Microcomputer-Based Software for Management of Calibration Service

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Electronics and Electrical Engineering
Electro systems Division
Washington, DC 20234

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MICROCOMPUTER-BASED SOFTWARE FOR MANAGEMENT OF CALIBRATION SERVICE

William E. Anderson

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MICROCOMPUTER-BASED SOFTWARE FOR MANAGEMENT OF CALIBRATION SERVICE

William E. Anderson

Abstract

The majority of the calibration customers' concerns are directed not to the technical details of the calibration service but to the timely delivery of that service. It is therefore proper that the calibration services be closely managed. For a Group or Division with a large calibration load, this can be a difficult task. The Applied Electrical Measurements Group of the Electrosystems Division has developed microcomputer-based software to provide considerable assistance to the calibration manager. With this database software, complete information on the status of all the calibration jobs is instantly available.

Key words: calibration management; calibrations; database management; microcomputer; software

1. INTRODUCTION

In order to provide adequate service to calibration clients, good management must be exercised at the Group and/or Division level. Most complaints concerning a calibration service are not directed to the technical aspects of the service but more often to the timely delivery of the service. Therefore, it would be of considerable value if complete information as to the status of each calibration job were instantly accessible.

In the past, the Applied Electrical Measurements Group of the Electrosystems Division kept a calibration log book. The arrival of purchase orders, test folders, and equipment prompted an entry into the log book. Also entered were the device type, closing date and fees. While most of the information necessary to maintain a calibration service was contained in the log, retrieval of the information in real time was not always possible. The requests for additional fiscal and statistical information (e.g., the income per quarter from a specific calibration service), sometimes required excessive amount of time for response.

With the advent of microprocessor-based workstations and commercially available database software, vast improvements could be made in providing the information without a significant expenditure in resources. Such a system was developed in the Electrosystems Division and has been in use for the past six months. The system has been able to meet all demands on it and also has served as a means for checking the accuracy of the centralized accounting system. Further, the availability of accurate information on the current financial status of the calibration service permits better planning decisions to be made.

2. DESCRIPTION OF SOFTWARE

Relational database software is readily available for both 8 and 16-bit microcomputers. The database management system, dBase II [1], from Ashton-Tate was selected because it was the only such software available at that time which
could be used on all the computers anticipated to be used by the Group. A similar calibration management program could be designed using database management software from other vendors.

While dBase II provides the command structure to create and manipulate databases, the user must provide the programs (in dBase II's language) to tailor the software to the user's needs. (A listing of the various programs along with sample output is provided in the appendix). In order to make it possible for this calibration management software to be used without any knowledge of dBase II, the software was written to be menu-driven. Assuming the operator has turned on the computer, loaded in the operating system, and that the programs and database reside on the default disk drive, entering 'dBASE menu' should provide the following onscreen menu:

NUMBER OF RECORDS IS ---

CALIBRATION FILE MENU

0 - EXIT
1 - ENTER NEW RECORD
2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD
3 - PRINT LIMITED
4 - PRINT ALL
5 - PRINT ACTIVE
6 - PRINT LATE JOBS
7 - PRINT BY DEVICE
8 - PRINT BY CUSTOMER
9 - DISPLAY ACTIVE
A - COPY DATABASE

ENTER DESIRED ACTION

WAITING

Menu choices '1' and '2' provide the user a method for changing the contents of a database record. The program is designed in such a way that each record corresponds to one instrument received for calibration. (For multiple instruments attached to the same test folder, suffixes A,B,C, etc. are concatenated to the test number). Each record consists of the following fourteen fields: test number, purchase order number, type of instrument, model name and number, serial number, staff member assigned to calibration, customer's name, customer's city and state (and zip code), starting date for job, promised date, finishing date, form letter information, number of manhours, and cost (excluding OPMS surcharges). While the contents of most of these fields may be apparent, the intended contents of the form letter information field may need explaining. It is the policy of the Electrosystems Division to keep its customers informed as to the status of their calibration job with the use of form letters. For example, if a purchase order is received with no instrument, the customer is so notified. The customer always receives at least one form letter with the estimated cost of the calibration and the date the job should be finished. The form letter information field is 50 characters wide, permitting the entry of the dates the form letters have been sent out and, if necessary, a one or two letter code describing the form letter contents. The menu choices allow either modification of the database or output of information contained in the database to the user. Each of the choices is explained below.
0 - EXIT  Menu choice '0' causes the program to terminate and exit to the
operating system (DOS or CPM). It is important that the user select this
choice before removing the diskettes or turning off the computer as this
selection also guarantees that the actual database file is properly updated
from memory.

1 - ENTER NEW RECORD  Menu choice '1' allows the user to enter initial
information concerning a calibration job. The user is prompted on each
data entry. The day's date is automatically entered as the job start
data. In the cases where the test number is not known, a temporary number
should be assigned in order to facilitate fast retrieval of the record.

2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD  Menu choice '2' allows the
user to observe or update the information in the database as the work
progresses. If the user selects menu choice '2', the user will be prompted
to give either the test number or purchase order number of the record to be
updated or checked. Since the database is indexed on test numbers, a
typical search for a test number takes less than 2 seconds.

3 - PRINT LIMITED  Menu choice '3' provides the user a means of getting a
partial listing on the system printer of the database contents. The fields
printed are the test number, type of instrument, customer name, job closing
date, and cost. The total cost or income is also listed. The listing is
in order of test numbers.

4 - PRINT ALL  Menu choice '4' results in a more complete listing of the
database contents than choice '3.' Specifically all the fields are printed
out except the purchase order, staff member, and form letter information
fields. The information is printed in compressed print (132 characters per
line on the IBM printer). The total cost or income along with the manhours
are also listed. Users can get hardcopy access to the three missing fields
by exercising choice '2' and a print screen command if their computer
supports it.

5 - PRINT ACTIVE  Menu choice '5' permits the user to receive a hardcopy
listing of all the active jobs. Basically the database is searched for all
records without a closing date entry. This enables the user to check the
active jobs against the OPMS monthly statement of active jobs.

6 - PRINT LATE JOBS  Menu choice '6' causes the database to be searched for
all records in which the promised date comes before the present date and
there is no closing date entry. These jobs demand immediate attention,
normally in the form of a letter to the customers informing them of a
revised promised date.

7 - PRINT BY DEVICE  Menu choice '7' provides the user with a hardcopy
summary of all the jobs to date of a particular type of instrument (e.g.,
voltage transformers). The summary also includes the total income earned
for that type of instrument and the calibration manhours expended.

8 - PRINT BY CUSTOMER  Menu choice '8' yields a hardcopy listing of the
jobs done or in progress for a particular customer. The total cost to that
customer is also presented. If a customer calls concerning a calibration,
this command may be the quickest way to find the corresponding record if
the test or purchase order number are not available.
9 - DISPLAY ACTIVE  Menu choice '9' is identical to choice '5' except the output is to the display screen and not the printer.

A - COPY DATABASE  Menu choice 'A' permits the user to copy the database onto another floppy diskette to serve as backup. It is assumed that the default drive is the "A" drive and contains the database programs and the database. A formatted diskette must be placed in drive "B" before selecting this menu choice. Experience has shown two problems with this menu choice. The first is that the duplication process is relatively slow in dBase II. The second is that if an error occurs during the duplication process, one often ends up in the operating system. This could result in the database not being updated since a proper exit from dBase II has not taken place. This command has been left on the display screen as a reminder to the user to backup the database. The best way to do this, however, is exiting via menu choice '0' and copying the database file in the operating system, using operating system commands.

The above choices represent only a small fraction of the useful information contained in the database. Unfortunately, the more choices presented on the menu, the more cluttered the screen becomes. A programmer with some familiarity with dBase II can extract a myriad of useful information from the database. For example, if there is a need to know the number and income derived from watt/hour standards calibrated in the third quarter from state governments, that information can be extracted readily from the database. Also, it is possible to modify the menu choices to better meet the needs of a particular group of users.

The software system described has a great amount of flexibility. If it becomes apparent that additional fields of information need to be saved in the database, they can be added. For example, in the future it may be important to keep track of when and if an instrument has been calibrated by the National Bureau of Standards previously. Also, field sizes can be modified. If it is found that 50 characters do not provide enough space to accommodate the form letter information, the field can be expanded. The information contained in the database can be communicated to files used by word processors or to other computers. The software is portable in the sense that although it was developed on the IBM PC [1], it runs perfectly on the 8-bit storeroom microcomputer after modification of three program lines.

[1] Certain commercial hardware and software are identified in this report in order to specify the procedure used to manage the calibration data. Such identification does not imply recommendation or endorsement by the National Bureau of Standards nor does it imply that the items identified are necessarily the best available for the purpose.
3. SUMMARY

We have developed a microcomputer-based software system for the management of a calibration service at the Group or Division level. The system has been designed for user "friendliness." A Group secretary has demonstrated total success in using the software. The software has provided Group and Division management with information on the status of calibrations far superior to that currently available from other sources. It has allowed the Group to make better estimates of the financial status concerning our calibration services. In fact, it is a likely case that this software itself has justified the investments the Group has made in the procurement of the microprocessor workstations.
APPENDIX A

The microcomputer-based software for the management of a calibration service is presented. The software was written to be used on an IBM PC or XT using dBase II version 2.4. A slight modification will be presented that enables the software to be run on the 8-bit storeroom microcomputer. Comments are not encouraged in dBase II in the sense that they must be on a separate program line. Variable names have been chosen, however, that should help in understanding the programs.

Listing A is the program entitled 'menu.' It can be run from the operating system by typing 'dbase menu' or from dBase II by typing 'do menu.' This program causes the menu shown in display A to appear on the screen. Users not having a color monitor and users of the 8-bit storeroom microcomputer should delete the second line (SET COLOR TO 4.2). The database in this listing has the file name CALFY83. The software is designed so that a new database should be used each fiscal year.

Selection of menu choice '1' causes the program 'NEWRCD' (listing B) to be called. Display B shows the resulting screen display. The user is prompted for each of the possible fields of data entry.

Selection of menu choice '2' calls the program 'AMERCD' (listing C). The user is requested to enter either the test number or purchase order number so the software can find the record to be modified or checked. The resulting display is shown in display C.

Selection of menu choice '3' calls the program 'PRINTLIM' (listing D). This listing also includes the report format to be used for the printout. (M=1 sets the lefthand margin, N results in no page heading, N results in a single-spaced report, Y allows numerical totalling, and N disallows subtotalling). A page of the resulting printout is shown in printout D.

Selection of menu choice '4' calls the program 'PRINTALL' (listing E). The second line of the program tells the IBM printer to use compressed type. For the Prism printer used with the storeroom microcomputer, this line should be changed from 'chr(15)' to 'chr(31).' A page of the resulting printout is shown in printout E.

Selection of menu choice '5' calls the program 'PRINTACT' (listing F). A sample of the printout is shown in printout F.

Selection of menu choice '6' calls the program 'PRINTDEL' (listing G). A sample of the printout is shown in printout G.

Selection of menu choice '7' calls the program 'PRINTDEV' (listing H). The user is prompted to enter the type of calibration instrument. A sample of the printout is shown in printout H.

Selection of menu choice '7' calls for the program 'PRINTCUS' (listing I). The user is prompted to enter the customer's name. The second line of the program tells the IBM printer to use compressed type. For the Prism printer used with the storeroom microcomputer, this line should be changed from 'chr(15)' to 'chr(31).' A sample of the printout is shown in printout I.
Selection of menu choice '9' calls the program 'DISPACT' (listing J). This menu choice is identical to choice '5' except the output is to the screen and not the printer. The report format for this program 'PRINTACT' is shown in listing F.

Selection of menu choice 'A' calls the program 'DUP' (listing K). As mentioned in the main text, this command should only be used on a machine known to have two well-running disk drives.
LISTING A

SET COLOR TO 4,2
ERASE
DO WHILE TRUE
USE CALFY83
GO BOTTOM
ERASE
?
? '
USE
USE CALFY83 INDEX TESTNO
?
? '
? '
? '
? '
? '
? '
? '
? '
? '
? '
?'
WAIT TO ACTION
DO CASE
CASE ACTION='O'
  SET TALK ON
  QUIT
CASE ACTION='1'
  DO NEWRCRD
CASE ACTION='2'
  DO AMERCD
CASE ACTION='3'
  DO PRINTLIM
CASE ACTION='4'
  DO PRINTALL
CASE ACTION='5'
  DO PRINTACT
CASE ACTION='6'
  DO PRINTDEL
CASE ACTION='7'
  DO PRINTDEV
CASE ACTION='8'
  DO PRINTCUS
CASE ACTION='9'
  DO DISPACT

NUMBER OF RECORDS IS', #

CALIBRATION FILE MENU'

0 - EXIT'
1 - ENTER NEW RECORD'
2 - AMEND OR CHECK CONTENTS OF

3 - PRINT LIMITED'
4 - PRINT ALL'
5 - PRINT ACTIVE'
6 - PRINT LATE JOBS'
7 - PRINT BY DEVICE'
8 - PRINT BY CUSTOMER'
9 - DISPLAY ACTIVE'
A - COPY DATABASE'

ENTERED DESIRED ACTION'

CASE ACTION='A'
  DO DUP
  OTHERWISE
  ? 'INVALID ENTRY, RE-ENTER'
ENDCASE
ENDDO
RETURN
DISPLAY A

NUMBER OF RECORDS IS 169

CALIBRATION FILE MENU

0 - EXIT
1 - ENTER NEW RECORD
2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD
3 - PRINT LIMITED
4 - PRINT ALL
5 - PRINT ACTIVE
6 - PRINT LATE JOBS
7 - PRINT BY DEVICE
8 - PRINT BY CUSTOMER
9 - DISPLAY ACTIVE
A - COPY DATABASE

ENTER DESIRED ACTION

WAITING
LISTING B

NEWRCRD

ERASE
GO BOTTOM
STORE 'Y' TO X
DO WHILE X='Y'
ERASE
STORE DATE() TO M:DATESTAR
STORE '0/'/' TO M:DATEPROM
STORE '/'/' TO M:DATECLOS
STORE ' ' TO M:TEST:NO
STORE ' ' TO M:MODEL
STORE ' ' TO M:SERIALNO
STORE ' ' TO M:CUSTNAM
STORE ' ' TO M:LOCATION
STORE ' ' TO M:STAFF
STORE ' ' TO M:FORMLET
STORE 0 TO M:MANHOURS
STORE 0 TO M:COST
@ 2,0 SAY "TODAY'S DATE" GET M:DATESTAR PICTURE '99/99/99'
@ 3,0 SAY 'TEST NUMBER' GET M:TEST:NO
@ 3,0 SAY 'PURCHASE ORDER NUMBER' GET M:PO:NO
@ 5,0 SAY 'TYPE CHOICES ARE; MAP,WATTHOUR STANDARD,CURRENT TRANSFORMER,'
@ 6,0 SAY 'VOLTAGE TRANSFORMER,DC DIVIDER,AC DIVIDER,XRAY DIVIDER, DC & AC'
@ 7,0 SAY 'DIVIDER,IMPULSE DIVIDER,VT COMPARATOR,OR CT COMPARATOR' GET M:TYPE
@ 8,0 SAY 'INSTRUMENT MODEL' GET M:MODEL
@ 9,0 SAY 'INSTRUMENT SERIAL NUMBER' GET M:SERIALNO
@ 10,0 SAY 'CUSTOMER NAME' GET M:CUSTNAM
@ 11,0 SAY 'CUSTOMER LOCATION' GET M:LOCATION
@ 12,0 SAY 'CALIBRATION STAFF MEMBER' GET M:STAFF
@ 13,0 SAY 'DATE PROMISED' GET M:DATEPROM PICTURE '99/99/99'
@ 14,0 SAY 'FORM LETTER INFO' GET M:FORMLET
@ 15,0 SAY 'CLOSING DATE' GET M:DATECLOS PICTURE '99/99/99'
@ 16,0 SAY 'COST EXCLUDING OMS SURCHARGE' GET M:COST PICTURE '#####.##'
@ 17,0 SAY 'CALIBRATION MANHOURS' GET M:MANHOURS PICTURE '#####.##'
READ
APPEND BLANK
REPLACE TEST:NO WITH M:TEST:NO,TYPE WITH !(M:TYPE),MODEL WITH !(M:MODEL)
REPLACE SERIALNO WITH !(M:SERIALNO),STAFF WITH !(M:STAFF)
REPLACE LOCATION WITH !(M:LOCATION),DATESTAR WITH M:DATESTAR
REPLACE FORMLET WITH !(M:FORMLET),DATECLOS WITH M:DATECLOS
REPLACE COST WITH M:COST,MANHOURS WITH M:MANHOURS,DATEPROM WITH M:DATEPROM
REPLACE PO:NO WITH !(M:PO:NO),CUSTNAM WITH !(M:CUSTNAM)
ACCEPT 'WANT TO CONTINUE 'Y' OR 'N'' TO X1
STORE !(X1) TO X
ENDDO
RETURN
DISPLAY B

TODAY'S DATE; 12/15/83:
TEST NUMBER: 
PURCHASE ORDER NUMBER: 
TYPE CHOICES ARE: MAP, WATTHOUR STANDARD, CURRENT TRANSFORMER, CAPACITOR, VOLTAGE TRANSFORMER, DC DIVIDER, AC DIVIDER, XRAY DIVIDER, DC & AC DIVIDER, IMPULSE DIVIDER, VT COMPARATOR, OR CT COMPARATOR: 
INSTRUMENT MODEL: 
INSTRUMENT SERIAL NUMBER: 
CUSTOMER NAME: 
CUSTOMER LOCATION: 
CALIBRATION STAFF MEMBER: 
DATE PROMISED: 0 / / : 
FORM LETTER INFO: 
CLOSING DATE: / / : 
COST EXCLUDING OMS SURCHARGE: 0.00: 
CALIBRATION MANHOURS: 0.00:
LISTING C

AMERCD

STORE 'Y' TO X
DO WHILE X='Y'
ERASE
STORE ' ' TO M:TEST:NO
STORE ' ' TO M:PO:NO
ACCEPT "ENTER TEST NUMBER IF KNOWN OTHERWISE 'RETURN'" TO M:TEST:NO
IF M:TEST:NO=''
   ACCEPT "ENTER PURCHASE ORDER NUMBER IF KNOWN OTHERWISE 'RETURN'" TO M:PO:NO
   RETURN
ELSE
   LOCATE FOR !(M:PO:NO) $ PO:NO
ENDIF
ELSE
   FIND &M:TEST:NO
ENDIF
IF (.NOT. EOF) .AND. (<>0)
   @ 5,0 SAY 'TEST NUMBER' GET TEST:NO
   @ 6,0 SAY 'PURCHASE ORDER NUMBER' GET PO:NO
   @ 7,0 SAY 'TYPE' GET TYPE
   @ 8,0 SAY 'INSTRUMENT MODEL' GET MODEL
   @ 9,0 SAY 'SERIAL NUMBER' GET SERIALNO
   @ 10,0 SAY 'CUSTOMER NAME' GET CUSTNAM
   @ 11,0 SAY 'CUSTOMER LOCATION' GET LOCATION
   @ 12,0 SAY 'JOB START DATE' GET DATESTAR PICTURE '99/99/99'
   @ 13,0 SAY 'DATE PROMISED' GET DATEPROM PICTURE '99/99/99'
   @ 14,0 SAY 'FORM LETTER INFO' GET FORMLET
   @ 15,0 SAY 'STAFF NAME' GET STAFF
   @ 16,0 SAY 'CLOSING DATE' GET DATECLOS PICUTURE '99/99/99'
   @ 17,0 SAY 'COST' GET COST PICTURE '#####.##'
   @ 18,0 SAY 'MANHOURS' GET MANHOURS PICTURE '#####.##'
   @ 19,0
   @ 20,0
   ACCEPT "WANT TO MAKE CHANGES 'Y' OR 'N'" TO Y1
   STORE !(Y1) TO Y
   IF Y='Y'
      READ
   ENDIF
ELSE
   @ 21,0 SAY 'RECORD COULD NOT BE FOUND'
ENDIF
ACCEPT "WANT TO CHANGE OR OBSERVE ANOTHER RECORD 'Y' OR 'N'" TO X1
STORE !(X1) TO X
ENDDO
RETURN
DISPLAY C

ENTER TEST NUMBER IF KNOWN OTHERWISE 'RETURN': 228554

TEST NUMBER: 228554:
PURCHASE ORDER NUMBER: :
TYPE: WATTHOUR STANDARD :
INSTRUMENT MODEL: SCIENTIFIC COLUMBUS SC-60 :
SERIAL NUMBER: :
CUSTOMER NAME: RFL INDUSTRIES :
CUSTOMER LOCATION: BOONTON, NJ 07005 :
JOB START DATE: / / :
DATE PROMISED: 10/01/82:
FORM LETTER INFO: :
STAFF NAME: RAMBOZ :
CLOSING DATE: 10/01/82:
COST: 262.50:
MANHOURS: 0.00:

WANT TO MAKE CHANGES 'Y' OR 'N':
LISTING D

PRINTLIM

REPORT FORM PRINTLIM TO PRINT
RETURN

PRINTLIM.FRM

M=1
N
N
Y
N
7,TEST: NO
20, TYPE
30, CUSTNAM
8, DATECLOS
9, COST
Y
PRINTOUT D

PAGE NO. 00002
12/15/83

229944  CURRENT TRANSFORMER  LOCKHEED GEORGIA COMPANY  05/10/83  645.00
229948  WATTHOUR STANDARD  RFL INDUSTRIES  03/25/83  1016.00
230019  MAP  WEST TEXAS UTILITIES CO  04/15/83  485.00
230025  DC DIVIDER  GENERAL ELECTRIC  03/11/83  530.00
230121A  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY COMPANY  03/25/83  3879.00
230121B  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY COMPANY  03/25/83  0.00
230121C  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY  03/01/83  0.00
230121D  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY  03/01/83  0.00
230121E  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY  03/01/83  0.00
230121F  VOLTAGE TRANSFORMER  MILL-POWER SUPPLY  03/01/83  0.00
230121G  WATTHOUR STANDARD  DALLAS POWER & LIGHT  02/01/83  1250.00
230176  WATTHOUR STANDARD  STATE OF MARYLAND  02/01/83  412.00
230180  WATTHOUR STANDARD  PHILADELPHIA ELECTRIC  02/01/83  781.00
230182  WATTHOUR STANDARD  RFL INDUSTRIES  03/01/83  898.00
230188  WATTHOUR STANDARD  TEXAS POWER & LIGHT  03/01/83  412.00
230193  WATTHOUR STANDARD  CENTRAL POWER & LIGHT  03/01/83  485.00
230198  WATTHOUR STANDARD  UNION ELECTRIC  03/01/83  664.00
230207  DC DIVIDER  SANDIA NATIONAL LABORATORIES  03/01/83  530.00
230219  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  03/01/83  1288.00
230238  MAP  SOUTH CAROLINA ELECTRIC & GAS  03/01/83  641.00
230241  WATTHOUR STANDARD  TRANSDATA  03/01/83  1055.00
230254  WATTHOUR STANDARD  KOREAN STANDARDS RESEARCH INST  03/01/83  508.00
230261  CURRENT TRANSFORMER  RAYTHEON  03/01/83  795.00
230268  WATTHOUR STANDARD  THE UNIV. OF WISCONSIN-MADISON  03/01/83  485.00
230280  CURRENT TRANSFORMER  AVCO SYSTEMS DIVISION  03/01/83  704.00
230285A  WATTHOUR STANDARD  GULF POWER  03/01/83  2090.00
230285B  WATTHOUR STANDARD  GULF POWER  03/01/83  0.00
230285C  WATTHOUR STANDARD  GULF POWER  03/01/83  0.00
230308  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  03/01/83  586.00
230345A  WATTHOUR STANDARD  PUBLIC SERVICE ELECTRIC & GAS  04/01/83  984.00
230345B  WATTHOUR STANDARD  PUBLIC SERVICE ELECTRIC & GAS  04/01/83  0.00
230435  DC DIVIDER  GENERAL ELECTRIC COMPANY  04/01/83  430.00
230455A  VT COMPARATOR  PACIFIC GAS & ELECTRIC  04/01/83  772.00
230455B  VOLTAGE TRANSFORMER  PACIFIC GAS & ELECTRIC  04/01/83  1799.00
230471  VOLTAGE TRANSFORMER  BOEING AEROSPACE COMPANY  04/01/83  851.00
230493A  VOLTAGE TRANSFORMER  GENERAL ELECTRIC COMPANY  04/01/83  1578.00
230493B  CAPACITOR  GENERAL ELECTRIC COMPANY  04/01/83  760.00
230493C  CAPACITOR  GENERAL ELECTRIC COMPANY  04/01/83  0.00
230493D  CAPACITOR  GENERAL ELECTRIC COMPANY  04/01/83  0.00
230497  WATTHOUR STANDARD  HOUSTON LIGHTING & POWER  04/01/83  1343.00
230506  WATTHOUR STANDARD  SCIENTIFIC COLUMBUS  04/01/83  820.00
230523  WATTHOUR STANDARD  VIRGINIA ELECTRIC & POWER  04/01/83  430.00
230530A  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  05/01/83  3925.00
230530B  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  05/01/83  0.00
230530C  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  05/01/83  0.00
230538  WATTHOUR STANDARD  GENERAL ELECTRIC COMPANY  05/01/83  742.00
230584  WATTHOUR STANDARD  CORN BELT POWER CORP.  05/01/83  549.00
230589  WATTHOUR STANDARD  MCDONNELL DOUGLAS ASTRONAUTICS  05/01/83  634.00
230640  XRAY DIVIDER  TECHNICARE CORPORATION  05/01/83  630.00
PRINT ALL

SET FORMAT TO PRINT @ 1,0 SAY CHR(15)
SET FORMAT TO SCREEN
REPORT FORM PRINTALL TO PRINT
SET FORMAT TO PRINT @ 1,0 SAY CHR(18)
SET FORMAT TO SCREEN
RETURN

PRINTALL.FRM

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Y
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11, TYPE
10, SERIALNO
15, MODEL
15, CUSTNAM
15, LOCATION
8, DATESTAR
START
8, DATEPROM
PROMISED
8, DATECLOS
CLOSED
9, COST
Y
8, MANHOURS
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RETURN

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20, TYPE
30, CUSTNAM
8, DATESTAR
START
8, DATEPROM
PROMISED
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DATECLOS=' ') .AND. DATEPROM \neq ' / / ') .AND. ;
DATEPROM \neq 'O / / ') TO PRINT
RETURN

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N
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10,STAFF
20,TYPE
30,CUSTNAM
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SET HEADING TO &M:TYPE
REPORT FORM PRINTDEV FOR !(M:TYPE)=TYPE TO PRINT
SET HEADING TO
ACCEPT "PRINTOUT FOR OTHER DEVICES 'Y' OR 'N'" TO X1
STORE !(X1) TO X
ENDDO
RETURN

PRINTDEV.FRM

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15, CUSTNAM
15, LOCATION
9, COST
Y
8, MANHOURS
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229923 PARK ROCKWELL INTERNATIONAL DOWNEY, CA 430.00 0.00
230025 FLUKE MODEL 80E-10 GENERAL ELECTRIC KING OF PRUSSIA, PA 530.00 0.00
230207 PARK SANDIA NATIONAL LABORATORIES ALBUQUERQUE, NM 530.00 0.00
230435 SINGER MODEL PARK GENERAL ELECTRIC CHAMBLEE, GA 430.00 0.00
230751 HALLMARK WESTINGHOUSE ELECTRIC BALTIMORE, MD 430.00 0.00
230771 HALLMARK MODEL PARK BENDIX CORPORATION SIDNEY, NY 430.00 0.00
230858 HALLMARK GENERAL DYNAMICS FORT WORTH, TX 430.00 0.00
230905 HALLMARK MCDONNELL DOUGLAS ST. LOUIS, MO 840.00 0.00
230929 ROSS MODEL VD240-6.2-J-K-D M ROSS ENGINEERING CAMPBELL, CA 430.00 0.00
230947 HALLMARK RAYTHEON COMPANY ANDOVER, MA 430.00 0.00
G44511 PARK DEPARTMENT OF THE AIR FORCE NEWARK AIR STATION, OH 740.00 0.00
G44568 SIEFERT NATIONAL BUREAU OF STANDARDS WASHINGTON, DC 430.00 0.00
G44660 HALLMARK PVD DEPARTMENT OF THE ARMY FT. MONMOUTH, NJ 07703 430.00 0.00

** TOTAL ** 6940.00 0.00
LISTING I

PRINTCUS

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SET FORMAT TO SCREEN
ACCEPT 'CUSTOMER NAME' TO CUST-
SET HEADING TO &CUST
REPORT FORM PRINTCUS FOR !(CUST) = $(CUSTNAM,1,LEN(CUST)) TO PRINT
SET HEADING TO
SET FORMAT TO PRINT
@ 1,0 SAY CHR(18)
SET FORMAT TO SCREEN
RETURN

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15,MODEL
30,LOCATION
10,STAFF
8,DATEPROM
PROMISED
9,COST
Y
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<td>230510F</td>
<td>Current Transformer</td>
<td>Westlon 127</td>
<td></td>
<td>Compton, CA 90220</td>
<td>RAMBOZ 03/01/83</td>
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**Total:** 937.00
LISTING J

DISPACT

REPORT FORM PRINTACT FOR DATECLOS=" "

? ' '

? ' HIT RETURN FOR MENU'
WAIT TO CHOICE
RETURN
LISTING K

DUP

COPY TO B:CALFY83
RETURN

28
The majority of the calibration customers' concerns are directed not to the technical details of the calibration service but to the timely delivery of that service. It is therefore proper that the calibration services be closely managed. For a Group or Division with a large calibration load, this can be a difficult task. The Applied Electrical Measurements Group of the Electrosystems Division has developed microcomputer-based software to provide considerable assistance to the calibration manager. With this database software, complete information on the status of all the calibration jobs is instantly available.