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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

The DTS-5128 is part of the Nicolet Digital Systems Division's DTS-5000 family of advanced digital test systems designed for upward expandability of instruments and analysis functions. This product line modular architecture provides maximum flexibility and performance. The DTS-5128 is available in three versions: the Model 5128-0 (128 channels), the Model 5128-1 (96 channels), and the Model 5128-2 (64 channels). This document treats the systems in a "generic" sense, since the operating aspects for each version are common to all. Hence, the system is described throughout this documentation as simply the "DTS-5128". See Figure 1-1 for an illustration of the DTS-5128.

Nicolet Digital Systems Division gives full access to the internal microcomputer of the DTS-5128 to allow automatic control, test storage, post-processing, and general-purpose computing application (word-processing, spreadsheet, and higher level programming languages).

This Operator's Manual provides information on both the system level of the DTS-5128 as well as the General Purpose Analyzer module level.

1.1.1 User Interface

All communications between the system user and the DTS-5128 is through the keyboard and color monitor peripheral devices (an optional joystick is also available). The color graphics monitor displays to the user all system/subsystem menus and displays. User input/selection of functions, parameters, and information to the DTS-5128 is performed through the use of keyboard and/or joystick devices. Remote access to the DTS-5128 is available through the RS-232 and IEEE-488 ports, with preprogramming of system operations using the CP/M-86 operating system.

1.2 EQUIPMENT DESCRIPTION

The DTS-5128 main system unit is housed in a metal casing. The power on/off, system reset switch, floppy disk drives, keyboard and joystick

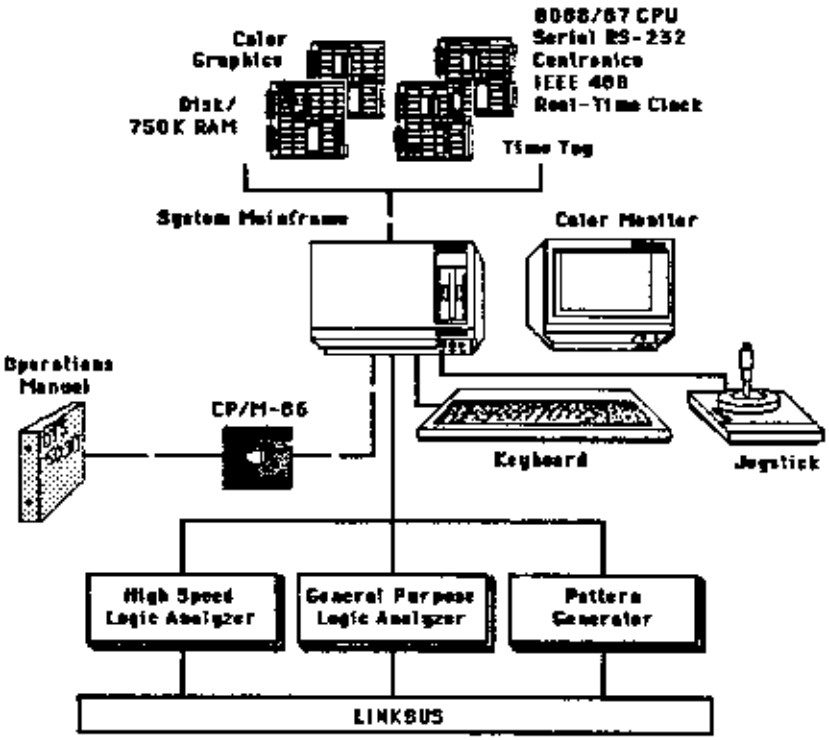


Figure 1-1. DTS-5128 System

connectors are located on the front panel. The system PCBs, AC power, and all instruments are accessed from the rear.

The General Purpose Logic Analyzer provides sophisticated event or word recognition of a minimum of 64 to a maximum 128 channels. Memory depth is 1000-words per channel. Data can be collected with either an external synchronous clock (dc to 25 MHz) or an internal asynchronous clock (20Hz to 20 MHz).

Sophisticated event or word recognition is accomplished through menus with which the user may specify any of six events and of an eight-level statement program. Statements include "if-then-else", with a base of five events and ranges of those events. Each statement level provides storing of None, All, or any two of the specified events conditional to event occurrence (or non-occurrence) plus a delay count of up to 65,530 maximum. One range may be specified per recording by using any two of the specified events. Collected data is displayed either in diagrams and displays.

Logic probes used with the General Purpose Logic Analyzer are DTS 5000 Series, two probes per PCB.

1.2.1 Data Acquisition

Data from the system under test is inputed through DTS 5000 Series logic probes, inserted into the keyed connectors on the General Purpose Logic Analyzer PCB. At this point external clocks and qualifier are also applied.

1.2.2 Input Sensing

All inputs are sensed through high impedance probes. These probes can be mechanically linked together. Input signals are compared to the threshold levels programmed in the Setup Menu. Signals are shown as logical "1" if they are higher than the threshold level, and as logical "0" if they are lower.

1.2.3 Probe Identification

There are two data input groups for each General Purpose Logic Analyzer PCB (probe A and B). Each group is 16 bits wide, and are divided into channels 0-5, 4-7, 8-B, and C-F. All probes are marked for the appropriate probe group, and are electronically identical.

1.3 SYSTEM CONFIGURATION

The DTS-5128 is comprised of the following basic units:

- Main System Unit
- Operations manual
- Keyboard
- Color graphics monitor
- (4) 32 channel General Purpose Logic Analyzer PCBs

This module allows collection of general logic behavior or specific signals from digital sources. The debugging power of the General Purpose Logic Analyzer is further enhanced when used with other test and measurement instruments. Linking of the General Purpose Logic Analyzer to other instruments in the DTS-5128 allows full cross domain analysis.

The fully configured DTS-5128 has six open expansion slots with a power supply that can accommodate the DTS Model 5000 family of instruments. These expansion slots can be used to provide for more General Purpose Logic Analysis instruments, High Speed Logic Analysis input, or a Pattern Generation.

As new instruments are installed, system control is maintained by a Link Bus Menu, which allows for the assignment of signals to and from each instrument. For precise measurement control, each instrument module has, from its respective setup menus, link input and output signals that are assignable to specific events.

1.3.1 Basic System Hardware Components

The following paragraphs outline the major features of the hardware elements that comprise the DTS-5128 system-level architecture.

Main System Unit — The CPU subsystem consists of the CPU, color graphics, 768k Random Access Memory (RAM), RS-232, IEEE-488, and dual floppy disk drives. The system microprocessor is an 8088-2 running at 6.36 MHz with an optional 8087 coprocessor. A real-time clock/calender and 50 bytes of CMOS RAM are battery backed-up for storage of power-on

	default parameters. The system unit includes Time Tag PCB and serial RS-232, centronics parallel printer interface, and IEEE-488 ports.
Color Monitor	The 9 inch color monitor provides the user with system menus and displays in 16-colors. Monitor display area is: 240V X 640H bit-mapped graphics and character matrix of 24 lines x 80 columns. Monochrome composite (STD EIA 170) video output is available for monochrome monitors.
Keyboard	Extended ASCII character set generation of user input to the main system unit over a 300 baud serial TTL DIN connector. Keyboard features include cursor control keys, numeric keypad, and number, shift locks. Ten function and several "soft" keys allow for easy user manipulation of system menus and displays.
Joystick	(Optional) Permits rapid user manipulation of system menus and displays. The joystick,"Select", "Help", and "Deflt" buttons duplicate the keyboard cursor control direction, select, help, and default keys.
Parallel Printer Port	Provides "Centronics"- compatible parallel interface for low cost graphics (e.g. Epson FX-80) printers.
Parallel Port	An IEEE-488 parallel port allows connection and communication with IEEE-488 compatible devices. User menu selections allow for configuration as a listener/talker or controller.
Serial Ports	Two RS-232 serial ports allow synchronous and asynchronous full/ half duplex operation. Allows configuration for RS-232.
Audible Alarm	Audible tones are generated in response to user input errors. Warnings regarding system operational errors are also audible alarmed. Alarm is user selectable on/off.

Time Tag

Provides all timing reference for other instruments at 32 bits of binary timing data for each instruments' request on the Linkbus. For each request, the requestor's (module) control information and a 32 bit time tag are stored in the time tag module onboard 1000-word memory. Up to two requests can be processed at a time with memory resetting back to zero at the beginning of each collection.

The time tag resolution is 50 nanoseconds or 50 microseconds, menu selectable with the time base derived from a 200 MHz internal clock. For asynchronous state analysis a 50 nanosecond to 50 millisecond TTL CLK is generated to the LINKBUS.

General Purpose Logic Analyzer

This module can analyze 64, 96, or 128 data channels (increments of 32), at a memory depth of 1000 - samples per channel. Data can be collected with either an external synchronous clock (dc to 25 MHz) or an internal asynchronous clock (20Hz to 20 MHz).

Sophisticated event or word recognition is accomplished through menus with which the user may specify any of 16 events and of an eight-level statement program. Statements include "if - then - else", with a base of five events and ranges for those events. Collection of data is displayed either in a tabular form or a timing diagram format.

Triggering can occur on eight levels of statements, six events (word recognizers), and one delay counter are available. Each statement level provides storing None, All, or any two of the specified events conditional to event occurrence (or non-occurrence) plus delay count (9,999 maximum). One range may be specified per recording using any two of the specified events.

1.3.2 DTS-5128 Options

The following paragraphs outline the major features of the DTS-5128 system optional instruments.

DTS Model 5400 High Speed Logic Analyzer

A Logic Analyzer featuring 400 MHz, 32 sample inputs, and 2K memory depth (alternately 200 MHz, 64 sample inputs, 1K depth). Clock rates from 2.5 ns to 5 ms are changable on Trigger occurrence (dc to 150 MHz with variable probe, dc to 200 MHz with ECL probe).

Triggering choices include edge qualified Arm event, two trigger events (each with 2-15 sample range filter), delay counter, and restart event. Glitch detection of 3ns with 25% overdrive or 250mV, whichever is greater. Glitch memory and tristate collection modes are provided. Burst mode collection provides repeated collection of segments of programmable length until sample memory is full.

DTS Model 5072 Pattern Generator

The Pattern Generator is a 50-MHz programmable (menu driven) module with 72 data outputs. It features 256 algo- rithmically programmable active steps and an external clock selectable for rising or falling edge. Each step period may be from 1 to 250 clocks. Strobe delay and strobe pulse width is programmable from 5 ns to 5 µs and for the number of active steps.

A sequencer controls data flow in 18-bit increments. Sequencer instructions in- clude increment, decrement, direct jump (and direct jump until E=0), conditional branch, etc. Two types of probe pods allow ECL or variable TTL/CMOS outputs. The Variable TTL/CMOS probes provide tristate for TTL and user- defined VDD for CMOS.

1.4 REFERENCE DATA

Reference data is provided in Table 1-1, Equipment Specifications, which gives a tabular listing of:

- Name Plate Data
- Power Requirements
- Functional Characteristics
- Dimensions
- Environment Characteristics

1.5 DESCRIPTION OF SYMBOLS, CODES, AND ABBREVIATIONS

Table 1-2 lists various symbols used throughout this manual for functional block diagrams.

Table 1-3 defines the various codes and abbreviations used in the text as well as in block diagrams throughout this manual.

TABLE 1-1. EQUIPMENT SPECIFICATIONS		
NAME PLATE DATA:		
POWER REQUIRE-MENTS:	VOLTAGE	90-130 or 210- 260 RMS VAC (Set at factory)
	FREQUENCY	50-60 Hz.
	WATTAGE	710 Maximum
	BATTERIES	G.E. Data Sentry Ni-Cad. 3.6V
	FUSING	110 V - 2 Amp(Slow/Blow) 220V - 1 Amp (Slow/Blow)
FUNCTIONAL CHARACTER-ISTICS:	APPLICATION	Logic analysis of digital test and measurement functions. Provides input, tracing, triggering, sampling, comparison, search, recording, memory/file management, and display of digitally based functions.
	OPERATING SYSTEM	DIGITAL RESEARCH CP/M-86
	FILE MANAGEMENT	Double Sided, Double Density, 96 Tracks Per Inch (640K)
	LANGUAGE	Includes CBASIC

TABLE 1-1. EQUIPMENT SPECIFICATIONS (Cont.)

CHASSIS DIMENSIONS:	SIZE	Height: 12.5 / Width: 17.5 / Depth: 12.5 in.
	WEIGHT	65 pounds including standard accessories.
ENVIRONMENT CHARACTERISTICS:	OPERATING TEMPERATURE	Range from 0 to 50 degrees Centigrade ambient temperature.

TABLE 1-2. SYMBOLS

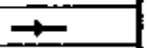
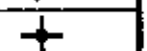
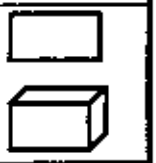
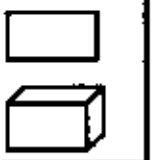
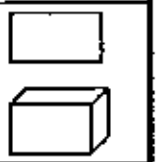
Symbol	Meaning
	Major Functional or Signal Flow
	Secondary Functional or Signal Flow
	Connection or Multiplication Of Function or Signal
	Major Data or Function Flow Transfer
	Key to Text or Note
	Signal or Function Flow Name
	Major Function (Level 1) (Sometimes May Be Shaded)
	PCB or Other Hardware (Level 2)
	Subfunction (Level 2 or 3)
	Indicator Or Control On Hardware Level
	Menu or Display

TABLE 1-3. CODES AND ABBREVIATIONS

Abbreviation	Meaning
AC	Alternating Current
ACTN	Action
A/D	Analog to Digital
ASCII	American National Standard Code For Information Interchange
AUX	Auxiliary
BCD	Binary-Coded Decimal
CONFIG	Configuration
CP/M*	Control Program for Microprocessors
CPU	Central Processing Unit
CRT	Cathode Ray Tube
EBCDIC	Extended Binary Coded Decimal Interchange Code
ECL	Emitter-Coupled-Logic
EXT	External
GPIB	General Purpose Interface Bus
I/O	Input/Output
NUM	Number
O/S	Operating System
PCB	Printed Circuit Board
SELCT	Select
SUT	System Under Test
TTL	Transistor-To-Transistor-Logic

*CP/M is a registered trademark of Digital Research

SECTION 2

UNPACKING AND INSTALLATION

2.1 GENERAL

Information for unpacking and preparation for use is contained in the following section. Instructions for repacking are included for use when any portion of the Model DTS-5128 General Purpose Logic Analyzer must be returned for alignment or repair.

2.2 UNPACKING

Open the Model DTS-5128 packaging carefully. The main unit is packaged in a plastic covered form-fitted foam. Carefully remove the unit and verify that the shipment is complete according to the shipping list. Refer to the unpacking information shipped with each instrument and other peripherals for details on unpacking of these items. See Figure 2-1 and perform the following visual inspection to determine that no physical damage occurred during shipping:

- Check for loose or missing screws, controls.
- Check for visible damage, e.g. chipped or broken controls, dents and scratches.
- Check PCB connectors for damaged pins.

2.3 WARRANTY INFORMATION

If the unit is damaged or does not operate in accordance with the operating instructions, notify your Nicolet Digital Systems Division distributor or Nicolet Digital Systems Division service department immediately. The shipping agent should also be notified if the unit has been physically damaged. The Nicolet Digital Systems Division warranty conditions are given in the back of this manual.

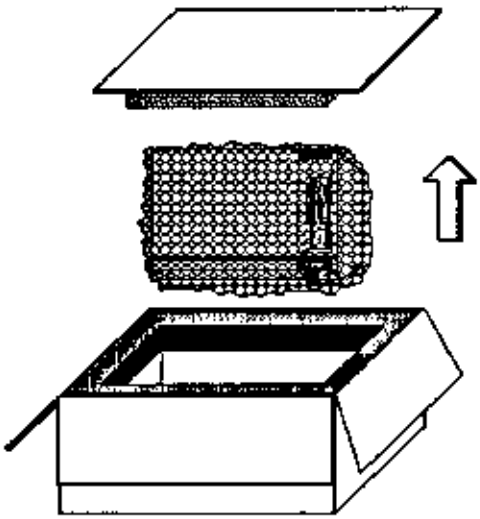


Figure 2-1. Unpacking Material For DTS-5128

Retain packaging material and shipping container for inspection if the unit is damaged.

2.4 SYSTEM PRE-POWER PROCEDURES

The DTS Model 5128 features self-test capabilities that facilitate easy installation. The following paragraphs provide detailed procedures for pre-power on, installation, power on/check out, and power off. The following paragraphs should be followed carefully and in sequence to prevent any possible malfunctions with the system.

2.4.1 Pre-Power Requirements

The Model DTS-5128 General Purpose Logic Analyzer operates at 90-130 and 210-260 VAC at 50-60 Hz. See Table 1-1. Operating voltage should be set to the required level by the factory. If the operating voltage is not correctly set, contact Nicolet Digital Systems Division service department immediately.

2.4.2 Installation

Refer to Figures 2-2 through 2-6 when performing the following installation steps.

1) Insert power cord supplied into "AC Line In" of the main system unit.

2) Connect the AC power cords of both the main system unit and the monitor to AC power.

3) Insert one end of the video cable into the Graphics PCB at the back of the unit and the other end to the back of the monitor.

4) Connect the keyboard and optional joystick to the front panel of the unit.

2.5 INSTRUMENT INSTALLATION

Instruments are inserted in the evelen card positions, 4 through 14. Refer to the documentation provided with each instrument for correct placement of these PCBs. Care should be taken when inserting the PCBs. Upper and lower plastic guides aid the correct positioning of each PCB. When inserted correctly, the PCBs will lock firmly into place. The locking brackets should be flush when closed. Blank panels cover empty card positions to maintain proper cooling within the system unit.

2.6 POWER-ON/CHECK-OUT PROCEDURES

Verify that all pre-power requirements have been observed. Refer to Section 2.4.1 and continue as follows:

1) Ensure that all PCBs are securely in place.

2) Remove the protective cardboard travel disk(s) and insert the disk labeled "SYSTEM DISK" into drive A, with the label to the left.

3) Set the power switch of both the monitor and the main system unit to the ON position.

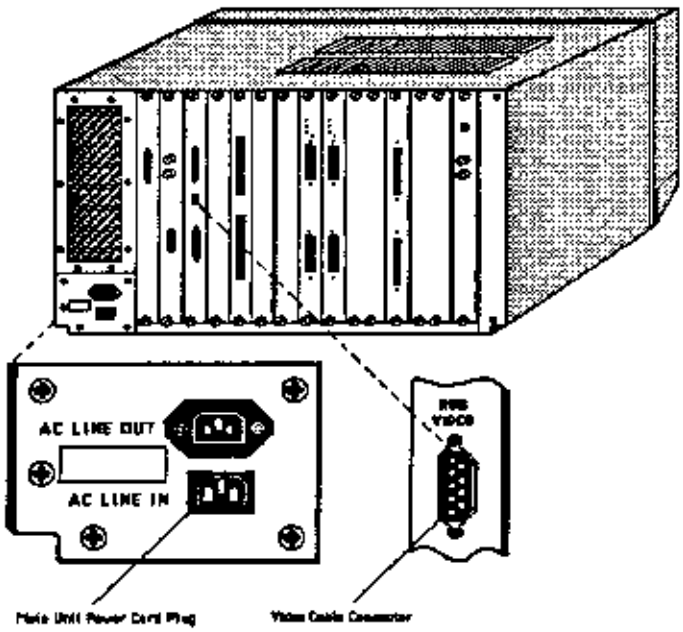


Figure 2-2. Main System Unit Connections

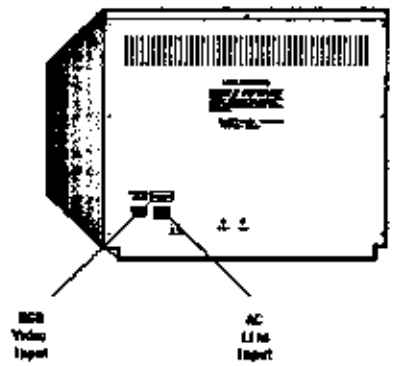


Figure 2-3. Monitor Back View

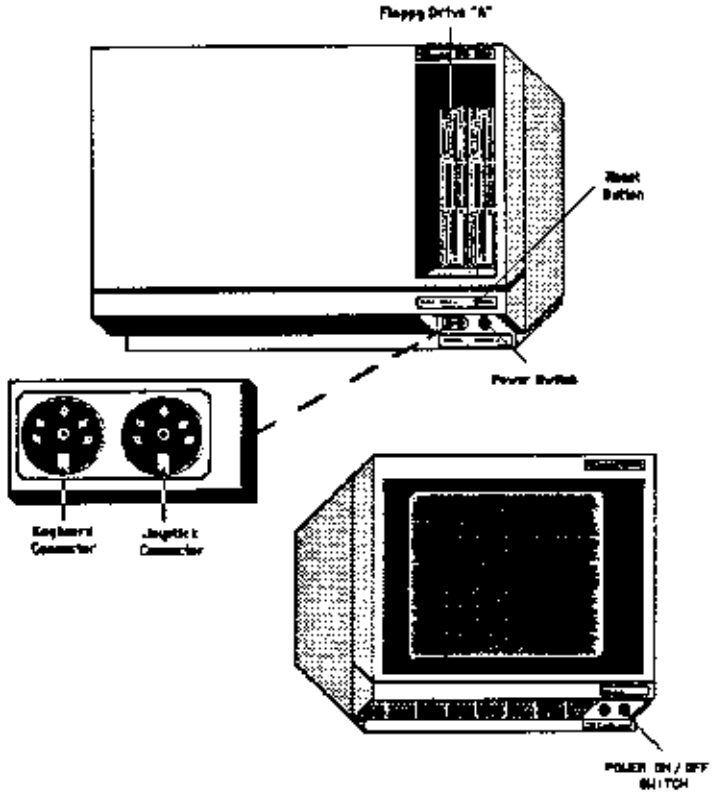


Figure 2-4. System Controls And Connectors

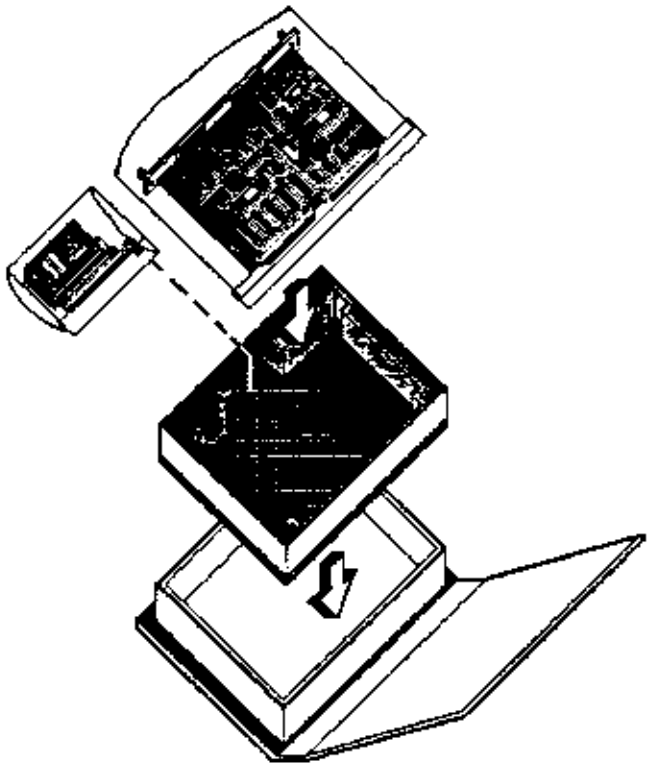


Figure 2-5. PCB Instrument Packaging

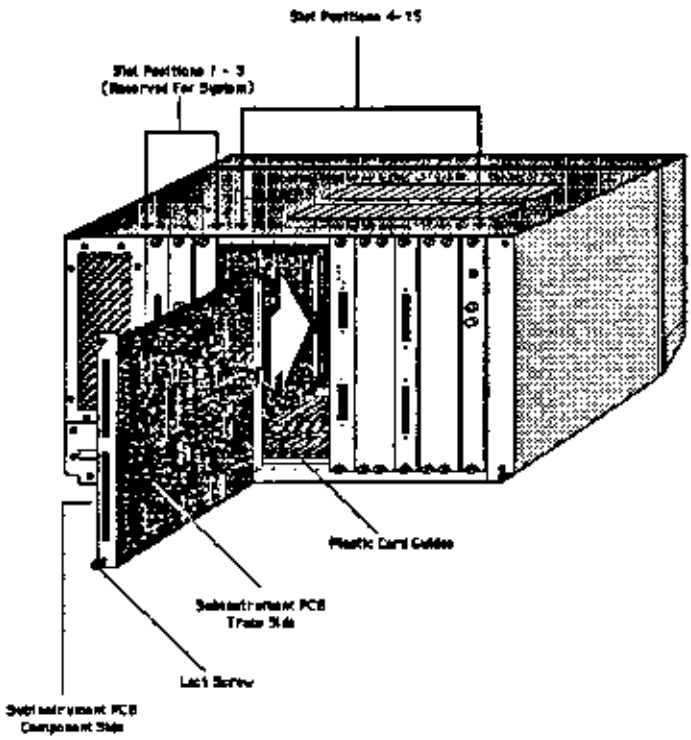


Figure 2-6. Instrument Module Installation

4) Once the operating system prompt "A>" is displayed on the monitor screen the system will automatically load the software.

5) Verify that "DTS Model 5128 Logic Analyzer LOADER Vx.xxx" is displayed on the monitor after approx. 5-10 seconds. The loading process takes approx. 30 - 50 seconds.

6) Once the DTS System load is complete, the "SYSTEM CONFIGURATION" menu will be displayed on the monitor.

If the system fails to power up completely, check the following items:

7) Verify that all PCBs are securely in place.

8) Verify that the correct disk has been placed in drive A.

9) Press the "RESET" button on the main system unit and continue with step 4 above.

2.7 TURN-OFF PROCEDURE

Otherwise, no special turn-off procedure is required. To save set-up parameters, refer to Section 5 of this manual for details. Remove floppy disk(s) and set the power switch off.

2.8 REPACKING FOR SHIPMENT

If reshipment is needed, the device should be repacked in the original packaging. If this is not available, pack the device using sufficient packing material and solid cardboard or wooden box. If repacking for device repair is necessary, inform your local representative. Enclose a note with the device describing the malfunction, damage, etc. with the company name, address, and department.

Shipment should be made to the Nicolet Digital Systems Division service department or supplier, as listed on the back cover of this manual.

2.9 SHIPPING INSTRUCTIONS

Before sending in an instrument for repair, please read the following instructions:

1) Call one of our Customer Service Departments and request a Return Material Authorization (RMA) number. We will need the model number, serial number, the name and phone number of someone to contact concerning the repair, and the reason for repair.

2) Please include a packing list describing the problems in detail. Include the name and phone number of the user.

3) Reference the RMA number on all documents and on the outside of the shipping container.

4) Package the instrument securely to prevent any damage during shipping.

5) Ship the unit prepaid to the closest authorized Nicolet Digital Systems Division service center. If an instrument has been damaged in shipping, a damage report will be made at Nicolet Digital Systems Division and a copy will be sent to you. Nicolet Digital Systems Division is not responsible for any damage incurred in shipping, and claims should be settled directly between the customer and the freight carrier. Before repair work can begin, a verbal P.O. is required with a hard copy to follow.

See the Warranty for additional details, and please call us at the factory if you have any questions.

SECTION 3

FUNCTIONAL DESCRIPTION

3.1 GENERAL

This section is divided into four parts: the first provides a functional description of the overall system hardware elements, the second part provides an overall operational theory of the DTS-5128 as a system, the third part describes a functional description of the General Purpose Logic Analyzer instrument operation, and the fourth part describes the General Purpose Logic Analyzer hardware. Figure 3-1 shows an overall hardware function diagram, with keys to text.

3.2 OVERALL HARDWARE FUNCTIONAL BLOCK DIAGRAM

Refer to Figure 3-1 for details in the following discussion. Outlined numbers are annotated to correspond to each subtitle in this section.

3.2.1 Input Function

The input function 1, represents the first stage of operation. Incoming samples are conditioned through probes, which then pass the data to the Input PCB's. Probes are connected to the PCB's at the rear of the Main System Unit.

3.2.2 Instrument Modules

The instruments are shown in 2. The open architectural design of the DTS-5128 allows for easy upgrade of the modules without major reconfiguration. Incoming data and clock(s) are transferred from the logic probes to the respective instrument(s) where it is manipulated and stored for future use. System generated stimulus, through by the Pattern Generator option may be programmed as output to the system under test.

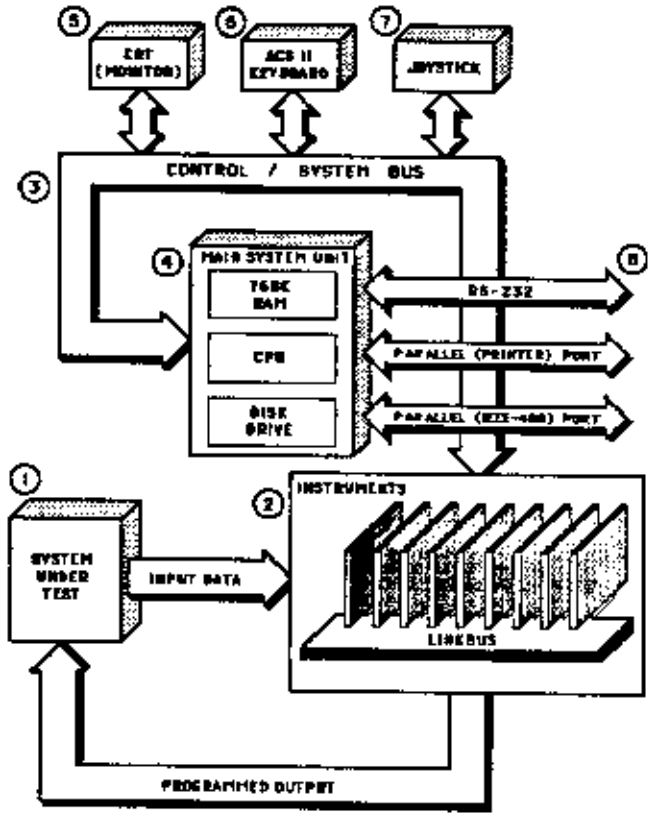


Figure 3-1. DTS-5128 System Overall Block Diagram

3.2.2.1 Linkbus. High-speed communications among all modules is performed over the Linkbus. When an occurrence of a programmed event takes place within a given instrument, control information is then passed to the Linkbus by that instrument. The information placed on the Linkbus is then available to other instrument(s). See Figure 3-2. An example of this is as follows. The General Purpose Logic Analyzer has been programmed to compare ten blocks of data. Once the compare has been performed, control information is then sent to the Linkbus. The information on the Linkbus is then acted on by the Pattern Generator, which then supplies programmed stimulus to the SUT.

3.2.3 Control/System Bus

All DTS-5128 PCB's and peripherals are connected to the microprocessor system unit (8088-2) by a customized internal control/system bus 3. Every PCB is self contained and may be changed, upgraded, replaced, or added without effecting the system architecture.

3.2.4 Computing Control Function

Control of all DTS-5128 functions is maintained by a 8088-2 microprocessor. This function, 4, is provided by the CPU PCB, where the 8088-2 resides, and the associated disk/memory PCB. The microprocessor controls the control/system bus as well as DTS-5128 interfaces to outside devices.

3.2.5 Display Function

The Display Function is shown in 5. It consists of the sixteen Color Graphics CRT, used to enhance user interface to all DTS-5128 menus and displays. The color graphics PCB is associated with the actual Display Function.

3.2.6 Operator Input Function

The normal input of system control and parameter manipulation is by Keyboard 6. User manipulation of menu parameters and displays is available through the optional Joystick 7. Remote control of the DTS-5128 may be accomplished through the RS-232 and IEEE-488 ports 8. Unattended operation of the system is performed either remotely or by programming of CBASIC within the CP/M-86 operating system.

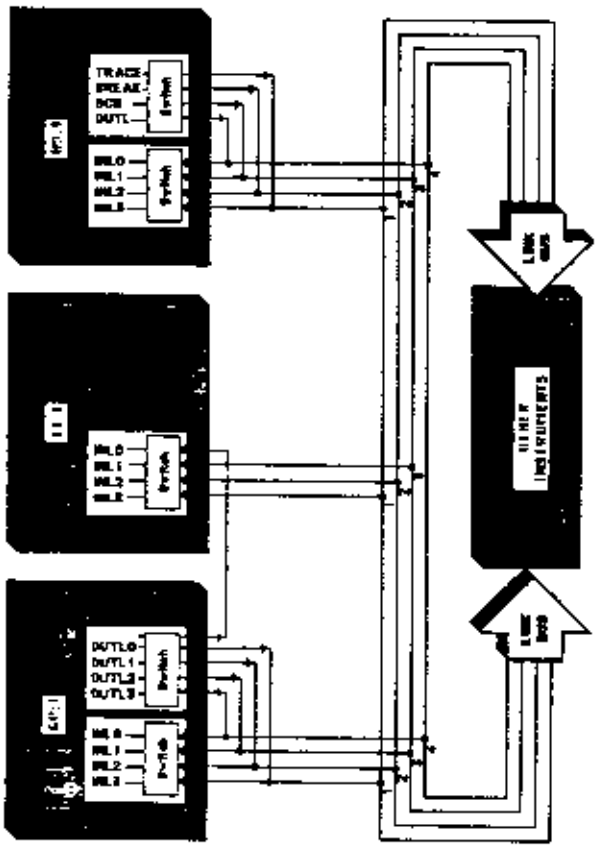


Figure 3-2. Link Bus

3.3 OVERALL SYSTEM OPERATING BLOCK DIAGRAM

Refer to Figure 3-3 for details in the following discussion. This section covers the "system-level" operational theory of the DTS-5128. The operational theory of the General Purpose Logic Analyzer instrument is covered in the next heading. Outlined numbers are annotated to correspond to each subtitle in this section.

The DTS-5128 operates in three basic modes:

- System Set-Up
- Instrument Set-Up
- System Control
- Data Management

3.3.1 System Set-Up

System level parameters for the I/O, Configuration, and Adapt Menu are given to the DTS-5128 during the System Set-Up mode of operation 1. The system set-up parameters are installed once during the initial system configuration. These parameters are recalled from disk and battery back-up RAM each time the system is powered on for use. Any changes made to the hardware/software after the initial configuration will require the user to perform operations outlined in Section 2.6 of this manual. Refer to Section 5 of this manual for description and details of operation.

3.3.1.1 I/O Menu. Remote control and printer operations for the DTS-5128 are performed through the RS-232, GPIB, and Centronics ports. The I/O Menu provides for selection of the various parameters for these ports. For normal day to day use of the system these parameters will usually be unchanged.

3.3.1.2 Adapt Menu. With the Adapt Menu the user tailors the colors of the DTS-5128 menu and display fields to preference. These parameters will not change with hardware changes and upgrades, unless when reprogrammed.

3.3.1.3 Configuration Display. This display provides the user with the current system level configuration of the DTS-5128. Information concerning the system (software version and revision), modules (size, unit designation, and location), date, and time are presented to the user in this display.

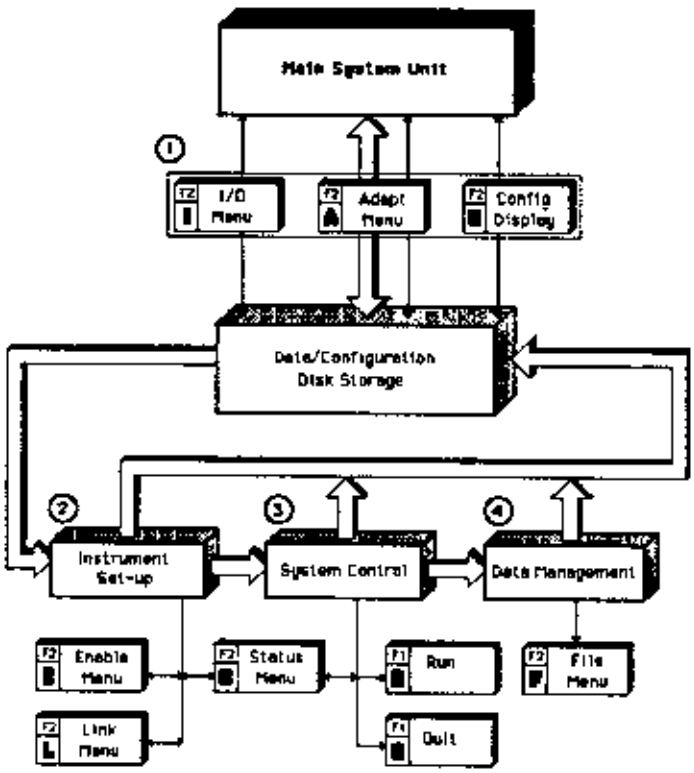


Figure 3-3. System Operations Block Diagram

3.3.2 Instrument Set-Up

All parameters necessary to control the instruments are given to the DTS-5128 during the Set-up mode of operation 2. This mode of operation can best be thought of as the time when the user tells the system what to do and how to do it.

3.3.2.1 Enable Menu. The user may select which configured modules will be enabled, if enabled their run mode of operation, and whether a compare operation will be performed. Enabled instrument(s) operations are defined by the Run Mode and the Compare function. The enabled instrument(s) will operate according to the user defined Run Mode and until a Compare condition has been met.

3.3.2.2 Link Menu. In this menu the user assigns the transmitting and receiving on the Linkbus. The Linkbus provides a means of communication between the modules which have been enabled in the "Execute" menu.

3.3.2.3 Status Display. This display provides the user with current status of all configured modules. Status information can quickly be obtained on all configured modules in both the instrument Set-up and System Control modes of operation.

3.3.3 System Control

Once the user has completed the instrument Set-up operations the system is ready for Data Management 3. The Status Display, as discussed above, also aids in the DTS-5128 Data Management mode of operation.

3.3.1 RUN and QUIT. The "RUN" and "QUIT" softkeys of the "F1 ACTN" function are used in the System Control mode of operations. To start and unconditionally stop data recording of all configured and enabled modules, the "RUN" and "QUIT" softkeys is used.

3.3.4 Data Management

After the System Control mode of operation is complete, system information and recorded data are ready for storage and analysis 4. This same information can also be transmitted to a remote device through the system RS-232 and IEEE-488 ports for later analysis.

3.3.4.1 File Menu. System configurations, parameters, and recorded data can all be stored on floppy disk and later retrieved for operations and analysis.

3.4 OVERALL INSTRUMENT OPERATING SEQUENCE

Refer to Figure 3-4 for details in the following discussion. Each part of the overall operating sequence of the General Purpose Logic Analyzer is referred to in the following sections.

The DTS-5128 operates in three basic modes:

- Setup
- Recording
- Analysis

The instrument can be considered as a shift register into which data is clocked continuously until a predefined event stops the recording. All parameters necessary to control the actual recording are provided during the Pre-Record Programming Mode of operation.

During the Data Recording Mode, the instrument either samples and traces all data until it satisfies the conditions required to stop the recording, traces only a specific sample, or traces continuous segments, depending on prerecording programming.

During the Post-Record Analysis Mode, the instrument can be ordered to recall previously recorded data in a variety of manners and formats. In this mode, functions allow for searching through the data and for comparing the recording to reference files.

3.4.1 Pre-Record Programming Mode

This mode of operation is best thought of as the time when the user tells the General Purpose Logic Analyzer the following:

- What to do
- How to do it
- When to do it

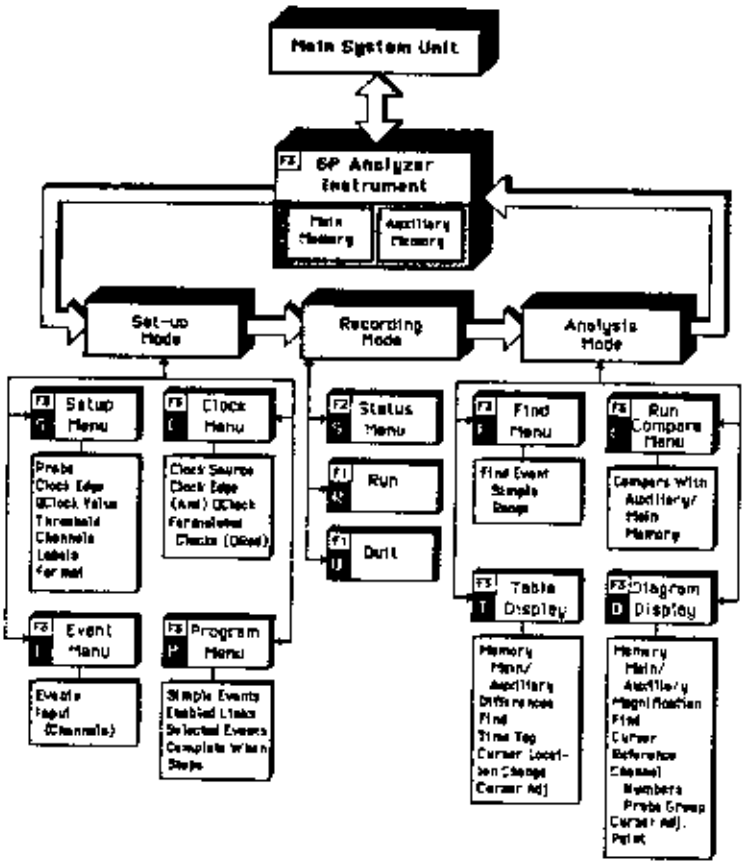


Figure 3-4. General Purpose Logic Analyzer Operation

Control over the sequence and type of recording to be done is provided by the following functions, which are represented by menus:

- Setup
- Recording
- Event
- Program

3.4.1.1 Setup Menu. The Setup Menu provides basic parameter selections. This allows the user to select, when the recording will be made, which number base format to use, what probes will be used as data inputs, what type of sampling will be done by the various memory blocks, and what kind of clocks will be used.

3.4.1.2 Clock Menu. The Clock Menu allows the user to specify either internal or external clocks. The internal clock is used for asynchronous sampling. Up to four external clocks can be used as well as four qualifiers per analyzer. Data for each probe can be clocked using some combination of the four clocks and four qualifiers.

3.4.1.3 Event Menu. The Event Menu allows the user to program the words for the Trace. In addition, each word may be up to 128 bits long.

3.4.1.4 Program Menu. The Program Menu allows the user to program the trigger word(s) or events to look for, how to look for them, and what action to take upon theri occurrance. The Program Menu allows for extremely complex sequences of events to be programmed through many levels. The organization is as follows:

- 4 Simple Events
- 1 Selected Event
- 8 Collection Steps

Using the Program Menu, the operator can program branches, jumps, loops and conditional operation.

3.4.2 Recording Mode

Once the user has programmed the setup parameters and has started the recording process, the analyzer performs the steps, as previously instructed.

3.4.2.1 Trace Monitor Function. During a recording, the trace activity of the analyzer may be displayed by pressing the F2 Status Menu function key. The activity, through all phases of recording, is shown. As each clock cycle or event is reached, the counter is incremented (number of events, clock cycles, etc.). This display serves as a running "score card" of the Program Menu instructions.

3.4.3 Analysis Mode

Once a recording has been made, the user may begin to analyze the data recorded in a variety of manners as follows:

- Display data in a TABLE DISPLAY, or TIMING DIAGRAM so that it is represented as clearly as possible for their application.
- Allow the General Purpose Logic Analyzer to analyze data with automatic search functions. These include main/auxiliary memory comparisons and searching for a word in memory.
- Transfer the recorded data from the Main Memory to the Auxiliary Memory or from the Auxiliary Memory to the Main Memory.

3.4.3.1 Timing Display. The TIMING DISPLAY shows, in a pseudo-timing diagram format (ones are high and zeros are low), the logical state (Binary) of each channel recorded over time. The user may make time measurements, add or delete channels to the display, and change other programmed parameters.

3.4.3.2 Table Display. The TABLE DISPLAY shows the memory locations in any radix, the logical state on each channel, and pod group assignment as programmed. As in the TIMING DIAGRAM, the user may utilize powerful search and memory functions.

3.5 INSTRUMENT HARDWARE BLOCK DIAGRAM

Figure 3-5 shows a functional block diagram of the General Purpose Logic Analyzer. The instrument clock and clock qualifier functions extends the trace capabilities of each instrument's 1000-word memory by restricting sampling to only valid system samples. Samples can be taken with either

an internal asynchronous clock (from 20 Hz to 20 MHz) or an external synchronous clock expression (dc to 25 MHz).

The internal clock qualifier is used to "self-qualify" the data coming to the analyzer from the probes. The external clock source uses two separate lines, per 16-channel probe, to control the data collection. Only the clock signals from the first four probes are active. If the QClock Value and the Clock Edge values programmed in the clock menu.

The General Purpose Logic Analyzer incorporates 8 levels of steps. Sophisticated event or word recognition is accomplished through specifying any 5 of 16 events, which configure an eight-level statement program, with a base of five combinatorial events.

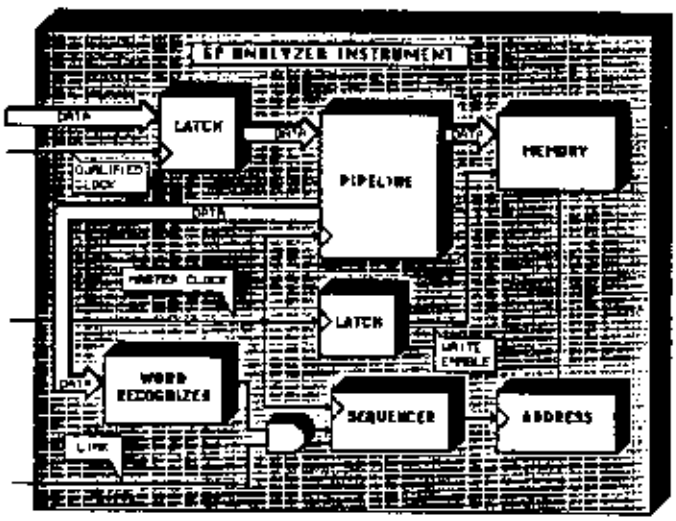


Figure 3-5. GPA Instrument Block Diagram

SECTION 4

CONTROLS AND MENUS

4.1 GENERAL

In this section, the location and function of all controls, indicators, displays, menus and connectors for the Model DTS-5128 General Purpose Logic Analyzer are given. In addition, the procedures necessary to gain access to the various menus and displays that control the system operating parameters are given. Note that this portion of the manual does not provide details on theory or operation of the elements identified. See Section 5, Operating Procedures for details on operation.

4.2 CONTROLS AND CONNECTORS

Refer to Figures 4-1 through 4-3 for an overall view of the Model 5128 controls and indicators. This section covers all controls, indicators, and connectors, located on the main system unit, monitor and keyboard.

4.2.1 Main System Unit Controls And Connectors

Refer to Figure 4-1 for an overall front view of the system unit. During normal operations the POWER indicator will be lit once power is applied to the unit. The OVERTEMP indicator will be lit once the operational temperature of the unit has been exceeded. Should this indicator go on at any time during operations the unit will automatically shut down the power supply. The system cooling fans will continue to operate to prevent damage to the unit.

Refer to Figure 4-2 for an overall view of the rear of the main system unit.

4.2.2 Monitor Controls, Indicators, And Connectors

Refer to Figure 4-3 for an overall front view of the monitor. The POWER ON indicator is lit during normal operations once power is applied. The brightness control adjusts the brightness of screen characters.

Refer to Figure 4-4 for an overall rear view of the monitor.

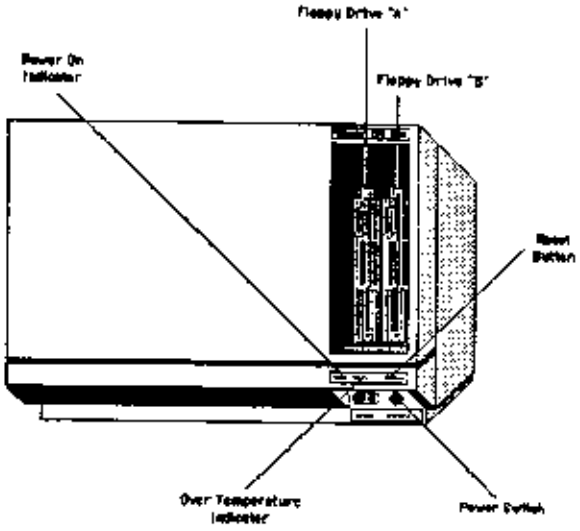


Figure 4-1. System Controls and Indicators

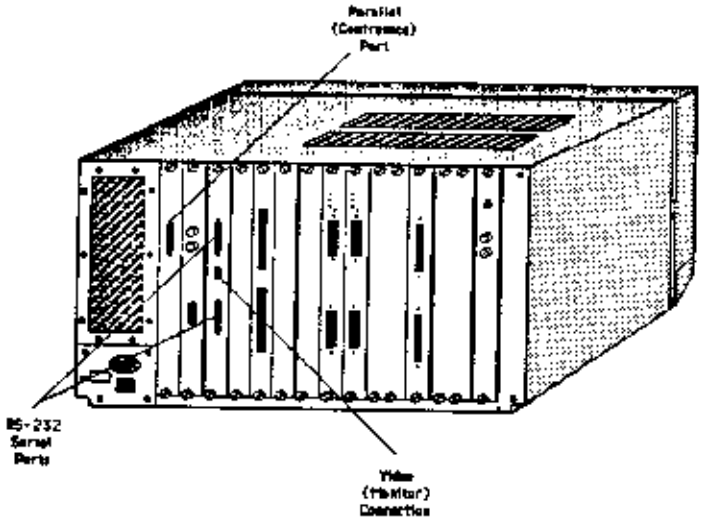


Figure 4-2. System Rear Panel Connectors

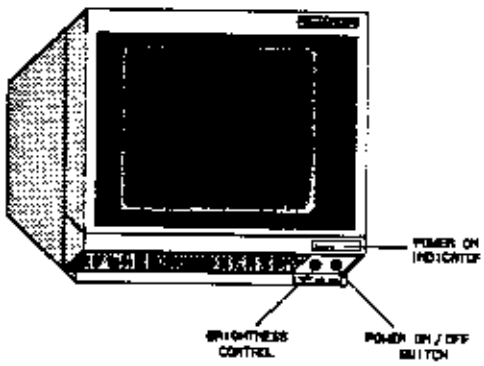


Figure 4-3. Monitor Controls and Indicators

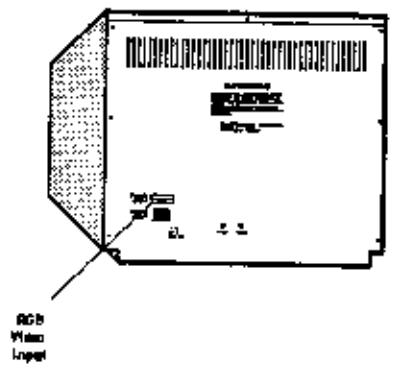


Figure 4-4. Monitor Connector

4.2.3 Keyboard

Refer to Figure 4-5 for an overall view of the keyboard and Tables 4-1 through 4-3 for key descriptions. The function keys F3 through F9 will vary depending on the system configuration. See Section 5 for a detailed description.

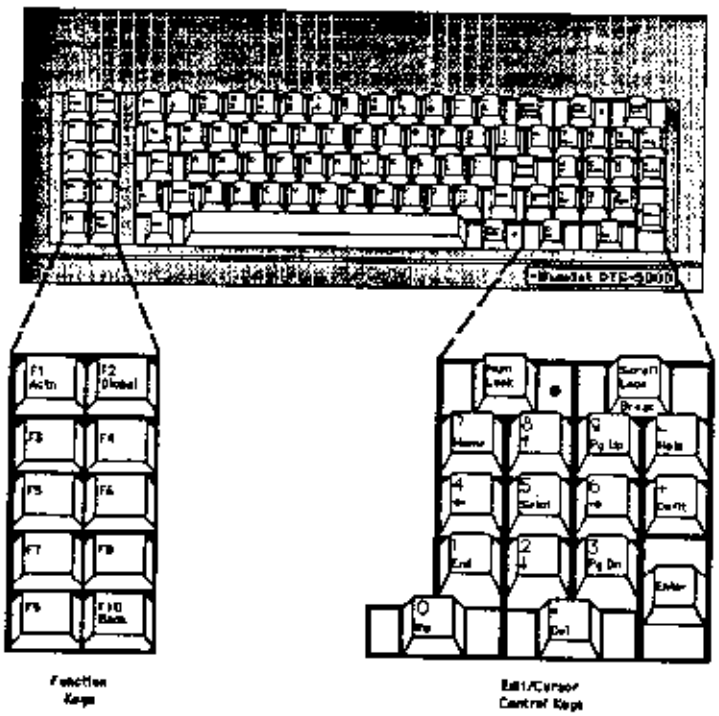


Figure 4-5. Keyboard

TABLE 4-1. FUNCTION KEYS

KEY	DESCRIPTION
F1	Selects Action softkeys.
F2	Selects functions and softkeys for Global Menus /Displays.
F3 - F9	Function keys assigned to instruments.
F10	Scrolls back through previous ten selected functions.

TABLE 4-2. EDIT/CONTROL KEYS

KEY	DESCRIPTION
Home	Cursor relocates to upper left corner of screen. When pressed a second time, cursor returns to prior location.
↑	Cursor movement up.
Pg Up	Cursor relocates to upper right corner of screen. When pressed a second time, cursor returns to prior location.
Help	Help request for input field closest to cursor.
←	Cursor movement to the left.
Selct	Select field closest to cursor. Selected field may change as with softkeys or allow user input of data.
→	Cursor movement to the right.
Deflt	Sets selected field to system default value.
End	Cursor relocates to lower left corner of screen. When pressed a second time, cursor returns to prior location.
↓	Cursor movement down.
Pg Dn	Cursor relocates to lower right corner of screen. When pressed a second time, cursor returns to prior location.
Enter	Save input data to field.
Ins	Insert line of data below cursor position.
Del	Delete line under cursor. When pressed, a message requesting confirmation is displayed and a second "Del" must be entered.