

PCR USER'S GUIDE

MANUAL PART NUMBER: 20-23-2001



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PREFACE

The Matrix PCR produces full color 35mm slides of outstanding quality with both 2048 x 1366 (2k) and 4096 x 2732 (4k) resolutions (software-selectable).

This manual provides you with the steps you need to install, operate, and maintain optimum performance of the PCR. The first four sections provide the information you need to produce slides. The fifth section will help you understand the basics of how the PCR works. The following is an overview of each section in this manual.

Section 1: Pre-Installation – Introduces you to your machine, its controls and connectors. It also contains information on choosing a site for installation.

Section 2: Installation – Contains the procedures for power-up.

Section 3: Operator Instructions – Includes procedures on loading and unloading film and taking an exposure on the PCR.

Section 4: PCR Maintenance – Contains information on keeping your film modules in proper working order and procedures for testing the PCR.

Section 5: Reference – Contains a system overview, a glossary, and a description of function numbers and error codes.

As with any standard office equipment, we recommend a service contract for your Matrix PCR. Contact your authorized Matrix representative for details.

1. PRE-INSTALLATION

Verify that you have all of the components listed below. If you are missing any of the components, contact your sales representative immediately.

1.1. PCR Accessory Kit

The following is a list of all accessory kit components for the PCR with the Contax Camera.

REF	QTY	DESCRIPTION	MATRIX PART #
A	1	Power Cord	01-04-010
B	1	User's Guide	20-23-2001
C	1	Factory Test Patterns (8 Slides)	

Save the factory test patterns for reference and all packing materials in case of future off-site upgrading or service.

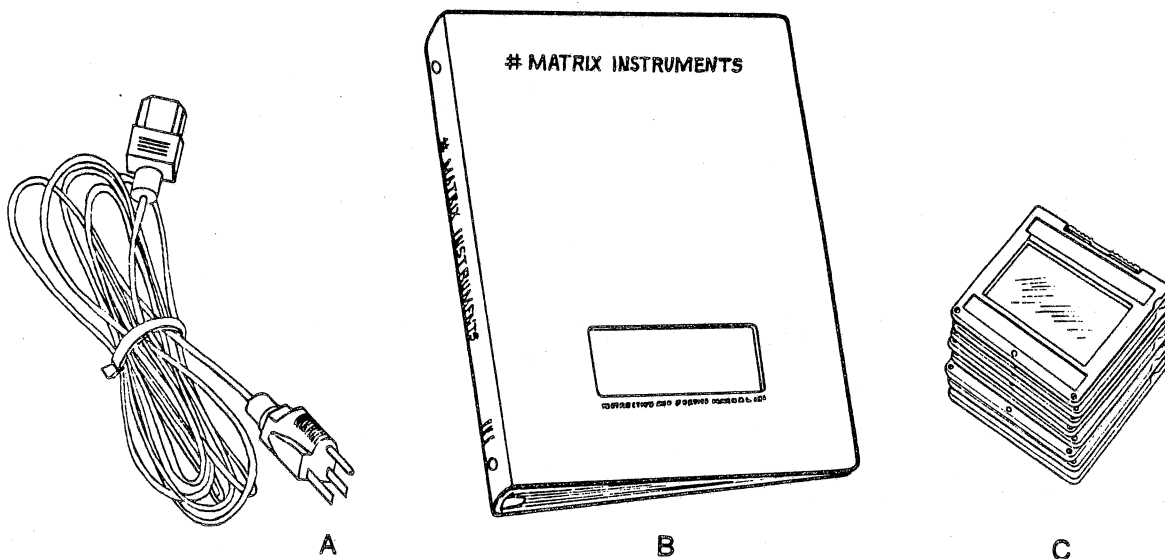


Figure 1-1 PCR Accessory Kit

REVISION	EFFECTIVE DATE	DESCRIPTION
1	Feb. 7, 1986	Initial Release
2	June 10, 1986	Editorial Revisions; changed 'QVP' references to 'MVP'
3	Nov. 12, 1986	Deleted item from Figure 1-1.
4	Feb. 2, 1987	Documentation Format Change
5	April 20, 1987	Revised document to reflect change in 35mm camera back modules. (Contax CGM has been replaced with the Pentax A3000)
6	May 4, 1987	Corrected 35mm film loading procedure.

LIST OF EFFECTIVE PAGES

PAGE	VER.	PAGE	VER.	PAGE	VER.	PAGE	VER.	PAGE	VER.
i	4	5-1	4						
ii	5	5-2	4						
iii	4	5-3	4						
iv	6	5-4	4						
		5-5	4						
1-1	4	5-6	4						
1-2	4	5-7	4						
1-3	4	5-8	4						
1-4	4	5-9	4						
1-5	4	5-10	4						
1-6	4	5-11	4						
		5-12	4						
2-1	4	5-13	4						
2-2	4	5-14	4						
		5-15	4						
3-1	6	5-16	4						
3-2	6	5-17	4						
3-3	5	5-18	4						
3-4	6								
4-1	4								
4-2	4								

1.2. Power, Space, and Environmental Requirements

1.2.1. Power

The PCR requires either 110 VAC, 60 Hz or 220 VAC, 50 Hz depending on your power specifications. You can find the unit's power requirements on the serial number identification label located on the rear of the unit.

The PCR draws approximately 2 Amps. Before installing the PCR, ensure that adequate power is available. Because the PCR is a precision electro-optical device, it is important that you adhere to the line voltage specifications and power requirements completely.

If your power system has other large electrical machinery connected to it, or it is subject to variations such as transients, voltage sags and surges, or brownouts, use a power line conditioner such as the Elgar Power Line Conditioner (PLC) Model PLC 250.

1.2.2. Space

The PCR film recorder measures 17.7 (length) x 11.5 (width) x 35.8 (height with wheels) inches (450 x 292 x 910 mm). It weighs 42 lbs. (19 kg). Because the PCR stands vertically, 17.7 x 11.5 inches constitutes the required floor space. Keep the space above the unit clear to facilitate film loading.

★ CAUTION ★

The internal CRT uses magnetic coils to position an electronic imaging beam. Although the PCR contains shields from external magnetic fields, you should locate it as far as possible from computer tape drives, disk drives, fans, or any other device with magnetic switching. This will minimize interference from these devices during imaging.

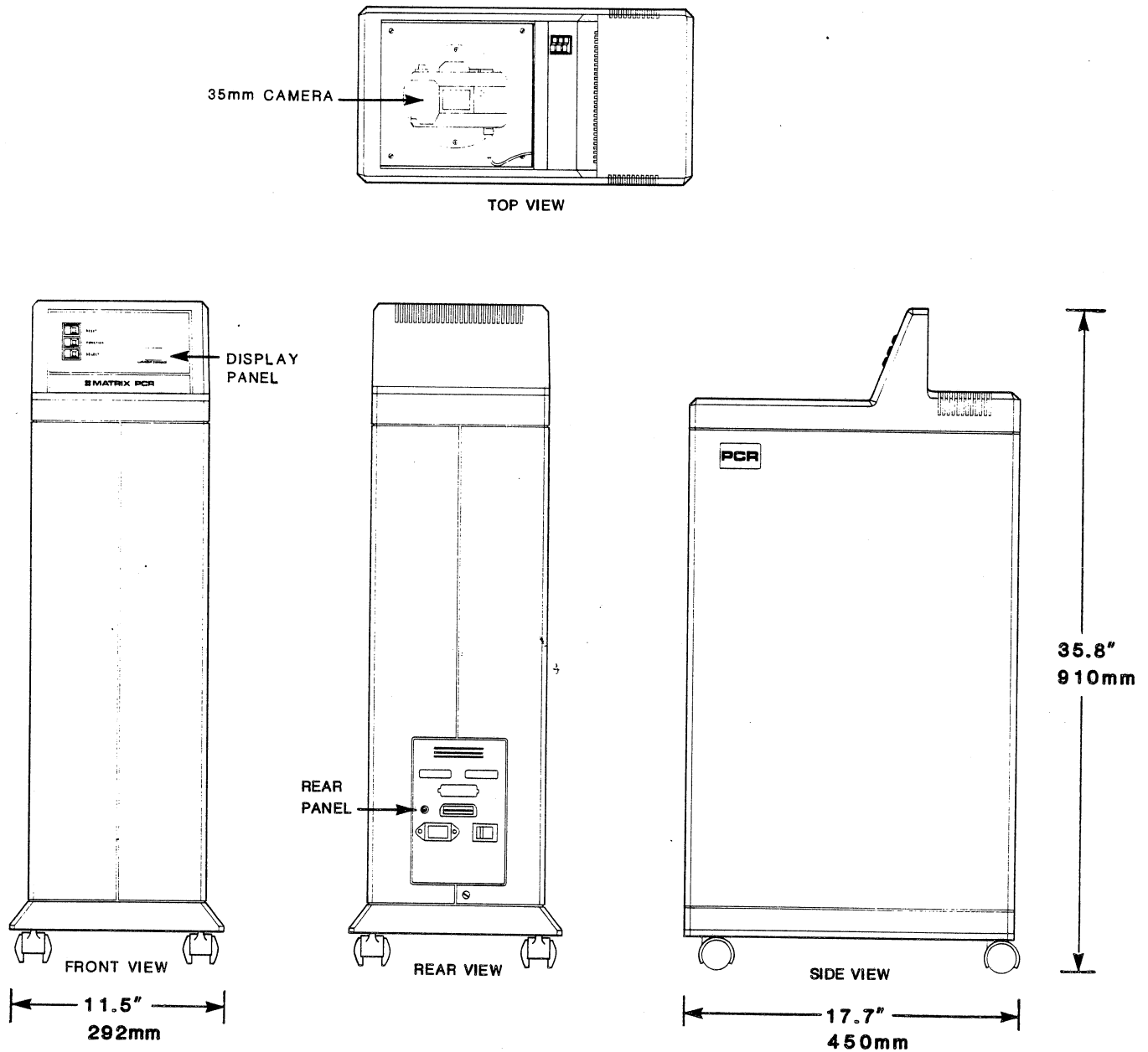


Figure 1-2 PCR Dimensions and External Features

1.2.3. Environment

Storage Temperature: 32° to 158° F.

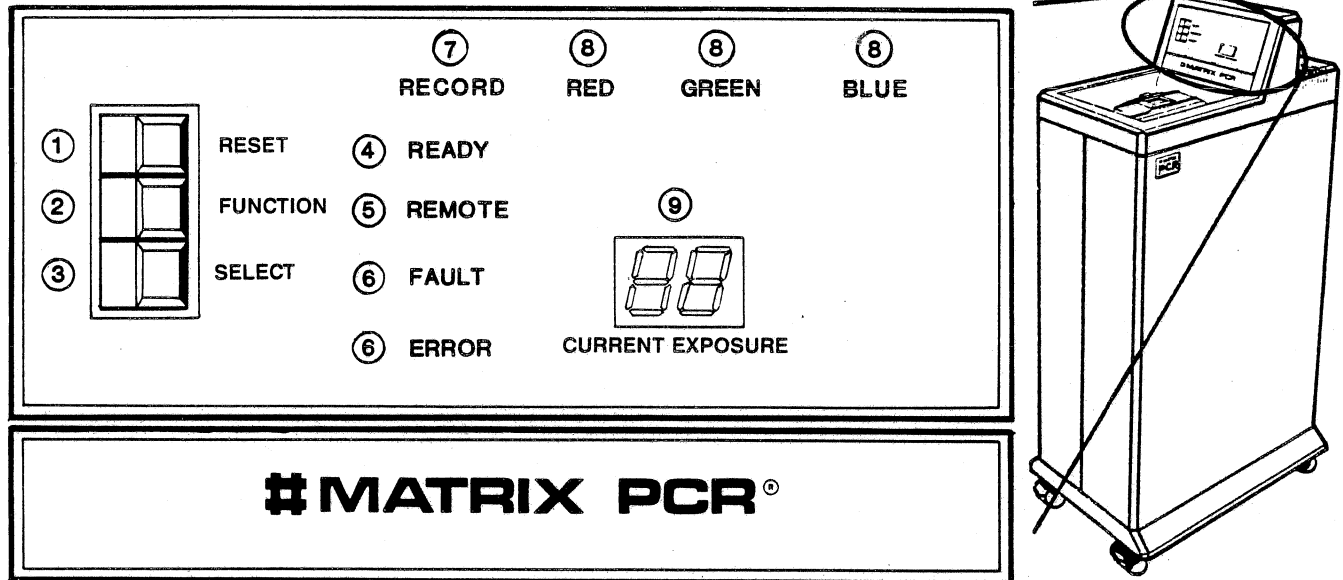
Operating Temperature: 59° to 86° F.

Relative Humidity: 35 to 65% non-condensing

1.3. CONTROLS AND CONNECTORS

The following describes the functions of the PCR's controls and connectors.

1.3.1. Display Panel



- | | |
|-------------------------|----------------------------|
| 1. RESET SWITCH | 6. FAULT & ERROR LIGHTS |
| 2. FUNCTION SWITCH | 7. RECORD LIGHT |
| 3. SELECT SWITCH | 8. RED, GREEN, BLUE LIGHTS |
| 4. READY LIGHT | 9. CURRENT EXPOSURE |
| 5. REMOTE LIGHT DISPLAY | |

Figure 1-3. Switch and Light Identification

- 1. Reset:** This switch initiates a system reset and moves the filter wheel (three colored glass lenses to the neutral position).
- 2. Function:** This allows you to select an internal function when the PCR is in the ready state. Pressing this switch displays the number of the function on the Current Exposure Display. Press it repeatedly or hold down to increase the displayed number to the function number desired. If you miss the desired number, the PCR will repeat the number cycle (1 to 11).
- 3. Select:** Press this switch to initiate the function number or value displayed on the Current Exposure Display.
- 4. Ready:** This signal light lets you know that the PCR is ready to accept commands.

5. **Remote:** This light indicates that the PCR is processing a command from the host computer.
6. **Fault and Error:** These lights indicate either a fault or an error condition. The PCR will issue a two-second-long warning alarm every fifteen seconds until a system reset occurs. When either light is on, the Current Exposure Display exhibits a primary hexadecimal error code. (See Section 5 for an explanation of each error code.)
7. **Record:** This light indicates that the PCR is recording an image.
8. **Red, Green, and Blue:** These lights indicate the position of the internal color filter wheel when the Record light is on. When all three are off, the wheel is in the neutral position. When all three are on, the wheel is moving.

When the three lights flicker randomly, the PCR is performing an automatic intensity calibration.

9. **Current Exposure Display:** This operates under three conditions.
 - During normal operation, the displayed digits indicate the film frame the PCR is currently exposing. A double dash (--) means that the film has run out, that no film is present, or that you have not set the "film load" function.
 - A numerical display concurrent with an illuminated Fault or Error light indicates the error code you need to interpret. (See Section 5 for a detailed explanation of error codes.)
 - If you have pressed the Function switch, the Current Exposure Display shows the function number currently selectable.

☞ **NOTE:** *The display will flash continuously while in the function mode. This is part of normal operation.*

1.3.2. PCR REAR PANEL

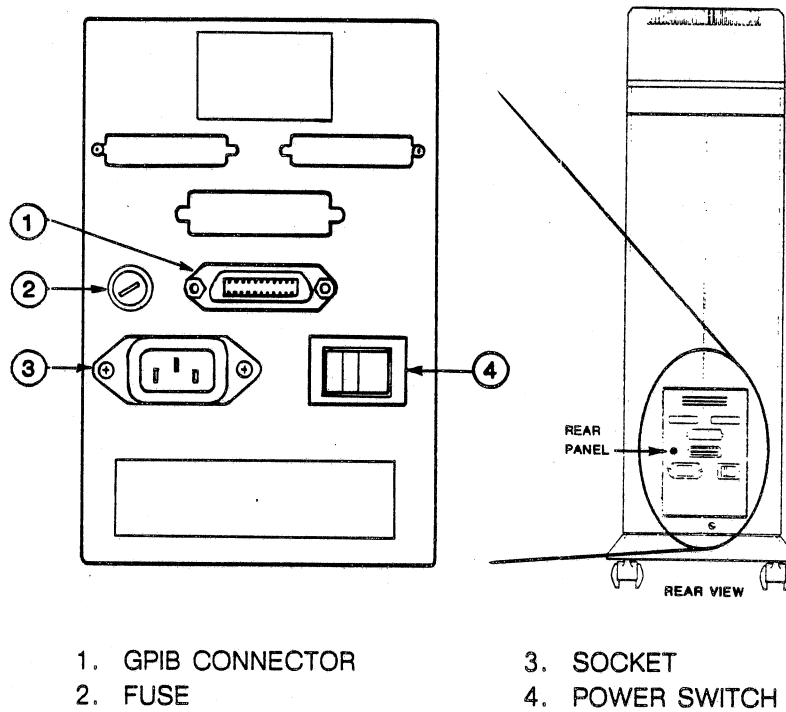


Figure 1-4. Switch and Connector Identification

1. **GPIB Connector:** Connector which accepts an IEEE-488 standard interface cable allowing the transmission of data and commands to the PCR.
2. **Fuse:** Protects the electrical system of the unit. It breaks the circuit when the current exceeds the rated value. The fuse value is stamped in the serial tag.
3. **Socket:** Input connector for line power.
4. **Power Switch:** Pressing this switch to the right applies AC power to the unit.

2. INSTALLATION

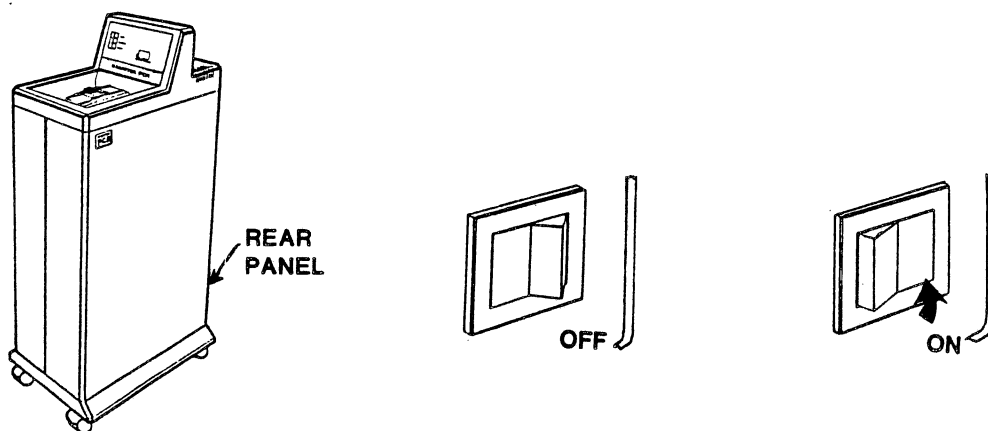
2.1. CONNECTING THE POWER LINE AND INTERFACE CABLE

- Ensure that the PCR's power switch is in the OFF position.
- Connect the female end of the AC power cord supplied with the PCR to the three-pronged socket on the rear panel.
- Plug the three-pronged male end into a standard AC power socket.
- Connect one end of an IEEE-488 standard interface cable to the GPIB connector on the rear panel.
- Connect the other end of this cable to the appropriate IEEE connector of the host computer or interface.

If your software requires a Matrix MVP (Matrix Vector Processor) graphics co-processor interface, install it and the SCODL software according to the instructions in the Installation Guide to the MVP.

2.2. POWER-UP SEQUENCE

- Locate the **POWER** Switch on the rear panel.
- Turn on the PCR by pressing right half of the **POWER** Switch.



The Display Panel is located on top of the PCR. It consists of eight indicator lights, three switches, and a two-digit LED display. After turning on the **POWER** Switch the PCR will begin a warm-up process during which the display panel lights will flash rapidly in various combinations for about two minutes.

During this time the PCR performs internal tests and calibrates the brightness of the CRT to ensure consistent color balance. When the self-test and calibration are complete, the PCR will beep, then run a calibration routine again. The RED, GREEN, and BLUE Lights will flash and the filter wheel will turn.

NOTE: *The PCR will periodically perform a calibration routine. This is a normal operation which ensures the proper functioning of the PCR. It will not interfere with the imaging process.*

When only the **READY** light is on, the self-test and calibration routine is complete. Two dashes will appear in the **CURRENT EXPOSURE** Display provided that you have not loaded or advanced any film since power-up.

If when the PCR completes its self test the **ERROR** or **FAULT** lights flash and the PCR beeps, locate the error code displayed in the **CURRENT EXPOSURE** Display and refer to Section 5 to identify the nature of the problem.

Although your PCR is ready for use upon warm-up completion (approximately two to four minutes), it is recommended that you wait an hour before imaging in order to achieve optimum performance.

NOTE: *It is not necessary nor recommended that you turn the PCR off overnight. However, you should turn it off if you will not be using it for more extended periods of time.*

3. OPERATOR INSTRUCTIONS

3.1. LOADING FILM

The Pentax Camera is the film receptacle for the PCR. It allows you to take up to 36 high resolution images per roll.

The PCR is optimized for Kodak Ektachrome ASA 100 35mm film. However, other film types with similar ASA settings may provide acceptable results.

To load the film (Refer to Figure 3-1.)

- Ensure that the PCR is on;
- Ensure that the Shutter Speed Selector ① is set to 'B'.
- Locate the film rewind knob ② at the top left of the camera;
- Unfold the rewind crank ③ by pushing it in with your fingernail. Pull the rewind knob upward until the back cover opens.
- Release the rewind knob, but do not push it back to its original position.
- Open the camera back.
- Place a roll of film into the cavity ④ at the left of the camera back with the flat side up.
- Lock the cartridge in place by pushing the rewind knob down and rotating it slightly so that it grips the spool.

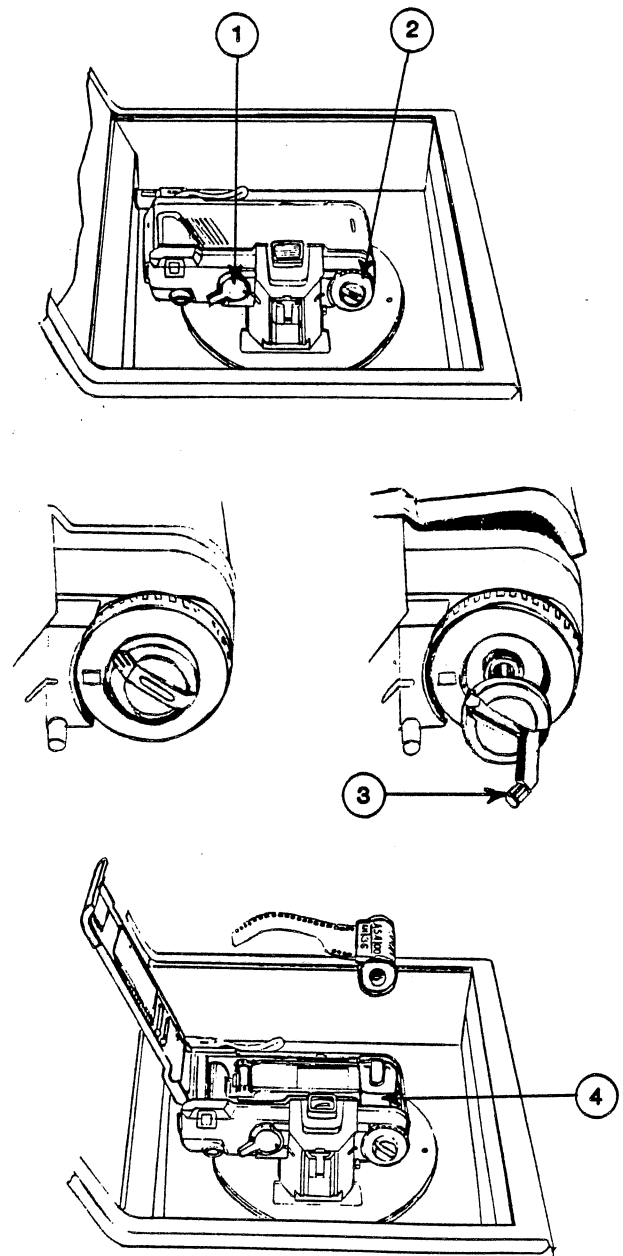


Figure 3-1.
Loading the Pentax A3000 35mm Camera

- Pull the film leader out so it aligns with the film leader end mark (dashed line) ⑤.
- Lay the leading end of film flat along the back of the camera so that the holes in the film fit over the sprocket teeth ⑥ and the spool teeth ⑦;
- Check that the film is properly placed and lays flat between the two guide rails ⑧.
- Take up any slack by rewinding the film into the cartridge.
- Close the camera back using light pressure until it clicks shut.
- Press the **FUNCTION** Switch on the PCR until a "1" appears in the Current Exposure Display.
- Press the **SELECT** Switch. This activates the PCR's *load film* function. The camera will advance the film until a '1' appears in the frame counter ⑨.
- If the rewind knob turns in the direction of the arrow ⑩ while the film is being transported, it means the film is advancing properly. If it does not, the film has not caught and you should reattempt the loading procedure.

A "1" should now appear in the small window of the camera. Because you can reset the current exposure number in the display to any value, it may not correspond to the camera's frame count. Pay closer attention to the current exposure number and do not set or reset functions during exposure.

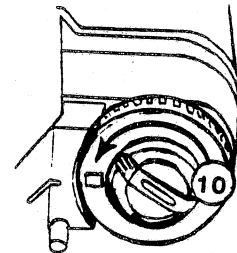
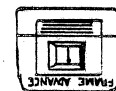
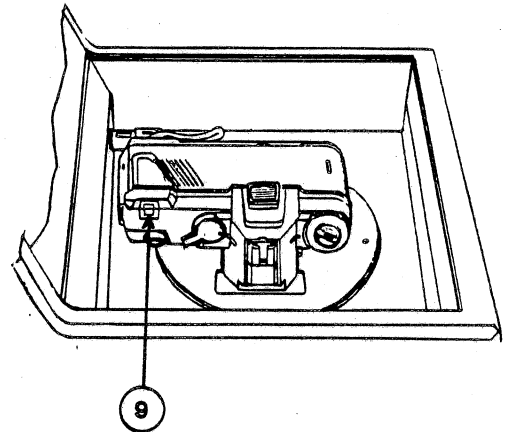
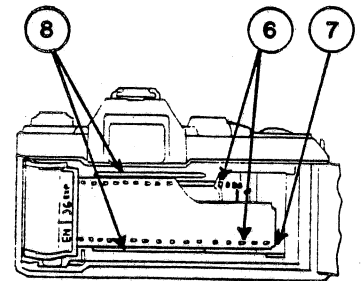
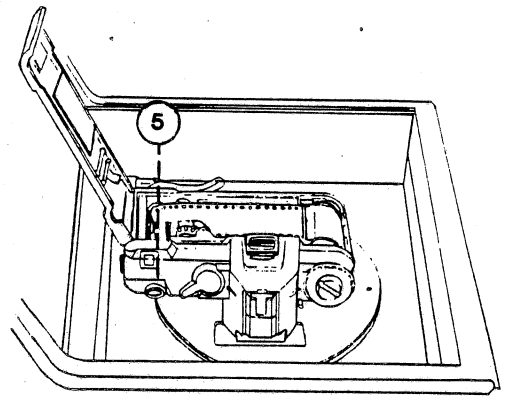


Figure 3-2.
Loading the Pentax A3000 35mm Camera
(Continued)

3.2. TAKING AN EXPOSURE

In order to take an exposure on the PCR, you must communicate with it through the host computer or through a Matrix MVP graphics co-processor interface.

Depending on the computer and graphics software used, procedures will vary. Follow the instructions appropriate to your system, contained in your software documentation. If you are using the MVP, you may also need to read the User's Guide to the MVP.

If you desire to run a test pattern, refer to Section 4 for instructions.

Exposure time will vary depending on the colors used and the complexity of the image and the interface used with the PCR. However, the average imaging time is approximately one and a half (1.5) minutes for a "typical" 2000 line business graphic, six (6) minutes for a 4000 line slide. Upon completion the PCR will produce 4 beeps indicating a successful exposure.

3.3. UNLOADING FILM

When the film advances past the last frame, two dashes (--) appear in the Current Exposure Display and the beeper sounds. You should now unload the film in the following way:

- Depress the film rewind button located on the underside of the Pentax Camera. If the button does not stay depressed, keep it depressed until the next step is complete.
- Unfold the rewind crank and turn in the direction of the arrow indicated in Figure 3-3 until the exposure counter returns to "S".
- Open the camera back by pulling up on the rewind knob;
- Remove the film;
- Press the **FUNCTION** Switch on the PCR, until a "2" appears;
- Press the **SELECT** Switch to execute the *unload film* sequence.

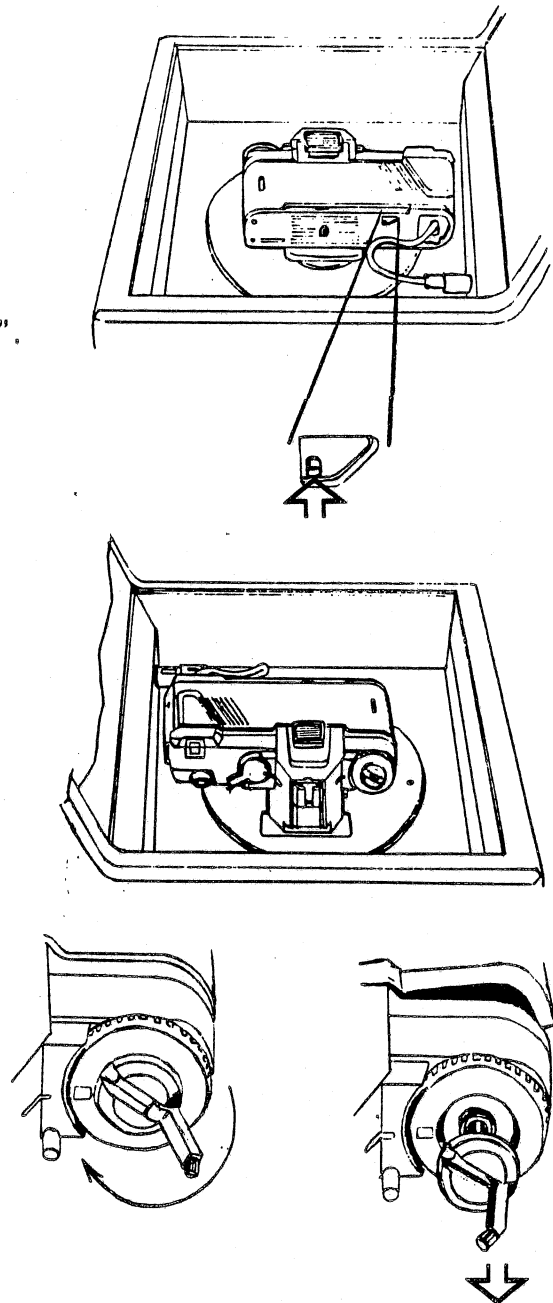


Figure 3-3.
Unloading film from the Pentax A3000 35mm Camera

4. PCR MAINTENANCE

4.1. GENERAL MAINTENANCE

Although the PCR is a relatively maintenance-free device, you should try to keep it as clean, dry, and free from dust as possible.

You may use a non-abrasive household cleaner to remove dust and scuff marks from the outside panels. Avoid getting any foreign substances near the Contax camera.

4.2. TESTING THE OPERATION OF THE PCR

You can test the operation of the PCR at any time by running a test pattern without film (Functions 6 and 7) or with film (Functions 8 and 9) to test the unit's brightness calibration, focus, and other imaging characteristics. The following text provides directions for running these tests.

NOTE: *Do not attempt to run test patterns while the PCR is actively controlled by the host computer. Local test patterns will interfere with the PCR remote activities. Neither the FAULT light nor the ERROR light should be on.*

4.2.1. Running a Test Pattern without Film (No Exposure)

You may run a test pattern without exposing an image on film. By looking through the open back of the camera, you can see the filter wheel moving and check that it is functioning normally.

- Press the **FUNCTION** Switch on the Display Panel, holding it down until the function number you desire, either 6 or 7, appears in the Current Exposure Display. (The CRT will display test pattern A when you select Function 6, test pattern B when you select Function 7.)
- Press the **SELECT** Switch. This executes the chosen function. The process takes approximately 3 to 4 minutes for 2k patterns, and up to 15 minutes for 4k patterns depending on the PCR setting (2k is the default test pattern mode unless the host/MVP sends a prior resolution setting command).

If the pattern finishes without the **ERROR** or **FAULT** lights turning on, the PCR is working properly.

☞ **NOTE:** *If an ERROR or FAULT light remains on, check the error code in the Current Exposure Display and refer to Section 5.5 to identify the problem. Then reset the PCR and try the test image again. If this problem persists, contact your authorized Matrix service representative.*

4.2.2. Running a Test Pattern with Film (With Exposure)

- Load film according to the instructions in Section 3.
- Press the **FUNCTION** Switch on the Display Panel, holding it down until the desired function, either 8 or 9, appears in the Current Exposure Display.
- Press the **SELECT** Switch to execute the function you chose. The process takes approximately 3 to 4 minutes for 2k patterns, and up to 15 minutes for 4k patterns depending on the PCR setting (2k default or software specified).
- Compare the test pattern with the equivalent factory test pattern you received with the PCR.

Test Pattern 0 (Function 8) verifies focus, proper geometric and radiometric registration, color registration, and color balance. In each colored or neutral section, three subsections contain patterns of exposed and unexposed pixels (pixel-on/pixel-off patterns).

Test Pattern 1 (Function 9) verifies linearity, focus, and color registration. It appears as a uniform field of neutral 16-pixel squares on a dark background. The neutral squares in this image are produced from three passes, that is, from light passed through all three color filters.

Upon pattern completion, the **READY** light will come on and a beeping tone will sound.

5. REFERENCE

5.1. SYSTEM DESCRIPTION

5.1.1. System Overview

The PCR receives files of rasterized image data from the host computer or from the MVP. It uses this data to produce high resolution 35mm slides.

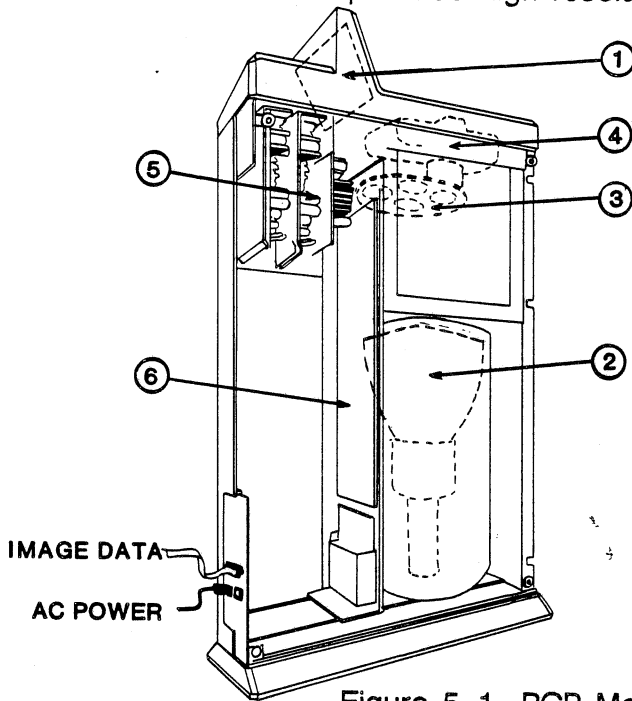


Figure 5-1 PCR Major Components

The PCR film recorder consists of the following components:

- ① A Display Panel with Input Switches;
- ② A monochrome cathode ray tube (CRT) which acts as the light source for film exposure;
- ③ A color filter wheel which positions one of four filters (red, green, blue, or neutral) across the optical path;
- ④ A 35mm camera which exposes the film to the CRT image and automatically advances the film;
- ⑤ A power supply; and
- ⑥ A micro-processor, memory, and associated circuitry.

The PCR's microprocessor decodes input data received from the host or MVP through an IEEE-488 interface cable and controls the CRT beam path and intensity. The CRT produces up to 256 different shades of gray which, when combined after the three color passes, can produce a maximum of 16.7 million colors.

The microprocessor rotates the filter wheel, controls the camera shutter, and advances the film. The display control indicates information on the display panel and accepts operator input via its panel switches.

The CRT images the computer-generated data in the form of a travelling spot of light. The filter wheel electronically selects the color filter that the light will pass through and a lens focuses the light on the film. The shutter in the film back opens to allow film exposure.

Images are created by exposing the film to each resolvable location along the scan line for the amount of time per color pass as specified by the incoming data.

After completing a color pass, the filter wheel rotates and the process repeats until each of the three primary colors (red, green, and blue) has been recorded.

The PCR digital film recorder utilizes a time-modulated film recording process. This means that the light intensity of the CRT's electron beam remains constant for each pixel exposure while the amount of time spent on recording each pixel varies. The result is a very consistent spot size and color balance.

5.1.2 Power-Up and System Reset

Upon power-up, the PCR

- Executes a warm-up;
- Diagnoses the system memory;
- Executes a system reset;
- Performs a calibration of assigned brightness levels; and
- Programs the two consecutive addresses specified by the display board DIP Switch, into the GPIB controller;

As well as during power-up, a system reset occurs in the following circumstances:

- You press the PCR **RESET** Switch;
- The PCR receives an IFC (interface clear) command from the host computer via the IEEE 488 interface;
- After an SRQ (Service Request) interrupt is serviced; and
- After the PCR receives a Select Resolution with Reset (42 or 43) command.

Upon a system reset the PCR

- Turns off all display lights;
- Loads the delay time constant with zero;
- Turns off and centers the CRT beam;
- Rotates the filter wheel to the neutral filter position;
- Sounds the alarm beeps for 1/2 second;
- Turns the READY light on to indicate that the PCR is operational;
- Loads default image dimensions (2048 pixels/line by 1366 scan lines for 2k, 4096 pixels/line by 2732 scan lines for 4k);
- Enables automatic calibration (if disabled);
- Enables automatic camera control (if disabled);
- Enables automatic filter wheel control (if disabled);
- Enables end of image warble signal (if disabled);
- Enables black jumping (if disabled);
- Disables 90 degree rotation (if enabled);
- Disables exchange of coordinates (if enabled);
- Disables mirror imaging (if enabled);
- Disables 180 degree rotation (if enabled);
- Interrupts current command in progress.

The PCR requires several seconds to complete a system reset, primarily due to the time it takes to rotate the filter wheel. Do not issue any commands until a reset has had time to complete. The READY light will go on after a reset is complete.

5.2. FUNCTION NUMBERS

Pressing the **FUNCTION** Switch accesses a number of functions which the PCR performs in order to execute pre-set instructions. The **FUNCTION** and **SELECT** Switches control the functions entirely while the operator responds to the two-digit reading in the Current Exposure Display.

To choose a function

- Press the **FUNCTION** Switch while in the READY state;
- Hold the **FUNCTION** Switch. Notice that the two-digit reading in the Current Exposure Display will increase.
- When the function number that you desire appears, release the **FUNCTION** Switch and press the **SELECT** Switch to indicate your choice. The PCR will then execute this function.

★ WARNING ★

Do not press the Function and Select Switches simultaneously. This causes the PCR to activate a diagnostics routine. At this time "dr" will appear in the Current Exposure Display. Press the Reset Switch to return the PCR to normal operation.

Diagnostic routines are to be performed only by trained, qualified service personnel. Initiating a diagnostics routine risks potential damage to the PCR and voids warranties made by Matrix.

For most functions, the PCR will execute the desired function sequence then return to normal operation. However, some functions, ie. 5 and 10, require you to make another choice (a GPIB address or a frame count). In these cases, perform the above steps again. Remember that you have not finished until the READY light comes back on.

Table 5-1. Numbered PCR Functions

Function Number	Function Description
1	Load film
2	Unload film
3	Disable automatic calibration
4	Calibrate to assigned intensities
5	Set GPIB addresses
6	Test pattern 0, no exposure
7	Test pattern 1, no exposure
8	Test pattern 0 with exposure
9	Test pattern 1 with exposure
10	Set frame counter
11	Enable automatic calibration

Choose the function number that corresponds to the function you wish to implement.

The following text describes the various functions the PCR can perform.

1 – Load Film: Select this function after loading film into the camera. It causes the PCR to

- Clear the “end-of-film” and “no film” flags,
- Set the “film present” flag,
- Move the film ahead to the first frame, and
- Set the frame counter to one.

2 – Unload Film: This function causes the PCR to

- Reset the end-of-film condition,
- Reset “film present” flag, and
- Set the frame counter to zero. (The Display Window will show two dashes.)

3 – Disable Automatic Calibration: This function causes the PCR to turn off automatic calibration between exposures.

Automatic calibration mode causes the PCR to re-calibrate the CRT's brightness levels automatically between images. This ensures a high standard of accuracy in image brightness, but takes time that this function can save.

4 – Calibrate to Assigned Intensities: This function causes the RED, GREEN, and BLUE lights to flash for a few seconds while the PCR calibrates. The PCR will calibrate only certain assigned levels in order to reduce the amount of time consumed by the process.

5 – Set the GPIB Device Addresses: This function lets the operator set the PCR device address on the IEEE interface to the host computer or MVP. On power up, the PCR reads a default address from the DIP Switches inside the display panel. Upon selecting this function, the current device address will appear in the Current Exposure Display. To leave this as the active address, press the **SELECT** Switch. Press the **FUNCTION** Switch to increase the current address in steps of two up to “1E” (after “1E” the display goes to zero and repeats the process). Press **SELECT** to indicate the address desired.

CAUTION

You may not operate the PCR remotely from the host computer unless it's GPIB address corresponds to the address programmed by the host. (See Section 5.4 for additional information.)

6, 7, 8, 9 – Test Patterns: The PCR comes with copies of two test patterns which it stores internally and can output on request. (You can find more information on test patterns in Section 4.2.) Either pattern will take approximately three minutes to image in 2k mode, longer in 4k mode. The PCR will beep four times when it is finished. The functions are as follows:

6 – The CRT will display test pattern 0 but the shutter will remain closed during imaging.

7 – The CRT will display test pattern 1 but the shutter will remain closed during imaging.

8 – The PCR will expose test pattern 0 on film.

9 – The PCR will expose test pattern 1 on film.

10 – Set Frame Counter: After selecting function 10, press **FUNCTION** again to increase the frame count in steps of one. Press **SELECT** to

- Set the frame count to the displayed value, and
- Reset the end-of-film condition.

11 – Enable Automatic Calibration: This function activates automatic calibration.

5.3. THE PCR BEEPER

The PCR contains a beeper that alerts the operator to various conditions with different kinds of beeps. The following is a list of the type (solid or warbled) and length of beeps, and why they occur.

- A solid one-half second beep indicates the completion of a hardware reset and power-up ready.
- A solid one-half second beep indicates an increase in function selection.
- Four short beeps indicate that the PCR has successfully recorded an image.
- A continuous repeating beep approximately once per second, the Current Exposure display flashing once per second, and a red LED on the camera indicate that the PCR is out of film. Turn the rotary switch off and on to terminate these symptoms.
- A ten cycle per second warbled beep for two seconds indicates an error. The beeper will emit a warbled sound approximately every fifteen seconds. The alarm will stop when you press the **RESET** Switch or service the SRQ from the host.

5.4. PROGRAMMING THE GPIB DEVICE ADDRESS (Optional)

The GPIB (General Purpose Interface Bus) Device

The GPIB (General Purpose Interface Bus) Device Address designates a specific location or destination of information. During manufacturing the PCR's Device Address is preset to 2 and 3 via DIP Switches as part of its communication protocol with the host processor.

You may verify the setting of the GPIB address by selecting Function 5 (described on the following page). The current address will appear in the Current Exposure Display.

You may alter the default settings in the following way:

- Turn off the PCR. Resetting the Dip Switches does not affect the PCR until the next power-up, so the unit should be off when you change the settings.
- Lift up the left end of the black plastic strip just beneath the display panel by carefully using a knife or a similar instrument. This strip is the same width as the display panel but about one inch high and adheres with velcro.
- Pull the left edge of the strip outward far enough to locate the DIP Switch underneath. It is set to "00010" when you receive it. ("0" is off, or down, and "1" is on, or up. The first switch should always remain in "0," or OFF, position.)

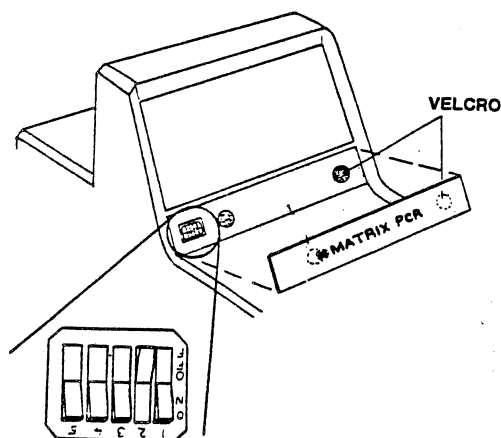


Figure 5-2 Location of the GPIB DIP Switch

- Set the switches to represent the desired even address in binary by pressing the appropriate bit until it clicks. You may use the tip of a pen or a pin-like instrument. This selects the even address and the odd address whose number is one higher. For example, setting the switches to "00010" selects addresses 2 and 3.
- Replace the plastic strip and turn on the PCR. The micro-processor will read the DIP Switch and program the PCR addresses.

You may select addresses other than the DIP-determined defaults by selecting function number 5 while the PCR is running.

To do this

- Press the **FUNCTION** Switch on the Display Panel, holding it down until the number 5 appears in the Current Exposure Display.
- Press the **SELECT** Switch. An even hexadecimal number between 0 and 1E will appear, representing the current address.
- Press the **FUNCTION** Switch again. The number displayed will increase by two. Press it as many times as necessary to reach the value you desire.
- Press the **SELECT** Switch to set this value.

5.5. PCR ERROR MESSAGES

Error codes are intended as a guide to the operator or programmer. Even though the PCR has an extensive set of error codes, you should not attempt a form of automatic error recovery. In most instances, an error means that the PCR has exposed incorrect information on film.

When the PCR detects an error, it reports the error by illuminating the **ERROR** or **FAULT** lights and displaying an error code in hexadecimal on the Current Exposure Display (referred to as a "primary error code" below). The following table explains the primary error codes:

Primary code	Problem
81	Unexpected command byte
82	Unexpected data byte
83	Illegal command byte
84	Illegal data byte
85	Command interrupt
86	Unimplemented function
91	Memory fault
92	GPIB interface fault
93	CRT beam calibration fault
A2	Filter wheel fault

Table 5-2 Primary Error and Fault Code Interpretations

When an error or fault occurs, the PCR emits a warbled beep every 15 seconds. During the 15 second interval between warbled beeps, and before the host processor services the SRQ, you may press the **FUNCTION** Switch to display a secondary error code on the Current Exposure Display.

After having displayed the secondary error code, you may display the contents of the PCR's interval registers to obtain even more information. You can do this by pressing the **SELECT** Switch. The PCR displays the registers in the following order: H, L, D, E, B, C. After the PCR displays register C, press the **FUNCTION** Switch to return the PCR to the primary error display.

NOTE: *Incorrect camera operation, incorrect data from the computer, or malfunctions of the PCR can result in errors and faults. If you believe that you have an error or fault due to PCR malfunctioning, note the primary and secondary error codes and the values of all registers. Then call your Matrix service representative.*

The following explanation describes the problems which cause an error message and the primary and secondary codes.

Primary code: 81

Problem: Unexpected Command Byte

Reason for error: While waiting for a data byte (even address) the PCR received a command byte (byte received over the odd address). The unexpected command is in register "H." An incorrectly used GPIB command pass through may cause this error.

Primary code: 82

Problem: Unexpected Data Byte

Secondary code: 00

Reason for error: While the PCR was in the idle state, it received an unexpected data byte over its even (data) address. When in the idle state, the PCR expects at least one byte of command (odd address) data to precede all data. The unexpected data byte is contained in register "H." An incorrectly used GPIB command pass through may cause this error.

Secondary code: 01

Reason for error: While the PCR was imaging the last line of a raster scan image, it received an extra byte. This is often due to either a data underflow (the host could not keep up with the PCR demanded data rate) or incorrect image dimensions.

Primary code: 83

Problem: Illegal Command Byte

Secondary code: 00

Reason for error: While the PCR was in the idle state, it received an unrecognized command byte on its command (odd) address. The illegal command byte is contained in register "H." An incorrectly used GPIB command pass through may cause this error.

Primary code: 84

Problem: Illegal Data Byte

Secondary code: 01

Reason for error: The PCR received an illegal run-length code (a length of zero). This code is contained in register "E," and indicates a special function. The function code (INTENSITY) does not correspond to any of the allowed codes. It is contained in register "C." An incorrectly used GPIB command pass through may cause this error.

Secondary codes: 02, 03, 04

- 02 indicates that the initial horizontal address was greater than the allowed minimum.
- 03 indicates that the calculated end address was greater than the allowed maximum.

- 04 indicates that the calculated end address was less than the start address.

For all three errors

- H and L contain the horizontal start address,
- D and E contain the end address, and
- B and C contain the pixel count.

Secondary codes: 05, 06, 07

Reason for error: The PCR used the image parameter information it received and calculated an illegal vertical video address.

- 05 indicates that the initial vertical address is greater than the allowed maximum.
- 06 indicates that the calculated end address is less than the allowed minimum.
- 07 indicates that the calculated end address is greater than the start address.

For all three errors

- Register pair H and L contain the vertical start address,
- D and E contain the end address, and
- B and C contain the number of lines per scan.

Secondary code: 08

Reason for error: A non-existent internal lookup table was requested.

Secondary code: 09

Reason for error: The PCR received an illegal intensity assignment.

Secondary code: 0A

Reason for error: The calculated horizontal endpoint was no longer within the digital image map when the image rotated by 90 degrees.

- Register HL contains the horizontal start address,
- DE contains the horizontal end address, and
- BC contains the horizontal line length.

Secondary code: 0B

Reason for error: The calculated vertical endpoint was no longer within the digital image map after the image rotated 90 degrees.

- HL contains the vertical start address,
- DE contains the vertical end address, and
- BC contains the number of lines per scan.

Primary code: 85

Problem: Command interrupted

Secondary error code: 00

Reason for error: While the PCR was exposing a raster-scan image, it received a "my-address-change" interrupt. Since the host processor supplies all image data over the even primary address, this address change interrupted and aborted the imaging process.

Secondary error code: 01

Reason for error: While the PCR was exposing Test Pattern O, as the host processor requested, it received a byte via the GPIB. Since the host processor must not attempt to transfer information until the test pattern is complete, the data byte interrupted and aborted the imaging process. The byte received is contained in register "H."

Secondary error code: 02

Reason for error: While the PCR was attempting to transfer data to the host processor, it received a byte. Since the host processor must not attempt to transfer information to the PCR at this time, it aborts all transfers. The PCR receives the byte in register "H."

Primary code: 86

Problem: Unimplemented Function

Solution: Reset the DIP Switches so that the GPIB address switches do not specify extended addressing.

Secondary code: 00

Reason for error: The GPIB address switches inside the display panel have specified extended addressing. The version of the software the PCR uses does not support this address mode. Register "H" contains the value read from the DIP Switch.

Secondary code: 01

Reason for error: The function code is legal but the software currently in the PCR does not support it. Eliminate it from the data.

Primary code: 91

Problem: Memory Fault

Solution: Turn off the PCR and wait 30 seconds. Turn the PCR back on and retry the image. If the error persists, there is a RAM failure.

Secondary code: 00, 01

Reason for error: Prior to imaging, the PCR verifies the checksums of various RAM data areas such as the LUTs. This code indicates corruption of one of these RAM data areas.

Secondary code: 02 to 07

Reason for error: On a power-up or reset sequence, the PCR has detected a memory failure during its memory diagnostics tests. Code "02" indicates an EPROM check sum failure; the remaining codes indicate RAM failures. You should bring errors of this nature to the attention of a qualified service technician.

Primary code: 92

Problem: GPIB Interface Fault

Secondary code: 00

Reason for error: When an operator attempted to start a local test pattern, the PCR was unable to put the GPIB interface into the local mode of operation. The PCR did not initiate a test pattern.

Secondary code: 01

Reason for error: The GPIB experienced a hand-shake error while transmitting or receiving data.

Primary code: 93

Problem: CRT Beam Calibration Fault

Secondary code: 00, 01

Reason for error: The PCR is unable to maintain proper CRT intensity.

Primary code: A2

Problem: Filter Wheel Fault

Secondary code: 00 to 05

Reason for error: The PCR is experiencing problems in reliably moving the filter wheel.

5.6. GLOSSARY OF TERMS

This glossary provides the meanings of terms for the purposes of using and programming the PCR. These meanings may not coincide with other usages or with formal definitions.

Black-jumping – An imaging mode in which the CRT beam skips over black pixels.

Brightness Level – One of nine CRT intensities (0 through 8). The user or the internal system assigns a subset of intensities to red, green, and blue colors in a given mode. Commands #44 and 45 return and load brightness levels for the current mode only; that is, only one byte for each of four color filters, and not an entire set of level assignments.

Brightness Table – A table, established internally by default or altered by the user, which corresponds each of the nine brightness levels to a CRT intensity value between 36 (the brightest value) and 220 (the dimmest).

Bus – A circuit over which information passes.

Cathode Ray Tube (CRT) – A vacuum tube in which an electron beam, directed at a phosphor-coated glass screen, causes a point on the screen to glow. As magnetic coils deflect the beam, the point of light moves across the screen. Variations in the intensity of the beam create a visible display on the screen.

Checksum – During a check, a sum of bits or bytes in a quantity of data ensuring that transmitted data is accurate.

DIP Switch – A set of five switches in a plastic box (a “dual in-line package” or DIP) which can be set by hand.

DRAM (Dynamic Random Access Memory) – A form of memory, continually refreshed, possessing both read and write capability. Memory contents are lost when the power is turned off.

Error – An operator-induced fault, a programming fault, or a data discrepancy.

Fault – A hardware-induced failure.

Filter Wheel – A movable wheel containing three color filters and one neutral filter which reside in the optical path and which color the imaging beam.

GPIB – (General Purpose Instrumentation Bus; also, IEEE 488–1978 Interface) – A standard data communication interface which allows high speed transmission of data from one device to another.

Host Computer – A computer from which the PCR receives image data and commands via the GPIB bus.

Intensity Calibration – Checking the CRT hardware to ensure it matches the intensity value for each of the nine brightness levels. The PCR automatically adjusts this intensity value. Calibration may be performed either automatically or manually.

Least Significant Bit – In a binary number, the bit representing the lowest exponent of 2.

Look-up table (LUT) – A table translating one set of values into another based on a known relationship. PCR LUTs compensate for non-linear film sensitivity.

Micro-processor – The component of the PCR (and of microcomputers) which performs logic, computational and control functions.

Most Significant Bit – The bit representing the highest exponent of two in a binary number.

Optical Path – The path that the light emitted by the CRT follows through the filter wheel and lens to the film.

Pixel (Abbreviation for picture element) – The smallest portion into which an image resolves. The term refers to both the smallest defined segment of a scan line (a unit of width) and to a two-dimensional screen area one pixel wide and one line high.

Power-up Sequence – A sequence of operations the PCR goes through when the user turns the power on. The PCR

- Tests its internal systems;
- Sends all GPIB functions to the idle state;
- Performs memory diagnostics, causing a random flashing of the display lights;
- Loads default LUT values, brightness tables, brightness levels; and
- Resets the system.

Reset Sequence – A sequence of operations the PCR goes through when the user presses the **RESET** Switch. It is described in detail in Section 5.1.3.

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