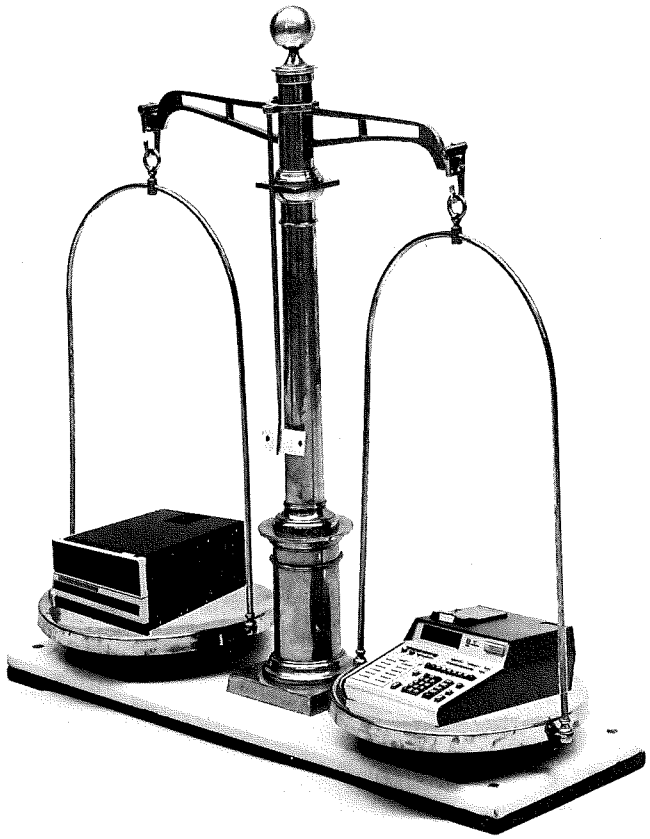
TEKTRONIX Calculators

Product and Price Information

TEKTRONIX®

Contents

Why use Tektronix calculators



Tektronix programmable calculators are used wherever there's a need for the performance of a minicomputer without costs and complexity. In education, business, industry, medicine, scientific research.

Tektronix calculators are replacing minis for three major reasons: The 31 calculator is a powerful computational tool. Its natural math and alpha language make it easy to use. And it is low cost.

The 31 calculator also makes possible automatic systems which were not possible with the dedicated mini for the same reasons. High cost, lack of acceptance by operating personnel, and programming difficulty.

Natural

The 31 calculator is used as the intelligence unit in machine tool measurement systems. Its computational power and man-machine interaction make it a natural for easy system control.

The user-definable overlays allow a computing system which is extremely simple to operate. Key labelling and sequencing are logical. With this and the alphanumeric printer, instructions guide the operator. This simplicity takes only a few hours to train operating personnel.

Previously insoluble gauging problems have been automated with the 31 and electronic gauging instruments. At half the cost of minicomputer systems.

Companies like CEJ Gage of Dearborn, Michigan; B&K Test Instruments, Brown & Sharpe now use the calculator instead of minicomputers in their systems.

Powerful

Ingersoll-Rand Corp. makes underground boring machines which cut 4 to 20 foot diameter shafts through solid rock. Mine operators who spend up to 1½ million dollars for the machines want to know what kind of performance they'll get in particular rock formations.

Now, with the aid of Tektronix' 31/53 calculator system, predictions are made quickly and accurately. Two transducer-connected DM 501 Multimeters measure force and penetration of a tungsten carbide button into rock samples. Results are run through the 31 calculator and plotted on a 4661 digital X-Y plotter.

Ingersoll-Rand gets 60-second results instead of the former ¾ hour manual processing. In addition, data stored on magnetic tape cartridges allow comparisons with 1800 other tests of rock samples from around the world.

This low-cost system eliminates computer time-sharing and waiting. The calculator also serves as a standard engineering tool when not being used in the system.

Significantly Less Expensive

When you have a group of engineers of different disciplines who need computation power, there's a place for calculators. Especially when they aren't trained in computer use.

That's the problem faced by a Federal Administration's Special Instruments Laboratory. In fact, it gave up the use of a computer terminal in favor of two 31 calculators for direct interaction in the lab.

The reasons: the 31 is a user-oriented machine. Its algebraic language and alphanumeric printer make it easy for engineers to use. Because there's no computer time-share cost, it is a low-cost and full-time worker.

The calculators are used for electronic and electrical circuit design evaluation. For analysis of power lines and hardware designs. For corona studies. For statistical reduction and metallurgical alloy evaluation.

Uses of the Tektronix calculators in education, business, industry, medicine and scientific research have been recognized. The next low-cost success story is up to you.

Who needs a computer when a programmable calculator *is now available?* Before you answer, make some comparisons.

Both take instructions, store information and perform rapid, complex mathematical operations. They compile, correlate and select. Both provide analysis capability. They can work with the same peripherals. And, they can control components in a system.

You can see today's programmable calculator is very much like a mini. But, there are some major beneficial differences.

Man-machine interface

Perhaps the most important advantages of the calculator are accessibility and response. There is an element of participation with a programmable calculator you don't get with computers—maxi or mini.

The calculator is approachable. It's complete—right there on your desk without high support costs.

You get immediate results from your ideas. Because it's self-contained. Input is easy with the user-oriented keyboard. Output is immediate, too. See it now on the built-in display and alphanumeric printer. Save your data or programs on handy magnetic tape cartridges.

No translators needed

The minicomputer with its assembly language is a tedious thing to program. You have to lean on an editor program to assemble your operating program.

That is, unless you add extra memory and other equipment to program it in a higher level language. So, you buy a teleprinter, reader, punch, disc and tape units. There goes your cost—up and up.

Compare that time and expense to programming a calculator. It uses a language you already know: math.

It's simple to compose programs right on the keyboard. Or, copy your handwritten notes. Since the math functions are built into the machine, you don't have to use algorithms or convert to and from a binary language. And, you don't have to pay extra for language memory.

All-around use

The calculator is extremely versatile and flexible, since it is self-contained. It can be used alone for its computational power. Or, as a non-dedicated processor-controller in systems.

Its easy programming allows it to be used for many tasks. Use it as the intelligence unit in any data acquisition and analysis systems. As a mathematical generator for graphic displays or plots. As a monitor. It can project trends, acting as a long-range forecaster.

With the plug-in magnetic tape cartridges, your data is safe.

The mind extender

This immediacy of interaction unfetters your mind to concentrate on ideas instead of operation mechanics and methods.

Because the calculator is so approachable—and accessible when you need it—an important element missing in computers is available. That is the spirit of "play" which is essential to the scientific searching process. The "what if?" method can lead to solutions when you have the calculator's freedom at your fingertips.

The sum total

When you put it all together, you'll realize that Tektronix's programmable calculators offer a combination of talents that can make your job easier. They're powerful math machines. Data analyzers. Recorders and reporters. Processors and controllers. Monitors and manipulators.

31 Programmable Calculator

Computer power, calculator ease. Don't let the simple appearance of the 31 calculator mislead you into thinking it's no more than an electronic abacus.

It's powerful. Capable of dealing with complex problems, sophisticated programs and controlling systems.

Naturally powerful

There are 35 math functions at your fingertips. And you needn't modify your thinking or sequencing of entries. Because the 31 follows natural math hierarchy to work problems the same way you do.

You can enter data in a free format: ordinary floating, scientific floating or mixed decimal. Exponents, trig and hyperbolic functions are a breeze to solve on the keyboard.

There are more than numbers on the keyboard. There is a full set of alpha characters. When you work this with the user-definable overlay, you get easy interaction between man and machine. And that makes for versatility.

Customize with overlays

The overlays let you define 24 keys to specialize in your problem areas by changing the math function keys to your own subroutines. Just combine several functions you use often into one key and label it.

When you need that complete operation, press your customized key. And get complex patterns resolved with one key stroke. That saves time and memory space.

Alphanumeric printer

The alphanumeric printer and keyboard work together to make operation even easier. Besides giving you hard copy print-out of your results, the printer aids programming. While you write your program, the printer copies it. Makes it easy to check for errors. Then it's simple to edit with the proper keys.

Talk with it

The conversational ability of the 31 is especially useful for systems work. You can set up a program and turn over the operation to anyone. The calculator will print instructions, telling your stand-in when to input data on the keyboard or when to press a key to sample from a system component. When to turn on or off another instrument.

Growth capability

Since the 31 calculator was designed with growth in mind, it is readily expandable to a variety of tasks.

Display:

- 10 digit mantissa with 2 digit exponent.

Standard accessories:

- 31 instruction manual
- 31 verification program
- power cord
- magnetic tape cartridge (6000 step capacity)
- two user definable overlays

Options:

1. Silent alphanumeric thermal printer

2.	1024 Steps	128 Registers
3.	1536 Steps	192 Registers
4.	2048 Steps	256 Registers
5.	2048 Steps	640 Registers
6.	3584 Steps	448 Registers
7.	5120 Steps	256 Registers
8.	2048 Steps	1000 Registers
9.	5120 Steps	640 Registers
10.	8192 Steps	256 Registers

- Statistics program library, Vol. 1 manual only, 062-1592-00. Manual and mag tape, 062-1592-10.
- Mathematics program library, Vol. 1. Manual only, 062-1593-00. Manual and Mag Tape, 062-1593-10.
- Thermal printing paper, 5 rolls, 006-1775-00.
- Carrying Handle Kit, 016-0575-00.
- User definable overlay, 10 per package, 016-0578-00.
- Magnetic tape cartridge, 020-0082-00.

Peripherals:

- 4661 X-Y plotter with program control, digital operation.
- 4010-1 Graphic Terminal. Data presentation and analysis with complete teletype keyboard. And hard copy compatible.
- 4921 and 4922 Flexible Disc Unit. Option 4 required.

Physical Characteristics:

- Weight: 32 lbs; 14.5 kg.
- Height: 7.9 ins; 20 cm.
- Width: 14.3 in; 36 cm.
- Length: 20.5 ins; 52 cm.
- Shipping weight: 48 lbs; 21.8 kg.

Environmental Characteristics:

Operating temperature:
32° F to 122° F;
0° C to 50° C.

Non-operating temperature:
−67° F to 167° F;
−55° C to 75° C.

Operating altitude:
15,000 ft; 4570 m.

Non-operating altitude:
50,000 ft; 15,250 m.

Power Requirements:

Line Voltage Range:

Low	Med	Hi	
100	110	120	operates between 90 V to 132 V RMS
200	220	240	operates between 180 V to 264 V RMS

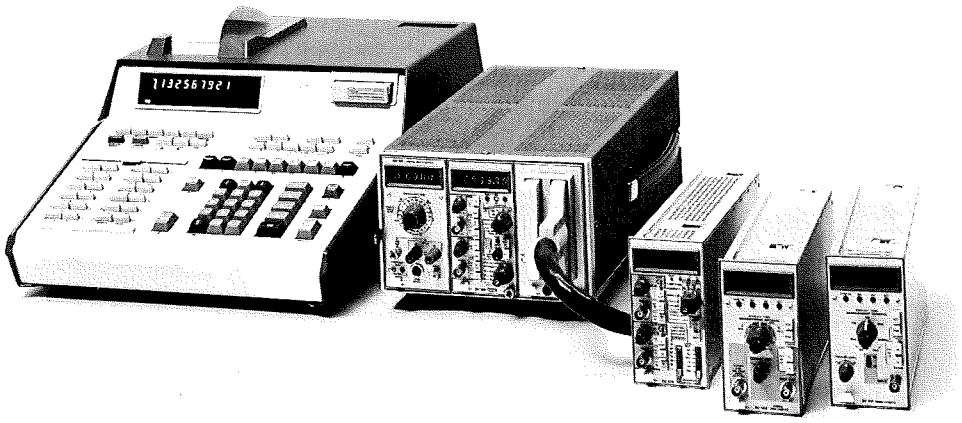
Maximum Line Voltage Input: 250 V RMS

Line Frequency: 48 Hz to 66 Hz
Power Consumption (Max) from 150 watts 60 Hz, 115 V line.

Price Information

Please see p. 13

31/53 Instrumentation Calculator System



Personal, modular data acquisition and analysis system.

The 31/53 calculator system masters a wide range of data acquisition and analysis operations. It can capture, translate, compare, analyze, record and store electrical measurement data.

It's like a minicomputer system. But in an easy-handling form with a lower price. And, no software or language problems.

It replaces manual logging. Eliminates conversion tables and visual strip chart scaling. It's automatic and free from human error.

The 31 calculator is the system processor-controller, working with a counter or multimeter—or two of a kind.

The 153 interface unit holds the plug-ins and translates messages between instruments and calculator. The calculator can control up to 20 plug-ins.

What you can do

The 31/53 system reads a vast signal range of time, frequency, voltage, current, resistance and counts events. Coupled with transducers, it gives readings in your terms, automatically.

It gives statistical parameters, averages, frequency distribution, group about the mean, fits curves. It logs data and times events. It converts input and labels output on the alphanumeric printer.

What you get

The 31 calculator and 153 instrumentation interface with built-in power supply, which holds two plug-ins. Operation manuals, standard software, overlays, and cables.

Software tapes provide automatic data acquisition and processing.

Counters

Provide accurate time base, measure direct frequency and totalize events to 9,999,999. The seven digit LED display positions decimal and blanks leading zeroes.

DC 501 measures frequency to 110 MHz.

DC 502 same as DC 501 but counts to 550 MHz with 10X prescale, with 50 ohm input.

DC 503 same as DC 501 but has period and ratio averaging. Six functions: period, ratio, frequency, time A-B, time manual and totalizing.

DC 505 does direct measure to 225 MHz and has pulse width and events A during B capabilities. All counters must be option 4 for operation in the 153 system.

Multimeter

DM 501 with 5 digit display provides ten times better resolution than 3½ digit instruments. One knob controls functions and ranges. Auto-polarity. Measures current, voltage, resistance and temperature. Fully isolated serial BCD output.

Software

Data logging on alphanumeric printer with sampling rate and numbers, single or dual source.

Data reduction Statistical summaries of variables and frequency distribution.

Data acquisition. Stores data internally and generates least squares curve fits for a line, exponential or power function.

Standard Accessories:

- 31 verification program
- power cord
- magnetic tape cartridge (6000 step capacity)
- two user-definable overlays

153 Instrumentation Interface Features:

Interface:

- Can transmit to calculator all data on digital display
- Programmable interface pulse outlets. Trig out, front and back panels 12 μs width
- Logic levels are TTL compatible $\geq$2.4V high $\leq$.8V low
- Calculator display flashed by interface with a $\geq$ 2 μs momentary short or pulldown to ground

Power Consumption:

- 153 interface, less plug-ins; 11.5 watts

Mainframe Dimensions:

153 Instrumentation Interface:

- Height: 6 in. (15.2 cm)
- Width: 8.7 in. (22.1 cm)
- Length: 15.3 in. (38.8 cm)
- Weight: 153 interface, less plug-ins; 11.2 lbs. (5 kg)

Environmental Characteristics:

Operating temperature:
32° F to 122° F;
0° C to 50° C.

Non-operating temperature:
−67° F to 167° F;
−55° C to 75° C.

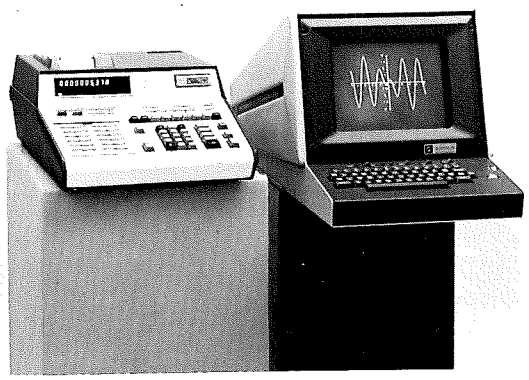
Operating altitude:
15,000 ft.; 4,570 m.

Non-operating altitude:
50,000 ft.; 15,250 m.

Price Information

Please see p. 13

31/10 Graphic Calculator



Rapid and interactive graphics and alphanumerics.

There are times when pictures tell your story best. And when you need vivid descriptions of your math concepts draw on our 31/10 personal graphic calculator system.

It's the perfect combination of mathematician and designer. The 31 programmable calculator has the computational power and the 4010-1 Graphic Terminal has the artistic skill.

Envision this

With both machines sitting at your desk, you have two keyboards to work with. The math keyboard of the calculator and the teletype keyboard of the terminal let you draw the shape of your thoughts as you build them.

This lets you concentrate on ideas instead of mechanics. You see your concepts take form on the bright screen. Right now.

You work easier because the system is fast. For example, tap the calculator's remote key to send these commands to the terminal: Erase screen. Accept X-Y coordinate data. Enable graphics. Start or start alpha. Print alpha. Make hard copies with optional hard copy unit.

Big screen capacity

The 4010-1 terminal puts up a big front. So you see 2590 characters without squinting. There are 35 lines of 74 upper case alpha and numeric characters per line.

As for graphics, it's fast with fine-line draftsmanship. Drawing time is 2.6 ms. with 1024 by 1024 addressable points and 1024 on X by 780 on Y viewable points.

Software lets you go to work immediately. Plug in a tape cartridge and get: automatic scaling, data plotting, X-Y coordinate value scaling, labelling and statistical operations.

Work and save

The 31/10 has capacity to meet your needs. Mathematical capacity via the 31 calculator with 35 math functions. Program and data storage memory—74 data registers and 512 program steps. Both can grow with options.

Store your results on tape cartridge or print it on the 31 alphanumeric printer.

For a long hard look at results, check our hard copy unit. It takes only 18 seconds to knock out the first copy and 10 seconds for extras.

Tektronix 31/10 System Components

- 31 programmable calculator
- 4010-1 graphic terminal (hard copy compatible)
- 31/10 interface

Standard Accessories:

Manuals:
- 31/10 system, 31, 4010 and special interface manuals

Software:
- Histogram, function, and data plot program packages
- 31 verification program
- power cord
- interface cable
- 1 magnetic tape cartridge
- 2 user-definable overlays

31 Physical Characteristics:

Input power:
- 100/240 VAC (low, med, high)
- 48 to 66 Hz, 190 watts

Operating temperature:
+0° C to +50° C;
+32° F to +122° F.

- Weight: 32 lbs.; 14 kg.
- Shipping weight: 48 lbs.; 22 kg.
- Height: 7.9 in.; 20 cm.
- Width: 14.3 in.; 36 cm.
- Length: 20.5 in.; 52 cm.

The Complete Terminal

Complete with 63 upper case and numeric characters in standard ASCII form, the 4010-1 keyboard also includes rocker switches for:
- Local or calculator control
- Hard copies of the display via the optional hard copy unit
- Changing the keyboard from alpha to numeric code. Depending on its position, the switch permits the calculator to interpret pressed terminal keys as letters or numbers. Execution of other calculator functions are also possible with this feature

4010-1 Graphic Terminal Characteristics:

Display medium:
- Direct view storage CRT

Display area:
- 7.5 in. wide by 5.6 in. high; 19 cm x 14 cm.

Alphanumeric mode:
- Format: 74 characters per line, 35 lines, 2590 characters per full screen
- Character set: 63 printing characters (TTY ASCII Code)
- Character size: 0.2 inch high x 0.1 inch wide (approx.); 5 x .25 cm.
- Character generation: 5 x 7 dot matrix, MOS read-only memory, 1200 characters per second capability
- Cursor: Pulsating 5 x 7 dot matrix

Graphic display mode:
- Vectors only
- Vector drawing time, 2.6 ms
- 1024 x 1024 addressable points
- 1024X x 780Y viewable points

Physical Characteristics:

Input power:
- 110/220 VAC (low, medium, high)
- 50 to 400 Hz, 110 W

Operating temperature:
+10° C to +40° C
+50° F to +104° F

- Dimensions: Height 41.5 in.; 105 cm.
- Width: 19 in.; 48 cm.
- Length: 28.5 in.; 72 cm.
- Weight: Net, 78 lbs.; 36 kg.
- Shipping, 87 lbs.; 40 kg.

Price Information

Please see p. 13

Tektronix Calculators, make them work for you

For many jobs there is enough memory in the 31 calculator to serve you well. But there are also nine memory options and a flexible disc to follow.

It has a good memory to start with and can grow more. There are 512 program steps and 74 data registers in the standard machine.

You can add memory in blocks of 512 program steps and 64 data registers up to 2,048 steps and 256 registers. Then, in various combinations you can go to 8,192 program steps or 1,010 registers.

Program and data are always stored separately.

The magnetic tape cartridges can hold programs or data, adding even more memory without detracting from the machine's internal memory.

For instant "on use" programs, plug in PROMs hold 1,024 program steps. If you need still more, the optional flexible disc with built-in interface puts a vast memory bank at your disposal.

Easy data storage

Two sets of keys control data storage: ten "K" registers and 64 "R" registers in the standard machine.

This is how easy it is to store a number: For example, to store .25943 in register R52 press the keys .25943 = R52. It's now stored in R52.

Recalling data is just as easy. For example to multiply the contents of two registers and store the result elsewhere, do this: Press KOxR33 = R14. The data is pulled from those registers, multiplied and stored.

Smooth Programming

No languages to learn. No extra-cost mechanics. No bothersome punch tapes.

It's as simple as writing your program and tapping the right keys. Just follow your own natural math rules, logic and language. The machine will do the same.

With its alpha capability, the calculator can communicate with you or your operator. It will ask for input instructions and label the results on the alphanumeric printer.

Use the definable overlay and 24 keys to deal with your special interests. Set up a subroutine for each of those 24 keys and then label your overlay. Your operator need only punch a key for the results you want. For example you could label keys magnitude, phase, real and imaginary to handle complex numbers.

Or for statistical work label them mean, variance, standard deviation and linear regression. A single keystroke does it.

There are other features which make programming simple: conditional and unconditional branching, editing, symbolic addressing and subroutine nesting.

Here's how: Press the GO TO key and the address of your program starting point. Press LEARN and enter your program. (Up to 512 steps on the standard machine.) Press PRINT DISPLAY to get results printed. PAPER FEED gives a blank line between results printed. Stop the program by pressing RESET and exit the learn mode by pressing LEARN.

Press the IF key for decision making or conditional branching. Test a displayed number for less than, equal to or greater than zero. Test condition of a programmable flag. Test for over-range or illegal math operations. If the conditions aren't met, the program branches to the appropriate point. There are also four types of unconditional branching.

You can edit as you write your program. Simply press step forward or back to check. If there is an error, just delete, insert or overwrite it. All subsequent steps are enumerated automatically.

Label subroutines symbolically. The calculator knows where to find it. And it will get the subroutine, execute and automatically remember the return address.

Return addresses can be sequentially stored and recalled to permit nesting of subroutines, or can be used to compute a new starting point.

Low cost, effective systems

The growing trend of using programmable calculators as system processor-controllers makes good sense. They are flexible, easily programmed, adaptable, expandable—and extremely cost effective.

The calculator itself is a system—look at the functional block diagram. Data input via keyboard or magnetic tape. Data processing through tape input. Data manipulation and analysis by internal mathematical functions. Storage in machine memory, mag-tape, and disc. And data output through the alphanumeric printer.

Now, expand on that with interfaces and a wide range of instrumentation and you can see the calculator as the processor-manager of any system. Here are some examples.

Interactive calculator replaces manual plotting

Radioimmunoassay techniques measure hormone and drug levels in the human body. Previously, it took half an hour of manual plotting to get test results after the radioactive complexes were counted.

Now, tape cartridge programs ask for information as the operator inputs data into the 31 keyboard. In five minutes, the calculator prints an alphanumeric plot of hormone concentrations.

Two peripherals make the system more useful and faster. Since the radioactive complex count comes from a TTY printer, a tape reader inputs data automatically into the calculator. And a 4661 digital plotter gives a graphic comparison to a standard curve.

Calculator replaces separate components

A 31 calculator replaces traditional medical test equipment. And, it gives faster, more complete analyses.

The calculator with programs on magnetic tape cartridges analyzes half a dozen lung tests gathered by instrumentation. Programs can be changed or altered easily on the magnetic tape cartridges. This flexibility was not available on the old system's built-in program.

The calculator's alphanumeric printer gives the technicians a better understanding of results than the old numeric printer it replaced.

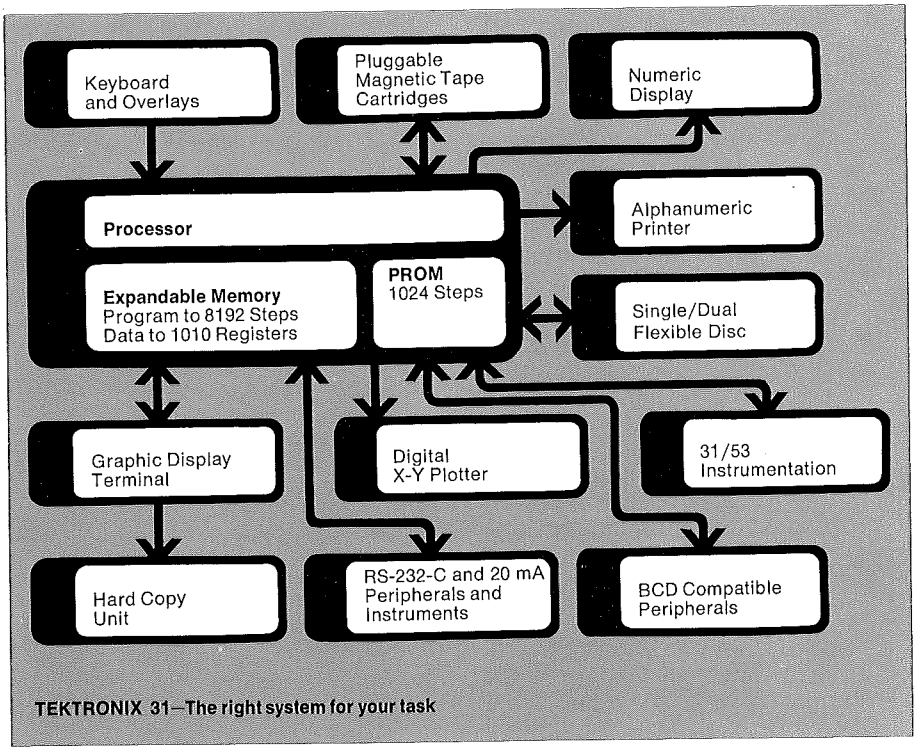
Calculator system in quality control

A core memory manufacturer tests and matches magnetic characteristics of 50,000 cores from weekly production of eighty million.

The former data acquisition system gave printouts of a 17-cell frequency distribution of each tested component. This meant manual processing of 30,000 printouts to produce closely-matched sets.

The 31 calculator and 154 interface automated the system. Now, the calculator initiates tests, collects, processes and stores data. Then, it compares data with acceptable test limits.

Finally, it retrieves individual lot data, compares and matches similar components. The result is a saving of 34 man-hours weekly and a production boost. Also, the calculator handles engineering and accounting work on the side.



TEKTRONIX 31—The right system for your task

Calculator as system monitor-controller

A 31/53 calculator system monitors, logs, processes and analyzes changes in a heating-air conditioning system. It computes BTU consumption as adjustments are made.

The program tells a scanner where to take readings from electrical and temperature probes and transducers in the water, air and power lines. Digital voltmeters relay their readings to the calculator where the data is processed.

It's a precise and low cost way to experiment with variables that can add up to big savings in energy costs today.

Calculator system speeds production

A 31/53 calculator system's computational power and interactivity has eliminated human error and doubled production of precision electronic components. It eliminates hours of test equipment stabilization time, hand logging and visual comparison of tables.

The operator presses a key as each part is tested for voltage drop. The calculator's program applies a formula to compute the voltage reading and oven temperature relationship. Then it accepts or rejects the part. The alphanumeric printer labels results and groups acceptable parts into three grades.

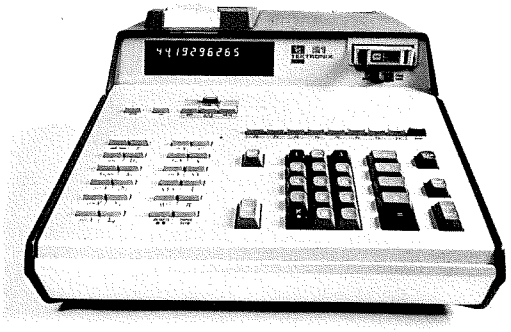
Growing up

The programmable calculator system is a powerful way to do many things. Use it as an independent processor or manage large, complex systems.

They can include graphic terminals, digital plotters, teleprinters, typewriter terminals, magnetic tape, paper tape/punch readers.

In fact the programmable calculator can be the brain of most any system you want. And it is still self-contained.

21 Programmable Calculator



High power at low cost.
The 21 calculator equals the mathematical power of the 31, with the same 35 built-in math functions. Also, it follows the same natural math hierarchy as the 31.

It's easy to use and program. Prints result on optional numeric printer for permanent records. Has the same big 12-digit display as the 31.

User-definable.
You can define eight keys with an overlay to perform special functions. Combine a series of keystrokes into a single key and label on the overlay. Press your customized key and get that complex job done.

Effortless programming
As simple as writing your thoughts. Only do it on the keyboard without computer language skill.

Follow your progress on the numeric printer. Correct mistakes as you go. To keep a program for repeated use, transfer it to a magnetic card.

Memory storehouse
The 21 has memory for program and data storage. Data is stored in ten registers, each with its own key. Store any displayed number in any register.

Program memory is available through eight keys, each holding 16 steps for 128 total. Use them separately or link them for longer programs. These are the same keys used with the definable overlay. Options can increase memory to 512 program steps.

The magnetic card can store your program for your future use.

Shortcuts save time
Indirect addressing of data registers shortens the number of program steps needed for successive operations. Saves time and memory. Conditional and unconditional branching simplify decision-making and provide response to changing situations.

Peripheral minded
The 21 interfaces with peripherals, too. Our interfaces let you link up with counters, multimeters, and our 4661 Digital Plotter.

The 21 will pay off in performance —with accessible computational power, programming ease and data processing ability. All at a modest price.

Display:
- 10 digit mantissa with a 2 digit exponent.

Standard Accessories:
- 21 verification program
- power cord
- 25 magnetic cards (256 step capacity)
- 25 user definable overlays

Options:
1. Silent numeric thermal printer.
2. Memory Expansion Pack. 256 step. Order 020-0084-00 if added later.
3. Memory Expansion Pack. 512 step. Order 020-0084-01 if added later.

Carry Handle Kit (016-0575-00)
Magnetic Card Package 25/package (016-0576-00)
Program Overlay Package 25/package (016-0577-00)
PROM (062-1648-00) (256 steps)
PROM (062-1649-00) (384 steps)
PROM (062-1650-00) (512 steps)
Statistics Program Library, Vol. 1/ (062-1590-00)
Mathematics Program Library, Vol. 1/(062-1591-00)

Environmental Characteristics:
Operating temperature:
32° F to 122° F;
0° C to 50° C.

Non-operating temperature:
−67° F to 167° F;
−55° C to 75° C.

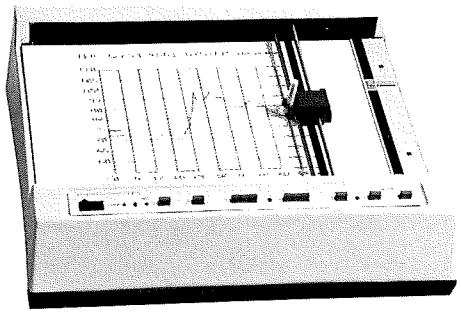
Operating altitude:
15,000 ft; 4,570 m.

Non-operating altitude:
50,000 ft; 15,250 m.

Physical Characteristics and Power Requirements are identical to the 31.

Price Information
Please see p. 13

4661 Digital Plotter



When a picture will give a quickly-grasped idea of your calculator's mathematical data, but you need accurate detail also. The 4661 digital plotter can make quick and digitally accurate presentation pieces: statistical data, histograms, schematics, sales and production curves.

Momentum

Fast is right. Vectors are zipped out at 15 to 22 inches per second. There's no lag either; while the pen is moving the calculator is computing the next move.

Accuracy

Precision drawing means no misinterpretation of data. Digital plotting keeps your lines vector straight and insures absolute repeatability to within .005 inch.

Right size

Scale controls give full scale plots within a 10x15 inch plotting area. Each axis can be separately reduced to half scale by front panel controls.

Set your data zero point any place on the plot from the calculator or the plotter. Zero is set automatically for first quadrant operations on power up.

Draw on any size paper you want —from sketch pad size to 11 x 17 inches easel-size. Electrostatic hold down keeps it in place.

Power Requirements:
- 100, 110, 120, 200, 220 or 240 volts (internally strap selectable) 48-66 Hz. Maximum power consumption is 180 watts

Dimensions:
- 8 inches high x 22 inches wide 18 inches deep (approximately 20 x 56 x 48 cm)

Weight:
- 40 lbs. (approximately 18 kg)

Environmental Characteristics:

Operating temperature:
32° F to 122° F;
0° C to 50° C.

Non-operating temperature:
−67° F to 167° F;
−55° C to 75° C.

Operating altitude:
15,000 ft.; 4,570 m.

Non-operating altitude:
50,000 ft.; 15,250 m.

Accessories:

4661 Digital Plotter
Includes standard accessories:
- 1 operator's manual
- 1 power cord
- 1 calculator interface cable
- 1 terminator pack
- three each: black, red, green, and blue pens
- 100 sheets paper, 10x15 inches Linear 10 div/inch

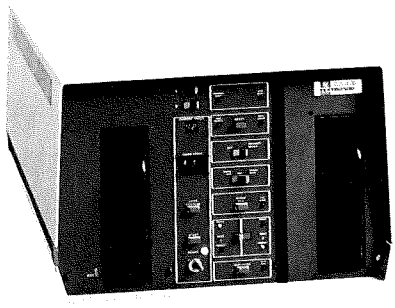
Optional Accessories:

Pens 3/Pkg.	Part Number
• Red	016-0589-00
• Green	016-0589-01
• Black	016-0589-02
• Blue	016-0589-03
Paper:	
• 100 sheets per package (11x16½ inches)	
• 10x15 inches linear 10 div/inch	006-1698-00
• Software package	062-1672-10
• 25x38 cm linear 10 div/cm	006-1699-00
• Semi-log 10 inches x 3 Cycles	006-1700-00
• Semi-log 15 inches x 2 Cycles	006-1701-00
• Log-log 2 Cycles x 3 Cycles	006-1702-00
Cables:	
• 2.5 ft. Type 2 Interface	012-0499-10
• 7 ft. Type 1 Interface	012-0498-01
• 7 ft. Type 2 Interface	012-0499-01

Price Information

Please see p. 14

4921/4922 Calculator Flexible Disc



Calculator flexible disc

This mass memory device allows the 31 calculator to perform jobs previously beyond the capacity of calculators. It is available as the 4921 single disc and the 4922 dual disc units with option 4 calculator interface.

Stores both program and data information in sector units. This means your calculator can now engage in program library management, more sophisticated programs and handle large amounts of data.

Operation is simple and straightforward. Keyboard commands from the calculator give access to the disc for read or write operations. Disc addresses and status are shown on the calculator display. The interface is optimized to make transfer of thousands of bytes of information as easy as transferring only a few.

Specifications:
- 64 data tracks per disc
- 32 sectors/track
- 128 steps/sector; 16 registers/sector
- Read after write error checking
- 128 character buffer
- 160 ms rotational latency
- 15 ms track-to-track access plus 5 ms head setting time
- 1 in 10^{11} bit error rate
- 10^7 pass/track disc life
- 5 year head life

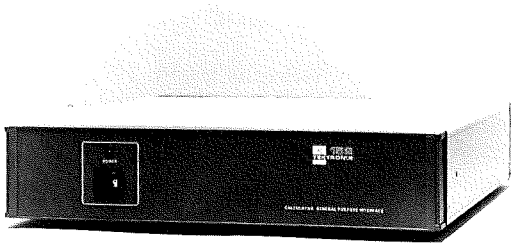
Accessories:

	Part Number
• interconnection cable	012-0498-01
• termination pack	016-0567-00
• connector guide	016-0579-00
• operator's manual	070-1829-00

Price Information

Please see p. 14

152 Parallel BCD Interface
154 RS-232-C Interface
153 Calculator Instrumentation Interface



These interfaces can be the difference between processing use of your calculator and realizing its full system potential. The difference between manual and automated systems. They allow the calculator to work with a variety of peripherals and programmable instruments.

152 General Purpose BCD Interface

The 152 is a Binary Coded Decimal full bit parallel input-output interface. It gives your calculator access to A/D and D/A converters, scanners, programmable power supplies, and realtime clocks. It also works with many straight binary and binary octal code instruments.

The 64 bit parallel inputs lay a big pipeline for your data to flow through—up to 15,000 samples per second using the 31 keyboard or DMA (Direct Memory Access).

With the 56 programmable outputs and the calculator's six triggers you can make up a system that can do a lot for you, in the area of high speed signal analysis or multipoint data acquisition.

The 152 can be the start of something big.

Standard Accessories:

- instruction manual
- power cord
- interconnect cable
- termination pack

Options:

1. Two input/output boards (one standard, one additional) 128 inputs, 112 outputs, 6 triggers

2. Three input/output boards (one standard, two additional) 192 inputs, 168 outputs, 6 triggers

Dimensions:
- 16.7 in. w x 16.3 in. d x 3.5 in. h (427 x 417 x 90 mm) in rack-mount version. May be converted to desktop use with addition of feet.

Signal levels:
- TTL compatible.

Power Requirements:
- 100, 110 or 120 volts at 48 to 66 Hz, 180 watts max. 200, 220 or 240 volts at 48 to 66 Hz, 180 watts max.

Temperature Range:
Operating:
0° to 50° C (32° to 122° F);
Non-operating: −55° to 75° C (−67° to 167° F)

Weight:
- 18 lbs. (8.1 kg)

153 Calculator Instrumentation Interface

The 153 interface easily allows the 31 to become a 31/53 instrumentation system. See the 31/53 description in this publication.

154 Calculator RS-232-C Interface

Takes advantage of the 31 calculator's programming and processing ability. Provides a two-way bit serial communication path for a host of RS-232-C devices. Also works with 20 mA current loop devices.

It uses ASCII code so your calculator can converse with teleprinter terminals, crt terminals, paper tape/ punch readers and digital tape casettes.

The 154 interface is compatible with Decwriter LA30, GTE Typewriter Terminal model 5741, NCR typewriter terminal model 260-6 ASR, Teletype model ASR33, Texas Instruments models 733KSR and 733ASR, Tektronix Computer Display Terminals 4010, 4012, 4013, 4014, 4015, 4023.

Print, process and store more

Get full page reports from teleprinters. Enlarge the calculator's data handling capability to many thousands of data points through the use of paper tape readers or tape casettes. Feed data from cards, tape or disc into the calculator. Gather information from analytical instruments and data acquisition systems for storage, processing and printout.

Standard Accessories:

- calculator cable
- termination pack
- connector guide
- instruction manual

Specifications:

Data Format:
- Seven bit ASCII, with even or odd parity (user selected), and one or two stop bits (user selected)

Signal Levels:
RS-232-C Standard or 20 mA current loop; RS-232-C Devices:

Channel Protocol:
- Full duplex, asynchronous

Bit Rate:
- 110, 150, 300, 600, or 1200 Baud, user selected

Power Requirements:
- 100, 110, 120, 200, 220, or 240 (all ± 10%) volts A.C. 48 - 440 Hz. 7 watts nominal

Temperature Range:
- 32° F to 113° F. Operating (0° to 45° C) Non-operating −40° F to 167° F (−40° to +75° C)

Dimensions:
- With Feet and Bail 15.3 in. L. x 3.9 in. W. x 6 in. H. (388 x 100 x 153 mm)

Weight:
- Approximately 6.5 lbs. (2.92 kg)

Price Information

For all Interfaces,
please see p. 14

Business Information

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. 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.

To eliminate chances of failure, all calculator products are aggressively tested under the stated environmental conditions.

General Terms of sale and warranty

Orders should be placed with your local Tektronix Field Office. 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 your local sales 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 product prices, a service charge is added to the price. The amount of the service charge depends upon the number of days the terms are extended.

Rental Agreement

Calculator products are available under an operating rental program where the customer pays only for use and maintenance of the equipment on a monthly basis. 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 and a purchase option is available.

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.

Warranty

All Tektronix products are warranted against defective materials and workmanship for one year. Additionally, Tektronix Computer Terminals, Calculators and related peripheral equipment are fully warranted against any trouble for the first 90 days. Any equipment trouble occurring to those Tektronix products during the 90 day period will be repaired by Tektronix personnel at no charge. Questions regarding this warranty should be discussed with your Tektronix sales representative.

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

Applications

Your Tektronix Sales Engineer can help you obtain optimum use and full value from any Tektronix instrument. He can help in specific applications, drawing from our wide experience in solving thousands of problems for our customers. This fund of knowledge can also be helpful in using your Tektronix equipment for routine checks and measurements.

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.

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 Sales 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.

Calculator Products Price List

Product	Purchase Price	Rental/Month (12 Month Minimum, Maintenance Included)	Maintenance/ Month[1]
Programmable Calculators			
21 Programmable Calculator	$1300	N/A	$11
Options			
Option 1 Numeric Thermal Printer (Factory Installed)	N/C	N/A	+$ 4
Field Installation Package[2]	+ 500	N/A	+ 4
Option 2 Memory Expansion Pack, 256 Steps	+ 125	N/A	+ 2
Option 3 Memory Expansion Pack, 512 Steps	+ 200	N/A	+ 3
Accessories			
006-1775-00 Thermal Printer Paper, 5 rolls/pkg	$ 7.50	N/A	N/A
016-0575-00 Carrying Handle Kit	25		
016-0576-00 Magnetic Card Package, 25 cards/pkg	20		
016-0577-00 Program Overlay Package, 25 overlays/pkg	10		
016-0600-00 Auto Start Termination Pack	95		
016-0602-00 Dust Cover	8		
016-0604-00 Rain Cover	10		
062-1602-00 Program Pad, 128 Steps	1		
062-1603-00 Program Pad, 256 Steps	1		
062-1604-00 Program Pad, 512 Steps	1		
062-1648-00 PROM, 64 Step f(4), 256 Steps	330		
062-1649-00 PROM, 64 Step f(6), 384 Steps	415		
062-1650-00 PROM, 64 Step f(8), 512 Steps	495		
31 Programmable Calculator	$2850	$150	$17
E31 Programmable Calculator	2495	N/A	15
31/10 Graphic Calculator System	7800	390	62
31/53 Calculator Instrumentation System	3995	See[3]	See[3]
Options (the following apply to all 31 Calculator Systems unless otherwise indicated)			
Option 1 Alphanumeric Thermal Printer (Factory Installed)	+$ 700	+$ 40	+$ 5
Field Installation Package[2]	+ 750	+ 40	+ 5
Option 2 1024 Steps, 128 Registers	+ 200	+ 11	+ 1.50
Option 3 1536 Steps, 192 Registers	+ 350	+ 20	+ 2.50
Option 4 2048 Steps, 256 Registers	+ 500	+ 28	+ 3
Option 5 2048 Steps, 640 Registers	+ 1000	+ 56	+ 6
Option 6 3584 Steps, 448 Registers	+ 1000	+ 56	+ 6
Option 7 5120 Steps, 256 Registers	+ 1000	+ 56	+ 6
Option 8 2048 Steps, 1000 Registers	+ 1400	+ 78	+ 8.50
Option 9 5120 Steps, 640 Registers	+ 1400	+ 78	+ 8.50
Option 10 8192 Steps, 256 Registers	+ 1400	+ 78	+ 8.50
Option 30 Delete Type I Patch Plug and Add Type II Patch Plug (31/53 System only)	N/C	N/A	N/A
Option 31 Delete Type I Patch Plug and Add Type III Patch Plug (31/53 System only)	N/C	N/A	N/A
Accessories (the following apply to all 31 Calculator Systems unless otherwise indicated)			
006-1775-00 Thermal Printer Paper, 5 rolls/pkg	$ 7.50	N/A	N/A
016-0575-00 Carrying Handle Kit	25		
016-0578-00 User Definable Overlay Pkg, 10 overlays/pkg	15		
016-0600-00 Auto Start Termination Pack	95		
016-0602-00 Dust Cover	8		
016-0604-00 Rain Cover	$ 10	N/A	N/A
020-0082-00 Magnetic Tape Cartridge	12		
062-1605-00 Program Pad, 250 Steps	1		
062-1651-00 PROM, 1024 Steps	660		
334-2291-01 Cardboard User Definable Overlay Pkg. 100 overlays/pkg	20		

Product	Purchase Price	Rental/Month (12 Month Minimum, Maintenance Included)	Maintenance/ Month[1]
Interfaces			
152 General Purpose BCD Interface (except E31)	$1150	$58	$7
Option 1 Two Interface Boards	+ 325	13	N/A
Option 2 Three Interface Boards	+ 650	25	N/A
153 Instrumentation Interface (includes Special TM 503 mainframe, plug-in interface and cable) (except E31)	995	See[3 & 4]	See[3]
154 RS-232-C Interface (except E31)	990	50	6
Digital Plotter			
4661 Digital Plotter (except E31)	$2550	$150	$25
Accessories			
006-1698-00 Linear Square Chart Paper, 10 x 10 to 1 inch	$ 6.60	N/A	N/A
006-1699-00 Linear Square Chart Paper, 10 x 10 to 1 cm	6.60		
006-1700-00 Semi-Log Chart Paper, 10 inch x 3 cycles	6.60		
006-1701-00 Semi-Log Chart Paper, 15 inch x 2 cycles	6.60		
006-1702-00 Full Log Chart Paper, 2 cycles x 3 cycles	6.60		
016-0589-00 Replacement Pen—Red, 3 pens/pkg	5		
016-0589-01 Replacement Pen—Green, 3 pens/pkg	5		
016-0589-02 Replacement Pen—Black, 3 pens/pkg	5		
016-0589-03 Replacement Pen—Blue, 3 pens/pkg	5		
Flexible Disc Memory			
4921 Flexible Disc Memory	$3695	$185	$40
+ Option 4 (required) (except E31)	+ 300	+ 18	+ 3
4922 Dual Flexible Disc Memory	5995	300	50
+ Option 4 (required) (except E31)	+ 300	+ 18	+ 3
Accessories			
119-0666-01 Extra Discs, 5/pkg	$50		
119-0666-02 Extra Discs, 10/pkg	85		
214-2207-00 Write-Protect Tab, 20/pkg	15		
31/53 Peripherals[9]			
DC 501 Digital Counter	$ 650	See[3 & 4]	See[3]
Option 4 Required	+ 20		
Option 1 5 MHz Time Base	150		
Option 2 Autoranging	65		
DC 502 Digital Counter	995		
Option 4 Required	+ 20		
Option 1 5 MHz Time Base	150		
DC 503 Universal Counter	725		
Option 4 Required	+ 20		
Option 1 5 MHz Time Base	150		
DC 505 Universal Counter	1395		
Option 4 Required	+ 20		
Option 1 5 MHz Time Base	150		
DM 501 Digital Multimeter	550		
Option 1 Delete Temperature Probe	− 85		
Option 2 Delete Temperature Capability and Probe	−125		

Software

	Use Price	Rental and maintenance costs do not apply
21 Programmable Calculator Software (presumes the use of Options 1 and 2)		
062-1590-00 Statistics Program Library, Volume 1	$ 40	
062-1591-00 Mathematics Program Library, Volume 1	40	
31 Programmable Calculator Software (presumes the use of Option 1)		
062-1592-00 Statistics Program Library, Volume 1 (Manual only)	50	
062-1592-10 Statistics Program Library, Volume 1 (Manual and Mag Tape)	250	
062-1694-00 Statistics Program Library, Volume 2 (Manual only)	50	
062-1694-10 Statistics Program Library, Volume 2 (Manual and Mag Tape)	200	
062-1756-00 Statistics Program Library, Volume 3 (Manual only)	50	
062-1756-10 Statistics Program Library, Volume 3 (Manual and Mag Tape)	200	
062-1696-00 Electrical Engineering Program Library, Volume 1 (Manual only)	50	
062-1696-10 Electrical Engineering Program Library, Volume 1 (Manual and Mag Tape)	125	
062-1755-00 Electrical Engineering Program Library, Volume 2 (Manual only)	50	
062-1755-10 Electrical Engineering Program Library, Volume 2 (Manual and Mag Tape)	125	
062-1593-00 Mathematics Program Library, Volume 1 (Manual only)	50	
062-1593-10 Mathematics Program Library, Volume 1 (Manual and Mag Tape)	250	
062-1643-00 Software Manual (31/53 System only)	15	
062-1643-10 Mag Tape Software Package (31/53 System only)	165	
062-1644-00 Software Manual (31/10 System only)	15	
062-1644-10 Mag Tape Software Package (31/10 System only)	150	
4661 Digital Plotter Software		
062-1672-00 Software Manual	5	
062-1672-10 Mag Tape Software Package	50	
062-1697-10 Character Generator ROM Pack	395	
062-1749-00 Extended Graphics Program Library (Manual only)	75	
062-1749-10 Extended Graphics Program Library (Manual and Mag Tape)	450	
062-1776-00 Electrical Engineering Program Library, Volume 3 (Manual only)	50	
062-1776-10 Electrical Engineering Program Library, Volume 3 (Manual and Mag Tape)	85	
4921-4922 Flexible Disc Software		
062-1767-00 Flexible Disc File Management (Manual only)	30	
062-1767-10 Flexible Disc File Management (Manual and Mag Tape)	500	
Accessory		
016-0321-00 Mag Tape Software Binder	$ 12.50	N/A N/A

[1]Eight hour day 0-100 miles. For eight-hour day 101-150 miles, add $50.00/month site charge. For eight-hour day 151-300 miles, add $100.00/month site charge. Maintenance coverage for locations beyond 300 miles must be quoted from Factory Service, Beaverton. Prices remain the same regardless of the length of the contract. (Site is defined as the area within a 15-mile radius where a single customer with one or more facilities is located.)

[2]Installation charge as quoted by Service Center.

[3]No on-site maintenance provided. Equipment must be returned to the nearest Tektronix Service Center for repair.

[4]Please contact your nearest Tektronix Field Office for fixed lease terms up to 36 months.

[5]Add $350 when ordered as an additional interface.

[6]Subtract $350 when ordered as option at same time terminal is ordered.

[7]01 suffix indicates paper tape and manual; 02 suffix indicates cards and manual; 03 suffix indicates magnetic tape and manual; 05 suffix indicates flexible disc and manual.

[8]When in use with a Computer Display Terminal.

[9]Tektronix Information Display Division quantity discount does not apply.

N/A—Not Available or Not Applicable. N/C—No Charge.