AUTOMATIC CRYOGENIC RECTIFIER (ACR) OPERATOR HANDBOOK

This publication defines operator responsibilities and provides general guidelines for performing ACR operations and maintenance actions. It outlines requirements, defines terms, and provides guidance for preparation and submission of reports pertinent to ACR operations. Specific instructions for each location are contained in the attachment. Any deviation from this publication will not be made without the prior approval of HQ.

Supercedes CENR 66-1, Vol XIV, 28 June 1985. (See signature page for summary of changes.)
No. of Printed Pages: 23
OPR: LGM
Distribution: X

Page

Figures

Attachment

Chapter 1

GENERAL

1-1. Terms Defined:

a. Parent Unit. Staff function responsible for the support required for equipment operations at a subordinate unit.

b. Area Technician. Parent Unit individual assigned field maintenance duties on the ACR equipment.

c. Equipment Location (EL). A location where the ACR is operated.

d. Technical Instruction (TI). Depot publication containing technical information necessary to assemble, install, operate, and maintain the ACR. Unless otherwise noted, all references in this publication are to TI 3D-ACR-1.

e. Laboratory Label. A 3-digit number assigned to each location for data submission purposes. Individual laboratory labels are provided by the Parent Unit.

f. Time. All times referred to in this publication and attachment are local times.

1-2. Julian Calendar. A Julian calendar immediately available in the area of the unit will aid in the completion of CEN Forms 33, Operational Log and Data Sheet. Submit requirements to the Parent Unit.

1-3. ACR Equipment Malfunctions. Equipment problems will be reported via the Equipment Status Report IAW Chapter 4.

1-4. Electrical Reporting During MINIMIZE. Communications crisis conditions are defined as periods of MINIMIZE. If this condition exists, continue to submit all electrically transmitted reports that are required by this publication.

1-5. Operator Identification. Every effort will be made to ensure two individuals at each location receive the formal ACR training course, usually enroute to the new duty station. The unit commander may task other personnel to take daily readings and assume routine ACR duties, provided they meet the criteria outlined in the attachment.

1-6. Operator Responsibilities:

a. Operate and maintain the ACR within parameters as outlined in this publication, applicable guides, and TIs.

b. Advise the Parent Unit immediately of any problem concerning the equipment, supplies, operations, manning, etc., which may impact mission capability.

c. Perform all scheduled Preventive Maintenance Routines (PMR) and unscheduled maintenance within local capabilities. The established PMR intervals will not be exceeded unless a waiver is first obtained from the Parent Unit.

d. Request technical assistance as required to ensure timely performance of any scheduled or unscheduled maintenance.

e. Ensure all sample run interruptions or conditions, which may affect unit production, are fully documented by Julian date and local time in the remarks section of the CEN Form 33.

f. Advise the Parent Unit by message of the name, grade, current duty assignment, and anticipated arrival date of personnel scheduled to replace present ACR operators.

g. Inform the Parent Unit when Time Compliance Technical Instruction (TCTI) kits are received. Parent Units are responsible for the accomplishment of each TCTI.

h. Annotate within the remarks section of the completed CEN Form 33 if the supply of CEN Form 33 falls below a 2 month level. The Parent Unit is responsible to ensure a resupply of forms to their locations.

i. Maintain the supplies, special tools, and support equipment necessary to effectively perform the mission.

j. Notify the Parent Unit by message if supply of sample containers falls below a 30-day level.

k. Ensure all compressed gases are safely stored IAW applicable directives.

1-7. Maintenance Requirements:

a. Scheduled maintenance requiring the unit to be turned off will be accomplished at the completion of the sample run. The area technician may terminate the sample run at any time for scheduled maintenance. In addition, the sample run may be interrupted when it is obvious that immediate unscheduled maintenance is necessary to ensure sample collection or to eliminate a condition hazardous to life or equipment.

b. To keep outages to a minimum, temporary repairs are authorized as soon as a malfunction is discovered. However, repairs that alter the physical characteristics of the unit to such a degree that it cannot be returned to the original configuration will not be made unless approved by HQ.

1-8. Supply of Forms. Center forms prescribed by this publication will be provided by the Parent Unit or through established channels.

1-9. Documentation Disposition Instructions. AFR 12-50, Vol II contains disposition instructions for all documentation. Recommended disposition:

a. CEN Form 33, Operational Log and Data Sheet. Identify on AF Form 80 as Source, Support, or Control Data IAW AFR 12-50, Vol II, Table 11-1.

b. Equipment Status Reports. Identify on AF Form 80 IAW AFR 12-50, Vol II, Table 66-10.

c. Outage Notification. Transitory material.

d. Results Messages. Transitory material.

Chapter 2

OPERATING INSTRUCTIONS

2-1. Normal Operations. The start time and sample run schedule for each ACR location is contained in the appropriate attachment. Permanent changes to this schedule must be approved by HQ prior to implementation.

2-2. Air Supply Requirements. The ACR will normally operate on outside air through no more than 100 feet of 3/8 inch tubing. A waiver must be obtained from HQ for any unit to operate permanently on inside air. The unit will concentrate any gas or vapor having a boiling point higher than that of liquid oxygen. The unit should never be installed where the air may be appreciably contaminated with flammable gases or vapors, or solvent vapor. It must never be operated where it may take in vapors from metal or electric cleaning, floor wax, or paint spraying operations, or where acetylene is being used or generated.

2-3. Terms Defined:

a. Sample Run. The time period from the start of sample collection until sample isolation period is completed. It consists of the sample collection period and the Sample Isolation Period (SIP). A sample run ends at the completion of SIP.

(1) Daily sample runs will begin each day at the time designated in the attachment and will end 24 hours later.

(2) Twice-weekly sample runs will begin each Monday and Thursday at the time designated in the attachment and will end 72 and 96 hours later, respectively.

b. Sample Collection. The time period from the start of the sample run to the start of sample isolation. Under normal operation, this period will be 23.5 hours for a 1-day run or 95.5 hours for a 4-day run. During Delayed Start Mode (DSM) sample collection does not start until the selected Delayed Start Time (DST) is reached.

c. Sample Isolation Period (SIP). The time during which the sample is isolated and the unit readies itself for the next sample collection period. The sample isolation period will always be 30 minutes regardless of the length of the sample collection period and will consist of the following distinct functions.

(1) Sample Recovery Period (SRP). The time during which the desired product is isolated into the sample container. The length of SRP will always be 10 minutes regardless of the length of the sample collection period. Normal pressure is 20 to 26 pressure per square inch guage (PSIG).

(2) Cool Down Period. The time during which the unit cools down to operating temperature. The length of cool down period will always be 20 minutes regardless of length of the sample collection period.

d. System Controls and Front Panel Indicators:

(1) Clock Display. Displays local time in 24 hour format. It is used to synchronize certain control system functions with local time.

(2) Fast Set. Minutes advance at 60 Hz rate. Seconds Counter not affected.

(3) Slow Set. Minutes advance at 2 Hz rate and seconds Counter is reset to :00. When Slow and Fast Set are simultaneously depressed, Hours and Minutes are reset to 0:00.

(4) DST. When Delayed Start Time is depressed, start time is displayed and can be changed by use of Fast and Slow Set switches.

(5) DSM. When the Delayed Start Mode switch is depressed, the unit will enter a stand-by condition. All systems will continue to function but there will be no air flow. The DSM light will illuminate and remain illuminated until actual sample collection begins.

(6) Reset. Resets all functions to the start of a sample collection cycle.

(7) SIP. When depressed will start a sample isolation period. This will not alter or restart a sample collection cycle; however, the sample position will be incremented.

(8) Cycle Time Select. Selects the sample collection cycle time in hours. SIP takes place during the last 30 minutes of the time selected. On reset or end of DSM, the selected cycle time is loaded into a down counter and timing begins. At this time, a new cycle time can be selected that will start at the end of the current cycle.

(9) Cycle Time Remaining. Shows time in hours remaining in the current collection cycle.

(10) Advance. Used to step through sample container positions 1 to 7. Position 8 is used to indicate that sample in position 7 is completed and all 7 sample containers may be removed.

(11) Power Fail. Indicates that one or more power failures occurred when the corresponding sample position was in use.

(12) In Use. Indicates the current sample position now in use.

(13) SR (Sample Reset). Used to return position 1 to in-use status and reset the power-fail indicators after all seven samples have been collected. SR is only active when position 8 indicator is on. SR can be used before or after the sample containers are removed.

(14) SV0 to SV6. Provide manual operation of solenoid valves to ease troubleshooting and maintenance.

(15) SV7. Provides manual operation of solenoid valve in sample positions one to seven as selected.

(16) Compressor. Provides manual operation of compressor. This function will not override an over temperature condition.

(17) OT. Indicates that the compressor has exceeded its over temperature set-point of 225°F for 1 minute or longer. This will put the unit in a standby condition with all loads turned off. This OT condition can only be removed when the compressor returns to a safe operating temperature and system reset is depressed.

(18) Battery. Used to turn off the batteries if unit is to be shipped or turned off for repair or storage. The battery used is a standard 9 volt alkaline Duracell type MN1604 or equivalent. New batteries will provide standby power (to the control system logic only) for 48 hours.

(19) Vacuum Guage, M-1. Indicates vacuum inside the cryostat.

(20) P-1. Indicates pressure in the argon heat pipe.

(21) P-2. Indicates high pressure of the cryorefrigerator helium supply.

(22) P-3. Indicates low pressure of the cryorefrigerator exhaust.

(23) P-4. Indicates pressure of the cryostat air supply.

(24) P-5. Indicates pressure of the cryostat air outlet during collection and sample bottle pressure during isolation.

(25) P-6. Indicates pressure in the molecular sieve air driers.

(26) Flow Meter, FM. Indicates air flow through the unit.

(27) Time Meter, M2. Indicates elapsed time. Timer does not run during power failures.

(28) Back-Pressure Regulator. Controls pressure in the air driers as indicated by P6.

(29) Pressure Regulator. Controls pressure of cryostat air supply as indicated on P4.

(30) HV2. Controls filling and venting of the helium system.

(31) HV4. Controls the helium pressure differential on P2 and P3.

(32) HV6. Controls sample air flow rate on FM.

(33) HV7. Controls filling and venting of the argon system.

2-4. Special Interest Periods. During specified time periods, HQ may alter the normal sample collection schedule and establish critical operating criteria for selected units. Parent Units will be notified by message listing the time frames and locations affected. This message will include any general requirements necessary during the period. Parent Units will in turn notify the affected locations. Every effort will be made to keep the equipment operational during tnese periods.

2-5. Periodic Readings and Equipment Checxs. Although requirements for periodic readings and equipment checks are flexible, they are a necessary and integral part of a successful operation and should be made within 30 minutes of the same time each day. Once times are established, they should not be changed without Parent Unit approval.

a. Daily locations will record periodic equipment readings between four hours after the start of sample collection and prior to the start of SIP each day. During nonduty days, the readings will be taken if at all possible; however, if the operator must make a special trip for this purpose, these readings may be omitted.

b. Twice-weekly locations will record periodic equipment readings 4 to 23 hours after the start of sample collection of the first day of the sample run, once each duty day thereafter, and before the start of SIP on sample collection day. Weekend readings will be taken whenever possible; however, if the operator must make a special trip for this purpose, the weekend readings may be omitted.

c. All locations will:

(1) Record a complete set of readings taken approximately 9 minutes into SIP once each week.

(2) Record a set of readings immediately prior to any maintenance affecting sample integrity.

(3) Record a set of readings 4 to 23 hours after resuming normal operation following extended equipment outage.

2-6. Sample Container Removal.

a. For locations on daily sampling schedule:

(1) Containers will be removed promptly after the collection of seven samples. The IN USE indicator light for position 8 will be illuminated.

(2) Remove each container by holding the container with one hand and lift up the collar of the quick-disconnect fitting.

(3) Replace the protective covers on each container.

(4) Process the containers for shipment to the laboratory IAW paragraph 3-3. It is imperative that all collected samples be placed into mail channels with minimum delay once removed from the unit.

b. For locations on twice-weekly sampling schedule:

(1) Containers will be removed promptly after the collection of each sample. The IN USE indicator light for position 3 will be illuminated.

(2) Depress the ADVANCE button until the IN USE indicator light for position 8 is illuminated.

(3) Change the Cycle Time Select tumblers to 72 hours for a 3-day run starting on Monday or 96 hours for a 4-day run starting on Thursday.

(4) Remove each container by holding the container with one hand and lift up the collar of the quick-disconnect fitting.

(5) Replace the protective covers on each container.

(6) Process the containers for shipment to the laboratory IAW paragraph 3-3. It is imperative that all collected samples are placed into mail channels with minimum delay once removed from the unit.

2-7. Sample Container Preparation. Prepare the required number of sample containers for installation by first removing them from their individual shipping boxes and placing them in a convenient location for pressure checking. Set the shipping boxes aside for later use.

a. Remove the protective covers from the quick-disconnect fitting of the container to be checked. Check each container by inserting the hand-held pressure gauge into the quick-disconnect. If the pressure is at least 10 PSIG, vent the container to atmosphere by opening the manual relief valve. Open and close the relief valve three or four times to ensure the container is completely vented. If the container pressure is less than 10 PSIG, process the container IAW paragraph 3-2d and select and check another container from stock. Continue pressure checking and venting until the required number of containers have been tested. Visually inspect each quick-disconnect for cleanliness and obvious damage.

b. Identify each container IAW paragraph 3-2.

c. Complete Sections I and II on a separate CEN Form 33 for each sample container. Ensure the position numbers entered in Section I match the numbers placed on the container.

2-8. Sample Container Installation. To load the sample tray with sample containers:

a. Select the container marked number 1 in step 2-7b above.

b. With the container in hand, visually compare the sample identification data marked on the container with the appropriate CEN Form 33. The number placed on the container will correspond with the sample position number entered in Section I of the CEN Form 33.

c. Install the number 1 container on sample tray position ONE by aligning the quick-disconnect of the container with the disconnect on the sample tray and push up until the connections are seated.

d. Continue in this manner until all required sample containers have been loaded onto their respective numbered disconnects.

e. Visually inspect the entire sample tray to double check the individual numbers placed on the containers match with the sample tray position numbers.

f. Depress the sample reset to advance the IN USE indicator from number EIGHT to number ONE. (NOTE: If the IN USE indicator is in any position other than EIGHT, depress the advance switch until number EIGHT is illuminated, then depress the reset.)

CAUTION: If the IN USE indicator is left in position EIGHT, the ACR will not automatically enter SIP but will continue to sample indefinitely.

2-9. Sample Recovery. If an outage in excess of one hour becomes necessary after the unit is nine or more hours into the sample run, demand SIP to recover the sample and forward the container to the laboratory for processing. If the unit has not been operating for at least nine hours, remove the container and return to Depot or Parent Unit IAW paragraph 3-2d. For restart procedures refer to paragraph 2-12.

2-10. Shutdown Procedures. A scheduled unit shutdown could occur any time for many reasons (preventive or corrective maintenance, extended power loss, etc.). Perform the following for scheduled unit shutdown:

a. If possible, recover the sample by depressing the Sample Isolation Switch at least 30 minutes prior to the shutdown. Refer to sample recovery in paragraph 2-9.

b. After SIP, remove all sample containers which have collected usable samples.

c. Place the battery switch in the OFF position, then place the main power circuit breaker in the OFF position.

d. Turn HV4 fully counterclockwise.

e. If the last sample collection was for a minimum of 9 hours, forward the container for processing.

f. If the last sample collection was for less than 9 hours, or if sample recovery was not possible prior to unit shutdown, return the container to the Parent Unit marked IAW paragraph 3-2d.

2-11. Power Outage. Scheduled or unscheduled power outages may occur anytime during the sample run. Total outage and inclusive times, if known, will be recorded in the Remarks Section of CEN Form 33. The system logic is maintained by the battery and automatically compensates for short duration power failures. This will not affect the normal completion time for the next sample run. The following instructions apply for all types of outages:

a. For scheduled power outages in excess of one hour:

(1) Recover the sample IAW paragraph 2-9, 30 minutes prior to the scheduled outage.

(2) Shut down unit IAW paragraph 2-10 after completion of Sample Recovery.

(3) When power returns, restart IAW paragraph 2-12.

(4) Record all actions in the remarks section of CEN Form 33.

b. For scheduled and unscheduled power outages of less than one hour, when the power returns, record the inclusive times in the remarks section of CEN Form 33 if known. No other action is required.

c. For unscheduled power outages in excess of one hour, no action is required unless power is expected to be off for over 12 hours. Then place the Battery Switch and the Main Power Circuit Breaker to the OFF position. Turn HV4 fully counter clockwise. When power returns, restart unit IAW paragraph 2-12. Record all actions in the Remarks Section of the CEN Form 33. A CEN Form 33 is required even if no sample is collected. For unscheduled power outages over 48 hours, replace the 9 volt DC battery IAW TI 3D-ACR-1.

2-12. Restart Procedures:

a. Place the Main Power Circuit Breaker to the ON position.

b. Place the Battery Switch to the ON position.

c. Ensure all solenoid valve and compressor switches are in the AUTO position, then depress the System Reset Switch.

d. Enter the correct local time into the system clock using the FAST SET and SLOW SET switches.

e. Depress and hold the DELAYED START TIME (DST) switch. Enter the time you desire sample collection to start using the FAST SET and SLOW SET switches. Release the DST switch when the time has been set.

NOTE: When calculating a desired DST, include a 3 hour cool down period. This will allow sample collection to resume exactly at the selected time. The DST must be on the start of an hour because the CYCLE TIME SELECT tumblers can only be programmed in whole hours. Example: Unit is restarted at 1445L. The DST will be at 1800. Refer to the table in figure 2-1.

f. Depress the DELAYED START MODE (DSM) switch. The DSM light will illuminate and remain illuminated until actual sample collection begins. The unit is now in a standby condition. All systems continue to function but there will be no air flow.

g. Enter on the CYCLE TIME SELECT tumblers, the number of hours that will elapse between the DST selected and the end of the sample collection period. The hours entered on the CYCLE TIME SELECT tumblers will not be entered into the system logic (down counter) until the DST occurs. (NOTE: You will usually be programming a short collection period to return to the normal sample collection cycle.)

h. After the selected DST occurs, you must program the next sample run length by changing the CYCLE TIME SELECT tumblers to the desired sample collection period. The tumblers must be changed before the next SIP ends. This new cycle time will automatically be entered into the logic after the next SIP when sample collection begins. This should be the standard collection period.

i. Allow the ACR to operate for at least 15 minutes with HV4 fully counterclockwise. This will allow the helium and compressor temperatures to stabilize. After the stabilization period, slowly adjust HV4 clockwise until the proper helium differential is achieved.

j. Check visually and audibly for normal unit operation. If the ACR has been off for some time it will take several hours for all readings to stabilize. The main concern should be for unusual sounds, smells or incorrect pressure readings. Minor adjustments are normal during initial start-up after extended periods of outage until the ACR temperatures stabilize.

		If unit normally enters SIP at 0900	If unit normally enters SIP at 1000
Local Time Unit Started	Set DST to:	Set CYCLE TIME SELECT tumblers to:	
0501 - 0600	0900	24	*
0601 - 0700	1000	23	24
0701 - 0800	1100	22	23
0801 - 0900	1200	21	22
0901 - 1000	1300	20	21
1001 - 1100	1400	19	2
1101 - 1200	1500	18	19
1201 - 1300	1600	17	18
1301 - 1400	1700	16	17
1401 - 1500	1800	15	16
1501 - 1600	1900	14	15
1601 - 1700	2000	13	14
1701 - 1800	2100	12	13
1801 - 1900	2200	11	12
1901 - 2000	2300	10	11
2001 - 2100	2400	9	10

* NOTE: Unit start-up should be avoided from 2101 - 0600 local time to preclude sampling for less than 9 hours.

Figure 2-1. DST and CYCLE TIME SELECT Settings.

k. If it is necessary to add sample containers to the sample tray see paragraph 2-8.

l. Ensure the SAMPLE IN USE indicator is illuminated for the desired sample container. If not, use the sample advance switch to select the proper sample container.

m. For stations on a daily sampling schedule:

(1) Set the CYCLE TIME SELECT tumblers for 24 hours, after the selected DST occurs.

(2) Record a set of readings between 5 hours after resuming normal operation and prior to the next SIP.

(3) The unit is now on an automatic cycle and SIP will occur daily during the last 30 minutes of sample collection .

(4) If necessary, submit a sample verification run IAW paragraph 2-13.

(5) Process any short cycle sample containers IAW paragraph 3-2c or 3-2d, as appropriate.

n. For stations on other than daily sampling schedule:

(1) If sample quality is suspect due to maintenance or equipment malfunction:

(a) Set the CYCLE TIME SELECT tumblers for 24 hours, after the selected DST occurs. This 24 hour run will be used as a sample verification run and will be submitted IAW paragraph 2-13.

(b) Once the 24 hour run has begun, set the CYCLE TIME SELECT tumblers to the number of hours required to return the ACR to the normal sample run schedule.

(c) Process any short cycle sample containers IAW paragraph 3-2c or 3-2d, as appropriate.

(2) If sample quality is not suspect:

(a) Set the CYCLE TIME SELECT tumblers, after the selected DST occurs, to the number of hours required to return the ACR to the normal sample run schedule.

(b) Record a set of readings at least 5 hours after resuming normal operation.

2-13. Sample Verification Runs:

a. One full 24-hour sample verification run is required following periods of maintenance or an equipment malfunction which caused sample integrity to be suspect, such as coldhead maintenance. If a partial collection of at least 9 hours was made following unit restart and prior to the start of the full 24-hour verification run, it, too, will be marked and submitted IAW paragraph 3-2c.

b. Locations may submit more than one full 24-hour verification run on an EXPEDITE basis as deemed necessary to verify proper equipment operation.

Chapter 3

SAMPLE REQUIREMENTS

3-1. Sample Collection Requirements. The ACR is designed to collect five cubic centimeters (cc) per day at a flow rate of 8.8-9.2, for sample runs of four days or less. Performance below these general guidelines usually indicates a need for maintenance. The following chart lists sample requirements for the ACR. These figures will be used to monitor unit output. HQ will forward to the Parent Unit marginal and unusable results by message when received from the laboratory. After any run with marginal or unusable results, the equipment should be kept under close supervision. Unexplained marginal or unusable results may indicate that maintenance is required. Ensure an ESR has been submitted for all unusable results due to equipment malfunction.

LENGTH OF RUN IN DAYS	SATISFACTORY (MORE THAN)	MARGINAL	UNUSABLE (LESS THAN)
1	5cc	3 to 5 cc	3cc
2	10cc	3 to 15 cc	3cc
3	15cc	3 to 15 cc	3cc
4	15cc	3 to 15 cc	3cc

3-2. Sample Container Identification:

a. Ensure the new sample containers are identified prior to installation by placing a 6 inch piece of 3/4 inch printable tape vertically on each container. Number the required amount of containers consecutively beginning with the number 1. Place the number near the top of the container tape using a waterproof felt tip pen. Ballpoint pens or non-waterproof felt tip markers will not be used as they tend to smear, making container identification data illegible. Avoid using other types of tape, such as masking tape, or writing directly on the container as residual adhesive and felt tip markings are difficult to remove.

b. Label each container with data extracted from Section II of the CEN Form 33 by writing the data on the container tape in the following order: Blocks 4-6; dash, Blocks 7-8; dash, Blocks 9-11;dash, Block 13; dash, Block 14 (if other than the preprinted G). For example, 800-86-181-1. Leave spaces between the sample identification and the container position number.

c. In addition to the routine sample identification data, containers sent to the laboratory for processing immediately following equipment maintenance, or when equipment operation is suspect, will be marked as follows on separate pieces of printable tape:

(1) Type of maintenance performed (i.e., Sample Air System, Helium System, etc.).

(2) EXPEDITE.

d. Defective containers which are being returned to Depot or Parent Unit will be marked with a piece of printable tape stating the reason for return. Applicable reasons are:

(1) Low pressure - less than 10 PSIG.

(2) Used during maintenance.

(3) Removed because of column blockage.

(4) Installed on unit for less than 9 hours.

3-3. Sample Container Shipment. After the sample run is complete and the sample container is removed, prepare the container for shipment as follows to the address listed in the attachment:

a. Ensure the sample container serial number is recorded on the CEN Form 33.

b. Ensure the sample container mail date is recorded on the CEN Form 33.

c. Ensure the sample container is properly identified and the identification data tape matches the information on the accompanying CEN Form 33.

d. Pack the sample container and one copy of the CEN Form 33 securely in the shipping box provided.

e. Apply outer labels as required.

f. All sample containers will be sent priority mail. Ensure "PRIORITY MAIL" is stamped on the outer wrapping.

g. Ensure sample containers are prepared and forwarded IAW procedures in the attachment as soon as possible once removed from the unit. Sample containers will not be held on site but will be forwarded as often as local mail permits.

3-4. Sample Results Reporting. ACR sample results will be forwarded to each Parent Unit via the consolidated laboratory report. Parent Units will develop local procedures for disseminating sample data to each location based on individual requirements.

3-5. Production Effectiveness. Production effectiveness is computed monthly for each operational unit based on the quality and number of samples recovered and submitted for analysis. These figures will be used to determine the overall efficiency of the network and indicate individual areas in need of corrective action. The formula:

$$\frac{\text{Satisfactory sample days + Marginal sample days}}{\text{Total sample days for the month - LIP and PLIP}} = \text{Production Effectiveness}$$

Chapter 4

REPORTING EQUIPMENT MALFUNCTIONS

4-1. ACR Equipment Status. Equipment malfunctions or suspected malfunctions will be reported via the electrically transmitted Equipment Status Report (ESR). ESRs are divided into three categories: initial, followup, and final. All sections of any ESR will be completed even if negative. All times will be local times reported in Julian date time groups, e.g. 188/1320L.

4-2. Initial Equipment Status Report:

a. Submit an initial ESR when an ACR malfunction results in any of the following conditions:

(1) The time of return to normal operation is unknown.

(2) The time of return to normal operation will exceed 14 hours.

(3) The equipment has been/is suspected of being inoperative for 14 hours or more.

(4) The malfunction precludes the collection of a usable sample for a scheduled sampling period.

b. Submit the initial ESR via priority precedence to the Parent Unit in the following format. Consult the attachment for message address and classification.

FROM: LOCATION

TO: PARENT UNIT

APPROPRIATE CLASSIFICATION

SUBJ: ACR EQUIPMENT STATUS REPORT - SITE NUMBER

A. JULIAN DATE/LOCAL TIME OF MALFUNCTION

B. TIME IN COMMISSION (TIC) OR ESTIMATED TIME IN COMMISSION (ETIC); SPECIFY TIC OR ETIC.

C. SPECIFIC ITEM OF EQUIPMENT THAT FAILED AND A FULL EXPLANATION OF MALFUNCTION. INCLUDE THE LAST SET OF NORMAL EQUIPMENT READINGS PRIOR TO THE FAILURE AND THE FIRST SET OF ABNORMAL EQUIPMENT READINGS FOLLOWING THE FAILURE.

D. CONCISE DESCRIPTION OF ALL CORRECTIVE ACTION TAKEN AND/OR PLANNED. IF THE MALFUNCTION HAS BEEN CORRECTED, DELAY THE REPORT TO INCLUDE A COMPLETE SET OF EQUIPMENT READINGS NO EARLIER THAN 5 HOURS AFTER RETURN TO OPERATION. IF THE FAILURE HAS NOT BEEN CORRECTED, AND/OR ADDITIONAL ASSISTANCE OR PARTS ARE REQUIRED, SEND THE REPORT IMMEDIATELY.

E. REMARKS (INCLUDE ANY ASSISTANCE REQUIRED).

4-3. Follow-up Equipment Status Report:

a. Use the follow-up ESR to update a continuing equipment problem for which corrective action may be delayed for any number of reasons. In most cases, the area technician will submit the follow-up ESR to provide an updated ETIC, to report major changes in the maintenance posture such as parts requisitions, failure of additional equipment, progress in repair efforts, etc., or to report any pertinent information not available at the time of the initial ESR.

b. When an ETIC cannot be met, submit a follow-up ESR in sufficient time to arrive at the Parent Unit upon or before the ETIC expiration date, explaining the delay and updating the ETIC.

c. Submit the follow-up ESR via routine precedence to the Parent Unit using the following format:

FROM: LOCATION

TO: PARENT UNIT

APPROPRIATE CLASSIFICATION

SUBJ: ACR FOLLOW-UP REPORT - SITE NUMBER

A. ETIC OR NEW ETIC

B. EXPLANATION OF CORRECTIVE ACTIONS TAKEN SINCE LAST REPORT AND ANY NEW ACTION PLANNED. INCLUDE PROBLEM AREAS ENCOUNTERED.

C. ANY OTHER INFORMATION CONSIDERED IMPORTANT AND NOT INCLUDED IN THE INITIAL ESR.

4-4. Final Equipment Status Report. Upon satisfactory resolution of the equipment problem and within 24 hours of return to normal operation, submit a final ESR via routine precedence to the Parent Unit. Do not send a final report when it would duplicate the initial report, e.g., when the TIC was given in the initial report.

FROM: LOCATION

TO: PARENT UNIT

APPROPRIATE CLASSIFICATION

SUBJ: ACR FINAL REPORT - SITE NUMBER

A. TIC

B. EXPLANATION OF ACTIONS TAKEN TO CORRECT THE PROBLEM.

C. A COMPLETE SET OF EQUIPMENT READINGS BETWEEN FIVE HOURS AFTER RETURN TO NORMAL OPERATION AND START OF SIP.

4-5. Outage Notification. Submit an outage notification message to the Parent Unit, info HQ, by routine precedence when equipment downtime in excess of 14 hours is anticipated for scheduled maintenance, power outages, severe weather, etc. Allow sufficient time for HQ response. Outage will not normally be taken prior to receipt of authorization. ESRs will be submitted when the outage occurs for periods exceeding 14 hours.

FROM: LOCATION

TO: PARENT UNIT

INFO: HQ

APPROPRIATE CLASSIFICATION

SUBJ: ACR OUTAGE NOTIFICATION - SITE NUMBER

ESTIMATE EQUIPMENT OUTAGE FROM (JULIAN DATE AND LOCAL TIME) TO (JULIAN DATE AND LOCAL TIME) FOR (REASON FOR OUTAGE).

Chapter 5

CENTER FORM 33

5-1. CEN Form 33, Operational Log and Data Sheet. The CEN Form 33 is the key to interpreting the sample product collected and for coordinating laboratory, maintenance, and administrative functions associated with data processing. Each completed form should be accurate and legible and should fully explain the events surrounding the sample collection. After the sample run is completed, review the form for accuracy and distribute IAW paragrapn 5-3. The CEN Form 33 will be completed as follows (an example of a properly completed CEN Form 33 is given in Figure 5-1):

a. Section I (Identification Data). Enter the unit serial number and sample position number. Enter the date the sample container is mailed.

b. Section II (Data for Automation). Entries in this section are used as computer inputs and must be accurate. The following is an explanation of each block entry:

BLOCK	REQUIRED ENTRY
1	Preprinted.
3	Preprinted.
4-6	Enter the Laboratory Label provided by the Parent Unit.
7-8	Last two digits of calender year in which sample run started.
9-11	Julian date sample run started.
13	Number of days constituting the sample run. Subtract the start date (Blocks 9-11) from the stop date (Blocks 32-34). Enter the result in this block.
14	Preprinted. Change to T for Depot test of rebuilt equipment; X for HQ directed experiment; F for 2nd operational unit at the same location.
18-21	Sample container serial number.
27-30	Local time sample run started. Normally this time will be the same as the completion time of Sample Recovery Period from the previous sample run.
32-34	Julian date sample run stopped.
36-39	Local time sample run stopped. Normally the completion of Sample Recovery Period.
77-80	Coded comments. Enter a two-digit coded comment '12' when the unit is inoperative for 30 minutes or more during the sample run. This code will be used anytime equipment outage for any reason totals 30 minutes or more between the recorded run start and stop times.

c. Section III (Periodic Readings):

(1) Date/Time. Enter the local Julian date and time readings are taken.

(2) Meter Readings. Front panel equipment readings.

(3) Ambient Temperature. Enter the reading of a thermometer placed near the unit but out of air streams. The temperature will be indicated using the Celsius scale.

(4) Visual Check. Enter "OK" in the visual check column to indicate there are no unusual noises, leaks or vibrations and all readings are within parameters.

(5) Initials. Enter the initials of the operator making the equipment check.

d. Section IV (Remarks):

(1) The remarks section will include, but will not be limited to, the Julian date, local time, and reason for any outage. All abnormal operations and outages must be explained in this section. Record any power fail lights that are illuminated when daily readings are taken. Attempt to determine cause and length of outage. If the entries in Blocks 27-30 or Blocks 36-39 are other than normal times, an explanation is required. Routine maintenance including PMRs will be entered. Problems occurring during the sample run that could affect the sample will be listed by the Julian date/local time started and ended. How was the problem discovered? What was done to correct the problem? What parts were consumed? Following is an example of the entries required: "181/1645L-181/1755L, no flow during operation check. *Replaced air compressor and fuse." The remarks section should be a chronological history of occurrences and actions taken during the sample run. The part that caused the actual failure will be preceded by an asterisk for the purpose of recording EDC data.

(2) Routine and unscheduled maintenance performed after the sample run ends (completion of Sample Recovery Period) will be entered on the form for the next run.

(3) Report operator status in the remarks section of the last CEN Form 33 submitted each month. Include the name, grade, and anticipated date of reassignment of at least two operators - the primary operator and one other individual responsible for the ACR operation and maintenance. Place an asterisk by the name(s) to identify personnel who have received formal training.

(4) Report container status in the remarks section of the last CEN Form 33 submitted each month. Note the number of serviceable containers on hand for use that day.

5-2. CEN Form 33 for Outage Periods. If the ACR is inoperative and the sample container is not submitted for analysis, a CEN Form 33 will be completed for the outage period. It will be completed as follows and distributed with the CEN Form 33 for the first sample run following the outage period (including appropriate laboratory).

a. Section I (Identification Data). Enter the unit serial number. Leave the date sample mailed and sample position number blocks blank.

b. Section II (Data for Automation):

BLOCK	REQUIRED ENTRY
1	Preprinted.
3	Preprinted.
4-6	Enter the Laboratory Label provided by the Parent Unit.
7-8	Last two digits of calendar year in which outage period started.
9-11	Julian date the previous run ended for which a sample container was submitted for analysis.
13	Number of days constituting the outage period. Subtract the outage period start date (Blocks 9-11) from the outage period stop date (Blocks 32-34). Enter the result in this block.
14	Preprinted.
18-21	Enter 'NONE'. There will be no container for the outage period.
27-30	Local time outage period started. This time will be the same as the time Sample Recovery Period was completed for the previous sample run.
32-34	Julian date outage period stopped. The date the new sample run started following the outage period.
36-39	Local time the outage period ended. The time the new sample run started following the outage period.

c. Section III (Periodic Readings). Leave blank.

d. Section IV (Remarks). Enter the reason for the outage condition and all maintenance actions taken during the outage.

5-3. CEN Form 33 Distribution. All completed CEN Forms 33 will be distributed as follows. Consult the attachment for mailing addresses.

a. Original copy to HQ where operational data are consolidated and analyzed.

b. One copy to Depot/LGEAC to be used in system standardization and quality control.

c. One copy to the Parent Unit for review, quality control, and file.

d. One copy will be enclosed with the sample container.

e. One copy for unit file.

5-4. CEN Form 33 Corrections. Corrections to CEN Forms 33 will be submitted to Parent Units.

OFFICIAL

SUMMARY OF CHANGES
Deleted paragraph on historical record from Chapter 1. Deleted paragraph on laboratory reports from Chapter 3. Simplified equipment status reporting procedures. Requires Equipment Locations to report only to their Parent Unit. Deleted all references to the Annex.

OPERATIONAL LOG AND DATA SHEET

I. IDENTIFICATION DATA

SERIAL NUMBER: 013

SAMPLE POSITION NO: 6

DATE SAMPLE MAILED: 2 July 86

II. DATA FOR AUTOMATION

1	3	4	5	6	7	8	9	10	11	13	14	18	19	20	21	27	28	29	30	32	33	34	36	37	38	39	77	78	79	80
1	6	8	0	0	8	6	1	8	1	1	G	8	2	6	1	0	9	0	0	1	8	2	0	9	0	0	1	2		

III. PERIODIC READINGS

JULIAN DATE/TIME	VAC	ARGON PRESS	HELIUM PRESSURE		SAS PRESSURE		PUMP PRESS	AIR FLOW	HOUR METER	EQUIPMENT TEMPERATURE						AMBIANT TEMP (°C)	VISUAL CHECK	INIT
	M-1	P-1	P-2	P-3	P-4	P-5	P-6	FM	M-2	T-0	T-1	T-2	T-3	T-4	T-5			
181 / 1300	10	35	50	205	3.0	2.5	18	9.0	00126.3	-25	24	30	28	70	26	27	OK	WM
182 / 0837	15	37	100	150	3.2	20	18	0.0	00144.9	+5	26	26	27	40	25	27	OK	BD

IV. REMARKS (Use reverse if needed)

181 / 1645 - 181 / 1755: No flow noted during operations check. *Replaced air compressor and fuse.
182 / 0830: Power failure indicator light for position 6 found ON. Hourmeter indicates less than six minutes outage.

*SSgt William Miller, DEROS SEP 87
TSgt Benjiman Delaney, DEROS AUG 89

46 containers on hand

CEN FORM APR 84 33

Figure 5-1. CEN Form 33, Operational Log and Data Sheet