OPERATOR'S MANUAL

CARRIER AMPLIFIER

AP-621G

2002 06 26

NIHON KOHDEN

GENERAL HANDLING PRECAUTIONS

This device is intended for use only by qualified medical personnel. Use only Nihon Kohden approved products with this device. Use of non approved products or in a non approved manner may affect the performance specifications of the device. This includes, but is not limited to, batteries, recording paper, pens and extension cables and cords for electrodes, input boxes and AC power.

Please read these precautions thoroughly before attempting to operate the instrument.

1. **To safely and effectively use the instrument, its operation must be fully understood.**

2. **When installing or storing the instrument, take the following precautions:**
   (1) Avoid moisture or contact with water, extreme atmospheric pressure, excessive humidity and temperatures, poorly ventilated areas, and dusty saline or sulphuric air.
   (2) Place the instrument on an even, level floor. Avoid vibration and mechanical shock even during moving.
   (3) Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.
   (4) The power line source to be applied to the instrument must correspond in frequency and voltage to specifications, and have sufficient current capacity.
   (5) Choose a room where a proper grounding facility is available.

3. **Before Operation**
   (1) Check that the instrument is in perfect operating order.
   (2) Check that the instrument is grounded properly.
   (3) Check that all cords are connected properly.
   (4) Pay extra attention when the instrument is in combination with other instruments to avoid misdiagnosis or other problems.
   (5) All circuitry used for direct patient connection must be doubly checked.
   (6) Check that battery voltage and battery condition are perfect when using battery-operated models.

4. **During Operation**
   (1) Both the instrument and the patient must receive constant, careful attention.
   (2) Turn power off or remove electrodes and/or transducers when necessary to assure the patient's safety.
   (3) Avoid direct contact between the instrument and the patient.

5. **To Shutdown After Use**
   (1) Turn power off with all controls returned to their original positions.
   (2) Remove the cords gently; do not use force to remove them.
   (3) Clean the instrument together with all accessories to keep them ready for their next use.

6. **The instrument must receive expert, professional attention for maintenance and repairs. When the instrument is not functioning properly, it should be clearly marked to avoid operation while it is out of order.**

7. **The instrument must not be altered or modified in any way.**

8. **Maintenance and Inspection:**
   (1) The instrument and parts must undergo regular maintenance inspection at least every 6 months.
   (2) If stored for extended periods without being used, make sure prior to operation that the instrument is in perfect operating condition.
   (3) Technical information such as circuit diagrams, parts list, descriptions, calibration instructions or other information is available for qualified user technical personnel upon request from your Nihon Kohden distributor.
9. **When the instrument is used with an electrosurgical instrument, pay careful attention to the application and/or location of electrodes and/or transducers to avoid possible burn to the patient.**
10. **When the instrument is used with a defibrillator, make sure that the instrument is protected against defibrillator discharge. If not, remove patient cables and/or transducers from the instrument to avoid possible damage.**

WARRANTY POLICY

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the operator's and service manuals.

No other party is authorized to make any warranty or assume liability for NKC's products. NKC will not recognize any other warranty, either implied or in writing. In addition, service performed by someone other than NKC or its authorized agents or technical modification or change of products without prior consent of NKC may be cause for voiding this warranty.

Defective products or parts must be returned to NKC or its authorized agents, along with an explanation of the failure. Shipping costs must be pre-paid.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

CONTENTS

Introduction

The model AP-621G is a sine-wave carrier amplifier which is a plug-in unit for the Polygraph system.
This unit measures the cardiac function of animals using a catheter or the pulmonary function. Also it measures pressure, velocity, accelaration, etc, in combination with each transducer.
The dynamic operating range of the unit offers both clinical and research applications.

Please read this manual thoroughly prior to operation. Also refer to the operator's manual of the main unit and the other plug-in units.

Features

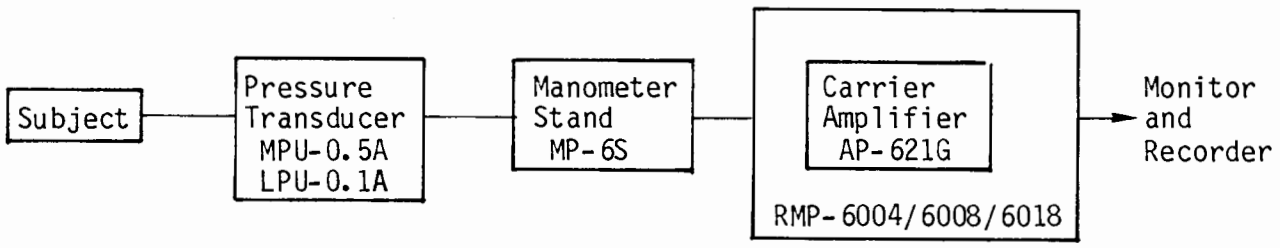
1. Provides a wide dynamic range of input (16μVrms to 300mVrms) and a wide calibration range.
2. The sine-wave excitation signal used for the bridge circuit allows many types of transducers to be connected.
3. Five types of measuring unit indication panels are provided.

Composition

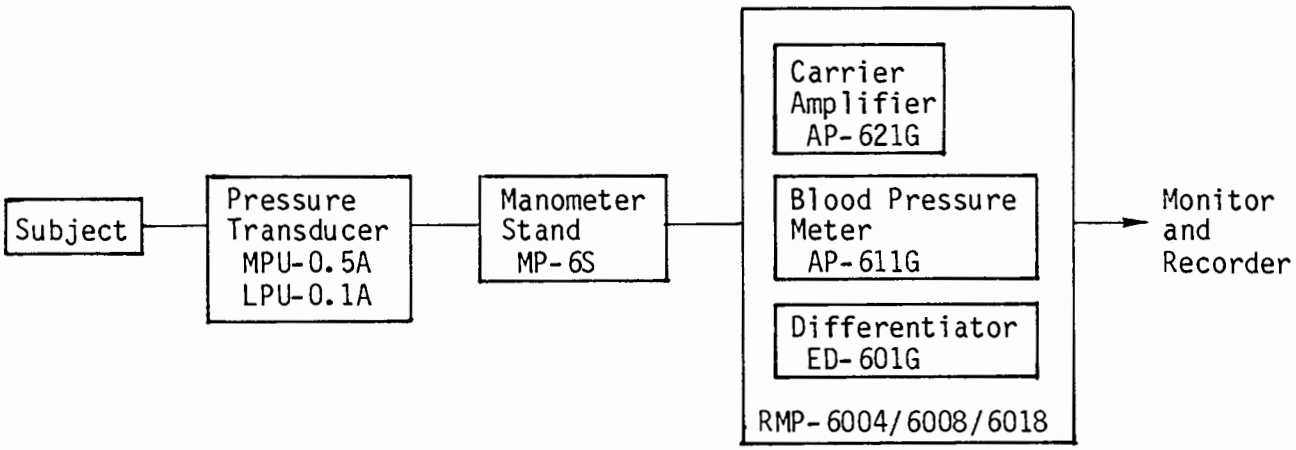
This unit is plugged in the Polygraph Amplifier Console RMP-6004/6008/6018.
In combination with various types of transducers, this unit permits various measurements.

COMPOSITION EXAMPLES

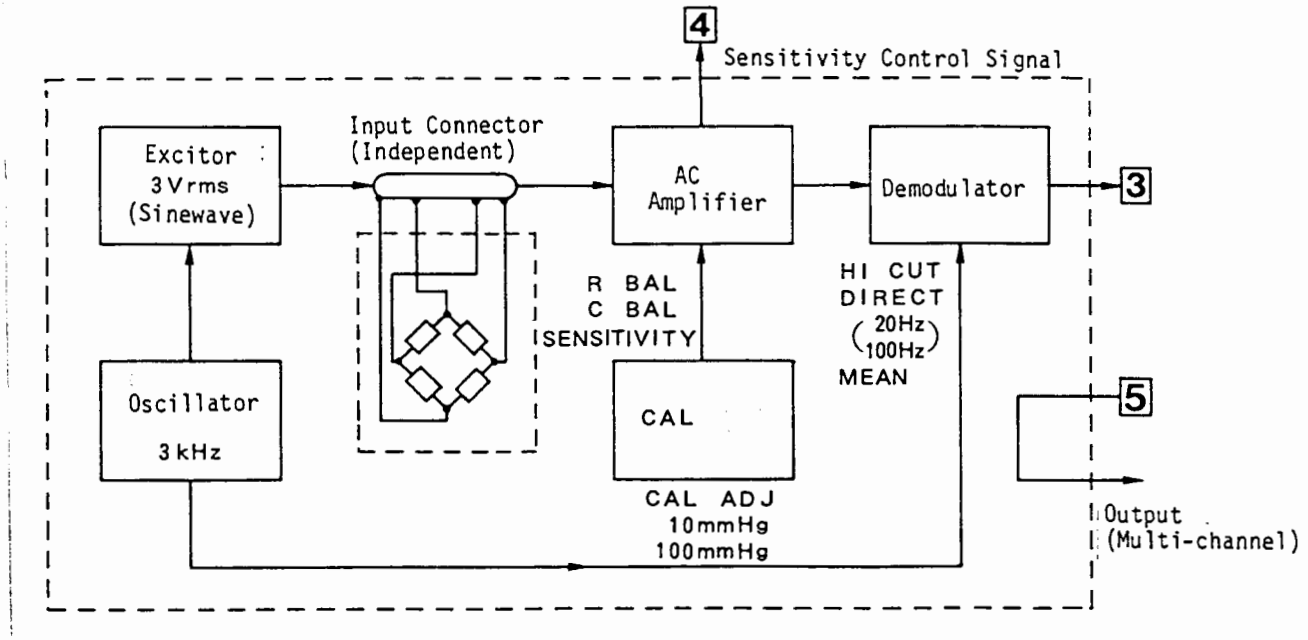
Blood Pressure Measurement



Blood Pressure Value Indication and Differentiation



BLOCK DIAGRAM



Controls and Switches

Refer to Panel Illustration on page 9. 10

(1) **MEAS-OFF-BAL-CAL**

MEAS : Measures the input signal.
OFF : Turns the amplifier off.
BAL : Balances the zero level of a transducer with two adjustment knobs.
CAL : Applies the calibration signal.
CAL I and II correspond to the numbers indicated on the right lower part of the SENSITIVITY control.

Measuring unit (mmHg/DIV)	CAL I ; 10mmHg CAL II ; 100mmHg
Measuring unit (mmH_2O/DIV)	CAL I ; 20mmH_2O CAL II ; 200mmH_2O

Other measuring unit indication panel show two calibration signals in the same way as above.

NOTE

The calibration signal can not be superimposed on the input signal during measurement (MEAS is pressed).

(2) **C-BAL**
Capacitance Balance
(3) **R-BAL**
Resistance Balance

Press the BAL of the MEAS-OFF-BAL-CAL switch (1), and adjust the C-BAL and R-BAL adjustment knobs to minimize output.

(4) **SENSITIVITY**
Step Control

Selects the sensitivity in 6 steps.

(5) **SENSITIVITY**
Fine Control

Controls the fine sensitivity.

(6) **CAL ADJ**

Adjust the amplitude of calibration signal using 2mm screwdriver only when a different calibration amplitude than indicated on the panel is required for use of other types of transducer.
(Refer to SENSITIVITY CALIBRATION on page 6.)

(7) **DIRECT-MEAN**

Selects high frequency characteristic of the amplfier.

DIRECT : An amplified signal is obtained directly at the output.
High cut frequency can be selected from 100Hz and 20Hz with the 20Hz-100Hz direct filter selector in the DIRECT mode.

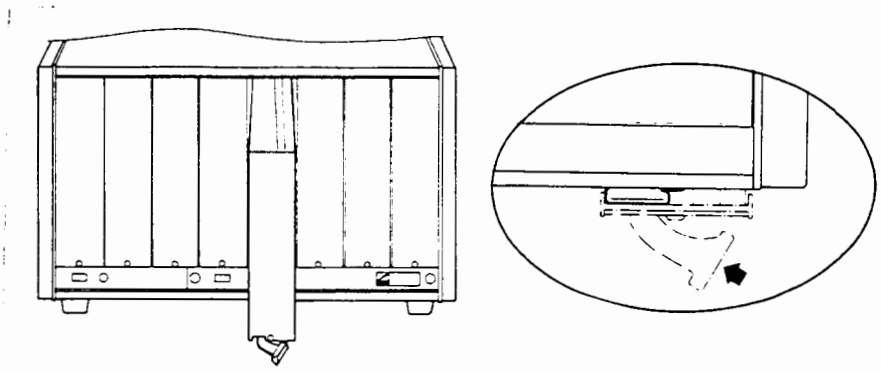
MEAN : The mean value (time constant : 2sec) of an amplifier signal is obtained.

NOTE

The mean value is obtained 4 or 5 seconds after this switch is set to MEAN from DIRECT.

(8) Module Lock Lever

Pull this lever to draw out the unit from the Polygraph Amplifier Console.
After setting the internal switch, be sure to attach the side shield plate to the plug-in unit and restore the unit.



(9) **20Hz-100Hz** DIRECT Filter Selector

This selector is available when the DIRECT-MEAN selector (7) is set to the DIRECT.
High cut frequency is set to 20Hz or 100Hz.

The following selectors are set in the factory with the Polygraph Amplifier Console. There is no need to set the selectors unless the console type is changed.

(10) RMP-6004/6004 - RMP-6018 Console Selector

Set this selector according to the Polygraph Amplifier Console.
When the AP-621G is plugged into the console RMP-6018, sensitivity and measuring unit annotations are printed on a recorder equipped with annotation printing.

(11) Sensitivity
(12) Annotation Socket

Used to set sensitivity annotation.
Plug 6 pins(11) or 2 pins(12) into the sockets for setting according to the list ALPHANUMERIC ANNOTATION on page 8.
This sockets are not available when the AP-621G is plugged into the console RMP-6004 or 6008.

(13) Measuring Unit Annotation Socket

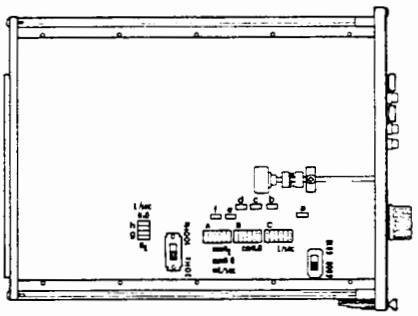
Used to set measuring unit annotation.
Plug a pin into the socket for setting according to the list ALPHANUMERIC ANNOTATION.
These sockets are not available when the AP-621G is plugged into the console RMP-6004 or 6008.

Measurement

(BLOOD PRESSURE)

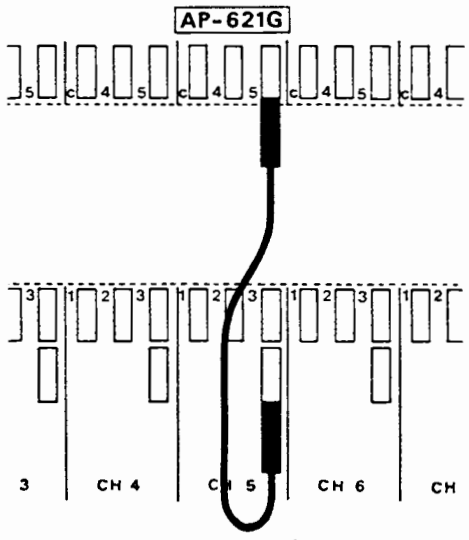
INTERNAL SWITCH SETTING

Pull the unit lock lever and draw out the AP-621G from the Polygraph Amplifier Console. Remove the side shield plate from the amplifier and check to see that the following switches are set properly as follows. After setting the internal switches, be sure to re-attach the side shield plate to the pulg-in unit and restore the unit.



CONNECTION BOARD WIRING

Draw out the connection board from the Polygraph Amplifier Console.
Connect terminals 3 and 5 of the corresponding channel with the connection lead. After connection, restore the connection board to the console



POWER ON

After making sure that the ground lead and power cord are properly connected, turn on the power of the rack, console, monitor and recorder.
Check to see that the power indication lamps light.

TRANSDUCER CONNECTION

Connect the transducer to the independent connector on the rear of the Polygraph Amplifier Console according to the measuring purpose.

NOTE

Remove air bubbles in the dome of a transducer or pressure path since air bubbles cause waveform distortion.
Beware of resonance of the catheter and vibration on the tip of the catheter which appear on the pressure waveform as noise.

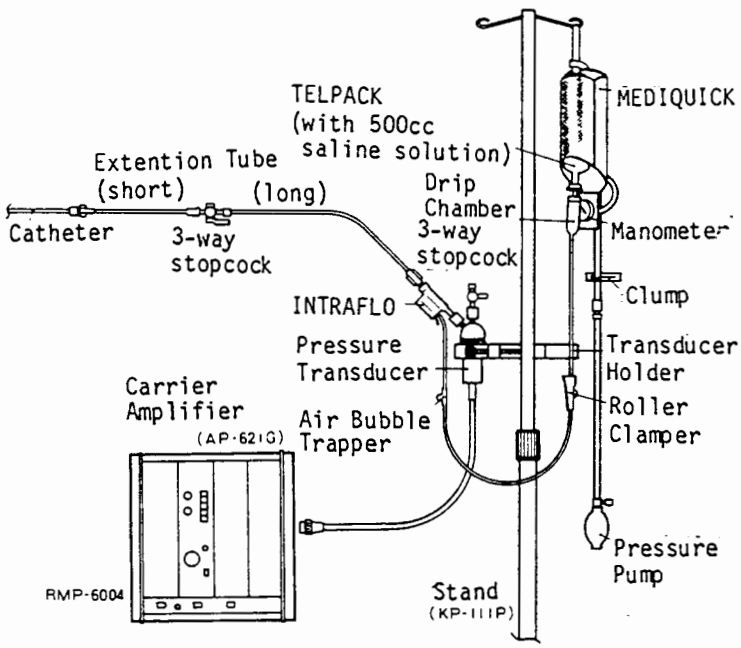
Electrocautery may induce high frequency noise.

ZERO BALANCE ADJUSTMENT

1. Make sure of the following control settings.

   MEAS-OFF-BAL-CAL switch(1) : OFF
   SENSITIVITY selector(4) : 100mmHg/DIV
   or 200mmH_2O/DIV
   DIRECT-MEAN selector(7) : DIRECT

2. Vent the transducer to the air.



3. Adjust the baseline position of the recorder and monitor.

4. Push the BAL of the MEAS-OFF-BAL-CAL switch(1).

5. Adjust the R-BAL knob(3) to bring the trace to the previous baseline position.
   Adjust the C-BAL knob(2) the same as the R-BAL.

6. Turn the SENSITIVITY control(4) one step to increase the sensitivity.
   Adjust the R-BAL and C-BAL alternately to bring the trace to the previous baseline position.
   Repeat this procedure, increasing the sensitivity to maximum.

7. Push the MEAS of the MEAS-OFF-BAL-CAL switch and make sure that the trace returns to the previous baseline position.
   If the trace does not return to the previous baseline position, adjust the R-BAL.

NOTE

Once the above adjustment is completed correctly, re-adjustment is not required. However when the unit is not used for a long period of time, or is used for long-term continuous measurement, the balance should be checked.
Also when the transducer is replaced, repeat the above adjustment from the beginning.

SENSITIVITY CALIBRATION

Push the CAL I or II of the MEAS-OFF-BAL-CAL switch according to blood pressure value. CAL I and II indicate the following calibration signals.

mmHg/DIV	CAL I	: 10mmHg
	CAL II	: 100mmHg
mmH_2O/DIV	CAL I	: 20mmH_2O
	CAL II	: 200mmH_2O
cmH_2O/DIV	CAL I	: 1cmH_2O
	CAL II	: 10cmH_2O

Make sure that pen deflects properly in every sensitivity position as follows.

Ex.) In mmHg/DIV

Sensitivity	Pen deflection
100	1cm
50	2cm

In mmH_2O/DIV

Sensitivity	Pen deflection
20	1cm
100	0.2cm

MEASUREMENT

After completing the above adjustment, set the MEAS-OFF-BAL-CAL switch(1) to MEAS to start the measurement.
Apply the signal to the transducer to obtain an amplified signal at the output. Set the SENSITIVITY control(5) to the desired position to obtain the appropriate recording on the recorder.
After measurement or when changing the sensitivity, record a calibration signal for later referece.

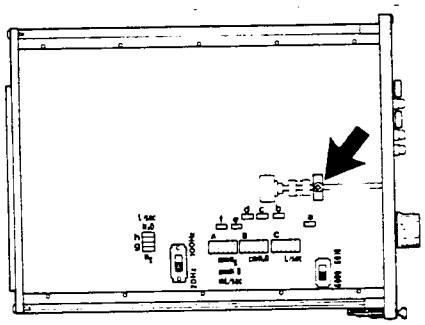
Calibration

Usually the carrier amplifier is calibrated in the factory, being coupled with the mating transducer. However, recalibrate the amplifier before measurement in the following cases.

* When the unit has not been used for a long period of time.
* When an uncalibrated transducer is used.
* When the measuring unit indication panel is replaced.

PREPARATION

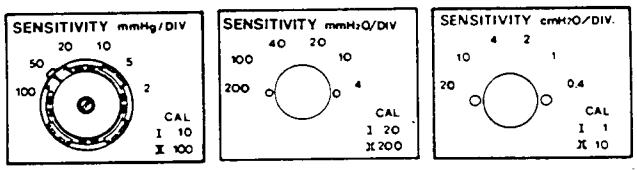
1. Draw out the unit from the console and remove the side shield plate.
2. Loosen the screw indicated by an arrow in the figure below.



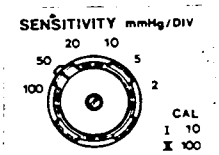
3. Adjust the CAL ADJ(6) for calibration signal amplitude adjustment.
4. Tighten the above screw.

PRESSURE CALIBRATION

(mmHg/DIV, mmH_2O/DIV, cmH_2O/DIV)



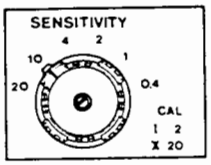
1. Run the recorder at slow paper speed.
2. Push the OFF of the MEAS-OFF-BAL-CAL switch(1).
3. Adjust the baseline position on the recorder as desired.
4. Set the SENSITIVITY selector(4) to 50mmHg/DIV.



5. Push the MEAS of the MEAS-OFF-BAL-CAL switch(1).
6. After making sure that the transduer zero balance is properly adjusted, apply 100mmHg pressure to the transducer using a mercury manometer.
7. Adjust the pen deflection to 20mm with the sensitivity fine control(5).
8. Push the CAL II of the MEAS-OFF-BAL-CAL switch(1).
9. Adjust the pen deflection to 20mm with the CAL ADJ(6).

Then, CAL I (10mmHg) is also calibrated. The mmH_2O/DIV and cmH_2O/DIV are calibrated in the same way using a water manometer.

FORCE/DISPLACEMENT CALIBRATION



Refer to the operator's manual of the TB-611T/612T.
This description applies to calibration of the white spring type.

1. Run the recorder at slow paper speed.
2. Push the OFF of the MEAS-OFF-BAL-CAL switch(1).
3. Adjust the baseline position on the recorder as desired.
4. Set the SENSITIVITY selector(4) to 20.
5. Push the MEAS of the MEAS-OFF-BAL-CAL switch(1).
6. After making sure that the transduer zero balance is properly adjusted, hook a weight of 200g to the transducer.
7. Adjust the pen deflection to 20mm with the sensitivity fine control (5).
8. Push the CAL II of the MEAS-OFF-BAL-CAL switch(1).
9. Adjust the pen deflection to 20mm with the sensitivity fine control(5).

Then, CAL I (10mmHg) is also calibrated.

Alphanumeric Annotation

The AP-621G when plugged into the Polygraph Amplifier Console RMP-6018 provides the following alphanumeric data to be printed on a recorder equipped with annotation printing facility.

Measuring unit : mmHg, mmH_2O, cmH_2O, L/sec, mL/sec
Plug-in unit status : MEAS, OFF, BAL, CAL I, CAL II
Sensitivity :

Sensitivity and unit		Socket
100-50-20-10-5-2	(mmHg)	A
200-100-40-20-10-4	(mmH_2O)	A
20-10-4-2-1-0.4	(cmH_2O)	B
2-1-0.4-0.2-0.1-0.04	(L/sec)	C
200-100-40-20-10-4	(mL/sec)	A
20-10-4-2-1-0.4	(No unit)	B

To output alphanumeric annotation, set pins into sockets as follows.

	Socket (11)	(12)	(13)
mmHg	A	g	a
mmH_2O	A	h	b
cmH_2O	B	h	c
L/sec	C	h	d
mL/sec	A	h	e
No unit	B	h	f

Specifications

Bridge Voltage	3Vrms, ±5%
Bridge Frequency	3kHz
Maximum Sensitivity	>1V/16μVrms
Sensitivity	2-5-10-20-50-100mmHg/DIV, ±5%
Calibration	10, 100mmHg/DIV, ±3%
Frequency Responce	
High Cut	DIRECT 20Hz, 100Hz, ±20%
Time Constant	MEAN 2sec
Linearity	3% Full scale
Internal Noise Level	<4μVp-p
Drift	
Time	5μV/h
Temperature	5μV/°C
Dimensions	50(W) x 200(H) x 280(D) mm
Net-weight	Approx. 1.1kg

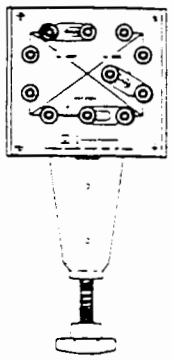
Related Instruments

Blood Pressure Meter

AP-611G

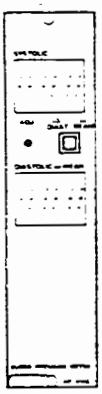
Pressure Procedure

EQ-601G



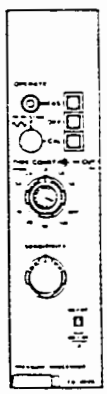
Integrator

EI-601G



Strain Gauge Input Box

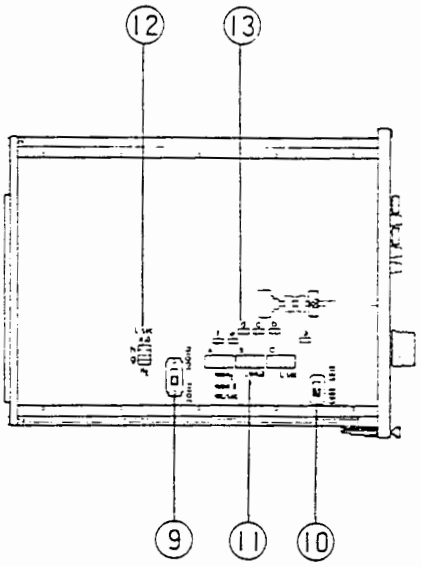
JP-610G

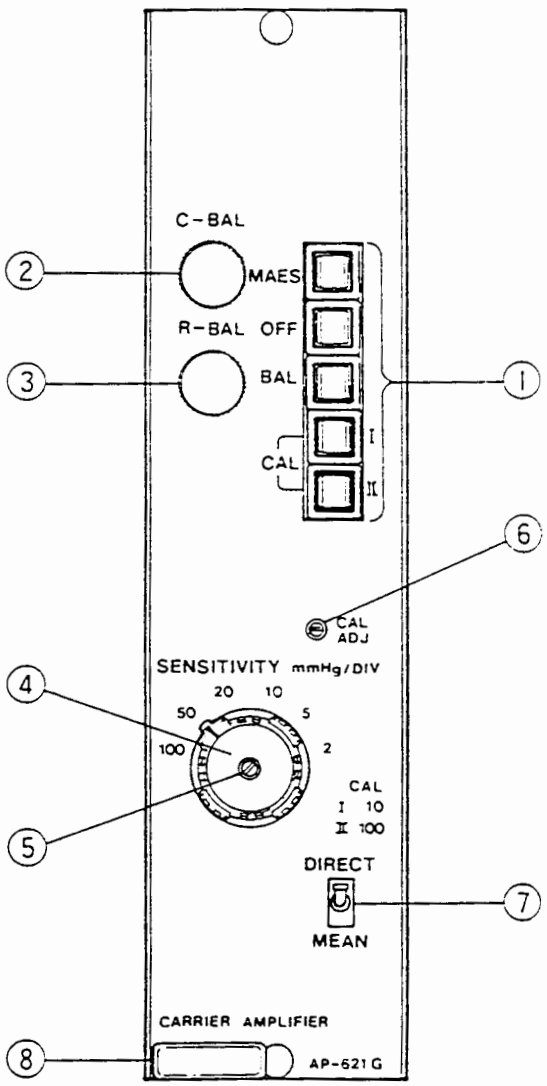


Standard Accessories

No.	Description	Q'ty	Code No.
1	Measuring unit (cmH_2O/DIV) indication panel	1	1124-008392
2	(mmH_2O/DIV)	1	1124-008418
3	(mL/sec/DIV)	1	1124-008427A
4	(No unit)	1	1124-008436A
5	(L/sec/DIV)	1	1124-008445

Panel Illustration





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The model and serial number of your instrument are identified on the rear or bottom of the unit. Write the model and serial number in the spaces provided below. Whenever you call your distributor concerning this instrument, these two pieces of information should be mentioned for quick and accurate service.

Model _____ Serial number _____

YOUR DISTRIBUTOR

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