QCR-Z
Operator's Guide

Document Number: 20-21-2001

AGFA *Agfa*

AGFA MATRIX DIVISION

QCR-Z
Operator's
Guide
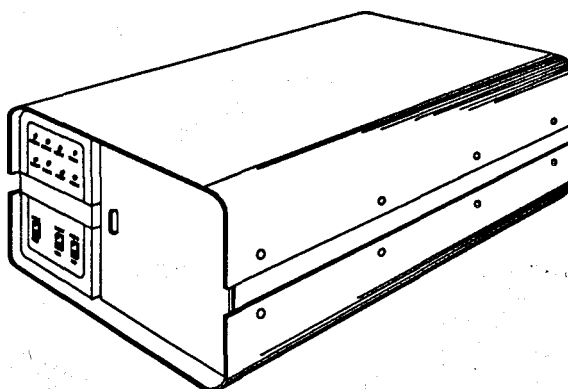
UNIT SERIAL NUMBER:

Agfa Matrix Sales and Service Offices

AGFA MATRIX FIELD SERVICE

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USA 10962
TELEPHONE: (914) 365-0202
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For telephone technical support, equipment repair, or
parts, call toll-free in the United States:
1-800-456-2600

For service contracts, upgrades, or training, call
toll-free in the United States:
1-800-365-0191

Statement of Manufacturer's Responsibility

The manufacturer, installer, or importer will be responsible for safety, reliability,
and performance of the film recorder only if:

- Installation, modifications, adjustments, changes, or repairs
  are performed by certified service personnel;

- The electrical installation of the site in which the film recorder
  is used is according to an applicable safety standard (UL,
  CSA, or IEC/VDE).

- The film recorder is used according to the instructions
  provided in the Operator's Manual.

Revision Record
Title: QCR-Z Operator's Guide
Document Number: 20-21-2001

Revision	Effective Date	Description
1	July 5 1989	Initial release for printing.
2	October 23, 1989	Revised specifications listed in Section 1.
3	July 16, 1990	Revised installation section to include description of buffered and unbuffered mode use.
4	January 2, 1991	Added operator instructions for Chinon 35mm camera module, and deleted instructions for Pentax 35mm camera. Complete document update and re-format.

Contents

Contents, continued

1 Pre-Installation

This chapter contains important information concerning the QCR-Z's power, space, and environmental requirements. Read this section carefully and determine whether your site meets all of these requirements *before* you attempt to install the film recorder.

Chapter 1 gives additional instructions on

- Inspecting the packaging for shipping damage
- Unpacking your new Agfa Matrix film recorder
- Checking that the accessory kit is complete

INSPECTION

Upon arrival, inventory the shipment with the carrier's driver.

- Carefully inspect the packing material for obvious signs of damage such as crushed, punctured, torn, broken, wet or rattling packages.

- If damage is not evident, sign and stamp a bill of lading "condition of contents unknown - subject to inspection".

- If damage is evident, contact your Purchasing Department for action, have the carrier's driver indicate the damage on the freight bill, and sign all copies of the bill.

During formal inspection, you should:

- Open all packages within 15 days of receipt for a complete inspection of the consignment.

- Report concealed damage to the carrier within 15 days of receipt or the carrier may not accept liability.
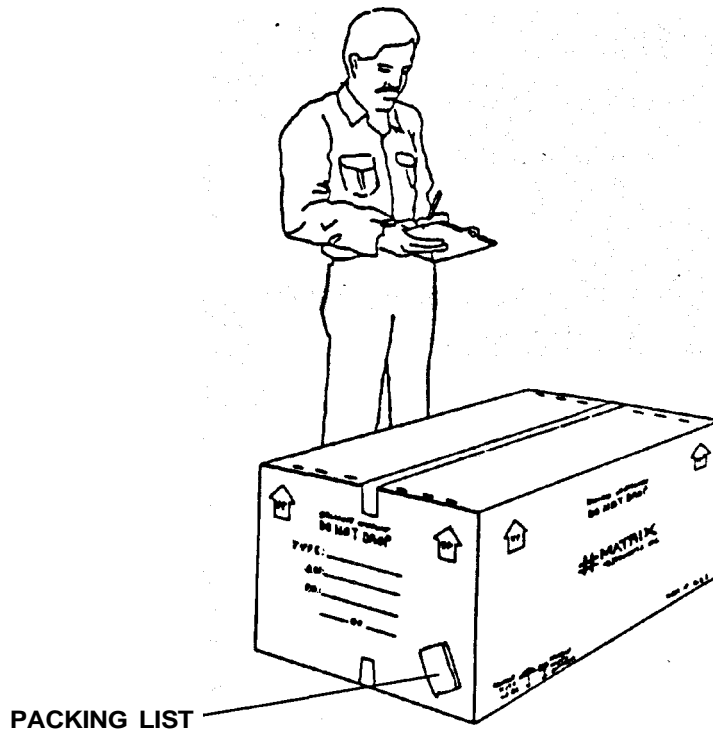
PACKING LIST

Figure 1-1. Receiving Inspection

UNPACKING INSTRUCTIONS

The film recorder and its accessories are shipped in a single carton, while the camera modules are shipped separately. To unpack the unit:

• Remove the carton staples from the top of the box by prying them up with a regular screwdriver.

• Remove the foam plate covering the unit. It is wrapped in blue plastic and lays across the entire machine. This exposes the unit and its accessory kit which is packaged separately.

• Take out the accessory kit and set it in a safe place.

• Carefully lift the video imager from the carton and place it on a flat, secure surface. The unit is heavy, so have another person assist you.

• Save all shipping materials in case the unit requires additional transportation.

FIND ENCLOSED
ACCESSORIES

REMOVE ALL
PACKING STAPLES

LIFT UNIT OUT OF
AND PLACE ON A
SECURE SURFACE
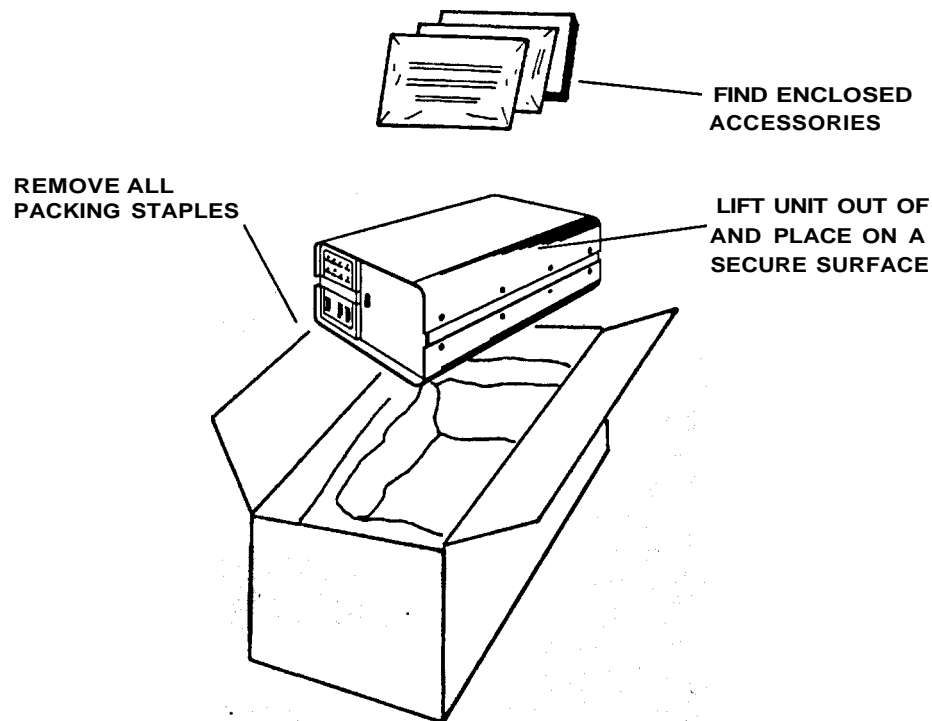
Figure 1-2. Unpacking the Film Recorder

INVENTORY OF ACCESSORY KIT

The following is a list of standard accessory kit components, and is for your reference only. Your kit may be different depending on specific order requests or customer requirements. The packing list attached to the shipping carton lists the exact contents of *your* accessory kit. Figure 1-3 will help you identify each component.
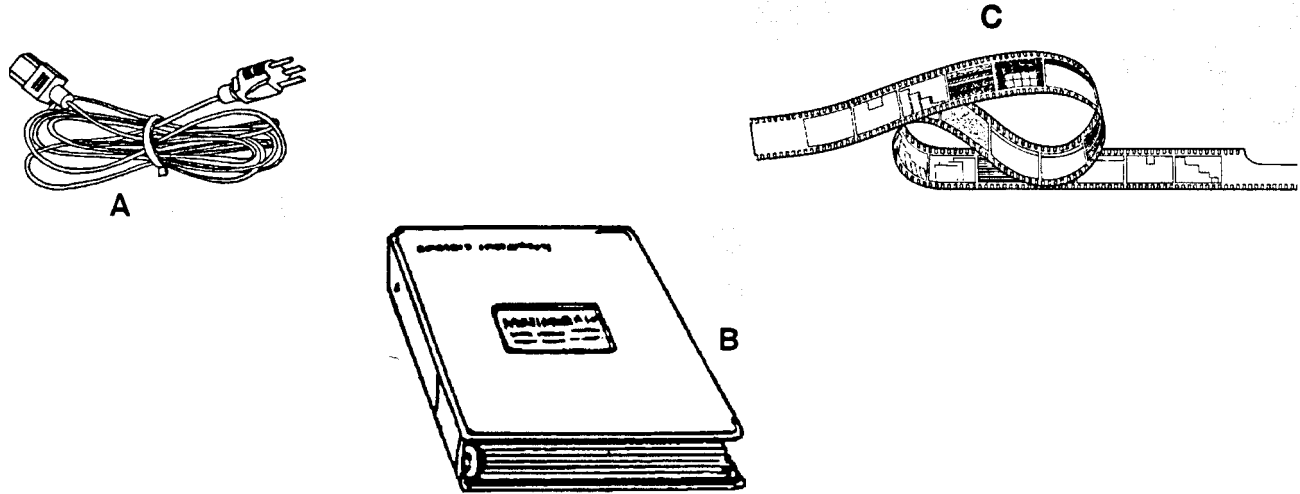
Item	Quantity	Description
A	1	Power cord
B	1	Operator's Guide (this manual)
C	1	Factory test films

Figure 1-3. Accessory Kit Components

PHYSICAL DIMENSIONS

The unit weighs approximately 84 pounds (38kg).

**Height =
240mm
9.45 in.**

**Depth =
710mm
28 in.**

**Width =
450mm
17.7 in.**
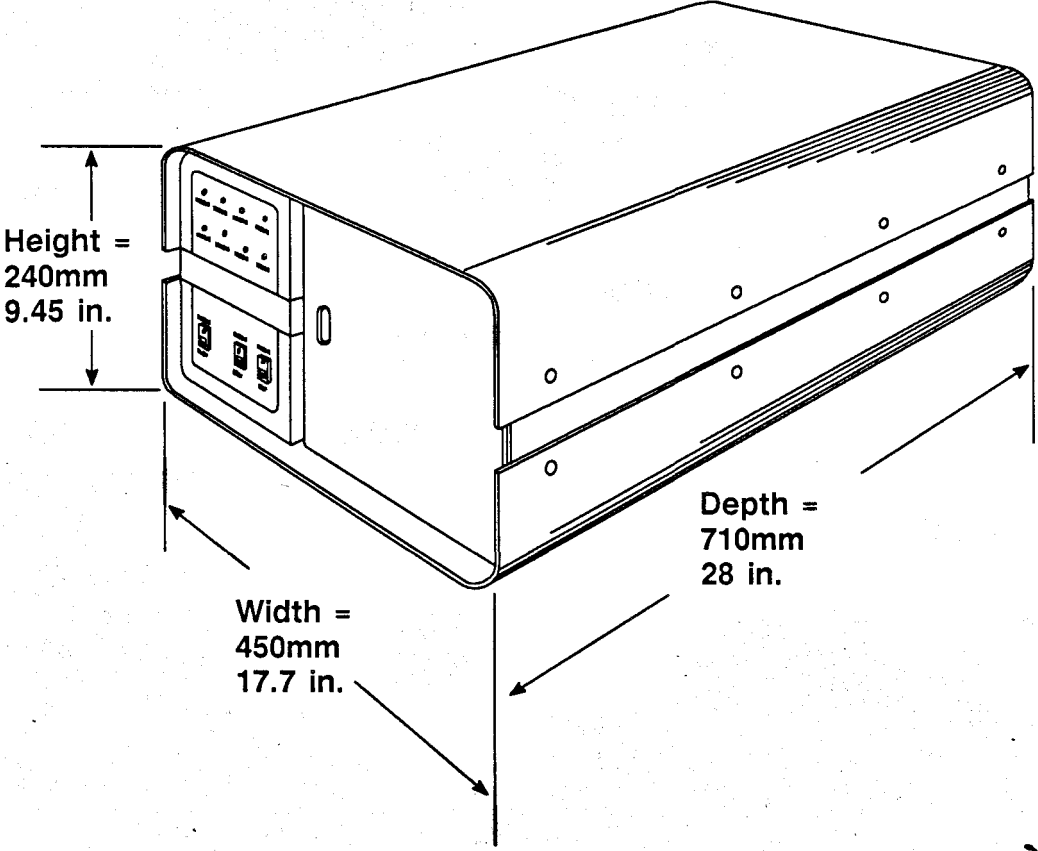
Note:
These dimensions do not include the camera module.

Figure 1-4. Cabinet Dimensions

SPACE REQUIREMENTS

The QCR-Z can be positioned on a table or sturdy shelf in a space only slightly larger than the outer dimensions of the cabinet itself. However, for servicing the unit you should provide an area of at least 20 square feet (48" x 60") for service access. This enables you to lay the unit on its base, remove the top cover, and access the interior of the system from all four sides.

You must keep clear an area of at least 36 inches (915mm) at the front side of the unit to access the user controls and use the camera modules. You should also allow an additional six inches of free space at the back of the unit for the GPIB and power cables. Refer to Figure 1-5. below for the recommended user and service clearances.
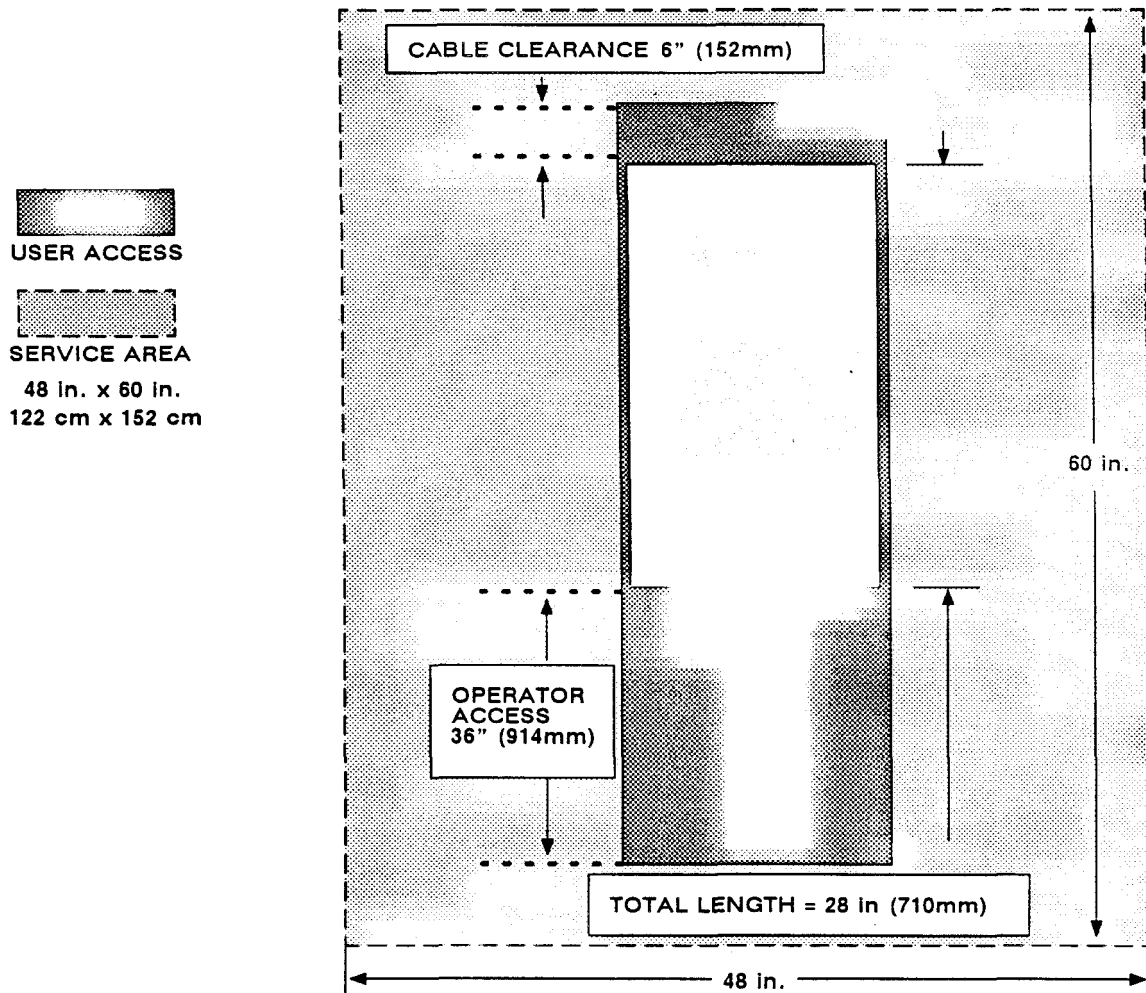
USER ACCESS

SERVICE AREA
48 in. x 60 in.
122 cm x 152 cm

CABLE CLEARANCE 6" (152mm)

60 in.

OPERATOR ACCESS 36" (914mm)

TOTAL LENGTH = 28 in (710mm)

48 in.

Figure 1-5. Space Requirements for User and Service Access

ENVIRONMENTAL SPECIFICATIONS

You should install the film recorder in a location where the operating conditions are within the limits specified below.

Conditions	Temperature	Humidity
Operating	+15° C to +30° C (+59° F to 86° F)	35%-65% non-condensing
Storage	0° C to +70° C (+32° F to +158 ° F)	20% to 70% non-condensing

POWER REQUIREMENTS

Ensure that adequate AC input power is available. The unit's power requirements are stated on the serial number identifying label located on its rear panel. Ideally, the film recorder should have its own 20 amp individual circuit with a common system safety ground.

Power Input	Voltages	Frequency	Voltage Variations	Fusings
3 wire (safety ground) single phase.	100, 120 220, or 240 Volts AC	47 Hz to 63 Hz	+/- 10% of rated voltage	100 -120 VAC: 1.5 AMP Slo-Blo 220 -240 VAC: 1.0 AMP Slo-Blo

AGENCY APPROVALS

All units will meet F.C.C. specifications according to CFR 47. Docket 20780 part 15 subchapter J for class A operation with respect to EMI/RFI emissions.

M35 Module Specifications (35mm Camera)

A.	Format:	35mm cassettes
B.	Roll Length:	36 frames
C.	Sensitivity:	>100 ASA / 21 DIN
D.	Color Balance:	Daylight
E.	Image Dimension (Horiz):	36mm
F.	Image Dimension (Vertical):	24mm
G.	Tolerance:	+/- 1%
H.	Scaling Factor (Horiz/Vert):	57 pixels/mm in 2K mode
		114 pixels/mm in 4K mode

M120 Module Specifications (4 x 5 Camera)

A.	Format:	4x5 sheet film
B.	Recommended Medium:	Polaroid 559
C.	Sensitivity:	>100 ASA / 21 DIN
D.	Color Balance:	Daylight
E.	Image Dimension (Horiz):	120mm
F.	Image Dimension (Vertical):	90mm
G.	Tolerance:	+/- 5%
H.	Scaling Factor (Horiz/Vert):	17 pixels/mm in 2K mode
		34 pixels/mm in 4K mode

M240 Module Specifications (8 x 1 0 Camera)

A.	Format:	8x10 sheet film
B.	Recommended Medium:	Polaroid 809
C.	Sensitivity:	>100 ASA / 21 DIN
D.	Color Balance:	Daylight
E.	Image Dimension (Horiz):	246mm
F.	Image Dimension (Vertical):	185mm
G.	Tolerance:	+/- 5%
H.	Scaling Factor (Horiz/Vert):	17 pixels/mm in 4K mode (2K not supported)

2 Controls and Connectors

Chapter 2 describes the front panel user controls and rear panel electrical connectors. Here you will find a description of each switch and connector and its related function to the QCR-Z film recorder. Use this chapter as a reference section to Chapter 3- Installation, and Chapter 4- Operator's Instructions.

USER CONTROLS AND DISPLAY

The following text describes the QCR-Z's front panel user controls. Familiarize yourself with each control and its function.
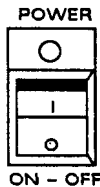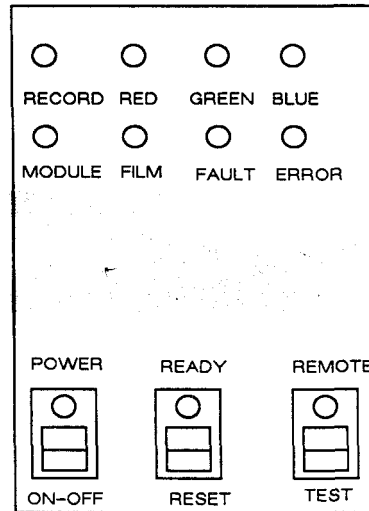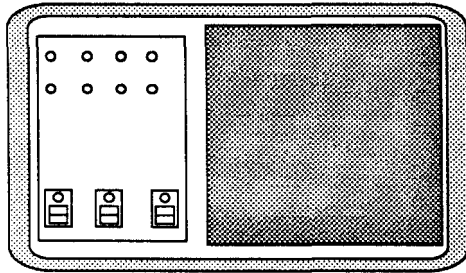
POWER ON - OFF SWITCH

Pressing in the top half of this switch turns on the film recorder and illuminates the lamp inside the power switch. Pressing in the bottom half of the switch turns the unit off.
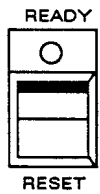
RESET SWITCH (READY INDICATOR)

Press RESET down to reset the QCR-Z or to choose an operating mode when the diagnostics mode is selected.
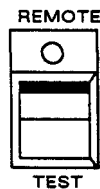
TEST SWITCH (REMOTE INDICATOR)

This switch selects the type of test pattern that the QCR-Z images in its test diagnostics mode.

STATUS AND ERROR INDICATORS

RECORD
O

RECORD INDICATOR
This indicator illuminates while the QCR-Z is recording an image onto the film.

RED
O

RED INDICATOR
This indicator illuminates while the QCR-Z is recording red image data onto the film. If there is a fault or error, a combination of the RED, GREEN, and BLUE indicators may be on, telling you what the problem is.
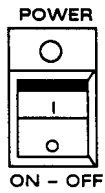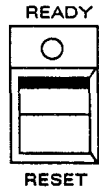
GREEN
O

GREEN INDICATOR
This indicator illuminates while the QCR-Z is recording green image data onto the film.

BLUE
O

BLUE INDICATOR
This indicator illuminates while the QCR-Z is recording blue image data onto the film.

MODULE
O

MODULE INDICATOR
This indicator illuminates if there is a fault with the camera module that you are using on the QCR-Z.

FILM
O

FILM INDICATOR
This indicator illuminates when the 35mm module reaches the end of film and the last frame is exposed.

FAULT
O

FAULT INDICATOR
This indicator illuminates if there is a hardware problem with the QCR-Z. Some combination of the RED, GREEN, and BLUE indicators will be lit, telling you where the problem is.

ERROR
O

ERROR INDICATOR
This indicator illuminates if there is a software problem with the QCR-Z or the host. Some combination of the RED, GREEN, and BLUE indicators will be lit, telling you where the problem is.
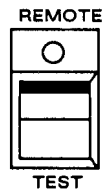
STATUS AND ERROR INDICATORS (CONTINUED)

POWER ON – OFF INDICATOR
This indicator is lit while the QCR-Z is powered on.

READY INDICATOR
This indicator illuminates when the QCR-Z is ready to record an image.

REMOTE INDICATOR
This indicator illuminates while the QCR-Z is receiving image data from the host computer.

POWER AND SIGNAL CONNECTOR PANEL

All external connections to the film recorder (with the exception of the camera modules) are made at its rear panel. Among these are the a.c. power receptacle and GPIB interface connector. The following describes the functions of each connector as well as the fuse holders and line voltage selector.
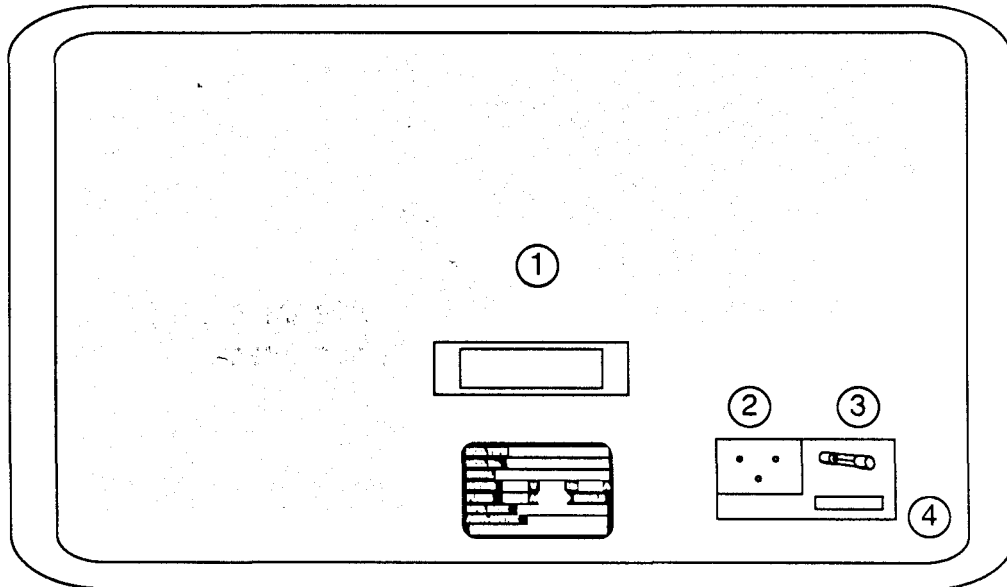
1. **GPIB INTERFACE CONNECTOR**

   This is the IEEE-488 1978 standard interface connector for the host computer. Image data and commands travel between the host computer and the QCR-Z through the GPIB cable.

2. **POWER INPUT RECEPTACLE**

   This is the connector for the AC line power. You connect the receptacle end of the molded power cord to the power input receptacle.

3. **FUSE HOLDER**

   This is the AC power fuse housing which contains the protective fuse.

4. **VOLTAGE SELECTOR**

   This is a removable printed circuit that selects the input power line voltage (120/220 VAC).

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3 Installation

Chapter 3 instructs you on how to properly install the QCR-Z film recorder. You should install the unit in a location which meets the power, space, and environmental requirements given in Chapter 1. Before installing the QCR-Z, familiarize yourself with the function and operation of each control and connector described in Chapter 2.

Chapter 3 gives instructions on

- Making the connections to hook up the power cord, selecting the proper line voltage, and connecting the GPIB cable.

- Programming the GPIB device address.

  If you encounter a problem during the installation of this equipment, contact the nearest Agfa Matrix service location immediately. Use the toll free telephone hotline if you are in the Continental United States. This telephone number is:

  1-800-456-2600

MAKING THE CONNECTIONS

POWER LINE

• Ensure that the POWER switch is in the OFF position. This switch is located on the film recorder's front panel, and is off when the bottom half ('0') is pressed in.

• Check the film recorder's a.c. line voltage requirements by inspecting the serial number tag, located on its rear panel. They must exactly match the line power that your wall outlet provides.

Check the serial number tag and make sure the line voltage requirements are met.
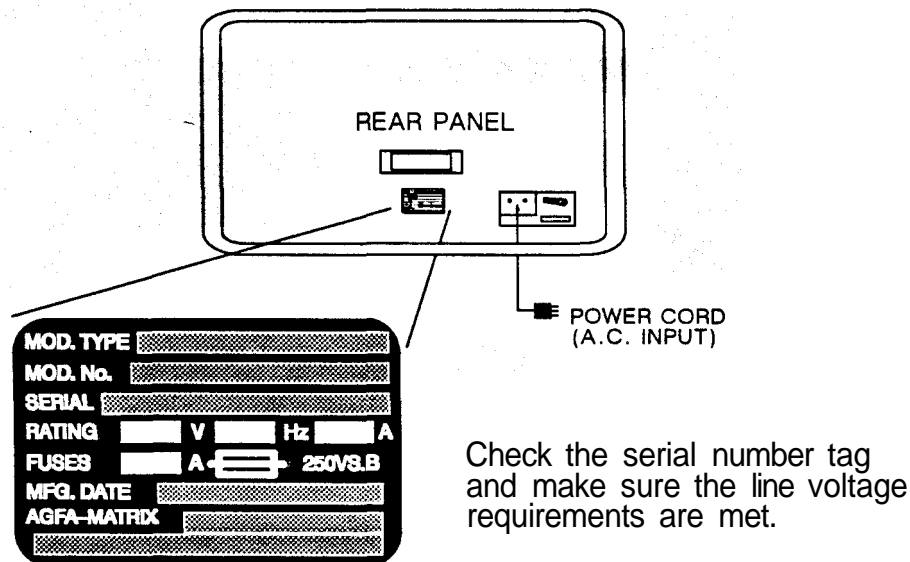
• Connect the molded end of the power cord (included in the accessory kit) to the a.c. receptacle on the QCR-Z's rear panel. Connect the three-prong end to a power line outlet sharing a common ground with the unit or a wall outlet having a common ground.

WARNING

If you are uncertain whether you have the correct power for the unit, contact a licensed electrician or qualified service engineer. Never use a 3-to-2 prong a.c. adapter or otherwise defeat the ground prong on the power cord provided with the unit.

CHECKING THE LINE VOLTAGE (120/220 VAC)

There is a line voltage selector card inside the power input module that houses the AC receptacle and the line fuse. This selector card is positioned just below the fuse and is inserted in such a way that allows you to select 120 or 220 volt operation. If you change the line voltage from 120 volt to 220 volt operation, be certain to change the fuse to the proper rating for the new line voltage. The fuse values are provided in Chapter 1 of this manual.

• Ensure that the POWER switch is in the OFF position, and that the power cord is removed from the receptacle on the back of the QCR-Z.

• Slide the clear plastic safety cover to the left, exposing the voltage selector board. The selected voltage is written on the card and should be clearly visible to you.

• To change the voltage, carefully remove the selector card with a pair of needle nose pliers, turn it 180 degrees, and re-insert it.
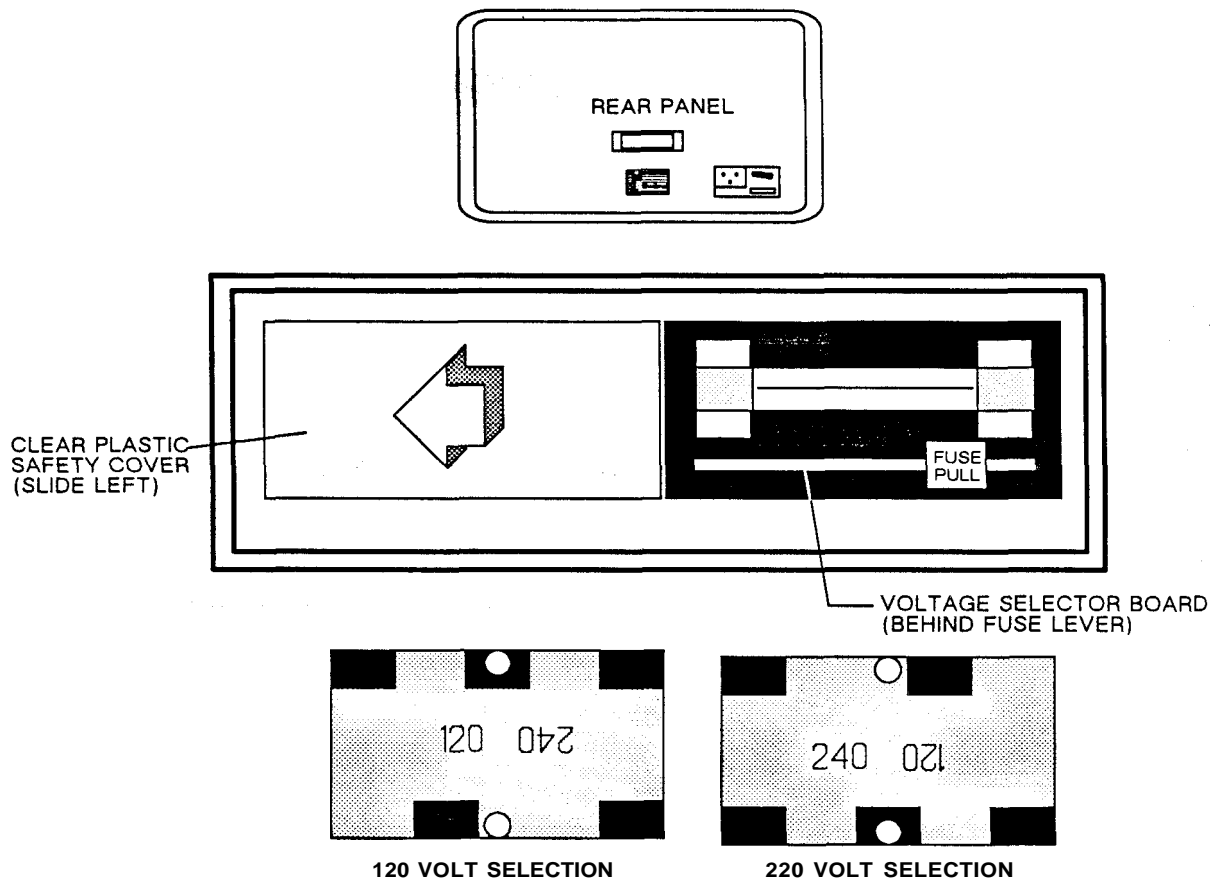
REAR PANEL

CLEAR PLASTIC
SAFETY COVER
(SLIDE LEFT)

FUSE
PULL

VOLTAGE SELECTOR BOARD
(BEHIND FUSE LEVER)

120 VOLT SELECTION   220 VOLT SELECTION

Figure 3-1. Input Power Selection

CONNECTING THE INTERFACE CABLE

The GPIB cable provides the link that allows the QCR-Z and the host computer to communicate with each other. Plug the 24 pin GPIB cable (supplied by the host computer) into the connector on the back of the QCR-Z. Secure the connector in pace by tightening the screws on either side of the connector.

It is possible that you may have to modify or configure the GPIB board inside the host computer in order to ensure that it can communicate with the QCR-Z. Consult your Agfa Matrix dealer if you need assistance with setting up the host's GPIB board.
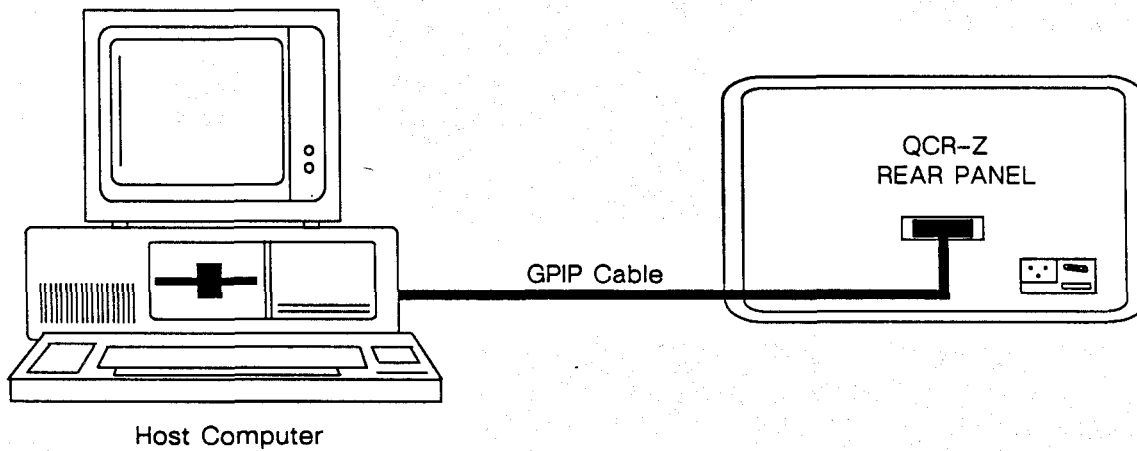
Figure 3-2. Interface Cable Connection

PROGRAMMING THE GPIB DEVICE ADDRESS

The QCR-Z is compatible with most PC systems. Knowing the rate of data transfer from your computer will help you determine the best operating mode for the QCR-Z.

If your bus speed is less than 8Mhz, the QCR-Z should be set to "buffered" mode. Buffered mode activates a two scan line (8K) memory within the QCR-Z. This helps to minimize data transfer problems associated with slower computers.

If your computer's bus speed is 8 Mhz or higher, the QCR-Z should be set to "un-buffered" mode. A typical PC-AT uses the un-buffered operating mode.

Activating the buffer when using faster computers can lead to data transfer errors.

SETTING THE GPIB DIP SWITCHES

The QCR-Z is assigned a GPIB address as part of its communication protocol with the host. The address is set during manufacturing to **02** using a DIP switch located on the inside of the display panel. You may set the address to one of thirty possible choices.

To change the QCR-Z's GPIB address perform the following steps:

1. Turn off the QCR-Z.

2. Remove the top cover by unscrewing the eight mounting screws.

3. Locate the eight bit DIP switch on the inside of the front panel.

4. Set the primary address bits A5 to A2 (8 to 5 on the DIP switch). The address bit designations are per IEEE 488 standard. A5 is the most significant bit, A1 is the least significant bit. The remaining switches are for extended addressing that is not currently available. These switches should be set to "1" for normal operation.

5. Replace the top cover and screws.

6. Power on the QCR-Z. The host computer will read the new address.

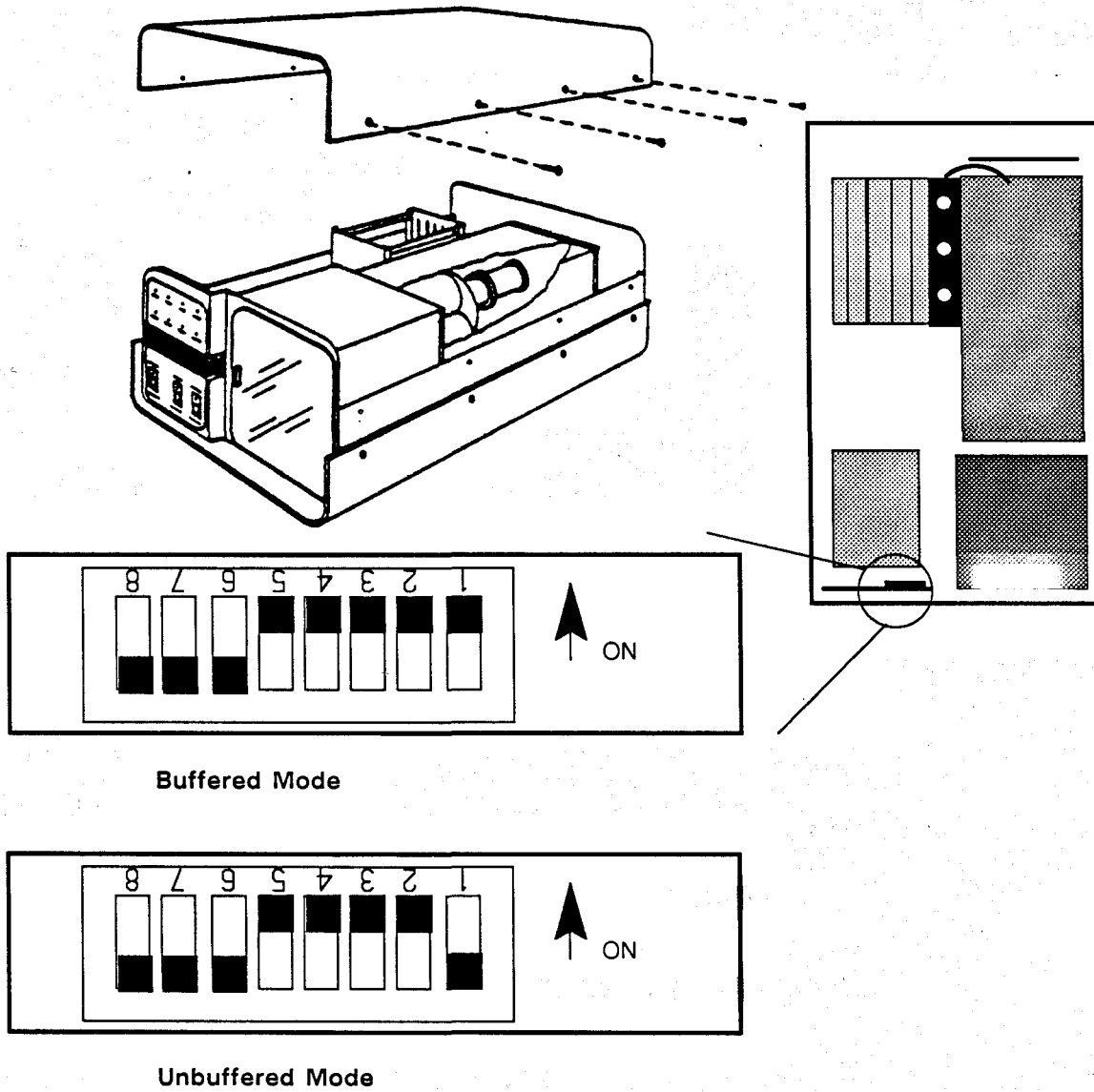**Buffered Mode**

Unbuffered Mode

Figure 3-3. Setting The GPIB Device Address

4 Operator's Instructions

Chapter 4 instructs you on routine operating procedures including:

- Powering the film recorder on and observing its warm up and self test routines
- Loading and unloading the camera modules
- Interpreting status and error messages, and taking corrective action if you have a problem.

WARM UP SEQUENCE

IMPORTANT

Allow the QCR-Z to warm up for at least 20 minutes before you begin imaging.

The QCR-Z's front panel LED indicators will begin flashing after you turn the unit on. The QCR-Z will perform internal intensity calibrations for red, green and blue according to the type film module you are using. Once the system has calibrated properly, the LED indicators will blank and the READY LED will illuminate.
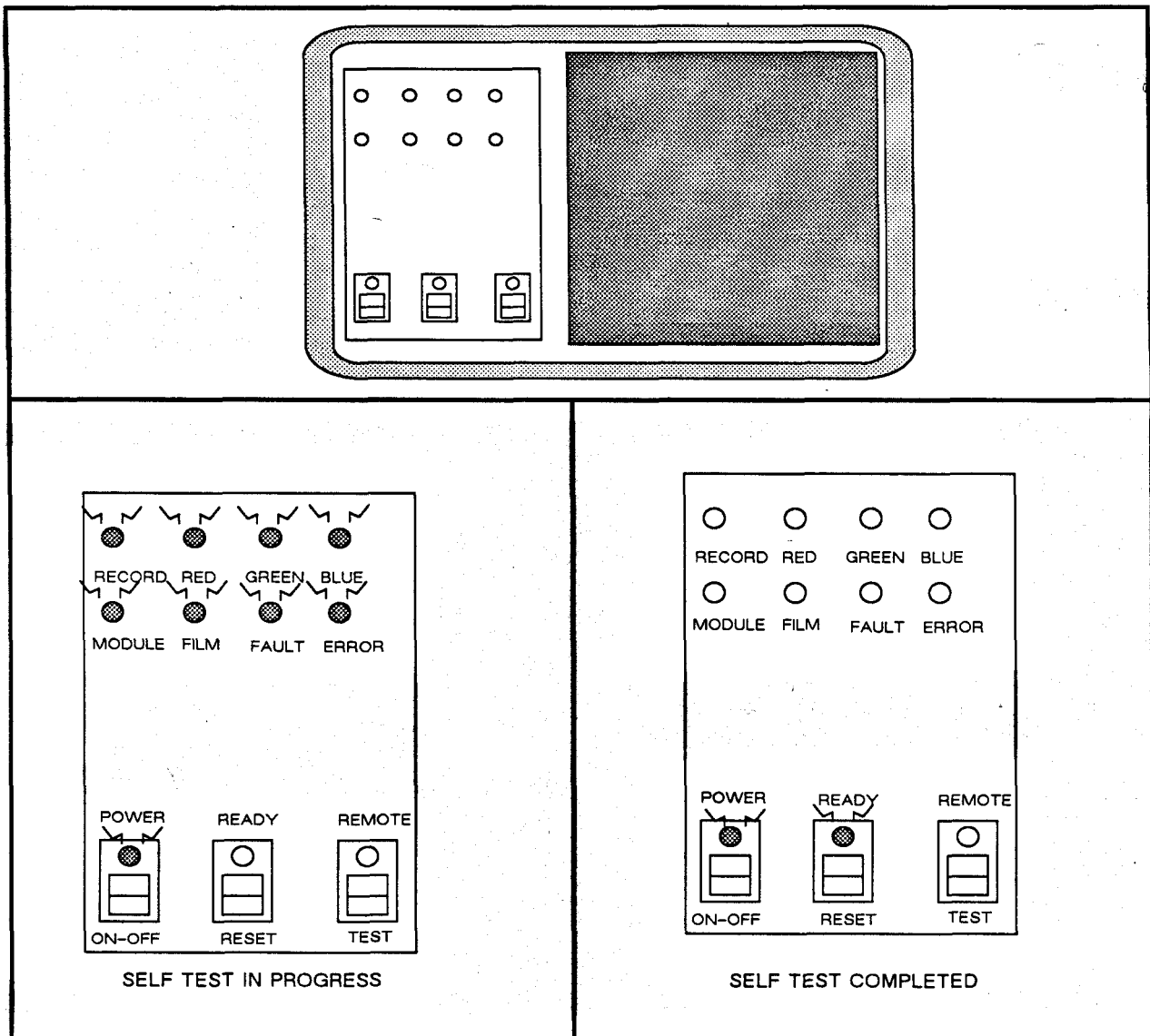

Figure 4-1. Warm Up Sequence

HANDLING THE FILM MODULES

The M35 Module

To prevent dust build-up on the face of the QCR-Z's CRT, you should leave a camera module installed in the unit at all times.

Removing the M35 Module

To remove the M35 module from the QCR-Z, perform the following steps:

• Power off the QCR-Z and open the smoked plastic door of the module.

• Reach inside the module and rotate the module latches to the open position (the handles will point toward each other).

• Pull the ejector tab at the top and center of the module's front opening to dislodge the module. Slide the module out of the enclosure while ensuring that the ejector tab does not jam against the QCR-Z.

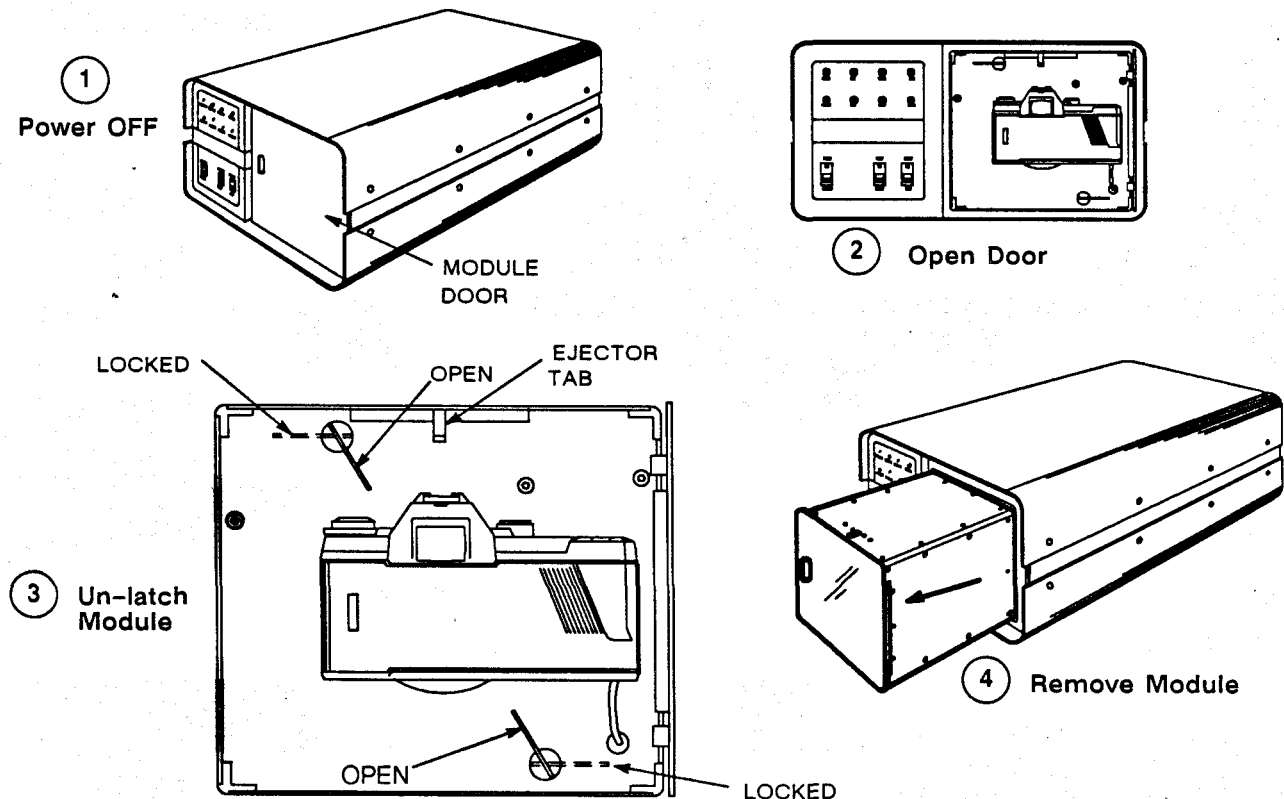• Close the smoked plastic door once the module has been removed.

Figure 4-2. Removing the 35mm Module

Inserting the M35 Module

To insert the M35 module in the QCR-Z, perform the following steps:

• Power off the QCR-Z and open the smoked plastic door of the module.

• Reach inside the module and rotate the module latches to the open position (the handles will point toward each other).

• Slide the module into the enclosure while ensuring that the ejector tab does not jam against the QCR-Z. Also check that the two guiding pins are engaged.

• Reach inside the module and rotate the module latches to the locked position. Close the module's smoked plastic door.
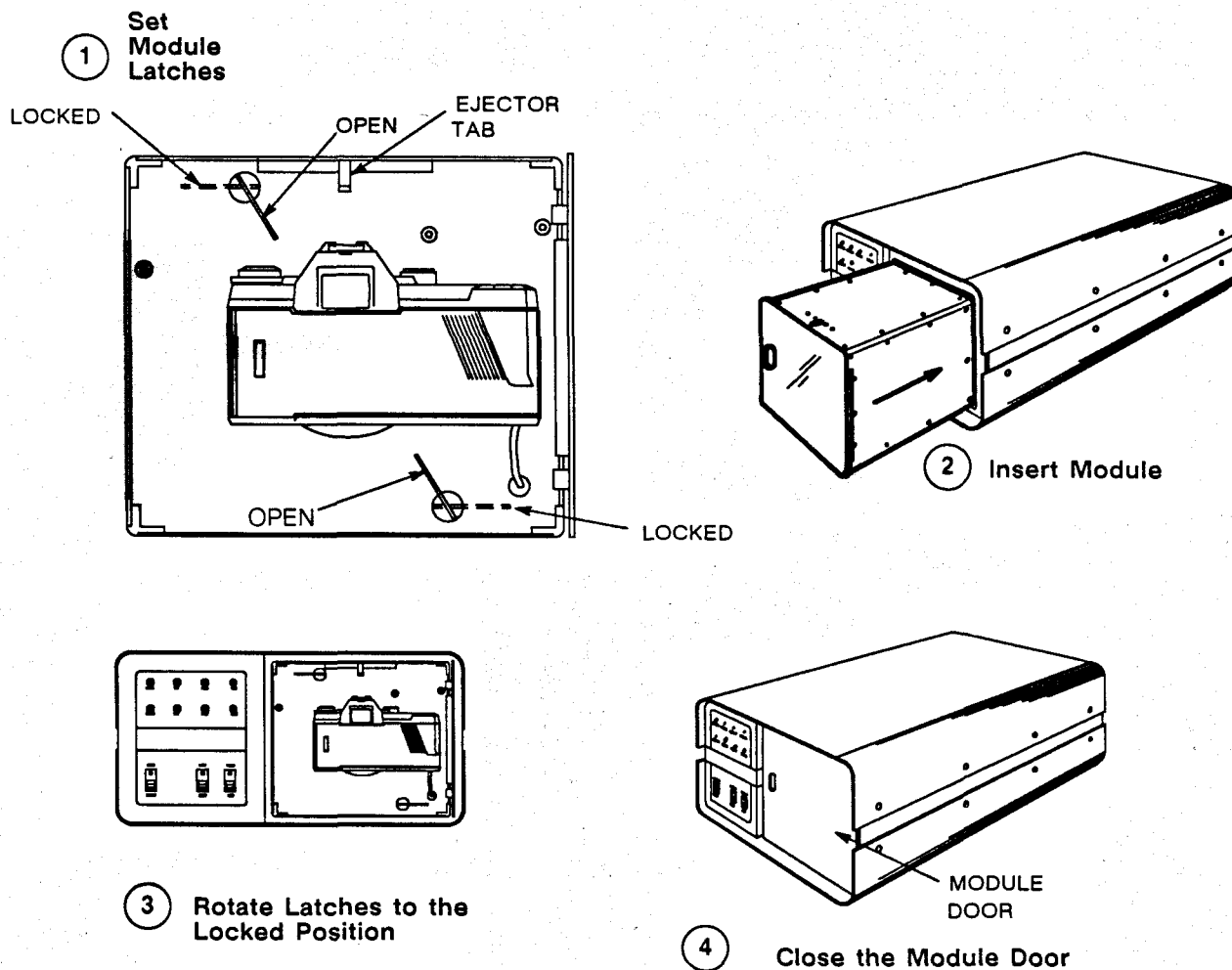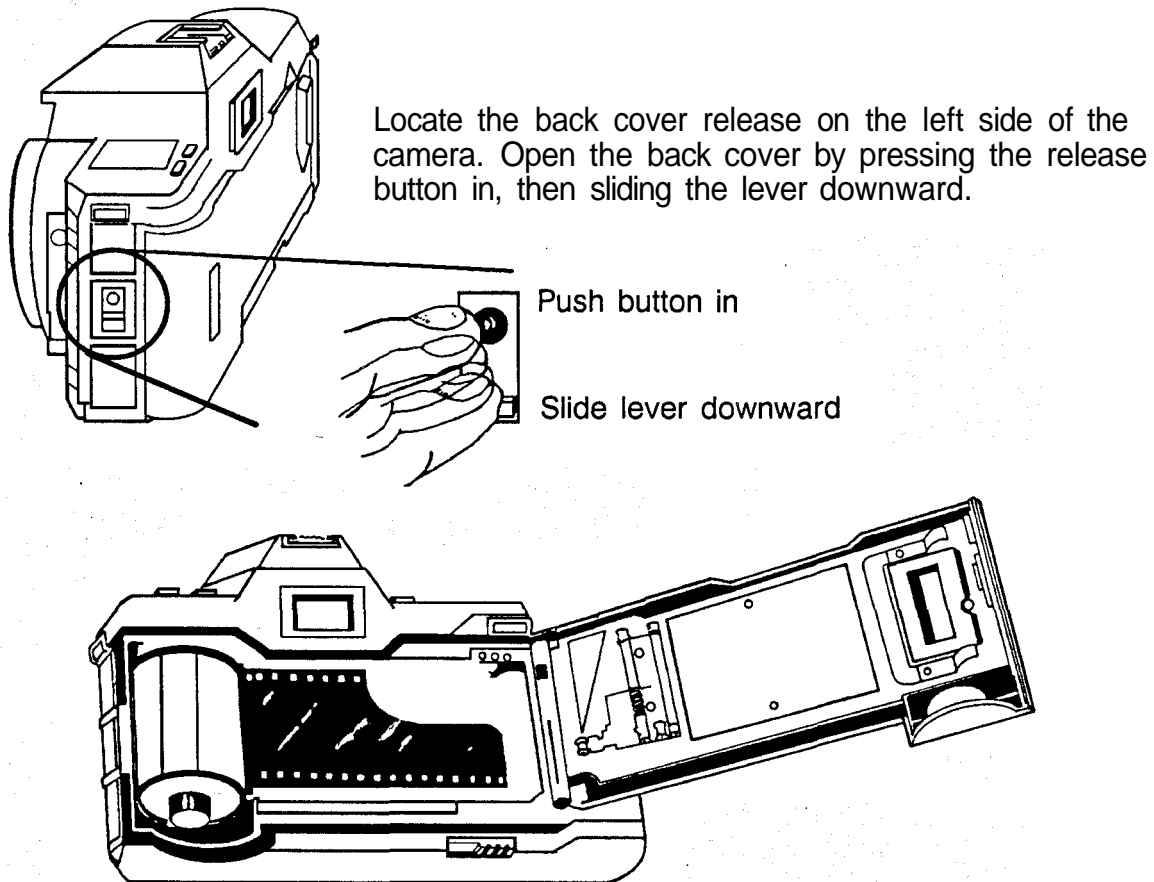
Figure 4-3. Inserting the 35mm Module

Loading Film Into The 35mm Camera

The Chinon camera allows you to take up to 36 high resolution images per roll of film. Many of its automatic features are not needed, and the camera has been factory-modified so that they are disabled. To load film into the camera, power the QCR-Z on, and perform the following steps:

Locate the back cover release on the left side of the camera. Open the back cover by pressing the release button in, then sliding the lever downward.

Push button in

Slide lever downward

- Insert the film cartridge into the chamber, and pull the film leader out until it aligns with the yellow leader mark inside the camera.
- Lay the leading edge of the film flat along the back of the camera so that the holes in the film fit over the sprocket teeth.
- Check that the film is properly placed and lays flat between the two guide rails.
- Close the camera back using light pressure until it clicks shut. If the film is loaded properly, the camera will automatically advance to frame number one.

Figure 4-4. Loading the Chinon 35mm Camera

<u>Loading Film Into The 35mm Camera (continued)</u>

Send the load film command from the host to ready the QCR-Z for imaging.

* The load film command will:
    Advance the film.
    Reset the Frame counter to 1.
    Clear the end of film condition.

You can use the QCR-Z's front panel controls to initiate a load film sequence. To do this, push the TEST button up on the front panel until the unit beeps three times.

Unloading 35mm Film

When the film advances past the last frame, the Error indicator is lit, and you should now unload the film in the following way:
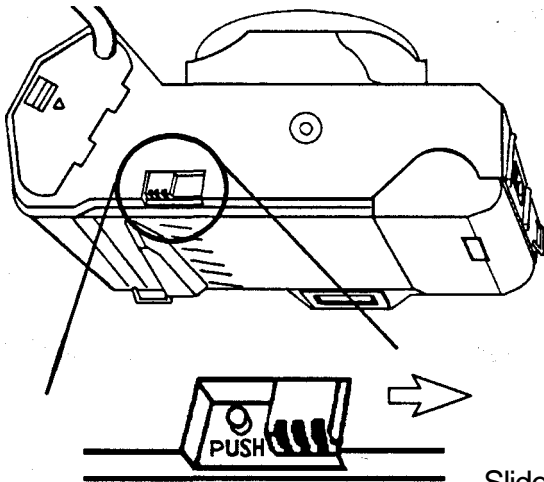
- Locate the film rewind button on the under side of the camera.
- Slide the rewind button's protective cover in the direction of the arrow to provide access to the rewind button.
- Press the rewind button to rewind the film.
- Remove the film from the camera only after it is fully rewound and the motor stops.

Slide protective cover
in direction of arrow
then press
Film Rewind Button
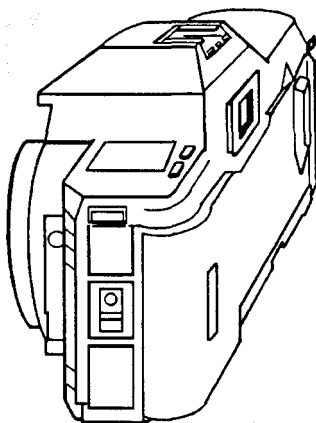
Locate the back cover release on the left side of the camera. Open the back cover by pressing the release button in, then sliding the lever downward. Remove the film from the chamber.
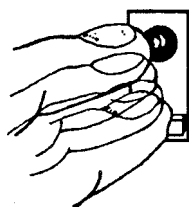
Push button in

Slide lever downward

Figure 4-5. Unloading Film from the Chinon Camera

Send the unload film command from the host or use the QCR-Z's front panel controls to initiate an unload film sequence. To do this, push the TEST button down on the front panel until the unit beeps three times.

The M120 Module

The M120 module is designed to handle 4x5 Polaroid 559 instant print film. The M120 module utilizes the industry standard Graflex film holder and will also accommodate 4x5 sheet film using Lisco cassettes.

Figure 4-6. Major Components of the M120 Module

Removing the M120 Module

To remove the M120 module from the QCR-Z, perform the following steps:

• Power off the QCR-Z.

• Rotate the module latches to the open position.

• Slide the module out of the QCR-Z.

Figure 4-7. Removing and Inserting the M120 Module

Inserting the M120 Module

To insert the M120 module in the QCR-Z, perform the following steps:

- Rotate the module latches to the open position.

- Slide the module into the QCR-Z and set the latches to the locked position.

- Power on the QCR-Z.

Loading Film Into The M120 Module

OPEN

LATCH

LOCKED

MODULE
ENCLOSURE

LOWER LATCH RECESS

STEEL CLASPS
PUSHED TO RIGHT

BLUE STRIPE

RIDGE
(ON BACK OF
FILM HOLDER)

DARK SLIDE

FILM HOLDER

Figure 4–8. Loading the M120 Module

The M240 Module

The M240 module handles 8x10 Polaroid 809 instant print film. It uses the industry standard 8x10 film holder and will accommodate 8x10 sheet film using Lisco cassettes.

The QCR-Z automatically defaults to the 4K mode when you install the M240 module.
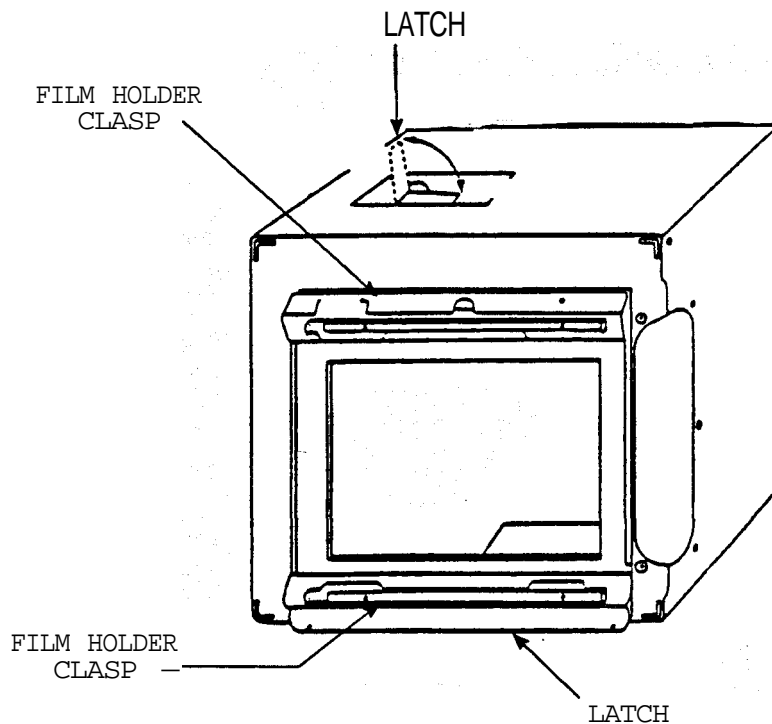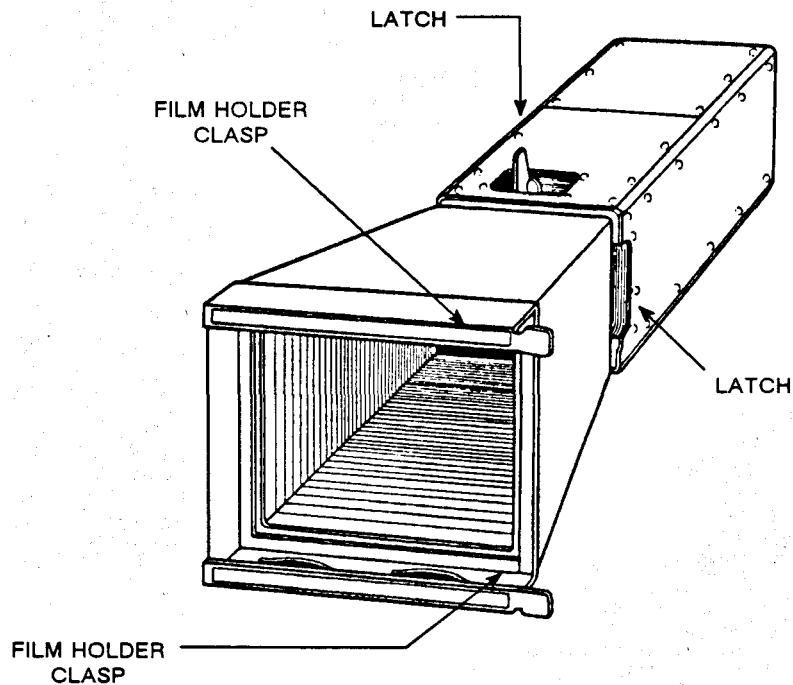
Figure 4-9. Major Components of the M240 Module

Removing the M240 Module

To remove the M240 module from the QCR-Z, perform the following steps:

• Power off the QCR-Z.

• Rotate the module latches to the open position.

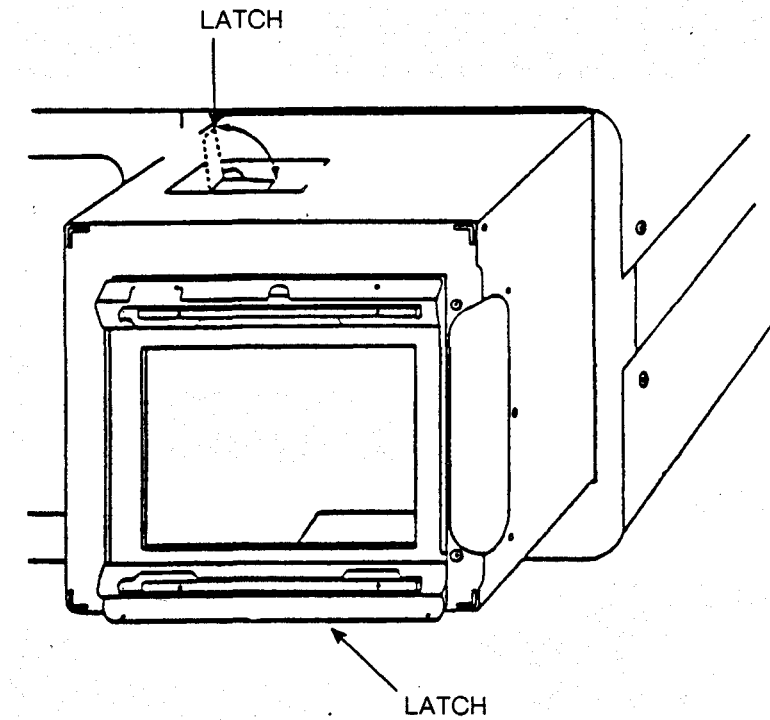• Slide the module out of the QCR-Z.

Figure 4-10. Removing and Inserting the M240 Module

Inserting the M240 Module

To insert the M240 module in the QCR-Z, perform the following steps:

• Rotate the module latches to the open position.

• Slide the module into the QCR-Z and set the latches to the locked position.

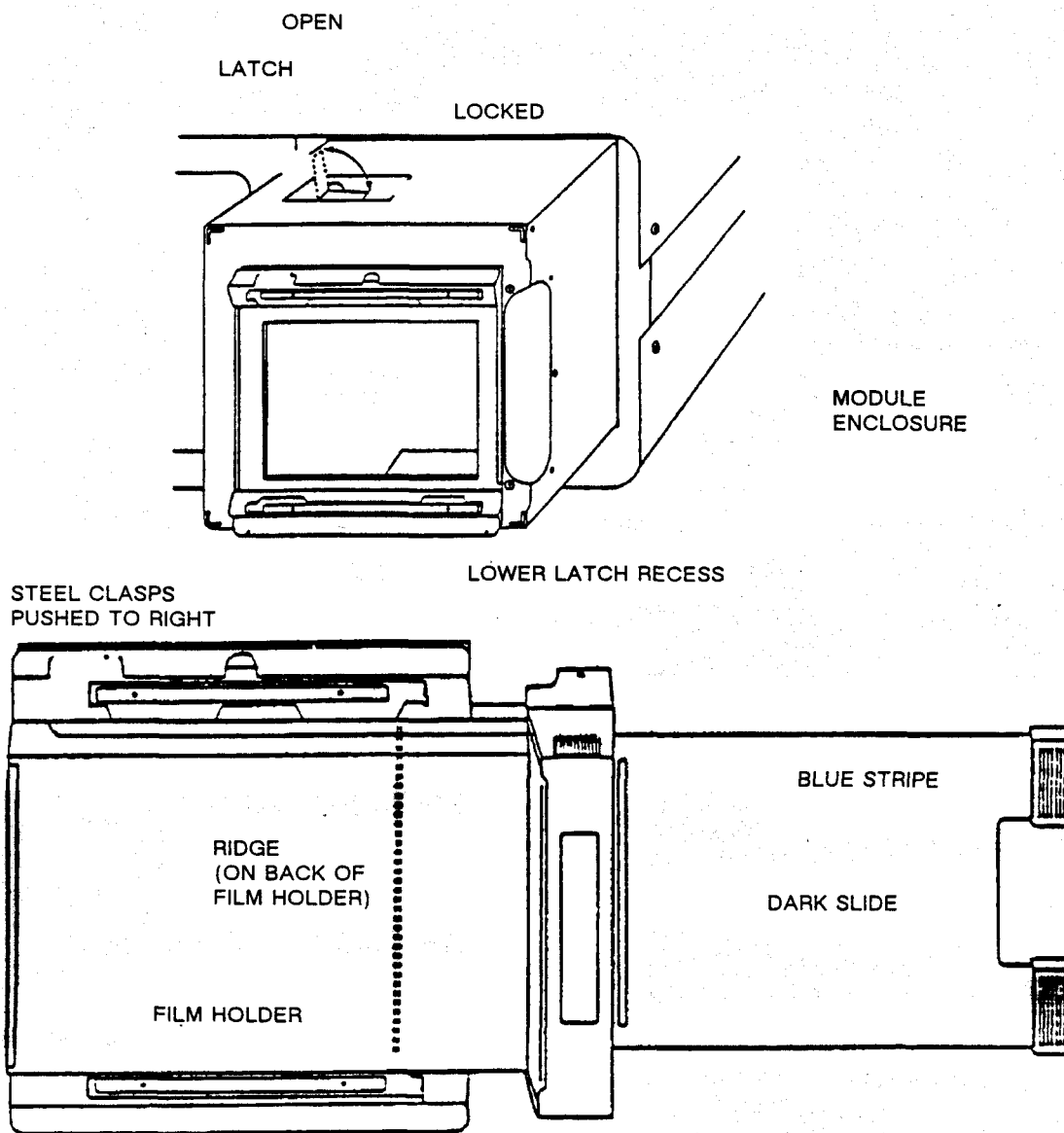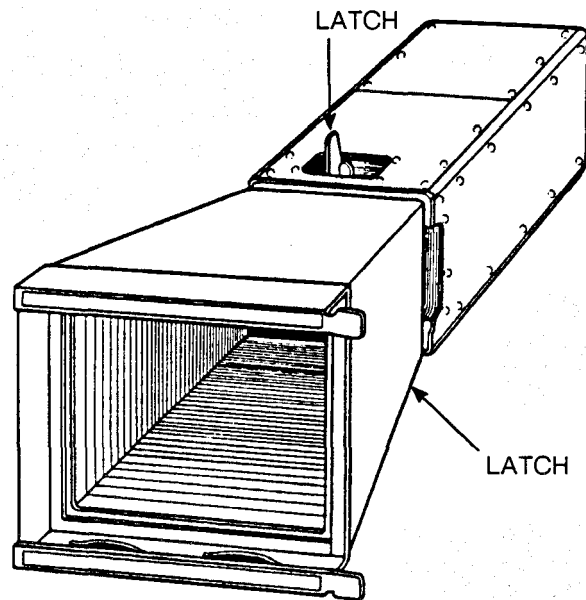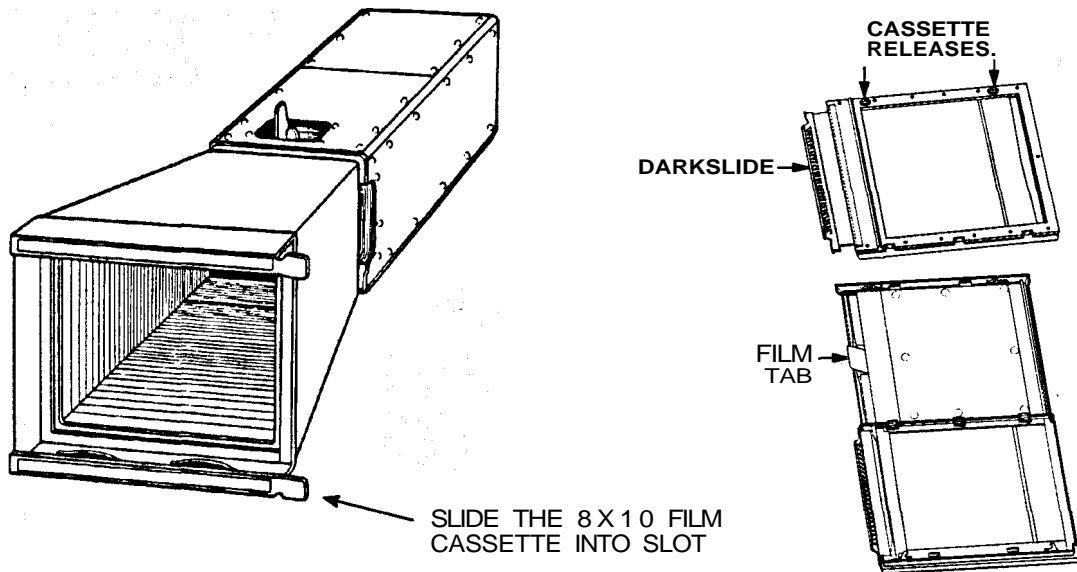• Power on the QCR-Z.

Loading Film Into The M240 Module

SLIDE THE 8 X 1 0 FILM
CASSETTE INTO SLOT

CASSETTE
RELEASES.

DARKSLIDE→

FILM→
TAB

FILM
LIP

Figure 4-11. Loading the M240 Module

• Position the film cassette so that it lays horizontally with the darkslide to the
left and with the releases at the top edge of the magazine.

• Open the cassette by pressing on the releases and unfolding.

• Place the 809 film into the cassette by placing the film lip under the film tab.
The film should align between the blue lines on the cassette. Close the cassette.

• Ensure that the darkslide is closed. Remove the film sleeve by pulling the
film from the side marked with the three arrows. Try not to pull the sleeve from
the side, this may cause the film to skew.

RECORDING INTERNAL TEST PATTERNS

The QCR-Z provides internal test and diagnostic functions which allow you to expose a test image onto film and determine whether or not the system is working properly. You should image the internal test pattern only after you turn the QCR-Z on, and allow the system to warm up for at least twenty minutes. Upon power up the QCR-Z does the following:

• It loads internal default brightness tables and the corresponding color look-up tables for each of the red, green and blue scans.

• It looks at the type of camera module that is installed, and determines the proper image size for the test pattern that you will expose onto the film. The QCR-Z will image the test patterns in the 2K mode for the M35 and M120 modules, and in the 4K mode for the M240 module.

• It calibrates to the brightness values stored in its internal look-up tables.
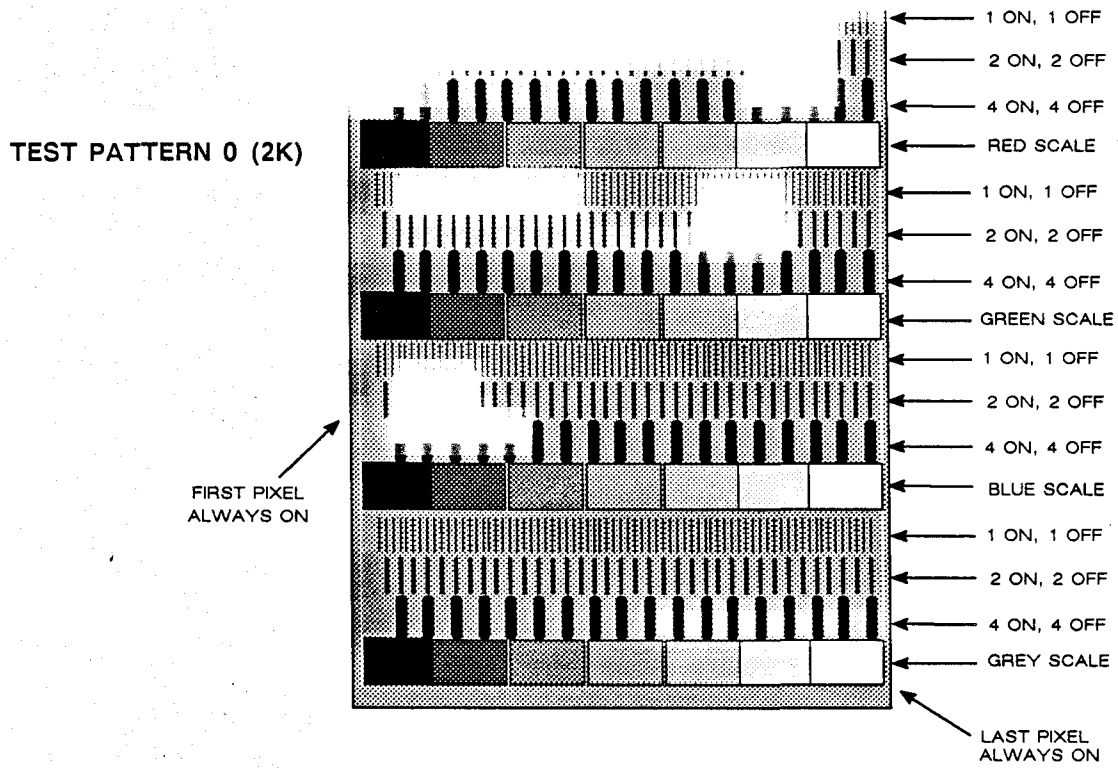
IMPORTANT

The QCR-Z must not be actively controlled by the host computer during the time that you are recording internal test patterns. Externally loaded look-up tables may cause an imbalance in the colors on the internal test patterns. This is why you image the internal test patterns after a power on and warmup cycle. As an added precaution, you may disconnect the IEEE-488 interface connector from the back of the QCR-Z, and reset the film recorder prior to running internal test patterns.

Test Pattern Descriptions

The QCR-Z can generate two different test patterns in the local mode. These patterns are illustrated in Figure 4-12.

Test pattern 0 verifies focus, geometric and radiometric registration, color registration, and color balance. It appears as a set of sixteen horizontal bars, four each of the three colors, and four in neutral. In each color area, three color bars contain alternating smaller bars of colored and dark pixels, and the other bar shows a scale of color intensity.

Test pattern 1 verifies linearity, focus, density, and color registration. It appears as a uniform field of neutral color, sixteen pixel squares on a dark background. The neutral color squares in this image are produced from the combination of the three color passes.

TEST PATTERN 0 (2K)

1 ON, 1 OFF
2 ON, 2 OFF
4 ON, 4 OFF
RED SCALE
1 ON, 1 OFF
2 ON, 2 OFF
4 ON, 4 OFF
GREEN SCALE
1 ON, 1 OFF
2 ON, 2 OFF
4 ON, 4 OFF
BLUE SCALE
1 ON, 1 OFF
2 ON, 2 OFF
4 ON, 4 OFF
GREY SCALE

FIRST PIXEL
ALWAYS ON

LAST PIXEL
ALWAYS ON
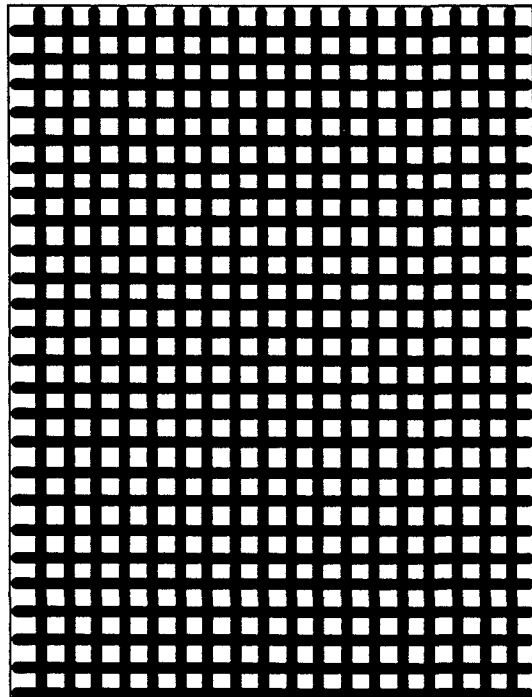
TEST PATTERN 1 (2K)

(4 PIXELS ON, 4 PIXELS OFF)

Figure 4-12. Internal Test Patterns

Imaging Test Pattern 0

Load film into the camera module and prepare the module for an exposure (advance film to frame #1, remove dark slide, etc.) To select test pattern 0, press and hold the TEST switch down so that you hear the QCR-Z's audio alarm beep *twice.* When this occurs, the QCR-Z will image test pattern 0 onto the film.

If you wish to view the the test pattern as it scans on the QCR-Z's CRT, power off the QCR-Z and remove the module. Power the film recorder on and wait for its warmup routine to finish. Press the TEST switch down so that you hear the QCR-Z's audio alarm beep *once,* then release the TEST switch. The QCR-Z will not care whether the camera module is installed, and it will begin scanning the test pattern line-by-line on the CRT. If you hold the TEST switch down for two beeps with no module installed, the QCR-Z will indicate a module fault and terminate the test sequence.
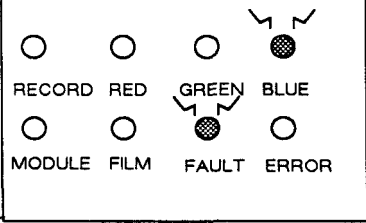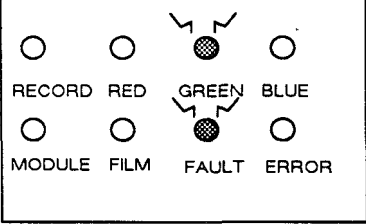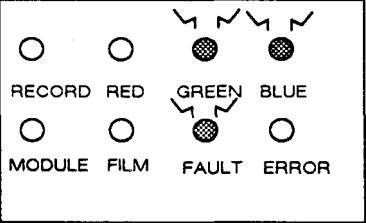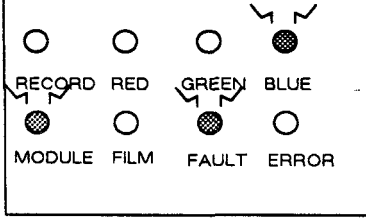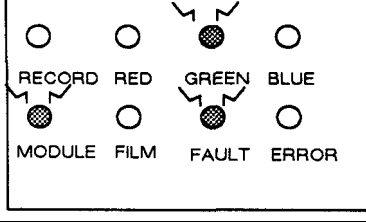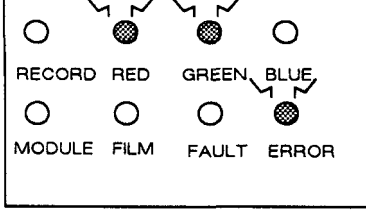
Imaging Test Pattern 1
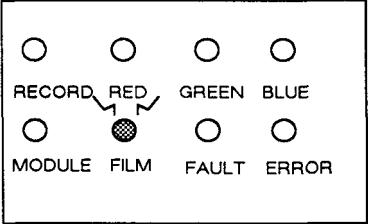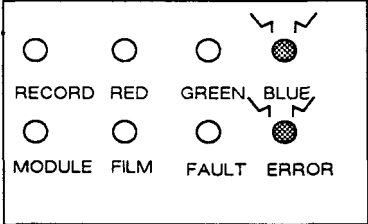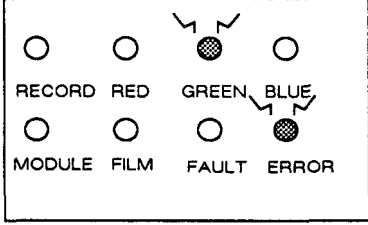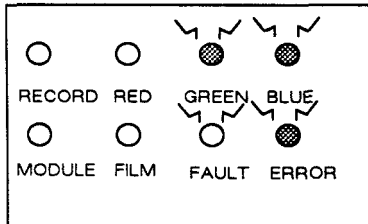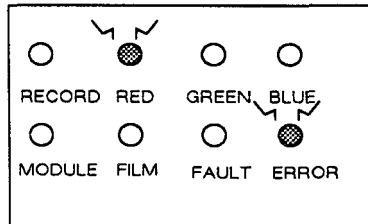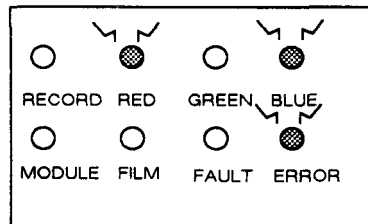
To select test pattern 1, press and hold the TEST switch up so that you hear the QCR-Z's audio alarm beep *twice.* When this occurs, the QCR-Z will image test pattern 1 onto the film. The same conditions apply as for test pattern 0; if you wish to view the test pattern on the CRT, press the TEST switch up so that you hear the QCR-Z's audio alarm beep *once.*

ERROR AND FAULT CODES

The QCR-Z uses its front panel LED array for reporting errors and faults. If you are using the Matrix MVP card in the host computer, the error messages will be also be displayed in Hexadecimal on the Foreground screen message window.

The QCR-Z provides additional error information through secondary error codes. This helps to isolate the source of the problem so that you or a qualified service engineer can troubleshoot it more effectively. Pressing the RESET switch down after an error occurs will display secondary error codes in the QCR-Z's LED array. The top four LEDs (RECORD - BLUE) serve as the most significant bit, while the bottom four LEDs (MODULE - ERROR) serve as the least significant bit. The contents of the QCR-Z's internal registers can be obtained by pressing the TEST switch down then up.

Primary Error Code	Secondary Error Codes
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = MEMORY FAULT COMPUTER DISPLAY = 91	00 LUT checksum Failure 01 Internal ROM checksum failure - geometry correction 02 Internal ROM checksum failure 03 RAM failure during bit set/reset test 04 RAM failure during all values test 05 RAM failure during mux test 06 RAM failure during A55A test 07 RAM failure during REFRESH test 08 LUT RAM failure
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = GPIB INTERFACE FAULT COMPUTER DISPLAY = 92	00 Unable to put interface into LOCAL mode 01 GPIB handshake error.
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = CRT BEAM CALIBRATION FAULT COMPUTER DISPLAY = 93	00 Beam intensity too high 01 Beam intensity too low
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = MODULE FAULT COMPUTER DISPLAY = A1	00 No module detected for an operation that requires a module 01 Invalid module ID 02 Film Jam error (bulk cameras only)
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = FILTER WHEEL FAULT COMPUTER DISPLAY = A2	00 Unable to find neutral filter position 01 Wrong number of filter positions 02 Unexpectedly found no filter position 03 Unexpectedly found no filter position 04 Maximum step count exceeded in searching for next filter position.
RECORD RED GREEN BLUE MODULE FILM FAULT ERROR = UNIMPLEMENTED FUNCTION COMPUTER DISPLAY = 86	

Primary Error Code	Secondary Error Codes
○ ○ ○ ○ RECORD RED GREEN BLUE ○ ◉ ○ ○ MODULE FILM FAULT ERROR = OUT OF FILM COMPUTER DISPLAY = 01	
○ ○ ○ ◉ RECORD RED GREEN BLUE ○ ○ ○ ◉ MODULE FILM FAULT ERROR = UNEXPECTED COMMAND BYTE COMPUTER DISPLAY = 81	
○ ○ ◉ ○ RECORD RED GREEN BLUE ○ ○ ○ ◉ MODULE FILM FAULT ERROR = UNEXPECTED DATA BYTE COMPUTER DISPLAY = 82	
○ ○ ◉ ◉ RECORD RED GREEN BLUE ○ ○ ○ ◉ MODULE FILM FAULT ERROR = ILLEGAL COMMAND BYTE COMPUTER DISPLAY = 83	
○ ◉ ○ ○ RECORD RED GREEN BLUE ○ ○ ○ ◉ MODULE FILM FAULT ERROR = ILLEGAL DATA BYTE COMPUTER DISPLAY = 84	
○ ◉ ○ ◉ RECORD RED GREEN BLUE ○ ○ ○ ◉ MODULE FILM FAULT ERROR = COMMAND INTERRUPT COMPUTER DISPLAY = 85	

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5 Addendum

This chapter contains a system overview of the QCR-Z that describes its basic operating principles. It may contain additional information that is added at the time the manual is shipped from the Publications Department.

SYSTEM OVERVIEW

The QCR-Z uses microprocessor electronics, a high resolution black and white video monitor and picture tube, and a camera module to record an image on film. A host computer creates the actual image data, and sends it to the QCR-Z in component blocks of red, green, and blue pixel information using a standard GPIB communication link.

QCR-Z camera modules use a "color wheel" which has red, green, and blue optical filters. A complete color image is made by making separate exposures for the red, green, and blue image data. The color wheel rotates a different filter into the light path for each of the three color passes, and the light output from the picture tube passes through a focusing lens and exposes the film.

You may select among three different data structures which define how the host transfers its image data to the QCR-Z. These include pixel mode, run-length-coding, and black jumping. The data structure essentially determines the amount of data compression that the QCR-Z applies to the incoming image data, and ultimately the speed at which the QCR-Z prints the information onto the film. The host computer assigns an eight-bit binary value to each piece of image data it sends the the QCR-Z. The QCR-Z stores this value in its RAM memory, and modifies it through the use of color look up tables to compensate for the non-linear characteristics of the imaging process and the film. The QCR-Z's microprocessor circuits convert the digital data into an analog voltage which varies the intensity of the CRT beam, and ultimately produces different colors on the film.

The QCR-Z's microprocessor counts each image data point, and creates analog voltages which drive the horizontal and vertical deflection windings surrounding the CRT. Since resolution quality is critical, the scanning speed is relatively slow when compared to a standard television set. The slower speed increases the time each pixel is exposed to the film, and allows the QCR to use relatively low brightness and contrast. This in turn provides a sharply focused CRT electron beam and greatly reduces the amount of pixel overlap or fringing that would occur with a brighter CRT.
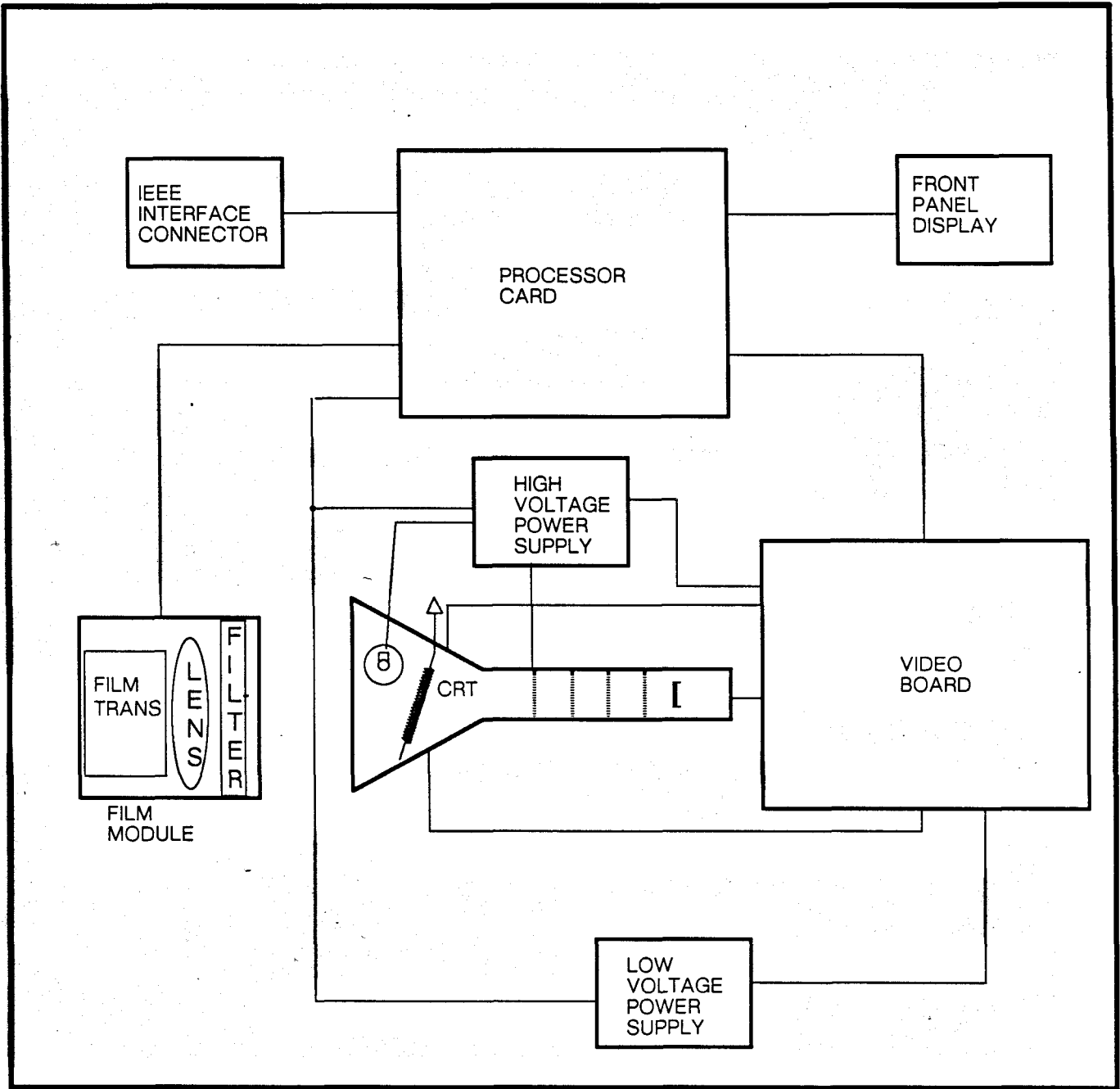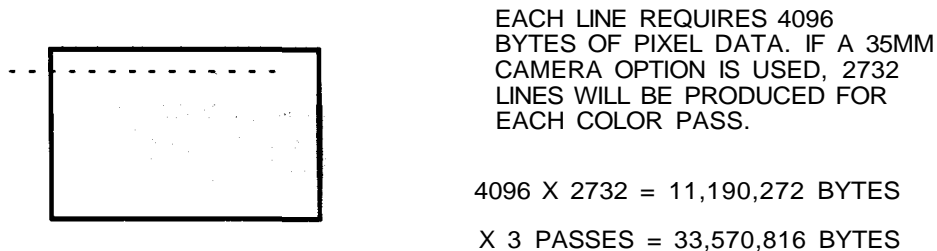
Figure A-1. Major Components of the QCR-Z

DATA STRUCTURES

Data structures can be defined through software commands to the QCR-Z. You should have a basic understanding these modes how they affect the way the QCR-Z scans an image.

Pixel Mode Data

The QCR-Z requires pixel data for each addressable location where its CRT can display information. If you create images with large amounts of information and detail, the corresponding image data file will be very large. *Pixel mode* is the data structure that sends image data pixel by pixel to the QCR-Z. An example of the amount of data that would be required for a 4K, 35mm pixel mode image is as follows:

EACH LINE REQUIRES 4096
BYTES OF PIXEL DATA. IF A 35MM
CAMERA OPTION IS USED, 2732
LINES WILL BE PRODUCED FOR
EACH COLOR PASS.

4096 X 2732 = 11,190,272 BYTES

X 3 PASSES = 33,570,816 BYTES

A SINGLE IMAGE WOULD CONTAIN OVER 33 MEGABYTES OF INFORMATION!

Figure A-2. Pixel Mode Data Requirements

Operating The QCR-Z in the 2K mode would decrease the amount of data by one-half, thereby decreasing the total imaging time, but the image would also suffer a corresponding loss in detail.

Run Length Encoded Data

Run length encoding is a form of data compression. Groups of pixels can be defined as segments to reduce the number of data transfers for a given scan line. *RLC* can achieve a data compression factor of 90 to 1 or greater. Simple images such as bar graphs do not require the high resolution detail that fine art images require, and are ideal for using *RLC.*

Black Jumping

Black jumping is an enhanced form of RLC that decreases the actual imaging time. When an area of an image does not have contrasted data, the QCR-Z will "jump" over this area and resume scanning at the next contrasted pixel position. The more areas that are blank, the greater the time saving during the imaging process.

COLOR FILM COMPENSATION

That the image quality and color balance will vary significantly between the image that you see on a viewing terminal the final image you view on film.

In order to produce an image on film that will accurately display the desired color shading, compensation for the film must be provided. Each color pass must be compensated for the relative sensitivity to red, green and blue light. This means that the average intensity for a red pass will differ from a green pass versus a blue pass. The average intensity selection for each color pass will be adjusted through the use of brightness levels.

The film's sensitivity to shades of color or "gamma response" is also non-linear. The QCR-Z modifies the pixel intensity data to compensate for the film's gamma response. This is performed through the use of color lookup tables.

Brightness Levels

Brightness levels are software selectable and are determined by the imaging mode and the camera module that you are using. A 4K image requires a lower brightness level than the same image in the 2K mode. The QCR-Z supports nine different brightness levels to accommodate the various camera modules. The QCR-Z's CRT scans the red image data at the highest intensity. This is due to the fact the the film's red emulsion is the first layer of the color film, and light must pass through the blue and green emlusions to reach it. The average intensity for green pass is less than the red pass. The average intensity for the blue pass is the lowest of all.

LIGHT FROM CRT

— COLOR FILTER
LENS

BLUE EMULSION
GREEN EMULSION
RED EMULSION
FILM BASE

• BLUE LIGHT ABSORBING FILTER
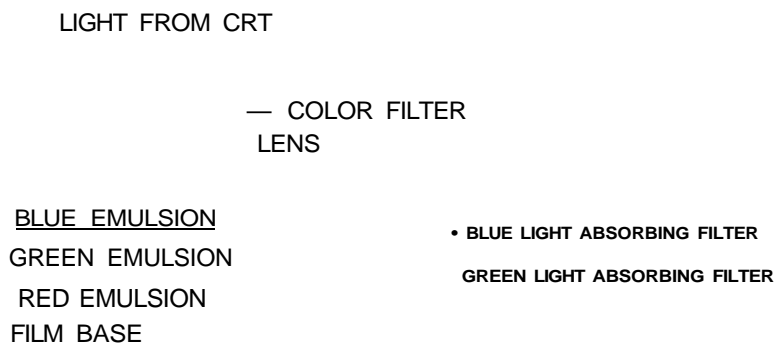
GREEN LIGHT ABSORBING FILTER

Figure A-3. Color Film Emulsion Layers

The QCR-Z determines the appropriate brightness levels soon after you power it on. It reads the type of camera module that you are using, and loads the brightness levels into memory. If you power the film recorder on and no camera module is attached, the QCR-Z defaults to the 35mm brightness levels.

Lookup Tables

The film's GAMMA response must be compensated in order to produce a linear image on film. The eight bit data for one image line enters the QCR-Z and is stored in its static RAM memory. When the data is read from the RAM, it is sent to the lookup table RAM chips where the eight bit data is color corrected, expanded into a 12 bit output, and converted to an analog voltage.
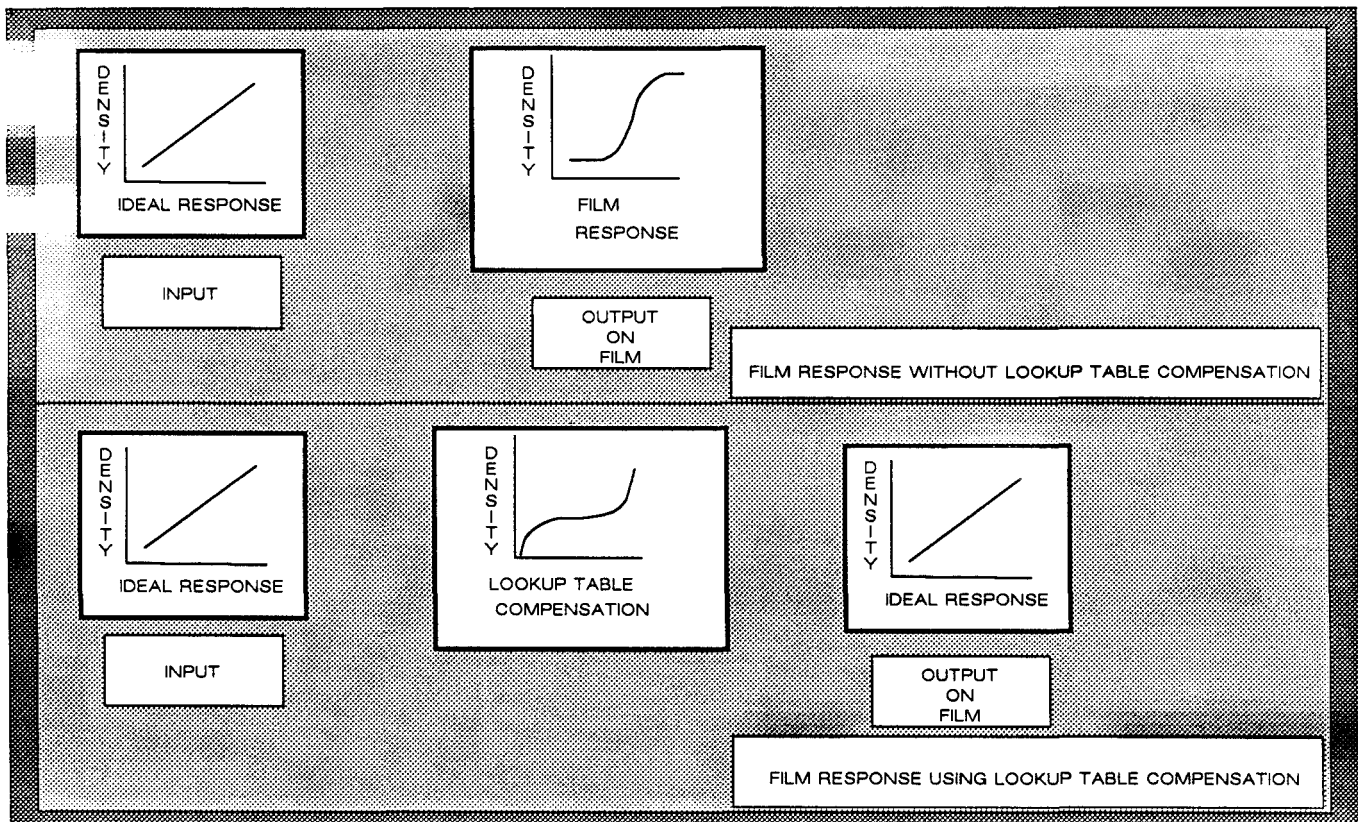

Figure A-4. Lookup Table Compensation

Lookup tables consist of three files, one for each color pass. The operating software PROM chips contain default lookup tables for each of the available modules. The lookup tables (LUTs) that are written into the PROM are:

1. Linear LUTs = linear ramp from 0-255 for all three colors.
2. Polaroid LUTs = properly compensated for Polaroid 559 film.
3. Kodak LUTs = properly compensated for Kodak Ektachrome 100 film.
4. Kodak LUTs = properly compensated for Kodak Professional 100 film (4K mode).
5. Polaroid LUTs = properly compensated for Polaroid 559 film (4K mode).
7. Polaroid LUTs = properly compensated for Polaroid 809 film (4K mode).

The QCR-Z determines the appropriate lookup tables soon after you power it on. It reads the type of camera module that you are using, and loads the brightness levels into memory. If you power the film recorder on and no camera module is attached, the QCR-Z defaults to the 35mm lookup tables.

Custom Brightness Levels and Lookup Tables

The host computer can send commands and data to "customize" the film recorder's internal brightness and lookup table information. When you do this, it overwrites the default values and replaces them with the custom tables that the host computer sends. Keep in mind that the QCR-Z's internal test patterns have been written to be used with the default LUTs. Using custom lookup tables may degrade the color quality of the internal test patterns.

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