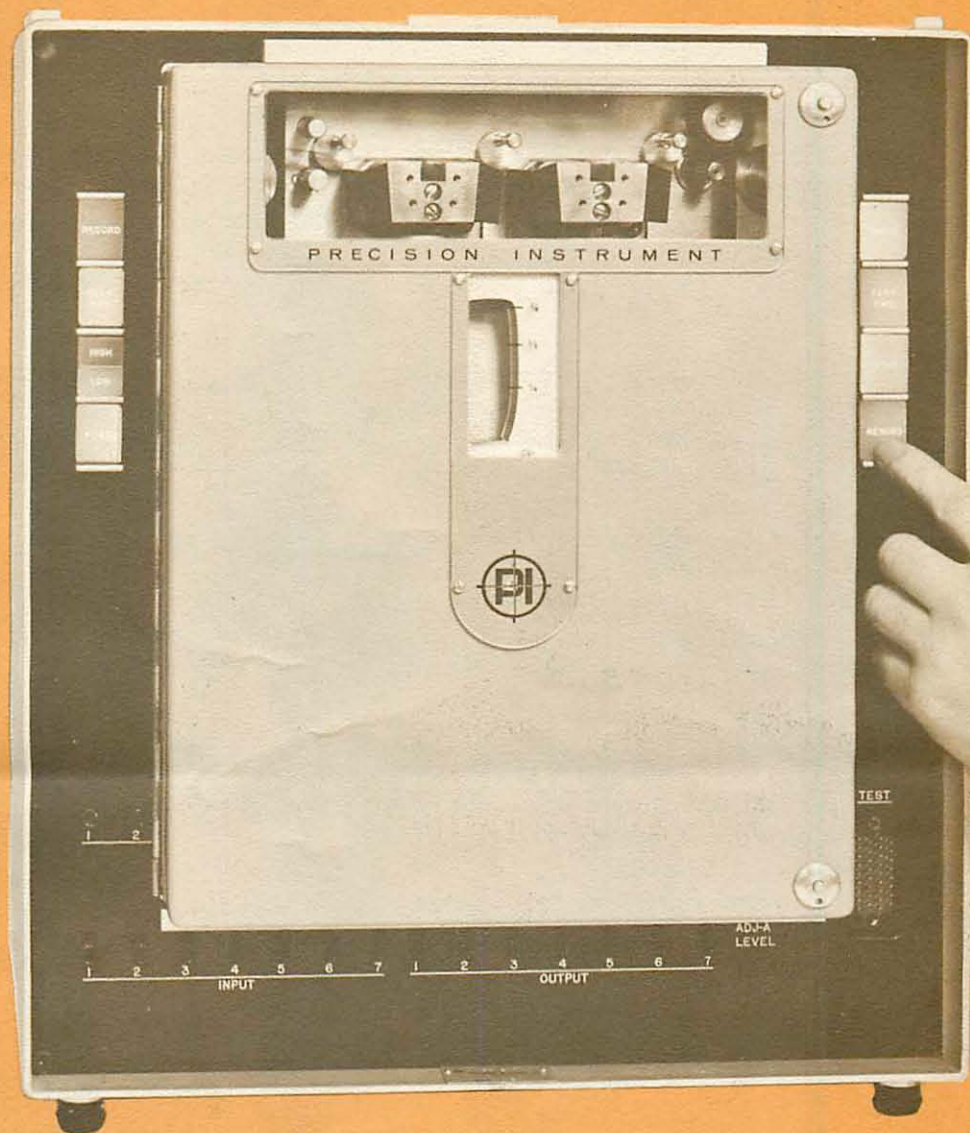


SERIES

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PRECISION INSTRUMENT

instrumentation
magnetic tape recorders

TRANSISTORIZED • MULTI-CHANNEL • MAGAZINE LOADING

THE STORY OF THE PS200

In the early days of research, development, and prototype evaluation, testing was normally performed in the laboratory at a central location. This restriction was imposed primarily by the nature of test instrumentation which was often delicate, cumbersome and complex. Present day requirements are for on-the-spot measurement, analysis and recording of test data in environments leaving much to be desired. Instrumentation engineers expect laboratory performance and accuracies under field testing conditions.

In the design of the PS-200 Series instruments, two major objectives were held paramount: reliability and simplicity of operation and maintenance. Both have been achieved and proven in field tests that very few "laboratory" recorders have been asked to endure.

A cabinet of equipment weighing over 1000 pounds and using 1000 watts has been replaced and improved upon by a recorder weighing 65 pounds and using only 250 watts. Now one man can carry a multi-channel precision recorder to a test site to record and reproduce data with laboratory accuracy!



PS-200 with magazine open

APPLICATIONS

- Telemetry vans*
- Seismic exploration*
- Medical hospital and field analysis*
- Airborne data acquisition*
- Wind tunnel testing*
- Machine and process control*
- Data storage and transmission*
- Structural testing*
- Training devices*
- Radar pattern measurements*

FEATURES

- Completely transistorized*
- Magazine loading*
- Modular construction*
- Push button function selection*
- End of tape sensing*
- Loop magazine available*
- Up to 14 channels*
- FM and direct modes of recording*
- Compact and lightweight*

DESCRIPTION

The PS-200 instrumentation magnetic tape recorder combines the advantages of transistorized electronics with a stacked reel tape magazine. These developments permit a reduction of approximately 10 to 1 in size, weight, and power consumption over comparable, existing equipment, with no degradation in flexibility or performance. Recording characteristics, tape speeds, and all other parameters of the PS-200 are completely compatible with standard recording practices.

Within its frequency range, the PS-200 can record any data that originates in electrical form or can be transduced into electrical signals. Any number of its available tracks can be apportioned to high-frequency recording, low-frequency data, transient phenomena, and quasi-static measurements. A variety of information can thus be recorded concurrently with a common time base.

Different types of data are accommodated by plug-in transistorized amplifiers, and any track can be quickly adapted to any of the four recording modes: direct recording, FM carrier recording, pulse width modulation, or digital. Standard tape speeds of 60, 30, 15, 7½, 3¾, and 1⅞ inches per second are quickly selected

prior to recording through a speed-selector switch or simple belt change. Optimum balance between recording time and frequency response is achievable. During analysis, data can be examined at slow or fast speeds.

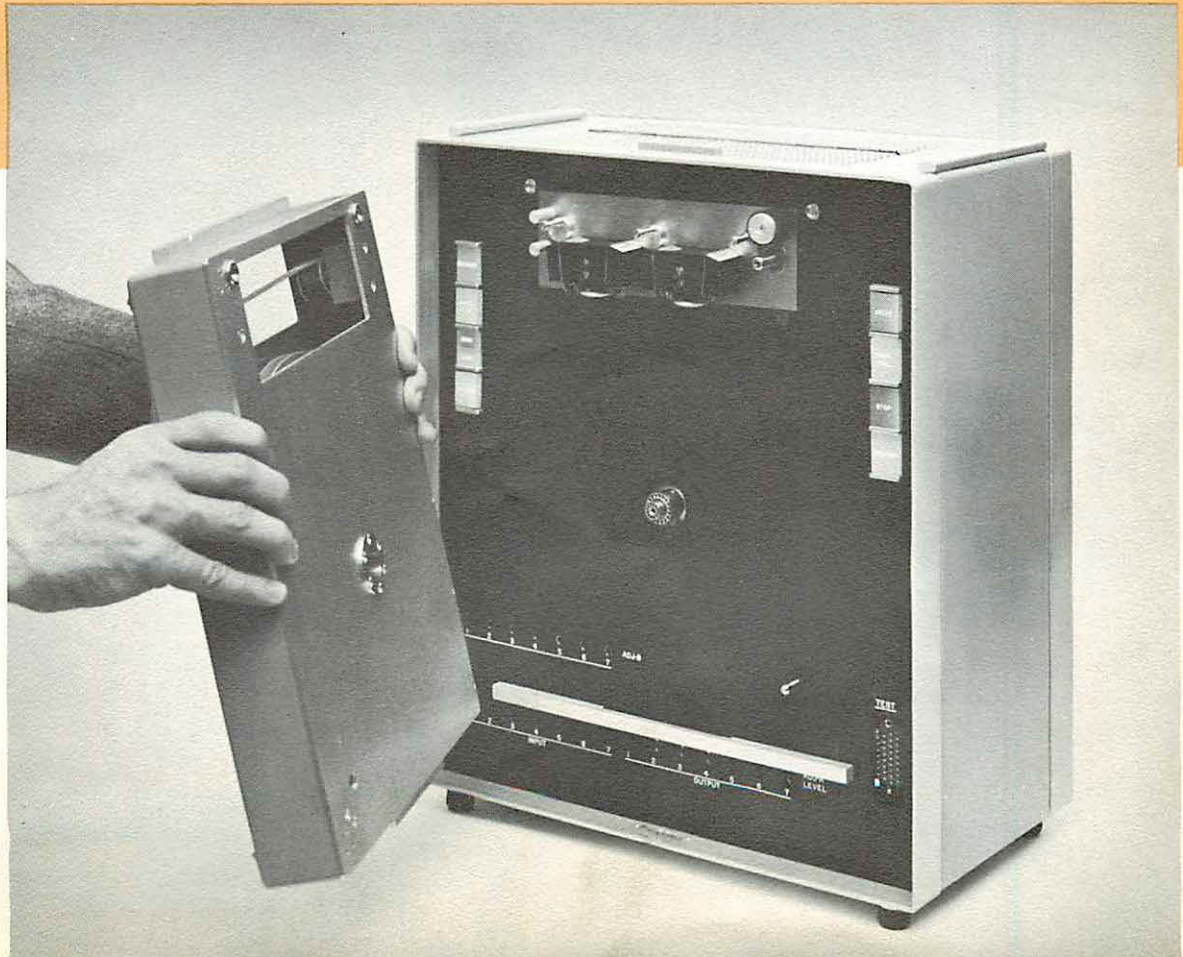
TAPE MAGAZINE

A unique feature of the PS-200 is its stacked-reel magazine.

Using 10½" standard NARTB or commercially available precision reels, the magazine is designed so that it can be completely removed from the transport or opened while attached to change reels.

When magazines are changed, no additional threading is required. The magazine automatically locks in place, ready for operation with only five seconds interruption. Tape is in contact with heads in drive mode only. Thus, head wear and oxide deposit are reduced. In threading the magazine, the user merely guides the tape around two pulleys, spaced approximately twelve inches apart, and attaches it to the empty reel. No complicated threading paths are involved in either procedure.

The PS-200 can be quickly converted to a loop transport by simply exchanging the reel-to-reel magazine for a loop magazine.



SPECIFICATIONS

MECHANICAL

TAPE SPEEDS

Four speeds in 1:2:4:8 ratio 1 $\frac{7}{8}$ to 60 ips may be selected by push-buttons and simple belt change. Other speeds and combinations on special order.

REEL SIZE

Standard NARTB 10 $\frac{1}{2}$ " reels. Precision reels are recommended for maximum utilization of recorder's characteristics.

TAPE WIDTHS

$\frac{1}{4}$ ", $\frac{1}{2}$ ", and 1" standard.

HEAD GEOMETRY

Plug-in assembly requires no adjustment. Spacing conforms with IRIG standards. IBM and other special spacings available.

Number of Tracks: 1 to 14, placed alternately on two head stacks, except 1, 2, 3, and 4 track recorders which have one head stack.

Track Dimensions: Track width is 50 mils. Track spacing is 70 mils center-to-center.

TOLERANCES

Azimuth within ± 1 minute of perpendicular. Gap scatter less than 100 microinches. Time displacement error between outer tracks less than 5 microseconds. Gap spacing between two stacks 1.5 ± 0.001 ".

CONTROLS

Back-lighted pushbuttons for RECORD, DRIVE, FAST-FORWARD, REWIND, STOP, HIGH and LOW speed selectors, OVERRIDE of the automatic stop, and POWER on-off.

START, STOP TIME

At 30 ips, 3 seconds are required for stable tape motion and one second for stop.

REWIND TIME

2 $\frac{1}{2}$ minutes for 2500' reel.

SIZE & WEIGHT

The complete seven-channel portable recorder/reproducer measures 15 $\frac{1}{2}$ " x 17 $\frac{1}{2}$ " x 10" over-all and weighs 65 lbs. The fourteen channel instrument measures 15 $\frac{1}{2}$ " x 25 $\frac{1}{2}$ " x 14" and weighs 85 lbs. Rack mounting units with Grant slides, hinges, or fixed panels are available.

FINISH & COMPONENTS

To highest industry standards and practices, including applicable MIL-E-4158B finishes and components throughout. Rugged scratchproof vinyl finish of light tan Armorhide.

ENVIRONMENT

Operating temperature 40 deg. to 120 deg. F. Storage temperature -80 deg. to +185 deg. F. Humidity: Up to 100% R.H. Shock and vibration mounts can be supplied for airborne and vehicular applications.

ELECTRICAL

FREQUENCY RESPONSE (With standard filters)

FM Recording

Tape Speed	*Frequency Response ($\pm \frac{1}{2}$ db)	RMS Signal-to-Noise	Total Harmonic Distortion
60 ips	0-10,000 cps	43 db	1.5%
30 ips	0- 5,000 cps	43 db	1.5%
15 ips	0- 2,500 cps	41 db	1.5%
7 $\frac{1}{2}$ ips	0- 1,250 cps	37 db	1.5%
3 $\frac{3}{4}$ ips	0- 625 cps	37 db	1.5%
1 $\frac{7}{8}$ ips	0- 312 cps	35 db	1.5%

*Frequency response at all tape speeds may be doubled at slight sacrifice in signal-to-noise ratio and distortion.

ELECTRICAL (Cont.)**LINEARITY**

DC: 1 $\frac{7}{8}$ to 30 ips—0.1%
AC: 1%

DC DRIFT

Less than 2% for combined line voltage variation of 105-125 volts and temperature variation of 40 deg. F. to 120 deg. F. after 5 minute warmup. For controlled temperature (within ± 10 deg. F.), drift is less than 1%.

INPUT LEVEL

0.5 to 50 volts RMS by means of front panel adjustment.

INPUT IMPEDANCE

10,000 ohms unbalanced to ground.

OUTPUT LEVEL

1 volt RMS across 10,000 ohm load at full scale recording level.

OUTPUT IMPEDANCE

Develops 1 volt RMS when terminated by 10,000 ohm load.

FREQUENCY RESPONSE**Direct Recording**

Uniform within ± 3 db between specified band edges.*

Tape Speed	Pass Band Noise Level RMS (38 db)	Pass Band Noise Level RMS (28 db)
60 ips	300 to 100,000	50-100,000
30 ips	300 to 50,000	50- 50,000
15 ips	300 to 30,000	50- 30,000
7 $\frac{1}{2}$ ips	300 to 15,000	50- 15,000
3 $\frac{3}{4}$ ips	300 to 7,500	50- 7,500
1 $\frac{7}{8}$ ips	300 to 3,750	50- 3,750

*Referred to 1.0 volts RMS and 1% distortion at 500 cps.

INPUT LEVEL

0.15 to 50 volts RMS by means of front panel adjustment.

INPUT IMPEDANCE

100,000 ohms, unbalanced to ground.

OUTPUT LEVEL

1 volt RMS across 10,000 ohm load at normal recording level (1% distortion).

OUTPUT IMPEDANCE

Output voltage is developed across 100 ohms in series with 40 mfd, unbalanced to ground.

GENERAL**FLUTTER AND WOW**

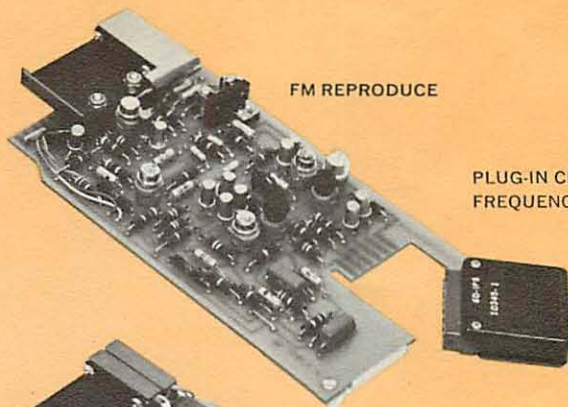
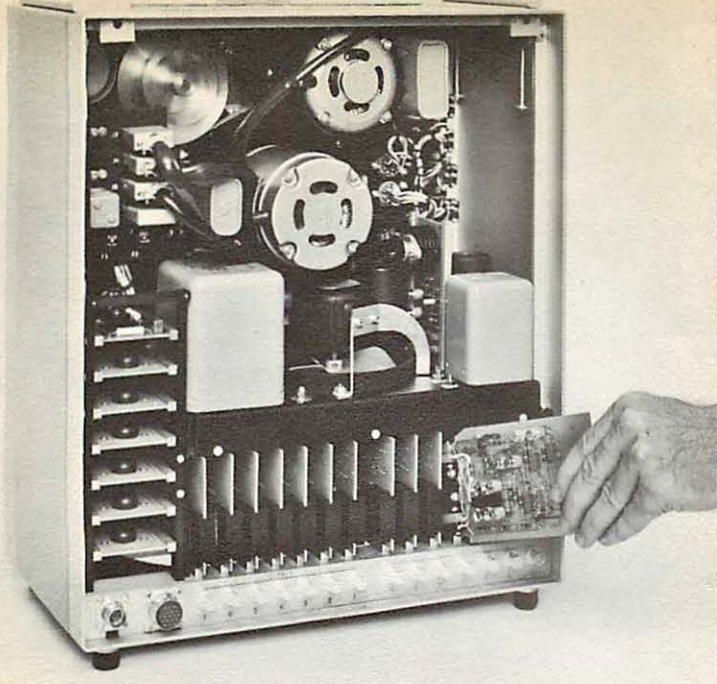
Well under 0.1% RMS, measuring all flutter components from 0-300 cps, using a 3000 cps tone at 30 ips. Peak-to-peak flutter, measuring all components from 0-300 cps is under 0.5% at 30 ips.

POWER REQUIREMENTS

115 vac 60 cps at 250 watts for typical 7-track record/reproducer. Standby power 30 watts. Can be supplied for 24 vdc operation.

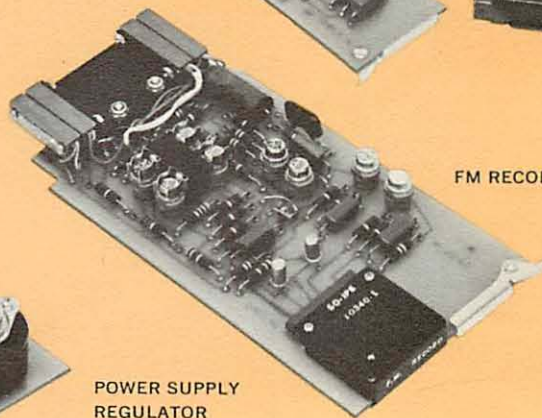
Specifications subject to change.

TRANSISTORIZED

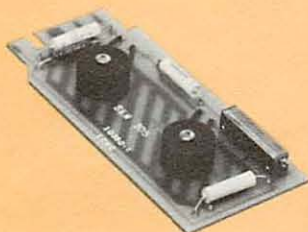


FM REPRODUCE

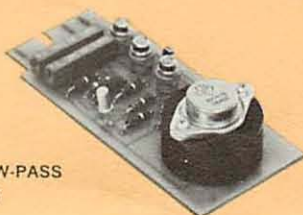
PLUG-IN CENTER
FREQUENCY UNITS



FM RECORD



FM LOW-PASS
FILTER



POWER SUPPLY
REGULATOR

End of tape sensing by means of lamp and photocell arranged as translucency detector. Sensor actuates stop mechanism when triggered. In ordinary use, transport would stop when tape leaves the supply reel. However, transport would also stop during tape breakage, or at any location on tape where oxide has been wiped off by suitable solvent. This allows possibility for automatic stop before end of reel for cyclic programming of the instrument.

Speed changing flexibility by push button for 2:1 motor speed change, and belt shift on two step pulley for a total of four speeds in 1:2:4:8 ratio.

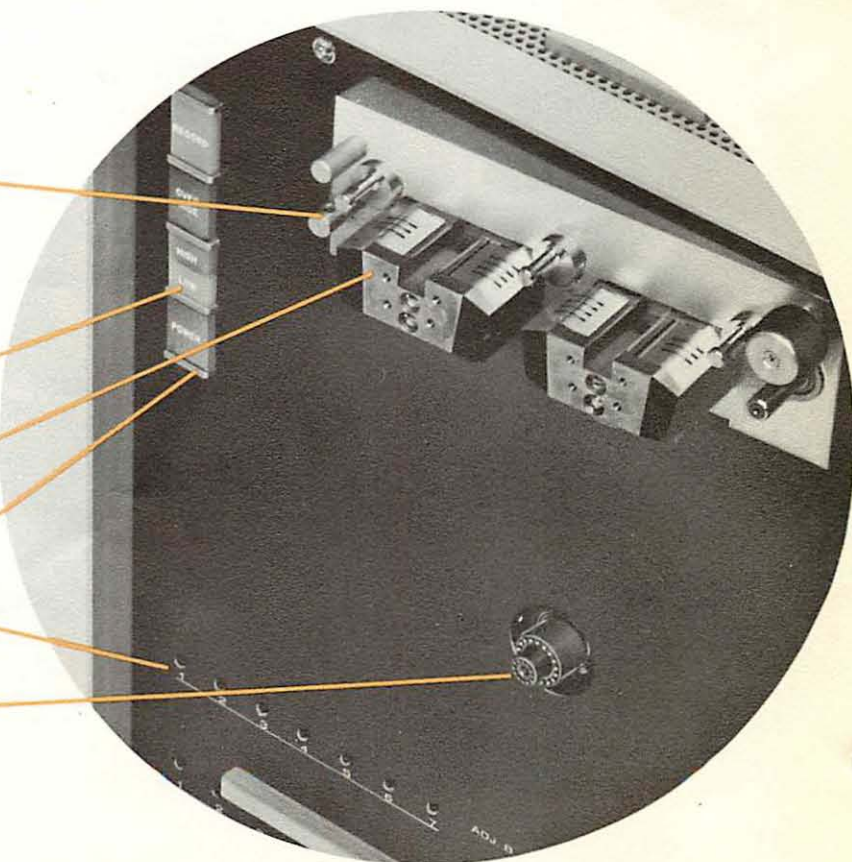
Record and reproduce heads are plug-in and self-aligning with no adjustment required.

Push button selection of all control functions with back lighting to indicate function selected.

Simplified calibration and adjustment of electronics by means of front panel screw driver controls and versatile test unit.

Concentric reel drives permits the use of a single integrated braking system and torque motor.

Head wear and depositing of oxide during fast forward and rewind modes is eliminated by lifting tape away from heads.



ELECTRONICS

Plug-in electronics modules allow easy replacement and interchangeability. Cards can be inserted in any channel for FM, Direct, PDM, or Digital recording. Power supplies, drive systems, and torque motor systems are removable sub-assemblies for ease in servicing.

A forced-air circulation system draws intake air initially across the electronic circuits so that electronics have essentially a zero temperature rise. All heat-producing components are located in the airstream away from the electronics.

The record and reproduce electronics of the PS-200 are completely transistorized and mounted on printed-circuit, plug-in cards. Any of the tracks can be quickly adapted to the desired recording mode by insertion of the appropriate card.

All adjustments for the electronics are made by screwdriver adjustment through the front panel with the electronics plugged in from the rear. Removal of the magazine is not necessary when making calibration adjustment.

Plug-in for each of the amplifiers permit rapid changing of FM carrier frequencies and equalization networks associated with the direct record/reproduce system.

Complete transistorization of the PS-200 electronics brings about a drastic reduction in its power requirements. A complete seven-channel record/reproduce system requires only 4 watts — actually less than the filament power for one 5U4 rectifier tube. Equivalent vacuum-tube recorders use approximately 450 watts.

To simplify calibration circuitry, a single plug is provided in the lower right of the front panel. This plug contains all the necessary points to be sampled to permit calibration of the recorder, including inputs, outputs, and appropriate test points on the various individual cards. When used in conjunction with the calibration unit, no external equipment is necessary to calibrate the recorder completely and accurately.

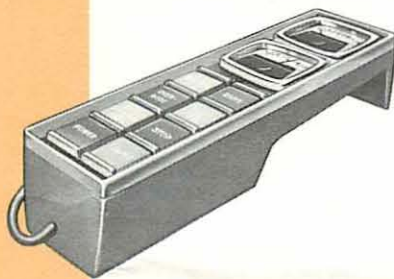
Because all components other than the motors operate from the PS-200's own 24 volt dc power supply, it is only necessary to supply ac power to the capstan and torque motors for conversion of the unit to complete 24 volt dc operation. This can be accomplished by the use of the motor drive amplifier in conjunction with a 24-28 volt dc supply.

MOTOR DRIVE AMPLIFIER

Available as an accessory to the PS-200 is a motor drive amplifier. This amplifier is capable of providing power for the capstan motor of the recorder at a frequency of 60 cycles $\pm .02\%$. In environments where line frequency is susceptible to wide variations, the motor drive amplifier will ensure that the tape speed is precisely the one desired. No rewiring of the recorder is necessary when the motor drive amplifier is used. The proper reconnection of the recorder is accomplished by using a different power input cable.



The motor drive amplifier is completely transistorized, and is in a housing $7\frac{1}{2}''$ H x $15\frac{1}{2}''$ W x $8\frac{3}{8}''$ D, matching the top dimensions of the recorder for convenient stacking. The unit is capable of supplying approximately 100 watts of power at 60 cycles $\pm .02\%$ from a supply voltage of either 24-28 volts dc or 115 volts ac. When used in conjunction with the PS-200 recorder, the record and reproduce speeds will be accurate within $\pm .1\%$.



REMOTE CONTROL

Every PS-200 is wired for complete remote control, and a remote control box is available as an optional accessory. All necessary power for the box is delivered to the remote control cable, and the back-lighted pushbutton selector switches duplicate the local selector switches on the instrument. The control box is designed to be conveniently carried in one hand.



METER PANEL

Meter and attenuator panels are available as accessory units to the PS-200 recorder. Up to four meters per panel are available. The panels can be supplied for rack mounting or in a housing of similar construction to that of the motor drive amplifier.

CALIBRATION UNIT

The calibration unit for the PS-200 is available as an accessory, and includes all necessary reference voltages and switching to permit complete calibration of seven channels with no external equipment. Necessary metering devices, frequency sources, and reference voltages are available internally in the unit. It is only necessary to plug the cable from the unit into the calibration plug provided in the lower right of the front panel of all PS-200 recorders and make the necessary adjustments on the electronics as indicated by the calibration unit. Included in this unit is a simple transistor checker for checking both PNP and NPN transistors. The switch on the calibration unit places the recorder in the record mode without the necessity of moving tape. It is not necessary to remove the tape from the heads or to have the tape moving in order to calibrate.

CONTROL TRACK GENERATOR

The control track generator, when used in conjunction with the PS-200, records on one channel of the tape a precision 60 cycle signal identical to the signal driving the capstan motor. Several options of control track method are available. One version uses a 50% amplitude modulated carrier, the modulation being 60 cycles. Another consists of an FM oscillator that is frequency modulated at 60 cycles. The choice of the particular method employed depends upon the reproduction equipment used.





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101 Administration Building
Boeing Field
Phone: PArkway 5-1460

EXPORT OFFICE, New York City
Precision Instrument Company
431 - 5th Avenue
Phone: MUrray Hill 3-2400

ENGLAND, London W. I.
B & K Laboratories, Ltd.
4 Tilney Street, Park Lane
Phone: GROsvenor 4567



PRECISION INSTRUMENT COMPANY

1011 COMMERCIAL STREET • SAN CARLOS, CALIFORNIA • TELEPHONE: LYTELL 1-4441
Cable: PRINCO