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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CANON EOS 630**
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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Canon EOS 630 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Canon EOS 630: - one 6 V lithium battery
  - Canon Quartz Date Back E: - one 3 V lithium battery
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*
  - TI 4120-3300, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3300, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Canon EOS 630 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Canon EOS 630 System, provided in the site operator's manual. Detailed schematic diagrams of the Canon EOS 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Canon EOS 630 Part I
- Canon EOS 630 Part II
- Canon Quartz Date Back E
- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3300.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries annually.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

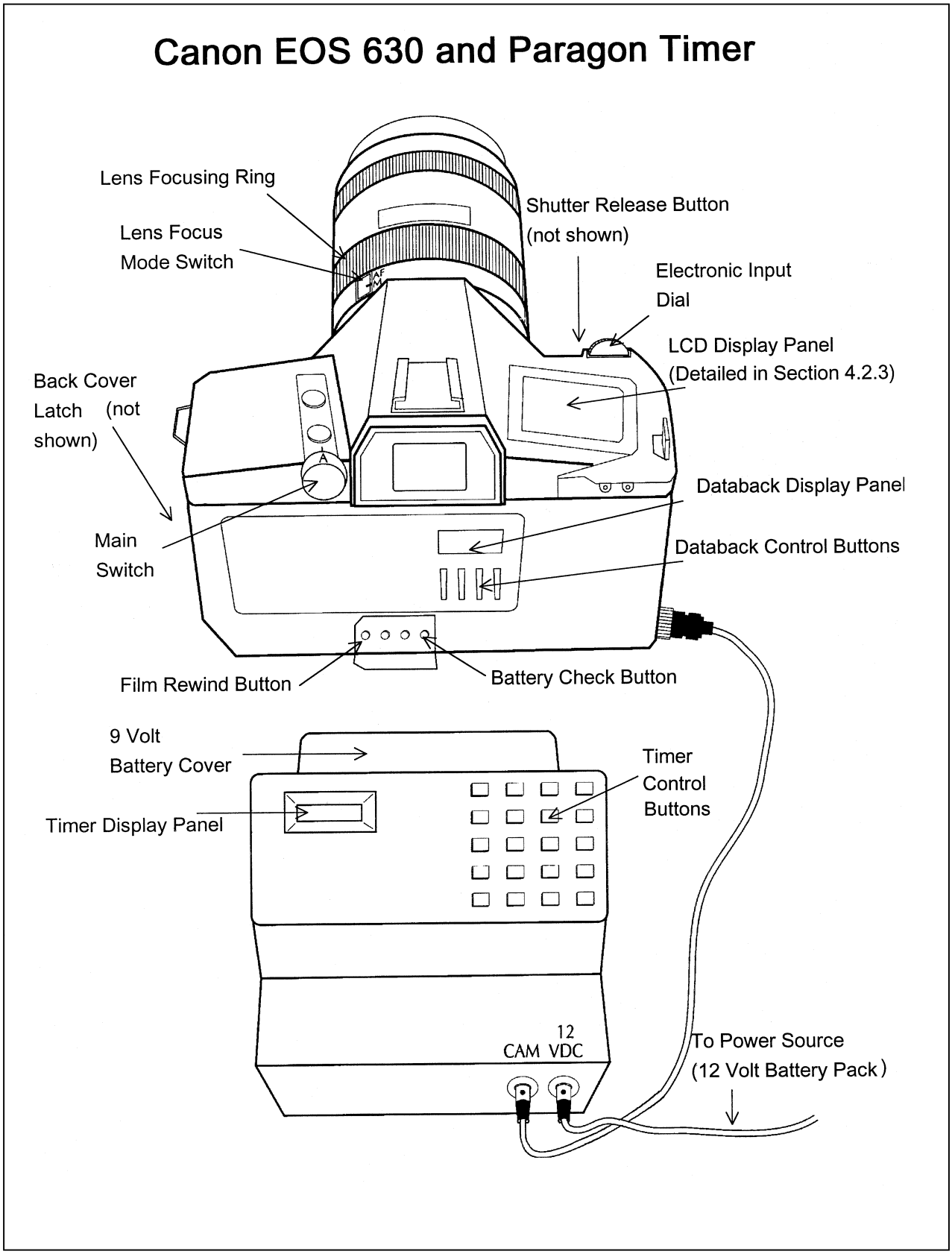

Figure 4-1. Canon EOS 630 System Components.

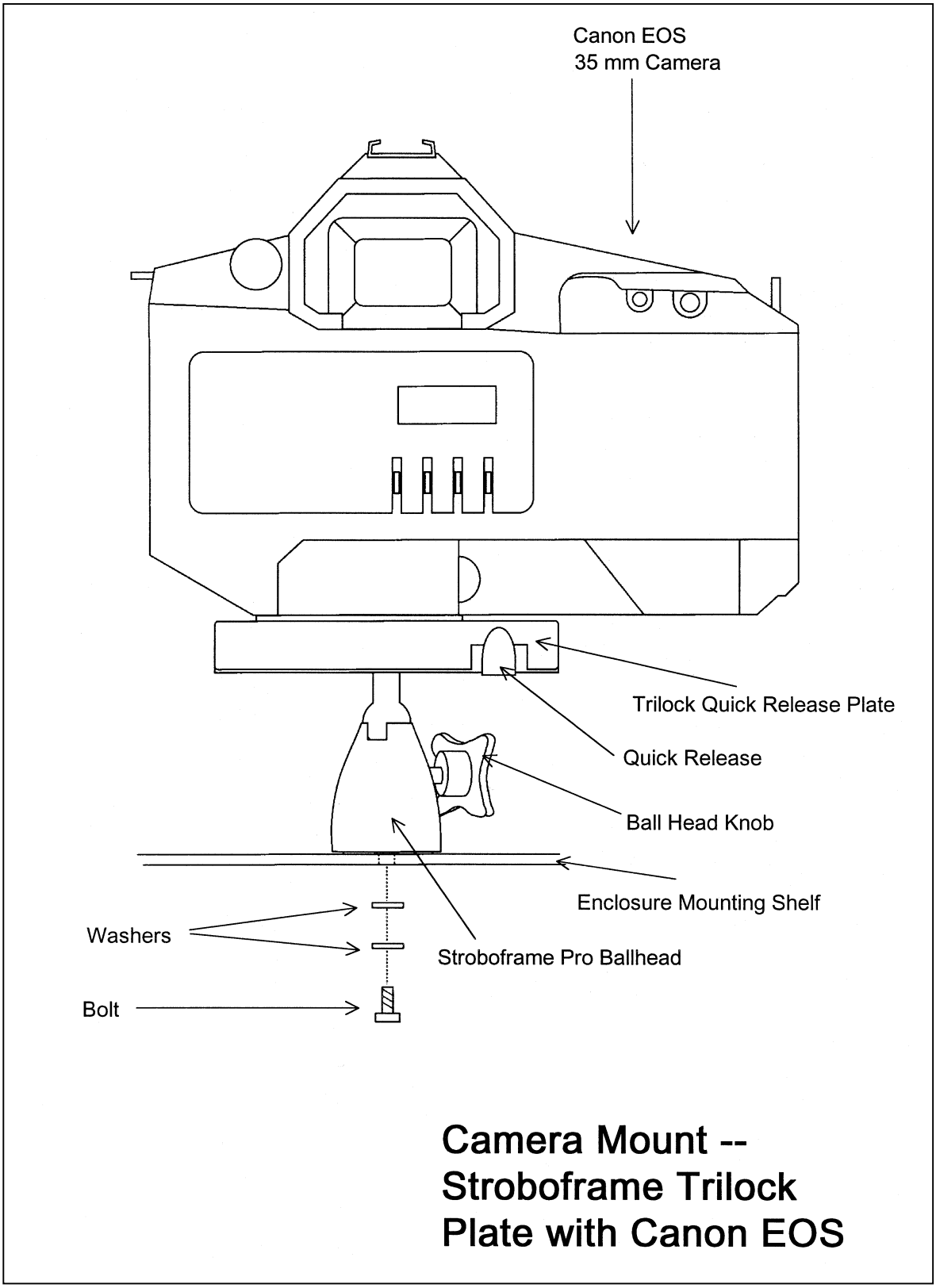

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

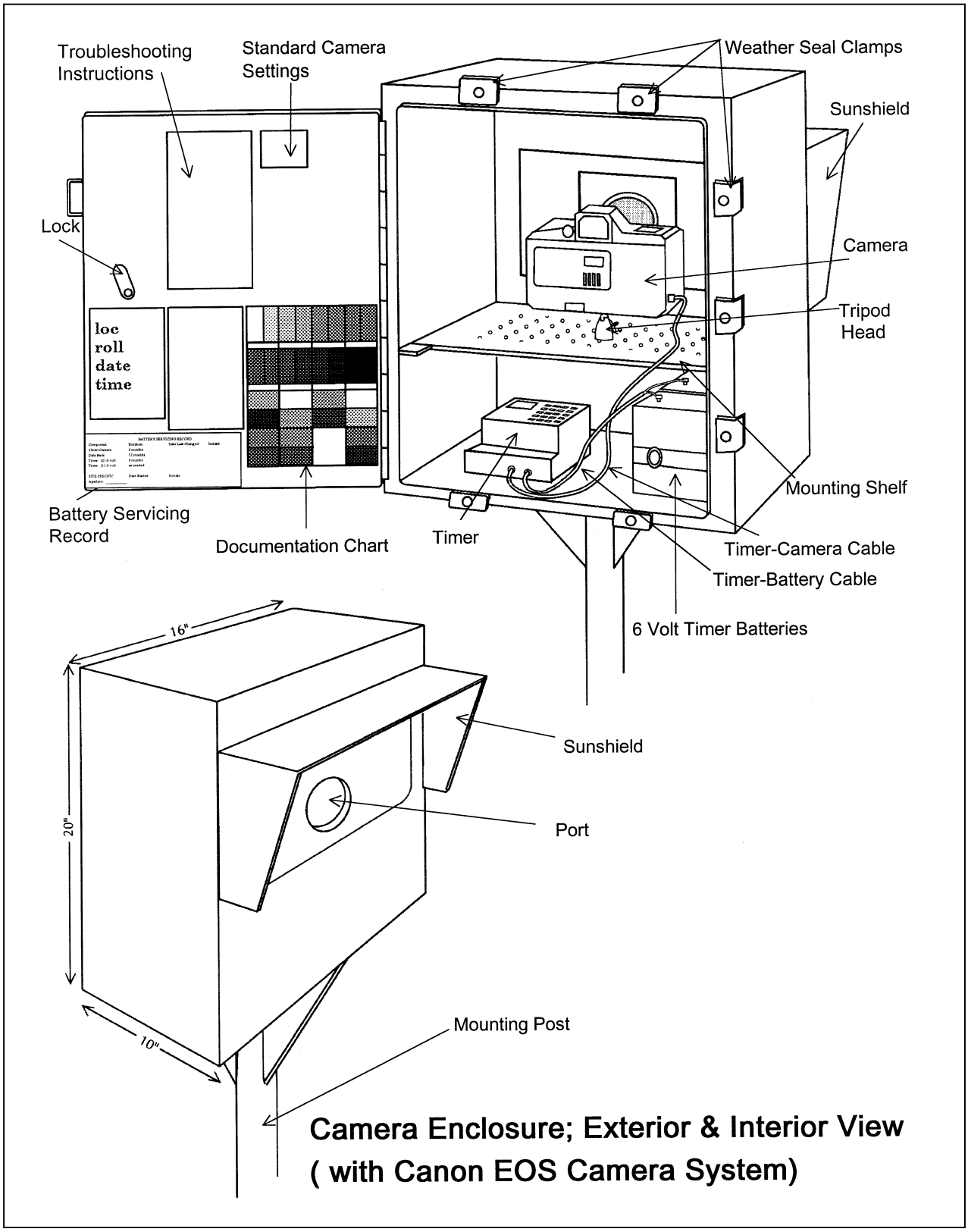

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED
Today's Date _____ Time _____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(EOS) Auto (OM2S) Off (OM2N) On(137MA) ☐(167MT) ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Databack display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED
Today's Date _____ Time _____

Yes	No	
☐	☐	Camera found in proper operation
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(EOS) Auto(OM2S) Off(OM2N) On(137MA)☐(167MT)ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____ (Now) _____ (Max) _____ (Min)

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Canon EOS 630 Automatic Camera System.

Location DENA Roll No. 9
Operator Andrea Blakesley

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 5/27/94 Time 11:30

Yes	No	
☑	☐	Batteries tested
☑	☐	Monitoring target visible
☑	☐	Camera alignment correct
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Documentation photograph taken
☑	☐	Lens focus on infinity
☑	☐	Film advancing properly
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) ON(PZ-20)
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

FILM REMOVED

Today's Date 6/4/94 Time 15:20

Yes	No	
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 29
☑	☐	Timer found in proper condition
☑	☐	Camera/timer cable secure
☑	☐	Camera found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) ON(PZ-20)
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

DESCRIBE WEATHER CONDITIONS for the duration of this roll Mostly sunny and mild, cool and rainy for two days

% Cloud Cover 75% Temperature Now 63 Max 65 Min 38

COMMENTS/ACTION TAKEN Manual shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6 v. timer batteries

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525 303-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emmision source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Push the **QUICK RELEASE** lever on the tripod plate and lift the camera off the mount. Disconnect the camera/timer cable from the timer at the timer jack and remove the camera from the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken durng the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS. If the film is already rewound, the film-load check mark will be flashing ( ). Assume all 36 exposures were taken and document as such.

VERIFY SETTINGS

Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

Observe the film-load check mark ( ) on the display panel:

- If flashing, the film was automatically rewound after the last frame was exposed.
- If not flashing, open the switch cover (on the back of the camera below the databack) and press the **FILM REWIND** button (first button on the left).

During rewind the film transport bars move in sequence from right to left to indicate the function in progress. The film rewind stops automatically when the film has been completely rewound. Do not open the back until the film-load check mark flashes.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the DX film contacts or shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permenantly logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation

- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, push the **BACK COVER LATCH** down while pressing the **BACK COVER LOCK** button. The Canon EOS loads the film automatically if the following steps are carefully taken:

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber, upper flat end first. The film-load check mark appears in the display panel.
- Pull the film leader across the shutter curtain until its tip is aligned with the orange index.
- Make sure the film has no slack and that its perforations are properly engaged with the sprocket teeth.

  NOTE: If the film leader extends past the orange index, remove the film cartridge and manually rewind excess film back into cartridge.

- Close the camera back cover. The film will automatically advance and stop when "1" appears in the display panel. During film advance the film transport bars will appear at the bottom of the display panel, moving in sequence from left to right.

  NOTE: If the film is not loaded correctly, the bars will flash after the camera motor has stopped and the shutter will not release. Open the back cover and reload the film.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.

- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.

- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

- Write the following on the note pad provided:

  - Monitoring site name or abbreviation

  - Roll number

  - Date and time

- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.

- Press the **SHUTTER BUTTON**. Verify that the film counter has incremented one frame.

- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Open the switch cover (on the back of the camera below the databack) and press the **BATTERY CHECK** button (the button at the farthest right). While pressing the button, observe the display panel. A "bc" appears in the display and the level of battery power is indicated by:

- three bars - battery power sufficient

- two bars - low (have a new battery on hand)

- one flashing bar - very low (replace with a new battery)

- blank display - drained (replace with a new battery)

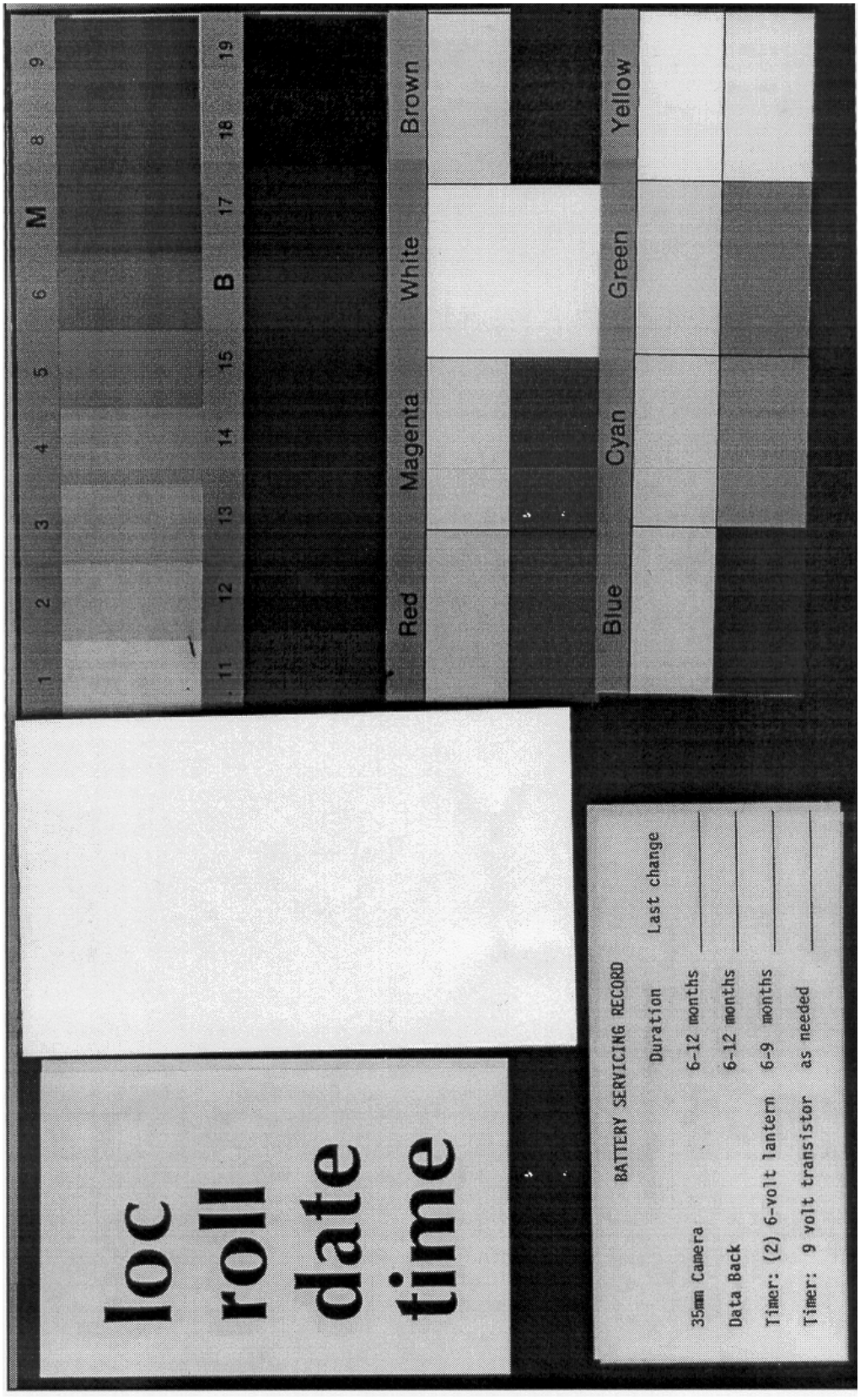

Figure 4-6. Photographic Documentation Board.

If required, change the camera 6 V lithium battery and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Canon EOS 630 are:

Main Switch	A
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0 (Zero)
Program Mode Selection	AV
Drive Mode Selector	S (single)
Lens Focus Mode	M (manual)

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

The databack should be in the "day-time" mode displaying the current day of the month and current time.

If the word "BATTERY" is displayed or if the display is blank, the databack battery is drained. Replace the battery only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current date and time.

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

<u>Review timer display:</u>

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.

- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.

- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review.
- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod plate.
- Securely reconnect the camera/timer cable to the timer at the timer jack.
- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

- Observe the camera display panel. The display should not illuminate for more than 6 seconds. If the display continues to illuminate beyond 6 seconds, an electrical short may exist in a portion of the cable jack.

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED	Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.
CLOSE AND SECURE ENCLOSURE	Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3300, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (annually)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Canon EOS 630 are provided in TI 4120-3300.

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE

The Canon EOS 630 camera runs on one 6 V lithium battery pack. This battery should be replaced every six months or as directed by the data coordinator.

- Remove the grip by loosening the screw on the right side of the camera with a coin or similar object.
- Push the orange lever in the battery compartment upward to release the used battery. Tilt the camera to allow the used battery to slide out of the compartment. Measure and record the voltage of the used battery.
- Remove the new battery from its packaging and test and record the voltage. The new battery should measure approximately 6 volts.
- Insert the new battery end first and lock it in place with the orange lever.
- Replace the grip securely and check the battery as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Canon Quartz Date Back E runs on one 3 V coin-shaped lithium battery. The databack battery should be replaced annually, or as required by the data coordinator. Be sure to replace the battery only when film is not loaded.

- Open the camera back. The battery compartment is located on the inside of the databack opposite the hinge. To open the compartment, turn the screw counterclockwise using a small Phillips-head screwdriver.
- Insert the screwdriver tip into the chamber and then gently push the used battery. It will pop up and can then be removed. Measure and record the voltage of the used battery.
- Remove the new battery from its packaging and test and record the voltage. The new battery should measure approximately 3 volts.

- Wait 15 seconds after removing the used battery and then load the new battery with the "+" side facing up.

- To load the new battery, first insert one side into the chamber and then press it to the left with your finger until it will go no further.

- Slide the battery slightly to the right, lock it into place and replace the cover; tighten the screw securely.

- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.

- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.

- Place the new batteries together at opposite polarity (in series).

- Connect the two batteries at one end.

- Connect the opposite terminals to the cable from the timer.

- Perform the above test to assure the connections are secure.

- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

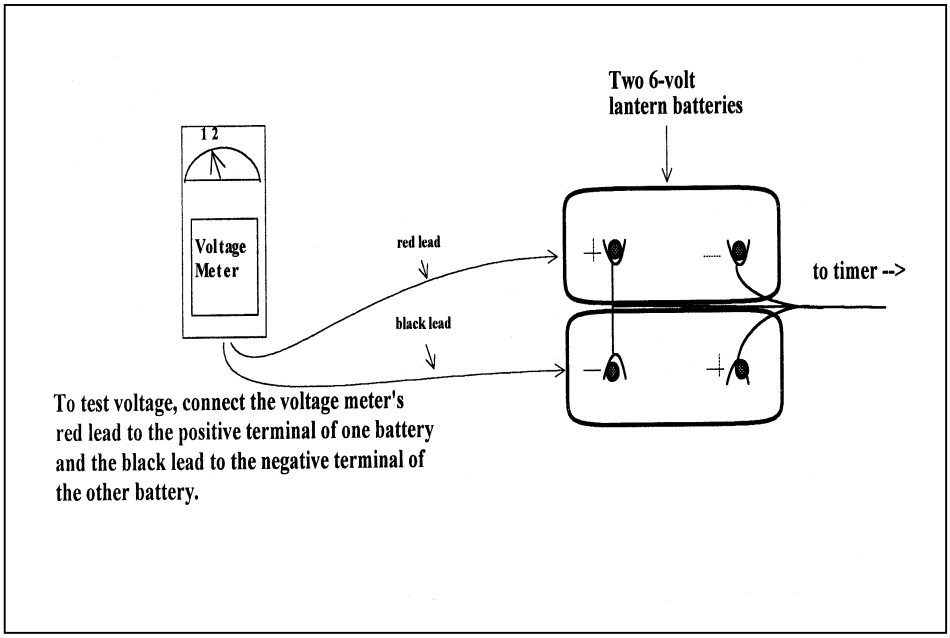

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

CANON EOS 630

The Canon EOS 630 is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The automatic (A) operation and aperture priority (AV) exposure mode provide properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Canon EOS 630 are:

Main Switch	A
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0 (Zero)
Program Mode Selection	AV
Drive Mode Selector	S (single)
Lens Focus Mode	M (manual)

REVIEW CAMERA SETTINGS

Press the **CAMERA SHUTTER** halfway or the display panel illumination button to view the camera display panel. If the display does not appear, confirm that the "main switch" is set to "A" and that the battery power level is sufficient. Verify all standard settings as they appear in Figure 4-8.

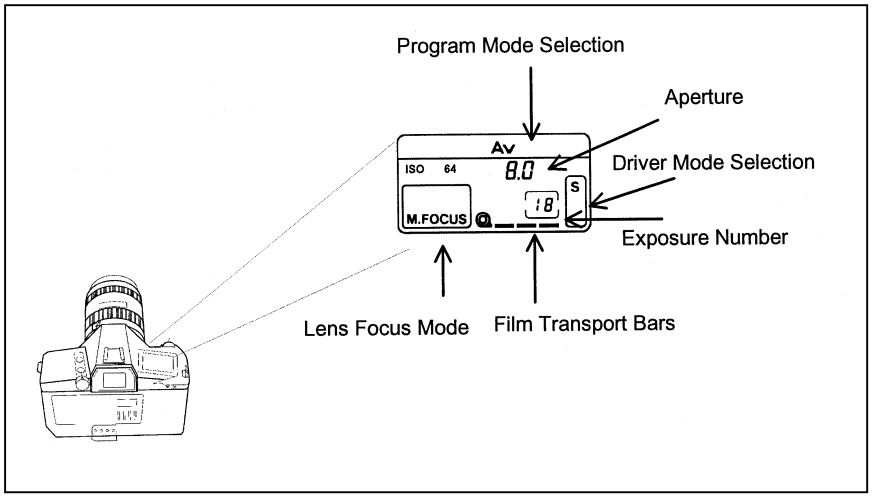

Figure 4-8. Canon EOS 630 Display Panel.

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Canon EOS 630 (Part I and Part II) manufacturers' instruction booklets for detailed camera setting procedures.

CANON QUARTZ DATE BACK E

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Canon Quartz Date Back E automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation the databack should display the local date and time. Verify that no colon or digits are flashing.

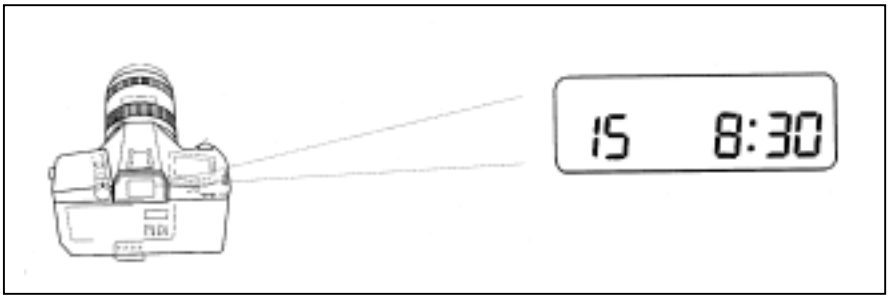

Figure 4-9. Canon Quartz Date Back E Display.

If the word "BATTERY" is displayed or if the display is blank, the databack battery is drained.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

To set the databack:

- Press the **MODE** button until the "DAY/HOUR/MINUTE" mode is displayed.
- Press the **SELECT** button twice -- the "MINUTES" display will flash.
- Press the **SET** button until the correct "MINUTES" are displayed. Constant pressure on the "SET" button will rapidly advance the numbers.
- Press the **SELECT** button -- the "HOUR" display will flash. Press the **SET** button until the correct "HOUR" is displayed.
- Press the **MODE** button four times until the "YEAR/MONTH/DAY" mode is displayed.
- Press the **SELECT** button -- the "YEAR" display will flash. Press the **SET** button until the correct "YEAR" is displayed.

- Press the **SELECT** button -- the "MONTH" display will flash. Press the **SET** button until the correct "MONTH" is displayed.

- Press the **SELECT** button -- the "DAY" display will flash. Press the **SET** button until the correct "DAY" is displayed.

- Press the **MODE** button once to return to the "day-time" mode. The databack should remain in this mode during regular operation.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule

- 2 photographs/day = 15-17 day servicing schedule

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

<u>To set the timer clock</u>:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the TIMER flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

<u>To program times for photographs to be taken</u>:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or

- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.

- The horizon is level.

- The vista is framed correctly.

- The sunshield and port are not visible in the viewfinder.

- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3300, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed or focused documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-10) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3300.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____

Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-10. Photographic Monitoring Network Quality Assessment Log.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CONTAX 167MT**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3110**
DATE	**JANUARY 1994**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Kristi Savig	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Contax 167MT 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Contax 167MT: - four AAA alkaline batteries
  - Contax 167MT Data Back D-7: - two 3 V lithium batteries
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*
  - TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Contax 167MT 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Contax 167MT System, provided in the site operator's manual. Detailed schematic diagrams of the Contax 167MT 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Contax 167MT
- Contax Data Back D-7
- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3310.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries annually.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

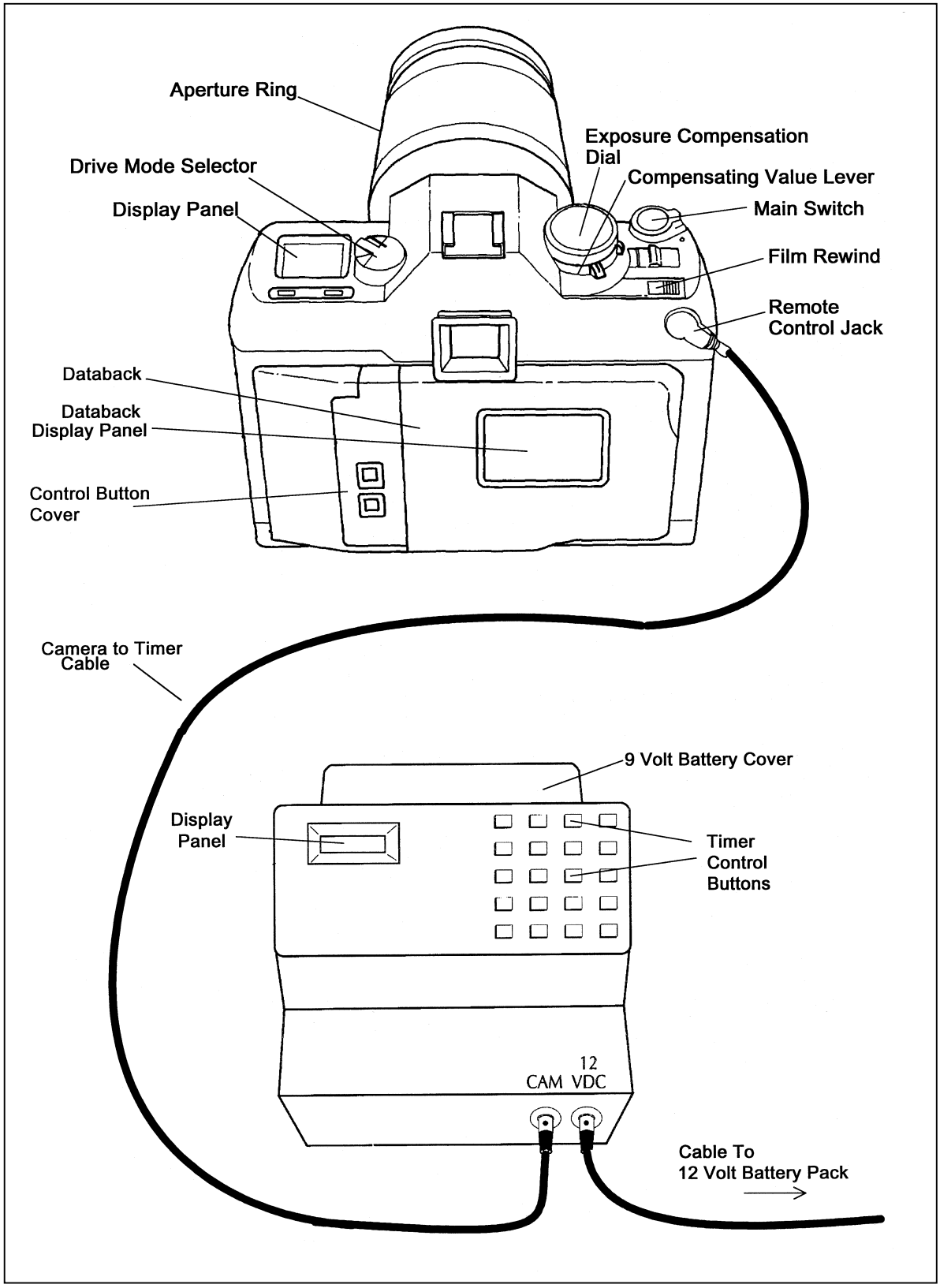

Figure 4-1. Contax 167MT System Components.

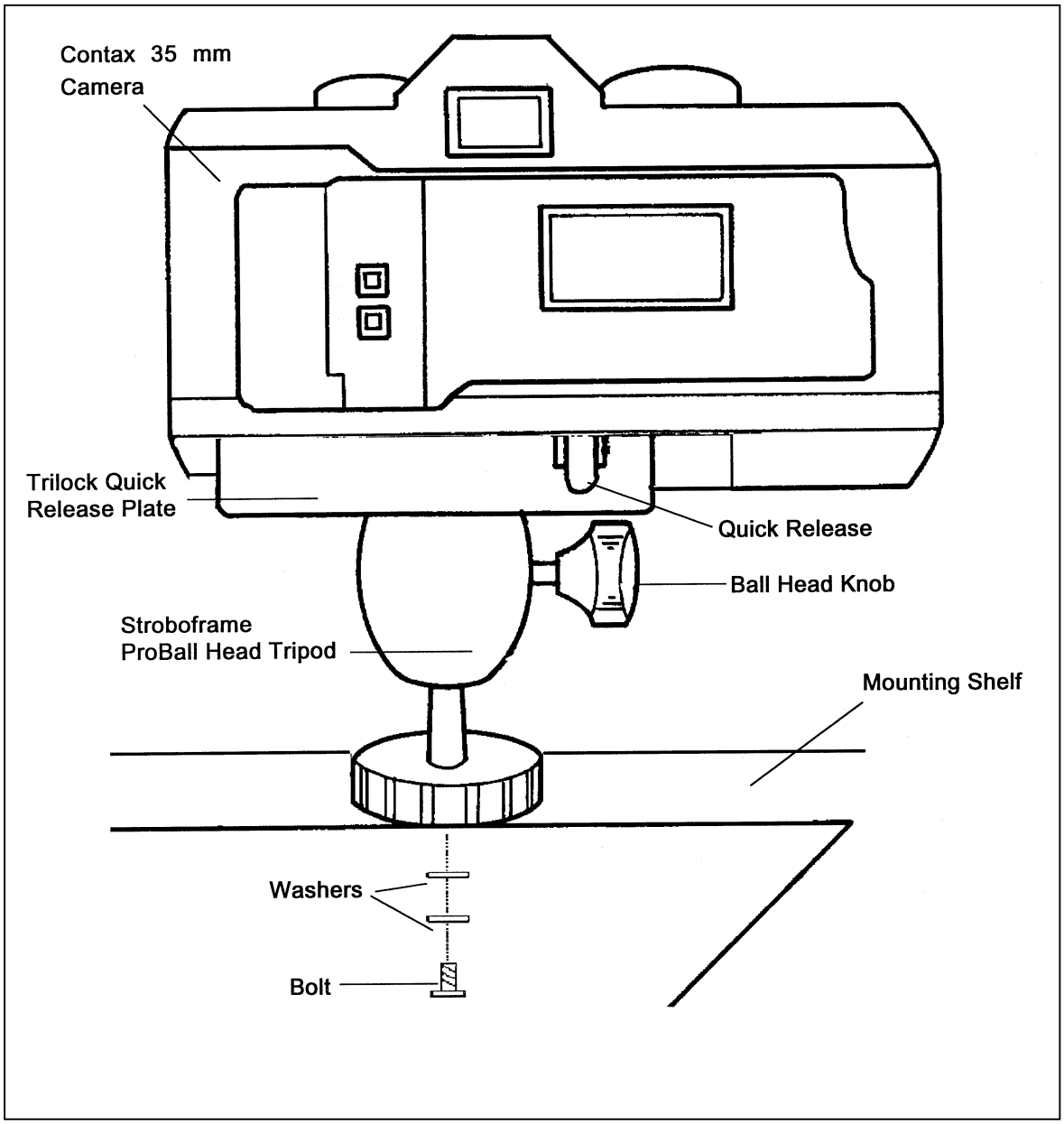

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

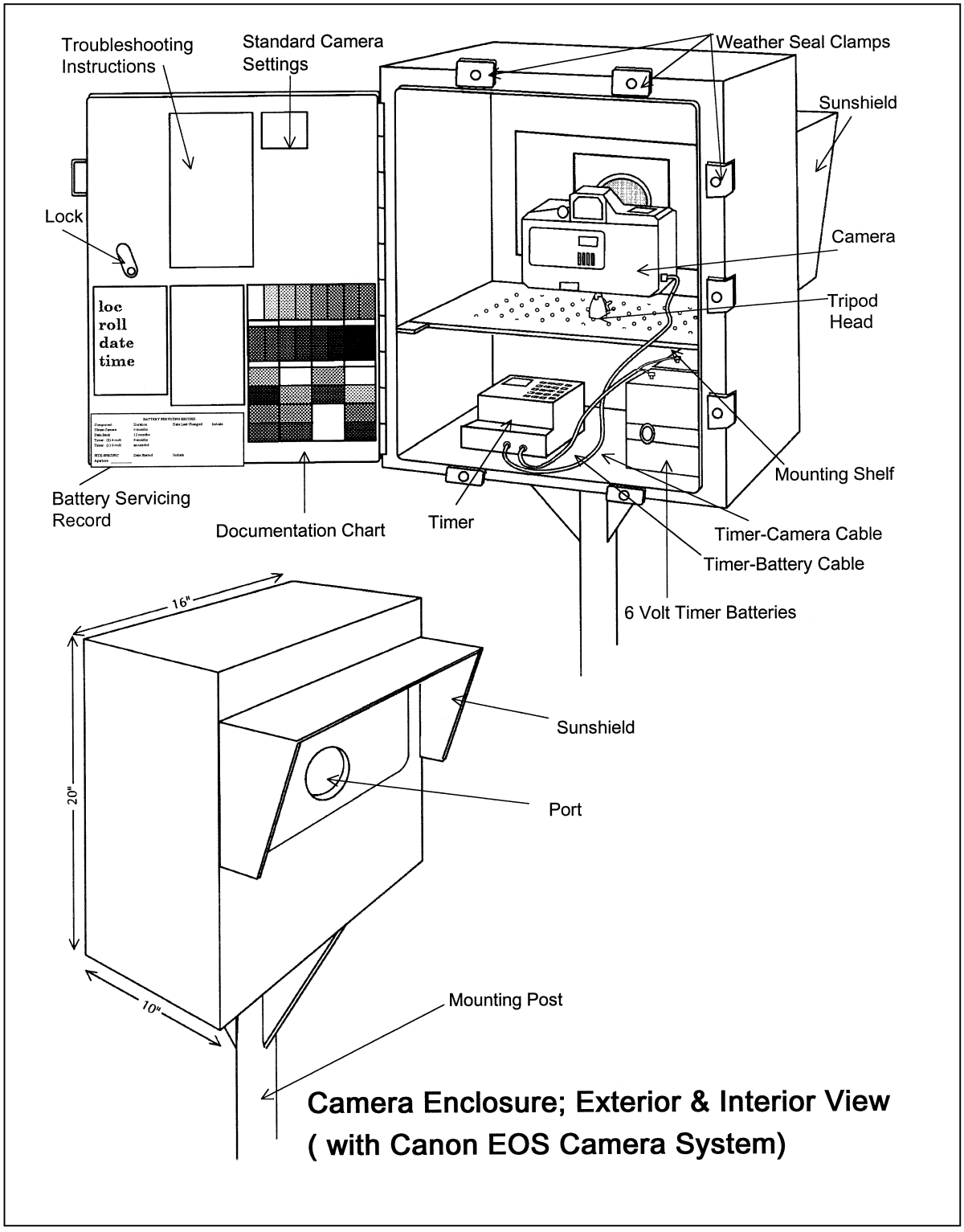

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED
Today's Date _____ Time _____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(EOS) Auto (OM2S) Off (OM2N) On(137MA) ☐(167MT) ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Databack display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED
Today's Date _____ Time _____

Yes	No	
☐	☐	Camera found in proper operation
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(EOS) Auto(OM2S) Off(OM2N) On(137MA)☐(167MT)ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____ _____ _____
Now Max Min

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Contax 167MT Automatic Camera System.

Location DENA Roll No. 9
Operator Andrea Blakesley

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 5/27/94 Time 11:30

Yes	No	
☑	☐	Batteries tested
☑	☐	Monitoring target visible
☑	☐	Camera alignment correct
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Documentation photograph taken
☑	☐	Lens focus on infinity
☑	☐	Film advancing properly
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	IS0/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

FILM REMOVED

Today's Date 6/4/94 Time 15:20

Yes	No	
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 29
☑	☐	Timer found in proper condition
☑	☐	Camera/timer cable secure
☑	☐	Camera found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

DESCRIBE WEATHER CONDITIONS for the duration of this roll Mostly sunny and mild, cool and rainy for two days

% Cloud Cover 75% Temperature 63 (Now) 65 (Max) 38 (Min)

COMMENTS/ACTION TAKEN Manual shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6 v. timer batteries

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525 303-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emission source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Press and move the **QUICK RELEASE** lever to the "R" (release) position and lift the camera off the mount. Disconnect the camera/timer cable from the timer at the timer jack and remove the camera from the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken during the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS.
VERIFY SETTINGS	Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

While pressing the **RELEASE** button, slide the **REWIND** switch to the left. The camera will automatically start rewinding the film.

Make sure the wind motor has stopped and the exposure counter shows "00" before opening the camera back.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation
- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, press the camera back **LOCK RELEASE** button in the center and push down the camera **BACK OPENING** lever. The Contax 167MT loads the film automatically if the following steps are carefully taken:

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber.

- Pull the film leader across the shutter curtain until its tip is aligned with the orange index.

- With the camera back open, press the **SHUTTER RELEASE** button once or twice to advance the film. Verify that the film is properly engaged on the take-up spool.

- Firmly close the camera back; verify that the main switch is "ON." Press the **SHUTTER RELEASE**. The camera will automatically advance the film until the exposure counter shows "01."

  NOTE: The exposure counter may advance even though the film is not loaded correctly. You must verify that the film is properly engaged on the take-up spool to ensure proper loading.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.

- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.

- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

- Write the following on the note pad provided:

  - Monitoring site name or abbreviation

  - Roll number

  - Date and time

- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.

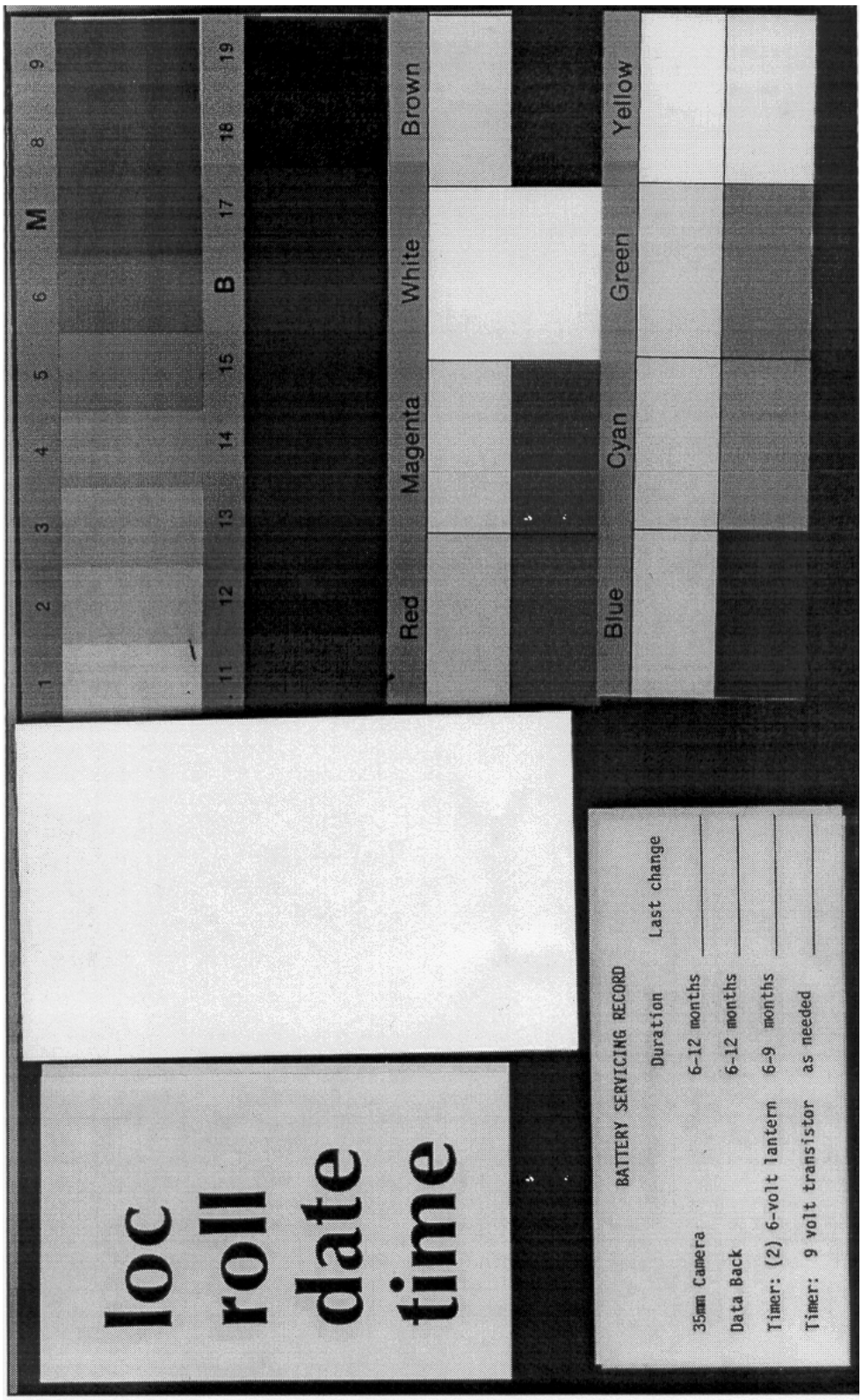

Figure 4-6. Photographic Documentation Board.

- Press the **SHUTTER BUTTON**. Verify that the film counter has incremented one frame.

- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Check the camera batteries by turning on the "main switch" and pressing the **MODE** and **ISO** buttons simultaneously.

- All display panel indicators on - battery power sufficient

- All display panel indicators flashing* - low (have new batteries on hand)

- No display panel indicators - drained or installed incorrectly (replace with new batteries or reinstall)

  * As batteries lose voltage, the display panel will flash faster.

If required, change the camera's four AAA alkaline batteries and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Contax 167MT are:

Main Switch	☐
Program Mode Selection	AV
ISO/ASA	64
Aperture	f8.0
Drive Mode Selector	S
Exposure Compensation	(zero) 0
Automatic Compensation Value Level	0&0

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

The databack should be in the "year-month-day-time" mode displaying the current year, month, day, and time.

If the display is flashing or blank, the databack batteries are drained. Replace the batteries only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current year, month, day, and time.

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

Review timer display:

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review.
- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod head.

- Press and move the **QUICK RELEASE** lever to the "L" (lock) position.

- Securely reconnect the camera/timer cable to the timer at the timer jack.

- Look through the viewfinder and align the camera on the vista to be photographed.

- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).

- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.

- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

- Observe the camera main lamp. The lamp should not illuminate for more than 20 seconds. If the lamp continues to illuminate beyond 20 seconds, an electrical short may exist in a portion of the cable jack.

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND A CTIONS PERFORMED	Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.
CLOSE AND SECURE ENCLOSURE	Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (annually)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Contax 167MT are provided in TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE	The Contax 167MT camera runs on four AAA alkaline batteries. The batteries should be replaced every six months or as directed by the data coordinator.

- Loosen the battery compartment cover screw on the bottom of the camera. Remove the battery compartment cover and used batteries. Measure and record the voltage of the used batteries.

- Remove the new batteries from their packaging and test and record the voltage. Each new battery should measure at least 1.5 volts.

- Insert four batteries with polarity as indicated by the (+) and (-) markings on the battery compartment. The camera will not operate if the (+) and (-) ends are reversed.

- Fit the mounting hole on the battery compartment cover onto the guide pin on the camera body, return the cover to its original position, and close it with the fixing screw.

- After changing batteries, check them as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Contax 167MT Data Back D-7 runs on two 3 V coin-shaped lithium batteries. The databack batteries should be replaced annually, or as required by the data coordinator. Be sure to replace the batteries only when film is not loaded.

- Open the camera back. The battery compartment is located on the inside of the databack opposite the hinge. To open the compartment, turn the screw counterclockwise using a small Phillips-head screwdriver.

- Insert the screwdriver tip into the chamber and then gently push the used batteries. They will pop up and can then be removed. Measure and record the voltage of the used batteries.

- Remove the new batteries from their packaging and test and record the voltage. The new batteries should measure approximately 3 volts.

- Wait 15 seconds after removing the used batteries and then load the new batteries with the "+" side facing up.

- Load the new batteries into each chamber and replace the cover; tighten the screw securely.

- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

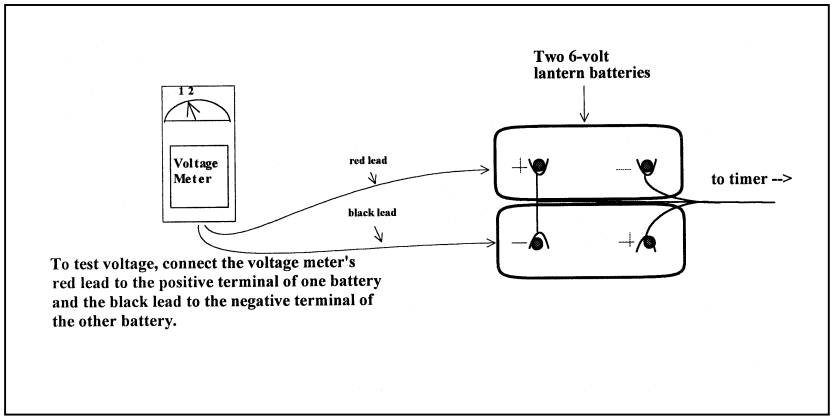

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

CONTAX 167MT

The Contax 167MT is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The aperture priority (AV) exposure mode provides properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Contax 167MT are:

Main Switch	□
Program Mode Selection	AV
ISO/ASA	64
Aperture	f8.0
Drive Mode Selector	S
Exposure Compensation	(zero) 0
Automatic Compensation Value Level	0&0

REVIEW CAMERA SETTINGS

Press the **CAMERA SHUTTER** halfway or the **MODE** button to illuminate the camera display panel for approximately 20 seconds. If the display does not appear, confirm that battery power level is sufficient. Verify all standard settings as they appear in Figure 4-8.

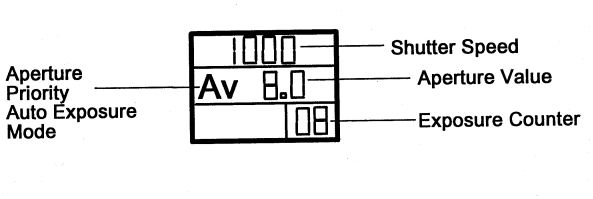

Figure 4-8. Contax 167MT Display.

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Contax 167MT manufacturers' instruction booklet for detailed camera setting procedures.

CONTAX DATABACK D-7

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Contax Data Back D-7 automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation the databack should display the local date and time with the colon flashing, as in Figure 4-9.

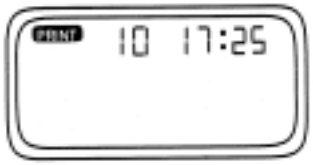

Figure 4-9. Contax Data Back D-7 Display.

If the display is flashing or is blank, the databack batteries are drained.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

To set the databack:

- Open the control button cover on the left side of the databack. A fingernail catch is located at the top of the cover.
- Press the **MODE** button until the "DATE AND TIME" mode is displayed.

- Press the **SET** button once--the "MINUTES" display will flash. Press the up (▲) or down (▼) button until the correct "MINUTES" is displayed.

- Press the **SELECT** button--the "HOUR" display will flash. Press the up (▲) or down (▼) button until the correct "HOUR" is displayed.

- Press the **SELECT** button--the "YEAR" display will flash. Press the up (▲) or down (▼) button until the correct "YEAR" is displayed.

- Press the **SELECT** button--the "MONTH" display will flash. Press the up (▲) or down (▼) button until the correct "MONTH" is displayed.

- Press the **SELECT** button--the "DAY" display will flash. Press the up (▲) or down (▼) button until the correct "DAY" is displayed.

- Press the **SET** button to return to the "DATE AND TIME" mode. The databack should remain in this mode during regular operation.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule.

- 2 photographs/day = 15-17 day servicing schedule.

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

<u>To set the timer clock</u>:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the TIMER flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

To program times for photographs to be taken:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or

- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.
- The horizon is level.
- The vista is framed correctly.
- The sunshield and port are not visible in the viewfinder.
- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment

- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-10) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3310, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____

Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-10. Photographic Monitoring Network Quality Assessment Log.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CONTAX 137 MA**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3120**
DATE	**OCTOBER 1993**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Karen K. Rosener	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Contax 137 MA 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Contax 137 MA: - four AA alkaline batteries
  - Contax 137 MA Data Back D-5: - two 1.5 V silver oxide batteries
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3120, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*
  - TI 4120-3320, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3320, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Contax 137 MA 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Contax 137 MA System, provided in the site operator's manual. Detailed schematic diagrams of the Contax 137 MA 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Contax 137 MA Quartz
- Contax 137 MA Data Back D-5 Quartz
- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3320.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries annually.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

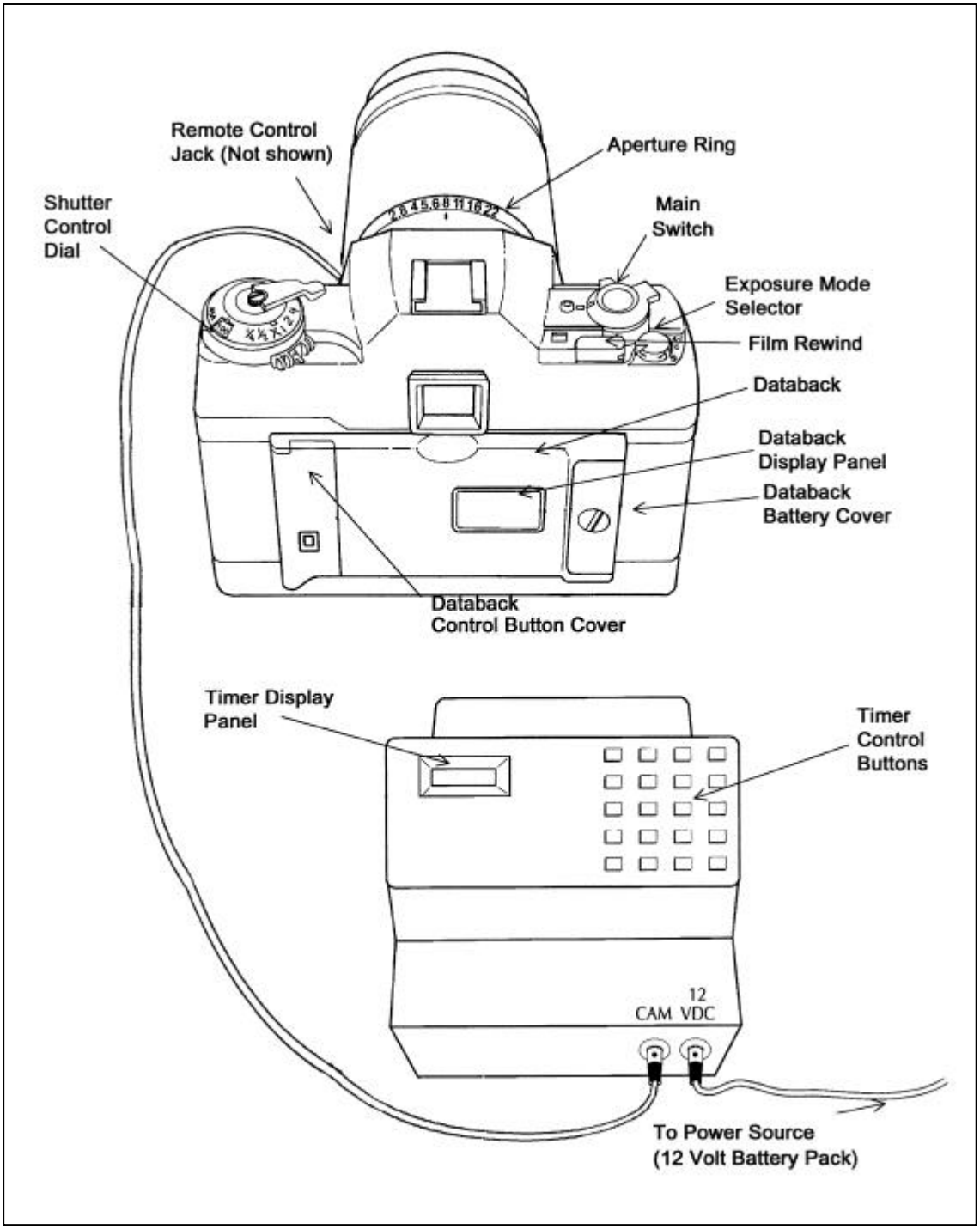

Figure 4-1. Contax 137 MA System Components.

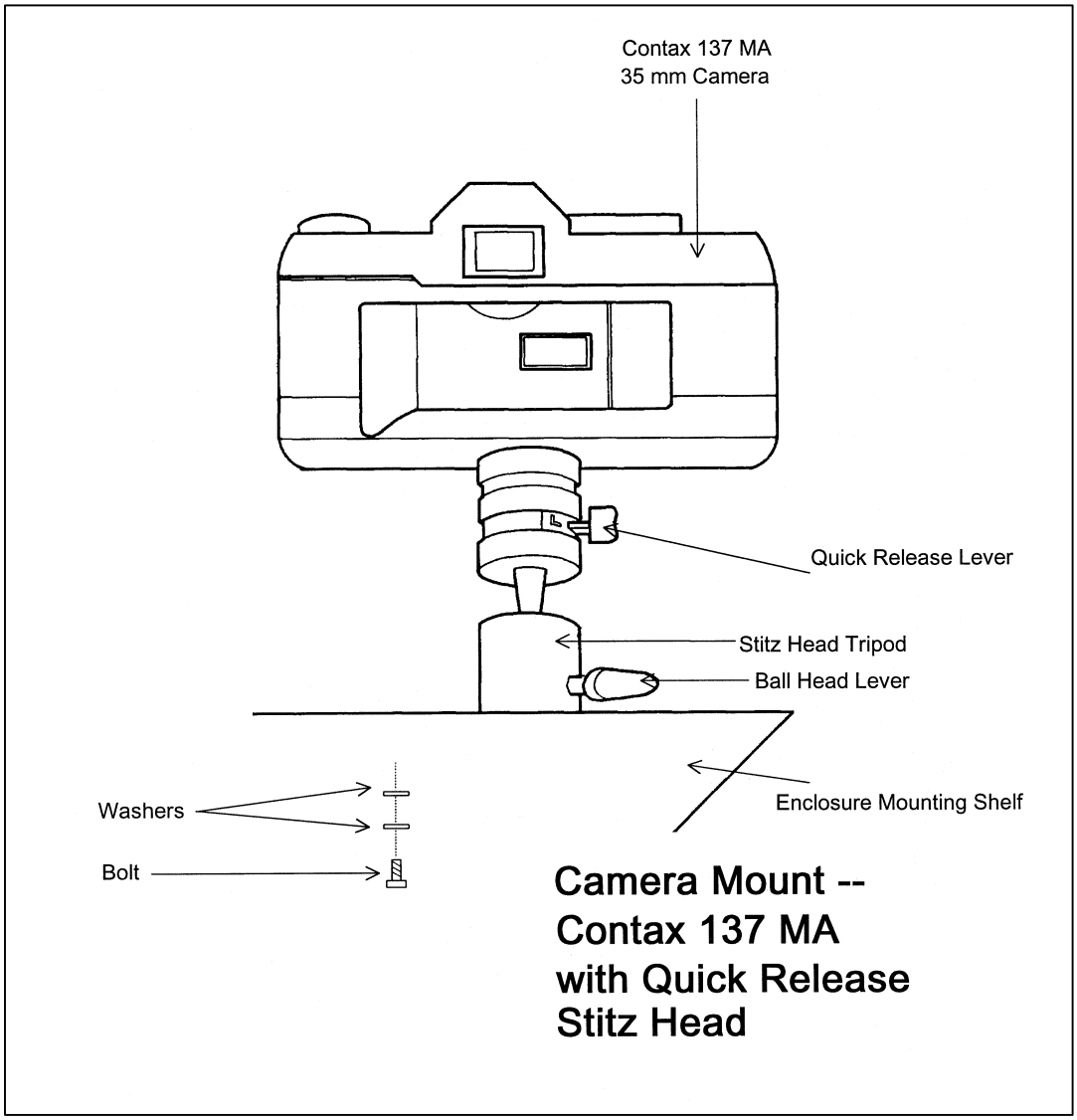

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

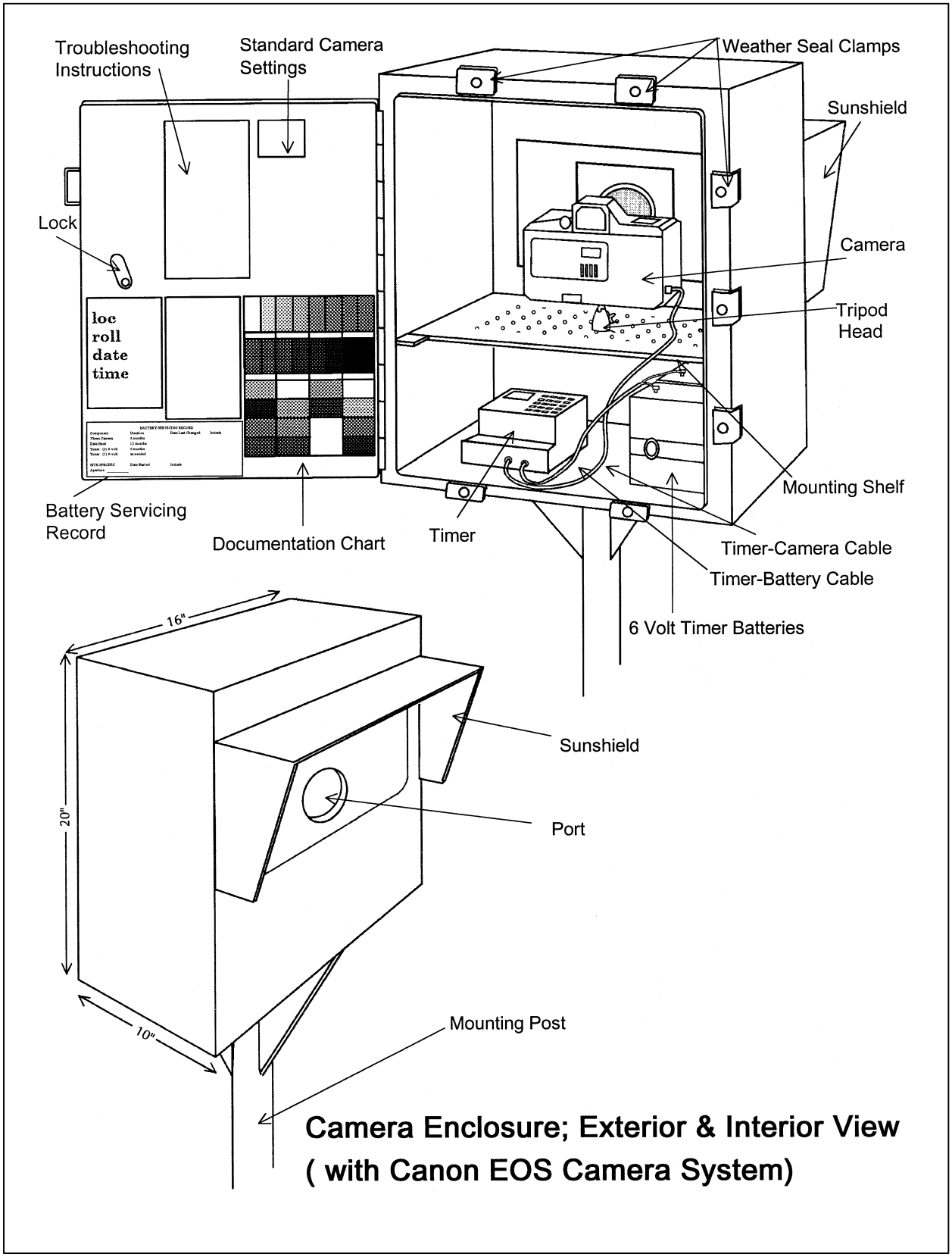

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED
Today's Date _____ Time _____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(EOS) Auto (OM2S) Off (OM2N) On(137MA) ☐(167MT) ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Databack display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED
Today's Date _____ Time _____

Yes	No	
☐	☐	Camera found in proper operation
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(EOS) Auto(OM2S) Off(OM2N) On(137MA)☐(167MT)ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____ (Now) _____ (Max) _____ (Min)

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Contax 137MA Automatic Camera System.

Location DENA Roll No. 9
Operator Andrea Blakesley

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 5/27/94 Time 11:30

Yes	No	
☑	☐	Batteries tested
☑	☐	Monitoring target visible
☑	☐	Camera alignment correct
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Documentation photograph taken
☑	☐	Lens focus on infinity
☑	☐	Film advancing properly
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) ON(PZ-20)
☑	☐	Aperture F8.0
☑	☐	IS0/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

FILM REMOVED

Today's Date 6/4/94 Time 15:20

Yes	No	
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 29
☑	☐	Timer found in proper condition
☑	☐	Camera/timer cable secure
☑	☐	Camera found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) ON(PZ-20)
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

DESCRIBE WEATHER CONDITIONS for the duration of this roll Mostly sunny and mild, cool and rainy for two days

% Cloud Cover 75% Temperature 63 (Now) 65 (Max) 38 (Min)

COMMENTS/ACTION TAKEN Manual shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6v. timer batteries

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525
303-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emission source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Press and move the **QUICK RELEASE** lever to the "R" (release) position and lift the camera off the mount. Disconnect the camera/timer cable from the timer at the timer jack and remove the camera from the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken during the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS.
VERIFY SETTINGS	Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

Open the rewind button cover (located next to the main switch) and press the **REWIND** button. The button should stay down; there is no need to keep pressing it.

NOTE: The film will tear if this button is not pushed in before attempting to rewind the film.

Lift the **FILM REWIND CRANK-HANDLE** up and turn it in the direction of the arrow. While rewinding, you will feel a slight resistance. If the rewind crank is difficult to turn, check the "rewind release" button as described above.

When the crank turns freely with no resistance, the film has been completely rewound into the cartridge. Do not open the camera back until you are sure that the film has been completely rewound.

Open the camera back by pulling up on the rewind knob.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation
- Roll number
- Date and time loaded

- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, lift the **REWIND CRANK HANDLE** and pull it up firmly.

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber.
- Pull the film leader across the shutter curtain and insert it into the film take-up spool.
- With the camera back open, press the **SHUTTER RELEASE** button to wind the film. Make sure the film has no slack and that its perforations are properly engaged with the sprocket teeth.
- Press the **SHUTTER RELEASE** button again until you are confident that the film is firmly connected to the take-up spool.
- Firmly close the camera back cover. Take additional exposures until "1" appears in the exposure counter.

NOTE: The exposure counter may advance even though the film is not loaded correctly. You can assume that the film is loaded correctly ONLY if the rewind shaft rotates when the shutter release is pressed.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

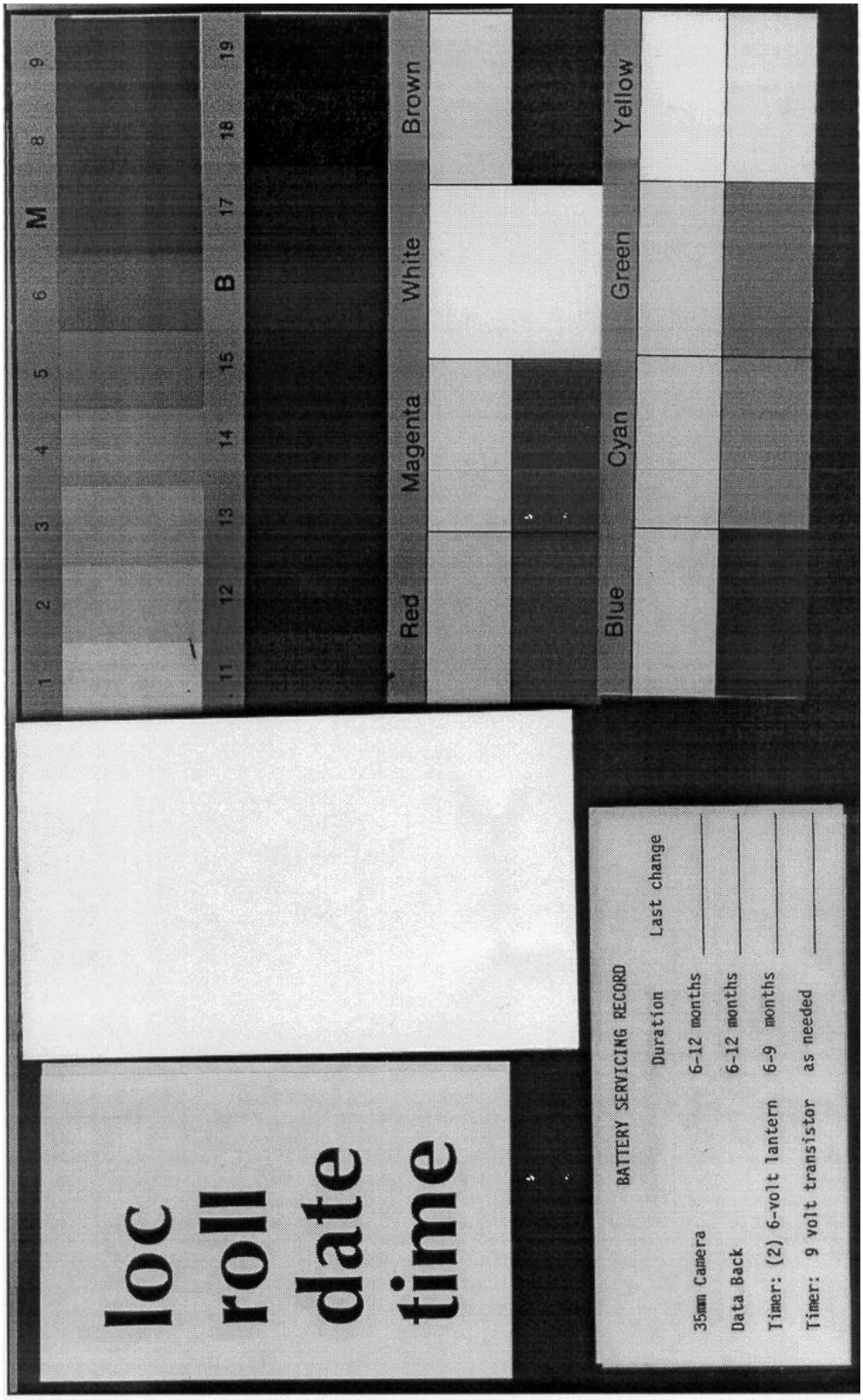

Figure 4-6. Photographic Documentation Board.

- Write the following on the note pad provided:
  - Monitoring site name or abbreviation
  - Roll number
  - Date and time
- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.
- Press the **SHUTTER BUTTON**. Verify that the film counter has incremented one frame.
- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Check the camera batteries by turning on the "main switch" and pressing the **MODE** and **ISO** buttons simultaneously.

- Bright Green Light - battery power sufficient
- Flashing or Dim Green Light - low (have new batteries on hand)
- No Light - drained or installed incorrectly (replace with new batteries or reinstall)

If required, change the camera's four AA alkaline batteries and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Contax 137 MA are:

Main Switch	ON
Exposure Mode Selector	S
Shutter Control Dial	A
Exposure Compensation	XI
Film Speed	ASA 100

Aperture Ring	F8
Focus	Infinity

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

The databack should be in the "day-time" mode displaying the current day of the month and current time with the colon flashing.

If the display is flashing or blank, the databack batteries are drained. Replace the batteries only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current date and time.

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

<u>Review timer display:</u>

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

<u>Review the programmed timer events:</u>

- Press **PRG** then **C1** to select Channel 1 for review.
- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod head.
- Press and move the **QUICK RELEASE** lever to the "L" (lock) position.
- Securely reconnect the camera/timer cable to the timer at the timer jack.
- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

- Observe the camera main lamp. The lamp should not illuminate for more than 15 seconds. If the lamp continues to illuminate beyond 15 seconds, an electrical short may exist in a portion of the cable jack.

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED

Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.

CLOSE AND SECURE ENCLOSURE

Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3320, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA.*

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (annually)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Contax 137 MA are provided in TI 4120-3320, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA.*

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE

The Contax 137 MA camera runs on four AA alkaline batteries. The batteries should be replaced every six months or as directed by the data coordinator.

- Lift up the fastening knob of the battery compartment cover located on the bottom of the camera. Turn it in the **OPEN** direction and remove the battery compartment cover.
- Remove the new batteries from their packaging and test and record the voltage. Each new battery should measure at least 1.5 volts.
- Insert four batteries with polarity as indicated by the (+) and (-) markings on the battery compartment. The camera will not operate if the (+) and (-) ends are reversed.
- After installing the batteries in the battery case, insert it into the battery compartment in the direction shown by the diagram in the battery compartment.
- Fit the mounting hole on the battery compartment cover onto the guide pin on the camera body, return the cover to its original position, and lock it in place by turning the fastening knob as far as it will go in the direction of the white dot.
- After changing batteries, check them as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Contax 137 MA Data Back D-5 runs on two 1.5 V coin-shaped silver oxide batteries. The databack batteries should be replaced every six months, or as required by the data coordinator. Be sure to replace the batteries only when film is not loaded.

- Insert a coin edge or other suitable object into the screwhead located in the center of the battery compartment cover on the outside of the databack.
- Turn the screw counterclockwise and open the cover. Remove the used batteries. Measure and record the voltage of the used batteries.
- Remove the new batteries from their packaging and test and record the voltage. The new batteries should measure approximately 1.5 volts.
- Install two 1.5 V silver oxide batteries with their plus (+) marks facing upward. Replace the cover.

- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

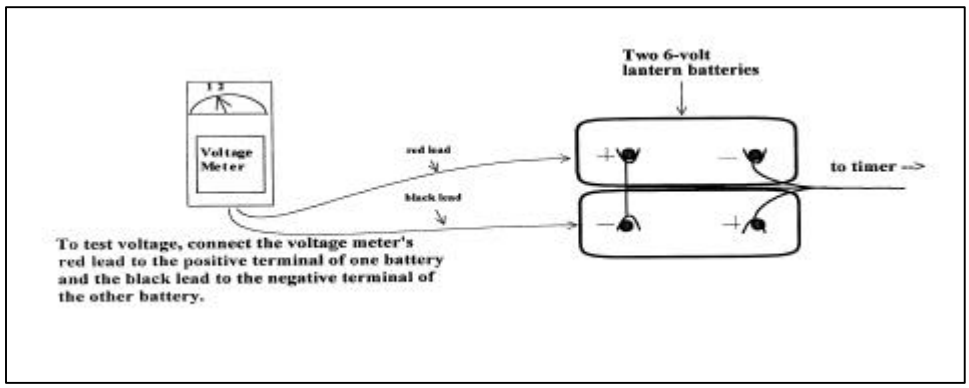

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

CONTAX 137 MA

The Contax 137 MA is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The automatic operation and aperture priority exposure mode provide properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Contax 137 MA (Figure 4-8) are:

Main Switch	ON
Exposure Mode Selector	S
Shutter Control Dial	A
Exposure Compensation	XI
Film Speed	ASA 100
Aperture Ring	F8

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Contax 137 MA manufacturers' instruction booklet for detailed camera setting procedures.

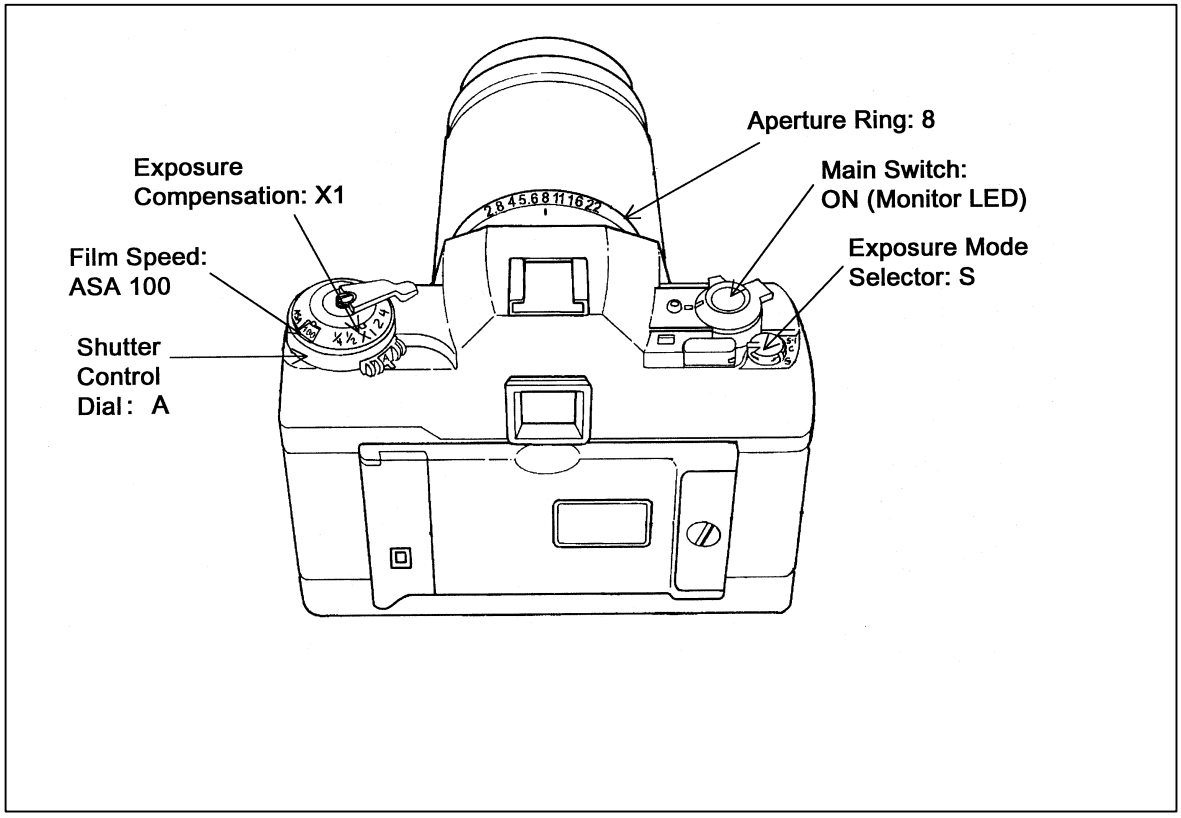

Figure 4-8. Contax 137 MA Standard Settings.

CONTAX DATABACK D-5

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Contax Data Back D-5 automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation the databack should display the local date and time with the colon flashing, as in Figure 4-9.

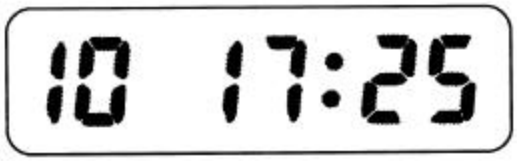

Figure 4-9. Contax Data Back D-5 Display.

If the display is flashing or is blank, the databack batteries are drained.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

To set the databack:

- Open the control button cover on the left side of the databack. A fingernail catch is located at the top of the cover.
- Press the **MODE** button until the "Y.M.D." (year-month-day) is displayed. In this mode the apostrophe (') in the upper left corner flashes.
- Press the **SELECT** button once and the "YEAR" display will flash. Press the **SET** button until the correct year is displayed.
- Press the **SELECT** button again and the "MONTH" display will flash. Press the **SET** button until the correct month is displayed.
- Press the **SELECT** button again and the "DAY" display will flash. Press the **SET** button until the correct day is displayed.
- Press the **MODE** button until the "D.T.M." (day-time) mode is displayed. The colon (:) between the hour and minute display will flash.
- Press the **SELECT** button and the "HOUR" display will flash. Press the **SET** button until the correct hour is displayed.

- Press the **SELECT** button again and the "MINUTE" display will flash. Press the **SET** button until the correct minute is displayed.

- Push the **SELECT** button one more time to return to the "D.T.M. OPERATING" mode. The databack should remain in this mode during regular operation.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule.

- 2 photographs/day = 15-17 day servicing schedule.

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

<u>To set the timer clock</u>:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the TIMER flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

<u>To program times for photographs to be taken</u>:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or

- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.

- The horizon is level.

- The vista is framed correctly.

- The sunshield and port are not visible in the viewfinder.

- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3320, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-10) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3320.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____

Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-10. Photographic Monitoring Network Quality Assessment Log.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - OLYMPUS OM2N**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3130**
DATE	**JANUARY 1994**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Kristi Savig	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Olympus OM2N 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Olympus OM2N: - two 1.5 V silver oxide batteries
  - Olympus Recordata Back 3 or 4: - two 1.5 V silver oxide batteries
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3130, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*
  - TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N.*

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Olympus OM2N 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Olympus OM2N System, provided in the site operator's manual. Detailed schematic diagrams of the Olympus OM2N 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Olympus OM2N
- Olympus Recordata Back 3 or 4
- Olympus Winder 2
- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3330.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries every 6 months.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

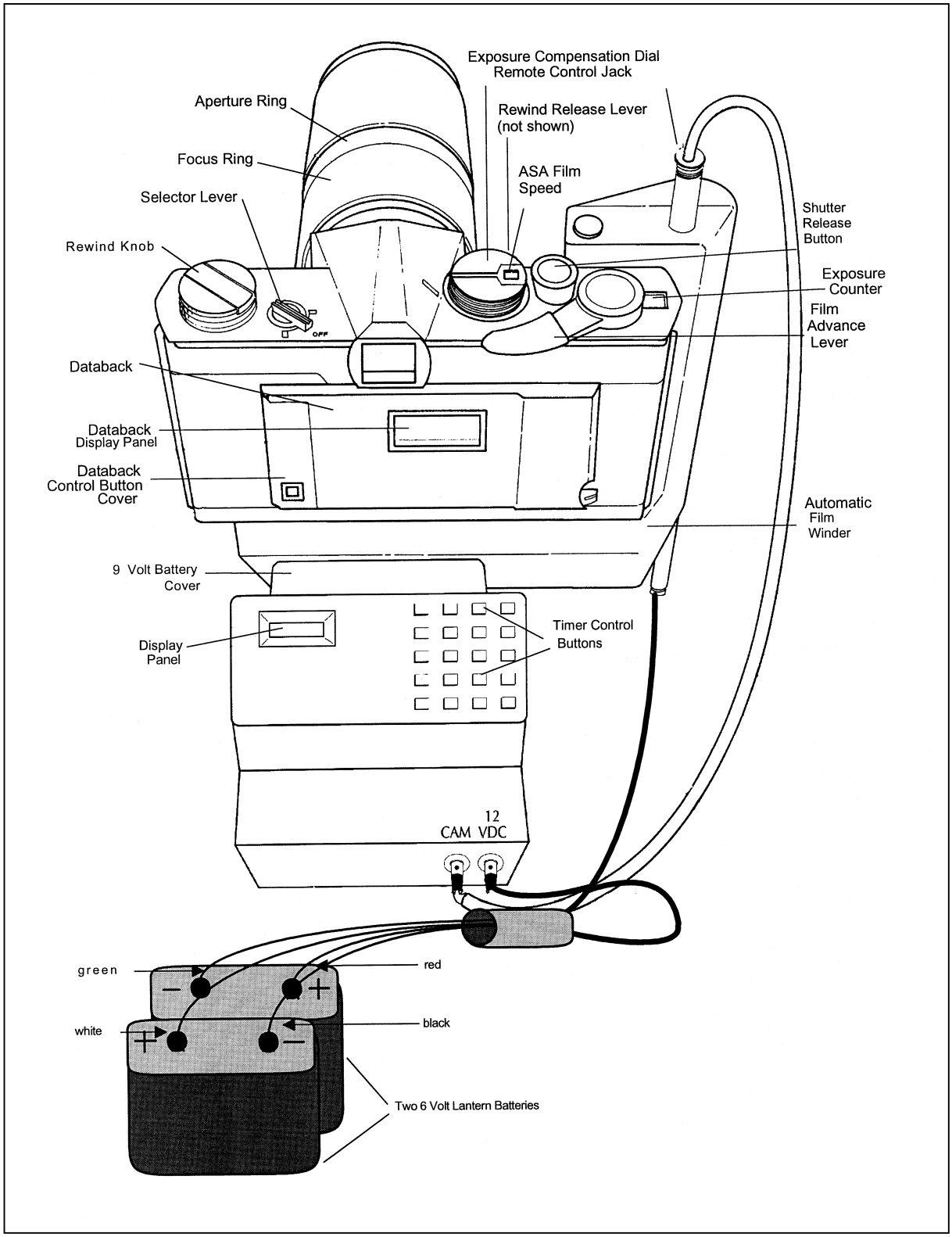

Figure 4-1. Olympus OM2N System Components.

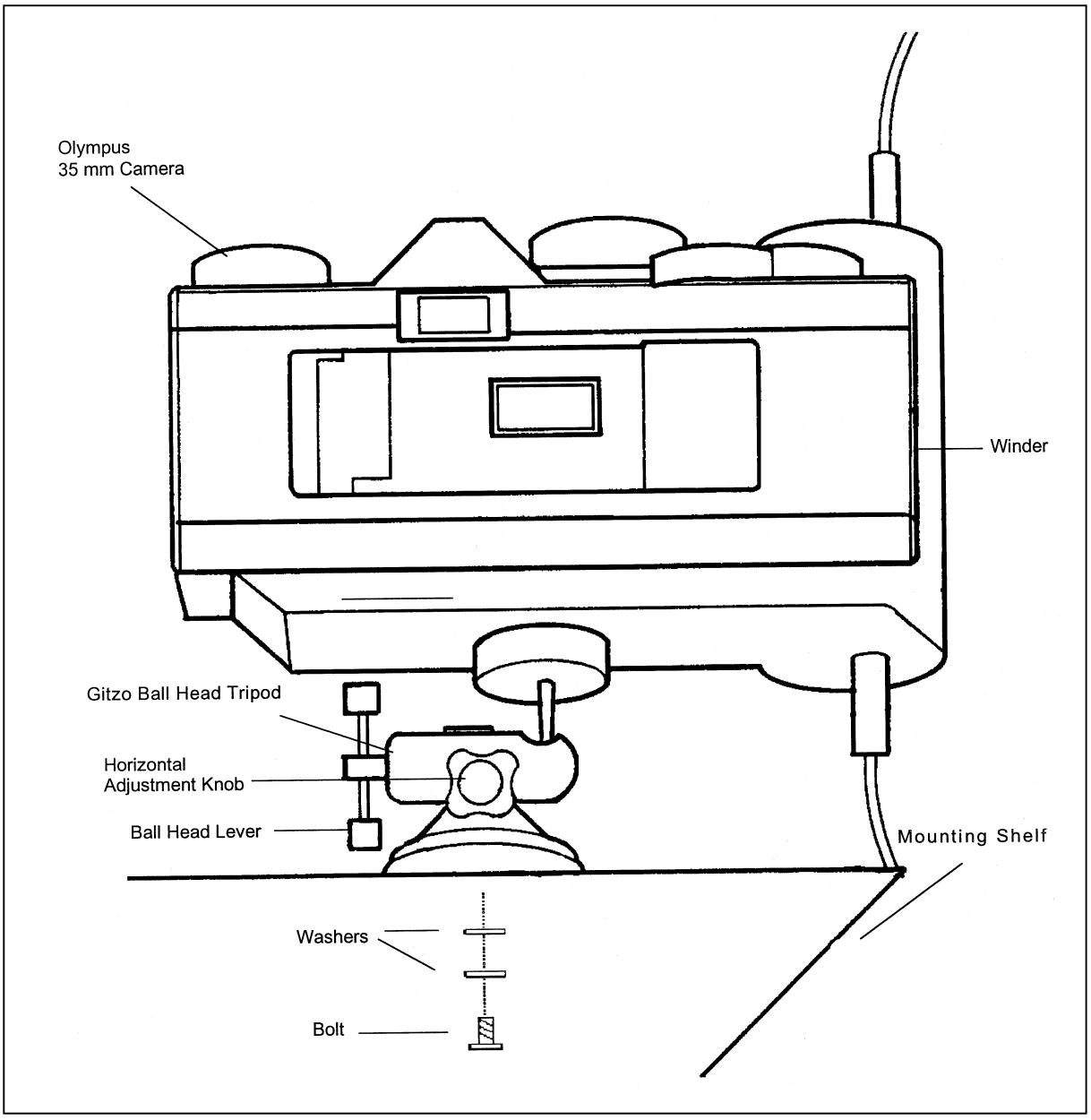

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

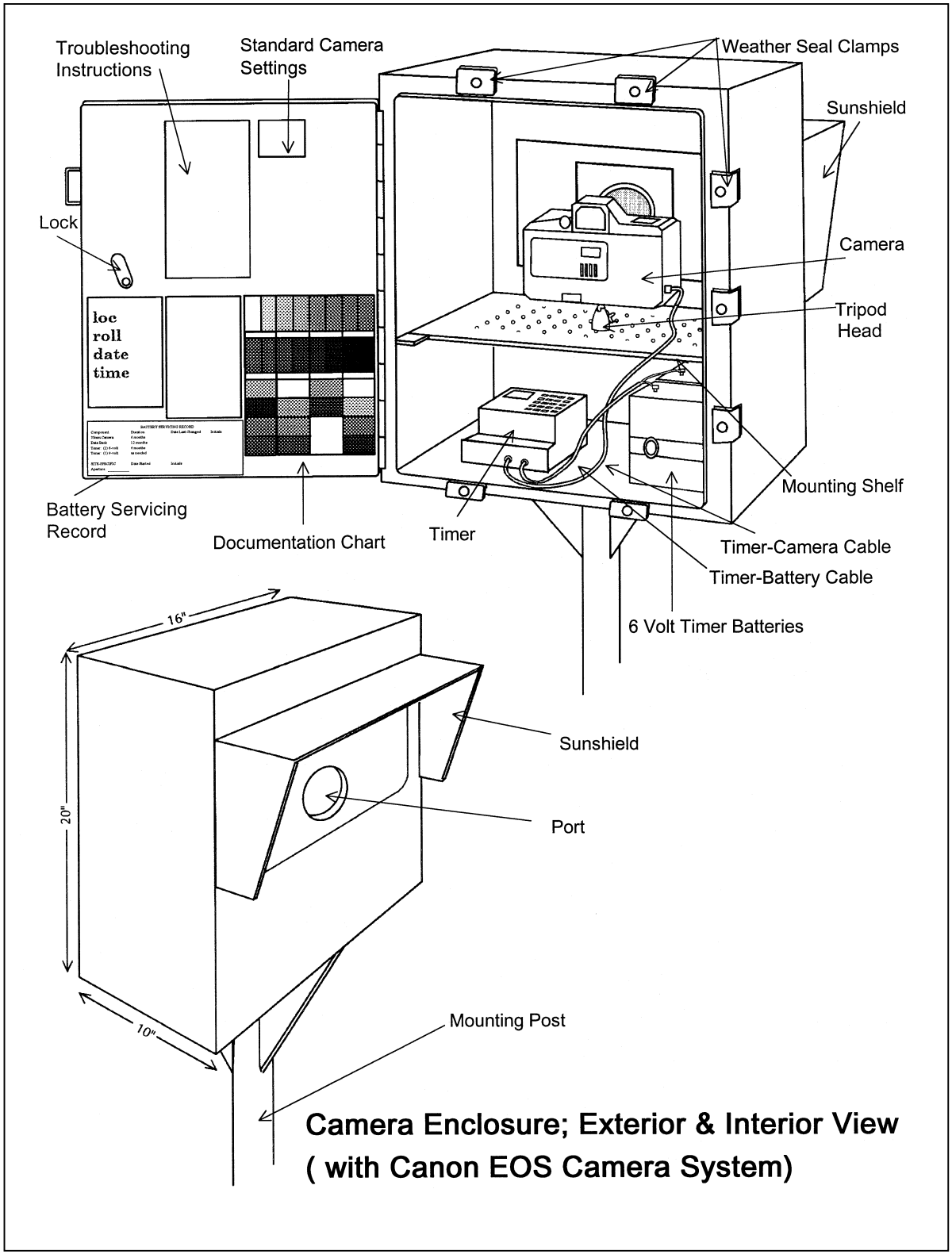

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED
Today's Date _____ Time _____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(EOS) Auto (OM2S) Off (OM2N) On(137MA) ☐(167MT) ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Databack display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED
Today's Date _____ Time _____

Yes	No	
☐	☐	Camera found in proper operation
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(EOS) Auto(OM2S) Off(OM2N) On(137MA)☐(167MT)ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____ (Now) _____ (Max) _____ (Min)

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Olympus OM2N Automatic Camera System.

Location DENA Roll No. 9
Operator Andrea Blakesley

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 5/27/94 Time 11:30

Yes	No	
☑	☐	Batteries tested
☑	☐	Monitoring target visible
☑	☐	Camera alignment correct
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Documentation photograph taken
☑	☐	Lens focus on infinity
☑	☐	Film advancing properly
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

FILM REMOVED

Today's Date 6/4/94 Time 15:20

Yes	No	
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 29
☑	☐	Timer found in proper condition
☑	☐	Camera/timer cable secure
☑	☐	Camera found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

DESCRIBE WEATHER CONDITIONS for the duration of this roll Mostly sunny and mild, cool and rainy for two days

% Cloud Cover 75% Temperature 63 (Now) 65 (Max) 38 (Min)

COMMENTS/ACTION TAKEN Manual shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6 v. timer batteries

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525 303-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emission source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Loosen the camera winder fastening screw. Disconnect the camera body from the automatic winder. The tripod, winder, and winder cabling will remain intact inside the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken during the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS.
VERIFY SETTINGS	Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

Located on the front of the camera body to the right of the lens piece is the rewind release lever. Turn the lever counterclockwise to the "R" position. The film will tear if the rewind lever is not set before attempting to rewind the film.

Fold out the **REWIND CRANK** and wind it in the direction of the arrow. While rewinding, you will feel slight resistance on the crank. IF THE REWIND CRANK IS DIFFICULT TO TURN, check the rewind release lever as described above.

When the crank turns freely without resistance, the film has been completely rewound into the cartridge. Do not open the camera back until you are sure that the film has been completely rewound. You cannot damage the film by turning the rewind lever longer than necessary, but the film will be exposed to light and damaged if it is not completely rewound.

Open the camera back by pulling up on the rewind knob.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation
- Roll number

- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, pull the **REWIND KNOB** up.

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber, upper flat end first.
- Pull the film leader across the shutter curtain and insert it into the film take-up spool.
- With the camera back open, press the **SHUTTER RELEASE** button and turn the advance lever to make sure the film has no slack and that its perforations are properly engaged with the sprocket teeth.
- Press the **SHUTTER RELEASE** button again and turn the advance lever until you are confident that the film is firmly connected to the take-up spool.
- Firmly close the camera back cover.

NOTE: The exposure counter will increment even if the film is loaded correctly. You can assume that the film is loaded correctly ONLY if the rewind shaft rotates when the shutter release is pressed.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

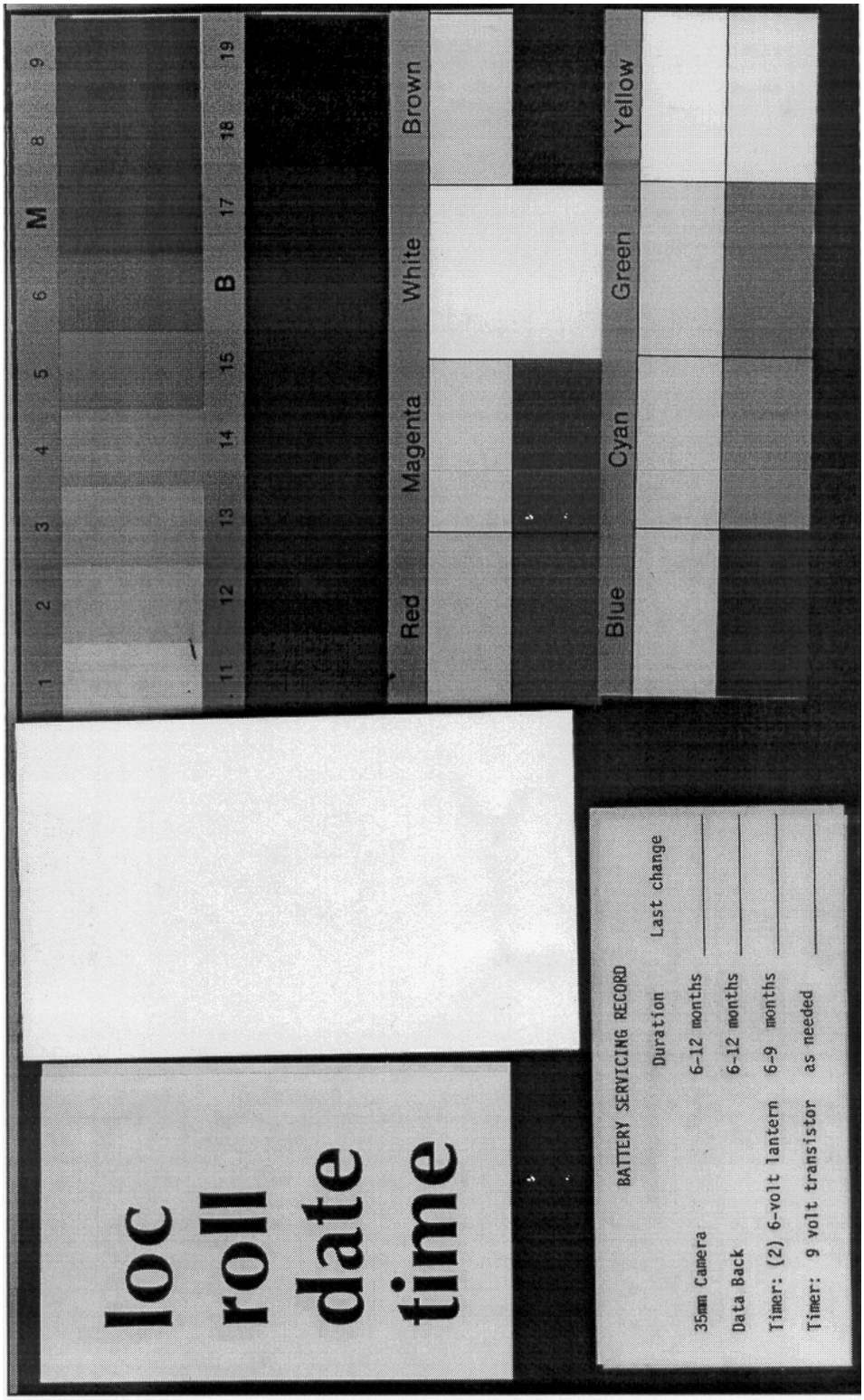

Figure 4-6. Photographic Documentation Board.

- Write the following on the note pad provided:
  - Monitoring site name or abbreviation
  - Roll number
  - Date and time
- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.
- Press the **SHUTTER BUTTON**. Manually turn the advance lever. Verify that the film counter has incremented one frame.
- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Move the selector lever to the battery check position. Note the condition of the red lamp:

- Continuous Red Light - battery power sufficient
- Flashing Light - low (have new batteries on hand)
- No Light - drained or installed incorrectly (replace with new batteries or reinstall)

If required, change the camera's two 1.5 V silver oxide batteries and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Olympus OM2N are:

OM2N Selector Lever	OFF
Winder	Single
Exposure Compensation	Zero
Film Speed	ASA 64
Aperture Ring	F8
Focus	Infinity

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

When using the Recordata Back 3, the databack should be in the "day-time" mode displaying the current day of the month and current time. If the Recordata Back 4 is used, the databack should be in the "year-month-day" mode displaying the current date.

Independent of the model used, if the display is flashing or blank, the databack batteries are drained. Replace the batteries only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current date and time (Recordata Back 3) or current date (Recordata Back 4).

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

Review timer display:

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review.
- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod head.
- Securely reconnect the camera/timer cable to the timer at the timer jack.
- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED	Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.
CLOSE AND SECURE ENCLOSURE	Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*.

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (every six months)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Olympus OM2N are provided in TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N.*

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE	The Olympus OM2N camera runs on two 1.5 V silver oxide batteries. The batteries should be replaced every six months or as directed by the data coordinator.

- The battery compartment is on the bottom of the camera. Unscrew the cap with a coin.
- Remove the new batteries from their packaging and test and record the voltage. Each new battery should measure at least 1.5 volts.
- Insert the two new 1.5 V silver oxide batteries with the (+) facing you.
- Always replace batteries as a pair.
- Replace the compartment cap and tighten.
- After changing batteries, check them as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Olympus OM2N Recordata Back 3 or 4 run on two 1.5 V silver oxide batteries. The databack batteries should be replaced every six months, or as required by the data coordinator. Be sure to replace the batteries only when film is not loaded.

- Open the camera back by pulling up on the rewind knob crank.
- Insert a coin edge or other suitable object into the screwhead located in the center of the battery compartment cover on the inside of the databack.
- Turn the screw counterclockwise and open the cover. Remove the used batteries. Measure and record the voltage of the used batteries.
- Remove the new batteries from their packaging and test and record the voltage. The new batteries should measure approximately 1.5 volts.
- Insert two 1.5 V silver oxide batteries with their plus (+) marks facing upward, otherwise the databack will not function.
- Replace the cover.
- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

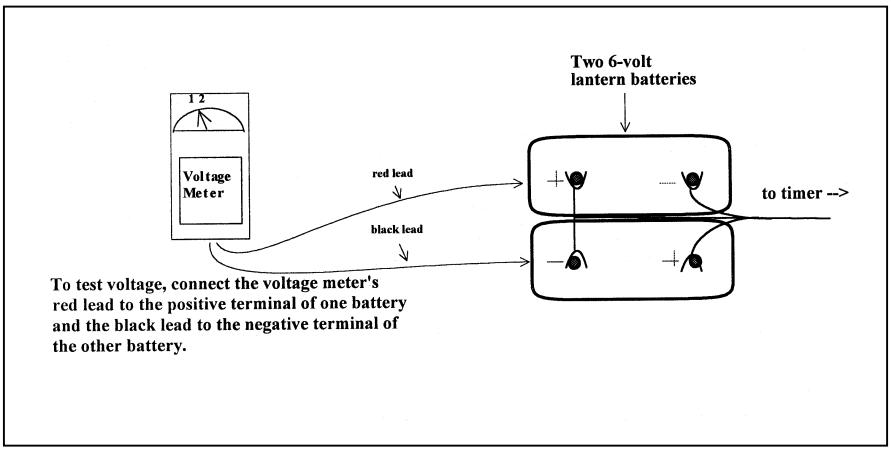

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

OLYMPUS OM2N

The Olympus OM2N is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The automatic operation and aperture priority exposure mode provide properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Olympus OM2N are:

OM2N Selector Lever	OFF
Winder	Single
Exposure Compensation	Zero
Film Speed	ASA 64
Aperture Ring	F8
Focus	Infinity

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Olympus OM2N manufacturers' instruction booklet for detailed camera setting procedures.

OLYMPUS RECORDATA BACK 3 OR 4

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Olympus Recordata Back 3 or 4 automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation, the Recordata Back 3 should display the local date and time. When using a Recordata Back 4, the databack should display the year, month, and day. Verify that no digits are flashing (see Figure 4-8).

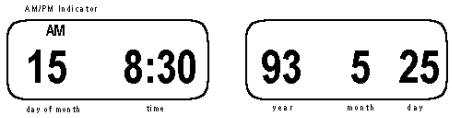

Figure 4-8. Olympus Recordata Back Displays.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

<u>To set the Recordata Back 3:</u>

- Open the control button cover on the left side of the databack. A fingernail catch is located at the bottom of the cover.
- Press the **TIME SET MODE** button (the second button from the top) until the flashing SET indicator in the top left corner is displayed.
- Press the **SELECT** button until the correct year-month-day format is displayed. The "DAY" will be flashing. Press the **SET** button until the correct day is displayed. Constant pressure on the set button will rapidly advance the numbers.
- Press the **SELECT** button again and the "MONTH" display will flash. Press the **SET** button until the correct month is displayed.
- Press the **SELECT** button again and the "YEAR" display will flash. Press the **SET** button until the correct year is displayed.
- Press the **SELECT** button again and the "TIME" format will be displayed. Again press the **SELECT** button and the "MINUTE" display will flash. Press the **SET** button until the correct minute is displayed.

- Press the **SELECT** button and the "HOUR" display will flash. Press the **SET** button until the correct hour is displayed.

  NOTE: The databack has an "AM" and "PM" setting. Be certain the correct indicator is displayed.

  Return to the correct operating mode by pressing the **TIME SET** mode button until ONLY the day, time, and AM or PM are displayed and the colon (:) between the hour and minutes is flashing.

To set the Recordata Back 4:

- Open the control button cover on the left side of the databack. A fingernail catch is located at the bottom of the cover.

- Press the **SELECT** button until the correct year-month-day format is displayed. The "DAY" will be flashing. Press the **SET** button until the correct day is displayed. Constant pressure on the set button will rapidly advance the numbers.

- Press the **SELECT** button again and the "MONTH" display will flash. Press the **SET** button until the correct month is displayed.

- Press the **SELECT** button again and the "YEAR" display will flash. Press the **SET** button until the correct year is displayed.

- Press the **SELECT** button twice and the time will be displayed with the seconds flashing. Press the **SELECT** button again and the minutes will flash. Press the **SET** button until the correct minute is displayed.

- Press the **SELECT** button and the "HOUR" display will flash. Press the **SET** button until the correct hour is displayed.

  NOTE: The databack has an "AM" and "PM" setting. Be certain the correct indicator is displayed.

  Return to the correct operating mode by pressing the top button until the year-month-day format is displayed.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule.

- 2 photographs/day = 15-17 day servicing schedule.

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

To set the timer clock:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the TIMER flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

To program times for photographs to be taken:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or
- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.
- The horizon is level.
- The vista is framed correctly.
- The sunshield and port are not visible in the viewfinder.
- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N.*

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-9) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3330.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____

Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-9. Photographic Monitoring Network Quality Assessment Log.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - PENTAX PZ-20**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3140**
DATE	**JULY 1994**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Karen K. Rosener	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Pentax PZ-20 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Pentax PZ-20: - one 6 V lithium battery
  - Pentax Data Back FE: - one 3 V lithium battery
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*
  - TI 4120-3340, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3340, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20.*

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Pentax PZ-20 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Pentax PZ-20 System, provided in the site operator's manual. Detailed schematic diagrams of the Pentax PZ-20 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Pentax PZ-20
- Pentax Data Back FE
- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3340.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries annually.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

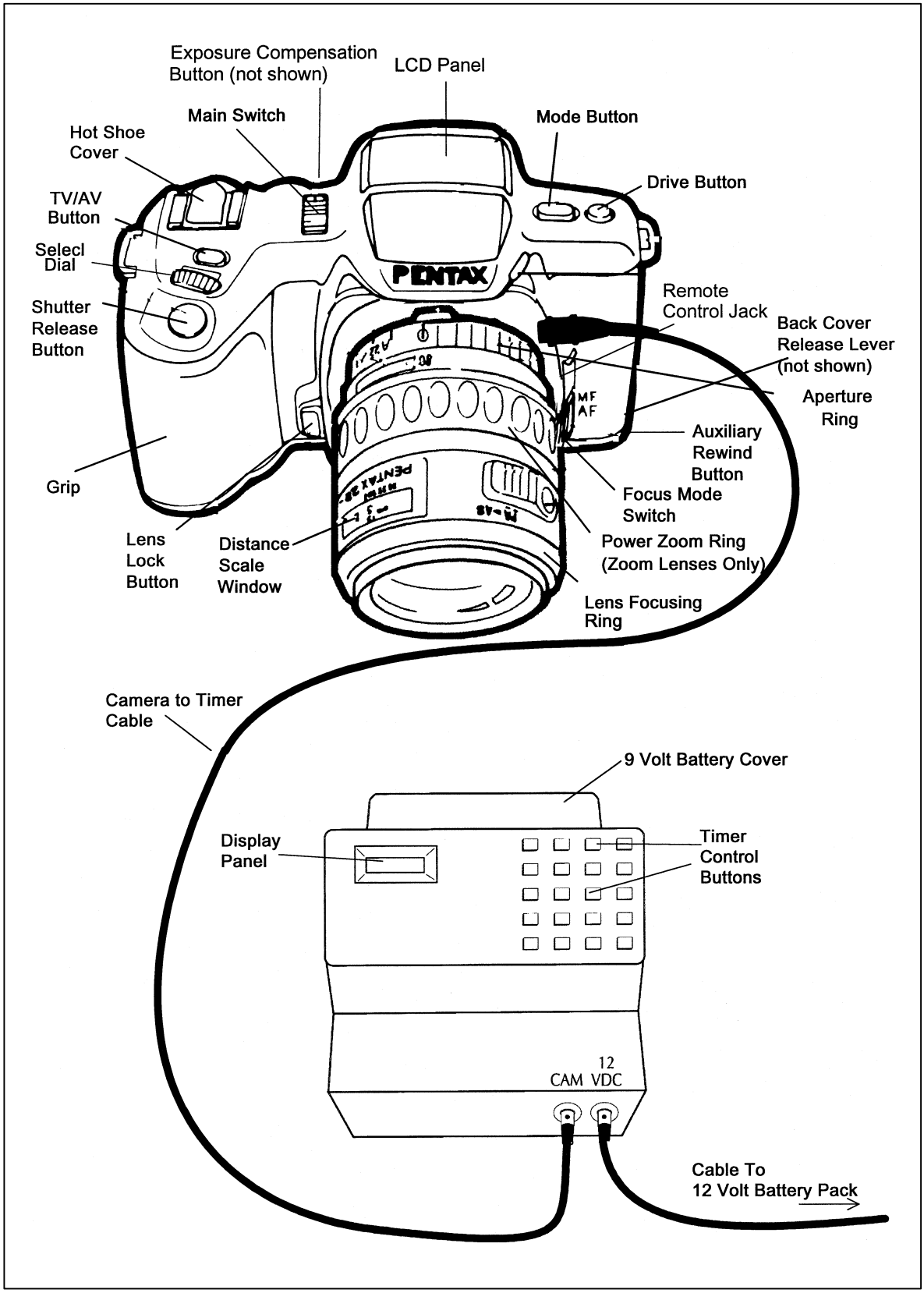

Figure 4-1. Pentax PZ-20 System Components.

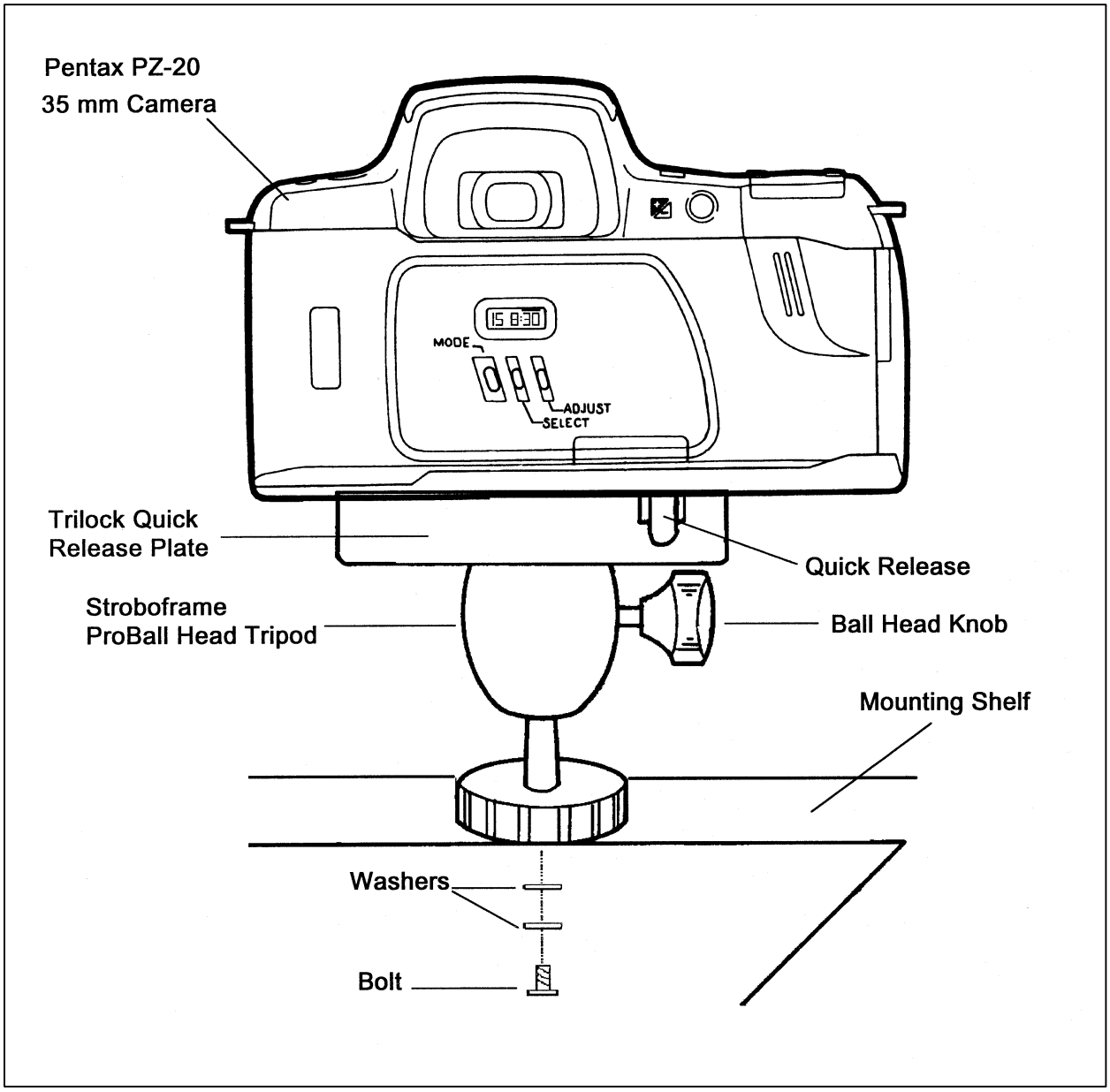

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

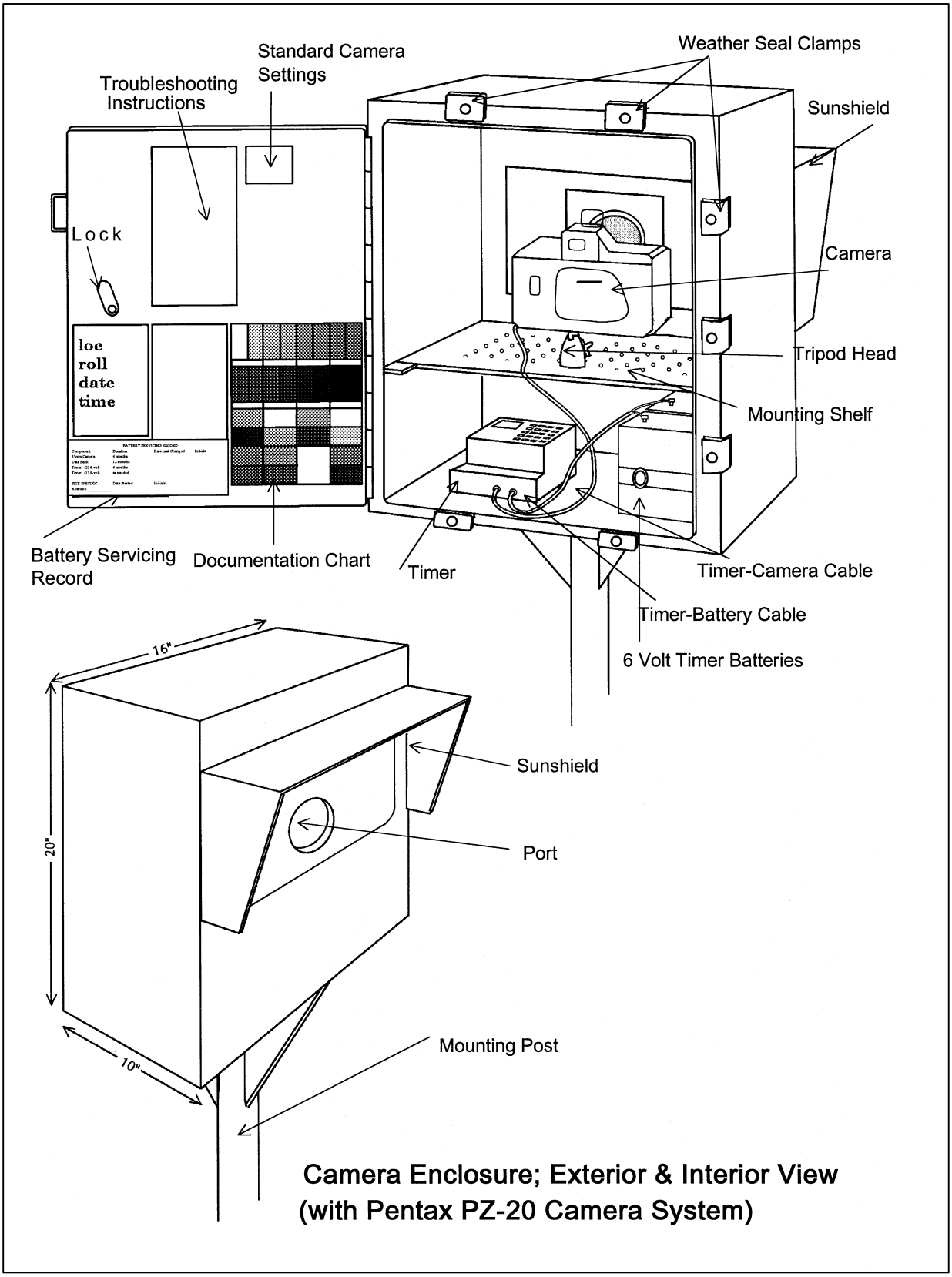

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED
Today's Date _____ Time _____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(EOS) Auto (OM2S) Off (OM2N) On(137MA) ☐(167MT) ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Databack display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED
Today's Date _____ Time _____

Yes	No	
☐	☐	Camera found in proper operation
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(EOS) Auto(OM2S) Off(OM2N) On(137MA)☐(167MT)ON(PZ-20)
☐	☐	Aperture F8.0
☐	☐	ISO/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35 mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____ (Now) _____ (Max) _____ (Min)

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Pentax PZ-20 Automatic Camera System.

Location DENA Roll No. 9
Operator Andrea Blakesley

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 5/27/94 Time 11:30

Yes	No	
☑	☐	Batteries tested
☑	☐	Monitoring target visible
☑	☐	Camera alignment correct
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Documentation photograph taken
☑	☐	Lens focus on infinity
☑	☐	Film advancing properly
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

FILM REMOVED

Today's Date 6/4/94 Time 15:20

Yes	No	
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 29
☑	☐	Timer found in proper condition
☑	☐	Camera/timer cable secure
☑	☐	Camera found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled
☑	☐	Camera main switch (circle one) A(E0S) Auto(0M2s) Off(0M2n) On(137MA) ☐(167MT) (ON(PZ-20))
☑	☐	Aperture F8.0
☑	☐	ISO/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)

DESCRIBE WEATHER CONDITIONS for the duration of this roll Mostly sunny and mild, cool and rainy for two days

% Cloud Cover 75% Temperature 63 (Now) 65 (Max) 38 (Min)

COMMENTS/ACTION TAKEN Manual shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6v. timer batterics

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525
303-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emission source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Push the **QUICK RELEASE** lever on the tripod plate and lift the camera off the mount. Disconnect the camera/timer cable from the timer at the timer jack and remove the camera from the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken during the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS. If the film is already rewound, the film-load check mark will be flashing ( ). Assume all 36 exposures were taken and document as such.

VERIFY SETTINGS

Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

Observe the film-load check mark ( ) on the display panel:

- If flashing, the film was automatically rewound after the last frame was exposed.
- If the roll of film has not been completely exposed, pull the **HOT SHOE COVER** off the top of the camera. Depress the **AUXILIARY REWIND** button with the protruding section of the hot shoe cover. (The camera main switch must be in the "ON" position).

During rewind, the film-load check mark ( ) will flash and the exposure counter counts frame numbers in reverse. The film rewind stops automatically when the film has been completely rewound. Do not open the back until the film-load check mark flashes.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the DX film contacts or shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any quipment or monitoring idscrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation
- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, push the **BACK COVER LATCH** down. The Pentax PZ-20 loads the film automatically if the following steps are carefully taken:

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber, upper flat end first.
- Pull the film leader across the shutter curtain until its tip is aligned with the orange index bar marked "FILM."
- Make sure the film has no slack and that its perforations are properly engaged with the sprocket teeth.
- Firmly close the camera back cover. The film will automatically advance and stop when "1" appears in the display panel.

  NOTE: If the film is not loaded correctly, the film transport symbol (0_ F) will flash after the camera motor has stopped and the shutter will not release. Open the back cover and reload the film.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

- Write the following on the note pad provided:
  - Monitoring site name or abbreviation
  - Roll number
  - Date and time
- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.
- Press the **SHUTTER BUTTON**. Manually turn the advance lever. Verify that the film counter has incremented one frame.
- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Observe the display panel. If a battery symbol ( ) appears in the display directly above the film transport symbol ( ) the level of battery power is:

- ( ) - nearly exhausted, replace with new battery
- ( ) flashing - very low, shutter will not release, replace with new battery
- blank display - drained, replace with new battery

If required, change the camera's 6 V lithium battery and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

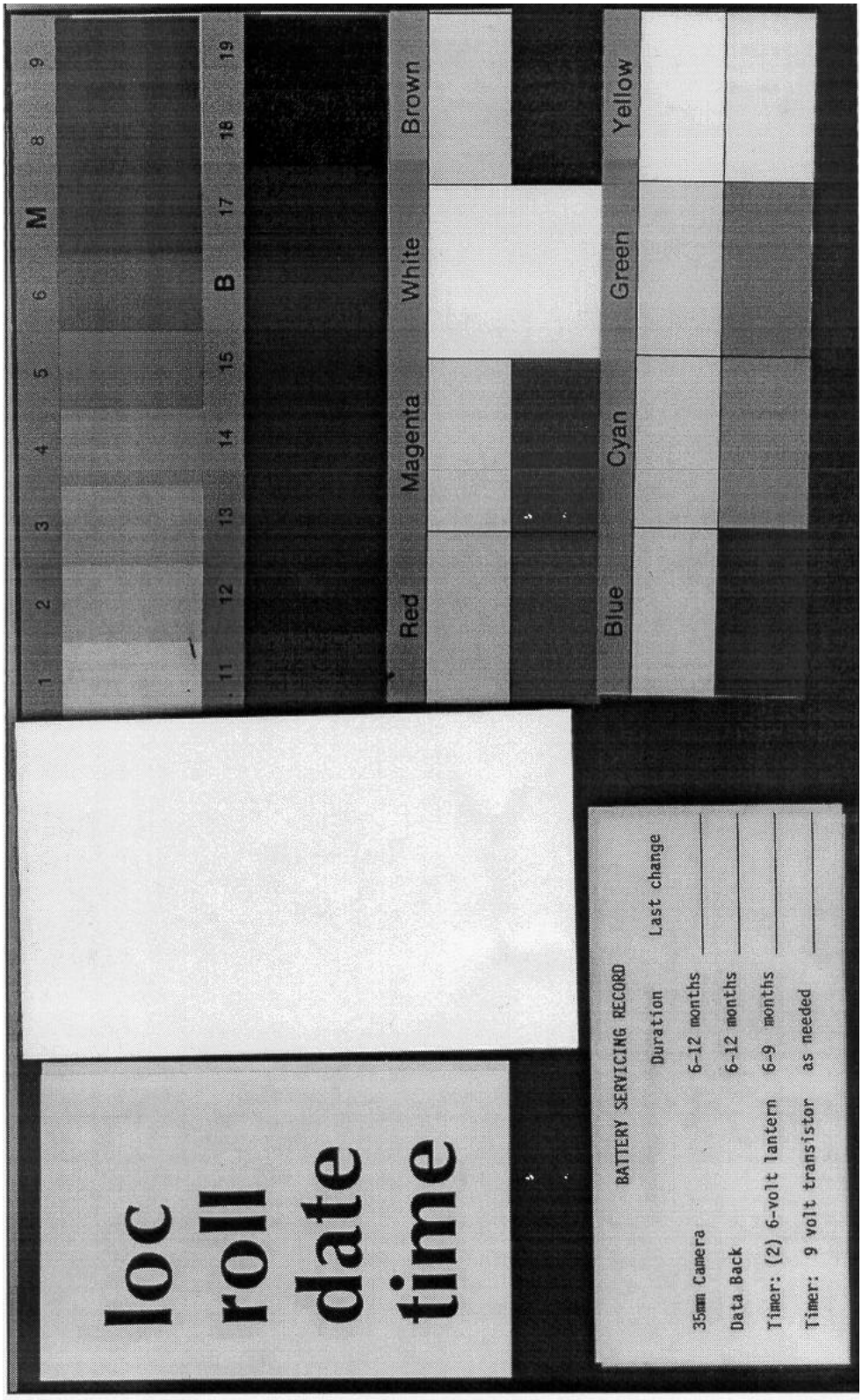

Figure 4-6. Photographic Documentation Board.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Pentax PZ-20 are:

Main Switch	ON
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0.0
Program Mode Selection	A
Drive Mode Selector	☐ (single)
Lens Focus Mode	MF (manual)

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

The databack should be in the "day-time" mode displaying the current day of the month and current time, with the bar mark (-) displayed directly above the minutes.

If the display is blank, the databack battery is drained. Replace the batteries only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current date and time.

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

<u>Review timer display:</u>

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

<u>Review the programmed timer events:</u>

- Press **PRG** then **C1** to select Channel 1 for review.

- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod head.
- Securely reconnect the camera/timer cable to the timer at the timer jack.
- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED	Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.
CLOSE AND SECURE ENCLOSURE	Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3340, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20.*

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (annually)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Pentax PZ-20 are provided in TI 4120-3340, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20.*

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE

The Pentax PZ-20 camera runs on one 6 V lithium battery pack. This battery should be replaced every six months or as directed by the data coordinator.

- Open the battery chamber cover by pulling the cover lock in the direction of the arrow.
- Turn the camera upright and allow the battery to slide out of the compartment. Measure and record the voltage of the used battery.
- Remove the new battery from its packaging and test and record the voltage. The new battery should measure at least 6 volts.
- Insert the new battery end first and lock it in place by closing the battery chamber cover.
- After changing the battery, check it as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Pentax Data Back FE runs on one 3 V coin-shaped lithium battery. The databack battery should be replaced annually, or as required by the data coordinator. Be sure to replace the battery only when film is not loaded.

- The battery compartment is located on the bottom of the camera back cover. To open the compartment, use a fingernail or small screwdriver and press down.
- The battery holder will pop out and can then be removed. Measure and record the voltage of the used battery.
- Remove the new battery from its packaging and test and record the voltage. The new battery should measure approximately 3 volts.
- Wait 15 seconds after removing the used battery and then load the new battery with the "+" side facing up.
- Slide the battery holder into the battery compartment until it locks in place.
- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

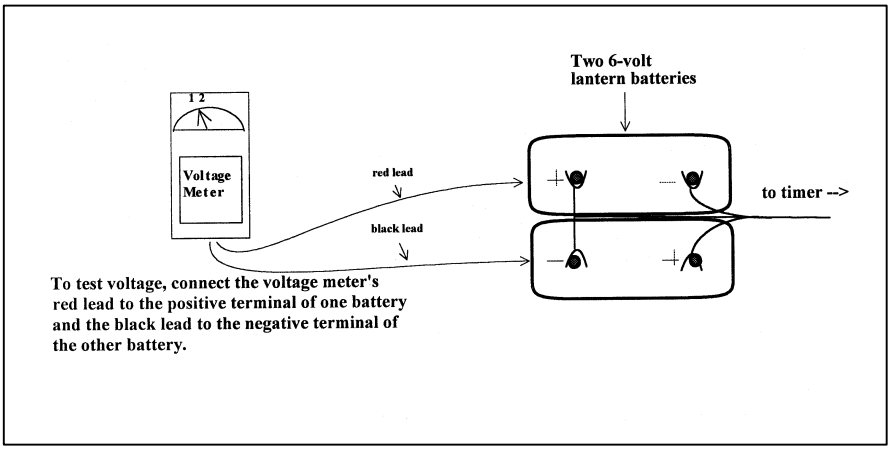

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

PENTAX PZ-20

The Pentax PZ-20 is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The automatic operation and aperture priority exposure mode provide properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Pentax PZ-20 are:

Main Switch	ON
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0.0
Program Mode Selection	A
Drive Mode Selector	☐ (single)
Lens Focus Mode	MF (manual)

REVIEW CAMERA SETTINGS

Press the **CAMERA SHUTTER** halfway to view the camera display panel. If the display does not appear, confirm that the main switch is set to "ON" and that the battery power level is sufficient. Verify all standard settings as they appear in Figure 4-8.

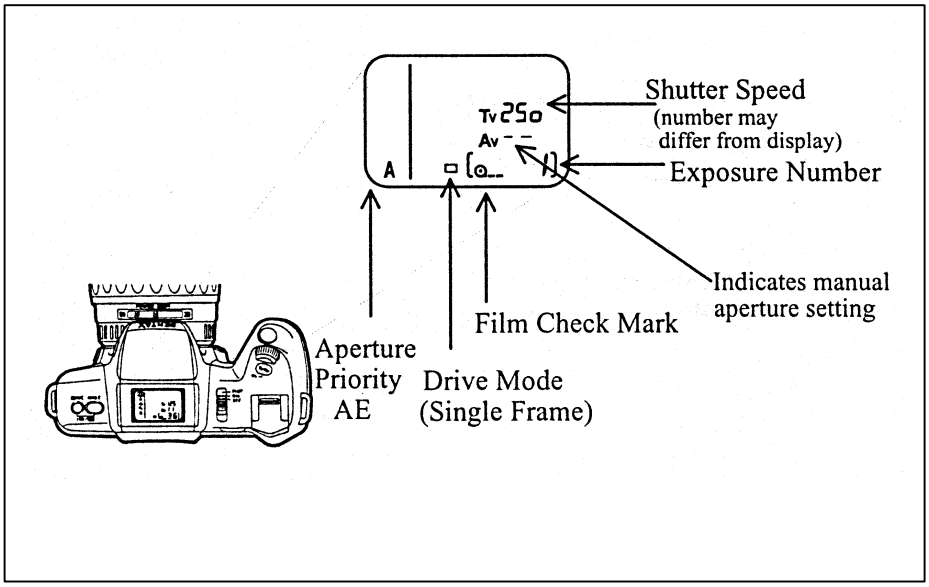

Figure 4-8. Pentax PZ-20 Display Panel.

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Pentax PZ-20 manufacturers' instruction booklet for detailed camera setting procedures.

PENTAX DATA BACK FE

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Pentax Data Back FE automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation, the Pentax Data Back FE should display the local date and time. Verify that the bar mark (-) appears above the minutes to ensure the databack is in the "IMPRINT" mode (Figure 4-9).

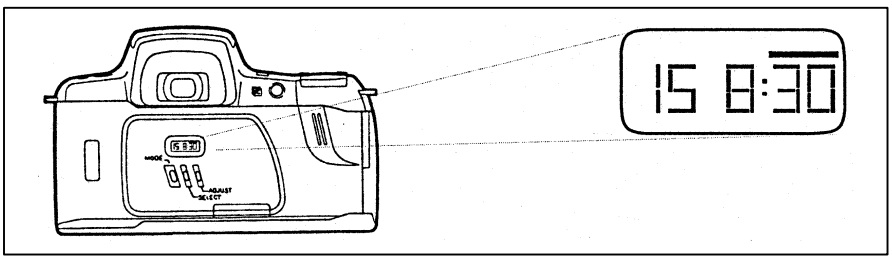

Figure 4-9. Pentax Data Back FE Displays.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

To set the Pentax Data Back FE:

- Press the **MODE** button until the "DAY/HOUR/MINUTE" mode is displayed.
- Press the **SELECT** button once -- the "HOUR display will flash.
- Press the **ADJUST** button until the correct hour is displayed. Constant pressure on the "ADJUST" button will rapidly advance the numbers.
- Press the **SELECT** button -- the "MINUTES" display will flash. Press the **ADJUST** button until the correct minutes are displayed.
- Press the **MODE** button four times until the "YEAR/MONTH/DAY" mode is displayed.
- Press the **SELECT** button -- the "YEAR" display will flash. Press the **ADJUST** button until the correct year is displayed.
- Press the **SELECT** button -- the "MONTH" display will flash. Press the **ADJUST** button until the correct month is displayed.
- Press the **SELECT** button -- the "DAY" display will flash. Press the **ADJUST** button until the correct day is displayed.
- Press the **MODE** button once to return to the "DAY AND TIME" mode. A bar mark (-) should appear in the upper right corner of the display. This indicates the databack is in the "IMPRINTING" mode. The databack should remain in this mode during regular operation.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule.
- 2 photographs/day = 15-17 day servicing schedule.

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

To set the timer clock:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the TIMER flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

To program times for photographs to be taken:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or
- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.
- The horizon is level.
- The vista is framed correctly.
- The sunshield and port are not visible in the viewfinder.
- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3340, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20.*

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-10) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3340.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____

Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-10. Photographic Monitoring Network Quality Assessment Log.

Air Resource
Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - PENTAX ZX-10**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3150**
DATE	**JANUARY 1999**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Karen K. Rosener	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Pentax ZX-10 35 mm camera system.

Routine servicing schedules are based on the number of photographs taken each day. Assuming a three-photograph per day schedule, site operators service the camera approximately every 10 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Automatic Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, the site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with his/her supervisor, the project manager, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera, databack, and timer batteries:
  - Pentax ZX-10: - two 3 V lithium batteries
  - Pentax Data Back: - one 3 V lithium battery
  - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*
  - TI 4120-3350, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*
  - Automatic 35 mm Camera System User's Manual
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film canister labels
- Ballpoint pen
- Grease pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3350, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10.*

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Pentax ZX-10 35 mm camera and Paragon EC72D automatic timer. Routine servicing procedures are summarized in the Automatic 35 mm Camera System User's Manual for the Pentax ZX-10 System, provided in the site operator's manual. Detailed schematic diagrams of the Pentax ZX-10 35 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided for reference in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Pentax ZX-10

- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3350.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking three photographs a day at 0900, 1200, and 1500. Assuming this schedule, site operators service the camera approximately every 10 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Remove camera.
- Verify that film advanced and settings are correct.
- Rewind and remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera and databack settings.
- Check timer settings.
- Photograph film documentation board.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheets:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
  - Describe visibility conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 35 mm databack batteries annually.
- Change 35 mm camera batteries every 6 months.
- Change 35 mm timer batteries every 6 months.

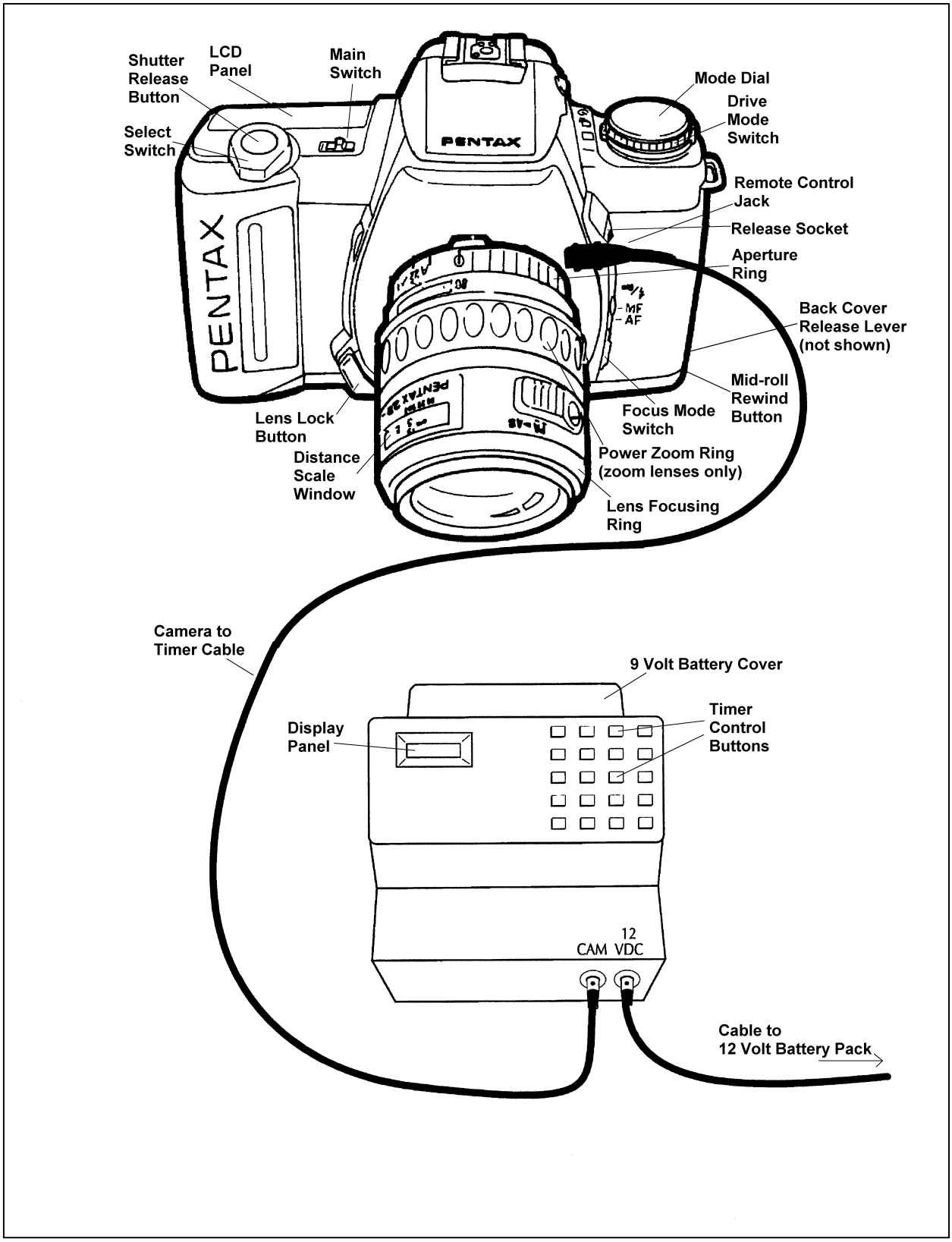

Figure 4-1. Pentax ZX-10 System Components.

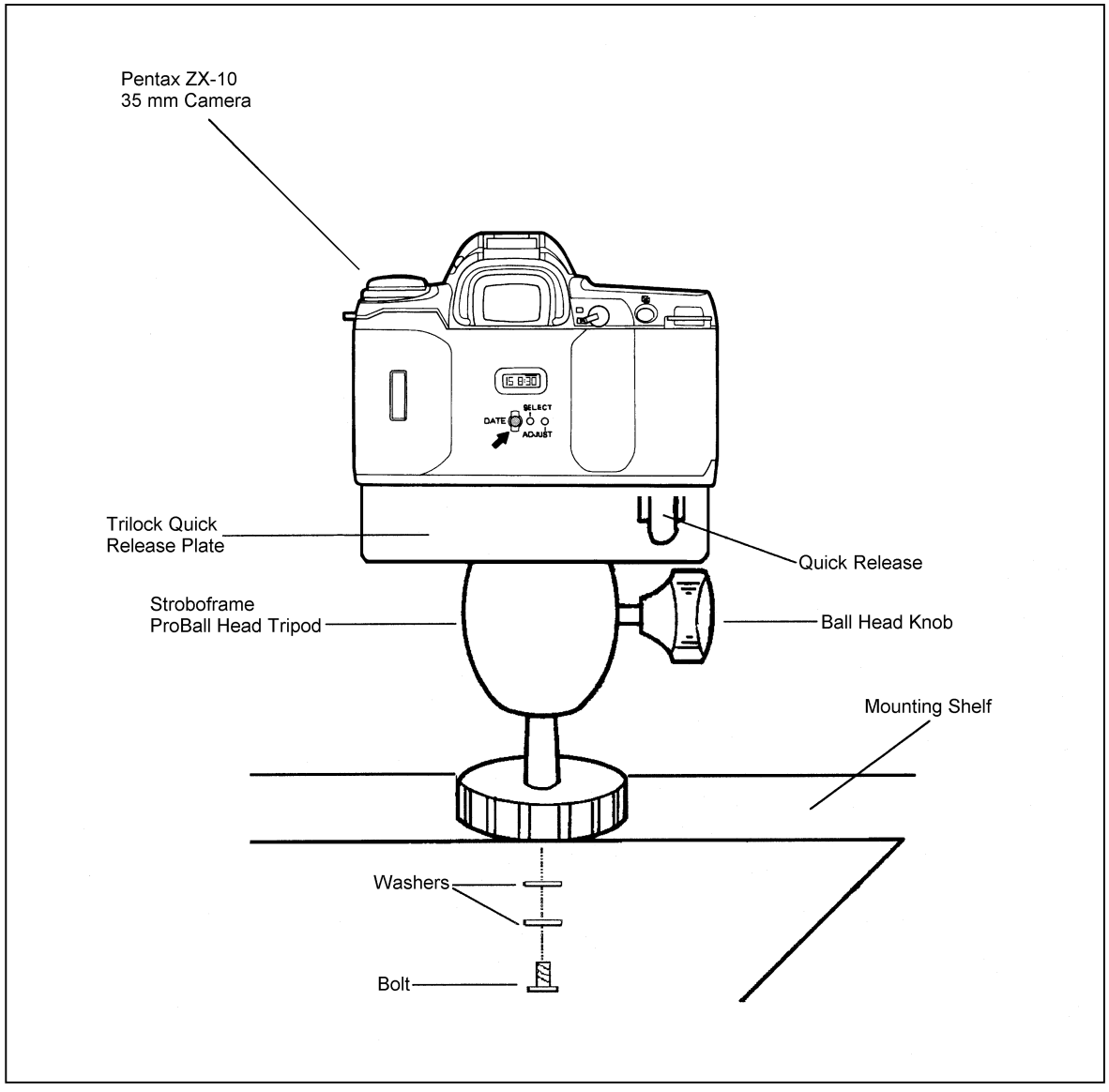

Figure 4-2. Automatic 35 mm Camera System Tripod Assembly.

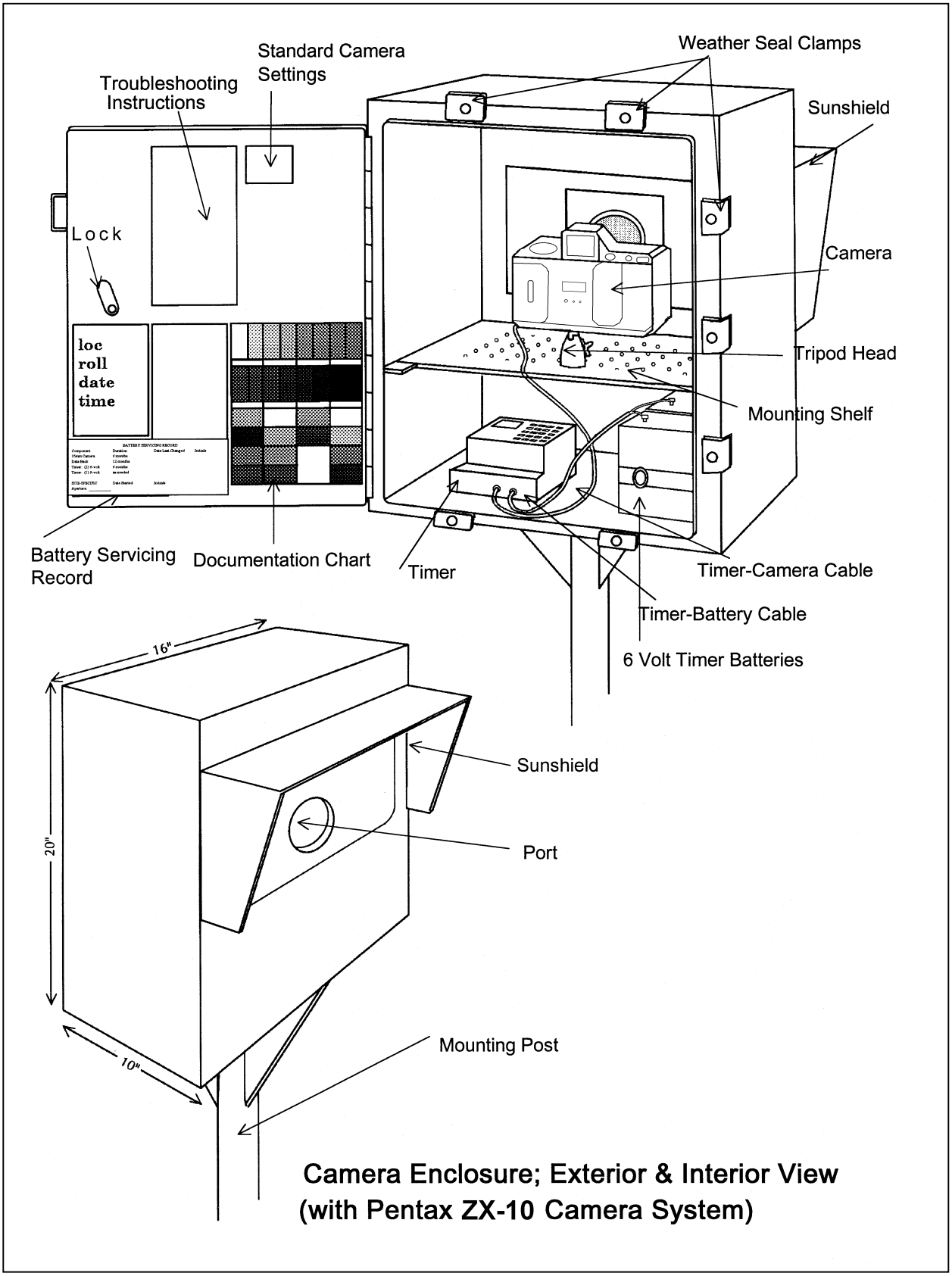

Figure 4-3. Automatic 35 mm Camera System Enclosure.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail the white original to the data coordinator with each roll of film. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
VISIBILITY CONDITIONS	Describe recent and current visibility conditions that may be useful in verifying qualitative photographic observations. Such conditions may include, but are not limited to: • Extremely clean • Regional haze • Layered haze

Location _____ Roll No. _____
Operator _____

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date_____ Time_____

Yes	No	
☐	☐	Batteries tested
☐	☐	Documentation photograph taken
☐	☐	Camera main switch (circle one) A(E0S) Off(0M2n) On(137MA) On(PZ-20) On(ZX-10) ☐ (167MT)
☐	☐	Aperture F8.0
☐	☐	IS0/ASA 64 (137MA ASA 100)
☐	☐	All other camera settings correct (refer to 35mm camera checklist)
☐	☐	Lens focus on infinity
☐	☐	Data back display correct
☐	☐	Timer clocks and alarms verified
☐	☐	Camera/timer cable secure
☐	☐	Camera alignment correct
☐	☐	Film advancing properly
☐	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED

Today's Date_____ Time_____

Yes	No	
☐	☐	Camera found in proper condition
☐	☐	Camera alignment correct
☐	☐	Film advanced as expected exposure count on _____
☐	☐	Camera main switch (circle one) A(E0S) Off(0M2n) On(137MA) On(PZ-20) On(ZX-10) ☐ (167MT)
☐	☐	Aperture F8.0
☐	☐	IS0/ASA 64 (137 MA ASA 100)
☐	☐	All other camera settings correct (refer to 35mm camera checklist)
☐	☐	Camera/timer cable secure
☐	☐	Timer found in proper condition
☐	☐	Film rewound correctly
☐	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

_____

_____

_____

Current % Cloud Cover_____ Temperature _____ _____ _____
Max Min

COMMENTS/ACTION TAKEN _____

_____

_____

_____

SUPPLIES NEEDED _____ _____

_____

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525 **970-484-7941**

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet for the Pentax ZX-10 Automatic Camera System.

Location FTCC Roll No. 45
Operator K. Rosener

AUTOMATIC CAMERA
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date 12/2/98 Time 10:15

Yes	No	
☑	☐	Batteries tested
☑	☐	Documentation photograph taken
☑	☐	Camera main switch (circle one) A(E0S) Off(0M2n) On(137MA) On(PZ-20) On(ZX-10) ☐ (167MT)
☑	☐	Aperture F8.0
☑	☐	IS0/ASA 64 (137MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)
☑	☐	Lens focus on infinity
☑	☐	Data back display correct
☑	☐	Timer clocks and alarms verified
☑	☐	Camera/timer cable secure
☑	☐	Camera alignment correct
☑	☐	Film advancing properly
☑	☐	Enclosure door locked and door seal clamps tightened

FILM REMOVED

Today's Date 12/10/98 Time 9:30

Yes	No	
☑	☐	Camera found in proper condition
☑	☐	Camera alignment correct
☑	☐	Film advanced as expected exposure count on 30
☑	☐	Camera main switch (circle one) A(E0S) Off(0M2n) On(137MA) On(PZ-20) On(ZX-10) ☐ (167MT)
☑	☐	Aperture F8.0
☑	☐	IS0/ASA 64 (137 MA ASA 100)
☑	☐	All other camera settings correct (refer to 35mm camera checklist)
☑	☐	Camera/timer cable secure
☑	☐	Timer found in proper condition
☑	☐	Film rewound correctly
☑	☐	Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll Sunny and cold

Current % Cloud Cover 10 % Temperature 37 (Now) 45 (Max) 25 (Min)

COMMENTS/ACTION TAKEN Manual Shot taken after doc chart photo

SUPPLIES NEEDED Back-up 6 V. timer batteries

Mail white copy and 35mm film to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive
Suite E
Fort Collins, Colorado 80525 970-484-7941

Figure 4-5. Completed Example of an Automatic Camera Visibility Monitoring Status/Assessment Sheet.

- Plumes
- Severity of haze
- Emission source activity (e.g., nearby forest fires, controlled burns, construction, dusty roads, residential wood burning, etc.)
- Any perceptible odors (e.g., wood smoke)

COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	List any servicing supplies or documentation materials required for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect the outside of the enclosure window for dirt and clean if necessary.
VERIFY CAMERA ALIGNMENT	The camera alignment must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA /TIMER CABLES	Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems, including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
REMOVE CAMERA	Push the **QUICK RELEASE** lever on the tripod plate and lift the camera off the mount. Disconnect the camera/timer cable from the timer at the timer jack and remove the camera from the enclosure.
DOCUMENT EXPOSURE NUMBER COUNT	The frame counter indicates if the film advanced properly and how many photographs were taken during the monitoring period. Document whether the film advanced correctly and the observed exposure count number. Report any discrepancies promptly to ARS. If the film is already rewound, the film-load check mark will be flashing (⊸). Assume all 36 exposures were taken and document as such.

VERIFY SETTINGS

Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality photographs). Correct any inconsistencies.

REWIND FILM

Observe the film-load check mark ( ) on the display panel:

- If flashing, the film was automatically rewound after the last frame was exposed.
- If the roll of film has not been completely exposed, depress the **AUXILIARY REWIND** button with the protruding section of the camera strap buckle or the tip of a ballpoint pen. (The camera main switch must be in the "ON" position).

During rewind, the film-load check mark ( ) will flash and the exposure counter counts frame numbers in reverse. The film rewind stops automatically when the film has been completely rewound. Do not open the back until the film-load check mark flashes.

REMOVE FILM AND COMPLETE CANISTER LABEL

Remove exposed film from the camera and place it in the most recently labeled plastic canister. Complete the film canister label by writing in the current date and time.

Inspect film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the DX film contacts or shutter curtain.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found.
- All servicing or maintenance actions performed.
- Current and recent weather conditions.
- Current and recent visibility conditions.

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CANISTER

The film canister label identifies the contents of each roll of film. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the plastic film canister. Fill out a film canister label with the following information and attach it to the outside of the plastic canister:

- Monitoring site abbreviation
- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To open the camera back, push the **BACK COVER LATCH** down. The Pentax ZX-10 loads the film automatically if the following steps are carefully taken:

- Remove the film cartridge from the plastic film canister, open the camera back, and insert the film cartridge into the film chamber, lower protruding end first.
- Pull the film leader across the shutter curtain until it is aligned with the orange film leader mark and the tip is positioned under the film retainer.
- Make sure the film has no slack and that its perforations are properly engaged with the sprocket teeth.
- Firmly close the camera back cover. The film will automatically advance and stop when (1) appears in the display panel.

  NOTE: If the film is not loaded correctly, the film transport symbol (E) will flash after the camera motor has stopped and the shutter will not release. Open the back cover and reload the film.

Store the empty, labeled plastic film canister inside the camera enclosure until the film is removed.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not remove the lens from the camera body or attempt to clean inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

PHOTOGRAPH DOCUMENTATION BOARD

The first exposure on every roll must be of the documentation board which contains the gray scale, color chart, battery servicing record, and pertinent data collection information (Figure 4-6).

- Write the following on the note pad provided:
  - Monitoring site name or abbreviation
  - Roll number
  - Date and time
- Adjust your position and turn the focus ring to achieve a close-up, sharply focused photograph.
- Press the **SHUTTER BUTTON.** Verify that the film counter has incremented one frame.
- Reset the focus ring to infinity.

The documentation chart should be evenly lit for the photograph. The board is mounted to the enclosed door with Velcro tabs and may be temporarily removed if proper lighting conditions are not possible in its normal position. You may have to shift your position slightly to find a spot where there is no glare from the sun on the board.

CHECK CAMERA BATTERY

Observe the display panel. If a battery symbol (▭) appears in the display directly above the aperture priority indicator (**Av**) the level of battery power is:

- (▭) - nearly exhausted, replace with new battery
- (▭) flashing - very low, shutter will not release, replace with new battery
- blank display - drained, replace with new battery

If required, change the camera's two 3 V lithium batteries and retest the system. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Report any problems promptly to ARS.

Camera battery change procedures are described further in Section 4.2.2.

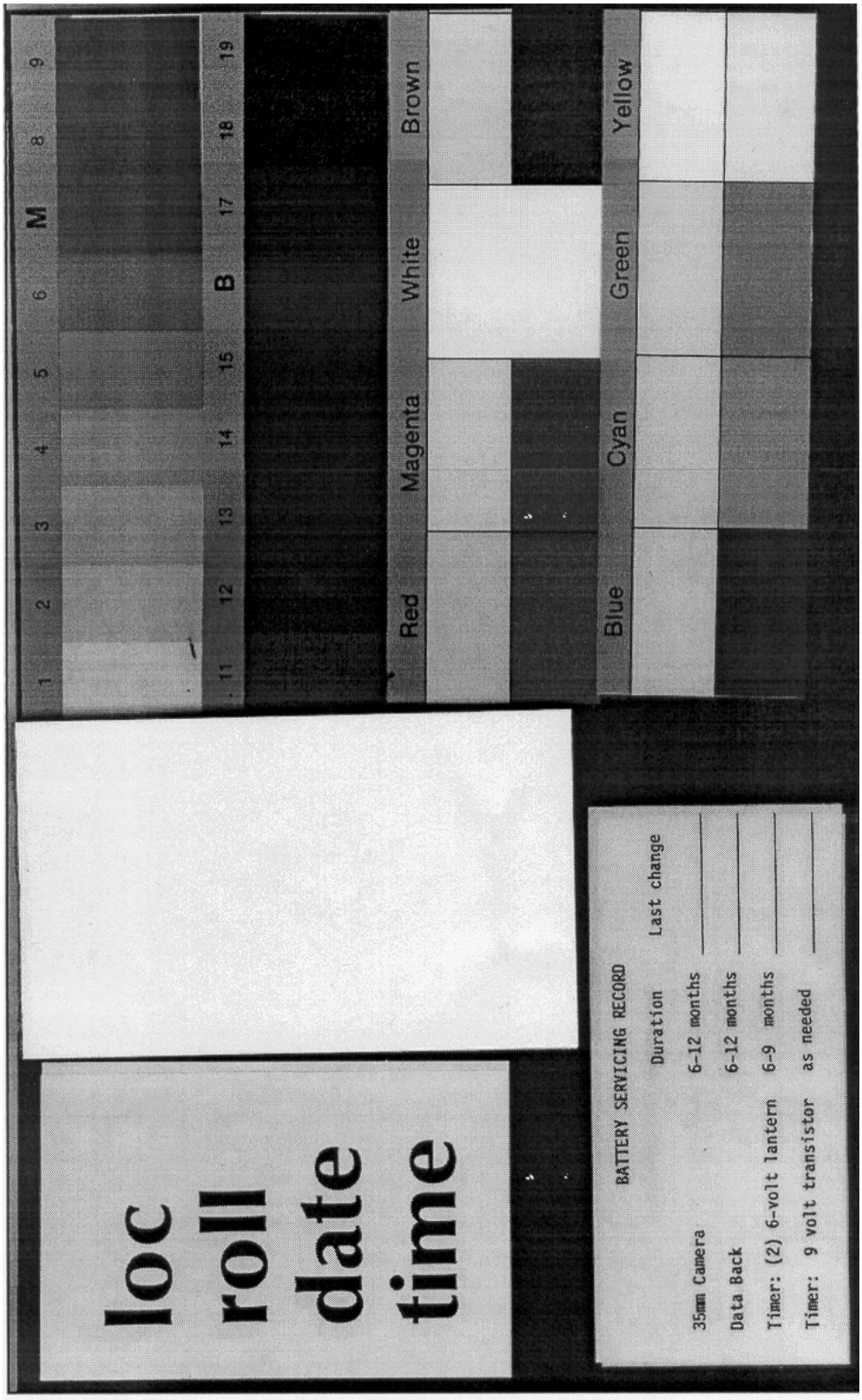

Figure 4-6. Photographic Documentation Board.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Pentax ZX-10 are:

Main Switch	ON
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0.0
Mode Dial	Pict
Drive Mode Selector	□ (single)
Lens Focus Mode	MF (manual)

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door and in the Automatic 35 mm Camera System User's Manual provided in the site operator's manual.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK DATABACK SETTING AND BATTERIES

The databack should be in the "day-time" mode displaying the current day of the month and current time, with the bar mark (¯) displayed directly above the minutes.

If the display is blank, the databack battery is drained. Replace the batteries only when the film is not loaded. Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and "battery servicing record" portion of the documentation chart. Reset the databack for the current date and time.

Databack setting and programming instructions, as well as battery change procedures are described further in Section 4.2.

CHECK TIMER SETTINGS

Review timer display:

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon should be flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review.

- Press **E** repeatedly to review each event. In normal operation, Event 1 (E:01) is 0900, Event 2 (E:02) is 1200, and Event 3 (E:03) is 1500. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If a photograph was scheduled to occur while you were reviewing or programming information, the photograph was not taken.

REPLACE AND ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Mount the camera on the tripod head.
- Securely reconnect the camera/timer cable to the timer at the timer jack.
- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment photograph is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera remote jack. If the camera fires, an electrical short may exist in a portion of the cable jack(s).

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED	Document any servicing or maintenance actions performed during the film loading process. Place the completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.
CLOSE AND SECURE ENCLOSURE	Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the camera enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding roll of film in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3350, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10.*

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of:

- Camera battery changes (every six months)
- Databack battery changes (annually)
- Timer battery changes (every six months)

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Replacement databack batteries are provided annually. Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera, databack, and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Pentax ZX-10 are provided in TI 4120-3350, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10.*

4.2.1 Film and Film Storage

Only Kodachrome 64 slide film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each roll of film has an emulsion number and expiration date. This information must be documented on the canister label of each exposed film roll (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA BATTERY CHANGE

The Pentax ZX-10 camera runs on two 3 V lithium batteries. These batteries should be replaced every six months or as directed by the data coordinator.

- Open the battery chamber cover by turning the cover lock with a coin to the “open” position.
- Turn the camera upright and allow the batteries to slide out of the compartment. Measure and record the voltage of the used batteries.
- Remove the new batteries from their packaging and test and record the voltage. The new batteries should measure at least 3 volts each.
- Insert the new batteries and lock them in place by turning the battery chamber cover to the “close” position.
- After changing the batteries, check them as described in Section 4.1.3.

DATABACK BATTERY CHANGE

The Pentax Data Back runs on one 3 V coin-shaped lithium battery. The databack battery should be replaced annually, or as required by the data coordinator. Be sure to replace the battery only when film is not loaded.

- The battery compartment is located on the inside of the camera back cover. To open the compartment, use a small Phillips screwdriver and remove the screw on the battery chamber cover.
- Remove the battery. Measure and record the voltage of the used battery.
- Remove the new battery from its packaging and test and record the voltage. The new battery should measure approximately 3 volts.
- Wait 15 seconds after removing the used battery and then load the new battery with the "+" side facing up.
- Replace the battery chamber cover and tighten the fixing screw.
- Check the display and reset the databack for the current date and time as described in Section 4.1.3.

TIMER BATTERY VERIFICATION AND CHANGES

The Paragon EC72D timer runs on two 6 V lantern batteries. If this power source is low or removed, the output will de-energize, but the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire. The timer automatically returns to the "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-7):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-7. The measurement should be approximately 12 volts.

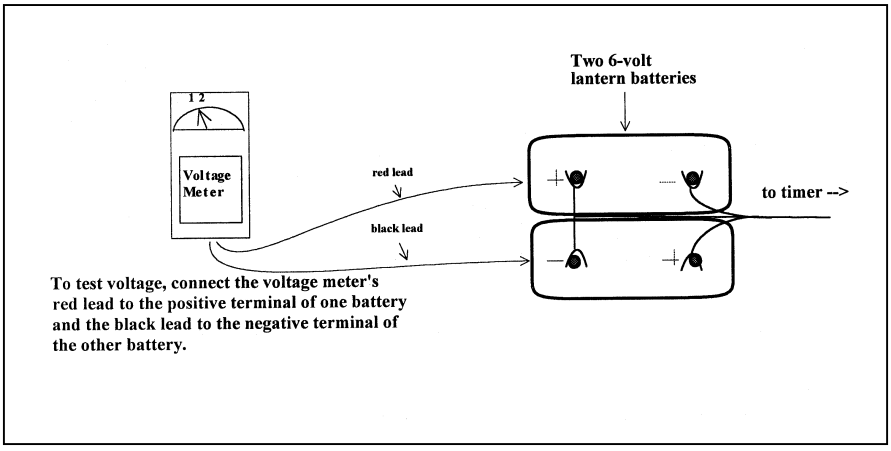

Figure 4-7. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If the clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet and battery servicing record portion of the documentation chart. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

PENTAX ZX-10

The Pentax ZX-10 is a rugged, reliable 35 mm camera equipped with an automatic film winder and remote control terminal. The automatic operation and aperture priority exposure mode provide properly exposed photographs under remote automatic monitoring conditions.

Standard settings for the Pentax ZX-10 are:

Main Switch	ON
Aperture	f8.0
ISO/ASA	64
Exposure Compensation	0.0
Mode Dial	Pict
Drive Mode Selector	☐ (single)
Lens Focus Mode	MF (manual)

REVIEW CAMERA SETTINGS

Press the **CAMERA SHUTTER** halfway to view the camera display panel. If the display does not appear, confirm that the main switch is set to "ON" and that the battery power level is sufficient. Verify all standard settings as they appear in Figure 4-8.

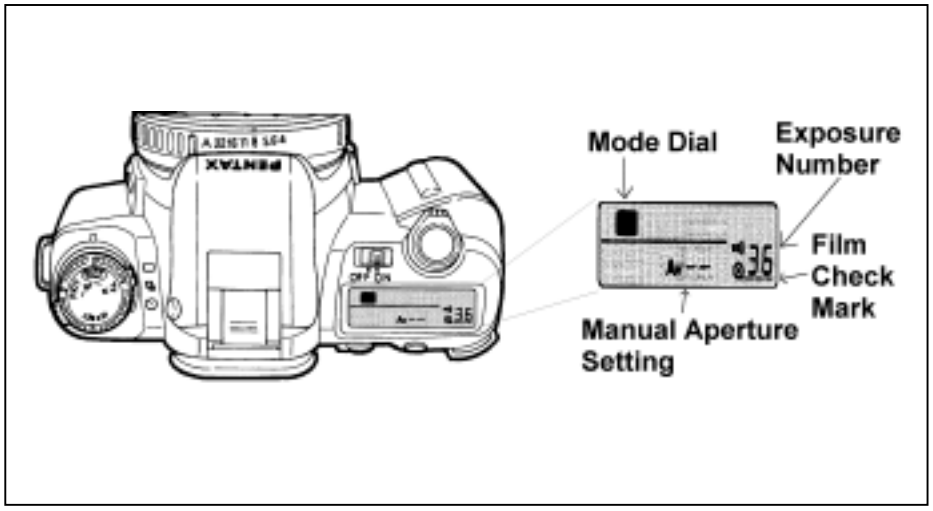

Figure 4-8. Pentax ZX-10 Display Panel.

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each roll of film that the setting is in effect.

Refer to the Pentax ZX-10 manufacturers' instruction booklet for detailed camera setting procedures.

PENTAX DATA BACK FE

The date and time that a visibility monitoring photograph was taken is vital information for analysis. The Pentax Data Back FE automatically imprints selected data on the film.

REVIEW DATABACK SETTINGS

During regular operation, the Pentax Data Back should display the local date and time. Verify that the bar mark (¯) appears above the minutes to ensure the databack is in the "IMPRINT" mode (Figure 4-9).

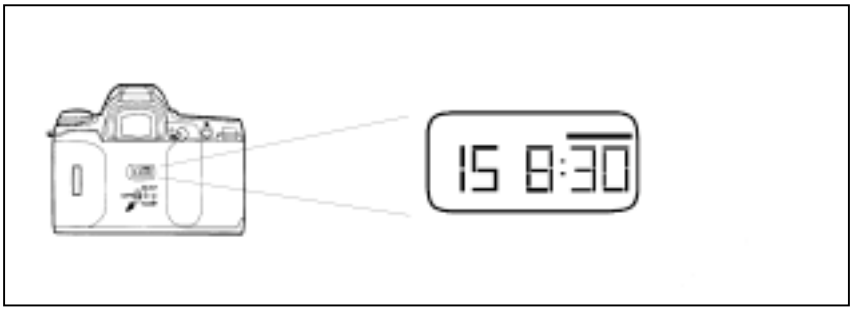

Figure 4-9. Pentax Data Back Displays.

NOTE: Standard/Daylight Savings Time Changes: Every spring and fall it will be necessary to change the databack clock to correspond with local standard or local daylight time. The data coordinator will provide a reminder postcard to document changes made.

To set the Pentax Data Back (use the protruding tip of the camera strap buckle):

- Press the **DATE** button until the "DAY/HOUR/MINUTE" mode is displayed.
- Press the **SELECT** button once -- the "HOUR display will flash.
- Press the **ADJUST** button until the correct hour is displayed. Constant pressure on the "ADJUST" button will rapidly advance the numbers.
- Press the **SELECT** button -- the "MINUTES" display will flash. Press the **ADJUST** button until the correct minutes are displayed.
- Press the **DATE** button four times until the "YEAR/MONTH/DAY" mode is displayed.
- Press the **SELECT** button -- the "YEAR" display will flash. Press the **ADJUST** button until the correct year is displayed.
- Press the **SELECT** button -- the "MONTH" display will flash. Press the **ADJUST** button until the correct month is displayed.
- Press the **SELECT** button -- the "DAY" display will flash. Press the **ADJUST** button until the correct day is displayed.
- Press the **DATE** button once to return to the "DAY AND TIME" mode. A bar mark (-) should appear in the upper right corner of the display. This indicates the databack is in the "IMPRINTING" mode. The databack should remain in this mode during regular operation.

PARAGON EC72D TIMER

The Paragon automatic timer is normally programmed for three photographs a day at 0900, 1200, and 1500. If necessary, alternate sampling schedules can be programmed for 1 to 32 user-selected photographs a day.

Routine servicing schedules are based on the number of photographs taken.

- 3 photographs/day = 10-11 day servicing schedule.

- 2 photographs/day = 15-17 day servicing schedule.

- 1 photograph/day = 30-33 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday = 1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D TIMER

To set the timer clock:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" is displayed, with a colon and "1" flashing. Press **CLK**; the flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., 1015 = 10:15 a.m.) Press one key for the current date of the week; (1 = Sunday . . . 7 = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1". Press two keys for the current month and two keys for the current date (e.g., 0615 = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984". Press two keys for the current year (e.g., 90). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day of week will be displayed with the colon flashing.

To program times for photographs to be taken:

- Press **PRG** to enter "program" mode.

- Press **C1** to select Channel 1 for programming; "E:01" (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., 0900 for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- The next event slot will be displayed (e.g., E:02). Repeat the step immediately above for each time of the day a photograph should be taken.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

NOTE: If more than 16 photographs per day are desired, Channel 2 may be used to program up to 16 additional events provided the Channel 2 output terminals have also been wired to the camera.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each photograph is compared to others of the same view during analysis. Therefore, alignment must remain constant from one roll of film to the next.

A 3" x 5" site alignment photograph is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or
- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.
- The horizon is level.
- The vista is framed correctly.
- The sunshield and port are not visible in the viewfinder.
- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3350, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10.*

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed with each roll of film. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Missing or improperly exposed documentation chart photographs
- Improper film loading or rewinding
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Weak or missing databack imprinting
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-10) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3350.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____
Operator: _____
From: _____

PROBLEM DESCRIPTION:

_____
_____
_____
_____

ACTION REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____

CORRECTIVE ACTION TAKEN (to be completed by site operator):

_____
_____
_____
_____
_____
_____

Date: _____ Operator: _____

Return Yellow Copy To:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Figure 4-10. Photographic Monitoring Network Quality Assessment Log.

Air Resource
Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 8 MM AUTOMATIC CAMERA SYSTEM - MINOLTA XL 401/601**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3200**
DATE	**JANUARY 1994**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
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OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Minolta XL 401/601 8 mm camera system.

Routine servicing schedules are based on the interval setting and number of hours photographed each day. Assuming an eight-hour per day schedule at 60-second intervals, site operators service the camera approximately every 6 to 7 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets, and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with the project manager, the site operator's supervisor, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera and timer batteries:
  - Minolta XL 401/601 - two 6 V lantern batteries
  - Paragon EC72D - one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3200, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*
  - TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for Automatic Camera System - Minolta XL 401/601*
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film cartridge labels
- Pen or pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for Automatic Camera System - Minolta XL 401/601*.

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Minolta XL 401/601 8 mm camera and Paragon EC72D automatic timer. Detailed schematic diagrams of the Minolta XL 401/601 8 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Minolta XL 401/601 Owners Manual

- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Camera System - Minolta XL 401/601*.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking photographs at 60-second intervals for 8 hours a day (e.g., 0800 - 1600). Assuming this schedule, site operators service the camera approximately every 6 to 7 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail it to the data coordinator with each film cartridge. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Verify that film advanced and settings are correct.
- Remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera settings.
- Check timer settings.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheet:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/ Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 8 mm camera and timer batteries every 6 months.

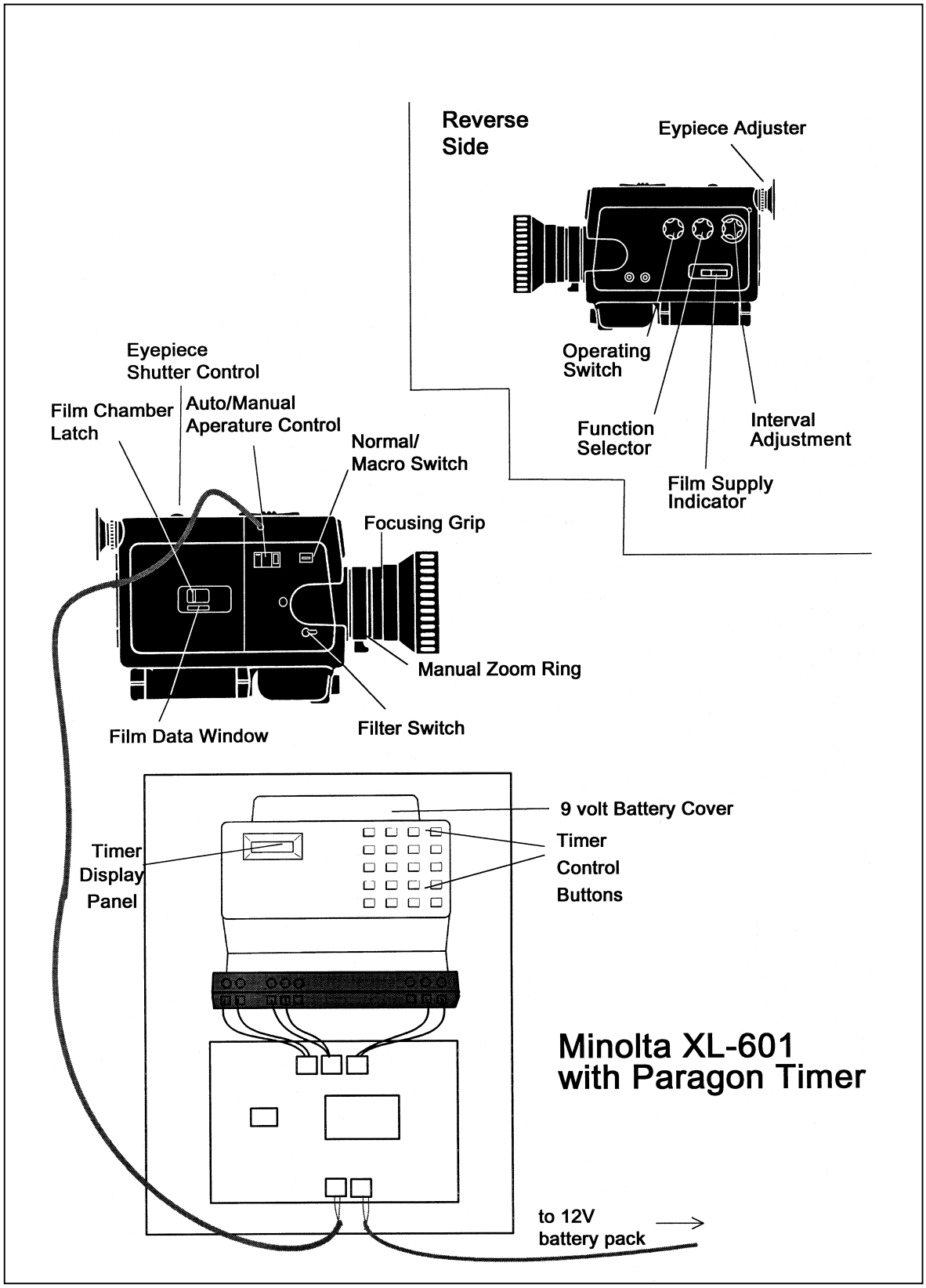

Figure 4-1. Minolta XL 401/601 System Components.

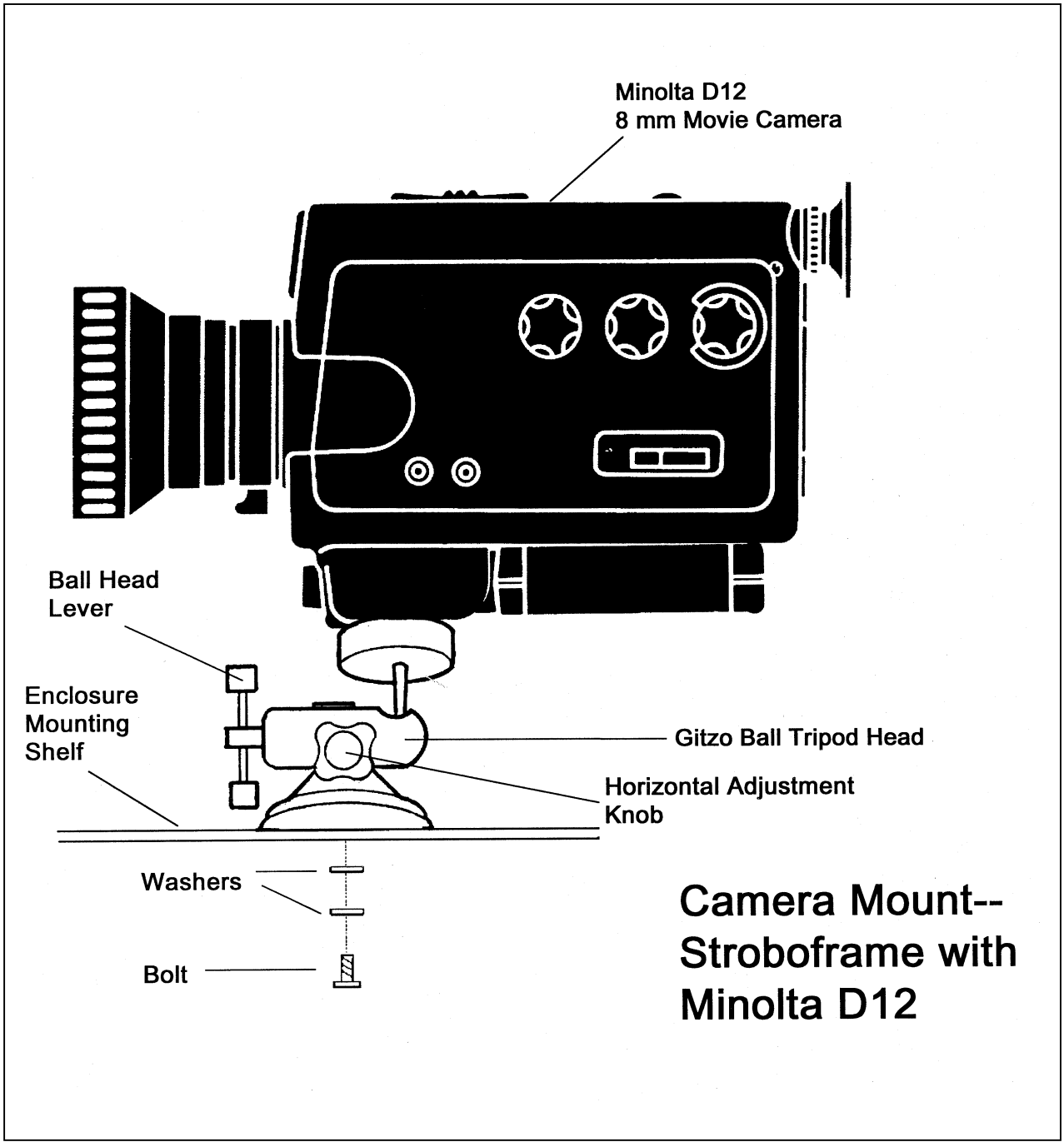

Figure 4-2. Automatic 8 mm Camera System Tripod Assembly.

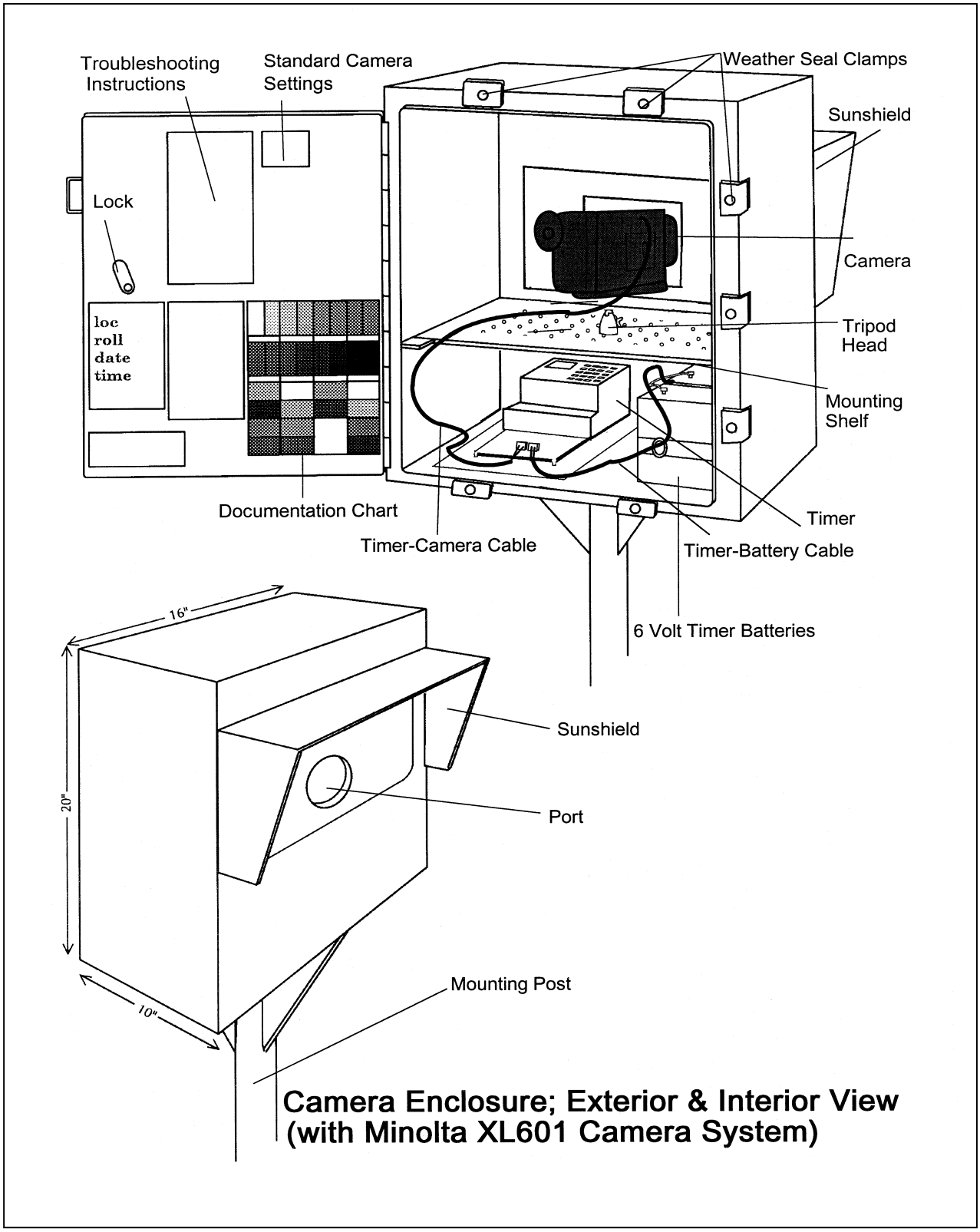

Figure 4-3. Automatic 8 mm Camera System Enclosure.

Location: _____ Roll No.: _____
Operator: _____

8 MM TIME-LAPSE CAMERA VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED **FILM REMOVED**

Today's Date: _____ Time: _____ Today's Date: _____ Time: _____

Yes	No		Yes	No	
___	___	Label Film Cartridge	___	___	Enclosure Found in Proper Condition (clean window if necessary)
___	___	Load Film:			
___	___	Lens Inspected	___	___	Camera Alignment Correct
___	___	Camera Settings Verified:	___	___	Camera and Timer Found in Proper Condition
		Normal/Macro Switch – NORMAL			
		Aperture Switch - AUTO	___	___	Exposure Count (record fraction):
		Filter Switch –DAYLIGHT			¼, ½, ¾, F) _____
		Function Switch - INTERVALOMETER	___	___	Camera Settings Verified:
		Interval Adjustment I			Normal Macro Switch - NORMAL
		- 60 second position (recommended)			Aperture Switch - AUTO
		Function Switch – INTERVALOMETER			Filter Switch - DAYLIGHT
		Zoom Magnification			Function Switch-INTERVALOMETER
		- At prescribed site-specific setting			Interval Adjustment
		Focus - ∞ (Infinity)			- 60 second position (recommended)
___	___	Verify Timer Settings			Zoom Magnification
___	___	Focus - ∞ (Infinity)			- at prescribed site-specific setting
___	___	Camera Aligned			Focus - ∞ (Infinity)
___	___	Verify Camera and Timer are Working Properly	___	___	Film cartridge label completed
___	___	Enclosure Secure			

DESCRIBE GENERAL WEATHER CONDITIONS _____
_____

Temperature _____ _____ _____ % Cloud Cover _____
(F) Now Max Min

COMMENTS/ACTION TAKEN _____
_____

SUPPLIES NEEDED: _____

Enclose this Status/Assessment Sheet with the 8 mm movie film and send to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Visibility Monitoring Status/Assessment Sheet for Minolta XL 401/601 8 mm Camera System.

Location: VOYB Roll No.: 23
Operator: Steve Blair

8 MM TIME-LAPSE CAMERA VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date: 7/20/93 Time: 13:05

Yes	No	
x		Label Film Cartridge
x		Load Film:
x		Lens Inspected
x		Camera Settings Verified:
		Normal/Macro Switch - NORMAL
		Aperture Switch - AUTO
		Filter Switch –DAYLIGHT
		Function Switch - INTERVALOMETER
		Interval Adjustment
		- 60 second position (recommended)
		Function Switch – INTERVALOMETER
		Zoom Magnification
		- At prescribed site-specific setting
		Focus - ∞ (Infinity)
x		Verify Timer Settings
x		Focus - ∞ (Infinity)
x		Camera Aligned
x		Verify Camera and Timer are Working Properly
x		Enclosure Secure

FILM REMOVED

Today's Date: 7/26/93 Time: 10:40

Yes	No	
x		Enclosure Found in Proper Condition (clean window if necessary)
x		Camera Alignment Correct
x		Camera and Timer Found in Proper Condition
x		Exposure Count (record fraction): ¼, ½, ¾, F)
x		Camera Settings Verified:
		Normal Macro Switch - NORMAL
		Aperture Switch - AUTO
		Filter Switch - DAYLIGHT
		Function Switch - INTERVALOMETER
		Interval Adjustmentl
		- 60 second position (recommended)
		Zoom Magnification
		- at prescribed site-specific setting
		Focus - ∞ (Infinity)
x		Film cartridge label completed

DESCRIBE GENERAL WEATHER CONDITIONS Mostly cloudy, wind out of the south at 10 mph

Temperature (F) 76 Now 85 Max 56 Min % Cloud Cover 70

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED: 8mm film

Enclose this Status/Assessment Sheet with the 8 mm movie film and send to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-5. Completed Example of a Visibility Monitoring Status/Assessment Sheet for Minolta 401/601 8 mm Camera System.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	Request any servicing supplies or documentation materials necessary for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

OPEN ENCLOSURE	Open the enclosure by loosening the weather-tight clamps and unlocking the latch.
INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect outside of enclosure window for dirt and clean if necessary. Document any abnormal accumulations.

VERIFY CAMERA ALIGNMENT

The camera alignment and zoom magnification must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.

VERIFY CAMERA/ TIMER CABLES

Listen for the shutter click and verify that the interval between clicks is correct. Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.

DOCUMENT CARTRIDGE EXPOSURE

The film supply indicator shows if the film advanced properly and how much of the film cartridge was exposed during the monitoring period. Document whether the film advanced correctly and the observed cartridge exposure. Report any discrepancies promptly to ARS.

VERIFY SETTINGS

Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality frame exposures). Correct any inconsistencies.

REMOVE FILM AND COMPLETE CARTRIDGE LABEL

Open the film chamber cover by pulling the **COVER LATCH** to the rear. Swing open the cover door and remove the exposed film cartridge from the camera. Complete the film cartridge label by writing in the current date and time.

Inspect the film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles.

COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET

Document:

- Any equipment or monitoring discrepancies found
- All servicing or maintenance actions performed
- Current and recent weather conditions

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CARTRIDGE

The film cartridge label identifies the contents of each film cartridge. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the packaging. Fill out a film cartridge label with the following information and attach it to the labeled side of the film cartridge:

- Monitoring site abbreviation
- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To load film:

- Open the film chamber cover.
- Insert the film cartridge into the film chamber with the labeled side out. Angle the cartridge into the camera from the rear and push down on the rear edge of the cartridge until it is seated flat in the compartment with a click.
- Close the cover and push until it clicks.
- Check the film view window for the film type display.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not attempt to clean the inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Minolta XL 401/601 are:

Normal/Macro Switch	NORMAL
Aperture Switch	AUTO
Filter Switch	DAYLIGHT (filter in position)
Function Switch	INTERVALOMETER
Interval Adjustment	60-second position (recommended)
Zoom Magnification	At prescribed site-specific setting
Focus	∞ (Infinity)

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK TIMER SETTINGS

Review timer display:

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review. In normal operation, Event 1 (E:01) is set at the desired starting time.
- Press **C2** to select Channel 2 for review. In normal operation, Event 1 (E:01) is set at the desired stopping time. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If the timer check occurs during operating hours, press **C1** to resume filming.

ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Look through the viewfinder and align the camera on the vista to be photographed.
- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment print is provided in the camera enclosure for reference).
- Firmly tighten all levers on the tripod head and recheck the alignment.
- Set the eyepiece shutter control to the "C" (closed) position.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- Press **C1**; the camera should fire at the set interval. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera. If the camera does not fire at the set interval, the cable might be malfunctioning.

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED

Document any servicing or maintenance actions performed during the film loading process. Place a completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems.

CLOSE AND SECURE ENCLOSURE

Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the site enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding film cartridge in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialist, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone:	970/484-7941
Fax:	970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Camera System - Minolta XL 401/601*.

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of camera and timer battery changes (every six months).

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Minolta XL 401/601 are provided in TI 4120-3400.

4.2.1 Film and Film Storage

Only Kodachrome 40 color movie film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each film cartridge has an emulsion number and expiration date. This information must be documented on the cartridge label of each exposed film cartridge (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA/TIMER BATTERY VERIFICATION AND CHANGES

The Minolta XL 401/601 8 mm camera and Paragon EC72D timer board run on two 6 V lantern batteries. If this power source is low or removed, the output from the board to the camera and timer will de-energize. However, the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire at the set interval. The timer automatically returns to "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-6):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.

- Measure the voltage of the new batteries as shown in Figure 4-6. The measurement should be approximately 12 volts.

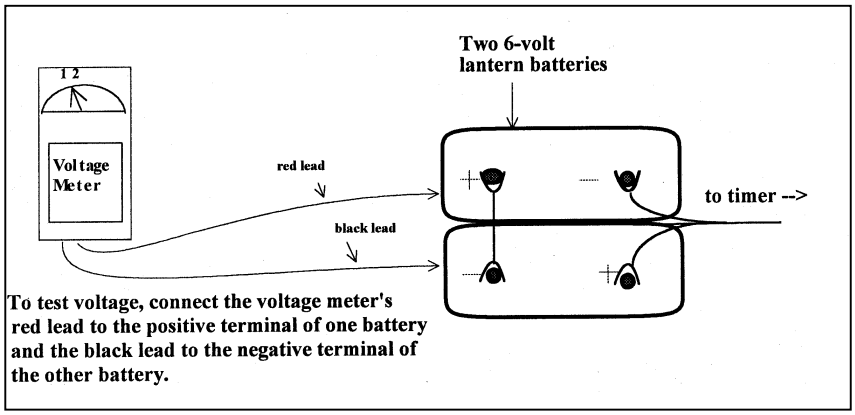

Figure 4-6. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

MINOLTA XL 401/601

The Minolta XL 401/601 is a rugged, reliable 8 mm camera equipped with an intervalometer for time-lapse filming. The internal camera batteries have been bypassed with internal wiring that can be directly connected to the timer board terminal block marked "camera." The wires must be inserted into the proper (positive (+) and negative (-)) position.

Standard settings for the Minolta XL 401/601 are:

Normal/Macro Switch	NORMAL
Aperture Switch	AUTO
Filter Switch	DAYLIGHT (filter in position)
Function Switch	INTERVALOMETER
Interval Adjustment	60-second position (recommended)
Zoom Magnification	At prescribed site-specific setting
Focus	∞ (Infinity)

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each film cartridge that the setting is in effect.

Zoom capabilities for the Minolta XL 401 or 601 can be changed between wide angle (8.5 or 7.5 mm respectively) to telephoto (34 or 45 mm respectively). A setting of 13 mm is approximately equivalent to a 50 mm lens field of view on a 35 mm camera.

The recommended time-lapse interval is 60 seconds. This allows for 60 hours of time on a 50-foot roll of film.

Refer to the Minolta XL 401/601 manufacturer's manual for detailed camera setting procedures.

Document any setting changes made that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

PARAGON EC72D TIMER

The Paragon automatic timer is often programmed for eight hours a day. Alternate sampling schedules can be programmed for any desired number of hours per day.

Routine servicing schedules are based on the number of hours photographs are taken. Assuming a 60-second time-lapse interval, the following servicing schedules are recommended:

- 8 hours daily monitoring = 6-7 day servicing schedule.
- 10 hours daily monitoring = 5-6 day servicing schedule.
- 12 hours daily monitoring = 4-5 day servicing schedule.
- 14 hours daily monitoring = 3-4 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday =1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

To set the timer clock:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" TIMERis displayed, with a colon and "1" flashing. Press **CLK**; the flashing stops.

- Using the 24-hour clock format, press four keys for the current time (e.g., **0915** = 09:15 a.m., **2330** = 11:30 p.m.). Press one key for the current date of the week; (**1** = Sunday . . . **7** = Saturday). Press **E** to enter.

- "101" is displayed, indicating "January 1." Press two keys for the current month and two keys for the current date (e.g., **0615** = June 15). Press **E** to enter.

- "84" is displayed, indicating "1984." Press two keys for the current year (e.g., **90**). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day-of-week will be displayed with the colon flashing.

To program times for photographs to be taken:

- Press **PRG** to enter "PROGRAM" mode.

- Press **C1** to select Channel 1 for programming. The starting time and E:01 (for the first event) is displayed.

- Press four keys for the time the first photograph should be taken (e.g., **0900** for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- Press **C2** to select Channel 2 for programming the ending time. "E:01" is displayed.

- Press four keys for the time the first photograph should be taken (e.g., **1700** for 5:00 p.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each film cartridge is compared to others of the same view during analysis. Therefore, alignment must remain constant from one film cartridge to the next.

A 3" x 5" site alignment print is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or
- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.
- The horizon is level.
- The vista is framed correctly (proper zoom factor).
- The sun shield and port are not visible in the viewfinder.
- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*.

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed to ARS with each film cartridge. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Improper film loading
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-7) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3400, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____
Operator: _____
From: _____

PROBLEM DESCRIPTION:

ACTION REQUEST:

CORRECTIVE ACTION TAKEN (to be completed by site operator):

Date: _____ Operator: _____

Return Yellow Copy To:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Figure 4-7. Photographic Monitoring Network Quality Assessment Log.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**ROUTINE SITE OPERATOR MAINTENANCE PROCEDURES FOR 8 MM AUTOMATIC CAMERA SYSTEM - MINOLTA D12**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**4120-3210**
DATE	**JANUARY 1994**

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Karen K. Rosener	
PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Revise illustrations and forms.	June 1996	

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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the Minolta D12 8 mm camera system.

Routine servicing schedules are based on the interval setting and number of hours photographed each day. Assuming an eight-hour per day schedule at 60-second intervals, site operators service the camera approximately every 6 to 7 days to change film, check the performance of the camera system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the data coordinator. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Site Operator's Manual for Visibility Monitoring Camera Systems that contains detailed routine site operator maintenance and troubleshooting procedures for the specific camera monitoring system(s) located at the site. Additional manufacturer instruction booklets, and a supply of Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout the monitoring effort. Operators are encouraged to call or notify ARS if they have any questions or problems. Many problems can be fully resolved over the telephone.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine maintenance.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine maintenance.
- Train the site operator in all phases of camera system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

- Coordinate with the project manager, site operator, his/her supervisor, and field specialist concerning the schedule and requirements for routine maintenance.
- Verify that scheduled visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all site documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Resolve problems reported by the site operator.
- Enter the results of all performed procedures into the site-specific Quality Assurance Database.
- Supply the site operator with all necessary monitoring supplies.
- Coordinate the replacement and repair of all malfunctioning units.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with the project manager, the site operator's supervisor, data coordinator, and field specialist concerning the schedule and requirements for routine maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.
- Thoroughly document all procedures on the Visibility Monitoring Status/Assessment Sheet; mail the white copy of the completed sheet to the data coordinator and maintain an on-site file of the yellow copy.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 SITE VISIT EQUIPMENT

Equipment and materials generally required to support a routine site visit or scheduled maintenance include:

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver

- Medium adjustable wrench
- Keys for enclosure and padlocks
- Voltmeter
- Backup camera and timer batteries:
  - Minolta D12 - two 6 V lantern batteries
  - Paragon EC72D - one 9 V transistor battery
- Watch
- Lens cleaner and lens paper
- Site Operator's Manual for Automatic Visibility Monitoring Camera Systems containing:
  - SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)*
  - TI 4120-3210, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*
  - TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for Automatic Camera System - Minolta D12*
  - Manufacturers' instruction booklets
  - Visibility Monitoring Status/Assessment Sheets
  - Film cartridge labels
- Pen or pencil
- Supplemental visibility monitoring film
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera, and/or automatic timer should be documented for future reference by the data coordinator in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database. Any on-site changes made should be documented by the site operator on a Visibility Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for Automatic Camera System - Minolta D12*.

4.0 METHODS

This section includes two (2) major subsections:

4.1 Routine Servicing
4.2 Scheduled Maintenance

Detailed procedures described in these subsections are summarized in Table 4-1.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Minolta D12 8 mm camera and Paragon EC72D automatic timer. Detailed schematic diagrams of the Minolta D12 8 mm camera system and associated components are provided in Figures 4-1 through 4-3.

The following manufacturers' instruction booklets are provided in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems:

- Minolta Autopak-8 D12

- Paragon EC72, EC72D, and EC72E

Resolution of problems noted during routine servicing or scheduled maintenance can be more fully investigated by following the troubleshooting and emergency maintenance procedures defined in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Camera System - Minolta D12*.

4.1 ROUTINE SERVICING

Routine servicing schedules are based on the number of photographs taken each day. A common monitoring schedule includes taking photographs at 60-second intervals for 8 hours a day (e.g., 0800 - 1600). Assuming this schedule, site operators service the camera approximately every 6 to 7 days. Alternate monitoring schedules are discussed in Section 4.2.3. Supplemental film and backup batteries should be on hand whenever the site is visited, this will minimize servicing time and data loss should a problem occur or be detected during servicing.

During each routine site visit, the operator will thoroughly document all pertinent data collection information, any maintenance performed, and note any equipment or monitoring discrepancies found on the Visibility Monitoring Status/Assessment Sheet (Figure 4-4). The site operator must complete all applicable portions of this sheet and mail it to the data coordinator with each film cartridge. A completed example status/assessment sheet is provided in Figure 4-5. Blank status/assessment sheets are provided in the site operator's manual. The following subsections detail how to complete the status/assessment sheet.

Table 4-1

Automatic Camera System
Field Quality Control Procedures

Regular Maintenance performed at each film change:

- Inspect overall system and clean shelter window.
- Verify that film advanced and settings are correct.
- Remove film (complete film canister label).
- Load new film (complete film canister label).
- Inspect and clean camera lens.
- Check system batteries.
- Check camera settings.
- Check timer settings.
- Replace and align camera.
- Verify system operation.
- Complete Visibility Monitoring Status/Assessment Sheet:
  - Document any equipment or monitoring discrepancies found.
  - Document all servicing or maintenance actions performed.
  - Describe weather conditions.
- Close and lock camera enclosure.
- Mail film and the white copy of the completed Visibility Monitoring Status/ Assessment Sheet to ARS.

Scheduled Maintenance performed as scheduled or as required:

- Change 8 mm camera and timer batteries every 6 months.

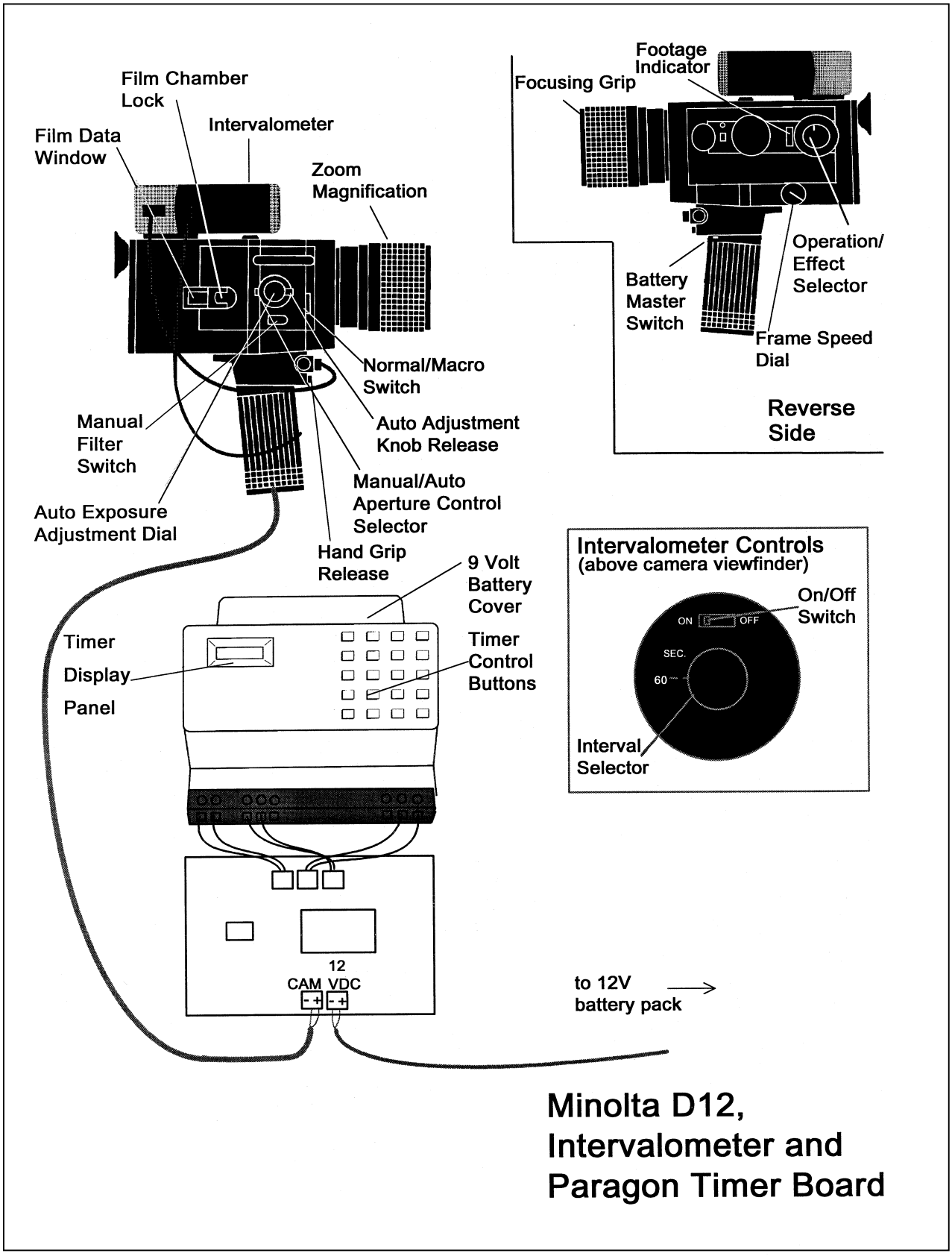

Figure 4-1. Minolta D12 System Components.

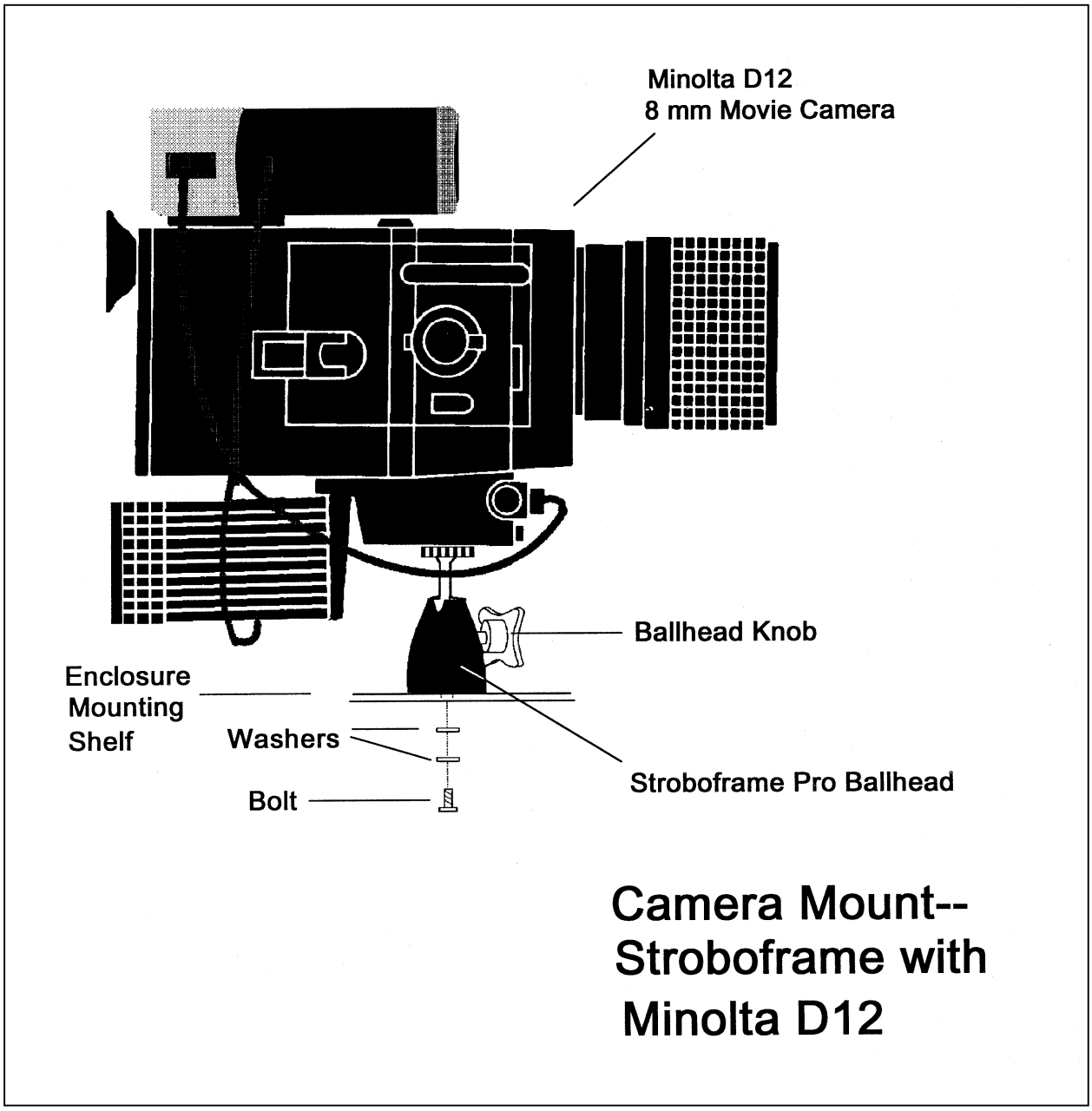

Figure 4-2. Automatic 8 mm Camera System Tripod Assembly.

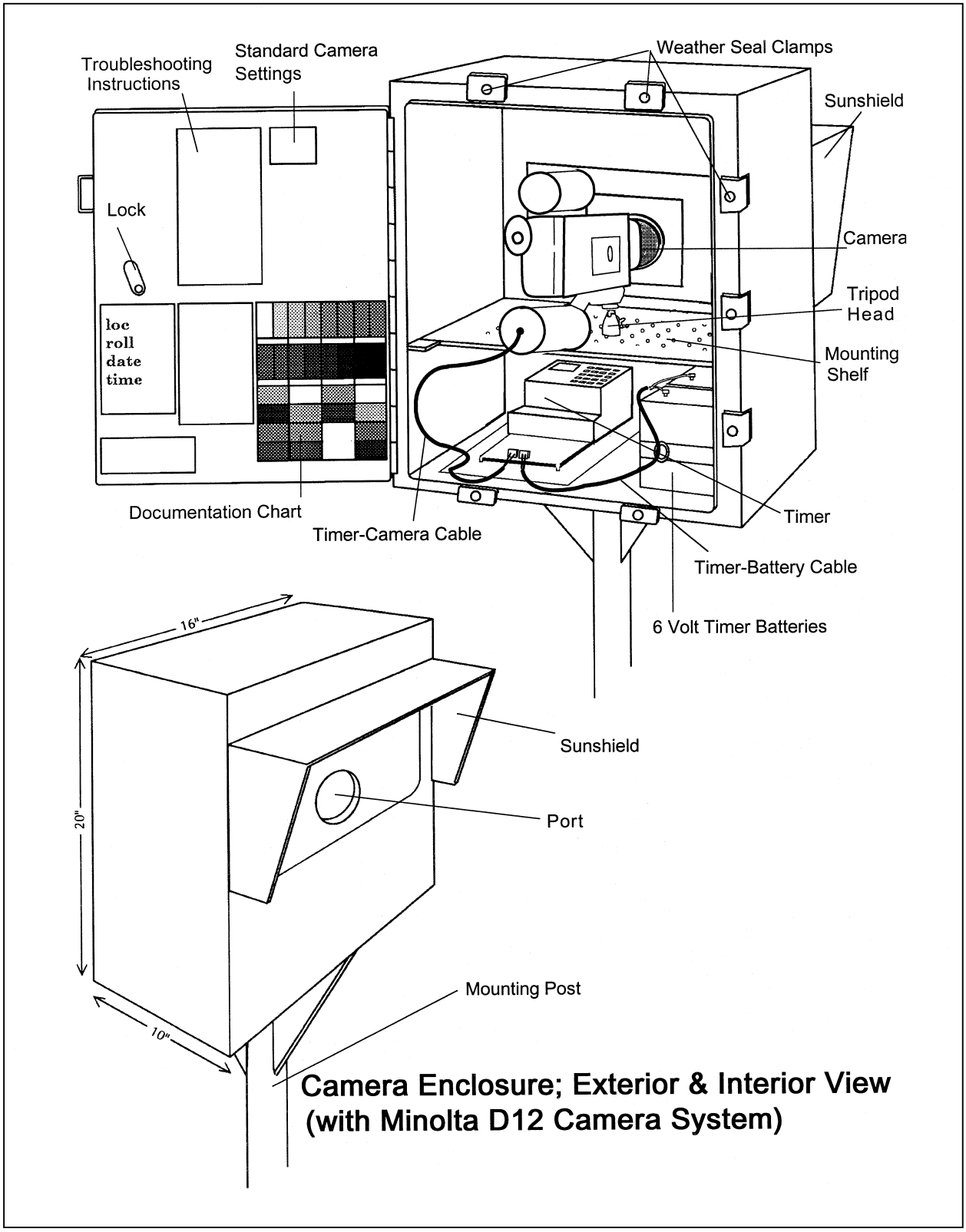

Figure 4-3. Automatic 8 mm Camera System Enclosure.

Location: _____ Roll No.: _____
Operator: _____

8 MM TIME-LAPSE CAMERA VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED **FILM REMOVED**

Today's Date: _____ Time: _____ Today's Date: _____ Time: _____

Yes	No		Yes	No	
___	___	Label Film Cartridge	___	___	Enclosure Found in Proper Condition (clean window if necessary)
___	___	Load Film:			
___	___	Lens Inspected	___	___	Camera Alignment Correct
___	___	Camera Settings Verified:	___	___	Camera and Timer Found in Proper Condition
		Normal/Macro Switch - N(normal)			
		Aperture Switch - A(auto)	___	___	Exposure Count (record footage): _____
		Manual Filter Switch -no lamp symbol (daylight position)	___	___	Camera Settings Verified:
		Auto Exposure Adjustment Dial - Red mark (no adjustment)			Normal Macro Switch - N(normal)
		INTERVALOMETER ON			Aperture Switch - A(auto)
		Interval Selector - 60 second position (recommended)			Manual Filter Switch - no lamp symbol (daylight position)
		Operation/Effect Selector - N(normal)			Auto Exposure Adjustment Dial - Red mark (no adjustment)
		Frame Speed Dial - S.F. (single frame)			INTERVALOMETER - ON
		Battery Master Switch - OFF			Interval Selector
		Zoom Magnification - At prescribed site-specific setting			- 60 second position (recommended)
		Focus - ∞ (Infinity)			Operation/Effect Selector - N(normal)
___	___	Verify Timer Settings			Frame Speed Dial - S.F. (single frame)
___	___	Camera Aligned			Battery Master Switch - OFF
___	___	Verify Camera and Timer are Working Properly			Zoom Magnification - at prescribed site-specific setting
					Focus - ∞ (Infinity)
___	___	Enclosure Secure	___	___	Film cartridge label completed

DESCRIBE GENERAL WEATHER CONDITIONS _____
_____

Temperature _____ _____ _____ % Cloud Cover _____
(F) Now Max Min

COMMENTS/ACTION TAKEN _____
_____

SUPPLIES NEEDED: _____

Enclose this Status/Assessment Sheet with the 8 mm movie film and send to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Visibility Monitoring Status/Assessment Sheet for Minolta D12 8 mm Camera System.

Location: VOYB Roll No.: 32
Operator: Steve Blair

8 MM TIME-LAPSE CAMERA VISIBILITY MONITORING STATUS/ASSESSMENT SHEET

FILM LOADED

Today's Date: 7/20/93 Time: 13:05

Yes	No	
x		Label Film Cartridge
x		Load Film:
x		Lens Inspected
x		Camera Settings Verified:
		Normal/Macro Switch - N(normal)
		Aperture Switch - A(auto)
		Manual Filter Switch -no lamp symbol (daylight position)
		Auto Exposure Adjustment Dial - Red mark (no adjustment)
		INTERVALOMETER ON
		Interval Selector - 60 second position (recommended)
		Operation/Effect Selector - N(normal)
		Frame Speed Dial - S.F. (single frame)
		Battery Master Switch - OFF
		Zoom Magnification - At prescribed site-specific setting
		Focus - ∞ (Infinity)
x		Verify Timer Settings
x		Camera Aligned
x		Verify Camera and Timer are Working Properly
x		Enclosure Secure

FILM REMOVED

Today's Date: 7/26/93 Time: 10:40

Yes	No	
x		Enclosure Found in Proper Condition (clean window if necessary)
x		Camera Alignment Correct
x		Camera and Timer Found in Proper Condition
x		Exposure Count (record footage): _____
x		Camera Settings Verified:
		Normal Macro Switch - N(normal)
		Aperture Switch - A(auto)
		Manual Filter Switch - no lamp symbol (daylight position)
		Auto Exposure Adjustment Dial - Red mark (no adjustment)
		INTERVALOMETER - ON
		Interval Selector - 60 second position (recommended)
		Operation/Effect Selector - N(normal)
		Frame Speed Dial - S.F. (single frame)
		Battery Master Switch - OFF
		Zoom Magnification - at prescribed site-specific setting
		Focus - ∞ (Infinity)
x		Film cartridge label completed

DESCRIBE GENERAL WEATHER CONDITIONS Mostly cloudy, wind out of the south at 10 mph

Temperature (F) 76 Now 85 Max 56 Min % Cloud Cover 70

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED: 8mm film

Enclose this Status/Assessment Sheet with the 8 mm movie film and send to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-5. Completed Example of a Visibility Monitoring Status/Assessment Sheet for Minolta D12 8 mm Camera System.

4.1.1 Status/Assessment Sheet General Information

The following general information appears on the Visibility Monitoring Status/Assessment Sheet.

LOCATION	Either the full site location name or the four-letter site abbreviation.
ROLL NO.	The consecutive site roll number of the film used to document the monitoring period.
OPERATOR(S)	The full name of the site operator(s).
DATE AND TIME	The standard calendar date and local time when the film was loaded and when the film was removed.
WEATHER CONDITIONS	At the time of film removal, describe recent and current weather conditions that may be helpful in interpreting the photographic data. Such conditions may include, but are not limited to: • Temperature extremes • Percent cloud cover currently observed • Severe weather (lightning, hail, high winds, etc.) • Passing storm fronts • Precipitation • Stagnant air masses • Fog
COMMENTS	Describe any equipment or monitoring discrepancies found, troubleshooting or scheduled maintenance performed, and/or corrective actions taken.
SUPPLIES NEEDED	Request any servicing supplies or documentation materials necessary for ongoing monitoring.

4.1.2 Status/Assessment Sheet Film Removal Section

OPEN ENCLOSURE	Open the enclosure by loosening the weather-tight clamps and unlocking the latch.
INSPECT ENCLOSURE	Inspect the interior and exterior of the enclosure for damage or other problems (water leakage, etc.). Inspect outside of enclosure window for dirt and clean if necessary. Document any abnormal accumulations.

VERIFY CAMERA ALIGNMENT	The camera alignment and zoom magnification must remain constant from one roll to the next. Look through the camera viewfinder to verify that the alignment has remained correct during the monitoring period. If not, note the degree of misalignment and the probable cause.
VERIFY CAMERA/ TIMER CABLES	Listen for the shutter click and verify that the interval between clicks is correct. Check the camera/timer and power system (6 V lantern batteries) cable connections. Verify that all cables are secure. Check the integrity of the cables and component connectors. Document any problems including broken connectors, loose or bare wires, etc. Report any problems promptly to ARS.
DOCUMENT CARTRIDGE EXPOSURE	The film supply indicator shows if the film advanced properly and how much of the film cartridge was exposed during the monitoring period. Document whether the film advanced correctly and the observed cartridge exposure. Report any discrepancies promptly to ARS.
VERIFY SETTINGS	Verify all camera and timer settings. Document any settings that are different from those listed on the Visibility Monitoring Status/Assessment Sheet, whether they are site-specific settings or settings made in error. (Site-specific settings may be required at sites where non-standard exposure settings are necessary to ensure quality frame exposures). Correct any inconsistencies.
REMOVE FILM AND COMPLETE CARTRIDGE LABEL	Open the film chamber cover by lifting the **FILM CHAMBER KEY** and turning it in the direction of the arrow. Swing open the cover door and remove the exposed film cartridge from the camera. Complete the film cartridge label by writing in the current date and time. Inspect the film compartment for fragments of film. Blow lightly into the compartment to remove film fragments or other particles. DO NOT TOUCH the DX film contacts or shutter curtain.
COMPLETE VISIBILITY MONITORING STATUS/ ASSESSMENT SHEET	Document: • Any equipment or monitoring discrepancies found • All servicing or maintenance actions performed • Current and recent weather conditions

4.1.3 Status/Assessment Sheet Film Loading Section

LABEL FILM CARTRIDGE	The film cartridge label identifies the contents of each film cartridge. All of the information on the label is permanently logged at ARS when the film is received.

Open a box of new, unexposed film and remove the packaging. Fill out a film cartridge label with the following information and attach it to the labeled side of the film cartridge:

- Monitoring site abbreviation
- Roll number
- Date and time loaded
- Emulsion number and expiration date (information listed on Kodak film box)

LOAD FILM

To load film:

- Open the film chamber cover.
- Insert the film cartridge into the film chamber with the labeled side out. Angle the cartridge into the camera from the rear and push down on the rear edge of the cartridge until it is seated flat in the compartment with a click.
- Close the cover and turn the film chamber key to lock it in place. Replace the key flat against the side of the case.
- Check the film view window for the film type display.

INSPECT CAMERA LENS

Inspect the exterior of the UV filter mounted on the camera lens for any accumulation of dust, dirt, or fingerprints. If accumulation is noted:

- Clean the outside of the UV filter with the lens paper and fluid provided.
- If necessary, unscrew the UV filter and clean the lens and inside surface of the UV filter. Do not attempt to clean the inner surface of the lens.
- Use lens paper and fluid to clean the viewfinder eyepiece when necessary.

CHECK CAMERA SETTINGS

Verify and change, if necessary, all camera settings for correct automatic operation. Standard settings for the Minolta D12 are:

Normal/Macro Switch	N(Normal)
Aperture Control Selector	A(Auto)
Manual Filter Switch	No lamp symbol (Daylight Position)
Auto Exposure Adjustment Dial	Red mark (No adjustment)
Operation/Effect Selector	N(Normal)
Frame Speed Dial	S.F. (Single Frame)

Battery Master Switch	OFF
Lens Focus	∞ (Infinity)
Intervalometer	ON
Interval Selector	60-second position (recommended)
Zoom Magnification	At prescribed site-specific setting

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS are documented on the enclosure door.

Document any settings that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

CHECK TIMER SETTINGS

Review timer display:

- The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, and the colon flashing.
- If the display is incorrect press **RUN** on the display panel to verify that the timer is in the "RUN" mode. If the time, date, or display is still incorrect, reset the timer.
- If the timer display is blank, the timer battery wiring may be incorrect or the battery power may be insufficient.

Review the programmed timer events:

- Press **PRG** then **C1** to select Channel 1 for review. In normal operation, Event 1 (E:01) is set at the desired starting time.
- Press **C2** to select Channel 2 for review. In normal operation, Event 1 (E:01) is set at the desired stopping time. The remaining events are not programmed.

If events are incorrect, reprogram the timer clock and timer events. Timer setting and programming instructions are provided in Section 4.2.3. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

NOTE: If the timer check occurs during operating hours, press **C1** to resume filming.

ALIGN CAMERA

It is important for the alignment to be consistent from one roll to the next.

- Look through the viewfinder and align the camera on the vista to be photographed.

- Verify that the alignment matches the previous alignment, the horizon is level, the enclosure port does not appear in the frame, and the lens focus is on infinity. (A 3" x 5" site alignment print is provided in the camera enclosure for reference).

- Firmly tighten all levers on the tripod head and recheck the alignment.

- Set the eyepiece shutter control to the "C" (closed) position.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck the alignment.

VERIFY CAMERA/ TIMER CABLES AND FILM ADVANCE

Verify the camera/timer and power system (6 V lantern batteries) cable connections.

Test the timer and battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.

- Press **C1**; the camera should fire at the set interval. The timer automatically returns to the "RUN" mode.

If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient.

Test the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the camera. If the camera does not fire at the set interval, the cable might be malfunctioning.

Document any discrepancies and/or corrective actions taken. Report any problems promptly to ARS.

DOCUMENT FINDINGS AND ACTIONS PERFORMED

Document any servicing or maintenance actions performed during the film loading process. Place a completed Visibility Monitoring Status/Assessment Sheet (yellow copy) in the Site Operator’s Manual for Automatic Visibility Monitoring Camera Systems.

CLOSE AND SECURE ENCLOSURE

Place the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems inside the site enclosure for future reference. Close and lock the camera enclosure door. Tighten all door seal clamps and padlock the enclosure door hasp.

4.1.4 Mailing the Film and Completed Status/Assessment Sheet

Place the original (white) copy of the Visibility Monitoring Status/Assessment Sheet and corresponding film cartridge in a padded mailing envelope.

Mail both the film and the Visibility Monitoring Status/Assessment Sheet immediately to:

Air Resource Specialist, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Call ARS immediately if any inconsistencies were noted or if any questions arise. Many problems can be resolved through telephone consultation.

ARS may be reached at the following telephone numbers:

Telephone: 970/484-7941
Fax: 970/484-3423

Detailed troubleshooting procedures to assist with telephone-directed problem resolution are presented in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Camera System - Minolta D12*.

4.2 SCHEDULED MAINTENANCE

Proper film storage and periodic preventive maintenance will help to ensure consistent, high quality data collection. Preventive maintenance servicing visits are performed as scheduled or required by the data coordinator.

Scheduled maintenance normally consists of camera and timer battery changes (every six months).

Replacement camera and timer batteries are provided by ARS with each film shipment (every six months). Additional batteries will be provided as needed or as requested by the site operator. Test all batteries with a voltmeter before placing them in the system component. Verify all timer or camera battery malfunctions by testing removed component batteries with a voltmeter.

Additional servicing tasks identified by the data coordinator may include:

- Camera and timer configuration checks or changes
- Camera alignment changes
- Revision of data collection procedures

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

Any equipment malfunctions or data collection discrepancies observed during a scheduled maintenance visit should be reported to ARS immediately.

The following subsections further describe proper methods for film storage, scheduled maintenance procedures, and corresponding servicing documentation. Troubleshooting and emergency maintenance procedures for the Minolta D12 are provided in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Camera System - Minolta D12*.

4.2.1 Film and Film Storage

Only Kodachrome 40 color movie film provided by ARS should be loaded into the visibility monitoring camera unless otherwise directed. Each film cartridge has an emulsion number and expiration date. This information must be documented on the cartridge label of each exposed film cartridge (see Section 4.1.3).

Photographic film is sensitive to heat and moisture. These elements can affect the film, altering both the processed photographs and the data analysis. For example, film subjected to heat often has a pink or purple cast while film subjected to moisture does not process consistently. To ensure proper film storage, keep the film inside a Ziploc bag with desiccant and place the bag inside the clearly labeled film storage box. The box should be stored in a freezer, refrigerator, or cool (less than 70°F), dry location.

If stored in a freezer, allow film to thaw at room temperature for at least two hours before loading it in the camera.

4.2.2 Changing System Batteries

CAMERA/TIMER BATTERY VERIFICATION AND CHANGES

The Minolta D12 8 mm camera and Paragon EC72D timer board run on two 6 V lantern batteries. If this power source is low or removed, the output from the board to the camera and timer will de-energize. However, the time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Both 6 V lantern batteries should be replaced biannually or as directed by the data coordinator.

To test the main power source (two 6 volt batteries):

- The timer must be in "RUN" mode, with the time and day displayed and colon flashing.
- Press **C1**; the camera should fire at the set interval. The timer automatically returns to "RUN" mode.
- If the camera does not fire, the camera/timer wiring is incorrect or the battery power to the timer is insufficient. Test and record the voltage of the used batteries. Camera/timer wiring verification procedures are described in Section 4.1.3.

To change the 6 volt batteries (Figure 4-6):

- Disconnect all wires from the used batteries.
- Place the new batteries together at opposite polarity (in series).
- Connect the two batteries at one end.
- Connect the opposite terminals to the cable from the timer.
- Perform the above test to assure the connections are secure.
- Measure the voltage of the new batteries as shown in Figure 4-6. The measurement should be approximately 12 volts.

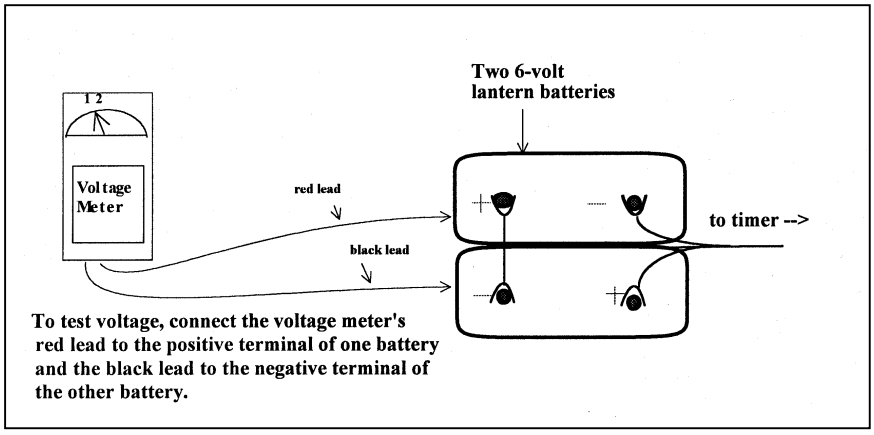

Figure 4-6. Paragon Timer Battery Configuration.

To test the 9 volt battery:

- Disconnect main power source.
- If clock display goes blank, no 9 V battery is connected or the battery needs to be replaced. The 9 V battery supplies only the current necessary to maintain the timer display and program memory when the main power source is disconnected. This battery should not need to be replaced more often than every two years unless the 6 volt batteries have failed and were not discovered for several days.

To change the 9 volt battery:

- Remove battery cover (located above timer control panel) by pressing sides together and pulling left or right.
- Snap the battery into the battery clip.
- Replace the battery cover.

Document all battery changes on the Visibility Monitoring Status/Assessment Sheet. Report any problems incurred promptly to ARS.

4.2.3 System Reconfiguration

MINOLTA D12

The Minolta D12 is a rugged, reliable 8 mm camera equipped with an intervalometer for time-lapse filming. The internal camera batteries have been bypassed with internal wiring that can be directly connected to the timer board terminal block marked "camera." The wires must be inserted into the proper (positive (+) and negative (-)) position.

Standard settings for the Minolta D12 are:

Normal/Macro Switch	N(Normal)
Aperture Control Selector	A(Auto)
Manual Filter Switch	No lamp symbol (Daylight Position)
Auto Exposure Adjustment Dial	Red mark (No adjustment)
Operation/Effect Selector	N(Normal)
Frame Speed Dial	S.F. (Single Frame)
Battery Master Switch	OFF
Lens Focus	∞ (Infinity)
Intervalometer	ON
Interval Selector	60-second position (recommended)
Zoom Magnification	At prescribed site-specific setting

CHANGE CAMERA SETTINGS

Lighting conditions of the target or vista may require site-specific exposure settings. Setting changes directed by ARS should be noted on the Visibility Monitoring Status/Assessment Sheet for each film cartridge that the setting is in effect.

Zoom capabilities for the Minolta D12 can be changed between wide angle (6.5 mm) to telephoto (78 mm). A setting of 13 mm is approximately equivalent to a 50 mm lens field of view on a 35 mm camera.

The recommended time-lapse interval is 60 seconds. This allows for 60 hours of time on a 50-foot roll of film.

Refer to the Minolta Autopak-8 D12 manufacturers' instruction booklet for detailed camera setting procedures.

Document any setting changes made that are different from those listed above on each Visibility Monitoring Status/Assessment Sheet.

PARAGON EC72D TIMER

The Paragon automatic timer is often programmed for eight hours a day. Alternate sampling schedules can be programmed for any desired number of hours per day.

Routine servicing schedules are based on the number of hours photographs are taken. Assuming a 60-second time-lapse interval, the following servicing schedules are recommended:

- 8 hours daily monitoring = 6-7 day servicing schedule.
- 10 hours daily monitoring = 5-6 day servicing schedule.
- 12 hours daily monitoring = 4-5 day servicing schedule.
- 14 hours daily monitoring = 3-4 day servicing schedule.

During regular operation the Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week (Sunday =1; Saturday = 7) with the colon flashing.

SETTING THE PARAGON EC72D

<u>To set the timer clock</u>:

- Wire power (two 6 V lantern batteries) to timer. A "0:00 1" TIMERis displayed, with a colon and "1" flashing. Press **CLK**; the flashing stops.
- Using the 24-hour clock format, press four keys for the current time (e.g., **0915** = 09:15 a.m., **2330** = 11:30 p.m.). Press one key for the current date of the week; (**1** = Sunday . . . **7** = Saturday). Press **E** to enter.
- "101" is displayed, indicating "January 1." Press two keys for the current month and two keys for the current date (e.g., **0615** = June 15). Press **E** to enter.
- "84" is displayed, indicating "1984." Press two keys for the current year (e.g., **90**). Press **E** to enter. Control will automatically switch to the "RUN" mode. The time and day-of-week will be displayed with the colon flashing.

<u>To program times for photographs to be taken</u>:

- Press **PRG** to enter "PROGRAM" mode.
- Press **C1** to select Channel 1 for programming. The starting time and E:01 (for the first event) is displayed.
- Press four keys for the time the first photograph should be taken (e.g., **0900** for 9:00 a.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.
- Press **C2** to select Channel 2 for programming the ending time. "E:01" is displayed.

- Press four keys for the time the first photograph should be taken (e.g., **1700** for 5:00 p.m.). Press **0** to program the event to occur daily. Press **E** to enter the event into memory.

- Press **RUN** to return to "RUN" mode after all selected photograph times are programmed.

Procedures to review programmed timer events are provided in Section 4.1.3.

SITE-SPECIFIC CAMERA ALIGNMENT

Correct alignment of the camera is extremely important. Each film cartridge is compared to others of the same view during analysis. Therefore, alignment must remain constant from one film cartridge to the next.

A 3" x 5" site alignment print is provided for your reference in the camera enclosure. Alignment changes or adjustments may be necessary when:

- Selected features are not properly framed in the view, and/or

- Exposure discrepancies result from intruding foreground or backlit features.

Any alignment change directed by ARS should be fully documented on the Visibility Monitoring Status/Assessment Sheet.

VERIFY CAMERA ALIGNMENT

Look through the viewfinder to verify the following:

- The alignment matches the referenced site-specific alignment photograph.

- The horizon is level.

- The vista is framed correctly (proper zoom factor).

- The sun shield and port are not visible in the viewfinder.

- The lens focus is on infinity.

Document any misalignment found and assess probable cause on the Visibility Monitoring Status/Assessment Sheet.

If weather conditions obscure the target area, use foreground features to judge alignment. Visit the site again when the weather clears to recheck alignment.

Procedures to ensure ongoing alignment are provided in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*.

4.2.4 On-Site Data Control

During each routine site visit, the operator documents maintenance performed and notes all discrepancies on the Visibility Monitoring Status/Assessment Sheet. The completed original (white copy) is mailed to ARS with each film cartridge. A copy (yellow) is kept in the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems. If discrepancies or operator comments on the sheets indicate that further action is necessary, immediate corrective action is taken.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Operators are encouraged to call or notify ARS if they have questions or problems. Ongoing review of film and site operator documentation often initiates corrective actions.

Common data collection problems identified include:

- Roll number discrepancies
- Improper film loading
- Late film changes
- Improper camera alignment
- Incorrect camera settings
- Incorrect timer settings
- Incomplete Visibility Monitoring Status/Assessment Sheet documentation

All scheduled maintenance requested by the data coordinator or performed by the site operator must be thoroughly documented on the Visibility Monitoring Status/Assessment Sheet and in the site-specific Quality Assurance Database.

If necessary, a Photographic Monitoring Network Quality Assessment Log (Figure 4-7) is mailed to the site to further document corrective actions taken. The site operator documents the date of correction and what was done, and returns a carbon copy of the log to ARS.

Problems and equipment malfunctions requiring extensive troubleshooting and/or maintenance are fully described in TI 4120-3410, *Troubleshooting and Emergency Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*.

PHOTOGRAPHIC MONITORING NETWORK
QUALITY ASSESSMENT LOG

Site: _____ Date: _____
_____
Operator: _____
From: _____

PROBLEM DESCRIPTION:

ACTION REQUEST:

CORRECTIVE ACTION TAKEN (to be completed by site operator):

Date: _____ Operator: _____

Return Yellow Copy To:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

White - Original, site copy
Yellow - return to ARS
Pink - ARS retain

Figure 4-7. Photographic Monitoring Network Quality Assessment Log.