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1,2	1	Design Authority DT Mildon		12/13/99	X3-74	1,2	1	EM Myott	
1,2	1	Design Agent CC Kinkel		12/14/99	X3-74	1,2	1	FDH/SNFP PA Casey	
1,2	1	Cog. Eng. CC Kinkel		12/14/99	X3-74	1,2	1	PTH/Security EA Koster	
1,2	1	Cog. Mgr. DT Mildon		12/13/99	X3-74	1,2	1	PTH/Security SE Davis	
1,2	1	QA 12/9/99 Diehl		12/9/99	X3-80				
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# 105KE BASIN AREA RADIATION MONITOR SYSTEM (ARMS) ACCEPTANCE TEST PROCEDURE

CC Kinkel

Fluor Daniel Hanford

Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-96RL13200

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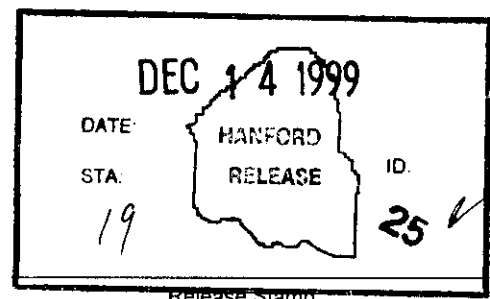
**Abstract:**

The attached Acceptance Test Will test the new KE Area Radiation Monitoring System (ARMS)

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Approvals:

Cognizant Engineer/  
Design Authority:

C.C. Kinkel 12-14-99  
C.C. Kinkel (Signature) Date

Technical Review:

E.M. Myott 12/14/99  
E.M. Myott (Signature) Date

Quality Assurance:

J.F. Diehl 12/14/99  
(Signature) Date

## Table Of Contents

1.0	Introduction . . . . .	1
1.1	Purpose And Scope . . . . .	1
1.2	Acronyms And Abbreviations . . . . .	1
1.3	References . . . . .	2
1.4	System Equipment Identification . . . . .	2
1.5	System Block Diagram . . . . .	4
2.0	Test Description . . . . .	5
2.1	Objectives . . . . .	5
2.2	Test Method . . . . .	5
3.0	Test Condition Limits . . . . .	5
3.1	Equipment Prerequisites . . . . .	5
3.2	Personnel Prerequisites . . . . .	5
3.3	Responsibilities . . . . .	7
4.0	Instruments And Calibration . . . . .	11
4.1	Tools, Equipment, And Materials . . . . .	11
4.2	Instrument List . . . . .	12
5.0	Test Facility . . . . .	13
5.1	Facility . . . . .	13
5.2	Equipment And Materials . . . . .	13
6.0	Safety . . . . .	14
7.0	Equipment Failure . . . . .	14
8.0	Test Data . . . . .	15
9.0	Personnel Requirements . . . . .	15
10.0	Procedure . . . . .	16
10.1	Security Door Tamper Test . . . . .	16
10.2	Record Equipment Serial Numbers . . . . .	16
10.3	Verify Rack Power And Check Fan Operation . . . . .	16
10.4	Calibration And Radiation Alarm Check . . . . .	18
10.5	System Alarm Test . . . . .	23
10.6	Watchdog Relay Test . . . . .	24
10.7	Upscale Check Functionality Test . . . . .	25
10.8	Source Check . . . . .	27
10.9	Password Security Test . . . . .	28
10.10	Final ARMS System Check Out . . . . .	28
11.0	Test Completion . . . . .	29
12.0	Data Sheets . . . . .	30
12.1	Calibration Data Sheets . . . . .	30

12.2	Radiation Alarm Data Sheets . . . . .	35
12.3	System Alarm Data Sheet . . . . .	40
12.4	Watchdog Relay Data Sheet . . . . .	42
12.5	Password Security Test Data Sheet . . . . .	43
13.0	Test Execution Completion Sheet . . . . .	44
14.0	Test Exception . . . . .	45

List Of Tables

105KE Equipment . . . . .	3
Instrument List . . . . .	12
Calibration Data Sheet - AIM Channel #1, Detector #7 . . . . .	31
Calibration Data Sheet - AIM Channel #2, Detector #8 . . . . .	31
Calibration Data Sheet - AIM Channel #3, Detector #9 . . . . .	32
Calibration Data Sheet - AIM Channel #4, Detector #10 . . . . .	32
Calibration Data Sheet - AIM Channel #5, Detector #11 . . . . .	33
Calibration Data Sheet - AIM Channel #6, Detector #12A . . . . .	33
Calibration Data Sheet - AIM Channel #7, Detector #12B . . . . .	34
Calibration Data Sheet - AIM Channel #8, Detector #13 . . . . .	34
Low Level Radiation & System Trouble Alarm Check . . . . .	36
Intermediate Level Radiation Alarm And Upscale Function Check . . . . .	37
High Level Radiation Alarm Check . . . . .	38
Source Bugging Chambers Alarm Check . . . . .	39
System Alarm Data Sheet . . . . .	41

List Of Figures

Figure 1. 105KE ARMS Block Diagram. . . . .	4
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List Of Appendices

Appendix A - VGR Alarm Function Table . . . . .	46
Appendix B - VGR System Alarm Table . . . . .	48
Appendix C - Equipment Failure Log . . . . .	50
Appendix D - 105KE Radiation Detector Data Sheet . . . . .	51



## 1.0 Introduction

### 1.1 Purpose And Scope

This procedure is intended for the Area Radiation Monitoring System, ARMS, that is replacing the existing Programmable Input-Output Processing System, PIOPS, radiation monitoring system in the 105KE basin. The new system will be referred to as the 105KE ARMS, 105KE Area Radiation Monitoring System. This ATP will ensure calibration integrity of the 105KE radiation detector loops. Also, this ATP will test and document the display, printing, alarm output, alarm acknowledgement, upscale check, and security functions. This ATP test is to be performed after completion of the 105KE ARMS installation.

The alarm outputs of the 105KE ARMS will be connected to the basin detector alarms, basin annunciator system, and security Alarm Monitoring System, AMS, located in the 200 area Central Alarm Station (CAS).

Note: Verification of the Video Graphic Recorder, VGR, Data Logger programming configuration has already been performed. See "Acceptance Test Report For New Data Logger Replacement For The PIOPS Radiation Monitoring Equipment", HNF-SD-SNF-ATR-022 for details.

Note: 24 hour notice shall be given to security and operations prior to the ATP being performed. All exterior doors to the basin limited area, with the exception of door 100, will remained locked with their intrusion detectors sensors in the secure mode unless prior arrangements have been made with security.

### 1.2 Acronyms And Abbreviations

AC	Alternating Current
ACK	Acknowledge
AIM	Analog Input Module
ALM	Alarm Module
AMS	Alarm Monitoring System
ARMS	Area Radiation Monitoring System
CAS	Central Alarm Station
CRT	Cathode Ray Tube
DC	Direct Current
DMM	Digital Multimeter
DVM	Digital Voltmeter
EXT	External
HLA	High Level Alarm
hr	Hour
ILA	Intermediate Level Alarm

KWD	Watchdog Relay
LED	Light Emitting Diode
ma	Milliamp
mm	Millimeter
MO	Magneto Optical
mR	Millirem
mv	Millivolt
NC	Normally Closed
NO	Normally Open
PC	Personal Computer
PIOPS	Programmable Input-Output Processing System
PRMS	PIOPS Radiation Monitoring System
TSR	Technical Safety Report
UART	Universal Asynchronous Receiver Transmitter
UPS	Uninterruptable Power Supply
VAC	Volts Alternating Current
VDC	Volts Direct Current
VGR	Video Graphic Recorder

### 1.3 References

The following references are provided as aids that can be used while performing the ATP test. Information contained in these documents describes how to operate the equipment and provides technical system configuration information.

- Video Graphic Recorder Configuration And Technical Information - Area Radiation Monitoring System (ARMS) 100K. HNF-SD-SNF-TI-037.
- Video Graphic Recorder User Manual - Area Radiation Monitoring System (ARMS) 100K, HNF-SD-SNF-TI-004.
- Acceptance Test Report For New Data Logger Replacement For The PIOPS Radiation Monitoring Equipment, HNF-SD-SNF-ATR-022.

### 1.4 System Equipment Identification

The equipment listed in Table 1, 105KE Equipment, is to be used during the ATP test. For a system overview see Figure 1, 105KE ARMS Block Diagram, located in section 1.5, System Block Diagram.

Table 1  
105KE Equipment

Equipment Type	Manufacturer	Model/Part #	Serial #
Video Graphic Recorder (VGR)	Angus Electronics	VGR 16	
Analog Input Module (AIM)	Angus Electronics	N/A	
Alarm Output Module (ALM)	Angus Electronics	N/A	
Color Printer	Citizen	GSX-190	
Relay, Time Delay (Watchdog, KWD)	Potter & Brumfield	CNS-35-76	N/A
105KE Basin Detectors	Facility Hardware (Existing)	N/A	N/A
ARMS Termination Cabinet	Facility Hardware (Existing)	N/A	N/A
Basin Alarm Interface	Facility Hardware (Existing)	N/A	N/A

## 1.5 System Block Diagram

The following system block diagram shows the 105KE ARMS as it will be when installed in the field. Refer to section 1.2, Acronyms And Abbreviations, for identification of system components shown in the following system block diagram.

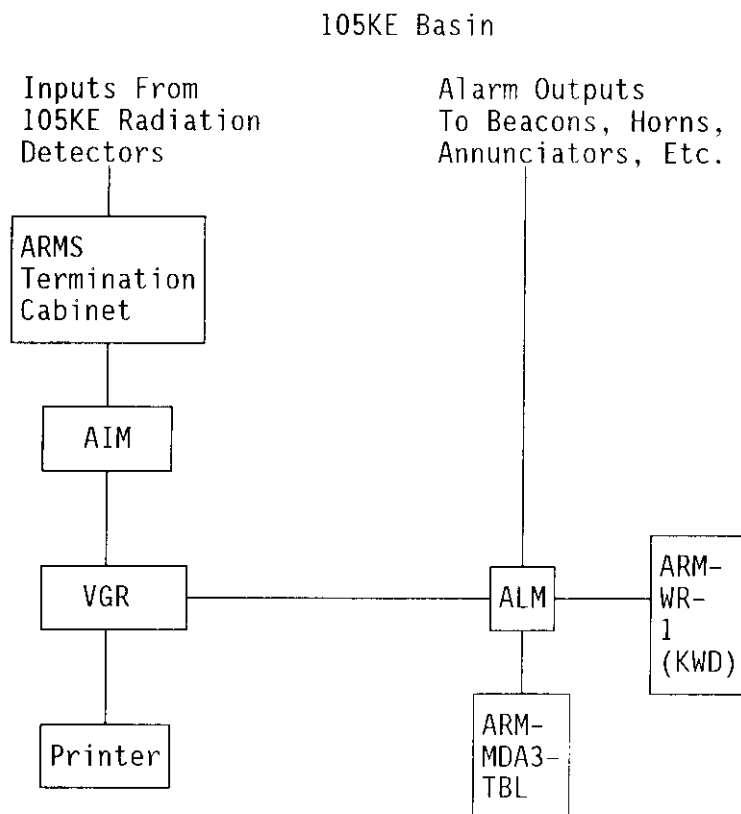


Figure 1. 105KE ARMS Block Diagram.

## 2.0 Test Description

### 2.1 Objectives

The ATP test will verify the operation of the equipment identified in Figure 1, 105KE ARMS Block Diagram, located in section 1.5, System Block Diagram. Specifically, the accuracy and operation of the display, printing, and alarm outputs will be tested and the results documented.

### 2.2 Test Method

The calibration will consist of providing known input signals, 4-19.98 ma corresponding to 1-<100,000 mR/hr, to the selected VGR input channels and observing the VGR, ALM, and printer for proper outputs. The results will be recorded in the spaces provided within this procedure. Also, VGR system failures will be simulated. The VGR system failures will be simulated by turning off the power to a peripheral (printer, ALM, AIM, etc.) and observing the VGR for the proper alarm.

Parts of the ATP test will be run concurrently, such as, verifying basin annunciators and security alarm functions while performing the calibration.

## 3.0 Test Condition Limits

### 3.1 Equipment Prerequisites

Prior to the ATP test, the 105KE ARMS wiring is to be verified to ensure that it is correct before energizing equipment.

### 3.2 Personnel Prerequisites

3.2.1 Operations must be notified before beginning the ATP test and Basin Personnel notified that Radiation Alarms at the Basin will be activated as part of the ATP test.

3.2.1.1 Post signs at the following building locations:

Main entrance South door.

Main entrance North door.

Basin entry door.

D & D entrance door by HPT counting station.

3.2.1.2 Make the following P.A. announcement in 105KE twice:

"Attention all personnel, Attention all personnel. Radiation monitoring system testing is being performed. Disregard radiation monitoring system annunciators and horns until further notice."

3.2.2 Security Maintenance is to be present during the ATP test and Security at the Central Alarm Station, CAS, are be notified of the ATP test and that radiation alarms will occur as part of the ATP test, but no other security alarms should occur.

3.2.3 Health Physics are to be notified of the ATP test.

### 3.3 Responsibilities

#### 3.3.1 Test Director (Cognizant Engineer/Design Authority or Designee)

Test director is responsible for the following:

- Coordinate ATP test activities with Operations, Shift Supervisor, Security, and Health Physics.
- Assign ATP test responsibilities.
- Monitoring the ATP test for compliance with the ATP test procedure.
- Assist with the ATP test prejob briefing.
- Act as liaison between the ATP test participants involved with the ATP test.
- Sign the Test Execution Sheet when the ATP test is approved and accepted.
- Take necessary action(s) to clear exception(s) to the ATP test.
- Sign the ATP Test Exception Sheet(s) when the exception(s) has/have been resolved.

ATP Test Director: \_\_\_\_\_  
Printed name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

### 3.3.2 Quality Assurance Representative (QA/QC)

QA/QC is responsible for the following:

- Observe the entire ATP test.
- Sign the Test Execution Sheet when the ATP test is approved and accepted.
- Concur with necessary action(s) to clear exception(s) to the ATP test.
- Sign the ATP Test Exception Sheet(s) when the exception(s) has/have been resolved.
- Verify calibration of M & TE. Ref Table 2.

ATP QA/QC Representative: \_\_\_\_\_  
Printed name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



### 3.3.3 Recorder

Recorder is responsible for the following:

- Record the names of all designated personnel on recorder's copy of the ATP prior to the start of the ATP test.
- Observe the entire ATP test and record all ATP test data.
- Mark off every ATP test step on the recorder's copy, next to the step number, after it is completed.
- Record ATP test exceptions, objections, and test steps not performed, on a Test Exception Sheet. Prepare a separate Test Exception Sheet for each exception, objection, etc.. The Test Exception Sheet is located in Section 14, Test Exception Sheet, make copies as needed.
- The final ATP test results are to be submitted to the Cognizant Engineer/Design Authority for approval signatures and distribution.

ATP Recorder:

\_\_\_\_\_  
Printed name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

#### 3.3.4 Training

It is the intent to have an Operations representative and a Radiological Control representative to be present during the ATP test in order to familiarize themselves with the 105KE ARMS. It is left to these organizations to determine the level of representation for the ATP test.

#### 4.0 Instruments And Calibration

##### 4.1 Tools, Equipment, And Materials

4.1.1 A 4-20 ma source is required to perform the ATP test. The 4-20 ma source will simulate the inputs from the 105KE radiation detectors and will be connected to channels 1-8 of the 105KE ARMS. The accuracy of the 4-20 ma source must be at least .5%. The Transmation model #1091, or equivalent, meets the requirements of the ATP test.

4.1.2 A timer or stop watch.

4.1.3 A V-Block source, Cobalt 60 with greater than 50 mR/hr. This can be obtained from K-Basins Radiological Control.

## 4.2 Instrument List

Record all instruments used during the ATP test in Table 2, Instrument List, shown below. Add additional sheets if more space is required.

Table 2  
Instrument List

[illegible]

## 5.0 Test Facility

### 5.1 Facility

The ATP test will be performed at 105KE Basin. The VGR system is located in 105KE, Room 4.

### 5.2 Equipment And Materials

The equipment to be tested is listed in Table 1, 105KE Equipment, located in section 1.4, System Equipment Identification. Also, the Angus Electronics - VGR Operating Instruction Manual and Citizen Printer - User Manual are to be available for reference, if needed during the ATP test.

A 10 ohm,  $\pm 0.05\%$ , precision resistor is installed across the input terminals of each 105KE radiation detector input, channels 1-8. The instruments listed Table 2, Instrument List, located in section 4.2, Instrument List, are needed to perform the ATP test. The 4-20 ma output of the 105KE radiation detectors will be simulated by the 4-20 ma source listed in Table 2, Instrument List, located in section 4.2, Instrument List. The 4-20 ma signal will be connected to the field termination input terminals located in the KE ARMS Termination Cabinet. The 4-20 ma signal will produce a 40-200 mv signal across the 10 ohm precision resistor into the VGR system.

A 3.5" floppy disk and MO disk for the VGR system must be available. The printer for the VGR system must have an adequate supply of paper and a replacement printer ribbon. Refer to the manufacturers documentation for installation instructions for each of these items.

The Alarm Module, ALM, relay outputs have no visual indicators on them. The Low, Intermediate, High, and selected system trouble alarm functions will be verified for each detector by observing the action of the 105KE ARMS beacons, lights, and horns. All alarm outputs use the normally closed, NC, relay output contact, except the VGR Reset, watchdog, output #24, Low/System Trouble Alarm To Security output #26, and Intermediate Alarm To Security output #27, which use the normally open, NO, relay output contact.

The watchdog relay, KWD, listed in Table 1, 105KE Equipment, located in section 1.4, System Equipment Identification, must be correctly wired and programmed. The watchdog circuit monitors the operation of the VGR system and activates an alarm on the basin annunciator control panel CP-A in room 7 if the VGR system locks up and can no longer scan the 105KE radiation detector outputs. The KWD relay has an adjustable time delay-on-release feature. The time delay knob on the KWD relay is set to seven to fifteen

(7-15) seconds. The KWD relay is maintained in an energized, non-alarm, state by periodic pulses from the VGR system, ALM. The reset pulses occur approximately every seven to fifteen seconds and reset the internal timer in the KWD relay. The KWD relay will de-energize in approximately seven to fifteen seconds if the VGR system stops sending the reset pulses to the KWD relay, causing a Low Level Radiation & System Trouble Alarm. The KWD relay contacts are wired in parallel with the Low Alarm & System Trouble relay output #40 of the ALM. This is done so that either the VGR system or the KWD relay can trigger an basin annunciator alarm.

## 6.0 Safety

- 6.1 Do not apply more than 100 volts DC, or peak AC, to the VGR inputs as this may cause damage to the equipment.
- 6.2 The KE Arms Termination Cabinet contains energized 120 VAC circuits. Extreme care is needed in removing wiring during the ATP test in order to prevent electrical shorts.
- 6.3 All basin personnel must be informed that the ATP test is in progress and that alarms will be activated, but they are not to respond unless directed otherwise.

## 7.0 Equipment Failure

The following identifies equipment failures that may occur and what action to take. The Cognizant Engineer/Design Authority will be the authority for restarting the ATP test after equipment failure. Record equipment failures in Appendix C, Equipment Failure Log.

### 7.1 Power Failure

After power is restored, observe equipment during power-up for any errors. If no errors occur, continue the ATP test from point of power failure.

### 7.2 Disk Failure

If the 3.5" floppy disk or MO disk fail, replace failed disk using the procedure in the Angus Electronics - VGR Operating Instruction Manual and continue the ATP test.

### 7.3 Printer Failure

If the printer fails, troubleshoot using the manufacturers manual. Problems like paper jams and ribbon failures can be cleared and the ATP test continued. If the printer fails completely replace it and continue the ATP test.

#### 7.4 AIM Failure

If the AIM fails, or does not pass calibration check, replace it with another AIM, perform section 10 calibration check, and continue the ATP test. If the AIM fails section 10 calibration check perform manufacturers calibration procedure listed in Angus Electronics - VGR Operating Instruction Manual and then perform section 10 calibration check.

#### 7.5 VGR Failure

If the VGR fails replace it with another VGR. Configure the VGR like the failed unit using the instructions in the Angus Electronics - VGR Operating Instruction Manual. Continue the ATP test from where it was stopped.

#### 7.6 Cable Failure

Replace the failed cable and continue the ATP test from the point of failure.

### 8.0 Test Data

The data to be gathered for the ATP test will be a combination of calibration and alarm function data. The data will be recorded on the data sheets in section 12.0, Data Sheets. The data will be displayed on the VGR screen and printer output. The data has no security classification and will be reported in Acceptance Test Report, ATR, HNF-3614, after completion of the ATP test.

### 9.0 Personnel Requirements

The ATP test will be performed by an Instrument Technician and the Cognizant Engineer/Design Authority. The Cognizant Engineer/Design Authority and a representative from QA/QC will observe the entire ATP test. Security personnel at the CAS will verify receipt of alarms as part of the ATP test. Representatives from Operations and Health Physics may be present to familiarize themselves with the KE ARMS.

The basin shall be manned and open with two person rule requirements met. Any individual who is in the RBA must have a 2 security clearance or be accompanied by an authorized escort.





- 10.3.2 Ensure that the KE Arms Rack temperature control circuit breaker is energized.

Completed OK \_\_\_\_\_  
Initials / Date

- 10.3.3 Verify the KE Arms Rack fan operation by increasing, then decreasing the temperature control located in the KE ARMS Rack and observing that the fan turns on with decreased setting and turns off with increased setting.

Completed OK \_\_\_\_\_  
Initials / Date

#### 10.4 Calibration And Radiation Alarm Check

The following steps outline the method for concurrently checking the calibration of an analog input channel and testing the radiation alarms. Also, the Low Level Radiation & System Trouble Alarm will be verified when the field wires of a 105KE radiation detector are disconnected to connect the simulated 4-20 ma signal. One channel will be checked/tested at a time by inputting a simulated 4-20 ma signal at the 105KE radiation detector input terminals located in the KE ARMS Termination Cabinet. The other channels will remain connected to their respective detectors. As each channel is checked/tested the results will be recorded on a data sheet located in section 12, Data Sheets.

The annunciation of the Low Level Radiation & System Trouble Alarm, and the Intermediate Level Radiation Alarm, both sent to CAS will be verified by personnel at these facilities during the calibration of the first detector. CAS will then be notified that subsequent alarms will not be verified.

Note: If the low level setpoint cannot be set low enough to turn off alarms, then the artificial background switch in the 105KE radiation detector will need to be activated. Change the VGR math channel configuration for the 105KE radiation detector setpoint as identified in the manual, Videographic Recorder Configuration And Technical Information - Area Radiation Monitoring System (ARMS) 100K, HNF-SD-SNF-TI-037, Appendix D, Alarm Setpoint Table.

10.4.1 Place the 3.5" floppy boot disk and MO disk into their respective drives and apply power to the KE ARMS.

Note: The VGR firmware revision numbers will only be on the screen for a short time. Be prepared to record the firmware revision numbers.

10.4.2 During the boot-up process the VGR will display it's firmware revision levels. Record Program Version and ROM Loader Version revision numbers in section 12.1, Calibration Data Sheets.

10.4.3 Record the AIM serial number above Tables 3 through 10, Calibration Data Sheets, located in section 12.0, Data Sheets.

10.4.4 Record the ALM serial number above Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets.

- 10.4.5 After a successful power-up of the VGR system press the PAGE button on the VGR front panel. Using the up or down arrows, highlight page 5 and press the PAGE button again. Record the VGR revision number in section 12.1, Calibration Data Sheets. Press the PAGE button again, highlight page 1 using the up or down arrows then press PAGE button again to return to the original screen.
- 10.4.6 Acknowledge all ARMS alarms and have operations at both 105 control panels CP-A take any radiation alarms for 105KE out of bypass and verify that all 105KE radiation alarms are cleared.
- 10.4.7 Verify at CAS that the low/system trouble and intermediate radiation alarms are in the secure mode and are cleared.
- Warning: 24 VDC power is on, creating a potential shock hazard. Be careful not to contact wiring with any unspecified points.
- 10.4.8 For each 105KE radiation detector under test, disconnect the field positive input wire at the appropriate terminal block in the KE Arms Termination Cabinet prior to testing. Be careful not to short the wire to any other object.
- 10.4.9 Perform a Low Level Radiation & System Trouble Alarm verification when removing one of the 105KE radiation detector field wires and record result in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check located in section 12.2, Radiation Alarm Data Sheets.
- 10.4.9.1 Verify for the 105KE radiation detector a Low Radiation Alarm at 105KE Basin Control Panel CP-A. Verify at CAS that a low/system trouble alarm has occurred. Verify that at the 105KW Basin Control Panel CP-A that a KE Hi Radiation Alarm has occurred. Record the results in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check located in section 12.2, Radiation Alarm Data Sheets.
- Note: Further acknowledgement of the alarm annunciation at remote facilities for the remaining detectors will not be necessary as

this verification verifies the rest due to the VGR programming configuration (i.e. if a Low Level Radiation & System Trouble Alarm for one 105KE radiation detector works then the rest will work).

- 10.4.9.2      Verify the remaining Alarm Function Activations listed in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets. Record results in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets.
- 10.4.9.3      Notify Security that further alarming will occur and no verification will be necessary until the Intermediate Radiation Alarm check.
- 10.4.10       Connect the 4-20 ma signal source to an AIM channel, detectors 7-13, of the VGR system. Adjust to a non-alarm value of 6.25ma (approx. 5mr).
- Note:           Acknowledge the Low Level Radiation & System Trouble Alarms by pressing the ALARM ACKNOWLEDGE and up/down arrow buttons on the front panel.
- 10.4.11       Ensure that the remaining channels are not in an alarm state and there is no System Trouble Alarm.
- 10.4.12       Verify that a channel Low Level Alarm is activated when the simulated signal is decreased below the low level setpoint (2mr/4.96ma). Record results in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets. Adjust to a non-alarm value of 6.25ma (approx. 5mr). Acknowledge the Low Level Radiation & System Trouble Alarms by pressing the ALARM ACKNOWLEDGE and up/down arrow buttons on the front panel.
- 10.4.13       Verify that the System Trouble Alarm is activated when the VGR is shut off via the power switch located on front of the VGR monitor. Record the result in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets.
- 10.4.14       Reboot the VGR system.

10.4.15 Perform the calibration checks and radiation alarm verification, concurrently. Apply the signals identified in Tables 3 through 10, Calibration Data Sheets, located in section 12.0, Data Sheets. Record the results in Tables 3 through 10, Calibration Data Sheets, located in section 12.0, Data Sheets. Sign and date below Tables 3 through 10, Calibration Data Sheets, when completed. Record any exception(s) on a Test Exception Sheet, located in section 14.0, Test Exception Sheet.

10.4.16 While performing the calibration check on a particular channel, proceed to Table 12, Radiation Alarm Data Sheet - Intermediate Alarm And Upscale Function Check, and Table 13, Radiation Alarm Data Sheet - High Alarm Check, both located in section 12.2, Radiation Alarm Data Sheets, and complete at the same time. As the simulated 4-20 ma signal of a 105KE radiation detector is increased above the Intermediate Radiation Level Alarm (9.44ma/50mr) and High Radiation Level Alarm (10.4ma/100mr) setpoints, record required data in Table 12, Radiation Alarm Data Sheet - Intermediate Alarm And Upscale Function Check, and Table 13, Radiation Alarm Data Sheet - High Alarm Check, respectively. Sign and date below Tables 12 and 13 when completed. Record any exception(s) on a Test Exception Sheet, located in section 14.0, Test Exception Sheet.

10.4.16.1 Verify a 105KE radiation detector Intermediate Radiation Alarm at the following locations: 1) 105 KE Basin Control Panel, 2) Alarm to Security at CAS. Verify at 105KW that a 105KE Hi radiation Alarm has occurred. Record results in Table 12, Radiation Alarm Data Sheet - Intermediate Alarm And Upscale Function Check, located in section 12.2, Radiation Alarm Data Sheets.

Note: Further acknowledgement for the remaining detectors will not be necessary as this verification verifies the rest due to the VGR programming configuration (i.e. if an Intermediate Level Radiation Alarm for one 105KE radiation detector works then the rest will work).

10.4.16.2 Verify the remaining actions listed in Table 12, Radiation Alarm Data Sheet - Intermediate Alarm And Upscale Function Check, located in section

12.2, Radiation Alarm Data Sheets. Record the results in Table 12.

Note: The Intermediate Radiation Alarm will be on during testing of the High Radiation Alarm. The output relay for the Intermediate Radiation Alarm will remain in an alarm state as long as the input signal is above the Intermediate Radiation Alarm set point.

10.4.16.3 Verify a 105KE radiation detector High Radiation Alarm at the following two locations: 1) 105 KE Basin Control Panel, 2) 105KW Basin Control Panel. Record results in Table 13, Radiation Alarm Data Sheet - High Alarm Check, located in section 12.2, Radiation Alarm Data Sheets.

Note: Further acknowledgement for the remaining 105KE radiation detectors will not be necessary as this verification verifies the rest due to the VGR programming configuration (i.e. if a High Level Radiation Alarm for one detector works then the rest will work).

10.4.16.4 Verify the remaining actions listed in Table 13, Radiation Alarm Data Sheet - High Alarm Check, located in section 12.2, Radiation Alarm Data Sheets. Record the results in Table 13.

## 10.5 System Alarm Test

This section tests the alarms relating to the VGR system itself. Not all of the system alarms can be simulated without possibly damaging the VGR system, so only the system alarms that can be simulated will be tested.

- 10.5.1 Connect all field wires that were removed from the 105KE radiation detectors. Ensure that all 105KE radiation detectors are in a non-alarm state.

Note: It will take approximately 2-3 minutes for the system printer alarm to occur after turning the printer off. The other system alarms should occur within a few seconds of the simulated failure.

- 10.5.2 Perform one of the actions listed in Table 15, System Alarm Data Sheet, located in section 12.3. Record the results in Table 15, System Alarm Data Sheet.

- 10.5.3 Verify the alarm by viewing the VGR alarm history page. To view the VGR alarm history page press the VGR PAGE button on the VGR front panel and then select the desired page by using the VGR arrow keys and then pressing the VGR PAGE button again.

- 10.5.4 Restore the VGR system to original, non-alarm, configuration when finished with the simulated failure.

- 10.5.5 Repeat steps 10.4.2 through 10.4.4 for the remaining system alarms to be tested.

- 10.5.6 Sign and date below Table 15, System Alarm Data Sheet, located in section 12.3, System Alarm Data Sheet. Record any exception(s) on a Test Exception Sheet, located in section 14.0, Test Exception Sheet.

## 10.6 Watchdog Relay Test

The watchdog circuit provides an independent alarm relating to the "health" of the VGR system. The Watchdog Relay, KWD, is a time delay relay that actuates an alarm if it does not receive an electrical pulse every 7-15 seconds from the VGR system. As the name implies, KWD watches the VGR system and in the event of a system lock up provides an alarm.

- 10.6.1 Ensure that system is in a non-alarm condition.
- 10.6.2 Disconnect the ALM Reset Pulse output from the KWD relay, KWD terminal 7 or from Relay 24 NC terminal. Start the stop watch/timer.
- 10.6.3 Stop the stop watch/timer when KWD relay trips and record the trip time for the KWD relay on the Watchdog Relay Data Sheet, located in section 12.4, Watchdog Relay Data Sheet.
- 10.6.4 Sign and date the Watchdog Relay Data Sheet, located in section 12.4, Watchdog Relay Data Sheet.
- 10.6.5 Verify system alarm at CAS and other functions identified in Table 11, Radiation Alarm Data Sheet - Low Level Radiation & System Trouble Alarm Check, located in section 12.2, Radiation Alarm Data Sheets. Record results in the Table 11. Sign and date Table 11.
- 10.6.6 Connect wire disconnected in step 10.5.2.
- 10.6.7 Record any exception(s) on a Test Exception Sheet, located in section 14.0, Test Exception Sheet.



## 10.7 Upscale Check Functionality Test

This section checks the upscale check function for each 105KE radiation detector.

10.7.1 Enable upscale check panel by turning the Enable Key Switch to the ON position.

10.7.2 Ensure system is in a non-alarm state.

NOTE: The act of turning on the upscale enable key will generate an alarm that will have to be acknowledged.

10.7.3 For each 105KE radiation detector engage the upscale detector switch and verify that the Intermediate Level Radiation Alarm activates, indicating that the upscale function is operating properly. Record data in Table 12, Radiation Alarm Data Sheet - Intermediate Alarm And Upscale Function Check, located in section 12.2, Radiation Alarm Data Sheets.

For detectors that have been recently changed out per procedure "Change Out PRMS Detector", SP-05-003, and where the procedure could not be completed due to PIOPS replacement activities, record the following on a 105KE Radiation Detector Data Sheet, located in Appendix D.

10.7.3.1 Record 105KE radiation detector number (i.e. RE-216-7, RE-216-8, etc.).

10.7.3.2 Record 105KE radiation detector serial number.

10.7.3.3 Record date.

10.7.3.4 Determine next calibration due date by adding one calendar year to the date shown on the 105KE radiation detector calibration sticker. Record the Next Calibration Due Date.

10.7.3.5 Record position of the AB/OFF, automatic background, switch.

Note: The AB/OFF switch should only be in the AB position if background radiation is causing nuisance alarms with the setpoint set at 1 mR, which is the lowest possible setting.

- 10.7.3.6 Determine the upscale reference value for a detector by initiating an upscale check. Record the As-Left Upscale Reference Value (mR/hr).
- 10.7.3.7 Initial and date the Detector Data Sheet.
- 10.7.3.8 Obtain signature and date from the PM/S Administrator for the Recall Database Verification.
- 10.7.3.9 Make photocopies of the Detector Data Sheet(s) and send to the Cognizant Engineer/Design Authority.

\_\_\_\_\_  
Initials / Date

- 10.7.3.10 Make photocopies of the Detector Data Sheet(s) and send to the PM/S Administrator so Recall Database can be updated.

\_\_\_\_\_  
Initials / Date

- 10.7.3.11 Update the KE ARMS database (formerly PIOPS database) with the current data for these detectors.

\_\_\_\_\_  
Initials / Date

## 10.8 Source Check

10.8.1 Lower the High Level Radiation Alarm set point for each 105KE radiation detector to 50 mR/hr.

10.8.2 Apply by direct contact the V-Block source to the side of each 105KE radiation detector at approximately 3 inches from the bottom. Record or verify the following in Table 14:

- mR/hr listed on VGR CRT.
- mR/hr listed on detector panel meter.
- Intermediate Level Radiation Alarm and High Level Radiation Alarm status on VGR CRT.
- Intermediate Level Radiation Alarm and High Level Radiation Alarm control panel annunciators are ON in 105KE, Room 7.
- Audible Intermediate Level Radiation Alarm and High Level Radiation Alarm are activated.
- Intermediate Level Radiation Alarm, amber lamp, and High Level Radiation Alarm, red lamp, on KE ARMS Rack status panel are ON.
- Intermediate Level Radiation Alarm, amber rotating beacon, outside of building next to main entrance is ON.
- 105KE High Level Radiation Alarm control panel annunciator and audible alarm are ON in 105KW, Room 20A.
- The 105KE Intermediate Radiation Alarm at security CAS is ON.

10.8.3 Set High Level Radiation Alarm set point for each channel back to 100 mR/hr, enter "1+02".

## 10.9 Password Security Test

- 10.9.1 Security to perform the Password Security Test and record the required information on the Password Security Test Data Sheet, located in section 12.5, Password Security Test Data Sheet.
- 10.9.2 Security to sign and date the Password Security Test Data Sheet.

## 10.10 Final ARMS System Check Out

### 10.10.1 Verify the following:

- VGR monitor is updating each of the eight channels approximately once per second.

\_\_\_\_\_  
Initials / Date

- No channel is reading 00.00+00 or 01.00+00 mR/hr.

\_\_\_\_\_  
Initials / Date

- No system error message on the VGR monitor.

\_\_\_\_\_  
Initials / Date

### 10.10.2 Close all cabinet doors. Call security at CAS to secure all 105KE radiation alarms and verify that all alarms are clear.

\_\_\_\_\_  
Initials / Date

11.0 Test Completion

- 11.1 Ensure system is operating without any alarms. Ensure the 3.5" floppy boot disk is in the disk drive and there is an MO disk in the Magneto Optical Drive.

\_\_\_\_\_  
Initials / Date

- 11.2 Ensure calibration sticker is placed on the AIM with a next due date of one year from successful completion date of this ATP test.

\_\_\_\_\_  
Initials / Date

- 11.3 Resolve all test exceptions.

\_\_\_\_\_  
Initials / Date

- 11.4 Sign and date the Test Execution Completion Sheet in section 13.0.

\_\_\_\_\_  
Initials / Date

## 12.0 Data Sheets

### 12.1 Calibration Data Sheets

The following data sheets document the accuracy of the VGR system Analog Input Module (AIM). The AIM unit is the only piece of equipment in the VGR system that would ever need to be calibrated and is the only component that could be calibrated in the system. The tolerances listed on the following data sheets are the same ones used on the existing system (PRMS). The VGR unit is a display/recording device with serial interfaces to the AIM and ALM units and has no calibration adjustments.

105KE VGR: Program Version # \_\_\_\_\_

ROM Loader Version # \_\_\_\_\_

VGR Revision # \_\_\_\_\_

Table 3  
Calibration Data Sheet - AIM Channel #1, Detector #7

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 4  
Calibration Data Sheet - AIM Channel #2, Detector #8

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 5  
Calibration Data Sheet - AIM Channel #3, Detector #9

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 6  
Calibration Data Sheet - AIM Channel #4, Detector #10

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_



Table 7  
Calibration Data Sheet - AIM Channel #5, Detector #11

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 8  
Calibration Data Sheet - AIM Channel #6, Detector #12A

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 9  
Calibration Data Sheet - AIM Channel #7, Detector #12B

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Table 10  
Calibration Data Sheet - AIM Channel #8, Detector #13

AIM Serial # \_\_\_\_\_

Input Value (ma)	VGR Display Output (mR/hr)	Tolerance ( $\pm 2\%$ ) mR/hr	Check If Cal. In	Check If Cal. Out
4.00		.98 - 1.02		
7.20		9.8 - 10.2		
10.40		98 - 102		
13.60		980 - 1020		
16.80		9.8K - 10.2K		
19.98		98K - 102K		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

## 12.2 Radiation Alarm Data Sheets

The following Radiation Alarm Data Sheets cover the three radiation alarms associated with each 105KE radiation detector. Each of the alarms have output relays that activate such functions as detector beacons, audible annunciators, CRT indication, etc.. The relays will activate when the listed set point is reached for the channel under test. Each alarm will cause an alarm message to appear on both the CRT and printer. The Low Level Radiation & System Trouble Alarm activates on a descending radiation level. The Intermediate and High Radiation Alarms activate on ascending radiation levels.

All the alarms have either manual or automatic acknowledge, ACK. This means that after the alarm condition clears the alarms with manual ACK will need to be manually acknowledged using the Alarm Acknowledge button on the front of the VGR. The alarms with auto ACK will clear automatically after the alarm condition is removed.

Table 11  
Radiation Alarm Data Sheet -  
Low Level Radiation & System Trouble Alarm Check

ALM Serial # \_\_\_\_\_

Alarm Function Activation	Alarm Initiation Event					
	Remove 105KE Radiation Detector Wire (Any 1 Detector)	Remove Watchdog Relay (KWD) Reset Pulse	Low 105KE Radiation Detector Activity (Detectors 7-13)	Remove VGR Power	Check If OK	Check If Fail
KE Arms Rack Status Panel Blue Light						
105KE Basin Control Panel						
Audible Annunciator						
Alarm to Security at CAS						
105KW Basin Control Panel						
KE Arms Rack Alarm Indicated on VGR CRT						
KE Arms Rack Alarm Printed						

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

**NOTE: Shaded areas of the above table do not have to be verified**

Table 12  
Radiation Alarm Data Sheet -  
Intermediate Level Radiation Alarm And Upscale Function Check

Action	ARMS 105KE Radiation Detector Channel No.							
	7 (1)	8 (2)	9 (3)	10 (4)	11 (5)	12A (6)	12B (7)	13 (8)
VGR CRT (mR/hr)								
Printer (mR/hr)								
Detector Panel Meter (mR/hr)								
Intermediate Status Indication On VGR CRT (Y/N)								
105KE Basin Control Panel ON (Y/N)								
Intermediate Audible Alarm Activated (Y/N)								
Intermediate Amber Lamp ON (Y/N)								
Intermediate Outside Amber Rotating Beacon ON (Y/N)								
105KW Basin Control Panel ON (Y/N)								
Alarm to Security at CAS ON (Y/N)								
Upscale Function Check								

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

**NOTE: Shaded areas of the above table do not have to be verified**

Table 13.  
Radiation Alarm Data Sheet -  
High Level Radiation Alarm Check

Action	ARMS 105KE Radiation Detector Channel No.							
	7 (1)	8 (2)	9 (3)	10 (4)	11 (5)	12A (6)	12B (7)	13 (8)
VGR CRT (mR/hr)								
Printer (mR/hr)								
Detector Panel Meter (mR/hr)								
High And Intermediate Status Indication On VGR CRT. (Y/N)								
105KE Basin Control Panel ON (Y/N)								
Intermediate and Hi Audible Alarm Activated (Y/N)								
Intermediate Amber Lamp and High Red Lamp ON (Y/N)								
Intermediate Outside Amber Rotating Beacon ON (Y/N)								
105KW Basin Control Panel ON (Y/N)								

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

**NOTE: Shaded areas of the above table do not have to be verified**

Table 14  
Radiation Alarm Data Sheet -  
Source Bugging Chambers Alarm Check

Action	ARMS 105KE Radiation Detector Channel No.							
	7 (1)	8 (2)	9 (3)	10 (4)	11 (5)	12A (6)	12B (7)	13 (8)
VGR CRT (mR/hr)								
Detector Panel Meter (mR/hr)								
High And Intermediate Status Indication On VGR CRT (Y/N)								
High and Intermediate Annunciator on Control Panel (Y/N)								
Intermediate and High Audible Alarm Activated (Y/N)								
Intermediate Amber Lamp and High Red Lamp ON (Y/N)								
Intermediate Outside Amber Rotating Beacon ON (Y/N)								
105KW Basin Annunciator Panel ON (Y/N)								
Alarm to Security at CAS ON (Y/N)								

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

**NOTE: Shaded areas of the above table do not have to be verified**

### 12.3 System Alarm Data Sheet

The System Alarm Data Sheet lists the VGR system alarms that can be simulated without damaging the equipment. The following System Alarm Data Sheet also lists the actions necessary to simulate these alarms. Not all of the system alarms can be simulated without possibly damaging the equipment, so not all of them can be tested. All system alarms will appear on the KE Arms Rack print out and on the VGR CRT Alarm page. All the system alarms have a manual ACK to clear the alarm relay output after the alarm condition is cleared. A complete list of the system alarms configured for this system can be found in Appendix B, VGR System Alarm Table.



Table 15  
System Alarm Data Sheet

VGR Channel #	Alarm Description	Action To Simulate Alarm	Print Out	Check If Pass	Check If Fail
49	No AIM Input Points	Disconnect Power Cable To AIM Unit	Yes		
54	AIM Link Fail	Disconnect Power Cable To AIM Unit	Yes		
55	External Alarm Link Failure	Turn Off Power Switch On ALM Unit	Yes		
57	Printer Failure	Turn Off Printer	No		

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

#### 12.4 Watchdog Relay Data Sheet

The Watchdog Relay Data Sheet in this section provides a space to record the response time of the Watchdog Relay after a simulated system failure.

##### Watchdog Relay Data Sheet

Time To Trip: \_\_\_\_\_ Seconds (Approximately 7-15 Seconds.)

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

12.5 Password Security Test Data Sheet

Password Security Test Data Sheet

105KE ARMS VGR: PASS \_\_\_\_\_ FAIL \_\_\_\_\_

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

### 13.0 Test Execution Completion Sheet

All steps in section 10.0, Procedure, have been successfully completed and all exceptions, if any, noted in section 14.0, Test Exception Sheet, have been resolved. The KE ARMS is accepted for beneficial use.

Cognizant Engineer/  
Design Authority:

\_\_\_\_\_  
Signature                      Date

QA/QC:

\_\_\_\_\_  
Signature                      Date

Operations:

\_\_\_\_\_  
Signature                      Date

FDH/SAS:

\_\_\_\_\_  
Signature                      Date

PTC/SAS:

\_\_\_\_\_  
Signature                      Date

#### 14.0 Test Exception Sheet

Print the following requested information in the spaces provided, unless otherwise indicated.

Exception Number: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_

Organization: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Exception: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Planned Action: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Action Taken: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Action Taken Date: \_\_\_\_\_

Retest Execution And Acceptance:

\_\_\_\_\_ Retest approved  
and accepted.

\_\_\_\_\_ Exception accepted  
as is. Provide details  
in the planned action area.

\_\_\_\_\_  
QA/QC Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Engineer Signature

\_\_\_\_\_  
Date

Appendix A - VGR Alarm Function Table

VGR Input Channel(s)	Math Block(s)	VGR Math Channel(s)	VGR Alarm Relay #(s)	Alarm Description	Acknowledge Function	Relay Action	Radiation Detector #(s)
1-8	N/A	25-32, 49-60	40	Low Alarm & System Trouble <sup>2</sup>	Manual	Close	All
1-8	0X6 <sup>1</sup>	N/A	39	High Level Alarm Relay (HLA-K)	Manual	Close	All
1-8	N/A	17-24	38	High Level Alarm Relay (5K)	Manual	Close	All
1-8	N/A	17-24	37	Intermediate Alarm Door Beacon (ILA-DOOR) And Intermediate Level Alarm Relay (ILA-K)	Automatic	Close	All
1-8	0X7 <sup>1</sup>	17-24	36	High Level Alarm Horns (3)	Manual	Close	All
1	018	17	35	Intermediate Alarm Beacon (7ILA)	Automatic	Close	7
2	028	18	34	Intermediate Alarm Beacon (8ILA)	Automatic	Close	8
3	038	19	33	Intermediate Alarm Beacon (9ILA)	Automatic	Close	9
4	048	20	32	Intermediate Alarm Beacon (10ILA)	Automatic	Close	10
5	058	21	31	Intermediate Alarm Beacon (11ILA)	Automatic	Close	11
6	068	22	30	Intermediate Alarm Beacon (12A1LA)	Automatic	Close	12A
7	078	23	29	Intermediate Alarm Beacon (12B1LA)	Automatic	Close	12B
8	088	24	28	Intermediate Alarm Beacon (13ILA)	Automatic	Close	13
1-8	90-97	17-24	27	Intermediate Alarm To Security	Automatic	Close	All
1-8	125-144	25-32, 49-60	26	Low/System Trouble <sup>2</sup> Alarm To Security	Manual	Close	All

N/A	100, 101	N/A	24	Watchdog Relay Reset Output	N/A	Pulse	N/A
9	N/A	61	N/A	Upscale Check Circuit Enabled	Automatic	N/A	All
N/A	N/A	N/A	1-23, 25	Spare Relay Outputs	N/A	N/A	N/A

1 X=1-8 (Corresponds to input channel number.)

2 System trouble alarms are generated by the VGR, see VGR System Alarm Table, Appendix 8, for the list of alarms used. See Angus Electronics Operating Instruction Manual, Appendix B, for the complete list of system inputs.

Appendix B - VGR System Alarm Table

VGR Channel	System Number	Alarm Type	Alarm Description/Function
1	N/A	N/A	Open Circuit Or Low/High Scale, Detector 7
2	N/A	N/A	Open Circuit Or Low/High Scale, Detector 8
3	N/A	N/A	Open Circuit Or Low/High Scale, Detector 9
4	N/A	N/A	Open Circuit Or Low/High Scale, Detector 10
5	N/A	N/A	Open Circuit Or Low/High Scale, Detector 11
6	N/A	N/A	Open Circuit Or Low/High Scale, Detector 12A
7	N/A	N/A	Open Circuit Or Low/High Scale, Detector 12B
8	N/A	N/A	Open Circuit Or Low/High Scale, Detector 13
9	N/A	N/A	Upscale Check Circuit Enable Input
17	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 7 (Printer Trace Color - Black)
18	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 8 (Printer Trace Color - Red)
19	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 9 (Printer Trace Color - Blue)
20	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 10 (Printer Trace Color - Yellow)
21	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 11 (Printer Trace Color - Green)
22	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 12A (Printer Trace Color - Orange)
23	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 12B (Printer Trace Color - Purple)
24	N/A	Intermediate/ High Radiation	Intermediate & High Radiation Alarms Setpoints, Detector 13 (Printer Trace Color - Black)
25	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 7
26	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 8
27	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 9
28	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 10
29	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 11
30	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 12A
31	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 12B



32	N/A	Low Radiation	Low Radiation Alarm Setpoint, Detector 13
33	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 7
34	N/A	High Radiation	High Radiation Alarm Print Out, Detector 7
35	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 8
36	N/A	High Radiation	High Radiation Alarm Print Out, Detector 8
37	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 9
38	N/A	High Radiation	High Radiation Alarm Print Out, Detector 9
39	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 10
40	N/A	High Radiation	High Radiation Alarm Print Out, Detector 10
41	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 11
42	N/A	High Radiation	High Radiation Alarm Print Out, Detector 11
43	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 12A
44	N/A	High Radiation	High Radiation Alarm Print Out, Detector 12A
45	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 12B
46	N/A	High Radiation	High Radiation Alarm Print Out, Detector 12B
47	N/A	Intermediate Radiation	Intermediate Radiation Alarm Print Out, Detector 13
48	N/A	High Radiation	High Radiation Alarm Print Out, Detector 13
49	S29	System Trouble	No Analog Input Module, AIM, Input Points
50	S45	System Trouble	No External Analog Input Module, AIM, Present
51	S46	System Trouble	No External Relay
52	S50	System Trouble	Analog Input Module, AIM, 1 UART Failure
53	S52	System Trouble	External Alarm UART Failure
54	S56	System Trouble	Analog Input Module, AIM, 1 Link Failure
55	S58	System Trouble	External Alarm Link Failure
56	S63	System Trouble	EEPROM Error
57	S85	System Trouble	Printer Failure
58	S90	System Trouble	Disk Error
59	S91	System Trouble	Magneto Optical, MO, Disk, Full
60	S92	System Trouble	Magneto Optical, MO, Disk, Error
61	N/A	Information	Upscale Check Circuit Enabled

† See Appendix B of Angus Electronics VGR Manual for the complete list.

## Appendix C - Equipment Failure Log

[illegible]

## Appendix D - 105KE Radiation Detector Data Sheet

## 105KE Radiation Detector Data Sheet

105KE Radiation Detector No. RE-216- \_\_\_\_\_

GD-6B 105KE Radiation Detector Serial No.: \_\_\_\_\_

Date: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

Next Calibration Due Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

AB/OFF Switch Position (Check One):     AB     OFF

As-Left Upscale Reference Value: \_\_\_\_\_mR/hr

Data Recorded By: \_\_\_\_\_  
Initials / Date

Recall Database Verified: \_\_\_\_\_  
PM/S Administrator  
(Signature)

Date \_\_\_\_\_