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TM-G2-SSP
USERS MANUAL



TECMAR, INC. • 23600 Mercantile Road • Cleveland, Ohio 44122 • Phone: (216) 464-7410

17-February-1982

To: TECLAB I - G2 users

Subject: Users Manual Addendum I
Description of Additional Menu Commands

The following additional commands are available from the ADDAll main menu:

IV. ASSOCIATED FUNCTIONS

RC - Repeat command string. The currently entered command string is repeated n times, where n is a number immediately following RC without intervening comma or space.

V. SCALE FUNCTIONS

VS - Scale data in memory array. NP data point are multiplied by factor VA and factor VB is added. For definition of VA and VB see below. After data is scaled with VS it may be displayed (or re-displayed) using the DV command. CL and CH may be used to selectively scale a given channel. Again, CL and CH are defined with respect to SCANBA and SCANBF.

VA - Analog scale factor. Data is multiplied by this number and replaced in the data array when the VS command is used.

VB - Analog offset factor. This factor is added to the data during scaling after the VA multiplicative factor is applied. The VB factor is defined in the same units as the output of the A/D converter. That is, to offset the data by a factor equal to 1/2 the video screen width (or 1/2 the output video range) $VB = 2048$.

19-April-1982

To: TECLAB I - G2 users

Subject: Users Manual Addendum II
Clearification of use of GA (GAIN) Command

The explanation of the use of the GA command in the Users Manual is incomplete. This command is used to set the GAIN of the A/D module. This feature is only available for those boards equipped with either the PGL or PGH option. To set the module gain, use the GA command with the following argument:

ARGUMENT	!	GAIN	
(GA)	!	PGL	PGH
0	!	1	1
1	!	10	2
2	!	100	4
3	!	500	8

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Section 1
Introduction to ADLIB16

Tecmar's ADLIB16 is a function library in the Microsoft (R) relocatable format containing subroutines for A/D, D/A, timing, alarm, video graphics, disk filename entry, and other functions supported by the Teclab I system hardware and other computer systems with Tecmar A/D, D/A and timing hardware. These are the same subroutines as those which perform the similar functions within the ADDALL program. The library is provided so that the user may write programs in Microsoft (R) Fortran-80 or other compatible languages and use these functions. The following documentation describes the procedures that must be used in calling these subroutines.

General Remarks:

1. Argument Transfer - The subroutines contained within ADLIB16.REL have their arguments passed by one of two routes, i.e. via a COMMON block or via a parameter in a CALL statement, depending upon the subroutine. These routes must be followed in the design of user-written programs. The names of subroutines within ADLIB16.REL, and the names of COMMON blocks are reserved, and must not be re-used by the user for other purposes. All of the COMMON blocks and associated type declaration statements used by ADDALL are stored for user convenience in writing programs on the distribution disk in the disk file COMMON.BLK. Note that we have used INTEGER type statements in the definitions of some of the variables. In the construction of programs which use COMMON blocks, it is (of course) important to make sure that the calling program COMMON blocks are the appropriate length.

The documentation describes the function of all of the user-accessible variables and common blocks. Each subroutine is described separately and examples of simple user test programs are given.

2. Linking Programs - When a user-written main program calls a routine from ADLIB16, the user must link the corresponding .REL file in ADLIB16.REL using the Microsoft linking loader L80. A typical linking operation for a program designated USERW would appear as follows:

```
A>L80          (enter L80, L80 responds with * prompt)
*USERW        (enter name of previously compiled .REL
               file)
etc.          (L80 responds with unsatisfied
               references)
```

*ADLIB16/S, FORLIB/S, USERW/N,/E

(Searching ADLIB16 resets the FORLIB
REQUESTflag and the user must enter
FORLIB/S explicitly)

A> (program is now linked and stored under
filename USERW.COM)

3. Internal Functions - When variables and subroutines are designated as having an internal function, their use for other purposes by the user is not supported and their names are reserved.

4. Important Note: Remember to always initialize the real-time clock with subroutine TSET before initiating A/D, D/A and other operations which depend on the real-time clock for timing purposes. The real-time clock must be initialized after each system power-up, but is not affected by system resets. Therefore, a separate program may be run first for the purposes of initiating the real-time clock. The operation of the real-time clock is affected by altering the Master Mode or Comparator Registers of the Counter Mode Registers from Counters (Timers) 1,2 or 3, of the timing chip on the AD-212 motherboard (the AMD 9513 System Timing Controller). Before attempting to make such modifications, the user should be familiar with assembly language programming and the operation of th AMD 9513.

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Section 2 Variables and Common Blocks

A. Common block IX1

INTEGER GBUFFX,GBUFFY,GBUFFT,CHIGH,GX,GY,GT,XA,YA,TA,
1SCANBA,SCANFA,SCANBD,SCANFD,CLOW,SCALE,WTCNT,CYCLE,CHANC,
2PTNUM,PTNUM0,PTNUM1,TRIG,PGAIN,PARM2,VC,CLOW,OX,OY,TL,
3CHANM

COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3
1,I4,I5,CHIGH,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD
2,SCANFD,SCALE,WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG
3,MBIAS,PGAIN,NCH,PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,
4,ITCINX,CHANM

- a. length = 272 bytes
- b. number of variables (counting arrays as one variable) = 43 integer variables
- c. definition of variables (R=reserved for internal functions)

NPTS

Number of Points - An integer variable representing the total number of data points to be collected from all channels during A/D operations (with or without simultaneous video display). During D/A operations this represents the total number of data points stored in memory to be displayed via D/A converters or Microangelo video display. This variable is reset to zero as each A/D or D/A subroutine is completed.

SCANBA

Scan Beginning - An integer variable which is the initial a/d channel in the round-robin series of channels to be sampled.

SCANFA

Scan Finish - Same as SCANBA, except that this defines the last channel in the round-robin series of channels to be sampled. In A/D modes where the auto-sequence mode of the Tecmar AD-212 board is used, the value corresponding to SCANFA must be set on the dipswitch on the AD-212 daughter board. It is usually most convenient to set this switch to the highest channel available in your particular A/D converter/multiplexer option (see under CHANM). SCANBA and SCANFA define the channels used in all A/D and video graphics display routines.

SCANBD,SCANFD

These are defined exactly as for SCANBA and SCANFA,

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except that they apply only to the analog D/A operations which occur when command DA (DAW4.MAC) is used. There is no hardware auto-channel increment feature available on the D/A routines.

CHIGH,CLOW

These are integer variables which define the range of channels to be displayed via Microangelo. When using ADDAll commands DV and AV (Adlib16 functions DAV1 and ADV1) data is displayed or collected from a range of channels defined by SCANBA and SCANFA. The display of channels less than CLOW and greater than CHIGH is suppressed. In other words, when using AV, if SCANBA=0, SCANFA = 3, CLOW = 1 and CHIGH = 2, data aquisition will occur from channels 0-3 and data display will occur on channels 1-2, inclusively.

GBUFFX(32),GBUFFY(32),GBUFFT(32) (R)

These are the character buffers for the X,Y, and title labels.

I1,I2,I3,I4,I5 (R)

I1-I5 are reserved as parameters for Microangelo ROM software calls.

GX,GY,GT,XS,YS

These are the graphics mode bytes (least sig 8 bits of 16-bit integer variable) for the X axis,Y axis and title labels and the X axis and Y axis scales, respectively. These determine the size of the characters and the direction of the print. The direction and size of the characters are not varied, but the white-on-black (normal video) or black-on-white (reverse video) is user selectable via ADDAll. XS and YS are elements of common block IX, but are discussed along with GX,GY and GT.

The graphics mode characters must be defined prior to the use of any routines that involve character output via Microangelo.

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definition	normal video value (default)	reverse video value
GX - X label	0	8
GY - Y label	2	10
GT - Title	4	12
(From common block IX3)		
XS - X scale label	0	8
YS - Y scale label	2	10

XA, YA, TA

These three integer variables set the offsets of the character strings used for labels in the graphics output and are defined as follows:

XA - Determines offset of X-label from bottom of graphics area (0-480) (default=0)

YA - Determines offset of Y-labels from left side of graphics area (12-511) (default=12)

TA - Determines offset of title from bottom of graphics area (0-480) (default=454)

(The values of XA, YA and TA should be initialized by the user to their default values)

SCALE*

An integer variable which determines the frequency source for the counter #5 in the AMD 9513 system timing controller on the AD212 mother board. This counter is used to time all of the D/A and A/D operations. The counter decrements once every scaler interval:

Decimal SCALE Value	Source Frequency
11	1 MHz
12	100 KHz
13	10 KHz
14	1 KHz
15	100 Hz

WTCNT*

An integer variable which is loaded into the AMD 9513 system timing controller chip counter 5 for determining

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the length of the interval between A/D and D/A operations in terms of the number of pulses from the SCALE counts. WTCNT SHOULD BE 2 OR GREATER.

* For simplicity of operation, we encourage the use of subroutine TIMSET, which eliminates the need to separately determine WTCNT and CYCLE and enables the user to specify a single floating-point value corresponding to the desired data collection/display interval in milliseconds.

CYCLE

An integer variable representing the number of D/A cycles-1 with analog (ADDAll function DA, ADLIB16 subroutine DAW4) and video (ADDAll function DV, ADLIB16 subroutine DAV1) D/A operations. If CYCLE = 0 the data file will be displayed once. If CYCLE = 1 the data file will be displayed twice. CYCLE used with function DA enables the use of a standard oscilloscope as a storage oscilloscope.

CHANM

The integer variable CHANM should be set to the same channel as the maximum auto-increment channel dipswitch on the AD-212 daughter board. This represents the maximum auto-increment channel and must be set correctly for use with the auto-increment subroutine ADR6.

CHANC (R)

The channel currently being examined during the execution of A/D and D/A operations.

PTNUM,PTNUM0,PTNUM1 (R)

Indexing variables for use during the execution of video-output routines.

TRIG

An integer variable which enables the trigger mode of operation with A/D operations (ADDAll functions AA and AV, subroutines ADR5, ADR6 and ADV1). TRIG is set prior to calling the A/D routine. If TRIG is = 0 then the trigger mode is disabled, but if TRIG is = 1 the operation of the A/D routine will be suspended until the GATE5 input to the AMD 9513 System Timing Controller rises to a +5 volt level. If the GATE5 input is held low the operation of the routine will be suspended as long as the input is low.

MBIAS

See below under ADR5,ADR6 and ADV1.

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PGAIN

The two low-order bits of this integer variable are loaded into the programmable gain register of programmable gain A/D modules. The following table lists the available programmable gain options and the resulting gains.

PGAIN OPTION ON A/D MODULE	BITS 0,1	GAIN FACTOR
PGL	00	1
	01	10
	10	100
	11	500
PGH	00	1
	01	2
	10	4
	11	8

PRK hardware (resistor) determined

NCH (R)

The number of channels used in the current operation.

PARM2 (R)

VC

When the integer variable VC = 1 graphics character output is enabled. When VC = 0 graphics character display is suppressed and only points are displayed. The graphics character that is being displayed is the ASCII equivalent of the hexadecimal representation of the channel number. For channels greater than 15, the ASCII characters G-Z are used for graphics symbols. When graphics symbol output is being used only every eighth data value is plotted.

OX,OY

An integer variable representing the X and Y coordinates if the graphical axis intersection point. OX may vary between ML and 511 - MR. OY may vary between MB and 479 - MT.

MT,MR,ML,MB

These four integer variables are the top, right, left and bottom margins. These MUST be fixed at values of 42,0,40 and 40, respectively, for proper operation of the scaling routines with ADDAll.

TL

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An integer variable which determines the tic-mark length of the X and Y axes on the Microangelo graphics display.

ITCINX (R)

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B. Common Block IX3

INTEGER XS,YS
COMMON /IX3/XS,YS
a. length = 4 bytes
b. number of variables = 2 integer variables
c. list of variables

XS,YS

See above under GX,GY and GT.

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C. Common Block IX4 - variables which are used in the setting up of the video display X and Y axes.

COMMON /IX4/XM,XZ,YM,YZ,QX,QY,CINX,CINY

- a. length - 32 bytes
- b. number of variables - 8 real variables
- c. list of variables

XZ

The value of the X axis scale at the origin of the video display (the intersection of the X and Y axes).

XM

The value of the X axis scale at its maximum point (the point where the X-axis reaches the right-hand margin of the video display).

YZ

The value of the Y axis scale at the origin (the intersection of the X and Y axes).

YM

The value of the Y axis scale at its maximum point (the point where the Y-axis reaches the top margin of the video display).

QX,QY

The intervals along the X and Y axes, defined in terms of the respective axis scales, where scale values are to be printed.

CINX,CINY (R)

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D. Common Block IX5

COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY

- a. length = 60 bytes
- b. number of variables (counting arrays as one variable) = 4 integer + 1 real variables
- c. list of variables

IMONTH(12)

An integer array that must be initialized with the number of days of each month, i.e., via the following data statement:

DATA IMONTH/31,28,31,30,31,30,31,31,30,31,30,31/

in the calling program. IMONTH is not initialized by the subroutine.

ITIME(6) (R)

XITIME(6) (R)

KALARM

An integer variable set to 1 if the alarm is set. This variable should be initialized to 0. This variable is reset to 0 after the alarm has gone off and when the control returns to the calling program from function ALWT (see section 3).

KY

An integer variable which is used to hold the last two digits of the year, i.e. 65 for the year 1965.

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Section 3 Timing and Disk File I/O Routines

In the following sections each user-accessible function within ADLIB16 is defined and an example of a calling program given. In some cases the subroutines within ADLIB16 call other subroutines within ADLIB16 and may call subroutines within FORLIB.

A. Subroutine TSET - set time of day.

The operation of the AMD 9513 system timing controller chip on the AD-212 motherboard are reset by this routine and the master and real-time clock mode registers are initialized. The computer system reset does not affect the operation of the 9513 system timing controller.

- a. Common blocks required
(1) IX5
- b. Parameters required in calling statement
(1) None
- c. Variables that must be defined prior to calling
(1) IMONTH must be initialized in the calling program.
- d. Variables modified by execution
(1) IMONTH, ITIME, XITIME, KY
- e. Sample calling program - see under TREAD
- f. Source provided for user modification of output format.

```
C
C   COPYRIGHT 1981 TECMAR INCORPORATED BY JD WEISSMAN
      SUBROUTINE TSET
      COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
C   FIRST INITIALIZE CLOCK AND ENABLE TIMERS WITH TOD32
1498   FORMAT(1H0,' HIT CARRIAGE RETURN ')
1497   FORMAT(1X,I4)
      WRITE(3,1500)
1500   FORMAT(1H1,///,
      8'   INITIALIZE THE REAL-TIME CLOCK',///,
      9'   ENTER THE MONTH, DAY AND YEAR AS INTEGER VALUES',/,
      1'   SEPARATED BY COMMAS',///,
      1'   FOR EXAMPLE: APRIL 7, 1981 WOULD BE ENTERED AS',/,
      2'   T>4,7,81(CR)',/, ' T>')
      READ(3,1495)KM,KD,KY
1495   FORMAT(3I3)
C   CHECK FOR LEAP YEAR
      KY0 = MOD(KY,4)
      IF( KY0 .EQ. 0) IMONTH(2) = IMONTH(2) + 1
      KD0 = 0
      I=0
C   CALCULATE DAY NUMBER FROM MONTH AND DATE
```

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```
1494 I=I+1
      KDO=KDO + IMONTH(I)
      IF(I .LT. KM) GO TO 1494
      KDO=KDO - IMONTH(I)
      KDO = KDO + KD
      WRITE(3,1493)
1493 FORMAT(1H1,/,/,
      8' ENTER THE HOURS, MINUTES, AND SECONDS AS',/,/,
      9' INTEGER VALUES SEPARATED BY COMMAS',/,/,
      1' FOR EXAMPLE: 13 HOURS, 45 MINS AND 19 SECONDS',/,/,
      3' WOULD BE ENTERED AS: T>13,45,19(CR)',/,/, ' T>')
      READ (3,1495)(ITIME(I),I=3,5)
C TO SET TIME WITH TOD32 THE ARRAY TOD32 MUST BEDEFINED
C AS FOLLOWS:
C ITIME(1) = 100'S OF DAYS, ITIME(2) = DAYS, ITIME(3)= HRS
C ON 24 HOUR CLOCK, ITIME(4) = MINUTES, ITIME(5) = SECONDS
C ITIME(5) = 1/100TH SECONDS
      ITIME(1) = KDO/100
      ITIME(2) = MOD(KDO,100)
      ITIME(6) = 0
      CALL TOD32(ITIME(1))
      RETURN
      END
```

g. TOD32 is an assembly-language routine in ADLIB16.

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- B. Subroutine TREAD - read time of day on 24 hour clock and date month and year.
- a. Common blocks required
(1) IX5
 - b. Parameters required in calling statement
(1) None
 - c. Variables that must be defined in calling program
(1) IMONTH must be initialized in the calling program.
 - d. Variables modified by execution
(1) ITIME, XITIME
 - e. Sample calling program

```
PROGRAM CTREAD
COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
DATA IMONTH/31,28,31,30,31,30,31,31,30,31,30,31/
CALL TSET  J F M A M J J A S O N D
PAUSE
100 CALL TREAD
PAUSE
GO TO 100
END
```

- f. Source provided for user modification of output format.

```
C
C COPYRIGHT 1981 TECMAR INC BY JD WEISSMAN
SUBROUTINE TREAD
COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
C READ TIME IF DESIRED AND OUTPUT TO CONSOLE
CALL TOD42(ITIME(1))
C ITIME(1) = 100'S OF DAYS, ITIME(2) = DAYS, ITIME(3) = HRS
C ON 24 HOUR CLOCK, ITIME(4) = MINUTES, ITIME(5) = SECONDS
C ITIME(5) = 1/100TH SECONDS
KD0 = 100*ITIME(1) + ITIME(2)
KM = 0
12001 KM = KM+1
KD0 = KD0 - IMONTH(KM)
IF(KD0 .GT. 0) GO TO 12001
KD = KD0 + IMONTH(KM)
XIT = FLOAT(ITIME(5)) + FLOAT(ITIME(6))/100.
WRITE(3,1202) KM,KD,KY,ITIME(3),ITIME(4),XIT
1202 FORMAT(' ----- DATE AND TIME -----',/,
16X,I2,'/',I2,'/',I2,' - ',I2,':',I2,':',F5.2,/, ' T>')
RETURN
END
```

- g. TOD42 is an assembly language routine in ADLIB16.

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- C. Subroutine SETAL - set 24 hour alarm
 - a. Common block required
 - (1) IX5
 - b. Parameters required in calling statement.
 - (1) None
 - c. Variables that must be defined in calling program
 - (1) If the software that the user is writing will make use of the ALSET and ALWT functions, the alarm enable flag variable should be initialized to zero prior to using ALSET.
 - d. Variables modified by execution
 - (1) ITIME,XITIME
 - (2) KALARM is set to 1 during the execution of ALSET.
 - e. Sample calling program - see under ALWT
 - f. Source provided for user modification of output format.

```
C
C   COPYRIGHT 1981 TECMAR INC BY JD WEISSMAN
      SUBROUTINE SETAL
      COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
      WRITE(3,1504)
1504  FORMAT(1H0,'  ENTER TIME FOR ALARM',/,
1'    AS INTEGER VALUES',/, '  FOR EXAMPLE, AN ALARM AT',/,
2'    13 HOURS, 45 MINS AND 19.89 SECONDS'
3'    WOULD BE ENTERED AS:  T>13,45,19,89',/, ' T>')
      READ(3,1505)(ITIME(I),I=1,4)
1505  FORMAT(4I3)
C ITIME(1) = HRS ON 24 HOUR CLOCK,ITIME(2) = MINUTES,
C ITIME(3)= SECONDS, ITIME(4) = 1/100TH SECONDS
      CALL SALARM(ITIME(1))
      KALARM = 1
      RETURN
      END
```

g. SALARM is an assembly language routine in ADLIB16.

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- D. Subroutine ALWT - wait for alarm to go off
- a. Common blocks required
 - (1) None
 - b. Parameters required in the calling statement
 - (1) None
 - c. Variables that must be defined in the calling program
 - (1) KALARM should be set to 1 before calling ALWT. This is done automatically by ALSET.
 - (2) Alarm function must be enabled on AD212 by calling ALSET.
 - d. Variables modified by execution
 - (1) KALARM is reset to 0
 - e. Sample calling program

```
PROGRAM CALWT
COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
DATA IMONTH/31,28,31,30,31,30,31,31,30,31,30,31/
CALL TSET
PAUSE
CALL TREAD
CALL SETAL
CALL ALWT
GO TO 100
END
```

100

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E. Subroutine TIMSET - set SCALE and WTCNT with one floating-point value representing the number of milliseconds per time interval

- a. Common blocks required
 - (1) IX5
- b. Parameters required in the calling statement
 - (1) WTIME, A floating point value (REAL Fortran variable) representing the number of milliseconds per time interval.
- c. Variables that must be defined in the calling program
 - (1) None
- d. Variables modified by execution
 - (1) WTCNT, SCALE
- e. Sample calling program

```
PROGRAM CWTIME
COMMON /IX5/IMONTH(12),ITIME(6),KITIME(6),KALARM,KY

WTIME = 1.25
CALL TIMSET(WTIME)
STOP
END
```

- f. This program sets the AMD9513 timer on the AD-212 motherboard to give 1.25 millisecond timing intervals.

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- F. Subroutine CRFL(N) - open a disk file with LFN = N on a specified disk drive with specified filename and filetype.
- a. Common blocks required
(1) None
 - b. Parameters required in the calling statement
(1) N, the desired LFN (5-9, or as allowed by your modification of Microsoft Fortran)
 - c. Variables that must be defined in the calling program
(1) None
 - d. Variables modified by execution
(1) None
 - e. Sample calling program

```
PROGRAM CCRFL  
CALL CRFL(6)  
END
```

This results in the creation of a file with LFN = 6. The subroutine then requests the operator to enter a filename in standard CPM format: D:NNNNNNNN.TTT, where D defines the disk drive (A-D, default = currently selected drive), where N is the filename and T is the filetype (optional).

Section 4
Video Graphics Subroutines

In the following sections each user-accessible function within ADLIB16 is defined and an example of a calling program given. In some cases the subroutines within ADLIB16 call other subroutines within ADLIB16 and may call subroutines within FORLIB.

A. Subroutine DAXIS - Draw X and Y axis

The X and Y axes are drawn with the origin at OX,OY and extending to the limits defined by MT,MB,MR and ML.

- a. Common blocks required
 - (1) IX1
 - (2) IX3
- b. Parameters required in the calling statement
 - (1) None
- c. Variables that must be defined in the calling program
 - (1) OX,OY,ML,MB,MR,MT,TL - integer
 - (2) XM,XZ,YM,YZ,QX,QY - real
- d. Variables modified by execution
 - (1) I1,I2,I3,I4
 - (2) Variables under c are not modified
- e. Sample calling program

PROGRAM CDAXIS

```
INTEGER OX,OY,MT,MR,ML,MB,TL,DR,VID
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,PARM1,PARM2,PARM3,
2 PARM4,CHANM
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,I6
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,PARM1,
3 PARM2,PARM3,PARM4,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
```

C DEFINE AXIS PARAMETERS

```
OX = 40
OY = 40
MT = 42
MB = 40
MR = 0
ML = 40
TL = 5
```

C DEFINE SCALE PARAMETERS

```
XM = 470.
XZ = 0.
YM = 15.
YZ = 0.
QX = 50.
QY = 5.
```


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```
CALL DAXIS  
END
```

This program draws a set of axes intersecting at (40,40) in Microangelo coordinates. Tic marks are drawn to match the scale values of routine DSCALE (see below).

B. Subroutine DSCALE - Draw X and Y axis scales

The placement of tic-marks and scale number labels are determined by the values of the scale label variables: XM,XZ,YM,YZ,QX,QY. These are real variables that are defined with arbitrary units for the X and Y axes. The values of the scales of the axes at the origin (the intersection of the axes) are determined by XZ and YZ. The values of the scales at the maximum positive positions are determined by XM and YM. The scale number label interval is given by QX and QY. Tic marks are placed every QX or QY interval along the positive and negative X and Y axes, respectively, until the maximum scale value less than or equal to XM or YM. If I5 = 0 the display of the maximum scale number labels is suppressed. This is advisable in most instances.

- a. Common blocks required
 - (1) IX1
 - (2) IX3
- b. Parameters required in the calling statement
 - (1) None
- c. Variables that must be defined in the calling program
 - (1) XO,YO,MT,MB,MR,ML,TL,I5 - integer
 - (2) XM,XZ,YM,YZ,QX,QY - real
- d. Variables modified by execution
 - (1) I1,I2,I3,I4
 - (2) variables under c are not modified
- e. Sample calling program

```

PROGRAM CDSC
INTEGER OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,PARM1,PARM2,PARM3,
2 PARM4,CHANM
DIMENSION GBUFF(20)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,I6
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,PARM1,
3 PARM2,PARM3,PARM4,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
4 /IX3/XS,YS/IX4/XM,XZ,YM,YZ,QX,QY,CINX,CINY
C DEFINE AXIS PARAMETERS
   OX = 40
   OY = 40
   MT = 42
   MB = 40
   MR = 0
   ML = 40
   TL = 5
   I5 = 0
C DEFINE SCALE PARAMETERS

```

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```
XM = 470.  
XZ = 0.  
YM = 15.  
YZ = 0.  
QX = 50.  
QY = 5.
```

```
CALL DSCALE  
END
```

This program provides the axes drawn by the previous program with numerical labels. The X axis has a zero value of 0. and a maximum value of 470. with tic marks and numerical labels every 50. units. The Y axis has a zero value of 0. and a maximum value of 15. with tic marks and numerical labels every 5. units. The Microangelo output resulting from the above two demonstration programs should be as follows:

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C. Subroutine CXENT - enter X axisdescriptive label.

- a. Common blocks required
 - (1) IXL
- b. Parameters required in the calling statement
 - (1) None
- c. Variables that must be defined in the calling program
 - (1) None
- d. Variables modified by execution
 - (1) GBUFFX is filled with the appropriate ASCII characters (up to 60)
- e. Sample calling program

```
PROGRAM CCXENT  
CALL CXENT  
END
```

f. CXENT is contained within assembly language routine PLOT1

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D. Subroutine CYENT - enter Y axis descriptive label.

- a. Common blocks required
(1) IX1
- b. Parameters required in the calling statement
(1) None
- c. Variables that must be defined in the calling program
(1) None
- d. Variables modified by execution
(1) GBUFFY is filled with the appropriate ASCII characters (up to 60)
- e. Sample calling program

```
PROGRAM CCYENT  
CALL CYENT  
END
```

f. CYENT is contained within assembly language routine PLOT1.

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- E. Subroutine CTENT - enter title of graph. This is displayed in double-size characters.
- a. Common blocks required
 - (1) IX1
 - b. Parameters required in the calling statement
 - (1) None
 - c. Variables that must be defined in the calling program
 - (1) None
 - d. Variables modified by execution
 - (1) GBUFFT is filled with the appropriate ASCII characters (up to 60)
 - e. Sample calling program

```
PROGRAM CCTENT  
CALL CTENT  
END
```

- f. CTENT is contained within assembly language routine PLOT1

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F. Subroutine DMPSCR - print Microangelo contents on IDS 460 printer.

- a. Common blocks required
(1) None
- b. Parameters required in the calling statement
(1) None
- c. Variables that must be defined in the calling program
(1) None
- d. Variables modified by execution
(1) None
- e. Sample calling program

```
PROGRAM CDUMP  
CALL DMPSCR  
END
```

- f. Printer mode settings

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- G. Subroutine CXCOM - draw X-axis label on Microangelo display
- a. Common blocks required
(1) IX1
 - b. Parameters required in the calling statement
(1) None
 - c. Variables that must be defined in the calling program
(1) GBUFFX contains title as entered by CXENT
(2) OX,OY,MT,MB,ML,MR,TL must be defined.
 - d. Variables modified by execution
(1) None
 - e. Sample calling program

```
PROGRAM CCXCOM
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION FN(20),ARGN(20),IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
C DEFINE AXIS PARAMETERS
  OX = 40
  OY = 40
  MT = 42
  MB = 40
  MR = 0
  ML = 40
  TL = 5
  I5 = 0

  CALL CXENT
  CALL CXCOM

STOP
END
```

f. CXCOM is contained within assembly language routine PLOT1

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H. Subroutine CYCOM - draw Y-axis label on Microangelo screen

- a. Common blocks required
 - (1) IX1
- b. Parameters required in the calling statement
 - (1) None
- c. Variables that must be defined in the calling program
 - (1) GBUFFY contains title as entered by CYENT
 - (2) OX,OY,MT,MB,ML,MR,TL must be defined
- d. Variables modified by execution
 - (1) None
- e. Sample calling program

```
PROGRAM CCYCOM
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION FN(20),ARGN(20),IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
C DEFINE AXIS PARAMETERS
   OX = 40
   OY = 40
   MT = 42
   MB = 40
   MR = 0
   ML = 40
   TL = 5
   I5 = 0

   CALL CYENT
   CALL CYCOM

STOP
END
```

f. CYCOM is contained within assembly language routine PLOT1

INTERFACE MANUAL FOR ADLIB16

- I. Subroutine CTITL - draw title on Microangelo screen.
 - a. Common blocks required
 - (1) IX1
 - b. Parameters required in the calling statement
 - (1) None
 - c. Variables that must be defined in the calling program
 - (1) GBUFFT contains title as entered by CTENT
 - (2) OX,OY,MT,MB,ML,MR,TL must be defined.
 - d. Variables modified by execution
 - (1) None
 - e. Sample calling program

```
PROGRAM CCTCOM
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION FN(20),ARGN(20),IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
C DEFINE AXIS PARAMETERS
  OX = 40
  OY = 40
  MT = 42
  MB = 40
  MR = 0
  ML = 40
  TL = 5
  I5 = 0

  CALL CTENT
  CALL CTCOM

  STOP
  END
```

- f. CTCOM is contained within assembly language routine PLOT1

INTERFACE MANUAL FOR ADLIB16

- J. Subroutine CLSC - clear Microangelo output screen.
 - a. Common blocks required
 - (1) None
 - b. Parameters required in the calling statement
 - (1) None
 - c. Variables that must be defined in the calling program
 - (1) None
 - d. Variables modified by execution
 - (1) None
 - e. Sample calling program

```
PROGRAM CCLSC  
CALL CLSC  
STOP  
END
```

- f. CLSC is contained within assembly language routine PLOT1.

Section 5
A/D and D/A Subroutines

In the following sections each user-accessible function within ADLIB16 is defined and an example of a calling program given. In some cases the subroutines within ADLIB16 call other subroutines within ADLIB16 and may call subroutines within FORLIB.

- A. Subroutine ADR5 - collect and store analog data using non- auto-sequence mode.
- a. Common blocks required
 - (1) IX1
 - b. Parameters required in the calling statement
 - (1) Integer Array Name, MBIAS
Data collection begins at the MBIASth elements of the array.
 - c. Variables that must be defined in the calling program.
 - (1) NPTS, SCANBA, SCANFA, PGAIN, SCALE, WTCNT, TRIG.
 - (2) If TRIG = 1 data collection is suspended until the AMD 9513 GATE5 input is high. Data collection continues as long as the GATE5 input remains high.
 - (3) The AD-212 real-time clock must be set by calling TSET after system power-up and prior to calling ADR5. TSET need only be called once after power-up or may be called if the operator wishes to change the setting on the real-time clock.
 - d. Variables modified by execution
 - (1) Integer array is filled with NPTS of data beginning at array element number MBIAS.
 - (2) NPTS is set to zero when control reverts to the calling program. Therefore the value of NPTS must be reset with each execution of ADR5.
 - e. Sample calling program

```
PROGRAM CADR5
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
```

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```
2  WTCNT, CYCLE, CHANC, PTNUM, PTNUM0, PTNUM1, TRIG, MBIAS, PGAIN, NCH,  
3  PARM2, VC, CLOW, OX, OY, MT, MR, ML, MB, TL, ITCINX, CHANM  
COMMON /IX5/IMONTH(12), ITIME(6), XITIME(6), KALARM, KY  
C  DEFINE DATA COLLECTION PARAMETERS  
  
C  NPTS IS AN INTEGER VARIABLE REPRESENTING THE NUMBER OF  
C  DATA POINTS TO BE COLLECTED  
C  
C          CALL TSET  
999      NPTS = 10000  
C  
C  SCANBA AND SCANFA DETERMINE THE ROUND - ROBIN SEQUENCE IN  
C  WHICH THE A/D CHANNELS ARE SAMPLED BY ADR5.  IF SCANBA =  
C  SCANFA = N, THEN ONLY CHANNEL N IS SAMPLED.  
C  SIMILARLY, SCANBD AND SCANFD DETERMINE THE SEQUENCE OF  
C  CHANNELS FOR D/A OPERATION.  
C  
C  
C          SCANBA = 0  
C          SCANFA = 0  
C          SCANBD = 0  
C          SCANFD = 0  
C          WTCNT = 300  
C          CYCLE = 100  
C          SCALE = 11  
C          MBIAS = 0  
C          TRIG = 0  
C          PGAIN = 0  
C  COLLECT DATA ON A/D CHANNEL 0  
C          CALL ADR5(IA(1), MBIAS)  
C          PAUSE  
C          NPTS = 10000  
C  DISPLAY DATA ON D/A CHANNEL 0 - DO THIS 100 TIMES  
C          CALL DAW4(IA(1), MBIAS)  
C          GO TO 999  
C          END
```

f. For further information about the definition of variables, reread the earlier section on variables.

g. The above routine will collect NPTS of data from channel 0. If SCANFA is = 3 then the above routine will collect NPTS of data from channels 0,1,2 and 3 in round-robin fashion: 0,1,2,3,0,1,2,3...

h. Important note: Read documentation about subroutines TIMSET and TSET

- B. Subroutine ADR6- collect and store data using auto-sequence mode.

Auto-sequence mode increases the speed of operation by deferring time-

- a. Common blocks required
 - (1) IX1
- b. Parameters required in the calling statement
 - (1) Integer Array Name, MBIAS
Datacollection and storage begins at the MBIASth elements of the array.
- c. Variables that must be defined in the calling program.
 - (1) NPTS, SCANBA, SCANFA, PGAIN, SCALE, WTCNT, TRIG.
 - (2) In contrast to the other data collection routines, ADR5 and ADV1; ADR6 uses the hardware-implemented automatic channel increment. This feature resets the A/D channel multiplexer to SCANBA after the channel entered on AD212 daughter board dipswitch SW1 is reached
 - (3) SCANBF should always be set to the channel entered on SW1D for the proper operation of ADR6.
 - (4) The variable CHANM is part of common block IX1 and by convention is used to hold the setting on SW1D so that the calling program may determine whether the auto-sequence mode may be used. Recapitulating, the auto-sequence mode (ADR6) can be used only if SCANBF is equal to the setting on SW1D. If SCANBF is not equal to the setting on SW1D, then the non-auto-sequence mode (ADR5) must be used.
 - (5) If TRIG = 1 data collection is suspended until the AMD 9513 GATE5 input is high. Data collection continues as long as the GATE5 input remains high.
 - (6) The AD-212 real-time clock must be set by calling TSET after system power-up and prior to calling ADR6. TSET need only be called once after power-up or may be called if the operator wishes to change the setting on the real-time clock.
- d. Variables modified by execution
 - (1) Integer array is filled with NPTS of data beginning at array element number MBIAS
 - (2) NPTS is reset to zero.
- e. Sample calling program

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```
PROGRAM CADR6
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
C DEFINE DATA COLLECTION PARAMETERS

C NPTS IS AN INTEGER VARIABLE REPRESENTING THE NUMBER OF
C DATA POINTS TO BE COLLECTED
C
C INITIALIZE THE REAL-TIME CLOCK
CALL TSET
999 NPTS = 10000
C
C SCANBA DETERMINES THE ROUND - ROBIN SEQUENCE IN
C WHICH THE A/D CHANNELS ARE SAMPLED BY ADR6. THE VALUE
C CORRESPONDING TO SCANBF IN ADR5 IS SET ON THE AD-212
C CAUGHTER BOARD DIPSWITCH. IF THE DIPSWITCH IS SET TO N AND
C SCANBA = SCANFA = N, THEN ONLY CHANNEL N IS SAMPLED.
C SIMILARLY,SCANBD AND SCANFD DETERMINE THE SEQUENCE OF
C CHANNELS FOR D/A OPERATION.
C
SCANBA = 13
SCANFA = 15
SCANBD = 0
SCANFD = 2
CHANM = 15
WTCNT = 300
CYCLE = 100
SCALE = 11
MBIAS = 0
TRIG = 0
PGAIN = 0
C COLLECT DATA FROM CHANNELS 13-15
CALL ADR6(IA(1),MBIAS)
PAUSE
NPTS = 10000
C DISPLAY DATA ON D/A CHANNELS 0-2 - DO THIS 100 TIMES
CALL DAW4(IA(1),MBIAS)
GO TO 999
END
```

f. For further information about the definition of variables, reread the earlier section on variables.

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data from channels 13,14, and 15 in round-robin fashion: 13,14,15,13,14,15...

h. Important note: Read documentation about subroutines TIMSET and TSET

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- C. Subroutine ADV1 - collect and store data with simultaneous video data display. Non-auto-sequence.
- a. Common blocks required
 - (1) IX1
 - b. Parameters required in the calling statement
 - (1) Integer Array Name, MBIAS
Data collection begins at the MBIASth element of the array.
 - c. Variables that must be defined in the calling program.
 - (1) NPTS, SCANBA, SCANFA, PGAIN, SCALE, WTCNT, TRIG, VC, CHIGH, CLOW.
 - (2) If TRIG = 1 data collection is suspended until the AMD 9513 GATE5 input is high. Data collection continues as long as the GATE5 input remains high
 - (3) Simultaneous video display of data may be selectively suppressed by the use of CHIGH and CLOW. Channels less than CLOW and greater than CHIGH are not output to Microangelo.
 - (4) When VC=1 the video display occurs in ASCII character mode, as described in Section II,A,1 under "VC".
 - (5) The AD-212 real-time clock must be set by calling TSET after system power-up and prior to calling ADV1. TSET need only be called once after power-up or may be called if the operator wishes to change the setting on the real-time clock.
 - d. Variables modified by execution
 - (1) Integer array is filled with NPTS of data beginning at array element number MBIAS.
 - (2) NPTS is set to zero
 - e. Sample calling program

```
PROGRAM CADV1
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
COMMON /IX5/IMONTH(12),ITIME(6),XITIME(6),KALARM,KY
```

C DEFINE DATA COLLECTION PARAMETERS

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```
C NPTS IS AN INTEGER VARIABLE REPRESENTING THE NUMBER OF
C DATA POINTS TO BE COLLECTED
C
      CALL TSET
999   NPTS = 10000
C
C SCANBA AND SCANFA DETERMINE THE ROUND - ROBIN SEQUENCE IN
C WHICH THE A/D CHANNELS ARE SAMPLED BY ADV1. IF SCANBA =
C SCANFA = N, THEN ONLY CHANNEL N IS SAMPLED.
C SIMILARLY,SCANBD AND SCANFD DETERMINE THE SEQUENCE OF
C CHANNELS FOR D/A OPERATION.
C
C
      SCANBA = 0
      SCANFA = 3
      SCANBD = 0
      SCANFD = 3
      WTCNT = 300
      CYCLE = 100
      SCALE = 12
      MBIAS = 0
      TRIG = 0
      PGAIN = 0
C COLLECT DATA FROM A/D CHANNELS 0-3 AND DISPLAY ON VIDEO
C CHANNELS 0-3
      CALL ADV1(IA(1),MBIAS)
      PAUSE
      NPTS = 1000
C DISPLAY DATA ON D/A CHANNELS 0-3 - DO THIS 100 TIMES
      CALL DAW4(IA(1),MBIAS)
      GO TO 999
      END
```

f. For further information about the definition of variables, reread the pertinent sections.

g. The above routine will collect NPTS of data from channels 0, 1, 2 and 3 in round-robin fashion: 0,1,2,3,0,1,2,3...

h. Important note: Read documentation about subroutines TIMSET and TSET

D. Subroutine DAW4 - Display data via digital-to-analog outputs with CYCLE feature so that, for instance, the function of a storage oscilloscope may be emulated with an ordinary non-storage instrument.

- a. Common blocks required
 - (1) IX1
- b. Parameters required in the calling statement
 - (1) Integer Array Name, MBIAS
Data display begins at the MBIASth elements of the array.
- c. Variables that must be defined in the calling program
 - (1) NPTS, SCANBD, SCANFD, PGAIN, SCALE, WTCNT, CYCLE
- d. Variables modified by execution
 - (1) None
- e. Sample calling program - SEE EXAMPLE PROGRAMS ADR5, ADR6 AND DAW4.
- f. For further information about the definition of variables, reread the pertinent sections.
- g. The above routine will collect NPTS of data from A/D channels 0, 1, 2 and 3 in round-robin fashion: 0,1,2,3,0,1,2,3...
Next, the data will be displayed in round-robin fashion on D/A channels 0,1,2 and 3 for 1000 cycles of the 1000 point data set.
- h. Important note: Read documentation about subroutines TIMSET and TSET

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- E. Subroutine DAV1 - Display data via video output with CYCLE feature.
- a. Common blocks required
 - (1) IX1
 - b. Parameters required in the calling statement
 - (1) Integer Array Name, MBIAS
Data display begins at the MBIASth elements of the array.
 - c. Variables that must be defined in the calling program
 - (1) NPTS, SCANBD, SCANFD, PGAIN, SCALE, WTCNT, CYCLE, CHIGH, CLOW, VC
 - (2) Simultaneous video display of data may be selectively suppressed by the use of CHIGH and CLOW. Channels less than CLOW and greater than CHIGH are not output to Microangelo.
 - (3) When VC=1 the video display occurs in ASCII character mode, as described in Section II,A,1 under "VC".
 - d. Variables modified by execution
 - (1) None
 - e. Sample calling program

```
PROGRAM CDV1
INTEGER FN,OX,OY,MT,MR,ML,MB,TL,DR,GBUFF,VID,FNJ
INTEGER CLOW,CHIGH
INTEGER GX,GY,GT,XA,YA,TA,GBUFFX,GBUFFY,GBUFFT,XS,YS,XY
INTEGER SCANBA,SCANFA,WTCNT,CYCLE,SCALE,TX,CHANC,PTNUM,
1 PTNUM0,PTNUM1,TRIG,SCANBD,SCANFD,PGAIN,GAIN,NCH,PARM2,VC,
2 PARM4,HX,HY,CHAN0,CHANM
DIMENSION IA(14000)
COMMON /IX1/GBUFFX(32),GBUFFY(32),GBUFFT(32),I1,I2,I3,I4,I5,
1 CHIGH
1 ,GX,GY,GT,XA,YA,TA,NPTS,SCANBA,SCANFA,SCANBD,SCANFD,SCALE,
2 WTCNT,CYCLE,CHANC,PTNUM,PTNUM0,PTNUM1,TRIG,MBIAS,PGAIN,NCH,
3 PARM2,VC,CLOW,OX,OY,MT,MR,ML,MB,TL,ITCINX,CHANM
```

C DEFINE DATA COLLECTION PARAMETERS

C NPTS IS AN INTEGER VARIABLE REPRESENTING THE NUMBER OF
C DATA POINTS TO BE COLLECTED

C

NPTS = 1000

C

C SCANBA AND SCANBF DETERMINE THE ROUND - ROBIN SEQUENCE IN
C WHICH THE A/D CHANNELS ARE SAMPLED BY ADR5. IF SCANBA =
C SCANFA = N, THEN ONLY CHANNEL N IS SAMPLED

C

SCANBA = 0

SCANBF = 3

WTCNT = 100

INTERFACE MANUAL FOR ADLIB16

CYCLE = 12
MBIAS = 0
TRIG = 0

C FIRST COLLECT DATA

CALL ADR5(IA,MBIAS)

C THEN DISPLAY IT 1000 TIMES ON D/A CHANNEL 0-3

CYCLE = 1000
SCANBD = 0
SCANFD = 3
CHIGH = 0
CLOW = 0
VC = 0

CALL DAV1(IA,MBIAS)

STOP
END

f. For further information about the definition of variables, reread the earlier section on variables.

g. The above routine will collect NPTS of data from A/D channels 0, 1, 2 and 3 in round-robin fashion: 0,1,2,3,0,1,2,3... Next, the data will be displayed in round-robin fashion on the Microangelo video-output screen for 1000 cycles of the 1000 point data set. The channels are displayed in a superimposed fashion.

h. Important note: Read documentation about subroutines TIMSET and TSET

Interfacing to ADDAll data files - PRELIMINARY

Data files are created by using the ADDAll "SD" command these files contain a number of points, defined by "NP", of the data array from a starting point MBIAS (default=0) data points from the beginning of the data array.

The data files contain the contents of the data array in "unformatted" format. This is used for the most efficient use of disk space and for increased speed of operation. The user should consult the Microsoft Fortran referrence manual for details on the operation of unformatted read and write operations. The structure of the data files is as follows:

Record 1 - contains 4 integer values representing the number the number of data points, the number of channels used in the data collection and the initial and final channels for data collection.

Records 2 thru n - contain 64 integer data values with zero padding in the last record if the number of data points is not an exact multiple of 64.

The following Fortran code will read the contents of an opened ADDAll data file.

```
      SUBROUTINE GETDAT
C     COPYRIGHT (R) 1981TECMAR INC. BY J. D. WEISSMAN
C     A PROGRAM FOR ACCESSING DATA FILES FROM ADDAll
C     7/10/81 - VERSION 002
C
      INTEGER FN,CLOW,CHIGH,SCANBA,SCANFA,IX
      DIMENSION FN(20),ARGN(20)
      COMMON /TECM/NPTS,NCH,SCANBA,SCANFA,IA(14000)
      WRITE(3,1)
1     FORMAT( READ UNFORMATTED DATA FROM DISK FILE,/)
C     LOAD DATA
C     THE FOLLOWING LINES INPUT A FILENAME, OPEN A DISK FILE,
C     AND LOAD DATA INTO IA
      CALL CRFL(8)
C     CRFL IS AND ADLIB15 FUNCTION THAT OPENS A DISK FILE WITH
C     LFN=N (8 IN THIS EXAMPLE).
      READ(8)NPTS,NCH,SCANBA,SCANFA
      WRITE(3,8921) NPTS, NCH,SCANBA,SCANFA
8921  FORMAT(1H0,I5, POINTS ,I5, CHANNELS  SCANBA= ,I3,
1     SCANFA= ,I3,/)
      DO 997 J0=1,NPTS,64
      J1 = J0 + 63
      READ(8)(IA(J2),J2=J0,J1)
997  CONTINUE
      ENDFILE 8
      RETURN
      END
```

GETDAT may be called from user-written Fortran programs or this code may be incorporated into the user program

itself. The COMMON block TECM should be used and it should be noted that the variables involved are defined as integers.

Two programs are provided for user convenience. READAT converts an ADDA11 data file into an ASCII character file with the following structure.

Record 1 - contains 4 integer values in I5 format representing the number the number of data points, the number of channels used in the data collection and the initial and final channels for data collection.

Records 2 thru n - contain 10 integer data values in I6 format with zero padding in the last record if the number of data points is not an exact multiple of 10.

These files may be read with the following Fortran code.

C COPYRIGHT (R) 1981 TECMAR INC. BY J. D. WEISSMAN

C

```
      INTEGER SCANBA,SCANFA
      COMMON /TECM/NPTS,NCH,SCANBA,SCANFA,IA(14000)
      CALL CRFL(8)
      READ(8,8922)NPTS,NCH,SCANBA,SCANFA
8922  FORMAT(4I5)
      DO 997 J0=1,NPTS,10
      J1 = J0 + 9
      READ(8,8923)(IA(J2),J2=J0,J1)
8923  FORMAT(10I6)
997   CONTINUE
      ENDFILE 8
      STOP
      END
```

ADLIB15.REL is a Microsoft library that contains the subroutines for A/D, D/A and other operations that are called by ADDA11. The details of accessing these will be forthcoming shortly. When using ADLIB15.REL with L80 to access CRFL as defined above, the command

*ADLIB15/S

should be used. Subsequently the command FORLIB/S will have to be entered explicitly, as the /S command resets the FORLIB REQUEST flag.

ADDAll - TECMAR A/D AND D/A PROCESSING SYSTEM

ADDAll is the latest version of Tecmar's general-purpose analog to digital and digital to analog operating system. With ADDAll the features of the AD212 A/D and DA100 D/A components (described below) are interfaced for user convenience and wide applicability to analog processing tasks. ADDAll allows the user to easily specify analog operations and executes these operations with maximum efficiency and speed using the associated assembly language routines contained within ADLIB16 (which are also available for use in user-written programs as a function library or as the assembly language source). The easiest way to show the capability of ADDAll is to define the various functions contained within.

ADDAll logs on with pre-specified default parameters values A/D and D/A operations. The user may alter these values in any sequence by typing a command code and the desired replacement value for the parameter. Data are stored sequentially in an array dimensioned to 30,000 bytes. All functions are initiated by a similar command code (no parameter is required). Parameter and function commands may be chained in any sequence.

The basic analog to digital operations of ADDAll are listed below:

I. ANALOG FUNCTIONS

- AA - Collect analog data (40 KHz maximum)
- DA - Convert previously collected data to analog signal for display on oscilloscope or other purpose.
- AV - Collect analog data with simultaneous video display
- DV - Display previously collected data on video display
- XY - Draw XY plot

ADDAll enables the user to make use of the multi-channel capability of the AD-212 and DA-100 components. Data is collected from (A/D) or output to (D/A) a user-specified number of channels. Analog operations are performed according to the following parameters:

II. ANALOG PARAMETERS

- ZA - A/D channel low (in round-robin sequence)(default=15)
- ZB - A/D channel high (default=15)
(the number of A/D channels is determined by the A/D converter and whether the accessory multiplexer board is used)
- ZC - D/A channel low (default=0)
- ZD - D/A channel high (default=0)
(4 D/A channels per D/A-100 board)
- NP - Total number of data points, beginning with BI for analog operations (default=1000)
- BI - This variable, designated "memory bias" enables the user to begin data collection and storage at a point = 2*BI

- bytes (i.e. BI data points or words) from the beginning of the data array. Using BI and NP the operator can selectively store or display (or output) analog data from any continuous subset of the data array (default=0)
- DT- The time interval for data collection/output in milliseconds (default=1.0). Consult A/D converter documentation for minimum value of DT. DT for function DA will not go below .05 millisecond.
- CY - The number of D/A cycles-1 with DA or DV (DA,DV explained above) (default=0). CY used with function DA enables the use of a standard oscilloscope as a storage oscilloscope.
- GA - Bits to set programmable gain on programmable gain A/D converters (default=0)
- TR - When set to one the operations initiated by AV and AA will be delayed until the GATE5 input reaches +5volts. This enables the A/D collection process to proceed in response to an external trigger (default=0)

ADDAll uses a high resolution video graphics display that is driven by a slave microcomputer. Data are displayed in graphical format with the automatic plotting of user-specifiable axes, tick-marks, scales and labels. Multi channel operations with video graphics display may be performed with graphics character output for data values. The video graphics parameters are listed below.

III. VIDEO GRAPHICS PARAMETERS

- VC - Video characters are plotted instead of points if VC=1 otherwise VC = 0 (default=0)
- CL - When multi-channel video-graphics display of data is being performed with AV or DV, channels less than CL are suppressed (default=0)
- CH - Same as for CL, but channels greater than CH are suppressed (default=15)

(CL and CH can be used when it is desired to collect data from many channels, but only display some of them. Similarly they can be used to examine the individual channels in a multi-channel data file)

- A. SCALE PARAMETERS-defined in terms of the 512x480 pixel graphics screen, with respect to the lower left-hand corner or in terms of the desired scale value
- OX- The X-coordinate(40-511)of the X and Y axis intersection point (default=40)
- OY- The Y-coordinate (40-479) of the X and Y axis intersection point (default=40)
- XM - (Maximum X scale value) The scale value of the limit of the X axis (511,OY) (default=471)
- YM - (Maximum Y scale value) The scale value of the limit of the Y axis (OX,438) (default=15.)
- XZ - X scale value at the intersection of the X and Y axes

- (OX,OY) (default=0.)
- YZ - Y scale value at the intersection of the X and Y axes
(OX,OY) (default=-15.)
- QX - The scale value interval at which tic marks are placed
and a label written on the X axis (default=50.)
- QY - The scale value interval at which tic marks are placed
and a label written on the Y axis (default=3.)

B. MODE PARAMETERS-determine reverse or normal graphics
for scale and title output

definition	normal video value (default)	reverse video value
GX - X label	0	8
GY - Y label	2	10
GT - Title	4	12
XS - X scale label	0	8
YS - Y scale label	2	10

C. OFFSET PARAMETERS

- XA - Determines offset of X-label from bottom of graphics
area (0-480) (default=0)
- YA - Determines offset of Y-labels from left side of
graphics area(12-511) (default=12)
- TA - Determines offset of title from bottom of graphics
area (0-480) (default=454)

D. XY-PLOT PARAMETERS

- HX - Channel from data to be plotted as X axis
- HY - Channel from data to be plotted as Y axis

IV. ASSOCIATED FUNCTIONS

- TS - Set 10,000 day real time clock
- RT - Read time from real time clock
- SA - Set 24 hour alarm
- AW - Wait for alarm to go off. This function is chained
with other functions to enable the initiation of
operations at a specified future time
- EL - Enter X,Y labels and title of graph through console
- RL - Read graph setup from disk file
- WL - Save graph setup on disk
- LD - Load NP data points into data array from disk file

WD - Save NP data points from data array in disk file
DP - Data List/Print

ALPHABETICAL LISTING OF COMMANDS FOR FUNCTIONS AND PARAMETERS

* denotes function

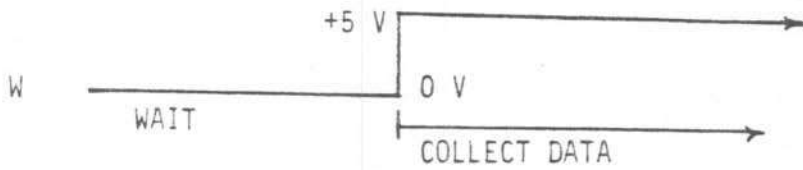
- * AA - Collect analog data (40 KHz maximum)
- * AV - Collect analog data with simultaneous video display
- * AW - Wait for alarm to go off
- BI - Memory bias (default=0)
- CH - Suppress video display of channels >CH (default=15)
- CL - Suppress video display of channels <CL (default=0)
- CY - the numberof D/A cycles-1 (default=0)
- * DA - Convert data to analog signal
- * DP - Data List/Print
- DT - the time interval, milliseconds (default=1.0)
- * DV - Display previously collected data on video display
- * EL - Enter X,Y labels and title of graph
- GA - Bits toset programmable gain converters (default=0)
- GX - X label mode (norm=def=0) (rev=8)
- GT - Title mode (norm=def=4) (rev=12)
- GY - Y label mode (norm=def=2) (rev=10)
- HX - Channel to be X axis on xy plot
- HY - Channel to be Y axis on xy plot
- * LD - Load NP data points into data array from disk file
- NP - Number of data points (default=1000)
- OX - The X-coordinate of graph origin point (default=40)
- OY - The Y-coordinate of graph origin point (default=40)
- QX - X axis tic interval (default=50.)
- QY - Y axis tic interval (default=3.)
- * RL - Read graph setup from disk file
- * RT - Read time from real time clock
- * SA - Set 24 hour alarm
- TA - Offset of title (default=454)
- TR - Enable trigger (default=0)
- * TS - Set 10,000 day real time clock
- VC - Video characters if VC=1 otherwise VC = 0 (default=0)
- * WD - Save NP data points from data array in disk file
- * WL - Save graph setup on disk
- XA - Offset of X-label (default=0)
- XM - X axis scale limit (default=471)
- XS - X scale label (norm=def=0) (rev=8)
- * XY - Draw XY plot
- XZ - The scale value of the X axis at origin (default=0.)
- YA - Offset of Y-label (default=12)
- YM - Y axis scale limit (default=15.)
- YS - Y scale label (norm=def=2) (rev=10)
- YZ - The scale value of the Y axis at origin (default=-15.)
- ZA - A/D channel low (default=15)
- ZB - A/Dchannelhigh (default=15)
- ZC - D/A channel low (default=0)
- ZD - D/A channel high (default=0)

APPENDIX A

DESCRIPTION OF HOOKUP FOR EXTERNAL TRIGGER



THE EXTERNAL TRIGGER MUST PROVIDE A CONSTANT LEVEL:

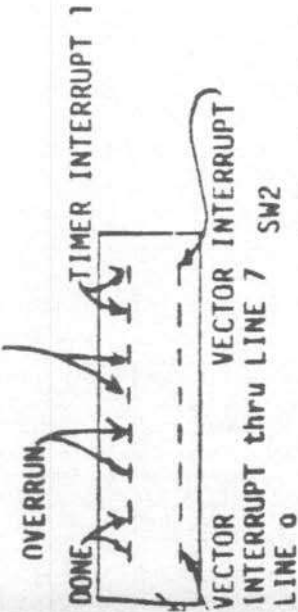


ENABLE INTERRUPTS FROM AM9513 OUT3 LINE

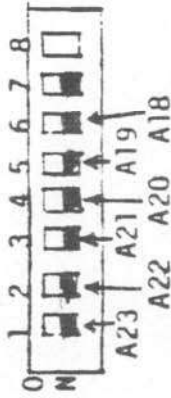


JUMPER PINS 3 and 4 on RIBBON CONNECTOR
(AS SHOWN ON TOP SIDE OF CONNECTOR)

TIMER INTERRUPT 2



SW2



SW2 (1-8) : OFF

SW3



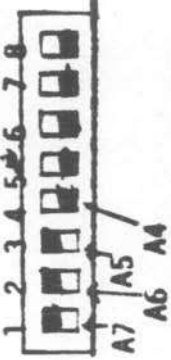
SW3 (1-5) OFF SW3 (6) ON
SW3 (7-8) OFF

SW4



SW4 (1-6) ON, SW4 (7-8) OFF

SW5 (1-3) ON (4-8) OFF



SW1-3,4

SINP +
SOUT

MEMORY
MAPPED

DO NOT
USE

T/O
MAPPED

MEMORY
MAPPED

SW5-5

ON

OFF

SW1



darkened portion of each switch is depressed