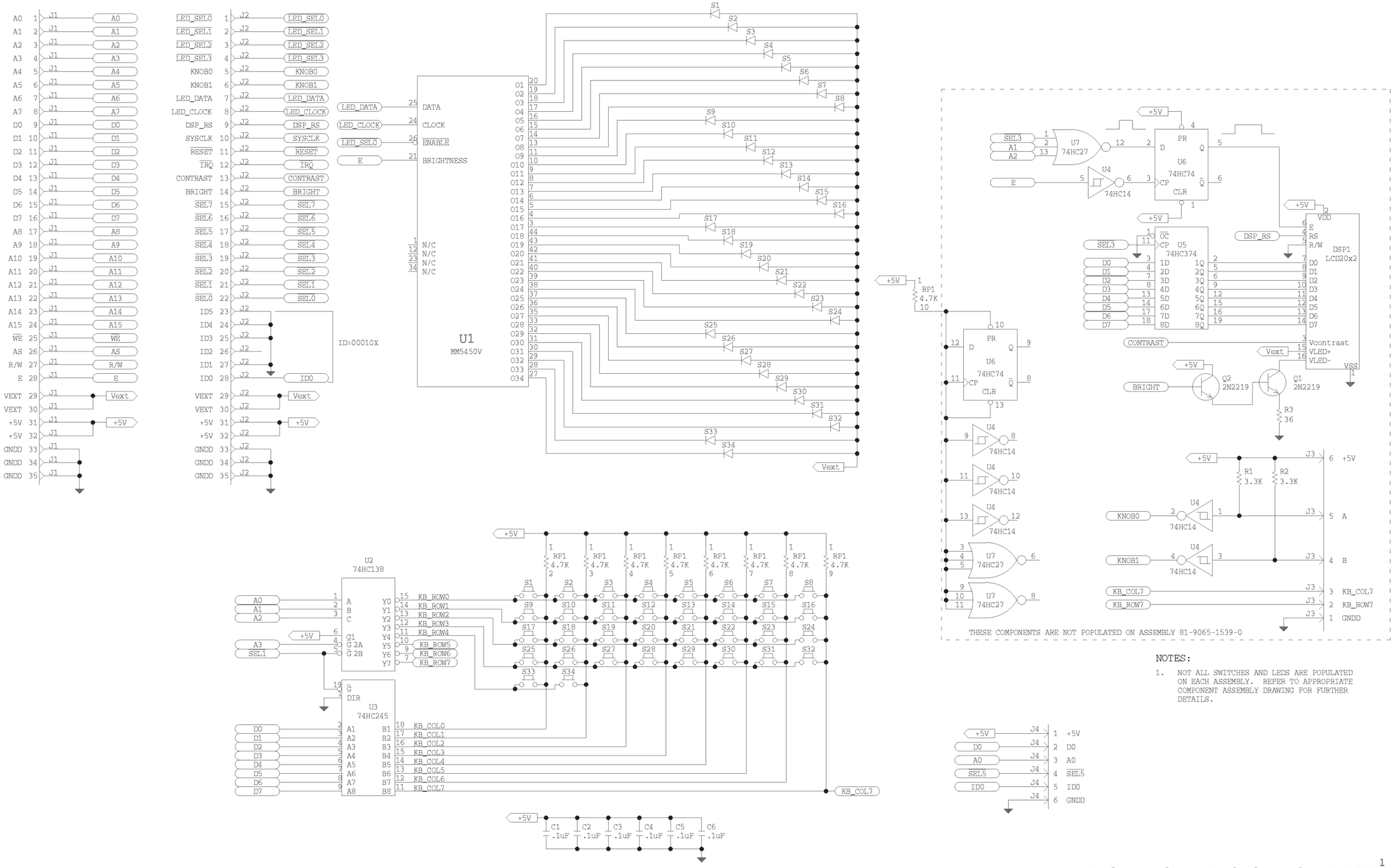
SWITCH CAP ASSEMBLY – DETAIL "A"

NOTES:

1. APPLY SILICON ADHESIVE AROUND ALL FOUR EDGES OF DISPLAY WINDOW AND INSERT INSIDE METAL OPENING, PRESS FIRMLY IN PLACE INSURING PROPER SEATING AND HOLD TIGHT FOR THIRTY SECONDS. REMOVE ANY EXCESS SILICON FROM DISPLAY WINDOW IMMEDIATELY.
2. TO INSTALL SWITCHCARD TO REAR PANEL, FIRST INSURE THAT THE CPU BOARD, ITEM 2, HAS BEEN MOUNTED TO THE REAR PANEL WITH 4 SCREWS AS SHOWN. NEXT, ALIGN THE CONNECTOR PINS ON THE SWITCHCARD TO THE CPU CARD AND PRESS FIRMLY ALLOWING THE NOTCHED EDGES OF THE SWITCHCARD TO FIT FLUSH INSIDE THE REAR PANEL SLOTS. SLIDE THE FRONT PANEL OVER THE INDENTS OF THE REAR PANEL AND SECURE WITH 4 SCREWS AS SHOWN.

Configuration Drawing • Mainframe Assembly • CD63-0700


SEE DETAIL B
STD LEGEND SET
81902104890
PRESET
LEVEL ADDR
PROT LOCK
CLEAR STORE
DEST SALVO
TAKE CHOP
NOTE: WHEN CUTTING LEGENDS COMPLETELY REMOVE BORDER.
SEE DETAIL A
SEE NOTE 2
SEE DETAIL C
REV LABEL
ADD SPACER TO Q1, Q2
BEFORE SOLDERING TO BOARD.

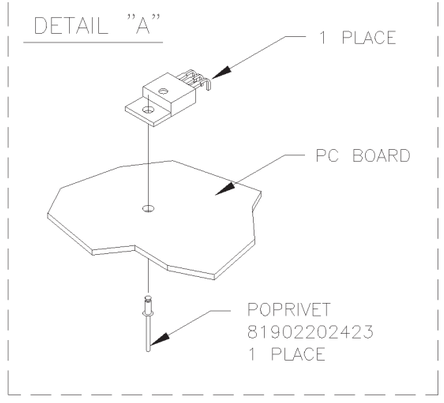


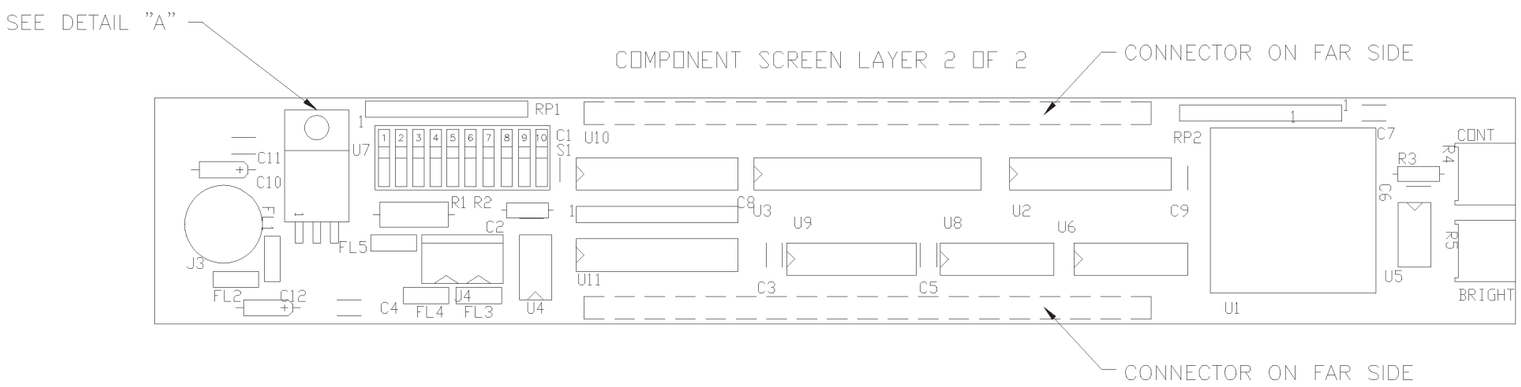
NOTES:

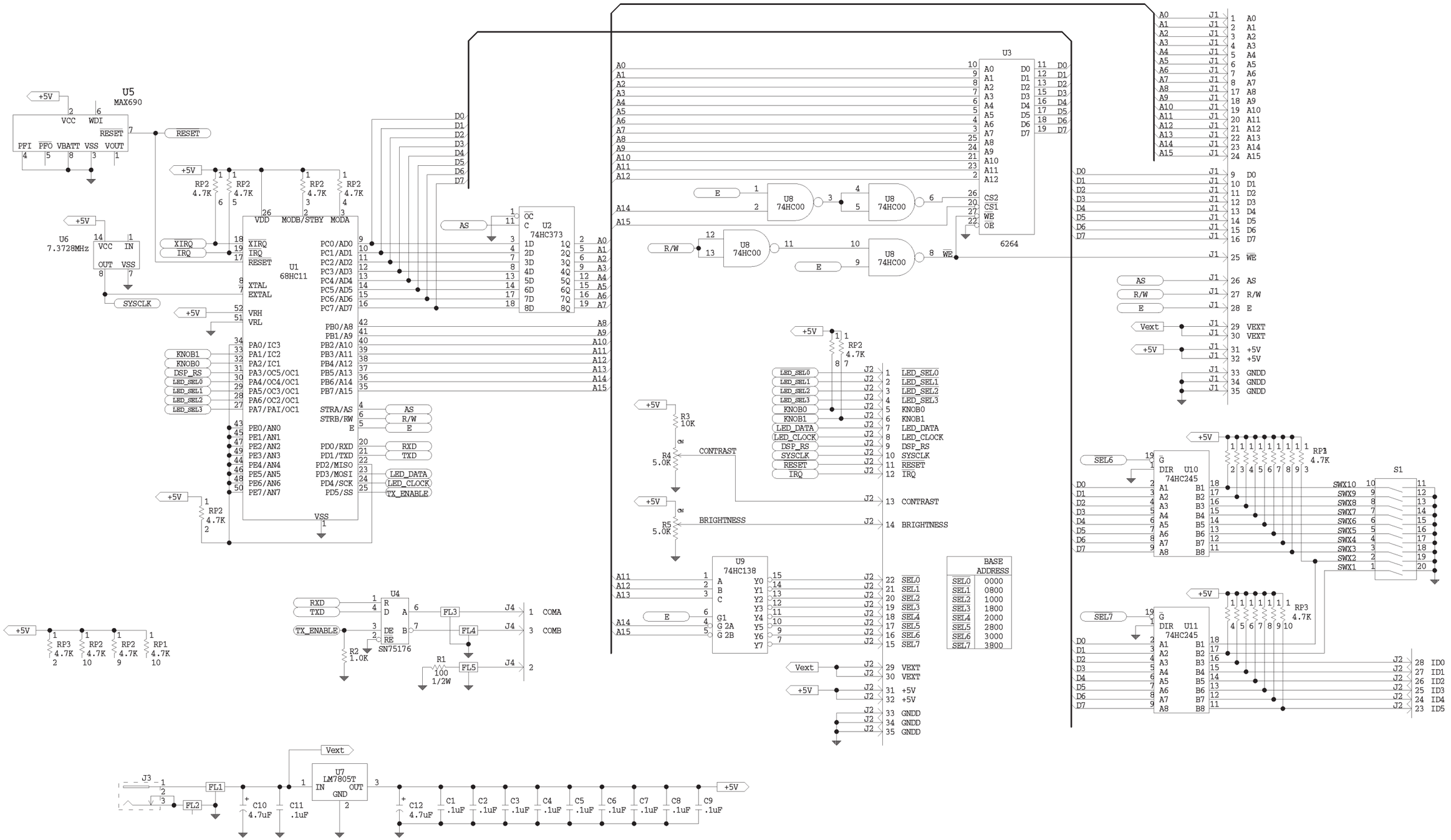
1. NOT ALL SWITCHES AND LEDS ARE POPULATED ON EACH ASSEMBLY. REFER TO APPROPRIATE COMPONENT ASSEMBLY DRAWING FOR FURTHER DETAILS.

Schematic • Switchcard • SC33-1186


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
RP2
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
C1
C2
C3
C4
C5
C7
C8
C9
C10
C11
C12
R1
R2
R3
R4
R5
R6
S1
FL1
FL2
FL3
FL4
FL5
J3
CONT
BRIGHT



Schematic • CPU Board • SC33-1190

7.1 Parts List

General

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

RCP–XY Assembly - 81906515320

81900500670	SOFTPOT ROTARY SELECTOR	1	EA
81902002419	KNOB 1.25” BLACK ALUMINUM	1	EA
81902003420	STANDOFF 4-40 X 15/16 NYLON	1	EA
81902101468	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
81903462250	FRONT PANEL ROTARY X/Y	1	EA
81903462300	REAR PANEL 1 RU CHASSIS	1	EA
81903462320	DISPLAY COVER 20X2 X/Y	1	EA
81906515370	SWITCH CARD ROTARY X/Y RC5	1	EA
81906515410	REMOTE CPU ROTARY MB CARD	1	EA
81906515550	SOFT ASSY PANELS	1	EA
PK65-1532	DOC PANEL ROTARY X/Y	REF	

Switchcard Assembly - 81906515370

81900200312	RESISTOR 36 OHM 5% 1/4W	1	EA
81900200783	RESISTOR 3.3K 5% 1/4W	3	EA
81900600958	SIP 4.7K 10-PIN 9-RESISTOR	1	EA
81900700055	CAP 0.1MF 50V CERAMIC RADIAL	6	EA
81900700238	CAP 0.001MF 1000V CERAMIC	1	EA
81901400010	TRANS 2N2219A NPN TO-5	2	EA
81901604314	IC 74HC245 CMOS BUSTRANSV	1	EA
81901604777	IC 74HC74 DUAL D FLIP-FLOP	1	EA
81901604827	IC 1 OF 8 DECODER/MULTIPLEXER	1	EA
81901605139	IC 74HC374 OCTAL D FLIP-FLOP	1	EA
81901606850	IC 74HC14 HEX SCHMTT TRIGGER	1	EA
81901606870	IC 5450 34 SEG LED DRIVER	1	EA
81901606890	IC 74HC27 TRIPLE 3-IN NOR	1	EA
81902000546	STANDOFF 7/16 X 4-40 ROUND	2	EA
81902001122	STANDOFF 9/16 X 4-40 ROUND	1	EA
81902101930	LENS ASSY BKC-6	22	EA
81902104890	LEGEND SET CONTROL PANEL	1	EA
81902202647	SCREW 4-40 X ¼ SIMM PAN HEAD	5	EA
81902411860	PCB SWITHCARD ROTARY X/Y	1	EA
81902600584	SWITCH PB T-5K-M-NO	22	EA
81902800044	SHRINK TUBING 3/64 BLACK	1	IN
81902800507	WIRE 22AWG BUSS	2	IN
81902901271	SOCKET TRANS (INDICE)	2	EA
81902907400	CONN SOCKET PLCC 44-PIN	1	EA
81902907410	CONN HEADER 7X2 UNSHROUD	1	EA
81902907430	CONN RECEPTACLE 35X1	2	EA
81902907440	CONN RECEPTACLE 6X1	2	EA
81902907450	CONN RECEPTACLE 7X2	1	EA
81903200301	LED YELLOW U-BRITE	22	EA
81903200590	DISPLAY 20 CHAR 2 ROW LCD	1	EA
PK65-1537	DOC SWITCHCARD ROTARY X/Y	REF	

CPU Assembly - 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	