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INTER - OFFICE MEMO

TECHNOLOGY

A Division of Science
Applications, Inc.

DATE: May 18, 1983

REF #: 203

TO: Jerry Cook

FROM: Roger L. Johnson *RLJ.*

SUBJECT: PORTABLE COMPUTER/DISPLAY SYSTEMS FOR USN APPLICATIONS

In response to our telecon on May 17 please find enclosed a copy of the executive summary of a recent SAIT proposal which included the GRID Compass Computer. As we discussed, this equipment is quite rugged and may provide a very attractive solution to your customer's problem. In addition, we are currently discussing the possibility of developing a MIL-SPEC version of this equipment under license with GRID.

I would be quite interested in developing a USN relevant demo with you that could be used in a number of USN marketing opportunities. After you have spoken further with your customer, please get back with me and we'll do some planning.

/aw

cc: S. Dalich
W. Hall
D. Layser
J. Redman

Enclosure

COMPANY CONFIDENTIAL

EXECUTIVE SUMMARY FOR A FLAT PANEL PORTABLE DISPLAY ASSEMBLY DEVELOPMENT PROGRAM

This data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to evaluate the proposal; provided, that if a contract is awarded to this offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from other source without restriction. The data subject to this restriction is contained in Sheets.....ALL.....(DEC.1966)

PREPARED FOR
U.S. ARMY
ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND
FORT MONMOUTH, NEW JERSEY

9 MAY 1983

SOLICITATION No. DAAK 20-83-Q-0295


 **TECHNOLOGY CO.**
A DIVISION OF SCIENCE APPLICATIONS, INC.

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EXECUTIVE SUMMARY

SAI Technology Company (SAIT), A Division of Science Applications, Inc. (SAI) has prepared a response to the U.S. Army ERADCOM solicitation for a Portable Display Assembly (PDA) development program which will provide to the U.S. Army the following key benefits:

- A technical approach which is consistent with the technical guidelines of the solicitation and which is based upon the combined experience of SAIT and four leading companies in the flat display and related technology fields: the GTE Lighting Products Group, Texas Instruments Inc., Elographics Inc. and GRiD Systems Corporation.
- An approach in which SAIT shares costs in management and technical areas that are common to both the PDA program and the advanced display IR&D activity currently being pursued at SAIT.
- A travel and technical meeting schedule whereby SAIT maintains close coordination with ERADCOM/ETDL/MDD throughout the program to incorporate technical contributions resulting from current ERADCOM AC-TFEL development programs, and to follow modified technical directions which may result from ERADCOM assessment of new technical results and expanding U.S. Army requirements.

- A technical approach in which design and technology decisions will be made by a proven team of experienced personnel who are cognizant of the important factors involved in developing MIL-SPEC display equipment and in accomplishing technology insertion, i.e. an approach which reduces expensive re-development when transferring the PDA program results into the MIL-SPEC design environment.
- A technical approach which uses several hardware and software system components which have already been developed by industry thus allowing for maximum concentration in the technology problem areas which relate to the size, weight, power efficiency and display performance of the tethered display element.
- An approach which will supply ERADCOM with a set of demonstrable equipment modules that can be easily carried from site to site as ordinary hand luggage.

TECHNICAL APPROACH

SAIT's approach to developing a Portable Display Assembly (PDA) to meet the ERADCOM technical guidelines is based on the concept of combining SAIT's extensive experience in developing MIL-SPEC flat panel display systems with the capabilities and resources of selected U.S. companies that are leaders in the key technology areas required. In late 1981, as part of a continuing, advanced display IR&D program at SAIT, a task was established to identify and evaluate the companies and/or laboratories working in the areas of flat display and

high voltage line driver technology, efficient power supply techniques, touch panel and keyboard technology, and low volume/low power semiconductor and packaging technology. From this study, SAIT has selected four specific high technology companies with which it will work to carry out the Portable Display Assembly development program. The criteria used in selecting these companies include their position in state-of-the-art technology development, their familiarity with U.S. Army requirements, the level of internal investment and resource allocation, and their willingness to work with SAIT on the ERADCOM program.

Two of the companies, the GTE Lighting Products Group and Texas Instruments Inc., are the leaders, respectively, in developing large area AC-TFEL display elements and compatible high voltage LSI drive circuit technology. Both companies are currently working under U.S. Army ERADCOM sponsorship on programs which have technical guidelines compatible with the PDA program. SAIT has involved both companies in its advanced terminal development program and has developed a strong working relationship with each company. The working relationship with the GTE Lighting Products Group has included a number of joint AC-TFEL technology assessment projects and technology transfer activity in the area of flat panel and drive circuit packaging. The working relationship with Texas Instruments' High Voltage LSI Technology Group extends over the past five years and includes extensive assessment of the MIL-SPEC characteristics of the BIFET technology by the Components Engineering Section of SAIT. SAIT uses TI BIFET line driver technology in several of its current flat panel products.

Two other companies have been selected by SAIT to work on the PDA program, Elographics, Inc. of Oak Ridge, TN and GRiD Systems Corp. of Mountain View, CA. Elographics, Inc. is

considered the current leader in developing high resolution, transparent touch input surfaces for display systems. GRiD Systems Corp. is a three year old company which has developed and is now manufacturing one of the most compact, portable 16-bit computer systems, the Compass Computer. GRiD has extensive experience in and resources for development of computer networks, network and graphic software as well as highly compact computer systems using AC-TFEL displays, VLSI semiconductors, compact and efficient power sources, and advanced packaging techniques. Figure ES-1 shows a typical interactive, graphic scenario on the Compass Computer display.

Each of the four companies has identified personnel who are assigned to the associated technology areas and each group is quite familiar with PDA program requirements. Combining all four companies' resources and technologies with SAIT's experience in MIL-SPEC microprocessor based graphic display systems provides the U.S. Army with an excellent development team for the PDA.

In conjunction with the development of outside technology resources, SAIT together with its parent, SAI, has identified an internal PDA program team with a proven base of experience in developing MIL-SPEC graphic display system hardware and software for U.S. Army and other DoD programs. Two key U.S. Army sponsored programs which provide an important base of experience for the PDA activity are the DIVAD high performance radar display and the color-graphic, topo-map display system developed for the National Training Center at Ft. Irwin. Both systems involve graphic hardware and software techniques similar to those called out in the PDA technical guidelines. In addition SAIT personnel and consultants have a working knowledge of emerging international graphic standards

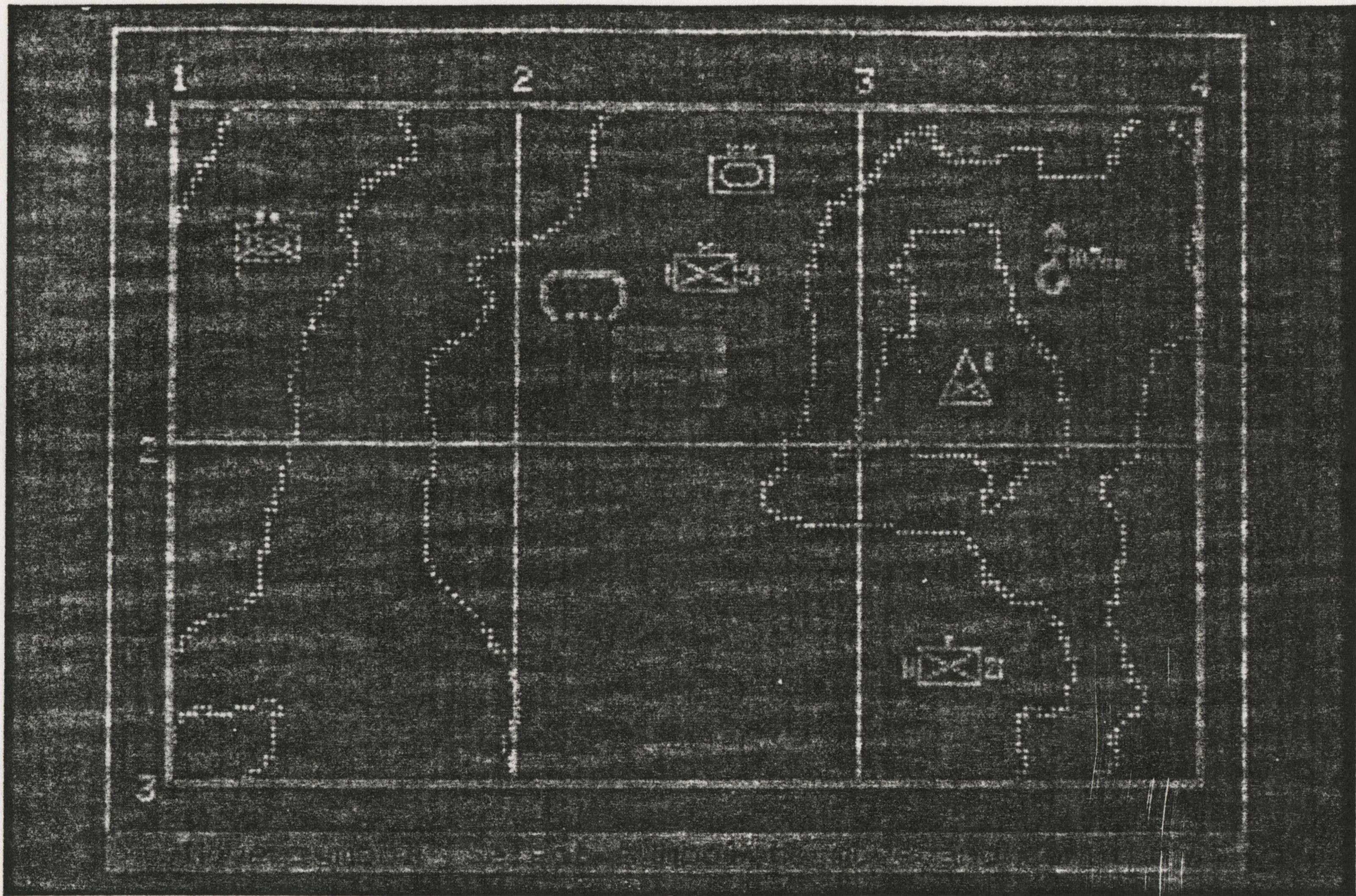


Figure ES-1 TYPICAL GRAPHIC SCENARIO ON COMPASS COMPUTER

and are familiar with DoD directed software developments such as the Ada and C programming languages.

The software development team assigned to the PDA program has been selected on the basis of past experience as well as knowledge of current and future trends and techniques in computer graphics as they relate to sensor and C³I display systems. The system specialists selected are experts in the integration of advanced technology hardware and software. Examples of recent technology integration and design projects handled by this team are the display systems developed for the Harpoon Missile System, the E-4B CAPS System and the Ground Launched Cruise Missile System.

PDA SYSTEM CONFIGURATION

Figure ES-2 illustrates SAIT's understanding of the concept of the PDA, i.e. a 512 x 640 pixel, transparent display element with touch input, mounted in a picture frame and operating as a graphic data presentation system in a map or document overlay mode.

SAIT has working experience in the design of map and document overlay systems with touch input.

The block diagram (Figure ES-3) shown below illustrates the relationship of the major PDA system elements which will be developed according to the technical guidelines provided by ERADCOM.

A minimum component version (three modules) of the proposed system implementation is shown in Figure ES-4 together with a chart of weight and size design goals. This version of the system, based upon the extremely compact GRiD Compass

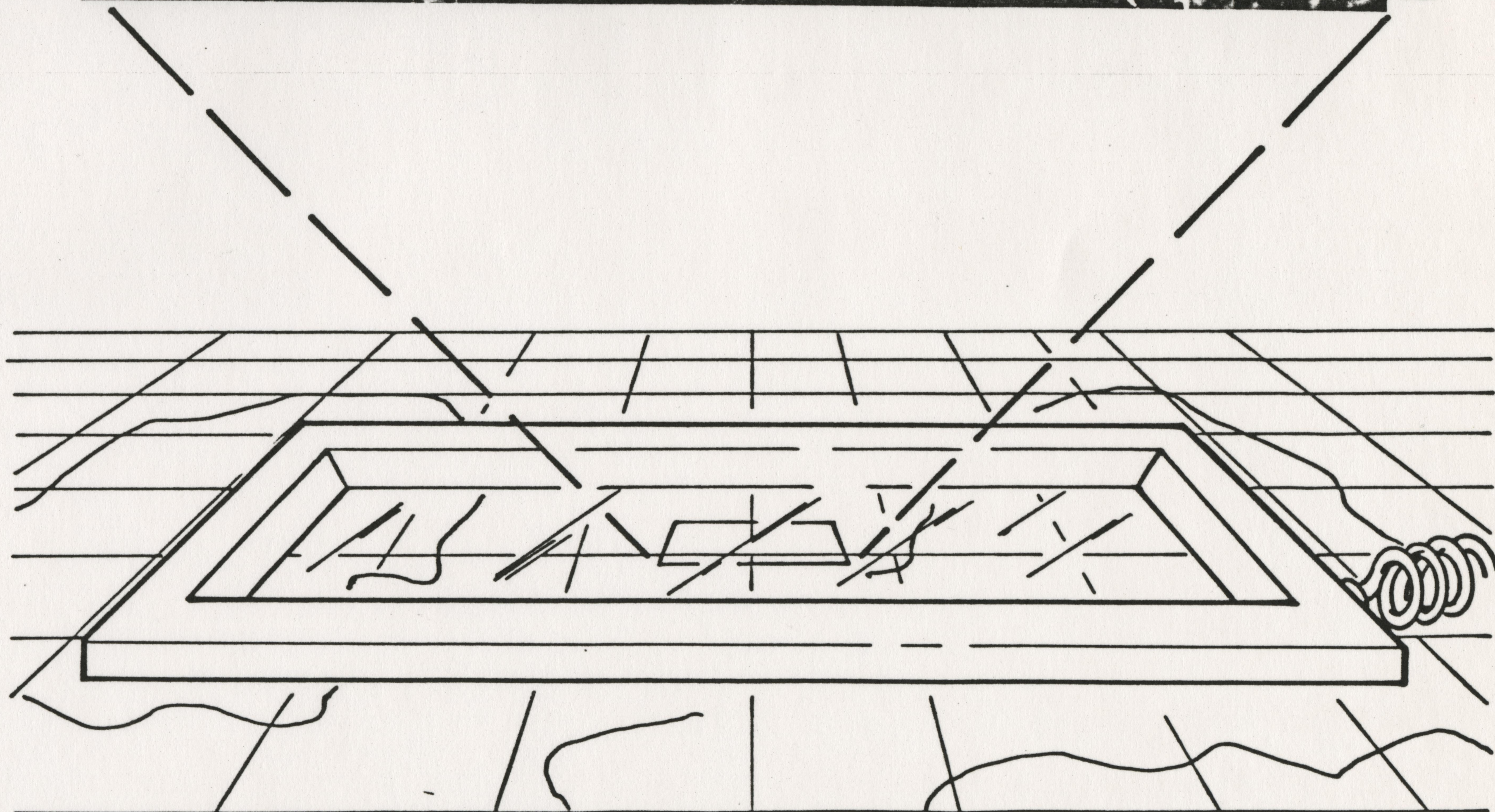
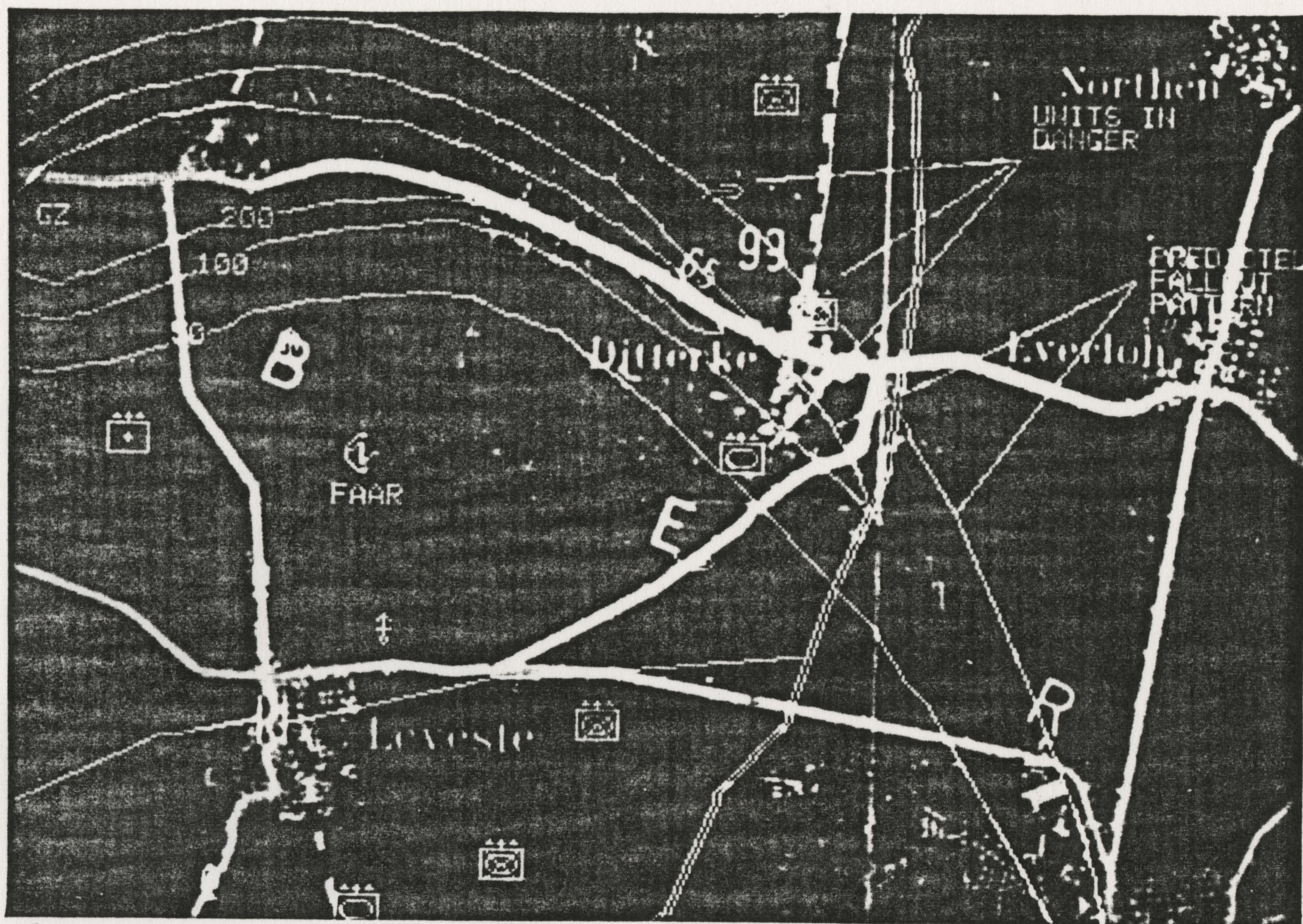


Figure ES-2 CONCEPTUAL VIEW OF THE PDA

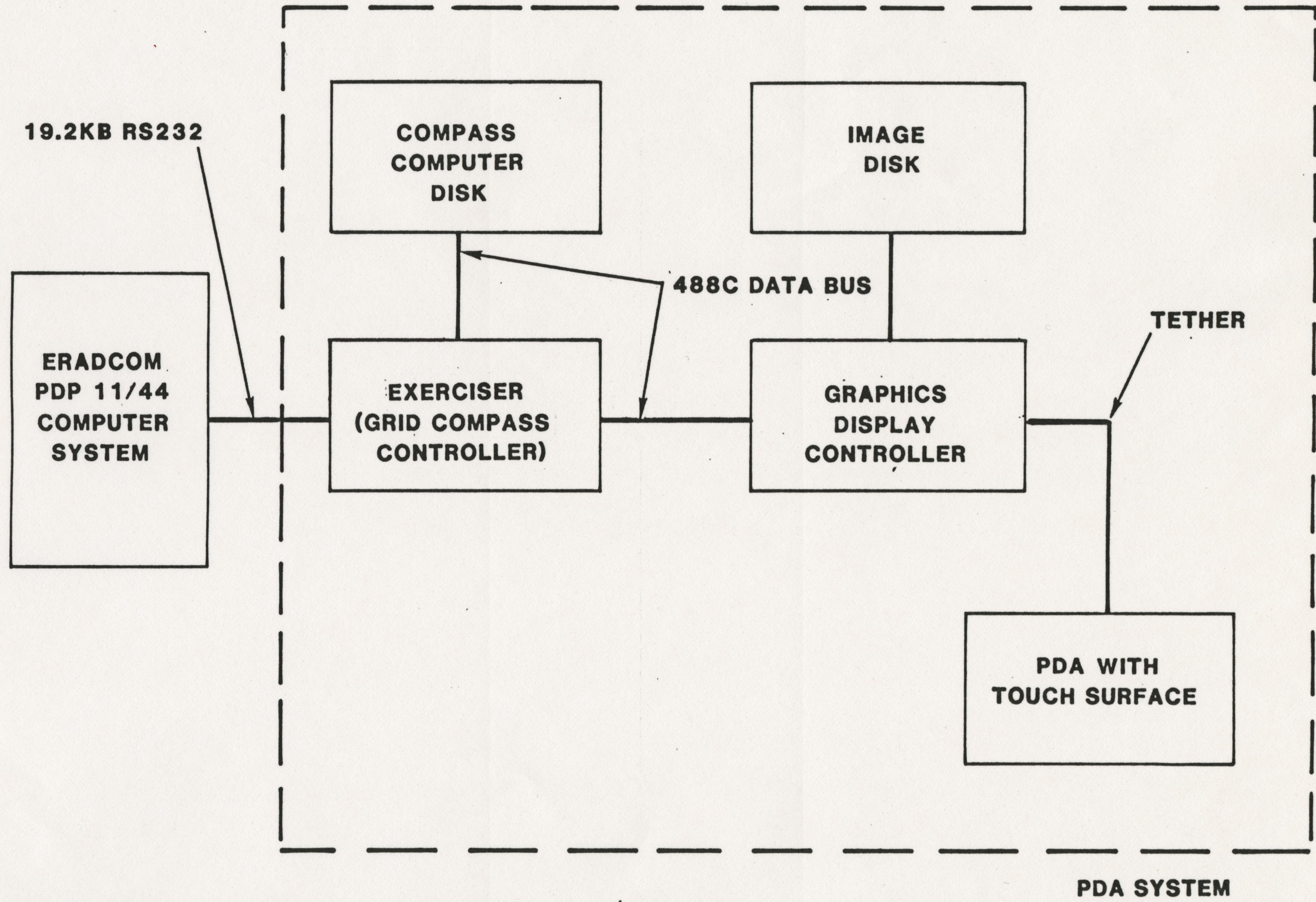
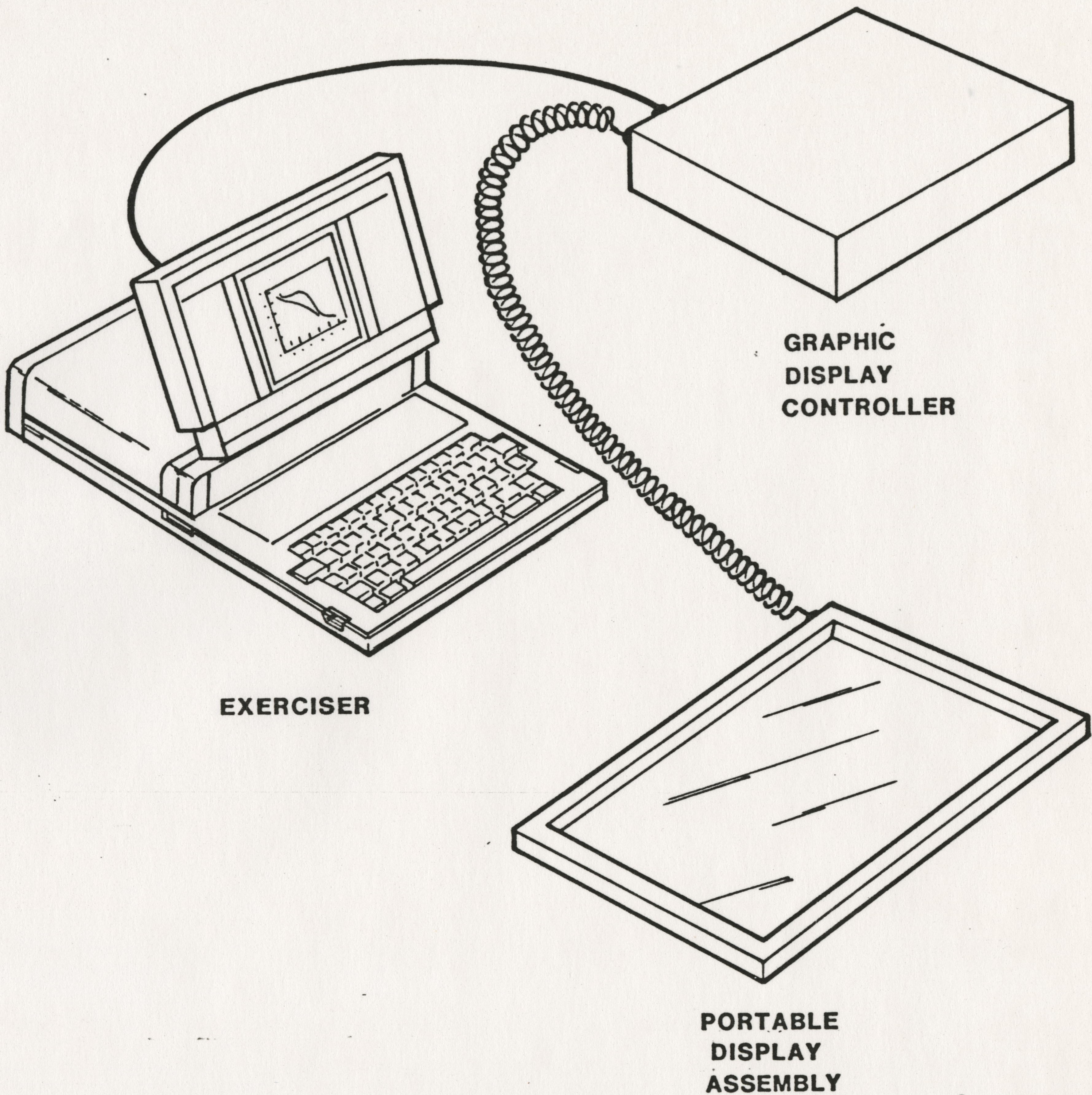


Figure ES-3 PDA BLOCK DIAGRAM



MODULE	SIZE (DESIGN GOAL)	WEIGHT (DESIGN GOAL)
EXERCISER	15 x 12 x 2 IN.	10 LBS.
DISPLAY CONTROLLER	15 x 12 x 4 IN.	20 LBS.
PORTABLE DISPLAY ASSY	12 x 15 x 0.75 IN.	5 LBS.

Figure ES-4 PDA SYSTEM MINIMUM COMPONENT VERSION

Computer, is highly portable and can be used to present traveling demonstrations of display performance as well as to show the level of volume reduction and power efficiency achievable with the selected technological approaches.

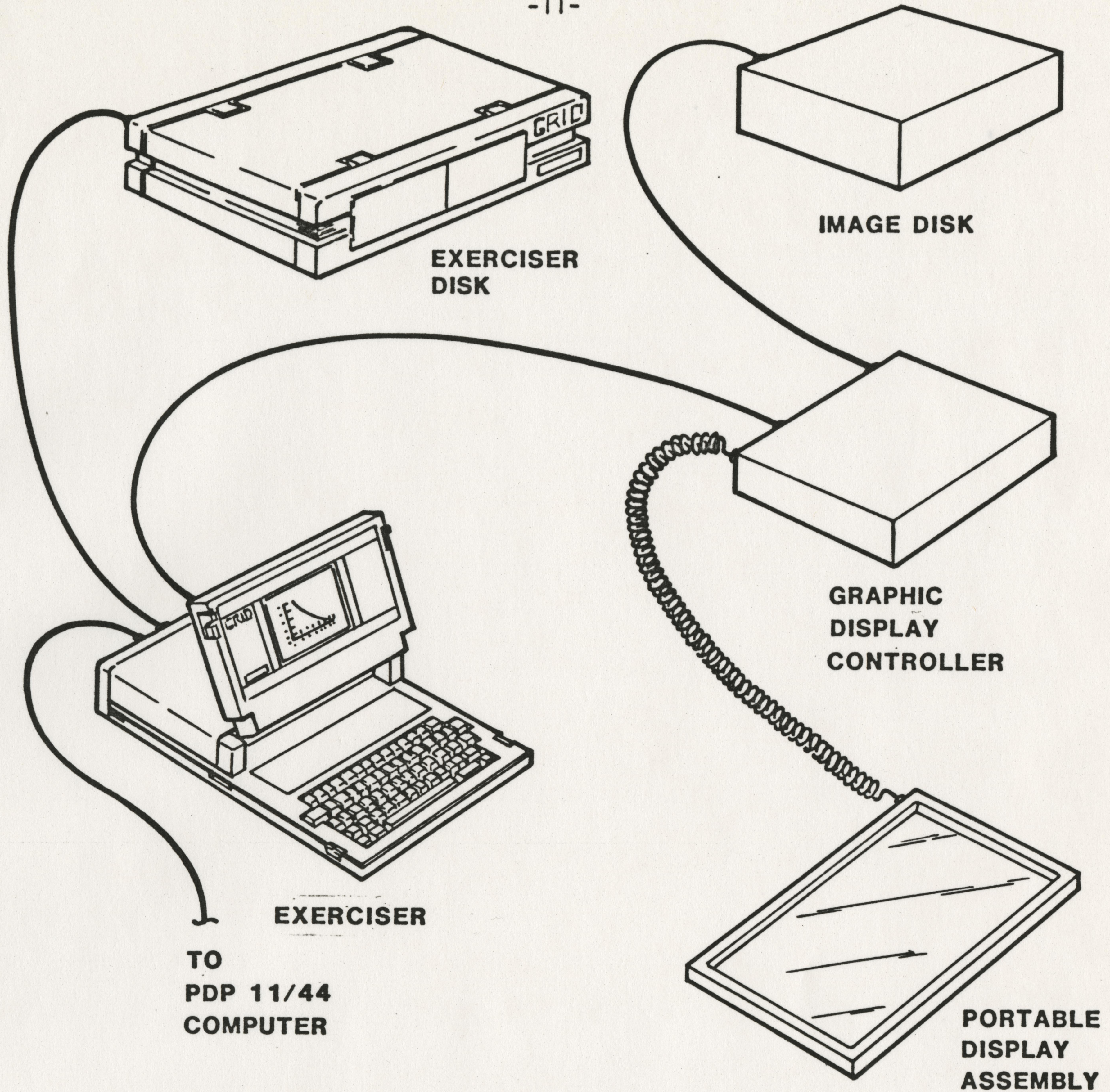
A second configuration of the PDA system, shown in Figure ES-5, contains the complete set of five modules to be developed under the program. This configuration, although still quite portable, is expected to be used most often in the ERADCOM Display Laboratory.

The detailed approach to be taken in developing each of the components in this figure is presented in PART I, the Technical Proposal. PART I also presents a more detailed description of the technology resources, consultants, and SAIT/SAI personnel and facilities that will be used in the PDA program.

CRITICAL PROBLEM AREAS

SAIT personnel have identified two critical problem areas of the proposed development program:

- High voltage line driver/AC-TFEL panel interface technology; i.e. material and electrical interface problems together with general high density mounting problems must be analyzed and solved.
- An efficient power supply/panel drive system using producible panels and line drivers must be designed.



MODULE	SIZE (DESIGN GOAL)	WEIGHT (DESIGN GOAL)
EXERCISER	15 x 12 x 2 IN.	10 LBS
EXERCISER DISK	15 x 11 x 4 IN.	18 LBS.
DISPLAY CONTROLLER	15 x 12 x 4 IN.	20 LBS.
IMAGE DISK	15 x 12 x 4 IN.	20 LBS.
PORTABLE DISPLAY ASSY	15 X 12 x 0.75 IN.	5 LBS.

Figure ES-5 COMPLETE PDA SYSTEM

SAIT is currently working with both GTE (Dr. L. Hope) and Texas Instruments (G. Wires) on the critical problem areas. A review of past and current work has been completed and, based on the results of this study, an initial design approach has been selected. The details of this approach are described in PART I.

All other design aspects of the program are considered to be tasks similar to those already under consideration as part of SAIT's advanced display project. Problems associated with the development of these elements are not considered to be critical in nature.

EXISTING ASSETS AND SUPPORTING RESEARCH

A key factor in SAIT's approach to developing the PDA system is the maximum utilization of existing assets and resources developed by U.S. industry under U.S. Army sponsorship. Through this approach, program funds can be concentrated on solving the primary technology problems identified by ERADCOM in the PDA technical guidelines, i.e. an approach which avoids re-invention of technology assets and resources already developed under DoD and industry sponsorship. Consistent with this philosophy, SAIT will use its advanced display laboratory, developed with internal funds, to support system and device level integration tasks. This facility currently includes many of the primary resources required in the PDA program. For example, a DEC PDP-11/44 computer system fully compatible with the ERADCOM system is available for use as the PDA host. Also, a GRiD Compass Computer with a 320x240 AC-TFEL display, supporting peripherals, and fully developed software development tools, equivalent to the system proposed as the PDA exerciser, is available at SAIT for immediate PDA software and interface development. Display controller

development similar to that which is required in the PDA program is already underway at SAIT to support the "next generation" U.S. Army display system project. A Sharp/Hycom AC-TFEL display module (320 x 240) is available in the laboratory for interim testing of these controller designs. This work can be of immediate use in realizing the objectives of the PDA program and will accelerate the demonstration of viewable results via the interim systems required in the PDA technical guidelines. Figure ES-6 is a block diagram of the SAIT Software Development Facility.

COST SHARING

SAIT is committed to improving current U.S. Army display products and responding to an expanding set of U.S. Army display requirements. To meet this commitment SAIT supports a continuing advanced display IR&D program whose goal is to identify and use new technology where it will lead to significant improvements in processing capability, display performance, size, weight, power efficiency, reliability, survivability and cost. The ERADCOM goals described in this solicitation are closely related to the SAIT IR&D effort and, as a result, SAI has made a Corporate decision to support the PDA program with \$310,000 of company funding, including \$150,000 in direct cost sharing. The details of this support are provided in the cost proposal.

EXPERIENCE AND TECHNOLOGY INSERTION

SAIT has over eight years of experience in developing and producing U.S. Army qualified MIL-SPEC display equipment. In 1974, under U.S. Army sponsorship, SAIT designed and produced the first MIL-SPEC, page size flat panel display terminal, the AN/UYQ-10. This terminal, now a member of the

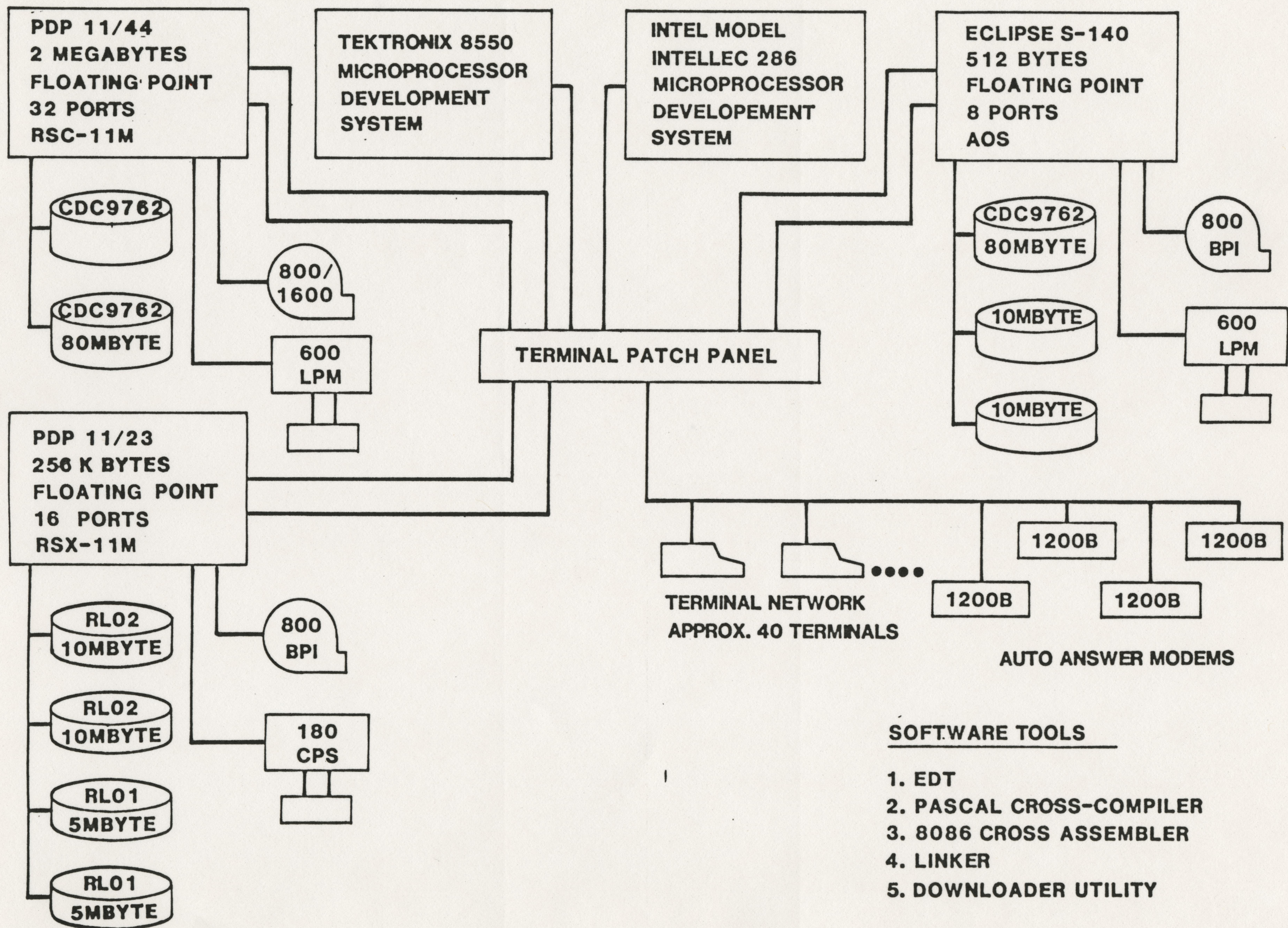


Figure ES-6 SAIT SOFTWARE DEVELOPMENT FACILITY

AN/UYQ-19 computer family, is in the U.S. Army inventory and is used in a variety of ground mobile and airborne platforms. A second generation derivative of the AN/UYQ-10 serves as the primary radar display in the U.S. Army's Sergeant York Gun System (DIVAD). The design, production and logistic support experience gained in the development of these and similar U.S. Navy and U.S. Air Force display products (HARPOON, TACAMO, GLCM and E-4B CAPS) gives SAIT a unique level of experience on which to base the development of the "next generation," portable, flat panel MIL-SPEC display systems. The U.S. Army can use this base of experience to achieve a lower cost and to reduce schedule risk in the PDA development program; i.e. the U.S. Army can concentrate its resources on high technology development in an environment of MIL-SPEC experience rather than sponsoring approaches which may not be transferrable at a later date to MIL-SPEC equipment design programs.

In addition to its extensive MIL-SPEC display development and production experience, SAIT, together with SAI, understands and in many cases is involved as a contractor in the development of future U.S. Army system concepts such as C3/VISTA, AFATDS, SHORAD C2, MCF and the HTTPB. In the context of these development activities, SAIT's Advanced Concepts Group has been studying U.S. Army display requirements for these systems as well as others needed to support the Air/Land Battle 2000 Concept. The purpose of this work is to establish the technical requirements baseline for use in a continuing SAIT IR&D program which supports the development of third generation display terminal concepts. This task was initiated to define and develop a display concept that will emulate the AN/UYQ-10 but will use advanced semiconductor, display and packaging technology to provide significant improvements in processing power, size, weight, display performance, power dissipation, reliability, survivability and cost. This SAIT IR&D investment

can enhance the ERADCOM Portable Display Assembly program and can provide the U.S. Army with an excellent approach to accelerate development of fieldable, next generation display systems.