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1.0 PURPOSE AND APPLICABILITY

The purpose of routine site operator maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance of the time-lapse video monitoring system. This technical instruction (TI) describes the steps of a routine site visit, scheduled maintenance, and on-site data control for the DNPP SVHS time-lapse video monitoring system comprised of a Sony SSC-20 video camera, environmental enclosure, Panasonic AG-6740 SVHS time-lapse VCR, and a Panasonic CT1384Y color monitor.

The site operator should service the video system approximately every 7 days and change the videotape cassette every 14 days. During each site visit the operator should check the performance of the video system, clean system components, and perform troubleshooting and/or emergency maintenance as required. Preventive maintenance site visits are performed every six months or as required by the project manager. The effective performance and documentation of each of these tasks is the key to quality data collection and minimal data loss.

Site operators should be fully trained and supplied with a Time-Lapse Video Monitoring Field Procedures Notebook 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, a supply of Time-Lapse Video Monitoring Status/Assessment Sheets, and monitoring supplies are also provided.

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

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall:

- Coordinate with the site operator, his/her supervisor, field specialist, and data coordinator concerning the schedule and requirements for routine and remedial maintenance.
- Review status/assessment sheets.

2.2 FIELD SPECIALIST

The field specialist shall:

- Coordinate with the project manager, site operator, his/her supervisor, and data coordinator concerning the schedule and requirements for routine and remedial maintenance.

- Train the site operator in all phases of video system maintenance.
- Provide technical support to the site operator via telephone to assure high quality site visits.
- Resolve problems reported by the site operator.
- Document all technical support provided to the site operator.

2.3 DATA COORDINATOR

The data coordinator shall:

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

2.4 SITE OPERATOR

The site operator shall:

- Coordinate with the project manager, the site operator's supervisor, data coordinator, and field specialist concerning the schedule and requirements for routine or remedial maintenance.
- Schedule regular site maintenance visits and perform all procedures described in this TI.

- Thoroughly document all procedures on the Time-Lapse Video Monitoring Status/Assessment Sheet.
- Immediately report any noted inconsistencies to the data coordinator or field specialist.
- Package videotapes with status/assessment sheets and mail to ARS.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The time-lapse video monitoring system consists of a camera assembly and a video recording assembly. The components included in each assembly are:

Camera assembly components:

- Color video camera
- Environmental enclosure for the video camera with the following accessories:
 - heater
 - sun shroud
 - pole mount
 - pan/tilt mount

Video recording assembly components:

- Heated shelter
- Color review monitor
- SVHS time-lapse video recorder
- UPS power supply
- Miscellaneous cables, connectors, etc.

3.1 SITE VISIT EQUIPMENT

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

- Medium and small flat-blade screwdriver
- Small Phillips-head screwdriver
- Medium adjustable wrench
- Keys for enclosure and padlocks

- Digital watch synchronized to National Institute of Standards and Technology (NIST) Time (303/499-7111)
- Time-Lapse Video Monitoring Field Procedures Notebook containing:
 - TI 4120-3650, *Routine Site Operator Maintenance Procedures for SVHS Time-Lapse Video Camera System at DNPP - Sony SSC-S20 Camera, Panasonic AG-6740 SVHS VCR, and Panasonic CT1384Y Monitor*
 - TI 4120-3750, *Troubleshooting and Emergency Maintenance Procedures for SVHS Time-Lapse Video Camera System at DNPP - Sony SSC-S20 Camera, Panasonic AG-6740 SVHS VCR, and Panasonic CT1384Y Monitor*
 - Manufacturer's instruction booklets
 - Time-Lapse Video Monitoring Status/Assessment Sheets
 - Videotape cassette labels
- Pen or pencil
- Optical cleaning supplies
- Supplemental SVHS videotape cassettes
- Padded mailing envelopes

3.2 INVENTORY

It is imperative that any capital instrumentation changes made as a result of routine or remedial maintenance be thoroughly documented. Specific model and serial numbers of the exchanged enclosure, camera, recorder, and/or monitor 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 Time-Lapse Video Monitoring Status/Assessment Sheet. Capital equipment exchange procedures are discussed in TI 4120-3750, *Troubleshooting and Emergency Maintenance Procedures for SVHS Time-Lapse Video Camera System at DNPP - Sony SSC-S20 Camera, Panasonic AG-6740 SVHS VCR, and Panasonic CT1384Y Monitor*.

4.0 METHODS

This section includes four (4) major subsections:

- 4.1 Routine Servicing
- 4.2 Changing the VCR Operating Times
- 4.3 Scheduled Preventive Maintenance
- 4.4 Videotape Storage

All procedures described in this TI refer to the Sony SSC-S20 camera with Panasonic AG-6740 SVHS VCR and Panasonic CT1384Y color monitor. Schematic diagrams of the video system components are provided as Figures 4-1 through 4-3.

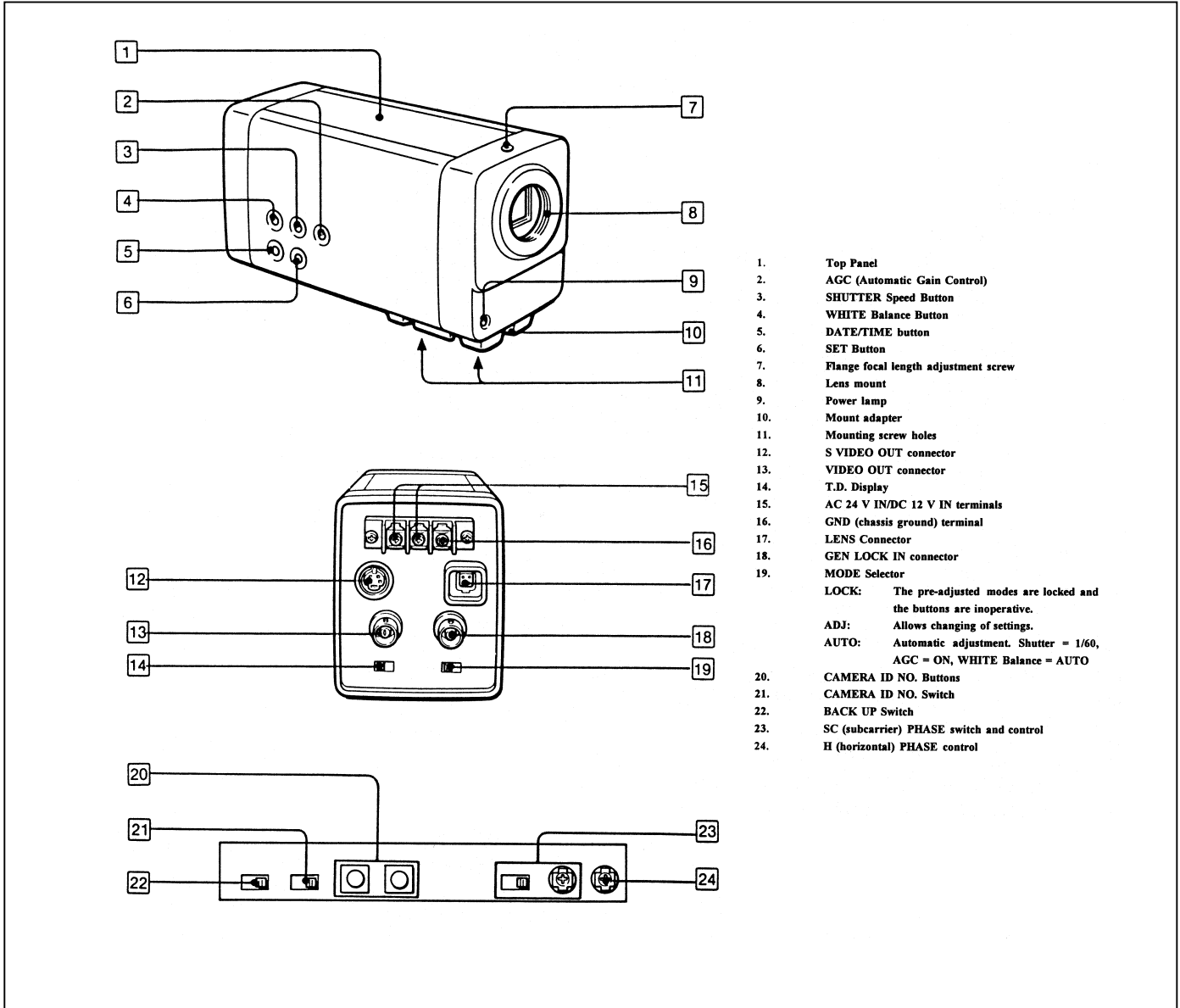


Figure 4-1. Sony CCD Camera Control Schematic.

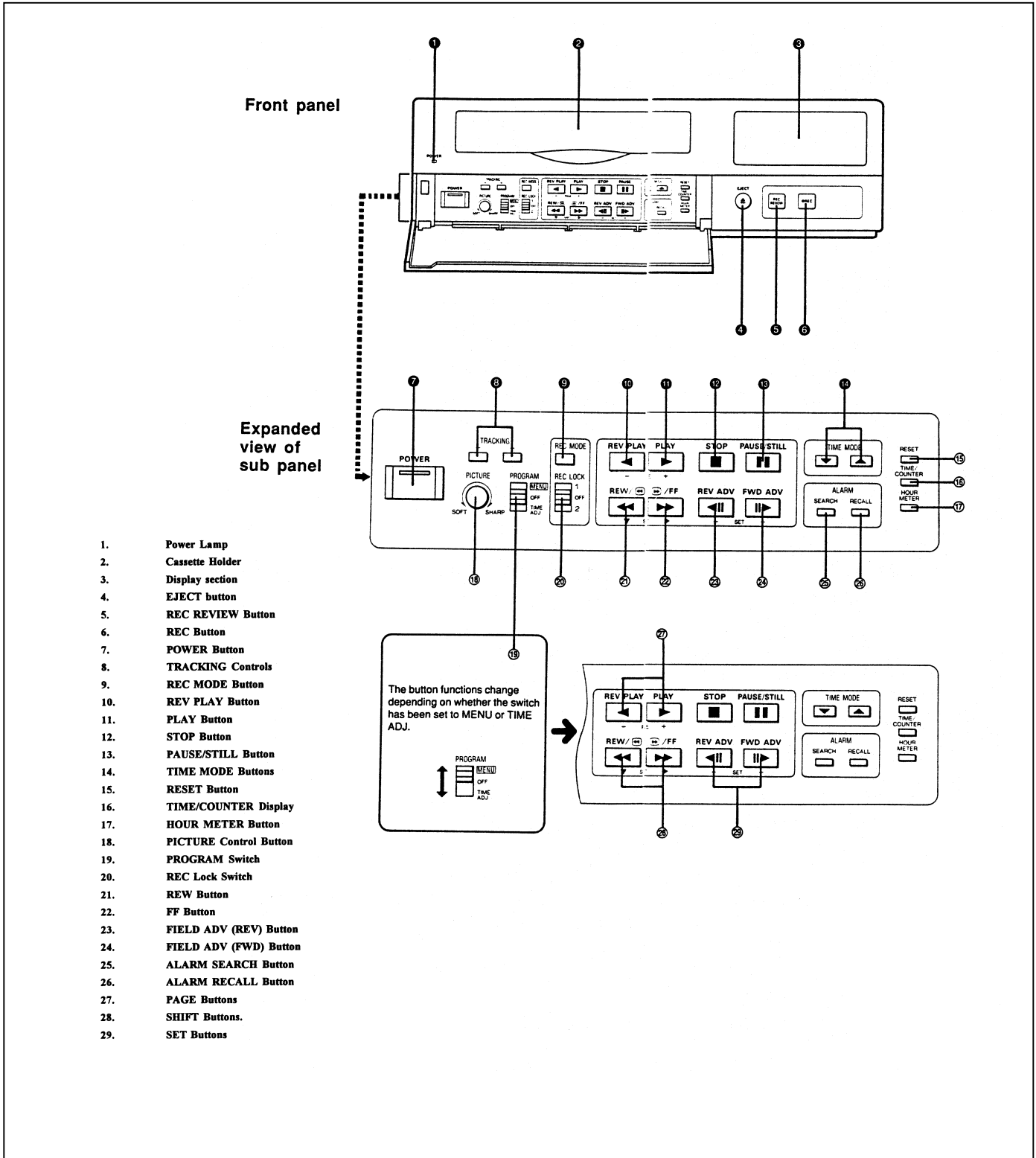


Figure 4-2. Panasonic AG-6740 Time-Lapse VCR Control Schematic.

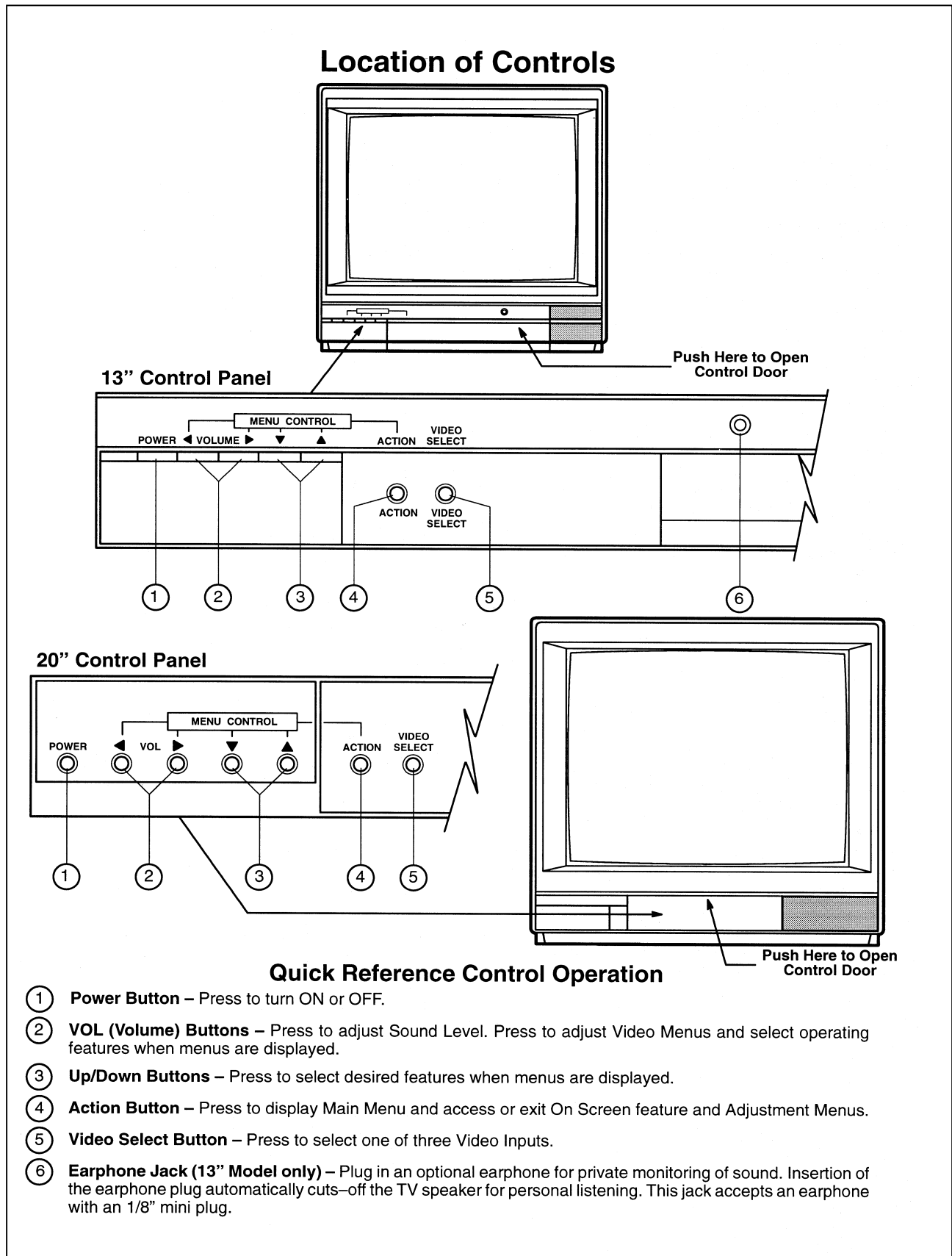


Figure 4-3. Panasonic CT1384Y Color Monitor Schematic.

4.1 ROUTINE SERVICING

Weekly site visits are required to properly maintain and service the time-lapse video monitoring system. Weekly system servicing by the site operator includes:

- Inspecting and cleaning the camera assembly components and shelter.
- Inspecting the video recording assembly components and shelter.
- Verifying camera alignment.
- Reviewing videotape contents.
- Securing the system.
- Documenting the servicing visit on a Time-Lapse Video Monitoring Status/Assessment Sheet.

Biweekly videotape servicing by the site operator includes:

- Reviewing videotape contents.
- Removing recorded videotape.
- Loading new videotape.
- Documenting the videotape servicing procedures on a Time-Lapse Video Monitoring Status/Assessment Sheet.
- Mailing recorded videotape with the Time-Lapse Video Monitoring Status/Assessment Sheet to ARS.

Proper documentation of each servicing visit performed on the status/assessment sheet is required. A properly completed status/assessment sheet must accompany each videotape cassette mailed to ARS.

4.1.1 Completing the Time-Lapse Video Monitoring Status/Assessment Sheet

Figure 4-4 presents an example Time-Lapse Video Monitoring Status/Assessment Sheet for the DNPP and Garner Hill Monitoring Sites. The top section of the sheet requires information pertinent to tracking the videotape and system servicing performed during the recording period. The body of the sheet has checkboxes for each of the required system and videotape servicing procedures. Each status/assessment sheet covers three site visits; the videotape loading visit, the interim weekly servicing visit, and the videotape removal visit. The site operator should check off the procedures performed during these three visits in columns 1, 2, and 3, respectively.

TIME-LAPSE VIDEO MONITORING STATUS/ASSESSMENT SHEET DNPP AND GARNER HILL MONITORING SITES		Location: _____ Tape No. _____		
		Operator: _____		
Date/Time of Site Visits #1: _____ : _____ #2: _____ : _____ #3: _____ : _____		Check procedures performed during each site visit in the appropriate column.		
VIDEOTAPE LOADED	#1	#2	#3	Comments
Labeled videotape cassette	<input type="checkbox"/>			_____
Loaded videotape	<input type="checkbox"/>			_____
OPERATION/MAINTENANCE CHECK				
<u>DNPP:</u> Inspected camera assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Cleaned viewport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Checked air filter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Verified camera sled alignment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Verified adjustable head alignment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Inspected video recording assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Record tape counter #	# _____	# _____	# _____	_____
Verified recorded image, date, and time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<i>***Proceed to VIDEOTAPE REMOVAL section if changing tape***</i>				
Repositioned tape	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<u>Garner Hill:</u> Inspected camera assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Cleaned viewport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Checked air filter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Verified pan/tilt head alignment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
CHECK OPERATION SETTINGS				
INT TIMER displayed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
REC displayed (appears only if activated during recording hours)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
SECURE SYSTEM				
<u>DNPP:</u> Secured camera assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Secured video recording assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Secured shelter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<u>Garner Hill:</u> Secured camera assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Secured shelter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
VIDEOTAPE REMOVAL				
Removed videotape			<input type="checkbox"/>	_____
Completed videotape cassette label			<input type="checkbox"/>	_____
Mailed videotape and assessment sheet to ARS			<input type="checkbox"/>	_____
ADDITIONAL COMMENTS/ACTIONS TAKEN: _____				

SUPPLIES NEEDED: _____				


Enclose this Status/Assessment Sheet with the labeled videotape cassette and send to:				
 1901 Sharp Point Drive, Suite E Fort Collins, CO 80525 Phone: 970-484-7941 Fax: 970-484-3423				

Figure 4-4. Example Time-Lapse Video Monitoring Status/Assessment Sheet for the DNPP and Garner Hill Monitoring Sites.

The comment column is to be used by the operator to note any inconsistencies or general observations during each visit. Comments concerning heavy dirt buildup, camera misalignment, power failure during the servicing visit, etc., are appropriate here. It is extremely important that the site operator properly complete the Time-Lapse Video Monitoring Status/Assessment Sheet and enclose it with each videotape mailed to ARS.

4.1.2 System Servicing and Videotape Servicing Procedures

The site operator should complete the following procedures during each system servicing and videotape servicing visit. A generic, quick-look reference guide that summarizes these procedures is also provided to the operator. A copy of this quick reference, titled "Automatic Time-Lapse Video Monitoring System Users Manual" is provided in Appendix A.

INSPECT
AND SERVICE
CAMERA
ASSEMBLY

Inspect and evaluate the camera assembly for any physical damage or abnormality. If damage is found, note it on the status/assessment sheet and call the ARS data coordinator.

Clean the camera assembly enclosure exterior viewport with the supplied wipes and cleaning solution. The inside of the enclosure viewport should be inspected and cleaned only if visual inspection from the outside indicates that dirt has accumulated on the inside. To clean the inside surface of the viewport, open the Pelco camera enclosure door by inserting the key in the latch on the top-rear of the enclosure and lifting the lid. Loosen the two Phillips-head screws holding the camera mount and slide the camera back from the viewport. Clean the viewport with supplied wipes and cleaning solution. Inspect the camera lens and clean similarly if necessary.

Inspect the camera enclosure air filter for any accumulation of dust or debris. The filter is a thin, gray foam material approximately 2" x 1" and is located under the viewport. If necessary, remove and clean with water. Shake out excess water (or dry) and replace.

VERIFY
CAMERA
ASSEMBLY
ALIGNMENT

Verify and/or realign the camera assembly sled mount to the marks provided. Tighten all associated screws. Close the housing lid and properly secure the assembly.

Verify that the camera assembly manual pan/tilt head is aligned properly by inspecting the alignment marks and viewing the image on the control monitor. If alignment is not correct, loosen the pan/tilt adjustment bolts and realign. Two bolts control the azimuth (vertical) alignment and one bolt controls the bearing (horizontal) alignment. Tighten the bolts snugly when alignment is complete.

Note any alignment changes on the status/assessment sheet. The camera view alignment must match the photograph provided in the "Site Specifications" section of the Time-Lapse Video Monitoring Field Procedures Notebook.

INSPECT
AND SERVICE
VIDEO RECORDING
ASSEMBLY

Inspect the exterior and interior of the video recording assembly shelter and cables for any physical damage or abnormality. Observe and note on the status/assessment sheet the current recorder settings and status of any associated environmental control components (i.e., heater, air conditioner, power supply).

If anything suspicious is found, note it on the status/assessment sheet and call the ARS data coordinator for instructions.

REVIEW
VIDEOTAPE

Turn the video recording assembly monitor ON. Stop the recorder by pressing the **REC MODE** button until the recording mode in the display is blank (i.e., INT TIMER is not displayed). Press the **STOP** button. The recording symbol (**REC**) and forward arrow (>) should no longer be displayed. Document the current date, time, and tape counter number on the status/assessment sheet.

Do not eject the videotape. Press **REV PLAY** to rewind a small amount of videotape. Play the videotape (press **PLAY**) to verify that proper picture quality, the correct date and time, and field of view have been recorded. Press **STOP** at the point where the recording ends. Document any inaccuracies found on the status/assessment sheet. If necessary, contact the ARS data coordinator for further instructions.

If continuing on the same videotape, return the videotape to its original position. Verify proper tape positioning by using the block counter on the recorder display and observing the recorded image on the monitor. Use the **PAUSE/STILL**, **REV ADV**, and **FWD ADV** buttons to move videotape in single frame increments if necessary. Skip the "Removing and Changing Videotapes" step and proceed to "Start the Automatic Recording Sequence" step below. Turn the monitor OFF.

REMOVING
AND CHANGING
VIDEOTAPES

If making a videotape change, remove the tape from the recorder by pressing the **EJECT** button. Complete the videotape cassette label and status/assessment sheet; denote date, time, and videotape counter number when the tape was removed. An example videotape cassette label is provided as Figure 4-5.


	Tape # _____	Date _____	Time _____	Counter # _____
	Site _____	Begin _____	_____	_____
	Operator _____	End _____	_____	_____

Figure 4-5. Example Videotape Cassette Label.

Complete a new videotape cassette label with the date, time, and tape counter number (should be 0000 for a new videotape) and place it on the spine of the new videotape to be inserted. Load the videotape into the VCR. Press the **TIME/COUNTER** button to show the counter, then the **RESET** button.

START THE AUTOMATIC RECORDING SEQUENCE

After the videotape has been positioned properly, restart the automatic recording sequence of the VCR by pressing the **REC MODE** button until INT TIMER is seen on the recorder display. If the recorder is placed in "Internal Timer Mode" during a scheduled recording period, REC (**REC**) will also appear in the display. If the recorder is placed in "Internal Timer Mode" during a scheduled non-recording period, the VCR will not begin recording immediately. Turn the monitor OFF.

SECURE SYSTEM

Carefully verify that the camera assembly, video recording assembly, and any other access to the time-lapse video system is secured and locked.

4.1.3 Reporting Problems to ARS

If at any time operational problems or mechanical failure occurs, contact ARS immediately at the following:

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

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

4.2 CHANGING VCR OPERATING TIMES

This section provides instructions for changing the daily start and stop time of the Panasonic AG-6740 time-lapse recorder. Time changes are required to adjust for the variation in day length throughout the year. Site-specific times for this monitoring site are presented in Table 4-1. Timer changes should take place on the first of each month.

Table 4-1

VCR Monthly Recording Start/Stop Timer Settings
Healy Clean Coal Project, Post-Construction Visibility Monitoring Program

Healy, Yukon-Koyukuk County, Alaska (longitude W149.0° latitude N63.9°)												
Adjustment Date	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	1-Dec
Video Start*	08:30	07:00	05:30	03:30	00:00	00:00	00:00	02:30	04:30	06:00	07:30	09:30
Video Stop*	18:00	19:00	20:30	22:30	00:00	00:00	00:00	00:00	21:00	19:00	17:30	16:00

* All times are in Standard Time. Do not set the VCR time to Daylight Saving Time.

Sunrise/Sunset Reference Table

Date	31-Jan	28-Feb	31-Mar	30-Apr	31-May	22-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	22-Dec
Standard/daylight	AST	AST	AST	ADT	ADT	ADT	ADT	ADT	ADT	ADT	AST	AST
Begin civil twilight	08:40	07:18	05:29	04:27				03:39	05:47	07:18	07:45	09:29
Sunrise	09:37	08:06	06:18	05:33	03:58	03:31	03:40	05:06	06:39	08:05	08:38	10:46
Sun transit	13:09	13:08	13:00	13:53	13:54	13:58	14:00	14:02	13:56	13:45	12:39	12:55
Sunset	16:43	18:12	19:44	22:15	23:51	00:25	00:18	22:56	21:10	19:25	16:40	15:03
End civil twilight	17:40	19:00	20:34	23:23				00:20	22:02	20:12	17:33	16:20

Source:

U.S. Naval Observatory, Astronomical Applications Department
http://aa.usno.navy.mil/AA/data/docs/RS_OneDay.html

The following instructions are intended as a guide. If difficulty is encountered completing this process, refer to page 51 of the Panasonic AG-6740 time-lapse recorder manufacturer's manual. The operator should not attempt to change any other parameters in the VCR setup without direct instruction from the ARS data coordinator.

NAVIGATING
THE VCR MENU
SCREENS

The REV PLAY, PLAY, REW, and FF, REV ADV, and FWD ADV buttons on the front panel of the VCR serve a secondary programming purpose when in the VCR programming menu mode. There are six (6) menu screens with multiple options on each menu screen to choose from when in the programming mode. Use the gold labels under these buttons to navigate through the menus as follows:

- Place the VCR in "program mode" by sliding the PROGRAM switch to MENU.
- Page through the six menu screens using REV PLAY (-) or PLAY (+).
- Scroll through items on a menu screen using REW (▼) or FF (►).
- Set the value of an item on a screen using REV ADV (-) or FWD ADV (+).

SETTING THE DAILY START AND STOP TIMES

Using the navigation techniques described above, select the “Internal Timer Rec” menu. Scroll down to the DLY line and set the start and stop times as specified in Table 4-1.

Note: The VCR and all recording times are kept in standard time (i.e., DO NOT SET THE VCR TIME TO DAYLIGHT SAVING TIME).

Record the change on the status/assessment sheet.

4.3 SCHEDULED PREVENTIVE MAINTENANCE

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

Additional servicing tasks identified by the data coordinator may include:

- Camera, VCR, monitor, or cable changes.
- Camera alignment changes.
- Revision of data collection procedures.

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

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

4.4 VIDEOTAPE STORAGE

To ensure proper storage, keep all videotapes in an environmentally controlled location (e.g., cool and dry). Do not store videotapes in a freezer or vehicle at any time.

Videotapes, like photographic film, are sensitive to heat and moisture. These elements can affect the videotape, altering both the quality of images and the data analysis. For example, videotape subjected to heat often has a pink or purple cast while videotape subjected to moisture has a streaky or grainy consistency.