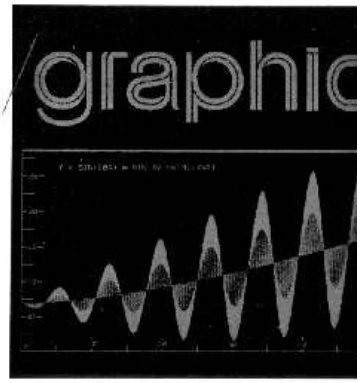
INTERSTATE ELECTRONICS CORPORATION
SUBSIDIARY OF ATO

alpha/graphic display terminal



Model PD 3000

The Interstate Electronics Corporation Alpha/Graphic Model PD 3000 is a low-cost military computer display terminal intended for use in airborne and shipboard environments. The Model PD 3000 receives signals from an external computer or its own keyboard, interprets the incoming information, performs addressing, formatting, and control operations required, and displays the requested functions on a plasma display panel. The terminal is a modular unit and includes the plasma panel, display drive electronics, power supply, microcontrolled display processor, full alphanumeric keyboard, and serial communications interface. Available optional capability includes high-speed parallel input/output, second serial communications port, additional function key controls, touch panel, joystick, special keyboard, MIL-STD-188C compatible I/O port, rack-mounting hardware, RAM installation, and ROM expansion for programmable character set, scrolling, high speed data storage, hard copy output and editing.

The IEC user software product set includes a real-time/high level macroinstruction set that provides subroutines for display control, alphanumeric display, incremental and vector graphics. This template package is easily implementable on any computer. Also included are a FORTRAN IV display library, FORTRAN IV terminal diagnostics and exerciser, BASIC language plotting routines, PLOT-10 Terminal Control System Conversion package, and a FORTRAN IV microcode cross-assembler.

- For airborne/shipboard environments
- Alphanumeric and graphics display capability is standard
- Inherent panel memory
- Single point write/erase on a flat screen
- Flicker-free and distortion-free presentation
- Constant spot size with no drift
- High speed screen erase
- Low operating voltages
- Excellent display resolution and repeatability
- Very bright display with high contrast ratio and wide viewing angles
- Over 4000 character display capacity
- EIA RS-232C compatible serial communicatic port.
- Completely modular construction
- High speed data transmission
- Comprehensive user software available

DISPLAY CHARACTERISTICS

Character Capacity (with margin control):	
5x7 matrix:	4335 characters
7x9 matrix:	2048 characters
Individual Line and Row Capacity:	
5x7 matrix:	85 characters/line, 51 rows
7x9 matrix:	64 characters/line, 32 rows
Panel Life:	>10,000 operating hours
Panel Size:	12.25" x 12.25"
Active Display Area:	8.55" x 8.55"
Resolution:	60 elements per inch
Individually Addressable Points:	262,144
Character Size (upper and lower case):	
5x7 (matrix=6x10):	0.077" x 0.112" (0.20 cm x 0.28 cm)
7x9 (matrix=8x16):	0.112" x 0.142" (0.28 cm x 0.36 cm)
Dot Spacing:	0.0167" center to center
Vector Address Rate:	50,000 dots per second
Worse Case Vector Writing Time:	10 milliseconds for 512 points

Brightness:	60 fL (approximately)
Control Ratio (small area):	25:1
Light Spectrum:	Neon Orange (5852A predominant)
Dielectric Coating:	Magnesium Oxide
Full Screen Erase:	20 microseconds
Automatic Bulk Erase:	30 +7.5 minutes after last address
Parallel Addressing Rate:	8333 characters/second (5x7 dot matrix) 6250 characters/second (7x9 dot matrix)
Serial Data Rate (synchronous or asynchronous):	150 to 19200 baud, switch selectable (9600 and 19200 baud rates require "clear to send" handshake logic)
Flicker:	None perceptible
Display Duty Cycle:	All points can remain lit indefinitely
Alpha Cursor:	Underline and flashing symbol (firmware generated)
Graphics Cursor:	Flashing dot (firmware generated)

This Product Bulletin subject to change without notice.

ENVIRONMENTAL CHARACTERISTICS

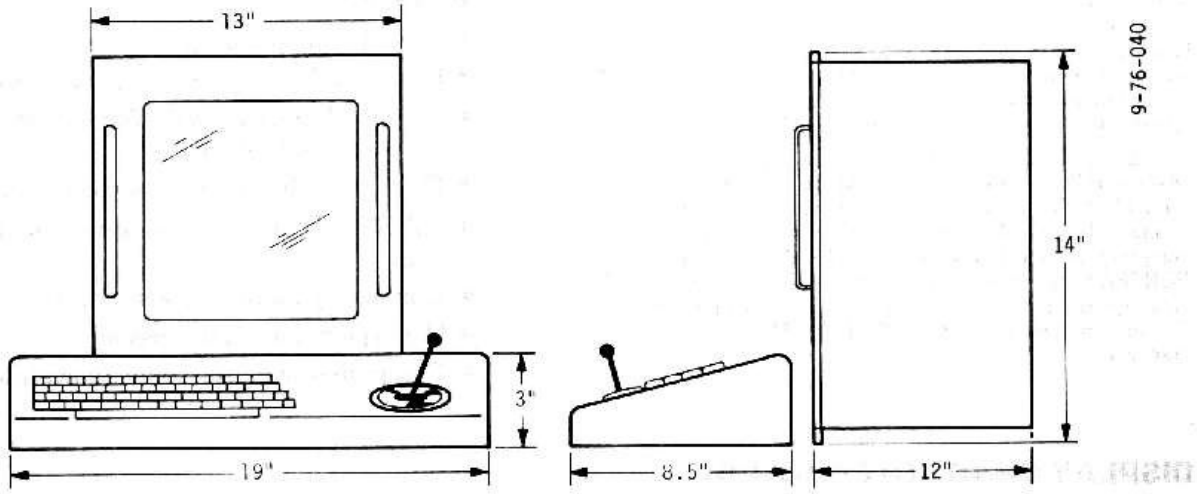
Operating Temperature and Humidity:	−54° to +55°C (intermittent operation to +71°C), up to 95% relative humidity (non-condensing).
Storage Temperature:	−62° to +85°C for extended periods.
Enclosure Drip Resistance:	Display, less keyboard, meets MIL-STD-810 drip test (15° test).
Vibration:	Meets MIL-E-5400R, Curve II of Figure 2 (5 to 2000 Hz sinusoidal excitation).
Ambient Pressure, Operating:	Equal to atmospheric pressure of 20,000 feet.
Nonoperating:	Up to 70,000 feet.
Electromagnetic Emissions:	Complies with MIL-STD-461, except for CE01 (additional filtering to meet CE01 available as option).
Equipment Shock:	No damage or failure from 18 impacts of 15g, three directions on three axes (tested per MIL-STD-810C).
Mounting (Crash) Safety:	With maximum load, no failure in attaching joints from 12 shocks of 30g, two directions on three axes (tested per MIL-STD-810C).
Explosive Conditions:	No ignition of ambient explosive gaseous mixture with air.

ELECTRICAL

Primary Power:	115 ±10V, 50-60 Hz (400 Hz optional).
Consumption:	300 watts average.

MECHANICAL

Weight:	Display: 45 pounds. Keyboard: 10 pounds.
Size:	As shown below.



This terminal is one of a family of functionally compatible plasma display terminals designed for reliable operation in commercial/industrial and sheltered, standard and full tactical military environments.

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The PD Series of Military Display Terminals
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The PD 2000 is environmentally qualified to meet sheltered military requirements. Model PD 2000-M has rear screen projection capability.
The PD 3000 is qualified for reliable performance in military shipboard, airborne, or ground environments.
The PD 4000 is suitable for tactical military applications in extremely adverse conditions.

The first family of military display terminals.

Interstate Electronics has developed a series of alphanumeric/graphic plasma display terminals with broad performance capabilities for application over the range of military environmental conditions—from base operations to full tactical use.

For the first time, the user can choose from a *family* of ruggedized display terminals with a variety of configurations, options and parts levels.

Interstate's alpha/graphic product series includes the PD 2000, 2000-M, 3000 and 4000 Models. Each is a fully functional alphanumeric/graphic display terminal. Yet each may be tailored to system requirements in a wide variety of ways.

Configurations are available for table top, rack-mount, panel-mount or modular use.

Electronic component levels include military screened, MIL temperature range and commercial computer grade parts.

Performance flexibility is assured by a complete selection of options and support software.

In addition, the whole family is upward/downward compatible to give the system designer maximum flexibility.

In sum, the Interstate family of military terminals provides a product envelope that may be configured to meet system- or program-related requirements.

The new generation of plasma display.

For the PD terminal series, Interstate Electronics developed "next generation" plasma technology based on several innovations:

Maximum use of LSI's and MSI's. This reduces the number of discrete components, physical size and power consumption, and yields a considerable improvement in reliability.

Implementation of a very high speed 16-bit parallel microprocessor for character and vector generation, character decoding, command recognition, data transmission control and other terminal functions. This implementation maximizes terminal performance, capabilities and flexibility while minimizing electronic parts count.

Partitioning of electronics into a minimum number of modules. This technique reduces terminal size and weight, minimizes module interconnections, requires fewer parts and enhances maintainability.

The modules are connected with cable harnesses for good air circulation and module removal without disconnection. Functional modules include...

1) Plasma Panel
A 12.25" x 12.25" x .48" glass sandwich containing primarily neon gas. The panel is an AC type with inherent memory that eliminates display refreshing. The 8.55" x 8.55" active display area has 512 vertical (X-axis) and 512 horizontal (Y-axis) thin film gold electrodes deposited on each glass surface. The electrodes are so thin that the panel is quite transparent. When properly mounted, the panel is very resistant to shock and vibration.

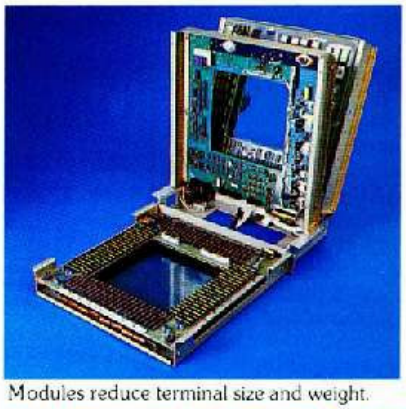
2) Panel Driver Module
256 IC drivers are connected to the panel electrodes. Each drives 4 electrodes. Maximum voltage from X-coordinate drivers is 170 volts. Maximum Y-coordinate driver voltage is 70 volts. Total maximum potential across the panel is 240 volts.

3) Driver Timing and Control Logic Module
This module contains the circuitry for generating the alternating voltage (sustainer) waveforms that control plasma panel operation and the level shifters which input signals to panel drivers. In addition there are circuits that perform clocking, decoding and storage of panel addresses. Interstate's unique single sustainer waveform design eliminates about 75% of the dual sustainer waveform circuitry required in earlier terminals.

4) Display Processor Module
Based on a 16-bit parallel microprocessor with 330 nanosecond execution time, the display processor is controlled by instructions contained in read only memory (ROM) which are not affected by power shutdown. It performs character and vector generation, command decoding and input/output data port control (including RAM), and data transmission formatting. This module also contains a UART for serial communications, crystal-controlled timing logic, panel coordinate registers and circuitry for the optional joystick cursor.

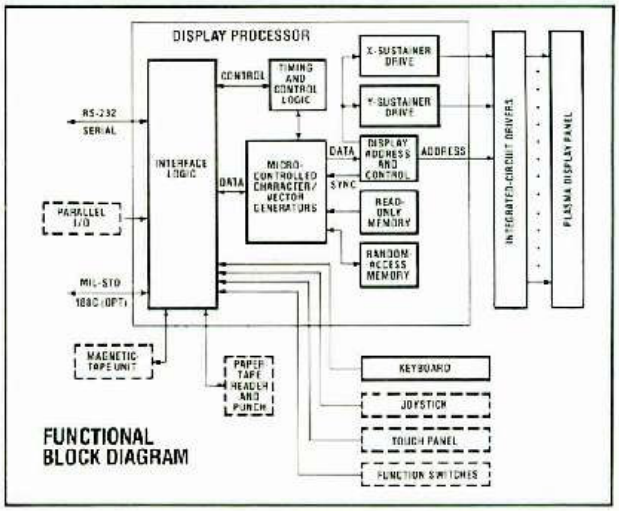
5) Power Supply Module
A high efficiency switching power supply generates the different DC voltages used by panel drivers and other modules. Power requirements conform to MIL-STD-704.

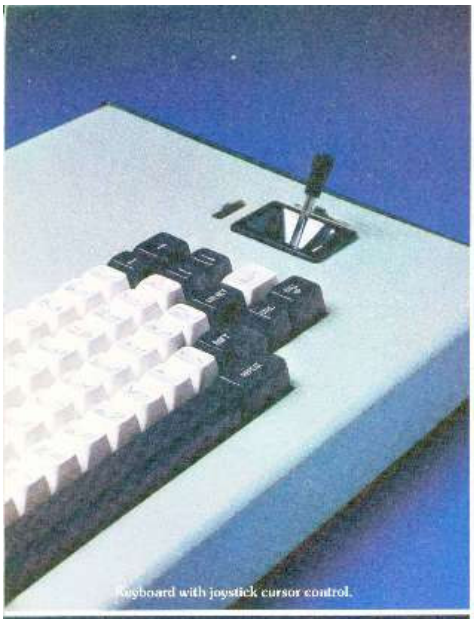
6) Optional Extended I/O Module
A second serial communications port and a fully implemented 16-bit parallel port is contained in this small module. The drivers, receivers, and control gating and buffering devices are integrated circuits.



Modules reduce terminal size and weight.

Modules may be removed individually without disconnection from cable harness.

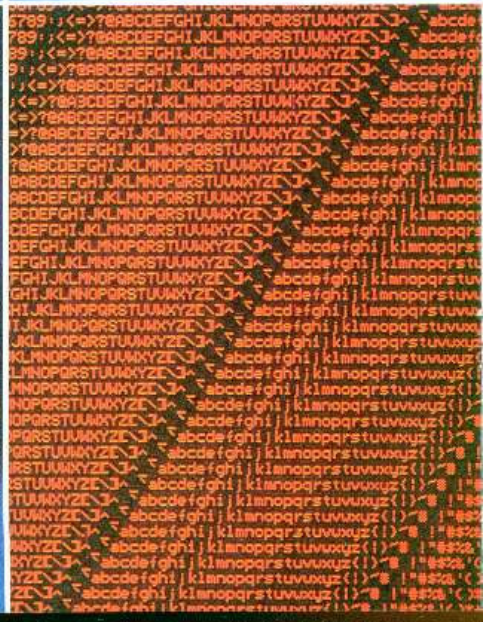




Keyboard with joystick cursor control.

Touch panel.

Rear screen projection.



Multiple performance capabilities.

Functions

Interstate Electronics terminals meet computer display requirements for most applications, including the following functions:

- Generate and display all standard alphanumeric characters and complete graphics.
- Decode and implement the complete ASCII character and control set.
- Implement standard serial communications and parallel input/output ports.
- Accept and respond to operator inputs in real time for interactive operation.
- Present a full page of viewable characters for compatibility with page-oriented messages.

Alphanumerics

Interstate terminals have outstanding alphanumeric flexibility. Many different types of characters and symbols can be displayed. The standard terminal can generate:

- 96 ASCII standard upper and lower case 7x9 dot matrix characters.
- 96 ASCII standard upper and lower case 5x7 dot matrix characters.
- 32 character ruling font.
- 96 programmable characters.
- Superscripted and subscripted characters.
- Dark on light and light on dark characters.
- Blinking characters.
- Overstruck characters.
- Protected fields.

Graphics

Every terminal has excellent high speed graphics capability. The random addressing design of the plasma panel is ideal for interactive graphics. The display can be updated at any time. Only the changed elements in the display need be written or erased. The standard terminal can generate:

- Incremental graphics.
- Full screen vector graphics.
- Auto-incrementing vector graphics.
- Programmable (dashed and dotted) vector graphics.
- Dark on light and light on dark graphics.
- Windowing.

Control Command

The Control Command concept in Interstate terminals emphasizes flexibility, non-interference with TTY commands, data transmission efficiency and multi-mode operation. Similar to a comprehensive computer language, the basic Control Command structure has more than 70 different commands controlling character and vector generation, data transmission, alphanumeric and graphic cursors, mode selection, character positioning, internal memory, joystick, write/erase, protected fields, windowing, display status, and cursor position indication.

With the addition of the optional scrolling buffer for operation in the "glass TTY" mode, the Control Command set is expanded to include control of scrolling, tabulation stops, an external device (ASR operation), and increased cursor facilities.

In the optional message communications mode, the full internal memory (RAM) is used and the Control Command set is again expanded for control of line and character insertion and deletion, setting and clearing margins, generating message separators, erasing lines and pages, and message and page transmission.

Keyboard

The standard keyboard is designed for interactive operation with the external computer. The solid state keys generate the full ASCII compatible 96 character set and can control the alphanumeric cursor. Keyboard options include a joystick subassembly cursor control and up to 64 special function keys.

Touch Panel

An optional touch panel can be installed on the faceplate allowing the operator a selection of 256 touch positions for computer notification.

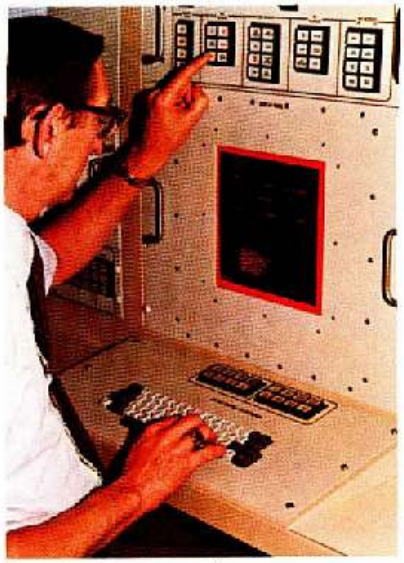
Rear Projection

The transparency of the plasma panel enables rear projection. Interstate's model PD2000-M has an integral remotely-controlled microfiche projector. Any one of 256 different full color images can be remotely selected and projected on the display screen. All the standard capabilities of the terminal are available to superimpose alpha/graphic information on the projected image.

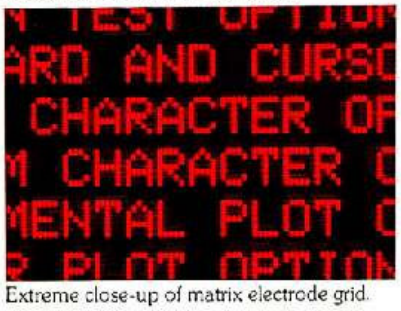
Maintainability. Reliability.

Other than cleaning the faceplate and air filters, Interstate terminals need no routine or preventative maintenance. There are no cooling fans to service. The power supply needs no adjustment in normal operation. If remedial maintenance is required, there are only five line replaceable units (LRU) in the standard terminal... the keyboard assembly, plasma panel with panel driver module, driver timing and control module, display processor module and power supply module. Fault isolation to the LRU level can be quickly accomplished using the keyboard or diagnostic programs stored in the external computer.

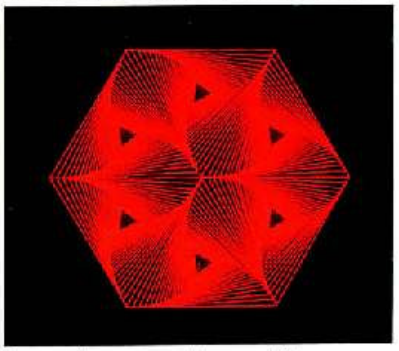
Operating reliability has been designed into the plasma display. Compared to earlier terminals with discrete component plasma panel drivers and hard-wired logic character/vector generators, Interstate terminals have approximately 80% fewer electronic components. With a maximum of six modules, the number of interconnections are minimized and reliability enhanced. Each member of the terminal family has components selected, analyzed and tested for operational reliability for that terminal's specified environment.



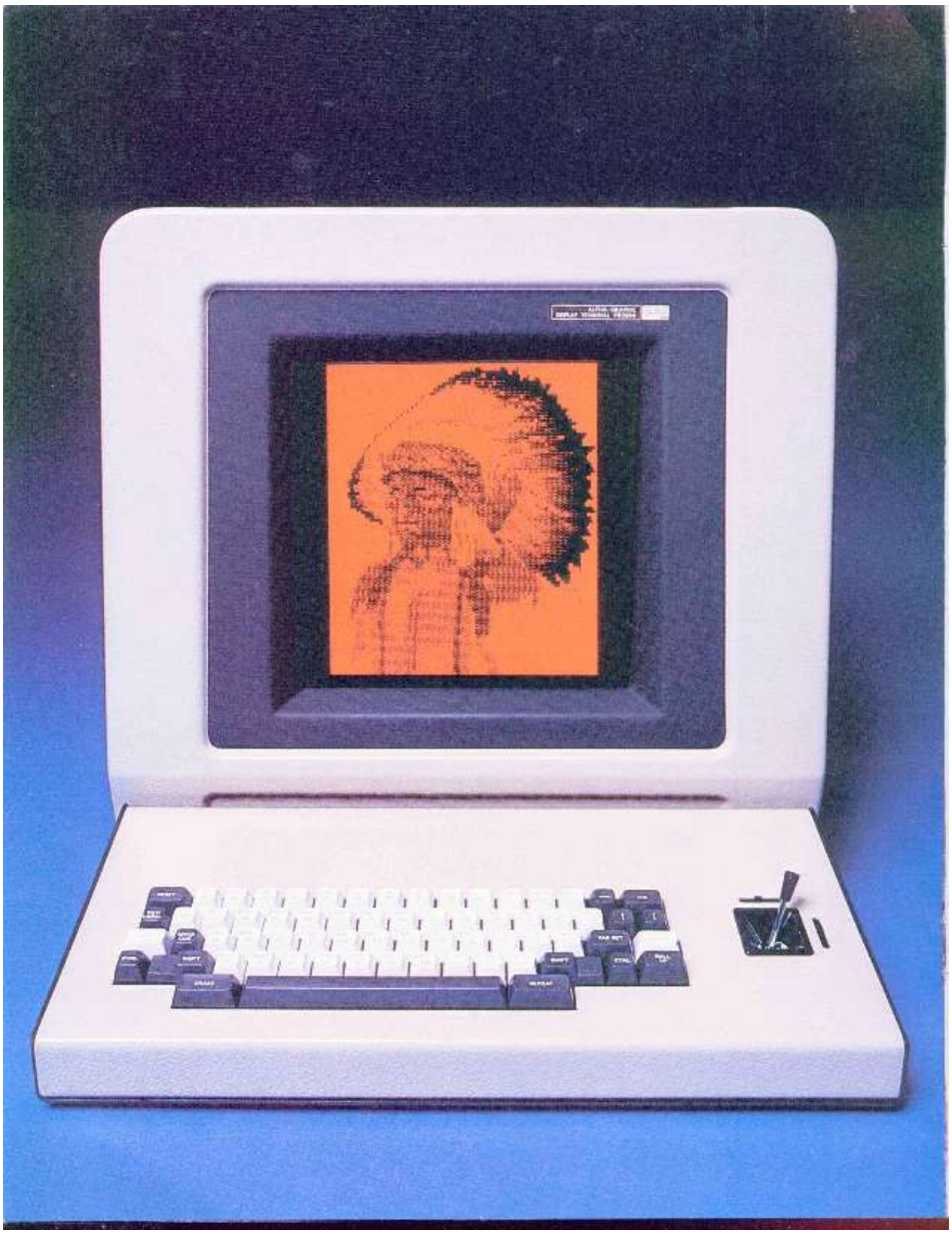
Typical rack-mount configuration.



Extreme close-up of matrix electrode grid.



Comprehensive graphics capability.



Display terminals for the military environmental spectrum.

Ruggedness is basic to Interstate's alpha/graphic display terminal family.

The mechanical packaging of each terminal is designed to minimize the user's environmental design task. Each model is convection and/or radiation cooled to eliminate the need for forced air cooling or internal fans. Every terminal is structurally reinforced to withstand specified shock and vibration conditions. Display unit RFI/EMI integrity is obtained by proper shielding, gasketing and filtering.

Because Interstate Electronics military display terminal family is price/performance optimized for a variety of environments, the user can select a terminal configured for his specific environmental requirements.

Military environmental classifications include:

Military Sheltered

A fixed installation, non-air-conditioned, with exposure to high electrical and magnetic fields, atmospheric contamination, proximity to vibrating equipment, and/or field test facilities. Non-operational unit must withstand rough handling and in-transit conditions.

Shipboard

An equipment configuration qualified to MIL-E-16400 for adverse surface and subsurface conditions including shock requirements contained in MIL-STD-810C and MIL-STD-901C, vibration levels as specified by MIL-STD-810C and MIL-E-5400, and RFI/EMI suppression as defined in MIL-STD-461.

Airborne

Environmental requirements of Class 1A equipment as defined in MIL-E-5400R include temperature extremes under operating and non-operating conditions, vibration levels in helicopters, propeller driven and jet aircraft; operation at altitudes in excess of 20,000 feet (non-operating to 70,000 feet) and RFI/EMI levels in accordance with MIL-STD-461.

Tactical

In addition to meeting temperature, vibration, shock, and RFI/EMI levels in MIL-E-5400R, MIL-STD-901C, and MIL-STD-461, this environmental class includes service under severe rain, salt fog, fungus and dust conditions.

The plasma panel itself is inherently rugged.

It is constructed of two ¼-inch plate glass sections securely mounted in a rigid metal frame. In addition, four rubber pads located on each corner of the panel provide isolation against vertical and horizontal shock. Since the display matrix is created by electrodes fixed in an exact geometric relationship, the panel never requires alignment or adjustment. Hazards such as implosion and susceptibility to x-ray emissions, radioactive materials, mercury vapor, and stray magnetic fields are virtually eliminated by the plasma panel design.

Fitting Into the System

From a systems viewpoint, the well-implemented terminal has to encompass more than pure performance/reliability/environmental capabilities. Interstate terminals satisfy many other considerations that affect terminal integration into a system, including...

Installation. A smaller, lighter terminal is more easily installed. Interstate terminals are designed for free standing, table top, rack-mount, panel-mount and modular use. The keyboard assembly is detached from the terminal for installation flexibility. For a minimum depth display, terminals are available with detached display processor and/or power supply.

Input Power. The small, high efficiency power supply in the terminal accepts standard input power in accordance with MIL-STD-704. Because power consumption is relatively low, no cooling fans are needed.

Signal Interfacing. Interstate terminals incorporate flexible signal interfacing capabilities. One or two serial communications ports are available, conforming to either EIA RS-232C or MIL-STD-188C standards. In addition, a fully-implemented 16-bit parallel input/output data port can be supplied. This port operates at very high data rates and conforms to the requirements for a Type C (ANEW) interface in MIL-STD-1397 (ships).

Documentation. Standard documentation for Interstate terminals includes detailed specifications, complete operations and maintenance manual, acceptance test report and recommended spare parts list. Available as data items are terminal reliability and maintainability analyses, qualification test report, and failure mode effects analysis (FEMA). Interstate Electronics' extensive documentation and publication facilities can produce virtually any data item needed for a particular program.

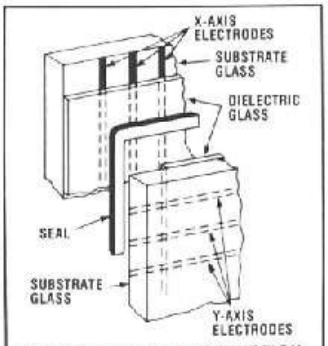
System Support. A combination of services are available from Interstate Electronics:

- Engineering assistance during terminal interfacing, installation, interconnection and checkout.
- Programming assistance in adapting and using computer routines for terminal control, data transmission and diagnostics; generating and checking out applications programs.
- Training courses in terminal operation and maintenance.
- Repair facilities for returned modules.

Program Products. To expedite terminal integration with the external computer, Interstate Electronics has developed a group of proven control, formatting and plotting routines, diagnostics and conversion packages. These programs are coded in macroinstruction, standard FORTRAN IV or Dartmouth BASIC languages for maximum computer independence and transferability.

Custom Engineering. Using the functional modules as building blocks, Interstate Electronics will apply terminal engineering, programming and documentation expertise to provide non-standard terminals and display units.

- Special formats, character fonts, and Control Command are easily accommodated without circuit redesign.
- The optional I/O module can be reconfigured to implement any type of signal port.
- Different and/or additional keys can easily be installed in the keyboard.
- Other tasks performed by Interstate include computer programming, additional documentation, configuration modification and custom peripheral interfacing.



PLASMA PANEL CONSTRUCTION

Interstate Electronics Corporation.
A subsidiary of A-T-O, Inc.

Interstate Electronics has designed, installed and maintained computer systems for both military and commercial applications at installations throughout the world. As a military systems contractor, Interstate has a successful track record in solving a variety of challenging technical problems. The company employs over 1700 technical, production and administrative personnel at corporate facilities in Anaheim, California, and also maintains offices in Washington, D.C., Dayton, Ohio, and Atlanta, Georgia.

Interstate Electronics Corporation is a subsidiary of A-T-O, Inc., a diversified international operating company with 30 divisions and subsidiaries serving six basic markets: fire protection, safety and security; consumer/recreation products; fluid controls and hydraulics; construction and mining equipment; electrical/electronic instrumentation; and packaging machinery/material handling equipment.

As a member of the electrical/electronics group of A-T-O, Interstate Electronics provides electronic instrumentation, systems and related services for national defense programs, the offshore oil industry and other technical markets.

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