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National Geodetic Survey

```
MM              MM   TTTTTTTTTTTT   EEEEEEEEE   NNN       NN
MMM            MMM        TT        EE          NNNN      NN
MMMM          MMMM        TT        EE          NN NN     NN
MM MM        MM MM        TT        EEEEEE      NN  NN    NN
MM  MM      MM  MM        TT        EE          NN   NN   NN
MM   MM   MM   MM         TT        EE          NN    NN  NN
MM    MMMM     MM         TT        EE          NN     NN NN
MM     MM      MM         TT        EEEEEEEEE   NN      NNNN
```

```
 33333333
       33
      33
    333
      33
3      33
33     33
 3333333
```

Updates to MTEN (November 1984)

A System for the Use with

NATIONAL GEODETIC SURVEY DATA BASE INPUT FORMATS AND SPECIFICATIONS Volume I. Horizontal Control Data

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APPENDIXES

A MTEN 3 Program Structure

The original MTEN System, written in 1982 was designed for a Columbia 1181 Micro computer. Then early in 1984 the entire MTEN System was converted to MTEN 2 and moved to an IBM PC computer. The MTEN 2 programs are very much like the original MTEN programs (only a few corrections or small screen changes were added). Also at the time of the conversion, the Micro-TENcol Reference Manual was re-written in order to include changes made during the IBM PC conversion: hereafter it will be called the "Manual". By mid July 1985, MTEN 2 was re-written to meet five new requirements listed below. This version was released on September 1, 1985 as MTEN 3.

The screen displays, seen by the user, and the data definitions stated in the Manual (Section 1) remain the same. The use of upper case letters for prompts in this document are to represent the text as seen on the screen or to identify MTEN Acronyms (see Manual Appendix B). However, several additions, changes, and modifications have been incorporated in the programs to create a new version called MTEN 3. MTEN 3 users should refer to Appendix A-2 for identification of programs currently supported.

(1) In order to respond to the sixty (60) changes requested in a document submitted by the National Geodetic Survey's Horizontal Network Branch entitled "Proposed Changes to the MTEN (2) System for the Purpose of Mark Maintenance Automation", it was decided that a completely new system called MTEN 3 should be created.

(2) A complete re-write of subroutine GETFLD was required in order to make it more transportable and less machine dependent. This way the system can be copied on a mini computer or major main frame computer.

(3) To consolidate several smaller MTEN programs which were written within 48K bounds, into logical programs of larger size (128K), thus reducing the number of programs and minimizing the number of program entry and exit calls required to be made by the user.

(4) To correct a few errors uncovered by NGS' Field Parties while using MTEN to execute their field assignments.

(5) To allow the user to change the selected project JobCode (JC) without leaving the program.

All the items listed above were simultaneously integrated into the programs creating MTEN 3. Table 1 lists a summary of the major program changes inherent to MTEN 3. Table 1 lists the old MTEN 2 programs on the left and the new MTEN 3 equivalents on the right.

TABLE 1

MTEN 3 Program Structure Changes

MTEN 2		MTEN 3
ABSINX	Multi-screen addressablity	ABSINX
ASTCHK ASTTME ASTRAD	Removed as separate MTEN 2 programs and then combined into one new MTEN 3 program.	ASTCTR
BBKDES	Program modified to include and to print additional vertical control (BM) information.	BBKDES
BBKOBS	Program modified to include additional options.	BBKOBS
GETABS	Removed as a separate program within MTEN 2 and added as a subroutine call within each of the "ABStract" programs supported by MTEN 3.	ABSAST ABSDST ABSEDM ABSHGT ABSHZT ABSLGH ABSZEN
GETSTA LSTSTA	Removed as separate programs within MTEN 2 and combined into ADJSTA as subroutine calls within the new MTEN 3 program.	ADJSTA
GETTXT	Removed as a separate program within MTEN 2 and combined into GETDES as a subroutine call within the new MTEN 3 program.	GETDES
LSTABS	The program was modified to print multi-pages for the astronomical abstract data and other abstract information not previously printed.	LSTABS
LSTJOB	Dropped from the executable list of programs supported by MTEN 3 for the IBM PC.	None
STRNAM STRGPN STRHGT	These three separate programs within MTEN 2 were removed and combined as one new MTEN 3 program called STRSPN.	STRSPN
WRKGPN	The program was modified to include additional computational options for the user.	WRKGPN

While re-programming the above items, the following screen patterns were added in order to allow the user to re-enter a MTEN 3 Command or to change the project JobCode (JC). Note also, the prompts are still written so that the "do the least damage" user response of <CR> is the "NO" answer:

```
REPEAT   ...  BBKDES  ...  (Y/N)?
              ADJSTA
              ABSHZT
              STRNAM
              STRGPN
              GETABS
               etc.
```

The above prompts will allow the user to remain at the current data entry program or screen level. The next screen prompt, just outside the "REPEAT" level, allows the user to re-enter the current program entry points or any other level available within the executable MTEN 3 program by:

```
RE-ENTER  ...  PROGRAMS  ...  (Y/N)?
```

The next prompt allows the user to change the project filename Jobcode (JC) extension so that another set of project data files can be attached to the MTEN 3 Command program without having to exit the program in order to reset the project Jobcode.

```
REPEAT THIS ENTRY COMMAND (Y/N)?
```

The MTEN 3 programs used to enter observational data such as the "ABStracts", have been modified to allow the user to turn program defaults on-and-off upon entry into the program, e.g.

```
PROMPT FOR ALL     ...  "OPTIONAL"   ...  ITEMS (Y/N)?
CHANGE THE DEFAULT ...   "METER"     ...  UNITS (Y/N)?
```

The first prompt "OPTIONAL" ... ITEMS means, that if the user touches <CR>, the "NO" response, will result in the MTEN 3 program to going into the "ZAP" option (Zap All Prompts that are non-mandatory for Bluebook entry). Thus at initial data entry, only mandatory Bluebook items will be prompted by the program and all non-mandatory items will be skipped over automatically. If the user replies Y <CR>, the "YES" response, the program will allow the user to enter data for each item row-by-row whether or not it is mandatory. As with MTEN, the user must make an entry for all mandatory items and those items which are non-mandatory can be skipped over with a simple <CR>. Once the initial screen data has been completed, a message will flash on the last row of the screen and prompt the user whether or not the information needs to be changed. If a change needs to be made, type Y <CR>, the "YES" response, and the program will enter the "Alters" or change Mode as described in the Manual.

When second option "METER" ... UNITS is answered with a <CR>, the "NO" change response, the program expects all measurements to be entered in meters only. If however, the user reply of Y <CR>, the "YES" response, the program to prompt the user each time for the type of units with "UNITS (M/F)?".

Since MTEN 3 was designed to execute on an IBM PC machine operating under MS-DOS (Disk Operating System by Microsoft, Inc.), a few DOS commands which relate to MTEN 3 are given for the user. Before the MTEN 3 Command Programs ABSINX and GETREC can be used to initialize the MTEN 3 project data files, the filenames must exist on a DOS directory. A sample MTEN directory structure can be created by using the following commands:

MKDIR (Make Directory)

C:>MKDIR\MTEN <CR> or

C:>MD\MTEN <CR>

This will create an entry in the system's root directory for the sub-directory called MTEN.

C:>MKDIR\MTEN\JC <CR> or

C:>MD\MTEN\JC <CR>

This will create another sub-directory, but this one will be listed under the sub-directory MTEN.

The next command the user should use is "PATH". This command will establish a path for the system to find the root programs from the user's lower sub-directories. The order of sub-directories immediately following the command PATH defines the search order the system will follow when looking for a file.

PATH (Set Search Directory)

C:>PATH C:\MTEN;C:\;

This forces the system to search the "MTEN" sub-directory first and then the DOS "Root" directory for the desired programs.

Once the PATH has been set and after all the sub-directories have been made, the following command is used to put the user at the desired level:

CHDIR (Change Directory)

C:>CHDIR\MTEN or

C:>CD\MTEN

This command will put the user at the "MTEN" sub-directory level. At this level all MTEN 3 executable programs can be loaded.

C:>CD\MTEN\JC

The sub-directory level "JC" is where all the data files are created for a given project. At this level, the user can initialize the project data files for the entire project by using EDLIN utility (the line editor) to create the directory names by the following set of commands:

```
EDLIN FILEINXX.JC <CR>
New file
*E <CR>

EDLIN FILEGPNX.JC <CR>
New file
*E <CR>

EDLIN FILENDXX.JC <CR>
New file
*E <CR>


EDLIN FILEDATX.JC <CR>
New file
*E <CR>

EDLIN FILEDESX.JC <CR>
New file
*E <CR>
```

Then as needed, the following "DEScription files" (FILEDES1, FILEDES2, FILEDES3, ... , FILEDESA, and FILEDESB) can be initialized by repeatedly re-entering of EDLIN by:

```
EDLIN FILEDES1.JC <CR>
New file
*E <CR>
```

All MTEN 3 programs use DOS's "Extended Screen and Keyboard Control" features. Therefore, if the user's system has not previously been configured to exploit these features, it will have to be done by adding to the system's configuration file "CONFIG.SYS" on the root directory. This can be accomplished by placing the following command within the CONFIG.SYS file.

DEVICE=ANSI.SYS

Since all MTEN 3 programs use random access I/O, and the number of DOS buffers is set by default to only two (2), the user should increase the number of buffers to between 10 and 20 by adding the next command to the CONFIG.SYS file.

BUFFERS=10

MTEN 3, at most, has only 5 files open at any one time, therefore, the DOS default of eight (8) files is sufficient and will not need to be increased. However, if the user wants to increase the number of files that can be open at once, the following command must be added to the CONFIG.SYS file.

FILES=10

A working "CONFIG.SYS" file for MTEN 3 should be similar to the the listing given below. To install this set of DOS configuration commands the system must be re-booted.

```
DEVICE=ANSI.SYS
BUFFERS=10
FILES=10
```

The MTEN 3 Command ABSINX Program (ABStract of project INdeXes) executes as stated in the Manual (Section 2.2), but with the following changes. The first change allows the user to skip to any one of the three screen entry points after initialization has been completed by the following prompt:

```
PROGRAM
 (Y/N)?

   N    ABSINX  ... FIRST  SCREEN

   Y    ABSINX  ... SECOND SCREEN

        ABSINX  ... THIRD  SCREEN
```

The second change allows the user to select which ellipsoid is to be used for all computation with the data. The following prompts are flashed to the screen:

```
NAD 1983 DATUM  ...  (Y/N)?  <CR>
WGS 1972 DATUM  ...  (Y/N)?  <CR>
NAD 1927 DATUM  ...  (Y/N)?  Y <CR>
```

If none of the above datums are selected, the"DATUM" must be defined by the user. If one of the three listed datums is selected by the user, the program will automatically load the ellipsoid parameters of the selected "DATUM" into the MTEN 3 data files.

The MTEN 3 Command ASTCTR /ASTCHK,ASTTME,ASTRAD/ Program (ASTronomic programs astChk astTme astRad) was written to allow the user to automatically perform astronomical azimuth computations within one program level. The new program still executes as stated in the Manual but doesn't requite running ASTCHK, ASTTME, and ASTRAD as three separate programs (Sections 8.1.1, 8.1.2, and 8.1.3).

Two warnings are given to help users better make use of the astronomic azimuth program ABSAST provided by MTEN 3.

---------- (WARNING ONE) ----------

Make sure that the correct Job Specific Instrument (JSI) number has been loaded, and that particular instrument was indeed actually used to take the observations in the field. When the instrument JSI was loaded it should have a "BUBBLE VALUE" other than zero (0.00). If the printed values for the instrument serial number and JSI as shown by Manual Figure (8.03) are incorrect:

```
INSTRUMENT SERIAL NO : xxxxxxxxxxxxxxxxxx
    INSTRUMENT (JSI) : xxx

        BUBBLE VALUE : 0.000
```

then WRKAST must be exited and the Job Specific Instrument information corrected before the observations can be completed with programs ASTCTR + WRKAST. First, re-enter the STRJSI program with the correct JSI number and enter the correct "BUBBLE VALUE" of the instrument at the following prompt:

```
CONSTANT (SNN.NNNN) :      X.xxxx      UNITS  ?
```

Second, re-enter the appropriate ABSAST program at the "PROGRAM" level and select the GETABS entry point. Then at the following row prompt:

```
Y    JOB INSTRUMENT NUMBER (NNN)?
```

re-key the instrument's (JSI) number, thus forcing the program to reload the correct information just put in with STRJSI. After the above corrections have been completed, the user can re-enter ASTCTR + WRKAST to compute the observed astronomic azimuth.

---------- (WARNING TWO) ----------

If the Inclination Correction (CORRN) as shown by Manual Figure (8.04) looks like the following:

```
---------------------
     CORRN |
  +  (SEC) |  -
---------------------
      0.0
      0.0
```

where the values for "CORRN" are all zeros on the printed listing, but the field data showed dislevelment values other than zero (0.0), then the instrument "BUBBLE VALUE" was not properly entered with STRJSI or else the JSI number coded within GETABS was incorrect and needs to be re-loaded.

The MTEN 3 Command BBKDES Program (Blue BooK DEScription) remains the same as stated in the Manual (Section 11.1). However, two additional options have been incorporated into the program.

Once the Vertical data format has been selected, the program's first new option will flash to the screen by:

ADD AN OFFSET TO CREATE BM ... "SPSN" ... NUMBERS (Y/N)?

The reply <CR>, the "NO" response, will force the program to assign SPSN numbers within the BBKVERTX.JC data set to be the same as the SPN numbers in the horizontal data set. If however, the user replies Y <CR>, the "YES" response, the user will be prompted to enter an "OFFSET" by:

ENTER THE OFFSET TO BE ADDED TO ALL SPNs (NNNN)?

This "OFFSET" will make the BBKVERTX.JC data set SPSNs equal to the assigned SPN plus the "OFFSET" value, e.g. with an OFFSET=2302 then:

SPN	OFFSET	SPSN
50	2302	2352
51	2302	2353
84	2302	2386

etc.

The second option comes after the "TODAYS DATE" entry has been completed. The program will prompt the user with the overall range of SPNs. The beginning SPN will always be one (1) and the ending SPN will be the last one (MAX value or highest SPN used on the project). The user is then prompted to enter a beginning and ending range of SPNs. After the range has been entered, the program's second option will flash to the screen:

SELECT ADDITIONAL ... SPN RANGES ... (Y/N)?

A reply of Y <CR>, the "YES" response, will allow the user to continue selecting ranges (up to an additional 8 ranges). Whereas, a reply of <CR>, the "NO" response, will cause the program to stop SPN range prompts and continue it's normal execution.

The MTEN 3 Command BBKOBS Program (Blue BooK OBServations) remains the same as stated in the Manual (Section 11.2). However, two updates and one additional option have been incorporated into the program.

The two program updates made to BBKOBS relate only to the NGS Survey Equipment Codes. The first update will have the following effect on the final BBKOBSXX.JC data set. Namely, all Job Specific Instrument numbers (JSI's) which have values between 900 and 999 will not be down-loaded into "*70*" Blue Book records. The second update will cause the program BBKOBS to only download those JSI numbers that were found to be on the observational data records corresponding to the specific SPN ranges selected by the user with the first option above rather than downloading all "*70*" instruments records.

Once the "TODAYS DATE" entry has been completed, the program will prompt the user with the overall range of SPNs. The beginning SPN will always be one (1) and the ending SPN will be the last one (MAX value or highest SPN used on the project). The user is then prompted to enter a beginning and ending range of SPNs. After the first range has been entered, new option will flash to the screen:

SELECT ADDITIONAL ... SPN RANGES ... (Y/N)?

A reply of Y <CR>, the "YES" response, will allow the user to continue selecting ranges (up to an additional 8 ranges). Whereas, a reply of <CR>, the "NO" response, will cause the program to stop SPN range prompts and continue it's normal execution.

The MTEN 3 Command ABSAST Program (ABStract of an ASTronomical azimuth) remains the same as stated in the Manual (Section 6.1). The computations remain the same, but to clarify how the deflection of the vertical component (Eta) is to be entered, the following information is given.

If the Laplace Correction is obtained from the National Geodetic Survey, the following printed format would be interpreted as follows:

```
                    (+) ../.. (-)

DEFLECTION IN       NORTH  /  SOUTH          -1.9  ARC SECONDS ..
DEFLECTION IN        WEST  /  EAST           -2.3  ARC SECONDS ..
LAPLACE CORRECTION                           -1.8  ARC SECONDS
```

Where the given values (NORTH & WEST) will have positive (+) signs and the given values (SOUTH & EAST) will have negative (-) signs. The deflection in the prime vertical (EAST or WEST) direction (called Eta) is defined by the following relationship between the astronomical and geodetic longitudes:

```
Given:        LON(A)  =  Astronomical Longitiude
              LON(G)  =  Geodetic     Longitiude
              LAT(G)  =  Geodetic     Latitude

                              LON(G)
                                |
            |      West         |         East     |
            + <-------------    +  -------------> +
            |      Eta (+)      |         Eta (-)  |
          LON(A)                                  LON(A)
```

The deflection of the vertical quantities given for the above example are as follows:

```
Xi  ...  (NORTH / SOUTH) component      =    -1.9 seconds or (SOUTH)
Eta ...  (WEST  /  EAST) component      =    -2.3 seconds or (EAST)
```

and the Laplace Correction is:

```
Laplace Correction                      =    -1.8 seconds or (EAST)
```

Where the geodetic azimuth is computed by:

```
AZIMUTH (geodetic)  =  AZIMUTH (astronomic)  +  Laplace Correction
```

and the Laplace Correction and ETA are computed by the following:

```
Laplace Correction  =  Tangent (LAT(G)) * ETA   or

Laplace Correction  =     Sine (LAT(G)) * ((LON(A) - LON(G))

ETA                 =   Cosine (LAT(G)) * ((LON(A) - LON(G))
```

The MTEN 3 Command ABSDST Program (ABStract of reference object DiSTances) remains the same as stated in the Manual (Section 6.2). To accomodate electronic distance measurements (EDM) where the distance to a reference object was measured in meters only, the prompt screen was changed to allow this entry by:

```
APPROXIMATE DISTANCE /KM,MI/ (Y/N)?  <CR>

MEASURED  FEET     ONLY      (Y/N)?  <CR>
MEASURED  METERS + FEET      (Y/N)?  <CR>

MEASURED  METERS   ONLY      (Y/N)?  Y <CR>
```

If none of the above prompts are selected, the program will recycle to the first prompt. The selection of "METERS ONLY" has only one limitation, that is, the horizontal measured distance must be less than 350.0 meters.

The MTEN 3 Command ABSEDM Program (ABStract of a Electronic Distance Measurements) remains the same as stated in the Manual (Section 6.3). Due to confusion or the terminology used by MTEN, the following explanation is presented to help clarify MTEN terms against those used in the FGCC Publication: "Specifications to Support Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys", July 1979, Revised 1980, pages 13-17.

In the MTEN 3 program BBKOBS, the value for the "NUMBER OF REPLICATIONS" to be down loaded into a Blue Book *51* or *52* record is the number "TOTAL REPLICATIONS" found on each "EDM" abstract and it is computed as follows by:

```
(    TOTAL     )          ( Number )        ( Number of    )
( REPLICATIONS )   -      (   of   )    *   ( Replications )
( Per Abstract )          ( Sheets )        ( Per Sheet    )
```

and for the FGCC Publication we have:

```
(   COMPLETE   )       ( Number of    )       ( Number of    )
(  MEASUREMENT )   -   ( Observations )   *   ( Readings Per )
(    One Set   )       ( Per Set      )       ( Observation  )
```

Whereas in the above mentioned publication we have the number of "Determinations of the measured slope distance ... " not to exceed 10 per sheet .. stated to mean the same as what MTEN 3 has for the Number of Replications Per Sheet.

Then "A complete measurement using direct-readout equipment consists of (this many readings per observation) ...

ten readings for ...
five readings for ... (Number of Replications Per Sheet)
three readings for ...

when highest accuracy is specified, two or more sets of observations from both ends of the lines and at different time periods are highly recommended."

The number of observations per set (number of sheets) required for a given survey order and class is given by TABLE 4 in the above listed FGCC publication.

The MTEN 3 Command ABSHGT Program (ABStract of a HeiGhT or difference of elevation) remains the same as stated in the Manual (Section 6.4). However, the new program was changed to allow the user to enter more than just one replication. If the user is going to use the difference of elevation abstract with a corresponding GETROD, then the number of replications must be entered as one (1).

The MTEN 3 Command ABSLGH Program (ABStract of a LenGtH or short traverse measurement) remains the same as stated in the Manual (Section 6.6). However, the new program was changed to allow the user to enter more replications other than the just one (1). If the user is going to use the short traverse measurement with a corresponding GETBAY, then the number of replications must be entered as one (1).

The MTEN 3 Command ADJSTA /GETSTA,LSTSTA/ Program (ADJust a STAtion) combines from one (1) to ten (10) horizontal abstracts (ABSHZT) into one unique combined list "LST" for the Standpoint SPN. To enter the program type ADJSTA <CR>. The program will prompt the user for the Standpoint SPN entry as follows, see Manual exsample (Section 9.1):

SURVEY POINT NUMBER /SPN/ (NNN)? 50 <CR>

After the SPN entry has been completed, the program will search for and collect all horizontal abstracts (ABSHZT) for the SPN requested. As each abstract is loaded, the abstract's "SET NUMBER" will appear on the screen and the names for all observed directions found on it will flash to the screen directly below the set number one-by-one.

ABSTRACT(S) FOR THIS STATION
1 2 3 4 5 6 7 8

PELLOW AZ MK 1 etc..

The ADJSTA program has the following restrictions for any one given adjustment: The total number of abstracts can not be greater than ten (10); and the total number of distinct points observed varies from a total of 51 with ten abstracts to a maximum of 57 with only four abstracts. The MTEN 3 version of ADJSTA will automatically call the two subroutines GETSTA + LSTSTA. As these subroutines are called and completed by ADJSTA, the following messages will flash to the screen:

GETSTA - START
GETSTA - ENDED

LSTSTA - START
LSTSTA - ENDED

The subroutine GETSTA (GET a STAtion) will compute a least squares station adjustment for the requested SPN. When GETSTA is completed, a summary of the collected abstracts will be printed. An sample listing is given in the Manual, Figure (9.02), for the Standpoint SPN=50.

The subroutine LSTSTA (LiST a STAtion adjustment) will reformat the computed data from GETSTA. When LSTSTA starts it's execution, the user is prompted:

SKIP THE PRINTED LISTING (Y/N)?

A reply of Y <CR>, the "YES" response, results in the program not providing a printed listing. However, the "LST" information will always be saved on the "DAT" file for future use by other MTEN 3 programs. A reply of <CR>, the "NO" response, will print a listing of the combined "LST" for the user. A sample "LST" listing for Standpoint SPN=50 is given by the Manual Figure (9.01).

The MTEN Command GETABS Program (GET an ABStract) in the Manual (Section 5.1) has been changed from a separate program in MTEN and MTEN 2 to a subroutine call within each of the field data entry programs (ABSAST, ABSDST, ABSEDM, ABSHGT, ABSHZT, ABSLGH, and ABSZEN) in MTEN 3. Thus when a user selects the appropriate abstract data entry program, there is no need for the user to select the type of data to be entered as shown by Figure (5.01). Instead the program will flash the data selection to the screen and ask the user to verify the selection. As an example of field data entry programs, the program ABSHZT will be used. Type ABSHZT <CR> and the following prompts will appear on the screen:

```
CHANGE DEFAULT DRIVE-C  (Y/N)?   <CR>
ENTER YOUR JOB CODE/JC/ (LL)?    JC <CR>

PROMPT FOR ALL     ...  "OPTIONAL"  ... ITEMS (Y/N)?  Y <CR>
CHANGE THE DEFAULT ...   "METER"    ... UNITS (Y/N)?  <CR>
```

The next screen to appear will be the program level display, where the user can use either program entry points, GETABS or ABSHZT. However, the very first time this "HZT" abstract is entered, the user must initialize the abstract by completing the program entry point GETABS. The screen display will appear as follows:

```
PROGRAM
 (Y/N)?

   Y     GETABS

         ABSHZT

-----------------------------------------------------------------------GETABS
```

After the entry point GETABS has been entered, the screen will clear and the following message will flash to the screen:

```
                    ABSTRACT

                       OF

              HORIZONTAL  DIRECTIONS

                  STOP  ...  (Y/N)?
```

Where the third line "HORIZONTAL DIRECTIONS" will represent the type of field data to be entered. This is equivalent to the old MTEN GETABS program where the user would have to select "HZT 5" from the table listing as shown by Figure (5.01). A reply of Y <CR>, the "YES" response, is equivalent to the "XIT 0" selection on Figure (5.01). The reply of <CR>, the "NO" change response, will let the program continue as stated in the Manual. Again two levels of protection are provided the user by namely:

```
NO ABSTRACT EXISTS    ...   CREATE ONE   (Y/N)?   Y <CR>
HZT  --  DATA TO BE ENTERED  --  CORRECT (Y/N)?   Y <CR>
```

Therefore the user must deliberately reply Y <CR> twice to create a new field data entry abstract. Upon completion of the program GETABS, the user is returned to the program level. Here the user may re-enter the program or exit the program to restart it with a different project JobCode (JC).

The MTEN 3 Command GETDES /GETTXT/ Program (GET a DEScription) executes the same as described in the Manual (Section 5.3). To enter the program type GETDES <CR>. The MTEN 2 GETTXT program has now been included within MTEN 3 as a subroutine call from GETDES; and it executes as stated in the Manual (Section 7.3 and 7.4). Once the proper drive specification (A:, B:, C:, etc.) and the JobCode (JC) have been selected, the new MTEN 3 program will flash the following prompts to the screen:

```
PROGRAM
 (Y/N)?

   Y      GETDES

          GETTXT
```

This allows the user to jump back and forth between the two program entry points without having to leave and then re-enter each program separately as was required with MTEN and MTEN 2 systems. However, before GETTXT can be entered, the program entry point GETDES must have been completed in order to initialize the Standpoint SPN data. Upon the first entry into GETDES for a new Standpoint SPN, the program will prompt the user for two items. The first prompt:

```
HORIZONTAL  DESCRIPTION (Y/N)?
```

will be used to identify the type of descriptive data. Once the type of descriptive data has been selected, the program will flash to the screen all available "DEScription files" that have been initialized and are ready for use are shown by the following, i.e. this information is similar to that shown in the Manual by Figure (12.06):

```
MAXDES (NUMBER OF RECORDS/FILE) =                          500
-FILE-  -NAME-     -MAXIMUM-  -USED- -DRIVE-

   1  FILEDESX        500      356      C
   2  FILEDES1       1000      286      C
   3  FILEDES2       1500        1      A
```

The maximum number of records per file (MAXDES) that can be established is still 500. This maximum was set by the program ABSINX and once this value is set, it cannot be changed for any of the remaining 12 project description files. In this example, three files are available for data entry:

```
File   Name

 1   FILEDESX
 2   FILEDES1
 3   FILEDES2
```

Associated with each of these files are:

1 -	-FILE-	number,
2 -	-NAME-	of the file,
3 -	-MAXIMUM-	records created,
4 -	-USED-	the number of records used on each file, and
5 -	-DRIVE-	the drive specification for each file

notice "-FILE- 3" is really "FILEDES2.JC" and located on drive A. At this point the user is prompted by the program to select which -FILE- to put the descriptive data on by the following message:

WHICH DES ... "FILE" ... DO YOU WANT TO USE (NN)? 3 <CR>

Remember, there must have enough records left on the -FILE- selected to complete the whole description, e.g. "-FILE- 3" has 500 records left. However, this is not correct because the true number of records left on any one file is computed as follows:

LEFT = (MAXDES - BUFFER) - (USED)

where BUFFER=100, USED=1, and MAXDES=500. "FILE 3" has only 399 records which can be used to enter descriptive data. Once a -FILE- has been selected for a given Standpoint SPN, then all descriptive data pertaining to that SPN must be keyed into that -FILE- selection including all information created with the MTEN 3 Command GETBOX Program.

---------- GETTXT

The MTEN 3 program entry point GETTXT (GET the descriptive TeXT) executes as stated in the Manual (Sections 7.3 and 7.4).

The MTEN 3 Command GETREC Program (GET RECords) executes as stated in the Manual (Section 2.3). To enter, the program type GETREC <CR>. The following example is provided as a procedure which could be used to initialize the descriptive data set "-FILE- 3" on a drive other than the default system drive.

(1) Format the diskette (use a new diskette)

```
FORMAT A: <CR>
```

(2) Use EDLIN (the line editor)

```
EDLIN A:FILEDES2.JC
New file
*E <CR>
```

```
Note:  Drive      =  A:
       Filename   =  FILEDES2.
       JobCode    =  JC
```

(3) Enter the MTEN 3 Command GETREC program and answer "T" to the following prompt, e.g. see Manual Figure (2.04):

```
TYPE WHICH LETTER (?)                    T <CR>
```

The program will then flash all file numbers that have been created to the screen. The user must stop at the next consecutive -FILE- to be created.

```
CURRENT   "DES"  FILE NUMBER =     X
CURRENT   "DES"  FILE NUMBER =     1
CURRENT   "DES"  FILE NUMBER =     2

                                    X       1       2
WANT TO CREATE THIS FILE (Y/N)?     N <CR>  N <CR>  Y <CR>
```

The program then prompts the user for the drive specification of the description file (for our example it is Drive A) by:

```
SELECT  "FILE DRIVE"  DRIVE  =  A <CR>
```

Upon completion of the above, the program will flash the filename "FILEDES2" to the screen and ask the user if the correct diskette is available and loaded on the proper disk drive by:

```
PROPER DISK AVAILABLE (Y/N)?    Y <CR>
```

If the reply is <CR>, the "NO" response, the user can change the diskette and retry. The reply of Y <CR>, the "YES" response, will cause the program to begin diskette initialization for this descriptive data set. As the records are initialized one-by-one, the program will flash a counter to the screen at intervals of 400 records, i.e. at 400, 800, 1200, 1600, 2000 and 2400 if MAXDES had been set to a value of 2600. When the initialization is complete, the following prompt will appear at the bottom of the screen:

```
REMOVE DISK/DISKETTE (?) -- "EXIT" AND "RESET" DRIVE
                                        STOP (Y/N)?
```

(4) Exit the program and type "DIR" on the selected drive (look for the number of bytes used).

(5) Enter MTEN 3 Command LSTSUM Program, screen two, and check fields for each of the following:

Name,
MAXREC,
USED, and
Drive specification

(6) The descriptive data set file should be ready for use at this point.

The MTEN 3 Command LSTABS Program (LiST ABStracts) will print any one of the seven types of abstracts used to enter observational data. To enter the program type LSTABS <CR>. The program will prompt the user for the Standpoint SPN. After the SPN's information has been entered, the program will flash a listing to the screen, see Manual Figure (5.01), and then the user must select an "ABSTRACT ENTRY NUMBER" for one of the seven possible types of abstracts. The screen will clear and all available abstracts for this SPN will flash to the screen. At this point the user must select the abstract "SET NUMBER" to be printed.

Two of the LSTABS printouts have been modified. The printed listing of an EDM abstract has two additional lines added to the bottom of the Manual's Figure (10.03) to display the following information:

TOTAL REPLICATIONS ... FOR ALL SHEETS - 10

JOB SPECIFIC INSTRUMENT NUMBER OF TARGET - 2

The second LSTABS modification was to provide for proper paging of the AST (astronomical azimuth) data abstract when more than 18 observations were entered on any one abstract.

The MTEN 3 Command STRSPN Program (SToRe a Survey Point Number) replaces three separate MTEN programs (STRNAM, STRGPN, and STRHGT). To enter the program, type STRSPN <CR>. The program will prompt the user to select a drive and JobCode (JC). After these two prompts are completed, the program will flash the following program entry points to the screen:

```
PROGRAM
 (Y/N)?

   Y     STRNAM

         STRGPN

         STRHGT
```

Upon exit from one of the above programs, the user will be prompted to remain at this entry level or to return to the program level by:

```
                    STRNAM
        REPEAT  ...  STRGPN  ...  (Y/N)?
                    STRHGT
```

If the reply is Y <CR>, the "YES" response, the program entry point level will be repeated. However, if the reply is <CR>, the "NO" response, the program will exit this program entry point level and retun to the program level and prompt the user to continue by:

```
        RE-ENTER ...  PROGRAMS  ... (Y/N)?  <CR>
```

If the reply is Y <CR>, the "YES" response, the user can re-enter the program and continue to enter data in one or all three program entry points. However, a <CR> reply, the "NO" response, will cause the program to drop to the program command level where the user can restart the command using a different Jobcode (JC) and different set of data files. This option allows the user to jump from project to project without exiting the program and thus avoids the repeated reloading of the old MTEN programs -- STRNAM, STRGPN, and STRHGT.

---------- STRNAM

The MTEN 3 program entry point STRNAM (SToRe a NAMe) was modified. Three changes were made to the old MTEN program to create the new entry point program within STRSPN. The first was to move the "PERIPHERAL" prompt to be the first prompt rather than near the end, see Manual (Section 4.2) Figure (4.03). The second change was to preload the "STATE OR COUNTRY" prompt with the state abbreviation selected using program ABSINX. The third and last change was to preload the first two (2) digits of the state Plane Coordinate Zone (PCZ) for the user.

---------- STRGPN

The MTEN 3 program entry point STRGPN (SToRe a Geographic PositioN) remains the same as stated in the Manual (Section 4.3), except two defaults are set up each time the program entry point is used. The defaults are:

```
DEFAULT LATITUDE  ... "NORTH"  ... CHANGE (Y/N)?  <CR>
DEFAULT LONGITUDE ... "WEST"   ... CHANGE (Y/N)?  <CR>
```

If the user replies <CR> <CR>, the "NO" change response, both defaults of "NORTH" and "WEST" will be used automatically. However, if the reply is Y <CR> for one or both, the "YES" change response, the user will be prompted each and every time to answer the prompts (N/S)? and (E/W)? for every geographic position entered.

---------- STRHGT

The MTEN 3 program entry point STRHGT (SToRe a HeiGhT or elevation) remains the same as stated in the Manual (Section 4.4), except one default will be prompted for each time the entry point is entered. The program default is:

```
DEFAULT SOURCE OF ELEVATION (N)?
```

Where "N" must be from zero (0) to nine (9) as per the "AGENCY CODE" stated in the Blue Book, Annex I or Chapter 3 page 23. The value of "N" selected will automatically be inserted as the source of each elevation entered with STRHGT until it is changed or until the user exits this program level.

The MTEN 3 Command WRKGPN Program (WoRK a Geographic PositioN) will compute a geographic position for an unknown Forepoint SPN from a Standpoint SPN as stated in the Manual (Section 8.4). However, several additional options have been added to the program. To enter program type WRKGPN <CR>.

The first option allows the user to turn off the printer during program execution. The following message will be flashed to the screen:

PRINT A ... WRKGPN ... LISTING (Y/N)? <CR>

The normal <CR>, the "NO" response, will not provide the user with a printed listing of the computations. The reply Y <CR>, the "YES" response, will turn on the printer and a printed listing of the computations will be printed as shown in the Manual by Figure (8.23) or (8.24).

The second option allows the user to either enter an observed astronomical azimuth or for the program to use a Laplace azimuth determined by the ABSAST program to establish the azimuth to the Forepoint SPN. The program will identify this option by the user keying the following sequence of SPNs; (1) to enter for the BACKPOINT SPN, the same SPN value to be used for the FOREPOINT; (2) to enter the STANDPOINT SPN for the occupied station; and (3) to enter the FOREPOINT SPN (same SPN as the BACKPOINT). This combination of SPNs will cause the program to flash the following message to the screen:

FOREPOINT/BACKPOINT ARE THE SAME ... CONTINUE (Y/N)? Y <CR>

A reply Y <CR>, the "YES" response, will cause the program to continue, while the reply <CR>, the "NO" response, will cause the program to recycle through the SPN prompts again. If the program is continued at this point, there are two paths the program can take. The first path, if an observed astronomical azimuth was entered using the ABSAST program, is for the Laplace azimuth to be flashed to the screen with the prompt:

USE THIS AZIMUTH AS AN INITIAL (Y/N)? <CR> DDD-MM-SS.SSS (FROM NORTH)

The reply Y <CR>, the "YES" response, will allow the program to continue in the "Normal" mode. However, a reply <CR>, the "NO" response, will cause the second path to appear on the screen and the program to change it's computation to a "Approximate" mode. The user must now enter from the keyboard a value for the azimuth (from North), either the observed azimuth or a Laplace azimuth. The line prompt will clear and the following message will flash to the screen:

ENTER AZIMUTH FROM NORTH (NNN,NN,NN.NN)? ----------

Since there is no "AST" abstract by which the program can identify the entered azimuth, this selected option will force WRKGPN to consider this computation as "Approximate" only.

At the completion of the determination of the azimuth to the Forepoint SPN, the program will return to the selection of distances as stated in the Manual.

The third option will allow the user to select which "ZEN" abstract observation to be used in the "Approximate" mode computation rather than the program default which was to use the first "ZEN" it found. The program will step through first the <STANDPOINT> then the <FOREPOINT> observations with the following prompt:

ENTER THIS ZENITH /DMS/ DDD-MM-SS.SS (Y/N)? <CR>

If the reply <CR>, the "NO" response, is made the program will continue to step through all "ZEN" observations at the STANDPOINT or FOREPOINT until each has been displayed to the user. If the reply Y <CR>, the "YES" response, is made while under the <STANDPOINT> selection, the program will use this "ZEN" observation and then jump to the <FOREPOINT> selection or if at the <FOREPOINT> selection, the program will stop the "ZEN" abstract search. This option will compute any one of the following three possibilities; (1) a zenith observation at only the Standpoint SPN; (2) a zenith observation at only the Forepoint SPN; and zenith observations at both the Standpoint and Fprepoint SPNs.

One new printed line was added to the WRKGPN printed listing (with the printer on and when in the "Approximate" mode). The computed difference of elevation (DIFF) between the Forepoint SPN (H2) and the Standpoint SPN (H1) in meters is computed by:

DIFF (H2-H1) = Forepoint(H2) - Standpoint(H1)

or the elevation of the Forepoint SPN is computed by:

Forepoint(Elevation) = Standpoint(Elevation) + DIFF

MTEN 3 -- BLUEBOOK PROGRAM SCHEMATIC

DATE: 850901

```
                                                                    BBKDOC
ABSINX GETREC          ............................................ LSTSUM
   STRJSI          ............................................... LSTJSI
   STRSPN /STRNAM,STRGPN,STRHGT/       ............................ LSTGPN
      ABSAST /GETABS/ GETAST.(ASTCTR /ASTCHK,ASTTME,ASTRAD/)..(WRKAST)
      ABSDST /GETABS/
      ABSEDM /GETABS/                ........................ (WRKEDM) LSTDST
      ABSHGT /GETABS/ (GETROD)
      ABSHZT /GETABS/  ....  (ADJSTA /GETSTA,LSTSTA/)  ............... LSTNET
      ABSLGH /GETABS/ (GETBAY)
      ABSZEN /GETABS/
         Abstract Listing(s)    ..................................... LSTABS

         GETTRI     ....................... (WRKTRI) ....... (WRKCHK) LSTTRI
                                                          (WRKGPN)
         GETDES /GETTXT/  (GETBOX)  ................................. BBKDES
                                                                    BBKOBS
                                                                    LSTBBK
                                                                    LSTNDX
                                                                    LSTDAT
                                          (ADJZEN) ... (ADJNET) ... ADJUST
```

(NAME) -- Computational Commands
/ NAME / -- Subroutine Callable Programs