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DCL Command Procedure Implementation for the Nuclear Data 9900 Data Aquisition and Processing System

J. W. Wade
S. H. Prestwood

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DCL COMMAND PROCEDURE IMPLEMENTATION FOR THE NUCLEAR DATA 9900 DATA ACQUISITION AND PROCESSING SYSTEM

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TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	2
GETTING STARTED	2
COMMAND PROCEDURES	4
SPECTRAL PROCESSING USING PROCEDURES	4
UTILITY COMMAND PROCEDURES	6
APPENDIX 1	8
APPENDIX 2	9
APPENDIX 3	11
APPENDIX 4	12
APPENDIX 5	13
APPENDIX 6	14
APPENDIX 7	15
APPENDIX 8	16
REFERENCES	17

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ABSTRACT

This document describes the usage of a Nuclear Data Model 9900 System by the Low Level Radiochemical Analysis Group of the Analytical Chemistry Division at Oak Ridge National Laboratory. Digital Command Language procedures are used extensively and enable those unfamiliar with the system to become efficient and productive with minimal training. The current system is controlled by a DEC MicroVAX II CPU with 7 M Bytes of memory and utilizes both hard and floppy disk drives for software and spectral storage. The hard disks are backed up using a DEC TK-50 95 MB tape unit. The system supports eight simultaneous users. This document describes in detail our command procedures and how they interact with existing Nuclear Data programs.

1. INTRODUCTION

A Nuclear Data (ND) 9900 system (Genie) was procured in August of 1986. We have been using the system routinely since September of that year and feel that others in the field of radiochemistry currently using a Genie would be interested in our software and command procedure applications. This document will assume that the reader is familiar with the Genie and VAX Digital Command Language (DCL) procedures. ND software will be discussed only if clarification is needed about how it works with our applications. User manuals supplied with Genie systems are generally quite good.[1] The reader is encouraged to consult them to resolve questions about ND software.

2. GETTING STARTED

We have found it most convenient to have all spectroscopy applications running under one user. Therefore, in order to implement the command procedures described in this document, a "spectroscopy user" must be set up with an account and a default login directory. For our applications, the username and login directory for spectroscopy applications was named TOPONE. ND supplies a command procedure for installing user accounts. For more information, see the command procedure ADDUSER.COM in the system manager's default login directory. For more information about setting up user accounts, consult the ND or Digital Equipment Corporation (DEC) manuals supplied with the system.[2]

Once the username was established and the user was authorized to access the Genie, a subdirectory was created corresponding to each detector that is controlled by the system. For example, on our system we have a detector configuration called G1. A subdirectory called [TOPONE.USER1] corresponding to the configuration G1 was created by typing:

```
CREATE/DIR [TOPONE.USER1]
```

at the DCL $ prompt. These subdirectories contain command procedures, efficiency files, QA files, and anything else associated with that particular detector. In addition to the

subdirectories for each detector, the subdirectories SAVE and PRINTER were created. The SAVE subdirectory is used to archive sample spectra. The function of the PRINTER subdirectory is discussed later in this document. For the remainder of this document, references will be made to the configuration G1 and its' corresponding subdirectory USER1. The reader is reminded that other configurations and subdirectories can be set up in similar fashion.

The detector configuration G1 was created following ND's instructions in the User's Manual.[3] After the detector was energy calibrated, PARS was run, and the appropriate identification parameters were entered. Using the ND program MOVE the configuration was copied to a file for later use. We use a radium-226 source for energy calibration and move the configuration to a file called RA-226. For example, after calibrating detector G1 with the radium source, the configuration data was moved to the proper file by typing:

MOVE G1 [TOPONE.USER1]RA-226

at the DCL $ prompt. In a later section of this document, a command procedure will be discussed that performs these commands.

A configuration that contains efficiency information for each standard geometry was created and saved for later recall. For this example, a configuration was created that contains efficiencies for a Marinelli beaker containing 900 ml of water. Using ND's certificate file editor, a certificate file was created that describes the standard that was placed in the Marinelli beaker. For example, a certificate file called QCY44.CER was created by typing

CFE [TOPONE.USER1]QCY44

at the DCL $ prompt. All information required to describe the standard was entered. The standard was counted long enough to obtain sufficient data in the peaks of interests. PARS was used to enter the appropriate header information, and then PEAK was run with the /NOLIST option. Efficiencies for each peak of interest were generated by typing:

EFF/CALC/CERTIF=[TOPONE.USER1]QCY44/LIST=LP G1

at the DCL $ prompt. This command also causes a report listing to be sent to the line printer. The configuration was moved to a file for later recall by typing:

MOVE G1 [TOPONE.USER1]G1M900

at the DCL $ prompt. The efficiencies were therefore saved in the configuration file G1M900.CNF for recall in a subdiretory that contains only files associated with detector G1.

Using the VAX text editor, a file called EFFICIENCY_FILE.DAT was created in the [TOPONE.USER1] subdirectory. On line one, G1M900 was entered with the editor. The remaining efficiency configuration names were entered on lines two, three, etc. A listing of EFFICIENCY_FILE.DAT that currently exists on our system in [TOPONE.USER1] can be found in appendix 1 of this report. The command procedure that is discussed later in this document uses this data file to check for valid efficiencies. The ND manual[4] has information about creating certificate files or efficiency configurations.

3. COMMAND PROCEDURES

Command procedures are big time savers and are a very important part of our system. We have command procedures that set up detector configurations when the system is rebooted, process samples that have been counted and do most anything that is routine in nature. The command procedures that are used to process routine sample spectra will be discussed first.

3.1 SPECTRAL PROCESSING USING PROCEDURES

A listing of the command procedure (NEW_G1.COM) used to process a spectrum from a sample that has been counted on detector G1 can be found in appendix 2. Command procedures that are used to process spectra from detectors other than G1 are very similar except for specific configuration and efficiency names. One of the unique features about this command procedure is that it can be started while a sample is counting or after it has

finished without disturbing the counting process. The procedure allows the user to enter the appropriate header and efficiency information pertinent to the sample being counted. It then submits a batch job that runs ND programs to analyze the spectra and generate hard copy reports. The batch job will wait until the ADC quits counting before it processes the spectra. Therefore, once the header and efficiency information has been entered, the user and terminal are free to perform other operations. A command procedure running interactively would tie up the terminal until counting and data reduction is complete.

The command procedure NEW_G1 performs several functions that need to be specifically addressed. The first thing that the procedure does is to check and see if the batch job it will eventually submit is running, as would be the case if a user inadvertently started the job earlier. If the batch job is already running, the user is notified and the procedure terminates. Next, the ND PARS program is run using the FPL forms option. Forms are an excellent way to enter information into a configuration using PARS. Forms make it very easy for a user unfamiliar with PARS to use the program. The screen on the system console is reset after running PARS, and the procedure continues to the next step.

Two parameters that were entered in PARS are then checked by running PARS with the /COMMAND option. First, the activity units are checked to ensure that the data will be reported in the proper units. For our applications, these can only be in picocuries or becquerels. If improper activity units have been entered, the user is notified and returned back to PARS. Next, the counting geometry is checked for validity. Once again using PARS with the /COMMAND option, the value of the parameter SGEOM is obtained from the configuration. If SGEOM matches a valid efficiency in EFFICIENCY_FILE.DAT, the procedure moves the efficiencies from the corresponding file to G1 using MOVE with the /PARTIAL option. If on the other hand SGEOM does not match a valid efficiency, the user is warned and returned to PARS.

If execution continues normally, the procedure notifies the user what efficiency file will be used, the command procedure BATCH_G1 is submitted as a batch job, and NEW_G1 exits. The terminal is free for other tasks and BATCH_G1 will wait until G1 finishes counting before processing the data. The entire process of setup takes less than a minute, and most of that time is spent entering information into PARS.

After the ADC finishes counting, BATCH_G1 obtains the value of the STITLE

parameter from PARS using PARS/COMMAND. As previously discussed, sample spectra are archived in a subdirectory called SAVE, and the STITLE parameter is used to construct the name of the file where the spectra are stored. Next, the configuration is moved to a work file called WORK1 and the spectrum is processed. The move to the SAVE subdirectory and to the WORK file takes only a few seconds, and once this is accomplished, the ADC memory can be cleared and counting of another sample can begin.

All reports generated by ND software (PEAK, NID, MDA, etc) are run by BATCH_G1 with the output directed to files. If all of the reports are sent to the line printer and more than one detector terminate at the same time, the reports for different samples can sometimes run together. When the spectral information has been processed, the batch job concatenates the individual files into one and copies that file to the subdirectory PRINTER. Another batch job that runs continuously looks in that subdirectory for the presence of files. When it discovers one, it prints and deletes it, waits for 30 seconds and continues. This eliminates any problems with printouts running together. A listing of this command procedure can be found in appendix 3.

3.2 UTILITY COMMAND PROCEDURES

We also created command procedures that set up detector configurations when the system is rebooted. An example listing of two such procedures can be found in appendices 4 and 5. The procedures use the configuration file RA-226.CNF to create the configuration G1. Whenever an energy calibration on a detector is performed, the setup configuration file RA-226 should be replaced. If the configuration is not replaced, the detector will not be properly calibrated when the system is rebooted. An example listing of a command procedure that performs a recalibration and subsequent replacement of the RA-226 file can be found in appendix 6.

Logical assignments are made in the spectroscopy users' LOGIN.COM file that will allow frequently used commands and programs to be accessed quickly and easily with a minimun of keystrokes. A partial listing of our LOGIN.COM file can be found in appendex 7.

Another useful procedure is one that runs in batch mode and moves the configurations to save files. After it performs the moves, it resubmits itself to run again in one hour.

With a procedure like this running, loss of an overnight count will be avoided if the system crashes before processing the spectra. An example of such a procedure can be found in appendix 8.

We have used the command procedures discussed in this document for over 2 years and have been well pleased with them. They have proven to be a very efficient and time saving step in our effort to automate the sample analysis process.

APPENDIX 1

G1M900
G1J100
G1M500
G1PETRI
G1EML_FILTER
G1EMSL_FILTER

APPENDIX 2

```
$ ! NEW_G1.COM Command file to set up configuration G1 and ready
$ ! the spectra for processing.  After all setup information has
$ ! been entered, the batch job BATCH_G1 will be submitted to
$ ! finish the task.
$
$ SET DEF DUA0:[TOPONE.USER1]
$
$ ! CHECK AND SEE IF THIS BATCH_G1 IS ALREADY RUNNING
$ ! IF IT IS THEN ALERT THE OPERATOR AND EXIT
$
$ SEARCH_ W_NOMATCH = %x08D78053
$ DEFINE/USER SYS$OUTPUT QUEUE1.DAT
$ SHOW QUEUE/ALL/BATCH
$ SEARCH QUEUE1.DAT BATCH_G1
$ STATUS = 0 + $STATUS
$ IF STATUS .EQ. SEARCH_W_NOMATCH THEN GOTO BEGIN
$
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "Batch_G1 is already running "
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$ GOTO ENDIT
$
$BEGIN:
$ DISPLAY G1
$ DEFINE/USER SYS$INPUT SYS$COMMAND
$ PARS/FORMS/FPL=[TOPONE]NEW_PARS G1
$ MCA SET WINDOW 2000
$
$ PARS/COMM G1  ACTIVUNITS
$ IF ACTIVUNITS .NES.  "pCi" .AND. ACTIVUNITS .NES. "PCI" then  -      GOTO
NOT_PCI
$ PARS/COMM G1 ACTIVMULT=1E6
$ GOTO START_GEOM
$
$NOT_PCI:
$ IF ACTIVUNITS .NES. "Bq" .AND. ACTIVUNITS .NES. "BQ" THEN GOTO -
NOT_BQ
$ PARS/COMM G1 ACTIVMULT=3.7E4
$ GOTO START_GEOM
$
$NOT_BQ:
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
```

```
$ WRITE SYS$OUTPUT "You have entered an invalid activity unit."
$ WRITE SYS$OUTPUT "See your system manager if you need help."
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$ WAIT 00:00:10
$ GOTO BEGIN
$
$ START_GEOM:
$ PARS/COMM G1 SGEOM/SYMBOL=PARS_GEOM
$ OPEN INPUT EFFICIENCY_FILE.DAT
$
$GET_GEOM:
$ READ/END_OF_FILE = END_GEOM INPUT GOOD_GEOM
$ IF PARS_GEOM .EQS. GOOD_GEOM THEN GOTO PUT_GEOM
$ GOTO GET_GEOM
$
$END_GEOM:
$ CLOSE INPUT
$ WRITE SYS$OUTPUT " "
$ WRIIE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "You have entered ", PARS_GEOM,  -
    " for efficiency"
$ WRITE SYS$OUTPUT "See your system manager if you need help."
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$ WAIT 00:00:10
$ GOTO BEGIN
$
$PUT_GEOM:
$ CLOSE INPUT
$ MOVE/PARTIAL/EFF 'GOOD_GEOM'/EFF G1
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "Calculations will be performed using ", -
    PARS_GEOM," Efficiencies"
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT " "
$
$ SUBMIT/NOLOG BATCH_GI
$
$ENDIT:
$ DEL QUEUEl.DAT:*
$ TOPONE
```

APPENDIX 3

```
$ ! BATCH_G1.COM to finish processing spectra stored in
$ ! configuration G1...If a sample is counting, the job will wait
$ ! until the ADC times out before finishing.
$
$ MCA WAIT G1
$ SET DEF DUA0:[TOPONE.USERl]
$ PARS/COMM Gl SIDENT/SYMBOL=WHAT_DO  ! GET THE SAMPLE NUMBER
$ WHAT_DO = F$EXTRACT(0,20,WHAT_DO)   ! FROM PARS
$
$ MOVE Gl DUA0:[TOPONE.SAVE]'WHAT_DO'.CNF
$
$ MOVE Gl WORKl
$ PEAK/NOLIST WORKl
$ ENBACK/BKGND=GlBACK/NOLIST
$ EFF/CALC/HEADER=HEADl/EMP/LIST=EFF.TMP
$
$ NID /LIBRARY=[TOPONE]MDA/NOHEADER /NOLIST  ! RUN NID WITH AN
$ MINACT/NOHEADER /LIST=MINACT.TMP           ! ABBREVIATED LIBRARY
$
$ NID /LIBRARY=SYS$SYSROOT:[SYSMGR]LIBD/NOHEADER -
        /REPORT=(ACT,SUM,UNK) /LIST=NID.TMP
$ COPY EFF.TMP,NID.TMP,MDA.TMP PRINT.DAT
$ COPY PRINT.DAT [TOPONE.PRINTER]PRINT.DAT
$ DELETE PRINT.DAT;*
$ DELETE *,TMP;*
$ DEL WORKl.CNF;*
```

APPENDIX 4

```
$ INIT.COM COMMAND FILE SETS UP SOME USEFUL PARAMETERS AFTER
$ A SYSTEM REBOOT AND SETS UP ALL ADC'S
$
$ WRITE SYS$OUTPUT " WORKING....PLEASE WAIT"
$ WRITE SYS$OUTPUT
$
$ MCA SET COLOR BVT100 0 0 0
$ MCA SET COLOR MARKER 0 0 255
$
$ MCA SET SAVER 5
$ MCA SET CLICK OFF
$
$ AADC1
$ AADC2
$ AADC3
$ AADC4
$ AADC5
$ AADC6
$ AADC7
$ AADC8
$ AADC9
$ AADC10
$ AADC11
$ AADC12
$
$ TOPONE
$
$ ! submit the command procedure to generate the printouts
$ SUBMIT/NOLOG DUA0:[TOPONE.PRINTER]PRINTER_DAT
$
$ ! submit a procedure to save the configurations every hour
$ SUBMIT/NOLOG/AFTER="+1" DUA0:[TOPONE.SAVE_CONFIG]SAVE_CONFIGS
$
$ WRITE SYS$OUTPUT " DONE....."
$ WRITE SYS$OUTPUT
```

APPENDIX 5

```
$ ! AADC1.COM TO CREATE CONFIGURATION G1
$
$ USER1                    ! Sets default directory to [TOPONE.USER1]
$
$ MCA CREATE G1 A1:6 /DEF=RA-226 /EFF=STD1 -
    /PROTECTION=(S:RWED,O:RWED,G:RWE)
$
$ TOPONE
$ EXIT
```

APPENDIX 6

```
$ ! SETUP1.COM TO CALIBRATE AND SAVE THE CALIBRATION FOR G1
$
$ USER1
$ CALIB/UPDATE/NOEFF/CERTIF=DUA0:[TOPONE]RA-226 G1
$ DEL RA-226.CNF;*
$ MOVE G1 RA-226
$ TOPONE
$ EXIT
```

APPENDIX 7

```
$! This command procdeure is a framework for building individual
$! login command procedures
$
$ ADCINIT     :== @INIT
$ TOPONE      :== SET DEF DUA0:[TOPONE]
$
$ USER1       :== SET DEF DUA0:[TOPONE.USER1]
$ USER2       :== SET DEF DUA0:[TOPONE.USER2]
$ USER3       :== SET DEF DUA0:[TOPONE.USER3]
$ USER4       :== SET DEF DUA0:[TOPONE.USER4]
$ USER5       :== SET DEF DUA0:[TOPONE.USER5]
$ USER6       :== SET DEF DUA0:[TOPONE.USER6]
$ USER7       :== SET DEF DUA0:[TOPONE.USER7]
$ USER8       :== SET DEF DUA0:[TOPONE.USER8]
$ USER9       :== SET DEF DUA0:[TOPONE.USER9]
$ USER10      :== SET DEF DUA0:[TOPONE.USER10]
$ USER11      :== SET DEF DUA0:[TOPONE.USER11]
$ USER12      :== SET DEF DUA0:[TOPONE.USER12]
$
$!                ADC 1'S COMMAND FILES
$ G1          :== @[TOPONE.USER1]NEW_G1
$ AADC1       :== @[TOPONE.USER1]AADC1
$ SETUP1      :== @[TOPONE.USER1]SETUP
$
$!                ADC 2'S COMMAND FILES
$ G2          :== @[TOPONE.USER2]NEW_G2
$ AADC2       :== @[TOPONE.USER2]AADC2
$ SETUP2      :== @[TOPONE.USER2]SETUP
$
```

APPENDIX 8

```
$ ! SAVE_CONFIGS.COM TO SAVE THE CONFIGURATIONS EVERY HOUR
$ ! AFTER RUNNING THE PROCEDURE WILL RESUBMIT ITSELF
$
$ SET DEF DUA0:[TOPONE.SAVE_CONFIG]
$ DEL *.CNF;*
$
$ MOVE G1 SAVE1
$ MOVE G2 SAVE2
$ MOVE G3 SAVE3
$ MOVE G4 SAVE4
$ MOVE G5 SAVE52
$ MOVE G6 SAVE6
$ MOVE G8 SAVE8
$ MOVE G10 SAVE10
$ MOVE G11 SAVE11
$ MOVE G12 SAVE12
$
$ SUBMIT/NOLOG/AFTER="+1" SAVE_CONFIGS
$ EXIT
```

4.0 REFERENCES

1. Nuclear Data Corporation, "VAX/VMS Spectroscopy Applications Package User's Manual," 07-0196, 1986.

2. Nuclear Data Corporation, "Software Installation and System Management Guide," 07-0197, August 1986.

3. Nuclear Data Corporation, "VAX/VMS Spectroscopy Applications Package User's Manual," 07-0196, Section 4.3.3.1, 1986.

4. Ibid., Sections 3.4, 3.11.

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