

TEKTRONIX
S-3130
DIGITAL MEASUREMENTS
SYSTEM

**TEKTRONIX
S-3130
DIGITAL MEASUREMENTS
SYSTEM**



The Type S-3130 Digital Measurement System is a dynamic measurement system intended for measuring the performance of active devices under simulated operating conditions. It is designed to test integrated circuits, transistors, diodes, circuit modules, circuit boards and subassemblies in all segments of the electronic industry. Typical areas of application are found in production testing, QC, incoming inspection and preproduction.

The Type S-3130 can sequence through measurements at a rate of more than 100 measurements per second. The disc memory provides local storage and random access to 1600 independent measurements, and permits sorting and classifying. Diagnostic test routines may also be performed. Provisions can be made for a computer or other control device to control the measurement or measurement routine.

<u>System Equipment List</u>	<u>Quantity</u>
Type R568 Oscilloscope	1
Type R230 Digital Unit	1
Type R240 Program Control Unit	1
Type R250 Auxiliary Program Unit	1
Type 3S6 Dual-Channel Sampling Plug-In Unit	1
Type 3T6 Sampling Time-Base Plug-In Unit	1
Type S-3 Sampling Heads (S-1 Heads/P6045 with dual stations)	2
Type R116 MOD 703L Programmable Pulse Generator	1
Disc Memory	1
Punched Tape Reader	1
Programmable Power Supply Unit (4 Supplies)	1
Probe Signal Choppers and 10X Attenuators	2
Operator Table (42" including a remote station control unit)	1
2-Bay Enclosed Rack Cabinet	1

TESTS TYPICALLY MADE BY DIGITAL SYSTEMS:

Input pulse
Amplitude
Width
Period
Risetime
Falltime
Delay between
input pulses

Output pulse
Amplitude
Width
Period
Risetime
Falltime
Overshoot
Undershoot

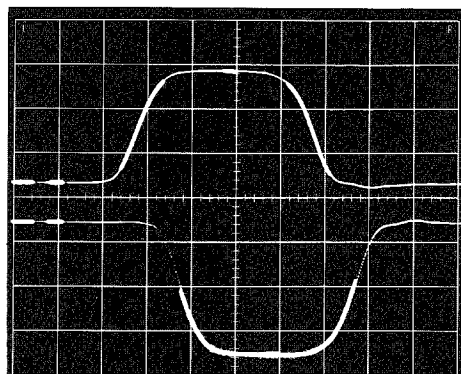
Delay time
Storage time
Turn on time
Turn off time
Propagation delay
Time to voltage level
Time between voltage levels

Diode forward and
reverse recovery time
Noise immunity
Noise feed through
Truth table verification

Input voltage
Output voltage
Set voltage
Reset voltage
Preset voltage
Offset voltage
Breakdown voltage
Saturation voltage

Input pulse
Amplitude
Risetime
Falltime
(Multiple Exposure)

Output pulse
Pulse width



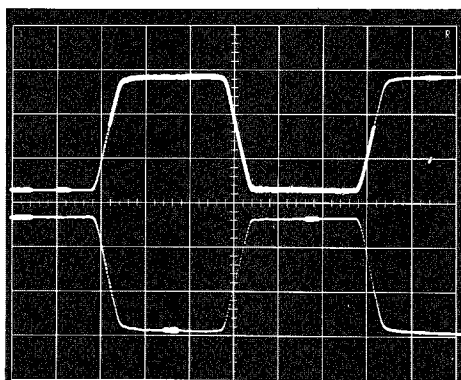
Input pulse
Storage time
A to B

Output pulse
Turn off time
A to C



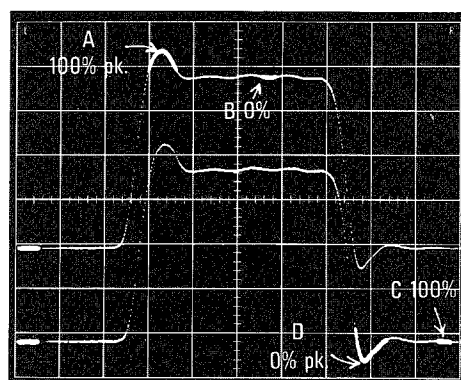
Input pulse
Period

Output pulse
Amplitude



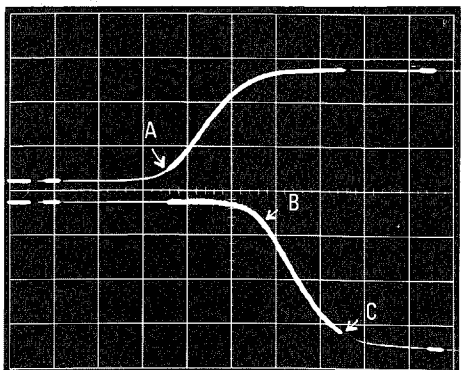
Output pulse
Overshoot
B to A

Negative
overshoot
C to D

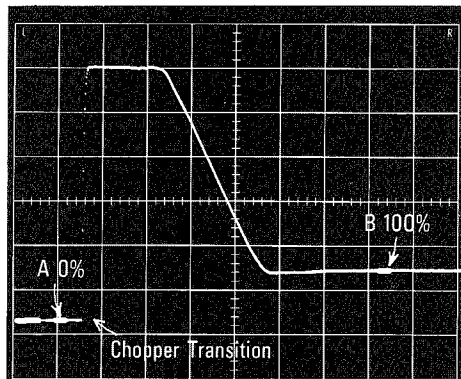


Input pulse
Propagation
delay
A to B

Output pulse
Turn on time
A to C



Output pulse
Collector to
emitter or
Source to
drain
Saturation
Voltage
A to B



GENERAL DESCRIPTION

System equipment is digitally programmed via the Types R240 and R250 Program Control and Auxiliary Programming Units. Complete series of tests are stored on the 8-track rotating disc memory. Each track on the memory has a capacity of 200 different, complete locations, giving a total memory capacity for 1600 complete tests. The format for any test is made up of 96 characters of 4 bits each, 1248 code. There is one parity bit per character, making a total of 480 bits per test.

NOTE: If a second Type R250 (optional) is added to the System, the number of characters will increase to 144 and the bits per test to 720. The number of different complete tests per track then will be 135 for a total memory capacity of 1080 complete tests.

Automatic test sequencing is possible since each test contains the memory address (track and sector) of the next test in the sequence. Variable test sequences, dependent on measurement results, may be accomplished through the program branching feature of the Type R240, thereby simplifying device classification. The System may be programmed to halt when any or all measurements exceed programmed upper or lower limits. Tests do not have to be in sequential order on any given track. Complete random access to any track and to any one of the 200 addresses on each track is provided.

The R240 Program Control Unit contains the circuitry for reading and writing on the disc. Information on the disc is written, stored and read out serially, bit by bit. Tests are read from the disc and shifted into registers in the R240 Program Control Unit and R250 Auxiliary Programmer. These registers convert the serial information into the parallel format required by the System.

Measurement programs may be prepared on the System itself (on line) or by a programmer at his desk (off line). On-line programming is accomplished by setting up the desired measurement through front-panel control of System instruments, then duplicating these settings for remote operation through use of the Type R240 Program Control Unit. The program prepared off line is converted to punched tape, which is then

read into System memory through the optical reader and the Type R240. These measurements may be read in one at a time and verified for accuracy and desired result before commitment to memory. A permanent punched tape record of programs recorded on the disc may be achieved through use of a tape punch (option) and the Type R240. This practice is highly recommended as it increases flexibility in System use and provides a hard copy of data stored on the local rotating memory.

The R240 Program Control Unit provides a read command waveform which lasts until the last character is clocked in. Data must be present at least 100 ns prior to the negative edge of the clock. The R240 is capable of accepting data at character rates up to 600 kHz.

The System contains a Type R116 MOD 703L Programmable Pulse Generator to provide dynamic stimulus to the device under test. Program data for the pulse generator is derived from the Type R250 Auxiliary Program Unit which accomplishes digital-to-analog conversion for proper setup of the pulse generator. The Type R116 may also be operated from the front panel for initial establishment of the test program. All input and output connectors are at the rear of the unit.

System instruments are mounted in a dark blue, dual-bay enclosure which has glass front doors that slide in at either side. An operator desk, approximately 42" wide, is provided which stands to the side of the System enclosure and houses the test station and operator console. Instrument color scheme is dark blue cabinets with anodized and matching silver-grey painted panels. The System enclosure includes a pull-out writing shelf in each bay for convenience in System programming and servicing.

Power supplies are provided to power the device under test (V_{CC} as well as logic voltages). The power supply unit is comprised of 4 programmable operational amplifier supplies. In the remote program mode, digital programming data is provided by the Type R250 Auxiliary Programming Unit which automatically sets up desired polarity and voltage levels. Front-panel controls are provided for initial System setup and as an aid to on-line programming.

Interface between the System and the device under test is accomplished at the test stations through a fixture socket which accepts

test fixture cards (performance boards). This socket arrangement, a 56-pin edge card connector, is mounted at the fixture unit inside a free-standing fixture table. The four programmable power supplies and their sense leads are connected to 4 of the 56 pins; 32 buffered control lines supplying approximately 24 volts at 100 mA each are connected to 32 of the lines.

The buffered control lines would normally be used to control switching circuits used to apply the generator and power supplies and various loads to the item under test and to connect the probes to the correct outputs. A prototype card, listed as an option, is available from Tektronix to aid the customer in performing necessary interface. This card mates to the 56-pin connector and fits into the fixture unit. Rows of plated holes in the card aid in installing necessary control circuitry, interwiring and mounting of special connectors.

A. Programming

The 3S6 Vertical Amplifier, Probe Choppers, 3T6 Horizontal Amplifier and R230 Digital Readout are all programmed directly from the R240. The following modes are programmable in the S-3130 System.

Characteristic

Performance

Programmable Functions

Type 3S6

Both channels: units/div, DC offset and smoothing.

Type 3T6

Time/div, delay, dot density and sweep reset.

R230

Type of measurement: start and stop pick-off points; upper and lower limits; Channel A and B — 0% zone position and width; Channel A and B — 100% zone position and width; measurement averaging; signal choppers; reset inhibit; ext scale — $\text{ext} \div 2$, $\text{ext} \div 5$, and high speed programming.

Programmable Power Supply

A, B and C Supply — 0 to ± 40 V;
D Supply — 0 to ± 80 V.

Type R116 MOD 703L Programmable
Pulse Generator

Amplitude, offset, risetime, fall-
time, period, delay or burst time
width.

B. System Setup

Setting up the System to make a series of measurements is accomplished by the following steps.

1. Install test fixture card.
2. Set System controls.
3. Insert device to be tested into DUT socket.
4. Select correct measurement program from disc.
5. Depress START button.

C. Operation

The Type R240 Program Control Unit provides for an automatic test sequence to be begun by manually selecting the first test address and actuating the START button. The sequence will continue automatically until an END OF TEST code is read by the Type R240 or an INHIBIT signal is generated by the GO, NO/GO logic of the Type R230 limit comparators.

Manual controls permit the operator to:

1. Start automatic sequence.
2. Stop automatic sequence.
3. Continuously recycle a program.
4. Advance the program one test (single cycle).

D. High-Speed Programmed Measurements

The Type 230 Digital Unit can program the sweep provided by the Type 3T6 Programmable Sampling Sweep Unit for increased measurement speeds. During the nonmeasurement part of the sweep, the time base can be made to run fast (10 dots/div) and then run at normal speeds (100 dots/div) for maximum resolution. This function is obtained by externally programming the high-speed program line.

Measurement speed can be increased by externally programming the

position of the 0% and/or 100% reference zones start point to 12 cm. This puts the reference zones into a memory hold position of up to 10 seconds and permits several different measurements to be made without a zone charging sweep. This gives an additional feature of permitting measurements referenced to reference zones that are not on the CRT display.

High-speed programming also resets the sweep immediately after the last memory zone, during the first sweep and after the measurement is completed during the measurement sweep.

MEASUREMENT METHOD

All input signals, stimulus voltages and measurement probes are centralized at the test station. Input signals reach the test station through properly terminated coaxial cable. Stimulus voltages reach the test station through a 56-pin edge card connector which mates with the test fixture card. Signal probes attach to the test fixture card through quick disconnect probe connectors.

Input and output waveforms are picked up simultaneously from the device under test. The two waveforms are reproduced by a dual-channel sampling system which constructs voltage analog equivalents of the original waveforms on a much slower time scale. The actual measurements are scaled from these analog waveforms. The circuitry which performs the measurement is comprised of DC analog memories, DC voltage dividers, analog voltage comparators and a digital counter.

Signals are presented to the measurement circuitry only during a gated time interval determined by the time-base unit. The resulting measurement "window" can be envisioned as a graph in rectangular co-ordinates with time as the X axis and amplitude as the Y axis. The CRT display portrays the relationships of the signals in the measurement window. The time window is made to begin at the correct instant by externally triggering the time base (signal related pretrigger) and adjusting the time delay between trigger and the start of the time axis. The duration of the time window is determined by selecting the rate range set in the time-base unit. The input signals are brought into the correct relationship with the amplitude scale or Y axis of the measurement window by selecting the optimum amplification ratio and adjusting the DC offsets of the dual-trace sampling.

Waveform measurements are taken by sampling vertical amplifier and time-base units operating in conjunction with an analog-to-digital conversion unit. The waveform quantities being measured are displayed in analog form on the CRT. The measurement results are displayed in numerical form on the digital unit.

For digitizing purposes, the time axis of the window is scanned in 1,000 incremental steps. On each recurrence of the input signal, a sample

is taken and the time window scan is advanced by one increment. The result is a voltage analog of the input signal made up of 1,000 steps (500 per trace). Each value represents the instantaneous amplitude of the input signal at a known time within the time window. Waveform timing measurements are made by counting the number of steps between selected points on the waveform along the time axis.

Each waveform parameter measurement requires a start pulse and a stop pulse for gating the digital counter. The gating pulses are generated at programmed pick-off points on the analog waveforms by analog voltage comparators. The comparators are set by precision voltage dividers referenced to the DC analog memories.

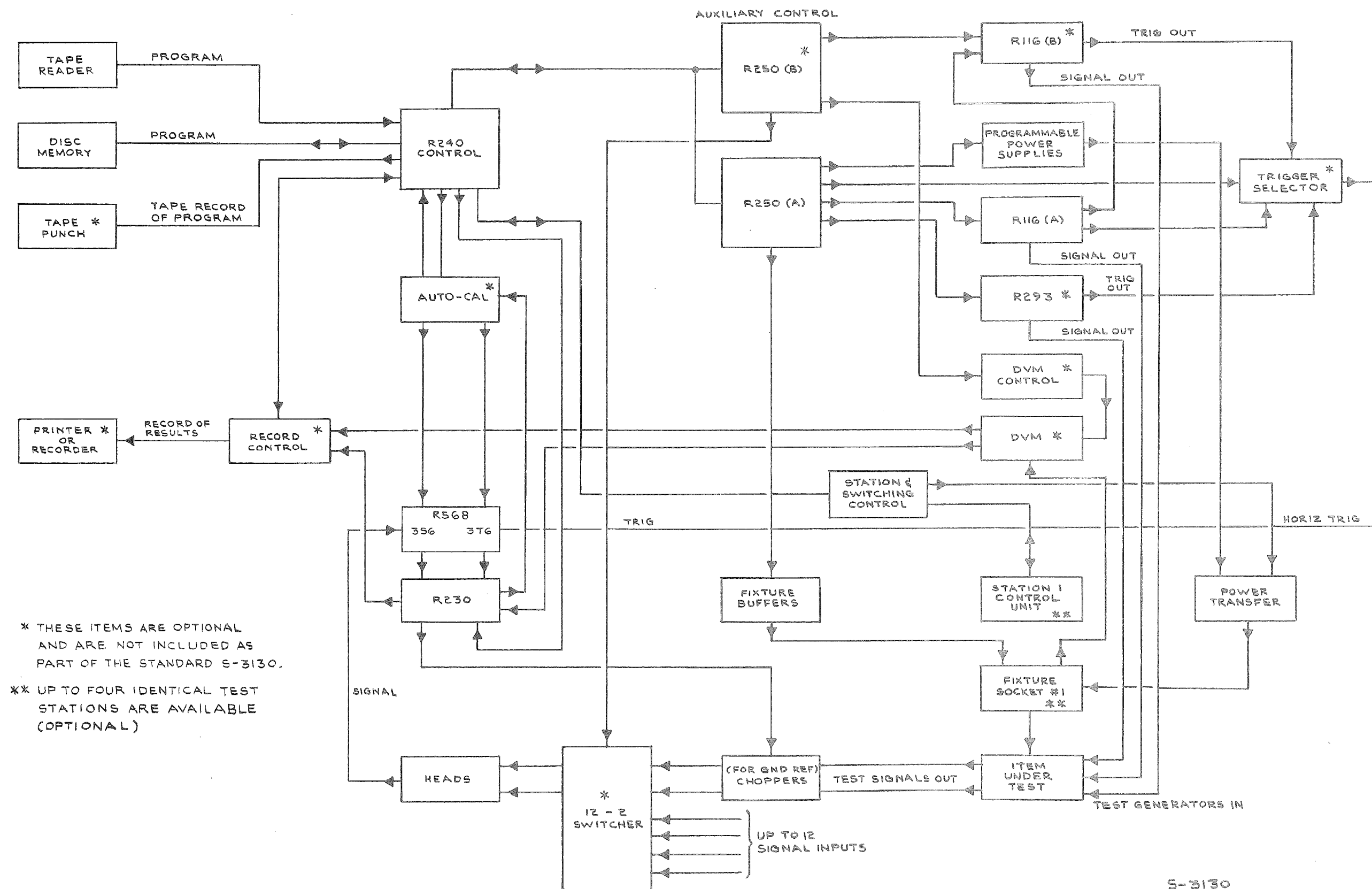
Amplitude measurements are made in a similar manner except that the amplitude axis is digitized by a different method. Pulses from a crystal controlled clock are gated to the digital counter during the time a linear ramp voltage is rising from the voltage level of one analog memory to the level of the other one.

There are two analog memories for each signal channel. One is referred to as the 0% memory, the other as the 100% memory. Each is connected to the signal analog waveform during a small fraction of the time window period. Generally, the 0% memory is gated to receive and store the baseline level of a waveform. The 100% memory is usually gated to receive and store the upper level of a waveform. Both memory zones can be positioned as desired within the time window to permit placing them to coincide with the desired waveform levels. The memories have two possible modes of response. They can be set to respond to the average value of the waveform existing during the zone period or they can be set to respond to the peak value that occurs in the zone. The time duration of each zone can be adjusted in the peak mode.

Percentage and voltage pick-off points as well as amplitude measurements are referenced to one or both of the 0% and 100% memories. When the necessary reference level is not present in the signal waveform, it must be injected into the signal input. Injection is accomplished by momentarily connecting the signal pick-up probe to the desired reference voltage level by means of a chopper relay. The relay operation is timed to coincide with the first zone. Measurements can then be made as though

the actual signal contained the reference value.

DC voltage measurements are accomplished by the waveform measuring system working in conjunction with probe nose choppers. These choppers provide a ground reference voltage. The 0% reference zone is normally set or programmed to this ground reference level. The voltmeter ramp facilities of the Type R230 Digital Unit are then employed to read the difference between the ground reference and the desired DC voltage.



S-3130
BLOCK DIAGRAM
769

SPECIFICATIONS

INSTRUCTION MANUAL

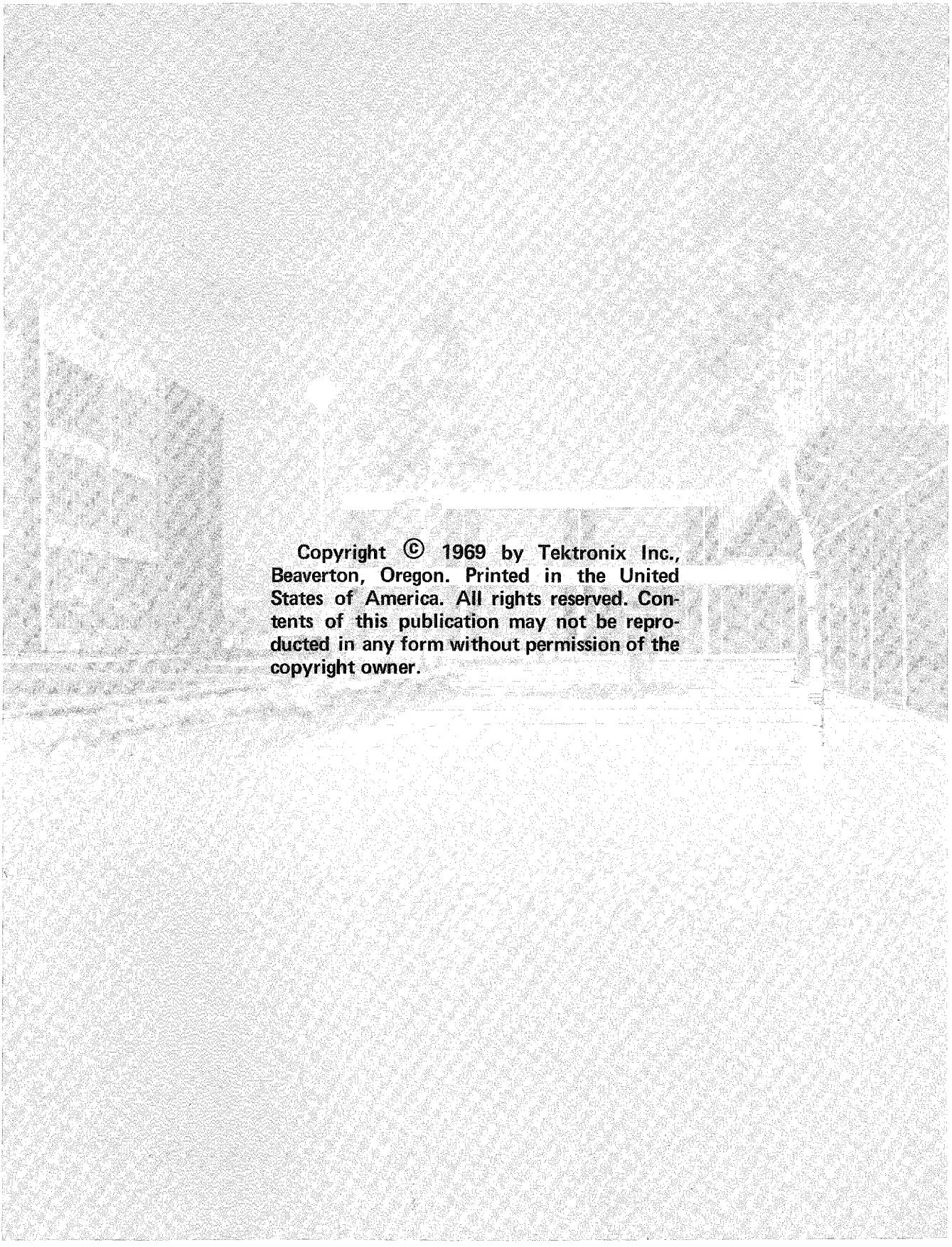
Serial Number _____

TYPE S-3130 CHARACTERISTICS

Tektronix, Inc.

S.W. Millikan Way • P. O. Box 500 • Beaverton, Oregon 97005 • Phone 644-0161 • Cables: Tektronix

070-3001-00



Copyright © 1969 by Tektronix Inc.,
Beaverton, Oregon. Printed in the United
States of America. All rights reserved. Con-
tents of this publication may not be repro-
duced in any form without permission of the
copyright owner.

TYPE S-3130

CHARACTERISTICS

Change information, if any, will be found at the rear of the manual.

General Information

The Type S-3130 Digital Measurement System is an assembly of precision instruments arranged for making programmed measurements on active and passive devices. The System permits the operator to make dynamic tests of diodes, transistors, integrated circuits, logic modules, cables, cores, circuit boards and similar items.

System Equipment

The Type S-3130 System equipment consists of Tektronix equipment and purchased equipment as outlined. The optional equipment is listed to show equipment that may be added to the System. For the performance of the optional equipment, refer to the optional equipment individual instruction manuals.

Tektronix Equipment

1. One Type R568 Oscilloscope with the following plug-in units:

Type 3S6 Programmable Sampling Unit
Type 3T6 Programmable Sampling Sweep Unit

2. One Type R230 Digital Readout Unit

3. One Type R240 Program Control Unit

4. One Type R250 Auxiliary Program Unit

5. One Programmable Power Supply Unit (Tektronix Part No. 015-0121-00). Contains one 80-volt supply and three 40-volt supplies.

6. One Type R116 Mod 703L Programmable Pulse Generator.

7. Two Type S-3 Sampling Heads

8. One pair signal Choppers (Tektronix Part No. 015-0128-01)

9. One System Interface Unit (Tektronix Part No. 015-0143-00)

10. Single Fixture Table, containing single fixture unit.

Tektronix Purchased Equipment

1. One Remex Model RR302 Tape Reader (Tektronix Part No. 020-0026-00)

2. One Data Disc Model F.75-6 Rotating Disc Memory (Tektronix Part No. 020-0024-00)

3. One Kepco OPS 100-0.2 Power Supply Module (used in Programmable Power Supply listed under Tektronix Equipment, item 5)

4. Three Kepco OPS 40-0.5 Power Supply Modules (used in Programmable Power Supply listed under Tektronix Equipment, item 5)

5. One Kepco PRM 24-8 Power Supply

6. One Electronic Enclosures 2-Bay Rack Cabinet

7. One Electronic Enclosures Fixture Table Assembly containing one Test Station

Tektronix Equipment, Optional

1. One Type R250 Auxiliary Program Unit (listed as 2nd Type 250)

2. One Type R116 Mod 703L Programmable Pulse Generator (listed as 2nd Type R116)

3. One Type R293 MOD 703M Programmable Pulse Generator

4. Two Type S-1 Sampling Heads

5. Two Type P6045 FET Probes with accessory power supplies (Tektronix Part No. 010-0205-00)

6. One pair signal choppers (Tektronix Part No. 015-0129-01)

7. One Auto Calibration Unit (Tektronix Part No. 015-0131-00)

8. One Fixture Station, dual or quad Test Station available.

9. One 2-12 50 Ω coaxial Switcher

Tektronix Purchased Equipment, Optional

1. One Tape Punch, modified Tally, Model 420 Tektronix Part No. 020-0027-00

2. One Digital Voltmeter, such as DANA Model 54-00-Series

3. One Printer, such as H. P. 5050B Printer

ELECTRICAL CHARACTERISTICS

Characteristics

The following characteristics apply over an ambient temperature range of 0°C to +50°C and after a 30 minute warmup, providing the instruments in the System were calibrated together in accordance with the System Calibration Procedure at a temperature between +20°C and +30°C.

Characteristics outlined below apply for the Type 3130 System properly connected and programmed, and includes the individual instrument specifications. See the individual instruction manuals for additional specification information.

Vertical

The Vertical characteristics of the Type S-3130 System apply when the proper deflection factor (units per division) is set so that the total measurement window is displayed on the Type R568 CRT screen. The vertical channel includes the Type S-3 Sampling Head, Signal Chopper and 10X attenuator. Analog values of the input signal are displayed on the Type R568 CRT screen and the digitized measurement results are displayed on the Type R230 numerical readout tubes.

Characteristics	Performance Requirement
Range	20 mV to 2 V/division
Tolerance	Within 3% plus one count (Type R230); Within 4% plus one count when the Normal-Smooth function is Smooth.
Response to step Signals Risetime (10% to 90%) with Signal Chopper and 10X attenuator.	0.5 ns or less with 25 Ω source
DC Input Resistance	1 M Ω within 1% with Chopper Reed switch open
Input Capacitance	2.4 PF within 10% with the Chopper Reed switch open.
Maximum Operating Signal Voltage with Probe 10X attenuator	20 V Peak-to-Peak
DC Offset	
Programmed controlled, referred to input, using Probe 10X attenuator.	
Range	-9.95 V to +9.95 V in 50 mV steps.
Tolerance	Within 2% of the programmed value or 50 mV whichever is greater.

Time Base

The equivalent and real time characteristics of the Type S-3130 System apply when the total time measurement window is displayed on the Type R568 CRT screen. The analog time values are displayed on the Type R568 CRT screen and the digitized time measurement results are displayed on the Type R230 numerical readout tubes.

Characteristic	Performance Requirement
TIME/DIV Range	
Real Time	500 ms to 1 ms in 9 calibrated steps, 1-2-5 sequence
Accuracy	Within 3%
Equivalent Time	500 μ s to 100 ps in 21 calibrated steps, 1-2-5 sequence.
Accuracy	Within 3% except as noted below
500 μ s to 200 μ s	Exclude first 150 μ s of sweep
100 μ s to 20 μ s	Exclude first 15 μ s of sweep
10 μ s to 2 μ s	Exclude first 1.5 μ s of sweep
1 μ s to 200 ns	Exclude first 150 ns of sweep
100 ns to 20 ns	Exclude first 15 ns of sweep
10 ns to 1 ns	Exclude first 15 ns of sweep
500 ps to 100 ps	Exclude first 15 ns of sweep (accurate within 5%)
DELAY Range	
TIME/DIV	
500 μ s to 2 μ s	0 to 999.9 μ s in 100 ns increments
1 μ s to 1 ns	0 to 999.9 μ s in 1 ns increments
500 ps to 100 ps	0 to 999.9 ns in 100 ps increments
DELAY Accuracy (with A B C D representing the Delay Window Integers)	Within 3% (see below)
TIME/DIV	
1 ns to 500 μ s	$100 \frac{A}{B} + 3 \frac{C}{D}$ $\frac{A}{B} \frac{C}{D}$ = max error in %
100 ps to 500 ps	$1000 \frac{A}{B} + 3 \frac{C}{D}$ $\frac{A}{B} \frac{C}{D}$ = max error in %
TRIGGERING	
External Auto	
Frequency Range	DC to 100 MHz
Amplitude Range	100 mV to 500 mV

Programmable Power Supply, Tektronix Part No. 015-0121-00.

The Characteristics of the four power supply modules, purchased by Tektronix Inc. for use in measurement systems, are included in the performance of the Programmable Power Supply as outlined in the following table.

Characteristics	Performance Requirement
Polarity	Positive or Negative
Amplitude	
40-volt Supply (A, B & C Supply)	0 to ± 40 V continuously variable manually, or programmable in 10 mV steps
80-volt Supply (D Supply)	0 to ± 80 V, continuously variable manually, or programmable in 10 mV steps
Current	
40-volt Supply	0 to 0.5 Amperes
80-volt Supply	0 to 0.2 Amperes
Tolerance	
Programmed	0.5% plus 5 mV. Repeatable within 0.5%, ± 3 mV.
Manual	Within 5% plus 10 mV
Regulation	
Line	Within 0.02% or 0.5 mV whichever is greater
Load	Within 0.25% or 1 mV whichever is greater

Type R116 Mod 703L Programmable Pulse Generator

The Characteristics of the Type R116 Mod 703L apply when the instrument is calibrated with the matched set of program cards for the Type 250 containing the Type R116 remote resistors. The Type R116 is programmed from the Type 250 as part of the S-3130 System. Output load is 50 Ω .

Characteristics	Performance Requirement
Amplitude	± 0.4 V to ± 10 V in 3 Ranges
Tolerance	Within 3%, ± 15 mV on the 0.2 V Range. Within 3%, ± 25 mV on the 0.5 V Range. Within 3%, ± 50 mV on the 1.0 V Range.
Offset (of pulse baseline)	-4.9 to +4.9 V
Tolerance	Within 5% ± 200 mV
Risetime and Falltime (specified when the Amplitude Multiplier is programmed for 10).	10 ns to 109 μ s in 4 Ranges

Characteristics	Performance Requirement
Tolerance	Within 10% in 1 ns Range above 10 ns (10 ns to 109 ns). Within 10% in 10 ns Range. Within 5% in 100 ns and 1 μ s Ranges.
Period	
Programmed Tolerance	100 ns to 10.9 ms in 5 ranges Within 5% in 100 ns Range. Within 3% in all other ranges.
External or manually triggered	Period is determined by the external triggering signal and/or the manual trigger.
Delay or Burst Time	50 ns to 545 μ s in 4 ranges
Tolerance	Within 3% plus 10 ns
Width (specified only when the risetime and the falltime are minimum and the amplitude multiplier is maximum)	50 ns to 545 μ s in 4 Ranges
Tolerance	Within 5% in 10 ns Width Range. Within 3% in all other Width Ranges.

Programming

Programs can be stored in an 8-track rotating disc memory. Each track on the memory has a capacity of 200 different, complete locations, giving a total memory capacity for 1600 complete tests. The format for any test is made up of 96 characters of 4 bits each, 1248 code. There is one parity bit per character, making a total of 480 bits per test.

NOTE

If a second Type R250 (optional) is added to the System, the number of characters will increase to 144 and the bits per test to 720. The number of different complete tests per track then will be 135 for a total memory capacity of 1080 complete tests.

Automatic test sequencing is possible since each test contains the memory address (track and sector) of the next test in the sequence. A means of making the next address a function of the previous test results is also provided. Tests do not have to be in sequential order on any given track. Complete random access to any track and to any one of the 200 addresses on each track is provided.

The R240 Program Control Unit contains the circuitry for reading and writing on the disc. Information on the disc

is written, stored and read out serially, bit by bit. Tests are read from the disc and shifted into registers in the R240 Program Control Unit and R250 Auxiliary Programmer.

Tests may be prepared using the Type R240 Program Control Unit. Any given test may be transferred from the disc (or tape) into the Type R240 registers, examined character by character, modified if necessary and stored on the disc in corrected form. Finally, if the System is connected to a compatible tape punch, complete programs may be punched out on paper tape directly from the System.

If your system does not contain a disc, refer to the Type R240 instruction manual, page 2-41 "Operation Without Disc Memory". The Type R240 can be programmed by input logic signals at J114 in lieu of a disc memory. The Type R240 provides a read command waveform which lasts until the last character is clocked in. Data must be present at least 100 ns prior to the negative edge of the clock. The Type R240 is capable of accepting data at character rates up to 600 kHz. The Type R240 logic levels on J114 are as follows:

True = Any voltage level between 0 V and +2 V.

False = Any voltage level between +6 V and +12 V (2 k Ω load to +12 V).

Read Command Output = Saturated NPN transistor between ground and a 1.5 k Ω load to +10 V. Additional loading of 2 k Ω to +10 V is acceptable.

Characteristics	Performance Requirement
Programmable Functions	
Type 3S6	Both Channel Units/div, DC Offset and Smoothing

Characteristics	Performance Requirement
Type 3T6	Time/division, Delay, Dot Density and Sweep reset
R230	Type of Measurement, Start and Stop Pickoff Points, Upper and Lower Limits, Channel A and B 0% Zone Position and Width, Channel A and B 100% Zone Position and Width, Measurement Averaging, Signal Choppers, Reset inhibit, Ext Scale, Ext -2, Ext -5, and High Speed.
Programmable Power Supply	A, B and C Supply 0 to ± 40 V, D Supply 0 to ± 80 V.
Type R116 Mod 703L Programmable Pulse Generator	Amplitude, Offset, Rise-time, Falltime, Period, Delay or Burst Time, and Width

Test Fixture Logic

There are 32 buffered control lines from the Type 250 Auxiliary Program Unit to the test fixture card socket. Up to 100 mA at 24 V are available at each control line to operate relays on the fixture cards for connecting the test inputs, output loads, and signal pickup probes to the device socket terminals.

The test fixture card socket is a 56-pin (28 to each side) edge card socket.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

INSTRUCTION MANUAL

Serial Number _____

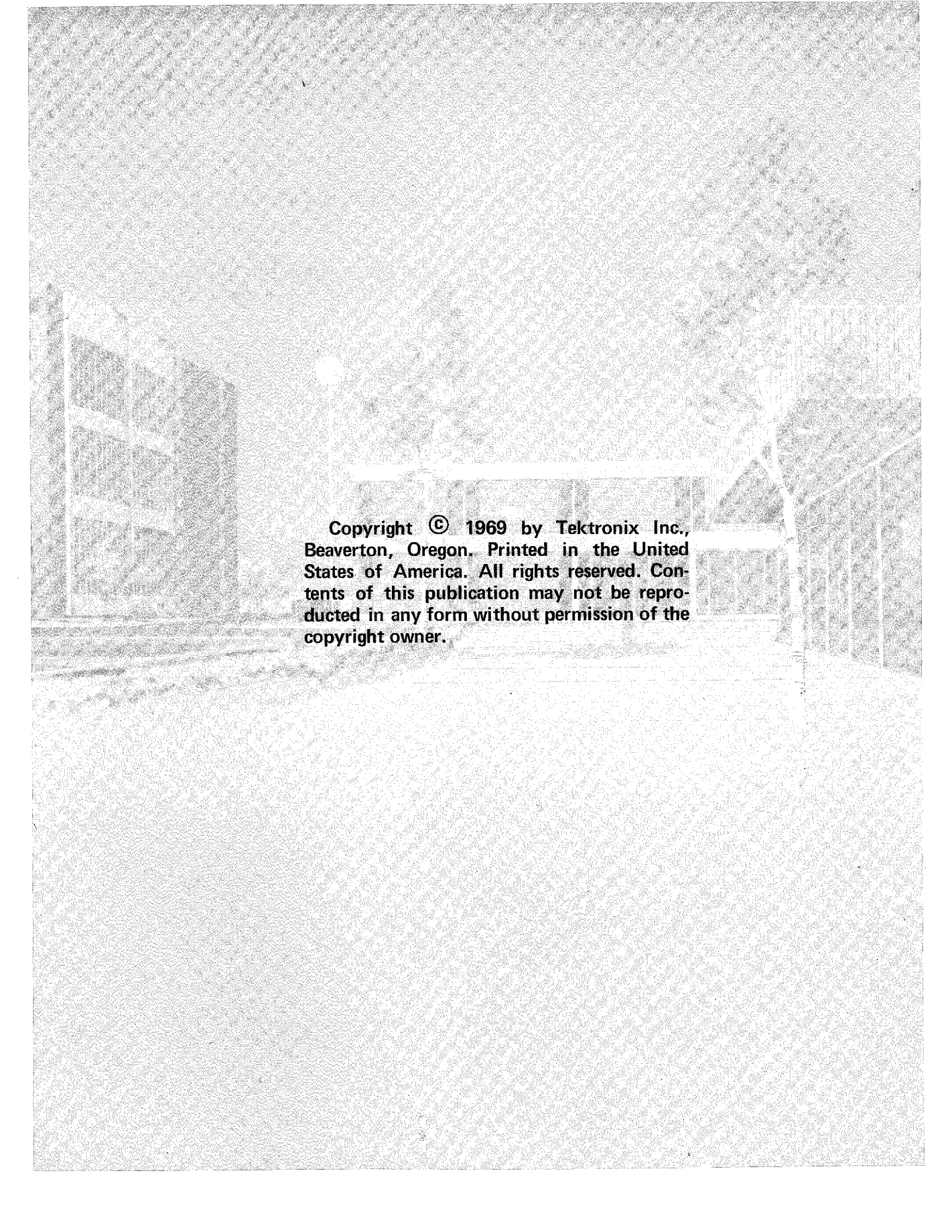
DIGITAL MEASUREMENT SYSTEM

SYSTEM CALIBRATION INTRODUCTION

Tektronix, Inc.

S.W. Millikan Way • P. O. Box 500 • Beaverton, Oregon 97005 • Phone 644-0161 • Cables: Tektronix

070-3003-00



Copyright © 1969 by Tektronix Inc.,
Beaverton, Oregon. Printed in the United
States of America. All rights reserved. Con-
tents of this publication may not be repro-
duced in any form without permission of the
copyright owner.

Type _____ Serial Number _____

The Digital Measurement System Calibration Procedure is contained within this manual and the individual instrument System Calibration Procedure Manuals listed below.

Instrument Types	Tektronix Part Number
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

SYSTEM CALIBRATION INTRODUCTION

SYSTEM CALIBRATION

This section contains a unified calibration procedure for the entire System. The unified procedure is based on the calibration procedures given in the standard instruction manuals for the individual instruments in the System. Calibration procedures for optional accessories that have been ordered with the System have been added at the end of the unified procedure.

Any required maintenance should be performed before proceeding with the system calibration. Maintenance information is contained in the maintenance section of the standard instruction manuals.

This system calibration procedure has been arranged in an order which will provide the most concise calibration of the system with a minimum of test equipment. At the beginning of the system calibration procedure is an equipment list which includes the test equipment needed to calibrate the system and a short description of each piece of equipment. This description should aid in choosing suitable options when the suggested equipment is not available.

EQUIPMENT REQUIRED

The following list of equipment is needed to calibrate the entire S-3130 system. This list is a composite of the lists found at the beginning of each of the standard instruction manual calibration procedures. Some substitutions have been made in the individual lists in order to eliminate duplication of instrument function or to substitute an instrument of more recent design. Additional recommended calibration equipment is listed as required by the calibration procedure.

1. Test Oscilloscope, Tektronix Type 547. Compatible with Type 1A1 (item 2) and Type W (item 3).
2. Dual Trace Unit, Tektronix Type 1A1, Minimum requirements, Dual Trace Bandwidth DC to 40 MHz with minimum deflection factor 0.005 volts/division.
3. Differential Comparator Unit, Tektronix Type W, compatible with Type 547 Oscilloscope. For voltage comparison and minimum deflection factor measurements. Bandwidth DC to 7 MHz minimum deflection factor 0.001 volts/division.
4. Two 1X probes, Type P6011. Tektronix Part No. 010-0193-00.
5. 10X probe, Type P6010. Tektronix Part No. 010-0188.
6. Variable autotransformer: Output voltage variable from 104 to 126 volts AC RMS for 115-volt nominal operation, or from 208 to 252 volts AC RMS for 230-volt nominal operation; output power 210 watts minimum. If the autotransformer does not include a monitor voltmeter, a separate AC voltmeter accurate within $\pm 3\%$ over the operating range listed above is required. General Radio W10MT3W metered Variac autotransformer meets these requirements.
7. Bench multimeter such as Simpson Model 262 or Triplett Model 630 NA. One measurement in the Type 568 requires a meter capability of measuring -3300 Volts accurate to within 1%.
8. Precision differential DC voltmeter accurate within $\pm 0.5\%$; meter resolution, 1 mV; range, 0.001 volt to 250 volts. A meter such as a John Fluke Model 825A is recommended. A 10 k Ω 1/2 w $\pm 5\%$ resistor is required to add across the meter input for some measurements.
9. 50 Ω Amplitude Calibrator. Output impedance 50 Ω ; voltage range 0.012 to 1.2 volt square wave; accuracy within $\pm 0.25\%$. Tektronix Calibration Fixture 067-0508-00.
10. Square wave and pulse generator that produces 1 μ s and 10 μ s period square waves with 1.0 volt peak amplitude into 50 Ω with an amplitude accuracy within $\pm 0.5\%$. Also required is a pulse of approximately 0.2 volt into 50 Ω having a X70 ps risetime with a trigger signal available at least 75 ns in advance of the fast pulse. The Tektronix Type 284 meets the above requirements. (If your Type 284 lead-time switch is labeled 5 ns-50 ns, order modification kit, Tektronix Part No. 040-0487-00.)
11. 50 Ω 2X attenuator with GR 874 connectors, such as GR874-G6. Tektronix Part No. 017-0080-00.
12. 50 Ω 5X attenuator with GR 874 connectors, such as GR874-G14. Tektronix Part No. 017-0079-00.
13. 50 Ω coaxial cable with GR 874 connectors such as 5 ns signal delay RG58C/U cable, Tektronix Part No. 017-0512-00.

14. 50 Ω coaxial cable, approximately 42 inches long with BNC connectors, for example, RG58C/U, Tektronix Part No. 012-0057-01. (This cable is supplied with the Type 284.)

15. 50 Ω Voltage Pickoff unit, Type VP-2, Tektronix Part No. 017-0077-01. (This part is supplied with the Type S-3.)

16. 50 Ω end-line termination, GR 874-W50B, Tektronix Part No. 017-0081-00.

17. Rigid plug-in extender, Tektronix Part No. 067-0590-00. This Calibration Fixture is used to operate the Type 3S6 outside the indicator oscilloscope.

18. Normalizer Head, for loop gain adjustment and to check Digital logic: Tektronix Calibration Fixture 067-0572-00.

19. Circuit card extender, Tektronix Part No. 012-0149-00.

20. Square wave generator with the following output characteristics: amplitude at least 12 volts into 50 Ω ; repetition rate of 50 kHz; risetime 12 ns or less. Tektronix Type 106 Square Wave Generator will meet these requirements.

21. 50 Ω 10X attenuator with BNC connectors, Tektronix Part No. 011-0059-00.

22. Two 50 Ω 10X attenuators, with GR 874 connectors, such as GR874-G20. Tektronix Part No. 017-0078-00.

23. Adapters, BNC Male to GR, such as Tektronix Part No. 017-0064-00 and BNC Female to GR, 017-0063-00.

24. DC Bridge for measuring 100 k Ω and 1 M Ω . Accuracy. $\pm 0.025\%$. Maximum DC Bridge volts allowed across 100 k Ω resistor is 100 volts.

25. Two 50 Ω coaxial cable with GR 874 connectors such as 20 ns signal delay RG213/U cable, Tektronix Part No. 017-0504-00.

26. A special variable attenuator with GR874 connectors. It consists of a 100 Ω potentiometer across the 50 Ω line, and does not have a guaranteed response. Tektronix Part No. 067-0511-00.

27. One 6 foot Sampling-Head extender (for two heads), Tektronix Part No. 012-0130-00. (Supplied with Type 3S6.)

28. Six circuit board connectors. Tektronix Part No. 388-0805-00. (Accessories included with Type 3S6, 3T6, and rigid extenders.)

29. Time mark generator, Tektronix Type 184. Minimum alternate requirements: time-mark or sine wave period

outputs from 0.5 s through 2 ns; accuracy within 0.5%; output amplitude at least 0.3 volt into 50 Ω .

30. Pulse generator, Tektronix Type 111 recommended. Minimum alternate requirements: positive-going and negative-going pulse outputs; pulse risetime less than 1 ns; pulse duration 2 ns; repetition rate 100 kHz; pulse amplitude at least 2 volts into 50 ohms. The Type 111 has an output pulse amplitude of 10 to 20 volts.

31. Rigid plug-in extender, Tektronix Part No. 067-0591-00. This Calibration Fixture is used to operate the Type 3T6 outside the indicator oscilloscope.

32. Signal delay, coaxial cable. Impedance, 50 ohms; delay 60 ns; GR874 connectors. Tektronix Type 113 Delay Cable.

33. Air Line; 20 cm length, GR874 connectors Tektronix Part No. 017-0084-00.

34. Coaxial T connector with GR 50-ohm connectors. Tektronix Part No. 017-0069-00.

35. Coaxial T Power Divider with 50-ohm connectors GR-TPD. Tektronix Part No. 017-0082-00.

36. Sine Wave generator, Tektronix Type 191 Constant Amplitude Signal Generator. Output frequency variable from 20 MHz through 100 MHz, accuracy within 3%; output amplitude variable from approximately 1 mV to approximately 1 V into 50 ohms.

37. 56-terminal circuit card extender. Tektronix Part No. 012-0078-00.

Performance Check/Calibration

Performance and/or calibration of the instruments making up the S-3130 System should be checked after each 500 hours of operation and at least once every six months to ensure that the instruments are operating correctly. Recalibration of the instruments may be performed periodically as part of a regular preventive maintenance schedule or may be done whenever the need is indicated by the system performance. Whenever defective components are replaced or other electrical repairs made within an instrument, then the performance of the instrument should be checked and recalibration performed as necessary.

When doing a complete calibration of the S-3130 System the best overall performance is obtained if each adjustment in each instrument is made to the exact setting, even if the observed performance is within the allowable tolerance.

A calibration record is included at the break point where the procedure goes from one instrument to the next. These calibration records can be used as a check list to verify correct instrument operation and as a calibration guide for experienced calibrators.

TEST EQUIPMENT USAGE CHART

The Test Equipment Usage Chart lists the equipment required, in abbreviated form, by the same numbers referred to in the Equipment Required paragraph, and shows what equipment is required to calibrate each system instrument.

System Instruments

Item	568	230	3T6	3S6	S-3	240	250	116	P'wr Supp	DATA DISC		
1. Type 547	X	X	X	X	X	X	X	X				
2. Type 1A1		X	X	X	X	X	X					
3. Type W	X	X	X	X	X							
4. 1X Probe	X	X	X	X	X	X	X	X				
5. 10X Probe			X	X	X							
6. Autotrans	X					X	X	X				
7. Multimeter	X	X	X	X	X	X	X					
8. John Fluke 825A	X	X	X			X	X	X				
9. Amp. Cal				X								
10. Type 284			X	X	X							
11. 2X Atten			X									
12. 5X Atten			X									
13. Coax 5 ns			X	X	X							
14. Coax (BNC)			X	X	X		X	X				
15. VP-2			X	X	X		X	X				
16. Termination			X	X	X		X	X				
17. Extender Plug-In				X								
18. Norm Head				X								
19. Extender Cir. Card			X	X								
20. Type 106 Square Wave Gen				X	X							
21. 10X Atten BNC					X							
22. 10X Atten GR				X								
23. BNC to GR			X	X	X			X				
24. DC Bridge				X	X							
25. Coax 20 ns			X	X	X							
26. Variable Atten			X									
27. Extender Sampling Head	X	X	X	X	X			X				
28. Connector Cir. Board	X	X	X	X	X			X				
29. Time Mark Gen			X					X				
30. Pulse Gen			X									
31. Extender Plug-In			X									
32. Type 113 Delay Cable			X									
33. 20 cm Air Line			X									
34. Coax T			X									
35. Power Divider			X									
36. Type 191			X									
37. Extender Card								X				

PRICES

A. Standard S-3130 System, FOB Beaverton, Oregon \$ 46,700.00

Total price of the System as described in System Equipment list. This price does not include items listed under Options. The System will be operational with one performance check-out fixture card and will include two prototype fixture cards to assist in customer development of test fixturing.

B. Options

1. Dual Stations

This lets the S-3130 multiplex between two separate test stations making separate measurements on command from the respective station control unit. Once a test sequence has been started from one station, the other station is held off until the first station has stopped its measurements. Each station has its own control to select its measurement sequence and indicate GO, NO/GO results. Each station also has its own independent fixture unit. Each operator can use his station independent of the other. The System measurement risetime is 2 ns when using dual stations instead of 0.5 ns.

Dual Stations \$ 3,840.00

Each station installed in separate, free-standing, 42" tables.

Dual Stations \$ 3,500.00

Both stations installed in one free standing, 60" table.

2. Auto Cal Unit, 015-0131-01 \$ 3,850.00

Increases the measurement accuracy of the System to within $\pm 1\%$ at vertical amplifier settings of 10 mV/div to 200 mV/div and at equivalent sweep speeds of 0.2 ms to 1 ns. The vertical settings of 5 mV/div and 2 mV/div and the sweep speeds below 0.2 ms and above 1 ns are at the respective vertical and horizontal plug-in accuracies as

listed previously.

3. Tape Punch, installed \$ 2,800.00

In conjunction with the Type R240 Program Control Unit, it generates new program tapes. Measurement programs, stored in the disc memory may be transferred through the Type R240 to the Tape Punch for permanent storage. The Tape Punch has a maximum speed of 60 characters/second. It occupies 10½" of rack space, 19" wide and 12" deep.

4. Printer (HP 5050B) \$ 4,350.00

The Printer has been purchased with special wheels, wheel location and negative true logic. The print format is from left to right as follows: first 4 columns, test numbers; next 5 columns, R230 numerical readout; next 2 columns, decimal location; next 2 columns, R230 units of measure; and last column, R230 GO, NO/GO results.

We are presently using 14 of the columns for printed information. Columns 2, 5, 8 and 14 are spaces separating the major categories of information. The Printer is controlled by the System interface unit. It has 4 modes of operation, OFF, ON, REJECT and ACCEPT. The maximum measurement speed is reduced to 15 measurements/second during the print/measure cycle.

<u>Test Number</u>	<u>Readout</u>	<u>Decimal Location</u>		
5372	±0024	-2	ns, µs, ms s, V, mV	High Medium Low

5. R293 MOD 703M Programmable Pulse Generator (installed) \$ 1,425.00

Risetime is less than 1 ns at maximum amplitude. Fall-time is less than 1 ns at greater than 20 ns width or less than 2 ns at 3 to 20 ns width, at maximum amplitude. Pulse amplitude is programmed in 0.5-V increments over a range of 6 V to 12 V, accurate within 3%. Pulse width is programmed in 1-ns increments over a range of 2 ns to 250 ns, accurate within 3%, +3 ns. Repetition rate is manually

controlled and is from less than 10 kHz to greater than 90 kHz. Polarity is manually controlled for + and - polarity. Over-all leading edge aberrations before the first 10 ns are less than +3%, -5% after first 10 ns and before last 15-ns over-all aberrations are $\pm 10\%$.

6. 2nd R250, referred to as R250B \$ 3,500.00

Adds 48 4-bit character for additional programming capabilities. It will contain the shift register-programming cards necessary to program the options ordered (listed below) and proper interconnections to these options. The remaining locations contain shift registers and standard programming cards. Extra interconnecting cables are not included. Extra 6-foot shielded interconnecting cables, 36-pin connectors on both ends are available at \$40 each (012-0131-00) and extra 8-foot shielded interconnecting cables with 36-pin connectors on one end, no connector on the other ends, are available for \$25 each (012-0132-00).

The following Options require a 2nd R250.

a. RI16 MOD 703L, referred to as RI16B \$ 3,050.00

Refer to standard S-3130 spec for specifications on RI16 MOD 703L.

b. 12-to-2 50- Ω Switcher \$ 1,910.00

The 12-to-2 50- Ω Switcher was primarily designed to be used as a remotely programmed probe or pulse generator switcher. When used as a probe switcher, it can select any of 12 probes to be referenced to either of 2 outputs. When used as a generator switcher, it can select any of 2 inputs, A or B to be connected to one of 12 outputs. The 12-to-2 Switcher requires 18 bits to program it.

7. 3-Bay Cabinet \$ 775.00

Extends the 2-bay cabinet to include 3 bays, adding an extra 57 3/4" of 19" rack space.

8. Long Single Table \$ 60.00
A 60" table replaces the standard 42" table with one fixture unit installed and one station control console.
9. DTL Test Fixture Card \$ 475.00
A flexible fixturing arrangement readily adapted to the S-3130 System which allows switching of pulses logic voltages, supply voltages and dynamic measuring points to any of 14 leads on DTL devices when appropriately used with the adapter cards.
10. DTL Adapter Card \$ 10.00
An unwired prototype card that mounts to the DTL fixture card making it possible to adapt the DTL card to several DTL devices.
11. Prototype Test Fixture Card, 670-1016-00 \$ 65.00
An unwired test fixture with 3 connectors. Two for adaption to the signal choppers and one coaxial connector for pulse input. With proper circuit design and wiring, the card can interface the item under test to the System. This card mates the 56-pin edge connector in the fixture unit.

GENERAL INFORMATION

THE UNITED STATES

INSTRUMENT ORDERS, TERMS, AND SHIPMENT

Orders should be placed with your Tektronix Field Engineering Office listed on page 13.

TERMS OF SALE

Credit terms may be arranged through your Tektronix Field Engineer.

Tektronix standard terms of sale are NET 30 DAYS, which is to agree that payment will be deferred for thirty days following shipment.

Other terms are offered to meet varied purchasing objectives and to assist in financial planning. Some of these terms of sale are:

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 product invoice.

Installment terms may be used to purchase instruments for use now, while payment is monthly for periods of six months to five years, depending on the amount to be financed. As little as 10% is advanced prior to shipment of an installment purchase.

A term lease (buying the use of instrumentation rather than the equipment) of six months to five years is available. At the expiration of the lease there is the opportunity to update your instruments, to renew the existing lease for a modest annual rental, or to return the equipment at Tektronix expense.

All prices, quotations and shipments are FOB Beaverton, Oregon.

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

FIELD MAINTENANCE

To help assure adequate instrument-maintenance facilities for our customers, Tektronix has established Field Engineering Offices and Service Centers at strategic points in the United States. Your own Tektronix Field Office will process all orders for repair parts promptly, and provide emergency parts service when needed to restore an instrument to operating condition. Your Field Office will also arrange for fast service with necessary adjustments or repair of your instruments at a nearby Service Center.

Tektronix repair and replacement-part service is geared directly to the field, therefore all requests for repairs and replacement parts should be directed to the Tektronix Field Office 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.

WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

Questions regarding warranty should be discussed with your Tektronix Field Engineer.

TEKTRONIX, INC.

An Oregon Corporation

Corporate Offices and Plant Located at:

TEKTRONIX INDUSTRIAL PARK
14150 S.W. KARL BRAUN DRIVE
BEAVERTON, OREGON

Mailing Address: P. O. Box 500, Beaverton, Oregon 97005

Telephone: (503) 644-0161

TWX: 503-291-6805

Telex: 36-691

Cable: TEKTRONIX

TRAINING

The training session will accommodate as many participants as the customer desires to send within reason. As a minimum, those persons to be involved in or responsible for operating the System, preparing its measurement programs and accomplishing its maintenance and calibration should attend these training sessions. Those to be responsible for maintenance and calibration must have prior knowledge of sampling and digital measurement techniques. Factory training courses on these instruments is available without charge. Your local Field Engineer can inform you on the scheduling of these classes. Trained maintenance personnel will assure a minimum of down time and the maximum benefit from the System.

An example of the training outline follows.

001-379D

WEEKLY SCHEDULE

ROOM NO. _____

FOR _____ GROUP

WEEK _____ 1

S-3130 SYSTEM

_____ TRAINEES

DATE _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-9:50 A.M. Introduction	8:00-9:50 A.M. Digital Logic and I.C.'s	8:00-9:50 A.M. Type 3S6 Vertical Plug-In	8:00-9:50 A.M. Type 3T6 Sampling Sweep	8:00-9:50 A.M. Type 3T6 Sampling Sweep
9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break
10:00-12:00 Sampling Concepts	10:00-12:00 Type 3S6 Vertical Plug-In	10:00-12:00 Type 3S6 Vertical Plug-In	10:00-12:00 Type 3T6 Sampling Sweep	10:00-12:00 Type 3T6 Sampling Sweep
12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch
12:30-2:20 P.M. Sampling Concepts	12:30-2:20 P.M. Type 3S6 Vertical Plug-In	12:30-2:20 P.M. Type S-1/S-3 Sampling Heads	12:30-2:20 P.M. Type 3T6 Sampling Sweep	12:30-2:20 P.M. Type 230 Block Analysis and Waveform Ladder Diagram
2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break
2:30-4:30 P.M. Digital Logic and I.C.'s	2:30-4:30 P.M. Type 3S6 Vertical Plug-In	2:30-4:30 P.M. Type P6045/ P6046 Probes	2:30-4:30 P.M. Type 3T6 Sampling Sweep	2:30-4:30 P.M. Type 230 Block Analysis and Waveform Ladder Diagram

001-379D

WEEKLY SCHEDULE

ROOM NO. _____

FOR _____ GROUP

WEEK _____ 2

S-3130 SYSTEM

_____ TRAINEES

DATE _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-9:50 A.M. Type 230 Operator's Course	8:00-9:50 A.M. Type 230 Zone Generator Cards	8:00-9:50 A.M. Type 230 Comparator and Offset Generator Cards	8:00-9:50 A.M. Type 230 Synchronizer Card	8:00-9:50 A.M. Type 230 Counters and Readout Circuits
9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break
10:00-12:00 Type 230 Operator's Course	10:00-12:00 Type 230 CRT Intensification Card	10:00-12:00 Type 230 Comparator and Offset Generator Cards	10:00-12:00 Type 230 Synchronizer Card	10:00-12:00 Type 230 Limit Card
12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch
12:30-2:20 P.M. Type 568 and Type 230 Power Supply	12:30-2:20 P.M. Type 230 Memory Cards	12:30-2:20 P.M. Type 230 Clock Card	12:30-2:20 P.M. Type 230 Synchronizer Card	12:30-2:20 P.M. Type 230 External Programming
2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break
2:30-4:30 P.M. Type 230 Buffer Card	2:30-4:30 P.M. Type 230 Memory Cards	2:30-4:30 P.M. Type 230 Clock Card	2:30-4:30 P.M. Type 230 Counters and Readout Circuits	2:30-4:30 P.M. Type 230 External Programming

001-379D

WEEKLY SCHEDULE

ROOM NO. _____

FOR _____ GROUP

WEEK 3

_____ TRAINEES

S-3130 SYSTEM

DATE _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-9:50 A.M. Data Disc	8:00-9:50 A.M. Type 240 Control Logic and Mode Switch	8:00-9:50 A.M. Type 240 Address Circuits	8:00-9:50 A.M. Type R116 Pulse Generator	8:00-9:50 A.M. Type S-3130 Auto Cal
9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break
10:00-12:00 Type 240 Operator's Course	10:00-12:00 Type 240 Control Logic and Mode Switch	10:00-12:00 Type 240 Address Circuits	10:00-12:00 Type R116 Pulse Generator	10:00-12:00 Type S-3130 Auto Cal
12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch
12:30-2:20 P.M. Type 240 Operator's Course	12:30-2:20 P.M. Type 240 Data Conversion Circuits	12:30-2:20 P.M. Type 240 Error Circuits and Trigger Delay	12:30-2:20 P.M. Type R116 Pulse Generator	12:30-2:20 P.M. Type S-3130 Programmable Power Supplies and Miscellaneous Purchased Equipment
2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break
2:30-4:30 P.M. Type 240 Operator's Course	2:30-4:30 P.M. Type 240 Examine- Modify Circuits	2:30-4:30 P.M. Type 240 Power Supply and Program Cards	2:30-4:30 P.M. Type R116 Pulse Generator	2:30-4:30 P.M. Type S-3130 Programmable Power Supplies and Miscellaneous Purchased Equipment

001-379D

WEEKLY SCHEDULE

ROOM NO. _____

FOR _____ GROUP

WEEK _____ 4

_____ TRAINEES

S-3130 SYSTEM

DATE _____

Four week students
(Technician)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-9:50 A.M. Type S-3130 Interface Unit	8:00-9:50 A.M. Type S-3130 Operator's Course	8:00-9:50 A.M. Type S-3130 System Operation and Programming	8:00-9:50 A.M. Type S-3130 System Operation and Programming	8:00-9:50 A.M. Type S-3130 System Maintenance and Troubleshooting
9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break
10:00-12:00 Type S-3130 Interface Unit	10:00-12:00 Type S-3130 Operator's Course	10:00-12:00 Type S-3130 System Operation and Programming	10:00-12:00 Type S-3130 System Operation and Programming	10:00-12:00 Type S-3130 System Maintenance and Troubleshooting
12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch
12:30-2:20 P.M. Type S-3130 Block Analysis and Data Flow	12:30-2:20 P.M. Type S-3130 Operator's and Programming Course	12:30-2:20 P.M. Type S-3130 System Operation and Programming	12:30-2:20 P.M. Type S-3130 System Operation and Programming	12:30-2:20 P.M. Lunch Out
2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break
2:30-4:30 P.M. Type S-3130 Block Analysis and Data Flow	2:30-4:30 P.M. Type S-3130 Operator's and Programming Course	2:30-4:30 P.M. Type S-3130 System Operation and Programming	2:30-4:30 P.M. Type S-3130 System Operation and Programming	2:30-4:30 P.M. Travel Time

001-379D

WEEKLY SCHEDULE

ROOM NO. _____

FOR _____ GROUP

WEEK 4

_____ TRAINEES

S-3130 SYSTEM

DATE _____

Fourth week students only
(Programmer/Engineer)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-9:50 A.M. Introduction	8:00-9:50 A.M. Type S-3130 Operator's Course	8:00-9:50 A.M. Type S-3130 System Operation and Programming	8:00-9:50 A.M. Type S-3130 System Operation and Programming	8:00-9:50 A.M. Type S-3130 System Maintenance and Troubleshooting
9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break	9:50-10:00 A.M. Coffee Break
10:00-12:00 Type 568/230/ 3S6/3T6/240 Operator's Course	10:00-12:00 Type S-3130 Operator's Course	10:00-12:00 Type S-3130 System Operation and Programming	10:00-12:00 Type S-3130 System Operation and Programming	10:00-12:00 Type S-3130 System Maintenance and Troubleshooting
12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch	12:00-12:30 Lunch
12:30-2:20 P.M. Type S-3130 Block Analysis and Data Flow	12:30-2:20 P.M. Type S-3130 Operator's and Programming Course	12:30-2:20 P.M. Type S-3130 System Operation and Programming	12:30-2:20 P.M. Type S-3130 System Operation and Programming	12:30-2:20 P.M. Lunch Out
2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break	2:20-2:30 P.M. Coffee Break
2:30-4:30 P.M. Type S-3130 Block Analysis and Data Flow	2:30-4:30 P.M. Type S-3130 Operator's and Programming Course	2:30-4:30 P.M. Type S-3130 System Operation and Programming	2:30-4:30 P.M. Type S-3130 System Operation and Programming	2:30-4:30 P.M. Travel Time



INTRODUCTION to DIGITAL INSTRUMENTS and SYSTEMS

DIGITAL INSTRUMENTS AND SYSTEMS

VOLTAGE MEASUREMENTS

PULSE AMPLITUDE

SATURATION VOLTAGE

TIME MEASUREMENTS

PULSE RISETIME AND FALLTIME

PULSE WIDTH AND PERIOD

PROPAGATION DELAY AND STORAGE TIME

MANY OTHER SPECIFIC MEASUREMENTS

DYNAMIC MEASUREMENTS

(100 measurements per second)

PROGRAMMABLE MEASUREMENTS

PROGRAMMING UNITS

AUTOMATED MEASUREMENT SYSTEMS

ON YOUR BENCH

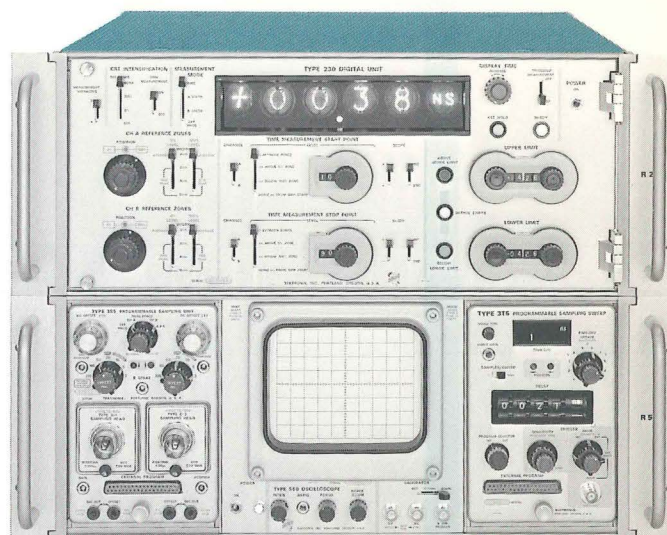
Type 568/230 Digital Oscilloscope System provides digital readout of measurements that are displayed in analog form on the CRT. They enable the engineer, technician or production worker to make dynamic switching time measurements with greater speed, convenience and repeatability than is possible by making measurements directly from the cathode-ray oscilloscope display. Typical measurements include pulse voltages, risetime, delay time, storage time, pulse width and many other specific measurements.

All of the measurement functions of the Type 568/230 can be externally programmed for use in high-speed automated measurement systems. The Type 568/230 can make more than 100 dynamic measurements per second, and data output connectors provide measurement results in convenient BCD code. The programming is accomplished with the use of Tektronix Program Units or by programming 157 parallel program lines using negative logic with true being ground or <2 V and false being open or >6 V.

New programmable plug-in units extend the automated measurement capabilities of the Type 568/230. The Type 3T5 and 3T6 Programmable Sampling Units have a programmable sweep range that extends from 100 ps/div to 0.5 s/div.

The Type 3S5 and Type 3S6 Dual-Trace Programmable Units feature Sampling Heads and programmable vertical deflection factors and DC offset.

Sampling Heads provide a choice of system measurement capabilities. Select the measurement performance you need today and update your performance with future Sampling Heads.



Type 3S6



Type 3T6

or



Type 3S5



Type 3T5

Type S-1
350 ps, 50 Ω



Type S-2
50 ps, 50 Ω



Type S-3
350 ps
100 k Ω , 2.3 pF



Type S-4
25 ps, 50 Ω

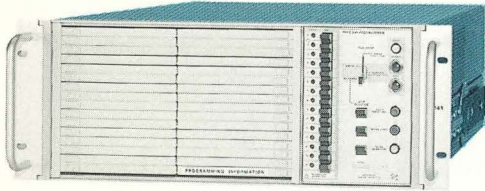


MORE
TO
COME

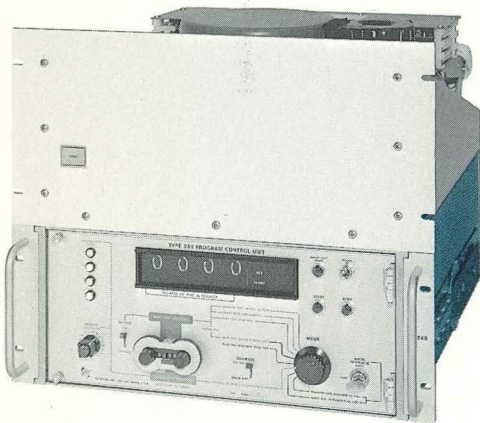
DIGITAL INSTRUMENTS AND SYSTEMS

IN YOUR SYSTEM

Tektronix digital instruments are designed for use in your automated measurement systems. Their modular construction lets you put together a complete measurement system designed to do your specific job.



TYPE 241 PROGRAMMER provides up to 15 measurement programs for the Type 568/230. Programs can be manually or remotely selected. The Type 241 will automatically sequence through up to 15 programs, stopping on out-of-limits measurements.



TYPE 240 PROGRAM CONTROL UNIT programs the Type 568/230 with up to 1600 measurement programs, stored in a Disc Memory or Punched Tape Reader. Additional units may be programmed by adding the Type R250 Auxiliary Unit.



TYPE R250 PROGRAM AUXILIARY UNIT adds additional programming capabilities to the Type 240 and provides programming and buffering for pulse generators, power supplies and other equipment. Customer engineering and design is required with the Type R250.

TEKTRONIX MEASUREMENT SYSTEMS

Tektronix Measurement Systems use Tektronix Catalog products and add additional equipment such as programmable pulse generators, programmable power supplies, fixtures, equipment racks and other equipment. Tektronix does the systems engineering and supplies a digital measurement system ready to do your measurement job.



TYPE S-3110 Digital Measurement System consists of the Type 568/230 with Type 241 Program Unit providing up to 15 automatic measurements.



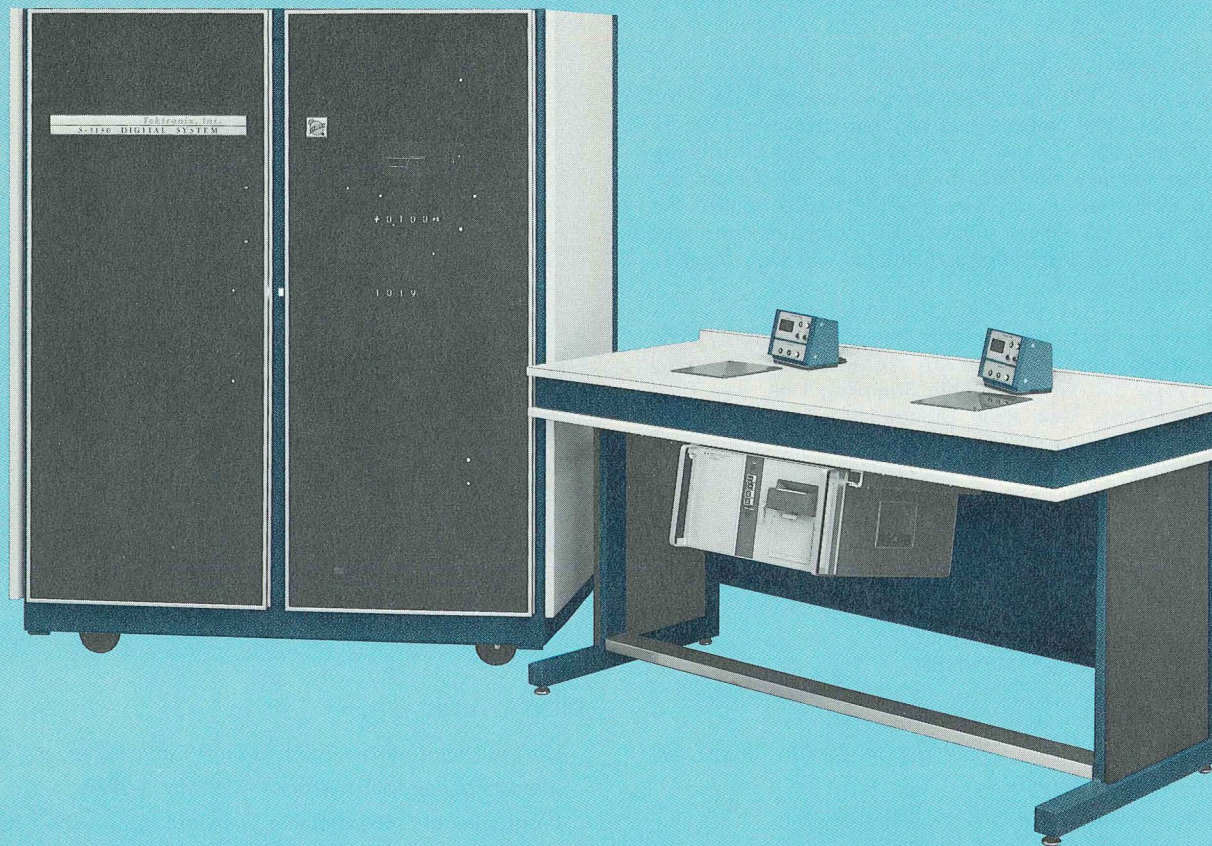
TYPE S-3120 Digital Measurement System consists of the Type 568/230 with the Type 240 Program Control Unit, a Disc Memory and Punched Tape Reader. It includes a pulse generator and 2 power supplies.



TYPE S-3130 Digital Measurement System consists of the Type 568/230/240 with the Type R250 Auxiliary Program Unit and a Disc Memory and Punched Tape Reader. It also includes a programmable pulse generator, 4 programmable power supplies and test fixtures.

TYPE **S-3130**

DIGITAL MEASUREMENT SYSTEM



- **DYNAMIC MEASUREMENT**
 - PULSE RISETIME AND FALLTIME**
 - PULSE WIDTH AND PERIOD**
 - PROPAGATION DELAY AND STORAGE TIME**
 - PULSE AMPLITUDE AND SATURATION VOLTAGE**
 - MANY OTHER SPECIFIC MEASUREMENTS**
- **1600 MEASUREMENT STORAGE**
- **PROGRAMMABLE**
 - PULSE GENERATOR**
 - POWER SUPPLIES**
- **100 MEASUREMENTS PER SECOND**
- **500-ps RISETIME**
- **PROGRAM BRANCHING FOR DIAGNOSTIC TESTING**
- **100 ps/DIV-to-500 ms/DIV
CALIBRATED SWEEP RANGE**
- **20 mV/DIV-to-2 V/DIV
CALIBRATED VOLTAGE RANGE**

TYPE S-3130

The Type S-3130 Digital Measurement System is a dynamic measurement system intended for measuring the performance of active devices under simulated operating conditions. It is designed to test integrated circuits, transistors, diodes, circuit modules, circuit boards and sub-assemblies in all segments of the electronic industry. Typical areas of application are found in production testing, QC, incoming inspection and preproduction.

The Type S-3130 can sequence through measurements at a rate of more than 100 measurements per second. The Disc Memory provides local storage and random access to 1600 independent measurements, and permits sorting and classifying. Diagnostic test routines may also be performed. Provisions are made for a computer or other control device to control the measurement or measurement routine. The computer can make calculations based on test data and employ the Disc Memory for further measurements.

The following instruments comprise the Type S-3130: Type R568 Oscilloscope with the Type 3T6 Programmable Sampling Sweep and Type 3S6 Programmable Sampling Unit, two Type S-3 Sampling Heads, Type R230 Digital Unit, Type R240 Program Control Unit, Type R250 Auxiliary Program Unit, Type R116 MOD 703L Programmable Pulse Generator, four Programmable Power Supplies, a Disc Memory, Punched Tape Reader, Probe Choppers, and a dual-bay enclosed cabinet with an operator table containing Test Station at one side. Several options for the Type S-3130 are available to satisfy specific measurement requirements.

DUAL TRACE VERTICAL AMPLIFIER

Vertical characteristics are stated with the Type S-3 Sampling Head, signal chopper, and 10X attenuator.

Voltage ranges are from 20 mV/div to 2 V/div (8 div full scale) accurate within 3%.

Bandwidth is equivalent to DC to 700 MHz.

Risetime is less than or equal to 500 ps.

Input characteristics are 1 M Ω within 1% paralleled by 2.4 pF within 10%.

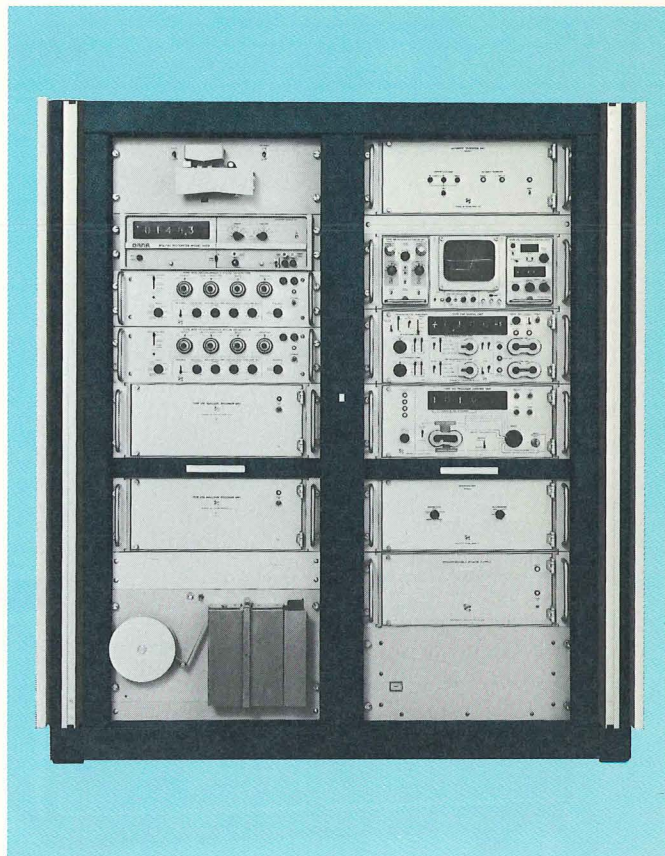
Programmable DC offset is from +9.95 V to -9.95 V in 50-mV steps, accurate within 2% of the programmed value or 50 mV, whichever is greater.

TIME BASE

Programmable sweep time/div is from 100 ps/div to 0.5 s/div in 30 calibrated steps. 1 ns/div to 0.5 s/div accurate within 3%. 100 ps/div to 500 ps/div accurate within 5%.

Programmable digital delay range is from 0 to 999.9 μ s in increments of 100 ps, 1 ns or 100 ns, depending on the sweep time/div, accurate within 3%.

Automatic triggering eliminates the need for trigger adjustments over a wide range of trigger amplitudes, shapes and repetition rates. Automatically triggers on signals of 100-mV to 500-mV amplitude over a frequency range from DC to 100-MHz.



DIGITAL UNIT

Units of measure are read out in V, mV, ns, μ s, ms, s.

Numerical readout is from -3999 to +3999.

Programmable measurement limits are from -3999 to +3999.

Data output is in parallel BCD code, 29 lines; 1, 2, 4, 8; true = ground, false = +12 V.

MEMORY AND PROGRAMMING

Storage capacity is 1600 measurements. Programming format is a fixed word length of 96 4-bit characters. A parity check is made on each character read into the Type 240 Program Control Unit. Program access time is 17 ms average and can be optimized to approximately 1 ms through minimum-access time programming. 360 parallel program lines are available to various systems instruments.

THREE 40-VOLT PROGRAMMABLE POWER SUPPLIES

Operating ranges from 0 to ± 40 V; 500 mA, programmed in 10-mV steps, repeatable within 0.5%, ± 3 mV. Output slewing rate is 200 V/ms. Load regulation is within 0.25% or 1 mV, whichever is greater. Line regulation is within 0.02% or 0.5 mV, whichever is greater. Ripple is less than 3 mV RMS.

TYPE S-3130

80-VOLT PROGRAMMABLE POWER SUPPLY

Operating range is from 0 V to ± 79.9 V; 200 mA, programmed in 10-mV steps, repeatable within 0.5%, ± 3 mV. Output slewing rate is 200 V/ms. Load regulation is within 0.25% or 1 mV, whichever is greater. Line regulation is within 0.02% or 0.5 mV, whichever is greater. Ripple is less than 3 mV RMS.

PROGRAMMABLE PULSE GENERATOR

The Type R116 Programmable Pulse Generator is modified (MOD 703L) to include 5 program assembly cards, that provide digital-to-analog conversion of program data. The Type R116 is calibrated with the program assembly cards that are mounted in the Type R250. The input and output connectors of the Type R116 are moved to the rear panel.

All functions of the Type R116 MOD 703L are programmed in the Type S-3130. These functions include: pulse period from 100 ns to 10.9 ms; pulse delay/period from 50 ns to 545 μ s; pulse width from 50 ns to 545 μ s; pulse amplitude from 0.4 V to 9.9 V; pulse risetime and falltime from 10 ns to 109 μ s; pulse DC offset from -4.9 V to $+4.9$ V.

DISPLAY UNIT

CRT display is 8 x 10 cm with P31 phosphor.

Calibrator provides 100 kHz accurate within 0.05%, and approximately 1-kHz signals; amplitudes of 0.5 V and 5 V P-P within 2% into ≥ 100 -k Ω load, or 50 mV and 500 mV P-P within 2% into a 1% 50- Ω load.

TEST STATION

The Test Station is in the operator table and provides the interface between the Type S-3130 and the device under test. Test inputs and outputs of the Type S-3130, including 32 program lines, are available on a 56-pin connector and through 50- Ω connectors located in the Test Station. A test fixture card that contains a socket for the device under test, and the appropriate test circuitry for input and output signals, can quickly and easily be inserted into the Test Station. This feature permits the test fixture to be easily changed when various devices are to be checked. Two unwired test fixture cards are included with the Type S-3130. They require circuit design and wiring to obtain a proper interface to the device under test. A system performance check-out test fixture card is also included. Consult your Field Engineer, Representative, or Distributor for quotations on wired test fixture cards for specific devices and tests.

DIMENSIONS

The Type S-3130 is 63 $\frac{1}{4}$ inches high, 54 $\frac{1}{2}$ inches wide, and 35 inches deep, excluding the operator table. Instruments are mounted on slide-out tracks and individually can be pulled out, tilted, and locked in any one of seven positions for convenient access.

POWER REQUIREMENTS

105 V to 125 V, 60 Hz, approx 1000 watts at 115 V and 60 Hz. Rear panel selectors on each instrument provide rapid accommodation for line-voltage ranges.

INSTALLATION

A Tektronix System Specialist installs the Type S-3130. He checks the complete system for proper operation, and assures that it meets or exceeds published specifications.

FACTORY TRAINING

Tektronix provides an intensive 3-week System Training course on the Type S-3130. Theory of operation, programming, calibration, and trouble-shooting are discussed for each System instrument, as well as the complete System. Classes are held at the Tektronix Industrial Park, Beaverton, Oregon.

TYPE S-3130 DIGITAL MEASUREMENT SYSTEM . . \$46,700

Includes the following instruments in a dual-bay enclosed cabinet with operator table containing a Test Station: Type R568 Oscilloscope; Type R230 Digital Unit; Type R240 Program Control Unit; Type R250 Program Unit; Type 3S6 Programmable Sampling Unit; Type 3T6 Programmable Sampling Sweep; two Type S-3 Sampling Heads; Type R116 Programmable Pulse Generator MOD 703L; Disc Memory; Punched Tape Reader; four Programmable Power Supplies; two Probe Choppers; two unwired test fixture cards; a performance check-out test fixture card; and includes the standard accessories of the above instruments.

PUNCHED TAPE PROGRAMMING ONLY

The Type S-3131 is identical to the standard Type S-3130 with the exception that the Disc Memory is deleted and programming is accomplished with the Punched Tape Reader. The maximum measurement rate with the Punched Tape Reader is 3 measurements per second. The Disc Memory can be added to the system at any time.

TYPE S-3131 DIGITAL MEASUREMENT SYSTEM . . \$39,400

DISC MEMORY PROGRAMMING ONLY

The Type S-3132 deletes the Punched Tape Reader from the standard Type S-3130 and maintains the maximum measurement rate of 100 measurements per second. The Punched Tape Reader can be added to the system at any time.

TYPE S-3132 DIGITAL MEASUREMENT SYSTEM . . \$45,300

TYPE S-3130

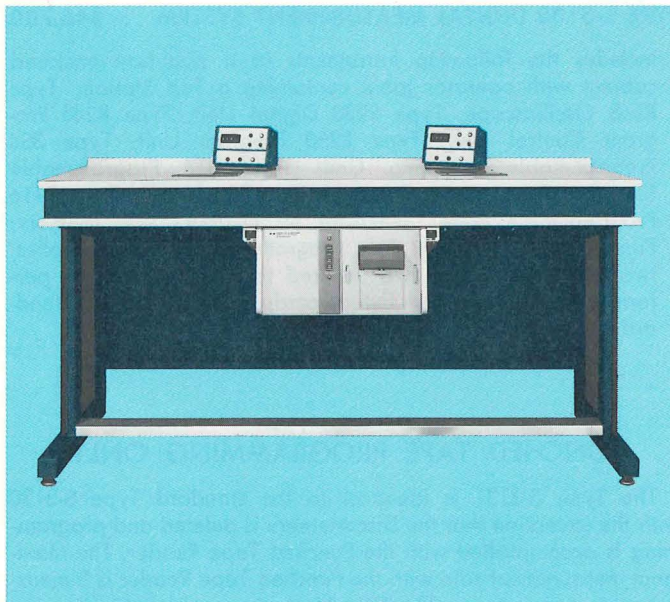
OPTIONS

DUAL-TEST STATIONS

Dual-Test Stations are available for the Type S-3130 that permit full use of its measurement speed of 100 measurements per second. This lets the Type S-3130 scan the two test stations, making measurements from either station on command. If the Type S-3130 is making a measurement at one station and receives a start command from the other station, it finishes the first measurement sequence before switching stations.

Each station has separate test fixture cards that permit checking different devices at each station. The station selects its own measurement sequence, indicates the measurement limit results (high, low, go), has a start and reset button, and indicates the station's condition of test (in process or waiting).

Both stations installed in one free-standing 60-inch table \$3500
Each station installed in separate free-standing 42-inch tables \$3840



AUTOMATIC CALIBRATION

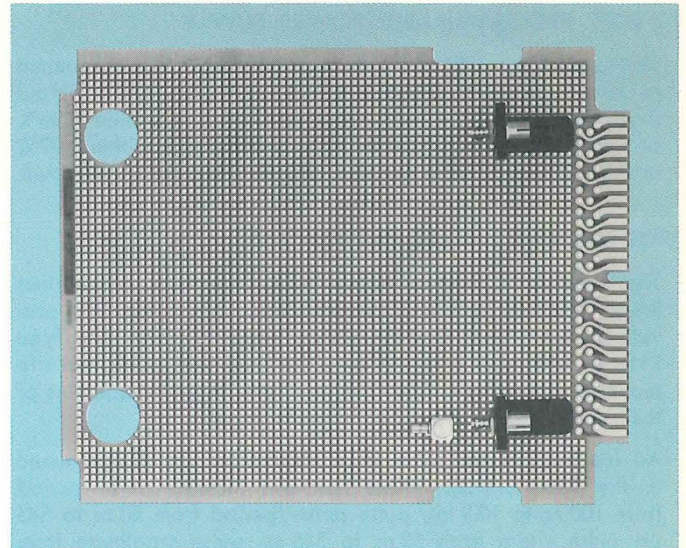
The automatic-calibration option checks and adjusts, when necessary, the vertical deflection factor (20 mV/div to 2 V/div) and the horizontal sweep rates (1 ns/div to 0.2 ms/div) to within 1%*.

Order 015-0131-01 \$3850

TAPE PUNCH

The Tape Punch provides punched tape copies of program data stored in the Disc Memory. The Tape Punch can be ordered installed, when ordering a Type S-3130.

Tape Punch, installed \$2800



TEST FIXTURE CARDS

Additional unwired test fixture cards can be ordered at any time. They require circuit design and wiring to obtain a proper interface to the device under test. The fixture card mates to the 56-pin connector in the Type S-3130 and has a coaxial connector for the pulse generator input and has two probe connectors mounted on the card.

Order 670-1016-00 \$65

TYPE R250 AUXILIARY PROGRAM UNIT

An additional Type R250 can be added to the Type S-3130 System. The Type R250 adds 192 program lines that can be used to program additional power supplies, pulse generators, programmable fixtures, automatic handler, or other programmable equipment. Consult your Tektronix Field Engineer, Representative, or Distributor for a quotation on the Type R250 designed to do your specific programming job.

The Type S-3130 is also available with different Sampling Heads featuring up to 25-ps risetime capabilities, and data recording options. Consult your Field Engineer, Representative, or Distributor for additional information.

*Accuracy on 20-mV/div and 50-mV/div positions is within 3%.

U.S. Sales Prices FOB Beaverton, Oregon

Tektronix, Inc.

P. O. BOX 500 • BEAVERTON, OREGON 97005 • Phone: (Area Code 503) 644-0161 • Telex: 036-691

TWX: 503-291-6805 • Cable: TEKTRONIX • OVERSEAS DISTRIBUTORS IN OVER 30 COUNTRIES

TEKTRONIX FIELD OFFICES in principal cities in United States. Consult Telephone Directory

Tektronix Australia, Ltd., Adelaide; Melbourne; Sydney • Tektronix Canada Ltd., Montreal; Ottawa; Toronto; Vancouver

Tektronix International A.G., Zug, Switzerland • Tektronix Ltd., Guernsey, C.I. • Tektronix U.K. Ltd., Harpenden, Herts

Relations Techniques Intercontinentales, Orsay, Lyon, Nice, Rennes, Toulouse, France • Sony/Tektronix Corporation Osaka, Tokyo, Japan

TYPE 3S6

- PROGRAMMABLE VOLTS/DIV
- PROGRAMMABLE DC OFFSET
- REMOTE SAMPLING HEADS
- ALL CONNECTIONS ON REAR PANEL

The Type 3S6 Programmable Sampling Unit is designed for use only in the Type 568 and Type R568 Digital Readout Oscilloscopes. The measurement functions of the Type 3S6 may be operated manually from the front panel or they may be controlled externally from connectors mounted on the rear panel of the Type 568 Oscilloscope. The Type 3S6 is designed primarily for use in automated measurement systems that require minimum front panel connections and remote programming of all vertical measurement functions. The programmable functions of the Type 3S6 are deflection factor, DC offset, and smoothing. Sampling Heads and program cables are attached to rear panel connectors on the Type 568 Oscilloscope.

Sampling Heads feature a choice of measurement capabilities and may be mixed or matched to meet specific measurement needs. A front-panel control allows adjustment of the interchannel time relationship to compensate for signal cables or other external delays.

CHARACTERISTICS

SAMPLING HEADS

Located remotely on included 6-ft Sampling-Head extender that connects on the rear of the Type 568 Oscilloscope. Type 568 Oscilloscopes below serial number B110000 require a modification. Please consult your Field Engineer, Representative or Distributor.

SAMPLING HEAD	RISETIME	INPUT	MINIMUM DEFLECTION FACTOR	RANDOM NOISE	
Type S-1	350 ps	50 Ω , GR874	2 mV/div	2 mV	
Type S-2	50 ps	50 Ω , GR874	2 mV/div	6 mV	
Type S-3	350 ps	2.3 pF, 100 k Ω	2 mV/div	3 mV	
Type S-4	25 ps	50 Ω , 3 mm	2 mV/div	5 mV	

DEFLECTION FACTOR

2 mV/div to 200 mV/div in 7 calibrated steps, 1-2-5 sequence. Each step accurate within 3% in normal mode, within 4% smoothed. Vertical outputs to the Type 230, each channel programmed with 3 program lines or by manual front-panel controls.

DC OFFSET RANGE

+1V to -1V. Allows signals between +1V and -1V limits to be displayed at 2 mV/div. Continuously variable and calibrated with front-panel controls between +1V and -1V, accurate within 10 mV of same offset voltage obtained in the external program mode. Programmable between +995 mV and -995 mV in 5-mV steps. The programmable accuracy is within 2% or 5 mV (whichever is greater) of the programmed value. Programming is accomplished with 9 program lines per channel in modified BCD code, plus one program line per channel for + or - polarity.

NEW

PROGRAMMABLE SAMPLING UNIT



B-DELAY RANGE

Channel B display can be continuously positioned in time from +5 ns to -5 ns with respect to Channel A. Accommodates up to 3-foot difference in signal cables.

PROGRAMMING

The Type 3S6 uses negative logic with true being ground or <2V and false being open or >6V. The units/div range is programmed with 3 lines per channel. DC offset is programmed with 9 lines per channel in modified BCD code plus one line per channel for + or - polarity. One line is used to program smoothed or normal operation. A total of 27 program lines plus ground is required to externally program all the measurement functions of the Type 3S6.

DISPLAY MODES

A only, B only, dual trace, and algebraic addition of A and B signals. In the external program mode, dual-trace operation is automatically provided. Independent controls for each channel permit positioning and inverting displays as desired.

WEIGHTS

Net weight	6 1/2 lb	3 kg
Domestic shipping weight	≈10 lb	≈4.5 kg
Export-packed weight	≈14 lb	≈6.3 kg

INCLUDED STANDARD ACCESSORIES

6-ft Sampling-Head extender (012-0130-00); two circuit board connectors (388-0805-00); two instruction manuals (070-0789-00).

TYPE 3T6

- **PROGRAMMABLE TIME/DIV**
- **PROGRAMMABLE SWEEP DELAY**
- **100 ps/DIV to 500 ms/DIV CALIBRATED SWEEP RANGE**
- **ALL CONNECTIONS ON REAR PANEL**

The Type 3T6 Programmable Sampling Sweep Unit is designed for use only in the Type 568 and Type R568 Digital Readout Oscilloscopes. The measurement functions of the Type 3T6 may be operated manually from the front panel or they may be controlled externally from connectors mounted on the rear panel of the Type 568 Oscilloscope. The Type 3T6 is designed for use in automated measurement systems that require minimum front panel connections and remote programming of horizontal functions.

The time/div range, sweep delay range and sample per sweep of the Type 3T6 are externally programmable using negative logic, with true being ground and false being open. Digital sweep delay and real-time sampling (1 ms/div to 500 ms/div) are controlled by a clock and digital counter within the plug-in unit. An automatic trigger mode is provided to eliminate the need for trigger circuit adjustment over a wide range of pulse amplitudes, repetition rates, and pulse wave-shapes. Type 568 Oscilloscopes below the serial number B11-0000 require a modification for use with the Type 3T6. Please consult your Field Engineer, Representative, or Distributor.

CHARACTERISTICS

SWEEP TIME/DIV

Remotely programmable or front panel operation from 100 ps/div to 500 ms/div in 30 calibrated steps, 1-2-5 sequence. TIME/DIV "window" provides digital readout of all sweep time/div settings in both programmable and manual modes of operation. Programming is accomplished with 7 program lines. Accuracy is within 3% (within 5% from 100 ps/div to 500 ps/div), except for non-linearities at the beginning of the sweep, that can be programmed off screen.

SAMPLES/SWEEP

1 sample/sweep or 1000 samples/sweep are available in the manual mode of operation; 1000 samples/sweep or 100 samples/sweep are available in the external programming mode of operation. In the external program modes, the Type 230 Digital Unit can program the sweep unit to scan quickly (100 samples/sweep) when not making a measurement, but provides maximum measurement resolution (1000 samples/sweep) when making the measurement. The Type 230 will also reset the sweep immediately after the completion of a measurement. These functions are obtained by externally programming the high speed program line on the Type 230.

DELAY RANGE

The digital delay is remotely programmable or selectable from the front panel. The delay range is from 0 to 999.9 ns in 100-ps increments from 100 ps/div to 500 ps/div; 0 to 9.999 μ s in 1-ns increments from 1 ns/div to 1 μ s/div; 0 to 999.9 μ s in 100-ns increments from 2 μ s/div to 500 μ s/div. Programming is accomplished with 16 program lines.

PROGRAMMABLE SAMPLING SWEEP UNIT



TRIGGERING

SOURCES: Internal, if sampling unit contains a trigger pickoff; External, 50- Ω terminated input.

JITTER: External automatic, pulse, 30 ps or less with 300-mV pulse, 2 ns or less wide; sinewave, 200 ps or less with 300-mV P-P signal at 30 MHz.

PULSE TRIGGERING		
SOURCE	FREQUENCY	AMPLITUDE
Internal	DC to 100 MHz	100 mV to 2 V
External	DC to 100 MHz	5 mV to 250 mV
External Automatic	DC to 100 MHz	100 mV to 500 mV
SINEWAVE TRIGGERING		
SOURCE	FREQUENCY	AMPLITUDE peak-to-peak
Internal	100 kHz to 100 MHz	100 mV to 2 V
External	1 Hz to 100 MHz	10 mV to 500 mV
External Sync	100 MHz to 1 GHz	10 mV to 150 mV
External Automatic	DC to 100 MHz	100 mV to 500 mV

WEIGHTS

Net weight	7 lb	3.2 kg
Domestic shipping weight	\approx 10 lb	\approx 4.5 kg
Export-packed weight	\approx 14 lb	\approx 6.3 kg

INCLUDED STANDARD ACCESSORIES

Circuit board connector (388-0805-00); two instruction manuals (070-0761-00).

TYPE S-1

350-ps SAMPLING HEAD



- **DC-TO-1 GHz BANDWIDTH**
- **RANDOM NOISE LESS THAN 2 mV (unsmoothed)**

The Type S-1 Sampling Head is a low-noise, 350-ps risetime unit with a 50- Ω input impedance. It is designed for use with the Type 3S2, 3S5 and 3S6 Dual-Trace Sampling Units, and can be plugged in or attached by a cable for remote use. A trigger pickoff within the Type S-1 provides a trigger signal output from the plug-in unit. When used with the Type 3T2 Random Sampling Sweep Unit, the triggering event may be displayed on the screen without the use of delay lines or a pretrigger.

RISETIME

Less than or equal to 350 ps.

BANDWIDTH

Equivalent to DC to 1 GHz at 3-dB down.

TRANSIENT RESPONSE

Aberrations as observed with the Type 284 Pulse Generator are $\pm 0.5\%$, -3% or less, total of 3.5% or less P-P, first 5 ns following the step transition; $\pm 0.5\%$, -0.5% or less, total of 1% or less P-P after 5 ns.

RANDOM NOISE

Equivalent to an input signal of 2 mV or less, unsmoothed; 1 mV, smoothed (tangentially measured).

SIGNAL RANGE

Variable DC offset allows signals between ± 1 V and -1 V limits to be displayed at 2 mV/div. Signals between ± 2 V and -2 V limits may be displayed at 200 mV/div. For best dot-transient response with random-sampling sweep unit, signal amplitude should be less than 500 mV P-P.

INPUT CHARACTERISTICS

Nominally 50 Ω . Safe overload is ± 5 V. GR 874 input connectors.

WEIGHTS

Net weight	$\frac{3}{4}$ lb	0.34 kg
Domestic shipping weight	≈ 2 lb	≈ 0.9 kg

INCLUDED STANDARD ACCESSORIES

5-ns, 50- Ω RG58/AU cable (017-0512-00); 10X, 50- Ω , GR attenuator (017-0078-00); instruction manual (070-0763-00).

TYPE S-2

50-ps SAMPLING HEAD



- **DC-TO-7 GHz BANDWIDTH**
- **RANDOM NOISE LESS THAN 6 mV (unsmoothed)**

The Type S-2 Sampling Head is a 50-ps risetime unit with a 50- Ω input impedance. It is designed for use with the Type 3S2, 3S5 and 3S6 Dual-Trace Sampling Units, and can be plugged in or attached by a cable for remote use. A trigger pickoff within the Type S-2 provides a trigger signal output from the plug-in unit. When used with the Type 3T2 Random Sampling Sweep Unit, the triggering event may be displayed on the screen without the use of delay lines or a pretrigger.

RISETIME

Less than or equal to 50 ps.

BANDWIDTH

Equivalent to DC to 7 GHz at 3-dB down.

TRANSIENT RESPONSE

Aberrations as observed with the Type 284 Pulse Generator are $\pm 5\%$, -5% or less, total of 10% or less P-P, first 2.5 ns following a step transition; $\pm 2\%$, -2% or less, total of 4% or less P-P after 2.5 ns.

RANDOM NOISE

Equivalent to an input signal of 6 mV or less, unsmoothed; 3 mV, smoothed (tangentially measured).

SIGNAL RANGE

Variable DC offset allows signals between ± 1 V and -1 V limits to be displayed at 2 mV/div. Signals between ± 2 V and -2 V limits may be displayed at 200 mV/div. For best dot-transient response with random-sampling sweep unit, signal amplitude should be less than 200 mV P-P.

INPUT CHARACTERISTICS

Nominally 50 Ω . Safe overload is ± 5 V. GR 874 input connectors.

WEIGHTS

Net weight	$\frac{3}{4}$ lb	0.34 kg
Domestic shipping weight	≈ 2 lb	≈ 0.9 kg

INCLUDED STANDARD ACCESSORIES

5-ns, 50- Ω RG213 cable (017-0502-00); 10X, 50- Ω , GR attenuator (017-0078-00); instruction manual (070-0764-00).

OPTIONAL ACCESSORIES

P6040/CT-1 Current Probe, order 015-0041-00

CT-3 Signal Pickoff, order 017-0061-00

VP-1 Voltage Pickoff "T", order 017-0073-01

P6034 10X Passive Probe, order 010-0110-00

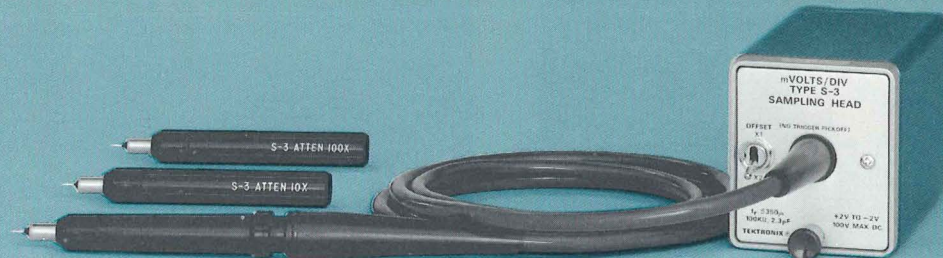
P6035 100X Passive Probe, order 010-0111-00

Power Divider GR 874-TPD, order 017-0082-00

Coupling Capacitor, GR 874-K, order 017-0028-00

350-ps SAMPLING HEAD

NEW



- **COMPACT PROBES**
- **100 k Ω , 2.3-pF INPUT RC**
- **DC-to-1 GHz BANDWIDTH**
- **DISPLAYED NOISE LESS THAN 3 mV (unsmoothed)**

The Type S-3 Sampling Head is a low-noise, 350-ps risetime, sampling-probe unit with a 100-k Ω , 2.3-pF input impedance. A switch on the Sampling Head selects a DC offset of X1 or X2 while maintaining a 2-mV/div deflection factor.

The Type S-3 Sampling Head is designed for use with the Type 3S2, 3S5 and 3S6 Dual-Trace Sampling Units and can be plugged in or attached by an optional Sampling-Head extender for remote use. When used with the Type 3T2 Random Sampling Sweep Unit, the triggering event may be displayed on the screen without the use of delay lines or a pretrigger.

CHARACTERISTICS

RISETIME

- Probe only, 350 ps or less.
- With 10X attenuator, 400 ps or less.
- With 100X attenuator, 500 ps or less.

BANDWIDTH

- Probe only is equivalent to DC-to-1 GHz at 3-dB down.

TRANSIENT RESPONSE

(As observed with Type 284 Pulse Generator)
Probe only: aberrations in the first 2 ns following a step are +8%, -2% or less, total of 10% or less P-P; +1%, -1% or less, total of 2% or less P-P after 2 ns.

With 10X attenuator: aberrations in first 5 ns following a step transition are +2%, -5% or less, total of 7% or less P-P; +1%, -1% or less, total of 2% or less P-P after 5 ns.

With 100X attenuator: aberrations in the first 5 ns following a step transition are +5%, -8% or less, total of 13% or less P-P; +2%, -5% or less, total of 7% or less P-P from 5 ns to 30 ns; +1%, -1% or less, total of 2% or less P-P after 30 ns.

DISPLAYED NOISE

Probe only, 3 mV or less, measured tangentially, referred to the probe tip.

SIGNAL RANGE

Variable DC offset allows signals between +1 V and -1 V, X1 range; or +2 V and -2 V, X2 range to be displayed at 2 mV/div. For best dot-transient response with random-sampling sweep unit, signal amplitude should be less than 1 V P-P. The signal range may be increased X10 or X100 with the use of the probe attenuators.

PROBE AND ATTENUATOR ACCURACY

Accuracy is within 1% for probe only, within 2.25% with 10X attenuator, within 3% with 100X attenuator, in addition to the accuracy of the vertical plug-in unit.

INPUT CHARACTERISTICS

Probe only is 100 k Ω paralleled by 2.3 pF.
With 10X attenuator, 1 M Ω paralleled by 2 pF.
With 100X attenuator, 1 M Ω paralleled by 1.75 pF.
With coupling capacitor 4.5 pF; probe only and coupling capacitor time constant is approx 100 μ s.

WEIGHTS

Net weight	3 lb	1.4 kg
Domestic shipping weight	\approx 5 lb	\approx 2.3 kg
Export-packed weight	\approx 10 lb	\approx 4.5 kg

INCLUDED STANDARD ACCESSORIES

10X attenuator (010-0364-00), 100X attenuator (010-0365-00), coupling capacitor (011-0098-00), probe tip (206-0114-00), bayonet-ground adapter (013-0085-00), two test-point jacks (131-0258-00), 5 1/2-inch ground lead (175-1017-00); 12 1/2-inch ground lead (175-1018-00); 3-inch cable assembly (175-0249-00); three probe clips (344-0046-00); end cap (200-0834-00); two end caps (200-0835-00); probe holder (352-0090-00); retractable hook tip (013-0097-00); 50- Ω voltage pickoff (017-0077-01), carrying case (016-0121-00), manual (070-0765-00).

OPTIONAL ACCESSORIES

Probe tip-to-BNC adapter, order 013-0084-00
Probe tip-to-GR adapter, order 017-0076-00

TYPE S-4

25-ps SAMPLING HEAD

NEW



- **25-ps SAMPLING HEAD**
- **DC-to-14 GHz BANDWIDTH**
- **RANDOM NOISE LESS THAN 5 mV (unsmoothed)**

The Type S-4 Sampling Head is a 25-ps risetime unit with a 50- Ω input impedance. It is designed for use with the Type 3S2, 3S5 and 3S6 Dual-Trace Sampling Units. The Type S-4 can be plugged into the sampling unit or attached by a Sampling-Head extender for remote use. A trigger pickoff within the Type S-4 provides a trigger signal output from the plug-in unit. When used with the Type 3T2 Random Sampling Sweep Unit, the triggering event may be displayed on screen without the use of delay lines or a pretrigger.

CHARACTERISTICS

RISETIME

Less than or equal to 25 ps.

BANDWIDTH

Equivalent to DC-to-14 GHz at 3-dB down.

TRANSIENT RESPONSE

Aberrations in the first 400 ps following a step are: -10%, +10% or less, total of 20% or less P-P as observed with Type S-50; from 400 ps to 25 ns following a step, 0%, +10% or less, total of 10% or less P-P, as observed with Type 284; after 25 ns, -2%, +2% or less, total of 4% or less P-P as observed with Type 284.

RANDOM NOISE

Equivalent to an input signal of 5 mV or less, unsmoothed; 2.5 mV, smoothed (tangentially measured).

SIGNAL RANGE

Variable DC offset allows signals between +1 V and -1 V limits to be displayed at 2 mV/div. For best dot-transient response with random-sampling sweep unit, signal amplitude should be less than 500 mV P-P.

INPUT CHARACTERISTICS

Nominally 50 Ω . Safe overload ± 5 V. 3-mm input connector.

WEIGHTS

Net weight	$\frac{3}{4}$ lb	0.34 kg
Domestic shipping weight	≈ 2 lb	≈ 0.9 kg

INCLUDED STANDARD ACCESSORIES

2-ns cable with 3-mm connectors (015-1005-00); 10X 50- Ω 3-mm attenuator (015-1003-00); GR874 to 3-mm male adapter (015-1007-00); 3-mm male-to-male adapter (015-1011-00); $\frac{5}{16}$ -inch wrench (003-0247-00); instruction manual (070-0896-00).

TYPE S-50

25-ps PULSE GENERATOR

NEW



- **25-ps PULSE RISETIME**
- **400-mV PULSE AMPLITUDE**
- **100-ns PULSE WIDTH**

The Type S-50 Pulse Generator Head is a high-speed, tunnel-diode step generator designed for use in the Type 3S2, 3S5 and 3S6 Sampling Unit or in the Type 285 Power Supply Unit. The Type S-50 when used with the Type S-4 Sampling Head provides high-resolution 35-ps TDR measurements. The Type S-50 is also used for verification of sampling system risetimes. A pretrigger output allows operation with sequential sampling systems.

CHARACTERISTICS

PULSE OUTPUT

Risetime is 25 ps or less. Amplitude into 50 Ω is at least 400 mV, positive going. Pulse duration is 100 ns, pulse repetition rate is 25 kHz. Pulse aberrations following the step are: -10%, +10% with a total of 20% or less P-P in the first 400 ps; -5%, +5% with a total of 5% or less P-P from 400 ps to 5 ns; -2%, +2% with a total of 4% or less P-P after 5 ns.

PRETRIGGER OUTPUT

Risetime is 400 ps or less. Amplitude into 50 Ω is at least 180 mV, positive going. Pretrigger pulse duration is 4 ns. Pretrigger occurs 75 ns (± 5 ns) before the pulse output. Pretrigger to pulse output jitter is 15 ps or less.

TRIGGER OUTPUT

Risetime is 200 ps or less. Amplitude into 50 Ω is at least 200 mV, positive going. Trigger pulse duration is 100 ns. The trigger output occurs in time coincidence with the pulse output.

POWER REQUIREMENTS

The necessary power is provided from the Type 3S2, 3S5, 3S6 or Type 285 Power Supply.

OUTPUT CONNECTORS

Pulse output uses a 3-mm connector. Pretrigger output and trigger output use BSM connectors. A pretrigger output from the rear of the Type S-50 provides a pretrigger pulse for internal triggering of the sampling sweep unit.

WEIGHTS

Net weight	$\frac{3}{4}$ lb	0.34 kg
Domestic shipping weight	≈ 2 lb	≈ 0.9 kg

INCLUDED STANDARD ACCESSORIES

500 ps 50 Ω solid coax (015-1015-00); instruction manual (070-0897-00).

TYPE S-51

1-to-18 GHz TRIGGER COUNTDOWN HEAD

NEW



The Type S-51 Trigger Countdown Head is a free-running tunnel-diode oscillator designed to provide stable sampling displays of signals up to 18 GHz. The Type S-51 may be used with the Type 3S2, 3S5 and 3S6 Sampling Units in place of one of the Sampling Heads, or it may be operated separately with the Type 285 Power Supply. The Type S-51 has a front-panel sync control that synchronizes the oscillator frequency to a sub-harmonic of the input signal. The output from the Type S-51 is available at a front-panel trigger output connector and through a rear-panel connector for internal triggering. The output signal is a direct countdown of the input and permits triggering by a standard sampling time-base unit.

CHARACTERISTICS

INPUT SIGNAL

Frequency range is 1 GHz to 18 GHz. Stable synchronization on signals at least 100 mV P-P, 5 V, P-P maximum.

INPUT CHARACTERISTICS

50-Ω 3-mm connector. Open termination paralleled by 1 pF.

TRIGGER OUTPUT

Front panel trigger output is at least 200 mV into 50 Ω, Type BSM connector. Internal trigger output is at least 100 mV into 50 Ω, internally connected to sampling unit. Jitter is 10 ps or less, with signals from 5 GHz to 18 GHz; 15 ps or less with signals from 1 GHz to 5 GHz. Kickout at signal input connector is 400 mV or less, kickout occurs between successive samples.

POWER REQUIREMENTS

The necessary power is provided from the Type 3S2, 3S5, 3S6 or Type 285 Power Supply.

WEIGHT

Net weight	$\frac{3}{4}$ lb	0.34 kg
Domestic shipping weight	≈ 2 lb	≈ 0.9 kg

INCLUDED STANDARD ACCESSORIES

Instruction manual (070-0898-00).

OPTIONAL ACCESSORIES WITH 3-mm CONNECTORS

10X 50-Ω attenuator, order 015-1003-00
 5X 50-Ω attenuator, order 015-1002-00
 2X 50-Ω attenuator, order 015-1001-00
 2-ns 50-Ω signal cable, order 015-1005-00
 5-ns 50-Ω signal cable, order 015-1006-00
 50-Ω termination, order 015-1004-00
 500-ps 50-Ω solid coax, order 015-1015-00
 50-Ω power divider T, order 015-1014-00

TYPE 285

POWER SUPPLY

NEW



- ACCEPTS ONE TYPE S-50 SERIES HEAD
 TYPE S-50 PULSE GENERATOR HEAD
 TYPE S-51 TRIGGER COUNTDOWN HEAD

The Type 285 Power Supply is designed for use with either the Type S-50 Pulse Generator Head or the Type S-51 Trigger Countdown Head. The Type 285 provides the regulated power supplies necessary to power one Type S-50 Series Head. It also provides a front panel trigger output jack. The trigger output jack provides the internal trigger pulse from the plug-in Head to the front panel of the Type 285.

CHARACTERISTICS

POWER REQUIREMENTS

90 V to 136 V or 180 V to 272 V, 50 Hz to 400 Hz, 10 watts at 115 V and 60 Hz. Slide switch on rear panel selects high or low voltage operation.

TRIGGER OUTPUT

BSM Connector provides internal trigger output of Type S-50 Series Heads to the front panel.

DIMENSIONS AND WEIGHTS

Height	$3\frac{1}{8}$ in	5.1 cm
Width	5 in	12.7 cm
Depth	8 in	20.3 cm
Net weight	$3\frac{1}{8}$ lb	1.4 kg

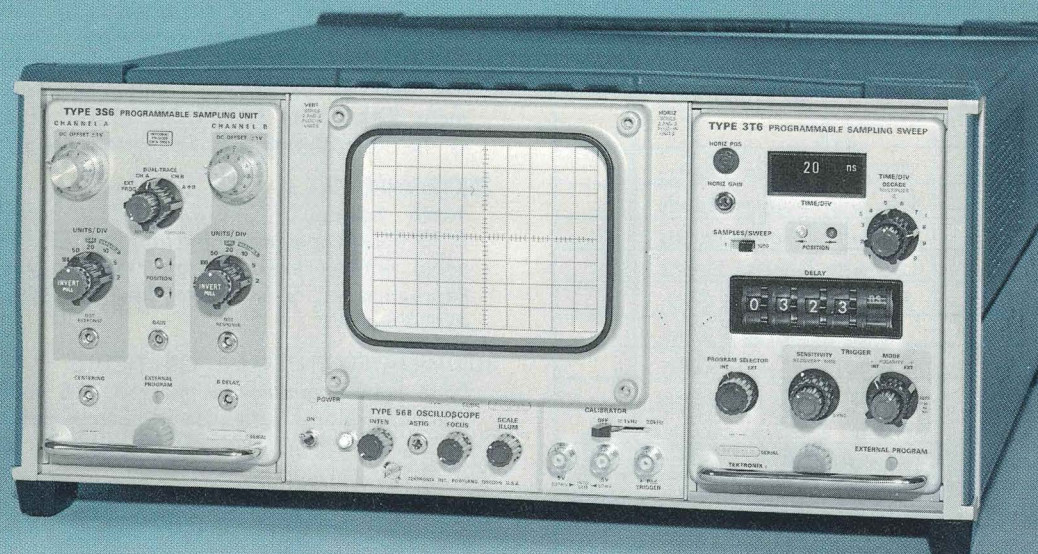
INCLUDED STANDARD ACCESSORIES

3-to-2 wire adapter (103-0013-00); two instruction manuals (070-0903-00). Cable, 18 inch, TRIGGER OUTPUT (012-0127-00).

Tektronix, Inc.

P. O. BOX 500 • BEAVERTON, OREGON 97005 • Phone: (Area Code 503) 644-0161 • Telex: 036-691
 TWX: 503-291-6805 • Cable: TEKTRONIX • OVERSEAS DISTRIBUTORS IN OVER 30 COUNTRIES
 TEKTRONIX FIELD OFFICES in principal cities in United States. Consult Telephone Directory

OSCILLOSCOPES



- **ANALOG DISPLAYS OF ANALOG/DIGITAL MEASUREMENT SYSTEM**
- **PROVIDES MEASUREMENT INFORMATION FOR TYPE 230 DIGITAL UNIT**
- **ILLUMINATED NO-PARALLAX GRATICULE**
- **SOLID-STATE DESIGN**

Type 568 and Type R568 Readout Oscilloscopes are designed for use with 2- and 3-series plug-in units in both the vertical and horizontal deflection systems. When used together with the Type 230 Digital Unit, digital readout of measurements (in addition to the analog display on the CRT) makes the measurements faster, more convenient, and more accurate.

Connectors on the rear provide measurement information for the Type 230 Digital Unit, couple trace-brightening information from the Type 230 to the Type 568, and provide input and programming information for programmable plug-in units.

The Types 568/R568 are designed mainly for use in digital measurement systems, but through use of amplifier, spectrum analysis, and time-base plug-in units, they may be used in other applications that do not require digital readout.

Through use of solid state components, the Types 568/R568 offer reliable operation with low heat dissipation.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of 2-series and 3-series Amplifier Plug-In Units. See chart for plug-in units that provide digital readout when used with a Type 230 Digital Unit.

HORIZONTAL

Horizontal deflection characteristics are extremely flexible through use of 2-Series and 3-Series Amplifier and Time-Base Units. See chart for plug-in units that provide digital readout when used with a Type 230 Digital Unit.

CRT

DISPLAY AREA—8 x 10 div. (Each major div = 1 cm.)

ACCELERATING VOLTAGE—3.5 kV.

PHOSPHOR—P2.

OTHER

AMPLITUDE CALIBRATOR—5 V and 0.5 V into $\geq 100 \text{ k}\Omega$ or 500 mV and 50 mV into 50 Ω . Repetition rate is 100 kHz or 1 kHz.

POWER REQUIREMENTS—Quick-change line-voltage taps permit operation from 90 to 110 V, 104 to 126 V, 112 to 136 V; or 180 to 220 V, 208 to 252 V, 224 to 272 V. Line frequency is 48 to 66 Hz. Power consumption is 210 watts maximum.

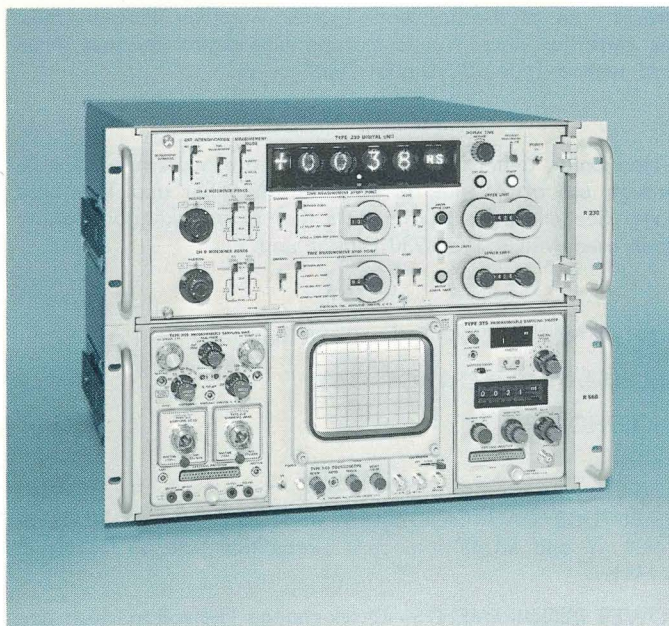
DIGITAL READOUT COMBINATIONS

Digital and analog displays are simultaneously presented on the Type 568 Readout Oscilloscope and Type 230 Digital Unit. A Digital Readout Combination consists of a Type 568, Type 230, and any of the following combinations of amplifier and time-base plug-in units. Units marked with asterisk are program-

mable in addition to providing digital readout. The Type 3A2 and 3B2 should be installed in pairs. Other 2-Series and 3-Series Plug-In Units can be used for normal analog CRT display, but do not provide digital readout.

PLUG-IN UNITS				
VERTICAL				
TYPE	MINIMUM DEFLECTION FACTOR	T _R	BANDWIDTH	
3S1	2 mV/div	350 ps	DC to 1 GHz	
3S2	2 mV/div	Use with S-Series Heads		
3S5*	2 mV/div	Use with S-Series Heads		
3S6*	2 mV/div	Use with S-Series Heads		
S-1	50-Ω Head	350 ps	DC to 1 GHz	
S-2	50-Ω Head	50 ps	DC to 7 GHz	
S-3	100-kΩ Head	350 ps	DC to 1 GHz	
S-4	50-Ω Head	25 ps	DC to 14 GHz	
3A2	10 mV/div	700 ns	DC to 500 kHz	
TIME BASE				
TYPE	CALIBRATED SWEEP RANGE			
3T2	200 ps/div to 100 μs/div plus X10 magnifier			
3T5*	100 ps/div to 500 ms/div			
3T6*	100 ps/div to 500 ms/div			
3T77A	200 ps/div to 100 μs/div plus X10 magnifier			
3B2	2 μs/div to 1 s/div			

*Programmable in addition to providing digital readout.



AMPLITUDE CALIBRATOR

Front-panel selection of squarewave outputs of 100 kHz, crystal-controlled, with an accuracy of $\pm 0.05\%$ or approx 1 kHz, RC time-constant controlled. Output voltages are 5 V and 0.5 V into 100 kΩ or greater or 500 mV and 50 mV into 50 Ω. + PRETRIGGER output provides a positive-going pulse that occurs $\approx 1/4$ cycle ahead of the rising portion of the calibrator signal. Connectors are BNC.

TEKTRONIX CRT

5-inch rectangular CRT with 3.5-kV accelerating potential. A P2 phosphor is normally supplied; P7, P11, or P31 are optional without extra charge. Consult your Field Engineer, Representative, or Distributor for application information and availability.

ILLUMINATED INTERNAL GRATICULE

Edge lighted graticule is marked in 8 vertical and 10 horizontal divisions (centimeters). Centerlines are also marked in 2-mm increments. Scale illumination is adjustable with a front-panel control.

DC-VOLTAGE SUPPLIES

Electronically regulated to compensate for widely varying line conditions. Separate regulated heater supply is included. The Type 568 has an additional 25 watts of regulated power available at the rear connector for system use.

POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 210 watts maximum. Rear panel selector provides rapid accommodation for six line-voltage ranges.

TYPE 568 DIMENSIONS AND WEIGHTS

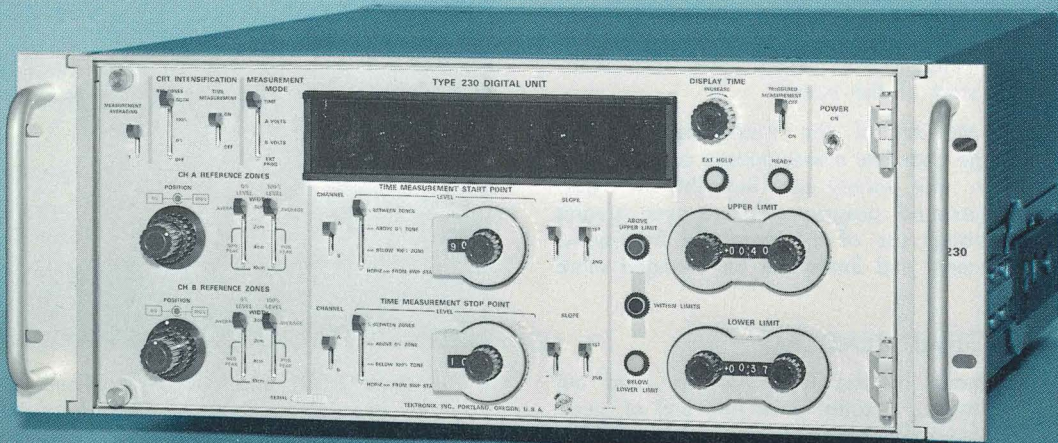
Height	8 in	20.3 cm
Width	16 $\frac{13}{16}$ in	42.7 cm
Depth	21 $\frac{7}{8}$ in	55.5 cm
Net weight	40 lb	18.2 kg
Domestic shipping weight	≈ 52 lb	≈ 23.6 kg
Export-packed weight	≈ 72 lb	≈ 32.7 kg

TYPE R568 DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	22 $\frac{3}{4}$ in	57.8 cm
Net weight	41 lb	18.6 kg
Domestic shipping weight	≈ 56 lb	≈ 25.5 kg
Export-packed weight	≈ 76 lb	≈ 34.5 kg

INCLUDED STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); CRT protector plate (387-0935-00); 18-inch patch cord, BNC-to-BNC (012-0087-00); 18-inch patch cord, BNC-to-banana plug (012-0091-00); patch cord, post jack-to-BNC (012-0092-00); two instruction manuals (070-0596-00). Type R568 also includes mounting tracks (351-0086-00) and mounting hardware.



- **PRESENTS OSCILLOSCOPE MEASUREMENTS IN DIGITAL FORM**

- **DIGITAL READOUT PARAMETERS**

PULSE AMPLITUDE
PULSE RISE AND FALL TIME
PULSE WIDTH
TIME INTERVAL

- **UP TO 50 MEASUREMENTS PER SECOND**

- **PARALLEL GROUND-CLOSURE PROGRAMMING**

- **BCD DATA OUTPUT (1 2 4 8)**

- **ALL SOLID STATE—EXTENSIVE USE OF INTEGRATED CIRCUITS**

The Type 230 and Type R230 Digital Units are new high-speed solid-state units that provide digital measurements of signals displayed on the Type 568 Oscilloscope. The Type 230 has flexible measurement capabilities with up to 50 measurements per second, easy programming, BCD data outputs, and solid-state circuitry with extensive use of integrated circuits. The Type 230 Digital Unit can make a wide variety of repetitive pulse measurements on the signals displayed on the Type 568. The digital presentations can designate voltage measurements, time-difference measurements between similar pulses, and time-difference measurements between percentages or voltages of pulse amplitudes. The Type 230 can be externally programmed for use in high-speed automatic measurement systems and data output connectors provide measurement results in convenient BCD code. Programming is easily accomplished with the use of new Tektronix Program Units.

TYPE **230** **R230**

MEASUREMENT MODES

The Type 230 Digital Unit's four basic measurement functions (Channel A volts, Channel B volts, Time, and External Program) are selected by the Measurement Mode switch.

VOLTAGE measurements are made on either Channel A or Channel B between the 0% and the 100% reference zones. The signal polarity is determined and read out automatically on the digital readout.

TIME measurements are made on either Channel A, Channel B or between the two channels. The time measurements are made from a pre-determined start point to a pre-determined stop point that can be referenced to the 0% and 100% reference zones or to the start of the sweep.

EXTERNAL PROGRAM: All of the front-panel functions required to make voltage and time measurements can be easily programmed externally. The variety and flexibility of measurements possible with external programming are even greater than those possible through use of the Type 230 front-panel controls, and measurements and limits can be changed more rapidly.

DIGITAL READOUT

The measurements made by the Type 230 are read out directly on six Nixie* tubes. Decimal point and unit of measure (ns, μ s, ms, s, mV, V) are automatically presented. The polarity of the measurement (+ or -) is also read out automatically.

DISPLAY TIME

The digital readout display time may be varied from ≈ 10 ms to 10 s. **EXTERNAL HOLD** light indicates when the measured data is being held until the recording device has had sufficient time to record the measurement. External hold does not prevent the next measurement from being made. In **TRIGGERED MEASUREMENT** operation, a measurement is started after a receipt of a trigger (+ or -) and after **DISPLAY TIME** has been completed. The **READY** light indicates a ready condition for a trigger.

REFERENCE ZONES

To make any digital voltage or time measurement of the waveforms displayed on the Type 568 Oscilloscope, the Reference Zones must be properly set. The 0% and the 100% zones establish the reference points from which all measurements are made. The reference zones can be brightened on the oscilloscope by means of the CRT Intensification Reference Zone switch. The switch brightens both zones, 100% zone only, 0% zone only or disables the zone intensification.

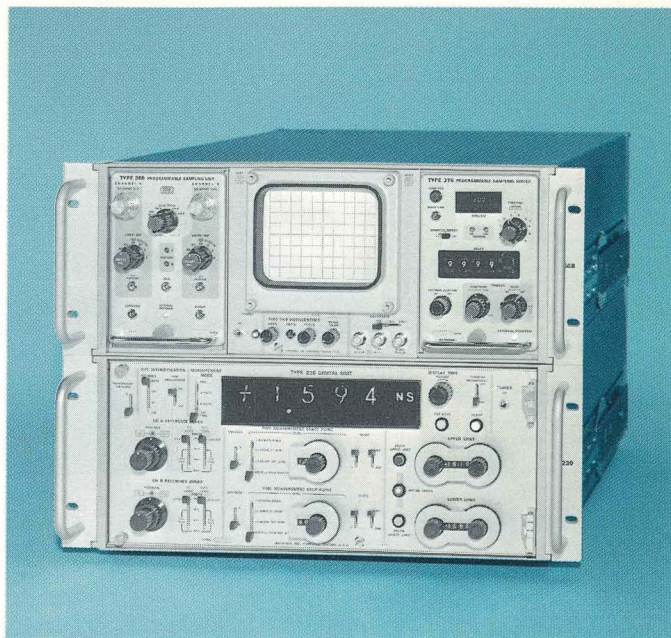
CHANNEL A REFERENCE ZONE

The 0% **POSITION** and 100% **POSITION** controls determine the start position of the 0% and 100% zones to any $\frac{1}{2}$ -cm point from the start of the sweep by means of a 20-position switch. Five external program lines are required for each position control.

LEVEL WIDTH controls select the width of the reference zone and select the type of voltage reading, average or peak.

The **AVERAGE 0.3-cm WIDTH** position of the control is normally used for average voltage and most time measurements.

*Trade-Mark Burroughs Corporation



The three **PEAK** positions (2-cm, 4-cm, 10-cm **WIDTH**) are used for average to peak, or peak to peak voltage measurements. Two program lines are required for each 0% **LEVEL** or 100% **LEVEL** width controls.

CH B REFERENCE ZONES are identical in function and operation as Ch A Reference Zones except they are set on Ch B display.

TIME MEASUREMENT START POINT

The start of the time measurement is selected to start on either Channel A or Channel B and on the first or second positive-going or negative-going slope. The time measurement starts when the signal reaches one of the 99 pre-determined levels. Four different modes of start point level selection are available: (1) % between 0% and 100% zones, (2) mm above 0% zone, (3) mm below 100% zone, and (4) Horizontal mm from sweep start. Eleven BCD program lines are required for externally programming the time measurement start point. There are 159 pre-determined levels available in the external programming mode.

CRT intensification during the time measurement portion of the sweep is selected by means of the CRT Intensification Time Measurement On-Off switch.

TIME MEASUREMENT STOP POINT

All functions of the Time Measurement Stop Point are identical to the previously explained Time Measurement Start Point. It stops the count on the selected point on Ch A or Ch B. If the Stop Point occurs before the Start Point, a negative reading is indicated.

LIMIT CONTROLS

The Limit Controls select the **UPPER** and **LOWER** measurement Limits. Measurement limit results can be quickly determined on the front-panel by means of three lights (**ABOVE UPPER LIMIT**, **WITHIN LIMITS**, **BELOW LOWER LIMIT**) and the information is available on the rear panel for stopping automatic measurement sequences or for automatic sorting. Fifteen BCD lines are required for programming each limit control.

RESOLUTION

DOTS/MEASUREMENT Time measurements are performed by gating and counting clock-pulses during the measurement interval. If a measurement interval occupied 2.5 div and the sweep speed was 10 ns/div with 100 samples/div, then 250 samples would be registered in the digital readout counter and reading would be 25.0-ns. For sweep speeds with multipliers of 2, the count is doubled and the decimal is shifted to maintain maximum resolution. For multiples of 5 the count is divided by 2 providing 50 samples/div.

The **TIME MEASUREMENT START** and **STOP** comparators have ± 0.1 mm pick-off resolution capabilities. This gives the Type 230 the ability to scale a 1-cm display in 1% steps.

MEASUREMENT AVERAGING permits selection of measurements to be a statistical average of eight sweeps or to be a measurement of only one sweep. One program line is required for Measurement Averaging selection.

EXTERNAL READOUT

Data outputs are available on the rear-panel of the Type 230 that permit the recording of measurement polarity, displayed digits, units of measure, decimal point, and measurement limit results. The information is in BCD code (1 2 4 8; true . . . ground, false . . . +12 Volts) and the Type 230 can be synchronized to the data recorder.

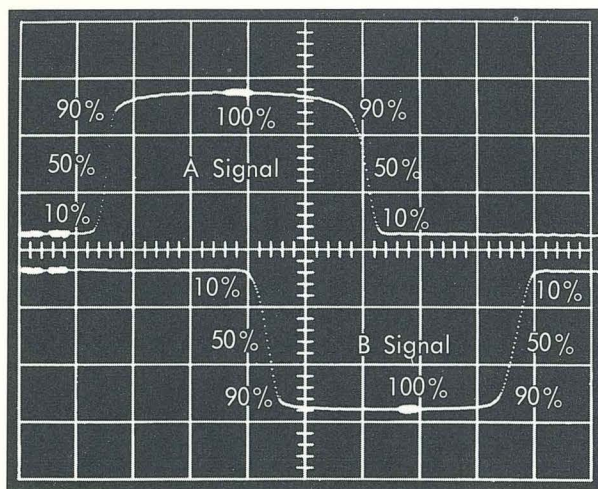
Regulated power is available for use in systems applications.

EXTERNAL PROGRAMMING

The Type 230 Digital Unit is designed to be externally pro-

TYPICAL MEASUREMENT CAPABILITIES

DUAL-TRACE DISPLAY SHOWING TYPICAL MEASUREMENTS		
MEASUREMENT	PROGRAM	
	Start	Stop
Risetime A	+10%A	+90%A
Falltime A	-90%A	-10%A
Risetime B	-10%B	-90%B
Falltime B	+90%B	+10%B
Delay A to B	+10%A	-10%B
Storage A to B	-90%A	+90%B
Turn on A to B	+10%A	-90%B
Turn off A to B	-90%A	+10%B
Width A	+50%A	-50%A
Width B	-50%B	+50%B



grammed for use in high-speed measurement systems, up to 100 measurements per second with proper programming techniques. All of its measurement functions can be programmed by means of ground closures or logic levels. The programming is achieved with 105 program lines using negative logic with true being ground or $< 2V$ and false being open or $> 6V$. Suitable programming devices include card readers, block readers, computers, etc.

HIGH SPEED PROGRAMMED MEASUREMENTS

When using the Type 3T5 or 3T6 Programmable Sampling Sweep Units for the oscilloscope time base, the Type 230 Digital Unit can program the sweep to provide increased measurement speeds. The time-base can be made to run fast (10 dots/div) during the non-measurement part of the sweep and then run at normal speeds (100 dots/div) for maximum resolution during the measurement. This function is obtained by externally programming the high speed program line.

Measurement speed can be increased by externally programming the position of the 0% and/or 100% Reference Zones start point to 12 cm. This puts the reference zones into a memory hold position of up to 10 seconds and permits several different measurements to be made without a zone charging sweep. This gives an additional feature of permitting measurements referenced to reference zones that are not on the CRT display.

OTHER CHARACTERISTICS

POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 130 watts maximum at 115 V and 60 Hz. Rear panel selector provides rapid accommodations for six line-voltage ranges.

TYPE 230 DIMENSIONS AND WEIGHTS

Height	8 in	20.3 cm
Width	16 ¹³ / ₁₆ in	42.7 cm
Depth	21 ⁷ / ₈ in	55.5 cm
Net weight	38 lb	17.3 kg
Domestic shipping weight	≈50 lb	≈22.7 kg
Export-packed weight	≈73 lb	≈33.2 kg

TYPE R230 DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth	22 ³ / ₄ in	57.8 cm
Net weight	40 lb	18.2 kg
Domestic shipping weight	≈52 lb	≈23.6 kg
Export-packed weight	≈75 lb	≈34.1 kg

INCLUDED STANDARD ACCESSORIES

Type 230 to Type 568 48-inch interconnecting cable (012-0119-01); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0635-00). Type R230 also includes mounting tracks (351-0086-00) and mounting hardware.

PROBE CHOPPERS

Probe choppers are available for the P6045 Probe or the S-3 Sampling Probe. With the probe choppers, the Type 230 Digital Unit can make DC and pulse voltage measurements with respect to ground.

Probe Choppers for S-3 Probe, order 015-0128-01

Includes: 10X attenuator (010-0367-00)

Probe Chopper for P6045 Probe, order 015-0129-01

Tektronix, Inc.

P. O. BOX 500 • BEAVERTON, OREGON 97005 • Phone: (Area Code 503) 644-0161 • Telex: 036-691
TWX: 503-291-6805 • Cable: TEKTRONIX • OVERSEAS DISTRIBUTORS IN OVER 30 COUNTRIES
TEKTRONIX FIELD OFFICES in principal cities in United States. Consult Telephone Directory



TYPE 240 PROGRAM CONTROL UNIT

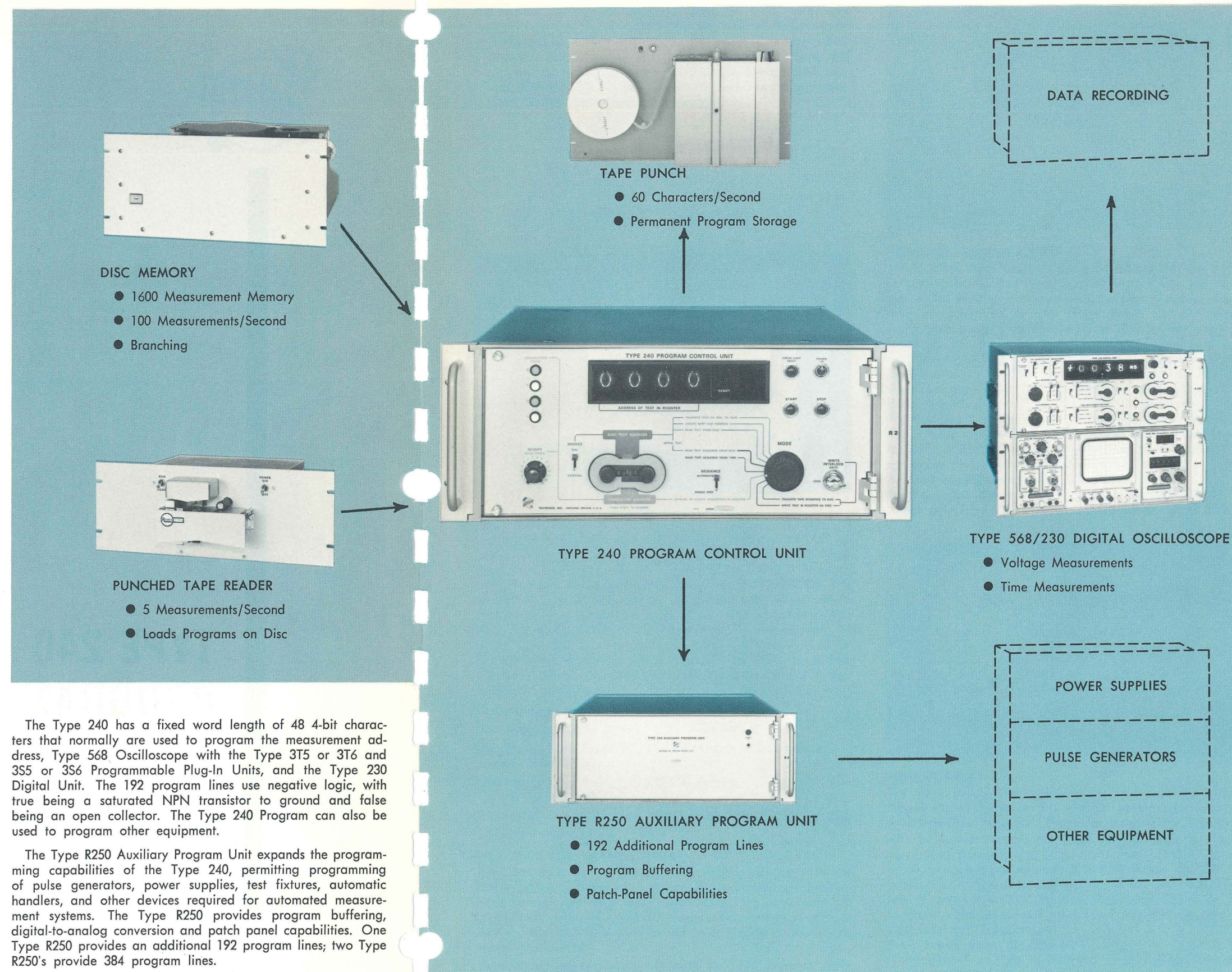
TYPE **240** **R240** PROGRAM CONTROL UNIT

- **CONTROLS TYPE 568 OSCILLOSCOPE AND TYPE 230 DIGITAL UNIT**
- **PROGRAM BRANCHING FOR DIAGNOSTIC TESTING**
- **SERIAL TO PARALLEL CONVERTOR**
- **PROGRAM PREPARATION, MODIFICATION AND VERIFICATION**
- **PROGRAM STORAGE**
 - Disc Memory Option
 - Punched Tape Reader Option
- **FIXED WORD LENGTH**
 - 48 4-bit Characters
- **EXPANDABLE WITH TYPE 250**
 - 192 or 384 Additional Program Lines

The Type 240 and Type R240 Program Control Units are designed to provide automated measurements utilizing the Type 568 Oscilloscope with the Type 3T5 or 3T6 and 3S5 or 3S6 Programmable Plug-In Units and the Type 230 Digital Unit. The Type 240 accepts program data serial-by-bit from the optional Disc Memory, serial-by-character from an optional Punched Tape Reader or from an external source. Programs may be originated or modified manually from the front panel of the Type 240. If other equipment needs to be externally programmed, a Type R250 Auxiliary Program Unit may be added to the Type 240.

Measurement rates in excess of 100 measurements per second are achieved using a Disc Memory. Sorting, classifying and diagnostic test routines are obtained using the Disc Memory. The Disc Memory also permits random access to a library of up to 1600 independent measurements. This feature permits a computer or other control device to have complete control over the test measurements, making calculations from the test data and using the Disc Memory for further measurements and sorting at the maximum test rates.

The Punched Tape Reader provides a maximum measurement rate of 5 measurements per second and is used in low-speed measurement systems. The Disc Memory can be added later to achieve maximum measurement rates and a library of 1600 measurement programs. The Punched Tape Reader is also used for loading measurement programs into the Disc Memory. The Type 240 may be used without the Disc Memory or Punched Tape Reader by providing program data externally in a serial-by-character form, asynchronously at up to 600-kHz character rate. Data sources include paper or magnetic Tape Readers and computer data output.



The Type 240 has a fixed word length of 48 4-bit characters that normally are used to program the measurement address, Type 568 Oscilloscope with the Type 3T5 or 3T6 and 3S5 or 3S6 Programmable Plug-In Units, and the Type 230 Digital Unit. The 192 program lines use negative logic, with true being a saturated NPN transistor to ground and false being an open collector. The Type 240 Program can also be used to program other equipment.

The Type R250 Auxiliary Program Unit expands the programming capabilities of the Type 240, permitting programming of pulse generators, power supplies, test fixtures, automatic handlers, and other devices required for automated measurement systems. The Type R250 provides program buffering, digital-to-analog conversion and patch panel capabilities. One Type R250 provides an additional 192 program lines; two Type R250's provide 384 program lines.

OPERATING MODES

The Type 240 has eight operating modes that are selected by the front panel mode switch. It will perform any of the eight functions after receiving the start command from an external source or the front panel. The functions are as follows:

TRANSFER TEST ON DISC TO TAPE

This function loads the shift registers of the Type 240 with program data from the Disc Memory as selected by the disc test address. When the register is full, the program data is shifted out of the register to the Tape Punch. When the Tape Punch has punched a complete program tape, the Type 240 is returned to a ready condition.

LOCATE NEXT DISC ADDRESS

This function locates the next disc address after a complete measurement has been made. Measurement programs on the disc are spaced to achieve minimum program access time, providing measurement rates in excess of 100 measurements per second.

READ TEST FROM DISC

This function loads the register with program data from the disc sector selected and tells the Type 568/230 to make the measurement. At the end of the measurement, the Type 240 returns to the ready condition.

READ TEST SEQUENCE FROM DISC

This function loads the shift register with program data from the disc sector selected and tells the Type 568/230 to make the measurement. At the end of the measurement, a print command from the Type 230 loads the shift register with data from the disc sector selected by the next program test address. In the automatic sequence mode, this sequence continues until the Type 240 receives a stop signal and returns to the ready condition.

In this mode of operation the Type 240 can be programmed to branch to a new measurement sequence and stop the sequence on out-of-limits measurements. For example when making a risetime measurement, a within-limits measurement would continue the normal measurement sequence; an above-limit measurement (slow risetime) can stop the sequence to reject the component, and a below-limit measurement (fast risetime) can branch to a new measurement sequence for reclassifying the component. Out-of-limit measurements are normally programmed to repeat, to check for possible measurement error.

READ TEST SEQUENCE FROM TAPE

This function loads the shift register data from the Punched Tape Reader, tells the Type 230 to make a measurement, and continues making measurements until the Type 240 receives a stop signal. The Punched Tape Reader can program the Type 240 to stop the measurement sequence on out-of-limit measurements. Out-of-limit measurements are normally programmed to repeat, to check for possible measurement error.

EXAMINE OR MODIFY CHARACTERS IN REGISTER

This function displays on the character data lights the data that is in the shift register. Characters are selected by the character address switches and the characters can be modified with the use of the new data switch and the modify pushbutton.

WRITE TEST IN REGISTER ON DISC

This function permits new or modified program data in the register to be written on the disc sector selected. A write inter-lock key prevents accidental writing and changing of data that is already written on the Disc Memory.

TRANSFER TAPE SEQUENCE TO DISC

This function loads the Type 240 shift register with new program data from the Punched Tape Reader and writes the program data on the disc sector selected. The write inter-lock key must be turned on and prevents accidental writing on the Disc Memory.

PROGRAM INPUTS

The Type 240 program inputs are in one of two forms: either serial by 4-bit character plus parity at up to 600-kHz character rate, or the Disc Memory input is serial by bit (4 bits plus parity per character) at a 3-MHz bit rate. The optional Disc Memory and Punched Tape Reader are designed specifically for use with the Type 240. The optional Disc Memory provides a storage capacity of 1600 measurements for the Type 240/250 Measurement System (1024 complete measurements for a Type 240/250/250 Measurement System). The program access time for the Disc Memory is 17 ms average and can be optimized to approximately 1 ms through the use of minimum access time programming. The optional Punched Tape Reader provides a maximum speed of 300 characters per second and is used in low-speed measurement systems and for loading programs into the Disc Memory. Other data sources could be used, including magnetic tape readers and computers.

DISC TEST ADDRESS

The disc test address can be selected manually from the front panel or can be controlled externally by a computer or other control device. This permits random access to the Disc Memory's library of up to 1600 independent measurements. For external control of the disc test address, 12 program lines are required with negative logic (true = 0 V to +2 V, false = +6 V to +12 V) plus one external enable line.

PROGRAM LINE OUTPUTS

The Type 240 has 192 program lines that are normally used to program the Type 568 Oscilloscope with the Type 3T5 or 3T6 and 3S5 or 3S6 Programmable Plug-In Units, and the Type 230 Digital Unit. These lines can be used to program other equipment when the Type 568 and Type 230 are not used. The 192 program lines feature negative logic, with true being a saturated NPN transistor to ground and false being an open collector. Space is available on the program boards for special circuitry such as logic level conversion, logical inversion, gating, etc.

OTHER CHARACTERISTICS

POWER REQUIREMENTS

90 V to 136 V or 180 V to 272 V, 48 to 66 Hz, 194 watts at 115 V and 60 Hz. Rear panel selector provides rapid accommodation for 6 line-voltage ranges.

TYPE 240 DIMENSIONS AND WEIGHT

Height	8 in	20.3 cm
Width	16 ³ / ₄ in	42.7 cm
Depth	21 ⁷ / ₈ in	55.5 cm
Net weight	37 ¹ / ₂ lb	17 kg
Domestic shipping weight	≈49 lb	≈24.2 kg
Export-packed weight	≈69 lb	≈31.3 kg

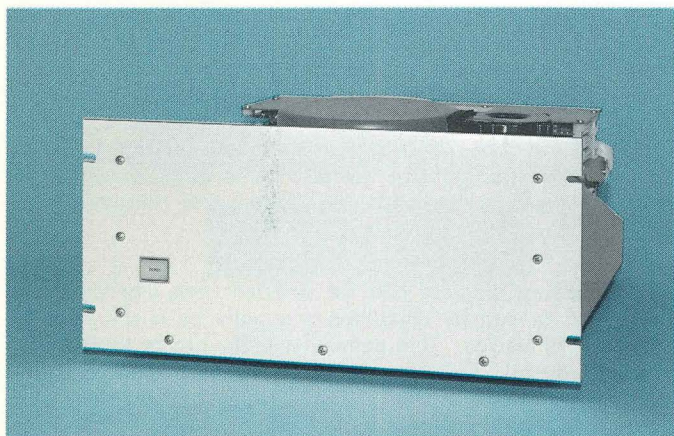
TYPE R240 DIMENSIONS AND WEIGHT

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth	22 ³ / ₄ in	57.8 cm
Net weight	38 ¹ / ₂ lb	17.4 kg
Domestic shipping weight	≈54 lb	≈24.4 kg
Export-packed weight	≈74 lb	≈33.6 kg

INCLUDED STANDARD ACCESSORIES

Type 240 only adapter (013-0095-00); Punched Tape Reader only adapter (013-0096-00); 5 36-pin cables with labels (012-0131-00); 36-pin cable with label (012-0131-01); Type 240 program format table tablet (070-0884-00); 2 instruction manuals (070-0749-00). Type R240 also includes mounting tracks (351-0086-00) and mounting hardware.

OPTIONAL ACCESSORIES



DISC MEMORY

Disc Memory is an 8-track rotation Disc Memory capable of storing 200 measurements per track or a total of 1600 measurements when used with the Type 240 or 240/250 Program Units (1080 measurements with the Type 240/250/250). The format for any test is made up of a fixed word length of 96 characters of 4 bits each plus parity (144 characters with Type 240/250/250). The Disc Memory is 8 $\frac{3}{4}$ inches high, 19 inches wide and 19 $\frac{3}{4}$ inches deep with a total weight of 62 lb. The instrument is factory wired for 108-V to 132-V operation, 190 watts, 60 Hz. The Disc Memory is made by Data Disc, Inc. especially for Tektronix.

Disc Memory, order 020-0024-00

Disc Memory, 50 Hz power, order 020-0028-00

Disc Memory for Type 240/250/250 System, 50 Hz power, order 020-0029-00

Disc Memory for Type 240/250/250 System, order 020-0025-00

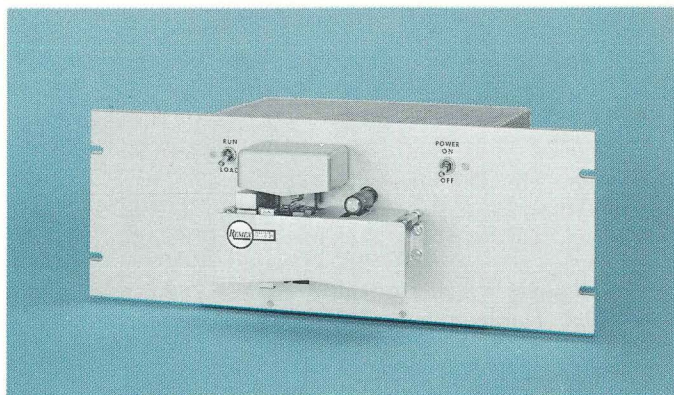
Includes: extender card (012-0151-00); Type 240 to Disc Memory cable (012-0133-00).

LINE SELECTOR TRANSFORMER

The Line Selector Transformer is designed for use with the above optional accessories, where line voltages are encountered outside the accessories' limitations. The transformer is capable of delivering 0.85 kVA, within the voltage ranges of 90 V to 136 V or 180 V to 272 V, 48 to 66 Hz, (50 or 60 Hz with above accessories).

Three outlets are available; one wired for 120 V nominal, while the additional two are wired for 115 V nominal.

Line Selector Transformer, order 120-0598-00



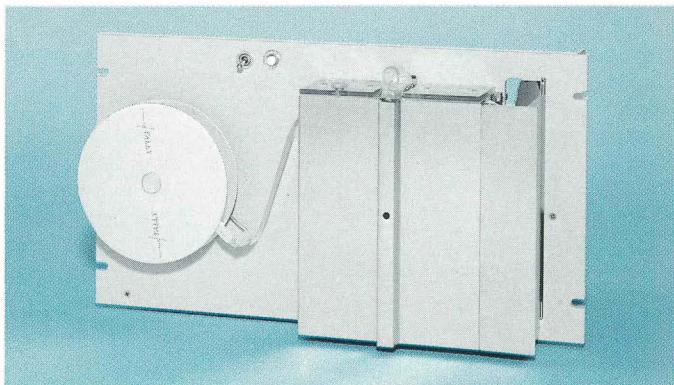
PUNCHED TAPE READER

The Punched Tape Reader is designed for use with the Type 240 for programming the Type 568/230 Digital Oscilloscope System or for loading programs into the Disc Memory. Programs may be generated on the Tape Punch or any standard ASCII tape punch. The Punched Tape Reader has a maximum speed of 300 characters per second. Measurement programs are fixed word length and require 48 4-bit characters plus parity when using the Type 240, 96 4-bit characters plus parity when using a Type 240/250, and 144 4-bit characters plus parity when using a Type 240/250/250 Measurement System. The Punched Tape Reader is 7 inches high, 19 inches wide, 7 $\frac{3}{4}$ inches deep and weighs 26 lb. Power requirements are 95 V to 130 V, 150 watts, 60 Hz. The Punched Tape Reader is made by Remex Electronics, Inc. especially for Tektronix.

Punched Tape Reader, order 020-0026-00

Punched Tape Reader, 50 Hz power, order 020-0030-00

Includes: Type 240 to Punched Tape Reader cable (012-0147-00).



TAPE PUNCH

The Tape Punch is designed to be used with the Type 240 Program Control Unit, and is used for generating new program tapes from the Type 240. Programs stored in the Disc Memory may be transferred via the Type 240 to the Tape Punch for permanent storage. The Tape Punch has a maximum speed of 60 characters per second. It is 10 $\frac{1}{2}$ inches high, 19 inches wide, 12 $\frac{3}{4}$ inches deep and weighs 38 lb. The tape Punch is factory wired for 105-V to 125-V operation, 320 watts, 50 Hz to 60 Hz. The perforator mechanism is made by Tally, Inc. especially for Tektronix.

Tape Punch, order 020-0027-00

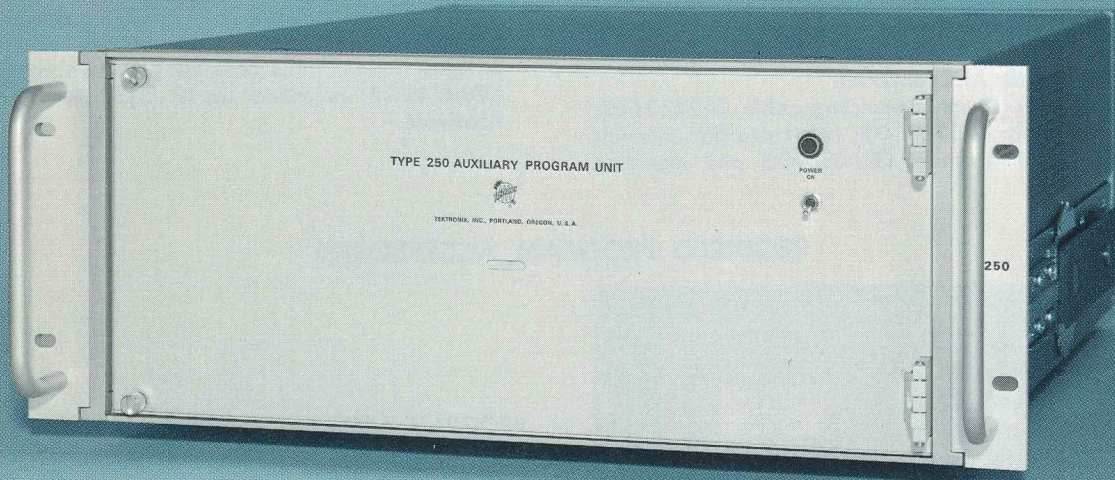
Includes: Type 240 to Punched Tape Reader/Tape Punch cable (012-0146-00).

Tektronix, Inc.

P. O. BOX 500 • BEAVERTON, OREGON 97005 • Phone: (Area Code 503) 644-0161 • Telex: 036-691
TWX: 503-291-6805 • Cable: TEKTRONIX • OVERSEAS DISTRIBUTORS IN OVER 30 COUNTRIES
TEKTRONIX FIELD OFFICES in principal cities in United States. Consult Telephone Directory

TYPE **R250**

AUXILIARY PROGRAM UNIT



● PROGRAMS

Type R116 Pulse Generator

Type R293 Pulse Generator

Power Supplies

Fixtures

Other Equipment

● 192 PROGRAM LINES

48 4-bit Characters

● PROGRAM BUFFERING

Level Conversion

Level Inversion

Digital-To-Analog Conversion

● PATCH-PANEL CAPABILITIES

The Type R250 Auxiliary Program Unit is designed for use with the Type 240 Program Control Unit and permits external programming of additional equipment such as power supplies, pulse generators, and fixtures. Internal power supplies are available for external programming requirements: +20 V at 300 mA, +10 V at 4 A, +3.6 V at 7 A, and -10 V at 2 A. The Type R250 requires 12 program assembly cards and cables for operation. Program assembly cards consist of one shift register card and two program (standard, resistance, conductance) cards in any combination.

Systems engineering is required with the shift register cards and the program boards. The customer must determine the proper interface required from the Type R250 to the auxiliary equipment to be programmed. Then two program boards are selected and wired to each shift register card to obtain the necessary program functions. Three program boards are available offering the following functions: standard program boards with negative logic programming, resistance program boards, and conductance program boards.

Up to two Type R250's may be used with the Type 240, providing an additional 192 program lines per Type R250. The Type R250 has 48 4-bit characters with 192 program lines. It features program buffering, digital-to-analog conversion and patch panel capabilities.

Two Tektronix programmable pulse generators are available and listed under optional equipment. They come complete with the program assembly cards and cables necessary for use with the Type R250.

POWER REQUIREMENTS

90 V to 136 V or 180 V to 272 V, 48 to 66 Hz, 194 watts at 115 V and 60 Hz. Rear panel selector provides rapid accommodation for 6 line-voltage ranges.

TYPE R250 DIMENSIONS AND WEIGHT

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth	22 $\frac{3}{4}$ in	57.8 cm
Net weight	37 $\frac{1}{2}$ lb	17 kg
Domestic shipping weight	\approx 52 lb	\approx 23.5 kg
Export-packed weight	\approx 72 lb	\approx 32.6 kg

INCLUDED STANDARD ACCESSORIES

Type 240 to Type R250 interconnecting cable (012-0134-00); program format table (070-0886-00); two instruction manuals (070-0748-00); mounting tracks (351-0086-00) and mounting hardware.

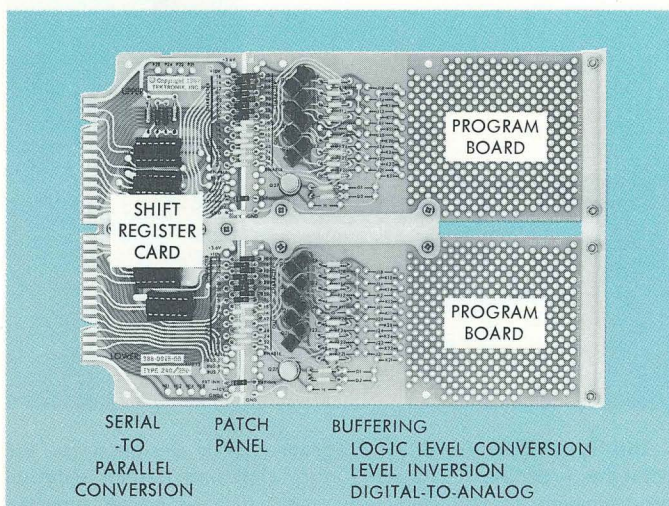
TYPE R250 MOD 29

If a second Type R250 is to be used in a system, please indicate on your order, Type R250 MOD 29.

INCLUDED STANDARD ACCESSORIES

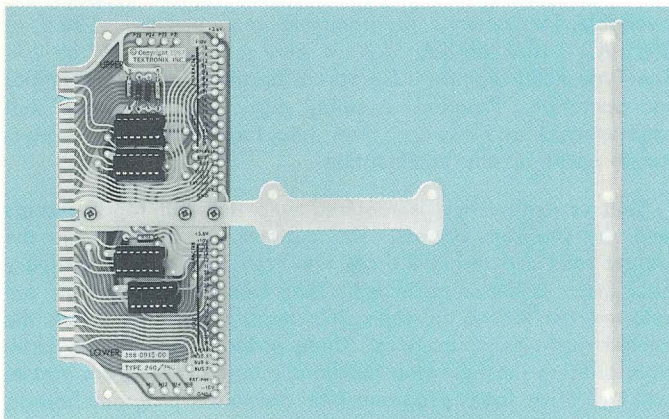
Type 240 to Type R250/Type 250 interconnecting cable (012-0135-00); performance check program tape (016-0134-00); program format table (070-0887-00); two instruction manuals (070-0748-00); mounting tracks (351-0086-00) and mounting hardware.

REQUIRED PROGRAM ACCESSORIES



PROGRAM ASSEMBLY CARDS

Twelve program assembly cards are required for operation of the Type R250. Each program assembly card consists of one shift register card that does the serial-to-parallel conversion, and two program boards that provide program buffering. Wiring between the shift register card and the program boards is required. Interwiring connections provide patch-panel capabilities. Two Tektronix Programmable Pulse Generators are available with program assembly cards necessary for programming their functions.



SHIFT REGISTER CARD

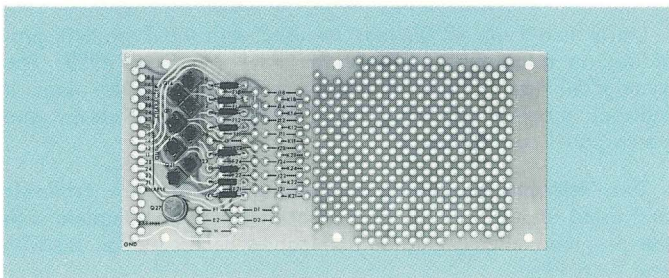
12 shift register cards are required for the operation of the Type R250. Each card contains a 4-character, 4-bit shift register providing a total of 16 bits for programming. The normal connection from the shift register is 8 bits to the upper program board and 8 bits to the lower program board. Two program boards are required with each shift register card. The program boards may be of the same or different types. The shift register card provides the following connections: 16 program lines to an associated rear panel connector, 8 lines to an adjacent program board on the right, and 8 lines to an adjacent program board on the left.

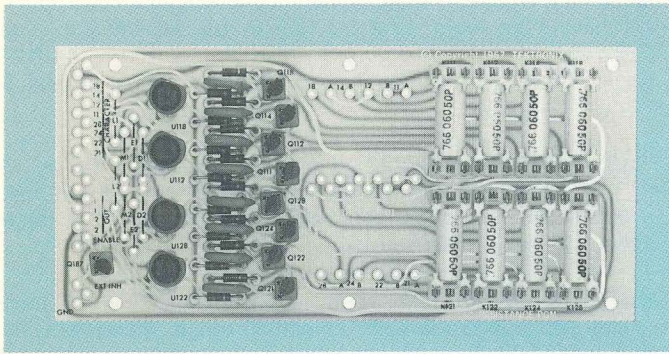
Order 020-0020-00

STANDARD PROGRAM BOARD

The standard program board contains separate buffer amplifiers for 8 program lines and has provisions for adding isolation diodes and RC delay networks for each program line. The standard program board must be mounted on the shift register card, and inter-wiring connections must be made. The board provides negative logic with true being a saturated NPN transistor to ground, and false being an open collector. Space is available on the board for special circuitry, such as logic level conversion, logical inversion gating, etc.

Order 020-0021-00

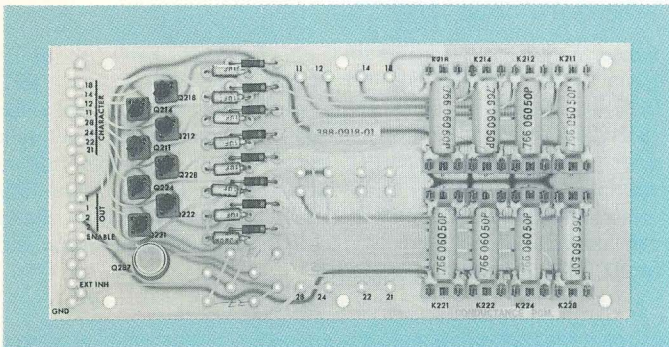




RESISTANCE PROGRAM BOARD

The resistance program board includes buffer drivers, amplifiers, and reed relay switches and coils for switching 8 resistors in a series of resistive networks. Eight program bits from the shift register provide 2 decades of resistance changes (1% increments) for programming analog functions. The resistance program board provides digital-to-analog conversion necessary for programming analog equipment. The resistance program board must be mounted on the shift register card, and inter-wiring connections must be made. Proper resistors must be wired on the board to program the steps desired in the external equipment.

Order 020-0023-00



CONDUCTANCE PROGRAM BOARD

The conductance program board is similar to the resistance board, except that 8 resistors are switched in a parallel resistive network. This gives 100 increments of conductance change for programming analog conversions which require linear change of conductance. The conductance program board must be mounted on the shift register card, and inter-wiring connections must be made. Proper resistors must be wired on the board to program the steps desired in the external equipment.

Order 020-0022-00

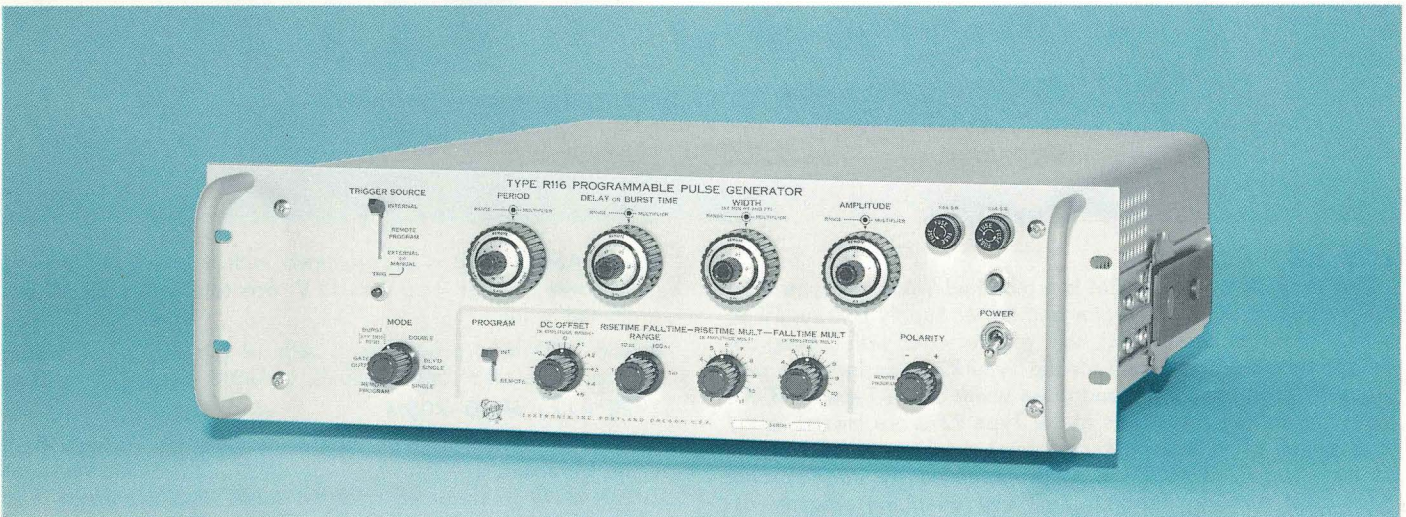
CABLES

The 192 program lines of the Type R250 are available on seven 36-pin connectors on the rear panel. Cables are required to connect the Type R250 to the programmable instruments. Interconnecting cables are included with the optional Tektronix programmable equipment.

6-ft shielded interconnecting cable with 36-pin connector on both ends, order 012-0131-00

8-ft shielded interconnecting cable with 36-pin connector on one end, no connector on other end, order 012-0132-00

OPTIONAL EQUIPMENT



TYPE R116 MOD 703L

The Type R116 MOD 703L Programmable Pulse Generator is a modified Tektronix Type R116 Programmable Pulse Generator furnished with 5 Program Assembly Cards and interconnecting

cables necessary for the Type R250. Program assembly cards program the Type R116 and are calibrated to the Type R116. The input and output connectors of the Type R116 are moved to the rear panel.

PROGRAMMING BITS required for all range and incremental programming plus mode and polarity programming is 75. If all functions do not require programming, one or more of the programming assembly boards need not be used. Front panel controls are accurate within the indicated tolerances plus an additional 2%.

PULSE PERIOD is programmed in 5 decade ranges (100 ns, 1 μ s, 10 μ s, 100 μ s, 1 ms). Each range can be programmed from X1.0 to X10.9 in 0.1 incremental steps. Accurate within 5% on 100-ns range, within 3% on all other ranges.

PULSE DELAY/BURST is programmed in 4 decade ranges (10 ns, 100 ns, 1 μ s, 10 μ s) with each range programmed from X5.0 to X54.5 in 0.5 incremental steps. Accurate within (3% + 10 ns).

PULSE RISETIME AND PULSE FALLTIME are programmed from 10 ns to 109 μ s. The risetime and falltime is the result of $(t_r/t_f \text{ range}) \times (t_r \text{ or } t_f \text{ multiplier}) \times (\text{amplitude multiplier})$. Range is programmed in 4 decade steps (1 ns, 10 ns, 100 ns, 1 μ s). Rise-time and falltime multipliers are separately programmable, but share a common range program. Multiplier ranges are from X1.0 to X10.9 in 0.1 incremental steps. Accurate within 10% above 10 ns on the 1-ns and 10-ns range, within 5% on the 100-ns and 1- μ s range. When $(t_r/t_f \text{ range}) \times (t_r \text{ or } t_f \text{ multiplier}) \times (\text{amplitude multiplier})$ is less than 10 ns, the output risetime or falltime is less than 11 ns, uncalibrated.

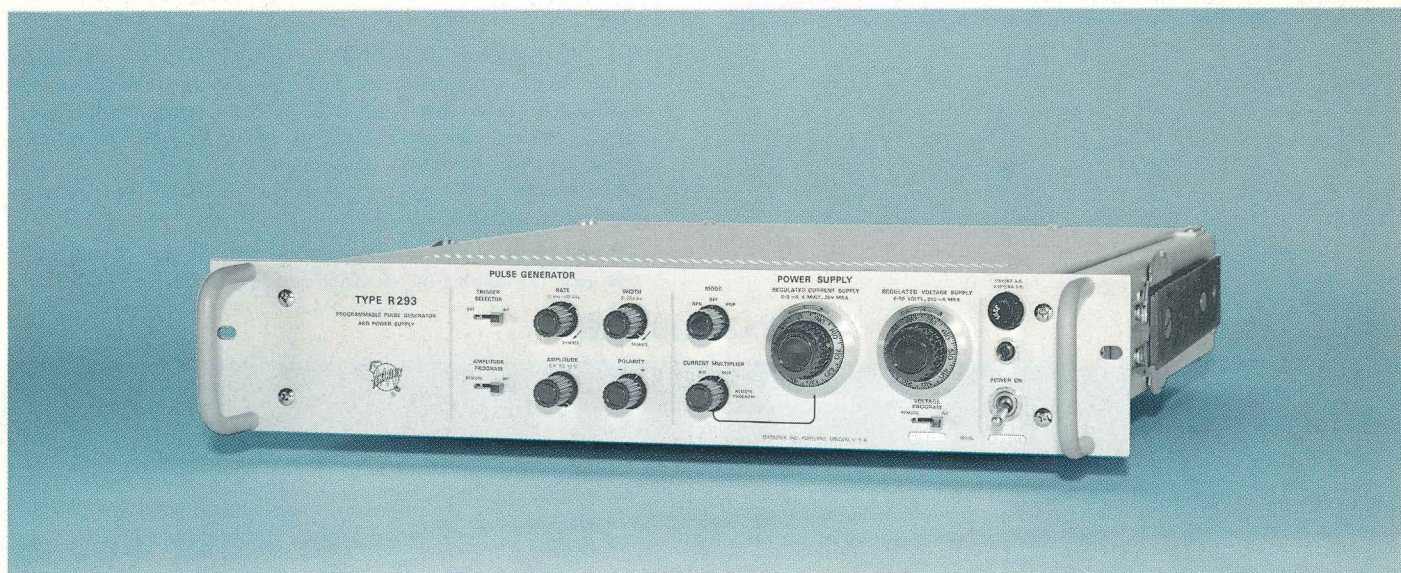
PULSE AMPLITUDE is programmed in 3 ranges (0.2 V, 0.5 V, 1 V) with multipliers from X2.0 to X9.9 in 0.1 incremental steps. Amplitude into 50 Ω is accurate within (3% + 15 mV) on 0.2-V range; within (3% + 25 mV) on 0.5-V range; within (3% + 50 mV) on 1-V range.

PULSE WIDTH is programmed in 4 decade ranges (10 ns, 100 ns, 1 μ s, 10 μ s) with each range programmed from X5.0 to X54.5 in 0.5 incremental steps. Accurate within 5% on 10-ns range, within 3% on all other ranges.

PULSE DC OFFSET RANGE is $-X4.9$ to $+X4.9$ in 0.1 incremental steps, times the pulse amplitude range. Accurate within (5% \pm 200 mV).

TYPE R116 MOD 703L

Includes: 5 program assemblies for the Type R250; board P7, pulse delay (672-0207-01); board P8, pulse period, mode (672-0208-01); board P9, pulse width, amplitude, t_r/t_f decade, offset (672-0208-02); board P10, pulse width multiplier, amplitude multiplier (672-0209-01); board P11, pulse risetime multiplier, falltime multiplier (672-0209-02); Type R116 MOD 703L to Type R250 interconnecting cable (012-0141-00); test format tables; standard accessories of Type R116; two instruction manuals with MOD 703L information added.



TYPE R293 MOD 703M

The Type R293 MOD 703M is a modified Tektronix Type R293 Programmable Pulse Generator and Power Supply Unit furnished with a program assembly (1 shift register card with 2 program boards installed and wired) for the Type R250, designed to program the pulse amplitude and pulse width of the Type R293. All input and output connectors of the Type R293 are moved to the rear panel. The following performance characteristics apply to the Type R293 MOD 703M programmed by the Tektronix Type R250 Auxiliary Program Unit and using the program assembly card furnished with the Type R293. Other characteristics of the Type R293 Programmable Pulse Generator and Power Supply Unit may be found on pages 321-322 of Tektronix Catalog 28.

PULSE AMPLITUDE is programmed with 4 bits in 0.5-V increments over a range of 6 V to 12 V, accurate within 3% of programmed value.

PULSE WIDTH is programmed with 10 bits in 1-ns increments over a range from 2 ns to 250 ns, accurate within (3% + 3 ns).

TYPE R293 MOD 703M

Includes: Program assembly board for Type R250 (672-0210-01); Type R293 MOD 703M to Type R250 interconnecting cable (012-0142-00); measurement format table; two instruction manuals with MOD 703M additions; plus included standard accessories of the Type R293.

Tektronix, Inc.

P. O. BOX 500 • BEAVERTON, OREGON 97005 • Phone: (Area Code 503) 644-0161 • Telex: 036-691
TWX: 503-291-6805 • Cable: TEKTRONIX • OVERSEAS DISTRIBUTORS IN OVER 30 COUNTRIES
TEKTRONIX FIELD OFFICES in principal cities in United States. Consult Telephone Directory