Tektronix® Computer Products

1974 Catalog

TEKTRONIX®

Table of contents

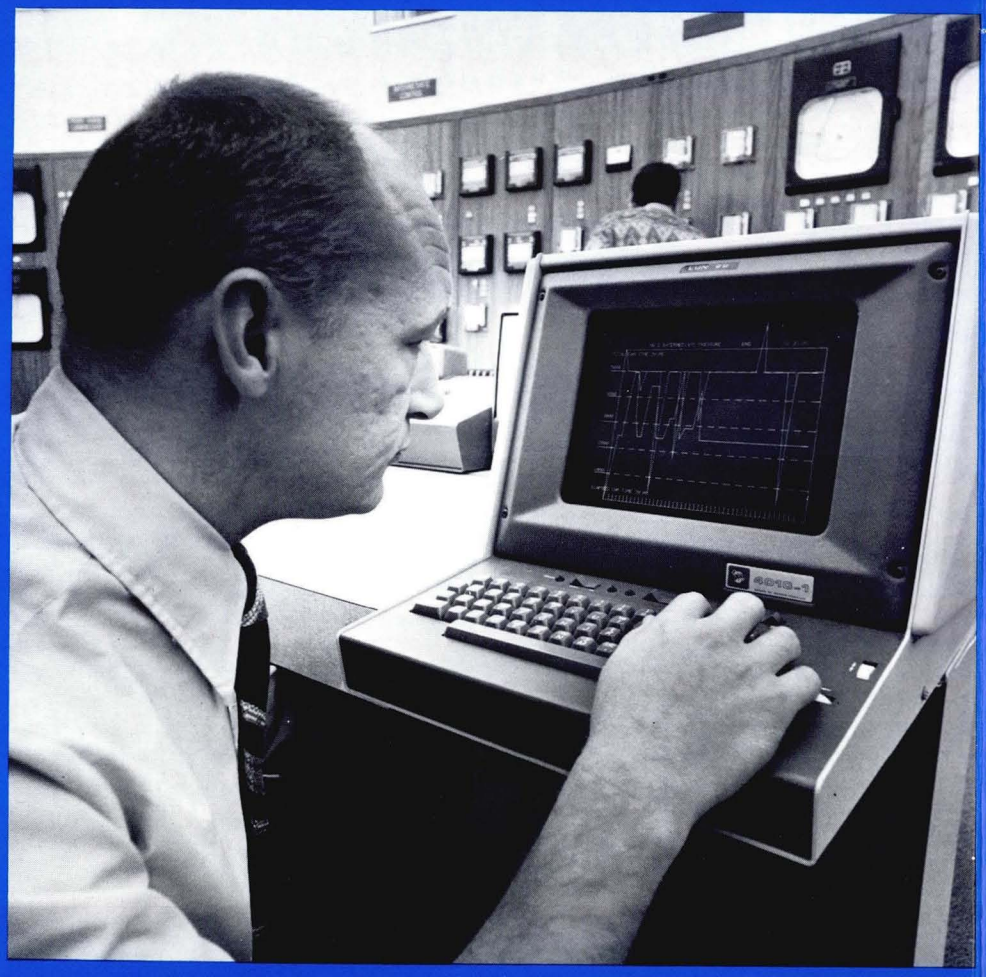
Computer Display Terminals ... 2
Solving Your Problems 3
4010, 4010-1 Terminal 4
4012 Terminal 6
4013 Terminal 8
4014, 4014-1 Terminal 10
4015, 4015-1 Terminal 12
4023 Terminal 14
4623 Hard Copy Unit 15
4002A Terminal 38

Peripheral and Displays 16
4632 Video Hard Copy Unit 17
4503 Scan Converter 18
4610; 4610, Option 2 Hard Copy Unit 19
4911 Paper Tape Reader/ Perforator 19
611 Storage Display Unit 20
633 Monochrome Picture Monitor 20
613 Storage Display Unit 21
602 Display Unit 21

Options and Accessories 22
Maintenance Manuals 23
Minibus Extender 23
Access Cover 23
Copy Holder 23
Viewing Hood 23
Desk Top Mounting Kit 23
Wheel Kits 23
Display Multiplexer Card 23

Interfaces 24, 29
Standard Data Communications .25
Optional Data Communications ..25
Audio Recorder 25
2741 Correspondence Code/APL 26
Teletype Port 26

Software 27
Configure Your System
Combinations of computer, interface, terminal and software possibilities 28



Software Hierarchy Chart 30
Plot 10/Decision Maker 32
Plot 10/Advanced Graphing-II ..33
Plot 10/Terminal Control System 33
Plot 10/Terminal Control System Implementation for IBM with TSO 34
Plot 10/Character Generation System 34
Plot 10/360-370 Graphics Software 34
Plot 10/Display Multiplexer Utility Routines 35
Plot 10/Preview Routines for CalComp® Plotters 35
Plot 10/Minicomputer Software .36
Plot 10/APL Graph 36
Dataform 37

4002A Computer Display Terminal 38
4601 Hard Copy Unit 38
4002A TTY Port Interfaces 38
4002A Plot 10/Software 38

Business Information 40

Making It Work for You 43

Quality Products from a Solid Foundation 44

Worldwide Offices 46

A reason for being

Although we often forget, the computer is still in its adolescence. It did not appear in the business environment until 1955 even though it was conceived a "war baby" in the 1940's. With each step of its development—from vacuum tube model to transistorized version and finally to integrated circuitry—the computer has become smaller and more reliable. It also has become cheaper and faster with larger storage capacity.

At the same time, software has grown from rudimentary programming to more complex levels in an effort to keep up with the capabilities of bigger and better computers.

"Sensory" devices, input-output machines, have not lagged behind either. Springing up in different form—from teletype, card punch/reader, paper tape punch/reader to Graphic Display Terminals—I/O devices have progressively filled the gaps between programmer and computer, helping man relate to the computer in easier and more complete ways.

The growing pains have not been altogether bad. Man is using computers to solve greater quantities of highly sophisticated problems. But we have a ways to go. Computers are only as good as their memory, and memory is only as good as storage space, always limited, and often too limited. Software, too, needs improvement. If the programs can't say it then the computer can't do it.

Computer systems are also affected by I/O devices. Most methods produce paper output of monumental proportions; waste in an age when we can no longer afford to be wasteful. Such data is a maze of output. Often it must be graphically translated to render it useful, which is a time-consuming and expensive process. Computer usage by these means is extremely slow. A programmer must doggedly pursue his train of thought in spite of the long mechanical process in which spontaneity comes to a standstill. And users may wait days to use data that took the computer just minutes to produce.

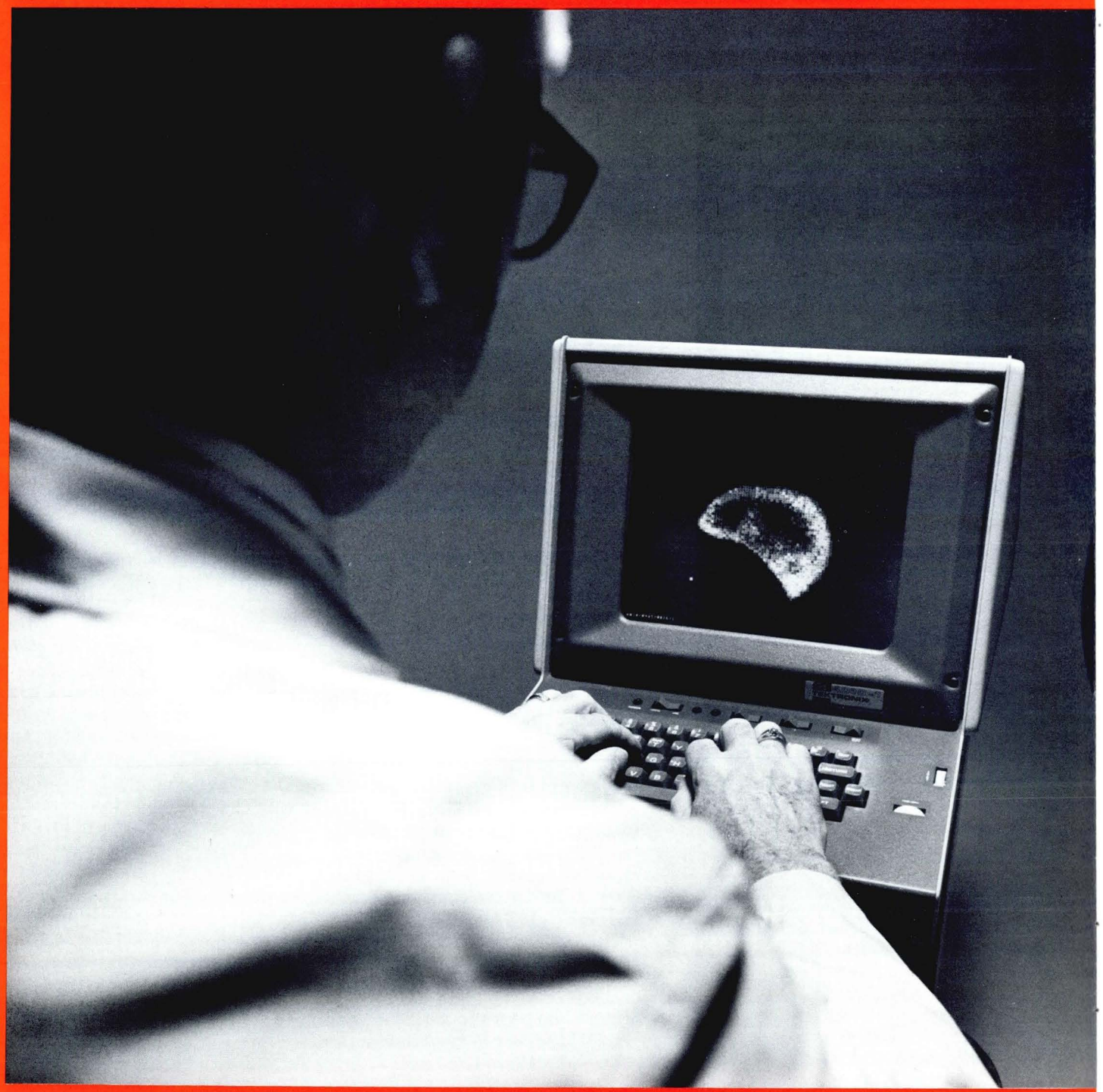
The Tektronix Computer Display Terminals were developed to solve these problems. No more paper piled to the ceiling, no more bulky files. The Graphic Display Terminal only gives you data and copies from an attachable Hard Copy Unit when you *want* it. More important, the terminals work in both graphic and character modes, providing pictures worth 1,000 words; data with meaning right from the beginning.

Finally, Graphic Display Terminals are faster, which means a programmer can remember what he's about while he's about it. Spontaneity is the key to developing ideas with ease, and the terminals let you have it by providing a "conversational" means of approaching the computer.

The terminal was designed for data which does not depend on critically precise graphic representation, but rather for idea representation and interrelationships. However, the terminal's speed and conversational mode have led to its use in conjunction with precision instruments as a program perfector and preview device.

The Graphic Display Terminal has helped computer evolution over some rough spots. It has strengthened computer systems at their weak points by speedy, pictorial graphic and character representation of data; it has become a true friend and servant of the programmer, giving him increased "idea power" with conversational speed. We don't claim that the terminals solve all of the problems all of the time, but it can solve many of them. Perhaps it can even solve some of yours.

Terminals



Solutions to today's problems will have an impact on the future. Medical research is only one area influenced by sophisticated use of terminals.

Solving your problems

Tektronix Computer Display Terminals have indeed helped computer systems through some of their growing pains. With their assistance, man is now able to quickly and directly come to terms with the computer. And this is not all just talk; the terminals are actually out in the working world solving problems for people like you. Terminals of various capabilities work at far-flung purposes in many areas of human endeavor.

The world of orthodontics, for one, may never be the same. Dr. G. Walker, of University of Michigan Dental School, using a 4010 Computer Display Terminal, digitized and categorized over 12,000 skull x-rays to analyze and predict average growth patterns for various skull types. With this data on line, he is able to display, on the screen, a digitized "average" skull type similar to that of an orthodontal patient. Using overlays, he compares the same skull type as it would look one, five or ten years later. As a result growth patterns are displayed, providing valuable information and assistance to decide on treatment programs.

At Children's Hospital Medical Center in Cincinnati, personnel in the intensive care ward use the ever watchful eye of a 4010 terminal to monitor life systems of fragile, newborn infants. Parameters such as body temperature, heart rate and breathing are monitored at 15 minute intervals over an eight hour period. When something goes amiss, the data displayed on the screen and a history of what caused the crisis is presented for instant inspection by doctors on the scene. Here is a shining example of equipment working to help people save lives.

The Interior Department's Bureau of Mines is also monitoring—but something very different from babies. They're developing a system using such parameters as carbon monoxide level, hydrogen concentration, air velocity, smoke detection, noise and temperature of critical working areas to watch for hazardous mine conditions. Their terminal makes every danger graphically clear. The keyboard is emergency-simple. A horizontal sweep of the keys shows all parameters at a particular station while a vertical sweep will plot a single parameter at all stations. When the warning signal beeps and lights go on, the terminal is there with the answers to help avoid catastrophe.

The terminal is also deep underground monitoring and distributing natural gas for the Public Service Company of Colorado. By keeping a finger on the pressure and flow of gas in the mains, the terminal monitors the system's gas contents. More than just monitoring, however, the system contains a closed loop control that activates solonoids to start motors that crank huge valves that control the flow of gas. This helps keep the flow at optimum efficiency with minimum waste and system wear.

In a time when there is no energy to spare, planning for future power systems becomes paramount. And the Bonneville Power Administration is using computer graphics for just this purpose. Possible power network diagrams with their associated electrical flow conditions are displayed on the terminal screen. Also incorporated into the planning are switches and buses connecting transmission lines at power substations. By studying these possibilities, plus factors such as population changes, new technologies, and changing electricity use patterns, engineers can plan equipment arrangements and optimize power network locations. By stringing lines in green and white, engineers are looking ahead to provide economical and reliable energy 10 years down the line.

Tektronix terminals are being used to make business decisions. Uniroyal rolled a $1.5 million tire order—but only after the computer display terminal provided the information needed to make a "go" decision. It's not easy to turn down a million and a half dollar order. But it's even worse to accept it and find out you can't meet the promised delivery date. Prior to acquiring their terminal, Uniroyal's massive data base of an 8,000 item product line permitted only month-long production projections. Too short a time to make a decision about an order this large. Enter the terminal. With a Tektronix 4010 and proper software support, Uniroyal was able to simulate sales, inventory and production curves. All they had to do was adjust the curves to reflect the increased business and they knew they could handle the order.

And computer terminals aren't just for adults. In Albany, New York's, Wildwood School, neurologically impaired children have a new friend, the Tektronix Graphic Terminal, Mr. Tek, to them. With infinite patience the terminal guides a student through relearning sessions, providing a non-threatening environment of two. Mr. Tek is the star of the classroom, providing motivation while at the same time freeing teachers to work individually with more students; he makes everyone happier.

These examples are not meant to be all-encompassing. Tektronix terminals are hard at work for highly divergent purposes at many, varied customer sites. From highly sophisticated medical research to garbage collection routes, from campus classrooms to corporate conference rooms, from life-saving to energy-saving, terminals are helping people solve problems quickly, conveniently and cost-effectively. Perhaps one could work for you, too.

The above uses of Tektronix products do not mean, nor are they meant to imply, customer endorsement of Tektronix equipment. The brief applications outlined have been condensed from previously published articles in *Tekgraphics,* a quarterly magazine published by the Information Display Division of Tektronix.

4010-1

Low-cost Graphics TTL, Alphanumerics

Despite its low price, the 4010 Computer Display Terminal is a data handling tool of great capacity and flexibility. The storage display tube has enabled simplification of terminal circuit design, keeping the 4010's price low. Yet Tektronix' pedestal minibus design opens the way to a variety of system concepts. You can start with a simple, low-cost terminal, leaving room for future expansion, or you may enlarge it with a variety of options for larger systems. With the 4010-1, permanent hard copies of displayed data can be obtained, using a 4610 Hard Copy Unit.

Physical Configurations. The keyboard and display unit may be secured at the top of the pedestal in a convenient free-standing model, or may be mounted on a desktop as much as four feet away. Or an extra-cost rackmount is also available.

The Keyboard. Data input at the 4010 console is through a TTY-style keyboard, featuring 63 printing characters (including upper case English alphabet and numerals), and standard ASCII control characters. Convenient rocker switches above the keyboard select Local or Line operation and (on the 4010-1) produce hard copies from the 4610. Independently-operated X and Y axes thumb-wheels position the Graphic Cursor in the Graphic Input Mode.

Operating Modes. Three operating modes can be selected from the keyboard or the computer. In Alphanumeric mode, 35 lines of 74 characters each constitute a full display screen. For short lines of data, a Margin 1 position after the 35th display line moves the left margin to screen center to display a second column of data. In Graphic Display mode, the terminal produces clear, accurate vector displays in response to computer commands. In Graphic Input mode, operator/computer interactivity is permitted.

Terminal Design Characteristics

Display Medium
Direct View Storage CRT

Display Area
7.5 inches wide by 5.6 inches high (19.05 cm. x 14.22 cm.)

Alphanumeric Mode
Format
74 characters per line, 35 lines
2590 characters full screen

Character Set
63 printing characters
(TTY ASCII Code)

Character Generation
5 x 7 dot matrix
MOS Read-Only Memory
1200 Characters per Second

Cursor
Pulsating 5 x 7 dot matrix

Graphic Display Mode
Vectors only
Vector Drawing Time, 2.6 ms.
1024 X by 1024 Y addressable points
1024 X by 780 Y viewable points

Graphic Input Mode
Thumb-wheel controlled cross hair cursor
3 through 1023 X, 0 through 780 Y

Input Power
110/220 VAC (LOW, MED, HI)
50 to 400 Hz, 110 W

Operating Temperature
+10 degrees to +40 degrees C

Physical Characteristics

Dimensions
Height, 41½ inches (103.41 cm.)
Width, 19 inches (48.26 cm.)
Length, 28½ inches (72.39 cm.)

Weight
Net, 78 pounds (35.10 kg.)
Shipping, 87 pounds (39.15 kg.)

Order Information
4010 Computer Display Terminal

Rackmount R4010 Computer Display Terminal
Rackmount configuration allows for separation of pedestal from keyboard and display portion of terminal in environments where this feature is necessary or desirable.

Rack Dimensions
Height:
Display, 15¾ inches (40 cm.)
Pedestal drawer, 8¾" (22.2 cm.)
Width, 19 inches (48.26 cm.)
Depth, 19¼ inches (48.89 cm.)

Note: Rackmounted instrument extends 10 inches from front of rack.

4010-1 Computer Display Terminal
(Compatible with 4610 Hard Copy Unit)

Rackmount R4010-1 Computer Display Terminal
(Compatible with 4610 Hard Copy Unit)

Details of Lease Arrangements for the 4010 and 4010-1 Are Found on Pages 40-41.

Minibus Extender
Up to five peripherals can be added to the 4010 or 4010-1 with a Minibus Extender.
Option 30.

The capabilities of the 4010 can be changed to adapt to a wide variety of computer systems and tasks. By using the right combination of interfaces, software, and peripheral equipment, the computer system can be made situation-perfect.

Interfacing. The 4010 is shipped with a Standard Data Communication Interface installed if no interface option is specified. The no-charge interface enables operation of the 4010 with most full duplex data communication systems. Option 1 for the 4010 is an Optional Data Communication Interface with added features for timesharing of other full or half duplex Data Communication system operations. Six additional options are offered to provide for connecting the 4010 at the TTY Port of the most commonly used minicomputers. For TTY Port Interface Options other than those listed on Pages 24-26, contact your Applications Engineer.

Interfaces Ordered Separately. When an interface is ordered as a second interface with the original order, or ordered later as a separate item, order by the nine-digit part number shown on Pages 25-26.

Peripheral Equipment. A number of peripherals can be purchased to help computer systems fit every need, one of which is the 4610 Hard Copy Unit. This useful product makes permanent high-quality paper copies of any information displayed on the 4010-1 screen in a matter of seconds either manually or under program control.
See Page 19 for more information.

Also available is a time and dollar-saver, the 4911 Paper Tape Reader/Perforator Unit. This device enables pre-punched data or programs to be entered into the computer at non-rush hour times making the system operate more smoothly and efficiently. At the same time, it provides permanent off-line data storage space which would ordinarily clutter up the computer's core storage.
See Page 19 for more information.

Software. Tektronix provides hardware to fit your needs, but we won't leave you out in the computer jungle without a map. We know that the equipment will just sit there unless the right words are whispered into its ear. Therefore, we provide an extensive collection of software packages for your computer operation.

The following Plot-10 Software packages are designed to be used with the 4010 Graphic Display Terminal: Terminal Control System, Advanced Graphing-II, Display Multiplexer Utility Routines, Preview Routines for Calcomp Plotters, Minicomputer Software, 360/370 Graphics Software, Character Generation System, Decision Maker. For further information about the capabilities of each software package, and part numbers, see Pages 27 through 37.

Extended Performance Options. Certain optional features are offered which give additional range to the 4010 terminal's performance. These include the Minibus Extender (Option 30), which allows a terminal to be connected to more than one interface or peripheral at a time. This increased potential means, among other things, that a terminal can communicate with more than one computer, or have an Audio Recorder, in addition to a Computer interface. The Audio Recorder Interface (Option 32) is another Extended Performance option available which allows the use of a commercial tape recorder as off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4010 Graphic Display Terminal. Another option offered is the Display Multiplexer (Option 31) which allows the terminal to control as many as three storage display monitors at once.

Terminal options numbered Option 30 through 49 are described as Extended Performance Options. The addition of any Extended Performance Option to a Tektronix terminal requires the use of the Minibus Extender (Option 30). A Minibus Extender is included as part of the Dual Interface Capability (Option 36). Be sure you order Option 30 with any Extended Performance Option except 36.

Dual Interface capability is provided by Option 36. This option has three components: Optional Data Communication Interface (Part No. 021-0074-00), Minibus Extender (Part No. 018-0069-00) and Access Cover (Part No. 200-1288-01). The TTY Port Interface should be ordered by the option number. Teletype Port Interfaces not listed in this catalog are quoted upon request. Contact your Applications Engineer.

Convenience Options. In addition are options which are designed for convenience in operating the terminal. These include a wheel kit, viewing hood, a copy holder, and an access cover. For additional information, see Page 23.

Manuals
A User's Manual (Part No. 070-1225-00) is supplied and a Maintenance Manual (Part No. 070-1183-00) is available at extra cost.

4012

High Resolution Upper, Lower Case

The 4012 Computer Display Terminal adds keyboard selection of the full ASCII set of 96 upper and lower case printing characters, or the 63 character TTY subset. In addition, the 4012 offers higher resolution graphics in two operational modes. Another advantage of the terminal is copying capability from the 4610 Hard Copy Unit.

The Display. The Tektronix storage display tube permits circuit simplification, making the 4012 easy to operate, inexpensive to maintain, and economical to purchase.

The Keyboard. Alphanumeric and control key entries are made directly from the keyboard. The TTY upper case subset is enabled by a special TTY Lock Key. Character repeat is available by merely holding a key down. The graphic cross-hair cursor is controlled by keyboard thumb-wheels.

Physical Configurations. The keyboard and display unit may be secured to the top of the pedestal in a convenient free-standing model, or may be mounted on a desktop as much as four feet away. Or, an extra-cost rackmount version is also available.

The Pedestal. The 4012 pedestal contains the Power Supply and the Terminal Minibus. The Minibus adaptability makes the 4012 an extremely versatile data-handling device.

Operating Modes. Alphanumeric mode uses the full upper and lower case ASCII character set, or the TTY upper case subset. In Graphic Display mode, vector displays are drawn in response to computer commands. In Graphic Input mode, the thumb-wheel controlled cross-hair cursor can be positioned on the display, for operator/computer interactivity.

Design Characteristics

Display Medium
Direct View Storage CRT

Display Area
8 inches wide by 6 inches high
(20.32 cm. x 15.24 cm.)

Alphanumeric Mode
Format
74 characters per line
35 lines per display
2590 characters per display

Character Set
96 printing characters on a 7 x 9 dot Matrix
(Full ASCII Code)

Graphic Display Mode
Vectors Only
Vector Drawing Time 2.6 ms

Graphic Matrix
1024 X by 1024 Y addressable points
1024 X by 780 Y viewable points

Graphics Input Mode
Thumb-wheel controlled cross-hair cursor
3 through 1023 X, 0 through 780 Y

Input Power
110/220 VAC (LOW, MED, HI)
50 to 400 Hz, 110 W

Operating Temperatures
+ 10 degrees C to + 40 degrees C

Physical Characteristics

Dimensions
Height, 41.5 inches (103.41 cm.)
Width, 19 inches (48.26 cm.)
Depth, 29 inches (73.66 cm.)

Weight
Net, 90 pounds (40.50 kg.)
Shipping, 107 pounds (48.15 kg.)

Order Information

4012 Computer Display Terminal

Rackmount R4012 Computer Display Terminal

Rackmount configuration allows for separation of pedestal from keyboard and display portion of terminal in environments where this feature is necessary or desirable.

Rack Dimensions

Height:

Display, 15¾ inches (40 cm.)

Pedestal drawer, 8¾" (22.2 cm.)

Width, 19 inches (48.26 cm.)

Depth, 19¼ inches (48.89 cm.)

Note: Rackmounted instrument extends 10 inches from front of rack.

Details of Lease Arrangements for the 4012 are found on Pages 40-41.

Minibus Extender

Up to five peripherals can be added to the 4012 with a minibus extender. Option 30.

The capabilities of the 4012 can be changed to adapt to most computer systems and tasks. By using the right combination of interfaces, software, and peripheral equipment, the computer system can be made situation-perfect.

Interfacing. The 4012 is shipped with a Standard Data Communication Interface installed if no interface option is specified. The no-charge interface enables operation of the 4012 with most full duplex data communication systems. Option 1 for the 4012 is an Optional Data Communication Interface with added features for timesharing of other full or half duplex Data Communication system operations. Six additional options are offered to provide for connecting the 4012 at the TTY Port of the most commonly used minicomputers. For TTY Port Interface Options other than those listed on Pages 24-26, contact your Applications Engineer.

Interfaces Ordered Separately. When an interface is ordered as a second interface with the original order, or ordered later as a separate item, order by the nine-digit part number shown on Pages 25-26.

Peripheral Equipment. A number of peripherals can be purchased to help computer systems fit every need, one of which is the 4610 Hard Copy Unit. This copy machine makes permanent high-quality paper copies of any information displayed on the 4012 screen in a matter of seconds, either manually or under program control. See Page 19 for further information.

Also available is a time and dollar-saver, the 4911 Paper Tape Reader/Perforator Unit. The 4911 enables pre-punched data or programs to be entered into the computer at non-rush hour times making the system run more smoothly and efficiently. At the same time, it provides permanent off-line data storage space which would ordinarily clutter up the computer's core storage. See Page 19 for more information.

Software. Tektronix provides hardware to fit your needs, but won't leave you out in the computer jungle without a map. Therefore, we provide an extensive collection of software packages for your computer operation.

The following Plot-10 Software packages are designed to be used with the 4012 Graphic Display Terminal: Terminal Control System, Advanced Graphing-II, Display Multiplexer Utility Routines, Preview Routines for Calcomp Plotters, Mini-computer Software, 360/370 Graphics Software, Character Generation System, Decision Maker. For further information about the capabilities of each software package, and part numbers, see Pages 27 through 37.

Extended Performance Options. Certain optional features are offered which give additional range to the 4012 terminal's performance. These include the Minibus Extender (Option 30) which allows a terminal to be connected to more than one interface or peripheral at a time. This increased potential means, among other things, that a terminal can communicate with more than one computer, or have an Audio Recorder, in addition to a Computer Interface. The Audio Recorder Interface (Option 32) is another Extended Performance option available which allows the use of a commercial tape recorder as off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4012 Graphic Display Terminal.

Another option offered is the Display Multiplexer (Option 31) which allows the terminal to control as many as three storage display monitors at once.

Terminal options numbered Option 30 through 49 are described as Extended Performance Options. The addition of any Extended Performance Option to a Tektronix terminal requires the use of the Minibus Extender (Option 30). A Minibus Extender is included as part of the Dual Interface Capability (Option 36). Be sure you order Option 30 with any Extended Performance Option except 36.

Dual Interface capability is provided by Option 36. This option has three components: Optional Data Communication Interface (Part No. 021-0074-00), Minibus Extender (Part No. 018-0069-00) and Access Cover (Part No. 200-1288-01). The additional TTY Port Interface should be ordered by the option number. Teletype Port Interfaces not listed in this catalog are quoted upon request. Contact your Applications Engineer.

Convenience Options. In addition are options which are designed for convenience in operating the terminal. These include wheel kits, viewing hood, a copy holder, and access cover. For additional information, see Page 23.

Manuals

A User s Manual (Part No. 070-1460-00) is supplied and a Maintenance Manual (Part No. 070-1461-00) is available at extra cost.

4013

High Resolution APL, ASCII, TTY

APL (A Programming Language), a highly inter-active problem-solving language, lends itself ideally to graphic displays of computer data.

The 4013 Computer Display Terminal gives you the choice of APL Language, in addition to the complete ASCII upper and lower case characters set and the TTY subset. The 88 symbol APL set includes the complete upper case italic alphabet, number set, special APL function symbols, and APL composites.

Another advantage of the 4013 is copying capability from the 4610 Hard Copy Unit.

The Display. The 4013, like other 4010 series Terminals, has all the advantages of the storage display tube such as high resolution display as well as other features.

The Keyboard. The 4013 keyboard has APL symbols on the top surfaces of the keys, and the ASCII symbol differences on the forward surfaces. Graphic cross-hair cursor controls and character repeat are also featured on the 4013 keyboard.

Physical Configurations. The 4013 keyboard and display unit may be secured to the pedestal base, or may be detached and mounted on a desktop as much as four feet away. An extra-cost rackmount version is also available.

The Pedestal. The Power Supply and Terminal Minibus are contained in the pedestal. The Minibus contains space for up to five additional options and/or interface cards.

Operating Modes. The 4013 offers Alphanumeric mode, Graphic Display mode for computer outputs, and the interactive Graphic Input mode.

Design Characteristics

Display Medium
Direct View Storage CRT

Display Area
8 inches wide by 6 inches high (20.32 cm. x 15.24 cm.)

Alphanumeric Mode
Format
74 characters per line
35 lines per display
2590 characters per display
Character Set
96 printing characters on a 7 x 9 dot Matrix
(Full ASCII Code)
88 character APL set

Graphic Display Mode
Vectors Only
Vector Drawing Time 2.6 ms
Graphic Matrix
1024 X by 1024 Y addressable points
1024 X by 780 Y viewable points

Graphics Input Mode
Thumb-wheel controlled cross-hair cursor
3 through 1023 X, 0 through 780 Y

Input Power
110/220 VAC (LOW, MED, HI)
50 to 400 Hz, 110 W

Operating Temperatures
+10 degrees C to +40 degrees C

Physical Characteristics

Dimensions
Height, 41.5 inches (103.41 cm.)
Width, 19 inches (48.26 cm.)
Depth, 29 inches (73.66 cm.)

Weight
Net, 90 pounds (40.50 kg.)
Shipping, 107 pounds (48.15 kg.)

Order

4013 Computer Display Terminal

Rackmount R4013 Computer Display Terminal

Rackmount configuration allows for separation of pedestal from keyboard and display portion of terminal in environments where this feature is necessary or desirable.

Rack Dimensions

Height:
- Display, 15¾ inches (40 cm.)
- Pedestal drawer, 8¾" (22.2 cm.)

Width, 19 inches (48.26 cm.)
Depth, 19¼ inches (48.89 cm.)

Note: Rackmounted instrument extends 10 inches from front of rack.

Details of Lease Arrangements for the 4013 are found on Pages 40-41.

Minibus Extender

Up to five peripherals can be added to the 4013 with a minibus extender. Option 30.

The capabilities of the 4013 can be changed to adapt to most computer systems and tasks. By using the right combination of interfaces, software, and peripheral equipment, the computer system can be made situation-perfect.

Interfacing. The 4013 is shipped with a Standard Data Communication Interface installed if no interface option is specified. The no-charge interface enables operation of the 4013 with most full duplex data communication systems. Option 1 for the 4013 is an Optional Data Communication Interface with added features for timesharing of other full or half duplex Data Communication system operations. Six additional options are offered to provide for connecting the 4013 at the TTY Port of the most commonly used minicomputers. For TTY Port Interface Options other than those listed on Pages 24-26, contact your Applications Engineer.

Interfaces Ordered Separately. When an interface is ordered as a second interface with the original order, or as ordered later as a separate item, order by the nine-digit part number shown on Pages 25-26.

Peripheral Equipment. A number of peripherals can be purchased to help computer systems fit every need, one of which is the 4610 Hard Copy Unit. This useful product makes permanent high-quality paper copies of any information displayed on the 4013 screen in a matter of seconds, either manually or under program control, depending on storage. See Page 19 for more information.

Also available is a time and dollar-saver, the 4911 Paper Tape Reader/Perforator Unit. This device enables pre-punched data or programs to be entered into the computer at non-rush hour times making the system operate more smoothly and efficiently. At the same time, it provides permanent off-line data storage space which would ordinarily clutter up the computer's core storage. See Page 19 for more information.

Software. Tektronix provides hardware to fit your needs, but we won't leave you out in the computer jungle without a map. Therefore, we provide an extensive collection of software packages for your computer operation.

The following Plot-10 Software packages are designed to be used with the 4013 Graphic Display Terminal: Terminal Control System, Advanced Graphing-II, Display Multiplexer Utility Routines, Preview Routines for Calcomp Plotters, Mini-computer Software, 360/370 Graphics Software, Character Generation System, Decision Maker, and APL Graph. For further information about the capabilities of each software package, and part numbers, see Pages 27 through 37.

Extended Performance Options. Certain optional features are offered which give additional range to the 4013 terminal's performance. These include the Minibus Extender (Option 30) which allows a terminal to be connected to more than one interface or peripheral at a time. This increased potential means, among other things, that a terminal can communicate with more than one computer, or have an Audio Recorder, in addition to a Computer, Interface. The Audio Recorder Interface (Option 32) is another Extended Performance option available which allows the use of a commercial tape recorder as off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4013 Graphic Display Terminal. Another option offered is the Display Multiplexer (Option 31) which allows the terminal to control as many as three storage display monitors at once.

Terminal options numbered Option 30 through 49 are described as Extended Performance Options. The addition of any Extended Performance Option to a Tektronix terminal requires the use of the Minibus Extender (Option 30). A Minibus Extender is included as part of the Dual Interface Capability (Option 36). Be sure you order Option 30 with any Extended Performance Option except 36.

Dual Interface capability is provided by Option 36. This option has three components: Optional Data Communication Interface (Part No. 021-0074-00), Minibus Extender (Part No. 018-0069-00) and Access Cover (Part No. 200-1288-01). The additional TTY Port Interface should be ordered by the option number. Teletype Port Interfaces not listed in this catalog are quoted upon request. Contact your Applications Engineer.

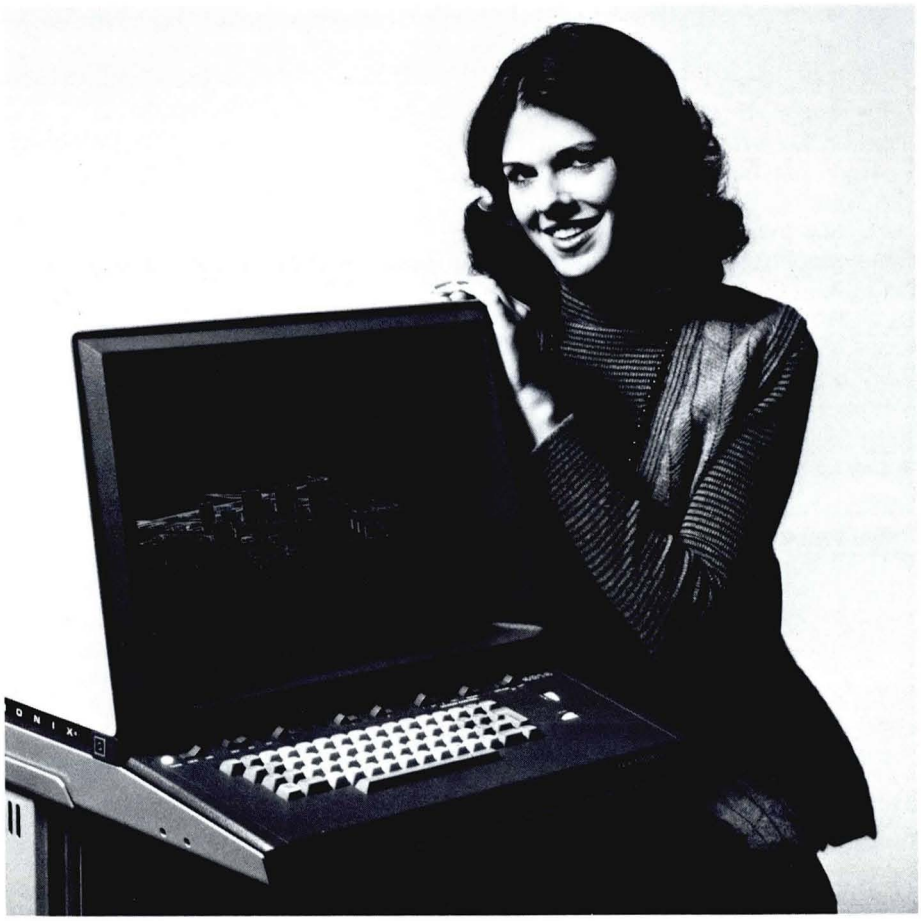
Convenience Options. In addition are options which are designed for convenience in operating the terminal. These include wheel kits, a viewing hood, a copy holder, and an access cover. For additional information, see Page 23.

Manuals

A User's Manual (Part No. 070-1476-00) is supplied and a Maintenance Manual (Part No. 070-1477-00) is available at extra cost.

4014-1

Big 19-inch Display, 8512 ASCII or TTY Characters



Tektronix introduces the only 19" Computer Display Storage Terminal in the industry, allowing over three times more graphic and alphanumeric data display than ever before. The 4014 offers the complete ASCII upper and lower case character set, plus the TTY upper case subset.

Also available is the 4014-1 Computer Display Terminal .This model is compatible with the 4610, Option 2 Hard Copy Unit which provides permanent copies of display information.

The Display. A direct view 19 inch storage display tube allows up to 8512 alphanumeric characters, and four different character sizes. The 4014 has two display modes and the option of five vector types for graphic display.

The Keyboard. Alphanumeric and control key entries are made from the keyboard, where the TTY lock key and graphic crosshair cursor controls are also located. Holding a key down causes character repeat.

Physical Configuration. The display unit (with keyboard) is secured to the pedestal to form a desk-height unit. An optional cable is available to allow desktop mounting of the display unit.

The Pedestal. The 4014 pedestal contains power supply and control circuitry, character generator, plus communication interfaces and optional interface space.

Terminal Design Characteristics

Display Medium

Direct View Storage CRT

Display Area

15 inches wide by 11 inches high (38.10 cm. x 28.04 cm.)

Alphanumeric Mode

Four Program—selectable Formats

1. 74 characters per line with 35 lines per display.
2. 81 characters per line with 38 lines per display.
3. 121 characters per line with 58 lines per display.
4. 133 characters per line with 64 lines per display.

Character Set

96 characters (Full ASCII upper and lower case).
63 character TTY subset.

Alphanumeric Cursor

Pulsating 7 x 9 dot matrix

Vector Mode

Vector drawing time, 5000 inches per second.
1024 X by 1024 Y addressable points.
1024 X by 780 Y viewable points.

4014 Enhanced Graphics Module, Option 34

4096 X by 4096 Y addressable points.
4096 X by 3120 Y displayable points.

Dotted and dashed line vectors (four variables) Point plot mode. Incremental plot-mode. Program control of Writing Beam Brightness.

Interactive Graphic Mode

Thumb-wheel controlled cross-hair cursor.

3 through 1024 addressable points horizontally.

0 through 780 addressable points vertically.

Input Power

110/220 VAC (LO, MED, HI)
50 to 400 Hz, 350 Watts

Physical Characteristics

Weight

150 pounds net (67.50 kg.)

Dimensions

Height, 43½ inches (110.49 cm.)
Width, 20 inches (50.80 cm.)
Length, 32½ inches (82.55 cm.)

Order Information

4014 Computer Display Terminal

4014-1 Computer Display Terminal
(Compatible with 4610, Option 2 Hard Copy Unit)

Minibus Extender
Up to five peripherals can be added to the 4014 with a minibus extender. Option 30.

Details of lease arrangements for the 4014 are found on Pages 40-41.

The capabilities of the 4014 can be changed to adapt to most computer systems and tasks. By using the right combination of interfaces, software, and peripheral equipment, the computer system can be made situation-perfect.

Interfacing. The 4014 is shipped with a Standard Data Communication Interface installed if no interface option is specified. The no-charge interface enables operation of the 4014 with most full duplex data communication systems. Option 1 for the 4014 is an Optional Data Communication Interface with added features for timesharing of other full or half duplex Data Communication system operations. Six additional options are offered to provide for connecting the 4014 at the TTY Port of the most commonly used minicomputers. For TTY Port Interface Options other than those listed on Pages 24-26, contact your Applications Engineer.

Interfaces Ordered Separately. When an interface is ordered as a second interface with the original order, or ordered later as a separate item, order by the nine-digit part number shown on Pages 24-26.

Peripheral Equipment. A number of peripherals can be purchased to help computer systems fit every need, one of which is the 4610, Option 2 Hard Copy Unit. This copy machine makes permanent high-quality paper copies of any information displayed on the 4014-1 screen, either manually or under program control.

Also available is a time and dollar-saver, the 4911 Paper Tape Reader/Perforator Unit. This device enables pre-punched data or programs to be entered into the computer at non-rush hour times making the system run more smoothly and efficiently. At the same time, it provides permanent off-line data storage space which would ordinarily clutter up the computer's core storage.
See Page 19 for more information.

Software. Tektronix provides hardware to fit your needs, but we won't leave you out in the computer jungle without a map. Therefore, we provide an extensive selection of software packages for your computer operation.

The following Plot-10 Software packages are designed to be used with the 4014 Computer Display Terminal: Terminal Control System, Advanced Graphing-II, Display Multiplexer Utility Routines, Preview Routines for Calcomp Plotters, Mini-computer Software, 360/370 Graphics Software, Character Generation System, Decision Maker. For further information about the capabilities of each software package, and part numbers, see Pages 27 through 37.

Extended Performance Options. Certain optional features are offered which give additional range to the 4014 terminal's performance. These include the Minibus Extender (Option 30) which allows a terminal to be connected to more than one interface or peripheral at a time. This increased potential means, among other things, that a terminal can communicate with more than one computer, or have an Audio Recorder, in addition to a Computer Interface. The Audio Recorder Interface (Option 32) is another Extended Performance option available which allows the use of a commercial tape recorder as off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4014 Graphic Display Terminal. Another option offered is the Display Multiplexer (Option 31) which allows the terminal to control as many as three storage display monitors at once. Also offered is Enhanced Graphics Module (Option 34), which allows 12-bit addressability (4096 X by 4096 Y) of the display screen. Also, the option allows for dotted and dashed line vectors, incremental plot, and point plot with control over plotted point brightness, i.e., grey scaling.

Terminal options numbered Option 30 through 49 are described as Extended Performance Options. The addition of any Extended Performance Option to a Tektronix terminal requires the use of the Minibus Extender (Option 30). A Minibus Extender is included as part of the Dual Interface Capability (Option 36). Be sure you order Option 30 with any Extended Performance Option except 36.

Dual Interface capability is provided by Option 36. This option has three components: Optional Data Communication Interface (Part No. 021-0074-00), Minibus Extender (Part No. 018-0069-00) and Access Cover (Part No. 200-1288-01). The additional TTY Port Interface should be ordered by the option number. Teletype Port Interfaces not listed in this catalog are quoted upon request. Contact your Applications Engineer.

Convenience Options. In addition are options which are designed for convenience in operating the terminal. These include wheel kits, viewing hood, and a copy holder. For additional information, see Page 23.

Manuals

A User's Manual (Part No. 070-1647-00) is supplied and a Maintenance Manual (Part No. 070-1648-00) is available at extra cost.

4015-1

Big 19-inch Display APL, ASCII, TTY

The 4015 Computer Display Terminal adds the powerful problem-solving APL language to the increased display power of the 19 inch screen, along with the full ASCII upper and lower case set and TTY subset.

Also available is the 4015-1 Computer Display Terminal. This model is compatible with the 4610, Option 2 Hard Copy Unit which provides permanent copies of display information.

The Display. The 19 inch display is a direct view storage tube with a capacity of up to 8512 characters. The 4015 has four different sizes of character display, two display modes and five vector types for graphic display.

The Keyboard. APL characters are depicted on the top surfaces of the keys, with ASCII symbol differences on the forward surfaces. The TTY Lock key and graphic cross-hair cursor controls are also on the keyboard. Character repeat is also included.

Physical Configuration. The keyboard and display unit is secured to the top of the pedestal to form a desk-height unit. An optional cable is available for desktop use of the keyboard and display unit.

The Pedestal. The 4015 pedestal contains a power supply, control circuits, character generator, plus communication interfaces and option interface space.

Operating Modes. The 4015 functions in three modes. The 4015 offers Alphanumeric mode, Graphic Display Mode for computer outputs, and the interactive graphic input mode. Data received may be displayed alphanumerically or graphically.

Terminal Design Characteristics

Display Medium

Direct View Storage CRT

Display Area

15 inches wide by 11 inches high (38.10 cm x 28.04 cm.)

Alphanumeric Mode

Four Program—selectable Formats

1. 74 characters per line with 35 lines per display.
2. 81 characters per line with 38 lines per display.
3. 121 characters per line with 58 lines per display.
4. 133 characters per line with 64 lines per display.

Character Set

96 characters (Full ASCII upper and lower case)

63 character TTY subset.

88 character APL set

Alphanumeric Cursor

Pulsating 7 x 9 dot matrix.

Vector Mode

Vector drawing time, 5000 inches per second.

1024 X by 1024 Y addressable points.

1024 X by 780 Y viewable points.

4015 Enhanced Graphics Module, Option 34

4096 X by 4096 Y addressable points.

4096 X by 3120 Y displayable points.

Dotted and dashed line vectors (4 variables). Point plot mode. Incremental plot-mode Program control of Writing Beam Brightness.

Interactive Graphic Mode

Thumb-wheel controlled cross-hair cursor.

3 through 1024 addressable points horizontally.

0 through 780 addressable points vertically.

Input Power

110/220 VAC (LO, MED, HI)
50 to 400 Hz, 350 Watts

Physical Characteristics

Dimensions

Height, 43½ inches (110.49 cm.)
Width, 20 inches (50.80 cm.)
Length, 32½ inches (82.55 cm.)

Weight

150 pounds net (67.50 kg.)

Order Information

4015 Computer Display Terminal

4015-1 Computer Display Terminal

(Compatible with 4610, Option 2 Hard Copy Unit)

Minibus Extender

Up to five peripherals can be added to the 4015 with a minibus extender.

Option 30

Details of lease arrangements for the 4015 are found on Pages 40-41.

The capabilities of the 4015 can be changed to adapt to most computer systems and tasks. By using the right combination of interfaces, software, and peripheral equipment, the computer system can be made situation-perfect.

Interfacing. The 4015 is shipped with a Standard Data Communication Interface installed if no interface option is specified. The no-charge interface enables operation of the 4015 with most full duplex data communication systems. Option 1 for the 4015 is an Optional Data Communication Interface with added features for timesharing of other full or half duplex Data Communication system operations. Six additional options are offered to provide for connecting the 4015 at the TTY Port of the most commonly used minicomputers. For TTY Port Interface Options other than those listed on Pages 24-26, contact your Applications Engineer.

Interfaces Ordered Separately. When an interface is ordered as a second interface with the original order, or is ordered later as a separate item, order by the nine-digit part number shown on Pages 25-26.

Peripheral Equipment. A number of peripherals can be purchased to help computer systems fit every need, one of which is the 4610, Option 2 Hard Copy Unit. This copy machine makes permanent high-quality paper copies of any information displayed on the 4015-1 screen, either manually or under program control.

Also available is a time and dollar-saver, the 4911 Paper Tape Reader/Perforator Unit. This device enables pre-punched data or programs to be entered into the computer at nonrush hour times making the system run more smoothly and efficiently. At the same time, it provides permanent off-line data storage space which would ordinarily clutter up the computer's core storage. See Page 19 for more information.

Software. Tektronix provides hardware to fit your needs, but won't leave you out in the computer jungle without a map. Therefore, an extensive collection of software packages are provided for your computer operation.

The following Plot-10 Software packages are designed to be used with the 4015 Graphic Display Terminal: Terminal Control System, Advanced Graphing-II, Display Multiplexer Utility Routines, Preview Routines for Calcomp Plotters, Minicomputer Software, 360/370 Graphics Software, Character Generation System, Decision Maker, and APL Graph. For further information about the capabilities of each software package, and part numbers, see Pages 27 through 37.

Extended Performance Options. Certain optional features are offered which give additional range to the 4015 terminal's performance. These include the Minibus Extender (Option 30) which allows a terminal to be connected to more than one interface or peripheral at a time. This increased potential means, among other things, that a terminal can communicate with more than one computer, or have an Audio Recorder, in addition to a Computer, Interface. The Audio Recorder Interface (Option 32) is another Extended Performance option available which allows the use of a commercial type recorder as off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4015 Graphic Display Terminal. Another option offered is the Display Multiplexer (Option 31) which allows the terminal to control as many as three storage display monitors at once. Also offered is Enhanced Graphics (Option 34) which allows 12-bit addressability (4096 X by 4096 Y) of the display screen. The option also allows for dotted and dashed line vectors, incremental plot, and point plot with control over plotted point brightness, i.e., grey scaling.

Terminal options numbered Option 30 through 49 are described as Extended Performance Options. The addition of any Extended Performance Option to a Tektronix terminal requires the use of the Minibus Extender (Option 30). A Minibus Extender is included as part of the Dual Interface Capability (Option 36). Be sure you order Option 30 with any Extended Performance Option except 36.

Dual Interface capability is provided by Option 36. This option has three components: Optional Data Communication Interface (Part No. 021-0074-00), Minibus Extender (Part No. 018-0069-00) and Access Cover (Part No. 200-1288-01). The additional TTY Port Interface should be ordered by the option number. Teletype Port Interfaces not listed in this catalog are quoted upon request. Contact your Applications Engineer.

Convenience Options. In addition are options which are designed for convenience in operating the terminal. These include wheel kits, viewing hood, and a copy holder. For additional information, see Page 23.

Manuals

A User's Manual is supplied (Part No. 070-1649-00) and a Maintenance Manual (Part No. 070-1650-00) is available at extra cost.

4023

Refreshed Alphanumerics Upper and Lower Case

The Tektronix 4023 is a general purpose, alphanumeric, refreshed terminal with all the built-in features of a refreshed terminal—it is quiet, bright, and buffered plus it has other features which are oriented towards rapid, error-free data base entry and retrieval operations.

The 4023 keyboard provides selection of the full ASCII set of 96 printing characters, or the 63 character TTY upper case subset.

The memory (buffer) of the 4023 allows space for 24 lines with 80 characters each, providing a total of 1920 characters. Standard terminal features permit the cursor to be addressed to any one of the 1920 character positions.

The 4023 can communicate directly with a computer, bypassing the buffer; or it can communicate via the buffer. Communicating directly to the computer is a character-by-character process; whereas, in buffered communications the data can be sent as one complete block.

Function Control and Numeric Pad. A cluster of 12 keys to the right of the keyboard serves a dual purpose. Normally these keys provide control for editing, transmission, cursor movement, etc. However, pressing the NUM LOCK key located in the bottom right corner of the key cluster, enables the 12 keys to function as a numeric pad.

Editing Capabilities. Insert character and line, delete character and line, erase to end, erase page. Editing is speeded by tab, back tab, and repeating character keys.

Field and Data Formatting. Displayed data can be arranged to resemble the source document. Forms information can then be rapidly retrieved, updated, edited, and entered. Visual field formats include: inverted, blinking, blacked, and dim fields. Logical formats include: transmittable, non-transmittable, protected, non-protected, and non-alpha fields.

Interfacing. Provided by two data communications interfaces for telephone line connection. One is the Standard Data Communications Interface supplied with the 4023 if no interface option is specified. Compatible with RS-232C this interface provides switch-selectable input/output data rates of 110, 150, 300, 600, 1200, 4800, or 9600 baud. Local echo is also switch selectable. Option 1 for the 4023 is an Optional Data Communications Interface with added features for timesharing or other Data Communication system operations.

Design Characteristics

CRT
Refreshed CRT, 12 inch diagonal

Display Area
9 inches wide by 5.5 inches high (22.86 cm. x 13.97 cm.)

Phosphor Type: P-4 (white)

Video
Composite Video, compatible with standard interlaced 525 line monitor.

Refresh Rate: 60 Hz

Cursor Type
7 by 10 dot matrix, non-destructive remote or local control.

Character Generator
5 x 7 dot matrix

Character Size
80 mils by 120 mils (0.80 inch wide by 0.12 inch high)

Character Code
128 ASCI, 96 printing upper and lower case characters.

Characters Per Line: 80

Lines Per Display: 24

Refreshed Buffer: MOS RAM

Intensity
Normal 30 foot lamberts, dim 15 foot lamberts for background identification

Keyboard 64/96 ASCI upper and lower case, two key roll-over, auto-repeat for any keys depressed over 0.3 second.

Input/Output Standard Data Communications Interface is RS-232C compatible Full Duplex, Serial Asynchronous, Start/Stop, LSB first, Baud rate Transmit/Receive selectable 110-9600 with backpanel switch, Transmission code is 128 ASCII upper/lower case.

Power Requirements
115/230 (hi, med, lo) VAC, 50 to 400 Hz, nominal 220 watts

Physical Characteristics
Dimensions
Height, 13 inches (33 cm.)
Width, 18 inches (46 cm.)
Depth, 23 inches (58 cm.)
Weight
Net, 46 lbs. (21 kg.)
Shipping, 67 lbs. (30 kg.)

Order Options
4023 Computer Display Terminal
(Including Standard Data Communications Interface)

Option 1
Optional Data Communication Interface

Option 31
Ruling Character Set (factory installed)

Option 32
Audio Recorder Card

Details of lease arrangements for the 4023 are found on Pages 40-41.

Interfacing. The 4023 is shipped with a Standard Data Communication Interface installed if no interface option is specified. Option 1 for the 4023 is an Optional Data Communication Interface with added features for timesharing or other Data Communication system operation.

Hard Copy Compatible
The 4623 Hard Copy Unit is designed to produce permanent high quality, 8½" x 11" copies from the 4023 refreshed Alphanumeric terminal.

Installation is easy and simple. The 4623 is plug-to-plug compatible to the 4023 and produces excellent quality copies at the touch of a single switch.

Colors available include red, gold, green and tan, matching color options available on the 4023 terminals. Color, which must be specified at the time of ordering, is available at no extra charge. If no option is specified, tan will be shipped.

Four channel input, which accommodates up to four 4023's, is standard, allowing copying capabilities (and cost-savings) from one to four terminals.

Characteristics

Copy Size

Adjusted to 8½ x 11 inches for horizontal raster display.

Copy Time

Approximately 18 seconds for first copy. Additional copies of the same display take about 8 seconds each.

Remote Signal Inputs

Remote Copy. A logic level "LO" (ground closure) initiates a copy command.

Output Signal Characteristics

$\overline{\text{Busy}}$ (Open Collector. Low during copy time.)

$\overline{\text{HCU}}$ (open collector, low when Hard Copy power is on.)

Warmup Time: 20 minutes

Ambient Temperature

0°C to +35°C is recommended

Power Source

(Factory-wired options)
100VAC 50-60 Hz
115VAC 50-60 Hz
200VAC 50-60 Hz
230VAC 50-60 Hz

Physical Characteristics

Dimensions
Height, 11 inches (27.9 cm)
Width, 16 inches (40.6 cm)
Depth, 25½ inches (64.7 cm)

Weight
Approximately 65 lbs. (29.48 kg)

Order Options

4623 Hard Copy Unit
Option 56—gold
Option 57—red
Option 58—green

Option 1—Copy Counter (automatically counts copies the 4623 makes)

Paper

One roll 3M Type 777 Dry Silver paper is included with each Hard Copy Unit. Refills are available from Tektronix, Inc.
One roll, Part No. 006-1603-00
One carton of 4 rolls, Part No. 006-1603-01

Standard Accessories

User's Manual (Part No. 070-1662-00); one 10 ft., 15 pin interconnecting cable (Part No. 012-0504-00) and Maintenance Manual (one mailed free upon request with order).

Optional Accessories

Maintenance Manual
Part No. 070-1697-00

10 foot, 15 pin interconnecting cable
Part No. 012-0504-00

20 foot, 15 pin interconnecting cable
Part No. 012-0504-01

50 foot, 15 pin interconnecting cable
Part No. 012-0504-02

200 foot, 15 pin interconnecting cable
Part No. 012-0504-03

Extended Performance Options.
Certain optional features are offered which give additional range to the 4023 terminal's performance. These include the Ruling Character Set (factory installed, Option 31) which allows for quick drawing of solid horizontal and vertical lines to resemble documents. Also offered is the Audio Recorder Interface (Option 32) which allows the use of a commercial tape recorder for off-line data storage. This interface also enables data to be moved from the recorder to the computer via the 4023.

Convenience Options.
In addition, options are available that are designed for convenience in operating the terminal. One option is the Logic Extender Card (Part No. 067-0659-00), a design and maintenance tool that permits monitoring of the terminal bus lines via light emitting diodes. It catches momentary signals for monitoring and permits the exercising of the various bus lines. Also available are the 72 Pin Extender Card (Part No. 067-0696-00), which allows for extending any logic card outside the terminal pedestal for easy access, and the pedestal (Part No. 016-0568-00), which provides a base upon which to mount the 4023 for user convenience.

4023 Manuals
A User's Manual (Part No. 070-1621-00) is supplied and a Maintenance Manual (Part No. 070-1617-00) is available at extra cost.

Peripherals and Displays

A more powerful system provides greater problem-solving capabilities. Hard copy units, displays, and scan converters add unlimited dimension for your work.

4632

Video Hard Copy Unit

The 4632 Video Hard Copy Unit is designed to provide permanent hard copies from standard composite video signals and from digital video signals of refreshed alphanumeric/graphic terminals. The copies may be either high-contrast (black and white) or grey scale copies. Operation is simple and quiet, with dry-process development within one lightweight unit.

The copy-making process is initiated by operating a single switch on the top panel. High quality copies are produced in seconds, and exit, completely dry, into a stacking tray.

The 4632 is easily interfaced into a video system or a refreshed terminal by a single cable. It can also be multiplexed to provide copying capability from one to four video sources.

Design Characteristics

Standard copy size adjustment is 8½ inches by 11 inches for horizontal raster display (4:3 aspect ratio). Copy time is approximately 18 seconds for the first copy and about 8 seconds for additional copies of the same display. Machine warmup time is 20 minutes. The recommended ambient temperature for operation is 0° C to +35° C.

Input Requirements

Input signals may be any one of three configurations: composite video, video with horizontal and vertical drive, or video with composite sync. Input video amplitude is from 0.3V to 5V. Impedance is 75 ohms, loop-through. Return loss is at least 46 dB. Common mode rejection is at least 30 dB. Maximum input is 10 VDC plus peak AC. Input sync amplitude is 0.3V to 8V p-p; impedance is 20 KΩ.

Power Requirements

The 4632 operates on 110-115 VAC, or 200-230 VAC, 50-60 Hz; these are factory wired options.

Physical Characteristics

Dimensions
Height, 11 inches (27.9 cm.)
Width, 16 inches (40.6 cm.)
Length, 25.6 inches (64.9 cm.)

Weight: Net, 65 lbs. (29.48 kg.)

Order Options

4632 Video Hard Copy Unit

Option 1
Copy Counter automatically counts copies the 4632 makes.

Option 2
4-Channel multiplexer provides copying capabilities from one to four video sources when multiplexed to selected configurations of display monitors and/or scan converters.

Option 3
Setup for 625/50Hz field operation

Option 4
Setup for 1029/60Hz field operation. Unless specified, the 4632 will be shipped set up for 525/60 Hz operation.

Paper

One roll of 3M Type 777 Dry Silver paper is included with each Hard Copy Unit. Refills are available from Tektronix, Inc.
One roll, Part No. 006-1603-00
One carton of 4 rolls, Part No. 006-1603-01

Standard Accessories

Included with the 4632 are one User's Manual, one 75-ohm terminator, and a Maintenance Manual (one mailed free upon request with order).

Optional Accessories

Maintenance Manual
Part No. 070-1686-00
Interconnecting Cable, 75 Ohm, BNC, 25 feet
Part No. 012-0157-00
10 foot, 15 pin interconnecting cable
Part No. 012-0504-00
20 foot, 15 pin interconnecting cable
Part No. 012-0504-01
50 foot, 15 pin interconnecting cable
Part No. 012-0504-02
200 foot, 15 pin interconnecting cable
Part No. 012-0504-03

4503

Scan Converter

The 4503 Scan Converter stores and converts analog input signals to a television video waveform for displaying on large screen TV monitors. It can integrate low level Z Axis input signals, frame freeze a vertical frame of video, selective erase portions of a display, store grey levels, and operate in a variable persistence mode.

The CRT target may be written by XY positioning the beam at random and writing at each point, or a series of points by staircase stepping. The beam may be scanned linearly, fast or slow, with modulation of the beam by a video signal or digital pulses. Analog waveforms may be written, preceded by a continuous erase bar.

The 4503 is designed for use with Tektronix Computer Display Terminals, allowing you to display information on display monitors. The Display Multiplexer Card (Option 31 or Part No. 018-0067-00) is necessary to take advantage of this feature.

Design Characteristics

Display

Display resolution is at least 500 lines at 50% modulation per picture height (1000 line resolution option available). Line writing time is 25 μs for a full screen vector; dot writing time is 25 ns. Read storage time is at least 30 minutes for saturated signal, and at least 10 minutes for full grey scale.

Vertical and Horizontal Amplifiers

The 4503 has a 1 MHz bandwidth (full screen deflection). The deflection factor for either axis is 1V full screen. Input resistance is 100K ohm; input capacitance is 150 pf or less. Common Mode Rejection Ratio is 500:1 DC to 10 kHz, 100:1 at 1 MHz.

Z Axis Amplifier

The Z axis amplifier controls the writing beam intensity. It is a linear analog input signal amplifier at 30 MHz bandwidth. Maximum signal input amplitude is 1V to turn the CRT beam full on. Input resistance is 1 MΩ; input capacitance is 70 pf or less. The input circuit may be selected to accept a + 1 or − 1 volt analog signal to turn on the CRT writing beam. A TTL HI or LO input may also be selected to turn on the CRT writing beam.

General Characteristics

The 4503 operates on 110 or 220 VAC (LO, MED, HI), 48 to 66 Hz, and requires 110 watts at 115V, 60 Hz. The instrument will externally synchronize to or internally generate any TV line rate from 525 to 1225 lines. The external sync input circuit automatically genlocks to either composite sync or composite video signals from 525 to 1225 TV lines. The composite sync out amplitude is OV to − 4V, with a return loss of at least 30 dB. Composite sync in amplitude is OV to − 4V, with a return loss of at least 40 dB at 5 MHz.

Standard Accessories

75 ohm terminator, 25-pin connector, and instruction manual.

Order Options

4503 Scan Converter Unit
R 4503 Scan Converter Unit (Rackmount)
Option 1, 1000 line resolution CRT
Option 2, RF modulator—TV channels 2, 3 or 4 available, factory adjusted for channel 3.
Option 3, Setup for 625/50Hz, 220V
Option 4, Setup for 1029/ 60 Hz, 115V

4610

Hard Copy Unit

The 4610 Hard Copy Unit makes permanent copies of the information displayed on the screen of the 4010 family of Computer Display Terminals or the 613 Storage Display Unit. The 4610 can be multiplexed to provide copying capability from one to four 4010-series Computer Display Terminals and/or 613 Storage Display Units.

Design Characteristics

Standard copy size adjustment is for 8½" by 11"; variable between 8½" x 6" and 8½" x 14". Copy time is 18 seconds for the first copy and 10 seconds for each additional.

Power Requirements

The 4610 standard unit is designed to operate on 115 VAC (LOW, MED, HI) at 50 to 60 Hz. A 220 VAC unit is also available. Power consumption is 1450 W for the first 40 seconds after turn on, 220 W to 520 W for normal operation, and 100 W on standby.

Physical Characteristics

Dimensions
Height, 11" (27.94 cm.)
Width, 17" (43.18 cm.)
Depth, 24" (60.96 cm.)

Weight, Net, 69 lbs. (31.05 kg.)
Shipping, 84 lbs. (37.80 kg.)

Order Options

4610 Hard Copy Unit
4610-1 Hard Copy Unit
(operates 220V—50Hz)
Option 1 (multiplexing from one to four 4010 series of computer terminals)
Option 2 (compatible with 4014-1 and 4015-1 computer terminals)

Paper

One roll 3M Type 777 Dry Silver paper is included with each Hard Copy Unit. Refills are available from Tektronix, Inc.
One roll, Part No. 006-1603-00
One carton of 4 rolls, Part No. 006-1603-01

Standard Accessories

Included with the 4610 are an 8 foot detachable power cord, a 10-foot interconnecting cable, and a User's Manual.

Optional Accessories

Copy Catcher (pulls and stacks copies from the Hard Copy Unit). Part No. 016-0298-00

Interconnecting Cables, 15 pin
10 foot, Part No. 012-0363-00
20 foot, Part No. 012-0363-01
50 foot, Part No. 012-0363-02
Maintenance Manual, Part No. 070-1300-00

Paper Tape Reader/Perforator

4911

The 4911 Paper Tape Reader/Perforator is a very efficient and useful peripheral that can enhance your graphics capabilities. With the appropriate interface card inserted into the minibus extender of the 4010 series of graphic display terminals, the 4911 can significantly reduce cost and on-line time by entering data or programs from pre-punched tape at slack computer times. This same capability can also expand the limited memory capacity of a minicomputer. Programs and data that would otherwise consume valuable space in core storage can be kept in permanent off-line form, and can be readily updated using a 4010-series Computer Display Terminal. Data can then be entered into the computer, using the 4911, at rates up to 200 characters per second.

Tape loading and operation of both the reader and the perforator are quick and simple through convenient grouping of front panel push-button controls. The 4911 Reader/Perforator unit uses standard, easily obtained one-inch paper, paper mylar, or aluminum-mylar tapes with a thickness range of 0.0030 to 0.0043 inch.

The 4911 requires Minibus Extender (Option 30 or Part No. 018-0069-00).

Design Characteristics

Punch Speed
75 characters per second

Reader Speed
200 Characters per second

Tapes: Paper, aluminum, or mylar

Tape Format: Roll

Bit Format: 8 bit (8 channel)

Blank Tape Supply: 1000 feet

Power Requirements
115 VAC (+10%)
47Hz—63Hz
50-60 Hz, 253 watts

Operating Temperature
+5 C to +55 C

Physical Characteristics

Dimensions
Height, 10½" (26.67 cm.)
Width, 19" (48.26 cm.)
Depth, 20" (50.80 cm.)

Weight
Net, 43 lbs. (19.35 kg.)
Shipping, 77 lbs. (34.65 kg.)

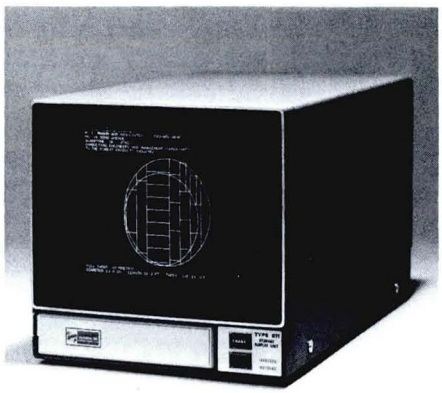
Order

4911 Reader/Perforator Unit
(including 1 roll paper tape)

611

High Resolution Storage Display

For displays of exceptional density, where high resolution is a must, the 611 Storage Display Unit is the answer to your needs. With a stored display, there is no problem of flicker or drift.



The 611 is an ideal display unit for use with the Display Multiplexer Card. All 611 control functions, Erase, Write-Thru, Nonstore, and View are remotely programmable. The 611 is also hard copy compatible, using the 4601 Hard Copy Unit. To use the 611 with Tektronix Computer Display Terminals, order the Display Multiplexer Card as Option 31, or if ordered as a separate item, Part No. 018-0067-00.

Design Characteristics

The Display. The 611 uses an 11″ (diagonal measure) flat-faced storage tube. Resolution is 4000 characters, based on a 70 x 90 mil matrix, clearly legible; this is equivalent to 400 vertical by 300 horizontal (300 vertical by 400 horizontal for the 611-2) stored line pairs. Dot writing time is 5 μs or less; erase time is 450 ms. Viewing time is 15 minutes without loss of resolution, but may be extended to one hour.

Vertical and Horizontal Amplifiers. The deflection factor is 1V full scale, either axis. Any of 9 adjustable initial beam positions can be selected by internal switches. Input R and C is 100 kΩ shunted by approximately 70 pf.

Z Axis Amplifier. Input turn-on level (unblanked) is + 1V; turn-off level (blanked) is + 0.5 V or less. Input R and C is the same as the Vertical and Horizontal amplifier.

Other Features. A busy signal is provided at the rear connector to inhibit external equipment (computer, etc.) during the erase cycle.

Requirements. The 611 operates on 110 or 220 VAC (LO, MED, HI), 48 to 66 Hz, and requires 250 watts at 115 V, 60 Hz.

Physical Characteristics

Dimensions
Height, 11⅞ inches (30.23 cm.)
Width, 11⅝ inches (29.46 cm.)
Depth, 22⅜ inches (57.40 cm.)

Weight
Net, 51 lbs. (22.95 kg.)
Shipping, 62 lbs. (27.90 kg.)

Order Information

611 Storage Display Unit
(Vertical Format)

611-2 Storage Display Unit
(Horizontal Format)

The 633 Monochrome Picture Monitor, when used with the 4503 Scan Converter, provides large screen display capabilities with excellent resolution.

Large Screen Video Display

633

The 633 is designed for measurement and qualitative evaluation of 525/60 and 625/50 standards. The monitors have many features in common such as a choice of D6500 or W9300 K phosphors. High resolution is maintained at full drive. Bandwidth is 6 MHz within 0.5 dB with 100% white amplitude.

The monitor is designed to display 50 fields/second 625-line or 60 fields/second 525 line television pictures. The display size is 8.8 inches by 11.7 inches with the 631 and 632, and 11.4 inches x 15.5 inches with the 633.

The monitor is all solid-state (except kinescope) and requires 14 inches of rack space. It can easily be changed into a rackmount version. A rectangular kinescope with a polished screen face (centered horizontally), display size of 11.4 inches x 15.5 inches, and 4:3 aspect ratio is used.

The monitor has two video input channels that can be selected from the front panel. Also, the 633 has both internal (displayed video) sync capability and external sync capability. Rear-panel input connector grounds are isolated from the chassis. Center connector and braid of the coaxial input cable drive differential input amplifiers to provide rejection of common mode signals for nondifferential input signals.

All inputs to the monitor are high impedance loop-through connected, compensated for optimum return loss when terminated into 75 ohms.

Remote operation of 633 controls is provided through a rear-panel 12-way multicon plug and modification instructions are provided for the following: Remote Contrast, Remote Brightness, Remote Video, and Tally Light.

For further information and specifications, refer to the Tektronix Television Products Catalog.

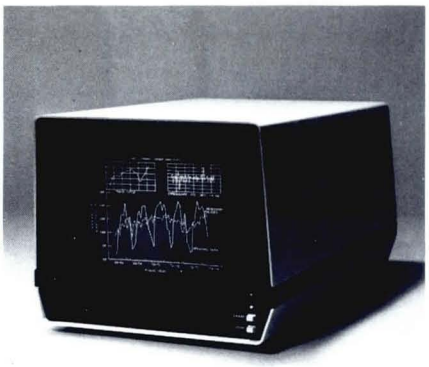
Order Information

633 Monochrome
Picture Monitor
R633 Monochrome
Picture Monitor

613

Low Cost Storage Display

The 613 Storage Display Unit is a bright, large screen data storage and display unit which allows satisfactory viewing under high ambient light conditions. It may be used whenever a substantial amount of data is stored and presented in a single display. The 613 storage display tube provides greater display brightness, at lower cost, and without any flicker or drift.



All operating functions are remotely programmable. These include View, Erase, Nonstore, and Cursor. View and Erase can also be controlled manually from the front panel of the 613.

Horizontal or vertical display formats are available. Hard copies of stored displays can be made using a Tektronix 4610 Hard Copy Unit.

Design Characteristics

The Display. The 613 uses an 11″ (diagonal measure) flat-faced CRT, with resolution equivalent to 200 vertical by 266 horizontal line pairs. Viewing time is normally 15 minutes; longer viewing may require more than one erasure to clear previously stored data. Dot writing time is 5 μs or less; erase time is 900 ms or less.

Vertical and Horizontal Amplifiers. The deflection factor is 1V full scale, either axis. Any one of nine initial beam positions may be internally selected. Input R and C is 20 KΩ/ minimum, shunted by less than 60 pf.

Z Axis Amplifier. Beam turn-on (unblanked) level is + 1 V; beam turn-off (blanked) level is + 0.5 V or less. Input R and C is 10 KΩ shunted by approximately 50 pf. A TTL LO input circuit may be selected to turn on the CRT writing beam.

Other Features. All 613 operating modes (Erase, View, Nonstore, Cursor) can be remotely controlled by applying appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible.

Requirements. The 613 operates on 110 or 220 VAC (LO, MED, HI), 48-66 Hz, and requires 180 watts (maximum) at 115 VAC, 60 Hz.

Physical Characteristics

Dimensions
Height, 11⅛ inches (28.32 cm.)
Width, 13¼ inches (33.655 cm.)
Depth, 21 inches (53.34 cm.)

Weight: Net, 43 lbs. (17.35 kg.)

Order Information

613 Storage Display Monitor
(Horizontal Display Format)

613-1 Storage Display Monitor
(Vertical Display Format)

Compact Storage Display Unit

602

The 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs.

The 602 is useful in displaying graphic (dynamic) and alphanumeric information where small display size (3.15 inches x 4 inches) is acceptable and mobility is desirable. The unit is also capable of displaying computer information in a raster format.

Design Characteristics

The Display. The 602 uses a 5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional. Standard graticule: Internal, parallax-free, variable illumination. Optional graticule: Internal 8 x 10-cm outline (no graticule lines). Maximum trace width within the display area is 14 mils at 0.5μA beam current.

Vertical and Horizontal Amplifiers. The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Z Axis Amplifier. A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to +1V range. Input R and C is 100 kΩ± 10% paralleled by 70pF or less.

Requirements. The 602 operates on 90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz, 50 watts at 115 VAC, 60 Hz.

Physical Characteristics

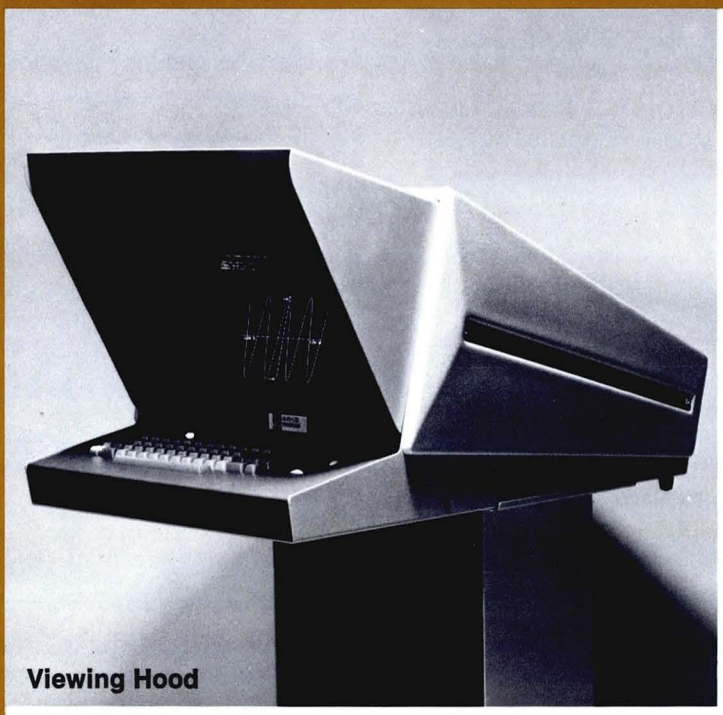
Dimensions
Height, 6 inches (15.3 cm.)
Width, 8½ inches (21.6 cm.)
Depth, 17⅜ inches (44.1 cm.)

Weight
Net, 17½ lbs. (7.9 kg.)
Shipping, 22 lbs. (9.9 kg.)

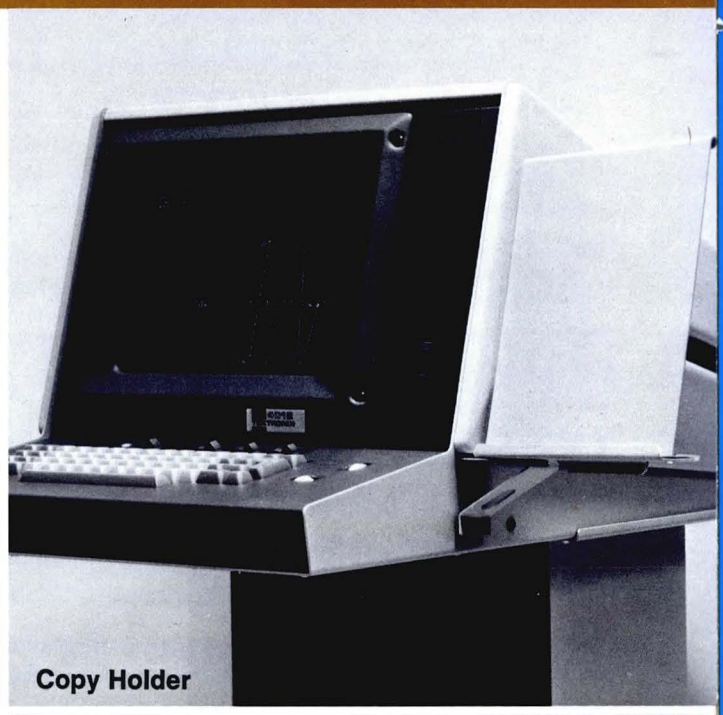
Order Options

602 Display Unit
Option 1, Without Cabinet
Option 2, Internal 8 x 10-cm Outline Graticule
Option 5, Vector Display Graticule
Option 76, P7 Phosphor

Options and Accessories



Viewing Hood



Copy Holder

Extender Cable

Wheel Kits

Maintenance Manual

A comprehensive instruction manual that provides a technician, with a reasonable background in digital electronics, the information needed to service, on at least a board-exchange basis, the terminal. The manual contains sections on physical configurations, theory of operation ,calibration, electrical and mechanical parts lists and a full set of schematics.

4010, 4010-1 Maintenance Manual

Part No. 070-1183-00

4012 Maintenance Manual

Part No. 070-1461-00

4013 Maintenance Manual

Part No. 070-1477-00

4014/4014-1 Maintenance Manual

Part No. 070-1648-00

4015/4015-1 Maintenance Manual

Part No. 070-1650-00

4023 Maintenance Manual
Part No. 070-1461-00

Minibus Extender

This circuit card allows up to five additional interfaces, options and/or peripherals such as the Audio Recorder Interface, Dual Interface and/or the 4911 to be plugged into the terminal. If more than one interface card of any type is going into the terminal, the Minibus Extender is required. The Minibus Extender is compatible with the 4010, 4010-1, 4012, 4013, 4014, 4014-1, 4015, and the 4015-1.

Minibus Extender—
Option 30, Part No. 018-0069-00

Access Cover

The access cover is an optional rear panel for the 4010, 4010-1, 4012 and 4013. It allows installation of the Dual Interface configuration in the 4010 family of terminals.

Access Cover—
Part No. 200-1288-01

Copy Holder

This allows 8½" x 11" copies to be held in a nearly vertical position on the right-hand side of the terminals. It's compatible with the 4010, 4010-1, 4012 and 4013.

Copy Holder—
Part No. 016-0291-00

Viewing Hood

The Viewing Hood is designed to shade the screens of the 4010, 4010-1, 4012 and 4013 Computer Display Terminals in high ambient light locations.

Viewing Hood—
Part No. 016-0304-00

Desk Top Mounting Kit

This kit allows for modifying the 4014, 4014-1, 4015 and 4015-1 Computer Display Terminals so the display portion can be separated from the pedestal and placed on a desk top. The interconnecting cable is 10 feet long.

Desk Top Mounting Kit—
Part No. 012-0511-00

Wheel Kits

These provide wheels for the rear legs on the 4010, 4010-1, 4012 and 4013 Computer Display Terminal.

4010, 4010-1 Wheel Kits—
Part No. 040-0604-00

4012, 4013 Wheel Kits—
Part No. 040-0653-00

4014, 4014-1, 4015, 4015-1 Wheel Kits—
Part No. 040-0714-00

Display Multiplexer Card

The 4010-Series Display Multiplexer card furnishes display and control information for one to three remote storage display monitors. By equipping the 4010-series Terminal with four Display Multiplexer cards, as many as 12 remote monitors can be used.

The Display Multiplexer is designed to operate with the Tektronix scan converter, 603, 611 or 613 Storage Display Unit.

The multiplexer allows monitors to be addressed either simultaneously or individually. It has adjustable X and Y signals, and can supply full screen deflection signals from 1 to 10 volts.

Order Information

Display Multiplexer Card
(with one cable). Option 31 when ordered with terminal, Part No. 018-0067-00 when ordered as a second option or separately.

Multiplexer-Monitor Interconnecting cable, 20 ft., connects additional monitors to display multiplexer card.

Part No. 012-0511-00

Interfaces

Different strokes for different folks. Whether you have a data communications system or use a minicomputer, you need an interface. Chances are we have it or can provide it.

Computer Interfaces. Through these interfaces, the 4010-series terminal can communicate directly to your computer or mini-computer, or remotely by data-communications. TTY Port Interfaces which communicate directly with minicomputers are available, as well as interfaces for data-communication with large time-shared computers, for both basic and more complex functions.

Standard Data Communications Interface. This is the standard interface which is included with each 4010-series terminal, unless another interface is selected. This interface incorporates the basic data communication control needed to get the 4010-series terminal "online" to a computer. The standard Data Communications Interface is fully compatible with RS-232C and its CCITT equivalent. It features full duplex communication, and "local echo" on/off control. Data communication rates are selectable from 150-9600 baud, and have separate control of transmit and receive rates. Typically this interface connects the 4010-series Terminal, through a modem, down the phone lines to a large time shared computer, but it may also be easily connected directly to a computer's Data Communication Interface (RS-232C).

Design Characteristics

Bit format
1 start bit, 8 data bits (least significant bit first), and two stop bits. The 8th data bit is normally held low.

Bit Rates (baud)
150, 300, 600, 1200, 2400, 4800, 9600

Communications Mode
Full Duplex
Local Echo, with on-off control

Electrical Connections
RS-232C Compatible

Hardware Included
One 4010 series Terminal interface board, Part No. 021-0065-00, 10-foot inter-connecting cable, and interface manual.

Optional Data Communications Interface. In a complex communications environment, extra interface performance capabilities may be required for the 4010-series terminal. The Optional Data Communications Interface has additional flexibility and convenience to match these more sophisticated data communications requirements. External switches for selecting from the five operating modes, and for separate transmit and receive bit rates, are located at the rear panel of the 4010 series terminals. Besides the standard transmit and receive data rates (110-9600 baud), two positions are available so the user can select other data rates determined by positioning internal components. This interface features even parity, and a loop through mode that enables a complete terminal check-out from the keyboard. Strap-selectable characters are available for communication line function control required by the user's system.

Design Characteristics

Bit Format
1 start bit, 7 data bits (least significant bit first) and 1 parity or data bit, 2 stop bits.

Data Rates (baud)
110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 or two user selected data rates can be programmed in place of 110 and 1800 baud settings, or externally supplied clock from Data Set can be used.

Communications Modes
Full Duplex without local echo of characters.

Full Duplex with local echo of characters.

Half Duplex; control characters signal the transmitting direction.

Half Duplex; control characters signal transmitting directions and enable receiver (Blanking).

Half Duplex; supervisory channels signal the transmitting directions.

Electrical Connections
Fully Compatible with EIA RS-232C or its CCITT equivalent.

Hardware Included
One 4010-Series Terminal plug-in interface board, Part No. 021-0074-00, control panel and 10-foot interconnecting cable with 25-pin connector.

Order Information
50-ft. Optional Interconnecting Cable Length
Part No. 012-0400-01

Audio Recorder Interface. Almost any commercial audio tape recorder with sufficient audio bandwidth can be made a useful part of your 4010-series terminal system, by the use of the 4010-series Audio Recorder Interface Card.

Design Characteristics

Audio Input (from recorder)
Signal frequency must be consistent with selected baud rate, ±5%.

Audio Output (to recorder)
Data rate baud is selectable, and is relative to data rate recorded versus audio tape speed (in inches per second)
Load requirements, 4.7Ω.

Physical Characteristics

Compatibility
Fits into 4010-series Terminal minibus connection

Order Information

4010-series Audio Recorder Interface Card
Option 32

2741 Correspondence Code/APL Interface. The 2741 Correspondence Code/APL Interface operates in any data communications environment with APL or standard 2741 correspondence code character sets, including IBM environments.

The 2741 interface features externally switchable data communication rates—134.5,300,600, 1200 baud. It operates, typically with modems, such as Bell types 103 or 113 data sets. It is fully software supported by the PLOT-10 APL GRAPH software packages as well as TSO implementations of PLOT-10 Terminal Control System, Advanced Graphics and Decision Maker.

Design Characteristics

Data Format 9 bit word, serial-asynchronous. Start, stop and parity bit inclusive.

Transmit/Receive Rates (baud)
134.5, 300, 600, 1200

Electrical Connections
EIA RS-232C Compatible

Hardware Included
One terminal plug in board, switch panel, 10 ft. interconnecting cable and interface manual.

Order Options

Ordered as the interface for the terminal:
Option 15
Ordered as the second interface with the original order or ordered later as separate item:
Part No. 021-0119-01

4010-Series TTY Port Interfaces.

TTY Port interfaces allow for direct, high-speed access to a minicomputer, using the existing teletype controller hardware.

The console teletype can be retained.

To take advantage of the terminal's speed, a fast clock signal is supplied to the TTY input/output buffers by the terminal's interface. This allows data transfer to the terminal at an optimum rate (1000-characters-per-second), and by turning this clock signal on and off the terminal can "FLAG" data when it is busy.

On Line—Selects the 4010-series terminal for high speed alphanumerics or interactive graphics.

Local—Selects the console teletype for hard copy, and paper tape input/output.

Design Characteristics

Communications Mode
High Speed, serial asynchronous

Character Format
7 data bits + 1 optional data or parity bit, start and stop bits

Transmit Bit Rate
Selectable, 11 to 300 kilo baud (bits per second) (Maximum baud rate determined by specific installation)

Receive Bit Rate
Selectable, 11 to 300 kilo baud (bits per second) (maximum baud rate determined by specific installation)

Character Receive Rate
1000 characters/sec maximum (flagged) dependent on terminal type

TTY Port Interfaces

Interface Option 2
(DEC PDP-11 with KL-11 Controller)
Part No. 021-0068-00

Interface Option 3
(DEC PDP-8/i, 8/I, 12, 15)
Part No. 021-0067-00

Interface Option 4
(Data General Nova, Super Nova, Nova 800, 1200/Nova 1200), 1220
Part No. 021-0072-00

Interface Option 6
(Hewlett-Packard 2100 Series, and others with 12531 B or C I/O controller)
Part No. 021-0071-00

Interface Option 16
(DEC PDP-11 with DL-11 Controller and PDP 11/OS)
Part No. 021-0068-01

Interface Option 17
(DEC PDP 8/e with Module M8650)
Part No. 021-0066-01

Additional Interfaces may be available upon request. Contact your Tektronix Applications Engineer for availability and quotations.

Order Options

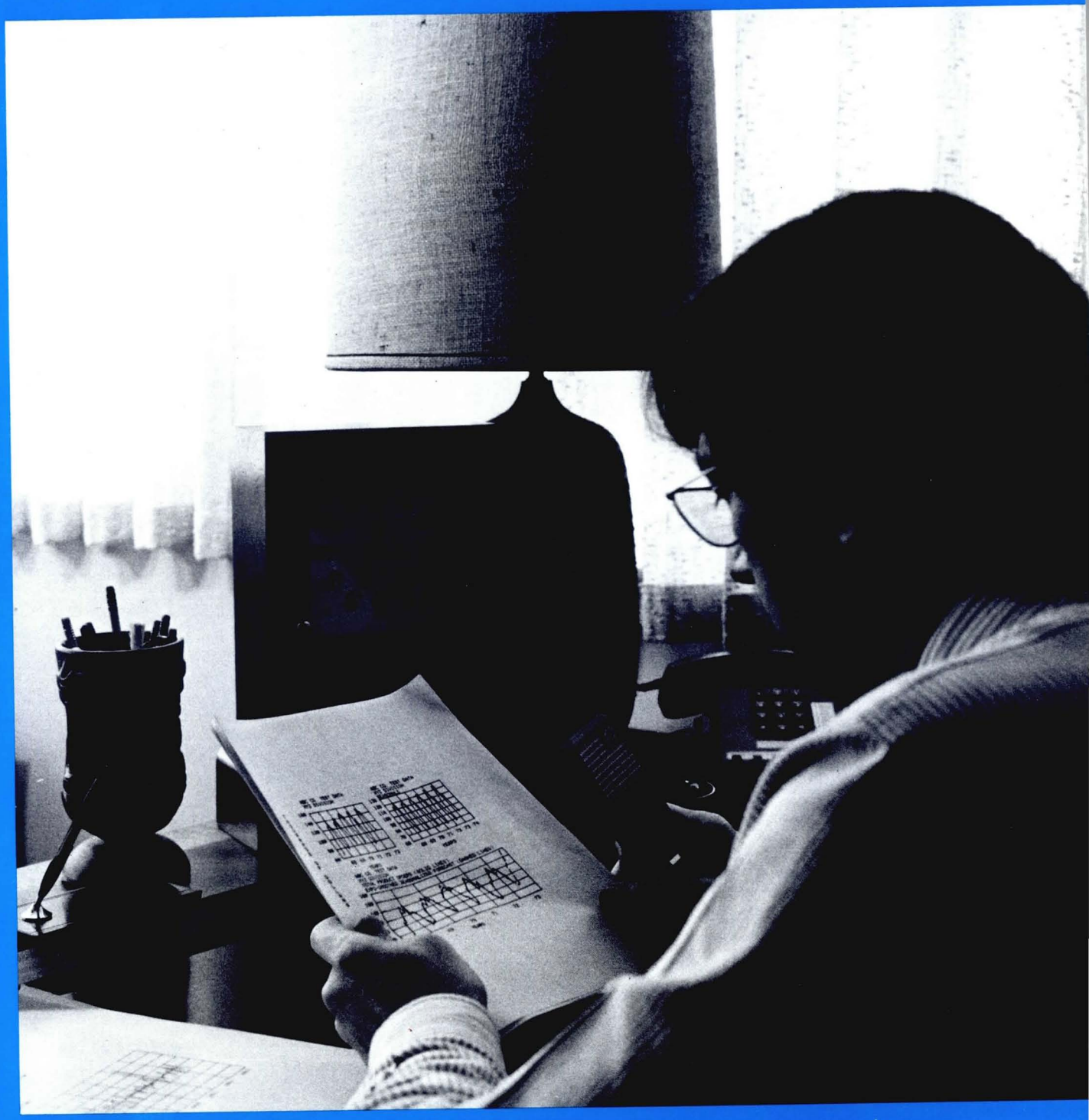
An interface ordered with the terminal is ordered by the Option number. When ordered as a second interface with the original order, or ordered later as a separate item, order by the nine-digit part number.

Hardware Included
Appropriate Interface module, 16 ft. interconnect cable with appropriate connectors and Interface Manual.

Optional Interconnecting Cable Lengths

Length	Part No.
Option 2 (DEC PDPII w/KL-11 Controller)	
50 ft.	012-0294-00
Option 3 (DEC PDP 8/i, 8I, 12, 15)	
50 ft.	012-0255-01
Option 4 (Data General Nova, Super Nova, 800, 1200)	
50 ft.	012-0256-03
Option 6 (HP 2100 Series, others with 12531 Card)	
50 ft.	012-0257-01
Option 15 (2741 Correspondence Code/APL Interface)	
50 ft.	012-0477-01
Option 16 (DEC PDP11 w/DL-11 Controller)	
50 ft.	012-0429-01
Option 17 (DEC PDP 8e with/8560 Module)	
50 ft.	012-0413-01

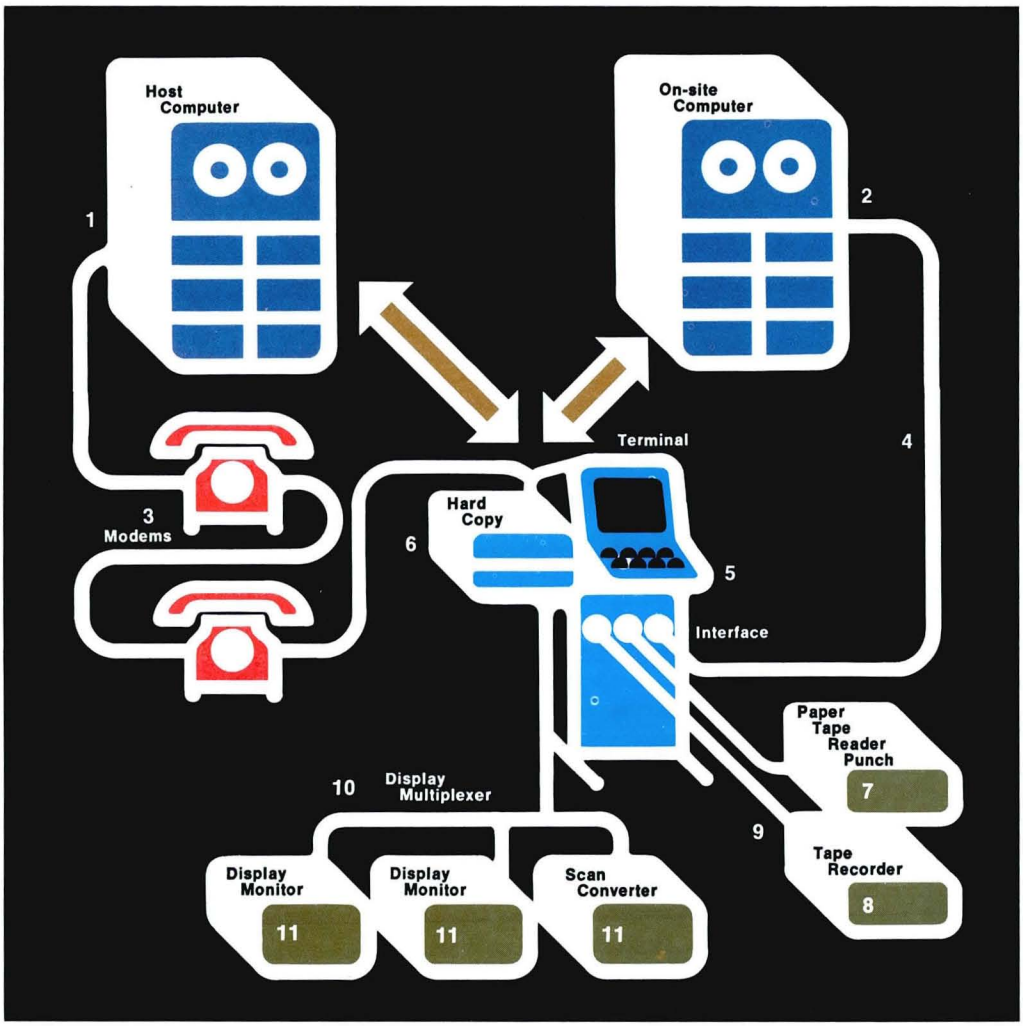
Software



Machines in themselves are useless. You have to make them go. Our extensive collection of software does that, providing you with solutions.

Guide

System Configurations Chart



1. Remote Computer
2. Local Computer
3. Data Communications Interface (Phone Line-Modems)
4. TTY Interface
5. Terminals: 4010, 4010-1, 4012, 4013, 4014, 4014-1, 4015, 4015-1, 4023
6. Hard Copy Units: 4610, 4610 Option 2, 4623
7. 4911 Paper Tape Reader Punch
8. Commercial Tape Recorder
9. Audio Recorder Interface
10. Display Multiplexer
11. 611, 613 Monitors or 4503 Scan Converter.

Terminal	Hard Copy Unit
4010-1 4012 4013	4610
4014-1 4015-1	4610, Option 2
4023	4623

Computer

IBM 360

IBM 370

G.E. 635

UNIVAC 1108

DEC PDP-10

XDS SIGMA 5, 6, 7, 8, 9

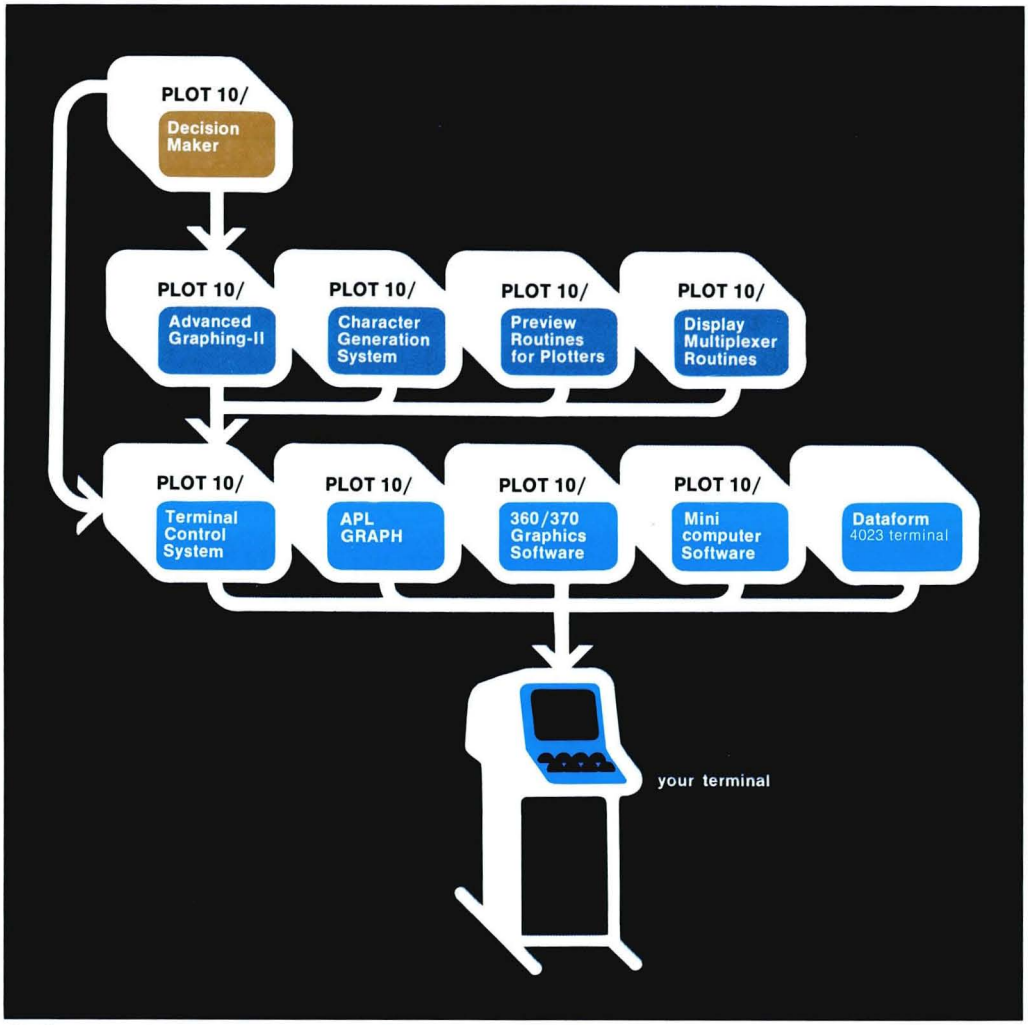
continued next page

to software

Interface	Terminal	Software
OPT. 1, STD	4010	360-370 Graphics Software[1], Terminal Control System Implementation for IBM with TSO[3], Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Decision Maker Implementation for IBM with TSO[3]
OPT. 1, STD., OPT. 15	4012	same as above
OPT. 1, STD., OPT. 15	4013	same as above plus APL GRAPH Implementation for APL/360
OPT. 1, STD., OPT. 15	4014	360-370 Graphics Software[1], Terminal Control System Implementation for IBM with TSO[3], Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Decision Maker Implementation for IBM with TSO[3]
OPT. 1, STD., OPT. 15	4015	same as above plus APL GRAPH Implementation for APL/360
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	360-370 Graphics Software[1], Terminal Control System Implementation for IBM with TSO[3], Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Decision Maker Implementation for IBM with TSO[3]
OPT. 1, STD., OPT. 15	4012	same as above
OPT. 1, STD., OPT. 15	4013	same as above plus APL GRAPH Implementation for APL/360
OPT. 1, STD., OPT. 15	4014	360-370 Graphics Software[1], Terminal Control System Implementation for IBM with TSO[3], Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Decision Maker Implementation for IBM with TSO[3]
OPT. 1, STD., OPT. 15	4015	same as above plus APL GRAPH Implementation for APL/360
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4012	same as above
OPT. 1, STD.	4013	same as above
OPT. 1, STD.	4014	same as above
OPT. 1, STD.	4015	same as above
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4012	same as above
OPT. 1, STD.	4013	same as above plus APL GRAPH
OPT. 1, STD.	4014	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4015	same as above plus APL GRAPH
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	Terminal Control System, Advanced Graphing-II[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Character Generation System[2], Decision Maker Implementation for DEC PDP-10
OPT. 1, STD.	4012	same as above
OPT. 1, STD.	4013	same as above plus APL GRAPH
OPT. 1, STD.	4014	Terminal Control System, Advanced Graphing-II[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2], Character Generation System[2], Decision Maker Implementation for DEC PDP-10
OPT. 1, STD.	4015	same as above plus APL GRAPH
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4012	same as above
OPT. 1, STD.	4013	same as above plus APL GRAPH

Guide

Software Hierarchy Chart



Software Page

Plot 10/Decision Maker 32
Plot 10/Advanced Graphing-II . . 33
Plot 10/Terminal Control System 33
Plot 10/Terminal Control System Implementation for IBM with TSO 34
Plot 10/Character Generation System 34
Plot 10/360-370 Graphics Software 34
Plot 10/Display Multiplexer Utility Routines 35
Plot 10/Preview Routines for CalComp® Plotters 35
Plot 10/Minicomputer Software . 36
Plot 10/APL Graph 36
Dataform 37

Computer

XDS SIGMA 5, 6, 7, 8, 9

CDC 6600

DEC PDP-11

DEC PDP-8e with KL8 communication interface

DEC PDP 8/i, 8/I, 12

DEC PDP-11 with DL-11 Controller

Nova, Super Nova, Nova 800, Nova 1200 with no operating system

Hewlett-Packard 2100A, 2114, 2115, 2116 with no operating system

to software

Interface	Terminal	Software
OPT. 1, STD.	4014	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4015	same as above plus APL GRAPH
OPT. 1, STD.	4023	Dataform
OPT. 1, STD.	4010	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4012	same as above
OPT. 1, STD.	4013	same as above plus APL GRAPH
OPT. 1, STD.	4014	Terminal Control System, Advanced Graphing-II[2], Character Generation System[2], Display Multiplexer Utility Routines[2], Preview Routines for CalComp Plotters[2]
OPT. 1, STD.	4015	same as above plus APL GRAPH
OPT. 1, STD.	4023	Dataform
OPT. 2	4010	Terminal Control System Implementation for PDP-11 with DOS (062-1529-01, 062-1529-03); ALS 062-1432-01[4]
OPT. 2	4012	same as above
OPT. 2	4013	same as above
OPT. 2	4014	same as above
OPT. 2	4015	same as above
OPT. 2	4023	none
OPT. 17	4010	ALS 062-1430-01[4]
OPT. 17	4012	same as above
OPT. 17	4013	same as above
OPT. 17	4014	same as above
OPT. 17	4015	same as above
OPT. 17	4023	none
OPT. 3	4010	ALS 062-1430-01[4]
OPT. 3	4012	same as above
OPT. 3	4013	same as above
OPT. 3	4014	same as above
OPT. 3	4015	same as above
OPT. 3	4023	none
OPT. 16	4010	Terminal Control System Implementation for PDP-11 with DOS (062-1529-01, 062-1529-03); ALS 062-1432-01[4]
OPT. 16	4012	same as above
OPT. 16	4013	same as above
OPT. 16	4014	same as above
OPT. 16	4015	same as above
OPT. 16	4023	none
OPT. 4	4010	ALS 062-1427-01[4]
OPT. 4	4012	same as above
OPT. 4	4013	same as above
OPT. 4	4014	same as above
OPT. 4	4015	same as above
OPT. 4	4023	none
OPT. 6	4010	ALS 062-1428-01[4]
OPT. 6	4012	same as above
OPT. 6	4013	same as above
OPT. 6	4014	same as above
OPT. 6	4015	same as above
OPT. 6	4023	none

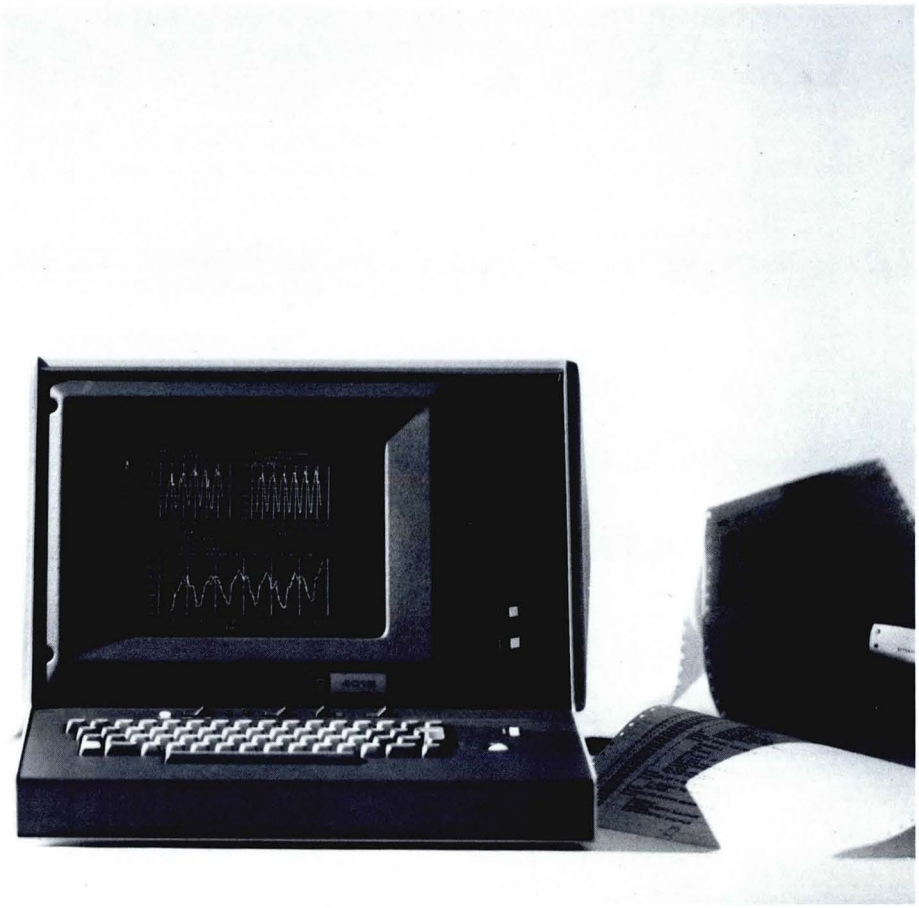
Note

The combinations of computer, interface, terminal and software compatibility shown on these charts do *not* reflect *all* possibilities. Please contact your Applications Engineer for further information concerning your system.

Footnotes

(1) Capable of running under OS-MFT, OS-MVT, and OS-MVT-TSO
(2) Needs the Terminal Control System for Implementation
(3) Operates only under OS-MVT-TSO
(4) Access Level Software written in the native language of the machine

Displays provide you with answers or the ability to get answers today. No more poring through piles of papers, analyzing data, charting and recharting to arrive at a solution.



Five years' experience in computer graphics has resulted in a useful, stable software product line, designed to help you produce informative computer graphics. This software makes maximum use of the graphic capabilities of Tektronix terminals.

Tektronix graphic software is collectively named Plot-10. All Plot-10 software permits our terminals to be used to develop new graphic applications, and to enhance those which exist. In addition, the Dataform software package has been added to the product line, to support our 4023 Refreshed Alphanumeric Terminal.

Along with a full line of software products, Tektronix also offers a variety of software support services, with a staff of software analysts at the Beaverton headquarters, and at regional offices around the United States, Europe and Japan.

Tektronix software documentation is available to all of our terminal users. For detailed information, contact your nearest Tektronix Applications Engineer or Systems Analyst. Software should be ordered through your nearest Tektronix Field Office, using the part numbers listed in the software descriptions.

Plot-10/Decision Maker. The PLOT-10/Decision Maker software system is a series of FORTRAN IV subroutines that supply the terminal user with interactive graphic analysis, forecasting, and report generation capabilities. The subroutines are divided into four groups: (1) the option select mode, (2) the data manipulation mode, (3) the analysis and forecasting mode and (4) the report generation mode. The option select mode allows the user to choose the correct mode, from the other three groups of subroutines, for what he desires to do next.

The Data Manipulation Mode is chosen by the user when he wishes to work with his data. He may generate statistics about a particular group of data. He also has the ability to enter new data, modify, add to or delete existing data, combine data mathematically, and apply seasonal patterns to his data. Data may be graphically reviewed at the terminal at any time, and the user may, at his option, zoom in on a particular series of data for closer inspection. Alphanumeric lists of any or all of the data may be generated for filing and inspection purposes.

The Analysis Forecasting Mode is selected when the user has his data ready to analyze. The data may be graphically inspected using the graphic cross-hair cursor. A judgmental technique is available for analysis of data, making use of the experience and judgment of the user. Data may be paired with a leading series to isolate turning points. Several other techniques are available for separation, computation and correlation of data. In this mode, the user also has the option to graph or tabulate his data at any time.

The Report Generation Mode provides the facility of creating finished report pages that may be saved and used later to speed up the report generation process. Graphs may be placed anywhere on the report page screen and modified to user specifications. Labels may be added to the graphs and the graphs and labels may be repositioned or deleted at any time. A dot matrix is available to aid in the positioning of the graphs and labels, and the report page may

be saved at any time during its creation.

The PLOT-10/Decision Maker package is built around the concept of a Work File and a Report File. User data (derived from the Data Manipulation Mode or Analysis-Forecasting Mode) is stored under an unique name in a "file segment" within the Work File. Report pages, generated in the Report Generation Mode, are saved under an unique page number in the Report File. User input regarding functions to be performed is accomplished through the "menu selection" process, in which a series of words are written on the screen and the desired option is chosen from them, using the cross-hair cursor. This process eliminates many of the problems previously associated with interactive techniques by eliminating the need to memorize keyword responses.

The PLOT-10/Decision Maker is designed to give the terminal user graphic analysis and forecasting capabilities without requiring him to do any programming. All of his intermediate and final results can be saved and viewed at any time, and can be combined into report pages for concise presentation of the various results.

A number of different documents is available to supplement the PLOT-10/Decision Maker package. The Primer gives a more general overview of the package, demonstrating many of the features in an easy-to-read form. The User's Manual gives an in-depth description of all of the available options and a guide to the usage of the package. The System's Manual is designed to aid the individual who has the responsibility for maintaining and/or extending the Decision Maker package at his installation. Description of the software routines, overlay techniques, and programming considerations are outlined in this manual.

The Decision Maker package comes complete with the Terminal Control System (TCS) and Advanced Graphing-II software included. This allows the user to enjoy the programming capabilities of TCS and Advanced Graphing-II (described elsewhere in this catalog), in addition to the interactive capabilities of the Decision Maker.

Decision Maker Implementation for IBM with TSO
FORTRAN IV, IBM Basic Assembler Language
User's Manual and 9-track Magnetic Tape
Part No. 062-1575-03
Decision Maker Implementation for DEC PDP-10
User's Manual and DEC Tape
Part No. 062-1576-03
User's Manual and 7-track Magnetic Tape (FAILSAFE)
Part No. 062-1576-04

Plot-10/Advanced Graphing-II.
The Advanced Graphing-II software package, written in FORTRAN IV, is extremely versatile, and will prove helpful in computer graphing to a wide range of users. It is constructed using TCS, and therefore benefits from the many strong features of that software package. By allowing the user to see and find relationships in a mass of computer data, this software package maintains the same concept of "pencil and paper" replacement. Advanced Graphing-II relieves the user of the major burden in plotting arrays of data, including axis generation, scaling, and labeling tasks.

Advanced Graphing-II provides the tools to do graphing for users on various levels. First, a full complement of routines is available to allow an experienced programmer or analyst to develop complete specialized graphs. Next, a programmer can, with minimum effort, do plotting with a series of default conditions.

With Advanced Graphing-II, the user can define his window specifications so that different graphs can be generated at different locations on the screen. User data may be displayed in a variety of graphic formats on cartesian, semi-log, log-log, and time series coordinate systems.

Important
Advanced Graphing-II software requires the Terminal Control System package for operation.

Advanced Graphing-II
User's Manual and Source Card Deck
Part No. 062-1530-02

Plot 10/Terminal Control System.
The Terminal Control System (TCS) software package is a group of FORTRAN IV subroutines. TCS forms the base for the fullest use of both the graphic and alphanumeric terminal capabilities of the 4010 family of Computer Display Terminals. This software package is designed to be modular as well as system-independent. It has user acceptance and is implemented on a variety of computers.

TCS is a tool to make your graphic terminal a more useful medium of information display. It is designed to be as close to a "pencil and paper" replacement as possible and can do complex line drawing with windowing and clipping. The windowing techniques were especially designed for easy use. They allow you to review all, or any part of complex drawings at any position on the terminal screen.

Normal alphanumeric formatting functions such as setting tabs and margins are supported by TCS. Routines are also included for support of specific terminal functions, such as erasing the screen and homing the alphanumeric cursor to a specific position.

An extremely useful terminal feature is the ability to input graphic coordinates, using the graphic cross-hair cursor. TCS provides straightfor-

ward support for this function, allowing the user to input points in the particular coordinate system he is using.

TCS can be a valuable tool in creating new graphic application programs, and in interfacing existing application programs, such as incremental plot previewing. TCS can be included in your FORTRAN library for easy access by all users. Experienced programmers may work at the basic terminal level, and facilities are provided for even the occasional user to operate easily at the conceptual level.

Although core requirements vary between systems, it has been found that 2K to 4K words is an average requirement. All I/O done by TCS uses two subroutines. These are system-dependent, and must be written by the user, according to the specifications outlined in the implementation notes supplied with TCS. Their function is simply to input and output ASCII characters.

A specific implementation of TCS is available for DEC PDP-11 users under DOS. This implementation offers complete access to TCS subroutines in Fortran and access to a major portion of TCS in assembly language. For further information, see the Plot-10/Mini Computer software section in this catalog.

Another implementation of TCS is available for IBM Systems with TSO.

Plot-10
Terminal Control System
Standard FORTRAN Subroutine Package, 4010-Series
User's Manual and Paper Source Tape
Part No. 062-1474-01
User's Manual and Source Card Deck
Part No. 062-1474-02

Plot-10/Terminal Control System. Implementation for IBM with TSO. The implementation and use of TCS for IBM with TSO is completely compatible with the description of TCS given in the preceeding section. The implementation package contains all of the IBM Job Control Language (JCL) statements, FORTRAN IV subroutines, and installation notes necessary to bring TCS up on the IBM system using TSO. The user first creates a partitioned data set from cards, and punches the indicated JCL. This deck is then used to actually create the TCS library of subroutines. Included in the installation notes are minor changes to the TCAM message control program necessary to support the Tektronix family of graphic terminals.

The TCS implementation for TSO can be used on any IBM OS/360-370 with standard TSO. This implementation contains routines and documentation required to support any of the Tektronix family of graphic computer terminals.

Plot-10
Terminal Control System Implementation for IBM with TSO
User's Manual and Source Card Deck
Part No. 062-1495-02

Plot-10/Character Generation System. To provide flexibility in character generation and display beyond that provided by the terminal's hardware character generator, Tektronix has developed the Character Generation System. This system is designed to use the facilities offered in TCS.

This package of FORTRAN IV subroutines allows the software generation and display of complex character sets. Two character sets are initially defined and provided for the user. The first is a simple, minimum stroke character set which contains upper case characters, numbers and a few special characters. The second is a more complex set which contains both upper and lower case characters, as well as numbers, and a large group of special characters which represent all the printable characters in the ASCII chart.

The Character Generation System also includes two utility routines, one for scaling and one for rotation of characters.

A stand alone program is also supplied in the Character Generation System that allows the terminal user to define his own set of characters if he has needs that cannot be fulfilled by the two provided sets.

IMPORTANT: The Character Generation System software package requires Terminal Control System for implementation.

Plot-10
Character Generation System
User's Manual and Paper Source Tape
Part No. 062-1494-01
User's Manual and Source Card Deck
Part No. 062-1494-02

Plot-10/360-370 Graphics Software. The Plot-10/360-370 Graphics Software is written in IBM's Basic Assembler Language, and is designed to operate on an IBM Model 360 or 370 with OS and MFT, MVT, or MVT with TSO. Use of this software is similar to the IBM Basic Telecommunications Access Method, in that the software handles terminal operations. The programmer who designs an application may call the Tektronix software routines that suit his purpose, while the same software may be used by the systems programmer designing a teleprocessing monitor.

The software developed to support Tektronix Graphic Computer Terminals in the System 360-370 environment falls into two general categories. The modules in the first category direct input/output operations. Routines in the second group perform special, single functions to

Software that's logical, helpful and complete. Tektronix is committed to giving you all the tools to do the job.

assist the programmer in writing a terminal application. The I/O modules are written on two levels. Level 2 routines are called by an application programmer to do character or graphic inputs and outputs. Use of the level 2 calls invokes the internal, or level 1 modules. The level one routines do the actual input and output, and perform control functions.

Terminal Input and Output operations are accomplished with IBM's execute channel program software when the package is running under OS, and TCAM TGET's and TPUT's when the package is running under TSO. The software modules that prepare and check data for transmission, or handle input, are included in the Tektronix software system. The user interfaces to the system through a number of function-oriented calls. The software supports the principal programming languages commonly used on System 360-370 including FORTRAN, BAL, PL/1, and Cobol.

The minimum core requirement for basic alphanumerics is 4K bytes. For basic graphing, the minimum requirement is 5K bytes. The maximum requirement for the entire system, including optional utility routines for axis generation and windowing, is 13K bytes. Each terminal referenced will add 308 bytes to the totals above. An additional requirement of 1.5K bytes of dynamic storage is used during execution for transient initialization routines.

Plot-10
360-370 Graphics Software
User's Manual and Magnetic Tape Source Program
Part No. 062-1437-03

Plot 10/Display Multiplexer Utility Routines. The recent growth of graphics has stimulated the desire for multiple display capabilities with Tektronix terminals. Tektronix has a Display Multiplexer Card available, which permits the use of remote monitors with any of the 4010-series computer terminals. The Display Multiplexer Utility Routines provide versatility in controlling those multiple displays.

This package includes a series of FORTRAN subroutines, using TCS, to permit individual or multiple addressing of numerous monitors in a system, and/or the terminal itself. It offers control of all remote monitors, including erasing any individual screen, generating hard copies, and initiating transmission of data from a scan converter to a video screen. IMPORTANT: the Display Multiplexer Utility Routines require Terminal Control System for operation.

Plot-10
Display Multiplexer Utility Routines User's Manual and Paper Source Tape
Part No. 062-1524-01
User's Manual and Source Card Deck
Part No. 062-1524-02

Plot-10/ Preview Routines For Calcomp Plotters. The Preview Routines for CalComp® Plotters are a set of FORTRAN subroutines designed to support the Tektronix 4010 family of Computer Display Terminals in previewing plots normally made on a CalComp plotter device. This allows viewing of plots for correction before drawing them on a plotter device. The routines were designed to interactively display information normally available to a plotter, in a variety of ways.

The Preview Routines are designed to make full use of the windowing capabilities provided in TCS. This

facilitates the previewing of large plots as a whole, or "windowing in" on more complex sections of plots. The software is designed to interface naturally with existing CalComp Incremental Plotter software routines. It also allows alteration of programs to go from normally passive plotting to the interactive plotting capabilities of the Tektronix 4010 terminal family.

IMPORTANT: Preview Routines for CalComp Plotters require Terminal Control System for implementation.

Plot-10

Preview Routines for CalComp Plotters
User's Manual and Paper Source Tape
Part No. 062-1526-01
User's Manual and Source Card Deck
Part No. 062-1526-02

Plot-10/Minicomputer Software. Tektronix provides terminal software support for minicomputers using teletype port interfaces. These software packages provide basic alphanumeric and graphics input/output routines. They are coded in the native Assembly Language for each minicomputer, and usually employ FORTRAN compatible subroutine linkages. This minicomputer software is designed for minicomputers with no operating systems.

Four basic software routines are provided with each PLOT-10 Minicomputer Software package. Subroutines are supplied for input and output of the 128 ASCII characters. A simple plot routine will draw vectors with no windowing or clipping available, and a routine is supplied to perform graphic input.

Depending on the minicomputer, between 150 and 200 words of storage are required for any one of the PLOT-10 minicomputer software packages.

For those minicomputer users with larger system configurations, consider our Terminal Control System software. Specifically, DEC PDP-11 users with DOS may take advantage of the PLOT-10/Terminal Control System Implementation for PDP-11 with DOS.

Plot-10/Minicomputer Software for 4010-Series Terminals

Data General Nova, Super Nova, Nova 800, and Nova 1200 Routines

User's Manual and Paper Source Tape
Part No. 062-1427-01

Hewlett-Packard 2114, 2116, 2100A Routines

User's Manual and Paper Source Tape
Part No. 062-1428-01

DEC PDP-8, 8/E, 8/I, 8/L, 12 Routines

User's Manual and Paper Source Tape
Part No. 062-1430-01

DEC PDP-11 Routines

User's Manual and Paper Source Tape
Part No. 062-1432-01

Varian 620/I, 620/L, 620/R, 620/F Routines

User's Manual and Paper Source Tape
Part No. 062-1431-01

Plot-10/TCS for 4010-Series Terminals

Implementation for PDP-11 with DOS

User's Manual and Paper Source Tape
Part No. 062-1529-01

User's Manual and DEC tape
Part No. 062-1529-03

Plot-10/APL Graph. APL (A Programming Language) provides an extremely flexible language for computer graphics. Tektronix has implemented a group of functions to exploit the advantages of APL for computer graphics.

The APL GRAPH package works using a "virtual window" concept. Lines and points are plotted in two dimensions in an arbitrary space, which is then projected onto the face of the terminal. This projection is onto a so-called "screen window," which may be positioned anywhere on the face of the terminal screen.

The plotting package is divided into four major sectors: Utility, Vector Plotting, Alphanumerics, and X-Y Plotting.

The Utility section includes functions to properly initialize and terminate a session at the terminal. The unique properties of the terminal are supported, including erasing of the screen, ringing of the audible bell, and hard copy generation. In doing vector plotting, window boundaries can be defined within which the vectors are to be drawn. The vectors generated can be located according to absolute coordinate locations, or relative to previously drawn vectors. Scaling and rotation can be done automatically. KCM and KIN are two functions which allow vector drawing in centimeters and inches respectively. This section also contains support of the graphics cursor input facility available on the 4013 and 4015.

A complete group of functions is provided for alphanumerics handling. These include functions to generate a new line, carriage return, line feed, back space, and home. In this section are functions to generate a new page, set up both horizontal and vertical tabs, and define software margins.

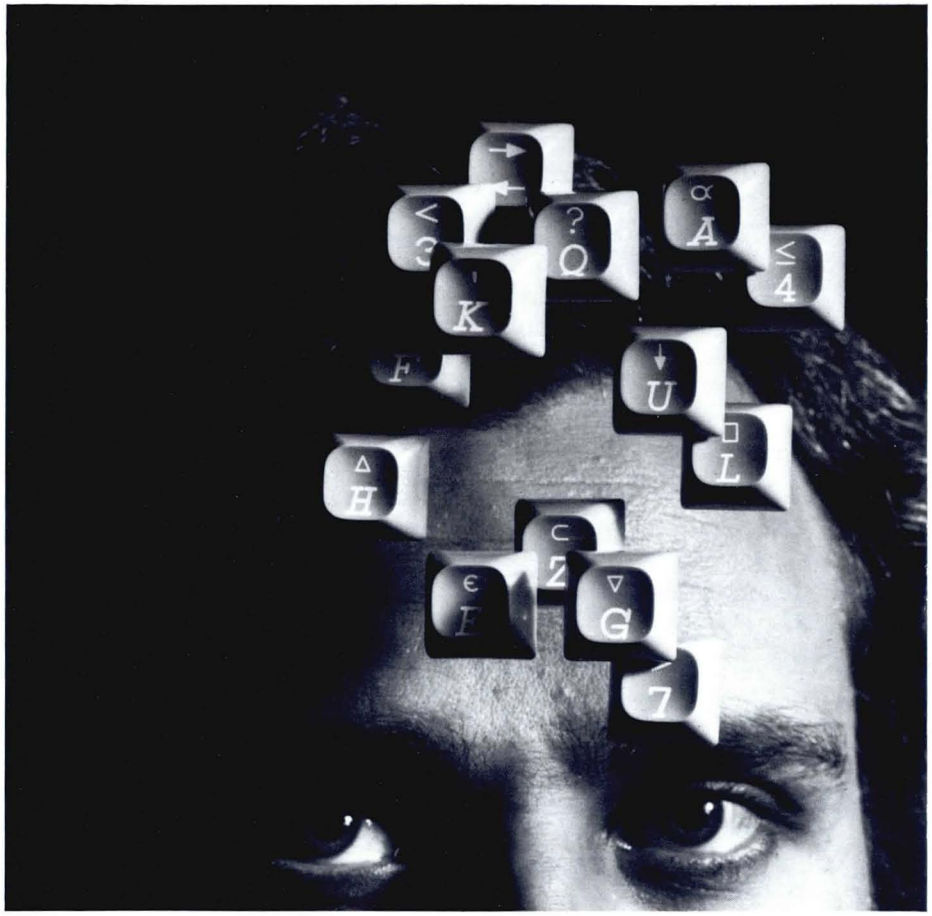
Plotting functions are available to graph X-Y coordinates on cartesian, semi-log, log-log, or polar coordinate systems. These graphs may or may not contain grids for data accuracy. Functions are also available for drawing date-time and stock market (High, Low, Volume) graphs.

For business uses, functions are available to generate pie charts and histograms. This section also contains a function which allows curve fitting with plotted results.

This software package allows the end user to solve problems from the extremely simple to the extremely complex. This can be done interactively in a straight forward fashion.

For IBM users, there is a 2741 interface available that supports the standard function package.

Products and solutions, not for a select few, but for many divergent purposes—from medical research to energy exploration, from business data to educational applications—software and hardware provide a better way to do it.



Plot-10

APL GRAPH Standard Function Package

User's Manual and Paper Source Tape
Part No. 062-1527-01

Plot-10 APL GRAPH Implementation for APL 360

A special implementation of the APL GRAPH software is available for users of APL\360. This software package contains all of the functions described under the APL GRAPH software package, along with the changes to APL\360 to support the 4013 and 4015 Graphic Display Terminals.

This APL GRAPH implementation is provided on magnetic tape as a normal work space dump tape along with the required changes to APL\360. This implementation will support the 4013 and 4015 Computer Display Terminals under APL\360.

Plot-10

APL GRAPH Implementation for APL\360

User's Manual and 9-track Magnetic Source Tape
Part No. 062-1528-03

Dataform. The Dataform software package has been designed to assist the application programmer in his use of the 4023 Alphanumeric Terminal. Full functional control and formatting routines are provided in the easy-to-use ANSI FORTRAN subroutines.

The 4023 functions that are supported by Dataform are numerous. Dataform can clear the display, clear the input fields only, and initiate hard copies by the 4623 Hard Copy Unit. It can also read the current character location, or position the cursor to a specified line and space. It can read the entire contents of the display buffer, or the display buffer input fields only. Dataform can also control the Rulings mode, permitting the entry or deletion of optional special characters in displaying horizontal or vertical lines. It can encode and set display format control characters, instructing the terminal to treat these characters as 4023 display fields.

In addition to functional control, Dataform provides the application programmer the means to manage all of the terminal features, and to structure the data to be input or displayed. The principal vehicle for structuring data exchange is called a FORM, which is a collection of field definitions, and associated text and subformats. The Dataform package provides several software tools to read, display, interpret, and modify forms. These routines free the application programmer from the task of manipulating characters to control the routine setup and use of the terminals, allowing him to concentrate on the application being developed.

Terminal input and output operations are localized in Dataform to two subroutines to assure ease of implementation. These routines are not provided in the standard Dataform package due to the system dependencies of terminal input/output, but a detailed explanation of these subroutines' structure is included in the implementation notes.

Dataform

Implementation for 4023 Terminal

User's Manual and Source Card Deck
Part No. 062-1573-02

4002A

The 4002A Display Terminal offers three graphic modes (vector, point plot, and incremental plot) for graphic display flexibility. In alphanumeric operation, both upper and lower case alphabets are offered, with the full ASCII character set of 96 printing characters, plus the TTY upper case subset.

Display Unit. The display screen is a direct-view storage CRT, with space for up to 39 lines of alphanumeric text, each with up to 85 standard-size characters per line. Located below the storage display is a refreshed one-line Scratch Pad display, with space for as many as 84 characters.

The Keyboard. Control and character key entries are made through a teletypewriter-style keyboard, with an adjacent control panel which sets terminal operating conditions.

The 4002A operates on 110 or 220 VAC (HI, MED, LO), at 50 to 60 Hz., and requires 250 watts operating power. It is designed to operate between + 10°C and + 40°C. It is 19.375 inches high, 19 inches wide, and 34.875 inches deep. Net weight is 130 lbs.; shipping weight is 187 lbs.

Order Information

4002A Graphic Computer Terminal without Interface

Data Communications Interface

(RS-232C Compatible)
Part No. 021-0033-00

TTY Port Interfaces

DEC PDP 8/i, 8/I, 12 Interface
Part No. 021-0034-00

Data General Nova, Super Nova, Nova 800 and Nova 1200
Part No. 021-0035-00

Hewlett-Packard 2100 series, and others with 123531 Card
Part No. 021-0036-00

DEC PDP-11 with KL-11 Controller
Part No. 021-0040-00

DEC PDP-11 with DL-11 Controller, and PDP-11/05
Part No. 021-0040-01

DEC PDP-8e with Module M8650
Part No. 021-0047-01

Additional interfaces may be available. Contact your Applications Engineer for availability and quotations.

Plot-10 Minicomputer Software.

DEC PDP-8, 8/e, 8/i, 8/I, 12 Routines

User's Manual and Paper Source Tape, Part No. 062-1400-01

DEC PDP-11 Routines

User's Manual and Paper Source Tape, Part No. 062-1402-01

DEC PDP-4, 7, 9, 15 with Advanced Monitor Routines

User's Manual and Paper Source Tape, Part No. 062-1399-01

DEC PDP-9, 15 with Background/Foreground Monitor Routines

User's Manual and Paper Source Tape, Part No. 062-1404-01

Hewlett-Packard 2114, 2115, 2116 Routines

User's Manual and Paper Source Tape, Part No. 062-1398-01

Data General Nova, Super Nova, Nova 800, Nova 1200 Routines

User's Manual and Paper Source Tape, Part No. 062-1397-01

DEC PDP-11 Fortran Compatible Routines

User's Manual and Paper Source Tape, Part No. 062-1476-01

The 4601 Hard Copy Unit provides permanent copy capability to the 4002A Computer Display Terminal and the 611 Storage Display Unit. Convenient, economical, high-resolution copies of alphanumeric or graphic displays are provided on 3M Type 777 Dry-Silver Paper.

A pushbutton on the 4601 front panel initiates copy-making, or copying may be started under program control.

Design Characteristics

Standard copy size, factory adjusted, is for 8½" by 11". Copy time is 18 seconds for the first copy and 10 seconds for each subsequent copy.

Power Requirements

The 4601 standard unit is designed to operate on 115 VAC (LO, MED, HI) at 50 to 60 Hz. A 220 VAC unit is also available.

Physical Characteristics

Dimensions

Height, 10½ inches (26.67 cm.)
Width, 16½ inches (41.91 cm.)
Depth, 23 inches (58.42 cm.)

Weight: Net, 69 lbs. (31.05 kg.)
Shipping, 84 lbs. (37.80 kg.)

Order Information

4601 Hard Copy Unit

4601-1 Hard Copy Unit
(operates on 220V, 50-60 Hz)

Option 1, Blue Cabinet

(Instrument set up for use with type 611 Display Unit)

Paper

One roll 3M Type 777 Dry Silver Paper is included with each Hard Copy Unit. Refills may be purchased from Tektronix, Inc.

One roll, Part No. 006-1603-00

One carton of 4 rolls, Part No. 006-1603-01

Standard Accessories

Included with the 4601 are two 6-foot interconnecting cables, one 8-foot detachable power cord, one User's Manual (Part No. 070-1393-00) and a Maintenance Manual (Part No. 070-1343-00, mailed free upon request with order).

Optional Accessories

Copy Catcher (automatically catches copies from 4601)
Part No. 016-0298-00

Business information

A quality product line backed by sound and fair business practices. Tektronix is genuinely concerned about you—the customer—before and after sales.

General terms of sale and warranty

Orders should be placed with your Tektronix Field Office listed on Pages 47-48.

Tektronix, Inc. offers many different terms of sale in order to meet varied purchasing objectives and to assist in financial planning. Any of the following terms may be arranged with an Applications Engineer.

Net 30 Days

Tektronix, Inc. standard terms of sale are NET 30 days, which is to agree that payment will be due thirty days following the date of shipment.

Extended Terms of Sale

Extended terms of 60 to 120 days are available on the same single payment basis as standard terms. Since the cost of extended terms is not included in catalog prices, a service charge is added to the catalog price. The amount of the service charge depends upon the number of days the terms are extended.

Rental Agreement

Certain Information Display products are available under an operating rental program where the customer pays only for use and maintenance of the equipment on a monthly basis. Rental terms are NET 15 days. The minimum fixed term of this rental agreement is 12 months, with automatic renewal on a month-to-month basis thereafter, until cancellation. Equipment rented on this program is maintained by Tektronix, Inc. during the term of the agreement.

Lease Agreement

All new catalog products are available under the standard Tektronix lease program. Accessories and parts are not available unless they are associated with the products being leased. Customers may provide their own maintenance or contract maintenance service from Tektronix.

A standard lease term of 12, 18, 24, 30 and 36 months is offered. Longer terms are negotiable. Under a Lease Agreement, the customer pays for the use of the product for the term of agreement. It is not a month-to-month rental . . . it is a noncancellable fixed-term agreement requiring no advance payment. At the expiration of the term there is the opportunity to update the instruments, to renew the existing lease agreement, or to return the equipment at the expense of Tektronix, Inc. The customer may exercise an option to purchase the equipment at any time during the term of the agreement, provided he gives thirty days' written notice. A portion of the monthly installments (50%—not to exceed 75% of catalog value) will be credited toward the purchase price.

Conditional Sales Contract

This program provides monthly installment payment terms while Tektronix products are in use by the customer.

Accessories and parts are not available unless they are associated with the products being purchased. New and used products may be purchased with a deduction for applicable quantity discounts.

An advance payment equal to at least 10% of the purchase price of the equipment desired is required for a Conditional Sales Contract. Installment terms covering the balance of the contract price are available for 6, 12, 18, 24, 30 or 36 months. Minimum balance amounts may be financed, ranging from $200 for six months to $2000 for thirty-six months. Longer terms of 48 to 60 months are available by quotation for financed balances of more than $10,000. There are no maximum finance balances.

All products carry the standard IDD warranty. The customer is responsible for the equipment and applicable property taxes, licenses, etc. Upon completion of the term of agreement and prescribed payments, the customer owns the equipment.

Warranty

All Tektronix instruments are warranted against defective materials and workmanship for one year.

Additionally, all Tektronix Computer Display Terminals and related computer peripheral equipment are fully warranted against *any* trouble for the first 90 days. Any equipment trouble occurring to your Tektronix computer terminal or related products during the 90 day period will be repaired by Tektronix personnel at no charge.

Questions regarding warranty should be discussed with your Applications Engineer.

Shipment

All prices, quotations and shipments are FOB Beaverton, Oregon, unless otherwise specified.

Unless otherwise specified, shipment will be made via the most economical method. Surface and air shipments will be insured at full valuation unless your order instructs otherwise.

Information in this publication supersedes all previously published material. Specification and price change privileges reserved.

Tektronix Field Services

There are field services available through Tektronix Field Offices and Overseas Representatives. It is our intent to consistently provide unequaled product service and support. These are available through local offices staffed by employees of Tektronix, Inc.

Application Engineers

Your Application Engineer is fully prepared to respond to your technical and business requirements. He has a strong technical background and has extensive product and business training.

Systems Analysts are located at Tektronix' field offices to help you, too. They are experts in analyzing systems and software, and can advise you about which Tektronix' products best fit your needs.

Applications

Perhaps the answers you need in a specific application can be obtained faster and easier through use of your Tektronix instrument. Your Applications Engineer can help you find out, and if use of your instrument is indicated, help you with procedures. He may also be able to suggest many time-saving uses for your instrument in routine checks and measurements.

Customer Ordering

Working closely with your Applications Engineer when preparing a purchase order for Tektronix products can assure you of more efficient delivery of your new equipment. Incorrect combinations of instruments ordered together, incomplete orders, etc. can cause your order to be delayed at the factory resulting in unnecessary idle time for you. Also, due to separate and individual instrument release dates, some products are ready for shipment well ahead of others. If a "no partial" order is received at the factory, the entire shipment will be held until delivery of all items is possible.

Maintenance

Tektronix, Inc., willingly assumes much of the responsibility for continued efficient operation of the instruments it manufactures. If you should experience a stubborn maintenance problem, your local service center will gladly help you isolate the cause. Often a telephone call will help you get your instrument back in operation with minimum delay.

Product Service—Reconditioning

To help assure adequate product service and maintenance facilities for our customers, Tektronix, Inc. has established Field Offices and Service Centers at strategic points throughout the United States and overseas. Contact your Applications Engineer for details concerning—warranty—emergency repairs—repair parts—scheduled maintenance—reconditioning and overhaul—pickup and delivery—maintenance contracts—on site service for fixed installations—other services available through these local offices and centers.

Emergency Repair

This service will help you in situations where products require immediate attention. If your Tektronix product malfunctions, or if you want a particular characteristic optimized, just bring it to your local service center. Work starts when you arrive. In most cases we will solve the problem immediately and get you on your way in a matter of minutes.

Repair Parts

Repair and replacement parts service is geared directly to the field; therefore, all requests for repairs and replacement parts should be directed to the Tektronix Field Office or service center in your area. This procedure will assure you the fastest possible service. Please include instrument type number and serial number with all requests for parts or service. *Please do not return instruments or parts before receiving directions.* Scheduled Maintenance, Reconditioning and Overhaul—Proper, scheduled maintenance will enable your Tektronix product to deliver many years of dependable service.

Your older Tektronix products can be reconditioned or completely overhauled, restoring them to catalog specifications. Our service centers are equipped to clean and completely overhaul, both electrically and mechanically, all Tektronix products.

General Information—Customers Outside the United States

To provide you with personal assistance in ordering as well as servicing products, we have established Field Offices and technically qualified Tektronix distributors in many countries throughout the world. The Tektronix office or distributor in your country will be pleased to help you select the instrument that best suits your requirements in performance, and provide you with prompt ordering service.

Service

If you require service, replacement parts, a warranty question resolved, or other help, please notify the Tektronix facility through which you ordered your instrument. They will process all orders when needed to restore an instrument to operating condition. They will also arrange for fast service with necessary recalibration or repair work on your instrument.

Europe: Datatek N.V.; (P.O. Box 7718, Schiphol Airport (East), The Netherlands. Telephone: 020-452155. Telex: 16565. Cable: Datatek Holland.

Japan: Sony/Tektronix Corporation; 9-31, Kitashinagawa-5, Shinagawa-Ku, Tokyo 141 (P.O. Box 14, Heneda Airport, Tokyo 149). Telephone: 445-0221 (Area 03/Tokyo). Telex: 02422850. Cable: SONYTEK Tokyo.

Canada: Tektronix Canada Ltd.; 900 Selkirk Street, Pointe Claire 730, Quebec. Telephone: (514) 697-5340. Telex: 05821-570.

Australia: Tektronix Australia Pty. Limited, Sydney; 80 Waterloo Road, North Ryde, N.S.W. 2113. Telephone: 888-7066. Telex: AA 24269. Cable: TEKTRONIX Australia, 128 Gilles Street.

East European customers requesting information should contact:
Austria: Rohde & Schwarz-Tektronix GmbH & Co. K.G., Prinz Eugen Strasse 70, 1040, Wien, Austria. Telephone: Vienna 653704. Telex: 13933.

Countries with no Tektronix Distributor or Tektronix Field Offices Please address your inquiries and orders to:

Tektronix, Inc.
Export Marketing Department
P.O. Box 500
Beaverton, Oregon 97005 USA

Tektronix

A friendly, relaxed environment on a 300-acre, parklike setting, Tektronix provides a favorable atmosphere for creating products that work for you.

Making it work for you

Tektronix is a relatively young company, being just 27 years old. It grew from a handful of employees working in one small garage-like building. The original lone item they were producing was an oscilloscope, a model which was even then the best of its kind. Sales for the first profitable year, 1948, totaled a humble $257,000.

Today Tektronix has over 11,500 employees designing and manufacturing more than twenty different products including oscilloscopes, information display products, automated measuring systems, television products, calculators, and spectrum analyzers. All this brought in a healthy total sales of nearly $200 million for 1973.

The home office located in Beaverton, Oregon has surpassed its original one small building many times over, until today it is no less than a 300-acre industrial park with over 2 million square feet dedicated to design and manufacturing. Field offices and service centers are now worldwide.

What kind of company is this that has sprung up like Topsy? In two words: people oriented. Every company is made up of human beings, but not every company continues to remember that. Tektronix does. Its attitude toward people makes it the kind of company it is today.

Four basic tenets, set down by the founders, have molded and guided Tektronix' growth. "First, the individual has dignity and importance. Second, people are honest in a total sense. Third, each person wants to do a good job, and fourth, no one has ever really found the limits of human ability." With this positive attitude, Tektronix has become a company based on trust, responsibility and respect.

It encourages its employees to think and to go beyond the limits of normal "workaday" jobs, to do the very best they can. Tektronix, therefore, is based on change. Because when people have an atmosphere in which to think unrestrictedly, change comes naturally.

Tektronix might have the looseness born of a short rulebook, but that doesn't mean its employees have easy jobs or get nothing done. It means they have the freedom to go beyond what the job calls for. This makes Tektronix a rather unusual company, but from the standpoint of management it was the only way to go. They knew that highly technical work done by very competent people was touchy to direct. They decided a heavy, rule-encrusted organization would only get in the way.

Instead, people and management learned to work in an informal, mutually-helpful environment which gives results surpassing a more structured approach .

With unnecessary formalization out of the way, the workers can get down to problem-solving and product-manufacturing, which is a difficult business in itself. In the first place, it is hard to create any technically precise instrument, and in the second place, putting precision to the acid test of mass production is a little like trying to perform one delicate brain operation a minute. It is a challenge, requiring the patience of Job and the industry of an ant.

Every drawing board idea is given tests on the engineering level which would be labeled abusive in some circles. Hours are spent working and reworking the original concept to the point where it can be handed over to meticulous assembly personnel. Then, more hours of exhaustive testing occur to make sure that everything performs to perfection, all adding up to products with quality and reliability on jobs throughout the world.

But it doesn't end there. Tektronix also backs up each product with after sales service that's hard to match anywhere. This includes instruction, installation, and maintenance service whenever, wherever you need it.

Tektronix and the people that work there are interested in giving you, the customer, the very best that can be produced. It is no doubt a difficult goal, and it may sound like a lot of talk, but when people direct their energy toward some common goal, it shows in the end.

Quality products from a solid foundation

Tektronix is a company genuinely interested in creating answers to your problems. These answers take the form of state-of-the-art products, which become that way purposely, not accidentally. Care is taken every step of the way, by every member of the Tektronix team. By the time you plug in the finished product, you can feel confident it will solve your problems.

The creation of a Tektronix display product begins in many places—business environments, research centers, universities, or the minds of engineers, marketing specialists or executives. When the problem is identified and a need established, our engineers go off and invent solutions. These solutions are introduced into the world only after being rigorously tested and reworked and then tested and reworked some more until every kink is smoothed out and every tangle is unraveled.

Each Tektronix product is tested to its own specifications. To give a good example of what goes on behind the testing room door, let's look at the fate of sample Tektronix 4010 terminals.

On the engineering level, terminals are environmentally tested both operationally and non-operationally to insure that they are adaptable to varied conditions. First, they go to the ovens for heat tests which put the terminals through 40 hours of temperature fluctuations ranging from 10° to 40°C while a computer exercises them to make sure nothing is burning up or freezing out.

Next, a humidity test simulates near desert (5%) to rainforest (80%) conditions, again under computer scrutiny, and then, as if to add insult to injury, the terminals are taken "flying." Operationally they must withstand pressures from sea level to 15,000 feet, while non-operationally (to assure they can fly to your door) they must go upwards around 50,000 feet.

A set of mechanical tests then does all it can to "shock, shake, and ship" the guinea pig terminals. First, they are dropped three times from a height of about three feet on x, y, and z axis, which puts about a 20g strain on them. As if that were not enough, they are given a thorough shaking on two and then three axes for about one half hour while a computer exercises them to make sure nothing goes amiss.

Tektronix even impersonates the postal system by putting the terminal testees in shipping containers and taking them through the "traffic simulator" which bounces them around like a truck. This almost abusive testing takes about a week to complete, but when it is all over, each product is what it is—highly reliable even under the most adverse conditions.

After the engineers' ideas are tested and refined, products are handed over to manufacturing personnel, who turn each protoype to mass production multiplicity. To insure that none of the quality is lost inbetween, Tektronix has developed a unique assembly line. Taking words of wisdom to heart, that too many cooks spoil the broth, fewer people assemble each single product than is normally the case in production lines. Each person is encouraged to learn how "the whole thing" works, so they know what they are doing with each wire and screw they put in. It may be slower, but inevitably more care is taken and a better job is done.

Tektronix has set up more than an assembly line. It has organized a group of craftsmen who take pride in creating products with the spark of excellence.

Tektronix information display products don't just go from workbench to shipping room. They are again exhaustively tested by a series of computer-programmed exercises aimed at every parameter of the circuit board, the cables, and the unit. To eliminate chances of failure, they are worked for 200 continuous hours at 40°C after which they are again given two more rigorous computer tests. Only then does Tektronix give you the finished product—well known for reliability and quality.

From engineering, manufacturing and testing to marketing and sales, the entire Tektronix team works together to build you quality products.

Worldwide Offices

Nationwide, and worldwide if you need, Tektronix' network of field offices and service centers provides you close, well-qualified maintenance and assistance.

Tektronix Field Offices

Alabama

Huntsville 35801
Suite 51, 3322 S. Memorial Parkway
Phone (205) 881-2912, Telex 59-4422

Arizona

*Phoenix 85034
2643 E. University Drive
Suite 113
Phone (602) 244-9795, Telex 66-7401
Tucson Area: Enterprise 383

California

*Concord 94520
2339A Stanwell Circle
Phone (415) 687-8350, Telex 335-344
From Oakland, Berkeley, Richmond, Albany and San Leandro: 254-5353

*Irvine 92705
16601 Hale Avenue
Phone (714) 556-8680, Telex
From Los Angeles: (213) 778-5225

†Santa Ana 92705
Suite E, 1420 So. Village Way
Phone (714) 541-4162

Santa Clara 95050
3000 Scott Blvd.
Phone (408) 249-5500

Palo Alto 94303
3750 Fabian Way
Phone (415) 326-8500, Telex 34-8411
(Info. Disp. Prod. 415-321-7728)

†Mountain View Service Center
2133B Leghorn Street
Mountain View 94040
Phone (415) 967-2863

*San Diego 92111
6841 Convoy Court
Phone (714) 292-7330, Telex 69-5025

San Jose
Suite 1B, 280 Martin Avenue
Santa Clara 95050
Phone (408) 296-3010, Telex 34-6439

*Van Nuys 91406
16930 Sherman Way
Phone (213) 987-2600, Telex 65-1426
From L.A. call: 873-6868

Colorado

*Denver
6801 So. Yosemite St.
Englewood 80110
Phone (303) 771-8012, Telex 4-5798

Connecticut

*Milford 06460
#20 Commerce Park Road
Phone (203) 877-1494, Telex 9-9338

Florida

*Fort Lauderdale 33311
1871 West Oakland Park Blvd.
Phone (305) 731-1220, Telex 51-4474
Also serves Puerto Rico and U.S. Virgin Islands
From Miami: 944-6948

*Orlando 32803
1040 Woodcock Road
Phone (305) 894-3911, Telex 56-4465
From the Cape Kennedy Area: 636-0343

Pensacola 32503
Suite 130, 4900 Bayou Blvd.
Phone (904) 476-1897, Telex 70-2430

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*Atlanta 30341
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Phone (404) 451-7241, Telex 54-9508

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1541 Elmhurst Rd.
Elk Grove Village 60007
Phone (312) 593-2830, Telex 72-6347

†Chicago Service Center
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Elk Grove Village 60007
Phone (312) 956-1774
Telex 28-2577

Indiana

*Indianapolis 46219
6121 East 30th Street
Phone (317) 546-2408, Telex 27-348

Kansas

*Kansas City
Suite 101, 6025 Lamar
Mission 66202
Phone (913) 432-1003, Telex 4-2321

Louisiana

New Orleans
3004 34th Street
Metrairie, La. 70001
Phone (504) 837-8454

Maryland

*Baltimore
1526 York Road
Lutherville 21093
Phone (301) 825-9000, Telex 87-804
From Harrisburg, Lancaster and York Area call: ENterprise 1-0631
(Info. Disp. Prod. 301-821-9390)

*Rockville 20850
1335 Piccard Drive
Phone (301) 948-7151, Telex 89-8349

Massachusetts

*Boston
244 Second Avenue
Waltham 02154
Phone (617) 890-4550, Telex 92-3446
From Providence: (401) 739-4771
(Info. Disp. Prod. 617-890-5950)

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*Detroit
22132 West Nine Mile Road
Southfield 48075
Phone (313) 358-3122, Telex 23-0692

Minnesota

*St. Paul 55112
3775 North Dunlap Street
Phone (612) 484-7255, Telex 29-7095

Missouri

*St. Louis
11331 Natural Bridge Road
Bridgeton 63044
Phone (314) 731-4696, 7, Telex 44-851

New Jersey

*Springfield 07081
964 South Springfield Avenue
Phone (201) 379-1670, Telex 13-8259

New Mexico

*Albuquerque 87108
1258 Ortiz Drive, S.E.
Phone (505) 268-3373, Telex 66-0421
Southern N.M. Area: ENterprise 678

New York

Albany
678 Troy Road
Latham 12110
Phone (518) 785-3353, Telex 145-402

Buffalo 14225
965 Maryvale Drive
Phone (716) 633-7861, Telex 91-385

*Endicott
3214 Watson Blvd.
Endwell 13760
Phone (607) 748-8291, Telex 932-421

*Long Island
125 Mineola Avenue
Roslyn Heights, L.I. 11577
Phone (516) 484-2300, Telex 96-1328

*Poughkeepsie 12603
One Old Mill Road
Phone (914) 462-4670, Telex 96-8414

*Syracuse 13211
1 Northern Concourse
North Syracuse 13212
Phone (315) 455-6661, Telex 937-239

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†Greensboro 27405
1011 Homeland Avenue
P.O. Box 6526
Phone (919) 274-4647, Telex 57-4416

Raleigh 27612
3717 National Drive
Suite 116
Phone (919) 782-5624

Ohio

*Cleveland 44129
5689 Pearl Road
Phone (216) 884-6558, Telex 98-5217

Columbus
Suite 5, 12 West Selby Blvd.
Worthington 43085
Phone (614) 888-4040, Telex 24-5497

Dayton 45439
501 Progress Road
Phone (513) 293-4175, Telex 2-88225

Oklahoma

*Oklahoma City 73105
Suite 201
800 N.E. 63rd
Phone (405) 848-3361, Telex 74-7227

Oregon

Portland
8845 S.W. Center Court
Tigard 97223
Phone (503) 639-7691, Telex 36-0205

†Factory Service Center
Tektronix Industrial Park
Beaverton 97005
Phone (503) 644-0161, Telex 36-0485

Pennsylvania

Ft. Washington 19034
165 Indiana Avenue
Phone (215) 542-1440, Telex 84-6338

†Philadelphia Service Center
1030 W. Germantown Pike
Norristown 19401
Phone (215) 539-5540, Telex 84-6482

*Pittsburgh
3834 Northern Pike
Monroeville 15146
Phone (412) 351-3345, Telex 86-761

Texas

*Dallas 75240
4315 Alpha Road
Phone (214) 233-7791, Telex 73-0570

*Houston 77036
5750 Bintliff Drive
Suite 217
Phone (713) 783-1910, Telex 77-5494

San Antonio 78228
Suite 100, 4415 Piedras St., West
Phone (512) 736-2641 2, Telex 76-7456
From Austin Area: ENterprise 9915

Utah

*Salt Lake City 84115
65 West 2950 South
Phone (801) 484-8501, Telex 388-365

Virginia

Hampton 23366
1929 Coliseum Drive
Phone (703) 826-4020, Telex 82-3409

Washington

*Seattle 98188
410 Baker Blvd.
Andover Industrial Park
Phone (206) 243-2494, Telex 32-488

***Field Office/Service Center**
†Service Center

Tektronix International Offices

Tektronix Datatek N.V., P.O. Box 7718, Schiphol Airport (East), The Netherlands
Telephone: 020-452155, Telex—16565, Cable—Datatek Holland

Datatek maintains a warehouse of United States-made instruments, accessories and parts to support these distributors in filling customer orders. Technical support of customers and distributors is also available from this facility.

Angola
Equipamentos Tecnicos, Lda.
Rua Serpa Pinto 39
(P.O. Box 6319)
Luanda
Phone 6917
Telex 3147 EQUIPAL LUANDA
Cable: EQUIPAL

East Africa (Kenya, Tanzania and Uganda)
Engineering & Sales Co., Ltd.
Bankhouse, Government Road
(P.O. Box 46658)
Nairobi, Kenya
Phone 26815

Federal Republic of Germany
Rohde & Schwarz
Vertriebs GmbH
2 Hamburg 50
Grosse Bergstrasse 213-217
(P.O. Box 1226)
Phone (1411) 38 14 66
Telex 0 213 749
Cable: ROHDESCHWARZ

West Berlin
Rohde & Schwarz
Handels-GmbH
1 Berlin 1
Ernst-Reuter-Platz, 10
Phone (0311) 34 14 03 6
Telex 0 181 636
Cable: ROHDESCHWARZ Berlin

Finland
Into O/Y
11, Meritullinkatu
(P.O. Box 10153)
Helsinki
Phone 11123
CABLE: INTO, Helsinki

Greece
Marios Dalleggio
Representations
2, Alopekis Street
Athens 139
Phone 710.669, Telex 216435
Telex Answer Code: DALM GR
Cable: DALMAR Athens

Iran
Berkeh Company Ltd.
20 Salm Road
Roosevelt Avenue
Tehran
Phone 828294 & 831584
Cable: BERKEHKAR, Tehran

Israel
Eastronics Ltd.
11 Rozanis Street
Tel-Baruch
(P.O. Box 39300)
Tel Aviv
Phone 440-466, Telex 033-638
Cable: EASTRONIX Tel Aviv

Italy
Silverstar Spa, Ltd.
Via del Gracchi No. 20
20146 Milano
Phone 4996 (12 lines)
Telex 32634 SILSTAR Milano
Cable: SILVERSTAR Milano

Lebanon
Projects
(P.O. Box 5281)
Beirut
Phone 251680, Telex 20466LE
Cable: PROJECTS Beirut

Morocco
F. Pignal,
Materiel Radio En Gros
21/29 Boulevard Girardot
(P.O. Box 86)
Casablanca
Phone 702-61
Cable: PIRADIO Casablanca

Mozambique
Equipamentos Tecnicos
(Mozambique) Lda.
Av. 24 de Julho, 1847
(P.O. Box 310)
Lourenco Marques
Phone 22601
Cable: EQUIPAL-Lourenco Marques

Norway
Morgenstierne & Co A/S
Konghellegt.3.
(P.O. Box 6688 Rodelokka, Oslo 5)
Oslo
Phone (02) 37 29 40, Telex 1719
Cable: MOROF Oslo

Portugal
Equipamentos de
Laboratorio Lda.
Estrada Lisboa - Sintra Amadora
P.O. Box 1100 (Casal de Garoto)
Lisbon
Phone 97 02 51, Telex 1702
Cable: EQUILAB, Lisboa

Republic of South Africa
Protea Physical & Nuclear
Instrumentation (Pty) Ltd.
Wemmer
(P.O. Box 7793)
Johannesburg
Phone 838-8351, Telex J7337
Cable: MANLU

Spain
C.R. Mares, S.A.
Valencia 333
Barcelona (9)
Phone 257.62.00, Telex 54676
Cable: SERAM Barcelona

Tunisia
Selection Internationale
17, Rue Kamel
Ataturk
Tunis
Phone 243.891 & 241.066
Cable: INTERSEL Tunis

Turkey
M. Suheyl Erkman
Necatibey Cad No. 207 Galata
Instabul
Phone 441546
Cable: INGMESUER Instalbul

Yugoslavia
Elektrotehna
Titova 51
61000 Ljubljana
Phone 311-233 & 320-241,
Telex 31184

Zambia
Baird and Tatlock (Zambia) Ltd.
Chandwe Musonda Road
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GmbH & Co. K.G.
Prinz Eugen Strasse 70
1040, Wien, Austria
Phone Vienna 653704, Telex 13933

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TEKTRONIX, nv, sa
Av. J. Cesar-laan 2
Brussel 1150 Bruxelles
Telephone 02/71.98.48
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Tektronix Canada Ltd.
900 Selkirk Street (Home Office)
Pointe Claire 730, Quebec
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91401 Orsay
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Sony/Tektronix Corporation
9-31, Kitashinagawa - 5,
Shinagawa-Ku
Tokyo 141
(P.O. Box 14, Heneda Airport,
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Tektronix Holland N.V.
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161 20 Bromma 20
Phone 08/98 13 40
Telex 178 31 Tekswed S
Cable: TEKTROSWED Stockholm

Switzerland
Tektronix International A.G.
Gubelstrasse 11
(P.O. Box 57)
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United Kingdom
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Beaverton House
36-38 Coldharbour Lane
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Harpenden, Herts
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Telex 25559
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International Distributors and Representatives

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Argentina
Coasin A.A.
Virrey del Pino 4071
Buenos Aires
Phone 52-3185, 51-9363 &
52-4368, Telex 012-2284
Cable: COASIN, Buenos Aires

Brazil
Importacao,
Industria E Comercio
Ambriex S.A.
Rua Ceara, 104 2° e 3° ands.
ZC-29
Rio de Janeiro, GB
Phone 264-7406
Cable: RAIOCARDIO

Ceylon
Maurice Roche Limited
P.O. Box 61
Colombo
Cable: LAXAPANA Colombo

Chile
Equipos Industriales S.A.C.I.
Moneda 812 - Of. 912
(Casilla 13550)
Santiago
Phone 716 882 & 382 942

Colombia
Manuel Trujillo Venegas
e Hijo Ltda.
Carrera 20 No. 37-33
Apartado Aereo 53747
Bogota 2, D.E.
Phone 32-06-79 & 45-23-04
Cable: TRUVEHIJO Bogota

Ecuador
Proteco Coasin Cia Ltda.
Apartado 228A
Quito
Phone 52-6759

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8th Floor, Alexandra House
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Cable: GILMAN Hong Kong

India
Hinditron Services Private Ltd.
Manesha
69A Nepean Sea Road
Bombay 6
Phone 365344, Telex 2594
Cable: TEKHIND Bombay

Korea
M-C International
Room 516, Bando Bldg.
(I.P.O. Box 1355)
Seoul
Phone 22-4316, 22-6891,
22-0811 & 28-1415
Telex 7872428 S
Cable: EMCEEKOREA Seoul

Malaysia
Mecomb Malaysia Sendirian
Berhad
2, Lorong 13/6A, Section 13
(P.O. Box 24)
Selangor
Petaling Jaya
Phone 53570, 53478

Mexico
Tecnicos Argostal, S.A.
Av. Jalisco 180
Mexico 18, D.F.
Phone 5-15-85-80, Telex 017-74208

New Zealand
W. & K. McLean, Ltd.
103-105 Felton Mathew Avenue
Glen Innes
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