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User Interface Guidelines for the Integrated Booking System Prototype (IBS-P)

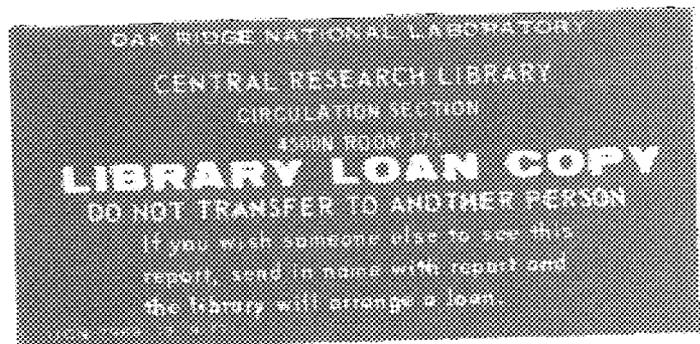
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FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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Energy Division

**USER INTERFACE GUIDELINES FOR THE
INTEGRATED BOOKING SYSTEM PROTOTYPE (IBS-P)**

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Date Published—May 1991

Prepared for the
MILITARY TRAFFIC MANAGEMENT COMMAND
DIRECTORATE OF INTERNATIONAL TRAFFIC
Falls Church, Virginia 22041-5050
under
Interagency Agreement DOE No. 1405-1351-A1

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400



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CONTENTS

	Page
PREFACE	v
ABSTRACT	vii
1. GENERAL	1
1.1 PURPOSE OF THE USER INTERFACE DOCUMENT	1
1.2 THE TARGET IBS AND THE IBS-P	2
1.3 ASSUMPTIONS	3
1.4 PROJECT REFERENCES	4
1.5 TERMS AND ABBREVIATIONS	5
2. SCREEN DESIGN	7
2.1 GENERAL GUIDELINES	7
2.1.1 System and Screen Specifications	7
2.1.2 Menu and Window Colors	10
2.1.3 Screen Cursor Control	11
2.1.4 Use of Acronyms and Abbreviations	12
2.2 MENUS	12
2.3 DATA ENTRY SCREENS	15
2.4 DATA OUTPUT SCREENS	18
2.4.1 Screen and Printed Reports	18
2.4.2 Graphical Displays	18
2.5 SPECIAL SCREENS	18
3. KEYBOARD AND MOUSE FUNCTIONS	21
3.1 FUNCTION KEYS	21
3.2 CURSOR MOVEMENT AND SPECIAL KEYS	21
3.3 MOUSE FUNCTIONS	24
3.4 HOT KEY FUNCTIONS	25
4. DATA EXCHANGES	27
4.1 EXCHANGING DATA WITH OTHER SYSTEMS	27
4.1.1 Unit Cargo Moves	27
4.1.2 Nonunit Cargo Moves	28
4.2 REPORTS AND MESSAGES	28
4.3 AD HOC QUERIES	28
5. USER ASSISTANCE	29
5.1 GETTING HELP	29
5.2 ERROR MESSAGES	29
5.3 ADDITIONAL HELP PROVIDED BY THE PROGRAMMER	30
5.4 DOCUMENTATION	30
6. SUMMARY AND RECOMMENDATIONS	31

PREFACE

The Oak Ridge National Laboratory (ORNL), under contract with the Directorate of International Traffic, Military Traffic Management Command (MTMC), completed tasking to design and develop a prototype for the Integrated Booking System (IBS). The final prototype software was completed at the end of March 1991. A second task was to provide documentation on the prototype. These documents, which have been delivered to MTMC, are being produced as a series of ORNL Technical Memorandums:

- ORNL/TM-11831 Database Specifications for the Integrated Booking System Prototype (IBS-P)
- ORNL/TM-11832 Test Plan and Implementation Procedures for the Integrated Booking System Prototype (IBS-P)
- ORNL/TM-11833 User Interface Guidelines for the Integrated Booking System Prototype (IBS-P)
- ORNL/TM-11834 End-User's Handbook for the Integrated Booking System Prototype (IBS-P)

A primary purpose of these documentation deliverables is to provide a baseline for life cycle management (LCM) documentation for the target IBS, which will be developed by MTMC. All of the reports follow the format recommended by Department of Defense Standard (DOD-STD) 7835A. Documentation for any software development project is critical to the success and maintainability of the system. Because the target IBS has a rapid development and deployment schedule, these reports, which are being provided by ORNL to MTMC in both hard-copy and electronic form, will be important sources of initial LCM support for the final IBS.

ABSTRACT

The User Interface Guidelines for the Integrated Booking System -- Prototype (IBS-P) describes the design requirements for the human-computer interface. The user interface design conforms to standards reported in the open literature as well as to standards provided through Department of Defense guidelines. The IBS-P interface was evaluated by personnel at Headquarters Military Traffic Management Command (MTMC) and at each of the MTMC Area Commands. As a result of comments received during demonstrations of the prototype at these sites, modifications to the design were made, as appropriate. The user interface was well accepted by the end users.

1. GENERAL

1.1 PURPOSE OF THE USER INTERFACE DOCUMENT

This User Interface (UI) document for the Military Traffic Management Command's (MTMC's) Integrated Booking System Prototype (IBS-P) provides

- a description of the IBS-P screen designs (menu and data screens),
- a description of the IBS-P keyboard and mouse control functions,
- information on input and output data, including electronic and manual file and message transfers, hard-copy report production, and ad hoc queries,
- information on various types of user assistance, and
- recommendations for future enhancements to the user interface.

The primary audience for this UI document is the group of MTMC personnel who will be building the target IBS. One purpose of the IBS-P is to provide guidance for the design, including the human-computer interface, for the target system. Other recipients of this document are MTMC management personnel who must ensure that the design of the target IBS fits within the overall MTMC computer systems design plan. Finally, this UI document will be available for testers of the IBS-P. It does not take the place of a Users' Manual, which is a separate document being prepared for the IBS-P.

A primary purpose of the IBS-P is to develop an appropriate design for the target system. However, it must be noted that the final user interface design for IBS will be dependent on capabilities and constraints of the target architecture -- both hardware and software.

1.2 THE TARGET IBS AND THE IBS-P

The IBS will be a lead execution system of the Defense Transportation System (DTS) for international surface cargo in both peacetime and wartime. IBS will support traffic management within MTMC and respond to the requirements of both commodity managers and war planners to have continuous access to information about international surface cargo movement. IBS will eventually be fielded at both Continental United States (CONUS) and Outside CONUS (OCONUS) sites. IBS will exchange data with other automated systems via ASCII files; IBS will also receive data manually. MTMC is currently studying the concept of a corporate-type database to which IBS would be a contributor.

IBS must exchange data with both classified and unclassified systems. Although IBS must receive data from classified systems in order to book wartime cargo movements, it is planned that the data actually used in the IBS booking functions will be unclassified. This declassification will occur before the data are entered into IBS. Therefore, IBS will be an unclassified system, using consistent and/or similar procedures in both peacetime and wartime. Because users will be familiar with peacetime operation of IBS, they will be proficient with its operation in the event of a contingency.

The prototype conceptually defines an approach for the fully developed IBS. Because it reflects the functional requirements of the target IBS, the IBS-P can help determine a user interface for the target system. The IBS-P tests concepts associated with development of the full-scale IBS, verifies the feasibility of a proposed modeling solution, further defines functional concepts, and promotes an understanding of full-operational-capability design information. The modules of the prototype include booking unit cargo moves (exercises and contingencies), peacetime nonunit cargo moves, and wartime nonunit cargo moves.

There are anticipated differences between the IBS and the IBS-P. For example, the IBS-P will operate on IBM-compatible microcomputers; however, the target IBS is not currently proposed as a microcomputer-based system. IBS-P is programmed using FoxPro as the development language; however, the target language of the operational system will probably not be FoxPro. Additionally, all interfaces to the IBS-P are simulated; thus, no actual data exchange will occur during operation of the IBS-P.

1.3 ASSUMPTIONS

The target IBS will retain, at a minimum, the functionality and features of the prototype. Thus, this UI document for the IBS-P (with appropriate modifications to allow for a different hardware, software, and communications environment) will be a guide for development of the target system. The IBS-P UI follows the guidelines of the Worldwide Military Command and Control System (WWMCCS) Information System (WIS) insofar as is reasonable for a prototype system. Any enhancements to the UI for the target IBS should also conform to these standards.

Throughout development of the IBS-P UI, primary emphasis was placed on the following: (1) usability -- that is, providing total functionality for the booking process, (2) consistency across all processes, (3) human-machine communication processes (e.g., mouse usage, help messages/screens, documentation), (4) adherence to the WWMCCS standards, and (5) conformance with proven UI theory. In the target system, it is assumed that emphasis will be placed on these areas, as well as additional important UI areas that are not important in a prototype (e.g., responsiveness and availability).

Neither IBS-P nor IBS will ever process classified material. All data will be unclassified or certified as declassified prior to entry into the system for processing. Data, however, especially that for booking unit moves, is sensitive. To conform with the WWMCCS standards for labeling information systems, a sticker containing the words "UNCLASSIFIED, SENSITIVE" will be affixed to each major piece of computer

hardware (central processing unit, monitor, and printer) to be used by the target IBS. Thus, the screen classification banner recommended by WWMCCS will not be necessary, since the label is permanently attached to the system hardware.

The target IBS will be programmed using a 4th-generation language and a relational database management system with UNIX as the operating system. Open architecture will be the rule. IBS will probably be installed on a network. Use of both table level and field level access will prohibit illicit usage and will ensure system security. If appropriate, modules of IBS may be developed using artificial intelligence techniques; however, access to these modules will be transparent to the user, since interfaces within IBS will be consistent across all modules.

1.4 PROJECT REFERENCES

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1.5 TERMS AND ABBREVIATIONS

AC	Area Command
AIS	Automated Information System
ASCII	American Standard Code for Information Interchange
ASPUR	Automated System for Processing Unit Requirements
AUEL	Automated Unit Equipment List
CONUS	Continental United States
CMR	Cargo Movement Request
DBMS	Database Management System
DDN	Defense Data Network
DOD	Department of Defense
DOE	Department of Energy
DOS	Disk Operating System
DTS	Defense Transportation System
ETR	Export Traffic Release
ETRR	Export Traffic Release Request
FORSCOM	U.S. Army Forces Command
GBL	Government Bill of Lading
HQ MTMC	MTMC Headquarters in Washington D.C.
IBS	Integrated Booking System
IBS-P	Integrated Booking System Prototype
JOPES	Joint Operation Planning and Execution System
LAN	Local Area Network
MENS	Mission Element Needs Statement
METS II	Mechanized Export Traffic System II
MILSTAMP	Military Standard Transportation and Movement Procedures
MSC	Military Sealift Command
MTMC	Military Traffic Management Command
OCONUS	Outside the Continental United States
OPLAN	Operation Plan
ORNL	Oak Ridge National Laboratory
PC	Personal Computer
POD	Port of Debarkation

POE	Port of Embarkation
RDD	Required Delivery Date
SOCO	Shipping Order/Clearance Order
SQL	Standard Query Language
TACOS	The Automated Container Offering System
TC ACCIS	Transportation Coordinator's Automated Command Control Information System
TC AIMS	Transportation Coordinator's Automated Information for Movements System
TPFDD	Time-Phased Force and Deployment Data
TUCHA	Type Unit Data (Characteristics) File
UI	User Interface
UMD	Unit Movement Data
WIN	WWMCCS Intercomputer Network
WIS	WWMCCS Information System
WPS	Worldwide Port System
WWMCCS	Worldwide Military Command and Control System

2. SCREEN DESIGN

2.1 GENERAL GUIDELINES

The screen design for the IBS-P is suitable for a high-resolution color monitor. Except for data entry, which must be performed using a keyboard, IBS-P can be operated using either mouse or keyboard control.

2.1.1 System and Screen Specifications

The following specifications were followed for the development of the IBS-P and are related to FoxPro programming requirements. If the specification is a result of WWMCCS requirements, this fact is noted in parentheses.

1. On any "scrolling" picklist, do not require the user to mark a record and press an accept key, unless more than one record can be marked. [Users should only have to highlight a record then press <ENTER> (or use the mouse) to select.]
2. Whenever using `set color`, remember to include `&datac` (i.e., set color to `&menu1c,&datac`).
3. Use the following colors for all screens. [This color scheme conforms with WWMCCS requirements (see reference in Section 1.4) reasonable for a prototype.]

black or blue	background
cyan	primary or secondary data
magenta	secondary data
green	to indicate go ahead, within a specific tolerance range, acceptable, ready
red	to indicate errors, malfunction, emergency conditions

white	to indicate functional or physical position, action in progress and as background displaying primary data
yellow	to indicate delay, check, recheck, extreme caution

4. Provide "HELP" through the FoxPro Help facility.
5. Format the current date (displayed on every screen) as YY/MM/DD and locate it at position 0,1.
6. Display time (24-hour format) on every screen at position 0,71.
7. Center a unique title for each screen at the top of the data entry/menu/window area (WWMCCS guidelines). [On data entry screens the title will replace the **Main Menu** on row 1.]
8. Clear all function key values before issuing a READ.
9. During an edit session, use a temporary database rather than allowing modifications to the master database.
10. When **Exit** is selected, prompt to **Save Changes**, **Cancel Changes**, or **Return to Edit**. The option **Save Changes** copies the temporary database to the master database; the option **Cancel Changes** deletes the temporary database. **Return to DOS** exits IBS-P and returns to the DOS prompt.
11. Always delete temporary databases after you are finished with them. Use the FoxPro command **erase** as opposed to the DOS command **run delete**.
12. Set up all data entry screens on a "one GET/one READ" structure. [This FoxPro-specific code enables field-sensitive help, lookups, etc.]
13. When validating a mandatory data entry field and incorrect data (or no data) are entered, display a pop-up window of valid choices for selection. The window should be scrolling, if necessary, and display both the code and the in-the-clear name (abbreviate if necessary). If the user entered invalid data (versus no entry), highlight the first code that begins with the same letter as the invalid entry. Provide a search capability if the list exceeds one page of the menu. Since it is a mandatory field, the user **must** either input appropriate data or select a valid entry from the picklist.
14. When validating nonmandatory data entry fields and incorrect data (or no data) are entered, display a pop-up window of valid choices for selection. The window should be scrolling, if necessary, and display both the code and the in-the-clear name (abbreviate if necessary). If the user entered invalid

data (versus no entry), highlight the first code that begins with the same letter as the invalid entry. Provide a search capability if the list exceeds one page of the menu. Since it is not a mandatory field, the user may ESCape (exit) the window without selecting a valid code; however, if an invalid code is entered in the same field again, the window should be redisplayed.

15. If **Lookup** is selected, display the listing of valid entries for the current field. If no lookup exists for the current field; deactivate the **Lookup** menu option.
16. If **Help** is selected, display a window which provides an explanation of the field.¹
17. Use **<CTRL-PAGE UP>** to go to first record in the database; use **<CTRL-PAGE DOWN>** to move to last record.
18. A scrolling picklist, which allows the user to choose from a list of valid values, will use the **<TAB>** key to perform searches. When more than one page of options exist, the **<PAGE UP/PAGE DOWN>** keys will be used to move between pages.
19. Wherever scrolling capabilities exist and the user presses **<PAGE DOWN>**, the last line of the current screen will be the first line of the next screen (WWMCCS guidelines).
20. Verification windows (e.g., "Are you sure you want to continue?") should be located in the center of the data entry screen (WWMCCS guidelines).
21. List no more than nine items per pull-down/pop-up menu (WWMCCS guidelines). (This limitation does not apply to scrolling picklists.)
22. All menu items will be left justified (WWMCCS guidelines).
23. All menus will have highlighted "Hot Keys" (to be used when the mouse is not available).
24. Do not list **Exit** as an option on pull-down or pop-up menus (ESCape implies exit from menus).
25. Mouse functionality should be maintained uniformly throughout the system.

¹Help is not available on all fields and a message appears to inform the user of this fact.

3. First Lookup Window (first pop-up menu displayed; overlays an existing screen)
 - title, box and items bright white on magenta
 - lightbar yellow on blue
 - marked records blue on magenta
 - hot keys bright cyan on magenta
 - disabled buttons bright black on magenta

4. Second Lookup Window (second pop-up menu displayed; overlays existing screen and first pop-up menu)
 - title, box and items blue on cyan
 - lightbar yellow on red
 - marked records bright white on cyan
 - hot keys magenta on cyan
 - disabled buttons bright black on cyan

5. Data Entry Screens
 - field prompts yellow on blue
 - data entry fields black on bright white
 - record number bright white on magenta
 - nonupdatable fields bright cyan on blue

6. Information messages yellow on brown

7. Help windows white on blue

8. Error messages bright white on red

2.1.3 Screen Cursor Control

When a menu screen first appears, the cursor (a highlighted bar) rests on the first menu option (upper left corner). When a data entry screen first appears, the cursor rests in the first field in which the user can enter data. That is, if the first field on a screen is one that the user cannot change, then the cursor will not be positioned on that field. Either the mouse or the keyboard (the <TAB/BACK TAB>, <PAGE UP/PAGE DOWN>, or up arrow/down arrow keys) can be used to move the cursor.

If the keyboard is used, then cursor movement is from left to right, top to bottom on the screen. If an application screen has a required field, then the user shall not be allowed to exit the screen, saving partial database changes, until that field is successfully completed.

2.1.4 Use of Acronyms and Abbreviations

Frequently used acronyms and abbreviations, e.g., Min (for minimum), UIC (Unit Identification Code), MTON (measurement ton), DODAAC (DOD Activity Address Code), are freely used on IBS-P screens. These acronyms are used consistently. Acronyms and/or abbreviations that are not familiar to the IBS-P users will be spelled out.

If measurements are used, they are abbreviated and placed inside parentheses -- for example, "Weight (lb)". The letter "s" is never added to make an abbreviation plural; if a unit of measure is used unabbreviated, the letter "s" is used to form the plural.

2.2 MENUS

IBS-P menus allow the user to access submenus, options, or data entry screens. After entering the command "IBS" at the DOS prompt, the user will see the main menu screen (Fig. 2.1).² This menu allows the user to access three main modules (Peacetime Resupply, Unit Moves, and Wartime Resupply) or to return to DOS.

²For the user of the target IBS, the first screen will be a login screen for entering a userid and password. Access to various modules and functions of the target system will be strictly controlled. The userid/password identification is one of these means of control.

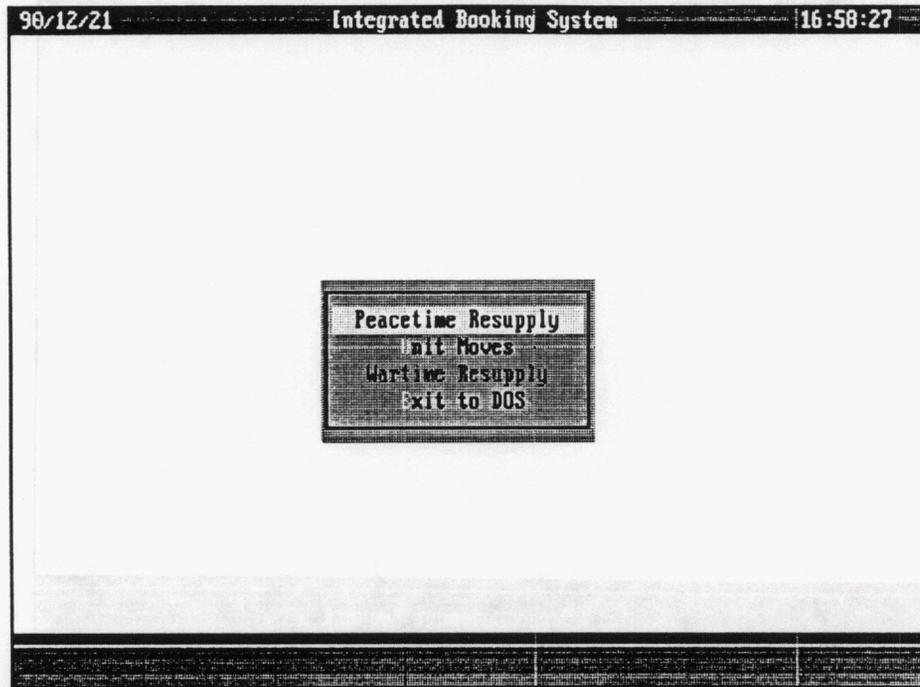


Fig. 2.1. IBS-P Main Menu.

After choosing one of the IBS-P's main modules, the user will see the top-level menu screen for that module. The menu screens are designed in a Lotus-like format. Across the top of the screen are the date (YY/MM/DD format), system title (Integrated Booking System), and time (hour:minute:second format). The next horizontal line provides the user with first-level submenu options. After the user selects (either by using arrow keys and pressing the <RETURN/ENTER> key, by pressing the Hot Key, or by clicking the mouse button), then either another submenu will appear in a window under the primary menu selection or an application screen will appear. At the bottom of the screen appears an explanation of the item on which the light bar rests. Figure 2.2 shows an example of the first-level menu for Peacetime Resupply. Figure 2.3 shows the Unit Moves first-level menu and a submenu pop-up of choices for "Movement Requirements."

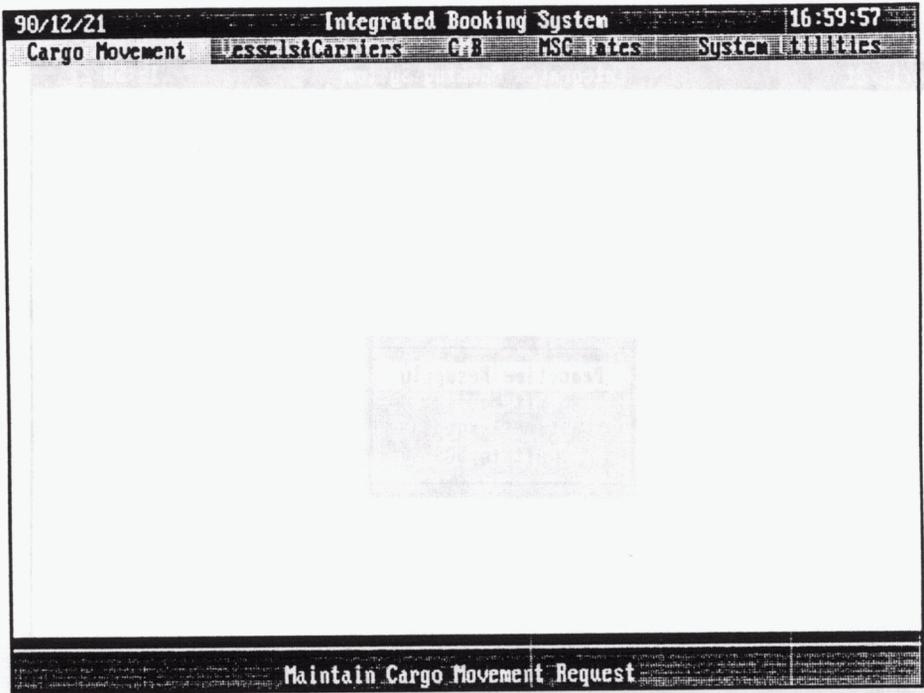


Fig. 2.2. First-level menu choices under "Peacetime Resupply."

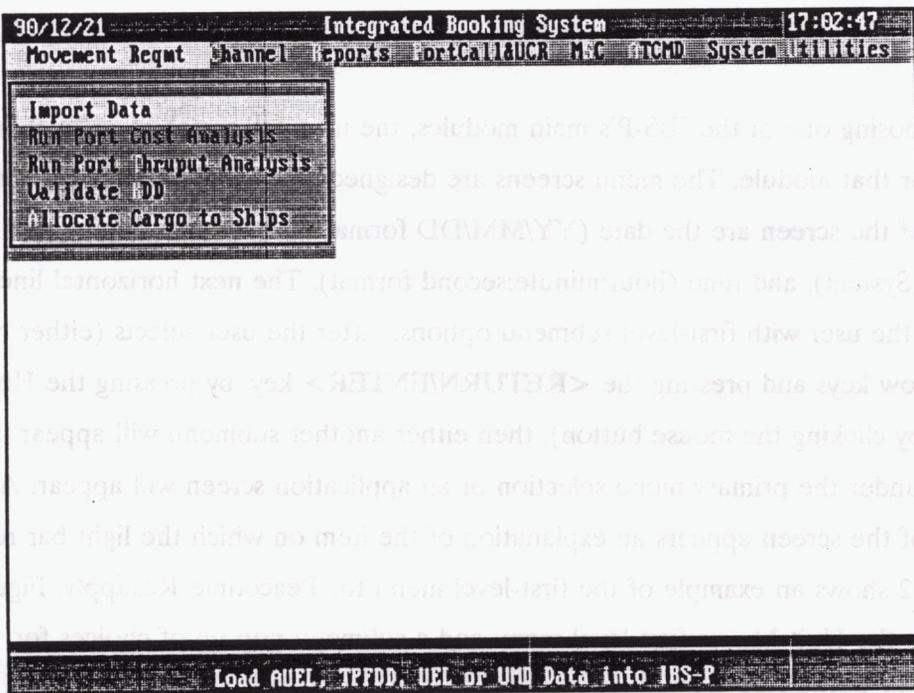


Fig. 2.3. "Unit Moves" first-level menu and submenu pop-up.

2.3 DATA ENTRY SCREENS

The following rules apply to all IBS-P data entry screens. Examples of typical data entry screens are shown in Figs. 2.4-2.5.

90/12/21 Integrated Booking System 17:01:41

F2 + Letter Add/Update ETRR

PCF No: E30983 Shipper: Z8ZZ81 Requester: WGN43A0141405

Help

Add Pcs : 1 Uans Reqd: 1 Avail : //

Del/Rest Cube : 599 Size : 2 RDD : //

Weight: 3250 Commodity: 90029 Proj Cd: 999

MTons : 15 Consignee: 43467 Fund Ag: Y

Cut/Paste LTons : 2 Priority : 1 LTC : //

Paste Cancel Cd: Reason : //

Lookup Delay Cd: Proj Rel: //

Filter Remarks: //

Search

Exit SRO DATA Id : POE: Due Date: //

1/6 Mode : //

Fig. 2.4. A data entry screen for adding or updating a cargo movement request (CMR). Note the menu buttons at the left, which provide aids to the user during data entry.

1. Try to keep information "grouped"; in the data entry portion, try to combine information into four or fewer groups; separate groups by spaces, not lines.
2. Close up the colon to the longest prompt in a group.
3. Align vertically all colons in any group.
4. Space once after the colon and before the data field.

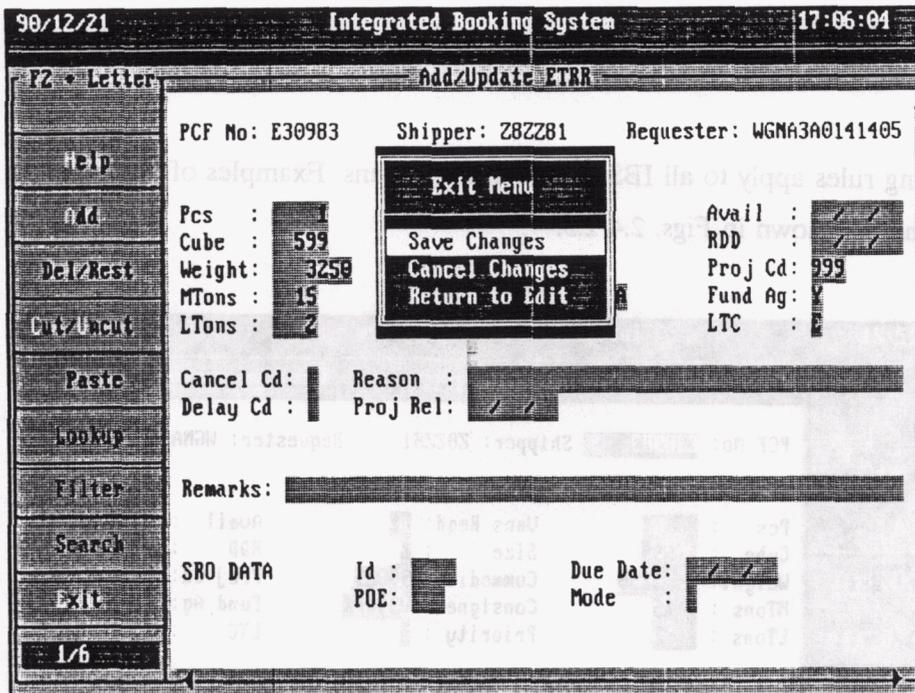


Fig. 2.5. An example of a pop-up menu which appears if the user selects "Exit" from the menu buttons at the left of the screen.

5. When possible, place all nonenterable fields at the top of the screens; these usually contain identification information. Put an extra blank line between the group of nonenterable fields and the first row of enterable fields.
6. Align all prompts on the left. (Note that the colons will also be aligned vertically, and the data fields will be aligned on the left.)
7. Remarks will be one line, scrollable.
8. Each data entry screen should have a title. The title corresponds to the selected menu option.
9. Use "Phone" as a prompt rather than "Telephone" or "Phone No."
10. Group costs vertically and align on the decimal.
11. The menu (options) bar on the left-hand side should never use the same hot key for two different functions.

Lists of valid values appear in a window when the user has selected a "function" (e.g., print) to be performed and the system is prompting for data to process that "function." Some value lists will allow only one data record to be selected at a time; other menus allow multiple selections. If multiple records can be selected, **Accept** will be a menu option. In those cases, the arrow keys plus the <RETURN/ENTER> key or the mouse can be used to "mark" all appropriate data records. Then selecting the **Accept** option records the selections. Otherwise, only one data record may be "marked" and processed at a time and **Accept** is not required. Figure 2.6 shows an example of a list of valid values (also called scrolling picklist). The first data record has been marked.

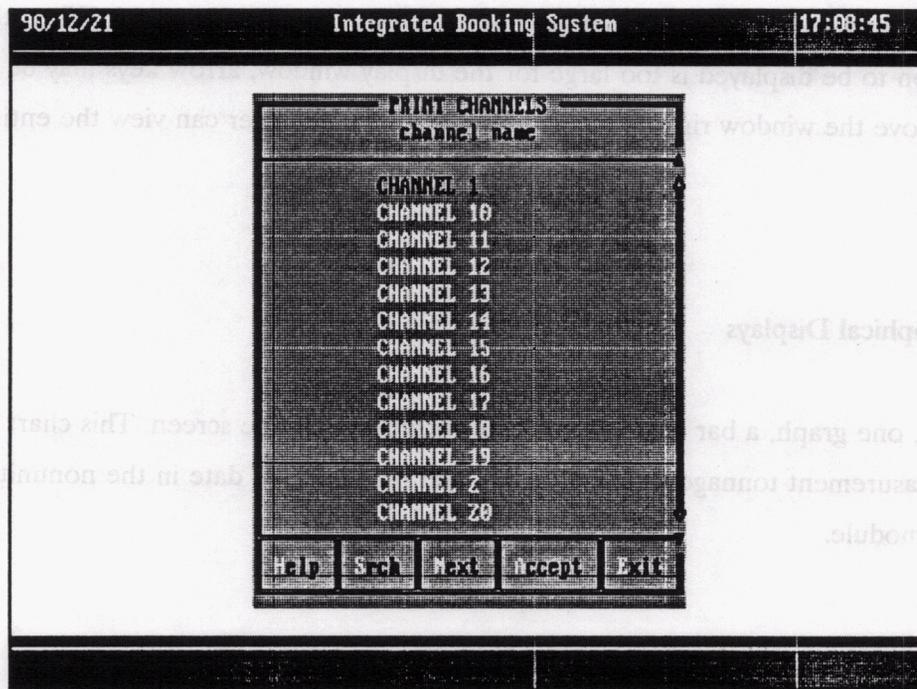


Fig. 2.6. The scrolling menu for printing multiple channels.

2.4 DATA OUTPUT SCREENS

The following subsections discuss formal system output requests. Ad hoc queries (which may be output to the screen) are discussed in Section 4.3.

2.4.1 Screen and Printed Reports

Currently all reports available in each of the three main modules are options on a menu. All of these reports can be printed to the screen. Reports printed on the screen may be sent to the printer by pressing "P" on the keyboard.

Reports printed to the screen are white characters on a black background. When the information to be displayed is too large for the display window, arrow keys may be used to move the window right/left and up/down so that the user can view the entire report.

2.4.2 Graphical Displays

Currently, one graph, a bar chart, is available for display on the screen. This chart shows measurement tonnage for a particular port on a specific date in the nonunit resupply module.

2.5 SPECIAL SCREENS

Some screens in IBS will be available only to special users, for example, the administrators and maintainers of the system. These screens were not developed for the IBS-P; they were unnecessary because the prototype will be neither administered

nor maintained in an operational capacity. The purpose of this discussion is to show desirable functionality for future design.

Upon login to the target IBS, the special users will be recognized by the system through their userid/password combination. These users will see menu options not shown to the ordinary user, who will use IBS to process booking requests. These special categories of user include the system administrator, database administrator, and the data administrator.

At a minimum, the system administrator of the target system will need to maintain transaction files and an audit log, provide for backup and recovery, maintain system userids and passwords, ensure that configuration management procedures are followed, and maintain appropriate security at all times. Data and database administrators will need screens that allow them to maintain data and database quality, define and maintain metadata and the data dictionary, and provide functionality for the system utilities (e.g., capability is required for a booking branch supervisor to assign a particular cargo movement request to a particular booking technician).

3. KEYBOARD AND MOUSE FUNCTIONS

Oak Ridge National Laboratory (ORNL) developers believe that IBS-P users will generally maneuver through the booking process using the mouse. However, the keyboard will also be used. Obviously, manual data entry will be via the keyboard. In addition, although cursor movement and item selection are easier to accomplish using the mouse, all actions that can be performed with the mouse can also be performed using only the keyboard.

3.1 FUNCTION KEYS

The function keys are not as important in IBS-P as in many similar systems. Use of the mouse and hot keys has supplanted the need to "reach" for a function key. The single exception to this statement is the use of <F1> for accessing HELP. The use of <F1> for accessing HELP is fairly common in personal computer (PC) off-the-shelf software packages, and it is felt that this is a natural sequence for most PC users. The same result can be achieved by clicking the mouse button on the hot key. The function keys <F2-F12> have no special uses within IBS-P.

3.2 CURSOR MOVEMENT AND SPECIAL KEYS

On a menu screen, the **cursor** (arrow) keys move the cursor left and right across the menu bar at the top of the screen or up and down on a submenu of the top-level menu. In a data entry screen, the left and right arrows move the cursor within a field. The up and down arrows move the cursor to previous and next fields, respectively.

On a menu screen, the <ESC> key cancels a selection and returns the user to the previous menu level. In a data entry screen, the <ESC> key brings up the exit menu.

On a data entry screen, pressing the <ALT> key with a hot key allows the user to select an option (see Section 3.4).

On a menu screen, the <TAB> and <BACK-TAB> (shift-TAB) keys move the cursor right and left on the menu bar at the top of the screen. In a window that displays a list of valid values, <TAB> performs the same function as the search button. In a data entry screen, the <TAB> key moves the cursor to the next (<BACK-TAB> to previous) field.

On a scrolling picklist (or scrollable list of valid values), the <CTRL-HOME> and <CTRL-END> keys reposition the cursor to the first record and last record, respectively, in the menu.

On a data entry screen, **CTRL-PAGE UP** moves to the first record in the database; the **CTRL-PAGE DOWN** key moves to the last record.

On a menu screen, the <BACKSPACE> key has no function. On a data entry screen, the <BACKSPACE> key moves the cursor backwards within a field and deletes the character that was positioned immediately to the left of the cursor.

On a menu screen, the <ENTER/RETURN> key accepts the selection of the field on which the cursor rests. Pressing the <ENTER//RETURN> key serves the same purpose as clicking the left mouse button on lists of valid values. On a data entry screen, the <ENTER/RETURN> key may be used to move to the next field.

On a scrolling picklist, the <SPACEBAR> will continue searching for the next occurrence of the previous search value. On a data entry screen, the <SPACEBAR> moves the cursor to the right within a field. If the <INSERT> toggle is on, the data

within the field, as displayed on the screen, is moved one character to the right and a space is inserted in the position that the cursor had previously held. If the <INSERT> toggle is off, pressing the space bar moves the cursor one character to the right and erases the character that was immediately to the right.

The <SHIFT> and <CAPS LOCK> keys perform their normal purpose -- capitalizing letters. IBS-P automatically converts all data entry to capital letters.

The <INSERT> key is a toggle key for inserting or overwriting characters in a field.

On a menu screen, the <DELETE> key has no function. On a data entry screen, it deletes the character under the cursor within a field.

On a menu screen, the <PAGE DOWN> and <PAGE UP> keys move the cursor to the bottom and to the top, respectively, of submenu options, or to the next/previous page of options when more than one screen is available. On a list of valid values, the cursor is moved to the first data record on the previous and next page, respectively. In a data entry screen, these keys move the cursor to the next and to the previous record, respectively.

On a scrolling picklist, the <HOME> and <END> keys move the cursor to the first and last option on the screen. On a data entry screen, the <HOME> key moves the cursor to the beginning of the field; the <END> key moves the cursor to the next blank space in the field.

<PRINT SCREEN> will print the screen. The <SCROLL LOCK> key has no function. The <PAUSE/BREAK> key also has no function.

3.3 MOUSE FUNCTIONS

The mouse has no restrictions on its movement around the screen. The left button is always the appropriate button for making a selection. The right mouse button is never used. In menu and data entry fields, if the cursor is positioned on a field, then clicking the left mouse button selects the choice highlighted.

In addition, data entry screens in IBS-P have borders that contain arrow points. The lower border has a left and a right arrow point located on the left and right, respectively, lower corners of the screen. If the mouse button is clicked when the cursor is positioned on the left arrow, then the cursor moves to the previous field. Clicking on the right arrow moves the cursor to the next field. The border on the right side of the data entry screen has an up arrow point and a down arrow point at the top and bottom, respectively. If the mouse button is clicked when the cursor is positioned on the up arrow, then the first record in the database is displayed. Clicking on the down arrow displays the last record in the database that is appropriate for display for this particular data entry application. Clicking on the vertical line between the up arrow and the middle of the line displays the previous record. Positioning the mouse between the middle of the vertical line and the down arrow and clicking displays the next record in the database. Clicking on a hot key (when the letter of the choice is highlighted) brings up that function. Clicking the mouse when not on a field or on an arrow point performs no function.

In a pull-down menu, clicking on a menu item brings up a submenu or an application. Clicking on a submenu choice brings up the application screen for that choice. Clicking on a border exits to the main menu.

3.4 HOT KEY FUNCTIONS

Hot keys allow the user to select an option from the keyboard without using the arrow keys or the mouse. Functional menus, data menus, and data entry screens all utilize hot keys. The hot key for an option appears in a different color from the rest of the option description. On functional and data menus, the user only has to press the letter of the hot key. Hot keys for data entry screen options are accessed by first pressing <ALT> and then the hot key. This extra key stroke is necessary since IBS-P has no way of differentiating a hot key from data input to an on-screen field.

4. DATA EXCHANGES

4.1 EXCHANGING DATA WITH OTHER SYSTEMS

The target IBS will exchange data with automated systems, will access and update data in a proposed corporate database shared by other automated systems, and will receive and process information from several groups through manual, on-line, and partially automated procedures. Because the IBS-P is a proof-of-concept system and is not intended to be an operational system, it will not actually exchange data with any other existing systems. The only actual data input mechanism for the IBS-P is the keyboard. Data exchange is simulated by "reading" files previously prepared and stored with the IBS-P reference files in the directory associated with the IBS-P program and database files.

4.1.1 Unit Cargo Moves

IBS-P simulates a data exchange with the Transportation Coordinator's Automated Information for Movements System (TC-AIMS). Data received from TC-AIMS are the Unit Movement Data (UMD).

Receipt of an extract of the Automated Unit Equipment List (AUEL) from the U.S. Army Forces Command (FORSCOM) and UEL from non-Army sites is simulated, in that the UMD data are used to represent this data exchange. This simulated data exchange is adequate for the prototype. (Obviously this action is **not** appropriate for the target IBS.) Receipt of an extract of Joint Operation Planning and Execution System (JOPES) data in the form of an E-3 report is simulated for the IBS-P. (Updating of JOPES is not included in the IBS-P.)

Some reference files for schedules and rates are included within the IBS-P database. Data exchanges with the Military Sealift Command (MSC) and MTMC Inland Traffic for the IBS-P are totally manual input/output.

4.1.2 Nonunit Cargo Moves

Interfaces with the Worldwide Port System (WPS), the Automated Carrier Interface (ACI), requestors, MSC, and MTMC-IN are proposed for the target IBS. These interfaces do not exist for the IBS-P. All movement requirements for the IBS-P must be manually entered.

4.2 REPORTS AND MESSAGES

IBS-P provides several screen and hard-copy reports (see Section 2.4). In addition, the IBS-P design recognizes that some messages (e.g., to the Supported Commander in Chief of an operation) must be provided automatically based on certain criteria being true or false. Although there is no actual transmission of data, IBS-P designers simulate the transmittal of this type of message and the functionality of the transmittal has been written into the Functional Description of the target system.

4.3 AD HOC QUERIES

At this time it is not possible to construct ad hoc queries for the IBS-P.

5. USER ASSISTANCE

5.1 GETTING HELP

The IBS-P uses the FoxPro Help facility. Help messages are available for many menu options and data fields. On an IBS-P menu screen, a message at the bottom of the screen explains the menu option that is highlighted. The message changes as different options are selected.

The Help facility for individual fields on data entry screens is only partially developed in the prototype software. Help is accessed (when available) by selecting the field desired and then selecting the option **Help** from the options listed down the left-hand side of the screen. If no help is available, a message will appear to this effect.

Help is also available in the **Lookup** option, which provides a scrollable picklist of valid values for a specific field.

5.2 ERROR MESSAGES

Help is also available in the form of error messages. For example, if a required delivery date (RDD) is entered that is not later than today's date, an error message will state that the RDD must be later than today's date. If the user attempts to leave a mandatory field blank, he/she will see a list of valid input options from which to select the input option desired. The input option will be copied back into the data field.

5.3 ADDITIONAL HELP PROVIDED BY THE PROGRAMMER

The IBS-P also provides assistance to the user through the use of validation routines that are never viewed by the user. For example, if a field is coded as a numerical field and the user attempts to enter alphabetic characters, the field will refuse to accept the entry and the user will receive an error message.

5.4 DOCUMENTATION

Documentation for the IBS-P exists in two forms: comments within the program code and hard-copy reports. The commented code serves to help the designer of the target system understand the logic and purpose of each program written in FoxPro. (The target system will not be written in FoxPro.) Final reports that have been written in support of the IBS-P include a Database Description, Developmental Test Plan, Implementation Plan, Users' Manual, and this User Interface Guidelines report. It is planned that the documentation written for the prototype will be used as the initial documentation for the target system and that this initial documentation will receive appropriate modifications to account for a new system architecture and enhanced capabilities.

Draft documentation that has been or will be provided for the target IBS includes a Functional Description and an Economic Analysis. Final versions of these documents will be produced by May 1991. Additional documentation (e.g., a Maintenance Manual) will be required for the target IBS.

6. SUMMARY AND RECOMMENDATIONS

Although the user interface for IBS-P is limited by its hardware and software development environment, its general design is appropriate to ensure usability and functionality of the target IBS. The user interface was tested by HQ MTMC, by Information Management personnel at MTMC Eastern Area Command, by Systems Management personnel at MTMC Western Area Command, and by bookers at MTMC Eastern and Western Area Commands.

The appropriateness, flexibility, and maintainability of the user interface will be further tested prior to development of the target IBS. In addition, enhancements to usability which are made possible by the target software and hardware environment are encouraged.

The following recommendations are offered as enhancements to the IBS-P for implementation in the target system.

- Additional graphics are recommended.
- System utilities must be developed. These include (but are not limited to) the following: tracking usage, errors, and attempts at illegal access; archiving procedures, and maintaining reference files.
- All system interfaces, data exchanges, report capabilities, and query capabilities must be developed.
- Incorporation of TACOS capabilities must be completed so that the transition between IBS and the decision support module is transparent to the user.
- A utility for ensuring data quality must be developed, incorporated, and used.

- Procedures must be developed and enforced to ensure system security, protection against viruses, and protection of sensitive data.
- Validation routines for downloaded files and manually input data must be incorporated.
- A welcome screen and login screen, which includes login identification and passwords, should be added.
- Standards for timing, responsiveness, availability, compatibility, capacity, and additional functionality must be determined.

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