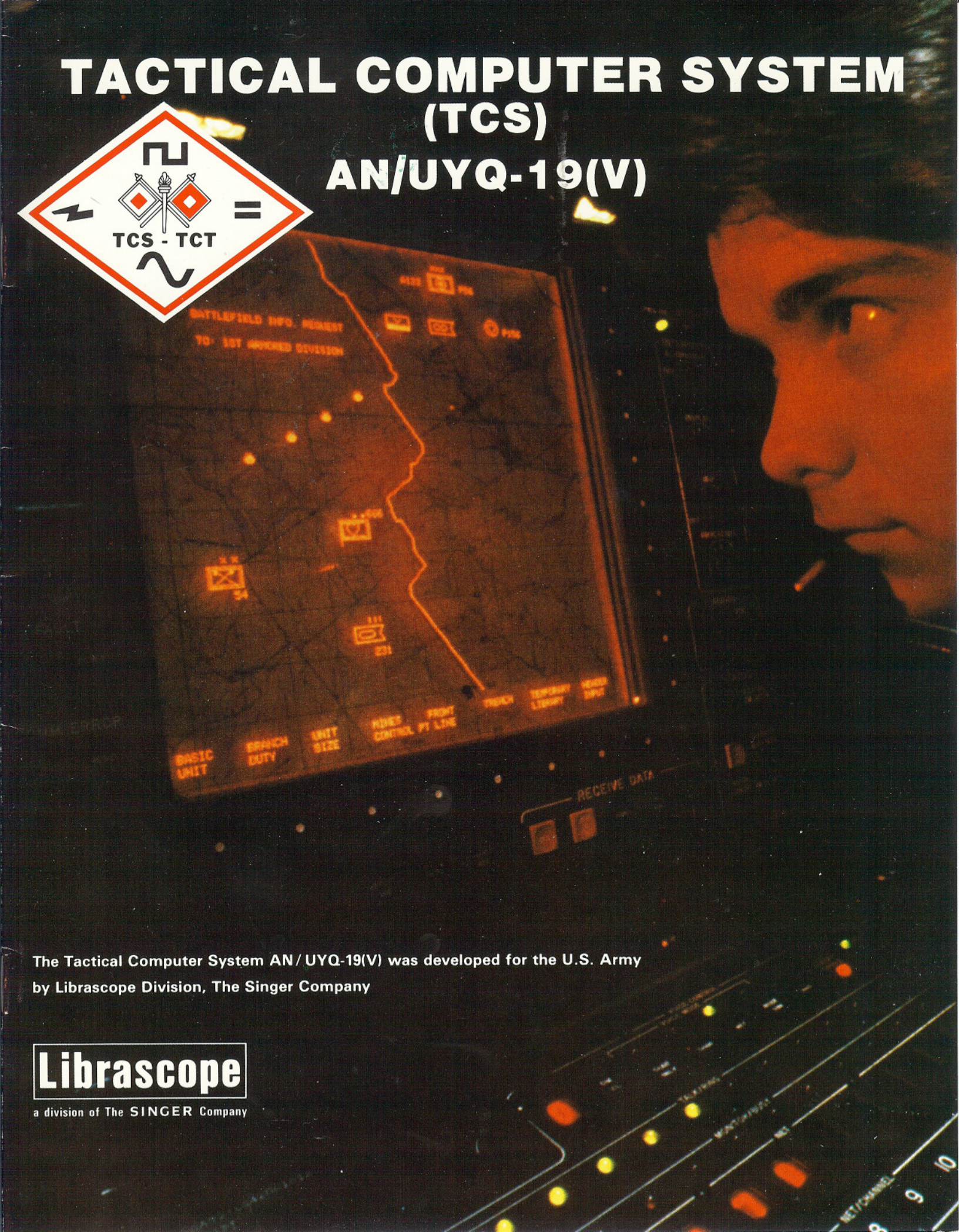
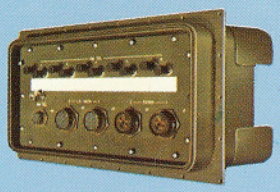
TACTICAL COMPUTER SYSTEM (TCS) AN/UYQ-19(V)



The Tactical Computer System AN/UYQ-19(V) was developed for the U.S. Army by Librascope Division, The Singer Company

Librascope

a division of The SINGER Company



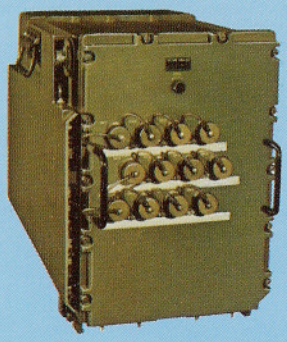
REMOTE MONITORING JUNCTION BOX

LINE PRINTER-PLOTTER

FIELD WIRE JUNCTION BOX

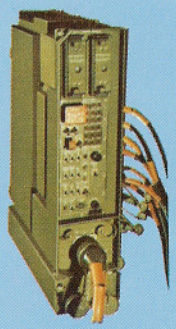
DISPLAY-KEYBOARD MODULE

MAGNETIC BUBBLE
RECORDER-REPRODUCER



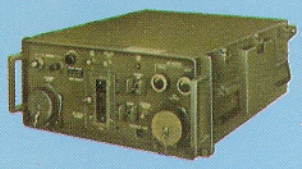
DIGITAL-VOICE COMMUNICATIONS
INTERFACE MODULE

DIGITAL PROCESSOR



DIGITAL INPUT / OUTPUT
INTERFACE MODULE

TAPE TRANSPORTS



POWER SUPPLY

TCS Modular Configuration

Tactical Computer System (TCS)

AN/UYQ-19(V)

Librascope
a division of The SINGER Company

SYSTEM DESCRIPTION

The TCS is a militarized, compact, general purpose data processing, display, and communication system intended for Army field use at all echelons in a variety of highly mobile tactical applications. It is designed to facilitate the collection, generation, review, analysis, and distribution of tactical information.

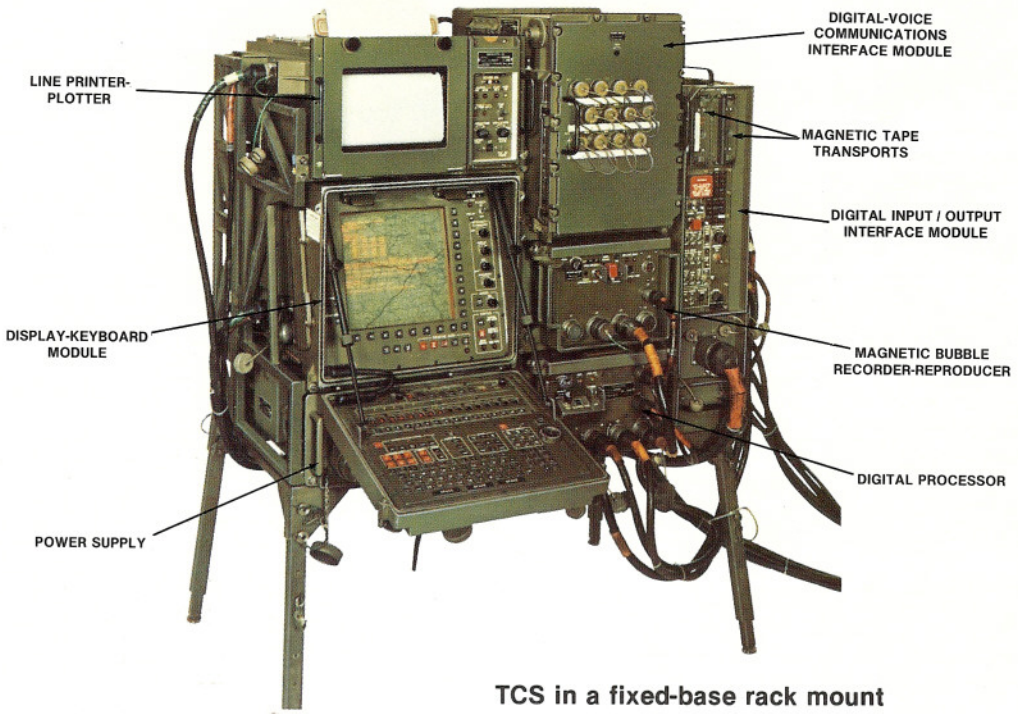
TCS capabilities include: computation; data entry; message composition and editing; validation; processing; storage; display/printout; transmission and reception; and net monitoring of digital and voice messages over standard existing and planned Army tactical communications equipment. The TCS is capable of interfacing with up to 48 communications channels.

TCS design is modular in both hardware and software. Hardware modularity is achieved by a physical partitioning of the system into separate modules, each with functional sub-modules that may be omitted or retained. It is this basic modularity concept that adapts the TCS to current and future Army C^3 networks.

Operationally, the TCS is capable of transmitting and receiving addressed data from digital/analog message devices, other TCS systems, and Army Computer Centers. It can also be used as a stand-alone data processing facility. Modular design of the TCS allows for setting up in a field environment, an M577 Armored Command Vehicle, an S-250 or S-280 shelter, or expandable vans or fixed bases.

TCS Display showing data being superimposed on a map inserted behind the Plasma Panel

The TCS consists of the following modules: Digital Processor; Magnetic Bubble Recorder-Reproducer; Display-Keyboard Module; Digital-Voice Communications Interface Module; Line Printer-Plotter; Digital Input/Output Interface Module; Magnetic Tape Transport; Power Distribution Module; Power Supply; and Junction Boxes. Separate Analyst Consoles can be configured from the Display-Keyboard Module and Line Printer-Plotter of the TCS. Each is described on the following pages.



TCS in a fixed-base rack mount

TCS MODULES

DISPLAY-KEYBOARD MODULE MX-10144/UYQ-19

The Display-Keyboard is the focal point for operator communication and interaction with the TCS System. The module requires the Digital Processor Module to perform the processing.

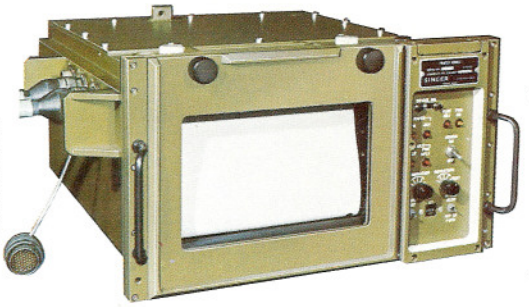
The Display consists of an 8½ inch square Plasma Panel which is utilized in both the Message Text Mode and the Graphics Mode. When used in the Graphics Mode, the transparent Plasma Panel superimposes tactical information over a paper map or drawing positioned behind it. A number of dedicated keys which communicate input commands to the processor are provided on the front of the module. In addition, programmable keys are located at the bottom and right sides of the Plasma Panel. These keys select and initiate functions displayed on the Plasma Panel.

The Keyboard utilizes elastomeric construction. It folds upward to protect the Display face in transit. A standard ASCII character set is featured with the numerics placed to one side. A separate set of cursor control switches is provided. Graphic controls include a Joystick which slews a marker at a rate proportional to the Joystick displacement, Processor Control Switches, and Input/Output Control Switches. Voice Mode Selection and Voice Channel Indication and Select Switches are also located on the keyboard.

- **FUNCTIONS**
  - Operator/Machine Interface
  - Message Reception and Control
  - Tactical and Graphics Displays
  - Communications Access Control
- **CHARACTERISTICS**
  - 14.5"h x 17"w x 23.2"d
  - 113 Pounds
  - 295 Watts
  - 4266 Hours MTBF
  - 12 min MTTR
- **SPECIAL FEATURES**
  - Map Background
  - Graphics
  - Variable Function Keys

LINE PRINTER-PLOTTER RP-271A/G

The Printer is an 80 column, noiseless, fast, non-impact type capable of 1200 lines per minute. It produces hard copy printout of data and messages, diagnostic data and errors, and accomplishes system logs. The unit also provides for plotting of graphics data at 8400 lines/minute.



- **FUNCTIONS**
  - Hard Copy Output of Data and Messages
  - System Logs
  - Printout of Diagnostic Data and Errors
- **CHARACTERISTICS**
  - 9.3"h x 17"w x 21.5"d
  - 75 Pounds
  - 130 Watts
  - 9105 Hours MTBF
  - 8.3 min MTTR
  - 1200 Lines per Minute
- **SPECIAL FEATURES**
  - Plotting Graphics

ANALYST CONSOLE

An Analyst Console is a Display-Keyboard Module used in combination with a Line Printer-Plotter to represent an additional TCS operator position. Combining the Display-Keyboard and Line Printer-Plotter permits support of 5 Analyst Consoles off the mini-computer.

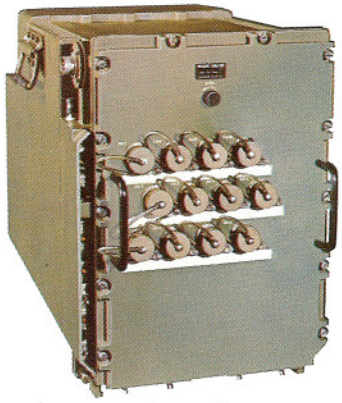
POWER SUPPLY PP-7607/G

When 28 VDC is not available, the Power Supply accepts inputs of 50 Hertz, 60 Hertz, or 400 Hertz AC power and converts it to 28 VDC. Output is 50 to 2500 watts.

- **FUNCTIONS**
  - Conversion of 50/60/400 Hertz AC to 28VDC
- **CHARACTERISTICS**
  - 7.0"h x 17"w x 22"d
  - 111 Pounds
  - 50-2500 Watts DC Output
  - 8649 Hours MTBF
  - 6 min MTTR

DIGITAL-VOICE COMMUNICATIONS INTERFACE MODULE J-3693A/UYQ-19(V)

The Digital-Voice Communications Interface Module provides interface between the TCS and external systems over standard tactical communication circuits from 45.5 BPS to 32000 BPS. Automated dialing is provided as an interface to Army switchboard equipment. Digital data and voice can be input to or output from the TCS on any of 12 channels. Voice is received or transmitted on the 12 channels, and radio wire integration is provided for up to eight nets of one to 12 channels each. The communication netting configuration is programmable by the operator.



Protocols are under microprocessor control on each channel. A channel is implemented with an individual circuit board. Channel circuit board electrical interfaces and protocols are plug-in selectable. AUTODIN protocols are available

- **FUNCTIONS**
  - 12 Independent Protocol Channels
  - Microprocessor Control on Each Channel
  - Protocols Software, Selectable
  - Various GFE Devices
  - AM/FM/Wire Multichannel Interfaces
  - Voice Nets on Radio/Wire
  - Modulation Techniques Include:
    Conditioned Di-phase
    FSK
    NRZ
  - Data Rates Include:
    45.5, 50, 75, 110, 134.5, 150, 300, 600, 1200, 2400, 4800, 8000, 9600, 16000 and 32000 bits/second
- **CHARACTERISTICS**
  - 17.0"h x 12.5"w x 24.6"d
  - 120 Pounds
  - 300 Watts
  - 3700 Hours MTBF
  - 4.2 min MTTR

MAGNETIC BUBBLE RECORDER-REPRODUCER RD-509/G

The TCS uses the Intel magnetic bubble memory, a non-volatile, fast-access, high-density memory. It has a storage capacity of 8 megabytes and an access time of 40 ms average, 80 ms maximum. The memory provides instant uploading and downloading and is portable and removable.

- **FUNCTIONS**
  - Program Storage
- **CHARACTERISTICS**
  - 8"h x 12.5"w x 25.5"d
  - 75 Pounds
  - 180 Watts
- **SPECIAL FEATURES**
  - Non-Volatile
  - Fast Access
  - High Density
  - Expandability
  - Emergency Erase

DIGITAL PROCESSOR CP-1413A/G

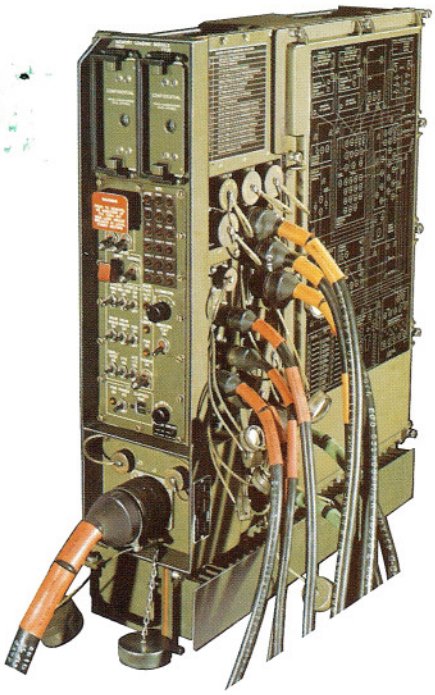
The TCS uses a Digital Processor Module which is a version of the ROLM 1666B, a fully militarized, general purpose, digital computer. It provides high speed computation, security, and data management capability to the TCS system. The Processor Module contains, in addition to the General-Purpose Direct Memory Access Processor, a Resource Management Unit and provision for 512K-words of memory. TCS main memory can be expanded from its basic configuration of 512K-words to 1M-words.

- **FUNCTIONS**
  - Message Processing
  - System Access Control
  - Display of Messages and Graphics
  - Computations
  - Edit and Validation
  - Program Storage
- **CHARACTERISTICS**
  - Digital Processor
    - 8"h x 12.5"w x 25.5"d
    - 70 Pounds
    - 235 Watts
    - 3239 Hours MTBF
    - 12 min MTTR
- **SPECIAL FEATURES**
  - General Purpose Processor
  - Floating Point Processor
  - Direct Memory Access Processor
  - Resource Management Unit

DIGITAL INPUT/OUTPUT INTERFACE MODULE J-3692/UYQ-19(V)

The Digital Input-Output Interface Module interfaces all modules in the basic TCS system and distributes DC power to other TCS modules, radio, and GFE equipment. This module provides a general purpose Input/Output communication bus for existing and new equipments.

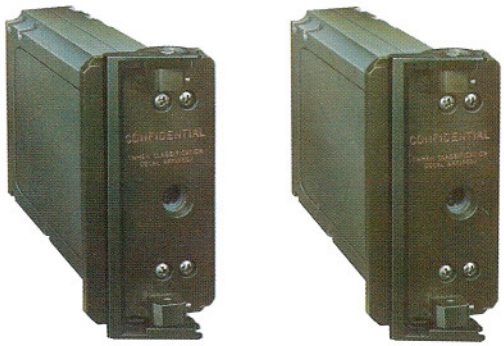
Inherent in the total system design is the provision for increasing the functional capability to service five operators stationed with interactive display-keyboards and high speed printer-plotters. Forty-eight tactical communications channels can be implemented. Further expansion can be achieved by interconnecting systems into multiprocessor configurations. In addition, interfaces to other peripheral devices such as general purpose computer systems and Block Oriented Random Access Memory (BORAM) are provided.



- **FUNCTIONS**
  - Controls Two Magnetic Tape Transports RD-462/UYQ-19(V)
  - Interfaces
  - Block Oriented Random Access Memories (8)
  - Magnetic Bubble Recorder Reproducer RD-509/G
  - General Purpose Computer (1)
  - Communication Interface Module (4)
  - Display-Keyboard (5)
  - Printer-Plotters (5)
  - Future High Speed Devices (8)
  - GFE
  - DC Power Distribution
- **CHARACTERISTICS**
  - 29"h x 6.7"w x 21.5"d
  - 103 Pounds
  - 183 Watts
  - 6070 Hours MTBF
  - 11 min MTTR

MAGNETIC TAPE TRANSPORT RD-462/UYQ-19(V)

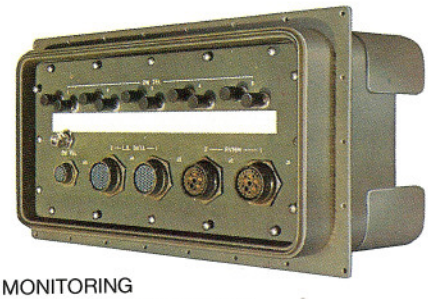
Two Magnetic Tape Transports plug into the Digital Input-Output Interface Module and are used to store system programs. They serve as initial loading devices and for loading programs not otherwise resident in memory. One transport contains system programs and is completely inhibited from writing. The other transport is used for reading, writing, and retaining initialization data.



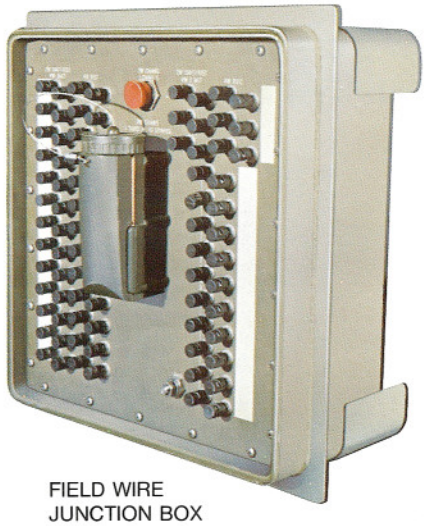
- **FUNCTIONS**
  - Program Load
  - Data Collection and Analysis
  - Initialization
  - Message Overflow
  - Non-Resident Programs
- **CHARACTERISTICS**
  - Tape Transport Unit (2)
    - 4.7"h x 2.1"w x 6.65"d
    - 4 Pounds
  - Electronic Assembly (1)
    - 2.8"h x 4.7"w x 7.5"d
    - 3.3 Pounds
  - 22.5 Watts
  - 22000 Hours MTBF
  - 4 min MTTR
  - 14.4 Million Bits on 4 Tracks

JUNCTION BOXES

Junction Boxes provide through-shelter/wall connections for field wire, telephone, and remote TCS modules such as additional Display-Keyboards and Printer-Plotters.



REMOTE MONITORING JUNCTION BOX J-3695/UYQ-19(V)



FIELD WIRE JUNCTION BOX J-3694/UYQ-19(V)

- **FUNCTIONS**
  - Through Shelter Connections
    - Field Wire
    - Telephones
    - Remote TCS Modules
      - Display Keyboards
      - Printers
- **CHARACTERISTICS**
  - FIELD WIRE JUNCTION BOX
    - 18"h x 17"w x 8"d
    - 23.3 Pounds
    - Power None
    - 62.721 Hours MTBF
    - 30 min MTTR
  - REMOTE MONITORING JUNCTION BOX
    - 10"h x 18"w x 8"d
    - 14.7 Pounds
    - Power None
    - 110.267 Hours MTBF
    - 30 min MTTR

OPERATIONAL SOFTWARE

Operational software is packaged into twelve major modules. Major program modules are either resident in the ROLM 1666B Module or are loaded in as needed from the Magnetic Tape Transport.

OPERATING SYSTEM

The Operating System provides real time control of all TCS hardware and software and provides a single point of logic interface between all TCS system software and communications with the TCS processor and peripheral hardware. It is capable of supporting the addition of user programs for new applications.

COMMUNICATIONS PROCESSING PROGRAM

The Communications Processing Program provides the capability to receive, transmit, store, display, and enqueue messages according to procedure and priority.

PRINT PROGRAM

The Print Program provides the capability to print messages (text and graphics), message logs, and alerts.

DISPLAY PROGRAM

The Display Program provides the capability to manage and format all data to be output to a selected Plasma Panel. It controls displayed cursor position, and displays messages, graphics, and programmable switch nomenclature.

DIAGNOSTIC PROGRAM

The Diagnostic Program performs real time fault isolation of TCS hardware to the least replaceable unit. When operator interaction is required, instructions or test patterns are displayed, and the system waits for keyboard inputs. The Diagnostic Program requires that the TCS be off-line during fault isolation.

DBMS

The Data Base Management System has the capability of storing and retrieving information on the status of friendly units two organizational levels below the TCS using organization. The DBMS is being expanded to provide hostile unit information. The initial system functions are: Data Update (setting data in the data base using a Commander's Report); Query (retrieving data based on the user's information needs); and Reporting (preparation of a rolled-up Commander's Report).

MESSAGE FILING

The message filing function provides for message filing and retrieval. Messages may be filed and retrieved locally or from a remote TCS or a TCT.

GRAPHICS PROGRAM

The Graphics Program provides the operator with the capability to create graphics messages using a predefined Army Tactical Symbol Library, full graphics drawing capability, and special symbol creation.

OPERATIONS VALIDATION PROGRAM

The primary function of the Operations Validation Program is to test the TCS hardware for faults while operational. Faults are displayed on the Plasma Panel, and fault indicators are lighted.

DATA INITIALIZATION PROGRAM

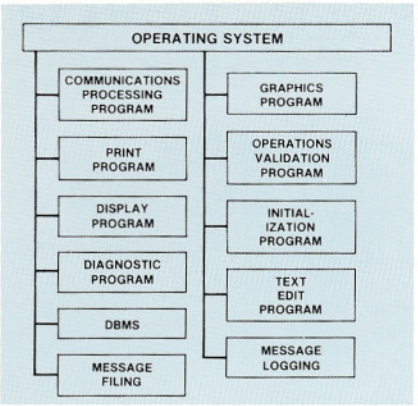
The Data Initialization Program permits input of remote and local system initialization data and provides edit capability during operations. Initialization data can originate from data tape input, and real time data changes may be made.

TEXT EDIT PROGRAM

The Text Edit Program provides the TCS with the capability to edit and compose messages. Prompts assist the operator in composing his messages and in operating the system.

MESSAGE LOGGING

The message logging function collects data on received, transmitted, relayed, and aborted messages and automatically prints a log after 20 communication transactions have occurred. The operator also has the option of printing the log at any time.



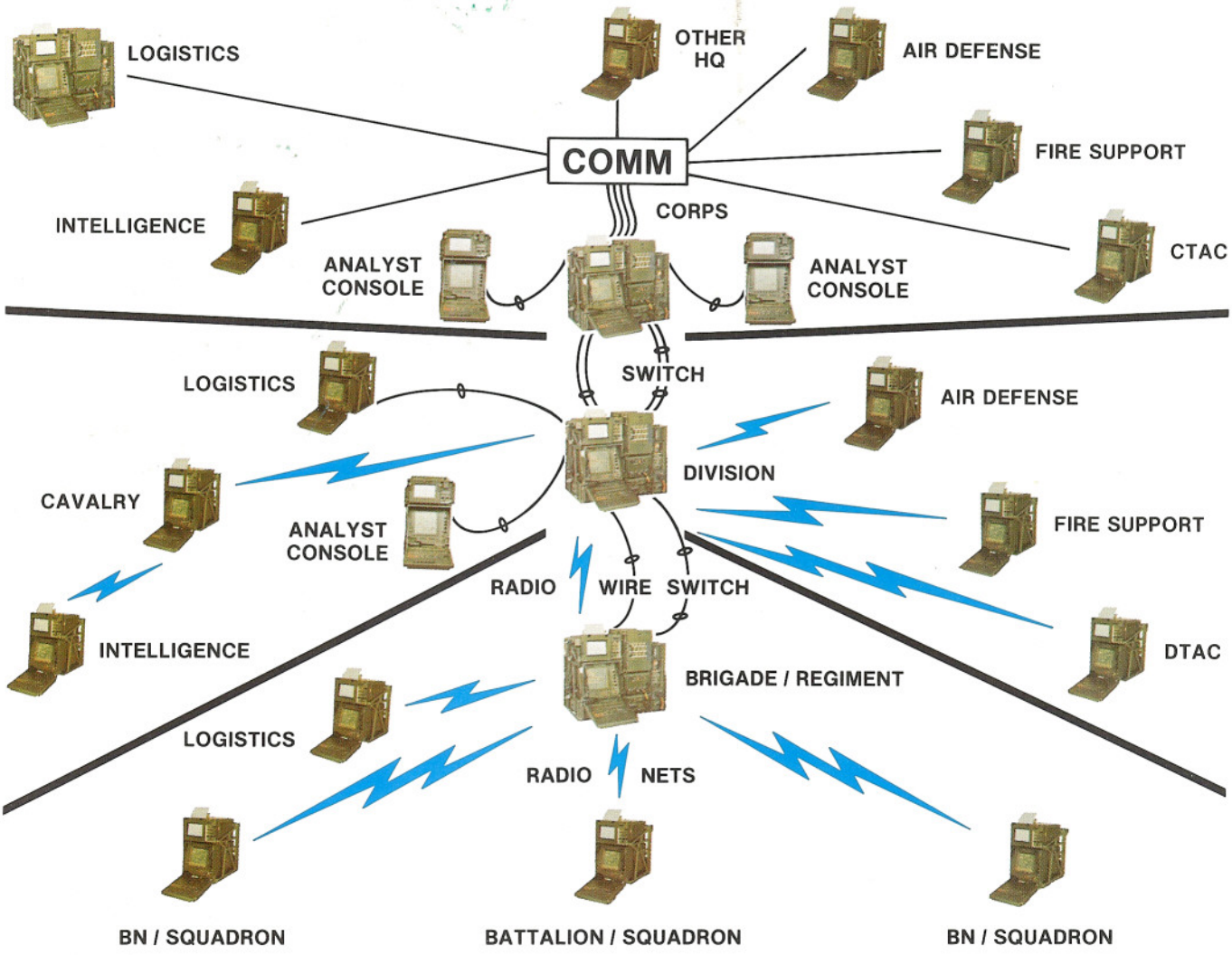
SOFTWARE DEVELOPMENT/SUPPORT CENTERS

TCS production is complemented by an off-line Software Development Center operational at Librascope's Glendale, California facility. This center is coordinated with the U.S. Army's Post-Deployment Software Support (PDSS) Center at Ft. Leavenworth, Kansas. Librascope's Software Development Center features:

- Real Time Disc Operating System
- Macro Editor
- Extended Assembler
- Relocatable Loader
- Extended Fortran IV
- Extended Algol
- System Generation
- Library File Editor
- Debugging Facilities
- Cross Assembler
- Arithmetic Library
- Utilities
- System Diagnostics

Section of the TCS Software Support Center.

DEPLOYMENT



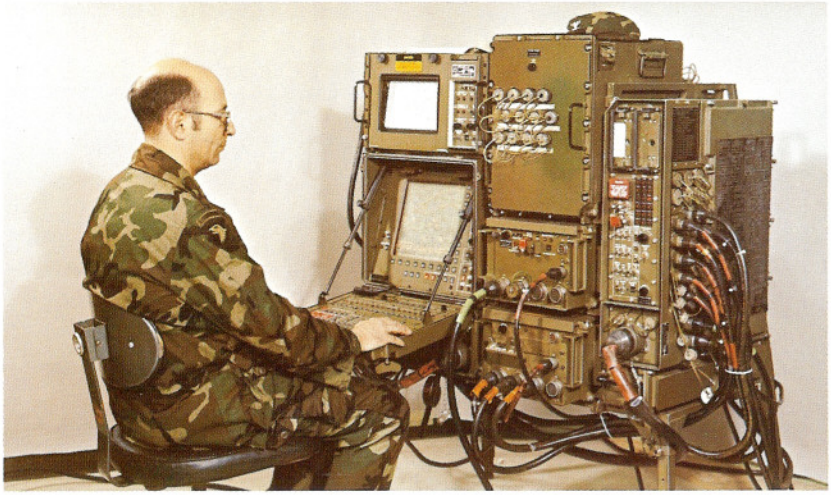


Photo of TCS in fixed-base command post

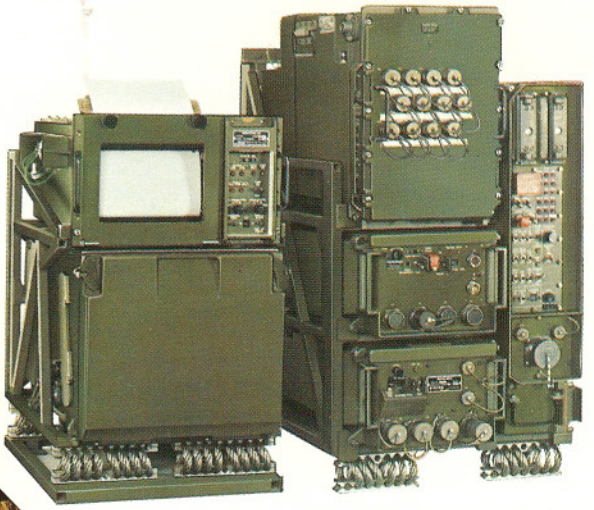
TCS IN U.S. ARMY MANEUVER CONTROL SYSTEM

Depicted here is the first application of the TCS in the U.S. Army's Maneuver Control System, one of five control systems employed by the Army. In this deployment, the TCS is integrated with Tactical Computer Terminals (TCT) AN/UYQ-30 and Analyst Consoles. Inherent in this configuration is the basic concept of distributed processing and information interchange between Army echelons.

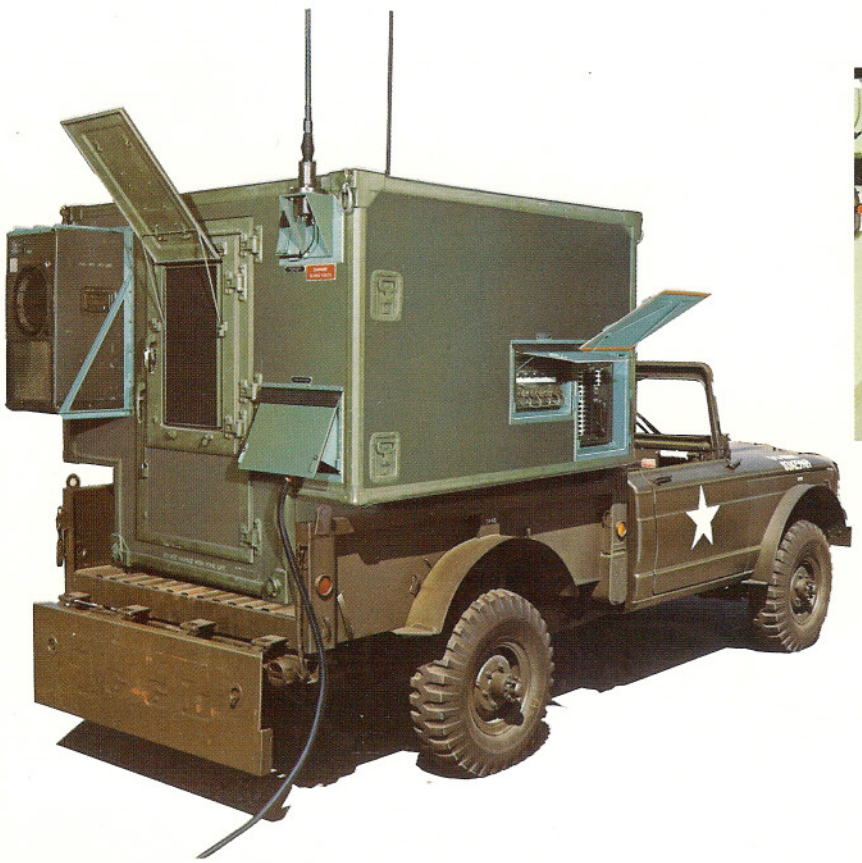
VEHICULAR INSTALLATION

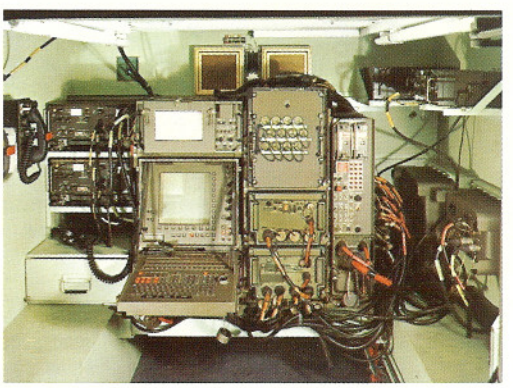
Demonstrating the TCS's suitability for vehicular deployment in the field, a TCS was shelf-mounted in a tracked M577 Command Post Carrier for roadability tests at Aberdeen Proving Grounds. The vehicle moved at varying speeds over three miles of straightaway, cross-country, profile, and washboard courses. During the straightaway and washboard runs, the TCS was placed in full operation, which included the keyboarding of data and the production of hardcopy display printouts at all speeds. At the conclusion of the test regime, no malfunctions of the TCS had occurred. Subsequently TCS's were fielded for tactical exercises in Europe, where operational results are reported as equally satisfactory.

TCS bi-modular vehicular mounting configuration provides rugged shock mounting and permits efficient utilization of space.



M577 test vehicle used in roadability tests





TCS installation in an S-250 shelter

LOGISTIC SUPPORT

The TCS is provided with a complete range of logistic products and services developed to U.S. Army specifications and designed to assure maximum utilization of the TCS over its life cycle. Each item of logistic support has been prepared and validated as an element of a comprehensive Integrated Logistic Support (ILS) program and is immediately available. The logistic package supports the TCS at the four maintenance support levels: Operator/Organizational, Direct Support, General Support, and Depot.

TECHNICAL MANUALS

Operator, Organizational Maintenance, and Direct Support Maintenance TCS manuals are written to the Army user's level of experience and capability. Highly illustrated, they employ step-by-step procedures keyed to work requirements, training materials, and embedded training capabilities of the hardware. The manuals provide for individualized instruction and on-the-job training. General Support Maintenance and Depot Maintenance manuals are written to the level of experience and capability of the technician for use in off-line repair.

TRAINING MATERIALS

Skill Performance Aids (SPAs) and Extension Training Materials have been developed to provide self-paced operator and maintenance training. Of prime importance are the self-teaching self-paced features of the training materials. Individuals of varying MOS's can train themselves as opportunities permit and at their own rates of speed using the manuals provided and the embedded training features of the TCS. The operational and diagnostic software permit rapid performance of man-machine interfacing and of operator and maintenance routines.

Librascope offers complete in-plant facilities for initial training under simulated field conditions to the degree that this type of training is desired. Librascope training instructors are also available for assignment at Army schools or field sites as needs might dictate.

PROVISIONING DATA

Provisioning data have been tabulated and illustrated for each support echelon. These data are maintained continuously by Librascope for the lifetime of the equipment.

All processing of this data is carried out by EDP means, facilitating the currency and frequency of issue of the data.

MAINTENANCE ENGINEERING SERVICES

Maintenance Engineering services are continuously and readily available to the TCS user to assist in vehicle or shelter installation design, to contribute to planned maintenance systems, and to perform other support engineering services as the need might arise.

A full-time Maintenance Engineering group is maintained at Librascope within the Logistics Department. Personnel of this organization represent maintainability and other logistic interests and work to assure an easily supportable product.

FIELD SERVICE

The TCS user can call upon Librascope's world-wide network of technical specialists to provide maintenance services at remote sites. These specialists stand ready to repair equipment, conduct special training, deliver parts, and provide consulting services in general.

CENTRALIZED LOGISTIC SERVICES

The Librascope Logistics Department incorporates all logistic service groups under a common leadership, thus offering customers a well-integrated array of logistic products. The two major objectives of the Logistics Department are always (1) to assure an easily-supported, user-oriented product design, and (2) to support the product promptly wherever it may be in use.

TRAINING REPORT FROM EUROPE

European field exercises with the TCS have confirmed the effectiveness of the self-paced self-teaching features of the associated technical manuals and training materials. These materials were broadly used by personnel of varying MOS's ranging from Officer to Master Sergeant to Clerk. Personnel were able to become proficient operators of the TCS with approximately four hours of exposure to these self-paced instructional materials.

AUTOMATED TEST PROGRAM SETS

Librascope has developed Test Program Sets for use with AN/USM-105 automated test equipment to isolate faulty components on TCS printed circuit boards (PCBs) and to keep Army circuit board maintenance procedures current and validated.

Test Program Sets information has been integrated with the troubleshooting procedures in the General Support Maintenance Manuals.

Technician conducting fault-finding of an Army PCB using AN/USM-105 automated test equipment

ENVIRONMENTAL SPECIFICATIONS

Altitude: Operation to 10,000 ft.
Transport to 50,000 ft.

Temperature: MIL-STD-810B, Method 501, Procedure II.

Operational	-45°C to	60°C.
Storage	-57°C to	71°C.

Humidity: MIL-STD-810B, Method 507, Procedure III.

Vibration: 5.0 to 5.5 Hz at 1.0 inch double amplitude.

5.5 to 30 Hz at 1.5G.

30 to 48 Hz at 0.036 inch double amplitude.

48 to 500 Hz at 4.0G

Shock: MIL-STD-810B, 15G, 11 millisecond shocks on three mutually perpendicular axes.

Immersion: MIL-STD-810B, Method 512, Procedure I.

Rain: MIL-STD-810B, Method 506, Procedure I.

Sand and Dust: MIL-STD-810B, Method 510, Procedure I.

Salt Fog: MIL-STD-810B, Method 509, Procedure I.

Acoustic Noise: SCL-1280D, Para. 4.7.4

Fungus: MIL-STD-810B, Method 508.

Bench Handling: MIL-STD-810.

Electromagnetic Interference: MIL-STD-461, Notice 4.

CE01	CS01	RE02	RS03
CE04	CS02	RE02.1	RS03.1
	CS06		

Chemical, Biological, Radiological: TM3-220

Other: Meets TEMPEST and Nuclear Survivability Requirements.

POWER REQUIREMENTS

DC Voltage: 22 to 30 VDC vehicular power per MIL-STD-1275 (AT) except for Para. 5.4 Abnormal System Without Battery Support.

22 to 30 VDC mobile generator power per MIL-STD-1332B, Class 2C.

AC Voltage:

Input Voltage	Input Frequency
120/240 VAC (three wire)	50 to 60, or 400 Hz
115 VAC	50 to 60, or 400 Hz
230 VAC	50 to 60, or 400 Hz

Per MIL-STD-1332 for Type I and II, class 1 and 2 and Mode I, II and III DOD generator sets.

Librascope

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For additional information, write or telephone:
Librascope Division, The Singer Company
833 Sonora Ave., Glendale, Calif. 91201-0279
Telephone: (818) 244-6541
TWX 910-497-2266 TELEX 674912

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