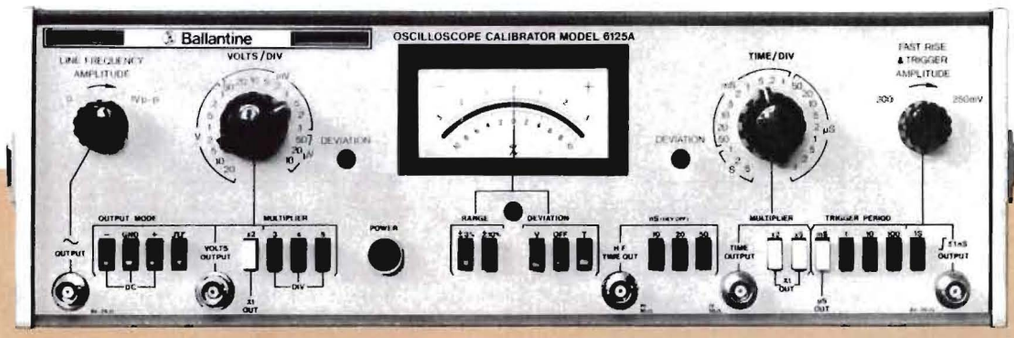
OSCILLOSCOPE CALIBRATOR MODEL 6125A



- ☐ Amplitude, Time, Risetime and Syncronization/Trigger Calibration for all Oscilloscopes to 250 MHz
- ☐ Simplicity of Use – Pushbutton Switching of Function and Multiplier Circuits
- ☐ Direct Reading of Percentage Error of Calibration Waveform
- ☐ Reduced Calibration Costs
- ☐ Negligible Operator Training Time through use of Deviation Principle
- ☐ Timing Accuracy – 0.01%
  Amplitude Accuracy – 0.25%

The Model 6125A provides in one compact, easy-to-use package, all facilities for the most accurate calibrations of oscilloscope parameters possible, outside of the standards laboratory. It comprises three precision instruments: a voltage calibrator; a sweep-time and delay-time calibrator; and a rise-time calibrator. Not to be confused with less accurate instruments of limited range, the Model 6125A approaches secondary-standard accuracy and stability in all calibrating-signal parameters . . . yet it costs less than the 3 individual instruments it replaces.

It is simple to use. The operator sets the amplitude or time control to the value required, depresses the appropriate function and multiplier buttons and observes the waveform on the oscilloscope. If the trace does not coincide with the appropriate graticule, the deviation control is adjusted until it does, when the error can be read directly off the meter as a percentage.

SPECIFICATIONS – MODEL 6125A

VOLTAGE CALIBRATOR

Ranges
(a) Volts/Division: 10 μV to 20 V
20 ranges in 1, 2, 5 sequence
(b) Number of divisions multiplier: X 3, 4, 5, 6, 8, 10
Absolute Range: 27 μV to 220 volts
Deviation ranges: ±3% and ±10%
Output Modes: AC 1 kHz ±0.01% positive going square wave (Crystal Controlled Frequency)
DC positive
DC negative
GND
Accuracy: Better than ±0.25% into open circuit
Offset: Less than ±5 μV below 50 mV. (After use on ranges above 50 mV, a five minute settling time is required to avoid thermal effects) Less than ±50 μV above 50 mV
Note: The same offset is obtained on all output modes including zero.
Ripple and Hum: Better than 0.1% +2 μV p-p
Square wave risetime: Less than 5 μs
Square wave overshoot: Less than 0.5%
Regulation (for 1 MΩ load): Varies between 0 and 0.27% depending on setting.
Deviation Accuracy: ±1% FSD ±2.5% of reading

Continued

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SPECIFICATIONS – MODEL 6125A

Overload Protection: Protected against overload of short duration
Reference: High quality zener diode,
(Temperature coefficient ± 0.002% per °C)
Temperature Coefficient of Output (10-30°C): Better than ±0.01% per °C (±100 ppm/°C)
Line Regulation for ±10% change: ±0.02% max
Stability: ±0.10% per year (maximum)

TIME CALIBRATOR

Ranges: 10 nsec to 5 second intervals
(a) Time/Division: 10 nsec to 0.5 sec/div – 21 ranges in 1, 2, 5 sequence
(b) Multiplier (Number of Divisions): X 1, 2, 5, 10 (on 100 nsec to 0.5 secs/div only)
Deviation Ranges (for 100 nsec/div to 0.5 sec/div): ±3% and ±10%
Accuracy
(a) Crystal controlled: ±0.01% of setting
(b) Deviation 3% range: ±0.1%
(c) Deviation 10% range: ±0.2%
Amplitude
(a) 100 nsec/div to 0.5 sec/div: 1.0 V (typical) into 50 Ω (1.4 V min into open circuit)
(b) Less than 100 nsec/div: 1.0 V p-p (typical) into 50 Ω
Pulse shape and width
(a) 100 nsec/div to 0.5 sec/div:
Spike, width at base 10% of pulse interval
(b) below 100 nsec/div:
Sinewave

RISETIME CALIBRATOR & TRIGGER OUTPUT

Amplitude: 200 mV to 250 mV continuously variable into 50 Ω (400 mV-500 mV open circuit)
Risetime: Less than 1 nsec positive going into 50 Ω
Period: 1 μsec to 1 second in 7 decade steps
Waveform: Square Wave
Overshoot: Less than 2%
Accuracy: Same as Time Calibrator

LINE FREQUENCY SYNC OUTPUT

Amplitude: Continuously variable from 0 to 1 volt peak-to-peak from 2 kΩ source max.
Waveform: Follows powerline sinewave

GENERAL INFORMATION

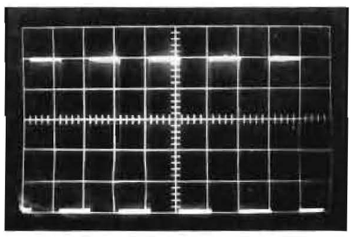
Power Requirements: 100/125 or 200/250 volts r.m.s., 17W, 50/60 Hz
Operating temperature: 0°C to +50°C ambient.
Storage temperature: 40°C to +70°C ambient.
Humidity: to 80% RH for full accuracy; to 95% RH operating
Dimensions: 16 3/8" wide, 5 1/4" high x 12" deep overall. (415.6 mm x 133.5 mm x 304.8 mm.)
Weight: 15 lbs 8 oz (7.08 kg.)
31 lbs (14.2 kg) shipping weight.

PRICE: $1875.00

Note: All accuracies specified at 23°C ±1°C with full compensation for output loading and referenced to a standard traceable to NBS with uncertainty of ±0.01%.

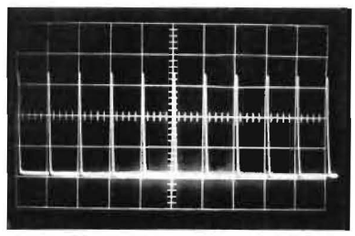
VOLTAGE CALIBRATOR

An accurate DC voltage, positive, negative, or zero, and a 1 kHz positive-going square wave are provided for amplitude calibration. The main output voltage control switch is designed to correspond with that on most oscilloscopes. Pushbutton switching, plus a deviation control, combine to allow the deviation meter to indicate percentage error directly. The 1 kHz square wave is crystal controlled.



TIME CALIBRATOR

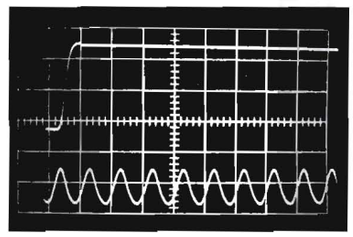
A high-stability quartz-crystal controlled time-mark generator provides time-calibration pulses. The section is split into two ranges, each with its own output. The time per division switch corresponds to that on most oscilloscopes. Pushbutton switching, plus a deviation control, combine to allow the percentage error to be read directly from the deviation meter.



RISETIME CALIBRATOR

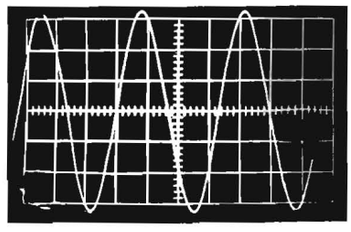
A 1 Hz–1 MHz squarewave having faster than 1 nanosecond risetime is provided for risetime measurements. Both the risetime and the bandwidth of the amplifier can be checked, using this fast pulse. The time base of the oscilloscope is first calibrated with the Model 6125A and then the risetime of the calibration pulse is measured on the screen.

The ultra-high speed capabilities of the Model 6125A, permit precise calibration of realtime scopes with 100 MHz bandwidths, and it is usable up to 500 MHz bandwidth.



SYNCHRONIZATION/TRIGGER CHECK

A 50/60 sinewave output of variable amplitude is available for the checking of trigger circuits at line frequency.



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P O Box 97, Boonton, New Jersey 07005, Phone (201) 335-0900, TWX (710) 987-8380
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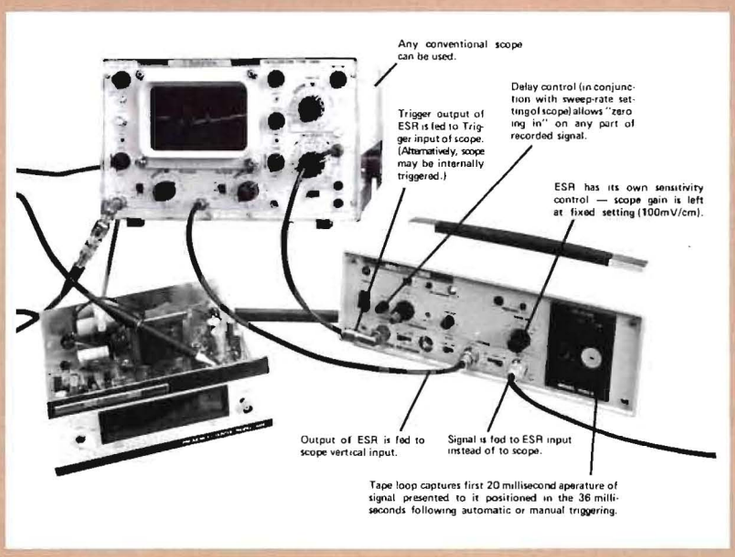
3/72 Printed in U.S.A.

MODEL 7050A ELECTRONIC SIGNAL RECORDER

This unique new instrument "captures" signals (transient or repetitive) by recording them on a small tape loop, and then provides a **versatile, stable, linear, essentially noise-free reproduction interface** that permits the captured signal to be analyzed at leisure. The Ballantine Electronic Signal Recorder (ESR) may be coupled to any waveform/spectrum instrument, from conventional oscilloscopes to spectrum, waveform, or vibration analyzers and Fourier plotters. The ESR converts any scope into a storage scope — with the important advantages of much greater signal-analysis flexibility, higher contrast, faster effective writing rate, and (with 2 ESR's) two-channel signal-comparison capabilities. The inexpensive tape loops may be safely stored indefinitely, yet are instantly and automatically erased for re-recording.



- CONVERTS *any* SCOPE INTO A HIGH-CONTRAST FAST-WRITING STORAGE SCOPE! . . . 3000 div/millisecond!
- PROVIDES HIGH-RESOLUTION "INSTANT REPLAY" (and Total Electronic Recall) OF ONE-SHOT OR REPETITIVE SIGNALS! . . . 0.5 megabit equivalent resolution!
- ADDS UNIQUE TRANSIENT-ANALYSIS CAPABILITY TO . . . SPECTRUM ANALYZERS . . . WAVEFORM ANALYZERS . . . FOURIER PLOTTERS . . . VIBRATION ANALYZERS — and many other instruments!
- PERMITS REMOTE FIELD RECORDING without viewing FOR LATER DISPLAY AND ANALYSIS

BALLANTINE LABORATORIES, INC.

FOUR DECADES OF INNOVATION IN ELECTRONIC INSTRUMENTATION

HOW IT'S USED...

Because the ESR can be used to provide "instant replay" of captured signals with so many different instruments, the simple steps described here may vary slightly from application to application. These procedures are given for use with an oscilloscope. **NOTE: See next page for variations in these procedures.**

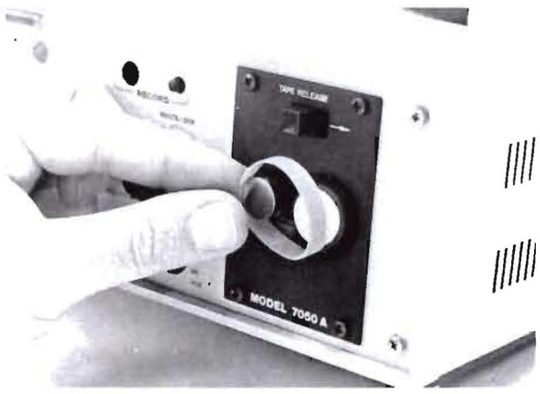
1 **Slip tape loop on spindles**— ingenious tapered design automatically draws tape into correct position.

2 **Interconnect signal ESR**, and scope as shown on page 1, and set scope sensitivity to 100mV/cm and trigger control to EXT. (ESR provides both plus and minus trigger-slope selection.)

3 **Set ESR sensitivity control** to appropriate level for signal. (If you don't know correct level, simply switch ESR to "THRU" Mode, and check the signal, as you ordinarily would, directly on scope.) Press the Playback button. Now you're ready.

4 **Press the RECORD button**. The next 20 milliseconds of signal (of adequate level, as set in step 3) will be recorded, after which the RECORD light will go out, and the PLAYBACK light will go on, indicating signal capture. Now the tape is being read repeatedly, and the captured signal is being displayed on the scope. (You may have to set the trigger level of the scope, but this is only done once, for all recordings.)

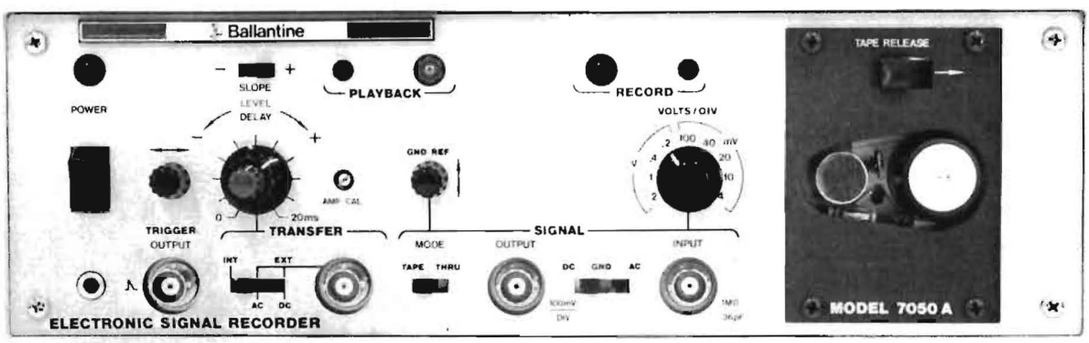
5 **Now you can observe, analyze, and even photograph, the captured signal,** at your leisure. Using the horizontal-position control (output trigger delay) on the ESR, in combination with the scope's sweep-rate control, you can "zero in" on any small part of the waveform (without significant jitter) you or can look at the whole 20 milliseconds of recording. You can't lose any of the leading edge, either — there's a built-in delay after the sweep starts. On the rear of the ESR is a pulse that can be used for Z-axis blanking or brightening, to identify the start of the recording. **NOTE**: With *two* ESR's, you can compare an old tape with a new one, too! You can also copy tapes from one ESR to another.



Two seconds — and the tape-loop is automatically and accurately drawn into place. Removal is just as fast and simple — push the lever, and the loop pops out!

APPLICATIONS include almost any requirement for capturing and/or storing time-domain signals . . . transient or repetitive, DC or AC coupled, with frequency components up to 250kHz. Here is a *partial* list:

- **"Instant Replay"** of transients or repetitive signals on a conventional CRO.
- **Analysis of the frequency/energy components of a spectrum,** in conjunction with any swept-spectrum (or stepped-frequency) device — e.g., microwave, RF, LF, AF, subsonic, noise, and shock/vibration spectra, from spectrum analyzers, swept-frequency receivers, telemetry-channel scanners, etc.
- **Detailed analysis of the impedance/transfer-function vs. frequency characteristic** of a device, circuit, or component, in conjunction with network or impedance analyzers, triggered sweep-frequency oscillators, etc. (With *two* ESR's, comparison of these characteristics with standards.)
- **Analysis of the harmonic (Fourier) content of a captured waveform,** in conjunction with waveform analyzers, Fourier plotters, sampled-data/computer processed analyzers, etc.



HOW IT WORKS...

The 7050A operates in two modes: "RECORD," and "PLAYBACK." Mode switching ("TRANSFER") is accomplished automatically, by an internally or externally generated trigger signal, or manually by front panel pushbutton. The transfer may be delayed from 0 to 16 milliseconds after the trigger.

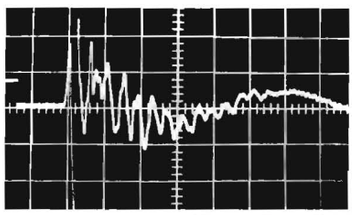
In the RECORD mode, the instrument continuously records input signals on a small endless loop of computer-grade magnetic tape, which is capstan driven by a brushless, constant-speed DC Hall-effect motor, at one revolution of the loop every 20 milliseconds. An erase head, positioned 16 milliseconds behind the recording head, continually erases the recorded signals after each revolution.

When a "TRANSFER" command is received, both recording and erasure cease, and the previous 20 milliseconds of recorded signals are read out as a continuously repeated, analog voltage signal. The recorded Read trigger signal is usable, as explained below, as a synchronization signal for the associated oscilloscope.

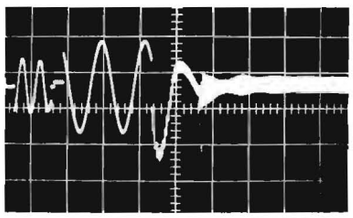
As the block diagram below indicates, the input signal is amplified, and used to FM modulate a 750kHz carrier. The resultant signal is fed through a Write amplifier to the recording head. Application of a TRANSFER signal, which may be derived from the input signal, from an external source, or by actuation of the PLAYBACK pushbutton, disconnects the erase head and switches the recording head to the playback amplifier. The recorded signals are fed through the playback amplifier to the demodulator, which removes the FM carrier, recovering the original signal.

In the PLAYBACK mode, a trigger output is available, for triggering the scope sweep. A unique feature of the ESR is its ability to transfer, manually or automatically, from RECORD to PLAYBACK, with an adjustable delay period, selected by front panel controls. A second adjustable delay of the sweep-trigger output permits precise examination of any small segment of the recorded waveform, by sweep expansion of the recorded signal. No other signal-storage medium — storage scope or photograph — has this capability.

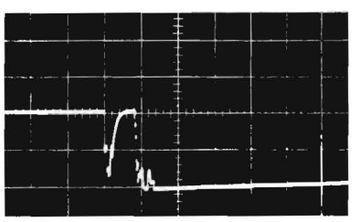
The sweep trigger can thus be adjusted in phase with respect to the recorded signal . . . similar to a scope delayed sweep. Thus, the scope time base trigger may be advanced or delayed with respect to the ESR's zero-reference signal.



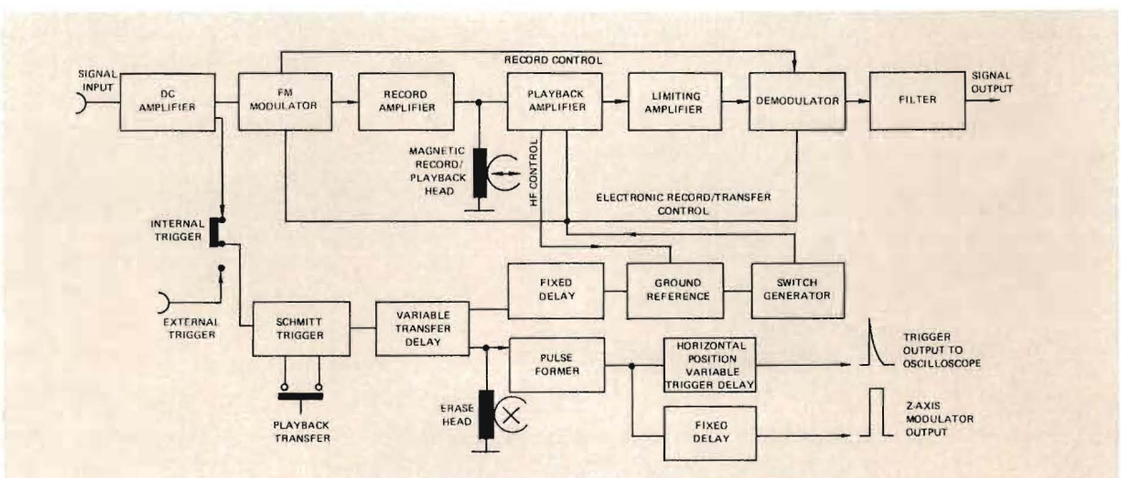
Examine the entire 20-millisecond recording, at an appropriate sweep speed . . . about 2 millisec/cm, for a 10-cm graticule.



Using the delay control on the ESR for positioning, and higher sweep speed, "zoom in" on any part of the captured signal. Use the ESR sensitivity control for vertical expansion, if necessary . . . the ESR has a very wide dynamic range, and very low noise.



High effective writing rate (3,000 divisions/millisecond) permits display of very fast, single-shot transients.



SPECIFICATIONS

RECORDING:

Frequency Range: DC–100kHz (3dB), usable beyond 200kHz.

Rise Time: 3.6 μsec.

Storage Time Period: 20 mS maximum.

Input Sensitivity (for an oscilloscope deflection coefficient of 100mV/cm): 9 ranges in 1, 2.5, 5 sequence 4/10/20/40/100 mV/cm 0.2/0.4/1/2V/cm

Input Signal for Full Recording Level: 10 x input sensitivity.

Maximum Input Voltage: 400 volts (DC plus peak AC).

Input Impedance: 1MΩ ±5%, 36pF ±2pF, compensated on all ranges for use with attenuator probe.

Distortion: < 1.5% at 1kHz.

TRANSFER COMMAND:

Automatic, from input signal.
External, by control pulse.
Manual.

Transfer Trigger Level Range: ±5 x input sensitivity (internal).

Transfer Level Range: ±5 x input sensitivity (internal).

Transfer Slope: positive or negative.

External Transfer Trigger Sensitivity: ⩾ 50 mV, t ⩾ 100 nsec.

Input Impedance, External Transfer Trigger Input: 1MΩ, 36pF.

Transfer Delay: adjustable 4 to 20msec.

PLAYBACK:

Output Level for Full Modulation: ±0.5V (1V p-p).

Signal to Noise Ratio During Full Level Recording: ⩾ 34 dB dynamic range, referenced to full scale.

Signal Output Source Impedance: ⩽ 50 Ω.

Repetition Frequency of Recording: 50 Hz (approx.).

Ground Reference: Short-duration reference level pulse recorded on tape at instant of transfer.

Ground Reference Adjustment: permits offsetting recorded signal ±3 x input — sensitivity setting, via front-panel control.

PULSE OUTPUTS:

Trigger for Oscilloscope: amplitude, > 13V into open circuit.

Trigger Delay: 4 . . . 17 mS — continuously adjustable.

Signal Blanking for Oscilloscope: amplitude, > 13V into open circuit.

PHYSICAL, ENVIRONMENTAL:

Dimensions: Width – 11.25" (300mm)
Height – 4.3 " (110mm)
Depth – 9.5 " (240mm)

Weight: 6½ pounds approx. 2.95 kg approx.

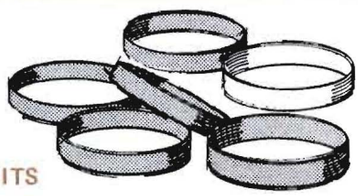
Power Requirements: 115/230V, ±10%, 50 to 60 Hz, 35 Watts.

Ambient Temperature Range: 0°C to +40°C operating.
–30°C to +75°C storage.

Price: $985.00 f.o.b. Boonton, New Jersey. U.S.A.

TAPE STORAGE

Captured signals may be stored indefinitely, provided that they are not exposed to very high magnetic fields, or high temperatures. The all-steel storage capsule shown here provides adequate magnetic shielding for all ordinary environments, and provides a label for identification and dating of the signal stored. Order as Model 70502A Tape Storage Capsule, $5.00 for a package of ten. (Quantity discounts are obtainable on request, from factory.)



TAPE KITS

Each Model 7050A Electronic Signal Recorder is furnished with one complete Tape Kit, as shown here. The kit contains five recording loops (each usable for more than eight hours of continuous operation) and one cleaning loop (used for cleaning the tape heads, about every eight hours of continuous operation). Order as Model 70501A Tape Kit, $10.00 each. (Quantity discounts are obtainable on kits or on bulk quantities of tape loops on request, from factory.)

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3078–5/72 Printed in U.S.A.