

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CANON EOS 630
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3300
DATE	JUNE 1993

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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	12
4.3 Final System Verification Check	12
4.4 Capital Equipment Exchange Procedures	12

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
4-1 Camera Display Panel Depicting Shutter Speed Reading	8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Canon EOS 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Canon EOS 630 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Canon EOS 630 automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

- 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
 - Manufacturer's instruction booklets
 - Visibility Monitoring Status/Assessment Sheets
 - Film canister labels
- Pen or pencil
 - Grease pencil
 - Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Canon EOS 35 mm automatic camera system and associated components are provided in TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

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

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings

- Improperly loaded film
- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Canon EOS 35 mm Camera and Paragon Timer

Standard Settings Check List		
Canon EOS 630	Canon Quartz Date Back E	Paragon Timer
Main Switch	A	Day-of-Month/Time
Aperture	f8.0	Time/Day-of-Week
ISO/ASA	64	
Exposure	0 (Zero)	
Compensation		
Program Mode	AV	
Selection		
Drive Mode Selector	S (Single)	
Lens Focus Mode	M (Manual)	
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Open the switch cover (on the back of the camera below the databack) and press the battery check button. A "BC" and three bars (indicating sufficient battery power) should appear in the display panel.	<ul style="list-style-type: none"> The battery pack was not installed properly. The camera battery power level is insufficient or drained (a "BC" and two bars or less appears).
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button. The shutter should open and close, and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> The "main switch" is in the "L" (lock) position. No film is in the camera. Camera battery malfunction. Camera needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> Camera/timer wiring is incorrect (refer to TI 4120-3100). Timer battery malfunction. Camera/timer cable needs repair.
Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> Timer battery/configuration is incorrect (refer to TI 4120-3100). The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> The timer is not in the "RUN" mode. Press RUN on the display panel. The timer clock needs to be reprogrammed (refer to TI 4120-3100). Timer battery malfunction (12 V and/or 9 V). Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event. Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> The timer events need to be reprogrammed (refer to TI 4120-3100). Timer battery malfunction. Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart. Note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Canon EOS 630 camera runs on one 6 V lithium battery pack. Under normal operating conditions, this battery lasts up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the battery pack before replacing, especially if it was recently replaced.
- Verify the "main switch" and "program mode selector" camera settings. If these selections are inadvertently left in a wrong position (i.e., green square or «•»), the batteries may drain prematurely.
- The metering system on the camera may not be shutting off, even when the automatic camera settings are correct. Check the camera for excessive current draw.

To check if all systems are working properly, press the camera shutter halfway to observe the camera display panel. The shutter speed display (Figure 4-1, upper left) should not illuminate for more than six seconds. If the shutter speed display continues to illuminate beyond six seconds, an electrical short may exist in a portion of the cable jack or in the camera itself.

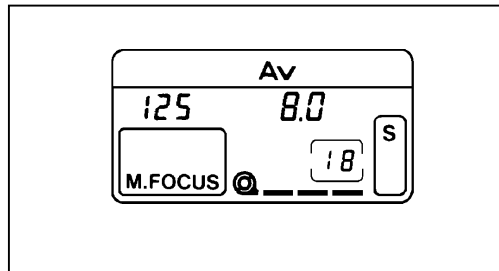


Figure 4-1. Camera Display Panel Depicting Shutter Speed Reading.

DATABACK BATTERIES

The Canon Quartz Date Back E runs on one 3 V coin-shaped lithium battery. Under normal operating conditions, this battery will last a minimum of 12 months. Replace the battery only when the film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The word "BATTERY" will be displayed or the display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or battery before replacing, especially if it was recently replaced.
- Verify that the databack is in the day-time mode displaying the current day of the month and current time. No information will be imprinted on the film when the display is in the "OFF" position.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3100.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the frame counter on the camera display panel. Document how many photographs were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER
FILM LOADING

If the film was not loaded correctly, the film transport bars will remain flashing and the shutter will not release. If so, open the back cover and reload the film. Review the film loading procedures described in TI 4120-3100, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Canon EOS 630*. Document your findings on a Visibility Monitoring Status Assessment Sheet and mail the sheet, without any film, to ARS.

VERIFY
INTERNAL
CAMERA
WINDER

Check the camera battery as described in TI 4120-3100.

- Take a manual photograph. Press the **SHUTTER RELEASE** button; the shutter should open and close, and the film and film OPERATION counter should advance one frame. If the camera will not fire manually, verify that the "main switch" is in the "A" position and the battery check is good.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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).
- Press **C1** on the timer panel to activate the camera shutter; the camera should fire. Observe the camera display panel; after firing, the shutter speed display should not illuminate for more than six seconds. If the shutter speed continues to illuminate beyond six seconds, an electrical short may exist in a portion of the cable jack.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3100.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 TI 4120-3100, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Canon EOS 630*. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3100.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3100, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Canon EOS 630*.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3100 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CONTAX 167MT
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3310
DATE	NOVEMBER 1993

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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	11
4.3 Final System Verification Check	12
4.4 Capital Equipment Exchange Procedures	12

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
4-1 Camera Display Panel Depicting Shutter Speed Reading	8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Contax 167MT 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Contax 167MT 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Contax 167MT automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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:
 - Contax 167MT: - four 1.5 V 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
- 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
- Manufacturer's instruction booklets
- Visibility Monitoring Status/Assessment Sheets
- Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Contax 167MT 35 mm automatic camera system and associated components are provided in TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

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

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

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings
- Improperly loaded film

- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Contax 167MT 35 mm Camera and Paragon Timer

Standard Settings Check List		
Contax 167MT	Contax 167MT Data Back D-7	Paragon Timer
Main Switch <input type="checkbox"/>	Year-Month-Day/Time	Time/Day-of-Week
Program Mode Selection AV		
ISO/ASA 64		
Aperture Ring f8.0		
Exposure Compensation 0 (Zero)		
Automatic Compensating Value Lever 0&0		
Drive Mode Selector S		
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Turn the main switch to <input type="checkbox"/> . Press the MODE and ISO buttons simultaneously. All the display panel indicators should come on.	<ul style="list-style-type: none"> The batteries were not installed properly. The camera battery power level is insufficient or drained. The display panel indicators are flashing or blank.
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button. The shutter should open and close, and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> The "main switch" is in the "OFF" position. No film is in the camera. Camera battery malfunction. Camera needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> Camera/timer wiring is incorrect (refer to TI 4120-3110). Timer battery malfunction. Camera/timer cable needs repair.
Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> Timer battery/configuration is incorrect (refer to TI 4120-3110). The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> The timer is not in the "RUN" mode. Press RUN on the display panel. The timer clock needs to be reprogrammed (refer to TI 4120-3110). Timer battery malfunction (12 V and/or 9 V). Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event. Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> The timer events need to be reprogrammed (refer to TI 4120-3110). Timer battery malfunction. Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart. Note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Contax 167MT camera runs on four 1.5 V AAA alkaline batteries. Under normal operating conditions, the batteries last up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the batteries before replacing, especially if they were recently replaced.
- Verify that the "main switch" camera setting is on "□". If the selection is inadvertently left in a wrong position (i.e., AEL), the batteries may drain prematurely.

To check if all systems are working properly, press the **MODE** button to observe the camera display panel. The display (Figure 4-1) should not illuminate for more than 20 seconds. If the shutter speed display continues to illuminate beyond 20 seconds, an electrical short may exist in a portion of the cable jack or in the camera itself.

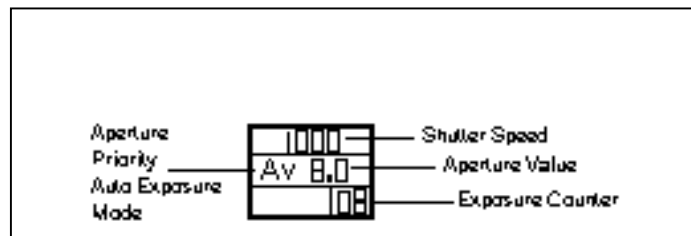


Figure 4-1. Camera Display Panel Depicting Shutter Speed Reading.

DATABACK BATTERIES

The Contax 167MT Data Back Quartz D-7 runs on two 3 V coin-shaped lithium batteries. Under normal operating conditions, the batteries will last a minimum of 12 months. Replace the batteries only when film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The word "BATTERY" will be displayed or the display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or batteries before replacing, especially if they were recently replaced.
- Verify that the databack is in the "day-time" mode displaying the current date and current time.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 167MT*.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3110.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the frame counter on the camera display panel. Document how many photographs were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER FILM LOADING

Observe the film advance with the back open after each film loading. Press the **SHUTTER RELEASE**. The film should engage and properly wind on the film take-up spool.

VERIFY INTERNAL CAMERA WINDER OPERATION

Check the camera battery as described in TI 4120-3110, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Contax 167MT*.

- Take a manual photograph. Press the **SHUTTER RELEASE** button; the shutter should open and close, and the film and film counter should advance one frame. If the camera will not fire manually, verify that the "main switch" is in the "□" position and the battery check is good.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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).
- Press **C1** on the timer panel to activate the camera shutter; the camera should fire. Observe the camera display panel; after firing, the shutter speed display should not illuminate for more than 20 seconds. If the shutter speed continues to illuminate beyond 20 seconds, an electrical short may exist in a portion of the cable jack.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- the timer must be in the "RUN" mode, with the time and day-of-week displayed; colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3110.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER
OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 TI 4120-3110, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Contax 167MT*. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3110.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3110.

- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3110 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - CONTAX 137 MA
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3320
DATE	SEPTEMBER 1993

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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	11
4.3 Final System Verification Check	12
4.4 Capital Equipment Exchange Procedures	12

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Contax 137 MA 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Contax 137 MA 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Contax 137 MA automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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:
 - Contax 137 MA: - four 1.5 V AA batteries
 - Contax Data Back Quartz D-5: - two 1.5 V silver oxide batteries
 - Paragon EC72D: - two 6 V lantern batteries and one 9 V transistor battery
- Watch
- 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
 - Manufacturer's instruction booklets
 - Visibility Monitoring Status/Assessment Sheets
 - Film canister labels
- Pen or pencil
 - Grease pencil
 - Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Contax 137 MA 35 mm automatic camera system and associated components are provided in TI 4120-3120, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.

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

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

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings
- Improperly loaded film

- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3120, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Contax 137 MA 35 mm Camera and Paragon Timer

Standard Settings Check List		
Contax 137 MA	Contax Data Back Quartz D-5	Paragon Timer
Main Switch On (test light position) between OFF and AE LOCK Aperture Ring f8.0 ASA Dial 100* Exposure Compensation Dial X1 Shutter Control Dial A Exposure Mode Selector S *Film remains Kodachrome 64	Day-of-Month/Time	Time/Day-of-Week
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Turn the "main switch" in the direction of the "BC" (battery check). The "main switch" test light should light up green.	<ul style="list-style-type: none"> • The batteries were not installed properly. • The camera battery power level is insufficient or drained. The lamp will become dim or not light up.
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button. The shutter should open and close, and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> • The "main switch" is in the "OFF" position. • Camera battery malfunction. • Camera needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> • Camera/timer wiring is incorrect (refer to TI 4120-3120). • Timer battery malfunction. • Camera/timer cable needs repair.
Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> • Timer battery/configuration is incorrect (refer to TI 4120-3120). • The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> • The timer is not in the "RUN" mode. Press RUN on the display panel. • The timer clock needs to be reprogrammed (refer to TI 4120-3120). • Timer battery malfunction (12 V and/or 9 V). • Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event. Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> • The timer events need to be reprogrammed (refer to TI 4120-3120). • Timer battery malfunction. • Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart. Note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3120, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Contax 137 MA camera runs on four 1.5 V AA batteries. Under normal operating conditions, the batteries last up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the batteries before replacing, especially if they were recently replaced.
- Verify that the "main switch" camera setting is on "□". If the selection is inadvertently left in a wrong position (i.e., AE LOCK), the batteries may drain prematurely.
- The metering system on the camera may not be shutting off, even when the automatic camera settings are correct. Check the camera for excessive current draw.

To check if all systems are working properly, press the **CAMERA SHUTTER** halfway to observe the main lamp. The lamp should not illuminate (red) 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 or in the camera itself.

DATABACK BATTERIES

The Contax Data Back Quartz D-5 runs on two 1.5 V silver oxide batteries. Under normal operating conditions, the batteries will last a minimum of 12 months. Replace the batteries only when film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The word "BATTERY" will be displayed or the display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or batteries before replacing, especially if they were recently replaced.

- Verify that the databack is in the "day-time" mode displaying the current date and current time.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3120, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3120.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the exposure counter on the top of the camera. Document the number of photographs that were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER FILM LOADING

The exposure counter on the camera will increment whether or not the film is loaded properly. To verify proper film loading, perform the following:

- Observe the rewind shaft when the shutter release is pressed. The shaft should rotate counter-clockwise.
- Pay close attention to the normal resistance when the film is rewound. If the film is improperly loaded, there will be a very slight to zero resistance during rewind. If the film was not loaded properly, open the back cover and reload the film. Review the film loading procedures described in TI 4120-3120. Document your findings on a Visibility Monitoring Status/Assessment Sheet and mail the sheet, without any film, to ARS.

VERIFY
INTERNAL
CAMERA
WINDER
OPERATION

Check the camera battery as described in TI 4120-3120, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Contax 137 MA*.

- Take a manual photograph. Press the **SHUTTER RELEASE** button; the shutter should open and close, and the film and film counter should advance one frame. If the camera will not fire manually, verify that the "main switch" is in the "ON" position and the battery check is good.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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).
- Press **C1** on the timer panel to activate the camera shutter; the camera should fire. 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.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and CABLE day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3120.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER
OPERATION

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

- 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 Ti 4120-3120, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Contax 137 MA*. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3120.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.

- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3110, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Contax 137 MA*.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3120 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - OLYMPUS OM2N
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3330
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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	11
4.3 Final System Verification Check	11
4.4 Capital Equipment Exchange Procedures	12

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Olympus OM2N 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Olympus OM2N 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Olympus OM2N automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- Document all capital instrumentation changes and maintain inventory records in the ARS Purchase Order/Inventory Database.

- TI 4120-3330, *Troubleshooting and Emergency Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*
- Automatic 35 mm Camera System User's Manual
- Manufacturer's instruction booklets
- Visibility Monitoring Status/Assessment Sheets
- Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Contax 137 MA 35 mm automatic camera system and associated components are provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*.

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

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings

- Improperly loaded film
- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Olympus OM2N 35 mm Camera and Paragon Timer

Standard Settings Check List		
Olympus OM2N	Olympus Recordata Back 3 or 4	Paragon Timer
Aperture Ring f8.0	Day-of-Month/Time (3)	Time/Day-of-Week
ASA Dial 64		
Exposure Compensation Dial Zero	Year-Month-Day (4)	
Shutter Control Dial Off		
Exposure Mode Selector Single Shot		
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Press the selector lever (located on the top of the camera) to the CHECK-RESET position. The battery check lamp should light brightly and remain steady.	<ul style="list-style-type: none"> The batteries were not installed properly. The camera battery power level is insufficient or drained (the battery check lamp will flicker or not light up).
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button on top of the winder. The camera shutter should open and close, and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> Power to winder is insufficient. Winder cable needs repair. Winder needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> Camera/timer wiring is incorrect (refer to TI 4120-3130). Timer battery malfunction. Camera/timer cable needs repair.
Timer Batteries	<p>Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).</p> <p>Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.</p>	<ul style="list-style-type: none"> Timer battery/configuration is incorrect (refer to TI 4120-3130). The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> The timer is not in the "RUN" mode. Press RUN on the display panel. The timer clock needs to be reprogrammed (refer to TI 4120-3130). Timer battery malfunction (12 V and/or 9 V). Timer needs repair.
	<p>Review the programmed timer events.</p> <p>Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event.</p> <p>Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.</p>	<ul style="list-style-type: none"> The timer events need to be reprogrammed (refer to TI 4120-3130). Timer battery malfunction. Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart to note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Olympus OM2N camera runs on two 1.5 V silver oxide batteries. Under normal operating conditions, the batteries last up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the batteries before replacing, especially if they were recently replaced.
- Verify the camera settings. If the selector level is inadvertently left in a wrong position (i.e., auto), the batteries can drain prematurely.

DATABACK BATTERIES

The Olympus OM2N Recordata Back 3 or 4 runs on two 1.5 V silver oxide batteries. Under normal operating conditions, the batteries will last a minimum of six months. Replace the batteries only when film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The word "BATTERY" will be displayed or the display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or batteries before replacing, especially if they were recently replaced.
- Verify that the Recordata Back 3 is in the "day-time" mode displaying the current day of the month and current local time. When using the Recordata Back 4, the databack should display the current year, month, and day.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Olympus OM2N*.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3130.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the exposure counter on the top of the camera. Document the number of photographs that were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER FILM LOADING

If the film was not loaded correctly, the rewind shaft of the top of the camera will not rotate when a photograph is taken. Open the back cover and reload the film. Review the film loading procedures described in TI 4120-3130. Document your findings on a Visibility Monitoring Status/Assessment Sheet and mail the sheet, without any film, to ARS.

VERIFY INTERNAL CAMERA WINDER OPERATION

Check the camera battery as described in TI 4120-3130.

- Take a manual photograph. Press the winder **SHUTTER RELEASE** button; the shutter should open and close, and the film and film counter should advance one frame. If the camera will not fire, verify that the selector lever is in the "OFF" position and the battery check is good. If the camera fires but the winder does not advance, verify that the camera body is firmly mounted to the winder assembly.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY CAMERA AND TIMER CABLES

Verify the camera/timer cable connection:

- Gently shake the camera/timer cable leading into the winder. If the camera fires, an electrical short may exist in a portion of the cable.

- Press **C1** on the timer panel to activate the camera shutter; the camera should fire.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Olympus OM2N*.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER
OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 TI 4120-3130. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3130, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Olympus OM2N*.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3130.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3130 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 35 MM AUTOMATIC CAMERA SYSTEM - PENTAX PZ-20
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3340
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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	12
4.3 Final System Verification Check	12
4.4 Capital Equipment Exchange Procedures	12

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
4-1 Camera Display Panel Depicting Shutter Speed Reading	8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Pentax PZ-20 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Pentax PZ-20 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Pentax PZ-20 automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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:
 - 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
- 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
 - Manufacturer's instruction booklets
 - Visibility Monitoring Status/Assessment Sheets
 - Film canister labels
- Pen or pencil
 - Grease pencil
 - Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.

- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.
- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Pentax PZ-20 35 mm automatic camera system and associated components are provided in TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*.

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

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

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings

- Improperly loaded film
- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Pentax PZ-20 35 mm Camera and Paragon Timer

Standard Settings Check List		
Pentax PZ-20	Pentax Data Back FE	Paragon Timer
Main Switch ON	Day-of-Month/Time	Time/Day-of-Week
Aperture f8.0		
ISO/ASA 64		
Exposure Compensation 0.0		
Program Mode Selection A		
Drive Mode Selector <input type="checkbox"/> (single)		
Lens Focus Mode MF (manual)		
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Check the camera display. If a battery symbol () appears directly above the film-load check mark () then the battery is low.	<ul style="list-style-type: none"> • The battery pack was not installed properly. • The camera battery power level is insufficient or drained.
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button. The shutter should open and close, and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> • The "main switch" is in the "OFF" position. • No film is in the camera. • Camera battery malfunction. • Camera needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> • Camera/timer wiring is incorrect (refer to TI 4120-3140). • Timer battery malfunction. • Camera/timer cable needs repair.
Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> • Timer battery/configuration is incorrect (refer to TI 4120-3140). • The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> • The timer is not in the "RUN" mode. Press RUN on the display panel. • The timer clock needs to be reprogrammed (refer to TI 4120-3140). • Timer battery malfunction (12 V and/or 9 V). • Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event. Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> • The timer events need to be reprogrammed (refer to TI 4120-3140). • Timer battery malfunction. • Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart to note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Pentax PZ-20 camera runs on one 6 V lithium battery pack. Under normal operating conditions, this battery lasts up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the battery pack before replacing, especially if it was recently replaced.
- Verify the "main switch" and "program mode selector" camera settings.
- The metering system on the camera may not be shutting off, even when the automatic camera settings are correct. Check the camera for excessive current draw.
- To check if all systems are working properly, press the **CAMERA SHUTTER** halfway to observe the camera display panel. The shutter speed and aperture (Figure 4-1, lower right) should not illuminate for more than 10 seconds. If the shutter speed continues to illuminate beyond 10 seconds, an electrical short may exist in a portion of the cable jack or in the camera itself.

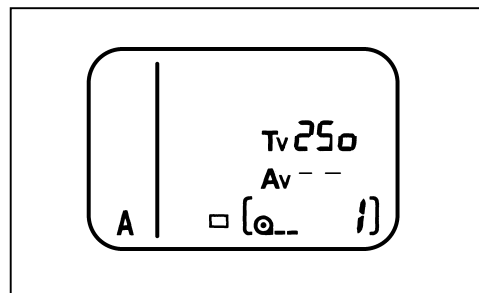


Figure 4-1. Camera Display Panel Depicting Shutter Speed Reading.

DATABACK BATTERIES

The Pentax PZ-20 Data Back FE runs on one 3 V coin-shaped lithium battery. Under normal operating conditions, the battery will last a minimum of 12 months. Replace the batteries only when film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or battery before replacing, especially if it was recently replaced.
- Verify that the databack is in the "day-time" mode displaying the current day of the month, current time, and the bar mark (—) is displayed directly above the minutes. No information will be imprinted on the film when the display is in the "_____" position, or the bar mark is not present.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*.


The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3140.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the exposure counter on the top of the camera. Document the number of photographs that were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER
FILM LOADING

If the film was not loaded correctly, the film transport symbol and the letter "E" () in the LCD panel will flash and the shutter will not release. If so, open the back cover and reload the film. Review the film loading procedures described in TI 4120-3140. Document your findings on a Visibility Monitoring Status/Assessment Sheet and mail the sheet, without any film, to ARS.

VERIFY
INTERNAL
CAMERA
WINDER
OPERATION

Check the camera battery as described in TI 4120-3140, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax PZ-20*.

- Take a manual photograph. Press the **SHUTTER RELEASE** button; the shutter should open and close, and the film and film counter should advance one frame. If the camera will not fire manually, verify that the "main switch" is in the "ON" position and the battery check is good.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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).
- Press **C1** on the timer panel to activate the camera shutter; the camera should fire. Observe the camera display panel; after firing, the shutter speed and aperture should not illuminate for more than 10 seconds. If they continue to illuminate beyond 10 seconds, an electrical short may exist in a portion of the cable jack.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3140.

- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 TI 4120-3140, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Pentax PZ-20*. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided in the site operator's manual and on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3140.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3140, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Pentax PZ-20*.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3140 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	9
4.2.3 Camera Misalignment	11
4.2.4 Enclosure Leakage	12
4.3 Final System Verification Check	12
4.4 Capital Equipment Exchange Procedures	12

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
4-1 Camera Display Panel Depicting Shutter Speed Reading	8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Pentax ZX-10 35 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Pentax ZX-10 35 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in standard operating procedure (SOP) 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Pentax ZX-10 automatic camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

Close personal communications should be maintained between Air Resource Specialists, Inc. (ARS) and site operators throughout all monitoring and unscheduled maintenance efforts. 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, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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:
 - 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
- 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
 - Manufacturer's instruction booklets
 - Visibility Monitoring Status/Assessment Sheets
 - Film canister labels
- Ballpoint pen
 - Grease pencil
 - Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.

- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.
- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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. Detailed schematic diagrams of the Pentax ZX-10 35 mm automatic camera system and associated components are provided in TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*.

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

- Pentax ZX-10 Operating Manual
- Pentax Data Back
- Paragon EC72, EC72D, and EC72E

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings

- Improperly loaded film
- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Pentax ZX-10 35 mm Camera and Paragon Timer

Standard Settings Check List		
Pentax ZX-10	Pentax Data Back	Paragon Timer
Main Switch ON	Day-of-Month/Time	Time/Day-of-Week
Aperture f8.0		
ISO/ASA 64		
Exposure Compensation 0.0		
Mode Dial Pict		
Drive Mode Selector □ (single)		
Lens Focus Mode MF (manual)		
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera Battery	Check the camera display. If a battery symbol () appears directly above the aperture priority indicator (Av) then the battery is low.	<ul style="list-style-type: none"> • The batteries were not installed properly. • The camera battery power level is insufficient or drained.
Camera Winder	Attempt to take a manual photograph. Press the SHUTTER RELEASE button. The shutter should open and close and the film and the film counter should advance one frame.	<ul style="list-style-type: none"> • The "main switch" is in the "OFF" position. • No film is in the camera. • Camera battery malfunction. • Camera needs repair.
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire.	<ul style="list-style-type: none"> • Camera/timer wiring is incorrect (refer to TI 4120-3150). • Timer battery malfunction. • Camera/timer cable needs repair.
Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> • Timer battery/configuration is incorrect (refer to TI 4120-3150). • The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> • The timer is not in the "RUN" mode. Press RUN on the display panel. • The timer clock needs to be reprogrammed (refer to TI 4120-3150). • Timer battery malfunction (12 V and/or 9 V). • Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Press E repeatedly to review each event. Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> • The timer events need to be reprogrammed (refer to TI 4120-3150). • Timer battery malfunction. • Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Review the "battery servicing record" section of the on-site documentation chart to note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The Pentax ZX-10 camera runs on two 3 V lithium batteries. Under normal operating conditions, these batteries last up to six months. Perform the following duties when servicing the batteries:

- Camera batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the battery check fails, attempt to warm the battery pack before replacing, especially if it was recently replaced.
- Verify the "main switch" and "mode dial" camera settings.
- The metering system on the camera may not be shutting off, even when the automatic camera settings are correct. Check the camera for excessive current draw.
- To check if all systems are working properly, press the **CAMERA SHUTTER** halfway to observe the camera display panel. The shutter speed and aperture should not illuminate for more than 10 seconds (see Figure 4-1). If the shutter speed continues to illuminate beyond 10 seconds, an electrical short may exist in a portion of the cable jack or in the camera itself.

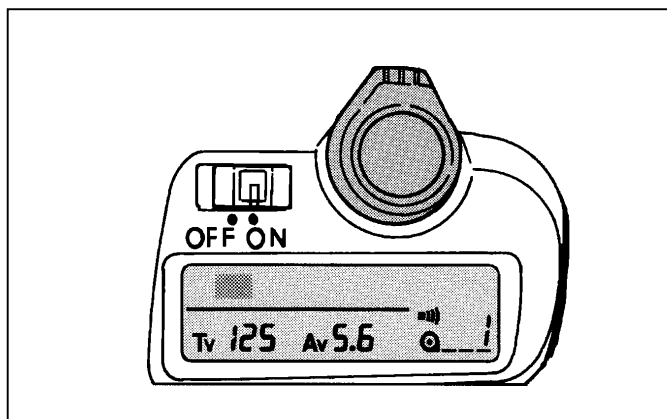


Figure 4-1. Camera Display Panel Depicting Shutter Speed Reading.

DATABACK BATTERIES

The Pentax ZX-10 Data Back runs on one 3 V coin-shaped lithium battery. Under normal operating conditions, the battery will last a minimum of 12 months. Replace the battery only when film is not loaded. Verify the databack date and time setting following each battery change.

- The databack battery can easily be affected by cold weather (less than 30°F). The display will appear blank when the battery has insufficient voltage to imprint the data. Attempt to warm the databack or battery before replacing, especially if it was recently replaced.
- Verify that the databack is in the "day-time" mode displaying the current day of the month, current time, and the bar mark(—) is displayed directly above the minutes. No information will be imprinted on the film when the display is in the "_____" position, or the bar mark is not present.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*.


The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3150.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the exposure counter on the top of the camera. Document the number of photographs that were taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY PROPER
FILM LOADING

If the film was not loaded correctly, the film transport symbol and the letter "E" () in the LCD panel will flash and the shutter will not release. If so, open the back cover and reload the film. Review the film loading procedures described in TI 4120-3150. Document your findings on a Visibility Monitoring Status/Assessment Sheet and mail the sheet, without any film, to ARS.

VERIFY
INTERNAL
CAMERA
WINDER
OPERATION

Check the camera battery as described in TI 4120-3150, *Routine Site Operator Maintenance Procedures for 35 mm Automatic Camera System - Pentax ZX-10*.

- Take a manual photograph. Press the **SHUTTER RELEASE** button; the shutter should open and close and the film and film counter should advance one frame. If the camera will not fire manually, verify that the "main switch" is in the "ON" position and the battery check is good.
- The camera must be sent to ARS for evaluation if it will not manually operate after taking the above steps. Document any discrepancies and/or corrective actions taken.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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).
- Press **C1** on the timer panel to activate the camera shutter; the camera should fire. Observe the camera display panel; after firing, the shutter speed and aperture should not illuminate for more than 10 seconds. If they continue to illuminate beyond 10 seconds, an electrical short may exist in a portion of the cable jack.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3150.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 TI 4120-3150, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Pentax ZX-10*. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

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

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided in the site operator's manual and on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3150.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3150, *Routine Site Operator Maintenance Procedures 35 mm Automatic Camera System - Pentax ZX-10*.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period (e.g., 0900 photograph) or by pressing **C1** on the timer panel. The camera should fire and advance one frame. Refer to TI 4120-3150 for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera body, lens, databack, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES

**TITLE TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES
FOR 8 MM AUTOMATIC CAMERA SYSTEM
- MINOLTA XL 401/601**

TYPE TECHNICAL INSTRUCTION

NUMBER 4120-3400

DATE NOVEMBER 1993

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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	8
4.2.3 Camera Misalignment	10
4.2.4 Enclosure Leakage	10
4.3 Final System Verification Check	11
4.4 Capital Equipment Exchange Procedures	11

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Minolta XL 401/601 8 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Minolta XL 401 or Minolta XL 601 8 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Minolta XL 401/601 8mm camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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 and Paragon EC72D: two 6 V lantern batteries and one 9 V transistor battery
- Watch
- 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 8 mm Automatic Camera System - Minolta XL 401/601*
 - Manufacturer's instruction booklets

- Visibility Monitoring Status/Assessment Sheets
- Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance 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 cameras and Paragon EC72D automatic timer. Detailed schematic diagrams of the Minolta XL 401/601 8 mm automatic camera system and associated components are provided in TI 4120-3200, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*.

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

- Minolta XL 401/601
- Paragon EC72, EC72D, and EC72E

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings
- Improperly loaded film

- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3200, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Minolta XL 401/601 8 mm Camera and Paragon Timer

Standard Settings Check List		
Minolta XL 401/601		Paragon Timer
Normal/Macro Switch	NORMAL	Time/Day-of-Week
Aperture Switch	AUTO	
Filter Switch	DAYLIGHT (filter in position)	
Function Switch	INTERVALOMETER	
Interval Adjustment	60-second position (recommended)	
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire at the set interval.	<ul style="list-style-type: none"> • Camera/timer wiring is incorrect (refer to TI 4120-3200). • Timer battery malfunction. • Camera/timer cable needs repair.
Camera/Timer Batteries	<p>Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).</p> <p>Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.</p> <p>Battery power to the camera can be checked by turning the operation switch on the camera to the BATTERY CHECK position. The battery check lamp in the viewfinder should light up.</p>	<ul style="list-style-type: none"> • Timer battery/configuration is incorrect (refer to TI 4120-3200). • The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> • The timer is not in the "RUN" mode. Press RUN on the display panel. • The timer clock needs to be reprogrammed (refer to TI 4120-3200). • Timer battery malfunction (12 V and/or 9 V). • Timer needs repair.
	<p>Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Repeat the process by pressing C2.</p> <p>Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.</p>	<ul style="list-style-type: none"> • The timer events need to be reprogrammed (refer to TI 4120-3200). • Timer battery malfunction. • Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3200, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta XL 401/601*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The internal camera batteries have been bypassed with internal wiring that can be directly connected to the timer board terminal block marked "camera." Under normal operating conditions, the two 6 V lantern batteries last up to six months. Perform the following duties when servicing the batteries:

- Batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the batteries fail, attempt to warm them before replacing, especially if they were recently replaced.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3200.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3200.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the film supply indicator. Document how far the film has advanced during the monitoring period. The amount of film taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY
CAMERA
AND TIMER
CABLES

Verify 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.
- Press **C1** on the timer panel to activate the camera; the camera should fire at the set interval.
- If the camera does not fire, verify that the timer battery cable connections are secure.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3200, *Routine Site Operator Maintenance Procedures 8 mm Automatic Camera System - Minolta XL 401/601*.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER
OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 (e.g., 0800). The remaining events are not programmed.
 - Press **C2** to select Channel 2 for review. In normal operation, Event 1 (E:01) is set at the desired stopping time (e.g., 1400). 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 TI 4120-3200. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

NOTE: If the timer operations are verified during operating hours, press **C1** to resume filming.

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided in the site operator's manual and on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3200, *Routine Site Operator Maintenance Procedures 8 mm Automatic Camera System - Minolta XL 401/601*.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3200.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period or by pressing **C1** on the timer panel. The camera should fire at the set interval. Refer to TI 4120-3200, *Routine Site Operator Maintenance Procedures 8 mm Automatic Camera System - Minolta XL 401/601*, for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES FOR 8 MM AUTOMATIC CAMERA SYSTEM - MINOLTA D12
TYPE	TECHNICAL INSTRUCTION
NUMBER	4120-3410
DATE	NOVEMBER 1993

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
0.1	Minor changes, including responsibilities.	April 1996	

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PURPOSE AND APPLICABILITY	1
2.0 RESPONSIBILITIES	1
2.1 Project Manager	1
2.2 Field Specialist	2
2.3 Data Coordinator	2
2.4 Site Operator	3
3.0 REQUIRED EQUIPMENT AND MATERIALS	3
3.1 Site Visit Equipment	3
3.2 Inventory	4
4.0 METHODS	4
4.1 General Information	5
4.2 Troubleshooting and Emergency Maintenance Procedures	8
4.2.1 Rapid Battery Drain	8
4.2.2 Improper Film Advance	8
4.2.3 Camera Misalignment	10
4.2.4 Enclosure Leakage	10
4.3 Final System Verification Check	10
4.4 Capital Equipment Exchange Procedures	11

LIST OF TABLES

<u>Table</u>	<u>Page</u>
4-1 Troubleshooting Procedures for the Minolta D12 8 mm Camera and Paragon Timer	7

1.0 PURPOSE AND APPLICABILITY

The purpose of on-site troubleshooting and emergency maintenance is to assure quality data capture and minimize data loss by performing operational checks that will verify proper system operation and/or quickly identify the probable source of an automatic camera system malfunction. This technical instruction (TI) describes on-site troubleshooting and emergency maintenance procedures for the Minolta D12 8 mm camera system.

Maintaining the visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. This TI is referenced in SOP 4120, *Automatic Camera System Maintenance (IMPROVE Protocol)* and serves as a guideline to facilitate the following unscheduled maintenance tasks:

- On-site troubleshooting procedures for the following components:
 - Minolta D12 8mm camera system
 - Paragon EC72D automatic timer
 - Batteries and support system components
- Notification of the field specialist or data coordinator
- System diagnosis and resulting corrective action(s)
- Installation of replacement system component(s)
- Final system verification check

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 automatic camera system Visibility Monitoring Status/Assessment Sheets are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall coordinate with the site operator, his/her supervisor, the field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the site operator, his/her supervisor, project manager, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Train the site operator in all phases of specific troubleshooting procedures necessary for on-site resolution of instrument problems.
- Provide technical support to the site operator via telephone to identify and resolve instrument problems.
- 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 site operator, his/her supervisor, project manager, and the field specialist concerning the requirements and completion of specific troubleshooting procedures.
- Identify possible instrument malfunction and contact the site operator to schedule troubleshooting procedure implementation.
- Verify that scheduled troubleshooting visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Provide technical support to the site operator via telephone to identify and resolve system problems. Document all technical support given to the site operator.
- Review documentation completed by the site operator for accuracy and completeness. File all documentation and correspondence.
- Coordinate the replacement and repair of all system components and support hardware.
- Enter all correspondence with site operators and the results of all performed procedures into the site-specific Quality Assurance Database.
- 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, project manager, field specialist, and the data coordinator concerning the requirements and completion of specific troubleshooting procedures.
- Perform all procedures described in this TI.
- Thoroughly document all troubleshooting procedures on the Visibility Monitoring Status/Assessment Sheet and mail the completed sheet to the data coordinator.
- Report any noted inconsistencies and troubleshooting efforts immediately 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 troubleshooting site visit or emergency 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 and Paragon EC72D: two 6 V lantern batteries and one 9 V transistor battery
- Watch
- 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 8 mm Automatic Camera System - Minolta D12*
 - Manufacturer's instruction booklets

- Visibility Monitoring Status/Assessment Sheets
- Film canister labels
- Pen or pencil
- Grease pencil
- Supplemental visibility monitoring film

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency 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 or Photographic Monitoring Network Quality Assessment Log (described in Section 4.0). Capital equipment exchange procedures are discussed in Section 4.4.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 General Information
- 4.2 Troubleshooting and Emergency Maintenance Procedures
- 4.3 Final System Verification Check
- 4.4 Capital Equipment Exchange Procedures

Maintaining a visibility monitoring camera system includes prompt detection and emergency maintenance when the system fails to function properly. The troubleshooting and emergency maintenance process should progress as outlined below to ensure ongoing, consistent data collection.

- A system malfunction is detected by the site operator during routine maintenance of the system or by the data coordinator during review of processed film.
- The site operator applies defined troubleshooting procedures to test the system and notifies ARS of his/her findings. The data coordinator diagnoses the problem and suggests specific action. The operator initiates the corrective action, tests the system, and again notifies the data coordinator of his/her findings.
- If the system appears to be operating normally, the operator returns it to service and visits the site periodically before the next regularly scheduled visit.

- When the site operator cannot identify or resolve a camera-related problem or if the site operator is not available to address the malfunction, the data coordinator ships a complete backup camera system to the site as quickly as possible, along with a Photographic Monitoring Network Quality Assurance Log. Site operators exchange the equipment, document the exchange on the log, and ship the malfunctioning unit to ARS for evaluation and repair.
- The site operator documents all problems, troubleshooting, and corrective actions on the Visibility Monitoring Status/Assessment Sheet. The documentation should include:
 - Date of noted malfunction
 - Actual or estimated amount of data loss
 - Steps taken to test system components
 - Corrective action taken
 - Current operational status
- All troubleshooting and emergency maintenance communications documentation will be retained in the site-specific Quality Assurance Database for future reference. The data coordinator will continue to monitor processed film for reoccurrences or resolution of the problem.

A variety of automatic camera monitoring configurations exist. Specific equipment servicing and maintenance requirements for each site will vary with the system configuration. All procedures described in this TI refer to the Minolta D12 8 mm cameras and Paragon EC72D automatic timer. Detailed schematic diagrams of the Minolta D12 8 mm automatic camera system and associated components are provided in TI 4120-3210, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*.

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

- Minolta D12
- Paragon EC72, EC72D, and EC72E

4.1 GENERAL INFORMATION

The following is a partial list of common causes of data loss:

- Incorrect camera settings
- Incorrect timer settings
- Improperly loaded film

- Improperly secured battery or timer cable connections
- Drained batteries

Most of these problems are easily avoided with diligent, routine maintenance of the visibility monitoring camera system.

Technical instructions and procedures that address these common data loss errors are provided in TI 4120-3210, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*. Extensive component troubleshooting procedures are described further in Section 4.2 and summarized in Table 4-1.

The site operator can often diagnose and solve equipment problems in the field, reducing costly site visits or loss of data. Two good practices to follow in troubleshooting are: 1) start with simple checks and then progress towards the more complicated, and 2) test the system by individual testable component.

Before reporting problems or calling for assistance to diagnose an equipment problem, follow this troubleshooting sequence:

- 1) Check the problem areas listed above and in Table 4-1.
- 2) Follow the component troubleshooting procedures described in the following subsections.
- 3) Document the results of troubleshooting so the data coordinator or field specialist can review the problem accurately.
- 4) Refer to the Site Operator's Manual for Automatic Visibility Monitoring Camera Systems when necessary.

Throughout the monitoring effort, ARS and site operators maintain close personal communications. Call ARS immediately if any inconsistencies are 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

If the person you need to speak with is not in, ask to be directed to another or leave a message including your name, location, and a brief description of the problem(s) or need(s).

Data collection errors or discrepancies observed by the data coordinator during film review can also initiate required corrective action. All requested maintenance or troubleshooting procedures performed must be thoroughly documented by the site operator on the Visibility Monitoring Status/Assessment Sheet and by the data coordinator in the site-specific Quality Assurance Database.

Table 4-1

Troubleshooting Procedures for the Minolta D12 8 mm Camera and Paragon Timer

Standard Settings Check List		
Minolta D12		Paragon Timer
Normal/Macro Switch	N (normal)	Time/Day-of-Week
Aperture Control Switch	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	
Intervalometer	ON	
Interval Adjustment	60-second position (recommended)	
Troubleshooting Procedures		
Component to be Checked	Checking Procedure	Malfunction Possibilities
Camera/Timer Cables	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Press C1 . Camera should fire at the set interval.	<ul style="list-style-type: none"> • Camera/timer wiring is incorrect (refer to TI 4120-3210). • Timer battery malfunction. • Camera/timer cable needs repair.
Camera/Timer Batteries	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing). Test and record the voltage of the timer batteries. The measurement should be approximately 12 volts.	<ul style="list-style-type: none"> • Timer battery/configuration is incorrect (refer to TI 4120-3210). • The timer battery power level (12 V) is insufficient or drained.
Timer	Verify that the timer is in the "RUN" mode (time and day-of-week displayed and colon flashing).	<ul style="list-style-type: none"> • The timer is not in the "RUN" mode. Press RUN on the display panel. • The timer clock needs to be reprogrammed (refer to TI 4120-3210). • Timer battery malfunction (12 V and/or 9 V). • Timer needs repair.
	Review the programmed timer events. Press PRG then C1 to select channel 1 for review. Repeat the process by pressing C2 . Press RUN when finished reviewing or changing events to return the timer to the "RUN" mode.	<ul style="list-style-type: none"> • The timer events need to be reprogrammed (refer to TI 4120-3210). • Timer battery malfunction. • Timer needs repair.

4.2 TROUBLESHOOTING AND EMERGENCY MAINTENANCE PROCEDURES

4.2.1 Rapid Battery Drain

Note the date the batteries were last changed. Prior to any change, test and record the voltage of the original and replacement battery(ies). Step-by-step battery replacement procedures are provided in TI 4120-3210, *Routine Site Operator Maintenance Procedures for 8 mm Automatic Camera System - Minolta D12*.

Notify the data coordinator of any inconsistencies or ongoing battery problems observed. Most reoccurring battery drain problems require a component replacement.

CAMERA BATTERIES

The internal camera batteries have been bypassed with internal wiring that can be directly connected to the timer board terminal block marked "camera." Under normal operating conditions, the two 6 V lantern batteries last up to six months. Perform the following duties when servicing the batteries:

- Batteries may drain quickly or may be temporarily inoperable when subjected to extreme cold (less than 30°F). If during cold weather the batteries fail, attempt to warm them before replacing, especially if they were recently replaced.

TIMER

The Paragon EC72D timer runs on two 6 V lantern batteries connected in series. If this power source is low or removed, the output will de-energize but the (display) time, date, and program memory will be maintained for 100 hours by an internal 9 V alkaline battery. Under normal operating conditions the 6 V lantern batteries should operate sufficiently up to six months.

- If the timer display is blank, the timer battery configuration may be incorrect or have insufficient battery power. Premature draining of the timer lantern batteries generally indicates an electrical short in the camera/timer cable circuitry. Camera/timer wiring verification procedures are provided in TI 4120-3210.

The two 6 V lantern batteries must be properly configured to provide the required voltage (12 V) to operate the timer display and signal output. A diagram depicting the Paragon timer battery configuration is shown in TI 4120-3210.

- Notify the data coordinator of any cable malfunctions or incorrect battery configurations. Most reoccurring timer battery failures require component and/or battery replacement.

4.2.2 Improper Film Advance

Observe the film supply indicator. Document how far the film has advanced during the monitoring period. The amount of film taken during the monitoring period. The number of photographs taken is often a good indicator of what component is responsible for the film not advancing properly.

VERIFY
TIMER
BATTERY
CABLE

Verify the timer battery cable connections:

- The timer must be in the "RUN" mode, with the time and day-of-week displayed and colon flashing.
- If the timer display is blank, or the camera does not fire, the timer battery wiring is incorrect or battery power to the timer is insufficient. Timer battery verification procedures and a diagram depicting the Paragon timer battery configuration is provided in TI 4120-3210, *Routine Site Operator Maintenance Procedures 8 mm Automatic Camera System - Minolta D12*.
- Document any discrepancies and/or corrective actions taken. Most reoccurring cabling and/or timer battery failures require component replacement.

VERIFY TIMER
OPERATION

The Paragon EC72D should be in the "RUN" mode displaying the local time and day-of-week, with 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.
- 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 (e.g., 0800). The remaining events are not programmed.
 - Press **C2** to select Channel 2 for review. In normal operation, Event 1 (E:01) is set at the desired stopping time (e.g., 1400). 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 TI 4120-3210. Press **RUN** when finished reviewing or changing events to return the timer to the "RUN" mode.

- If the timer display is blank, verify the camera/timer and timer battery cable connections, as described above. If no configuration discrepancies or cable malfunctions are evident, the timer, batteries, and cabling must be sent to ARS for evaluation and repair.

NOTE: If the timer operations are verified during operating hours, press **C1** to resume filming.

4.2.3 Camera Misalignment

The visibility monitoring camera may fall out of alignment if the tripod is not tightened properly, if the camera enclosure is subjected to repeated vibrations (such as shaking in the wind), or if the camera enclosure is forcefully jarred. To ensure proper alignment:

- Look through the viewfinder. Verify that the vista alignment matches the site-specific alignment photograph provided in the site operator's manual and on the enclosure door.
- Tighten all tripod levers and mounting screws as firmly as possible. A figure depicting the automatic camera system tripod assembly is provided in TI 4120-3210, *Routine Site Operator Maintenance Procedures 8 mm Automatic Camera System - Minolta D12*.
- If the tripod appears to be defective or the tripod levers are stripped from wear, notify ARS for a replacement.

4.2.4 Enclosure Leakage

If water or large amounts of dust are found inside the camera enclosure:

- Make sure that all perimeter clamps on the enclosure are firmly tightened after every visit. The enclosure is designed to seal out the elements and should do so if all clamps are secure.
- To determine where leaks may be occurring, examine the sealant at enclosure joints (the tops and sides of the sunshield and around the window and portal perimeters). If obvious, attempt to correct the problem and/or call ARS to discuss possible solutions. An enclosure diagram is provided in TI 4120-3210.
- Carefully examine the camera system components for signs of damage from water or dirt. If damage is suspected, call ARS for instructions.
- Condensation on the inside of the enclosure window is a common problem during periods of high humidity. Packages of desiccant (a substance that absorbs moisture) are available from ARS by request. When placed inside the enclosure and changed frequently, desiccant greatly reduces the amount of condensation.

4.3 FINAL SYSTEM VERIFICATION CHECK

A thorough review of all system components and camera settings should be made following any component (or system) replacement or troubleshooting effort. Verify proper automatic operation by observing the system during a scheduled monitoring period or by pressing **C1** on the timer panel. The camera should fire at the set interval. Refer to TI 4120-3210, for complete system verification procedures.

Verify the system periodically between scheduled site visits to insure ongoing operation. The data coordinator will review all processed film as soon as possible to ensure correct film exposure and advancement.

4.4 CAPITAL EQUIPMENT EXCHANGE PROCEDURES

When the site operator cannot identify or resolve a camera-related problem or is not available to address the malfunction, ARS ships a backup camera system or system component to the site as quickly as possible. Site operators exchange the equipment and ship the malfunctioning unit to ARS for evaluation and repair. All camera systems returned to ARS are routinely cleaned and lubricated, and automatic exposures are calibrated before being placed back into service.

Note that backup equipment and system components must be available to accommodate emergency system replacement with minimal data loss. Where no backup equipment is available, no data are collected until the system or system component can be repaired and returned to the site.

It is imperative that any capital instrumentation changes made as a result of troubleshooting or emergency maintenance be thoroughly documented. The data coordinator should document the specific model and serial numbers of the exchanged enclosure, camera, and/or automatic timer in the site-specific Quality Assurance Database and ARS Purchase Order/Inventory Database for future reference. The site operator should document any on-site changes made on a Visibility Monitoring Status/Assessment Sheet or Photographic Monitoring Network Quality Assessment Log.