

## MODEL 8190 Graphics Terminal



*\$20K  
incl. vectors,  
char. gen.,  
table*

*+  
ca.  
5-10  
interfaced*

The MONITOR DISPLAY 8190 generates and displays characters and graphics from digital input data. The basic terminal contains a CRT monitor, position, character, and vector generators, packaged in an attractive user oriented console.

Options are available for expansion of the 8190 up to a full interactive graphics system such as The Monitor Displays Model 8100. These options may be installed prior to delivery or when

needed.

This economical terminal will write characters at the rate of 10 microseconds maximum per character or faster as an option and graphics at the rate of 200,000 inches per second. Random positioning time is 14 microseconds for full scale deflection. Character-to-character positioning time is 3 microseconds.

### DESIGN FEATURES

- Performs all generation and display functions of a graphic system
- Simple interface to display controller
- Expandable by incremental options to full interactive graphics system
- Proportional time vectors with constant intensity output
- High resolution arcs (option)
- 4-programmable character sizes
- Programmable character orientation-horizontal or vertical
- Repertoire of 64 alphanumeric characters and symbols
- Large Display Area (12" x 12")
- Phosphor protection
- Pincushion correction

## FUNCTIONAL DESCRIPTION

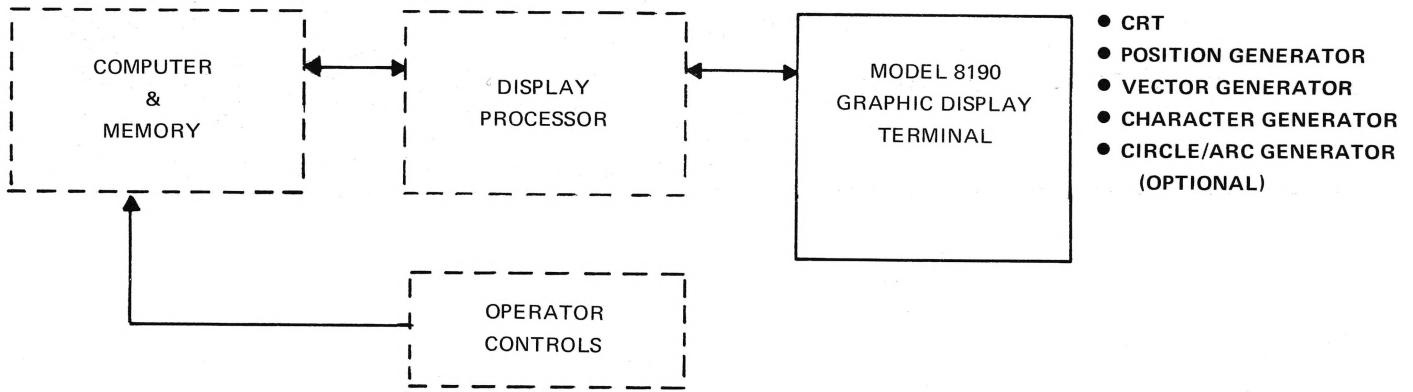


FIGURE 1-TYPICAL INTERACTIVE GRAPHIC DISPLAY SYSTEM

The use of a Model 8190 Graphics Display Terminal is shown in figure 1. Data contained in an external computer is applied to a display processor where it is formatted for input to the 8190 terminal.

An operator control panel interfaces with the computer to provide the desired interaction. Devices typically contained on this panel are special function keys, light pens, trackballs or graphic tablets.

The 8190 terminal provides a digital to analog interface as well as the analog circuits and function generators necessary to display computer generated data on a cathode ray tube. The system approach shown in Figure 1 allows the user to concentrate on the computer and software aspects of the system and to treat the display hardware as a black box.

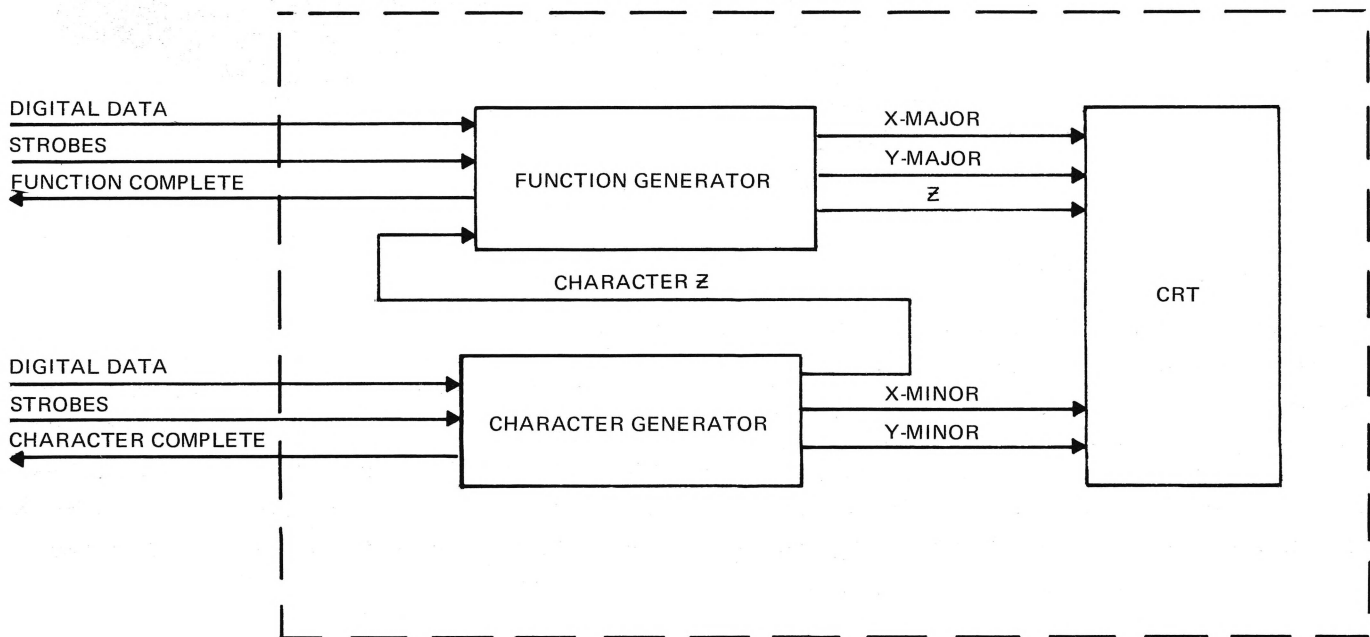


FIGURE 2 BLOCK DIAGRAM, MODEL 8190 GRAPHIC DISPLAY TERMINAL

A block diagram of the 8190 is shown in Figure 2. The function generator contains the position generator and vector generator. A circle/arc generator can be added as an option. The function generator accepts digital inputs from an external source and derives the necessary deflection and intensity signals to drive the CRT display. After the specified graphic element is drawn, a function complete signal is supplied to the external data source.

Character identification data is strobed into the character gen-

erator, which contains all circuitry necessary to supply the minor deflection signals to the CRT. A character intensification signal is applied to the intensity select circuitry in the function generator. After the character is drawn on the CRT, a character complete signal is supplied to the external data source.

The CRT is a 21" rectangular display representing the output device of the computer display system.

## SPECIFICATIONS

### OVERALL PHYSICAL CHARACTERISTICS (with all chassis mounted)

- a. Size ..... 62"W x 49"H x 30"D
- b. Weight ..... approximately 500 lbs.
- c. Power ..... 115v  $\pm$ 10%, 60 Hz  $\pm$ 5%,  
single phase, 5A
- d. Temperature Range ..... 50°F to 100°F
- e. Humidity ..... To 95% without  
condensation

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### CHARACTER GENERATOR

All digital input and output signal levels and impedances are compatible with conventional TTL integrated-circuit logic.

#### Inputs

- (a) Character Address: 6-bit parallel word selects 1 of 64 characters. Lines are high when true. Lines must not change while character is being drawn.
- (b) Character Reset: Negative-going pulse used to reset digital-to-analog converter. Pulse width should be 100 nanoseconds minimum. Must precede the character strobe.
- (c) Character Strobe: Negative-going pulse used to synchronize internal clock. Generation starts on the first internal clock edge after the leading edge of strobe. Pulse width should be greater than one stroke period but less than 2 stroke periods.
- (d) Character Orientation: A high level on this line causes the character to be drawn in a horizontal orientation. This signal should not change during the time a char-

acter is being drawn. 100 nanoseconds are required for the orientation circuitry to settle to the new value.

- (e) Character Size: Two signal lines that are used to select 1 of 4 character sizes. Four microseconds are required for the size select circuitry to settle.

#### Outputs

- (a) Character Complete: Negative-going pulse 500 nanoseconds wide. Leading edge indicates that character is complete.
- (b) Character Deflection Voltages:  $\pm$ 1.5 volts @ 20 mA (measured at the input to any display when terminated with 75 OHMS.)
- (c) Character Intensification Voltage: Digital signal TTL compatible, low during blanking, high during writing.

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### FUNCTION GENERATOR

Contains position and vector generators (circle/arc generators optional)

#### Inputs

- (a) Data Bus (Standard) 15 bit parallel word. Lines are high when true. Word contains the x and y position, circle radius, arc starting position, arc ending position, vector x and y projection, or x and y projection of a short vector. Routed into appropriate generator by 1 of 8 strobes.
- (b) X Position Strobe (Option P) Negative going pulse used to enter x position coordinate into D/A converter. Zero x coordinate is located at the left of the CRT.

- (c) Y Position Strobe (Option P) Negative going pulse used to enter y position coordinate into D/A converter. Zero y coordinate is located at the top of the CRT.
- (d) Circle Radius Strobe (Option C) Negative going pulse used to enter circle radius information into circle generator.
- (e) Arc Start Strobe (Option CA) Negative going pulse used to enter arc starting location into arc generator. Zero degree position of arc is defined along the minus x axis. Circle can be considered to be composed of 1024 arc segments.

(f) Arc End Strobe (Option CA)	Negative going pulse used to enter arc ending location into arc generator.	(j) Line Structure (Option PL)	Two data lines used to define the line structure of any vector. Solid, dotted, dashed, or dot-dashed lines may be drawn.
(g) $\Delta x$ Strobe (Standard)	Negative going pulse used to enter signed $\Delta x$ data into vector generator. Minus $\Delta x$ causes the vector to be drawn toward the lefthand edge of the CRT. Plus $\Delta x$ causes the vector to be drawn toward the righthand edge of the CRT.	(k) Intensity Level (Option P)	Two data lines used to define 1 of 4 intensity levels (including blank) at which graphic element will be drawn.
(h) $\Delta y$ Strobe (Standard)	Negative going pulse used to enter signed $\Delta y$ data into the vector generator. Minus $\Delta y$ causes the vector to be drawn toward the bottom of the CRT. Plus $\Delta y$ causes the vector to be drawn toward the top of the CRT.	<b>Outputs</b>	
(i) Short Vector Strobe (Standard)	Negative going pulse used to enter both the signed $\Delta x$ and signed $\Delta y$ data into the vector generator. Short vector resolution is limited to $\pm 6$ bits ( $\pm 64$ raster elements).	(a) Circle/Arc Complete	Negative going pulse indicating that circle or arc has been drawn.
		(b) Vector Complete	Negative going pulse indicating that vector has been drawn.
		(c) X-Deflection	$\pm 3$ volts into a 75 ohm load
		(d) Y-Deflection	$\pm 3$ volts into a 75 ohm load
		(e) Intensity	Standard unit provides a TTL output level.

## CRT DISPLAY

### CATHODE-RAY TUBE

SIZE AND TYPE .....	21" with P31 phosphor and bonded faceplate.
DISPLAY AREA .....	12" x 12"
LINEARITY .....	$\pm 1\%$
PINCUSHIONING .....	$\pm 2\%$
LIGHT OUTPUT .....	50 foot-lamberts
WRITING SPEED .....	500,000 inches/second
SPOT SIZE .....	0.020"

### Z-AXIS

INPUT SENSITIVITY .....	+3 v for full intensity
INPUT IMPEDANCE .....	75-ohm termination is standard.
RISE TIME .....	50 nsec
GAMMA CORRECTION ...	Light output is linear with respect to input voltage
DELAY TIME .....	Zero differential delay of the z-axis with respect to the X and Y signals.

### MAJOR DEFLECTION

INPUT SENSITIVITY .....	5 v p-p for 12" deflection.
INPUT IMPEDANCE .....	75-ohm termination is standard.
LARGE SIGNAL RESPONSE	20 kHz.
SMALL SIGNAL RESPONSE	500 kHz @ -3db.
X-Y PHASE SHIFT .....	Less than 1 line separation @ 15 kHz.
SETTLING TIME .....	14 microseconds for full deflection within 12" x 12" viewing area to settle within 0.25% .3 microseconds for 0.5" deflection to settle within 0.25%

### MINOR DEFLECTION

INPUT SENSITIVITY .....	5 v p-p 0.5 inch deflection.
INPUT IMPEDANCE .....	75-ohm termination is standard
FREQUENCY RESPONSE .	1 MHz @ -3db.
X-Y DIFFERENTIAL PHASE SHIFT .....	Less than 1 line separation @ 1 MHz.

8190 4-70 10M

Monitor Displays reserves the right to change specifications without notice.

**MONITOR DISPLAYS**  
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