Technical Note 2-92

A PRELIMINARY EVALUATION OF THE PROTOTYPE TACTICAL COMPUTERIZED INTERACTIVE DISPLAY

Diane K. Mitchell
Kragg P. Kysor

January 1992
AMCMS Code 612716.H700011

Approved for public release;
distribution unlimited.

U.S. ARMY HUMAN ENGINEERING LABORATORY

Aberdeen Proving Ground, Maryland

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S): Technical Note 2-92	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: Human Engineering Laboratory; 6b. OFFICE SYMBOL (If applicable): SLCHE	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code): Aberdeen Proving Ground, MD 21005-5001	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION; 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO. 6.27.16; PROJECT NO. 1L162716AH70; TASK NO. ✓; WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

A Preliminary Evaluation of the Prototype Tactical Computerized Interactive Display

12. PERSONAL AUTHOR(S)

Mitchell, D. K., and Kysor, K. P.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM _____ TO _____	1992, January	98

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
05	02		battlefield digital message processing digital text editing flat panel computer display human-computer interaction (HCI) (see reverse)
05	08	(see reverse)	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

In June 1990, the U.S. Army Human Engineering Laboratory (HEL) conducted a preliminary evaluation of a prototype computer device called the tactical computerized interactive display (TACID). The objective of this preliminary investigation was to identify human factors evaluation issues related to the TACID liquid crystal display (LCD) and message software.

A practical method of user interface evaluation (Johnson, Clegg, & Ravden, 1989) was used to evaluate the TACID. During Phase 1 of the evaluation, a system designer evaluated the TACID display and software using checklists from DOD-HDBK-761 (DoD, 1985). Four HEL researchers, who were taught to use the TACID, noted the general readability of the LCD display as well as human factors problems associated with the software. During Phase 2 of the study, the performance of 27 West Virginia Army National Guardsmen was recorded on video tape as they performed relatively simple military communications tasks using the TACID. Finally, during Phase 3, the operators were asked to complete questionnaires about the TACID training they had received and their operational experience with the device.

In most cases, the software used on the TACID was consistent with DOD-HBK-761 (DoD, 1985). The subjects had no problems reading the LCD display, and they only had a few problems with the TACID message software.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	Unclassified

22. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Technical Reports Office	(301) 278-4478	SLCHE-SS-TSB

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

17. (continued)

12	05
12	06
15	04
15	06
23	02
25	03
25	05

18. (continued)

human-computer interface guidelines
human factors checklist
human factors evaluation (HFE)
legibility
liquid crystal display (LCD)
readability
rugged personal computer
tactical computerized interactive display (TACID)
video data analysis

AMCMS Code 612716.H700011

Technical Note 2-92

A PRELIMINARY EVALUATION OF THE PROTOTYPE TACTICAL COMPUTERIZED INTERACTIVE DISPLAY

Diane K. Mitchell
Kragg P. Kysor

January 1992

APPROVED
JOHN D. WEISZ
Director
Human Engineering Laboratory

U.S. ARMY HUMAN ENGINEERING LABORATORY

Aberdeen Proving Ground, Maryland

CONTENTS

EXECUTIVE SUMMARY

In June 1990, the U.S. Army Human Engineering Laboratory (HEL) conducted a preliminary evaluation of a prototype computer device called the tactical computerized interactive display (TACID). The objective of this preliminary investigation was to identify human factors evaluation issues related to the TACID liquid crystal display (LCD) and message software.

A practical method of user interface evaluation (Johnson, Clegg, & Ravden, 1989) was used to evaluate the TACID. During Phase 1 of the evaluation, a system designer evaluated the TACID display and software using checklists from DOD-HDBK-761 (DoD, 1985). Four HEL researchers, who were taught to use the TACID, noted the general readability of the LCD display as well as human factors problems associated with the software. During Phase 2 of the study, the performance of 27 West Virginia Army National Guardsmen was recorded on video tape as they performed relatively simple military communications tasks using the TACID. Finally, during Phase 3, the operators were asked to complete questionnaires about the TACID training they had received and their operational experience with the device.

In most cases, the software used on the TACID was consistent with DOD-HBK-761 (DoD, 1985). The subjects had no problems reading the LCD display, and they only had a few problems with the TACID message software.

A PRELIMINARY EVALUATION OF THE PROTOTYPE TACTICAL COMPUTERIZED INTERACTIVE DISPLAY

INTRODUCTION

As part of the Army Materiel Command (AMC) D650 foreign technology evaluation program, the U.S. Army Human Engineering Laboratory (HEL) acquired a small, high resolution, liquid crystal display (LCD) manufactured by Japan. Blazie Engineering of Street, Maryland, an HEL contractor, integrated this display into a prototype computer device called the tactical computerized interactive display (TACID). The TACID is a small, rugged computer system, based on an International Business Machines (IBM) personal computer (PC). Human interaction with the TACID is accomplished through the use of three buttons and a track ball, which are integral to the device, or a keyboard which may be plugged into the device. The TACID's output is displayed on the Japanese LCD (see Figures 1 through 3).

The U.S. Army is developing a number of automated command and control systems, which are intended to improve the coordination and responsiveness of the various combat arms of the Army in a wide variety of threat environments and tactical situations. The maneuver control system (MCS), a part of the Army tactical command and control system (ATCCS) which will serve the infantry and tank-equipped forces, is currently designed to serve corps through brigade echelons. Since the portability standard is 35 pounds (DoD, 1983) and the portable computer unit (PCU) of the ATCCS weighs 55 pounds, it is too bulky, heavy, and difficult for lower maneuver echelons to use. This creates a need for a small, rugged computer capable of running software that will allow company level maneuver elements to communicate with MCS and other ATCCS command and control systems. In addition, this lower echelon computer must be able to survive the harsh environment of military tracked vehicles. The TACID was designed to satisfy both these requirements. It is capable of running MCS-formatted messages, and the LCD display is more likely than a fragile cathode ray tube (CRT) to survive in a tracked vehicle. Seeing the potential of such a computer device with its relatively large and high resolution display, HEL conducted a preliminary evaluation of the prototype TACID in June 1990. The objective of this evaluation was to identify human factors engineering (HFE) issues related to the system's LCD display and message software.

METHOD

Subjects

Twenty-seven West Virginia Army National Guardsmen (all male) participated as potential users in the TACID evaluation. They were all military occupational specialty (MOS) 13-B (field artillery), which was not as desirable as soldiers trained in infantry or armor, but did ensure combat arms experience and exposure to maneuver operations.

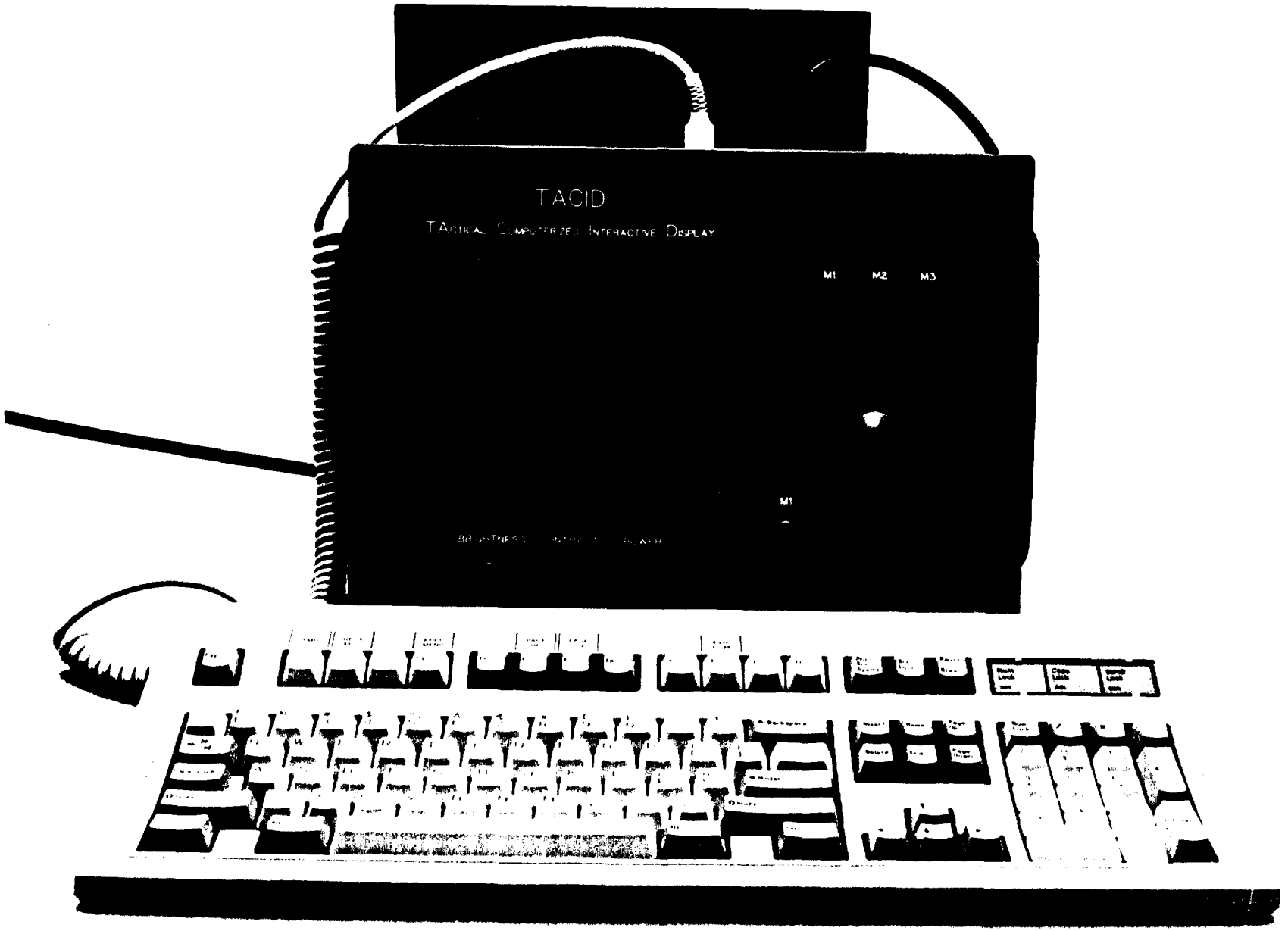


Figure 1. TACID device with PC-type interchangeable keyboard (front view).

Figure 2. TACID device showing configuration of LCD display, controls, indicator lights, selector buttons, and trackball. (Also shown is the top portion of a PC-type keyboard with a horizontal arrangement of programmable function keys labeled to designate their programmed functions.)

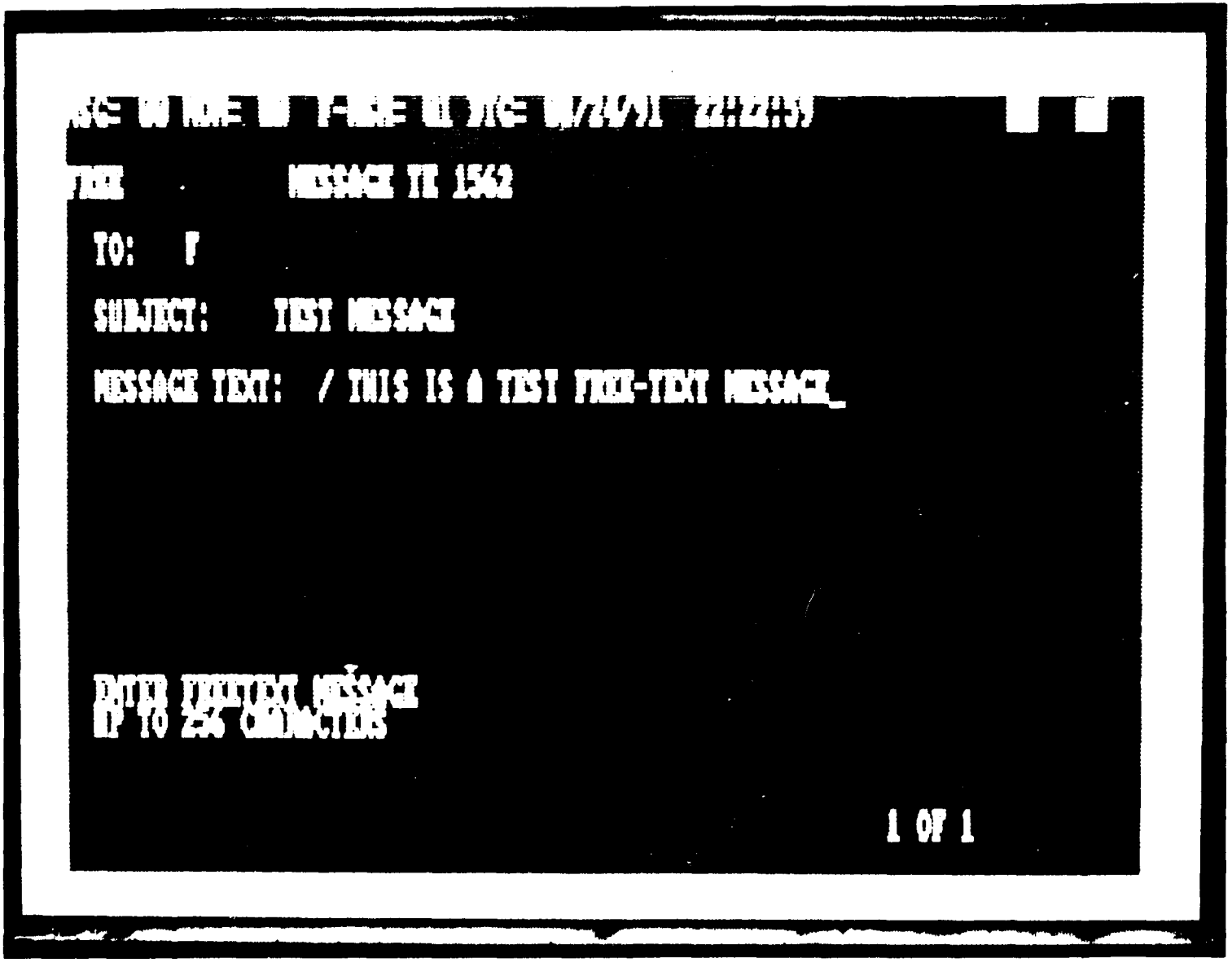


Figure 3. TACID LCD screen showing alphanumeric characters used to display prototype military tactical message data. (Only upper case letters were used to maximize the legibility of the relatively small scaled text and screen size.)

Apparatus

The piece of equipment that was the main subject of this effort is the TACID. The TACID is a locally fabricated computer system, based on an IBM PC. Two 3.5-inch disk drives are mounted in the right side of the TACID. The entire system is housed in a metal case, 34 by 24 by 10 centimeters, weighing 6.8 kilograms. Data can be input with a trackball or a keyboard. However, the software used for this study only allowed the keyboard to be used. Data output is achieved through an LCD display. The LCD is an Hitachi, 6.3-inch diagonal flat panel display. The flat panel is a high definition thin film transistor (tft) with eight colors and no gray scale. It has 200 x 640 pixels and is 24 lines by 80 characters wide. This LCD was one of the largest color LCDs commercially available at the time of the study in 1990.

For this exercise, the TACID operated using Microsoft disk operating system (MS-DOS), with an HEL written tactical command and control applications program, that is, the company commander's battlefield communication system (CCBCS) software (Thomas, Schroeder, Tyrol, & Marsh, 1989).

Additional equipment included an unmodified IBM PC running the same software to act as a stimulator for the TACID. Checklists from DOD-HDBK-761 (DoD, 1985) were used to evaluate the TACID and its software.

Video recording of typical military user's performance was done on tape using a 1/2-inch video home system (VHS) format video cassette recorder Panasonic model WV-8500. A tripod-mounted color charge-coupled device (CCD) camera, Panasonic model WV-CL304 with a zoom lens, was used initially. This camera, positioned at an angled distance approximately 5 feet behind and above the TACID operator's left shoulder, viewed the screen display and the operator's hands on the keyboard. The arrangement was not entirely satisfactory, however, because the camera angle often resulted in the operator's hand blocking the view of the key that he was pressing. Subsequently, the problem was virtually eliminated by the use of an overhead-mounted color CCD micro-camera, Panasonic model GP-CD1. This extremely small and lightweight camera was mounted directly above the keyboard so that it looked down at both the display and the unobstructed view of the operator's fingers pressing the individual keys. A 13-inch diagonal color video monitor, Panasonic model BT-S1300N, was used to adjust the camera's field of view. An electret type microphone was located between the military user and the researcher to record their conversation on the video cassette audio track.

PROCEDURE

A practical method of user interface evaluation (Johnson, Clegg, & Ravden, 1989) was used in the evaluation of the TACID system. Their method emphasized "the conduct of realistic tasks with an interactive system and the subsequent systematic elicitation of end users' and designers' reactions to the interface using a criterion-based evaluation checklist" (p. 255). Consequently, this study conceived of the various human factors evaluation approaches as different "phases" of analysis representing (a) the developers' point of view, (b) the objective performance of the end user interacting with the system, and (c) the subjective reactions of the end users to the system.

During Phase 1 of the evaluation, the TACID display and software were evaluated by HEL system designers. During Phase 2 of the study, the performance of representative operators was recorded on video tape as they performed relatively simple military communications tasks using the TACID interacting

with a simulated system. Finally, during Phase 3, the operator was asked to complete a questionnaire regarding the training he was given about the TACID and his operational experience with the device.

Phase 1. Developers' Evaluation

Four HEL researchers were taught to use the TACID to transmit and receive relatively unstructured text, that is, "FREE TEXT" messages. The researchers noted the general readability of the LCD display as well as human factors problems associated with the CCBCS software. The software designer then implemented the suggested software changes. The LCD, being manufactured commercially by a foreign manufacturer, was in a relatively hardened technological state and therefore was not amenable to modification by local developers. However, since the participating researchers observed that the LCD was generally readable, no changes in the prototype LCD were felt to be mandatory.

Next, one HEL developer compared the revised CCBCS software and the TACID LCD to human engineering guidelines provided in DOD-HDBK-761 (DoD, 1985). This handbook contains checklists for evaluating management information systems for design characteristics, dialogue and display, language considerations, working in the file, forms, training, keyboard and input devices, screens and printers and work stations. These checklists were used by the developer for evaluating the TACID and the CCBCS software. Sample checklists are provided in Appendix A.

Phase 2. End User's Performance (Video Recording)

Twenty-seven West Virginia Army National Guardsmen, howitzer crew members, used the TACID to transmit and receive FREE TEXT messages. This data-processing task was selected because a howitzer crew in combat would be most likely to use the TACID to communicate with its battalion headquarters. Therefore, the task represents a realistic and a practical use for the TACID in the field.

The crew member subjects were trained in the concept and operation of the TACID and its CCBCS software. This "hands-on" training involved the test crew member who sat in front of the TACID and communicated by a direct wire connection to a second, commercial, personal computer (PC) operated by the trainer. The operator was seated in a chair in front of the TACID. He could move the chair closer to or farther from the TACID to obtain the viewing distance he liked best. This procedure is consistent with field scenarios. The CCBCS software allowed the TACID and PC to interact. The TACID operator was taught to compose, transmit, and receive a FREE TEXT message. The training booklet is provided in Appendix B.

During the test sessions, each subject spent 30 minutes responding to a set of prepared test messages (see Appendix C), for example, "How many HE do you have left?". The TACID operator was required to read the question, compose a reasonable answer, and transmit his answer to the evaluator. All the test sessions were videotaped. After all the test sessions were completed, the video tapes were reviewed to identify human factors problems associated with the TACID or CCBCS software. Specifically, the reviewers looked for any comments the subjects made regarding the readability of the LCD since it was smaller than standard computer displays. The reviewers also looked for software commands where the TACID operators frequently made errors.

Phase 3. End Users' Evaluations (Questionnaire)

At the end of the test session, the TACID operator was asked to complete a questionnaire. The questionnaire form is provided in Appendix C. Paralleling the identification of human factors problems from the objective performances on the videotapes, the reviewers looked for the subjective impressions and reactions, expressed on the questionnaire form that the TACID operators had with the LCD screen displays or their operator interactions with the CCBCS software.

RESULTS AND DISCUSSION

Phase 1. Developer's Evaluation

All four HEL researchers reported that they had no problems with the readability of the TACID display. They suggested a couple of minor changes be made in the CCBCS software. As a result of their suggestions, "RECEIVED MESSAGES" was eliminated as a selectable option in the main menu. Since there already was a RECEIVED MESSAGES function key, it was redundant to duplicate this option in the main menu. Extraneous characters, which the researchers noticed on some of the screens, were also removed.

The developer, evaluating the LCD by checklists from DOD-HDBK-761 (DoD, 1985) found no HFE problems with it. The primary HFE problems with CCBCS software identified by the checklists are listed below by checklist category. The checklists completed by the developer are provided in Appendix A.

A. Interactive Dialogue and Display

One of the screen displays was not formatted consistently with all the others. That is, while most of the screens show the command lines starting at the bottom left of the display, the RECEIVED MESSAGES screen has a command line across the top of the display. This screen needs to be made the same as the others to conform to the user's expectancy of where command type information is to be.

Appropriate user feedback needs to be added for situations when the user incorrectly tries to use a function key. For example, the RECEIVED MESSAGES function key is usually used to read a new RECEIVED MESSAGE. When editing a RECEIVED MESSAGE, however, the user cannot use this button to read a new message. This occurs because the RECEIVED MESSAGES subroutine does not automatically allow access to the most recently updated message file. To read the new message(s), the user must exit his current working RECEIVED MESSAGES file by pressing the function button F4 to leave his older RECEIVED MESSAGES file and gain access to the newer RECEIVED MESSAGES file through a PREVIOUS MENU screen that displays the list of the most current RECEIVED MESSAGES. A suggested solution is to provide the user with a prompt such as: "To receive a new message list, press the function key F4 (Previous Menu) to see the newest message list." The majority of the screens (MAIN MENU, CREATE A TACTICAL MESSAGE, EDIT, AND RECEIVE MESSAGES) do not contain any directions to assist the user. Therefore, it is suggested that "user directions" be added to these screens. These directions should precede the list of choices and guide the user with next steps or alternate choices.

Although human engineering guidelines recommend using a box or block type cursor, the CCBCS's cursor is a line. In this case, the line may be preferable since a box is already being used on the TACID display to indi-

cate that a message has been received. Therefore, if a box were also used for the cursor, the cursor would look too similar to the RECEIVED MESSAGES indicator. According to the HFE guidelines, the cursor could be made more visible if its blink rate were increased from one flash per second to at least three flashes per second. However, none of the users in Phase II reported any difficulty identifying the cursor.

The text appears on the TACID's display in all capitals. According to the HFE guidelines, the user would probably find the text more readable if it were changed to both upper and lower case font.

B. Language Considerations

The TACID's CCBCS software contains no HELP screens. These need to be added so that the user can request help at any time to determine what commands are permitted.

C. Working in the File

The data entry steps for the CREATE A MESSAGE procedure are not consistent with the steps for editing a message. When a FREE TEXT message is created for the first time, the software automatically advances to the next line to be completed. However, when a message is edited, the software automatically returns to line 1 after each change. One of these procedures should be changed so the two will be consistent.

The system should be designed so that the user does not have to be familiar with its internal retrieval and storage mechanisms. The edit routine for RECEIVED MESSAGES violates this rule. If the user is editing a RECEIVED MESSAGE and s/he receives a new message, s/he cannot retrieve the new message by pressing the RECEIVED MESSAGES function key. If the user is familiar with internal retrieval, s/he would understand that this occurs because he is already in the RECEIVED MESSAGES subroutine. To solve this problem a prompt, "Already in RECEIVED MESSAGES, hit F4 (previous menu) to receive message", should appear.

Guidance information should be presented in the same location on the screen. When the user creates or edits a FREE TEXT message, the prompts, indicating the number of characters allotted to each field, appear at the top rather than the bottom of the screen. For consistency, these prompts should be moved to the bottom of the screen.

The TACID's CCBCS software provides the user with few error messages or prompts. When the system rejects a user input, the user should be provided with a message indicating why the input was rejected. The software should also provide the user with messages specifying the actions necessary to correct an error.

D. Training

The training program was designed for users who had some previous computer experience. Since most lower echelon military users are not likely to have keyboard proficiency, it is desirable to design a second training program for less experienced users. Also, the training manual did not contain an overview of the system. A few introductory paragraphs describing the system with its capabilities and limitations should be added.

E. Screens and Printers

Human factor guidelines recommend that characters on a display be at least 5 x 7 pixels. Since proportional spacing was used for the characters displayed on the TACID, some of the letters (e.g., "I") were not 5 x 7. Although none of the HEL researchers or military personnel using the TACID reported any difficulty reading the text, future testing of the TACID might include a comparison of proportionally spaced text to uniformly spaced (5 x 7) text.

The majority of lines displayed on the TACID screen have sufficient space between the lines. However, several of the prompts, which appear at the bottom of the screen, and some of the FREE TEXT lines are juxtaposed with no space between the lines. More spacing needs to be allotted between these lines. At least one line of pixel space should be used to improve the legibility in these cases.

Human factors guidelines recommend a 12-inch diagonal screen. Although the TACID's LCD is only 6 inches, it is one of the largest color LCDs commercially available, and none of the subjects participating in the study reported any difficulties reading it.

Phase 2. End User's Performance (Video Data Analysis)

The video tapes of the subjects operating the TACID were reviewed to see what errors were made, which commands caused problems, and if there were any LCD readability problems.

For the test of readability, the subjects were asked to read a line of characters appearing across the top of the LCD display. All the subjects were able to read the characters, although some of them complained that the character string appeared too close to the top of the TACID screen.

Most of the subjects had very few problems operating the TACID. The subjects who were better typists found it easier to enter the message text than slower typists did. In addition, several consistent problem areas were identified with the function keys, the editing routine, the key repeat function, and the RECEIVED MESSAGES queue.

All the subjects experienced difficulty remembering which function key to use to obtain the latest RECEIVED MESSAGES list after editing an older message. When a message is sent to the TACID, the operator, if s/he is viewing the MAIN MENU screen, presses the RECEIVED MESSAGE function key to display the RECEIVED MESSAGES list. S/he then presses the ENTER key to display the RECEIVED MESSAGES text. S/he can compose a reply to this RECEIVED MESSAGES either by (a) exiting the RECEIVED MESSAGES sub-routine and creating a whole new message or (b) by remaining in RECEIVED MESSAGES subroutine and editing the message s/he has just received. All the subjects chose to edit the RECEIVED MESSAGES. After they had finished editing the message, they transmitted it to the evaluator's PC. Next, the evaluator sent them another message. Since the subject was still in the older RECEIVED MESSAGES edit routine, he needed to use the PREVIOUS MENU function key to see the evaluator's latest message identified in the most recent RECEIVED MESSAGES list. Most of the subjects mistakenly tried to use the RECEIVED MESSAGES function key to display the RECEIVED MESSAGES list. To solve this problem, a prompt, "Use the F4 function key (PREVIOUS MENU) to display new RECEIVED MESSAGES list", should be added to the RECEIVED MESSAGES edit screen.

The subjects also experienced problems with the edit routine itself. Many of them tried to preserve existing text by using the space bar to move to an editing location where they could change some of the words without retyping the whole message. The edit routine would not let them do this. Instead, when they press the space bar, the old text was deleted. To solve this problem, the editor should either (a) allow the user to move the cursor without changing the old text or (b) delete the old text as soon as the line is selected for editing.

Subjects also had problems saving the changes they made during an editing session. The edit routine required the subject to hit ENTER after each edited line. Many of the subjects forgot to do this. Instead, they typed the changes and then pressed XMIT. As a result, they sent a blank message. One subject suggested a solution to this problem might be to add a SAVE function key to the display.

The function keys on the TACID keyboard repeated their function if they were held down too long. Some of the subjects pushed the transmit function key so hard that its function repeated. This excess force caused the message to be transmitted many times. To correct these problems, the repeat function should be disabled for the function keys.

The transmit button was labeled "XMIT." This button should probably be relabeled "TRANSMIT", since some of the subjects had trouble remembering which button to use to send a message.

All messages received by the TACID were automatically saved in a message list unless the subject deliberately hit the delete button to remove them. For this reason, the RECEIVED MESSAGES list usually contained many messages. When the subject displayed the RECEIVED MESSAGES list, he could see the number of the message, who sent it, and the time of transmission. He could not, however, see the topic of the message. Several users recommended that a topic heading be added to the message list display. The prompt, "Press the ENTER key to read message", should also be added to this screen since some of the subjects forgot how to display the message text. The prompt, "Press the PAGE DOWN button for page 2 of 2" should be added, since some subjects forgot how to display page 2 of the messages received list. Only two pages of messages could be stored.

Phase 3. End User's Evaluations (Questionnaire Analysis)

A. Demographic Data

A summary of the demographic data is provided in Table 1. All the military subjects except one reported that they had completed high school. In addition, 7 of the 27 subjects had some college education, and one subject had a college degree. A majority of the subjects (20 of 27) had previous computer experience which ranged from 2 weeks to 6 years. Also, a majority (19 of 27) had previous typing experience. However, they are not proficient typists since most of them reported that they typed only 25 or fewer words per minute. Seven of the 27 subjects had neither typing nor previous computer experience.

Table 1

Subject's Education, Military Occupation Level and Experience, and Typewriter and/or Computer Experience Proficiency

Demographic data				Part I. Computer and typewriter usage					
Subject No.	Army rank	Month in MOS	Years of school	1a. Used computer?	1b. Computer type	1c. No. of years	2a. Used typewriter?	2b. No.of years	2c. Typing rate (WPM)
1.	SSG	124	12	Yes	unknown	0.1	Yes	2.0	25
2.	SPC	29	12	Yes	Apple,TI,Tandy	3.0	Yes	3.0	54
3	E-4	28	12	Yes	Apple	2.0	Yes	2.0	--
4.	E-5	96	12	Yes	FMC	0.1	Yes	0.3	20
5.	SGT	65	12	Yes	BCS,Zenith,IBM,HP	5.5	Yes	5.5	-
6.	SP4	36	12	Yes	Apple	0.1	Yes	0.1	3
7.	E-6	108	12	No	--	--	Yes	0.1	4
8.	SGT	24	12	No	--	--	No	0.0	0
9.	SGT	48	12	Yes	IBM	0.2	Yes	0.5	10
10.	SSG	116	15	Yes	PC's,BCS,HP,BUCS	5.0	Yes	10.0	25
11.	E-4	49	--	Yes	BCS,TI,Mac	6.0	Yes	5.0	--
12.	E-4	65	13	Yes	IBM,Vax	2.1	Yes	2.1	20
13.	SSG	72	16	Yes	Zenith	2.2	Yes	14.0	--
14.	E-4	24	12	Yes	Apple,IBM,VIC20	3.0	Yes	1.5	65
15.	SGT	40	12	No	--	--	No	0.0	0
16.	SSG	---	14	Yes	unknown	0.8	Yes	12.0	20
17.	E-5	69	12	Yes	Tandy	0.3	Yes	0.3	--
18.	E-4	24	12	No	--	--	No	0.0	0
19.	SSG	24	12	No	--	--	No	0.0	0
20.	E-7	144	12	No	--	--	No	0.0	0
21.	E-4	80	13	Yes	Televideo	1.0	Yes	1.0	25
22.	SPC	52	14	Yes	unknown	0.5	Yes	2.0	--
23.	E-4	56	12	Yes	IBM	0.3	No	0.0	0
24.	SP4	48	13	Yes	IBM PC	1.0	Yes	3.0	--
25.	E-6	35	12	No	--	--	No	0.0	0
26.	E-4	1	13	Yes	M1Tank,Zenith	4.5	Yes	1.0	7
27.	E-3	46	11	Yes	IBM,Apple	0.3	No	0.0	0

B. Operator Training

This part of the questionnaire gathered information about the TACID operator's training. Summaries of the data for Part 2 of the questionnaire are provided in Tables 2 and 3. Questions 1, 2, and 4 asked the subjects to report about the appropriateness of the length of training. Summarizing across these three questions, only two subjects reported that too much training had been provided. Nine people reported that the length of training was appropriate. The remainder of the subjects felt that either the training was too short (10) or felt uncertain (6) about the length of training. Since the purpose of this study was to identify human factors problems with the TACID, it was critical to see where the subjects made errors and which procedures caused these errors. Therefore, training was kept to a minimum to prevent subjects from learning to circumvent problem areas. This probably explains why ten subjects felt the training was too short. Also, the majority of these ten subjects had no prior computer or typing experience, and they would be most likely to be affected by the shortness of the training session. For future TACID testing, it is suggested that the subjects be divided into two training programs, "computer experience" and "no computer experience." Those subjects in the no-computer-experience group should receive a longer training session than those in the experienced group.

In response to statements 3 and 5, the subjects reported about the words and instructions used during training. The majority of the subjects (20 of 27) understood all the words used during training and thought the training instructions were not confusing (25 of 27). However, three of the inexperienced computer users reported that they did not understand all the words. Two of these subjects also reported that the instructions were confusing. Once again, this demonstrates the need for a separate training program for novice computer users. This program should include definitions of all the computer terminology used so the training instructions will not be confusing to the trainees.

A majority of the subjects (25 of 27) agreed with statement 6 that the equipment was easy to operate. This majority includes six of the seven inexperienced computer users. Also, the majority (18 of 27) disagreed with statement 7 which said that the equipment was too complex to learn in the time allowed. Most of the subjects (17 of 27) thought that they could now operate the TACID. However, five of the seven subjects with no prior computer experience were either uncertain or did not think they could operate the TACID. Since they had agreed that the equipment itself was easy to operate, they probably did not think they could operate the equipment because of the shortness of their training sessions. Surprisingly, the subject with the most experience (6 years) also reported that s/he did not think s/he could operate the TACID and that it was too difficult to learn in the time allowed. Since this subject had much experience, s/he probably knew that the TACID PC was capable of performing many more functions than those s/he had been taught. This could explain why s/he did not believe s/he could operate the TACID with the training s/he had been given.

C. Displays and Software

This part of the questionnaire gathered information about the TACID display and software. A summary of the data is provided in Table 4.

Table 2

Subject Responses* to TACID Training and Equipment Complexity Questions

Part II. Training and equipment complexity

Subject No.	1. Insufficient training time?	2. Excessive training time?	3. Understood all words?	4. Adequate training time?	5. Confusing instruc-tions?	6. Easy equipment?	7. Complex equipment?	8. Operational confidence
1.	A(2)*	D(4)	U(3)	D(4)	D(4)	A(2)	U(3)	U(3)
2.	U(3)	D(4)	SA(1)	U(3)	SD(5)	SA(1)	SD(5)	A(2)
3	SA(1)	--	SA(1)	U(3)	SD(5)	D(4)	D(4)	A(2)
4.	U(3)	D(4)	A(2)	A(2)	D(4)	A(2)	D(4)	A(2)
5.	U(3)	U(3)	SA(1)	U(3)	SD(5)	A(2)	U(3)	A(2)
6.	SD(5)	SD(5)	A(2)	A(2)	SD(5)	SA(1)	SD(5)	A(2)
7.	D(4)	D(4)	A(2)	A(2)	D(4)	A(2)	D(4)	U(3)
8.	A(2)	D(4)	A(2)	D(4)	SD(5)	D(4)	U(3)	U(3)
9.	U(3)	U(3)	A(2)	U(3)	SD(5)	A(2)	D(4)	A(2)
10.	D(4)	D(4)	SA(1)	A(2)	D(4)	A(2)	D(4)	A(2)
11.	SA(1)	SD(5)	SA(1)	SD(5)	D(4)	A(2)	A(2)	D(4)
12.	D(4)	A(2)	SA(1)	D(4)	SD(5)	SA(1)	SD(5)	SA(1)
13.	SA(1)	SD(5)	A(2)	SD(5)	D(4)	A(2)	A(2)	SD(5)
14.	D(4)	U(3)	SA(1)	SA(1)	SD(5)	SA(1)	SD(5)	SA(1)
15.	SA(1)	D(4)	U(3)	D(4)	D(4)	A(2)	D(4)	A(2)
16.	U(3)	U(3)	A(2)	A(2)	D(4)	A(2)	D(4)	A(2)
17.	A(2)	D(4)	A(2)	D(4)	D(4)	A(2)	D(4)	U(3)
18.	A(2)	SD(5)	D(4)	SD(5)	D(4)	A(2)	U(3)	U(3)
19.	SA(1)	SD(5)	D(4)	U(3)	A(2)	A(2)	SA(1)	SD(5)
20.	A(2)	A(2)	D(4)	A(2)	U(3)	SA(1)	U(3)	A(2)
21.	D(4)	A(2)	A(2)	U(3)	SD(5)	SA(1)	D(4)	A(2)
22.	D(4)	D(4)	A(2)	D(4)	D(4)	SA(1)	D(4)	A(2)
23.	D(4)	D(4)	A(2)	SA(1)	SD(5)	SA(1)	SD(5)	SA(1)
24.	D(4)	SA(1)	SA(1)	A(2)	SD(5)	SA(1)	SD(5)	A(2)
25.	A(2)	D(4)	U(3)	D(4)	D(4)	A(2)	A(2)	SD(5)
26.	D(4)	D(4)	SA(1)	SA(1)	D(4)	A(2)	A(2)	SD(5)
27.	D(4)	D(4)	U(3)	U(3)	D(4)	A(2)	D(4)	U(3)
Median	U(3)	D(4)	A(2)	U(3)	D(4)	A(2)	D(4)	A(2)

*SA(1)=Strongly Agree, A(2)=Agree, U(3)=Uncertain, D(4)=Disagree, SD(5)=Strongly Disagree

Table 3

Subject Responses to TACID Training and Equipment Complexity Questions
(by median response rating indicating degree of agreement[a])

Part II. Training and equipment complexity		
Item No.	Description	Median response
3.	Understood all words?	Agree
6.	Easy equipment?	Agree
8.	Operational confidence?	Agree
1.	Insufficient training time?	Uncertain
4.	Adequate training time?	Uncertain
2.	Excessive training time?	Disagree
5.	Confusing instructions?	Disagree
7.	Complex equipment?	Disagree

[a]Response rating indicated degree of agreement as follows: strongly agree, agree, uncertain, disagree, strongly disagree.

Table 4

Subject Responses to TACID Display and Software Questions
(by frequency of "yes" responses)

Part III. TACID display and software				
Item No.	Description	Yes	No	Unknown
2.	Easy to use?	26 (96%)	1 (4%)	0 (0%)
5.	Easy to read?	26 (96%)	1 (4%)	0 (0%)
7.	Easy to operate?	26 (96%)	1 (4%)	0 (0%)
10.	Easy to create/transmit messages?	26 (96%)	0 (0%)	1 (4%)
13.	Easy to receive message and read received message?	25 (93%)	0 (0%)	2 (7%)
6.	TACID help job?	17 (63%)	9 (33%)	1 (4%)
1a.	Problems learning?	6 (22%)	21 (78%)	0 (0%)
1c.	Solve problem?	9 (33%)	3 (11%)	15 (56%)
8.	Problems creating/transmitting msgs?	6 (22%)	21 (78%)	0 (0%)
9.	Change procedure to create/transmit messages?	4 (15%)	22 (81%)	1 (4%)
12.	Change message-receiving procedure?	4 (15%)	22 (81%)	1 (4%)
4.	Change display?	3 (11%)	22 (81%)	2 (7%)
14.	Problems deleting/saving messages?	3 (11%)	22 (81%)	2 (7%)
15.	Change sending/receiving msg procedures?	3 (11%)	22 (81%)	2 (7%)
3.	Problems reading?	2 (7%)	25 (93%)	0 (0%)
11.	Problems looking up messages?	1 (4%)	25 (93%)	1 (4%)

(N)%=Percentage of 27 total responses per question.
Dotted line separates positive and negative comments.

Questions 1 and 2 asked the subjects if they had had any problems learning to operate the TACID and if it was easy to use. The majority of the subjects (21 of 27) reported no problems learning to use the TACID. However, four of the inexperienced computer users reported they needed more time to really learn how to operate the TACID. Also, two subjects reported they had problems with the RECEIVED MESSAGES function key and the edit routine. These problems are discussed in more detail in the video data analysis section of this report. All but one of the subjects thought the TACID was easy to use.

Questions 3 through 6 asked the subjects about the TACID's display. A majority of the subjects (24 of 26) had no problems reading the display and thought it was easy to read (26 of 27). Most of the subjects commented that the display was very clear and very easy to read. One subject reported he had problems initially but after some explanations, his problem had been resolved. Most of the subjects (22 of 27) did not want any changes made in the display. Seventeen of the 27 subjects thought the display would be useful in their jobs, especially for sending and receiving status reports from battalion level headquarters.

The remainder of the questions in this part of the questionnaire asked about the procedures for creating and transmitting messages. In answering these questions, the majority of the subjects reported that the TACID and its procedures for creating and transmitting messages were easy to learn and use. These responses were consistent with their answers to the first two parts of the questionnaire. Specific problems experienced by individual subjects are described in the completed questionnaires in Appendix C.

CONCLUSIONS AND RECOMMENDATIONS

The subjects had no problems reading the LCD display. However, they were reading the display in a laboratory environment. Therefore, it is recommended that further testing of the LCD be conducted during more realistic field, weather, and vehicle conditions.

In most cases, the CCBCS software was consistent with DOD-HDBK-761 (DoD, 1985). However, the following software improvements should be made: (1) the addition of more help screens and prompts, (2) an increase in the blink rate for the cursor, and (3) consistency in the editing procedures and displays. Future tests of the software should include (a) a comparison of performance when text is in all capitals versus text in lower and upper case characters and (b) proportionally spaced text versus evenly spaced text.

The subjects had few problems operating the TACID using the CCBCS software. However, a few consistent problems with the software were identified. These problems can be resolved by (a) revising the edit routine, (b) disabling the function keys' repeat feature, (c) adding a subject heading to the RECEIVED MESSAGES list, and (d) adding more user prompts to the screens. The revised software should then be tested again using representative military operators. Training could be optimized by dividing the test equipment operators into two training groups (i.e., computer experience and no computer experience) and allocating the training resources as appropriate.

REFERENCES

Department of Defense. (1985). Military handbook on human engineering guidelines for management information systems (DOD-HDBK-761). Washington, D.C.: Author.

Headquarters Department of the Army. (1983). Man-materiel systems human factors engineering program (MIL-STD-1472C). Washington, D.C.: Author.

Johnson, G.I., Clegg, C.W., & Ravden, S. J. (1989). Towards a practical method of user interface evaluation. Applied Ergonomics, 20(4), 255-260.

Thomas, M.A., Schroeder, K.C., Tyrol, D. E. & Marsh, K.B. (1989). A description and user's manual of the Human Engineering Laboratory fire support test (HELFIST) prototype digital infantry company commander's command and control terminal (Technical Note 12-89). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory.

APPENDIX A

CHECKLIST

DIALOGUE AND DISPLAY CHECKLIST

INTERACTIVE DIALOGUES	Yes	Not Applicable	Not Known*	No*
1. Have the screen layouts been modeled?	☑	☐	☐	☐
2. Are the screens visually consistent, i.e., do all command lines start at the bottom left of the screen?	☐	☐	☐	☑
3. Is appropriate feedback given for each user action?	☐	☐	☐	☑
4. Are actions (task sequences) easy to learn?	☑	☐	☐	☐
5. Are actions (task sequences) arranged rationally or logically?	☑	☐	☐	☐
6. Is it easy to escape from or abort an action or process?	☑	☐	☐	☐
7. Is it easy to recover from mistakes?	☑	☐	☐	☐
8. Can the user focus attention on the task rather than on the placement of his hands on various devices?	☑	☐	☐	☐
LABELS				
9. Do the directions to the user always precede the list of choices or required actions by the user?	☐	☐	☐	☑
10. Does each individual data group, message, or frame contain a descriptive title, phrase, word, or similar identifier to designate the content of the group or message?	☑	☐	☐	☐
11. Are labels located adjacent to the data group or message they describe?	☑	☐	☐	☐
12. Is the relationship of the label to the group or message being described clearly?	☑	☐	☐	☐
13. Are the labels highlighted to facilitate user scanning and recognition?	☑	☐	☐	☐
14. Is the method used easily distinguished from that used to highlight or code emergency or critical messages?	☑	☐	☐	☐
15. Are the labels constructed so that the user does not think that some action must be done to the label?	☑	☐	☐	☐
16. Are the labels unique among themselves to avoid confusion?	☐	☐	☐	☑
17. Does the label reflect the question being posed to the user when presenting a list of user options?	☑	☐	☐	☐
18. Where possible, are units of measurement included in the column labels or first row entry?	☑	☐	☐	☐

DISPLAY FORMAT DESIGN	Yes	Not Applicable	Not Known*	No*
19. Are the display formats designed to facilitate information transfer to the user?	☑	☐	☐	☐
20. Are there fixed formats for:				
a. Data?	☐	☑	☐	☐
b. Text?	☑	☐	☐	☐
c. Tables?	☐	☑	☐	☐
21. Can the user personalize the formats?	☐	☑	☐	☐
GROUPING				
22. Are like classes of information grouped to permit the user to associate or compare them?	☑	☐	☐	☐
23. Are group boundaries clearly indicated?	☑	☐	☐	☐
24. Is spacing used to maintain information relationships?	☑	☐	☐	☐
25. Are the items to be compared character by character one over the other?	☐	☑	☐	☐
26. Is each item started on a new line when enumerating?	☑	☐	☐	☐
DATA PRESENTATION				
27. Are data presented in a usable and readable format? (There should be no need to transpose, compute, or mentally translate into other units.)	☐	☑	☐	☐
28. If groups of five or more digits of alphanumerics are displayed and no natural organization exists, are the characters grouped in blocks of three to four characters each?	☐	☑	☐	☐
29. Are groups separated by a minimum of one blank character?	☐	☑	☐	☐
30. If the data contain a naturally occurring order, is that order reflected in the organization of the field?	☐	☑	☐	☐
31. Are identical data displayed in a consistent, standardized manner irrespective of the module or origin?	☐	☑	☐	☐
32. If there is a case of double meanings, is the intended meaning specified?	☐	☑	☐	☐

DATA PRESENTATION (continued)	Yes	Not Applicable	Not Known*	No*
33. Are all the necessary data to support a user activity or sequence of activities grouped together?	☐	☑	☐	☐
34. Is the use of hyphens minimized?	☐	☑	☐	☐
35. Is each field labeled?	☐	☑	☐	☐
36. Is each paragraph of text separated by at least one blank line?	☐	☑	☐	☐
37. Is displayed text left justified with paragraphs indented?	☐	☑	☐	☐
38. Are periods placed:				
a. At the end of a sentence?	☐	☑	☐	☐
b. After item selection number?	☐	☑	☐	☐
c. Where necessary for clarification?	☐	☑	☐	☐
39. Do frequently used commands and subcommands appear in the same place on the screen?	☐	☑	☐	☐
40. Are alphanumeric series as short as possible?	☐	☑	☐	☐
41. When developing alphabetic acronyms, are they pronounceable and do they relate to the objects that they represent?	☐	☑	☐	☐
42. Are documents designed so that when copying data there is a minimum distance between the copier and the source?	☐	☑	☐	☐
43. Since mixed alphanumeric acronyms are associated with more errors, are numbers and letters separated in the sequence?	☐	☑	☐	☐
TABULAR / GRAPHIC				
44. Are tables or graphics interpretable by themselves without referring to the text?	☐	☑	☐	☐
45. Does each table or graph have a descriptive title?	☐	☑	☐	☐
46. Are the axes clearly marked?	☐	☑	☐	☐
47. Is each segment of a pie chart marked?	☐	☑	☐	☐

	Yes	Not Applicable	Not Known*	No*
48. Where symbols or codes are used on a table or graph, is a key to their interpretation also provided?	☐	☑	☐	☐
49. Where there are multiple lines on a graph, are they uniquely identified?	☐	☑	☐	☐
50. In tables, is every fifth row and column set off by some distinctive feature like dots between columns?	☐	☑	☐	☐
51. Are the columns in a table arranged according to relevance or frequency of use?	☐	☑	☐	☐
52. Are graphic symbols standardized?	☐	☑	☐	☐
53. Are tables or graphics placed as soon as possible after their mention in the text?	☐	☑	☐	☐
54. When alphanumeric data are presented in tabular form, are they left justified?	☐	☑	☐	☐
55. When numeric data are presented in tabular form, are they right justified by decimal point?	☐	☑	☐	☐
56. Are lists vertically aligned?	☐	☑	☐	☐
57. Are lists left justified?	☐	☑	☐	☐
58. Are subclassifications indented?	☐	☑	☐	☐
59. Are tabular data displays used to present row–column data that are significant in themselves?	☐	☑	☐	☐
60. Are graphics used to facilitate scanning or comparing numeric data?	☐	☑	☐	☐
61. Where appropriate, are line drawings used to supplement textual explanations?	☐	☑	☐	☐
62. Are tabular data displayed in a left–to–right, top–to–bottom array?	☐	☑	☐	☐
PROPORTIONAL SPACING				
63. Has the proportional spacing been designed so that the reading speed is not adversely affected?	☑	☐	☐	☐
64. If text is printed proportionately spaced, does it appear that way on the VDT screen?	☑	☐	☐	☐

	Yes	Not Applicable	Not Known*	No*
SIGNIFICANT DIGITS				
65. Does the system produce only numbers justified by the computational accuracy of its number-handling procedures and the basic data?	☐	☑	☐	☐
66. Does the system round the output to the last significant digit?	☐	☑	☐	☐
CURSOR				
67. Does the system use a box or block type of cursor with an optional blinking capability?	☐	☐	☐	☑
68. Does the cursor blink three to five flashes per second?	☐	☐	☐	☑
69. Is the cursor easy to locate at random positions on the display?	☐	☐	☐	☑
70. Is the cursor easy to track as it is moved through the display?	☑	☐	☐	☐
71. Is the text free from visual interference by the cursor?	☑	☐	☐	☐
POSITIONING CURSOR				
72. Is the cursor placed at the first character position at the appearance of each frame?	☑	☐	☐	☐
73. As each input field is completed, does the cursor automatically move to the first character position of the next field?	☑	☐	☐	☐
74. Are formats organized to minimize cursor movement?	☑	☐	☐	☐
75. Are predefined home positions for the cursor consistent on displays of a given type?	☑	☐	☐	☐
76. Does the system automatically place the cursor in the correct position for data entry or change when proportional spacing is used?	☑	☐	☐	☐
77. Are user cursor movements minimized on form-filling displays?	☑	☐	☐	☐
78. Does an ENTER action result in entry of all items regardless of the cursor position?	☑	☐	☐	☐
79. Is the cursor automatically placed at the most likely option on the menu so that only activation or entry without movement of the cursor selects the item?	☑	☐	☐	☑

	Yes	Not Applicable	Not Known*	No*
FIXED LENGTH ENTRIES				
80. Are fixed length data or a collection of characters indicated on the screen by underscores?	☐	☐	☐	☑
81. Are adequate field delineation cues provided, e.g., a broken underscore for required entry?	☑	☐	☐	☐
USER'S STATUS				
82. Is information detailing the user's status—file or model—displayed?	☑	☐	☐	☐
83. Is the command line placed at the bottom of the screen?	☐	☑	☐	☐
HISTORICAL FILE				
84. Is a "historical" file of user actions available?	☑	☐	☐	☐
85. Are file names distinctive and descriptive of the contents of the file?	☐	☑	☐	☐
DISPLAY LEVELS				
86. If the system has multiple display levels, does the system:				
a. Minimize the number of levels required?	☑	☐	☐	☐
b. Provide priority access to the more critical display levels?	☑	☐	☐	☐
c. Provide the user with information about the current position within the sequence of levels?	☐	☐	☐	☑
d. Ensure similarity, wherever possible, between display formats at each level?	☑	☐	☐	☐
e. Supply all data relevant to making an entry on one display frame?	☑	☐	☐	☐
CODING				
87. Is coding used to:				
a. Differentiate between items of information?	☐	☑	☐	☐
b. Call the user's attention to changes in the state of the system?	☑	☐	☐	☐
88. Is flash coding used to call the user's attention to mission critical events only?	☑	☐	☐	☐

CODING (continued)	Yes	Not Applicable	Not Known*	No*
89. Is the flash rate between three and five flashes per second?	☐	☐	☐	☑
90. Are there equal on and off times?	☑	☐	☐	☐
91. Are event acknowledgement or flash suppression controls provided?	☑	☐	☐	☐
92. Do codes conform to population stereotypes, accepted abbreviations, and general user expectations?	☑	☐	☐	☐
93. Are the codes meaningful rather than arbitrary e.g., "M" for MALE rather than "1"?	☑	☐	☐	☐
94. Is location coding used to reduce operator information search time?	☑	☐	☐	☐
95. Is symbol coding used to enhance information transfer?	☐	☑	☐	☐
96. Are the symbols:				
a. Analogs of the event or system element they represent?	☐	☑	☐	☐
b. Familiar to the users?	☐	☑	☐	☐
97. Where size difference between symbols is used:				
a. Is the larger at least 1.5 times the height of the smaller?	☐	☑	☐	☐
b. Is there a maximum of three size levels?	☐	☑	☐	☐
98. Is color blindness irrelevant or tested for where color coding is used? Do all necessary terminals have color capacity where color coding is used?	☑	☐	☐	☐
NECESSARY INFORMATION				
99. Is the information on the display only that which is necessary?	☑	☐	☐	☐
100. Are only appropriate options displayed?	☑	☐	☐	☐

	Yes	Not Applicable	Not Known*	No*
INFORMATION DENSITY				
101. Is the information density held to a minimum on displays used for critical task sequences?	☑	☐	☐	☐
102. Is a minimum of one character space left blank vertically above and below critical information?	☑	☐	☐	☐
103. Is a minimum of two character spaces left blank horizontally before and after critical information?	☑	☐	☐	☐
104. Are certain areas of the display designated for certain types of information?	☑	☐	☐	☐
105. Are users able to temporarily or permanently eliminate irrelevant items from the display?	☐	☑	☐	☐
MULTIPLE PAGES AND MOVING DATA				
106. Are the users able to see the entire page on which they are working?	☑	☐	☐	☐
107. For items or data that cover more than one page:				
a. Are those that are continued on another page numbered relative to the initial page(s)?	☑	☐	☐	☐
b. Is there a message indicating the data are on several pages?	☑	☐	☐	☐
108. Does the system contain a scroll or windowing function?	☑	☐	☐	☐
109. If the system does not offer windowing or scrolling, does it offer page scrolling or paging?	☑	☐	☐	☐
110. When scrolling, are the present and maximum locations displayed on the viewable portion?	☑	☐	☐	☐
MODE OF ENTRY				
111. Are frames designed so that the user can use one entry device as long as possible before switching to another?	☑	☐	☐	☐
TEXT DISPLAY				
112. Is running text displayed in both uppercase and lowercase font?	☐	☐	☐	☑

NEW COMMANDS	Yes	Not Applicable	Not Known*	No*
113. When a new format, procedure, or command is defined that replaces an old one, is the user compelled to refer to a brief description of the new one whenever the old one is typed?	☐	☑	☐	☐
ENTRY STATUS				
114. Is the status of the system displayed to the user?	☑	☐	☐	☐
115. Does the system immediately signal receipt of an entry?	☑	☐	☐	☐
116. Does the system periodically e.g., every 30 s, inform the user what the computer is doing while the user is waiting for a response?	☑	☐	☐	☐
INFORMATION CONTROL				
117. Is the information necessary for the user to select, or to enter a specific control action, available on the screen when selection of that control action is available?	☑	☐	☐	☐
118. Are only the relevant alternatives among the control actions displayed at the time of selection?	☑	☐	☐	☐
119. Is the current value of any parameter with which the user is interacting displayed?	☑	☐	☐	☐
120. Do the values displayed mislead the user with regard to:				
a. Nomenclature?	☐	☐	☐	☑
b. Units of measure?	☐	☐	☐	☑
c. Sequence of task steps?	☐	☐	☐	☑
d. Time phasing?	☐	☐	☐	☑

CONTROL INPUT DATA DISPLAY	Yes	Not Applicable	Not Known*	No*
121. Are the location and presence of control input data entered by the user clearly and appropriately indicated?	☑	☐	☐	☐
122. If the user is prompted by the system for a parameter with a predefined default, is the default shown?	☐	☑	☐	☐
123. Are user interrrupts or aborts of processing allowed by the system?	☑	☐	☐	☐
124. Are the users able to leave the system and store their work so that upon reentry at a later date they can resume where they left off?	☑	☐	☐	☐
STORAGE				
125. Are the users able to maintain files or libraries of their own subroutines, programs, defaults, and language equivalents?	☐	☑	☐	☐
MONITORING				
126. Where monitoring is a task, does the computer perform the monitoring where this is possible and inform the user when a change has occurred?	☑	☐	☐	☐
COMBINE COMMANDS				
127. Is the user able to combine commands to make a new command?	☐	☑	☐	☐
BACKUP MEMORY				
128. Does the system have a backup memory that stores all data disregarding changes or deletions for 72 h?	☐	☐	☑	☐
RESPONSE TIMES				
129. Is the response time for system activation 2 s or less?	☑	☐	☐	☐
130. Is the response time from a request to contact another system 5 s or less?	☐	☑	☐	☐
131. Is the response time for a control activation, like appearance of a printed character after a key is depressed, 0.1 s or less?	☑	☐	☐	☐
132. Is feedback that an ID card or number has been inserted correctly 0.5 s or less?	☐	☑	☐	☐

RESPONSE TIMES (continued)

	Yes	Not Applicable	Not Known*	No*
133. Is feedback that the ID number is correct in length or format 0.5 s or less?	☐	☑	☐	☐
134. Is a simple request or command implemented in 2 s or less?	☑	☐	☐	☐
135. Is a complex command either implemented or is feedback sent concerning implementation in 5 s or less?	☑	☐	☐	☐
136. If processing will take more than 15 s, is an acoustic signal provided when the terminal is ready for the next command?	☐	☐	☐	☑
137. Is error feedback given within 2.0 s?	☑	☐	☐	☐
138. Are commands to interrupt automatic processes acknowledged within 2 s?	☑	☐	☐	☐
139. After requesting to interrupt an automatic process, are users able to execute new commands within 5.0s?	☑	☐	☐	☐
140. For response times of 0–2 s, is the maximum variability +/– 5%?	☐	☐	☑	☐
141. For response times of 5 s, is the maximum variability +/– 10%	☐	☐	☑	☐
142. For response times greater than 5 s, is the maximum variability +/– 15%?	☐	☐	☑	☐

PRINTED OUTPUT

143. Is the user able to obtain a paper copy of the contents of the display?	☐	☐	☐	☑
144. If the output is printed away from the user, is a print confirmation or denial message displayed?	☐	☑	☐	☐
145. Is the system designed so that the contents of the screen are not changed as a result of the print operation?	☐	☑	☐	☐

CONTROL FUNCTIONS	Yes	Not Applicable	Not Known*	No*
146. Does the system dialogue prompt the user with next steps or alternatives rather than just dead ending?	☐	☐	☐	☑
147. Is the user able to transfer control of different modes to another user?	☐	☑	☐	☐
148. Does the interactive system allow a specific time between the last keyboard action and automatic log out?	☐	☑	☐	☐
149. Is the user provided adequate information for making decisions?	☐	☑	☐	☐
150. Does the system give the user an indication of:				
a. How much time has been used?	☐	☑	☐	☐
b. How much money has been spent?	☐	☑	☐	☐
c. How much time is left in the account?	☐	☑	☐	☐
d. How much money is left in the account?	☐	☑	☐	☐
151. Are mechanical overlays avoided?	☐	☑	☐	☐
AUDITORY SIGNALS				
152. Are auditory signals used to alert and direct the user's attention to the appropriate visual display?	☑	☐	☐	☐
153. Is the intensity, duration, and source location of the signal compatible with the acoustical environment:				
a. Of the user?	☑	☐	☐	☐
b. Of other personnel in the signal area?	☑	☐	☐	☐
154. Is the system designed so that auditory signals used in conjunction with visual displays cannot be falsely sounded for system failure or user response errors?	☑	☐	☐	☐
155. Can auditory signals be turned off at the discretion of the user?	☑	☐	☐	☐
156. Are auditory signals easily acknowledged or turned off?	☑	☐	☐	☐
157. Is the meaning of auditory signals readily apparent?	☑	☐	☐	☐

CHECKLIST

DIALOGUE AND DISPLAY

ITERATIVE DIALOGUES

2. Are the screens visually consistent, i.e., do all command lines start at bottom left of screen?

When you are reading a RECEIVED MESSAGE the prompt "RECEIVED MSG EDIT <DEL> TO DELETE MESSAGE" appears at the top of the screen. To make this screen consistent with other TACID screens, the prompt <DEL> etc. should be moved to the bottom left of the screen. Also, when you are creating or editing a freetext message, the prompts indicating the number of characters for the "to:, subject: and message text:" fields should appear at the bottom. Currently they appear at the top.

3. Is appropriate feedback given for each user action?

Usually, you use the F2 RECV MSG button to read a new RECEIVED MESSAGE. When you are editing a RECEIVED MESSAGE, however, you cannot use the F2 button to read a new message. The reason for this is that you are already in RECEIVED MESSAGES. You must jump out of RECEIVED MESSAGES and then reenter the screen to read your new received message. Therefore a feedback message should appear when you hit F2 RECV MSG. The feedback message might read, "Already in RECV MSG, push F4 to read new recv msg."

LABELS

9. Do the directions to the user always precede the list of choices or required actions by the user?

The "main menu" and "create tactical message" screens contain lists of user selectable options with no instructions for the user. The label "select one" should be added to both of these screens.

The RECEIVED MESSAGES screen also contains no instructions. The label "to view message select number then hit enter" should be added to this screen.

The edit routine also does not contain any instructions. The label, "To edit a line select line number then hit enter. When finished editing that line hit enter again", should be added to this routine.

12. Is the relationship of the label to the group or message being described clearly?

The freetext format screen is labeled "free". I would label it "freetext" to be consistent with its label in the main menu option list. Also next to the title "free" appear the extraneous characters " TO: 2". These characters should be removed.

16. Are the labels unique among themselves to avoid confusion?

The "free" screen for creating a freetext message has the same label as the received freetext screen.

CURSOR

67. Does the system use a box or block type of cursor with an optional blinking capability?

The cursor is a line rather than a box. In this case a line is probably preferable. A box is already being used on the TACID display to indicate a message has been received. Therefore, if a box was also used for the cursor, the cursor would look too much like the RECEIVED MESSAGES indicator.

68. Does the cursor blink three to five flashes per second?

The cursor blinks one time per second. The cursors blink rate should be increased to at least three flashes per second.

69. Is the cursor easy to locate at random positions on the display?

Since the cursor is blinking very slowly, it is difficult to locate. However, if the blink rate is increased, this problem should be resolved.

POSITIONING CURSOR

79. Is the cursor automatically placed at the most likely option on the menu so that only activation or entry without movement of the cursor selects the item?

In the "edit" routine, after you have edited a line, the cursor automatically returns to line 1. Since a user would normally edit lines sequentially, I think the cursor should move to the line below the edited line.

FIXED LENGTH ENTRIES

80. Are fixed length data or a collection of characters indicated on the screen by underscores?

Some of the fixed length fields do not contain underscores. These fields are too long for underscores e.g. 256 characters. If underscores were used in these fields, the screen would be cluttered.

DISPLAY LEVELS

86. If the system has multiple display levels, does the system: c. Provide the user with information about the current position within the sequence of levels?

The user cannot tell s/he is in the RECEIVED MESSAGES menu, when they are editing a RECEIVED MESSAGE. The screen needs to be modified in some way to indicate to the user that s/he is in the RECEIVED MESSAGES window menu.

TEXT DISPLAY

112. Is running text displayed in both uppercase and lowercase font?

The text appears in all capitals. The user would probably find the text more readable if it was changed to both uppercase and lowercase font.

CONTROL FUNCTIONS

146. Does the system dialogue prompt the user with next steps or alternatives rather than just dead ending?

This software contains very few user instructions. Instructions should be added which prompt the user with next steps.

LANGUAGE CONSIDERATIONS CHECKLIST

LANGUAGE	Yes	Not Applicable	Not Known*	No*
1. Is the language:				
a. Logical?	☑	☐	☐	☐
b. Consistent?	☑	☐	☐	☐
2. Do the commands conform to those in Appendix C?	☑	☐	☐	☐
3. Are the command words consistent—i.e., if "U" means UP, does "D" stand for DOWN?	☑	☐	☐	☐
INDEXES				
4. Are on-line indexes provided for:				
a. Commands?	☑	☐	☐	☐
b. Inquiries?	☐	☑	☐	☐
c. Data bases, etc.?	☐	☑	☐	☐
5. Do the indexes allow operating information to be obtained on-line?	☐	☑	☐	☐
6. Are the labels and messages:				
a. Distinct?	☑	☐	☐	☐
b. Meaningful?	☑	☐	☐	☐
7. Are the messages free from humor or sarcasm?	☑	☐	☐	☐
8. Is the terminology that of the functional user rather than that of the designer?	☑	☐	☐	☐
9. Are the commands logically related to the user's conception of what is being done for him?	☑	☐	☐	☐
10. Is the user able to request help at any time for determining what commands are permitted?	☐	☐	☐	☑
11. Is the interactive version of the language as similar as possible to the noninteractive version of the existing language?	☑	☐	☐	☐
12. Was the language reviewed by a sample from the user population?	☑	☐	☐	☐
13. Is the nomenclature the same for similar or identical functions across all modes?	☑	☐	☐	☐

LANGUAGE CONSIDERATIONS CHECKLIST

	Yes	Not Applicable	Not Known*	No*
MEMORIZATION				
14. Is memorization of codes, sequences, etc., minimized?	☑	☐	☐	☐
15. Are the codes designed to aid human memory?	☑	☐	☐	☐
16. Does the system make clear to the user not only the context of the message but also what is required?	☑	☐	☐	☐
17. Is there a clear indication of when the computer is waiting for a response or command from the user?	☑	☐	☐	☐
SYMBOLOGY				
18. Are the symbols standardized:				
a. Within the system?	☑	☐	☐	☐
b. Among systems having similar operations?	☑	☐	☐	☐
19. If logical operators (like "and", "or", and "not") are used to manipulate files or data, are Venn diagrams, illustrating the meanings of these terms, continuously displayed to reduce errors?	☐	☑	☐	☐
20. Is the information displayed in plain, concise text?	☑	☐	☐	☐
ABBREVIATIONS				
21. If space does not permit plain text, are approved abbreviations, acronyms, or display codes used?	☐	☐	☐	☑
22. Are abbreviations used for output only when they were given as input?	☑	☐	☐	☐
23. Are abbreviations used only if they are significantly shorter than the complete word?	☑	☐	☐	☐
24. Is each abbreviation unique?	☑	☐	☐	☐
25. Are the rules for abbreviations given?	☐	☑	☐	☐

LANGUAGE CONSIDERATIONS CHECKLIST

	Yes	Not Applicable	Not Known*	No*
STANDARDIZED FIELDS				
26. Are standardized fields used for:				
a. The time?	☑	☐	☐	☐
b. The date?	☑	☐	☐	☐
c. Telephone numbers?	☐	☑	☐	☐
27. Is the standard displayed when the user is entering this information?	☐	☑	☐	☐
28. Are the fields identified so that the user can recognize the data category?	☑	☐	☐	☐
DATA LABELS				
29. Are numbers used when listing options?	☑	☐	☐	☐
30. Are alphabetic characters used in prose or text?	☑	☐	☐	☐
31. Do the numbered menu items start with one?	☑	☐	☐	☐
INDIVIDUALIZED LANGUAGE				
32. Is there a system provision allowing individuals to create their own commands by assigning a unique name to a fixed sequence of commands?	☐	☑	☐	☐
33. If so, is the system designed so that user changes will not affect other users in any way?	☐	☑	☐	☐
34. If the user is using a synonym for a system command name, does the system use that same synonym when interacting with the user?	☐	☑	☐	☐
HYPHENATION				
35. Is the use of hyphens minimized?	☑	☐	☐	☐
36. Is automatic carriage return used in composition modes?	☑	☐	☐	☐
PUNCTUATION				
37. Is unnecessary punctuation avoided?	☑	☐	☐	☐
BLANKS				
38. Is the information displayed so that the user does not have to distinguish between single and double blank spaces?	☑	☐	☐	☐

LANGUAGE CONSIDERATIONS CHECKLIST COMMENTS

INDEXES

10. Is the user able to request help at any time for determining what commands are permitted?

    TACID's software currently contains no help screens. These need to be added.

ABBREVIATIONS

21. If space does not permit plain text, are approved abbreviations, acronyms, or display codes used?

"DEL" is used as the abbreviation for "delete". This should be changed to the approved abbreviation "dele".

WORKING IN THE FILE CHECKLIST

GENERAL	Yes	Not Applicable	Not Known*	No*
1. Are the user's most frequent transactions the easiest to accomplish?	☑	☐	☐	☐
2. Is data entry designed so that it is easily learned?	☑	☐	☐	☐
3. Is data entry designed so that there are consistent steps or structure to the process?	☐	☑	☐	☐
4. Are input actions and memory requirements minimized?	☑	☐	☐	☐
5. Is automatic data editing provided wherever this is possible?	☐	☑	☐	☐
6. Do data protection or security measures present a formidable barrier to those without the authority to access or change data while not hindering authorized users?	☐	☑	☐	☐
7. Are the data that are entered through the keyboard displayed as keyed on the screen?	☑	☐	☐	☐
8. Are there provisions for not showing passwords or other security measures on the screen?	☐	☑	☐	☐
LOGGING IN				
9. If users cannot log into the system, are they:				
a. Notified why?	☐	☑	☐	☐
b. Notified what action to take?	☐	☑	☐	☐
10. Does the LOG ON frame appear as soon as the user connects to the system?	☐	☑	☐	☐
11. After sign-on, is the user able to start productive work immediately?	☐	☑	☐	☐
SECURITY CLASSIFICATION				
12. Does the display screen indicate the security classification of displayed data?	☐	☑	☐	☐
REDUNDANT KEYING				
13. Does the software minimize the requirement for a user to enter information that is already available on the program?	☑	☐	☐	☐
14. Is user typing kept to a minimum?	☑	☐	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
EXPLICIT ACTION				
15. Do data entry, error correction, selection of menu items, and commands require an explicit user action?	☑	☐	☐	☐
16. Does the system require an explicit command before the user can exit the system?	☑	☐	☐	☐
17. Is the user able to edit material before entering it into the system?	☑	☐	☐	☐
USER KNOWLEDGE				
18. Is the system designed so that the user does not have to be familiar with the internal retrieval and storage mechanisms?	☐	☐	☐	☑
19. Does the system refer the user to other sources for additional explanatory information?	☐	☐	☐	☑
STANDARD PROCEDURES				
20. Are standard procedures provided for accomplishing tasks?	☑	☐	☐	☐
STANDARD PLACEMENT OF INFORMATION				
21. Is guidance information, like options available, presented in the same location on the screen?	☐	☐	☐	☑
22. Do forms correspond to the screen display and vice versa?	☐	☑	☐	☐
CURRENT LOAD				
23. Is the user at LOG ON given specific information concerning response times and periods when response time is optimal?	☐	☑	☐	☐
CRITICAL ACTIONS				
24. Does the system ask the user to verify critical actions?	☐	☑	☐	☐
25. Is the user told what data will be entered?	☑	☐	☐	☐
26. When the user signals for LOG OFF, are pending transactions checked to see whether or not this would cause data loss?	☐	☑	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
AUTOMATIC RECORDING				
27. Are the users informed concerning the nature and purpose of automated recording of user actions?	☐	☑	☐	☐
OMITTING DATA				
28. Can the user indicate that required data have been temporarily omitted?	☐	☑	☐	☐
29. Is user typing kept to a minimum?	☑	☐	☐	☐
FIXED FUNCTIONS				
30. Are fixed function (dedicated) keys used for:				
a. Time-critical inputs?	☑	☐	☐	☐
b. Error-critical inputs?	☑	☐	☐	☐
c. Frequently used control inputs?	☑	☐	☐	☐
COMMAND STACKING				
31. Does the system provide for command stacking?	☐	☐	☐	☑
DELETE				
32. DELETE key:				
a. Does it allow for successive deletion of characters?	☑	☐	☐	☐
b. Is it placed next to the letter Q?	☐	☐	☐	☑
33. Is a separate mechanism provided for deleting the entire last line?	☐	☐	☐	☑
INSERTIONS				
34. When editing, does the user have the option to have the insertion displayed:				
a. Where it actually will appear?	☑	☐	☐	☐
b. In a buffer area of the screen?	☑	☐	☐	☐
35. Can additional steps be inserted without renumbering the old steps?	☐	☑	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
DITTO				
36. If many inputs have components that are the same, is a ditto or a default option provided to the user?	☐	☑	☐	☐
37. Is the user able to change or initiate defaults for his own use?	☐	☑	☐	☐
38. With columns of data, does the system use the previous line as a default--automatic ditto?	☐	☑	☐	☐
SURPLUS MEANING				
39. Are leading zeroes used only if they have meaning?	☐	☑	☐	☐
40. If the system does not recognize a command entered by the user, does the system:				
a. Indicate nonacceptance?	☑	☐	☐	☐
b. Provide a list of applicable commands?	☐	☐	☐	☑
41. Are multiple data items enterable without special separators or delimiters?	☑	☐	☐	☐
HIGHLIGHTING				
42. Is the item that the user is currently working on highlighted?	☑	☐	☐	☐
43. Are the highlighting methods used by the system designed so that they:				
a. Do not interfere with the readability of the material?	☑	☐	☐	☐
b. Are easily recognizable?	☑	☐	☐	☐
c. Are available for both the CRT and the printouts?	☐	☑	☐	☐
44. Does the user have the option of highlighting a line of data?	☐	☑	☐	☐
45. If color is used for highlighting, do ALL CRTs have color and can the colors be recognized by color-blind operators?	☐	☑	☐	☐
46. If additional coding or highlighting is needed, is it provided?	☐	☑	☐	☐
47. Is the highlighting used for each function unique?	☐	☑	☐	☐
48. Are the options selected by the user highlighted?	☑	☐	☐	☐
49. To cancel the highlighting, is the same option selected again?	☐	☑	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
SIMULTANEOUS USE				
50. Is the system designed so that simultaneous users do not interfere with each other's operation?	☐	☑	☐	☐
EDIT TRAIL				
51. Is it possible to indicate the history of changes to a text where this is required?	☐	☑	☐	☐
MESSAGES				
52. Are users alerted when messages arrive?	☑	☐	☐	☐
53. Can users specify what notification is given, depending on the source or type of message?	☐	☐	☐	☑
54. Does the system provide the format for message generation?	☑	☐	☐	☐
55. Are users informed whether messages have been received?	☑	☐	☐	☐
56. Are users able to develop standard lists of recipients?	☑	☐	☐	☐
57. Does message transmission require an explicit action?	☑	☐	☐	☐
58. Are there convenient procedures for reviewing messages?	☑	☐	☐	☐
SPLIT SCREENS				
59. Are split or dual screens provided for:				
a. Comparing or merging two texts?	☐	☑	☐	☐
b. Inspecting a given set of typographic and layout commands?	☐	☑	☐	☐
c. Listing and editing the commands?	☐	☑	☐	☐
FEEDBACK				
60. Is feedback provided to indicate the status of system functioning?	☑	☐	☐	☐
61. Does the system acknowledge receipt of a command within one second?	☑	☐	☐	☐
62. Do feedback responses to correct user input consist of direct changes into those elements displayed?	☑	☐	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
63. Is an acknowledgement message used:				
a. Where the command does not affect the display?	☑	☐	☐	☐
b. Where feedback response time must exceed one second?	☑	☐	☐	☐
64. When a displayed message to data is selected by the user as an option or input to the system, is it acknowledged by the system?	☐	☑	☐	☐
65. When the system is processing command(s), is periodic feedback provided to the operator?	☑	☐	☐	☐
66. If a process that has taken more than 15 s is completed by the system, is the user given an auditory and visual indication of this?	☐	☑	☐	☐
67. If a process is aborted by the system, is the user prompted by requirements for subsequent user actions?	☐	☑	☐	☐
68. If the system rejects a user input, is the user provided with:				
a. The reason?	☐	☐	☐	☑
b. The required corrective action?	☐	☐	☐	☑
69. Does the system allow easy transitions between modes like error correction, information requests, typing text?	☑	☐	☐	☐
70. Does the system display:				
a. The operating mode?	☐	☑	☐	☐
b. The name of the file displayed?	☐	☑	☐	☐
71. Does the system permit correction of individual errors without requiring reentry of correctly answered data?	☑	☐	☐	☐
72. Does the system require verification before processing changes that result in extensive, final and permanent change to data?	☐	☑	☐	☐
73. Does the system require an explicit command for exiting from an activity?	☑	☐	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
74. Do sign–on processes require minimum input from the user?	☐	☑	☐	☐
75. Is the level of prompting controllable by the user?	☐	☑	☐	☐
76. Does the system prompt for all required parameters?	☑	☐	☐	☐
77. Are all the options displayed for any one field wherever possible?	☑	☐	☐	☐
78. Are user options ordered:				
a. By frequency of use?	☑	☐	☐	☐
b. Alphabetically?	☐	☐	☐	☑
c. In some other consistent fashion?	☑	☐	☐	☐
ERRORS				
79. Is an easy means of correcting errors provided?	☑	☐	☐	☐
80. Are the users able to stop their control process at any point in the sequence as a result of:				
a. An indicated error?	☑	☐	☐	☐
b. User option?	☐	☐	☐	☑
81. Is the user able to return easily to previous levels in multistep processes to:				
a. Nullify an error?	☑	☐	☐	☐
b. Make a desired change?	☑	☐	☐	☐
82. Can the user cancel or reenter already entered commands?	☑	☐	☐	☐
83. Is a means provided for correcting or inserting data?	☑	☐	☐	☐
84. If a command/input has been rejected, is the portion in error highlighted?	☐	☑	☐	☐
85. If an error is repeated, does the error message indicate to the user that the error was made again?	☐	☐	☐	☑
86. Is the user provided with an error message as soon as possible?	☑	☐	☐	☐

WORKING IN THE FILE CHECKLIST

	Yes	Not Applicable	Not Known*	No*
87. Do error messages communicate:				
a. Where the error occurred?	☐	☑	☐	☐
b. The nature of the error?	☐	☑	☐	☐
c. How to recover from the error?	☐	☑	☐	☐
d. Where to find out how to recover from the error?	☐	☑	☐	☐
88. Are all fields in error indicated until they are corrected?	☐	☑	☐	☐
89. If a new error is generated in the attempt to correct an error, is the new error presented next?	☑	☐	☐	☐
90. Does the system include at least two levels of error messages--one detailed; the other brief?	☐	☐	☐	☑
91. Are users able to alter a line of input:				
a. During entry?	☑	☐	☐	☐
b. After entry?	☑	☐	☐	☐
92. If an error is detected in a string of user entries, does the computer process inform the user with an error message before processing the input?	☐	☐	☐	☑
93. Are error messages:				
a. Understandable?	☐	☑	☐	☐
b. Non-threatening?	☐	☑	☐	☐
94. Are user errors minimized by internal software checks?	☑	☐	☐	☐
SYSTEM STATUS				
95. Is the user provided a telephone number to call for accurate system information?	☐	☑	☐	☐

WORKING IN THE FILE CHECKLIST COMMENTS

GENERAL

3. Is data entry designed so that there are consistent steps or structure to the process?

When you are creating a FREE TEXT message for the first time, the software automatically advances line by line. You enter the data for line 1, hit enter, and the software advances to line 2. However, when you are editing a message, the software automatically returns you to line 1 each time. You key in the number of the line you want to edit, hit enter, key in the new data and hit enter again. One of these procedures should be changed so the two procedures are consistent.

USER KNOWLEDGE

18. Is the system designed so that the user does not have to be familiar with the internal retrieval and storage mechanisms?

If you are editing a RECEIVED MESSAGE and you receive a new message, you cannot retrieve the new message by hitting F2 RECV MSG. If the user is familiar with internal retrieval, s/he would understand that this occurs because you are already in the RECEIVED MESSAGES subroutine. To solve this problem, a prompt, "Already in RECEIVED MESSAGES, hit F4" should appear when the user hits F2 while editing a RECEIVED MESSAGE.

19. Does the system refer the user to other sources for additional explanatory information?

No help screens are currently available. Help screens should be added.

STANDARD PLACEMENT OF INFORMATION

21. Is guidance information--like options available--presented in the same location on the screen?

When you are creating or editing a FREE TEXT message, the prompts, indicating the number of characters allotted to each field, appear at the top rather than the bottom of the screen. For consistency, these prompts should be moved to the bottom of the screen.

COMMAND STACKING

31. Does the system provide for command stacking?

Currently the TACID software does not allow this option. This option might be added to future TACID software.

DELETE

32. DELETE key:

b. Is it placed next to the letter Q?

The delete key on the keyboard used with the TACID is not located next to the letter Q. The keyboard is not actually part of the TACID display. A number of different keyboards can be connected to the TACID. Therefore,

if the location of the delete key significantly affected performance, then a new keyboard could be attached to the TACID.

33. Is a separate mechanism provided for deleting the entire last line?

The TACID software allows you to delete individual characters, but it doesn't allow you to delete lines. A delete line function should be added.

SURPLUS MEANING

40. If the system does not recognize a command entered by the user, does the system:

b. Provide a list of applicable commands?

The TACID software does not provide you with a list of applicable commands. This option should be added.

MESSAGES

53. Can users specify what notification is given, depending on the source or type of message?

This option is currently not available. It might be added to future TACID software.

FEEDBACK

68. If the system rejects a user input, is the user provided with

a. The reason?

Currently the TACID software provides the user with few error messages or prompts. When the system rejects a user input, the user should be provided with a message telling her/him why the input was rejected.

b. The corrective action?

Currently the TACID software does not provide the user with any information about how to correct an incorrect input. Messages providing the user with corrective actions should be added to the software.

78. Are user options ordered

b. Alphabetically?

The options are ordered by frequency of use and similar functions, rather than alphabetically. Alphabetical ordering is not necessary in this situation.

ERRORS

80. Are the users able to stop their control process at any point in the sequence as a result of

b. User option?

The TACID software does not contain a user option for aborting a previously selected option. A quit option should be added.

85. If an error is repeated, does the error message indicate to the user that the error was made again?

Currently there are no error messages in the TACID software. They need to be added to make the system more effective.

90. Does the system include at least two levels of error messages--one detailed; the other brief?

Currently there are no error messages in the TACID software. They need to be added to make the system more effective.

92. If an error is detected in a string of user entries, does the computer process inform the user with an error message before processing the input?

Currently there are no error messages in the TACID software. They need to be added to make the system more effective.

TRAINING CHECKLIST

	Yes	Not Applicable	Not Known*	No*
1. Has formal training been designed for the system?	☑	☐	☐	☐
2. Was as much as possible of the training on-line?	☑	☐	☐	☐
3. Was the instructor familiar with the system?	☑	☐	☐	☐
4. Has the instructor been selected because of her/his knowledge of the system?	☑	☐	☐	☐
5. Are the trainees given an instruction manual to aid in their comprehension of the material?	☑	☐	☐	☐
6. Have behavioral goals, i.e., performance level, been established to ensure that they can be achieved by both the instructor and the trainee?	☑	☐	☐	☐
7. Does the training include a program specifically designed for the beginner or naive user?	☑	☐	☐	☐
8. Is there a brief review for the intermittent user?	☐	☑	☐	☐
9. Is there a program for a user experienced in the use of another system?	☐	☐	☐	☑
10. Does the training program minimize the time before the user begins actually working at the CRT?	☑	☐	☐	☐
11. Does the training program incorporate the materials—e.g., manuals and printouts—normally used at the workplace?	☐	☑	☐	☐
12. Does the training allow the trainee to practice on a dummy file?	☑	☐	☐	☐
13. Is a brief, nontechnical description of the system available?	☐	☐	☐	☑
14. Does the training include information on the capabilities and limitations of the system?	☐	☐	☐	☑
15. Are a tour and explanation of the central computer facility given?	☐	☑	☐	☐
16. Are there a name and telephone number of a person to call when the user experiences difficulties with the system?	☐	☑	☐	☐
17. Have required tasks been identified?	☑	☐	☐	☐

TRAINING CHECKLIST

	Yes	Not Applicable	Not Known*	No*
18. Have current skills been assessed?	☑	☐	☐	☐
19. Do training goals establish the specific job skills that will be learned?	☑	☐	☐	☐
20. Are trainees evaluated to determine whether training was successful?	☑	☐	☐	☐
21. After the person is on the job, is another evaluation done to assess the relevancy of the training to the actual job?	☑	☐	☐	☐

TRAINING CHECKLIST COMMENTS

TRAINING

9. Is there a program for a user experienced in the use of another system?

   The training program was designed for naive users. It would be a good idea to design a training program for more sophisticated users.

13. Is a brief, nontechnical description of the system available?

   The training manual did not contain a overview of the system. A few introductory paragraphs describing the system should be added to the training manual.

14. Does the training include information about the capabilities and limitations of the system?

   The training manual should contain an overview of the system and the system's capabilities and limitations.

KEYBOARD AND INPUT DEVICES CHECKLIST

KEYBOARD / INPUT DEVICES	Yes	Not Applicable	Not Known*	No*
1. Does the keyboard follow the proposed standard keyboard?	☑	☐	☐	☐
2. Does the keyboard contain all 128 ASCII characters?	☑	☐	☐	☐
3. For all applications requiring a significant amount of high numeric input, is there a separate numeric keyboard either located to the right of the main keyboard or movable so the user can select the option?	☑	☐	☐	☐
4. Is the numeric keypad arranged in the telephone format—i.e., 1, 2, 3 across the top?	☐	☐	☐	☑
5. Does the terminal have the overall appearance and feel of an electric office typewriter?	☑	☐	☐	☐
6. Is the terminal quiet during operation?	☑	☐	☐	☐
7. Are all controls both visible and operable without necessitating undue stretching or gross posture changes?	☑	☐	☐	☐
8. Are telephones readily available at each terminal work site where the communication to the main computer is done by telephone?	☐	☑	☐	☐
9. Is the keyboard detachable from the VDT?	☑	☐	☐	☐
10. Is the keyboard heavy enough to prevent unintentional movement?	☑	☐	☐	☐
11. Are the key legends molded to the key top?	☑	☐	☐	☐
12. Are the "F" and "J" keys distinguishable to facilitate correct placement of fingers?	☑	☐	☐	☐
13. In the event of system or VDT malfunction, is there a visual or auditory warning signal given to the user?	☑	☐	☐	☐
14. Is the layout of the keyboard designed in a manner that minimizes the chance of likely errors? (For instance, is the "delete" key separated from other frequently used keys?)	☑	☐	☐	☐
15. Is a free area of approximately 60 mm (2.4 in.) provided on the front surface of the keyboard as a resting place for the user's hands?	☐	☐	☐	☑

KEYBOARD AND INPUT DEVICES CHECKLIST

	Yes	Not Applicable	Not Known*	No*
16. Are the fixed and variable function keys grouped according to their purpose, i.e., all edit keys together?	☑	☐	☐	☐
17. Are the function keys labelled with standard symbols, the function itself, or the abbreviation of the function?	☑	☐	☐	☐
18. Is the slope of the keyboard between 175 mrad and 524 mrad (10 deg and 30 deg)?	☑	☐	☐	☐
19. Is the operating force of the terminal keyboard between 0.25 N and 1.5 N (0.9 oz and 5.3 oz)?	☐	☐	☑	☐
20. Is the key displacement between 0.8 mm and 8 mm (0.03 in. and 0.32 in.)?	☐	☐	☑	☐
21. Is the user provided visual feedback of his keyed input?	☑	☐	☐	☐
22. Does the keyboard provide kinesthetic feedback in the form of "bottoming out" when the keys are maximally depressed?	☑	☐	☐	☐
23. Is the keyboard provided with an interlock system to prevent two keys from being activated simultaneously?	☑	☐	☐	☐
24. Is the keyboard equipped with an N-key rollover feature?	☐	☐	☑	☐
25. Is an auditory warning signal given when two keys are depressed simultaneously?	☐	☐	☐	☑
26. Does the key top have a dished profile curvature?	☑	☐	☐	☐
27. Are the key tops approximately 12.7 mm (0.5 in.) wide?	☑	☐	☐	☐
28. Is the shape of the key tops approximately square?	☑	☐	☐	☐
29. Are the labels on the keys explicit to the user?	☑	☐	☐	☐
30. Are the legends or symbols at least 3 mm (0.12 in.) high?	☑	☐	☐	☐
31. Do the key surfaces have a matte finish to reduce glare?	☑	☐	☐	☐
32. Is there a "repeat" provision for characters that might be used in multiples?	☑	☐	☐	☐
33. Is the center-to-center spacing of the keys between 18 mm and 20 mm (0.71 in.) and 0.79 in.)?	☑	☐	☐	☐

KEYBOARD AND INPUT DEVICES CHECKLIST

	Yes	Not Applicable	Not Known*	No*
34. Where the joystick is employed, are the following conditions met:				
a. Is the movement smooth in all directions?	☐	☑	☐	☐
b. With no noticeable backlash?	☐	☑	☐	☐
c. With no cross-coupling?	☐	☑	☐	☐
d. With no need for multiple corrective movements?	☐	☑	☐	☐
e. Does it allow rapid gross positioning?	☐	☑	☐	☐
f. Precise fine positioning?	☐	☑	☐	☐
g. Are recessed mounting or pencil attachments used to provide greater precision control?	☐	☑	☐	☐
h. Is the refresh rate of the screen sufficiently high to give the appearance of a continuous track?	☐	☑	☐	☐
i. Is the delay between control movement and corresponding display response a maximum of 0.1 sec.?	☐	☑	☐	☐
j. Is the length of the joystick between 75 mm and 150 mm (3 in. and 6 in.)?	☐	☑	☐	☐
k. Is the diameter of the joystick between 6.5 mm and 17 mm (0.25 in. and 0.68 in.)?	☐	☑	☐	☐
l. Is the resistance of the joystick between 3.3 N and 8.9 N (12 oz and 32 oz)?	☐	☑	☐	☐
m. Is the maximum displacement of the joystick PIE/4 rad (45 deg)?	☐	☑	☐	☐
n. Is the display clearance to stick clearance between 0 and 400mm (0 and 15.75 in.)?	☐	☑	☐	☐
o. Does the clearance around the stick allow maximum stick excursion plus 100 mm (4 in.)?	☐	☑	☐	☐
p. Is the joystick located where it will not interfere with the operation of the keypad?	☐	☑	☐	☐
35. If the arrow keys are used for cursor control, do they allow movement by discrete steps and continuous movement with continued depression of a particular key?	☑	☐	☐	☐

KEYBOARD AND INPUT DEVICES CHECKLIST

	Yes	Not Applicable	Not Known*	No*
36. The following questions apply to the use of the light pen as an input device:				
a. Does the light pen have an actuating mechanism?	☐	☑	☐	☐
b. Is there feedback concerning exact location of light pen placement on the screen, e.g., an illuminated circle?	☐	☑	☐	☐
c. Is the user given feedback that the light pen has actuated and that the input has been received by the system?	☐	☑	☐	☐
d. If the light pen is being used as a two-axis controller, does the movement on the VDT surface result in a smooth movement of the follower?	☐	☑	☐	☐
e. Is the refresh rate of the follower sufficiently high to insure the appearance of a continuous track?	☐	☑	☐	☐
f. Is the light pen between 120 mm and 180 mm (4.7 in. and 7.1 in.) long?	☐	☑	☐	☐
g. Is the diameter of the light pen between 8 mm and 20 mm (0.3 in. and 0.8 in.)?	☐	☑	☐	☐
h. Is there a clip located conveniently on the lower right side of the VDT to hold the light pen when not in use?	☐	☑	☐	☐
37. The following questions apply when the mouse is used as a data input device:				
a. Does the design of the controller and placement of the maneuvering surface allow the operator to consistently orient the mouse to within 175 mrad (10 deg) of the correct orientation without visual reference to the mouse?	☐	☑	☐	☐
b. Is the mouse easily movable in any direction without a change in hand grasp?	☐	☑	☐	☐
c. Does movement of the mouse result in movement of the follower in the same direction +/- 175 mrad (10 deg)?	☐	☑	☐	☐
d. Is an indicator provided to bring the follower back onto the display after it has been driven off the edge?	☐	☑	☐	☐
e. Is the mouse approximately rectangular with no sharp edges?	☐	☑	☐	☐

	Yes	Not Applicable	Not Known*	No*
f. Do the dimensions of the mouse conform to the following limits:				
(1) Width 40 mm (1.6 in.) 70 mm (2.8 in.)	☐	☑	☐	☐
(2) Length 70 mm (2.8 in.) 120 mm (4.7 in.)	☐	☑	☐	☐
(3) Thickness 25 mm (1.0 in.) 40 mm (1.6 in.)	☐	☑	☐	☐
38. The following questions apply when a ball controller (trackball) is being used as an input device:				
a. If the follower is driven off the display, are there indicators to advise the user how to bring the follower back onto the display?	☐	☑	☐	☐
b. Is the ball control capable of rotation in any direction?	☐	☑	☐	☐
c. Do the control ratios meet the dual requirement of:				
(1) Rapid gross positioning, and				
(2) Precise fine positioning?	☐	☑	☐	☐
d. Do the physical characteristics conform to the following criteria:				
(1) Diameter: 50 mm (2 in.)-minimum	☐	☑	☐	☐
150 mm (6 in.)-maximum	☐	☑	☐	☐
100 mm (4 in.)-preferred	☐	☑	☐	☐
(2) Surface exposure: 1745 mrad (100 deg)-minimum	☐	☑	☐	☐
2445 mrad (140 deg)-maximum	☐	☑	☐	☐
2095 mrad (120 deg)-preferred	☐	☑	☐	☐
(3) Precision required: 1.0 N (3.6 oz)-maximum	☐	☑	☐	☐
0.3 N (1.1 oz)-preferred	☐	☑	☐	☐
(4) Vibration or acceleration condition:				
1.7 N (6 oz)-minimum	☐	☑	☐	☐
(5) Display clearance to ball clearance:				
320 mm (12.63 in.)-maximum	☐	☑	☐	☐
(6) Around ball: 50 mm (2 in.)-minimum	☐	☑	☐	☐
(7) Ball to shelf front: 120 mm (4.75 in.)-minimum	☐	☑	☐	☐
250 mm (9.75 in.)-maximum?	☐	☑	☐	☐

KEYBOARD AND INPUT DEVICES CHECKLIST

	Yes	Not Applicable	Not Known*	No*
39. The following questions pertain to the use of grid and stylus devices:				
a. Will placement of the stylus at any point on the grid cause the follower to appear at the corresponding coordinates?	☐	☑	☐	☐
b. Will the follower then remain in steady position if the stylus is not moved?	☐	☑	☐	☐
c. Is the refresh rate for the follower sufficiently high to ensure the appearance of a continuous track?	☐	☑	☐	☐
d. Do grids that are displaced from the display approximate the display size?	☐	☑	☐	☐
e. Are the displaced grids mounted below the display in an orientation to preserve directional relationships to the maximum extent?	☐	☑	☐	☐
40. The following questions pertain to the use of the touch-sensitive displays:				
a. Are the touch areas indicated?	☐	☑	☐	☐
b. Are the touch areas large enough so that each is easily activated without also activating adjacent areas?	☐	☑	☐	☐

KEYBOARD/INPUT DEVICES CHECKLIST COMMENTS

KEYBOARD/INPUT DEVICES

4. Is the numeric keypad arranged in the telephone format, i.e., 1, 2, 3 across the top?

   The keypad has the numbers 1, 2, 3 across the bottom.

15. Is a free area of approximately 60 mm (2.4 in.) provided on the front surface of the keyboard as a resting place for the user's hands?

   The keyboard has approximately 0.5 inch of clear space. The slope of the keyboard allows the user's hands to rest beyond the keyboard on the desk surface.

25. Is an auditory warning signal given when two keys are depressed simultaneously?

   No signal is given. Both keys print--one after the other.

SCREENS AND PRINTERS CHECKLIST

LEGIBILITY	Yes	Not Applicable	Not Known*	No*
1. Is the luminance level for the characters on the VDT adjustable in a range including 170 candela meter2 (cd.m2) (50fL) or fixed at 170 cd m2 (50 fL)?	☑	☐	☐	☐
2. Are the luminance ranges of surfaces immediately adjacent to the display between 10% and 100% of screen background luminance?	☑	☐	☐	☐
3. Are all light sources except emergency indicators less bright than the display characters?	☑	☐	☐	☐
4. Is the contrast between the characters on the display and the background of the display 90%?	☑	☐	☐	☐
5. Does the display have bright characters on a dark background?	☑	☐	☐	☐
6. Can the user reverse to dark characters on a bright background?	☐	☐	☐	☑
CHARACTER GENERATION				
7. Are the characters on the display generated by dot matrix at least 5 x 7 ?	☐	☐	☐	☑
8. If a font is used, are the characters based on the Lincoln/Mitre (L/M) font?	☐	☑	☐	☐
9. Does the display have both uppercase and lowercase letters?	☐	☐	☐	☑
10. Does the letter A have a clearly delineated space above the horizontal stroke?	☑	☐	☐	☐
11. Does the letter B have approximately equal loops at the top and bottom?	☑	☐	☐	☐
12. Are the letters C, G, and O sufficiently differentiated?	☑	☐	☐	☐
13. Are the horizontal strokes of the letter E equally separated?	☑	☐	☐	☐
14. Is the center section of the letters M and W sufficiently long?	☑	☐	☐	☐
15. Does the letter P have a loop halfway down the line?	☑	☐	☐	☐

SCREENS AND PRINTERS CHECKLIST

	Yes	Not Applicable	Not Known*	No*
16. Are the letter S and the number 5 sufficiently differentiated from each other?	☑	☐	☐	☐
17. Is the letter O recognizably different from the number 0?	☑	☐	☐	☐
18. Are the letters U and V easily discriminated?	☑	☐	☐	☐
19. Are the letters Y and T easily discriminated?	☑	☐	☐	☐
20. Are the numbers 6 and 9 easily recognizable?	☑	☐	☐	☐
21. Is the character spacing between individual characters at least two pixels?	☐	☐	☐	☑
22. Is the spacing between words proportional to character spacing?	☑	☐	☐	☐
23. Is the interline spacing on the display between 100% to 150% of the character height so the ascenders (superscripts) and descenders (subscripts) do not intrude into the characters above or below the line?	☐	☑	☐	☐
24. Is there sufficient space so that adjacent ascenders and descenders do not overlap or intersect?	☐	☐	☐	☑
25. Is the display screen free from flicker?	☑	☐	☐	☐
26. Are all areas of the display surface legible at least 525 mrad (30 deg) from the normal viewing angle?	☑	☐	☐	☐
27. Is the screen angle nearly perpendicular to the viewer's line of sight but placed so that reflection from overhead lighting is avoided?	☑	☐	☐	☐
28. Is the viewing angle adjustable?	☐	☑	☐	☐
29. Is the size of the display at least 305 mm (12 in.)?	☐	☐	☐	☑
30. Is the size of the usable display areas—area of surface where information and data are displayed—smaller than the outer perimeter of the VDT?	☑	☐	☐	☐
31. Is the display capacity for text input and editing VDTs 25 to 30 lines of text in a single column format with at least 132 characters per line?	☑	☐	☐	☐

SCREENS AND PRINTERS CHECKLIST

PRINTER	Yes	Not Applicable	Not Known*	No*
32. Does the printer conform to the guidelines already noted for CRT legibility, e.g., character size and character spacing?	☐	☑	☐	☐
33. If the user is interacting with the computer through the printer, does it print at least 400 words per minute?	☐	☑	☐	☐
34. Is the printer delay less than 1 to 2 s for acknowledging a command if the user is interacting with the computer through the terminal?	☐	☑	☐	☐
35. Is the printer noise level below 75 dB?	☐	☑	☐	☐
a. If no, is the printer in an inclosed area separated from personnel?	☐	☑	☐	☐
36. Is a paper advance control provided?	☐	☑	☐	☐
37. Is a paper take-up device provided?	☐	☑	☐	☐
38. Is a cutting edge provided?	☐	☑	☐	☐
39. Is there an indication of the remaining paper supply?	☐	☑	☐	☐
40. Do instructions for reloading paper, replacing ribbon, refilling ink, etc., appear on the instruction plate attached to the printer?	☐	☑	☐	☐
41. Is reloading paper or replacing ribbons accomplished without disassembly or using special tools?	☐	☑	☐	☐
42. Are storage facilities provided for supplies such as ribbons, spare paper, and ink?	☐	☑	☐	☐
43. Is a paper retainer provided to reduce paper vibration?	☐	☑	☐	☐
44. Are guides provided that facilitate accurate positioning of paper?	☐	☑	☐	☐
45. Does the printer accept letter size, legal size, computer paper, and all the forms that will be used?	☐	☑	☐	☐
46. Are printing or typing sets, e.g., ball and daisy wheel, easily replaceable?	☐	☑	☐	☐
47. Are there printing malfunction alarms?	☐	☑	☐	☐

SCREENS AND PRINTERS CHECKLIST

OUTPUT PAPER CONTENT	Yes	Not Applicable	Not Known*	No*
48. Is the information contained on the computer output easy to understand and concise?	☐	☑	☐	☐
49. Is the title of the output clear and distinctive?	☐	☑	☐	☐
50. Is all the information the user needs on the printout?	☐	☑	☐	☐
51. Has all unnecessary or extraneous information been removed?	☐	☑	☐	☐
52. Is the information organized in the order in which the user will access it?	☐	☑	☐	☐
53. Does the computer perform subtotals, add columns, sort data, and other tasks in which it is more efficient than humans?	☐	☑	☐	☐
54. Are adequate spaces left between fields so that they are easily differentiated?	☐	☑	☐	☐
OUTPUT PAPER QUALITY				
55. Is the output paper a matte-type finish to reduce smudging and glare?	☐	☑	☐	☐
56. Does the hard copy have black characters on a white background?	☐	☑	☐	☐
57. Is the print legible on all copies?	☐	☑	☐	☐
58. Are hard copy records available on demand by the user?	☐	☑	☐	☐
59. Are the hard copy records in the desired form?	☐	☑	☐	☐
60. Is the hard copy paper bound or stapled for storage?	☐	☑	☐	☐
61. Does the production of hard copy delay or otherwise change the operation of the overall system?	☐	☑	☐	☐

SCREENS AND PRINTERS CHECKLIST COMMENTS

LEGIBILITY

6. Can the user reverse to dark characters on a bright background?

   Although the programmer can reverse the screen to dark characters on a bright background, the user cannot.

CHARACTER GENERATION

7. Are the characters on the display generated by dot matrix at least 5 x 7?

   Proportional spacing was used for the letters. Therefore, some of the letters are 5 x 7, e.g., M, but other letters are narrower, e.g., I.

9. Does the display have both upper case and lower case letters?

   Only upper case letters are used on the display. The material might be more readable if both types of letters were used.

21. Is the character spacing between individual characters at least two pixels?

   The characters appear to be separated by only one pixel.

24. Is there sufficient space so that adjacent ascenders and descenders do not overlap or intersect?

   The majority of lines displayed on the TACID screen have sufficient space. However, several of the prompts which appear at the bottom of the screen overlap. More spacing between lines should be allotted to these prompts.

29. Is the size of the display at least 305 mm (12 in.)?

   The display is approximately 6 in. This display is the largest color LCD type display currently available.

APPENDIX B

TRAINING BOOKLET

1 MAIN MENU SCREEN

MSG= 00 MON= 00 F-MSN= 01 DTG= 04/31/90 16:05:37 CH1 MSG

MAIN MENU

1] TACTICAL MESSAGES

2] LOGISTICAL MESSAGES

3] FIRE SUPPORT MESSAGES

4] ACTIVE FIRE MISSIONS

5] COMPANY STATUS

6] UNIT LOCATIONS

7] SET-UP

2 MAIN MENU SCREEN

MSG=00 MON=00 F-MSN=01 DTG= 04/31/90 16:05:37 CH1 MSG

THE NUMBER OF MESSAGES (MSG) YOU HAVE RECEIVED

THE NUMBER OF MESSAGES (MON) YOU HAVE MONITORED

THE NUMBER OF MISSIONS (F-MSN)

THE DATE - TIME GROUP (IN GREENWICH MEAN TIME)

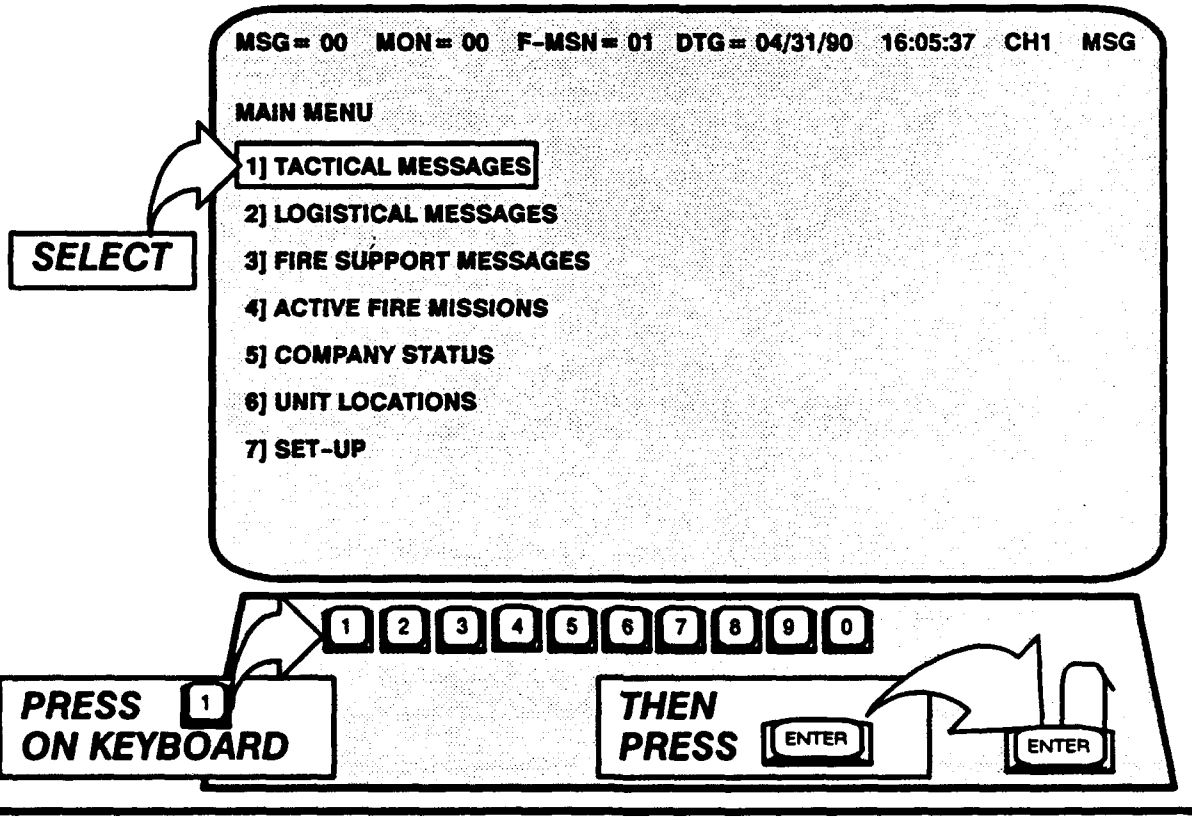
3 MAIN MENU SCREEN

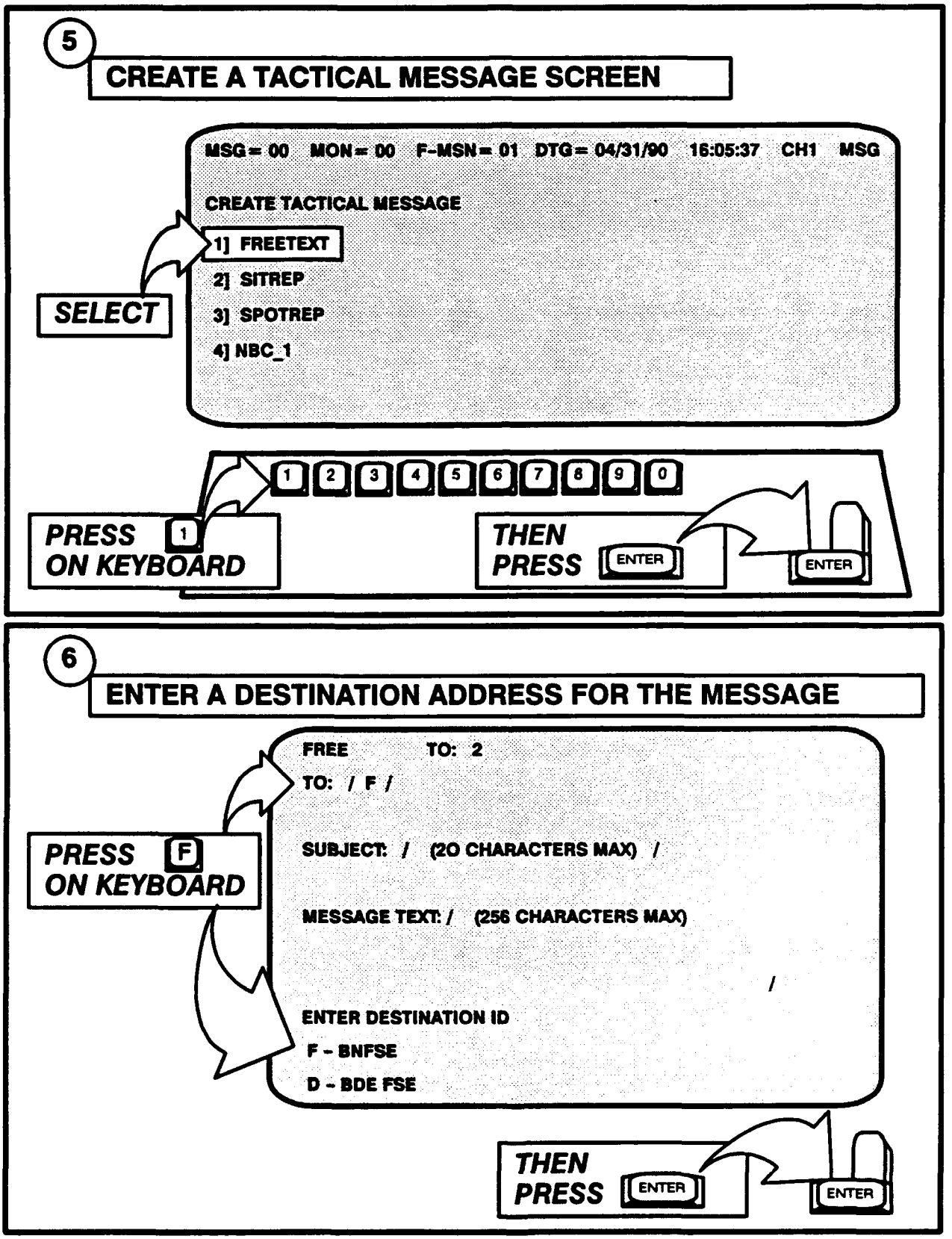
MSG=00 MON=00 F-MSN=01 DTG= 04/31/90 16:05:37 CH1 MSG

WHEN YOU RECEIVE A MESSAGE THESE BLOCKS WILL FLASH RED AND YOU WILL HEAR A BEEPING NOISE.

(THESE BLOCKS APPEAR AT THE TOP OF EVERY SCREEN)

4 CREATE A TACTICAL MESSAGE SCREEN




5
CREATE A TACTICAL MESSAGE SCREEN
MSG= 00 MON= 00 F-MSN= 01 DTG= 04/31/90 16:05:37 CH1 MSG
CREATE TACTICAL MESSAGE
1] FREETEXT
2] SITREP
3] SPOTREP
4] NBC_1
SELECT
1 2 3 4 5 6 7 8 9 0
PRESS 1 ON KEYBOARD
THEN PRESS ENTER
ENTER
6
ENTER A DESTINATION ADDRESS FOR THE MESSAGE
FREE TO: 2
TO: / F /
SUBJECT: / (20 CHARACTERS MAX) /
MESSAGE TEXT: / (256 CHARACTERS MAX)
/
ENTER DESTINATION ID
F - BNFSE
D - BDE FSE
PRESS F ON KEYBOARD
THEN PRESS ENTER
ENTER

7 ENTER SUBJECT TITLE OF THE MESSAGE

FREE TO: 2
TO: / F /

SUBJECT: / (20 CHARACTERS MAX) /

MESSAGE TEXT: /

/

USE KEYBOARD CHARACTERS.

EXAMPLE: "TEST MESSAGE"

IF NECESSARY, CORRECT ERRORS USING BACKSPACE KEY.

THEN PRESS ENTER

8 ENTER MESSAGE ("FREE TEXT")

FREE TO: 2
TO: / F /

SUBJECT: / TEST MESSAGE /

MESSAGE TEXT: / THIS IS A FREETEXT MESSAGE.

/

ENTER FREETEXT MESSAGE
UP TO 256 CHARACTERS

USE KEYBOARD CHARACTERS.

EXAMPLE: "THIS IS A FREETEXT MESSAGE."

THEN PRESS ENTER

9 TRANSMIT MESSAGE

FREE TO: 2
TO: / F /

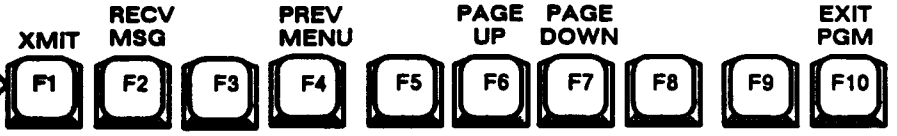
SUBJECT: / TEST MESSAGE /

MESSAGE TEXT: / THIS IS A FREETEXT MESSAGE.

/

ENTER FREETEXT MESSAGE
UP TO 256 CHARACTERS

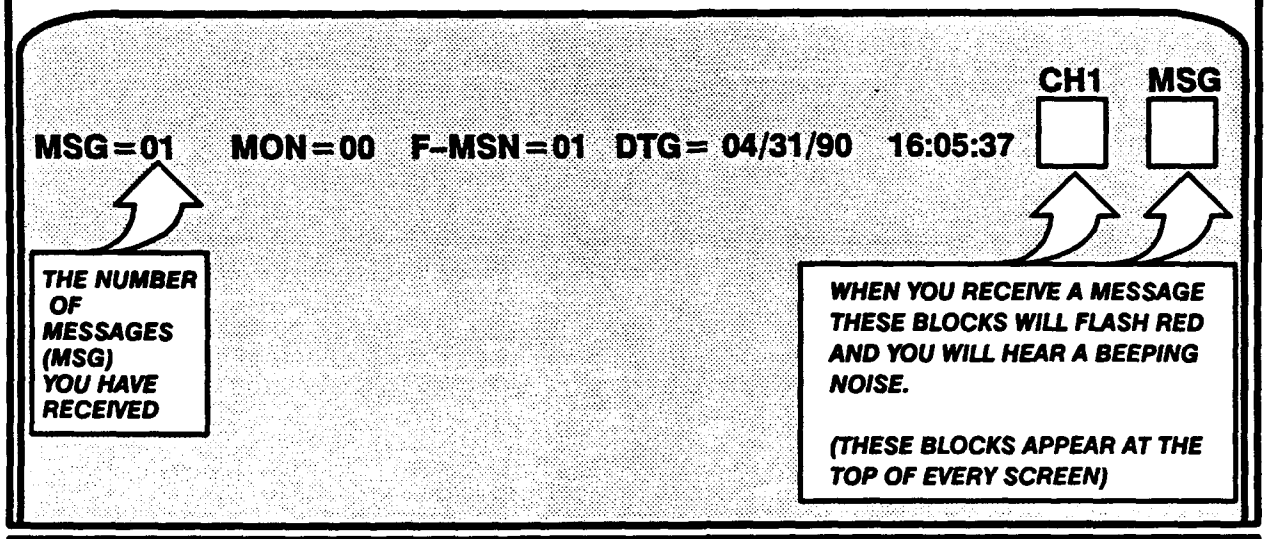
PRESS F1



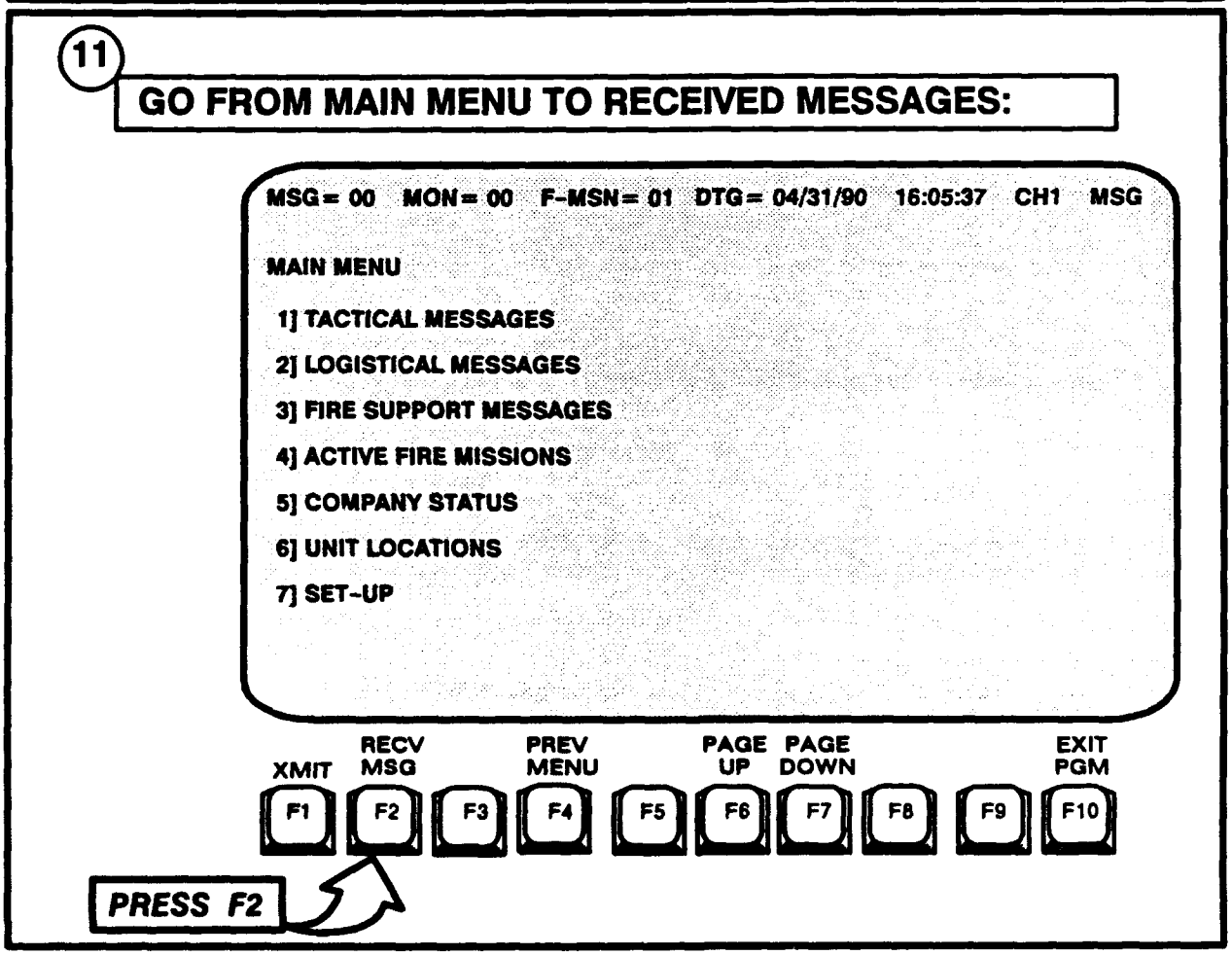
10 RECEIVING MESSAGES

(CONTINUED ON NEXT PAGE)

10 RECEIVING MESSAGES:



11 GO FROM MAIN MENU TO RECEIVED MESSAGES:



12 RECEIVED MESSAGES SCREEN (example)

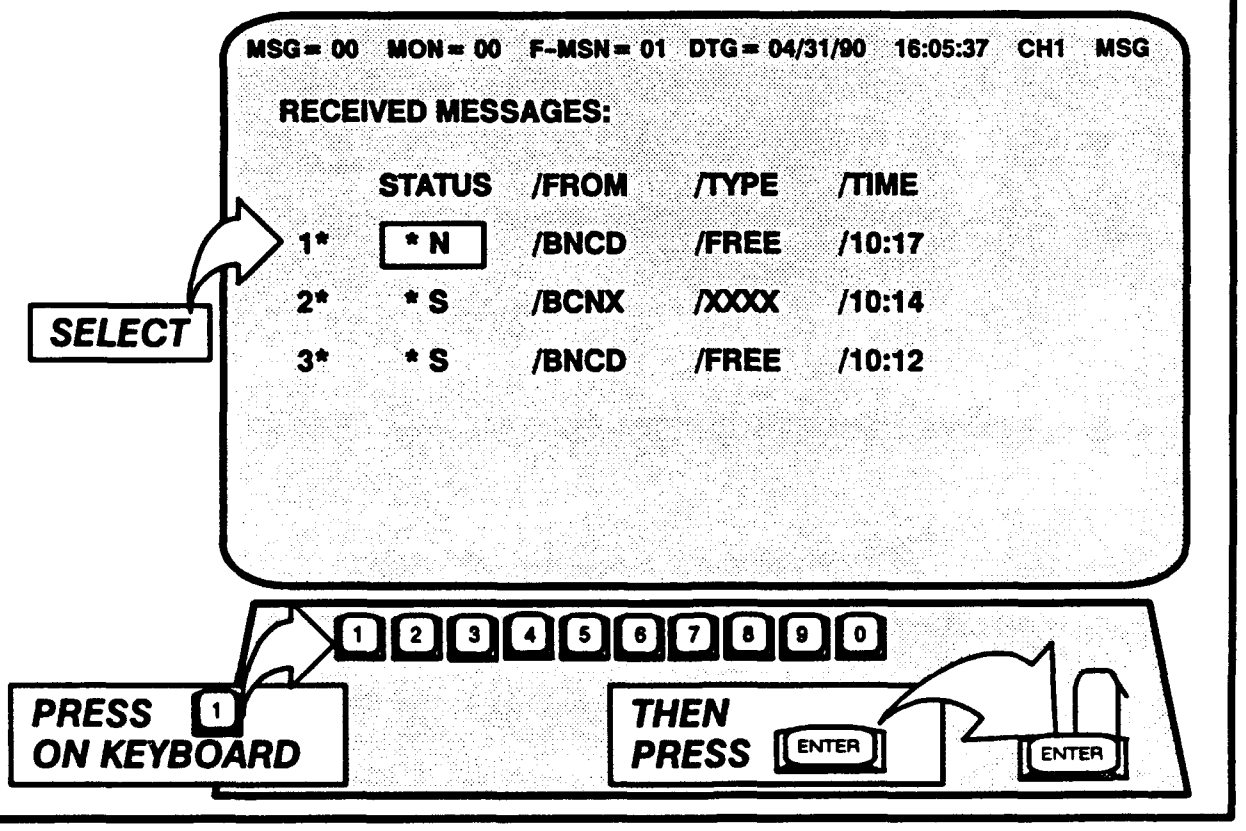
CH1 MSG

MSG=01 MON=00 F-MSN=01 DTG= 04/31/90 16:05:37

RECEIVED MESSAGES:

	STATUS	/FROM	/TYPE	/TIME
1*	* N	/BNCD	/FREE	/10:17
2*	* S	/BCNX	/XXXX	/10:14
3*	* S	/BNCD	/FREE	/10:12

13 TO READ RECEIVED MESSAGE:



14 RECEIVED MESSAGE (example):

FREE 0 TO: 2
TO: / F /

SUBJECT: / TEST MESSAGE /

MESSAGE TEXT: / THIS IS A FREETEXT MESSAGE.

/

MESSAGE IS AUTOMATICALLY SAVED
UNLESS USER DELETES MESSAGE

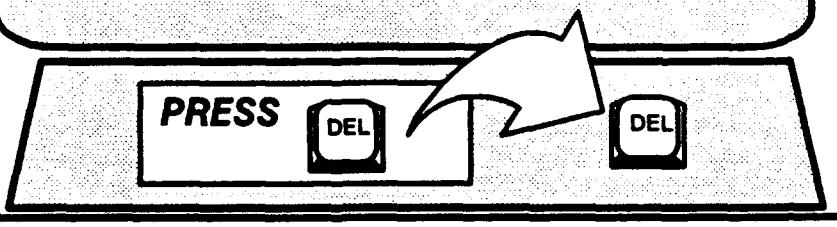
15 TO DELETE MESSAGE:

FREE TO: 2
TO: / F /

SUBJECT: / TEST MESSAGE /

MESSAGE TEXT: / THIS IS A FREETEXT MESSAGE.

/



16 TO SAVE AN INCOMPLETED MESSAGE:

FREE TO: 2
TO: / F /

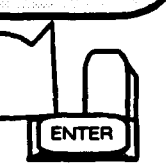
SUBJECT: / TEST MESSAGE (INCOMPLETED) /

MESSAGE TEXT: / THIS IS A FREETEXT MESSA . .

/

IF YOU RECEIVE A NEW MESSAGE WHILE YOU ARE CREATING ANOTHER MESSAGE THEN SAVE YOUR PARTIALLY COMPLETED MESSAGE.

SAVE BY PRESSING ENTER



17 TO READ A NEW MESSAGE JUST RECEIVED:

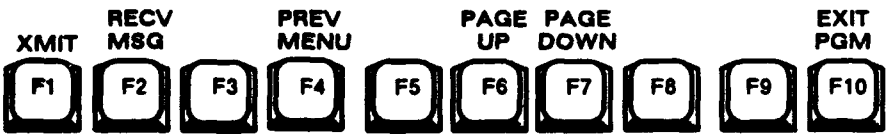
FREE TO: 2
TO: / F /

SUBJECT: / TEST MESSAGE (INCOMPLETED) /

MESSAGE TEXT: / THIS IS A FREETEXT MESSA . .

/

PRESS F2



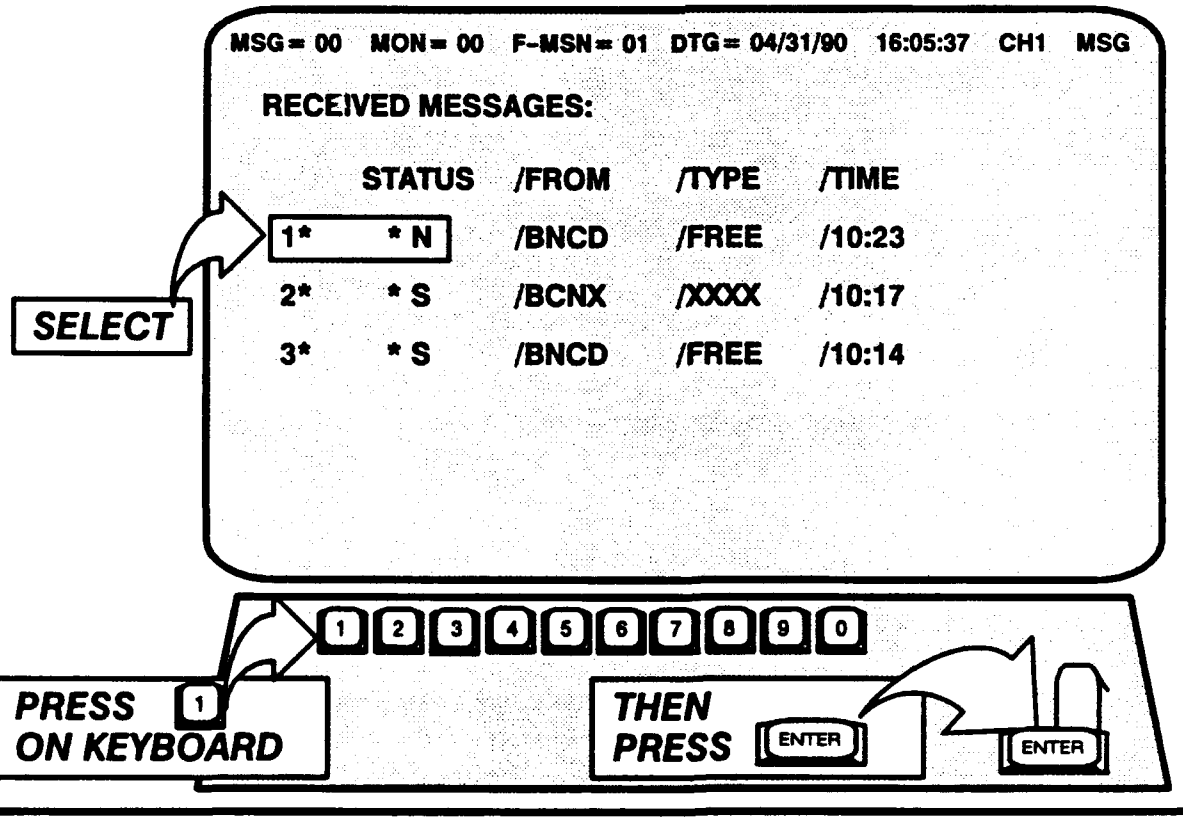
18 CHECK ID NO. OF NEWLY RECEIVED MESSAGE

MSG=01 MON=00 F-MSN=01 DTG= 04/31/90 16:05:37 CH1 MSG

RECEIVED MESSAGES:

	STATUS	/FROM	/TYPE	/TIME
1*	* N	/BNCD	/FREE	/10:23
2*	* S	/BCNX	/XXXX	/10:17
3*	* S	/BNCD	/FREE	/10:14

19 TO READ NEWLY RECEIVED MESSAGE:



20 READ THE NEWLY RECEIVED MESSAGE (example):

FREE TO: 2
TO: / F /

SUBJECT: / NEWLY RECEIVED MESSAGE /

MESSAGE TEXT: / THIS IS A NEW FREETEXT MESSAGE.

/

21 TO RETURN TO THE INCOMPLETED MESSAGE YOU WERE CREATING:

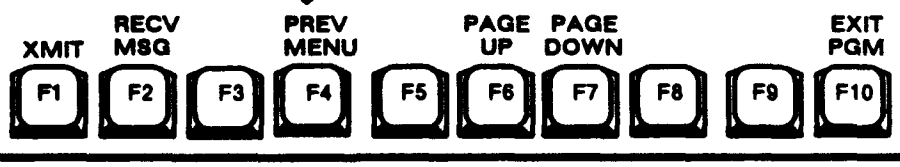
FREE TO: 2
TO: / F /

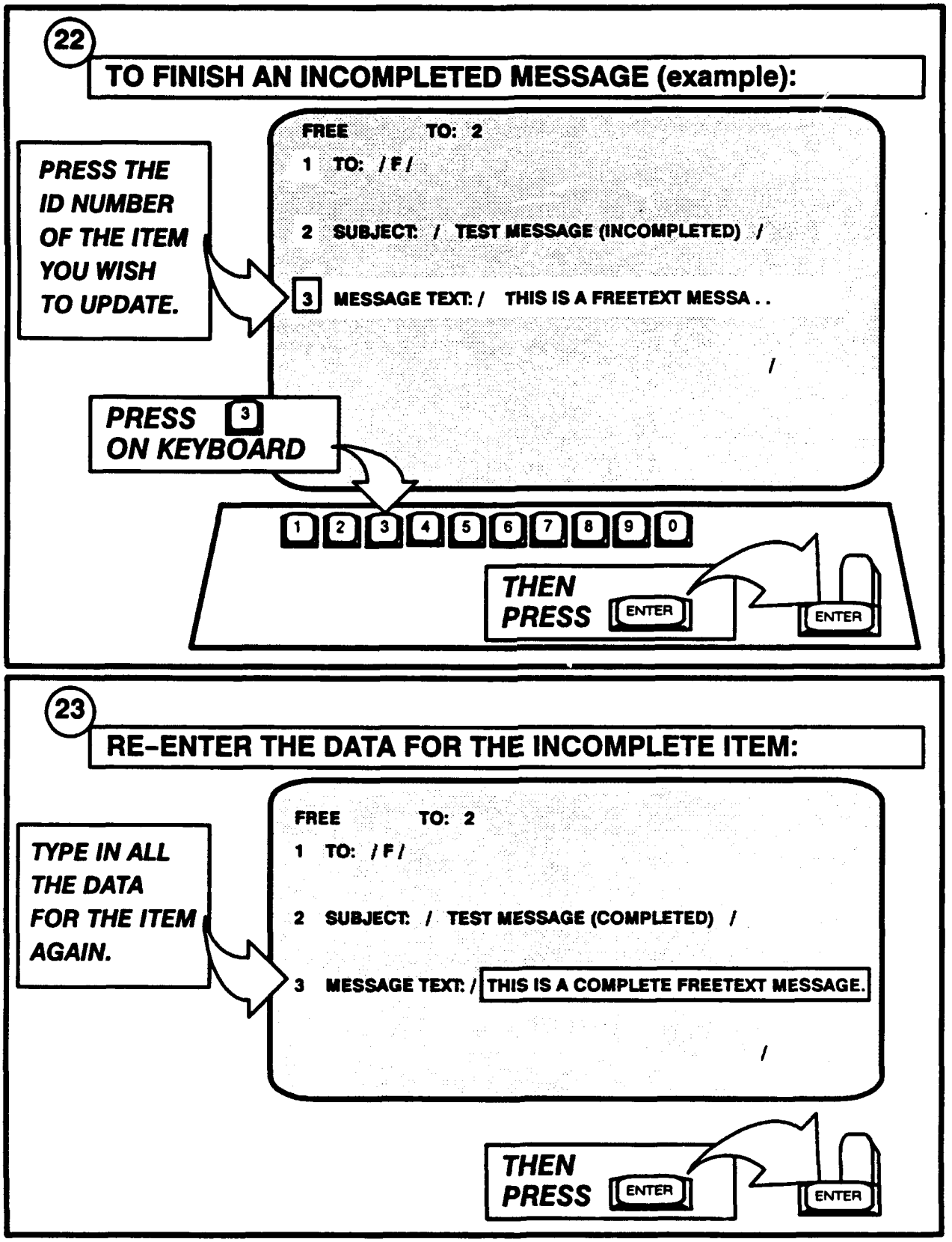
SUBJECT: / NEWLY RECEIVED MESSAGE /

MESSAGE TEXT: / THIS IS A NEW FREETEXT MESSAGE.

/

PRESS "F4" BUTTON TWICE




22
TO FINISH AN INCOMPLETED MESSAGE (example):
PRESS THE ID NUMBER OF THE ITEM YOU WISH TO UPDATE.
FREE TO: 2
1 TO: / F /
2 SUBJECT: / TEST MESSAGE (INCOMPLETED) /
3 MESSAGE TEXT: / THIS IS A FREETEXT MESSA . .
/
PRESS 3 ON KEYBOARD
1 2 3 4 5 6 7 8 9 0
THEN PRESS ENTER
ENTER
23
RE-ENTER THE DATA FOR THE INCOMPLETE ITEM:
TYPE IN ALL THE DATA FOR THE ITEM AGAIN.
FREE TO: 2
1 TO: / F /
2 SUBJECT: / TEST MESSAGE (COMPLETED) /
3 MESSAGE TEXT: / THIS IS A COMPLETE FREETEXT MESSAGE.
/
THEN PRESS ENTER
ENTER

24 TRANSMIT THE FINALLY COMPLETED MESSAGE:

FREE TO: 2

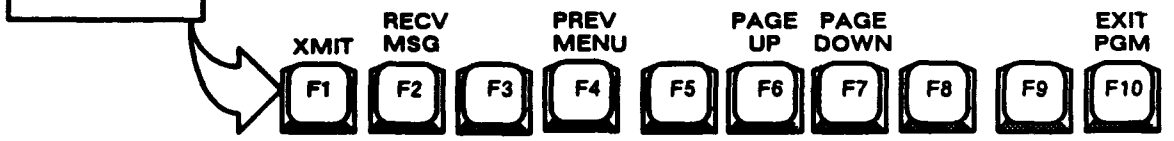
TO: / F /

SUBJECT: / TEST MESSAGE (COMPLETED) /

MESSAGE TEXT: / THIS IS A COMPLETED FREETEXT MESSAGE.

/

PRESS F1



25 TO RETURN TO MAIN MENU:

FREE TO: 2

TO: / F /

SUBJECT: / TEST MESSAGE /

MESSAGE TEXT: / THIS IS A FREETEXT MESSAGE.

/

PRESS F4

APPENDIX C

TEXT MESSAGES AND QUESTIONNAIRES

TACID TRAINING/TEST MESSAGES

	SUBJECT	QUESTIONS
1.	Elevation	What is your max elevation?
2.	Checkfire	What is nature of checkfire?
3.	Ammo Count	Report ammo count.
4.	Powder Temperature	What is the current powder temperature?
5.	BC	Is the BC on your gun?
6.	HE	How many HE do you have left?
7.	Safety Limit	Report right and left safety limit.
8.	Chow	Has everybody on your gun had chow?
9.	Fire Mission	Did you fire that mission?
10.	Fire Mission	Btry Adjust #3 1 round DF 3217 QE 388. Report when safe and ready
11.	Ammo Count	Report ammo count.
12.	Powder Temp	Report powder temp.
13.	PD Fuzes	How many PD fuzes do you have left?
14.	Powder Lot Number	What is the lot number of the powder you have?
15.	Fire Mission	Did you fire that mission?
16.	Weight HE Rounds	What square weight are the HE rounds on your gun?
17.	Azimuth	Report azimuth of lay.
18.	FFE	Number of rounds fired in fire for effect?
19.	Quadrant	Say again to Quadrant fired.
20.	Site to Crest	Report site to crest.

TACID OPERATOR'S QUESTIONNAIRE

NAME(Optional)_____ RANK_____

UNIT_____ MOS _____

NUMBER OF MONTHS IN MOS_____ DATE_____

Circle the highest grade you completed in school.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 OVER 16

The purpose of this questionnaire is to gather information about your operator's training on the TACID, your operation of the TACID display, and your experience with the TACID software.

PART I

The following data will be used for statistical purposes only. Please answer each question as accurately as possible.

1. a. Have you ever used a computer before?

Yes____ No____

b. If yes, what type? _____

c. How long? Years____ Months_____

2. a. Have you had some experience using a typewriter before you came here for the test?

Yes____ No____

b. If yes, over how long a period of time? Years____ Months____

c. How many words per minute ? _____

PART II

This part of the questionnaire gathers information on your TACID operator's training.

Place an X in the column which best describes your opinion.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. There was too little time allowed for the instruction.	____	____	____	____	____
2. There was too much time allowed for the instruction.	____	____	____	____	____
3. I understood all of the words used in the training.	____	____	____	____	____
4. The time allowed for training was just about right.	____	____	____	____	____
5. The instructions given by the instructors were confusing.	____	____	____	____	____
6. The equipment is easy to operate.	____	____	____	____	____
7. The equipment is too complex to learn in the time allowed.	____	____	____	____	____
8. With the instructions I have received, I can now operate the TACID.	____	____	____	____	____

PART III

This part of the questionnaire gathers information about the TACID display and its software.

1. a. Did you have any problems learning how to operate the TACID?

Yes____ No____

b. If yes, what problems did you have?

_____

_____

_____

c. Did you solve the problem?

Yes____ No____

2. Do you think the TACID was easy to use?

Yes____ No____

Comments:_____

_____

_____

_____

3. Did you have any problems reading the TACID display?

Yes____ No____ Comments:_____

_____

_____

_____

4. Are there any changes you would like to see made to the display?

Yes____ No____ Comments:_____

_____

_____

_____

5. Was the display easy to read?

Yes _____ No_____ Comments:_____

6. Would the TACID display help you perform your job? If so how?

Yes_____ No_____ Comments:_____

7. Was the display easy to operate?

Yes_____ No_____ Comments:_____

8. Did you have any problems creating and transmitting messages?

Yes _____ No_____ Comments:_____

9. Are there any changes you would make to the procedure for creating and transmitting messages?

Yes_____ No_____ Comments:_____

10. Did you think it was easy to create and transmit a message?

Yes_____ No_____ Comments:_____

11. Did you have any problems looking up the messages you received?

Yes _____ No_____ Comments:_____

12. Are there any changes you would make to the procedure for receiving messages?

Yes_____ No_____ Comments:_____

13. Did you think it was easy to receive a message and read the received message?

Yes_____ No_____ Comments:_____

14. Did you have any problems deleting or saving messages?

Yes _____ No_____ Comments:_____

15. Are there any changes to sending and receiving messages you want to suggest?

Yes_____ No_____ Comments:_____

16. Space is provided below for any additional comments you would like to make.