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STANDARDS AND CONVENTIONS FOR THE TOPS USER INTERFACE

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Energy Division

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ACRONYMS

CTRL	Control (specifically the control key)
MTMC	Military Traffic Management Command
ORNL	Oak Ridge National Laboratory
PSL/PSA	Problem Statement Language/Problem Statement Analyzer
TOPS	Transportation Operational Personal Property Standard System

ABSTRACT

The Transportation Operational Personal Property Standard System (TOPS) is an automated information management system to help administer the personal property transportation program for the Department of Defense. Prototype testing at four field sites is planned for the late summer of 1988.

These standards are written to ensure that the user interface for TOPS is consistent among modules, easy for the user to understand, and efficient to use. The standards provide guidance to TOPS analysts in the design of screens, the programming of function keys, and the implementation of user instructions, error messages, and help files. In cases where flexibility is more important than consistency, optional conventions are suggested.

1. INTRODUCTION

1.1 BACKGROUND

The Military Traffic Management Command (MTMC) operates the personal property transportation program of the Department of Defense at military bases throughout the continental United States and overseas. Currently, labor-intensive manual methods are used for data storage and retrieval, and over 2000 forms and reports are needed for management information. Imperfections in the system remain a sore point for thousands of armed service personnel whose household goods are mishandled in the shipping process.

In 1983, Oak Ridge National Laboratory (ORNL) agreed to apply its expertise to the design of an integrated, automated information management system to help MTMC better administer the program. The resulting system, called Transportation Operational Personal Property Standard System (TOPS), was demonstrated as a limited working model in 1986. Software tools used to develop TOPS included Problem Statement Language/Problem Statement Analyzer (PSL/PSA),¹ ORACLE Database Management System,² and the UNIX operating system.

TOPS contains five modules for use by the field transportation offices. Current efforts on TOPS are directed at completing prototype development. Working prototypes for all five modules will be provided to four field sites and satellite offices in the summer of 1988.

1.2 PURPOSE

The ultimate success of the TOPS project will depend on the completeness and accuracy of the databases and applications and also on the effectiveness of the interface between the system and the users. Users must find the system easy to learn and simple to use. The TOPS user interface addresses design issues in three functional areas: screen displays (i.e., menus and data screens) and output (hard-copy forms and reports), keyboard functions, and user assistance (i.e., user instructions, error messages, and help screens). Throughout the design of the user interface, response time has been a consideration. It is anticipated that the average time to execute a single command (e.g., data base searches or screen access via keyword) will take no longer than 3-4 seconds. (Unfortunately, some commands take as much as 10 seconds to execute.)

¹Developed by ISDOS Inc. of Ann Arbor, Michigan.

²Trademarked ORACLE Corporation, Belmont, California.

The purpose of this document is to establish standards and conventions for use in the design of the user interfaces to the TOPS program and to suggest approaches and techniques which will lead to a consistently good human interface for those system elements that are under the control of the design team. This document will not attempt to explain the functionality of TOPS; other documents and manuals will serve that purpose.

Some important details of the user interface are hardware dependent. The specific hardware configuration for TOPS at a particular site varies depending on the needs of the site. A "typical" configuration, however, for a typical base consists of the Unisys 5000/80 computer and a sufficient number of each of the following devices: Unisys PC-IT microcomputer, Unisys UVT-1224 terminal, Unisys laser printer model 37, Unisys line printer Q300, and associated support hardware and software.

1.3 ASSUMPTIONS

When implemented, TOPS must be able to satisfy the needs of a wide range of personnel with differing keyboard skills, varying degrees of experience with computer systems, and different levels of understanding of transportation regulations. The following assumptions were used in establishing standards and conventions for the TOPS user interface:

1. The majority of users have little previous experience with interactive computer systems, but many are experienced typists. (Data entry is performed primarily on the alphanumeric keys; however, use of function keys requires leaving the home position on the keyboard.)
2. Most users have little or no need to use the functions of the ORACLE database management system directly.
3. Users will rapidly become familiar with the system design and will develop necessary keyboard skills to use the system efficiently.
4. Users will occasionally be required to use parts of the system with which they are not familiar.
5. The TOPS screens and programs will not be responsible for teaching users the transportation business; however, TOPS should make their efforts easier and more consistent.
6. Security is not an issue to be considered in the design of the screens and keyboard functions. User sign-on procedures will ensure that the user can access only those areas of TOPS for which the user is authorized.
7. Regulations included in the Privacy Act will be followed in the TOPS design.

2. SCREEN DESIGN

Good screen design depends on many factors. Because of the complexity of the TOPS project, one of the most important features is consistency of design among screens. For maximum user friendliness, information that is common to several screens is located consistently on the screens among the applications. If a user is expected to perform a certain sequence of actions to complete a task in one application, the same sequence of responses is followed in all similar tasks. If a particular format is needed frequently on TOPS screens, it is used consistently throughout TOPS.

A number of audio and video display options can be used to enhance a user interface.¹ Both audio and video display options will be used sparingly in TOPS. The only auditory stimulus will be a beep. This beep will call the user's attention to certain messages or actions (e.g., the beep alerts the user about an input error). Inverse video will be incorporated as specified below, and the other video options will not be used.

When the user first logs on to TOPS, the welcome logo is the first screen viewed. This screen is automatically replaced by a single screen containing information about the Privacy Act. Because access to TOPS implies access to data that falls under the purview of the Privacy Act, the purpose of this screen is to inform the user of his/her responsibilities. The user will press a function key to indicate readiness to continue to the third screen.

The third screen that the TOPS user views is the first menu screen. This menu may be the TOPS main menu or it may be a module main menu. Users who receive the TOPS main menu have access to all of TOPS, while those who access a module main menu have access to all of that module but to no other modules of TOPS. It is potentially possible to limit access to only a portion of a module. This limited view serves as a security measure; that is, the user cannot access any portion of TOPS

¹Some computer programs incorporate auditory stimuli, such as musical tunes or caricatures of naturally occurring sounds. In addition, video options, such as underlining, inverse display, high intensity (boldface), blinking print, and varying type sizes, are available on many terminals and can be used to emphasize important features. Use of these options is subject to both hardware and software limitations, however. Also, overuse of display options can produce confusion rather than the desired emphasis. In general, the objective should be to provide unobtrusive yet effective emphasis of important features.

above his/her log-in position. For ease of presentation, the remaining discussion assumes that the user has top-level log-in capabilities.²

At this point, the user's purpose is to arrive at an application (data) screen. The user may progress through a series of menu screens or may enter a keyword to view the data screen.

2.1 MENUS

The TOPS user moves through a sequence of menus to arrive at an application screen. Each module is limited to a maximum of three menu sublevels. Thus, a user could move through a maximum of five menus (counting the TOPS main menu and the module main menu) before arrival at a data screen.³

The number of options per menu is limited to a maximum of seven with a target range of four to six. A menu option for returning to the previous menu is unnecessary since the EXIT key provides this option.

A standard menu layout is illustrated in Fig. 1. There are five functional areas in the menu: heading, menu options, option information line, command lines, and error/help/ORACLE status information area. These areas are discussed below.

2.1.1 Functional Areas

2.1.1.1 Heading. Lines one through three are reserved for a status banner. The top line is presented in inverse video; the second is a horizontal rule; and the third is a blank line. This header indicates the location of the user within the system (see Fig. 1). The right-hand block of the header is the title of the menu or data screen being displayed. The left-hand block represents the user's "root" or log-in position in the menus [i.e., TOPS main menu, a module main menu, or (possibly) one entry level below the module main menu]. Entries in the header are in capital letters. This heading is identical in format throughout all menus and data screens. (For additional information on the heading banner, see Sect. 2.2.1).

2.1.1.2 Menu Options. Menu options (lines 4 through 16) are limited to a single line, and entries are double spaced. The menu list is aligned flush left, and the entire block of entries is centered. This block appears in inverse video.

²"Top-level" for a typical TOPS user implies log-in at the TOPS main menu level. The TOPS system administrator at a site will have a higher level of access.

³The user could also move directly to an application screen through use of a keyword (see Sect. 2.1.2.3).

line number	1	8	8	8	8	42
1		COUNSEL				SAMPLE This is a Sample Menu Screen
2						
3						
4-16	 → 1. KEYWORD: Perform a task 2. UNIQUE: Do Something 3. PATMGT-C: Print Management Reports for Counseling 4. GO FORTH: Switch to a New Topic 5. START: Start a Job 6. FINISH: Complete a Job 					
17						
18	This is the comment that describes menu choice 1.					
19						
20						
21	Enter Menu Selection Number Here: <input type="text" value="1"/> or Enter Keyword Here:					
22						
23	Enter a number or use the arrow keys. Press SELECT after making your selection.					
24	Char Mode: Replace		Page 1		Count: x0	

Fig. 1. Standard TOPS menu screen.

Each menu choice is numbered. The number is followed by a period and two spaces. The keyword, which consists of no more than eight characters, is in capital letters and is followed by a colon. The colon is followed by a single space and the description of the menu option. The description begins with an active verb and has no end punctuation. When the menu is first accessed, a pointer is to the left of the first menu option. This pointer indicates the selected option. The pointer is moved through use of the up and down arrow keys or by typing a different number into the menu selection box on line 21.

2.1.1.3 Option Information Lines.⁴ Line 17 is blank. Line 18 is reserved for display of additional information concerning the highlighted menu option. The display in this area changes to correspond to the option selected. Information concerning the menu item will be contained in this single line. If more information is needed, it will be provided as a help screen (see Sect. 4). Line 19 is a horizontal rule.

2.1.1.4 Command Lines. Lines 20-22 are reserved for user input. Line 20 is blank; line 21 has two fields in which the user may enter a choice. In the first field, he/she may enter a menu option number or may select an option using the arrow keys to move the pointer. The second field is for a keyword. Whether the user decides to make a choice using the first field or the second on line 21, the choice must be followed by pressing SELECT (see Sect. 3.2). Line 22 is blank.

2.1.1.5 Error/help/status Lines. Line 23 is reserved for error messages and standard information on how to proceed. Line 24 describes the status of the screen [e.g., type of mode (insert, update, delete) and page number of the particular application).

2.1.2 Selection of Menu Options

To provide maximum flexibility, the TOPS user interface provides three alternative methods for user selection of menu options. These methods are (1) entering the number of a menu selection, (2) cursor pointing to the desired menu choice using the arrow keys, and (3) entering a command string consisting of a keyword.⁵ Each of these options is described in the following subsections.

2.1.2.1 Entering the number of the desired menu selection. The simplest method for novice or infrequent users is to select items from a menu of choices. This method will be the primary one used during the initial training phase. Some users may prefer this method even after

⁴Studies have shown that the display of information concerning the options available in the next menu level significantly benefits persons learning to use a menu-driven system. TOPS provides for the display of this type of information on the "option information line" (line 18). The information contained in this line must be as informative as possible; it should be more than just a repetition of the menu item.

⁵Menu-driven interfaces are best suited to the needs of novice or infrequent users. Command-driven interfaces are best suited to the needs of experienced users who are familiar with the system and wish to avoid the time delays inherent in navigating through a series of menus.

they become familiar with the system. Menu selections will be identified by numbers.⁶

To proceed through the menus using this method, the user accesses each menu screen one by one. When the menu first appears on the screen, the pointer indicates the first menu option. The number of the first menu option is given as the option of choice on the command line (line 21), and the option information line (line 18) describes the first menu option. The cursor first appears in the one-character field on line 21, following the prompt to "Enter Menu Selection Number Here" prompt. After viewing the menu options, the user enters the number of the desired choice. The pointer moves to indicate the chosen selection, and the option information line displays information about the choice. When the user is ready to proceed, pressing SELECT clears the screen, and the menu or data screen for the selected option appears.

2.1.2.2 Cursor pointing using the arrow keys. When a menu is initially displayed, the pointer will indicate the first menu item. The cursor keys (up arrow and down arrow) can be used to move the pointer. As the pointer moves, additional information about the highlighted option is displayed on line 18, and the number in the command field on line 21 changes to correspond with the selection. If the user moves the arrow beyond the last menu choice, the pointer returns to choice 1. After the user moves the cursor to the desired item, pressing SELECT causes the screen to clear and the menu or data screen for the selected option to appear.⁷

2.1.2.3 Entering a keyword representative. Designed to accommodate the experienced user, this option allows entry of a command (keyword) which results in more rapid selection of a desired TOPS function.⁸ In designing menus for the initial implementation, an appropriate keyword corresponding to each menu selection will be identified and indicated by

⁶Because inexperienced typists are generally able to find the number keys more easily than the letter keys, selection by number rather than by letter usually results in fewer errors.

⁷Even for experienced users, this method of selection may be chosen because of its ease. In systems for which the sequence of choices are well represented by keywords, however, it is believed that users will eventually choose to select their option via a command string.

⁸Research has indicated that as users of interactive computer systems become familiar with the functioning of the system, they become increasingly frustrated by the delays inherent in navigating through a series of menus when they know exactly which functions they want to carry out.

use of upper-case letters followed by a colon and the usual menu description. The menu screen includes a request for a keyword on line 21.

To use the keyword command feature, the user presses NEXT FIELD to move the cursor from the first enterable field on the menu (i.e., "Enter Menu Selection Number Here:") to the second enterable field (i.e., "Enter Keyword Here:"). If the user reconsiders and decides to select by number or cursor pointing, pressing PREV FIELD or NEXT FIELD returns the user to the menu selection number field.

A keyword is limited to eight characters, including any spaces. This length is sufficient to identify an application but is short enough to type quickly. Special characters should not be used, although a hyphen is acceptable. The keyword used to identify the menu option must be unique in TOPS and should be easily related to the menu option. If the same keyword seems appropriate for more than one menu option (e.g., PRTMGT is an obvious keyword for all menu options that specify production of printed management forms), the keyword will be made unique by attaching a module code (e.g., PRTMGT-C for PRTMGT-Counseling). If a keyword is unique throughout TOPS, then no module code is attached to the keyword.

The exact keyword must be entered in order to arrive at a particular menu or data screen. It is possible to proceed from a position within any menu to any other menu level or data screen in TOPS (within the constraints imposed by the security level of the user). Typing a keyword associated with a menu or data screen, followed by pressing SELECT, takes the user immediately to that screen. If the user wishes to return to the log-in (or "root") directory, typing a slash (/) or the keyword TOPS at the "Enter Keyword Here:" prompt and pressing SELECT is sufficient.

If a user types a nonexistent keyword, the system responds with "Nonexistent keyword entered. Reenter keyword or use menus for selection."

The keywords used in menu selection will be the keywords used in the heading banner (see Sect. 2.2.1). To ensure consistency in menu design and simplicity in command structure, keywords must be carefully chosen. An actual word or well-known abbreviation or acronym is preferable to a "keyword" which has been manufactured, through the omission of vowels, to fit into the eight-character limit. Some suggested keywords are listed in Table 1.

Table 1. RECOMMENDED KEYWORDS

Function or module	Keyword
Counseling	COUNSEL
Inbound	INBOUND
Outbound	OUTBOUND
Nontemporary Storage	NTS
Quality Assurance	QA
Handle In	HI
Handle Out	HO
Route a Shipment	ROUTE
Book a Shipment, Outbound module	BOOK-O
Book a Shipment, NTS module	BOOK-N
Administrative Functions	ADMIN
Update Member/Shipment Records	UPDATE

2.2 DATA SCREENS

The screens on which data entry, retrieval, and manipulation are performed are termed "data screens" (as opposed to menu screens). The menus lead the user to the desired data screen. Most TOPS applications contain between one and six screens, although there may be as many as 17. Foremost in both menu and data screen design is the need to provide a logical work flow.

To proceed from one screen to the next, the user must press one of two function keys -- either NEXT PAGE or SELECT. These keys function differently and are not interchangeable. (For a discussion of these keys, see Chap. 3).

Figure 2 shows a standard data screen. Note the three functional areas -- heading (lines 1-3) which identifies the user's location in the system; data input/output area (lines 4-22); and error message/field help and ORACLE status area (lines 23-24). To provide continuity, the data screen is very similar in design to the menu screen.

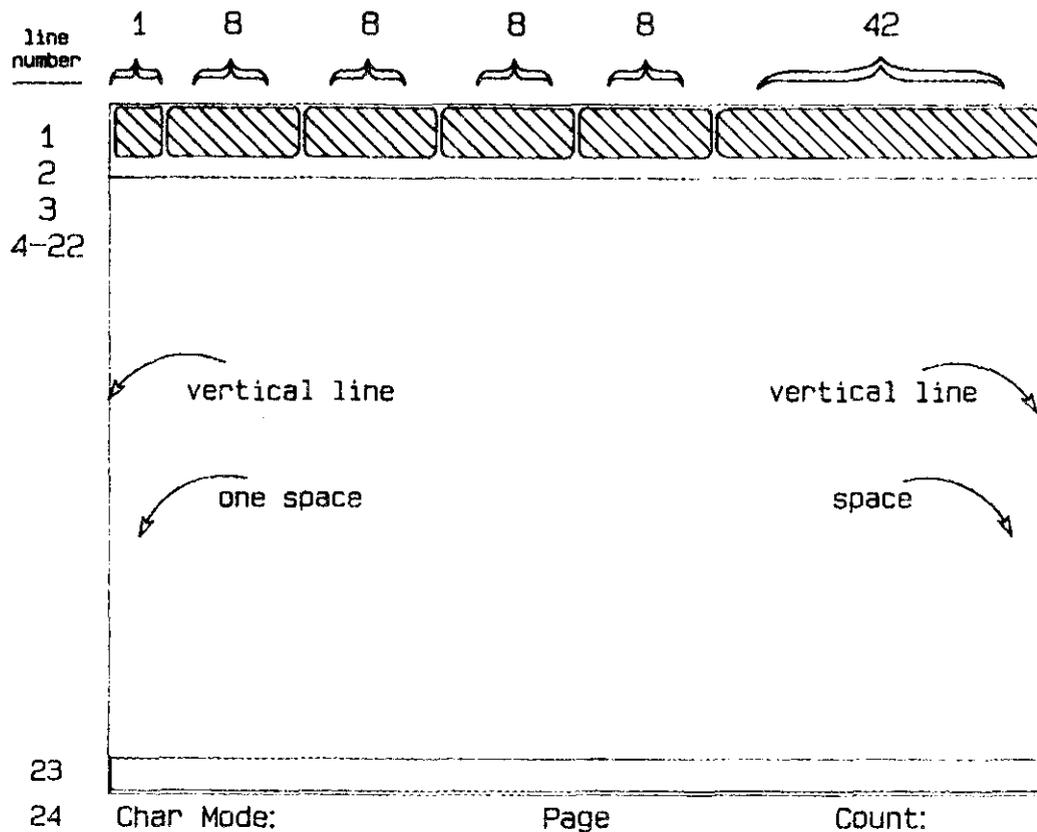


Fig. 2. Standard application (data) screen layout. Note the extension of the vertical lines along the sides of the screen to connect functional areas.

The information included in data entry screens is based on forms currently in use at transportation offices and on the functionality needed to accomplish TOPS goals. Because TOPS consolidates redundant information and eliminates unnecessary forms, the layout of the TOPS data screen is new in appearance to experienced military transporters.

Many of the data items to be entered are of fixed format (e.g., social security numbers, phone numbers, dates). However, the majority of the information to be entered on the data screens is of variable length and must be terminated by a NEXT FIELD keystroke. Terminating all data entry with a NEXT FIELD keystroke, or, in some cases as noted, by a SELECT⁹ keystroke (Sect. 3.2), provides a consistent method of data entry.

⁹Although the fixed-format fields could be designated for automatic skip to the next field when the required number of characters have been entered, TOPS will not use automatic skip. Forcing the use of NEXT FIELD at the end of every data entry field will prevent inadvertent skipping of fields resulting from pressing NEXT FIELD following entry of data into a field designated as auto-skip.

2.2.1 Heading

The heading, which occupies the first three lines of the screen, identifies the user's progress through menu and data screens. The first line is the heading banner; line 2 is a horizontal rule; line 3 is blank. The far right section always names the current position. Thus, a user always knows the current location within TOPS. Pressing EXIT takes the user to the previous menu level as shown in the heading. An example of progression through menus to an application level is given in Fig. 3. Throughout the following discussion, it is assumed that the user has access to all of TOPS and will enter the system at the TOPS main menu. If TOPS is not the user's highest menu level, then the highest menu level is represented by the slash (/), and the same philosophy applies for the remaining keywords.

Menu level	TOPS heading banner
1	_____/ : TOPS Main Menu _____
2	/ _____ NTS: Nontemporary Storage Main Menu _____
3	/ NTS _____ BOOKING: Book/Record Shipping Data _____
4	/ NTS BOOKING HI: Perform Handle-In Functions _____
5	/ NTS BOOKING HI DD1164HI: Print DD 1164 -- Handle-In _____

Fig. 3. Progression through menus to a data screen level. In this example, menu level 1 is the TOPS main menu; menu level 2 is a module main menu; menu level 5 actually represents the heading for the data (i.e., application) screen.

The heading banner is in inverse video. All keywords are in capital letters. At the TOPS main menu, the left block of the heading banner is blank and "/: TOPS Main Menu" is in the right-hand block. At the second level of menu selection, a slash (/) appears in the first block on the left (one available space) and the title of the second-level menu (i.e., the module name) is in the right-hand block (42 available spaces). At the third level of menu selection, the module keyword will appear in the second block (eight available spaces). Each of the next three blocks in the header have eight available spaces. Unique keywords associated with the menu options and applications (Sect. 2.1.2.3) identify the path to the current screen.

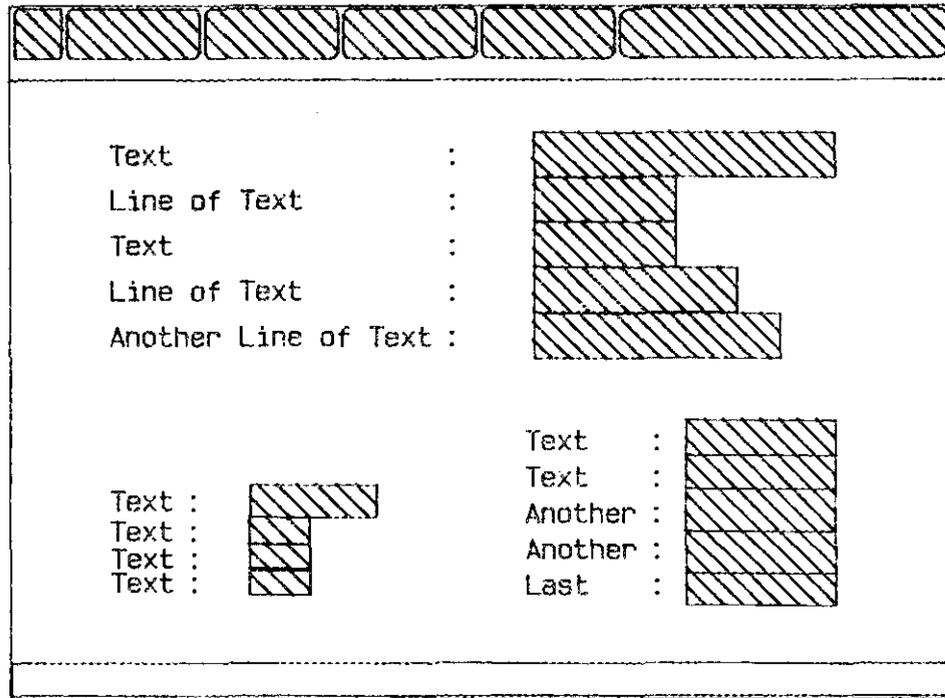


Fig. 4. Sample layout of data entry/output area.

2.2.2.1 Overall Density. In general, an overall density of about 25% for screen displays is considered ideal (about 480 characters on a 24 x 80 character screen). The TOPS data input/output space has a 19 x 76 character area available (i.e., the total screen excluding the header and error/help areas and the vertical lines and spaces on each side). Thus, the overall density can be measured as follows:

high	>450 char	31%
ideal	360 char	25%
low	<230 char	16%

Note that this "ideal" is a generalization of good screen design; most of the TOPS screens (though not all) are tabular in layout and, therefore, can be more dense. A good rule of thumb is to keep the overall density as low as possible while still including all the relevant subject information for that screen.

2.2.2.2 Grouping. Grouping of entries on a screen must be carefully considered. A small number of groups of information on each screen is easier for the user to complete than is a large number of

individual items. Figure 5 shows one method for grouping using horizontal and vertical lines. A similar effect can be accomplished using blank lines. Asterisks, hyphens, or other symbols are not used to divide the screen into groups. If solid lines are used for grouping, the data entry portion of the screen is not divided into more than three areas.

The figure shows a terminal window layout. At the top, there is a header bar with six shaded rectangular segments. Below this, a horizontal line separates the top section from the bottom section. The top section contains two columns of text. The left column has three lines: 'Text :', 'Text :', and 'Line of Text :'. Each line is followed by a shaded rectangular box containing the word 'stuff'. The right column has two lines: 'More Text :' and 'And Last :', each followed by a shaded rectangular box containing the word 'stuff'. The bottom section contains three lines of text: 'This is a Line of Text :', 'Here is Another :', and 'Another and Another :'. Each line is followed by a shaded rectangular box. The first box contains the word 'enterable', the second contains 'fields', and the third is empty. Below these three lines, there is a single line of text: 'This is an instruction.'

Fig. 5. Example of grouping of text. Note that the horizontal line divides the screen into areas of nonenterable fields above (i.e., data retrieved from the data base) and enterable fields below.

Single spacing is used within groups, double spacing between them. Deciding which format for grouping is best for each data screen is the responsibility of the TOPS analysts, with guidance from the TOPS user interface designer.

When some data screens are accessed, certain fields are already completed as a result of a query of the data base. These fields are displayed to the user but are not accessible by the user. These data, which are most often record identification information, are usually displayed at the top of the screen in a standard format. They are set off from the enterable fields with a horizontal line. When the screen appears, the cursor is in the first enterable field under the horizontal line. An additional blank line is coded below the horizontal line. If

space permits, a blank line may also be coded above the horizontal line. The standard format for display of this identification information is given in the examples below.

Name : Last (17 sp), First (15) Middle/MI (15) SSN: (11 sp)

Name : Last (17 sp), First (15) Middle/MI (15) SSN: (11 sp)

Branch: 1 Orders No.: (10 sp) Ship. No.: 2

The top line always contains the member's name and social security number. The second line, which may or may not be present, consists of different standard information depending on the module; for example (see second example above), the second line may include branch of service, orders number, and shipment number, or it may include other fields as needed. If the analyst determines that a second line of record information is not necessary, the horizontal rule following the standard name-and-social-security-number line should be omitted. An extra line of space under the name and social security number is still needed. The analyst for each module is responsible for determining which fields are most useful to the transportation clerk who will be using that module. It is this information that will appear on the second line. Each analyst is also responsible for determining which data screens require the standard record identification information as described in this paragraph. If standard record identification information is needed, then the first line must be in the order given in the examples above.

Screen complexity can effectively be reduced by the use of a small number of horizontal positions (i.e., "tab stops") for the beginning of field prompts and data fields. Each line should normally be limited to a maximum of two columns, where each column consists of a field prompt and a data field. Exceptions may be made for items which are customarily grouped together (e.g., city, state, and zip code).

The use of subheadings for groupings is optional. When subheadings are used, they appear centered over the groupings in upper- and lower-case letters, with no punctuation. They are not underlined.

Most data elements will be stored and displayed in upper-case letters because ORACLE is case sensitive. However, field data entry will not be dependent on the format chosen by the user because critical data elements (i.e., member's name, alphabetic codes, etc.) are always coded by TOPS programmers to be converted to upper-case letters. User comments can be entered and stored in a user-determined format. Input field format for common items such as addresses, social security numbers, phone numbers, dates, etc., were standardized among the modules by the TOPS data base designer.

2.2.2.3 Formatting of text and data fields. The formatting of text and data fields among the TOPS data screens adhere to the following conventions.

1. All text groupings are aligned left. All field prompts of a particular grouping are aligned left. The colons following the field prompts are vertically aligned, and one space follows the colon. The column in which the colons appear is determined by the length of the longest field prompt; the colon immediately follows the text of this field prompt.

2. All text in this area of the screen is formatted in upper- and lower-case (i.e., the first letter of every important word is capitalized).

3. All data fields in a particular grouping are aligned left.

4. If the data screen has only a few short entries, these entries are aligned left, and then the block is centered on the screen.

5. If an instance occurs which involves entering numeric data that will be arithmetically manipulated by the user (adding, subtracting, etc.), these fields and their data are aligned right or (if there is a decimal) on the decimal.

6. When a field identifier refers to a member's name, it is not necessary to use the prompt "Member Name." "Name" is sufficient. When referring to agent, carrier, or contractor, however, the proper field identifier is "Agent Name," "Carrier Name," or "Contractor Name."

7. The prompt "Phone" is preferred to "Phone Number" or "Phone No."

8. The abbreviation "No." is used in prompts such as "Orders No." or "Amendment No." For a construction such as "Number of Items," the spelled out version is preferred if possible (within space constraints).

For consistency, certain words and/or terms should always be abbreviated in the user instructions, in prompts, and on the formatted reports. A listing of these words and their abbreviations is given in Table 2. Note that abbreviations are followed by a period and acronyms are not. Some words and terms should not be abbreviated; for example, the abbreviation "Req." should not be used because it could be read as either "required" or "requested." Abbreviations that are not well-known to the users in the transportation offices are avoided (for example, COS for "Code of Service"). If an acronym or abbreviation is acceptable for a word or words, it should be used as consistently as possible.

The last one or two lines of the data input/output area may be needed to provide the field user with additional instructions for proceeding (e.g., "Press COMMIT to enter data into the database." or "Press COMMIT before proceeding to the next page." or "To proceed to next screen, press NEXT PAGE.")¹⁰ Note that these instructions, which are always centered, are written as sentences; only the initial word is capitalized, and the instruction ends with a mark of punctuation. Names of function keys are always designated in all-capital letters.

¹⁰These instructions are kept to a minimum. If an application needs more than two lines of instructions, the application is usually redesigned to decrease screen complexity.

Table 2. RECOMMENDED ABBREVIATIONS AND ACRONYMS

APO	Air post office
BLB	Bluebark
BOA	Basic ordering agreement
BPA	Blanket purchasing agreement
CDR	Contract discrepancy report
CERS	Carrier evaluation report system
CONUS	Continental United States
CTT	Cost and transit time
DITY	Do It Yourself
DODAAC	Department of Defense activity address code
DPM	Direct procurement method
DTGBL	Domestic TGBL
ETA	Estimated time of arrival
FPO	Fleet post office
GBL	Government bill of lading
GBLOC	Government bill of lading office code
GOC	Government-owned container
HHG	Household goods
HQ	Headquarters
ICC	Interstate Commerce Commission
ITGBL	International TGBL
ITO	Installation transportation officer
JFTR	Joint Federal Travel Regulations
LOI	Letter of intent
MDC	Movement designator code
MH	Mobile home
MI	Middle initial
MTMC	Military Traffic Management Command
MIA	Missing in action
NMF	Navy management fund
NTS	Non-temporary storage
PBF&E	Professional books, papers, and equipment
PCS	Permanent change of station
POD	Port of debarkation
POE	Port of embarkation
POV	Personally-owned vehicle
PPSO	Personal property shipping office
QA	Quality assurance
RDD	Required delivery date
RIP	Reduction in payment
RSMO	Regional storage management office
SCAC	Standard carrier alpha code
SIT	Storage in transit
SPLC	Standard point locator code
SSN	Social security number
TAC	Transportation account code

Table 2 (continued)

TAD	Temporary active duty
TCMD	Traffic Control Management Document
TCN	Transportation control number
TDR	Traffic distribution record
TDY	Temporary duty
TELEX	Automatic teletypewriter exchange service
TGBL	Through government bill of lading
TMO	Transportation Management Office
TO	Transportation officer
TWX	Teletypewriter exchange
UB	Unaccompanied baggage
access.	accessorial
acct.	account or accounting
accum.	accumulated
act.	action
addl.	additional
addr.	address
admin.	administrative
allow.	allowance
altern.	alternative
amend.	amendment
amt.	amount
approp.	appropriation
appt.	appointment
auth.	authorized
avail.	available
carr.	carrier
cert.	certification
chrg.	charge
compl.	complete
consol.	consolidated
constr.	constructive
cont.	contractor
conv.	converted, conversion
debark.	debarkation
del.	delivery
depn.	dependent(s)
desc.	description
desig.	designated
dest.	destination
detach.	detachment
discrep.	discrepancy
dom.	domestic
embark.	embarkation
entlmnt.	entitlement
est.	estimate, estimated
eval.	evaluation
exp.	expense, expensive

Table 2 (continued)

govt.	government
id.	identification
info.	information
init.	initial
instr.	instruction
inter.	interstate
intl.	international
intra.	intrastate
max.	maximum
mbr.	member
mi.	miles
mid.	middle
min.	minimum
mod.	modification
msg.	message
no.	number
ord.	order, orders
orig.	origin, original
%	percent or percentage
para.	paragraph
pro.	professional
pro. gear	professional "gear"
pt.	point
qtrly.	quarterly
recd.	received
redist.	redistribution
relatn.	relationship
rem.	remark
rpt.	report
sched.	schedule
svc.	service, serviceable
ship.	shipment
sol.	solicitation
spon.	sponsoring
stg.	storage
temp.	temporary
ton.	tonnage
trans.	transaction
transl.	translation
unaccom.	unaccompanied
unserv.	unserviceable
wt.	weight
Y/N	yes/no

The following convention is used to format multiple records that must be scrolled (Fig. 6).

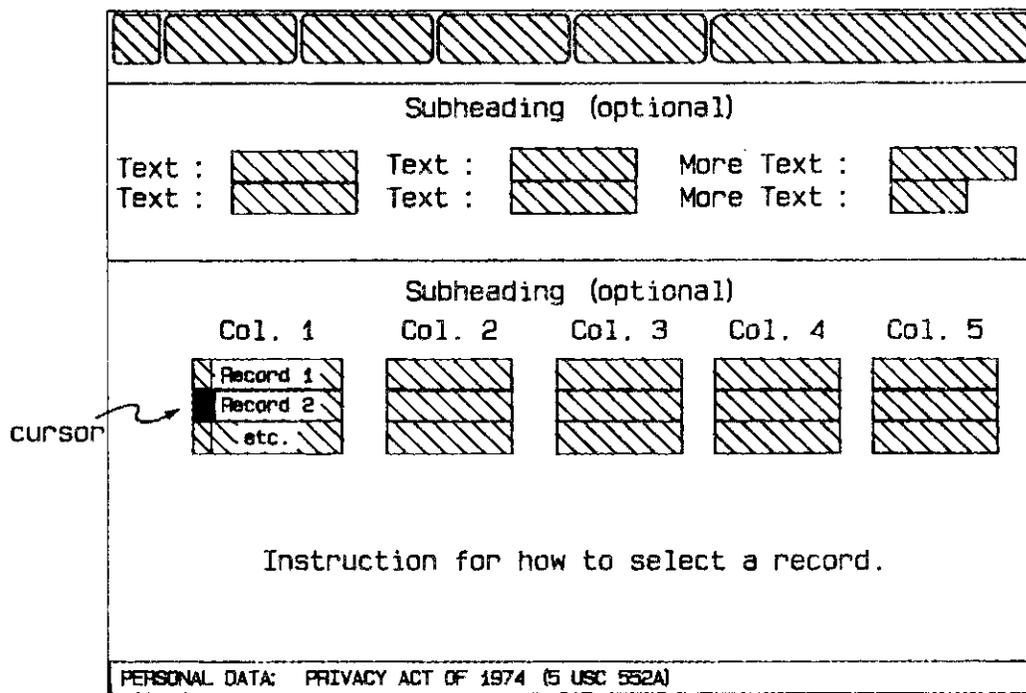


Fig. 6. Sample screen design for multirecord display.

1. Headings (in upper- and lower-case letters) will identify each column of material to be displayed.

2. A column for the cursor is aligned left. There is no space between this cursor column and the first letter of the entry in the first column of the retrieved record. The user is not able to enter data in this cursor field.

3. The instruction to the user is "Use arrow keys to move between records; then press SELECT." or "Use arrow keys to move to desired shipment; then press SELECT." (This procedure makes searching through records much like searching the menu listings. Only the up arrow and down arrow are used.)

4. For multirecord screens, there are no blank lines between records. When the user indicates a selection by pressing SELECT, an

asterisk appears in the cursor position. The SELECT key acts as a toggle, and the user can deselect a choice (and remove the asterisk) by pressing SELECT a second time.

For scrolling through multiple records, each of which is a separate screen, the user uses the arrow keys to move between records and presses the SELECT key to retrieve the desired record.

The analyst has coded the data screen to prevent the user from entering material into a field that would corrupt the data base. The analyst codes the input/output area of the data screens to provide a logical work flow, leading the user to enter, exit, retrieve, etc., as appropriate.

2.2.3 Error Message and Help Area

Lines 23 and 24 are reserved by ORACLE for help/error messages and status information. Some messages are automatically supplied by ORACLE and can be confusing to the user of TOPS, who is not expected to be versed in ORACLE jargon. As much as possible, the user is being protected from the confusing messages through additional coding to prevent their appearance on the screen. Additional messages can also appear on line 23. Some of these will be coded to appear automatically, and some will be coded to appear when the user presses HELP (Sect. 4).

Line 23 is also used to convey precautionary messages to the user regarding the Privacy Act. Any time the user must enter data or access records containing data that are covered by the Privacy Act,¹¹ a warning message appears in the inverse video area of line 23. The message states the following, "PERSONAL DATA - PRIVACY ACT OF 1974 (5 USC 552A)." This message is displayed until another message replaces it or until a different screen is displayed.

2.3 Printed Forms and Reports

TOPS can produce two types of official reports. One is official numbered forms (usually multicopy). The second is reports (potentially multicopy) that are formatted for printing on "white paper." The Government Bill of Lading (SF-1203) and the Service Order for Personal Property (DD-1164) are examples of official numbered forms. The Daily Inspection Schedule and Shipment Status Report are examples of formatted reports. A tentative list of the hard-copy forms and reports (both numbered forms and formatted reports) that will be produced by TOPS is given in Appendix A.

¹¹The Privacy Act warns against disclosure of "any item, collection, or grouping of information about an individual ... that contains his name, or the identifying number, symbol, or other identifying particular assigned to the individual, such as a finger or voice print or a photograph."

The ORACLE report writer utility (ORACLE.rpt) is used to generate all printed forms and reports. Although ORACLE.rpt is relatively slow, all code is written with efficiency in mind. When the user must wait for the system to gather the data and prepare for printing, a message appears on the screen instructing the user that the system is "Working...."

When ready to print a form, a user accesses the screen on which the form may be requested. These screens are located within each module. Additional information (such as dates) may or not be required in order to identify the appropriate data to print. If additional data are needed, the user is asked to supply the data. The user also specifies the printer number (identifying either laser or line printer) and verifies that printer paper or the appropriate form is in the printer. Screens on which the user selects the desired print options are consistently designed.

After requesting the form to be printed, the user exits the screen for defining print options. The user is then returned to the previous menu level.

TOPS is designed to allow the user to print both individual and batch jobs. There is also a corrected copy (or reprint) function for those reports for which this capability is needed.

The ability to obtain hard-copy printout of TOPS data is a function of the user's security clearance. A user can request that a form be printed if the user can log into the area in which that form is requested.

From time to time, a TOPS user may wish to print a "screen dump" of data that is displayed on the screen. Pressing ESC P will display a list of print options. The output will be routed to the user's default printer. This "screen dump" is not an official TOPS output and is not considered part of the TOPS printed forms and reports.

Over 100 official TOPS output products have been defined. About 60 of these forms and reports will be available when the prototype is fielded in late summer of 1988. The reports are produced on request, and the requester determines which printer will be used. The screens on which the user inputs his requests are consistently designed to minimize the chance of error. Finally, reports that were designed by ORNL (i.e., all reports that are not preprinted forms) were designed with consistent conventions. All output products conform with the requirements of the Privacy Act.

3. KEYBOARD FUNCTIONS

The keyboard is the primary source of input to the TOPS system. Because of the anticipated broad range of user keyboard skills, the system must be able to accommodate the needs of novice as well as experienced typists. The purpose of these standards is to provide consistency in programming the keyboard for the TOPS user.

3.1 KEYBOARD DESCRIPTION

The TOPS hardware configuration calls for two Unisys keyboards: one for the UVT-1224 terminal and one for the PC-IT microcomputer. The keyboards are very similar in layout, and both are similar to the VT-220 keyboard. The UVT-1224 is shown in Fig. 7. There is a standard typewriter keyboard and a numeric keypad with four arrow keys. Function keys across the top of the keyboard and on the right side are reprogrammed to perform specific TOPS functions (see Fig. 8). Templates will be provided to users to aid them in use of the function keys (Fig. 9).

Although the UVT-1224 terminal and PC-IT microcomputer keyboards are equipped by the manufacturer with standard VT-220 key names (e.g., TAB, FIND, INSERT HERE) and function key numbers (F1, F2, F3, etc.), TOPS on-screen and user manual instructions do not use these standard VT-220 key names. Instead, users will ignore the VT-220 key names and follow the TOPS keyboard template to locate key functions. Thus, an instruction will read "Press FIELD HELP" rather than "Press F6."

The TOPS function keys have the following features. Each key performs a single function (e.g., "EXIT" or "COMMIT"). This assigned function will remain consistent throughout various tasks and transactions. For example, "NEXT PAGE" will do nothing more than move to the next page. The keys labeled SPECIAL 1 and SPECIAL 2 will be used for miscellaneous, infrequently used functions (as explained by the analyst to the user via screen messages -- e.g., "Press SPECIAL 1 to enter another split portion number."). If it is absolutely necessary to change the action of the programmable function keys, instructions at the bottom of the screen tell the user which key to press for the specialized function.

The function key assignments for the TOPS keyboard are grouped according to function, importance, and frequency of use.

Keys for similar actions are grouped together. For example, the cursor movement keys (the arrow keys, backspace, NEXT FIELD, PREV FIELD, NEXT PAGE, PREV PAGE, and NEXT RECORD) are adjacent to one another, as are FIELD HELP and ADDITIONAL HELP, ENTER QUERY and EXECUTE QUERY, and so on. In addition, SELECT has been positioned close to the arrow keys because it is frequently used in sequence with the cursor.



Fig. 7. Keyboard for the UVT-1224.

Needed function	Final system keystrokes	Oracle key-macro to define
Cursor Movement Keys		
Move cursor right	Right arrow	
Move cursor left	Left arrow	
Next record	Down arrow	
Previous record	Up arrow	
Backspace and erase	BACKSPACE	
Next field	NEXT FIELD	
Previous field	PREVIOUS FIELD	
Previous page	PREVIOUS PAGE	Key-Prvblk
Next page	NEXT PAGE	Key-Nxtkey
Next set of records	NEXT RECORDS	
Other Functions		
Commit transaction	COMMIT	
Field help	FIELD HELP	
Additional help	ADDL HELP	Key-Menu
Miscellaneous needs	SPECIAL 1	Key-Cquery
More misc. needs	SPECIAL 2	Key-Dupfld
List valid values	LIST VALUES	Key-Listval
Create record	CREATE RECORD	
Show funct. key defs	ESC K	
Redisplay screen	ESC R	
Show print options	ESC P	
Insert mode on/off	ESC I	
Clear field	ESC C	
Enter query	ENTER QUERY	
Execute query	EXECUTE QUERY	
Select record or value	SELECT	Key-Nxtblk
Exit/cancel	EXIT	

Fig. 8. Proposed function keys. Note that in the column headed "Final system keystrokes," a word or term in all caps implies that this is a label for the final system. Also note that the key-macros that are listed represent the nondefault keys needed for coding.

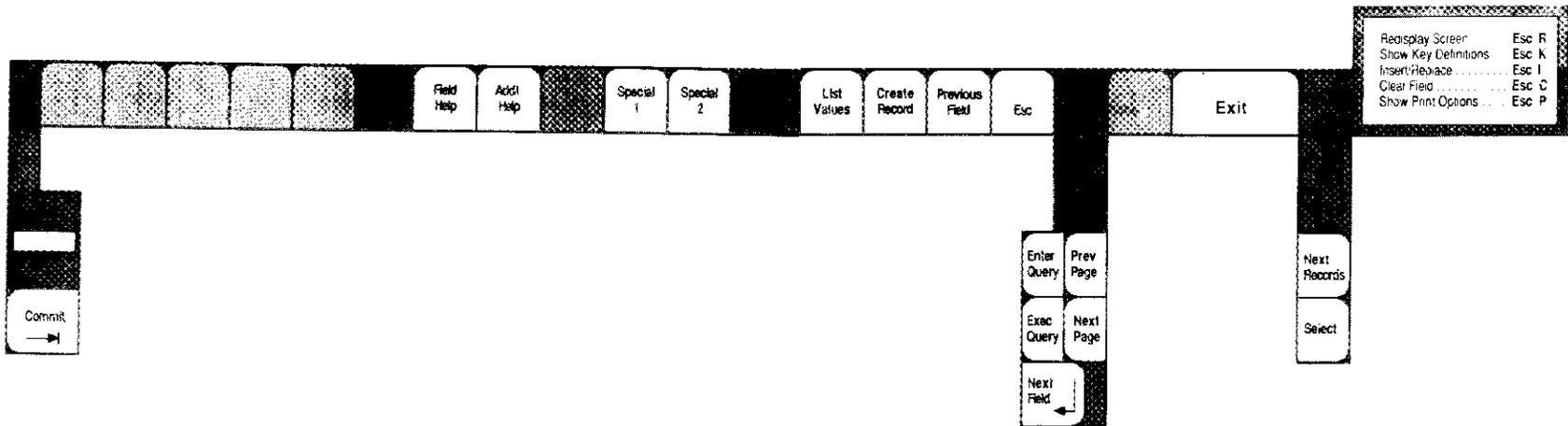


Fig. 9. Proposed TOPS template for location of function keys.

Keys are also positioned according to importance and frequency of use. For example, if a function is used often, an attempt has been made to assign it to a key with an index- or little-finger reach, since those reaches are easily made and remembered. Moreover, since the function keys are in clusters, important or often-used keys are assigned to the ends of clusters, since end keys in a cluster are easier to hit without mistake than are the center keys. Any keys that could cause errors if pressed by mistake are segregated; for example, EXIT has nonfunctional keys beside it.

If a function key serves no purpose in the current field or if accidentally pressing it could confuse the user, that function key is disabled for the current field. For example, all of the ORACLE "next block" and "previous block" functions are inoperative for the actual transportation office user. (These ORACLE functions are incorporated by the TOPS programmers, but their use is transparent to the transportation office user.) The COMMIT key is disabled until an appropriate time to commit data because committing data part-way through an application might corrupt the data base. As a matter of course, all function keys are disabled at the beginning of an application and are turned on only as appropriate.

3.2 CURSOR MOVEMENT KEYS

The cursor movement keys include the arrow keys, backspace key, NEXT FIELD, PREV FIELD, NEXT PAGE, PREV PAGE, and NEXT RECORDS.

The left and right arrow keys move backward and forward through a field. The up and down arrow keys are used to scroll through records on data screens and through menu selections on menu screens.

To back up within a field, the user may use either the "backspace" (i.e., the current "delete character" function) or the left arrow key. The "backspace" key backs up and eradicates; the left arrow key simply moves the cursor backward in the field. After use of the arrow keys, the user may choose to type over existing material (if the character mode is "replace"), insert characters (if the character mode is "insert"), or delete existing characters with the space bar. (The insert mode is determined by the user by pressing ESC-I.)

The key generally known as the "return" or "enter" key on the standard keyboard will be labeled NEXT FIELD on the TOPS template. This key has no visible function in TOPS except to acknowledge that data entry into a field is complete. It can move the cursor to the next enterable field, but it cannot be used to scroll through valid field values nor to select a record for retrieval.

The PREV FIELD key moves the cursor to the beginning of the previous data entry field.

Just as pressing NEXT FIELD is necessary to progress from one field to the next, it is mandatory to press NEXT PAGE to progress from the last field on one page to the first enterable field on the next page.

Thus, after completing the final enterable field on a page, the user may press both the NEXT FIELD and NEXT PAGE keys in sequence or may press only the NEXT PAGE key in order to progress. It is not necessary to tell the user to press NEXT PAGE.

The NEXT PAGE key always means "next screen," and the PREV PAGE key always means "previous screen." Defined in this way, these keys are not alternatives to SELECT and EXIT at the menu level. Therefore, they are disabled on menu screens. Note that use of PREV PAGE could allow a user to "return" to a previous page and select a different record.

As a rule, the user should not be able to return through previous screens to a point preceding the most recent "commit" of information to the data base. Programmers either disable the PREV PAGE key or require that, if any changes are made, the user answer a reminder question about the need to commit changes. This helps to keep the user's interaction with the data base orderly and logical.

When multiple records are displayed, NEXT RECORDS advances the viewing area to show the next set of records. (By contrast, the down arrow key advances the viewing area one record at a time.)

3.3 OTHER FUNCTIONS

Figure 8 displays the standard, programmable functions needed by TOPS, the final system template labels, and, if appropriate, the ORACLE key-macro to define. Since the majority of TOPS users will have no need for the predefined ORACLE functions, only those functions required for use of the TOPS system in the field will be implemented. In addition to the cursor movement keys (Sect. 3.2), these functions are identified by the following labels: COMMIT, FIELD HELP, ADDL HELP, SPECIAL 1, SPECIAL 2, LIST VALUES, CREATE RECORD, ESC (to be used in conjunction with other keys), ENTER QUERY, EXECUTE QUERY, SELECT, and EXIT.

The key generally known as the "Tab" key on the standard keyboard is labeled COMMIT on the TOPS template. This key has no other function in TOPS except to enter data into the TOPS data base.

Two levels of HELP are available. Field help is a one-line message that analysts provide as a hint for how to complete the field. ADDITIONAL HELP provides more information about those fields than can be provided in one line (see also Sect. 4).

The SPECIAL 1 and SPECIAL 2 keys perform seldom-needed functions not associated with any other key. On-screen messages guide the user in using these keys.

When displaying various field values that are valid for a specific field, the automatic ORACLE message instructs the user to press the "next field" key to see all possible field values and then to press "exit" to select a field. This ORACLE procedure will not be used in the final TOPS design because it has the potential for confusing the user. Instead, TOPS has developed a "LIST VALUES" function.

When the cursor moves into a field for which there exists a list of valid values, a message will appear in the inverse video area (line 23) reserved for error/help messages. This message will read, "To view valid field values, press LIST." If the user does not need to see the possible values, he/she simply completes the field and presses NEXT FIELD. If, however, the user needs to see the list of values, pressing LIST displays a new screen containing all valid entries for the field. The user moves the cursor through the list with the arrow keys and makes a selection by pressing SELECT. The user is then returned to the data screen, and the field is filled with the entry selected from the list. To move to the next field, the user must press NEXT FIELD.

The user is provided on-screen instructions when it is appropriate to use the function key CREATE RECORD.

The ESC key is used in combination with particular alphabet keys to perform the functions listed in Fig. 8.

The ENTER QUERY and EXEC QUERY keys allow the user to search the data base for specific records.

In the menus, SELECT will be used to indicate a menu choice. SELECT will also be used to select a particular record in multiple-record screens. The up and down arrow keys will be used to scroll through menu selections and records, as well as the screen of valid field values as explained above.

The user is always able to leave a menu or an application and always in the same manner; that is, the EXIT key will return the user to the previous level (usually previous menu) or can be used to cancel a query (i.e., exit from the query mode). Most of the time, the user may choose to exit an application at random. In these cases, TOPS will not accept an incomplete (i.e., uncommitted) data record the user has already keyed into the application. The TOPS analysts have ensured that the user cannot exit with undesirable results.

4. USER ASSISTANCE

TOPS has three avenues for user assistance: (1) instructions that appear on the menu and data screens, (2) error messages, and (3) help.

4.1 SCREEN INSTRUCTIONS

The first on-screen guidance the user sees is the instruction on the menu and data screens (e.g., "Enter Menu Selection Number Here" or "To view valid field values, press LIST"). Because these instructions appear before either error messages or help screens, their usage and format are very important. Therefore, this user interface standard emphasizes consistency in the use and format of such screen instructions.

Two types of screen instructions are available to the TOPS user: those that are always available because they are part of the screen design and those that appear in the inverse video area at the bottom of the screen.

Built-in screen instructions tell the user how to proceed (e.g., "Use up and down arrow keys to indicate the desired carrier; then press SELECT."). The number and content of screen instructions is limited since it is best not to clutter the screen with unnecessary instructions.¹

All TOPS instructions, to be consistent, use the word "Press" rather than "Hit" or "Enter" when giving instructions about function keys. These instructions are centered on the last line (or lines) of the screen input/output area and are followed by a period. They are formatted as simple English sentences. Only the first word is capitalized unless the instruction contains the name of a function key, in which case the function key name is given in capital letters.

Screen instructions that appear as ORACLE messages are occasionally very good but, at other times, are very unclear. For example, when scrolling through a set of records, the user might receive the following messages within the inverse video area: "At first record" (an excellent and informative message), "Can't insert into or update data in view," "Record must be entered or deleted first," "Field must be entered," or "Last row of query retrieved." The first of these messages is ideal; the message "Record must be entered or deleted first" is potentially confusing to the user and is replaced by TOPS analysts and programmers

¹During early demonstrations of TOPS, before a consistent user interface was adopted, it was necessary to provide transportation personnel with many screen instructions on the use of function keys. Because users will be trained and will be assisted by a user manual, this practice will not be necessary in the prototype version.

to read "At last record." Although messages such as the above examples may be perfectly clear to persons familiar with ORACLE, they need clarification to be appropriate for the user. In the case of a confusing ORACLE message that cannot be overridden or otherwise hidden from the user, a clear explanation of how the user must react to the message will be supplied during training and in the user manual.

When accessing the data base or retrieving a record will take more than 4 seconds, the user must be informed that the system is doing something. Although ORACLE has an automatic "Working ..." message, it does not appear immediately. This problem was solved, and the TOPS analysts and programmers now insert code that displays the "Working ..." message more rapidly.

Another essential message is one which verifies a user's intention at the end of a data-entry session. If the user presses the EXIT key after entering data but before committing the data, ORACLE automatically displays a message saying, "Do you want to commit the changes you have made?" Because a response is required [Y (for yes) or N (for no)] before exiting the application, the user must make a conscious decision to save (Y) the data or discard it (N).

To prevent data from being committed at inappropriate times, it is necessary to instruct the user as to the proper time to commit. This is done in the form of a screen instruction, "Press COMMIT when data is correct and complete."

It is better to have no message for the user than to have a message that is confusing or useless. (An example of a useless message is a field help message that simply repeats a menu option.)

Some sample screen messages are given in Fig. 10.

4.2 ERROR MESSAGES

Error messages appear when the user has made an unacceptable entry. The validation checks coded by the analysts and the automatic ORACLE checks determine the occurrence of an error message and its content. Containing no more than one line, the message appears in the reserved inverse video line at the bottom of the screen. Many ORACLE messages are jargon and, although meaningful to computer-literate developers, may be meaningless to the user. Most of the ORACLE messages can be avoided if the programmers check carefully for errors.

Error messages should be direct and positive. They should be neither sarcastic nor humorous. They do not simply state that an error has been made, nor do they identify the error. Instead, they tell the user how to complete the field correctly. (Note: it is important that the user understand the error; however, the one-line limit precludes such an explanation in the "error" message. See also the explanation of HELP, below.) Error messages for TOPS generally fall in one of the following categories: (1) instructions on proper format for the field or (2) instructions on how to proceed.

Poor user instructions

Enter PF4 to exit.

Note: there will be no PF4; users will be trained to use the EXIT key; there will be no need to instruct the user to "Press EXIT to exit."]

Hit the Next Field key

Several points can be made with this example: (1) Use "Press" rather than "Hit." (2) Since the NEXT FIELD key will always perform the same function, you should have no need to tell the user when to use the key. (3) Be brief; that is, "Press NEXT FIELD" is better than "Press the NEXT FIELD key." (4) Always express the key label in capital letters. (5) Follow user instructions with end punctuation.]

Good user instructions

Use up and down arrow keys to move through records.
Press SELECT to choose a specific record.

Use up and down arrow keys to indicate the desired carrier;
then press SELECT.

Press SPECIAL 1 to see another split portion.

Press COMMIT to enter data into the database.

Press COMMIT if all data have been entered and are correct.

Fig. 10. Examples of user instructions.

Validation is almost always completed field by field. In TOPS, the user is presented an error message and must correct the error before proceeding to the next field. There should be no automatic error correction without user knowledge and/or acceptance. For example, if a user inserts a social security number in an incorrect format, the error message displaying the proper format is displayed as soon as the user presses NEXT FIELD. The cursor will not move to the next field until the error has been corrected.

Some sample error messages are given in Fig. 11.

Poor "error" messages

You have made an illegal entry.

Incorrect; please try again.

Fatal error; program terminated.

Press any function key to acknowledge message.

[This last message currently cannot be suppressed. The training manual and user manual will explain how to deal with the message. Hopefully, future releases of SQL*Forms will allow designers to skip this particular message.]

Good "error" messages

Correct format for date is DD-MON-YY.

At first record.

At last record.

For additional information, press ADDL HELP.

Fig. 11. Examples of error messages.

4.3 HELP MESSAGES

A primary consideration when designing a system is to provide adequate help facilities for new or inexperienced users while not boring the experienced user. That is, the system should be adaptable to various user skill levels.

Two types of help are available to the TOPS user -- both only on request. Field help, which will be accessed by pressing the HELP key on the new hardware, will appear in the inverse video area at the bottom of the screen and will contain only one line. This message, which always pertains to the field in which the cursor is located, frequently will be the same message that appears as an error message if the user makes an illegal entry in the field. The analyst may, however, choose to insert the following message: "For additional information, press ADDL HELP."

Whereas the HELP message for field help consists of only one line, the ADDL HELP message presents a new screen. Each full-screen² help screen begins with a centered title that is formatted in all capital letters and identifies the subject of the HELP file. The remainder of the screen is boxed. The first entry in the boxed area is headed "General Information" and contains format information, which may be length, content, peculiar features, etc. Each item in this category begins with a bullet. The next entry is "Notes" and contains miscellaneous additional information -- for example, what to do if the information is too short or missing or inconsistent with the guidelines; whether or not the field could be left blank; and what to do about punctuation. Each item in this category begins with a number. The final entry on the HELP screen is entitled "For More Information" and contains a reference to the user manual. These help screens, however, should not be extracts of pages from the manual; they are stand-alone, very specific screens. The user manual represents further help if the user is still confused.

To exit from the help facility, the user will press EXIT. The screen will clear, and the user will be returned to the screen (either menu or data screen) and cursor position at which he/she was working when additional help was requested.

The following very general "rules" apply to help screens: (1) the vocabulary should be consistent with the rest of TOPS (common abbreviations and standard input vocabulary); (2) computer jargon or terms that may not be familiar to the field user should not be used; (3) information or instructions should be clear and concise; (4) information should be organized in outline form so that the individual who calls for help can find the most important information immediately; bullets are

² At this time, ADDL HELP is a planned enhancement of TOPS. The code for pulling up the ADDL HELP screens has been written; however, the text for each screen has not. The current plan for the ADDL HELP screens is to have a free text explanation of the data field in question. Eventually, however, it is hoped that the design described in this section will be incorporated.

used in the "General Information" section and numbers in the "Notes" section.

HELP will not teach the field user about the world of transportation. There may be situations, however, when a short lesson in transportation is appropriate. The purpose of extended help files is to help the user maneuver efficiently in the world of TOPS. Each separate menu screen is specific to the field to which it is keyed (through ADDL HELP); however, the same screen may be used to explain more than one field. These help screens can be coded as tables for retrieval from the TOPS database.

A generic page format for the ADDL HELP request is given in Fig. 12.

TOPS HELP SCREEN FOR _____

GENERAL INFORMATION:

- o Information set up in bullet format.
- o Additional information which is explanatory in nature and explains what the user is to do in the field on the screen at which he requested help.
- o More information if necessary.

NOTES:

1. This is note 1 and is formatted in an outline manner to make it stand out.
2. This is note 2.
3. There may be several notes or none.

FOR MORE INFORMATION:
See User's Manual, Sect. xx.

Fig. 12. Sample help screen (accessed with ADDL HELP).

5. SUMMARY

The purpose of this document is to provide guidelines for a well-designed user interface for TOPS. The design incorporates practices and guidelines that have been proven valid in human factors research. In some situations unique to TOPS, the design was determined on the basis of what seemed best for TOPS -- from the viewpoint of functional representatives, ORACLE representatives, analysts, and interface designer.

The TOPS human interface guidelines address screen design, keyboard functions, and user assistance functions. Screen design incorporates both menus and data screens. Consistency among screens and logical work progression are foremost in the design. User assistance functions include design of user instructions that appear on the screen, error messages that automatically appear when the user enters data in an incorrect format, and help (which may be one-line messages or full-page screens).

It is imperative that any computer system possess an easy-to-use and efficient user interface in order to be effective. The TOPS user interface has been carefully designed to help TOPS be user friendly. Thus, with functionality fully integrated and with a complete data base design, TOPS will be prototyped at four field sites in mid-1988 and completely implemented in the continental United States in 1990. It will be one of the largest systems for which human factors were specifically considered.

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APPENDIX A

LIST OF TOPS OUTPUT PRODUCTS

This listing was originally provided by Gunter Air Force Station. A few reports have been added to the original list. Some reports have been identified that may be added by the TOPS Project Management Office, and some of the reports listed below are being considered by the Project Management Office for deletion from TOPS. A majority, though not all, of the reports on this list will be completed by the summer of 1988, when the TOPS prototype is fielded.

Counseling Module

Counseling Status Report*
DD Form 1797*
POV Counseling Sheet
Management Statistical Report--Counseling
DD Form 1299
Excess Cost Sheets
Mailing Labels--Counseling

Outbound Module

Consolidated Shipment Report*
Contract Call Register (Outbound and Local)
Contractor Daily Capability Report (Outbound and Local)
Routing Book Status Report*
DPM Confirmation Notice--Outbound
PPGBL Register
DPM Invoice and Accounting Class Summary (Local)*
DPM Invoice and Accounting Class Summary (Outbound)*
SF Form 1200**
SF Form 1203
SF Form 1203--DPM*
SF Form 1109**
Shipment Refusal Turnback Report
Management Statistical Report--Outbound
TDR Extract Report
TGBL Public File
Tonnage Differential Notice
Document Suspense Report--Outbound*
Shipment Folder Label--Outbound
Mailing Labels--Outbound

*Will not be completed for the prototype.

**Currently being considered for deletion from TOPS.

Origin Services Confirmation Card
 Agent Information Report
 Historical TDR--Outbound

Nontemporary Storage Module

NTS Expiration Report
 NTS Refusal Report
 DD Form 1164 for Complete Removal (Outbound and Local)
 DD Form 1164 for Partial Removal (Outbound and Local)
 DD Form 1164 Handle In (Estimated and Actual Weights)
 Mass DD Form 1164
 Annual Service Order Removal (Blanket DD 1164)
 Annual Service Order Renewal List
 Four-Year Renewal Output
 Four-Year Renegotiation List
 DD Form 1164 Member Mailing Label
 Alpha by Contractor Report
 Document Suspense Report--NTS*
 Management Statistical Report--NTS
 Quarterly Storage Invoice and Accounting Class Summary*
 Handle In Invoice and Accounting Class Summary
 Handle Out Invoice and Accounting Class Summary
 NTS Commercial Storage Report
 Service Order Register
 Government Quarters Report--NTS
 NTS Expiration Warning Letter
 MTMC-20 Report*
 NTS Master Record Action List*
 NTS BOA Rate Spread List*
 NTS Master Record List*
 Report of HHG Storage Action*
 Mailing Labels--NTS

Inbound Module

Commercial Storage Accounts Report*
 DPM Confirmation Notice--Inbound
 Shipment Status Report
 DPM Invoice and Accounting Class Summary--Inbound
 Reweigh Confirmation
 Temporary Storage Status Report
 SIT Report
 Document Suspense Report--Inbound
 Temporary Storage Expiration Report
 Temporary Storage Expiration Letters
 Mailing Labels--Inbound
 Shipment Folder Label--Inbound
 Contractor Daily Capability Report--Inbound
 Contract Call Register--Inbound

*Will not be completed for the prototype.

DD Form 1671*
 Inbound Arrival Notification
 Management Statistical Report--Inbound
 Reweigh Summary Report
 SF Form 1200**
 DD Form 619-1
 Storage Report by Agent/Warehouse/Carrier*
 Tracer Request Message

QA Module

Facility Inspection Report
 DD Form 1781**
 Agent Workload Report*
 Management Statistical Report--QA
 Shipments Inspected List
 Documents Suspense Report--QA
 Daily Inspection Schedule Report
 Carrier TOS Repeat Violation Report
 Carrier Information Report
 Agent Carrier LOI List
 Mailing Labels--QA
 Carrier Punitive Actions Report
 Missed RDD Report
 Agent Punitive Actions Report*
 DD Form 2223
 Carrier Evaluation Worksheet
 DD Form 1780*
 NTS Inspection Output Report*
 Contractor BOA Repeat Violation Report*
 DPM Daily Composite Output*
 MT-347-1R*
 MT-348*
 MT-349*
 MT-350-FG*
 Nonsampled Payment Output*
 Sampled Payment Output*

General Management Reports

TDR Override Notice*
 DPM Funds Summary*
 Terminal/CPU Usage Report*
 Module Access Report*
 Management Report Card.2*

*Will not be completed for the prototype.

**Currently being considered for deletion from TOPS.

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