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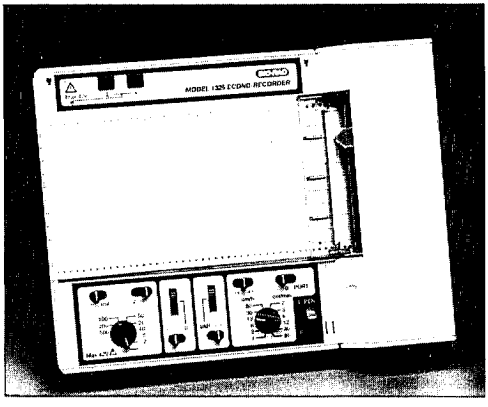
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Model 1325 Econo Chart Recorder Instruction Manual

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Section 1
Introduction

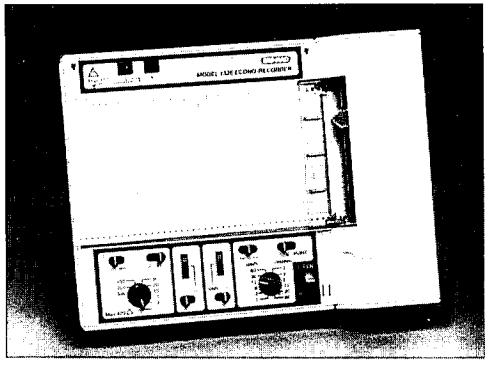


Fig. 1.1. Model 1325 Econo Chart Recorder

The Model 1325 Econo Chart Recorder is a high quality flat-bed chart recorder for the laboratory environment, and specifically for use as an integral part of Bio-Rad's Econo System. It has 14 range settings (1 mV to 20 V), 12 paper speed settings (1 cm/h to 60 cm/min), and can be used with most UV/Vis monitors, conductivity monitors, RI monitors, pH meters, and a host of other equipment. When used as an integral part of the Econo System, the pen lift and paper feed functions are controlled automatically. A battery compartment provides uninterrupted operation (up to 30 h) in the event of a power failure.

Before operating the Model 1325 Econo Chart Recorder, read all warning notes contained in this manual.

Section 2
Unpacking

Carefully remove the contents of the shipping box and check for any obvious damage or problems with the instrument. Figure 2.1 is an illustration of all the parts included with the Model 1325 Econo Chart Recorder. Check off all parts against the supplied packing list.

If any parts are missing or damaged, contact Bio-Rad Laboratories immediately.

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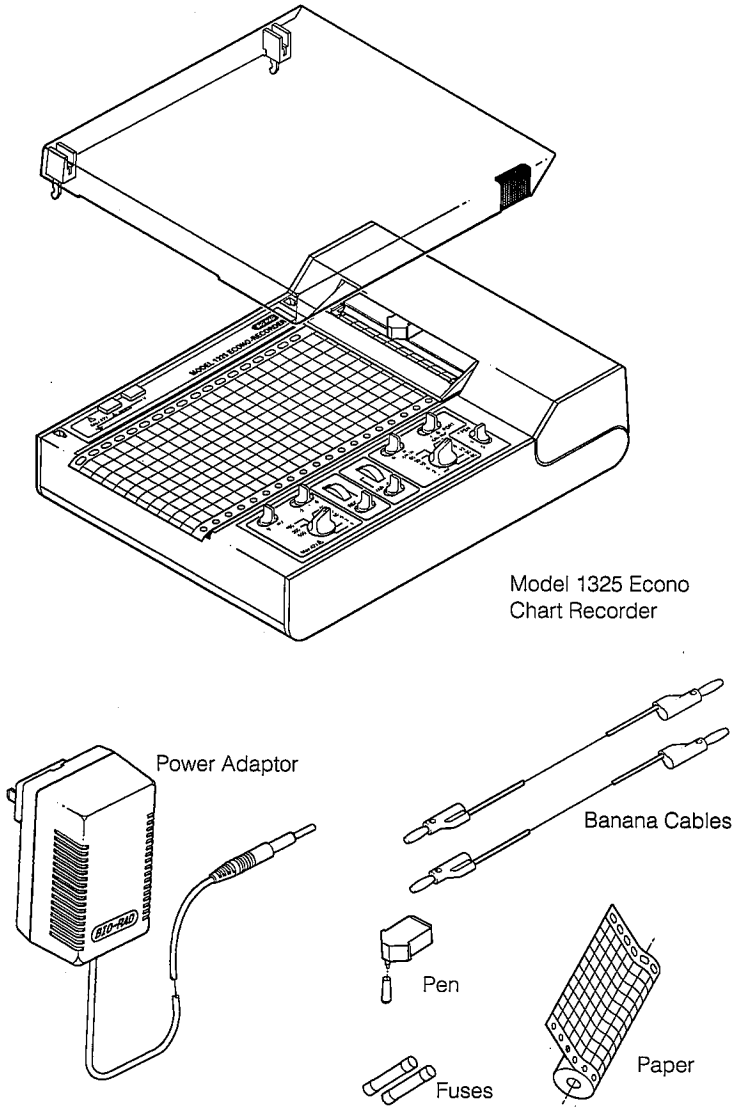
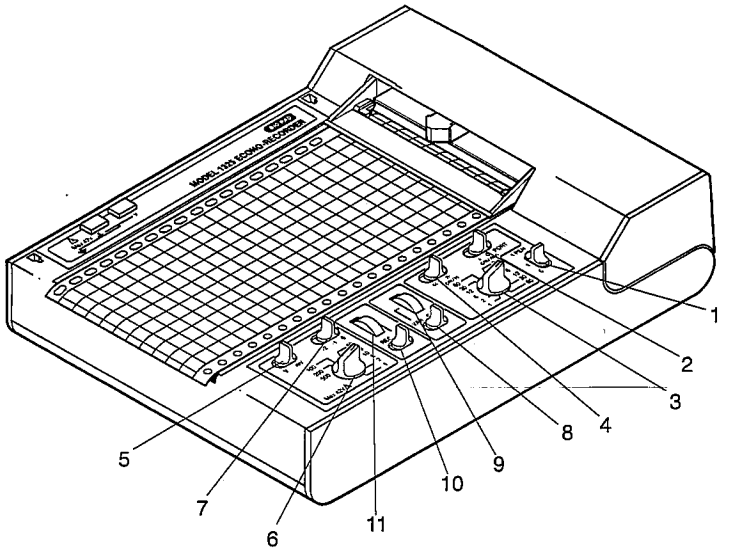


Fig. 2.1. Parts supplied with the Model 1325 Econo Chart Recorder.

Section 3
Description of Features

The following tables and illustrations describe the Model 1325 Econo Chart Recorder's features and controls. For information on additional features available when operating with Econo System components, refer to Section 6.

3.1 Top Panel Controls



1. Main Switch
2. Mode Switch
3. Paper Speed Dial
4. Manual Paper Feed
5. Sensitivity Switch
6. Range Selector
7. Zero Suppression Switch
8. VAR/CAL Switch
9. Range Adjustment Dial
10. REC/O Switch
11. Baseline Adjustment Dial

Fig. 3.1. Top panel controls.

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Table 3.1. Functional Description of Top Panel Controls

Note: When using with the Econo System, set controls to position marked in green.

Control	Setting	Function
1. Main Switch	**0**	Power off.
	1	Power on/pen up.
	1 PEN	Power on/pen down.
2. Mode Switch	**0**	Paper feed off.
	<	Paper feed on.
	PROT	Report recording parameters (see Appendix A).
3. Paper Speed Dial	**12 settings**	Sets paper speed from 1 cm/min to 60 cm/h.
4. Manual Paper Feed	**>>**	Paper advance.
	<<	Paper reverse.
5. Sensitivity Switch	**mV**	Sets range selector to read in mV DC.
	V	Sets range selector to read in V DC.
6. Range Selector	**9 settings**	In conjunction with the sensitivity switch, this dial sets the range of full scale deflection from 1 mV to 500 V **(maximum safe input is 42 V).**
7. Zero Suppression	**0**	Normal operation.
	-1	Baseline is lowered 10 cm. Allows user to chart peaks that would normally run off-scale.
	-2	Baseline is lowered 20 cm. Allows user to chart peaks that would normally run off-scale.

Table 3.1. cont.

Control	Setting	Function
8. VAR/CAL Switch	**CAL**	Use the **CAL** setting when operating with one of the 18 pre-calibrated measuring range settings as selected by the range selector dial and the sensitivity switch.
	VAR	Operating within the **VAR** setting allows the measuring range, as selected by the range selector dial and the sensitivity switch, to be increased up to 250% using the range adjustment dial.
9. Range Adjustment	**variable**	When the VAR/CAL switch is in the VAR position, this dial can be used to expand the measuring range selected by the sensitivity selector and the range switch by up to 250%.
10. REC/0 Switch	**REC**	Use the **REC** setting whenever recording, or when setting the chart baseline to equal the signal baseline.
	0	Use the **0** setting to set the chart baseline equal to 0 V.
11. Baseline Adjustment	**variable**	Use this dial for adjustment of the baseline position. (See REC/0 Switch.)

The green numbers on the front panel are used to denote recommended settings when using the Model 1325 Econo Chart Recorder with the Econo System.

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3.2 Rear Panel Sockets

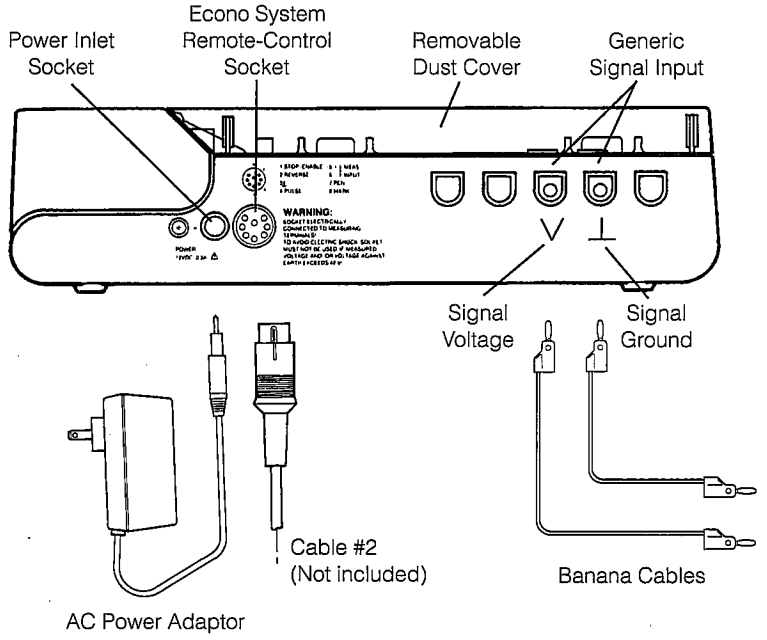


Fig. 3.2. Rear panel sockets.

Function	Comment
Power Inlet Socket (12 V DC)	For connection of power adaptor. **-WARNING- VERIFY THAT THE VOLTAGE RATING ON THE POWER ADAPTOR MATCHES THE MAINS VOLTAGE. IF IT DOES NOT, CONTACT BIO-RAD LABORATORIES.**
Generic Signal Input	The ⊥ socket and the black banana cable should be connected to the signal ground or negative (-). The V socket and the red banana cable should be connected to the signal positive (+). **-WARNING- THIS CHART RECORDER SHOULD NOT BE USED TO MEASURE SIGNALS GREATER THAN 42 V. THE DIFFERENTIAL VOLTAGE BETWEEN MEASURING INPUTS AND EARTH GROUND MUST NOT EXCEED 42 V.**

Function	Comment
Econo System Remote Control Socket	Control of pen lift, paper direction, paper speed, event marks, fraction marks, and analog input contacts is accessible through this 8-pin standard DIN socket. It is through this socket that Econo System control of chart functions is attained. Section 6 of this manual contains detailed information on the use of the Model 1325 Econo Chart Recorder with other Econo System components. See Appendix B for technical information regarding the use of this socket with other equipment.

3.3 Bottom Panel/Battery Compartment

The battery compartment in the bottom panel of the Model 1325 Econo Chart Recorder holds nine 1.5 V batteries for use when main power is not available. The batteries also allow the recorder to operate without interruption during a power failure (batteries are not available from Bio-Rad).

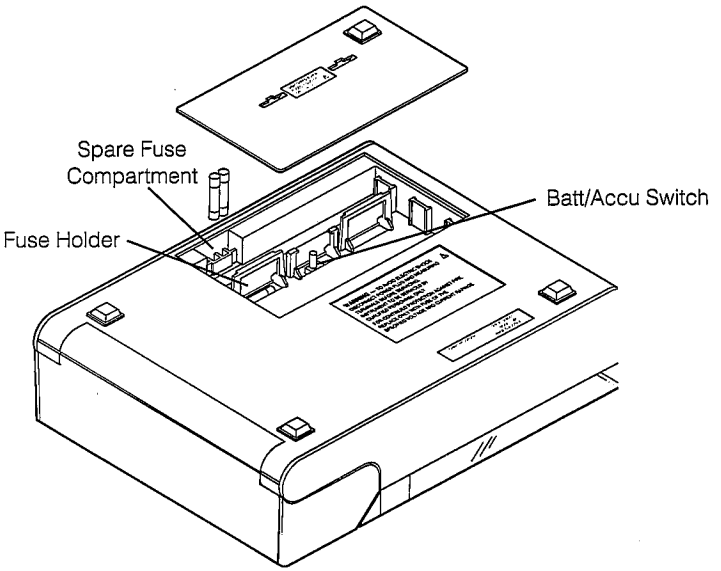


Fig. 3.3. Bottom panel.

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Function	Comment
BATT/ACCU Switch	This switch, in the battery compartment, allows continual charging of the batteries when in the ACCU position. **-WARNING- THE BATT/ACCU SWITCH MUST NEVER BE IN THE ACCU POSITION WHEN NON-RECHARGEABLE BATTERIES ARE IN THE UNIT. THEY MAY EXPLODE.**
Fuse Holder	The fuse holder is in the battery compartment. The unit is shipped with a fuse installed. The fuse rating is: T 1A/250 slow. **-WARNING- WHEN REPLACING FUSES, DISCONNECT THE POWER SUPPLY. NEVER USE FUSES RATED AT OTHER THAN THE RECOMMENDED VALUES.**
Spare Fuse Compartment	This compartment provides space for four spare fuses. The recorder is shipped with one spare fuse.

Section 4
Setting Up

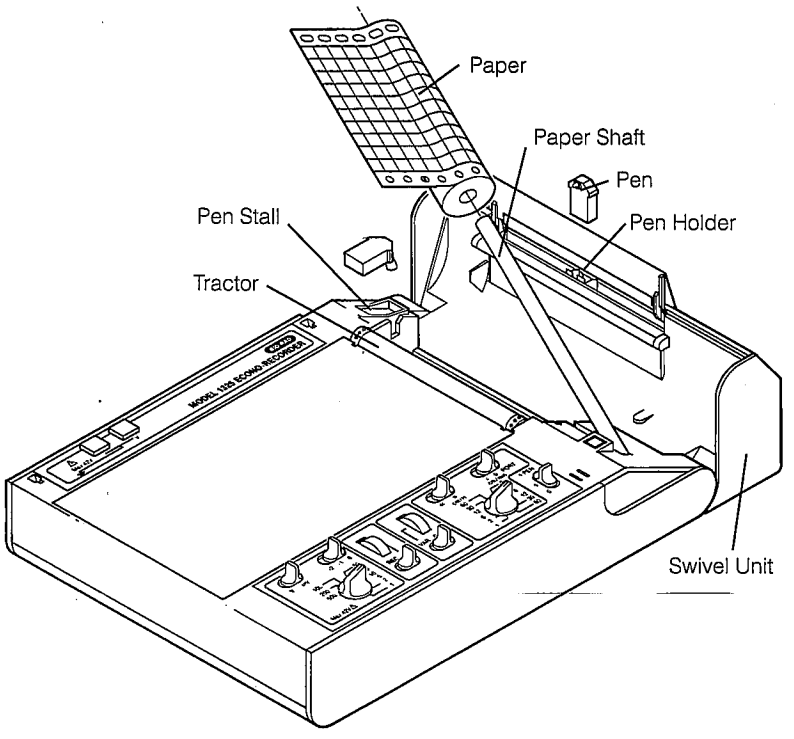


Fig. 4.1. Chart paper and pen installation.

4.1 Chart Paper Installation

1. Pull the swivel unit up and back (see Figure 4.1).
2. Raise the paper shaft and slide on a roll of paper.
3. Lower the paper shaft and adjust the paper so that the pins on the tractor line up with the holes in the paper.
4. Close the swivel unit.

4.2 Pen Installation

Remove the cap from the pen and store it in the pen stall. Insert pen into the pen holder until it stops (see Figure 4.1).

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4.3 Power Adaptor Connection

-WARNING- VERIFY THAT THE VOLTAGE RATING ON THE POWER ADAPTOR MATCHES YOUR MAINS VOLTAGE. IF IT DOES NOT, CONTACT BIO-RAD LABORATORIES BEFORE USING THE MODEL 1325 ECONO CHART RECORDER.

1. Make sure that the main switch is in the 0 position.
2. Plug the power adaptor cord into the power inlet socket on the rear panel of the recorder.
3. Plug the power adaptor unit into a grounded mains outlet.

4.4 Analog Signal Connection

If the Model 1325 Econo Chart Recorder is to be used with the Econo System or any of its components, refer to Section 6 of this manual.

With other equipment, use the black lead of the banana cable to connect the negative (-) output, or ground, to the ⊥ socket on the rear panel of the Model 1325 Econo Chart Recorder (see Figure 3.2). Use the red lead of the banana cable to connect the positive (+) output to the V socket on the rear panel of the Model 1325 Econo Chart Recorder.

Section 5
Operation

There are a number of ways to collect data using the Model 1325 Econo Chart Recorder. To some extent the method of data collection will depend upon the application and other instruments being used. Below is one scenario suitable in most situations.

1. Set up the Model 1325 Econo Chart Recorder as described in Section 4.
2. Turn on the instrument that will be providing the analog signal and allow it to warm up. Make sure that baseline conditions have been established.
3. Using the sensitivity switch and the range selector, set the input range to 20 V.
4. Set the zero suppression switch to the 0 position.
5. Select an appropriate paper speed using the paper speed dial.
6. Set the REC/0 switch to the REC position.
7. Set the VAR/CAL switch to the CAL position.
8. Set the mode switch to the 0 position.

9. Turn the Model 1325 Econo Chart Recorder on by placing the main switch in the 1 position.
10. Use the baseline adjustment dial to move the pen to a position over the 50% mark on the chart paper. Reduce the input range one setting at a time (20 V, 10 V, 5 V...) until the proper setting for the instrument providing the analog signal is reached. If the pen starts to move away from center, use the baseline adjustment dial to return it to the 50% mark.
11. When the proper range setting is reached, use the baseline adjustment dial to position the pen to the desired position.
12. The Model 1325 Econo Chart Recorder is now ready for recording. Place the main switch in the 1 PEN position to lower the pen, and place the mode switch in the < position to start the paper.

It is suggested that the user experiment with functions not mentioned above, such as the PROT function and the manual paper feed. If you are unsure of their function, refer to Section 3.1 and Appendix A.

If you are using other Econo System components and want to take advantage of system features, refer to Section 6.

Section 6
Operating the Model 1325 Econo Chart Recorder with Other Econo System Components

When the Model 1325 Econo Chart Recorder is used with the Econo System, all routine chart functions are controlled automatically. If the Model 1325 Econo Chart Recorder is used with just one or two Econo System components, only the appropriate functions will be controlled (i.e., event marks come from the UV monitor, fraction marks from the fraction collector, and pen and paper control from the pump).

6.1 Econo System Functions

Below is a brief description of functions which can be accessed when two or more Econo System components are connected. For a more in depth discussion of these functions, refer to the manual on the specific instrument indicated in parentheses below the function listed.

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Function	Description
Collection Delay (Econo Pump)	The V_o function on the Model EP-1 Econo Pump can be used to delay the collection of effluent until after some predetermined volume of liquid has passed through the column.
Fraction Control (Econo Pump)	The fraction size function of the Model EP-1 Econo Pump is used to control the Model 2110 Fraction Collector to permit the collection of fractions on a volume basis. This is in addition to collection as a function of time or drops, which is a standard feature of the Model 2110 Fraction Collector in its stand-alone mode.
Collection Marks (Econo Pump)	Large ticks are superimposed on the trace when the diverter valve changes from waste to collect or vice versa.
Event Marks (Econo UV Monitor)	Large ticks are superimposed on the trace when the event mark key on the Model EM-1 Econo UV Monitor is pressed.
Fraction Marks (Fraction Collector)	Small ticks are superimposed on the trace each time the carousel on the Model 2110 Fraction Collector advances.
Paper Feed and Pen Lift (Econo Pump)	The Model 1325 Econo Chart Recorder may be set so that it will collect data only when the Model EP-1 Econo Pump is running.
Gradient Formation (Econo System Controller)	The Econo System Controller can be used to deliver solvent gradients.
Peak Detection (Econo System Controller)	The Econo System Controller, in conjunction with the Model EP-1 Econo Pump and the Model EM-1 Econo UV Monitor can be used for peak sensitive sample collection.

6.2 Interfacing with Other Econo System Components

Below are examples of using the Model 1325 Econo Chart Recorder with other Econo System components. In each case the system features obtained in the configuration (described in Section 6.1) are indicated in bold type in the table to the right of the picture representing the configuration.

Using the Model 1325 Econo Chart Recorder with the Model EM-1 Econo UV Monitor



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the signal output socket on the rear panel of the Model EM-1 Econo UV Monitor. Set the input range on the Model 1325 Econo Chart Recorder to 1 V full scale.

Using the Model 1325 Econo Chart Recorder with the Model 2110 Fraction Collector



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #8 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the I/O socket on the rear panel of the Model 2110 Fraction Collector.

Using the Model 1325 Econo Chart Recorder with the Model EP-1 Econo Pump



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the AUX socket on the rear panel of the Model EP-1 Econo Pump. Set the mode switch on the Model 1325 Econo Chart Recorder to the < position.

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Using the Model 1325 Econo Chart Recorder with the Model EM-1 Econo UV Monitor and the Model 2110 Fraction Collector



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #1 to connect the I/O socket on the rear panel of the Model 2110 Fraction Collector to the AUX socket on the rear panel of the Model EM-1 Econo UV Monitor.

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the signal output socket on the rear panel of the Model EM-1 Econo UV Monitor. Set the input range on the Model 1325 Econo Chart Recorder to 1 V full scale.

Using the Model 1325 Econo Chart Recorder with the Model EM-1 Econo UV Monitor and the Model EP-1 Econo Pump



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #3 to connect the AUX sockets on the rear panels of both the Model EM-1 Econo UV Monitor and the Model EP-1 Econo Pump.

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the signal output socket on the rear panel of the Model EM-1 Econo UV Monitor.

On the Model 1325 Econo Chart Recorder, set the input range to 1 V full scale and the mode key to the < position.

Using the Model 1325 Econo Chart Recorder with the Model EP-1 Econo Pump and the Model 2110 Fraction Collector



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

Use cable #1 to connect the I/O socket on the rear panel of the Model 2110 Fraction Collector to the fraction collector socket on the rear panel of the Model EM-1 Econo Pump.

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the AUX socket on the rear panel of the Model EM-1 Econo Pump. Set the mode switch on the Model 1325 Econo Chart Recorder to the < position.

Using the Model 1325 Econo Chart Recorder with the Model EM-1 Econo UV Monitor, the Model EP-1 Econo Pump, and the Model 2110 Fraction Collector



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

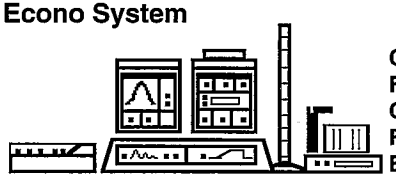
Use cable #1 to connect the I/O socket on the rear panel of the Model 2110 Fraction Collector to the fraction collector socket on the rear panel of the Model EP-1 Econo Pump.

Use cable #3 to connect the AUX sockets on the rear of both the Model EM-1 Econo UV Monitor and the Model EP-1 Econo Pump.

Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the signal output socket on the rear panel of the Model EM-1 Econo UV Monitor.

On the Model 1325 Econo Chart Recorder, set the input range to 1 V full scale and the mode key to the < position.

Using the Model 1325 Econo Chart Recorder with a Complete Econo System



Collection Delay
Fraction Control
Collection Marks
Fraction Marks
Event Marks
Gradient Formation
Peak Detection
Pen Lift
Paper Feed

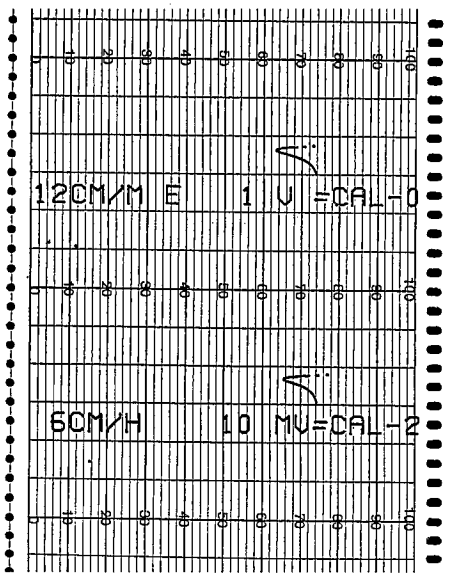
Use cable #2 to connect the remote-control socket on the rear panel of the Model 1325 Econo Chart Recorder to the signal output socket on the rear panel of the Model EM-1 Econo UV Monitor. Set all top panel controls on the recorder to their green settings.

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Appendix A
The PROT Function

When the mode select switch is momentarily pushed to the PROT position, the Model 1325 Econo Chart Recorder will print the recording parameters in the following order (see Figure A-1):

Chart speed	1 cm/h to 60 cm/min
Control status	E if under Econo System control
Measuring range	1 mV to 500 V
Calibration status	CAL or VAR
Zero suppression	-0, -1, or -2



The chart is set to run at 12 cm per minute under Econo System control. The measuring range is set to 1 V full scale (calibrated), and the zero suppression is set at 0.

The chart is set to run at 6 cm per hour. It is not under Econo System control. The measuring range is set to 10 mV full scale (calibrated), and the zero suppression is set at -200%.

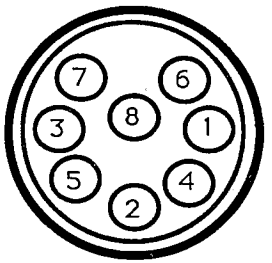
Fig. A-1. Examples of PROT function printouts.

Appendix B
Remote-Control Socket

The remote-control socket is an 8-pin standard socket (DIN 45 326) that allows the Econo System to control the chart recorder functions via cable #2. The following information is provided for those wishing to use this socket with non-Econo System equipment. Cable #6 may be used as a breakout cable to access these functions.

All functions can be controlled by TTL signals, or by contact closure to ground. All inputs are active LOW. Table B-1 gives the pin assignments for the remote-control socket.

Table B-1 Remote-Control Socket Pin Assignments



Function	Pin	Notes
Paper stop	1	Enables pulse function (pin 4)
Reverse paper	2	
Ground	3	Digital ground
Pulse	4	See below
Signal positive	5	42 V maximum
Signal negative	6	
Pen down	7	
Event mark	8	

If external control of chart speed is desired, the mode select switch should be in the < position, and pin 1 held low. If these conditions are met, external pulses delivered through pin 4 can be used to control the chart speed according to the following formula (see Figure B-1 for the duty factor):

$$\text{(Actual chart speed in cm/min)} = \frac{\text{((Pulse rate in Hz)(Paper speed setting in cm/min))}}{\text{(128 Hz)}}$$

Maximum chart speed is 120 cm/min. The chart paper will not move if greater speeds are attempted.

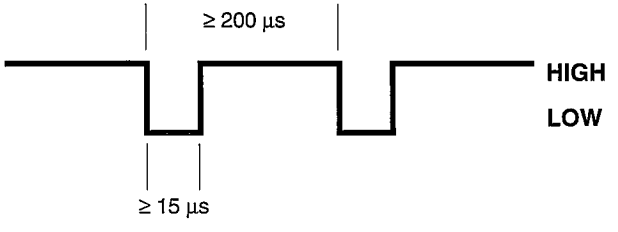


Fig. B-1. Duty factor.

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Appendix C
Technical Specifications

Applied Stipulations and Standards

IEC 654-1	Operating regulations for electrical equipment and systems
ÖVE/VDE 0411	Safety standards for electronic measuring instruments
UL/1244/IEC 348 VDE 0871/6.78	Stipulation for radio interference suppression on electrical equipment and systems
DIN 41 662/ UL 198 G	Specifications and standards for fuse-links

General Information

Number of channels	1
Recording width	100 mm
Recording medium	Chart paper, 0...100 linear, 50 divisions
Pen types	Disposable felt pens, recording length: approximately 1,000 m
Dead zone	0.3% of FSV
Linearity	0.25%
Response time	Approximately 0.5 s
Attenuation	As per DIN 43 782; overshoot/rounding ≤ 1% of the recording width
Recording speed	Approximately 20 cm/s
Critical frequency	Approximately 1 Hz
Chart feed	Driven by quartz-controlled and microcomputer-controlled stepper motor
Speed	12 feed rates selectable by switch: 1-2-6-12-30-60 cm/h, 2-3-6-12-30-60 cm/min
Resolution	0.078 mm/step
Feed accuracy	0.01% temperature sensitivity: 0.01/10°C
Positioning	Progressive motor control for forward and reverse feed with switch; maximum reverse feed: 180 mm
Remote-Control	External control by means of TTL/CMOS signal or by switch (active on LOW) via eight-pole standard socket STOP/ENABLE: holding the chart feed/actuation of PULSE externally (internal/external switch over); REVERSE: Reversal of the feed direction; maximum reverse feed: 180 mm; PULSE: actuation of the chart feed by means of external pulses; PEN: Lowering of the recording pen onto the chart
Measuring ranges (calibrated)	1-2-5-10-20-50-100-200-500 mV DC, 1-2-5-10-20 V DC (maximum 42 V)
Zero suppression (calibrated)	2 x 100% manual, accuracy 0.2% of the set value
Intermediate ranges	Continuous sensitivity increase up to a factor of 2.5
Accuracy	0.5% of FSV
Zero	Continuous setting from -100% to +105%; check by means of zero switch with measured quantity imposed
Input	Floating, asymmetrical, maximum admissible potential difference between input and earth: 42 V; connection via safety sockets 4 mm diameter or via standard socket (maximum 42 V)
Input resistance	1 MΩ
Source resistance	Nominal value 100 Ω maximum admissible: 1 kΩ
	Ranges V: nominal value 100 Ω maximum admissible: 1 kΩ
Interference	AC SMR ≥ 40 dB
suppression	AC CMR ≥ 70 dB
	DC CMR ≥ 90 dB
Temperature sensitivity	0.2%/10°C or 10 µV/ °C (the largest value applies in each case)
External influence	0.4% at 0.5 mT and mains frequency 50/60 Hz
Ambient conditions	Reference temp. range: +20° C to +25° C
	Operating temp. range: 0° C to +50° C
	Storage and shipment temp.: -40° C to +70° C
Climatic category	B2 as per IEC 654-1
Safety regulations	ÖVE/VDE 0411/IEC 348/UL 1244
Radio interference suppression	VDE 0871/6.78, radio interference category B
EMC compatibility	As per IEC 801, Sections 2 and 3
Mode of protection	Protection category II without protective conductor
Test voltage	Mains circuit via mains supply unit to case and socket plug: 3 kV~ mains circuit via mains supply unit to measuring circuit: 8.4 kV=, measuring circuit to case: 8.4 kV=

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Voltage supply	External supply 12 V DC; socket plug DIN 45 318 SG 3.5 9 R14 cells 1.5 V, IEC LR 14 or IEC R 14; service life approximately 15 h (approximately 8–30 h depending on the type of battery) 9 NiCd accumulators 1.25 V, IEC KR 27/50; service life approximately 15 h, charging time approximately 14 h, maximum admissible time 20 h; mains supply unit (according to country of destination): primary voltage alternatively 120/220/240 V; plug according to the country of destination; frequency: 50/60 Hz, secondary 16 V/0.3 A, socket plug
Power input	Approximately 1 W for pen deflection of up to 0.5 Hz; maximum 3 W
Fuse	Fuse DIN 41662 or 41662/5 diameter x 20 mm, or UL 198 G/6.3 diameter x 32 mm mains circuit SE 110, T 1.00 (1.00 AT) for slow acting
Dimensions	306 x 231 x 76 mm (W x D x H)
Weight	Approximately 2.2 kg (including NiCd accumulators)

Appendix D
Ordering Information

731-8190	**Model 1325 Econo Chart Recorder,** with US power adaptor includes dust cover, 1 roll chart paper, 1 fiber tip pen, 1 spare fuse, 1 set banana cables, 1 U.S. power adaptor
731-8192	**Model 1325 Econo Chart Recorder,** without power adaptor includes dust cover, 1 roll chart paper, 1 fiber tip pen, 1 spare fuse, 1 set banana cables
731-8194	**Power Adaptor for USA, Canada, Japan, Mexico, Taiwan, Latin America**
731-8195	**Power Adaptor for UK, Commonwealth (Except Canada, Australia, and New Zealand)**
731-8196	**Power Adaptor for Australia and New Zealand**
731-8197	**Power Adaptor for Europe (Except the UK) and Other Countries Not Specifically Listed**
731-8198	**Chart Paper,** 2 rolls: 10 cm x 1,300 cm
167-0215	**Disposable Fiber Tip Pens,** 3 pens, each good for approximately 1,000 min
731-8261	**Cable #1,** 8-pin mini-DIN to DB-9 connector. For connection of Econo Fraction Collector to the Econo Pump, Econo UV Monitor, or Econo System Controller
731-8262	**Cable #2,** 8-pin mini-DIN to 8-pin standard DIN. For connection of the Model 1325 Econo Recorder to the Econo UV Monitor, Econo Pump, or Econo System Controller
731-8263	**Cable #3,** 8-pin mini-DIN to 8-pin mini DIN. Connects the Econo Pump to the Econo UV Monitor in the absence of the System Controller
731-8264	**Cable #4,** 8-pin mini-DIN to banana cable. To connect Econo UV Monitor to most non-Bio-Rad chart recorders
731-8266	**Break-out cable #6,** 8-pin standard DIN to bare wires. To connect Econo Recorder to non-Econo System recorders
731-8268	**Cable #8,** 8-pin standard DIN to DB-9 connector. For connection of Econo Recorders to Econo Fraction Collector
731-8191	**Model 1326 Dual-Pen Chart Recorder, 100/120 V,** with 1 roll chart paper, 2 fiber tip pens, 2 sets banana cables, 1 U.S. power cord
731-8193	**Model 1326 Dual-Pen Chart Recorder, 220/240 V,** with 1 roll chart paper, 2 fiber tip pens, 2 sets banana cables

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